

ARGUS

User Manual

Intelligent Automation, Inc.



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1 FCC Certifications and Regulatory information

FCC Part 15 Class B

Radio Frequency Interface (RFI) (FCC 15.105)

This device has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 Subpart B, of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Intelligent Automation, Inc. may void the user's authority to operate this equipment.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance are not recommended.

2 Quick Start Guide

This Quick Start section of the user manual presents the basics of getting an ARGUS deployment up and running. For more details on each topic, refer to the later sections in this manual.

Step 1: Turn on the laptop PC

Note that if the laptop is locked, the default username is '**argus**' and the password is '**iai**'

Step 2: Connect the Gateway node and turn it on

The 'Gateway Node' enables communication between the ARGUS nodes and the laptop PC. The Gateway node connects to the PC via a short USB cable, and uses a 2.4GHz antenna with a standard RP-TNC connector) to communicate with the ARGUS network.

- Attach an antenna to the port on the top of the Gateway node.
- Connect the included USB cable to the rugged connector on Gateway Node and plug the other end into one of the USB ports on the right side of the laptop (see Figure 1). Be sure to use the same USB port each time you connect the Gateway Node, as the software is configured to look for it on the same port each time. The gateway will power on as soon as it is connected to the USB port.
- Attach the external 2.4GHz antenna to the Gateway Node. Optional: Connect an RF extension cable and outdoor rated antenna to position the antenna outside of a building or on a rooftop. For antenna coax cable runs greater than 10ft, use an RF amplifier (contact IAI for details).



Figure 1: ARGUS Gateway connection to PC

Step 3: Start the ARGUS software

To start the ARGUS software, click the 'ARGUS' software icon on the desktop (see Figure 2). The splash screen for the ARGUS View application should appear, then after a few seconds, the main graphical user

interface (GUI) should appear. For a full description of the GUI, modes, buttons, etc. see Section **Error! Reference source not found.**

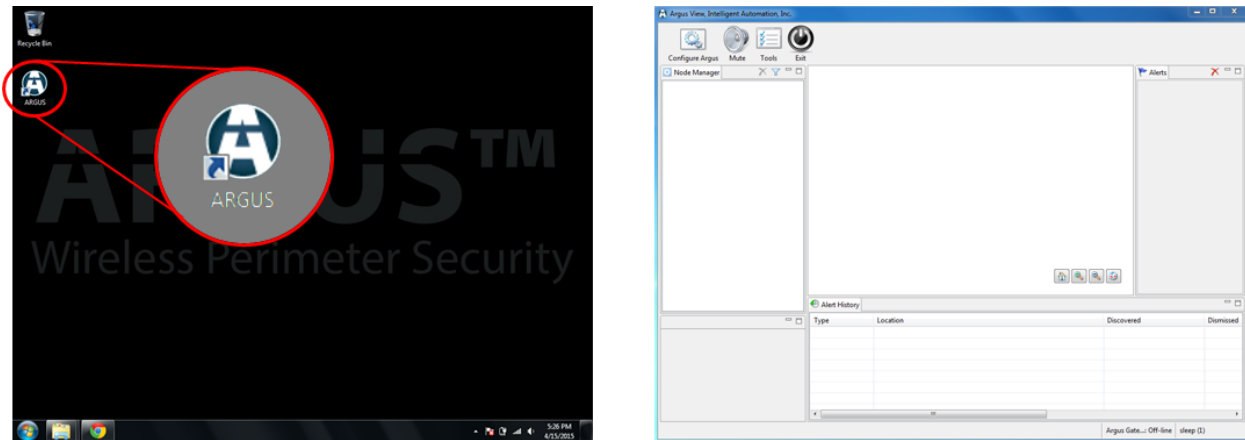


Figure 2: Starting the ARGUS software. Click the 'ARGUS' icon (left) to start the GUI software (right)

Step 4: Create a new ARGUS configuration

Prior to operating the ARGUS system, it must be configured by defining the node locations and active fence links to monitor.

- Press the 'Configure' button in the upper left corner of the screen.
- Select 'New' as the Configuration Type and click 'Next'.
- Specify a configuration description (optional) and select a Map Type: None, Satellite, or User Defined (see Section 4.3 for descriptions). Click 'Next'.
- Click 'Next' to leave Camera Monitoring disabled (see Section 4.9.1 for details).
- Click 'Finish' to leave SMS/MMS Notifications disabled (see Section 4.9.2 for details).
- The new configuration has been created, and you are now in Configuration Mode. The main GUI should again be displayed (see *Figure 3*).

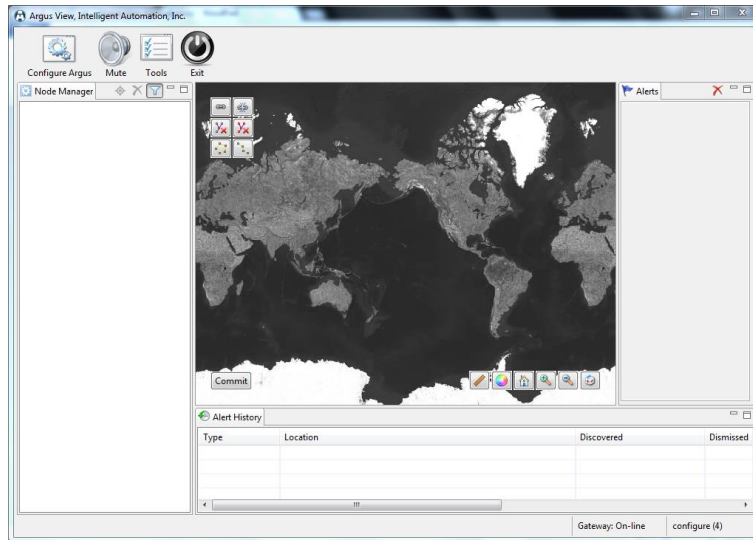


Figure 3: Initial Configuration Mode view (with satellite map type selected)

Step 5: Turn on fence nodes

Attach antennas to and turn on at least two ARGUS fence nodes. They will automatically register with the system and appear in the 'Node Manager' list on the left side of the screen. The nodes will appear on the screen with the identification number corresponding to the node ID number on the back of each ARGUS unit. See Section 4.2.2 for detailed descriptions of the icons that are shown in the Node Manager.

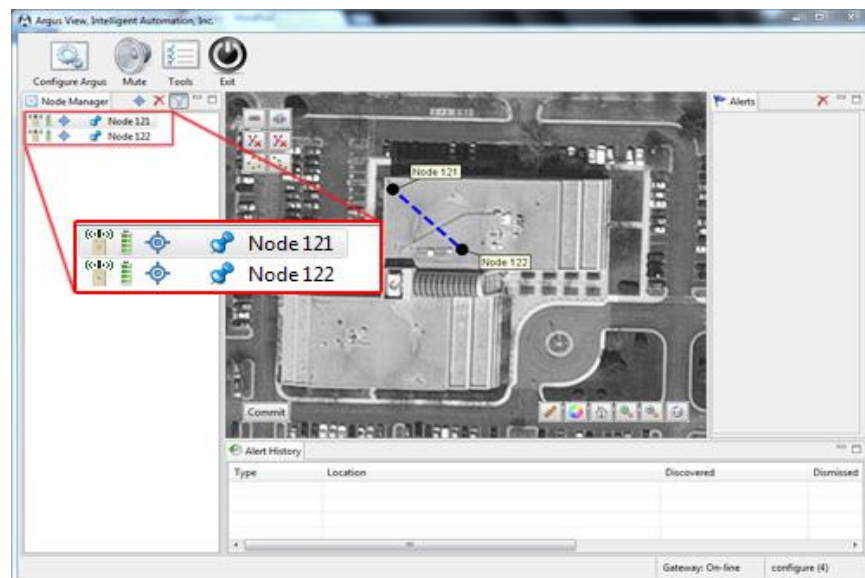


Figure 4: Configuration Mode with two ARGUS nodes turned on

Step 6: Position nodes on the on-screen map

Pan and zoom to the desired area of the on-screen map. Drag the nodes from the Node Manager list directly onto the map or click-and-drag the nodes around on the map as desired. See Section 4.5 for full details regarding placement on nodes on the map.

Step 7: Enable fence links

Click on a link to display the link details window, in which you may specify a link description (optional) and set the link as either 'Active' (actively monitored by the software) or 'Inactive' (ignored by the monitoring software). Active links are indicated in the Map View by solid yellow lines and Inactive links are indicated by dotted blue lines. See Figure 5 for an example configuration with three nodes, one active link, and two inactive links. See Section 4.6 for full details regarding link configuration.

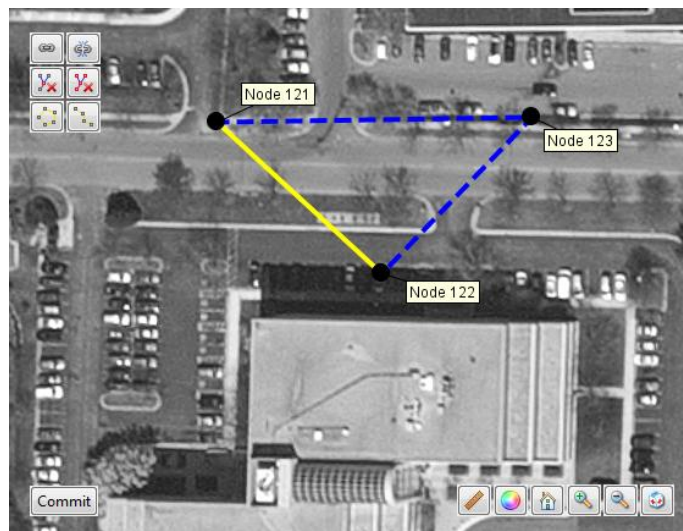


Figure 5: Map view of three node configuration with one Active link (yellow line) and two Inactive links (blue dotted lines)

Step 8: 'Commit' the configuration

Press the 'Commit' button in the lower left corner of the Map View to save the ARGUS configuration and place the system into Active Mode. The system will now be continuously monitoring and logging any fence link triggers, displaying alerts both within the Map View and in the Alerts panel on the right side of the GUI. See sample screenshot in Figure 6, and refer to Section 4.8 for more details regarding the alerts.

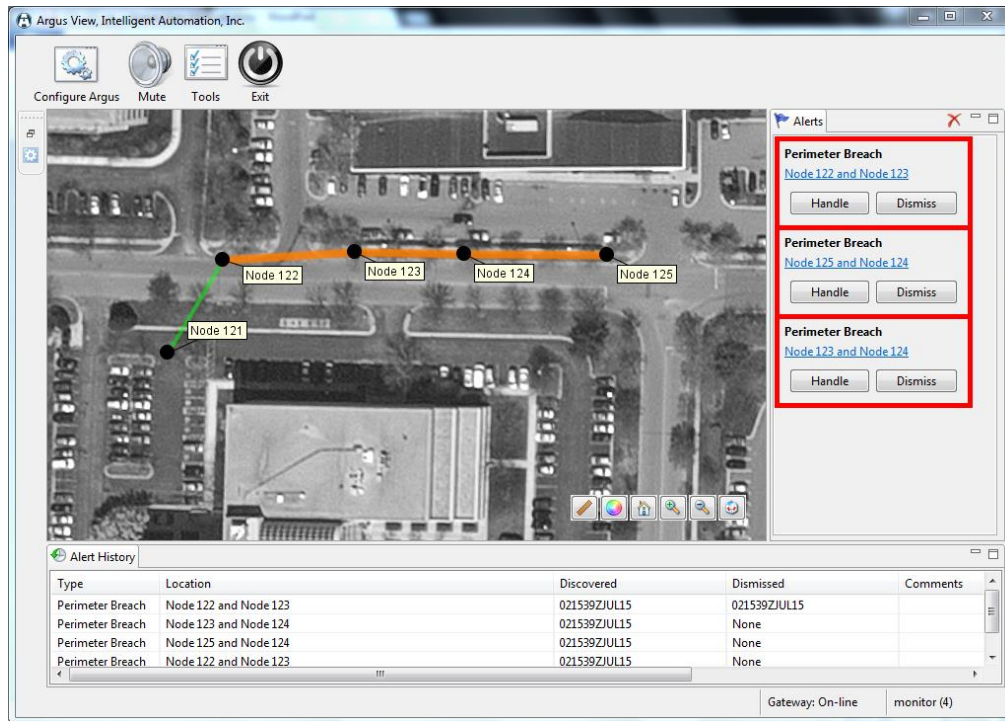


Figure 6: ARGUS GUI in Active Mode. Alerts are shown in the right panel; Alert History is shown in the bottom panel, and current status is shown in the center Map View.

3 Hardware Overview

3.1 Sensor Node Description

Each ARGUS sensor node is physically contained within a rigid fiberglass tube with a robust plastic base. The sensor itself is contained within an electronics module that sits inside the top of the fiberglass tube body. The base can free stand on flat ground, it can be anchored into the ground using 3/8" spikes, or it can be weighted down using a traffic cone weight or other suitable weight.

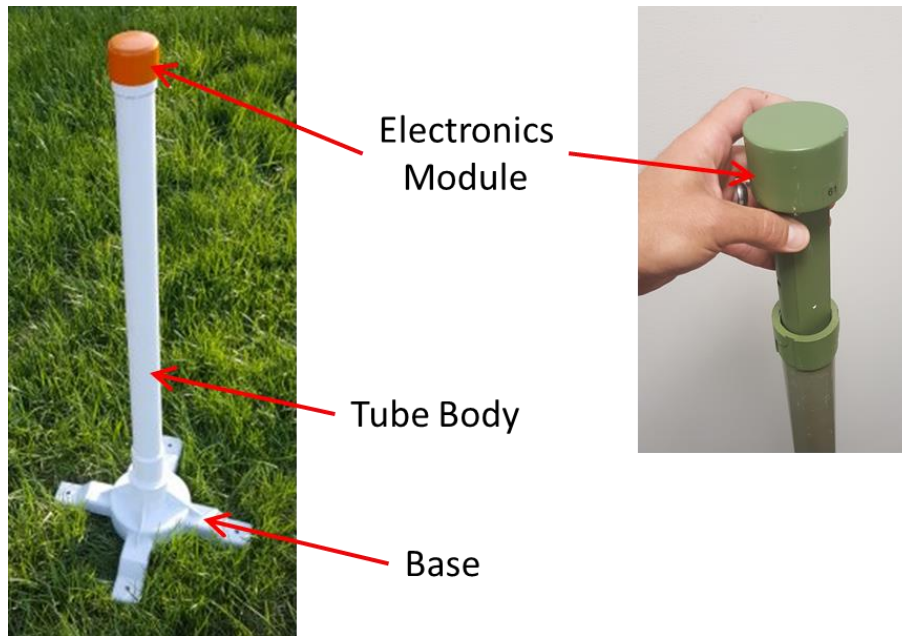


Figure 7: ARGUS Node (left). Close-up of electronics module removal (right).

The top portion of the ARGUS sensor node includes the Electronics Module (see Figure 7 and Figure 8). The Electronics Module is removed from the pole via a simple twist-lock mechanism. The Electronics Module is comprised of the ARGUS sensor PCB (housed within the module) and a single D-cell Lithium battery. Then the battery is installed, the ARGUS sensor PCB will automatically start up and attempt to join the sensor network. The LED indicator will blink green three times to indicate that the ARGUS sensor node has powered on. If this indication is not seen, check the battery state and battery connections.

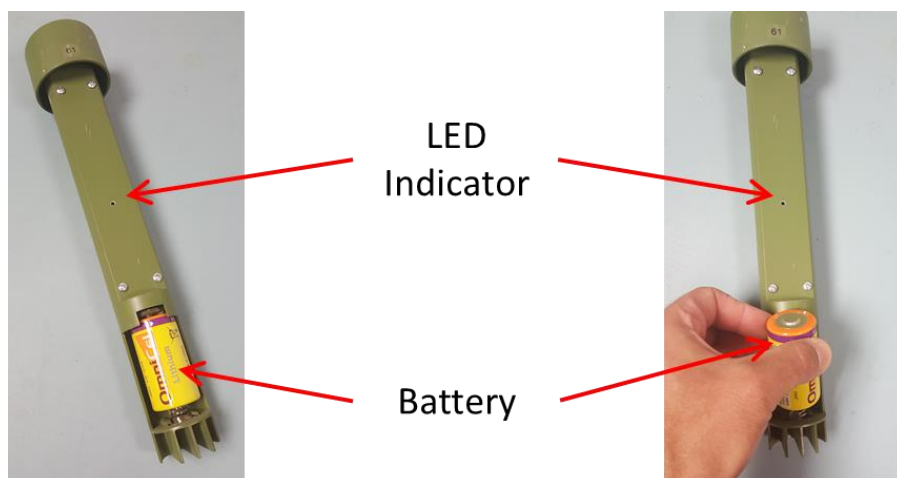


Figure 8: ARGUS Node electronics module (left) and battery replacement (right).

The typical runtime for a single fully charged Lithium D-cell battery is approximately 5 months, although this may vary slightly due to temperature and the specific network configuration of the sensor node. The ARGUS node has been tested with the OmniCel ER34615 Lithium D-cell battery, which has a nominal capacity of 19Ah at 3.6V. Other similar Lithium primary cell batteries should also work well.

4 Software Overview

The proper install location for Argus is C:\Argus, where you can find the application, logs, and configuration files.

4.1 Initial Setup Wizard

When the software is run for the first time on a new machine, it will automatically start the Initial Setup Wizard upon startup (see *Figure 9*). Once the Initial Setup Wizard has been completed for a particular Gateway node, it will not need to run again. The primary purpose of the Initial Setup Wizard is to establish which serial port is used to communicate with the Gateway node. Carefully follow the on-screen instructions to enable the software to automatically identify the correct port.

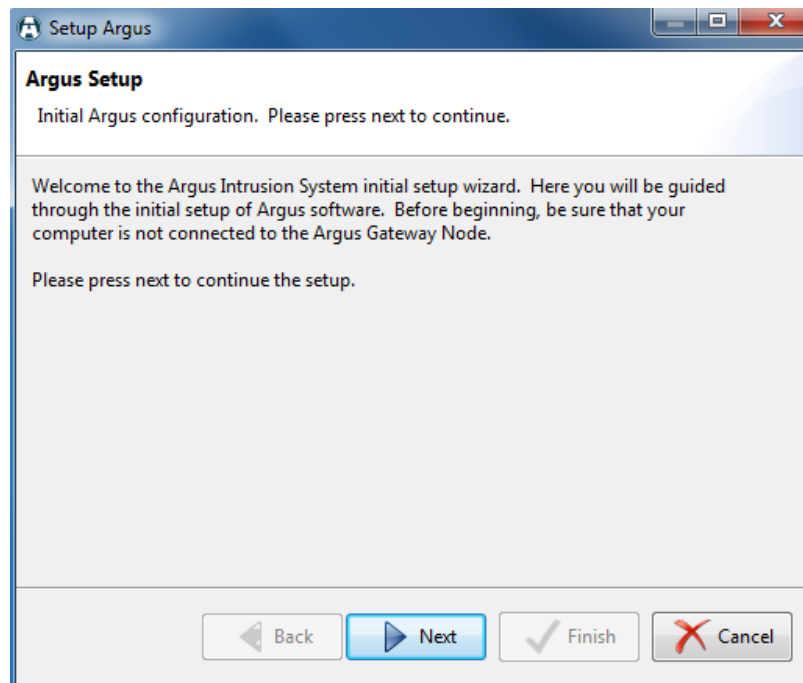


Figure 9: ARGUS software Initial Setup Wizard

If the Gateway node is changed for some reason, the Initial Setup Wizard will need to be run again so that the software can be configured to use the correct serial port. To trigger the Initial Setup Wizard to run again, close the ARGUS software and run the 'reset-settings' script in the installation directory. Restart the ARGUS software, and the Initial Setup Wizard should run again.

4.2 User Interface Overview

Upon starting the ARGUS software, the user will be presented with the main Graphical User Interface (see *Figure 10*). This section presents an overview of the interface before diving into the operational details in subsequent sections.

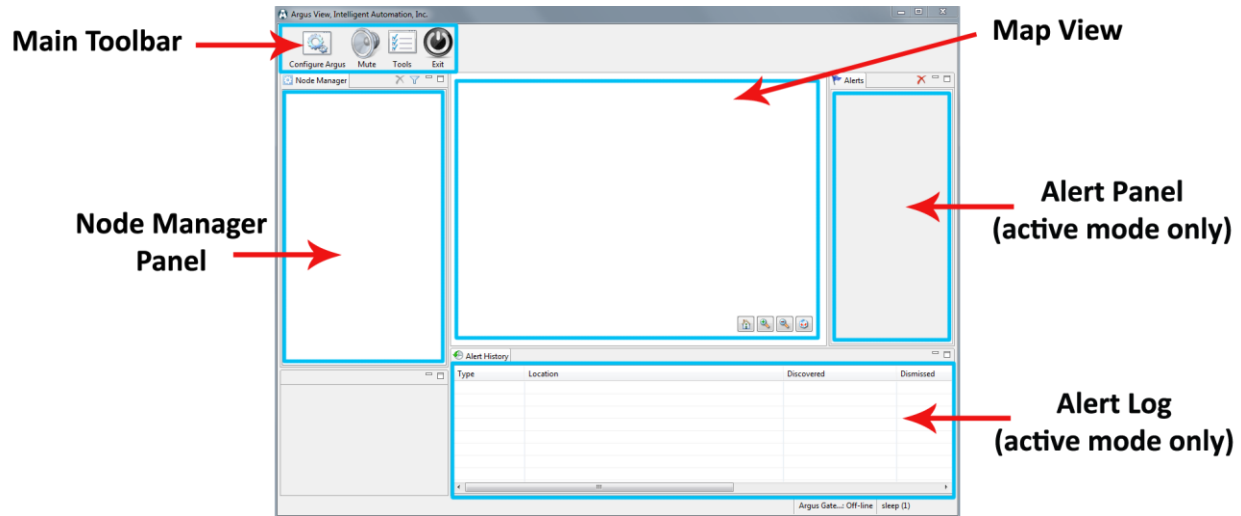


Figure 10: Main Graphical User Interface (GUI) layout

4.2.1 Main Toolbar

The main toolbar is located at the top left corner of the GUI. The toolbar includes five buttons:


- *Configure* – Launch the Configuration Wizard (see Section 4.3)
- *Mute* – Enable/disable the audible alarm when an alert is received from the ARGUS hardware
- *Tools* – Enter the admin utility (not described in this manual)
- *Exit* – Close the ARGUS View software









Figure 11: Main Toolbar

4.2.2 GUI Panels

The GUI consists of several panels with various functions:

- *Node Manager Panel* – This panel includes a list of ARGUS nodes and their status (see *Figure 12*). Each row in the list indicates the state of one node in the system, including battery status and GPS status.
 -  The radio icon indicates an active ARGUS fence node – future versions of the system may have different types of nodes, which will be indicated by different icons in the leftmost location.

-  The battery icon indicates the battery status of the node. If the icon has a small red 'x' on it, this indicates that the node is 'dead' (i.e., it has not checked in for some time, or it is turned off).
-  The presence of the third icon (a small satellite) indicates that a valid GPS fix has been received from the node. See Section 4.5.3 for more information regarding GPS node positions.
-  The pin indicates that the node has been placed on the map.
-  The shield icon indicates that a node is unpinned.
-  The delete icon hides a node from the Node Manager view.
-  Clicking on the filter icon makes hidden nodes reappear.

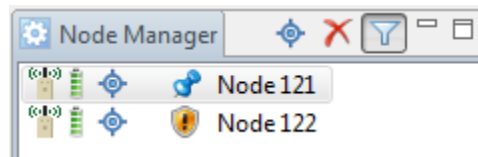


Figure 12: Node Manager Panel

- **Map View** – This is the central panel in the GUI, and shows the location and status of all of the nodes and the links between the nodes. This area may use satellite imagery or a user-supplied image as the background for the view. Depending on the current mode (Configuration or Active) some buttons may or may not be displayed within the Map View.
 - In Configuration Mode, the Link Configuration Toolbar is shown in the upper left corner (see Section 4.6.2 for details regarding this toolbar) and the 'Commit' button is shown in the lower left corner.
 - In both modes, the View Control Toolbar is displayed in the lower right corner of the Map View (see Figure 13). This toolbar includes several buttons for manipulating the Map View.
 - **Measure** – In satellite view, measure between two points by clicking to select a starting point and moving the mouse to the second point. Right click to reset the starting point.
 - **Color/grayscale** – Switch the satellite view between color and grayscale
 - **Home** – Pan/zoom the view to put all nodes within the view window
 - **Zoom in/Zoom out**
 - **Link metrics**– Displays received signal strength indicator (RSSI) and packet reception rate (PRR) for the active fence links. See section 3.7 for details.



Figure 13: View Control Toolbar

- **Alert Panel** – This is the panel in which alert messages are displayed when in Active Mode (see Section 4.8).

- *Alert Log* – This panel shows a log of all past alerts.

4.3 Configuration Wizard

After starting the ARGUS software, a configuration will need to be loaded into the system. To start the configuration process, press the 'Configure' button in the upper left corner of the GUI. This will launch the Configuration Wizard (see *Figure 14*). Either a new configuration can be created, or an existing configuration can be loaded. To start a new configuration, select the 'New' radio button and press 'Next'. To reload an existing configuration, select the 'Recent' radio button, select the desired configuration by date/time/description, and press 'Finish' (in which case the wizard will exit, the existing configuration will be loaded, and Configuration Mode will be entered immediately).

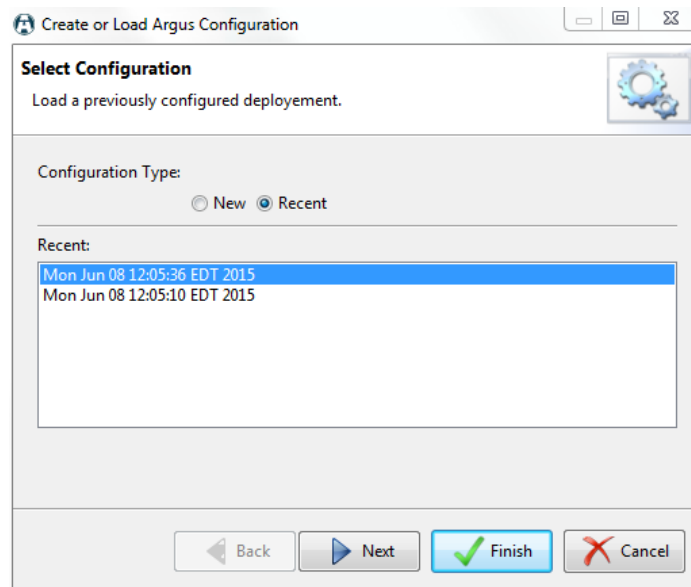


Figure 14: Configuration Wizard – Initial page

If a new configuration was selected, then the next page in the Configuration Wizard is the 'Select Map Type' page (see *Figure 15*). A description may be entered for the configuration (optional) and the map type can be specified. There are three different map types that may be selected:

- *None* – No map is used (white background)
- *Satellite* – Satellite imagery from an online resource is used. To view map locations and/or zoom levels that have not been previously viewed, an active Internet connection will be required to download map tiles. Map tiles are cached locally, so if a particular area and zoom level have already been viewed, then the connection to the Internet is not required.
- *User Defined* – A user provided image can be used as the background for the configuration. This may be useful if, for example, the area of interest is around an object such as a helicopter. Referencing the deployment to an image of a helicopter may be more intuitive than referencing it to a map.

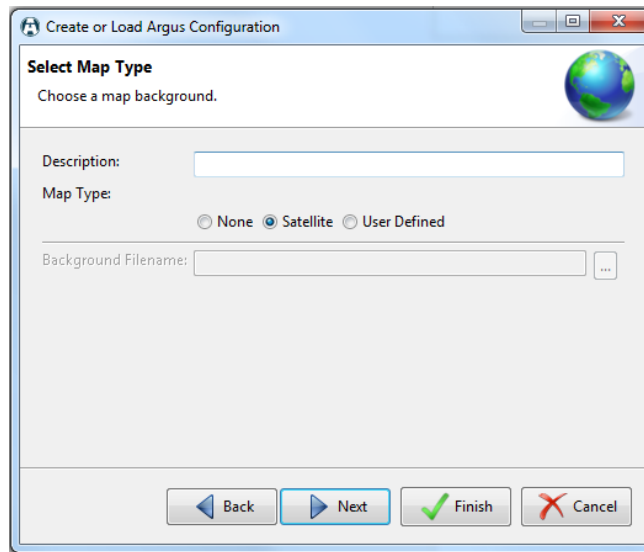


Figure 15: Configuration Wizard – Map Type selection

After clicking 'Next', other wizard pages may be presented, depending on the plug-ins included with the particular distribution of the ARGUS software being run. See Section 4.9 for information on configuring each of the available plug-ins.

4.4 Configuration and Active Modes

There are two main modes of operation for the ARGUS control software: *Configuration Mode* and *Active Mode*.

Configuration Mode is the initial state that is entered when creating a new configuration or reloading a preexisting configuration. In this mode, nodes can be repositioned (see Section 4.5) and links can be made active/inactive (see Section 4.6). Alerts are not issued in Configuration Mode. Pressing the 'Commit' button in the lower left corner of the Map View saves the configuration and transitions to Active Mode.

In Active Mode, nodes cannot be repositioned and the active/inactive state of links cannot be changed. Alerts may be generated in this mode (see Section 4.8). To transition back to Configuration Mode, click the 'Configure' button in the upper-left corner of the GUI and select 'Recent' to reload an existing configuration.

4.5 Node Positioning

The process of Node Positioning involves specifying the locations of each ARGUS node within the configuration. There are multiple methods for accomplishing this.

4.5.1 Drag-and-Drop Node Positioning

Any node may be manually positioned at any time (in Configuration Mode) by dragging the node to a new position on the Map View. The node may be dragged from the Node Manager list on the left side of the GUI onto the Map View, or from another location on the Map View.

4.5.2 Manual Lat/Long Node Positioning

If a specific latitude/longitude position for a node is known, it can be manually typed into the Node Configuration Window (see *Figure 16*). This window is displayed by clicking on a node in the Map View, or by right clicking on a node in the Node Manager panel and selecting 'Properties'. Note that the latitude/longitude values must be entered as an MGRS 10 digit grid, and that only the WGS84 map datum is currently supported.

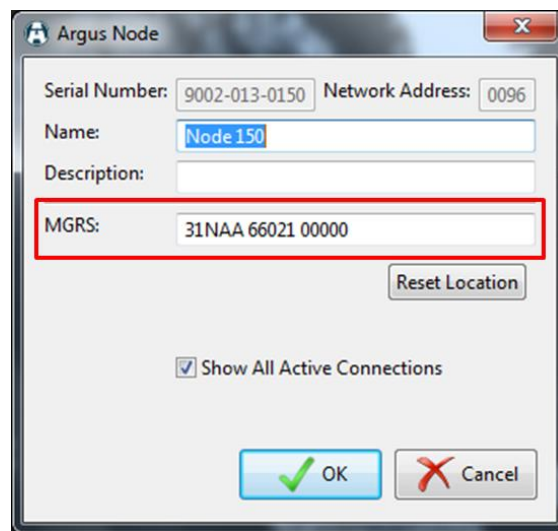


Figure 16: Node Configuration Window with Lat/Long boxes highlighted

4.5.3 GPS Node Positioning

If an ARGUS node has an enabled GPS module and is positioned outdoors, the GPS fix information may be used to position the node on the map. The GPS status of each node is indicated in the Node Manager panel by presence of a small satellite icon immediately to the left of the node name (see *Figure 17*). If the icon is present, this indicates that a valid GPS fix has been obtained for the node.

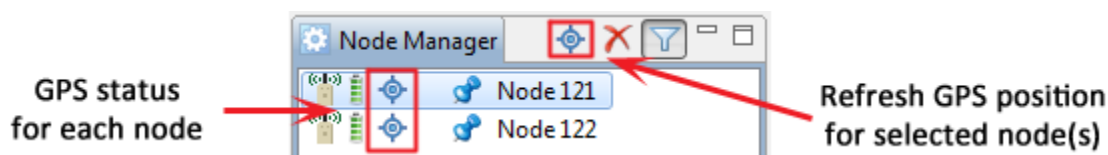


Figure 17: Node Manager panel with GPS indicator icons highlighted

If a particular node does have a valid GPS fix, the on-screen location of the node can be updated according to the latest fix provided by the GPS. To do so, first bring up the Node Configuration Window, either by clicking the node in the Map View or by right clicking the node in the Node Manager panel and selecting 'Properties'. Then click the 'Reset Location' button. A prompt will be displayed to confirm that

the user wishes to update the node's position to the latest GPS fix (see *Figure 18*). If no GPS fix is available, an error message will be displayed to the user. Alternately, the GPS positions of one or more nodes may be refreshed by selecting the desired nodes in the Node Manager panel and then clicking the satellite icon near the top of the Node Manager panel (see *Figure 17*).

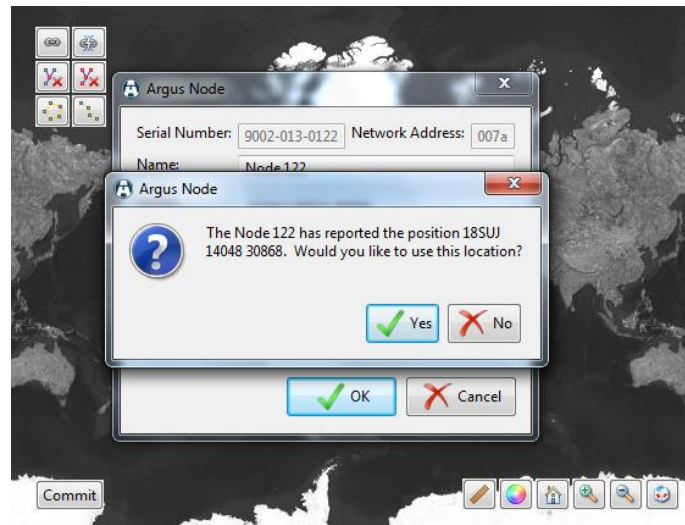


Figure 18: Node Configuration Window - 'Reset Location' result

4.6 Link Configuration

The process of Link Configuration involves specifying which links the user wishes to monitor. Since the hardware may 'see' several viable links per node and cannot automatically determine which links may be of interest to the user, the user must manually configure the active links. There are multiple methods available for configure the links.

4.6.1 Link Configuration Window

For relatively simple deployments (a handful of nodes), the most straightforward method for configuring links is to click on each link to make them active/inactive as desired. Within the Map View, simply click on a link between two nodes to pop up the Link Configuration Window (see Figure 21). Within this window, the link can be set to Active or Inactive by selecting the appropriate radio button. Also, this window gives the option for the user to provide a textual link description (e.g., 'North link') that, if provided, will be used in any alert indications.

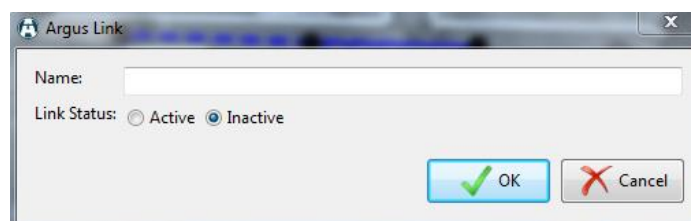


Figure 19: Link Configuration Window

4.6.2 Link Configuration Toolbar

As an alternative to manually clicking on each individual link to enable/disable them, a Link Configuration Toolbar is provided in the upper left corner of the Map View (see *Figure 20*). This toolbar includes six buttons that enable rapid configuration of the Active/Inactive status of links, which is particularly useful in larger ARGUS deployments.

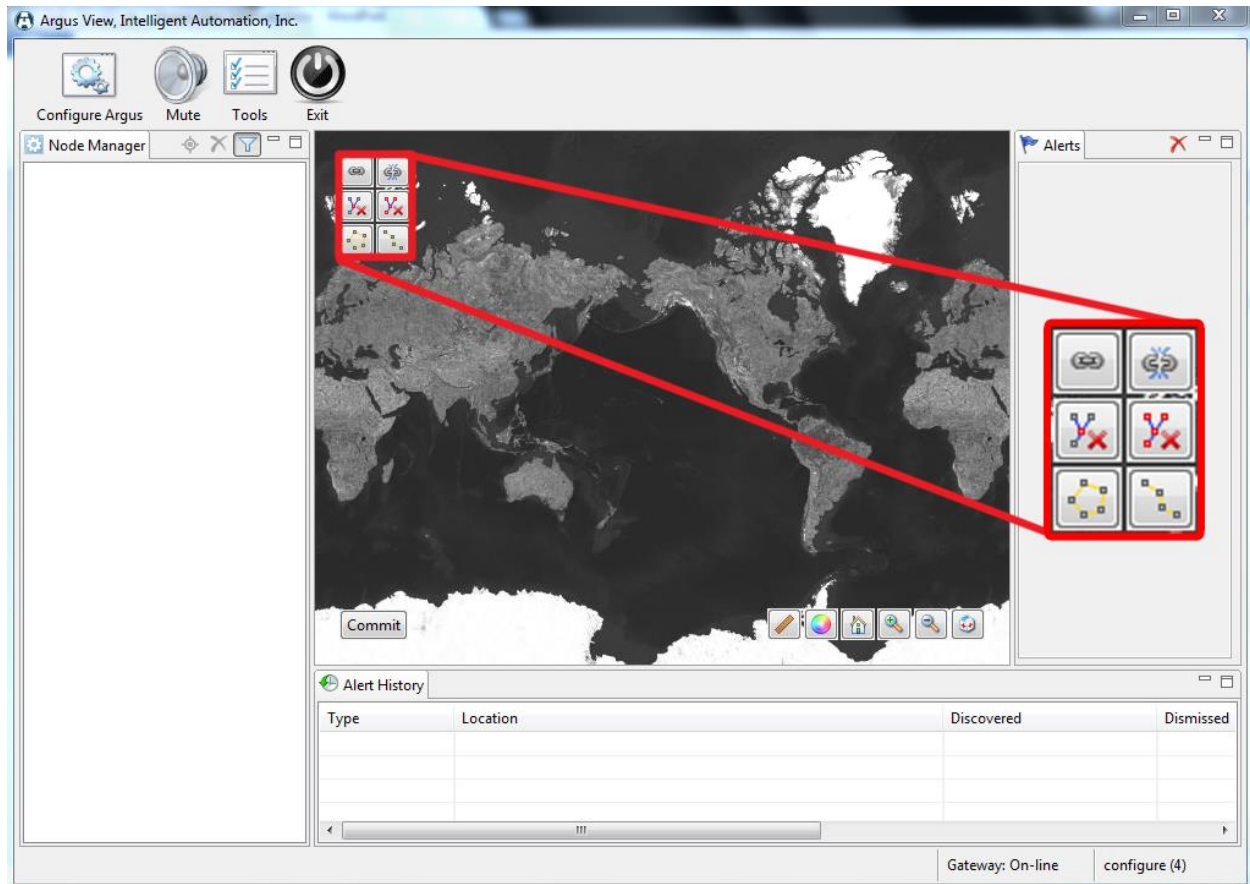


Figure 20: Link Configuration Toolbar (upper left corner of the Map View in Configuration Mode)

4.6.2.1 Link Mode

Link Mode enables the user to rapidly activate links by sequentially selecting the nodes within the Map View. This mode is enabled by clicking the upper left icon in the Link Configuration Toolbar, and will remain enabled until the icon is clicked again. When the Link Mode is enabled, any node clicked in the Map View will have the link to the next most recently clicked node made *active* (if a viable link exists between the two nodes). This process can continue to enable any number of links.

4.6.2.2 Unlink Mode

Unlink Mode is the opposite of Link Mode – any node clicked in the Map View will in the Map View will have the link to the next most recently clicked node made *inactive*. This mode is enabled by clicking the upper right icon in the Link Configuration Toolbar, and will remain enabled until the icon is clicked again.



Figure 21: A single fence link before (left) and after (right) enabling the link

4.6.2.3 *Line Mode*

Line Mode enables the user to rapidly activate an entire sequence of links that are in a roughly linear configuration. This mode is enabled by clicking the lower right button in the Link Configuration Toolbar, and remains active only until the set of nodes has been selected. After clicking the Line Mode icon, the user can click and drag to box-select a set of nodes for which to configure as a line. Once the nodes have been selected, the software will attempt to automatically configure the set of nodes in a roughly linear topology. See Figure 22 for an example of the Line Mode tool in operation.

Note that this tool can be used to select all nodes in the configuration, or just a subset of the nodes. Also, the tool will not modify links that are to/from nodes outside of the set of selected nodes. Thus, this tool can be used to configure a part of the deployment that happens to be linear, and then use the other methods to configure other links as desired.

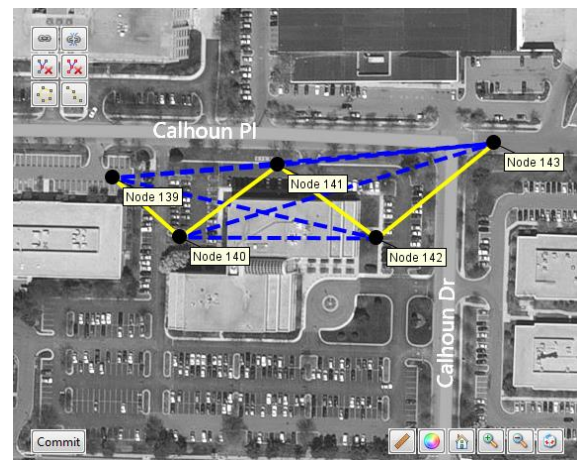


Figure 22: A set of links configured with Line Mode from the toolbar

4.6.2.4 *Perimeter Mode*

Perimeter Mode enables the user to rapidly activate an entire sequence of links that are in a roughly circular configuration. This mode is enabled by clicking the lower left button in the Link Configuration

Toolbar, and remains active only until the set of nodes has been selected. After clicking the Perimeter Mode icon, the user can click and drag to box-select a set of nodes for which to configure as a perimeter. Once the nodes have been selected, the software will attempt to automatically configure the set of nodes in a roughly circular topology. See Figure 23 for an example of the Perimeter Mode tool in operation.

Note that this tool can be used to select all nodes in the configuration, or just a subset of the nodes. Also, the tool will not modify links that are to/from nodes outside of the set of selected nodes. Thus, this tool can be used to configure a part of the deployment that happens to be a perimeter, and then use the other methods to configure other links as desired.

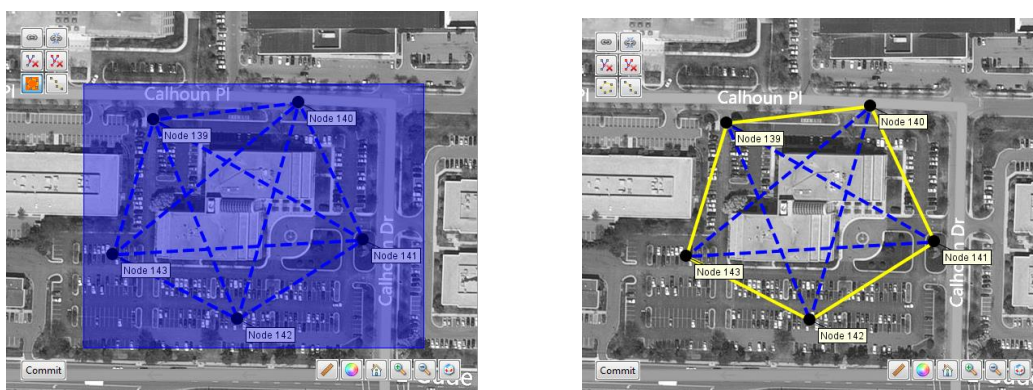


Figure 23: A set of links configured with Perimeter Mode from the toolbar

4.6.2.5 Remove Node Links Mode

Remove Node Links Mode enables the user to rapidly deactivate all links connected to a particular node simply by clicking on the node. This mode is enabled by clicking on the center right icon in the Link Configuration Toolbar, and will remain enabled until the icon is clicked again.

4.6.2.6 Remove All Links

The Remove All Links button is the center left icon in the Link Configuration Toolbar. Clicking this button will deactivate all links from all nodes in the configuration.

4.7 Link Metrics Mode

In either Configuration Mode or Active Mode, clicking the 'Link Metrics' button on the View Control Toolbar (see Figure 13) activates the Link Metrics Mode. This mode enables the display of real-time link metrics for each active link in the configuration (see Figure 24), including received signal strength indicator (RSSI) and packet reception rate (PRR). The numbers are presented as a pair in the form RSSI:PRR, and there are two pairs displayed for each link (one set of link measurements reported by each node). The value for RSSI is bound in the range of 0-255, although values in the range of 30-100 are generally seen. The value for PRR is bound in the range of 0-100.

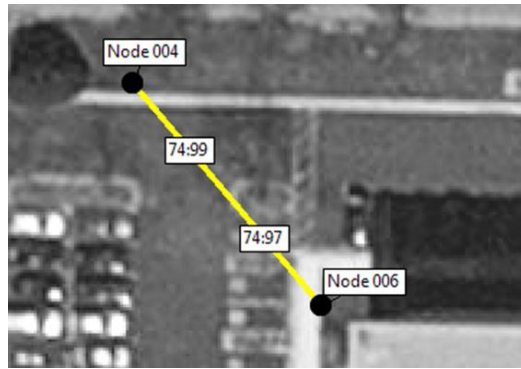


Figure 24: Link Metrics Mode activated for fence link

4.7.1 Link Metrics Guidelines

The link metrics are useful as an indication of the 'quality' of a particular link. In general, links with higher RSSI and PRR metrics perform better than links with lower metrics. **The recommended minimum RSSI metric for a quality link is 50, and the recommended minimum PRR is 90.**

4.8 Alerts

Once in Active Mode, the ARGUS software can present several types of alerts to the user.

- Perimeter Breach – This is the primary type of alert that the software will display, and indicates that something or someone has passed through a link that is configured to be active. This alert will display in the Alerts panel on the right side of the GUI and will have a corresponding graphical indication in the Map View – the link will flash red and then pulse orange until the alert has been 'handled' or 'dismissed'.
- Low Battery – This alert indicates that the node is reporting a low battery voltage, and the batteries should be replaced or recharged soon.
- Node Failure – This alert indicates that the node has stopped reporting updates to the ARGUS control software for some period of time. This alert generally means that the node has failed for some reason (dead battery, turned off or destroyed, disconnected antenna, etc.), but could also be caused by a jammer preventing one or more nodes from transmitting. When node failure occurs, links connected to that node turn purple.

For all types of alert, an alert indication will be displayed in the Alerts panel on the right side of the GUI (see Figure 25), and an alert entry will be added to the Alerts log at the bottom of the GUI. The user is expected to 'handle' or 'dismiss' each alert in the Alerts panel. Pressing the 'Handle' button for the particular alert will allow the user to enter some text to explain the cause and/or resolution of the alert (e.g., 'dog crossed', 'changed battery', etc.). Pressing the 'Dismiss' button for an alert will allow the user to clear the alert without entering any information. The red 'X' at the top of the Alerts panel will dismiss all currently active alerts.

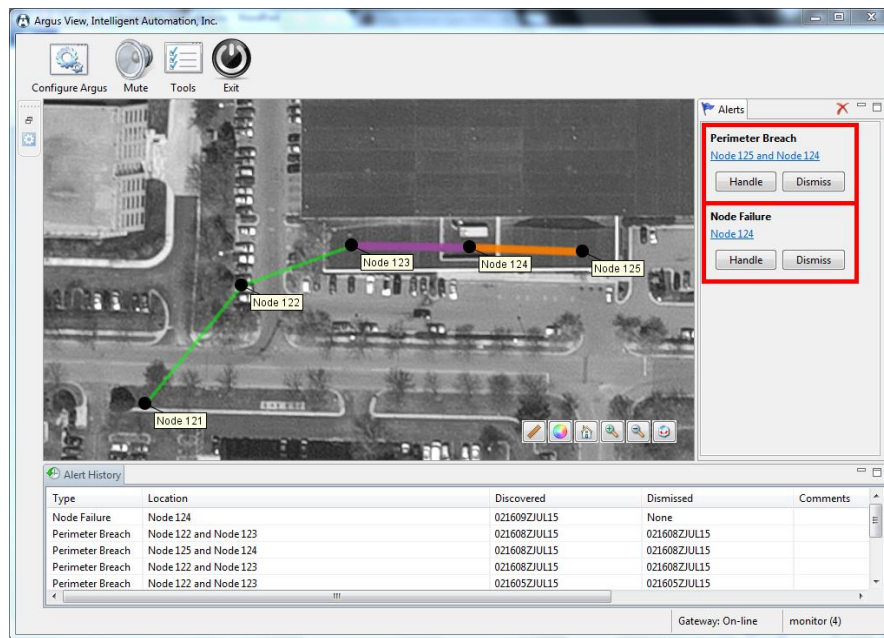


Figure 25: Screenshot showing a 'perimeter breach' alert and a 'node failure' alert

4.8.1 Alert Log Files

Alert logs are stored in the logs folder of the Argus application directory, C:\Argus\logs, as a .csv file. Alert log filenames contain the date, time, and end with "alerts." The file contains information about the alert type, nodes involved, location, discovery and dismissal time, and comments.

	A	B	C	D	E	F
1	Perimeter Breach	Node 140 and Node 142	18SUJ 14152 30941	091744ZJUN15	091745ZJUN15	Dismissed.
2	Perimeter Breach	Node 141 and Node 143	18SUJ 14112 30919	091744ZJUN15	091745ZJUN15	
3	Perimeter Breach	Node 139 and Node 140	18SUJ 14110 30961	091744ZJUN15	091745ZJUN15	Car entered
4	Perimeter Breach	Node 142 and Node 143	18SUJ 14146 30917	091744ZJUN15	091745ZJUN15	Dismissed.
5	Perimeter Breach	Node 139 and Node 141	18SUJ 14090 30946	091744ZJUN15	091745ZJUN15	Dismissed.

Figure 26: Alert log file contents

4.9 Plug-in Configuration

Some versions of the RF Fence installation may have optional plug-ins installed, such as camera monitoring or SMS/MMS notifications. If these are available, additional configuration windows will appear during the Configuration Wizard and additional options may be available within the system.

4.9.1 Camera Plug-in

The Camera Plug-in allows ARGUS operators to integrate existing camera systems within the ARGUS system. This is configurable with the Configuration Wizard and during Configuration Mode.

- 1) Enable cameras for your deployment
 - a. Press the Configure tool bar button to launch the Configuration Wizard.
 - b. Navigate to the Camera Monitoring page in the wizard.
 - c. Set Camera Monitoring to Enabled.

- d. (Optional) Scan the network for available cameras. Press the Scan button and all of the available cameras will be displayed in the list below.
- e. (Optional) Test the video stream from the Camera. Press the Show button to open a stream to the camera. Streams may take up to 5 seconds to initialize.

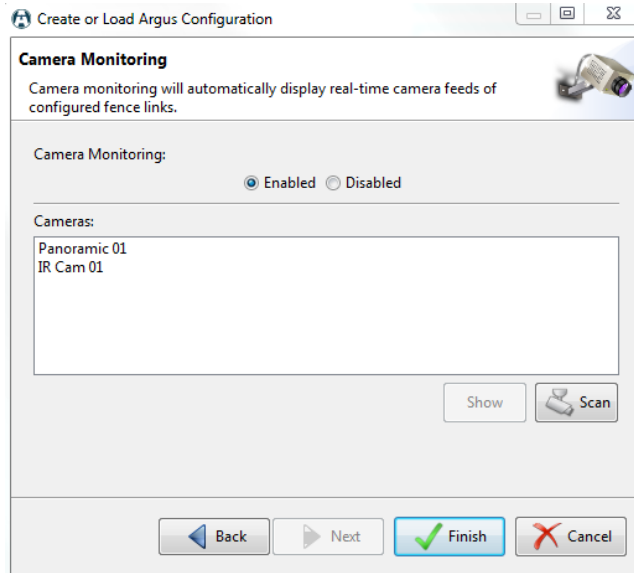


Figure 27: Camera Monitoring Configuration Window

2) Configuring cameras for use in the ARGUS system

- a. Camera nodes will appear in the Node Manager view on the left. Camera nodes can be positioned, just like ARGUS nodes, by dragging from the Node Manager view to their desired location on the Map Editor.
- b. After the ARGUS deployment has been configured, click a link in the Map Editor that should be mapped to a particular camera. This will bring up the Link Configuration dialog.
- c. With the Link Configuration dialog, check the option Trigger Camera on Alert. By default the option is displayed. When checked, the ARGUS system will automatically display the video feed from the selected camera.

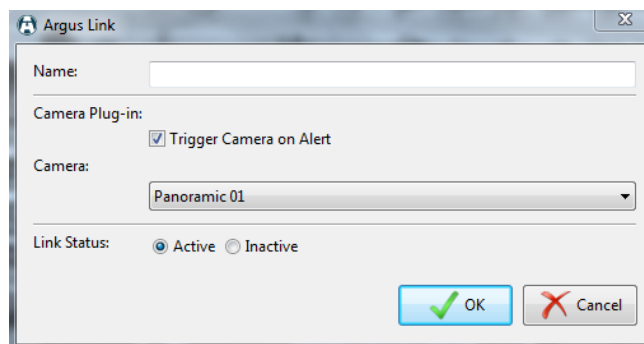


Figure 28: Link Configuration Dialog with Camera Plug-in

4.9.2 Text Message Plug-in

The Text Message Plug-in allows ARGUS operators to forward alerts to mobile phone via Text or Multimedia Messages. This is fully configurable within the Configuration Wizard. Note that an active Internet connection is required for this feature to operate.

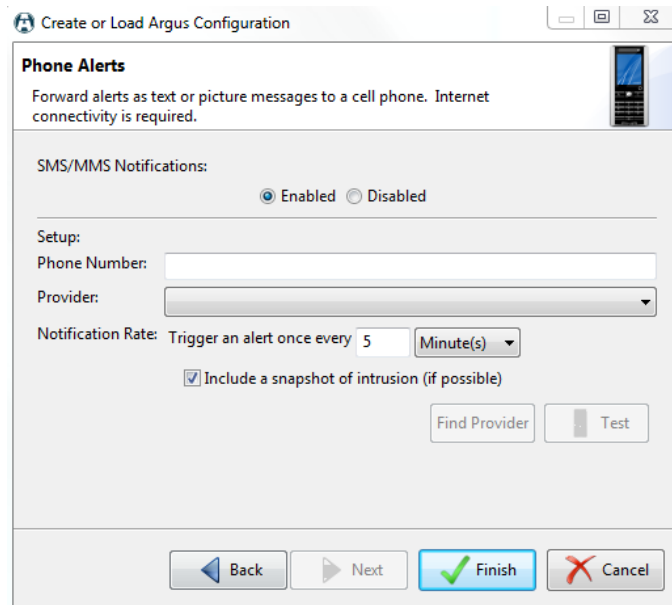
The image shows a software window titled "Create or Load Argus Configuration". Inside, the "Phone Alerts" section has a sub-header "Forward alerts as text or picture messages to a cell phone. Internet connectivity is required." Below this, "SMS/MMS Notifications:" are set to "Enabled" (radio button selected). The "Setup:" section includes a "Phone Number:" text field, a "Provider:" dropdown menu, and a "Notification Rate:" section set to "Trigger an alert once every 5 Minute(s)". There is a checkbox for "Include a snapshot of intrusion (if possible)" which is checked. At the bottom right of the setup section are "Find Provider" and "Test" buttons. The bottom of the window has navigation buttons: "Back", "Next", "Finish" (highlighted with a green checkmark), and "Cancel" (highlighted with a red X).

Figure 29: Phone Alerts Configuration Window

- 1) Navigate to the Phone Alerts page in the wizard.
- 2) Set SMS/MMS Notifications to Enabled.
- 3) Enter the phone number, area code first, of the recipient.

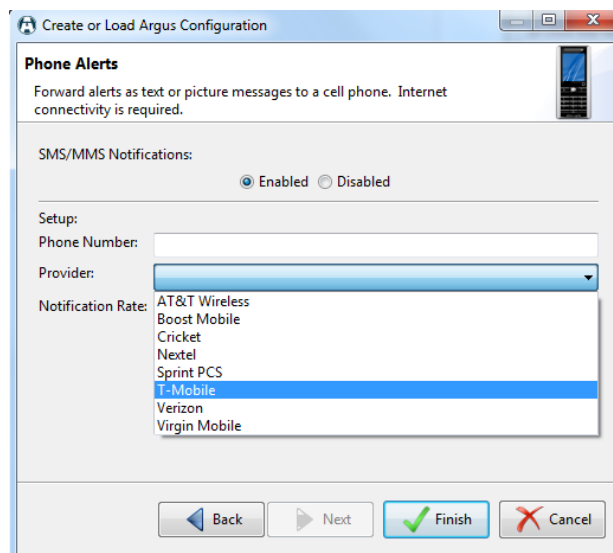
This image shows the same "Phone Alerts" configuration window, but with the "Provider:" dropdown menu open. The dropdown list displays several mobile providers: AT&T Wireless, Boost Mobile, Cricket, Nextel, Sprint PCS, T-Mobile (which is highlighted in blue), Verizon, and Virgin Mobile. The "Notification Rate:" remains at "5 Minute(s)". The "Finish" button is still highlighted with a green checkmark.

Figure 30: Phone Alerts Provider Selection

- 4) Select the cell phone provider. (This information is used to properly route the message). If you are unsure of the provider of the cell phone you are using, press the Find Provider button and the system will attempt detect it.

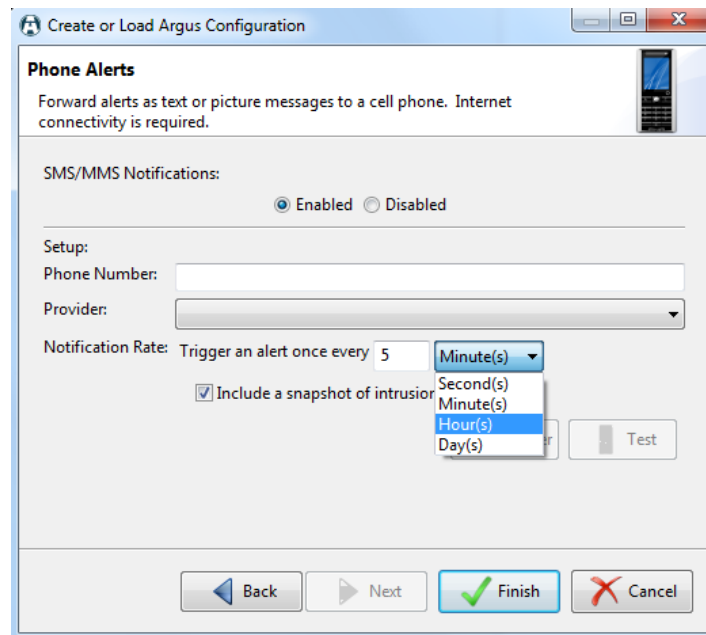


Figure 31: Phone Alerts Notification Rate Selection

- 5) Enter the notification rate. The default value is a maximum of one alert every 5 minutes.
- 6) (Optional) Check the Include a snapshot of the intruder (if possible) button to enable Multimedia Messages. This option is only available to ARGUS installations supporting the Camera Plug-in.
- 7) (Optional) Test that the ARGUS system can send alerts to your phone.
 - a. Press the Test button.
 - b. Press the Send button, and wait for the alert to be received on your phone. This can take up to 30 seconds.
 - c. (Optional) For Multimedia Messages, be sure that an image was present in the received message.

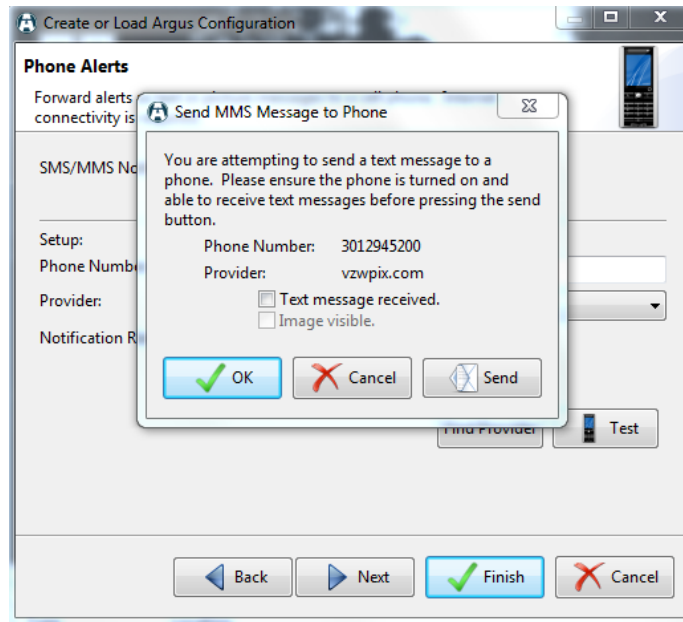


Figure 32: Phone Alerts Test Message

5 System Shutdown

Use the Exit button on the main toolbar (see Figure 11) to shut down the system. Once the user interface is closed, turn off all nodes to complete the shutdown. To turn off each node, press and hold the power button for at least 5 seconds. The node will flash the LED red three times and shut itself off.

6 Node Deployment Guide

This section presents many tips and pointers regarding the physical deployment of the ARGUS nodes. As the system is based on RF propagation, it is sometimes difficult to always determine if and how well a given link will work prior to deployment. The following guidelines will help installers to effectively deploy the ARGUS system. With a little experience, installers will develop an intuitive sense of what deployment strategy will be effective in a given situation.

- 1) We recommend that you give a little thought to deployment strategy prior to beginning placing nodes. Try to position each node so that it will have the best exposure to adjacent nodes in the fence. When it makes sense for the deployment, try to also have single nodes monitor several links simultaneously – there is no performance penalty for doing this. For example, see figure 38, which shows 2 nodes participating in three links each (the blue dotted lines represent all *possible* links, whereas the yellow links represent the *active* links).

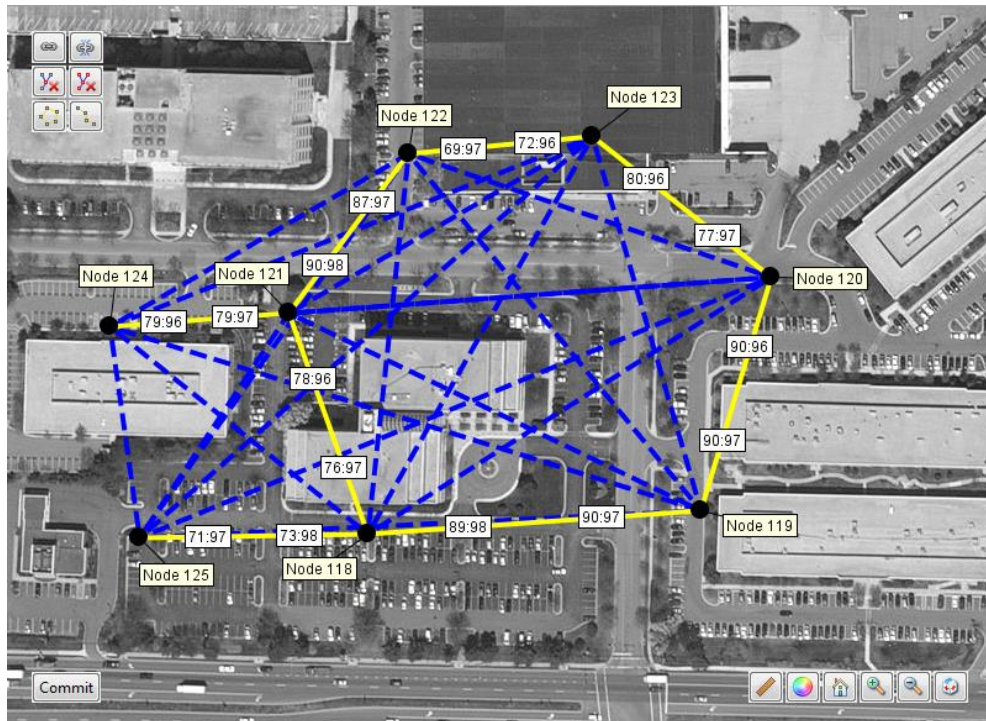


Figure 33: Example deployment with nodes 118 and 121 participating in 3 links each

- 2) The best link performance will be achieved when two nodes have line-of-sight (LOS) and are at a maximum distance of 200 feet in fairly open areas, or 100 feet with nearby buildings. If deploying the system indoors, the maximum node-to-node distance is reduced further, perhaps down to 10 or 20 feet (this depends very much on the composition of the structure and nearby reflective materials).
- 3) For detecting walking humans, the nodes should be mounted such that the antennas are vertical and are located at about hip/waist height (~3-4 ft). If detecting crawling humans is required, position the nodes slightly lower (~2-3 ft) and spaced no farther apart than 100 ft.

- 4) The fence signal cannot penetrate tree trunks, light posts, cars, etc. If one of these obstacles is in the direct path between two nodes, the link may still work, but the region of sensitivity will be along a reflected path *around* the obstacle, rather than *through* the obstacle. Thin “RF transparent” obstacles (many plastics, thin wood signs, light foliage, camouflage netting, fabric, etc.) can usually be penetrated directly.
- 5) The installation terrain should also be taken into consideration when deploying the system. The fence signals cannot penetrate the ground, nor will they go down into deep dips and gullies between two nodes. Thus, the nodes should generally be placed in such a way that the terrain between adjacent nodes is more or less even.
- 6) In the event that a working node suddenly begins reporting low RSSI and/or PRR measurements and possibly begins false triggering frequently, check to make sure that the installation method has not failed (e.g., the unit over).
- 7) In general, avoid placing links parallel to a nearby building or other strong reflector. Part of the RF signal energy will travel along the reflected path, so you may inadvertently have a sensitive region along that reflected path (although in some circumstances this may be acceptable or even desired).
- 8) In general, avoid placing links parallel to a high traffic road. The RF signal energy will bounce off of vehicles driving along the road and may sometimes trigger the fence (although in some circumstances this may be acceptable or even desired).
- 9) Avoid placing links running in between two strong reflectors, such as running down a long alleyway. The RF signal energy will travel along many reflected pathways simultaneously, such that the link becomes completely insensitive to an intruder passing through. Running across such an alleyway is fine, just not along the alleyway lengthwise.

7 Troubleshooting

Problem: A link is generating too many false alarms (i.e., false positives)

Possible Solutions:

- Do not position either end of a link close to human activity that should not trigger the fence. Moving close to either node may trigger the link, even if not physically in between the two nodes. Try adjusting the location of one or both of the nodes.
- Make sure the link does not try to pass through any highly RF reflective/absorptive materials (metal, cinder block, etc.). If so, move one or both ends of the link to avoid the obstruction.
- Note that RF signals will bounce off of nearby hard surfaces (metal, sides of buildings, etc.), so the region of sensitivity may be larger than simply the straight line between two nodes. Similarly, nearby moving metallic objects (moving cars, opening doors, etc.) may trigger the link. If this is not desired, try slightly repositioning one or both ends of the link.

Problem: A link is not triggering when it should (i.e., false negatives)

Possible Solutions:

- Just as nearby reflective objects may cause false alarms (see above), it is also possible that these objects could prevent some actual triggers by spreading the RF energy over too wide an area. Try slightly repositioning one or both ends of the link.

Problem: The system is non-responsive (i.e., no triggers)

Possible Solutions:

- Make sure all of the deployed ARGUS nodes are powered on. If the node doesn't turn on or only turns on briefly, the battery is probably discharged – replace with a fresh battery.
- Make sure the Gateway node is plugged in. If you unplug and replug the gateway, it may take several minutes for the nodes to rejoin the network.
- If the USB cable was jostled during operation, the serial connection to the Gateway Node may have been lost. Try shutting down the ARGUS software, unplug and re-plug the USB cable, and then restart the ARGUS software.
- Click on the link health button to view status of links. If link status labels displays **0 (zero)**, reset all nodes and the user interface.

Notes

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