REFERENCE MANUAL

Portal

for Version 2.4

Wireless Technology to Control and Monitor Anything from Anywhere™

Doc# 600024-01B

1. Introduction

Synapse *Portal* is a standalone software application that runs on a standard PC. Using a USB or RS232 interface, it connects to any node in the SNAP Wireless Network and becomes a graphical user interface (GUI) for the entire network. Using *Portal*, you can quickly and easily create, deploy, configure, and monitor SNAP-based network applications. Once connected, the *Portal* PC has its own unique SNAP Network Address and can participate in the SNAP network as a peer.

It is also possible for *Portal* to connect to your SNAP network through the SNAPconnect application (instead of a direct USB or RS-232 connection). This allows you to develop, configure, and deploy SNAP applications over the Internet.

Along with this document there are several other main documents you need to be aware of:

Start with an "Evaluation Kit Users Guide"

Each evaluation kit comes with its own Users Guide. For example, the EK2500 kit comes with the **EK2500 Evaluation Kit Users Guide** ("**EK2500 Guide**"), and the EK2100 kit comes with the **EK2100 Evaluation Kit Users Guide** ("**EK2100 Guide**").

Each of these guides walks you through the basics of unpacking your evaluation kit, setting up your wireless nodes, and installing *Portal* software on your PC. You should start with one of those manuals, even if you are not starting with an EK2500 or EK2100 kit. (Synapse SNAP nodes and even their component *RF Engines* are also sold separately, as well as bundled into evaluation kits.) These manuals are available from the support forum.

There is also a companion manual to this user's guide, the **SNAP Reference Manual**. In the **SNAP Reference Manual** you can find detailed information about the SNAP protocol and how to use it.

About This Manual

This manual assumes you have read and understood either the **EK2100 Guide** or the **EK2500 Guide**. It assumes you have installed the *Portal* software, and are now familiar with the basics of discovering nodes, uploading SNAPpy scripts into them, and controlling and monitoring them from *Portal*.

Other Important Documentation

Be sure to check out all of the SNAP documentation:

There is a separate user manual on Synapse *SNAPconnect*. *SNAPconnect* allows you to monitor and control your nodes from remote locations, over TCP/IP.

There is a wealth of valuable information in the **SNAP Hardware Technical Manual**. This document covers every jumper and every connector of every type of node included in the evaluation kit.

For your convenience, much of the information available in the **SNAP Hardware Technical Manual** has been broken down into individual "Quick Start" guides. For example, there is a **SN171 Proto Board Quick Start** and a **SN132 SNAPstick Quick Start**.

There is also a dedicated support forum at http://forums.synapse-wireless.com.

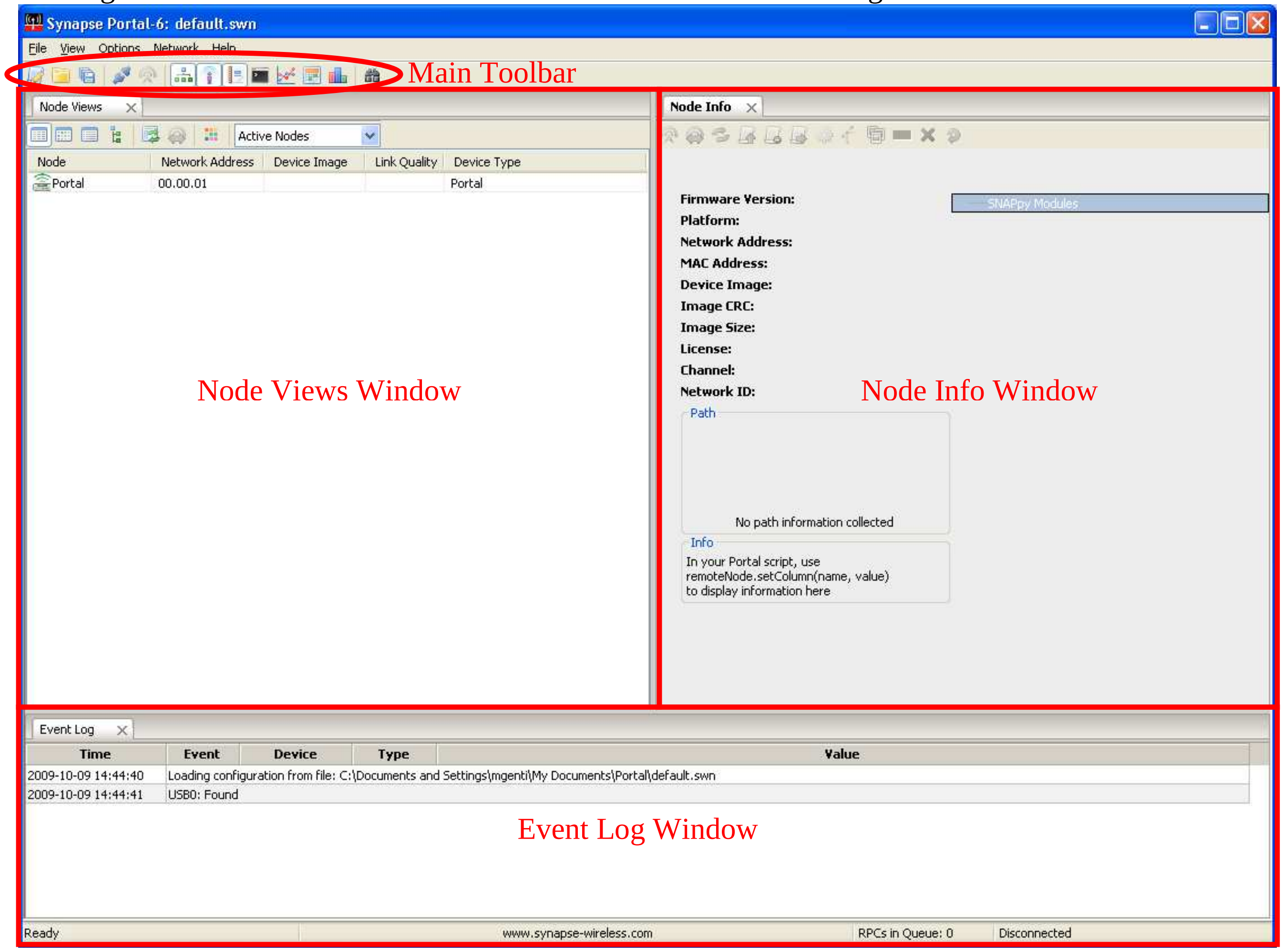
In the forum, you can see questions and answers posted by other users, as well as post your own questions. The forum also has examples and Application Notes, waiting to be downloaded.

You can download the latest *SNAP*, *Portal*, and *SNAPconnect* software from the forum. You can also download the latest documentation from the forum, including the *EK2500* and *EK2100* guides. (You might want to do this if you bought standalone modules instead of buying a kit.)

2. The Portal Environment

Portal is the desktop environment used to configure and deploy a *SNAP* network. It also provides a user-customizable interface to aid in developing your SNAPpy scripts. All of *Portal*'s windows can be resized, relocated, and enabled/disabled to configure the environment as needed.

Starting *Portal* for the first time shows *Portal*'s default window configuration:



Node	Network Address	Device Image	Link Quality	Device Type
Portal	00.00.01			Portal

Firmware Version:
Platform:
Network Address:
MAC Address:
Device Image:
Image CRC:
Image Size:
License:
Channel:
Network ID:

Path

No path information collected

Info

In your Portal script, use remoteNode.setColumn(name, value) to display information here

Time	Event	Device	Type	Value
2009-10-09 14:44:40	Loading configuration from file: C:\Documents and Settings\mgenti\My Documents\Portal\default.swn			
2009-10-09 14:44:41	USB0: Found			

```
Ready          www.synapse-wireless.com          RPCs in Queue: 0          Disconnected
```

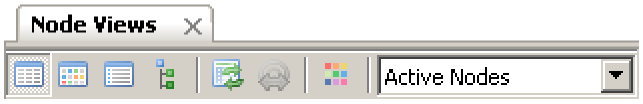
From this user interface you can connect to a SNAP bridge node and start viewing and configuring your SNAP network. The nodes in your network will be displayed in the **Node Views** window as they start responding to queries made by *Portal*. Selecting a node by clicking on it in the **Node Views** window will display detailed information about that node over in the **Node Info** window. Finally, the **Event Log** window displays event message about things that have occurred in the system and in the SNAP network.

The remainder of this document is a reference guide to all of the *Portal* GUI elements. Each of *Portal*'s windows, toolbars, and options will be described in the next sections. For a more tutorial-like introduction to *Portal*, please see the **EK2100** or **EK2500 Users Guide**.

3. SNAP Node Views

The starting point for managing SNAP nodes is the **Node Views** tab. If this window is not already open, you can click on **View**, then choose **Node Views window**. Alternatively, you can click on the icon on the toolbar.

You will notice that the **Node Views** window has its own toolbar.

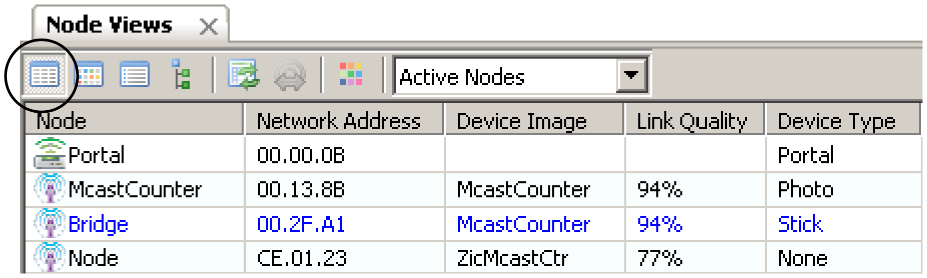


The **Node Views** tabbed window lets you look at your nodes in four different ways:

- ***Report View***
- ***Icon View***
- ***List View***
- ***Tree View***

These four options provide different views of the same network information.

Click on the ***Change to Report View*** button in the ***Node Views*** toolbar (not the main toolbar). Several columns of information are shown about each node found.



Node	Network Address	Device Image	Link Quality	Device Type
Portal	00.00.0B			Portal
McastCounter	00.13.8B	McastCounter	94%	Photo
Bridge	00.2F.A1	McastCounter	94%	Stick
Node	CE.01.23	ZicMcastCtr	77%	None

The **Node** column shows an *icon* and a *name* for each node. Both the icon and name can be changed by the user. What you see here are just the default icons.

is used within *Portal* to generically represent any SNAP node.

is used within the *Portal* user interface to represent *Portal* itself.

(Remember, *Portal* is able to participate in the network as if it were a wireless node.)

The name for the node is assigned when the node is first discovered, and can come from three possible sources:

- As of version 2.1, it is possible to assign a name to a node
- If you don't give a node a name, it will use the name of any loaded script
- If no name given and no script loaded, *Portal* will use "Node" as a base name

If more than one node would have the same name based on this arrangement, a trailing numeric identifier is appended to the base name so that all nodes have unique names. This is a *Portal* requirement. You can rename your units but each name must be unique.

The **Network Address** column shows the three-byte Network Address for each node. The Network Address is simply the last three bytes of the node's MAC Address, and is not user definable.

The **Device Image** column shows the SNAPpy script/image loaded into the device. If there is no script loaded into the node, then this field is blank. Notice that this field tracks the currently loaded script. If you upload a different script into a node *after* it has been discovered/named, then this column can be different from the **Node** column.

The **Link Quality** column shows a snapshot of the *radio* receive level. By default, it is expressed as a percentage, with 0% (-95 dBm) representing the weakest possible signal and 100% (-18 dBm) representing a maximum strength signal. (You can the system preferences to display the direct signal strength in the system preferences. See section 9 for more details.)

It is important to understand three things about the displayed Link Quality:

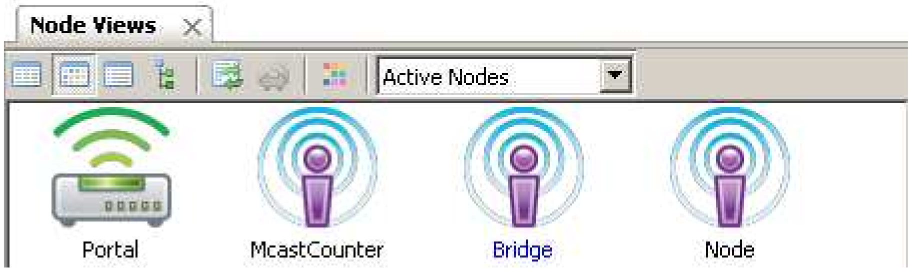
1) Normally this field **is not** continuously refreshed – *Portal* does not "poll" nodes unless you tell it to. You *can* use the **Broadcast PING** button to update the Link quality fields of all active units. There is also a ***Refresh*** button you can click on to force a refresh of a single node's Link Quality. This button is on the **Node Info** toolbar, and is covered in section 4. Finally, there is a **Watch Nodes** button that essentially turns on automatic broadcast pings.
2) The value shown is based on the received signal strength of the most recent message *from **any** other wireless node*. It **does not** represent the signal strength between *Portal* and the node. (It **is not** an indication of the USB or RS232 quality between *Portal* and *Portal*'s bridge node.)
3) It is possible that *at the time* the **Link Quality** field was read from the unit, it had *not yet* received any radio messages from any other node. In this case, a value of 0 will be reported. This does not mean the unit has a faulty radio; it simply has not done any radio communications yet. This is most often seen with the node that is acting as a "bridge" for *Portal*, because *Portal* can be interacting with this *directly attached* node *without* necessarily generating any **radio** traffic.

The **Device Type** column shows one of the non-volatile (NV) configuration parameters of the unit. Device Type is simply a second string label that can be applied to a node. Unlike the **Node Name**, this label does not have to be unique, and is often used to show what job or role a node is filling. This parameter can also be read by SNAPpy scripts, allowing a single script to act differently on different nodes, simply by setting the Device Type of each node appropriately.

You may notice the text for one of the nodes is blue. This is *Portal*'s way of showing which node it thinks is its bridge onto the SNAP network.

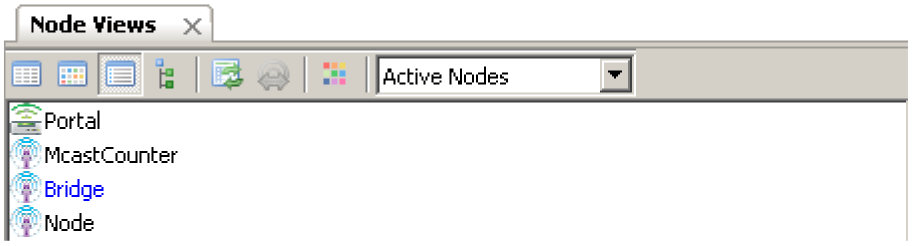
NOTE – If you change cabling on nodes it is possible to trick *Portal*. The blue highlighting is only accurate when you first discover your SNAP network. (You can use ***Network → New Configuration…*** to force a re-discovery.)

Clicking on the ***Icon View*** button brings up the following representation of your network.



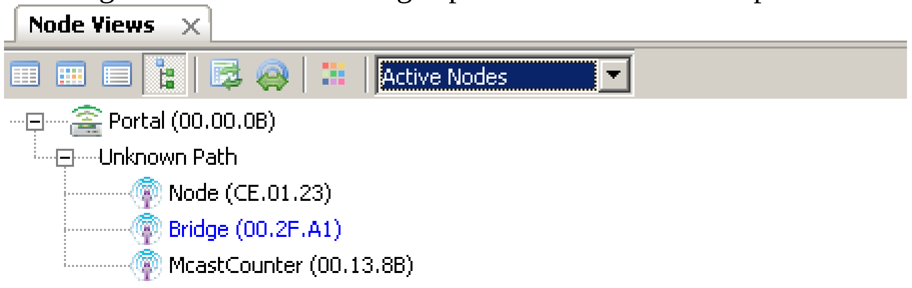
In this view only the Node Icon and Node Name are shown.

Clicking on ***List View*** brings up another alternate view of your network.



This view shows the same information as the **Icon View**, but comes in handy when you have a large quantity of SNAP nodes in your network.

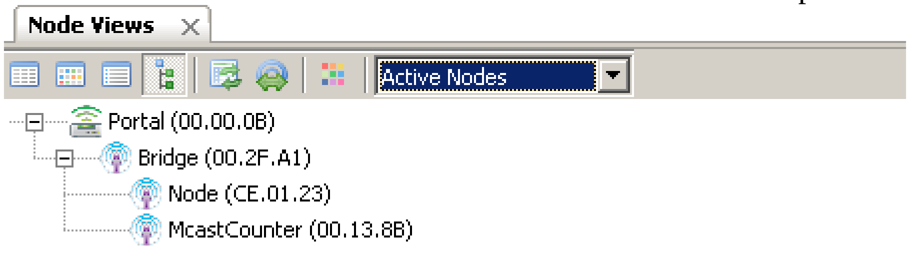
Clicking on ***Tree View*** brings up the next Node View option.



The tree view can show a hierarchical representation of how nodes reach each other. By default, *Portal* does not collect the path information to display a full tree view of a SNAP network. However the ***Trace Route*** button, described later, can assist in getting this information.

The ***Watch Nodes*** button has already been mentioned briefly. This button toggles *Portal*'s "Node Watcher" (automatic periodic polling of nodes). If you need to "see" nodes coming and going, you can turn on the Node Watcher instead of manually clicking ***Broadcast PING*** periodically. To accommodate increased network traffic, *Portal* extends its timeout for listening for ping replies by one second when ***Broadcast Ping*** is on. You can set this timeout (the Ping Response Spread) from the Properties window.

The ***Trace Node Routes*** button enables *Portal* to collect path information about currently displayed nodes. This option is only available while in the tree view mode. Once *Portal* has collected the path information on how to reach each node the tree view will be updated:



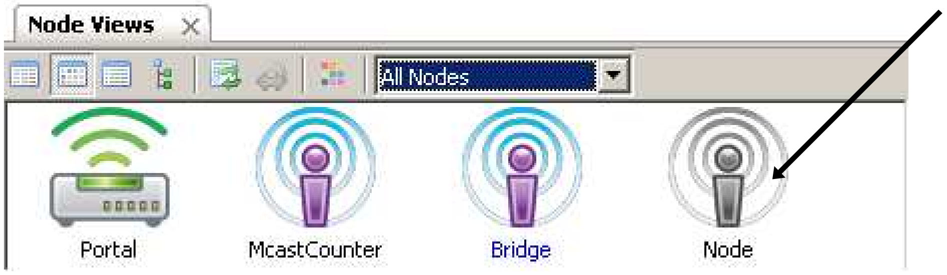
```
Portal (00.00.0B)
  Bridge (00.2F.A1)
    Node (CE.01.23)
    McastCounter (00.13.8B)
```

In this example network we can see that nodes CE.01.23 and 00.13.8B route packets through the bridge node, 00.2F.A1, to reach *Portal*. As nodes are spread apart and it is necessary for nodes to "hop" through other nodes, the tree view can become more and more branched. This view enables you to see a snapshot of how nodes route messages through each other through the SNAP mesh network.

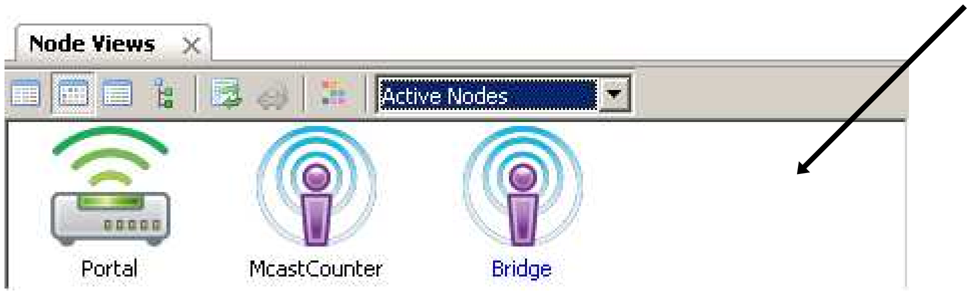
The ***Change Colors*** button brings up a color selection dialog used to change the text and/or background colors of these views. You might need to do this if you are using your own custom icons. Be careful to not set the text and background colors to the same (or similar) colors, or you will not be able to read your text against the background. The text for the bridge node remains blue regardless of how you set the text color.

The last control in the ***Node Views*** toolbar is a drop-down selector box that lets you choose to see only the **Active Nodes** or **All Nodes**. Both views are identical as long as all nodes are online and communicating.

With the filter set to show **All Nodes**, when *Portal* sees that a unit has stopped responding, it will be grayed-out in all three views.



With the filter set to show only **Active Nodes**, when *Portal* sees that a unit has stopped responding it will be completely removed from all three views.



Screenshots are only shown for the **Icon View**, but the other views behave similarly.

4. SNAP Node Configuration

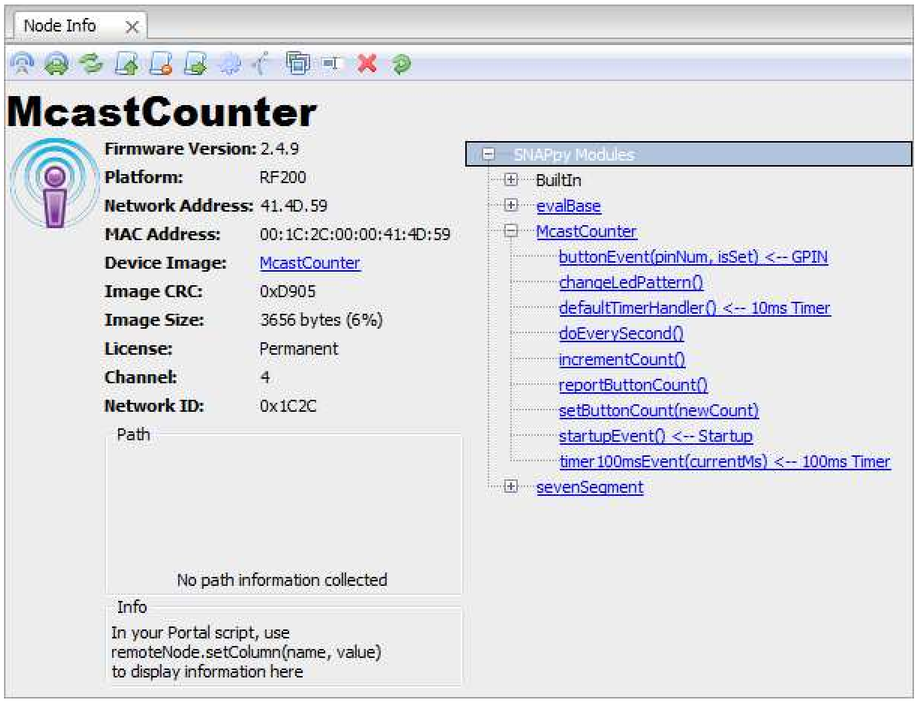
The configuration of an individual node, including the *Portal* node, can be viewed and changed from the ***Node Info*** tab.

If the ***Node Info*** tab is already visible within *Portal*, selecting a node in the ***Node Views*** tab will display that specific node's info in the ***Node Info*** tab.

If the ***Node Info*** tab is not already visible, you can show it by using ***View → Node Info Window*** or by double-clicking on the desired node in the ***Node Views*** tab.

Starting in the upper left-hand corner, the ***Node Info*** tab shows the:

- "Logical name" of the node
- Firmware (or software, for the *Portal* node) version and type, if special (Debug, AES-128)
- Some network configuration parameters
- Device Image and Image CRC for remote nodes, or Image Modified date for *Portal* images
- Image size information, indicating how much space is in use in the node for SNAPpy scripts[1]
- License information (Permanent or Demo)
- Some more network configuration parameters



McastCounter

Firmware Version:	2.4.9
Platform:	RF200
Network Address:	41.4D.59
MAC Address:	00:1C:2C:00:00:41:4D:59
Device Image:	McastCounter
Image CRC:	0xD905
Image Size:	3656 bytes (6%)
License:	Permanent
Channel:	4
Network ID:	0x1C2C

Path

No path information collected

Info

In your Portal script, use remoteNode.setColumn(name, value) to display information here

The left-hand side continues with **Path** and **Info** panes. The right-hand side shows a tree view of the callable scripted functions.

[1] On RF300 and RF301 hardware, which features external memory on an Si100x platform, Portal will display two numbers. The first refers to the internal memory space in use, and the second refers to the external space in use. Internal memory is used for global variables, lists of functions, lists of constants, and other overhead data, while external memory is used for constant data, variable data, script storage, and other overhead. If you find you are on the border of running out of internal memory, you can reduce the number of constants in use, reduce the number of functions in your program, or reduce the size of your function names to recover some space.

Network Configuration Parameters

There are four network configuration parameters: **Network Address**, **MAC Address**, **Channel**, and **Network ID**.

SNAP **MAC address**es are standard 64-bit IEEE MAC addresses. MAC addresses are assigned to the node at the factory.

The **Network Address** is the three-byte identifier that is actually used by the SNAP wireless protocol. It matches the last three bytes of the eight-byte MAC address.

There are 16 allotted **Channel**s for Synapse products. In the 2.4 GHz band used under the 802.15.4 specification, each channel maps to a particular specification channel. For nodes in the 900 MHz range these are logical channels, each of which uses a range of 25 frequencies. See the SNAP Reference Manual for more details on the frequencies used by each of these configurations.

The SNAP **Network ID** can be thought of as a “logical channel.” This 16-bit integer may be assigned any hexadecimal value from 0x0001 through 0xFFFE. Devices in a SNAP network must share both the same Channel and same Network ID in order to communicate. This allows multiple SNAP networks to share the same channel if required, although it is preferred to place independent networks on separate *physical* channels to reduce collisions.

Node Info – Tasks Pane

There are ten toolbar options in this pane. (Not all are active for the *Portal* node.)

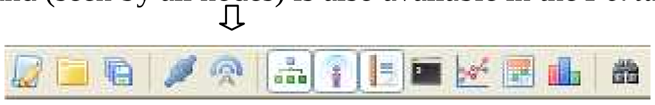
- ***Ping –*** poll a node for connectivity.
- ***Traceroute*** – collect path information to the node.
- ***Refresh*** – poll a unit for the values shown in the Node Info tab.
- ***Upload SNAPpy Image*** – program a node with a new script. (This button is labeled ***Change Portal Base File*** for the *Portal* node.)
- ***Erase SNAPpy Image –*** remove previously loaded script. (This button is labeled ***Clear Portal Base File*** for the *Portal* node.)
- ***Export SNAPpy Image*** – export a SNAPpy image as a .SPY file.
- ***Change Configuration Parameters –*** more on this below.
- ***Intercept STDOUT –*** divert the node’s script output to *Portal*.
- ***Change Icon*** – substitute an alternate PNG graphic file as the node’s icon.
- ***Rename Node*** – replace the node’s current logical name.
- ***Remove Node –*** remove the node from the various **Node Views**.
- ***Reboot Node –*** reboot the node.

Ping

Clicking on this action causes *Portal* to make a quick connectivity test to the selected node. Observe the Event Log for confirmation of Ping activity.

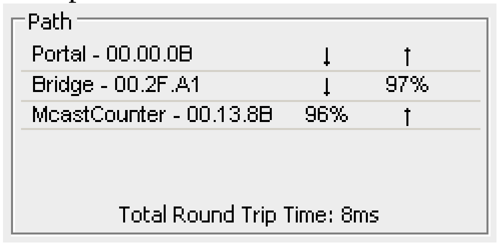
The ***Ping*** action is not available for the *Portal* node.

A ***Broadcast Ping*** command (seen by all nodes) is also available in the *Portal* toolbar, here:



Traceroute

This action sends a SNAP traceroute packet to the current node. A traceroute packet collects the SNAP network address and link quality of each node that it travels through to reach its destination. For example, a traceroute from *Portal*, at address 00.00.0B, to another node, at address 00.13.8B, might take the following path:
00.00.0B *to* 00.2F.A1 *to* 00.13.8B *back to* 00.2F.A1 *and finally back to* 00.00.0B
This path would be visualized in the **Path** pane as:



Path		
Portal - 00.00.0B	↓	↑
Bridge - 00.2F.A1	↓	97%
McastCounter - 00.13.8B	96%	↑

Total Round Trip Time: 8ms

The arrows represent a hop in the path where no link quality information needed to be collected. The link between *Portal*, 00.00.0B, and the bridge node, 00.2F.A1, is a serial connection, which has no link quality. The 96% link quality shown in the example represents the link quality as received by node 00.13.8B when sent from 00.2F.A1. Another way to describe it is the link quality shown is what the listening node “heard” from the sending node.

Lastly, the *Total Round Trip Time* is the time it took for the bridge to send the traceroute request and then receive the response back. You might notice that the time varies between traceroute requests to the same node. This is due to external factors such as mesh network route discovery, network collisions in a crowded channel, random backoff, or waiting for another node to finish transmitting.

The ***Traceroute*** action is not available for the *Portal* node.

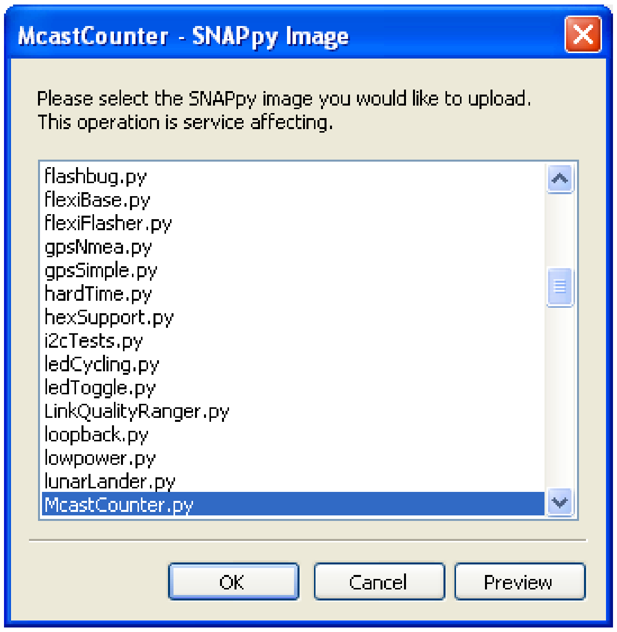
Refresh

Clicking on this action will poll the node for the information shown on the ***Node Info*** tab. Check the Event Log for confirmation of ***Refresh*** activity.

The ***Refresh*** action is not available for the *Portal* node.

Upload SNAPpy Image

Clicking on this action will bring up a dialog box allowing you to choose which script to upload into the node.

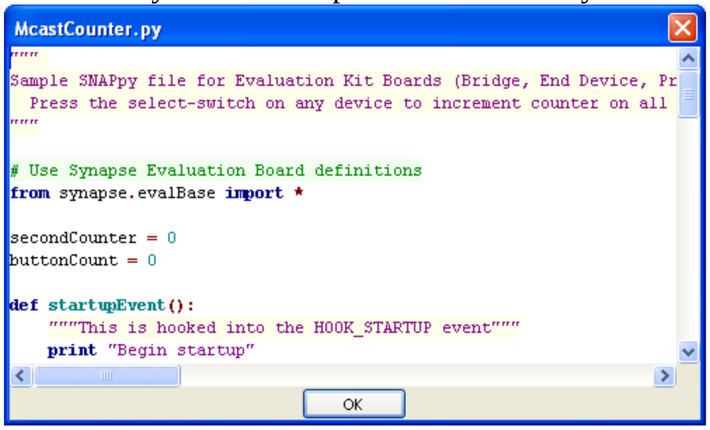


Please select the SNAPpy image you would like to upload.
This operation is service affecting.

flashbug.py
flexiBase.py
flexiFlasher.py
gpsNmea.py
gpsSimple.py
hardTime.py
hexSupport.py
i2cTests.py
ledCycling.py
ledToggle.py
LinkQualityRanger.py
loopback.py
lowpower.py
lunarLander.py
McastCounter.py

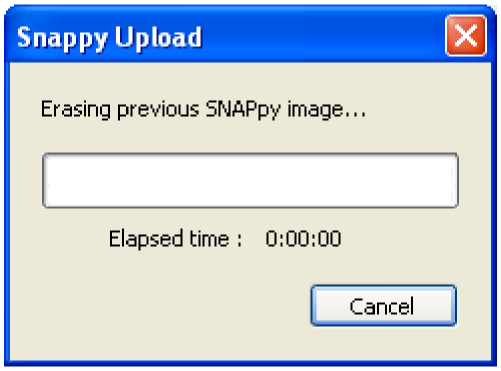
A node can only contain one script at a time, but the script can actually consist of multiple source files, using the Python “import” functionality.

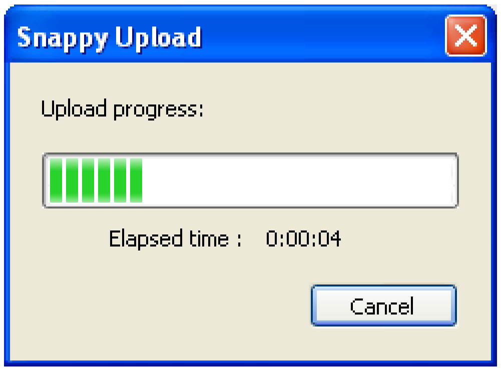
If you are not sure which script you want, you can click on the ***Preview*** button to take a quick look at the currently selected script. Click ***OK*** when you are done looking at it.



```
"""
Sample SNAPpy file for Evaluation Kit Boards (Bridge, End Device, Pr
  Press the select-switch on any device to increment counter on all
"""

# Use Synapse Evaluation Board definitions
from synapse.evalBase import *

secondCounter = 0
buttonCount = 0

def startupEvent():
    """This is hooked into the HOOK_STARTUP event"""
    print "Begin startup"
```

Once the script has been chosen, *Portal* will tell the node to erase any previous script, and then upload the new script to the node.





When the entire script has been uploaded to the node *Portal* will automatically reboot the node, which in turn will cause the node to execute any script code contained within the HOOK_STARTUP event handler of that script.

If you click on the name of a script within the ***Node Info*** window, an editor window containing that script will be opened for you.

For the *Portal* node, this action is named ***Change Portal Base File***. The *Portal* node is not restricted to SNAPpy scripts, and can run any Python script. Therefore the button opens a standard Windows dialog allowing you to browse to the Python script of your choice.

For more information about SNAPpy scripting, please consult the **SNAP Reference Guide**.

Erase SNAPpy Image

Clicking on this action will erase any currently loaded (and running) script from the selected node.

NOTE – You do not have to manually erase a previous script to load a new one. *Portal* will do this for you. This button has been added so that misbehaving scripts can be shut down while you work on making corrections to them.

For the *Portal* node, this action is named ***Clear Portal Base File***.

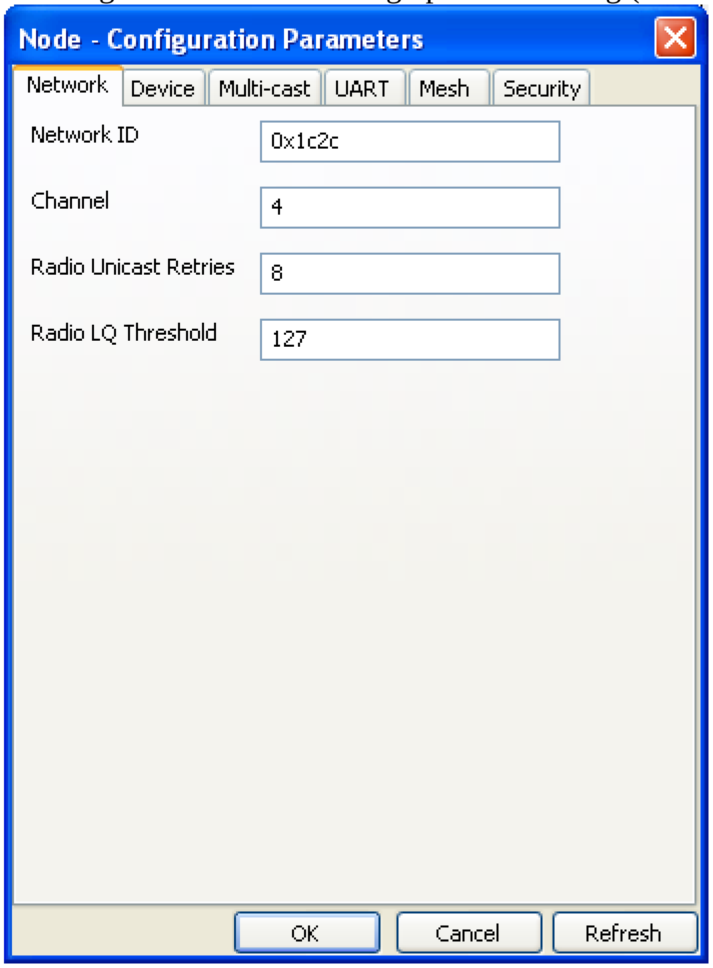
Export SNAPpy Image

This toolbar option allows you to export the SNAPpy script as a SNAPpy Export (.SPY) file. The .SPY files are used to save the current local copy of the script as a compiled script ready to upload to a node. For example, *SNAPconnect* cannot upload .py files because it requires the scripts to already be compiled. This option allows you to create the necessary .SPY file for *SNAPconnect* to upload to your nodes. Another use for the .SPY files is if you want to provide a script to another user of *Portal* without giving them the source code.

The ***Export SNAPpy Image*** action is not available for the *Portal* node, because *Portal* can run Python scripts that are not valid in another node.

Change Configuration Parameters

Clicking on this task will bring up the following (tabbed) dialog box:



Network ID 0x1c2c

Channel 4

Radio Unicast Retries 8

Radio LQ Threshold 127

From this dialog box, you can view and edit the Configuration Parameters of the current SNAP Node.

Configuration Parameters are also known as Non-Volatile Parameters, or NV Parameters, and they are described in detail in the SNAP Reference Manual.

You can see the different NV Parameters broken down by category by clicking on one of the six named tabs within the dialog box.

The ***Network*** tab lists parameters relating to general radio operations.

The ***Device*** tab lists parameters relating to node "identity," and some hardware features.

The ***Multi-cast*** tab lists parameters relating to multicast communications.

The ***UART*** tab lists parameters relating to the buffering of data received from the system's universal asynchronous receiver/transmitter(s) for serial communications.

The ***Mesh*** tab lists parameters relating to the mesh routing capabilities of the node.

Synapse nodes communicate with each other using mesh routing. This means that any unit can communicate with any other unit (they are all *logical* peers within the mesh), even though in some cases units that are out of radio range of each other might have to pass messages through intermediate nodes to do so. Only units that are within radio range of each other can communicate directly (*physical* peers).

The necessary "route discovery" and "packet forwarding" necessary to make this work are all done automatically by the node.

There are several ***Mesh Routing Timeouts***. The default values should cover most network topologies. Be careful if changing these values on remote nodes: you could make it impossible to communicate with the node remotely.

Contact Synapse Customer Support for assistance with tuning these timeout parameters.

There are also several "non-timeout" parameters. Refer to the **SNAP Reference Manual** for information about using them.

The ***Security*** tab lists parameters relating to encryption. Specify an Encryption Type of 0 for no encryption, 1 for AES-128 encryption, or 2 for Basic encryption. If encryption is enabled, the Encryption Key must be exactly 16 characters long, and can be any combination of text string and hexadecimal values.

NOTE – Not all nodes support AES-128 encryption. This is determined by the SNAP firmware currently loaded into the node. However all nodes running firmware version 2.4 or newer will have Basic encryption available.

To change one or more of the editable fields, just type the replacement value(s) in before clicking on ***OK***. The new values will be sent to the node and stored.

The ***Change Configuration Parameters*** action is not available for the *Portal* node.

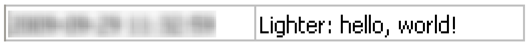
Intercept STDOUT

Script output (from "print" statements) normally goes to the "data sink" specified by the script itself. For example, the script might be outputting text to serial port 2.

For testing purposes, it is sometimes handy to "intercept" the script output from the node (which might be remotely located), and display it within *Portal* instead.

Clicking on this action will send the necessary commands to the node to accomplish this.

The intercepted text will appear in the *Portal* ***Event Log***.



```
[illegible]    Lighter: hello, world!
```

In the above example, the script did a **print "hello, world!"** The node name ("Lighter") was pre-pended by *Portal*, providing an easy way to see which node printed the text.

You must specify which types of messages you want your node to redirect to *Portal* using the ***Preferences*** window available from the File menu in Portal. You can have your nodes send STDOUT, error messages, both, or neither to the *Portal* log. If you have both the ***Intercept STDOUT*** and ***Intercept ERROR*** checkboxes unchecked on the ***Preferences*** window, no output from the node will be redirected to the *Portal* log.

The ***Intercept STDOUT*** action is not available for the *Portal* node.

Change Icon

You can replace the default icon *Portal* uses to represent each node with your own 60x60 PNG files. This might be used to make it easier to track which nodes are serving what purpose. The graphic is only associated with the node while *Portal* is aware of the node. If you remove the node from the network, you will need to reassign your graphic icon to it.

Rename Node

The default "logical name" for a node with no name provided by the user, and no script loaded is "Node" (for the first one found) or "NodeX" (for subsequent nodes), where "X" is a number (starting at 2) that represents the order in which *Portal* discovered the nodes.

The ***Rename Node*** action allows you to choose your own name for a node, instead of using the default name assigned by *Portal*. This "given name" is stored in the node itself (in NV Parameter 8), and will automatically be reported by *Portal* (instead of "Node") if *Portal* re-discovers the node in the future.

Node names may not contain spaces, punctuation or any special characters other than underscore. You should not specify a node names longer than 64 characters.

Remove Node

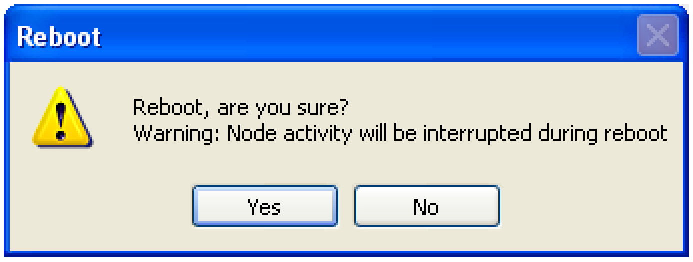
Clicking on this action will remove the node from *Portal,* including removing the node from the **Node *Views***.

Be aware that if the node really does still exist, it will be re-discovered by *Portal* on the next broadcast ping.

The ***Remove Node*** action is not available for the *Portal* node.

Reboot Node

Clicking on this action will bring up the following prompt.



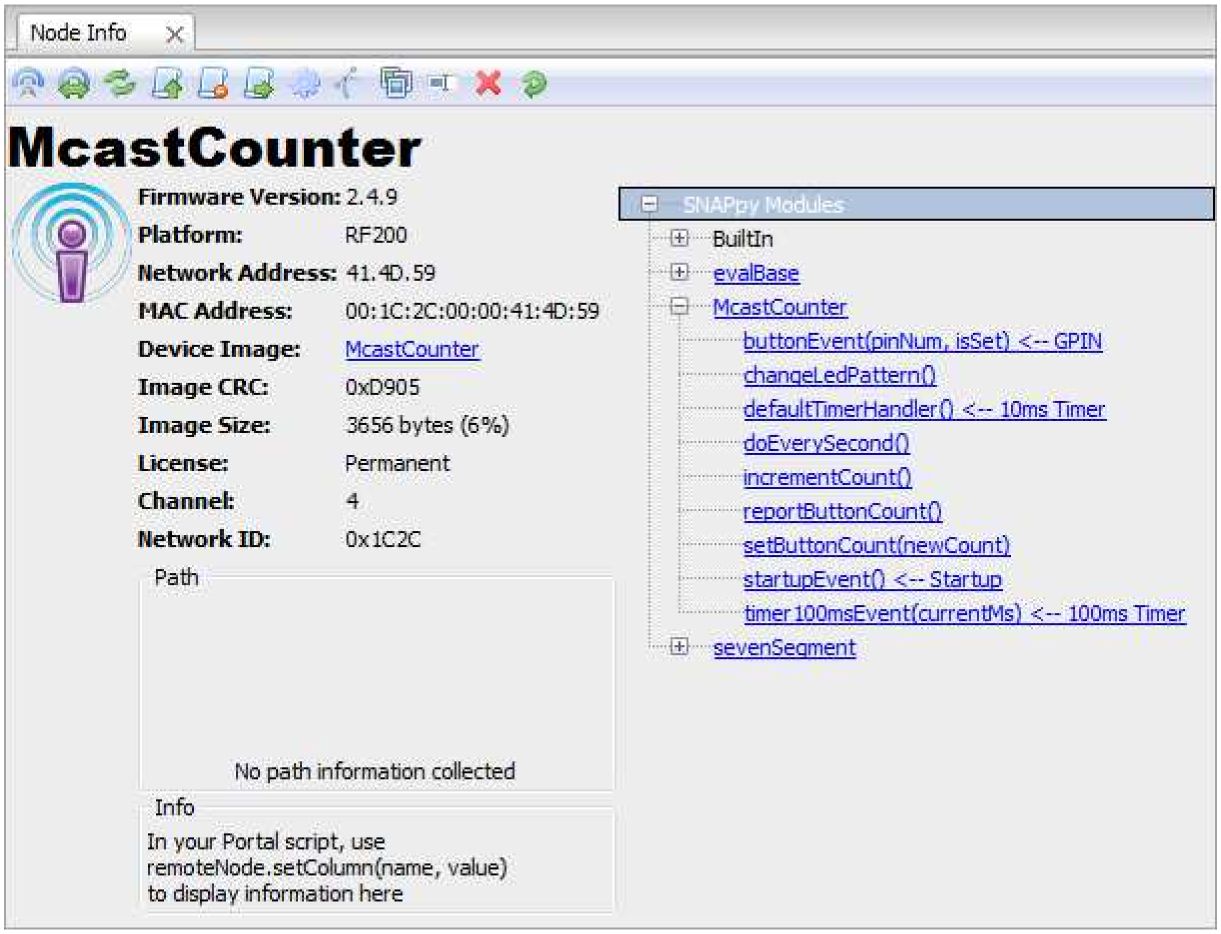
Reboot, are you sure?
Warning: Node activity will be interrupted during reboot

If you really do want to reboot (restart) the node, select ***Yes***, otherwise select ***No***.

The ***Reboot Node*** action is not available for the Portal node.

Node Info – "SNAPpy Scripts" Section

The right hand side of the ***Node Info*** tab shows a tree view of all the callable functions within that node.



Firmware Version:	2.4.9
Platform:	RF200
Network Address:	41.4D.59
MAC Address:	00:1C:2C:00:00:41:4D:59
Device Image:	McastCounter
Image CRC:	0xD905
Image Size:	3656 bytes (6%)
License:	Permanent
Channel:	4
Network ID:	0x1C2C

Path

No path information collected

Info

In your Portal script, use
remoteNode.setColumn(name, value)
to display information here

```
SNAPpy Modules
  BuiltIn
  evalBase
  McastCounter
    buttonEvent(pinNum, isSet) <-- GPIN
    changeLedPattern()
    defaultTimerHandler() <-- 10ms Timer
    doEverySecond()
    incrementCount()
    reportButtonCount()
    setButtonCount(newCount)
    startupEvent() <-- Startup
    timer100msEvent(currentMs) <-- 100ms Timer
  sevenSegment
```

The **BuiltIn** functions represent the core SNAPpy feature set, and are functions that can be called from *Portal* even when no user script has been uploaded into the node. These same functions are also always available for use *within* scripts.

Refer to the **SNAP Reference Guide** for details on these built-in SNAPpy functions.

The other branch(es) of the tree view show(s) the uploaded script's name, with all of the callable functions implemented by that script. (If the script imports other scripts, each imported script's functions will be shown under that script's name in the tree. In this example, the McastCounter script imports both the evalBase and sevenSegment scripts.)

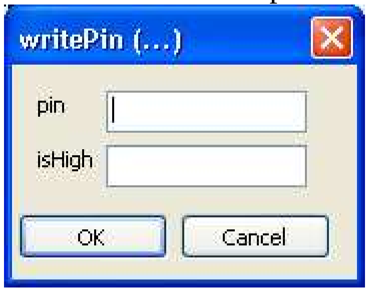
Hovering the mouse cursor over the links in any branch of the tree will bring up a short tool-tip on that function, if one has been defined.

NOTE – for this to be useful for the functions defined in *your* scripts, be sure to put a Python "doc string" as the second line of your function definitions. For example:

```
def mySuperFunction():
    '''This is the text that will appear as a tool-tip'''
    pass
```

Clicking on any function name in the tree will cause the selected node to execute that function.

If the function takes parameters, a dialog box will pop up and prompt the user for the needed values.



In the above example, clicking on the writePin() function has brought up a dialog box asking for "pin" (which IO pin), and for a Boolean (True or False) value to make the pin high (True) or low (False).

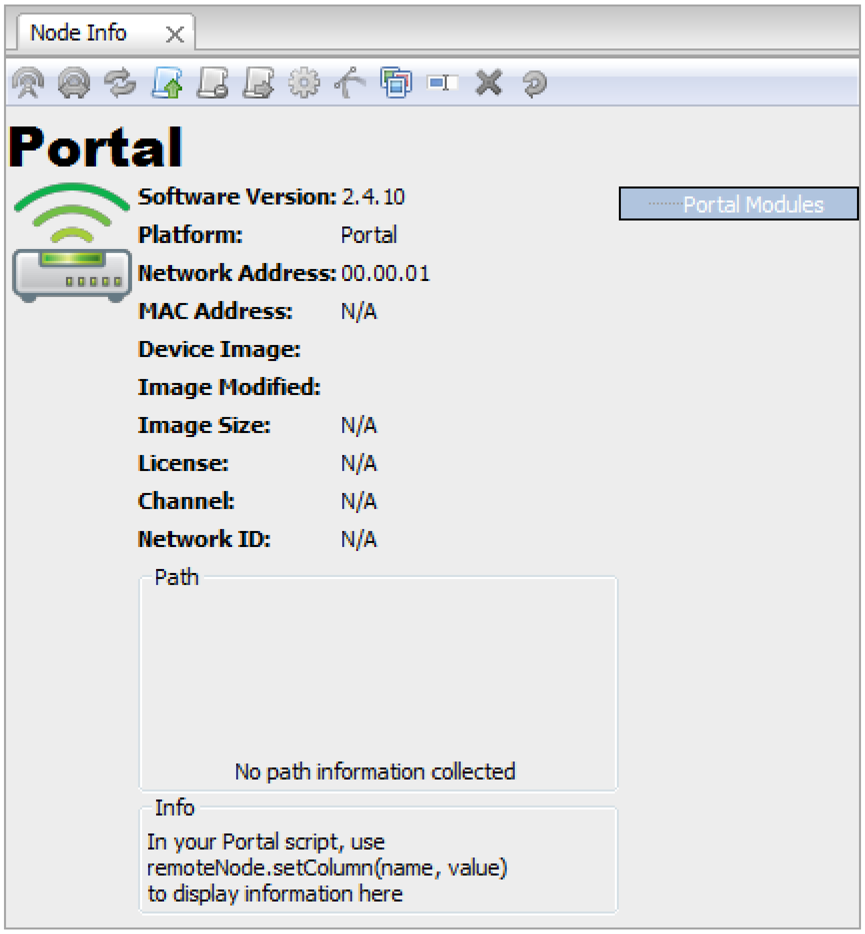
Once you fill in the values, click on the ***OK*** button to invoke the function *on the actual node*.

This can be very useful for learning the built-in functions, as well as for testing and debugging scripts.

Portal is a Node Too

Most of this section has been focused on using *Portal* to interact with remote SNAP nodes. However, *Portal* itself can function as a node on the network. Many of the actions available in the toolbar work with the *Portal* node, with exceptions and clarifications noted above.

If you select *Portal* in the ***Node Views*** pane, the ***Node Info*** pane will show info similar to the following.



Portal

Software Version: 2.4.10
Platform: Portal
Network Address: 00.00.01
MAC Address: N/A
Device Image:
Image Modified:
Image Size: N/A
License: N/A
Channel: N/A
Network ID: N/A

Path

No path information collected

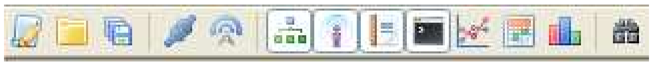
Info

In your Portal script, use
remoteNode.setColumn(name, value)
to display information here

If a *Portal* script has been loaded, you will see it in the ***Portal Modules*** function tree as well. You can invoke any functions defined in that script by clicking on them, just as you can with the functions defined in the remote SNAP nodes.

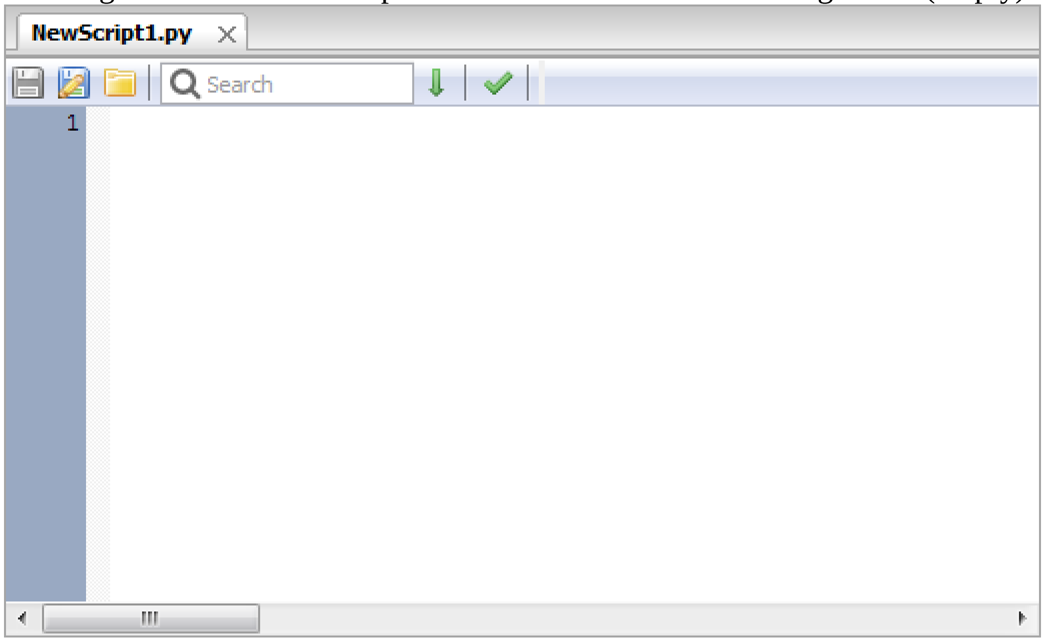
5. Portal Tools

The main toolbar provides quick access to *Portal*'s tabbed windows. These windows can be shown, hidden, or rearranged to suit a variety of operational modes. Some of the toolbar buttons invoke immediate commands instead of opening new tabbed windows.



New Script

Clicking on this button will open a new ***Edit Window*** containing a new (empty) source file.

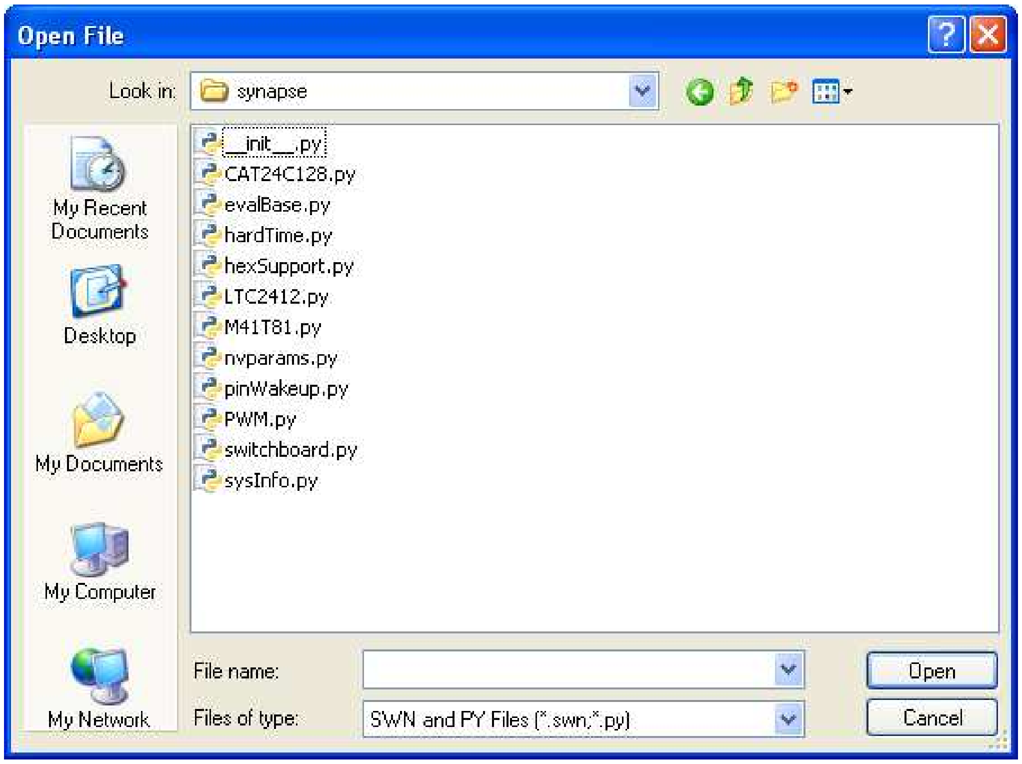


The default name of the script will be "NewScriptX" where "X" is a trailing number to enforce uniqueness.

The ***Edit Window*** is described in section 6.

Open File

Clicking on this button will bring up a file chooser dialog, from which you can select a previously saved source or *Portal* configuration file.



Source (.py) files can be SNAPpy scripts (these go into your SNAP nodes) or full Python files (these can be loaded into your *Portal*).

A *Portal* configuration specifies things like which nodes are available in the network and which Python script is currently loaded as the *Portal* base file. *Portal* configurations are saved in files having a .SWN extension (Synapse Wireless Network), and are created using the ***Save All*** toolbar button.

Save All

This toolbar button will initiate creation of a .SWN file containing all of the currently active Portal settings. The most recently saved configuration file will automatically be re-loaded by *Portal* when it restarts.

Connect Serial Port / Disconnect Serial Port

This modal toolbar button is used to connect and disconnect from the attached bridge node. Because the icon (and its tool-tip) changes when you connect or disconnect, it also serves as a quick status indicator.

If your network does not seem to be responding, this is the first thing to check.

Broadcast Ping

Clicking on this toolbar button will cause *Portal* to broadcast a special “answer if you hear me” message to all nodes. When the nodes answer, any nodes that *Portal* did not already know about will be individually queried for additional information. You might use this button if you just added one or more new nodes to your network.

Broadcast Ping will only find nodes using the same channel and network ID as your bridge node.

Node Views

This tab provides a graphical display of the nodes in *Portal*’s internal device directory. Internally, *Portal* indexes all nodes by network address. When a new network address is discovered, a corresponding icon in the Node Map will be created.

Deleting a node (select on the node and then click ***Remove Node*** from the ***Node Info*** tab) removes the device from *Portal*’s internal database. This removes all knowledge of the device from *Portal*. If the device is subsequently re-discovered, usually via a ping, it will reappear in the ***Node Map***.

The **Node Views** pane is covered in section 12.

Node Info

The ***Node Info*** tab provides node information, a mini-toolbar for common tasks, and SNAPpy script information about the currently selected node. (Refer to section 13).

Event Log

The ***Event Log*** captures real-time event history for *Portal*. All network-affecting activity is recorded here. Log entries are time-stamped to a 1-second resolution.

Events Captured Include:

- Configuration save/load
- Script STDOUT (print statements, errors)
- Status messages
- RPC communication messages

Command Line

The ***Command Line*** window provides interactive access to *Portal*’s Python-based scripting engine. Using this tool, you can invoke the *Device API* on all discovered and active devices. This is useful for testing and debugging commands interactively before incorporating them into *Portal* scripts.

Most of what can be done through the command line can also be done through the other parts of the GUI. For example, you can type the command:

```
rpc(‘\x01\x02\x03’, ‘reboot’)
```

… ***or*** you can just click on the node’s `reboot()` function in the ***Node Info*** tree.

Within the ***Command Line*** pane, you can use the up and down cursor arrows to re-select previously executed commands. Position the cursor on a previously executed command and press the <Enter> key, and it will be re-displayed (but not executed yet) at the bottom of the ***Command Line*** window. You can then edit the recalled command (using the left and right cursor keys to move the cursor horizontally within the command). When the command line has been edited to your liking, press the <Enter> key again to execute it.

To re-execute the most recently executed command *as-is* (no changes), just press the keys <Up>, <Enter>, <Enter>. The first <Enter> chooses the command for editing, and the second <Enter> executes it.

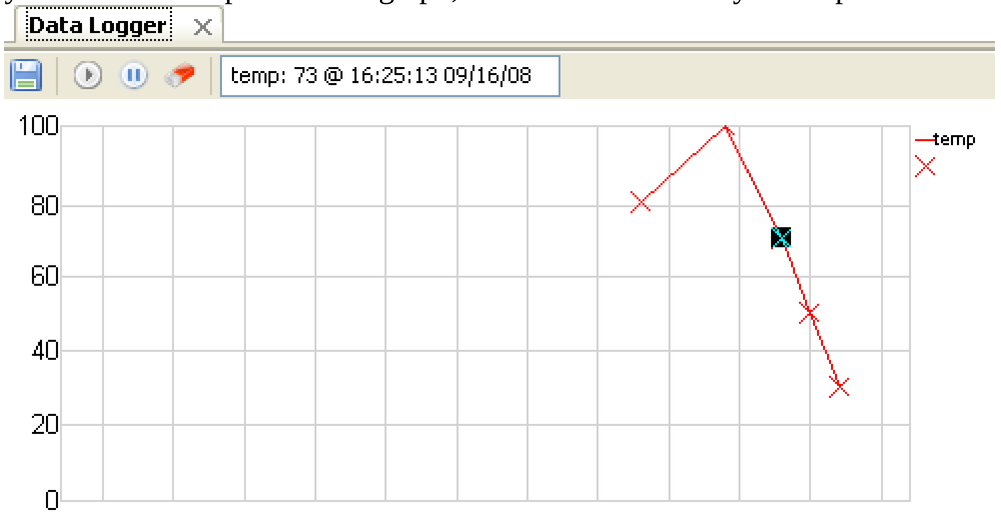
Within the ***Command Line*** window, you can type `shell.help()` to learn more of the tricks the ***Command Line*** window supports.

Data Logger

The Data Logger window gives a strip-chart view of a set of values plotted over time. It is very simple for scripts in nodes to add completely new categories of data. Just use a unique name, and you've created a new strip. You can either send an RPC function call from your node to Portal's address, invoking the `logData()` function with your desired data, or you can RPC your data back to some other function in Portal, where you can use Python code to evaluate and interpret your data before that function invokes `logData()`.

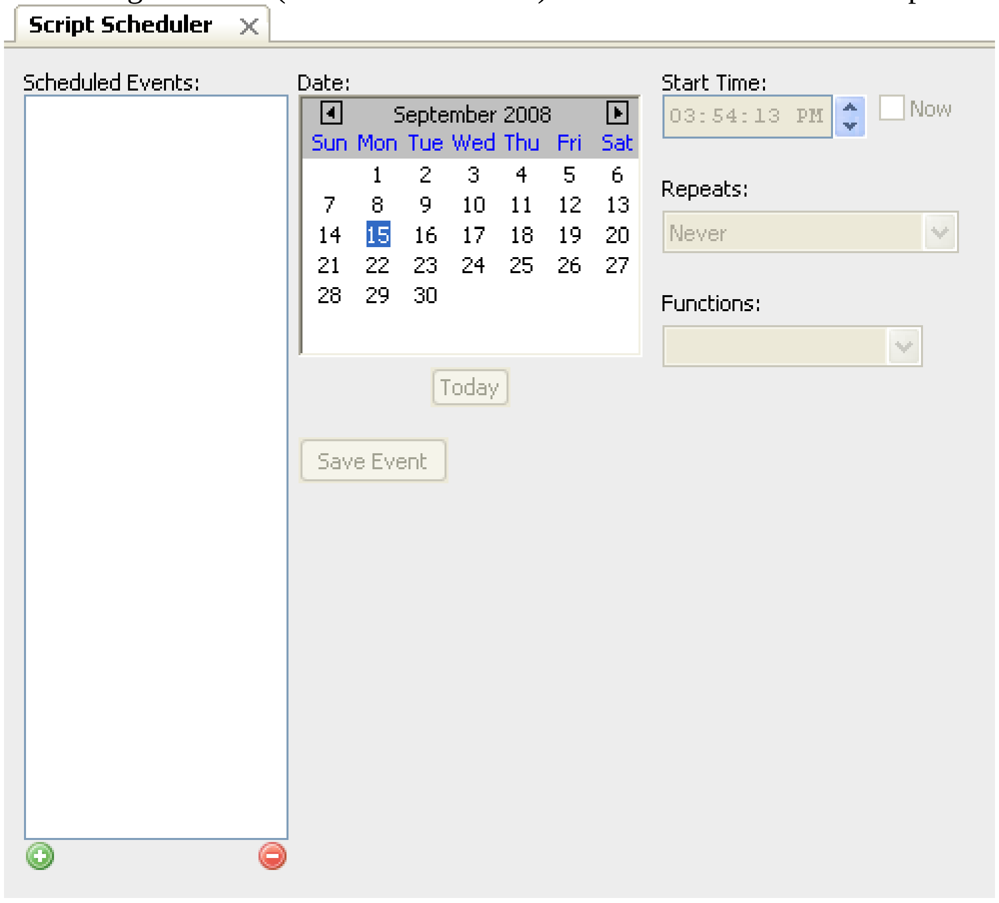
Scaling

The *vertical axis* is fixed at 100 units. Since a heterogeneous collection of data types may occupy the same plot, generic units are used. However, the `logData()` function accepts a scaling factor so that each value can map its full-scale range onto the vertical axis. The *horizontal axis* is a continuous timeline, with automatic scaling. You can plot multiple values, from the same or multiple nodes. If you select a data point in the graph, the window will tell you the point's data and time.



Script Scheduler

This button brings up the ***Script Scheduler*** window, which provides the ability to manage the scheduling of events (handler subroutines) from the current *Portal* script.

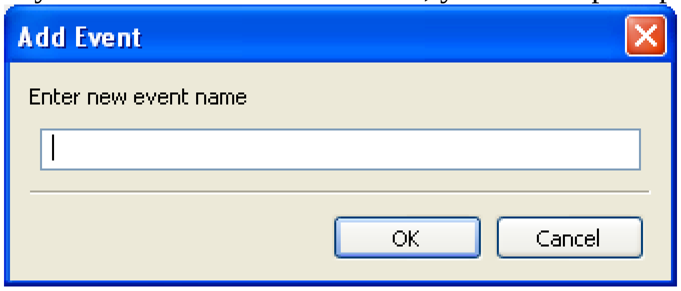


Normally events in *Portal* are invoked either by the user (by clicking on function names within the ***Node Info*** pane), or by remote SNAP nodes (via RPC). The ***Script Scheduler*** provides a third mechanism by which script functions can be invoked.

Note that you must have a *Portal* script loaded in order to schedule any events. (The “event handlers” are functions already defined by your *Portal* script.) *Portal* also has to actually be running in order for the scheduled event to run. It does no good to schedule an event to occur at midnight, and then shut *Portal* down (or turn your PC off).

The ⊕ and ⊖ buttons at the bottom of the event list are used to add new events and delete existing ones.

If you click on the add button, you will be prompted to provide a name for the event.



Enter a unique event name in the dialog box, and click on ***OK***. An event with the requested name will be *created*, but you still have to *configure* it.

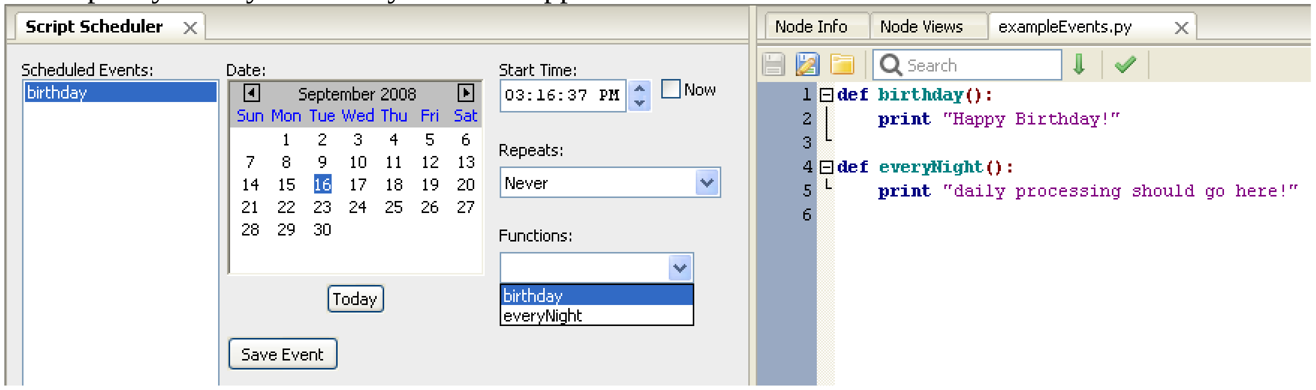
Click on an event in the list to select it, and then configure the event's ***Start Date***, ***Start Time***, and ***Repeatability***.

You choose the event's ***Start Date*** using the calendar control near the top of the pane. There is a ***Today*** button that is a shortcut to scrolling back to the current day (if you have changed it).

You choose the ***Start Time*** using the clock control to the right of the calendar control. There is a ***Now*** shortcut button, but since time marches on you will have to make some manual adjustments. (*Portal* will not allow you to schedule an event in the past.)

The ***Repeats*** control lets you choose if the event should only occur once (Repeats = Never), or if it should repeat every minute, every hour, or every day. You can also choose the special case of *On Load*, which means the event will occur when *Portal* next loads a configuration containing that event (for example, at *Portal* startup).

After you have specified *when* you want the event to occur (and any optional "repeats"), you then must specify *what* you actually want to happen.



```
def birthday():
    print "Happy Birthday!"

def everyNight():
    print "daily processing should go here!"
```

The ***Functions*** drop-down selector lets you choose any of the functions defined in the currently active *Portal* script. This means you must load the correct *Portal* script before you can define events that use that script.

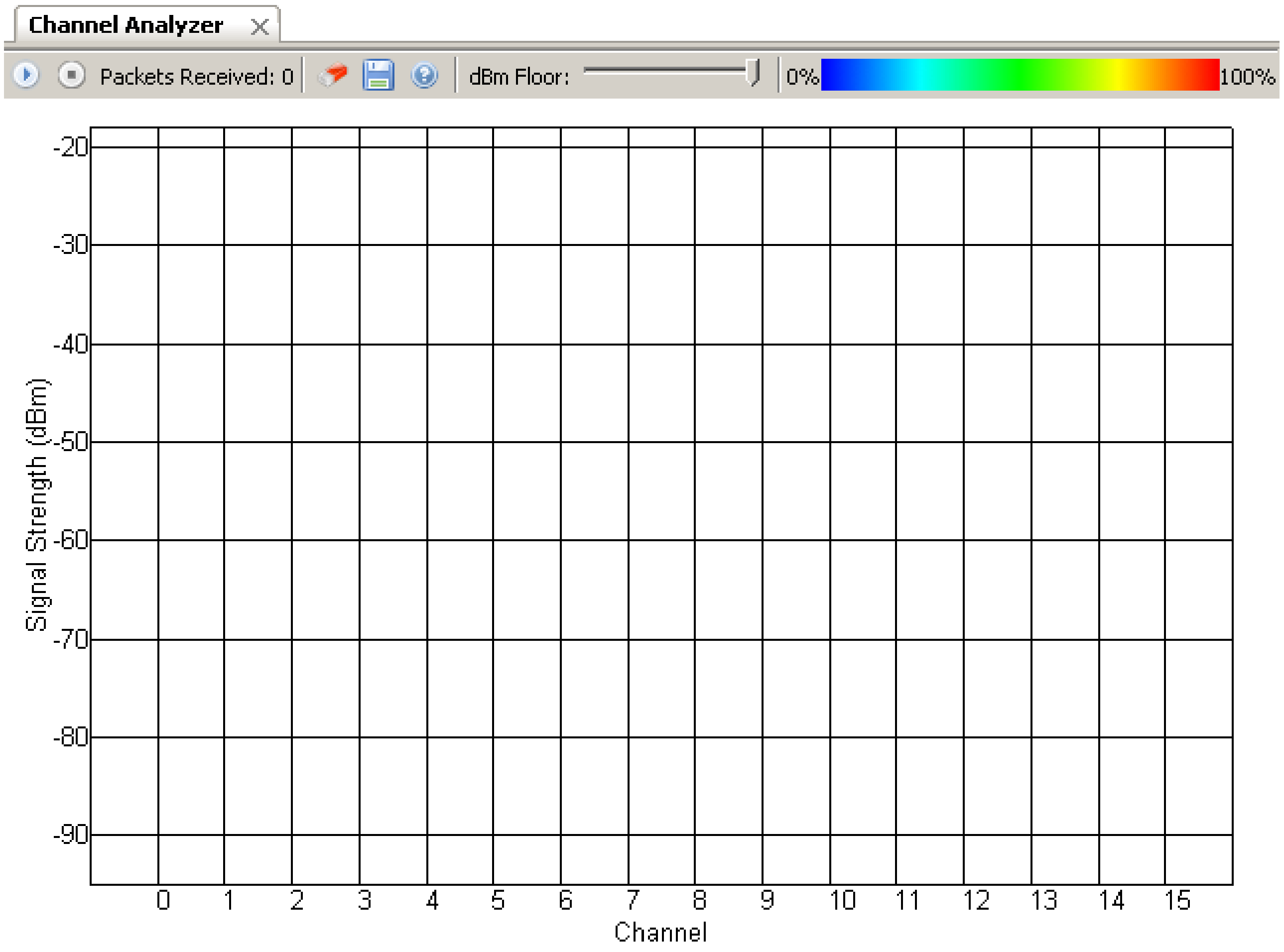
In the screenshot above, both the ***Script Scheduler*** pane and a ***Script Editor*** pane are shown. You can see the correlation between the ***Functions*** field and the script source code.

When the event has been configured like you want, be sure to press the ***Save Event*** button.

If you change your script after setting a scheduled event in *Portal*, the script scheduler will continue to run a cached version of the script until the next time *Portal* is started. To ensure the latest version of your script will run on schedule, be sure to restart *Portal* after making the change.

Channel Analyzer

Clicking this button will open the ***Channel Analyzer*** pane within *Portal*.



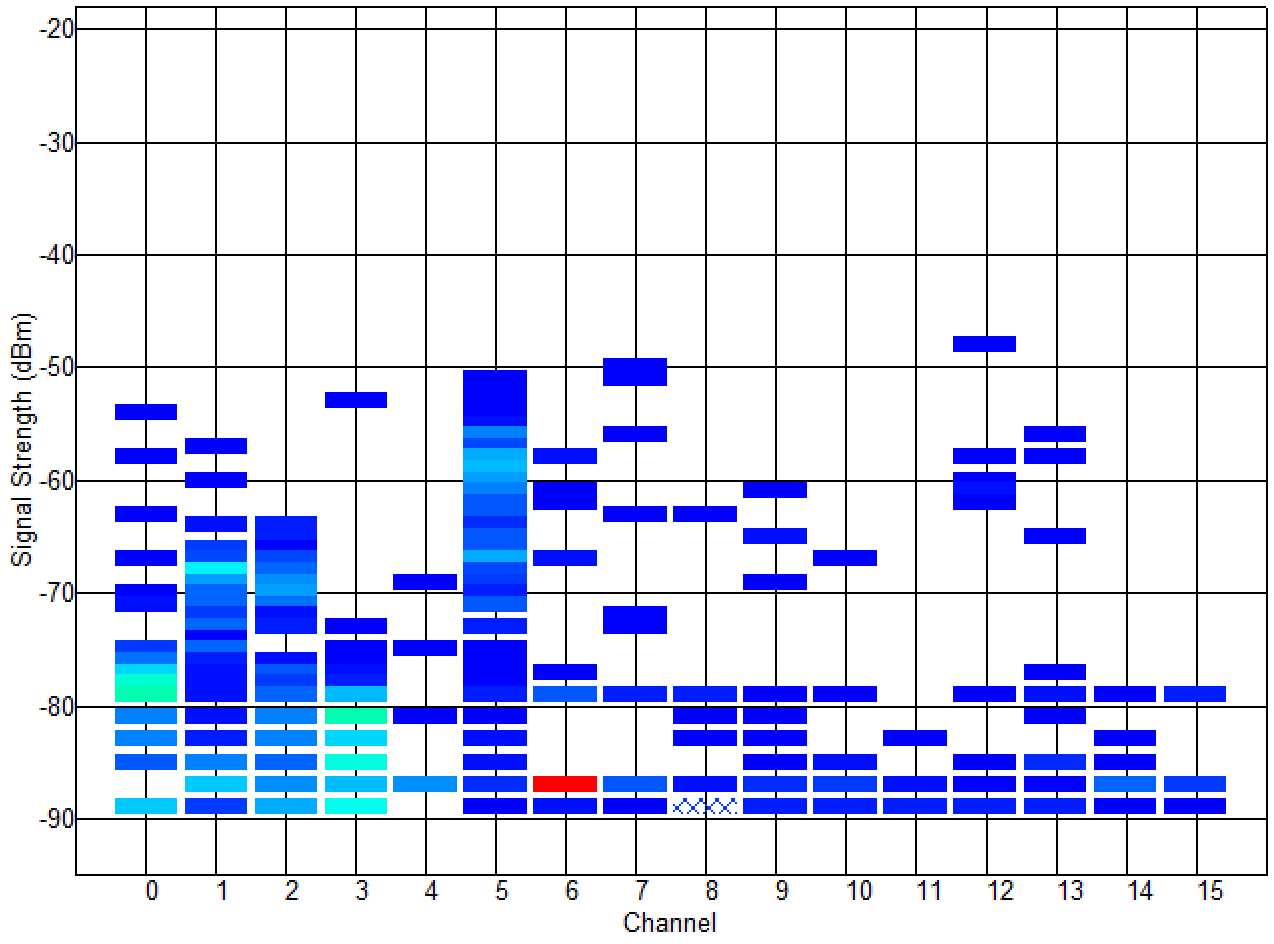
Performing a channel analysis (energy detection scan) consumes significant resources on your bridge node, so the function is only performed on demand. Performance of other functions within *Portal* (such as uploading scripts to a node or running a *Portal* script) may be significantly affected while the Channel Analyzer is running. It may be best to pause the analyzer while you perform other functions.

Like many panes, the ***Channel Analyzer*** pane has its own mini-toolbar.

- The ***Start*** button begins continuous channel scanning.
- Once started, the ***Stop*** button can be used to stop it.

- The ***Packets Received*** indicator show the number of energy detection packets received from the bridge.
- The ***Clear Values*** button can be used to erase any existing data and start a fresh plot.
- The ***Save Graph*** button can be used to save the currently graphed data as a graphic.
- The ***Channel Help*** button brings up a list of channels with an indication of how clear each channel is. This can help you choose the best channel for your nodes based on radio traffic in your environment.
- A ***dBm Floor*** slider lets you choose a cutoff value for the graphed data. This lets you ignore low-level signals and focus on stronger ones.

Here is a screenshot taken from a system while scanning was actually in progress. Note that you may not have as much active traffic as in the example shown. If you are using nodes in the 900 MHz range, the Channel Analyzer will show 66 frequencies rather than the 16 channels. See the **SNAP Reference Manual** for information about how frequencies map to channels on 900 MHz SNAP nodes.



The colored bars in the chart provide three pieces of information simultaneously:

1) The horizontal position of each bar tells you the *channel* on which the signal was seen.
2) The vertical position tells you the signal strength seen for that signal.

3) The color of each bar tells you the number of times a signal of that level has been seen (in % form). A color legend near the top of the pane shows you the scaling.

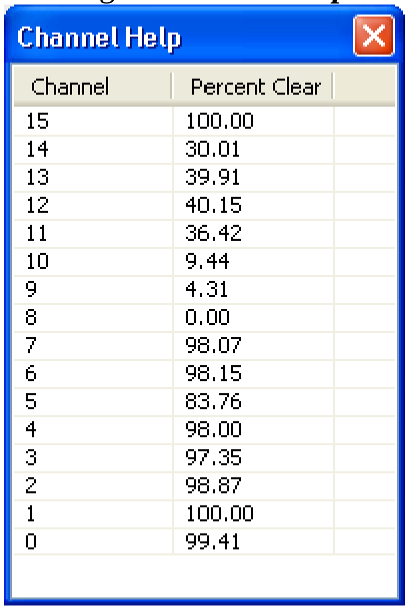
In the example above, you can see that the *strongest* signals have been detected on channel 12 (around -48 dBm), but that the *most frequently seen* signal is on channel 6 (at around -87 dBm).

Note that the ***Channel Analyzer*** takes “live” readings, and can only detect signals from nodes that are actually *powered on*, *awake*, and *communicating* at the time of the scan.

You can restart your graph at any time with the ***Clear Values*** button, and you can save as many graphs as you want using the ***Save Graph*** button.

Be sure to use the ***Stop*** button when you are done. This will give your bridge node more time to handle other network traffic.

Clicking on ***Channel Help*** brings up a dialog similar to the following:



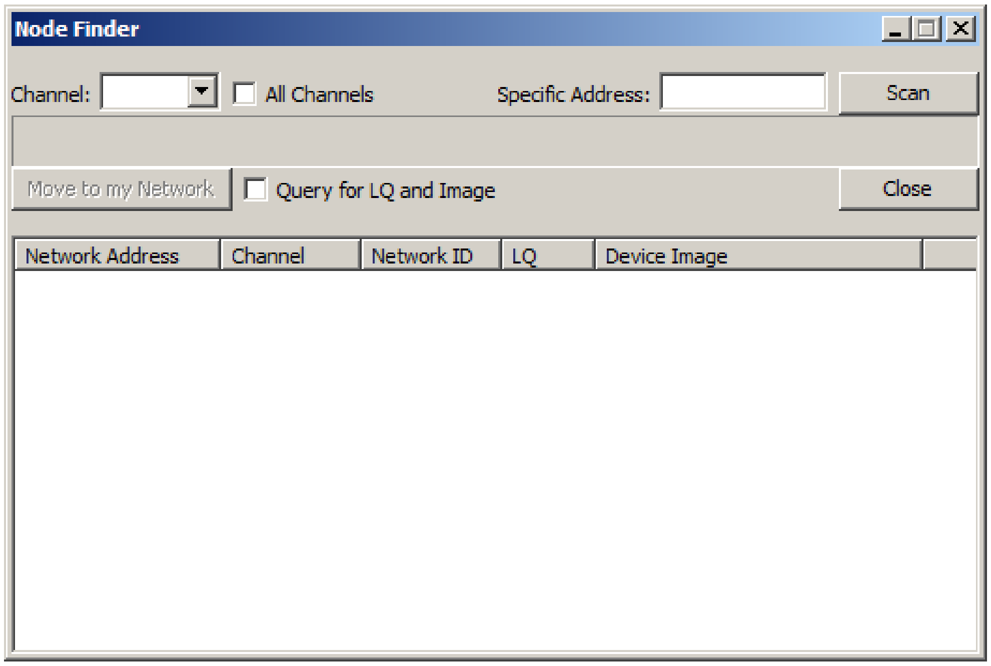
Channel Help

Channel	Percent Clear
15	100.00
14	30.01
13	39.91
12	40.15
11	36.42
10	9.44
9	4.31
8	0.00
7	98.07
6	98.15
5	83.76
4	98.00
3	97.35
2	98.87
1	100.00
0	99.41

From the example chart, you would expect that channel 1 or channel 15 would be the best choice for newly deployed nodes (as they are relatively quiet right now), followed by channels 0 and 2. You can click column headers to sort the list to quickly find the weakest signal seen (most clear channel) or strongest signal seen (most crowded channel).

Find Nodes

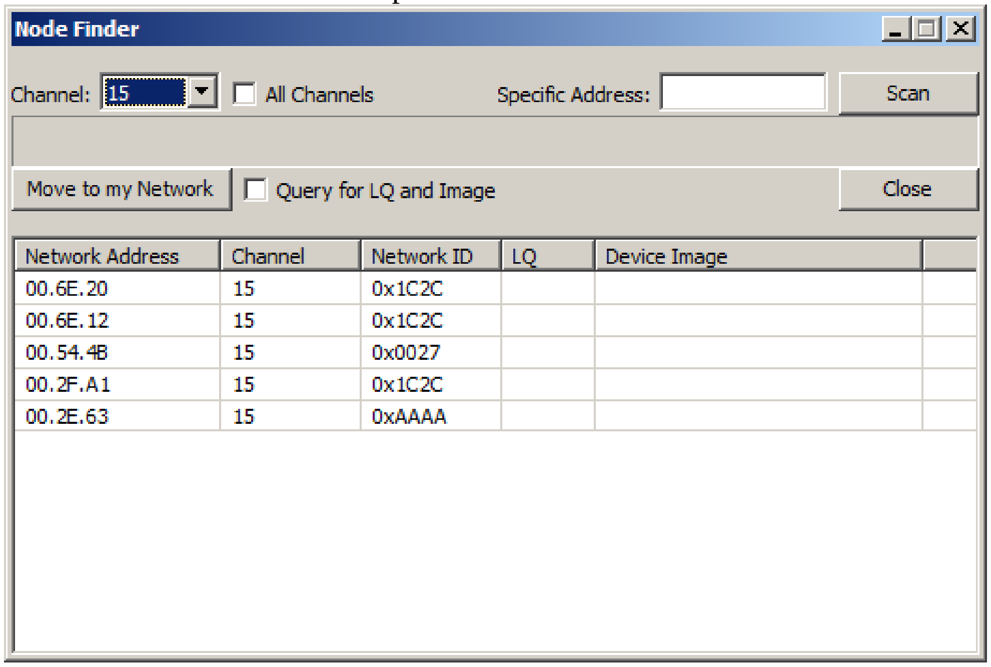
Clicking on this button will bring up the following interactive dialog:



Network Address	Channel	Network ID	LQ	Device Image

First choose a specific channel to scan, or check the ***All Channels*** flag. Next click the ***Scan*** button.

Portal will switch the bridge node to a special "wildcard" Network ID value that all nodes will respond to. *Portal* will then broadcast pings on the specified channel (or all channels) and build up a list of all SNAP nodes that respond.



Channel: 15

Network Address	Channel	Network ID	LQ	Device Image
00.6E.20	15	0x1C2C		
00.6E.12	15	0x1C2C		
00.54.4B	15	0x0027		
00.2F.A1	15	0x1C2C		
00.2E.63	15	0xAAAA		

Note that this is an active scan, and *Portal* can only find nodes that are *powered on*, and *awake*. If you check the ***Query for LQ and Image*** checkbox, *Portal* will query each found node for its link quality and to determine what code image the node contains when it completes its node search.

In the example shown here, five nodes were found on Channel 15, on three separate networks.

Because the broadcast ping process uses (unacknowledged) broadcast messages, some nodes may not respond. You may have to hit the ***Scan*** button more than once to find the node you are looking for.

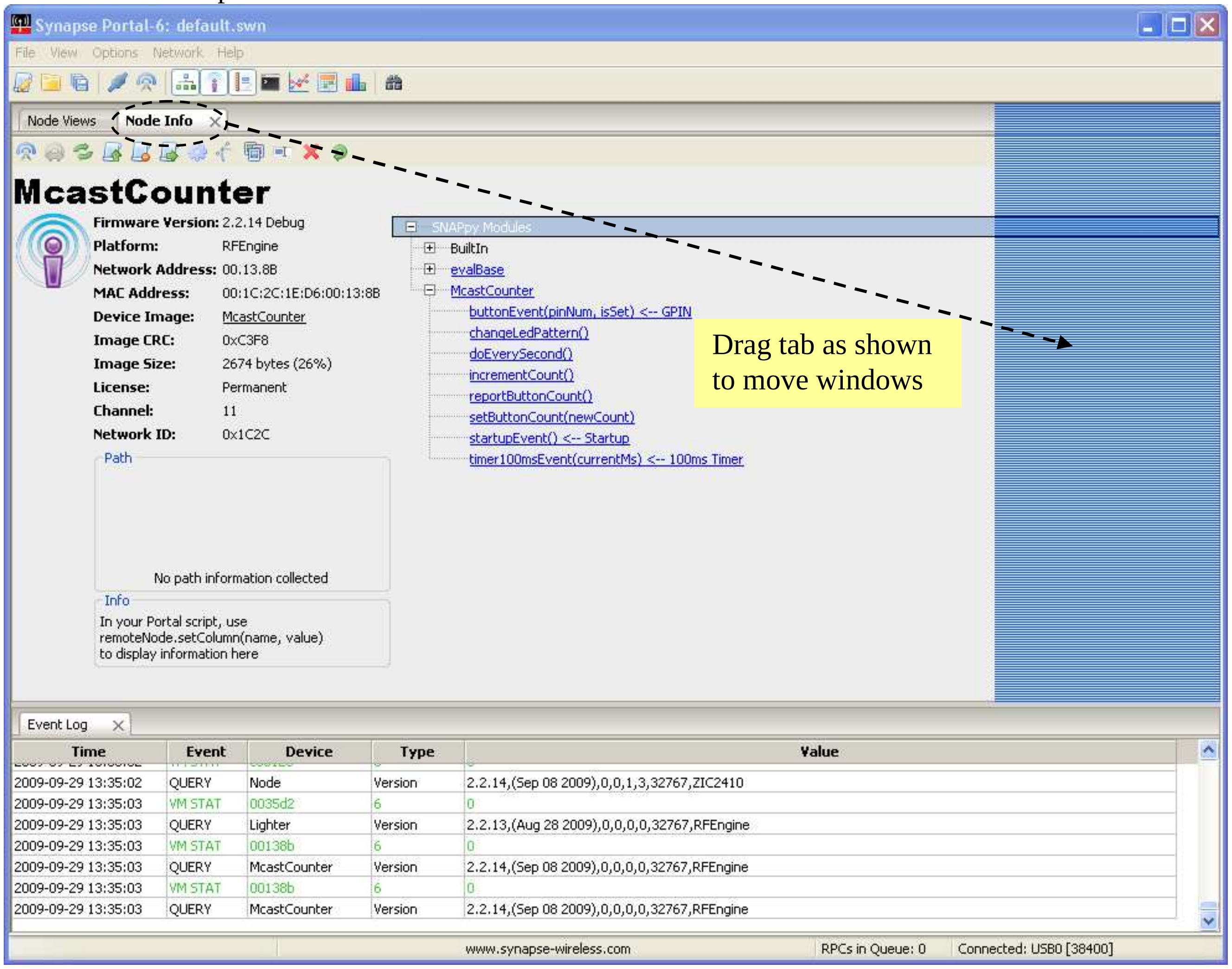
If the ***Node Finder*** locates a node on a different channel or using a different network ID than *Portal*'s bridge node is using, you can select the node within the list and click the ***Move to my Network*** button. *Portal* will then command the node to change channel and/or network ID as needed.

Press the ***Close*** button to close this dialog and resume normal *Portal* operations.

If you are looking for a specific node with a known network address, you can use the ***Specific Address*** textbox to enter its network address. This allows you to search for that specific node and move it to your current network if needed, instead of getting a list of all nodes.

Rearranging Windows

The tabbed windows in *Portal* can be dragged and repositioned on the screen. To do this, press and hold the left mouse button while the cursor is positioned over the tab label you want to move. While holding the button down, drag the tab until you see a light blue “shadow” indicating a possible new position for the window. When you’ve found a suitable new position, release the mouse button and the move will be complete.



McastCounter

Firmware Version:	2.2.14 Debug
Platform:	RFEngine
Network Address:	00.13.8B
MAC Address:	00:1C:2C:1E:D6:00:13:8B
Device Image:	McastCounter
Image CRC:	0xC3F8
Image Size:	2674 bytes (26%)
License:	Permanent
Channel:	11
Network ID:	0x1C2C

Path

No path information collected

Info

In your Portal script, use remoteNode.setColumn(name, value) to display information here

Time	Event	Device	Type	Value
2009-09-29 13:35:02	QUERY	Node	Version	2.2.14,(Sep 08 2009),0,0,1,3,32767,ZIC2410
2009-09-29 13:35:03	VM STAT	0035d2	6	0
2009-09-29 13:35:03	QUERY	Lighter	Version	2.2.13,(Aug 28 2009),0,0,0,0,32767,RFEngine
2009-09-29 13:35:03	VM STAT	00138b	6	0
2009-09-29 13:35:03	QUERY	McastCounter	Version	2.2.14,(Sep 08 2009),0,0,0,0,32767,RFEngine
2009-09-29 13:35:03	VM STAT	00138b	6	0
2009-09-29 13:35:03	QUERY	McastCounter	Version	2.2.14,(Sep 08 2009),0,0,0,0,32767,RFEngine

Window panes may be resized by clicking and dragging the horizontal and vertical borders separating them.

If you have made changes to your window placement and sizing and wish to have *Portal* return to its default layout, select ***View → Rearrange to Default View*** and you will be returned to a view with the ***Node Views*** window on the left, the ***Node Info*** window on the right, and the ***Event Log*** window across the bottom of the screen.

6. Built-in Editor

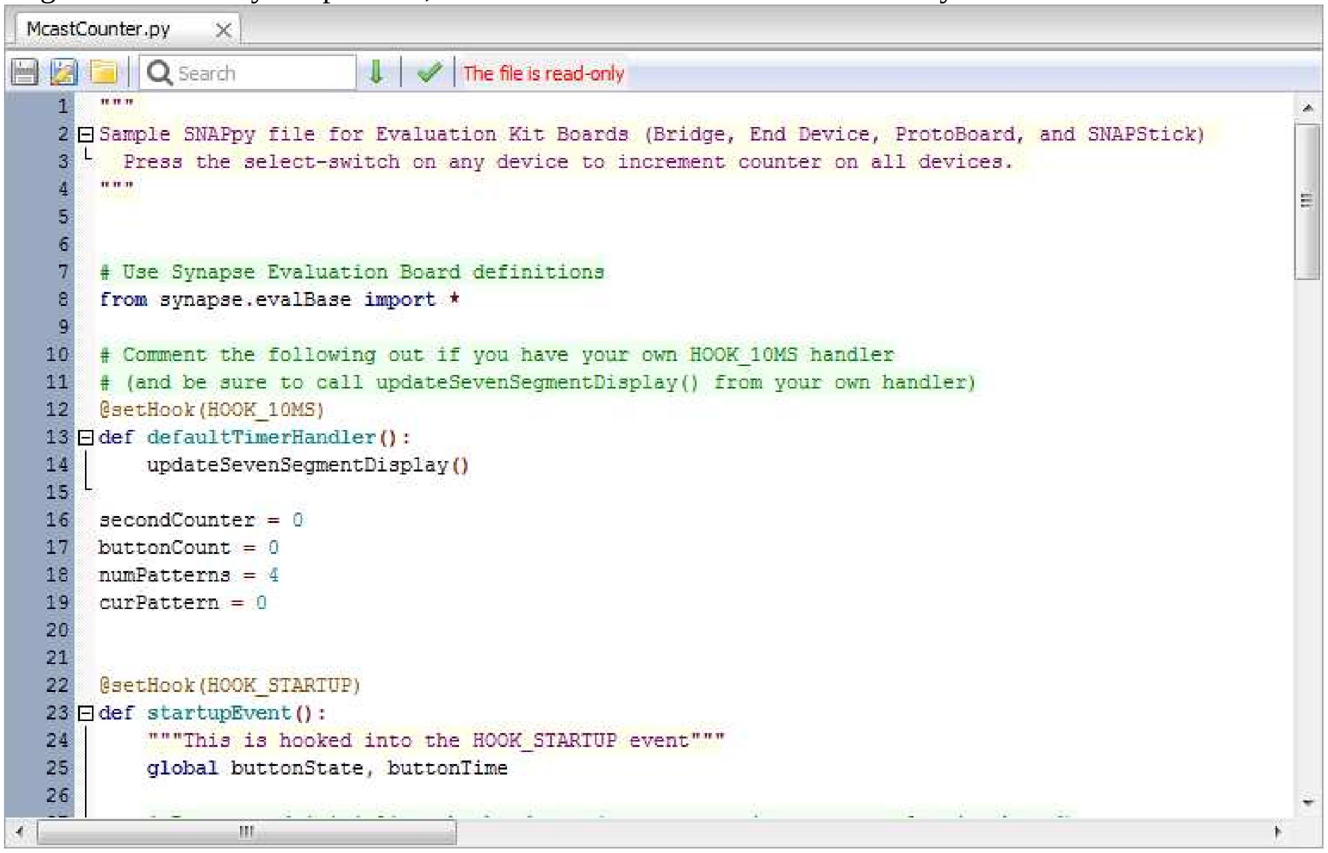
Portal includes a built-in code editor, making it an all-in-one solution. The code editor includes useful features such as line numbering, automatic indentation, code folding, and text auto completion[2], making it easy to develop scripts that meet your needs.

Note – If you already have a favorite editor, you can use it instead.

There are several ways to open an editor pane:

- Click on a script name from the ***Node Info*** pane
- Use the ***Open File*** button on the main toolbar
- Use the ***New Script*** button on the main toolbar

Regardless of how you opened it, all the edit windows work the same way.



The file is read-only

```
"""
Sample SNAPpy file for Evaluation Kit Boards (Bridge, End Device, ProtoBoard, and SNAPStick)
  Press the select-switch on any device to increment counter on all devices.
"""


# Use Synapse Evaluation Board definitions
from synapse.evalBase import *

# Comment the following out if you have your own HOOK_10MS handler
# (and be sure to call updateSevenSegmentDisplay() from your own handler)
@setHook(HOOK_10MS)
def defaultTimerHandler():
    updateSevenSegmentDisplay()

secondCounter = 0
buttonCount = 0
numPatterns = 4
curPattern = 0


@setHook(HOOK_STARTUP)
def startupEvent():
    """This is hooked into the HOOK_STARTUP event"""
    global buttonState, buttonTime

```

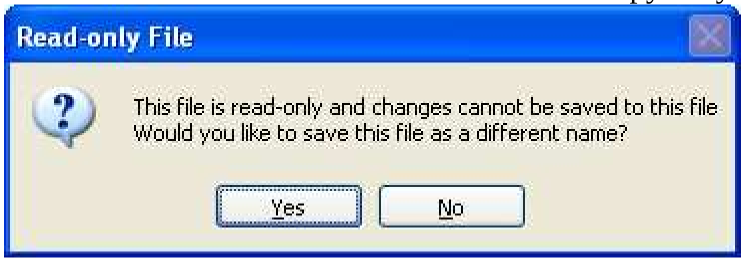
A mini-toolbar provides buttons to ***Save***, ***Save As***, and ***Open File***.

Next is a search window (<Ctrl-F> is a keyboard shortcut for this), and a ***Find Next*** button.

[2] Auto completion of text requires that the synapse.BuiltIn.py file be present in your scripts directory. This file is present when Portal is installed, and you should no move, delete or rename it.

The ✓ ***Test SNAPpy Script*** button lets you validate SNAPpy scripts (only) before you try to upload them into a node. Starting in version 2.2 the platform and version can affect how a script is compiled for a node. When you click the button to compile the script, you will be prompted for the platform and version appropriate for your target SNAP node. For the version, enter the firmware version for your node (e.g., 2.4.9). Select the platform and the appropriate CPU. (The platform selected can will control which code is compiled in your script. It matches the Platform specified for the node. If you exclusively use the "default" platforms specified by Synapse Wireless, the CPU will automatically default for you. Refer to the platform selections listed in the platforms.py file included in the snappyImages\synapse directory for examples of the default platform values.)

If you have opened a read-only file, a message on the toolbar will tell you so. You can perform a ***Save As*** to create a separate editable copy. This lets you start with an existing demo script and make your own custom variations. If you *try* to type characters into the edit window of a read-only file, *Portal* volunteers to save the file to a writable copy for you.

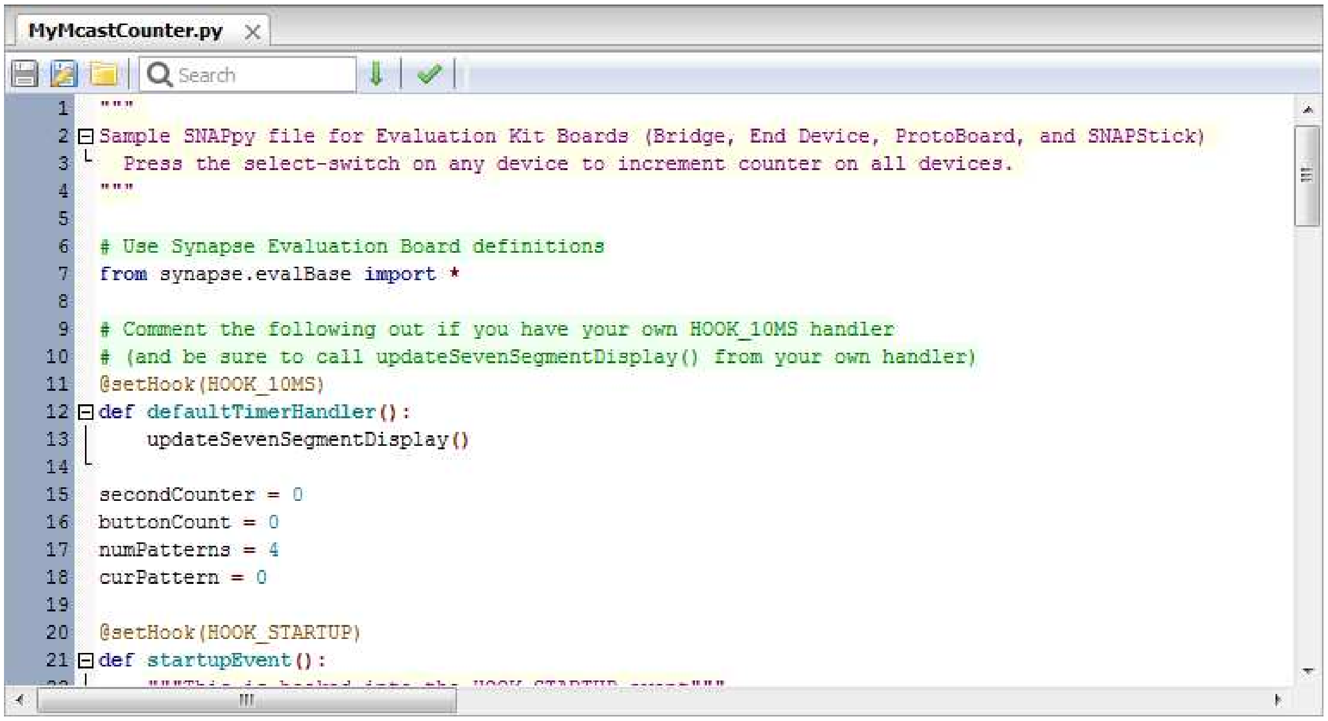

Read-only File

This file is read-only and changes cannot be saved to this file
Would you like to save this file as a different name?

If you did not mean to be editing the read-only file, just click on ***No***.

If you *do* want to edit a copy of the original read-only file, click on ***Yes***.

The usual file dialog box will allow you to specify the new file name. The edit window will automatically switch to editing the newly created file.



```
"""
Sample SNAPpy file for Evaluation Kit Boards (Bridge, End Device, ProtoBoard, and SNAPStick)
  Press the select-switch on any device to increment counter on all devices.
"""

# Use Synapse Evaluation Board definitions
from synapse.evalBase import *

# Comment the following out if you have your own HOOK_10MS handler
# (and be sure to call updateSevenSegmentDisplay() from your own handler)
@setHook(HOOK_10MS)
def defaultTimerHandler():
    updateSevenSegmentDisplay()

secondCounter = 0
buttonCount = 0
numPatterns = 4
curPattern = 0

@setHook(HOOK_STARTUP)
def startupEvent():
```

Be sure to **_Save_** your edits when you are done. Your new script can be uploaded into one or more SNAP nodes using the **_Upload Snappy Image_** button in the **_Node Info_** window.

7. Firmware Updates

The Firmware Version is shown in the **Node Info** pane for each SNAP node in your network. Upgrading your devices to a newer version of SNAP is easy with *Portal*.

Note – Upgrades use UART1 of the *RF Engine* (on engines with more than one UART). This means a connection to the second serial port (usually RS-232) of the device being upgraded is required. Note that the *SNAPstick* carrier does not support reprogramming. You must move the *RF Engine* from the *SNAPstick* to some other board (like the *SN171 Proto Board*) in order to upgrade that *RF Engine*'s firmware.

Obtaining Firmware

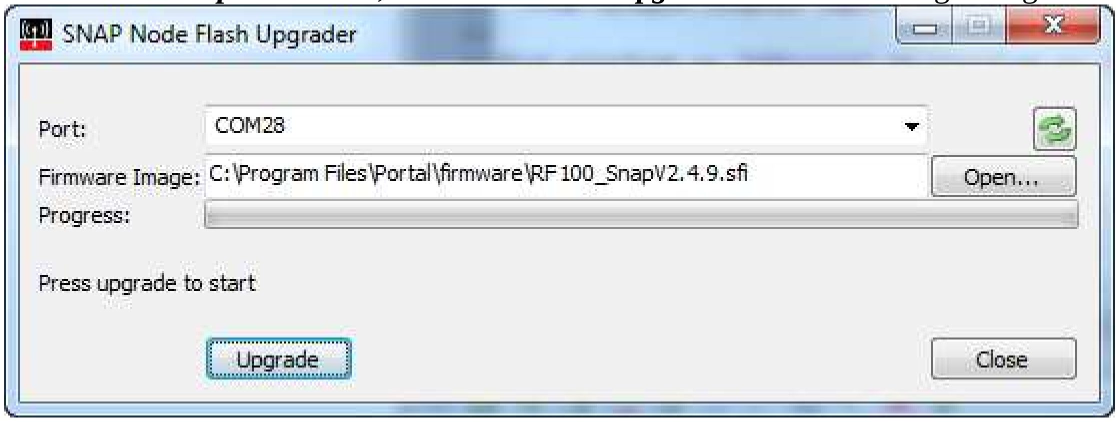
Each new release of *Portal* includes the most current version of the SNAP firmware *at the time of that Portal release*. Intermediate "firmware only" updates may also be available on the *Synapse Support Web Site*:
http://forums.synapse-wireless.com/

Look in the ***Latest Releases*** thread on the forum, under the ***Software Releases*** topic.

Installing new Firmware

First make sure you have an **RS232** connection to the device you are upgrading. This requires a connection to the DB9 connector on the Evaluation kit board, as the USB connection on that board connects to UART0, which is not supported for firmware upgrades.

From *Portal*'s ***Options*** menu, select ***Firmware Upgrade…*** The following dialog box will display:


SNAP Node Flash Upgrader

Port: COM28

Firmware Image: C:\Program Files\Portal\firmware\RF100_SnapV2.4.9.sfi

Progress:

Press upgrade to start

Portal will list the available COM ports on your system under the ***Port*** dropdown. Manually select the correct COM port to which that your SNAP node is connected. (You may need to click the ***Scan*** button for *Portal* to locate your serial connection.)

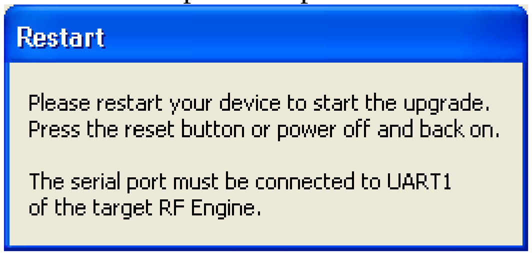
Select the Firmware Image to be used for the upgrade. Note that starting with version 2.1, there are now **four types** of firmware images from which to choose:

- Firmware images with "debug" in the title have extra error checks to help debug user scripts and configurations. These extra diagnostic checks come at the expense of a slight decrease in speed and SNAPpy image space.
- Firmware images without "debug" in the title do not have these extra error checks, which allow them to run faster, and have more room for SNAPpy images.
- Firmware images with AES128 in their name have built-in support for AES-128 over-the-air encryption. These images are not included with *Portal*, but can be ordered separately from Synapse. (There is an additional charge for AES-128 support.)
- Firmware images without AES in the title do not support AES-128 encryption.

The firmware image names also indicate the version of that firmware. For example, 2.4.10 is newer firmware than 2.4.6, and both are newer than 2.2.16.

After choosing the correct firmware image to load, press the ***Upgrade*** button to begin.

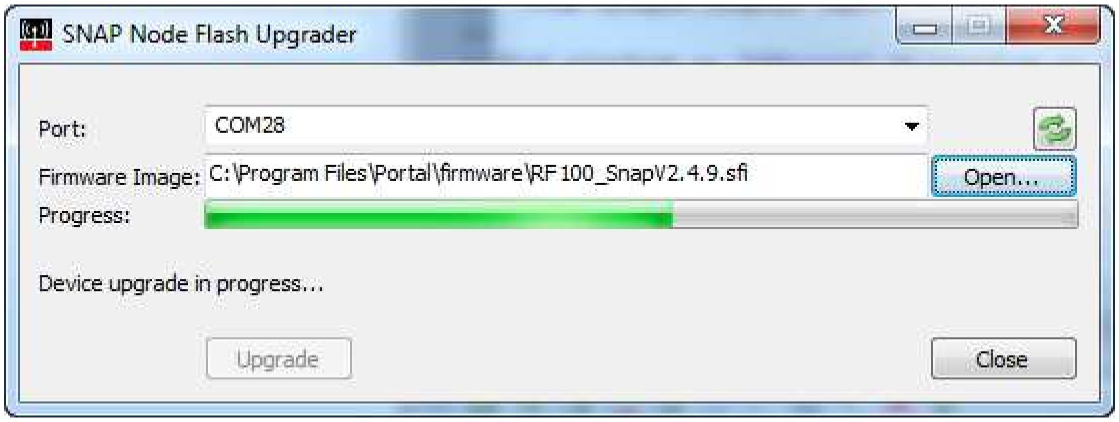
Follow the instructions given in the dialog, which may have you restart (power-cycle or reset) your device to complete the process.


Restart

Please restart your device to start the upgrade.
Press the reset button or power off and back on.

The serial port must be connected to UART1
of the target RF Engine.

New firmware will be sent to the SNAP node over the serial connection.

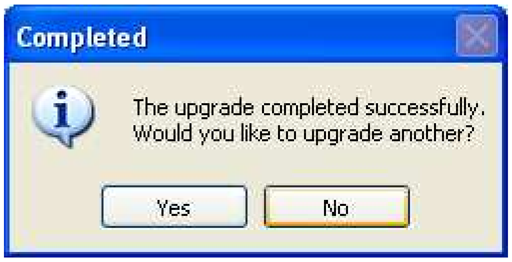

SNAP Node Flash Upgrader

Port: COM28

Firmware Image: C:\Program Files\Portal\firmware\RF100_SnapV2.4.9.sfi

Progress:

Device upgrade in progress...


Completed

The upgrade completed successfully.
Would you like to upgrade another?

Choose ***Yes*** to download the same image into another SNAP node, or ***No*** to return to *Portal*.

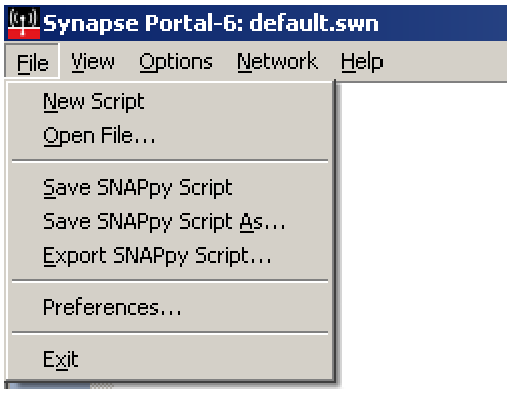
Troubleshooting

There is a possibility of interruption (power, serial connection, etc.) in the midst of the upgrade process. This may leave the SNAP node in a state where the SNAP application firmware is unusable. However, upgrade is still possible, since the SNAP boot-loader firmware is protected in a “locked” region of the node. Simply restart the upgrade process. This time you’ll need to *manually select the appropriate COM port* for RS232 communication, since *Portal* won’t be able to detect a running *RF Engine* on the serial port.

8. Menu Options

The following sections will go through the menu options within *Portal*.

File Menu



New Script

The ***New Script*** menu option will allow you to open a new ***Code Editor*** window with a blank script. This option has the same effect as using the ***New Script*** button on the main toolbar

Open File

This menu option displays a standard open file dialog that will open a SNAPpy or *Portal* script to edit in a code editor panel. This option has the same effect as using the ***Open File*** button on the main toolbar.

Save SNAPpy Script

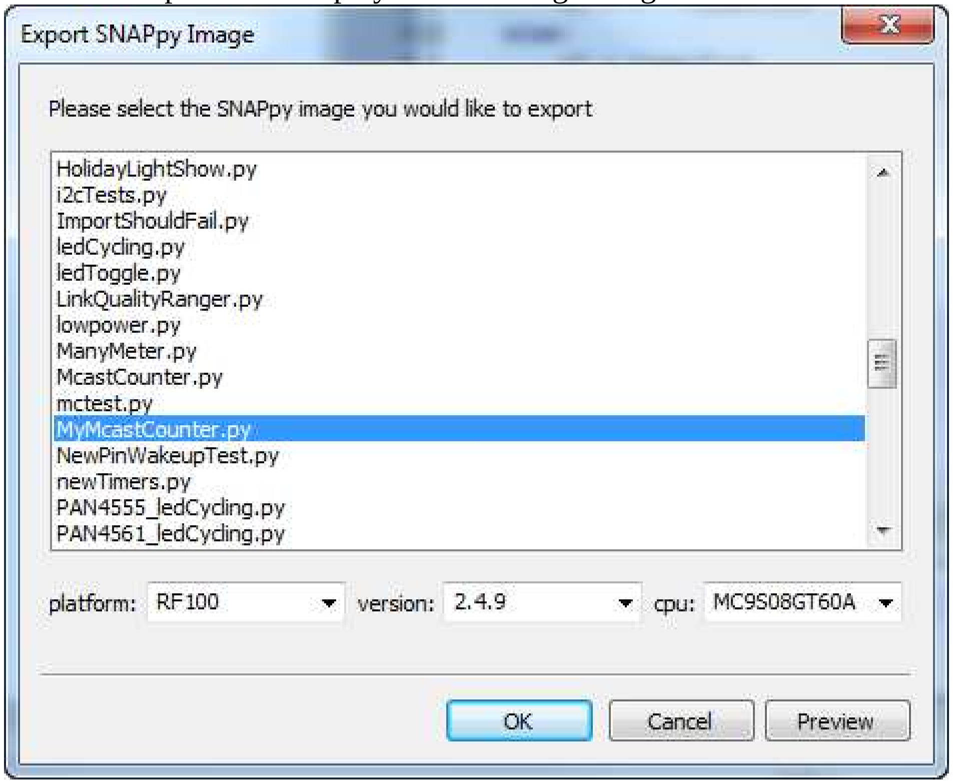
When a code editor panel is currently active this option will save the current file. This option has the same effect as using the ***Save*** button in the ***Code Editor*** toolbar.

Save SNAPpy Script As

When a code editor panel is currently active this option will save the current file as a different filename. This option has the same effect as using the ***Save As*** button in the ***Code Editor*** toolbar.

Export SNAPpy Script

This menu option will display the following dialog box:



Export SNAPpy Image

Please select the SNAPpy image you would like to export

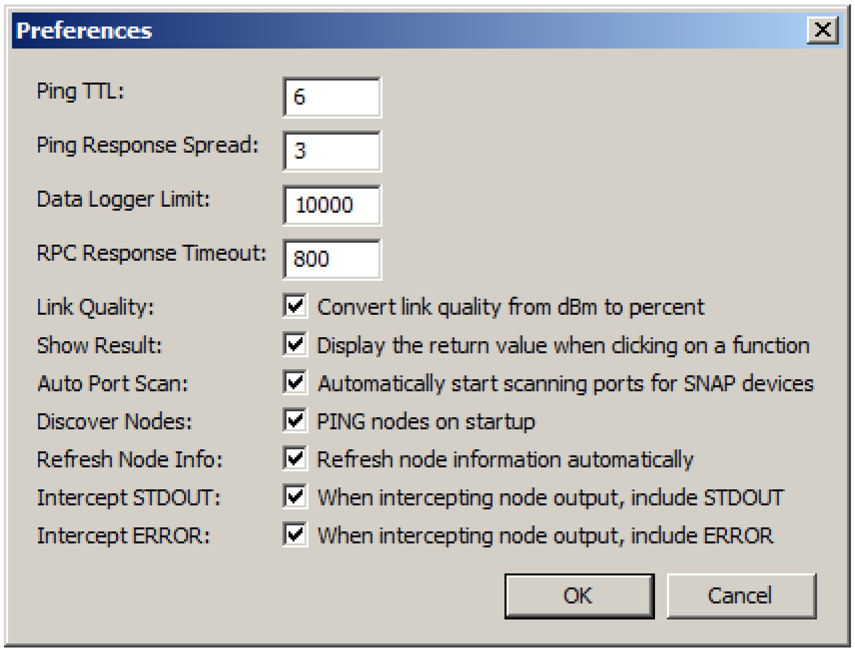
HolidayLightShow.py
i2cTests.py
ImportShouldFail.py
ledCycling.py
ledToggle.py
LinkQualityRanger.py
lowpower.py
ManyMeter.py
McastCounter.py
mctest.py
MyMcastCounter.py
NewPinWakeupTest.py
newTimers.py
PAN4555_ledCycling.py
PAN4561_ledCycling.py

platform: RF100 version: 2.4.9 cpu: MC9S08GT60A

This option is similar to the ***Export SNAPpy Image*** button on the Node Info panel toolbar but this dialog allows you to manually specify the platform and version to use when exporting the script.

Preferences

The preferences dialog box allows you to configure different options on how you would like *Portal* to behave:



Preferences

Ping TTL:	6
Ping Response Spread:	3
Data Logger Limit:	10000
RPC Response Timeout:	800
Link Quality:	✓ Convert link quality from dBm to percent
Show Result:	✓ Display the return value when clicking on a function
Auto Port Scan:	✓ Automatically start scanning ports for SNAP devices
Discover Nodes:	✓ PING nodes on startup
Refresh Node Info:	✓ Refresh node information automatically
Intercept STDOUT:	✓ When intercepting node output, include STDOUT
Intercept ERROR:	✓ When intercepting node output, include ERROR

The following table describes each option in the ***Preferences*** dialog:

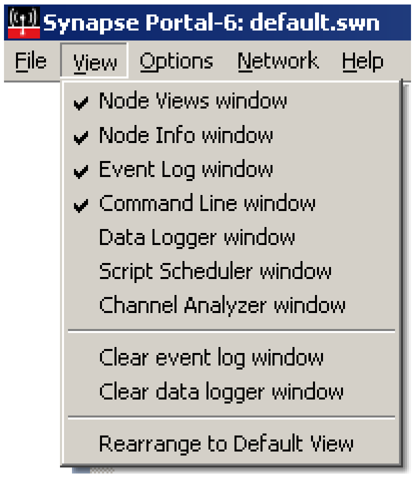
Ping TTL	The Time to Live (TTL) value to use when *Portal* sends a broadcast ping request. TTL is sometimes referred to as hops.
Ping Response Spread	The time in seconds to request nodes to randomize their broadcast ping responses across.
Data Logger Limit	The number of data log entries to keep before dropping the oldest entry.
RPC Response Timeout	When *Portal* sends an RPC command to a node for which it expects a response (such as a callout, or a ping to the node), this parameter specifies how long, in milliseconds, *Portal* will wait for the response before sending the next packet. If your network requires many hops to reach all your nodes, you may want to lengthen this from the default value of 800.
Link Quality	Where applicable display link quality as a percentage instead of dBm.
Show Result	When a function is clicked in the ***Node Info*** function tree, request that the node send the return value of that function to *Portal*'s event log.
Auto Port Scan	At startup have *Portal* automatically start scanning for SNAP bridge nodes.
Discover Nodes	Automatically have *Portal* send a broadcast ping at startup. This does not prevent *Portal* from discovering who the bridge node is.
Refresh Node Info	When *Portal* receives a message from a node not previously heard from, this option automatically retrieves the node's information. When administering a large SNAP network, you may want to turn this off to reduce traffic.
Intercept STDOUT	When you select a node and use the ***Intercept STDOUT*** function, any messages that a node would normally output through a print statement are redirected to the *Portal* log instead. If you have both this checkbox and the ***Intercept ERROR*** checkbox unchecked, the ***Intercept STDOUT*** function does not do anything.
Intercept ERROR	When you select a node and use the ***Intercept STDOUT*** function, any error messages generated by SNAP in the node redirected to the *Portal* log instead.[3] If you have both this checkbox and the ***Intercept STDOUT*** checkbox unchecked, the ***Intercept STDOUT*** function does not do anything.

Exit

This menu option closes *Portal*, prompting to save any open and unsaved scripts first.

[3] In nodes with firmware older than release 2.4, error messages are included in STDOUT automatically, and this option has no effect.

View Menu



Various Windows

The first seven options in the View menu correspond to toolbar options to toggle the display of other windows:

View Menu Option	Toolbar Icon
Node View window	
Node Info window	
Event Log window	
Command Line window	
Data Logger window	
Script Scheduler window	
Channel Analyzer window	

If a menu item has a check mark next to it, this indicates the window is currently open.

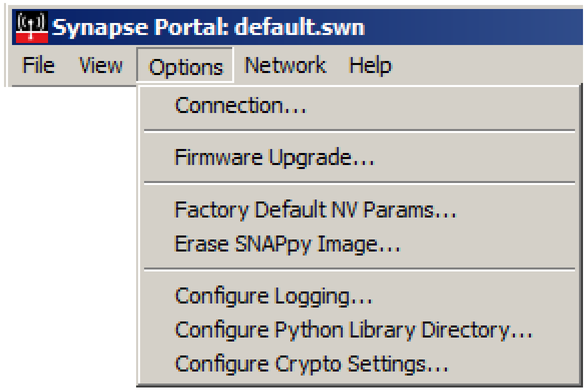
Clear Windows

The ***Clear event log window*** and ***Clear data logger window*** menu options allow each window's respective captured data to be cleared.

Rearrange to Default View

If you have rearranged your *Portal* window layout, this option will rearrange the windows to the default layout view.

Options Menu


Synapse Portal: default.swn
File
View
Options
Network
Help
Connection...
Firmware Upgrade...
Factory Default NV Params...
Erase SNAPpy Image...
Configure Logging...
Configure Python Library Directory...
Configure Crypto Settings...

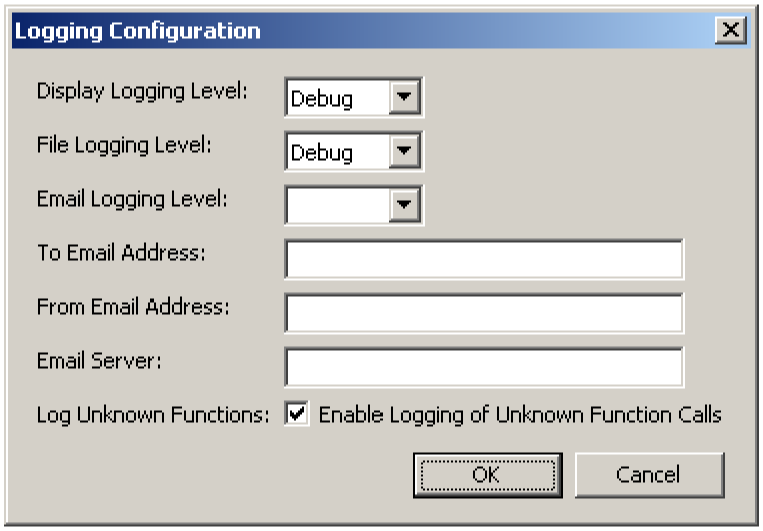
Connection...
This menu option shows the standard *Portal* connect dialog box. This option has the same effect as using the button in the main toolbar.

Firmware Upgrade...
This menu option displays the Firmware Upgrade dialog to facilitate upgrading your SNAP nodes to a different version. This is described in further detail in section 7.

Factory Default NV Params...
This menu option displays the Factory Default NV Params dialog, which allows you to reset all NV parameters to the defaults as shipped from the factory.

Erase SNAPpy Image...
This menu option displays the Erase SNAPpy Image dialog, which allows you to erase the currently loaded SNAPpy script in your node. This option is useful if your script has inadvertently been programmed to lock you out of your node over the air.

Configure Logging...
The Logging Configuration dialog enables the configuration of different logging levels and methods for *Portal*.

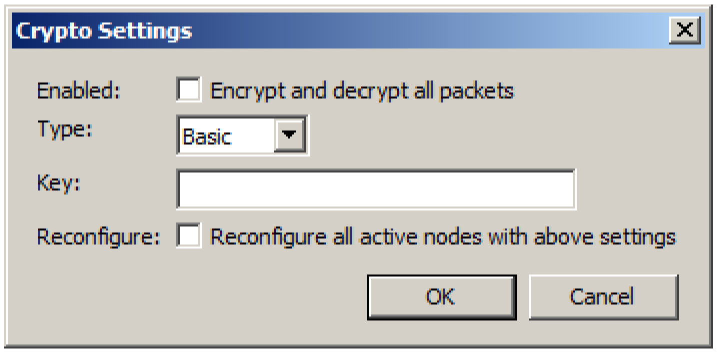


Logging Configuration

Display Logging Level: Debug
File Logging Level: Debug
Email Logging Level:
To Email Address:
From Email Address:
Email Server:
Log Unknown Functions: ☑ Enable Logging of Unknown Function Calls

Configure Python Library Directory...
The ***Configure Python Library Directory*** menu option display a standard directory dialog box to choose the directory where you have optionally installed a local copy of Python. This enables you to use the power of full desktop Python in your *Portal* scripts. If you have installed Python in its default directory, this will likely be something like *C:\Python**NN**\Lib*, where the NN in PythonNN refers to the version number of your Python installation.

Configure Crypto Settings...
The Crypto Settings dialog enables the configuration of encryption for the *Portal* node. Beginning with firmware release 2.4, all serial communication between nodes is encrypted when encryption is enabled, so *Portal* must be configured with the same encryption options used in your other nodes.

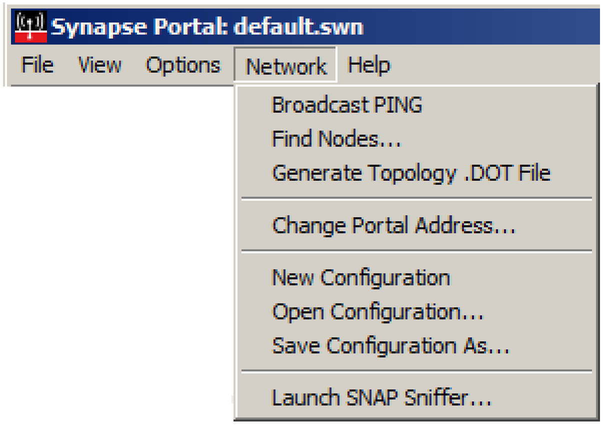

Crypto Settings
Enabled:
Encrypt and decrypt all packets
Type:
Basic
Key:
Reconfigure:
Reconfigure all active nodes with above settings
OK
Cancel

Check the Enabled checkbox to indicate that you want to use encryption. Select the appropriate encryption type (either ***Basic*** or ***AES128***, if available), and specify a 16-character encryption key. The encryption key and the encryption type must match the key and type used in your other nodes or they will not be able to communicate.

The key must be exactly 16 bytes long. You can specify the key as a simple string (e.g., ThEeNcRyPtIoNkEy), as a series of hex values (e.g., \x2a\x14\x3b\x44\xd7\x3c\x70\xd2\x61\x96\x71\x91\xf5\x8f\x69\xb9) or as some combination of the two (e.g. \xfbOF\x06\xe4\xf0Forty-Two!). Standard security practices suggest you should use a complicated encryption key that would be difficult to guess.

If you check the Reconfigure checkbox, *Portal* will set all available nodes to use the same encryption settings, using traceroute information to work from the outer edges of your network, in. Refer to the **SNAP Reference Manual** for more information about encrypted SNAP networks.

Network Menu



Broadcast PING

This menu option sends a broadcast PING request to the SNAP network. This option has the same effect as using the ***Broadcast PING*** button on the main toolbar.

Find Nodes...

This menu option opens the Find Nodes dialog box to search for nodes across different SNAP networks. This option has the same effect as using the ***Find Nodes*** button on the main toolbar.

Generate Topology .DOT File

This option generates a topology.dot file to view a snapshot of your SNAP mesh network. This is accomplished by having the SNAP nodes query for any nodes that are one hop away and report that information for *Portal*.

To view the .DOT file, which is saved in your *Portal* documents directory, you will need to use a .DOT file viewer. There are several freely available viewers on the internet.

Change Portal Address...

This option changes the network address of your *Portal* node. This may be necessary if you have an environment with multiple computers running *Portal* where the nodes can interact. If more than one *Portal* node has the same network address (the default is 00.00.01), you can have unpredictable results when nodes attempt to communicate with *Portal*.

The valid network addresses for *Portal* range from 00.00.01 through 00.00.0F. It is not necessary to restart *Portal* for this change to take effect.

New Configuration

This option creates a new *Portal* configuration, which deletes any locally saved *Portal* information. Your window layout and all your preferences will be preserved, however scheduled scripts and saved node information will be deleted. For example all the nodes in the ***Node Views*** will be deleted and a broadcast ping will be preformed to rediscover the network.

Open Configuration...

This option opens a previously saved Synapse Wireless Network (.SWN) file that contains saved information about nodes.

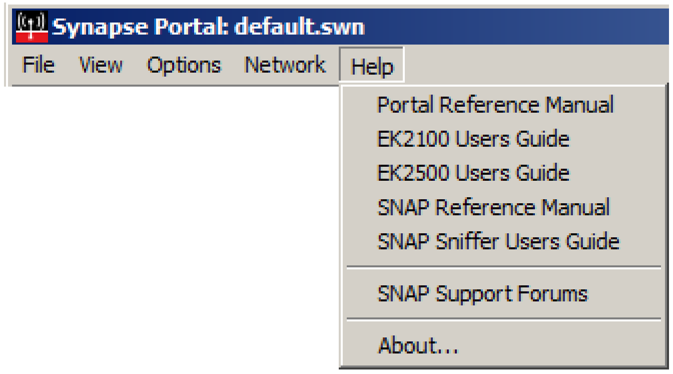
Save Configuration As...

This option saves a Synapse Wireless Network (.SWN) file that contains information about your nodes.

Launch SNAP Sniffer...

The SNAP Sniffer is an external program that helps to analyze and debug your SNAP network. Please consult the **SNAP Sniffer Users Guide** for detailed information.

Help Menu



Portal Reference Manual

This option will open the **Portal Reference Manual** (this document) in your default PDF viewer.

EK2100 Users Guide

This option will open the **EK2100 Users Guide** in your default PDF viewer.

EK2500 Users Guide
This option will open the **EK2500 Users Guide** in your default PDF viewer.
SNAP Reference Manual
This option will open the **SNAP Reference Manual** in your default PDF viewer.
SNAP Sniffer Users Guide
This option will open the **SNAP Sniffer Users Guide** in your default PDF viewer.
SNAP Support Forums
This option will open the Synapse Support Forums website in your default web browser. This website is the preferred place to ask any technical questions you may have while using our products.
About
The about dialog displays information about the current version of *Portal* you are running.

9. Portal API

This section details the API presented to *Portal* Scripts. The ***Command Line*** window of *Portal* also has access to this API.

When a node makes a call to a *Portal* function, two variables are set within the scope of the *Portal* function that allow easy identification of and access to the calling node. The `remoteNode` variable is set to the calling node's node object, and the `remoteAddr` variable is set to the address of the calling node. These variable values persist only for the duration of the called function. They can be used to invoke node methods or read node attributes on the node, or to send messages or commands back to the node.

Node Methods

The following are functions bound to each network device (node) known to *Portal*, i.e. visible in one of the ***Node Views***, or appearing in the ***Node Info*** window.

To invoke one of these methods, you must prefix the desired function name with the a variable containing a reference to the node that you want to invoke the function on, followed by a "." character. For example:

```
MyNode.getFormattedNetAddr()
```

In order to get a reference to a node, you can use the `remoteNode` property in your Portal script. The variable contains a reference to a node object any time Portal is running a function invoked by an RPC call from another node.

`getColumn(`*`name`*`)`	Returns the current value stored for the specified column name
`getFormattedNetAddr()`	Returns this node's network address as a string in the format ##.##.##
`getFormattedNetworkId()`	Returns the node's network ID as a hexadecimal string in the format 0x####
`ping(`*`toggleResponding`*`=True)`	PINGs the node. Parameter *toggleResponding* determines how the result of the PING affects the Node Views and Node Info windows
`refresh(`*`ping`*`=True, `*`toggleResponding`*`=True)`	Queries the node for information to display in its Node Info tab.
`setColumn(`*`name`*`, `*`value`*`)`	Stores the specified value for the specified name
`setNvParam(`*`id`*`, `*`value`*`)`	Tells the node to set the NV parameter *id* to the specified *value*.
`setStdoutPortal()`	Tells the node to redirect its STDOUT to *Portal*'s network address. Whatever the node prints will appear in the *Portal* ***Event Log***
`linkQualityAsk()`	**Deprecated:** Queries the node for its currently link quality value

`linkQualityPercentVal()`	**Deprecated:** Returns an integer value in the range 0-100 based on the node's last known link quality
`macAsk()`	**Deprecated:** Queries the node for its MAC Address
`netParamAsk()`	**Deprecated:** Queries the node for its channel and network ID
`reboot()`	**Deprecated:** Tells the node to reboot
`versionAsk()`	**Deprecated:** Queries the node for its current version string

Node Attributes

The following are attributes bound to each network device (node) known to *Portal*, i.e. visible in one of the ***Node Views***.

Like the node methods, these must be prefixed by a reference to the node you want to examine, and a "." character. For example:

```
print MyNode.channel
```

Note – These are data fields, not functions. Do not put parentheses "()" after them.

`MyNode.channel` returns a number.
`MyNode.channel()` returns an error.

`channel`	An integer corresponding to the node's channel
`isResponding`	A boolean value indicating whether the last query was successful
`lqVal`	A float value of the node's last queried link quality in dBm
`name`	A string that describes this node in *Portal*'s node views
`netAddr`	A string containing this node's unformatted network address
`networkId`	An integer corresponding to the node's network id
`version`	A string containing the node's last queried version

Portal Methods

The following methods are independent of SNAP Nodes. They provide a system-level interface between *Portal* scripts and system-wide capabilities.

Because they are not node specific, you do not prefix them with a node name and a "." character.

Some of these routines do take a node parameter. You can specify the correct node in two different ways:

- By explicit address
- By node name (the node's name within *Portal*)

Explicit addresses are three-byte strings. *Portal* shows node Network Addresses in hexadecimal, but omits any number base prefixes or suffixes. If *Portal* shows a node's Network Address as 12.34.56, then the individual address bytes are 0x12, 0x34, and 0x56 (hexadecimal), not 12, 34, and 56 (decimal).

To specify hexadecimal constants within Python or SNAPpy strings, you use a leading "\x". Going back to our example, if you want to specify the node with address 12.34.56, you would use "\x12\x34\x56" in your script.

Portal also assigns names to nodes when it first discovers them. If the node with address 12.34.56 has a displayed name of "MyNode" then instead of specifying an explicit address string, you can just use the text MyNode instead.

Note – There are <u>no</u> quotation marks used when referencing nodes *by name* within *Portal* scripts (or from the *Portal* command line).

So, assuming node MyNode4 is at address AB.CD.EF, the following two commands are equivalent:

```
sendData("\xAB\xCD\xEF", "This is a test")
sendData(MyNode4, "This is a test")
```

`logEvent(`*`message`*`)`	Log the specified *message* to the Event Log
`logData(`*`name`*`, `*`value`*`, `*`fullscale`*`=100.0)`	Plot the specified *value* to a named strip chart in the Data Logger window
`mcastRpc(`*`groups`*`, `*`ttl`*`, `*`function`*`, `*`*args`*`)`	Sends a multicast RPC request to the specified *groups*. Parameter *function* is the routine to invoke on each node in the specified *groups*, and the remaining parameters are passed to that routine.
`multicastRpc(…)`	The same as the mcastRpc function above but left for backwards compatibility with older version of *Portal*
`rpc(`*`node`*`, `*`function`*`, `*`*args`*`)`	Sends an RPC request to the specified node. Parameter *function* is the routine to invoke on the node, and the remaining parameters are passed to that routine.
`sendDataModePkt(`*`node`*`, `*`data`*`)`	Sends *data* to the specified *node* in a way that mimics TRANSPARENT MODE. This lets *Portal* insert data into TRANSPARENT MODE links.
`sendEmail(`*`recipients`*`, `*`sender`*`, `*`msg`*`, `*`server`*`)`	Sends an e-mail containing *msg* text to the specified *recipients* via the specified (e-mail) *server*, addressed as if it came from *sender*.
`sendMcastDataModePkt(`*`group`*`, `*`ttl`*`, `*`data`*`)`	Sends *data* to the specified multicast *group* in a way that mimics TRANSPARENT MODE. This lets *Portal* insert data into TRANSPARENT MODE links.

`sendTraceRouteRequest(`*`node, sequence`*`)`	Sends a traceroute request packet to the specified *node* with the specified *sequence* number

There are also some commands that must be prefixed by "root."

`root.clearEventLog()`	Clears the *Portal* Event Log
`root.displayTraceFile()`	Pops up a tabbed window with the contents of an internal log file sometimes used in debugging.
`root.sendDataModePkt(`*`node, data`*`)`	This is the same as the standalone function `sendData()`, use `sendData()` instead
`root.setPortalNetAddr(`*`newAddr`*`)`	Change *Portal*'s network address from the default value of "\x00\x00\x01" (00.00.01). *Portal*'s network address can range from \x00\x00\x01 to \x00\x00\x0F.

There are several commands that are deprecated or for Synapse internal use only. They are listed here only for completeness; you **should not** be calling these functions.

`cmdDispatcher`	Synapse use only
`notifyOnComplete()`	Synapse use only
`setup_usb_as_vcp()`	Synapse use only
`setupSynapseUsb()`	Synapse use only
`snappyErrorDecode(`*`node, errorMsg`*`)`	Synapse use only