

TASKVisualizer

The TASKVisualizer tool supports the visual deployment, configuration, and visualization of a sensor network. This document explains how to use TASKVisualizer.

Assumptions:

- 1) The rest of the TinyOS and TASK distribution has been installed and compiled.
- 2) A Postgres database is running.
- 3) The tinydb.conf configuration file has been configured correctly

If any of these assumptions are incorrect, please see the main TinyOS and TASK documentation for instructions on how to install and configure them.

Compiling TASKVisualizer:

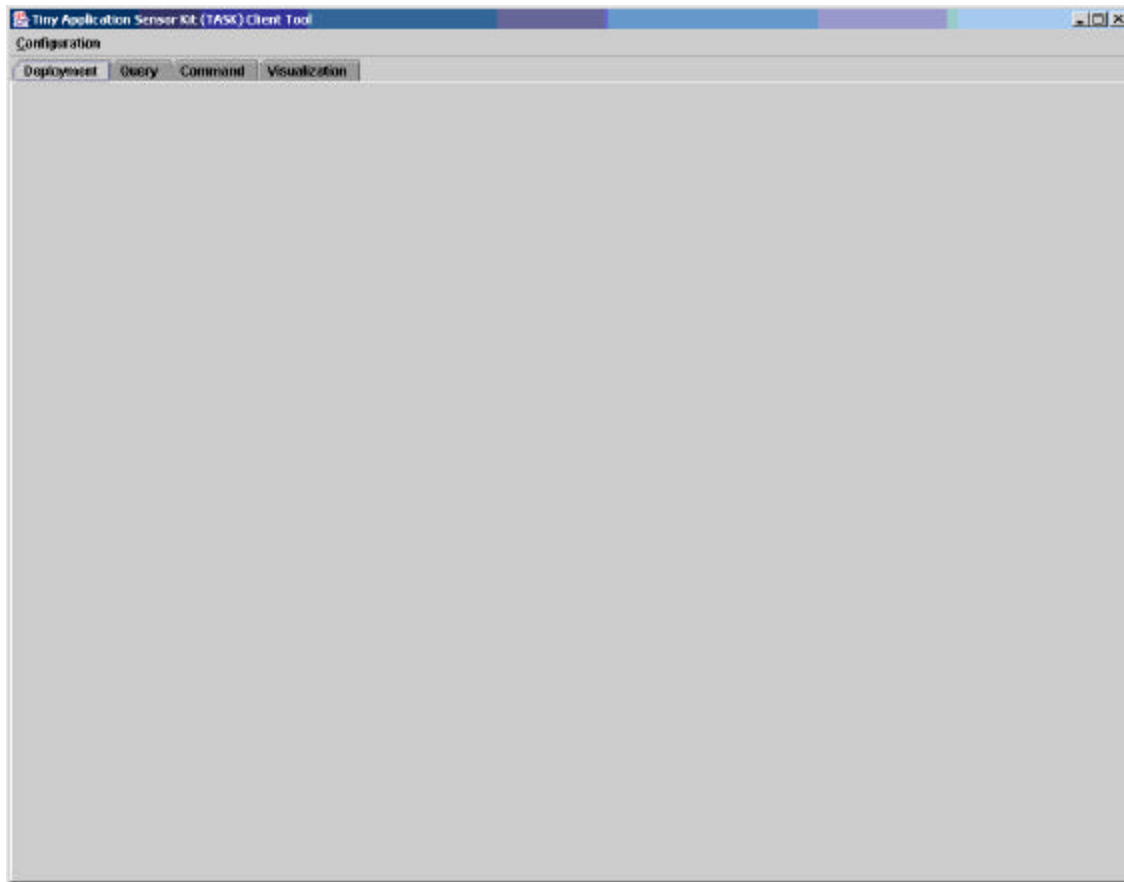
- 1) `cd <TINYOS_DIR>/tools/java/net/tinyos/TASKVisualizer`
- 2) `make`

Running TASKVisualizer:

- 1) Using simulated data:
 - a. `cd <TINYOS_DIR>/apps/TinyDBApp/build`
 - b. `pc/main.exe <number_motes>` where `number_motes` is the number of motes to simulate with identities 0 to `number_motes-1`. Data from the simulated network will be written to the screen.
 - c. In a separate window, `cd <TINYOS_DIR>/tools/java/`
 - d. `java net.tinyos.taskServer.TASKServer -sim`
 - e. In a separate window (including on a separate machine with TinyOS and TASK installed), `cd <TINYOS_DIR>/tools/java/`
 - f. `java net.tinyos.taskViz.TASKVisualizer TASKServer_host>` where `TASKServer_host` is the hostname of the machine where the `TASKServer` is running (localhost, if running locally)
- 2) Using real data:
 - a. Deploy a sensor network as described in the TinyOS and TASK documentation.
 - b. `cd <TINYOS_DIR>/tools/java/`
 - c. `java net.tinyos.taskServer.TASKServer`
 - d. In a separate window (including on a separate machine with TinyOS and TASK installed), `cd <TINYOS_DIR>/tools/java/`
 - e. `java net.tinyos.taskViz.TASKVisualizer TASKServer_host>` where `TASKServer_host` is the hostname of the machine where the `TASKServer` is running (localhost, if running locally)

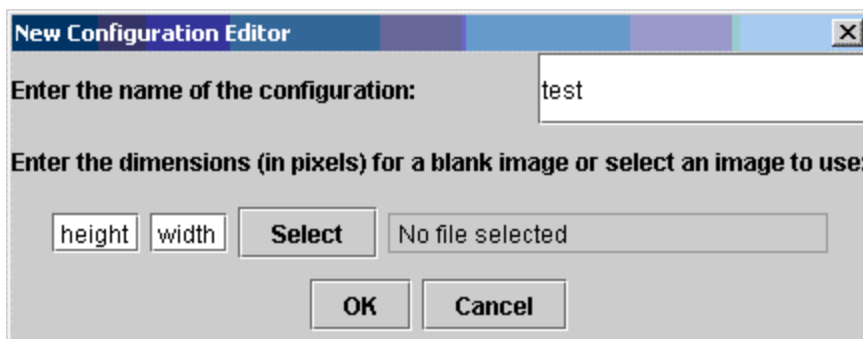
TASKVisualizer Tool:

When the tool is launched, the following interface is seen:



Creating and loading a configuration:

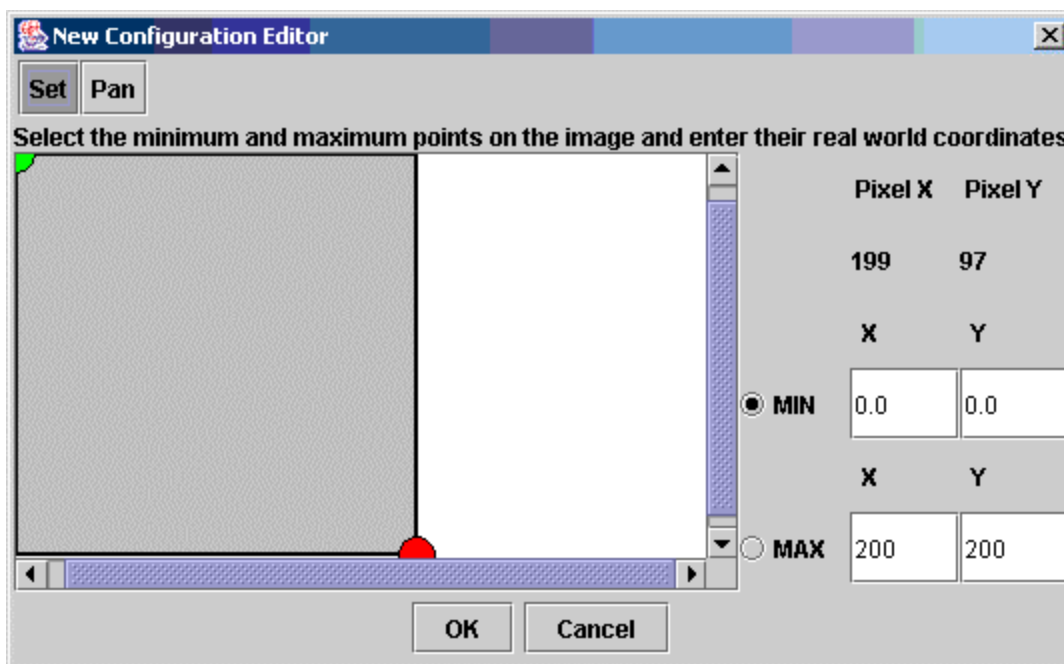
To use the tool for a new deployment, select <Configuration> <New>. A dialog box will appear, allowing you to define a new configuration. The dialog asks for a name for the configuration, and either the name of an image to use for the “floorplan” or background of the configuration, or the dimensions of a blank background to use.



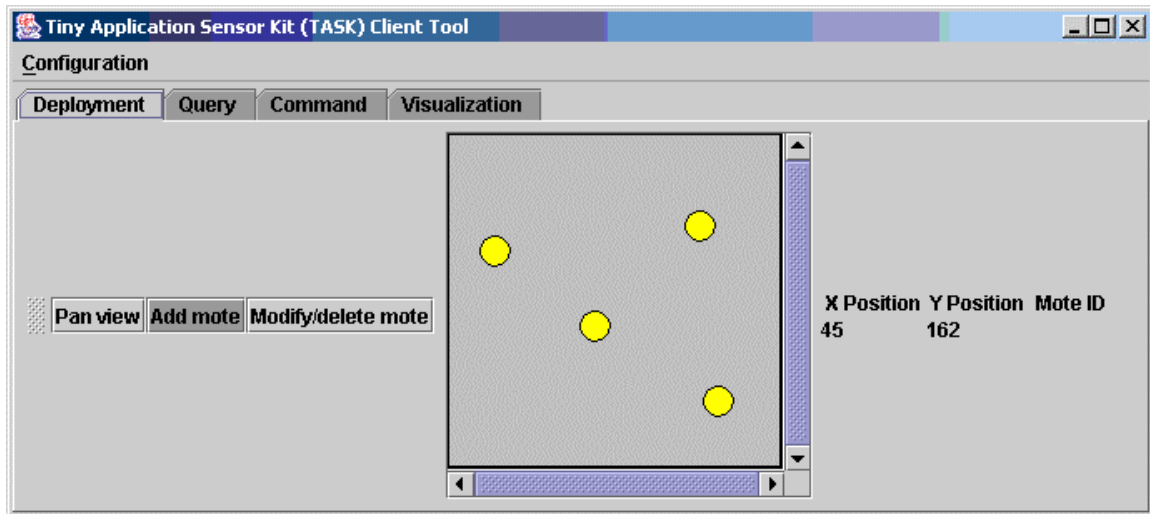
Once this information has been entered, click the OK button and then you will be asked to register the image. This process allows you to use a different Cartesian coordinate

system than the one specified by the image. The default coordinate system should be adequate for most uses.

If you do want to use a different coordinate system, click on the background image (a green circle will appear) and this clicked point will serve as one corner of the coordinate system. Besides the selected MIN radio button, enter the coordinates for this corner. Select the MAX radio button, click on the background image where you would like the other corner to be (a red circle will appear), and enter the coordinates for this corner. To make the selection easier, you can zoom in and out of the image, using the right mouse button (hold down the right mouse button and drag the mouse right or left to zoom in or out). You can also pan the image, by selecting the Pan button from the toolbar. To select a coordinate corner or to zoom, you will need to select the Set button.



Once you have selected the coordinate system, click the OK button. The background image will be reloaded with a rectangle shown to reflect the coordinate system. Motes can be added to the deployment by clicking on the image at the location where the motes will be or are actually placed. After each click, you will be asked to provide the numeric identity of the added mote. Motes can be deleted by clicking on the "Modify/delete mote" toolbar button and then clicking on the motes to be deleted. In this mode, motes can also be moved by dragging a selected mote with the mouse. Select the "Add mote" toolbar button to resume adding motes. The image can be panned or zoomed as described above. When you have finished adding motes, save the configuration by selecting <Configuration> <Save> from the menu.



You can cancel the configuration at any time. No data from the configuration will be stored, unless the configuration has been saved using the <Configuration> <Save> menu option or by accepting the save configuration prompt. The prompt will be shown if a new configuration is started, an existing configuration is loaded or the program is exited without saving.

To load an existing configuration, select <Configuration> <Load> from the menu. You will be prompted to select the name of the configuration to load from the list of existing configurations. Once selected, you will be asked whether you would like to edit the configuration. Selecting the YES option takes you through the procedure described above for creating a new configuration (except that the values for the configuration default to the existing configuration). Selecting the NO option simply loads the configuration to be used.

Configuring the deployment:

To select what data is collected from the sensor network, click on the Configuration tab. On this screen, you can create the sensor query to run on the network, start and stop the sensor query, and start and stop the hardcoded healthy query. NOTE: due to a Java redraw bug, you probably will need to resize your window to make it display correctly, as shown in the image below.

Tiny Application Sensor Kit (TASK) Client Tool

Configuration

Deployment Query Command Visualization

Data to collect (click or shift-click)

- nodeid: node id
- light: light sensor reading
- temp: temperature sensor reading
- parent: parent node id in routing tree
- accel_x: accelerometer reading in x axis

Sample Period (ms)

Time to Live (days) 14

Sample Period (ms) 1011

Editing Sensor Query

Remove Entry

Clear List

Submit Query

SELECT SAMPLE PERIOD 1011

Current Sensor Query

No sensor query running

Edit

Enter name to store results as: Default

Current Health Query

No health query running

Enter name to store results as: Default

Start Sensor Query Stop Sensor Query

Start Health Query Stop Health Query

Click on the attributes you would like to include in the sensor query. If you want to set a condition on an attribute (<, =, >, *etc.*) or set an aggregate on an attribute (winavg, winsum, winmax, winmin, wincnt), hold down the SHIFT key when you click on an attribute.

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Sample Period (ms)

Time to Live (days) 14

Sample Period (ms) 1011

Editing Sensor Query

Attribute Aggregate/Filter Dialog: temp

Aggregators

winsum Argument 1 Argument 2

Filter

temp =

OK Cancel

Current Sensor Query

No sensor query running

Edit

Enter name to store results as: Default

Current Health Query

No health query running

Enter name to store results as: Default

Start Sensor Query Stop Sensor Query Start Health Query Stop Health Query

As you add attributes to your query, they will be added to the list below and the text representation of the query will be updated.

Tiny Application Sensor Kit (TASK) Client Tool

Configuration

Deployment **Query** **Command** **Visualization**

Data to collect (click or shift-click)

- nodeid: node id
- light: light sensor reading
- temp: temperature sensor reading
- parent: parent node id in routing tree
- accel_x: accelerometer reading in x axis

Sample Period (ms)

Time to Live (days) Sample Period (ms)

Editing Sensor Query

temp
parent
light
nodeid

Remove Entry
Clear List
Submit Query

SELECT temp,parent,light,nodeid SAMPLE PERIOD 1011

Current Sensor Query

Current Sensor Query
No sensor query running

Enter name to store results as:

Current Health Query

No health query running

Enter name to store results as:

Start Sensor Query Stop Sensor Query Start Health Query Stop Health Query

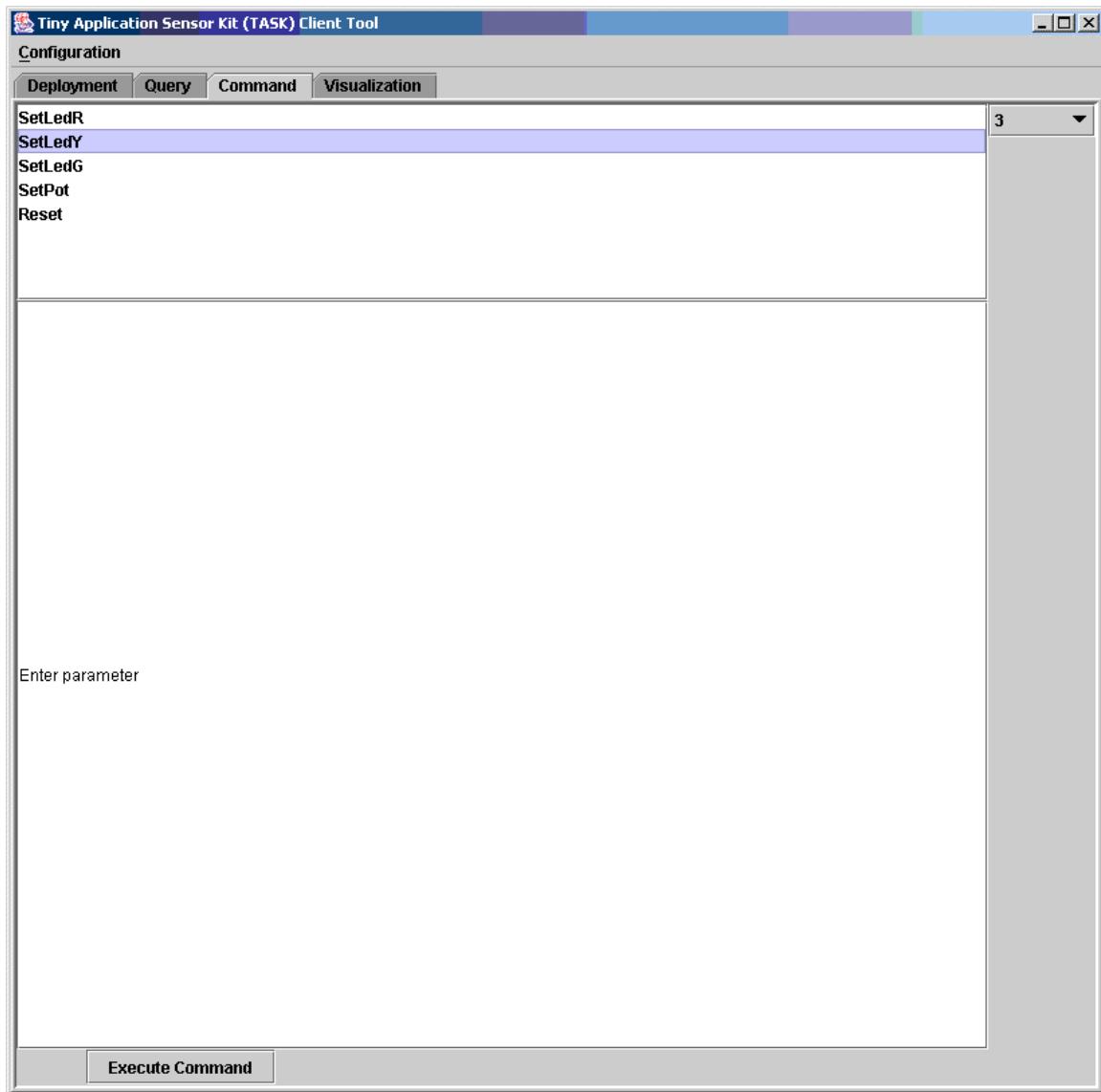
Select either the time you want the deployment to live or the period you want to sample the network at. These two parameters are correlated. The longer the sample period, the longer the deployment will last.

With the created sensor query, you can use the buttons on the right to remove an attribute, clear the entire query or submit the query to be started. Using the buttons on the bottom of the interface, you can start or stop the sensor query and start or stop the health query. The results of the query will be stored in a table in the Postgres database with a default name. To use a particular name to store the results, enter the name of the table to store the results in.

Executing commands:

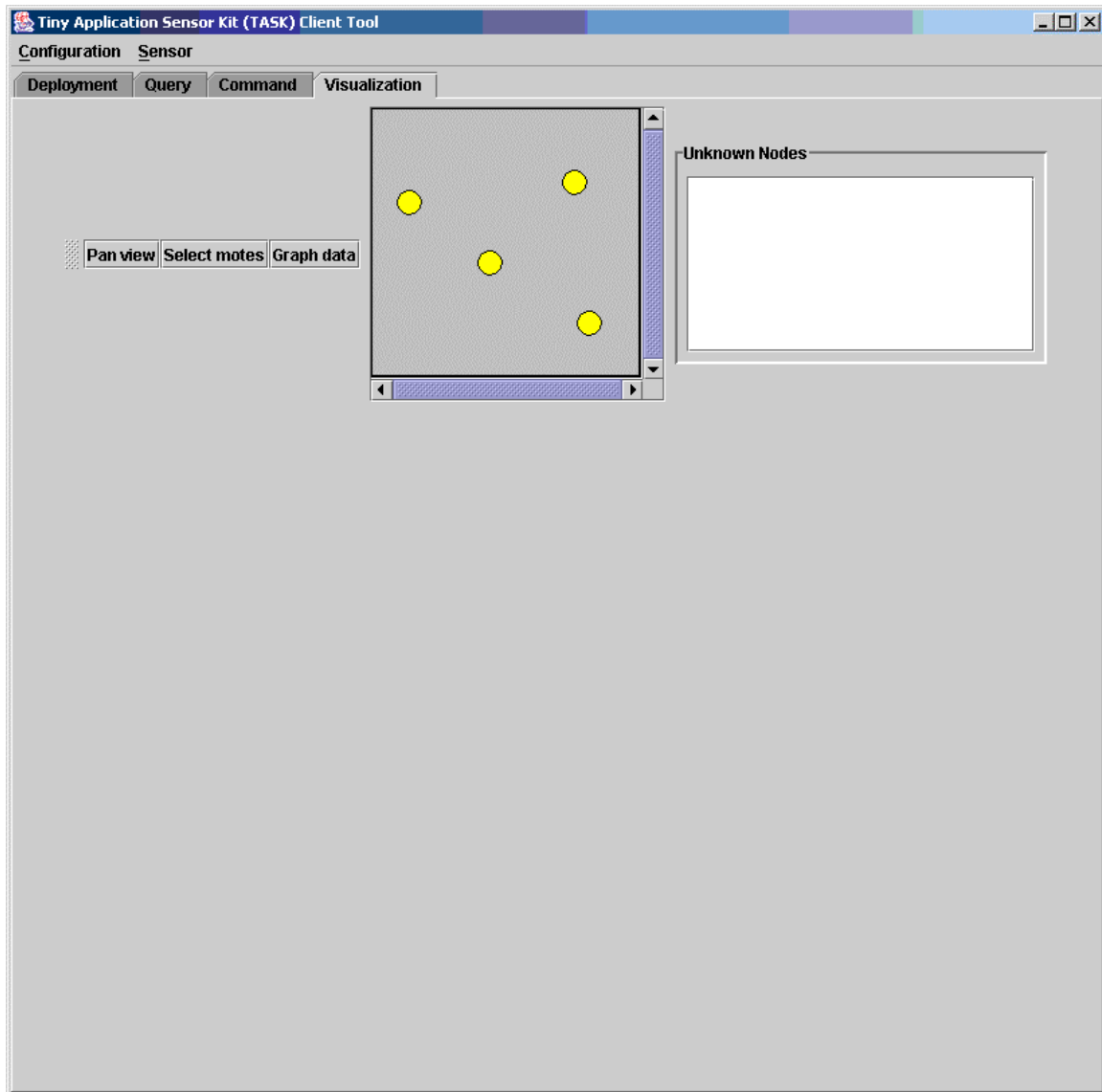
To run commands on the network, select the Command tab. To run a command on the network, select a command from the list. Some commands have one or two parameters

that must be entered before the command can be run. In addition, you can select the mote you want to run the query over or select all motes. Click the Execute Command button to run the command on the network.



Visualizing the data collection:

To visualize the data that is being collected from the sensor network, click on the Visualization tab. On this screen, you can view the physical layout of the sensor network using the image chosen during initial configuration, numerical and graphical representations of the data being collected, and view plots of the data being collected.



By default, you will see the physical layout of the sensor network. By hovering the mouse over a node in the network, you will see the numerical node identity and the last data for each of the attributes being collected. The visualization can be panned and zoomed, as described above.

By clicking on the Sensor menu, you can select an attribute and view it graphically (using color). One of four colors will be used to represent an attribute value: white, red, blue or green. For each color, the lower the value of the attribute, the lighter the color. For example, a low value represented in white would look close to black. The range for the color selection is 0 to 1024. Any value outside that range will saturate the color on one end of the color representation. An option on the Sensor menu is to turn on or off a visualization of the data route (Route checkbox).

<SCREENSHOT HERE>

To graph attributes for a subset of network nodes, select the “Select nodes” toolbar button and click on the nodes to graph. Then, click on the “Graph data” toolbar button. A dialog box will be presented that allows you to select the attributes to graph. When you select them, a plot of these attributes for each of the selected nodes will be rendered in a new window.

<SCREENSHOT HERE>

Finally, on the right side of the interface, a list of nodes that are not part of the configuration but are reporting data are shown. This list is intended to help you complete the configuration of your network. You should load and edit the configuration (by clicking on the Deployment tab) and add these nodes at the appropriate locations.