

Lookout™ Tutorial

This document provides a brief tutorial to help you become familiar with the basics of Lookout development. Refer to the *Introduction to Lookout* manual, available by navigating to the `lookout\Documentation` directory and opening the `Lookout_Introduction.pdf` file, for more information about using Lookout.

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Create a Server Process

In this exercise, you simulate connections to hardware. You will use this process as the server process in later exercises.



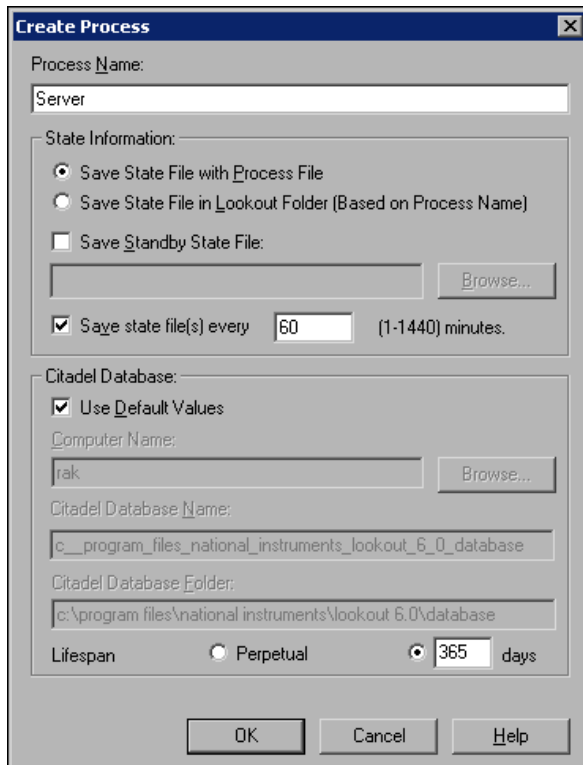
Note While *server* is a networking term, a Lookout server process does not necessarily need to be connected to a network.

This exercise shows how to create and configure Lookout objects, make and edit connections between those objects, and configure data for logging.

1. Start Lookout by selecting **Start»All Programs»National Instruments»Lookout x.x»Lookout**, where *x.x* is the version number of Lookout.
2. Browse the information offered in the default process by clicking the topic links.
3. Close the default process by selecting **File»Close All**. Click **Yes** to stop the process.
4. Select **File»New** to create a new Lookout process.

Notice that the status bar at the bottom of the Lookout workspace is now yellow. This signals that Lookout is in edit mode. If you have trouble completing any of the steps in this tutorial, check to see whether Lookout is in edit or run mode. You can change modes by pressing <Ctrl-Space> or selecting **Edit»Edit Mode**.

5. In the **Create Process** dialog box, name your process *Server*, as shown in the following figure. Leave the rest of the fields with their default settings.



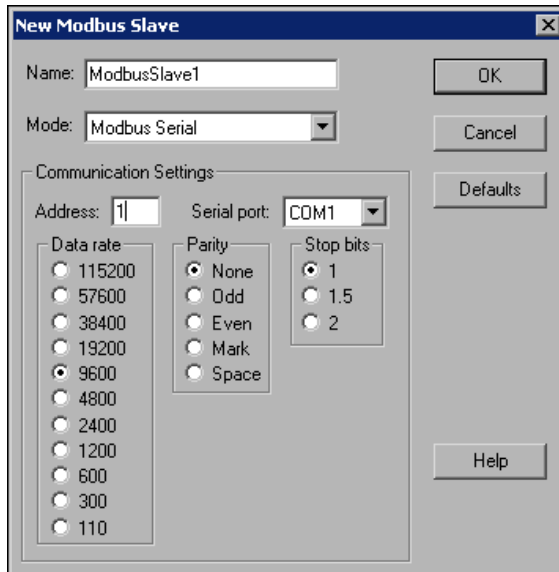
6. Click **OK**.
7. In the **New Control Panel** dialog box that appears, change the **Title** (not the **Name**) to Lookout Server Control Panel.
8. Click **OK**.
9. Select **Object»Object Explorer**.
Use the Lookout Object Explorer to examine Lookout processes running on any Lookout computer on your network, create new objects, arrange objects in hierarchical folders, make connections, edit data members, and register computers running Lookout on your network.
10. Arrange your Lookout workspace so that you can see both your control panel and the Object Explorer.

Create a Server Modbus Slave Object



Note These exercises use the Modbus Slave driver object because it does not return errors if it cannot locate hardware connected to your serial port. You can use the Modbus Slave driver object as you would any PLC or RTU driver object, if your control hardware is not available.

1. Right-click the *Server* process in the Object Explorer, and select **New Object** from the menu. The Select object dialog box appears.
2. Select the **ModbusSlave** object, which is in the **Drivers** folder if the objects are categorized. Notice that a description of this object appears in the field to the right of the list of objects.
3. Click **OK**. The New Modbus Slave dialog box appears, as shown in the following figure. For this example, accept the default values for the object `ModbusSlave1` by clicking **OK**.



The Modbus Slave object, `ModbusSlave1`, appears under your *Server* process in the Object Explorer.

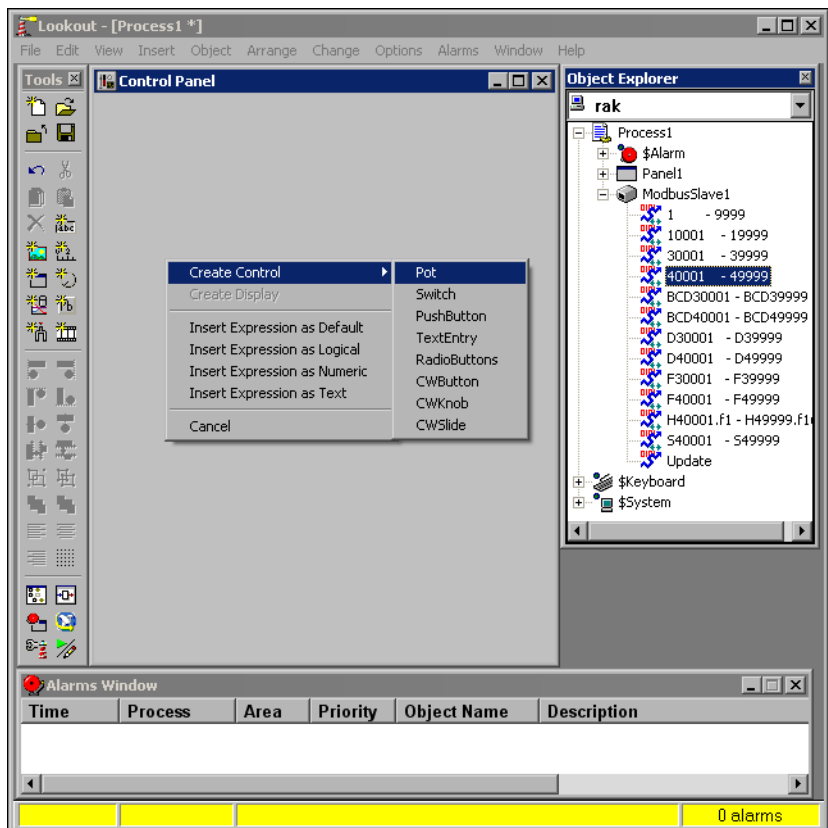
Create and Connect a Server Pot Object to Your Modbus Slave

Typically, you do not need to develop the user interface for a server process, except for perhaps a few displays to help you verify and troubleshoot connections to hardware. The following steps show how to add some simple displays. In the [Create a Client Process](#) section, you will construct a more detailed user interface.

1. Expand the tree view of your newly created `ModbusSlave1` object by clicking the **+** sign to the left of it in the Object Explorer, as shown in the following figure. You use the Object Explorer to view the data members available for you to use.

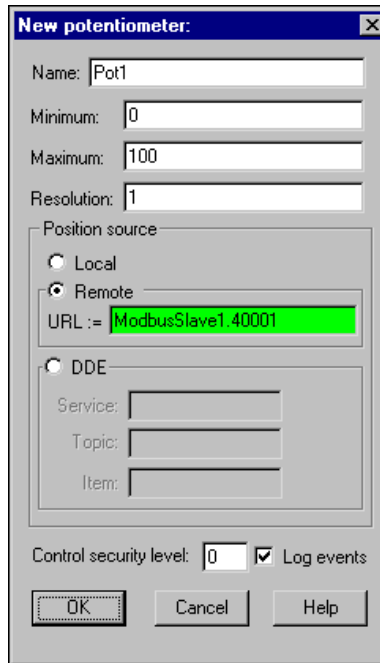
A data member is a data source or sink associated with a Lookout object. In the following steps, you will display the 40001 data member of the Modbus Slave on your control panel. This data member might represent a particular hardware register.

2. Right-click the 40001-49999 data member range in Object Explorer and drag it to your control panel. Release the mouse button and select **Create Control»Pot**.



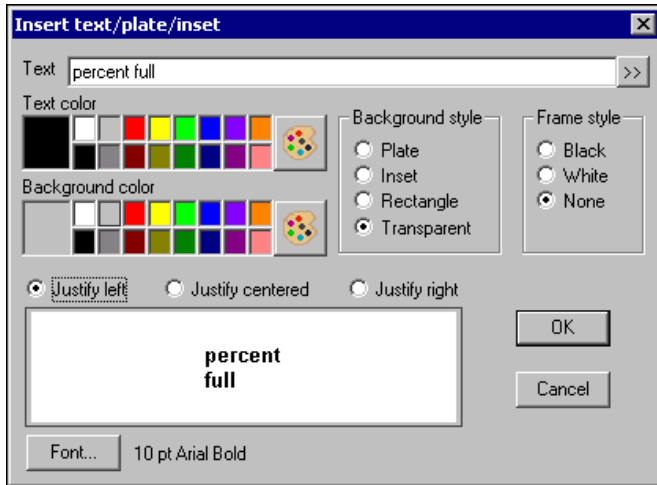
Tip *Pot* is an abbreviation for *potentiometer*. In Lookout, you use Pot objects to set or control analog outputs.

3. The New potentiometer dialog box appears, as shown in the following figure. It is connected to 40001 because the first available data member is used by default when you select a range.

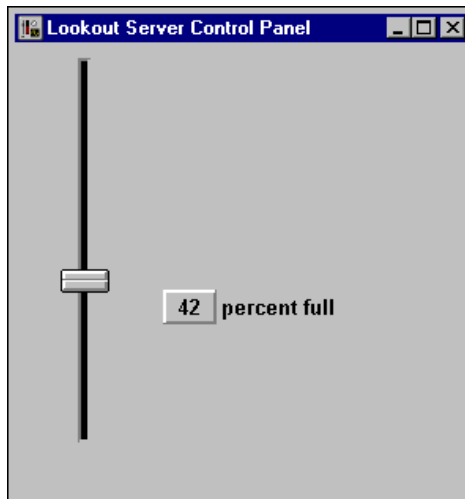


4. Accept the default values for Pot1 by clicking **OK**. The Insert Pot dialog box appears.
5. Select the vertical slider (top row, second graphic). Select the **Use as Default** checkbox, then click **OK**. You can position your object anywhere on the control panel.
6. To check that your connection works, place a digital display of the ModbusSlave1.40001 data member on your control panel by left-clicking 40001-49999 in the Object Explorer and dragging it to your control panel.
7. Use the sizing handles around the number to make the display large enough to show three digits.

- Right-click the control panel and select **Insert Text/plate/inset** and type a percent full label for your digital display with a transparent background, as shown in the following figure. Click **OK** and position the label next to the digital display.



- View your process in action. Press <Ctrl-Space> to leave edit mode, then use your pointer to move the Pot slider up and down. Notice the number in the digital display changes as you move your Pot control, as shown in the following figure. The Pot slider object output is connected to the `ModbusSlave1` data member 40001, and the value the Pot sets for that data member is shown in the digital display.



10. Toggle back to edit mode by pressing <Ctrl-Space>.
11. Select **Object»Connection Browser**. In the **Objects** column, double-click your computer name, then **Server**, then **Pot1** to see the Pot's connection to the Modbus Slave 40001 data member in the **Inputs** column. Click **Close**.

The connection between your Pot control and the Modbus Slave driver is an example of a remote source connection. This two-way connection makes the Pot an indicator as well as a control. Refer to the *Lookout Help*, available by selecting **Start»All Programs»National Instruments»Lookout x.x»Lookout Help**, for more information about the various types of connections.

The digital display is an example of an expression. To learn more, right-click the digital display, choose **Object Properties**, then click the **Help** button in the **Revise expression** dialog box that appears.

Configure Data for Logging, Scaling, and Alarms

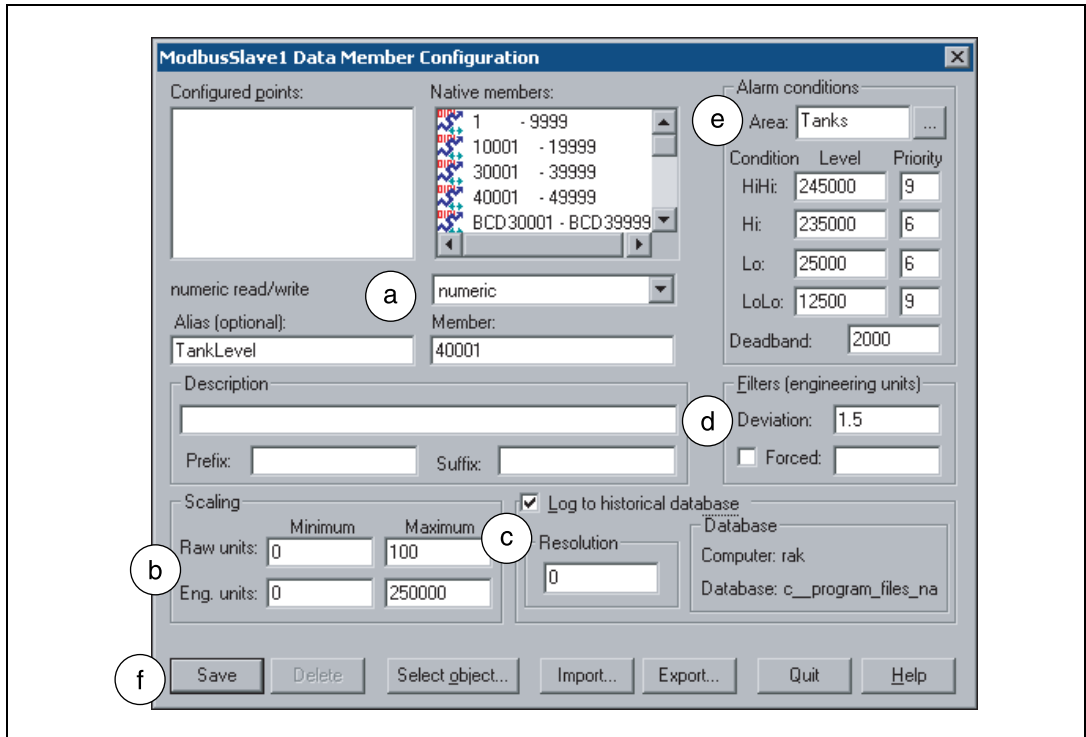
The following steps show how to configure logging, scaling, alarms, and more for your data. You might want to show how many gallons of liquid the tank is holding, display information about the tank and its contents graphically, and trigger alarms when the tank is too full or almost empty. To keep track of this data and to make it easier to handle, Lookout uses the internal Citadel database. Each time you create a Lookout object, every one of its data members is a potential entry in Citadel.

Assume your tank holds 250,000 gallons. You can configure a Citadel entry for your tank to track how full the tank is (in gallons), convert the percentage measurement to a volume measurement, and handle your logging and alarming.

1. Right-click the `ModbusSlave1` object in the Object Explorer. Select **Edit Data Member Configuration**.
2. Using the following figure for help, enter these values in the dialog box.
 - a. Select the 40001 data member you connected your Pot object to by clicking 40001-49999 in the **Native members** list. Assign it an **Alias** of `TankLevel`.
 - b. In the **Scaling** section of the dialog box, set the **Raw units** at 0 for the **Minimum** and 100 for the **Maximum**. These are the raw numeric values connected to the 40001 data member, indicating what percentage of the tank is currently full. Set the **Eng. units** to 0 for the **Minimum** and 250000 for the **Maximum**.

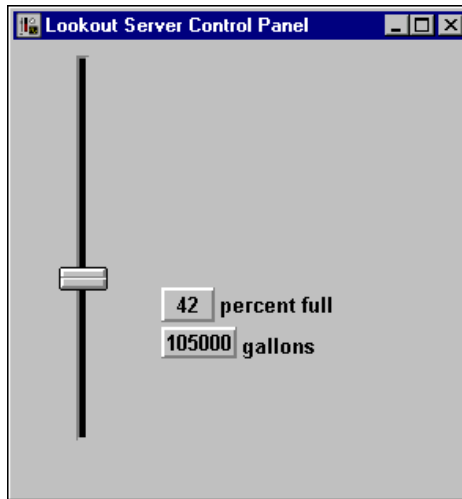
Lookout will now automatically scale the 0–100 input to a value between 0–250,000 that you can display using the alias value TankLevel.

- c. Check **Log to historical database**, and set the **Resolution** to 0.
- d. Set the **Deviation** to 1.5. (This will be used in the next exercise.)
- e. Set your **Alarm conditions** as shown. Notice that Lookout lets you divide alarms into groups, called alarm areas. In this case, the alarm **Area** is Tanks.
- f. Click the **Save** button (or the **Update** button if you saved earlier in the process), then click the **Quit** button to exit the dialog box.

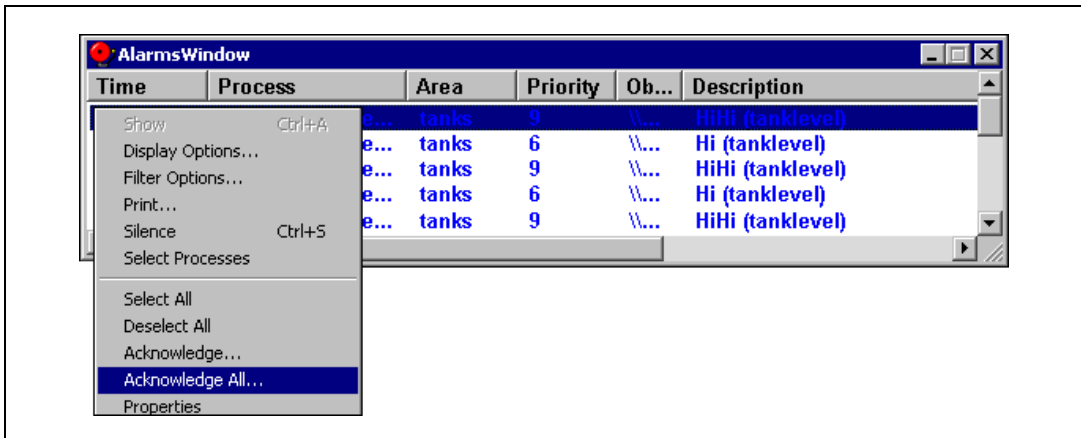


3. Expand the ModbusSlave1 object in the Object Explorer by clicking the +, and drag the scaled data member TankLevel to your control panel. This digital display reports the contents of your tank in gallons.
4. Select **Insert>Text/Plate/Inset**, and type a gallons label for this digital display, choose a transparent background, and click **OK**. Position the label next to the scaled tank level display.

Your control panel should now look similar to the following figure.



5. Press <Ctrl-Space> to exit edit mode, then move the Pot slider up and down. Moving the Pot to the upper and lower limits of its range triggers the alarms you set for `TankLevel` in step 2e. Notice that the alarms appear in the Alarms Window. If you cannot see the Alarms Window, select **Alarms»Show**.
6. Right-click an alarm in the Alarms Window and select **Acknowledge All** to acknowledge the alarms. You can click **OK** without entering a comment.



7. Save your server process by selecting **File»Save**. You will be accessing it with the client process you create next.



Tip If you want to change the size and location of the Alarms Window, select **Alarms»Display Options**. To control what is displayed in the Alarms Window, select **Alarms»Filter Options**. Refer to the *Lookout Help* for more information about alarms and alarming.

Review—Creating a Server Process

A Lookout server process runs on the computer that has direct or physical connections to your industrial automation hardware. You can configure the data for logging, alarms, scaling, and so on in the server process. A server process provides data for clients, and does not need an elaborate user interface.



Tip You can add network and local security to this server process. Refer to the *Lookout Help* for more information about using the Lookout security features.

Create a Client Process

In this exercise, you build a simple Lookout client process to interact with the server you built in the *Create a Server Process* exercise.

The instructions for this exercise assume you are developing your client process on the same computer that is running your server process. In the *Use Networked Client Process* section, you will have a chance to move the client to another computer, add a feature, and fix a simulated data quality problem.

1. If the `Server` process is not already running, launch Lookout and load it using the **File»Open** command.

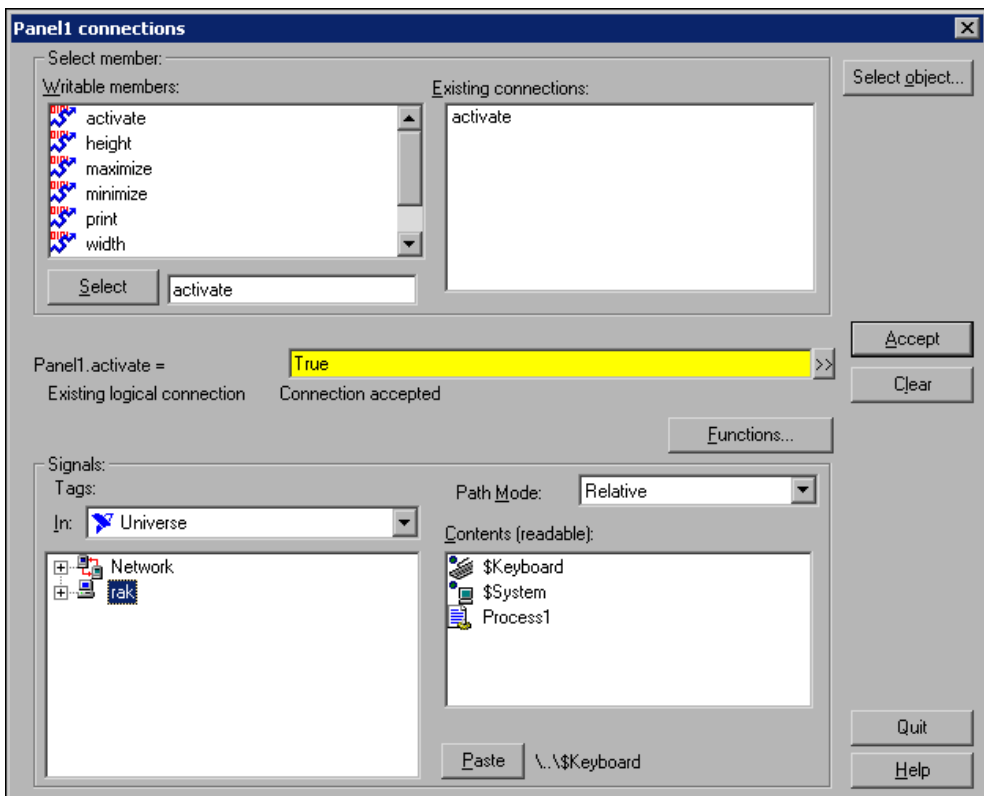
If you did not save your server process from the previous example, you can use the `Server` sample process, found in the `Examples` folder installed with your copy of Lookout.

2. Select **File»New** to create a Lookout client process.
3. In the **Create Process** dialog box that appears, name your new process `Client`. Click **OK**.
4. In the **New Control Panel** dialog box that appears, change the **Title** to `Client Control Panel`, and click **OK**.

Configure the Panel to Activate Automatically

By default, Lookout control panels are minimized. The following steps show how to make your client control panel active and visible every time you load the process.

1. Select **Object»Edit Connections** and navigate to the Panel object in your client process. Click **OK**. The *Objectname connections* dialog box appears.
2. Select `activate` from the **Writable members** field and click the **Select** button. Type `TRUE` in the yellow expression field, and click **Accept**. Your client control panel will now activate when you first open the process.

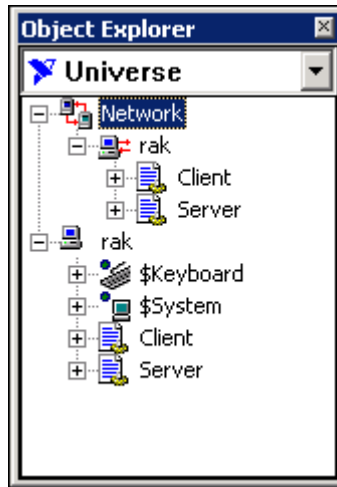


3. Click **Quit**.

Set the Root

To work with your processes properly, you need to set the Object Explorer root to an appropriate folder.

1. Select **Object»Object Explorer**.
2. Select **Universe** from the combo box at the top of the **Object Explorer** window.
3. Expand your view so that you can see both the network presence of your computer and the local presence, as shown in the following figure.



Notice that the Network branch and local branch show both Server and Client processes.

Create a Client Pot Object

1. In the Network branch of Object Explorer under *Server* and *ModbusSlave1*, right-click and drag the 40001-49999 data member range to your *Client* control panel. Release the mouse button and select **Create Control»Pot**. This Pot will have a remote connection to the Modbus Slave object, defined by a URL.

The path shown in the green field of this dialog box will work no matter which computer on your network is running this client process.

2. Click **OK** in the **New potentiometer** dialog box, then select the vertical slider and click **OK**.

3. Arrange panels so you can see both control panels. Operate the Pot control in the *client* process control panel. Notice that on the server process control panel, both the Pot control and digital displays respond.
4. Operate the Pot control in your *server* process. Notice that the Pot control in your client process changes to reflect movement of the server values.

Connect a Client Switch Object to Your Modbus Slave

1. In the client process, press <Ctrl-Space> to return to edit mode (the status bar at the bottom of the Lookout workspace should turn yellow).
2. Right-click your `Client` process in the local branch of the Object Explorer, and select **New Object**.

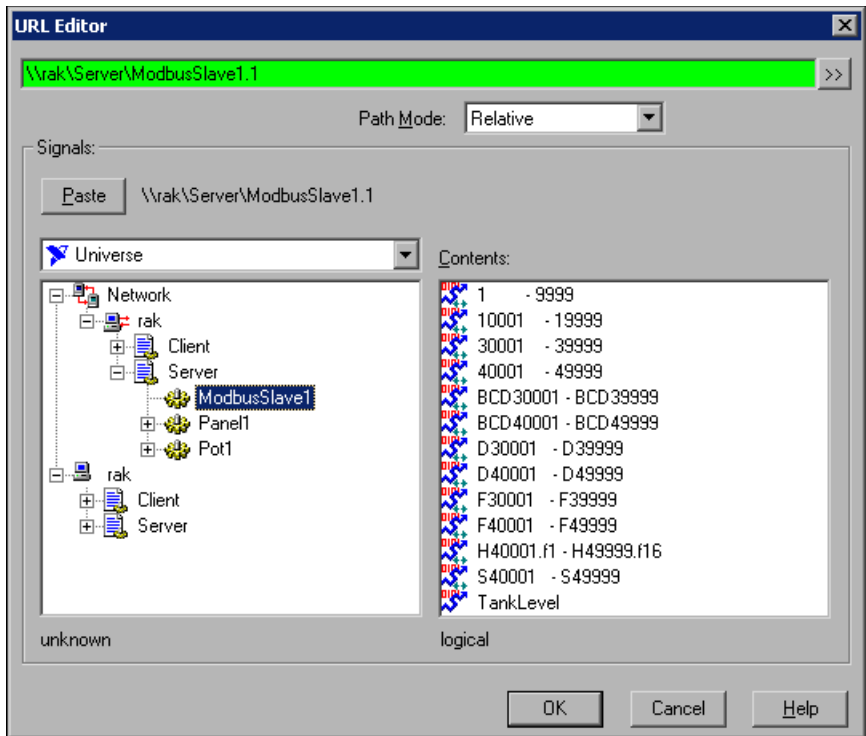


Note Lookout does not allow you to edit a process remotely. If you right-click the `Client` process in the Network branch of Object Explorer, you will not be able to access the **New Object** option.

3. Select **Switch**, which is in the **Control** category if the objects are categorized, and click **OK**. The **New switch** dialog box appears.
4. For **Position Source**, select the **Remote** option, and right-click in the green **URL** field. The URL Editor dialog box appears.

When you created your Pot object for your client, Lookout automatically used an absolute path mode to make sure the URL would work from any computer on your network. In this case you will create a computer-relative path that will later fail when you move the client process to another computer. This will demonstrate Lookout's ability to alert you to data quality problems, and give you a chance to learn how to correct such problems.

5. Expand the `Network` node in the tree that appears, expand your computer under the `Network` node, then expand the `Server` process. Select the `ModbusSlave1` object as shown in the following figure.



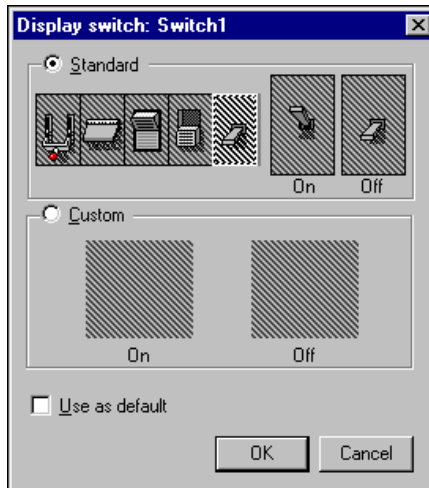
6. Select the 1–9999 data member in the **Contents** list and click **Paste** to insert the URL string into the green URL field. The URL is an absolute path.
7. In the green field, delete your computer name and substitute a period (.) to convert the absolute path to a computer-relative path. The final string should be the following:

```
\\.\Server\ModbusSlave1.1
```

Use computer-relative mode when you want to reference other processes running on the same computer. After you move the process with this Switch to a client computer, the Switch will attempt to find its remote source on that client computer.

8. Click **OK**.

9. Click **OK** in the **New switch** dialog box to finish creating your Switch object.
10. Drag the Switch object from the Object Explorer to your client control panel. Select the standard switch on the far right as shown in the following figure, and click **OK**.



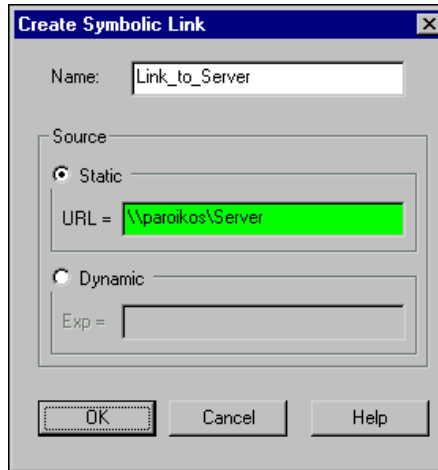
Create a Symbolic Link

So far you have created a Pot in your client process that has a remote source connection to the server, which will work no matter where you move the client process on your network. You also created a Switch that will work when the client process is running on the same computer as the server process. However, if you move your server process to a new computer, or otherwise change the server computer's name, your connections will break. Repairing these broken connections becomes difficult if you have a large number of them. To make maintenance easier, you can use a Symbolic Link connection between a client and a server.

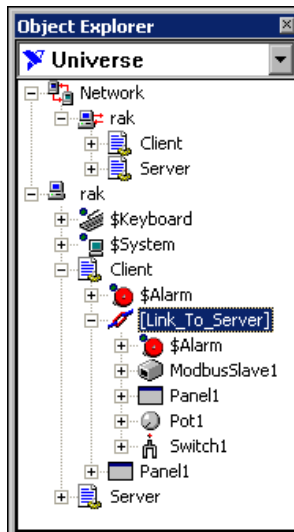
1. In the Object Explorer of Lookout running the client process, right-click the local branch of your `Client` process and select **New Symbolic Link**. The Create Symbolic Link dialog box appears.

2. Name the Symbolic Link `Link_to_Server` and enter the absolute path to your server process in the **URL** field, in the following form:

`\\your_computername\Server`



3. Click **OK**.
4. In the local branch of Object Explorer, expand the Symbolic Link you just made. Notice that all the objects in the server process are exposed in the Symbolic Link.



5. Expand the `ModbusSlave1` object under `Link_to_Server`. Drag and drop the 1-9999 data range to your client control panel to insert an LED display that will reflect operation of the Switch you made.
6. Right-click the LED and select **Object Properties** to see that the expression is as follows:

```
[Link_to_Server]\ModbusSlave1.1
```

This indicator is now linked to the server process through the Symbolic Link. You can, in fact, make all your connections through the Symbolic Link, making your client more flexible, portable, and reusable. By editing the path in the Symbolic Link, you can change every connection in your process with one operation instead of changing connections one at a time.

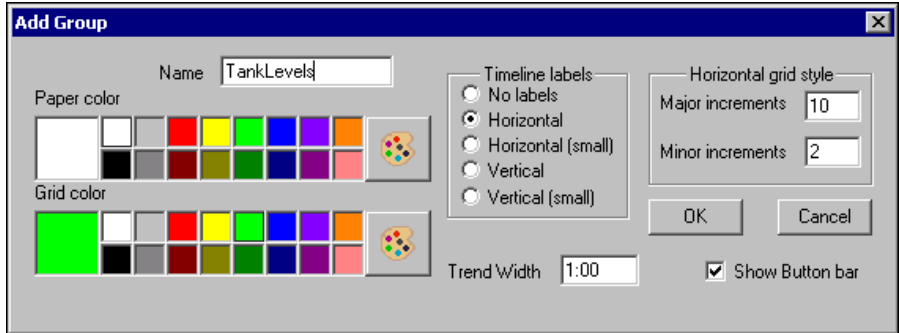
7. Click **OK**. Save your client process.

Create a HyperTrend Object

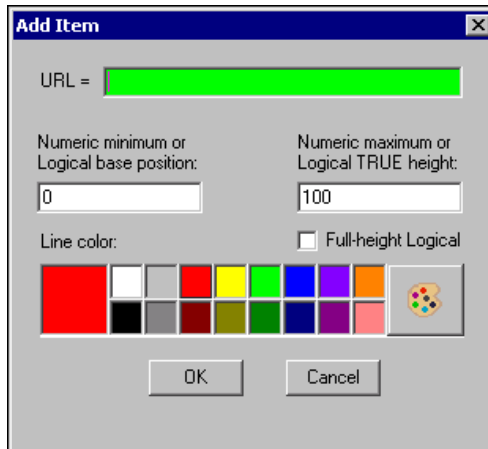
In the *Configure Data for Logging, Scaling, and Alarms* section, you configured the `TankLevel` data member in your server process for scaling, and set it to be logged to Citadel. As long as your server process is running, Lookout is keeping track of this value in Citadel.

1. Make note of the current time on your computer, then switch to run mode and change the position of the Pot slider on your client or server process a number of times in large increments. Later, you will view the changes you made on the HyperTrend.
2. Press <Ctrl-Space> to return to edit mode.
3. In Object Explorer, right-click your computer in the local branch and select **Make Root**. You no longer need access to the `Server` process in the network view.
4. Right-click your `Client` process in the Object Explorer and choose **New Object**. Select **HyperTrend**, which is in the **Logging** folder if the objects are categorized, and click **OK**.

- In the **Create HyperTrend** dialog box, click the **Add Group** button. The following dialog box appears.

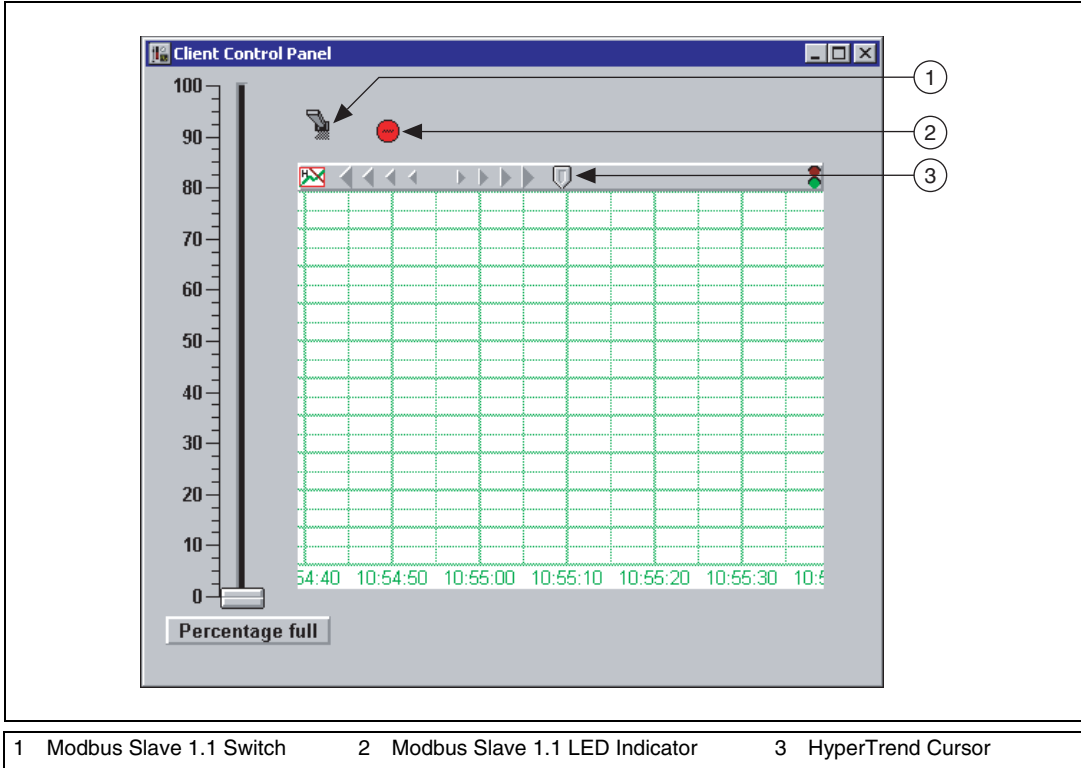


- Name the group `TankLevels`. The default trend width is one minute; accept this and the other defaults.
- Click **OK**. Lookout returns you to the Create HyperTrend dialog box. Make sure your new `TankLevels` group is highlighted, and then click the **Add Item** button. The following dialog box appears.



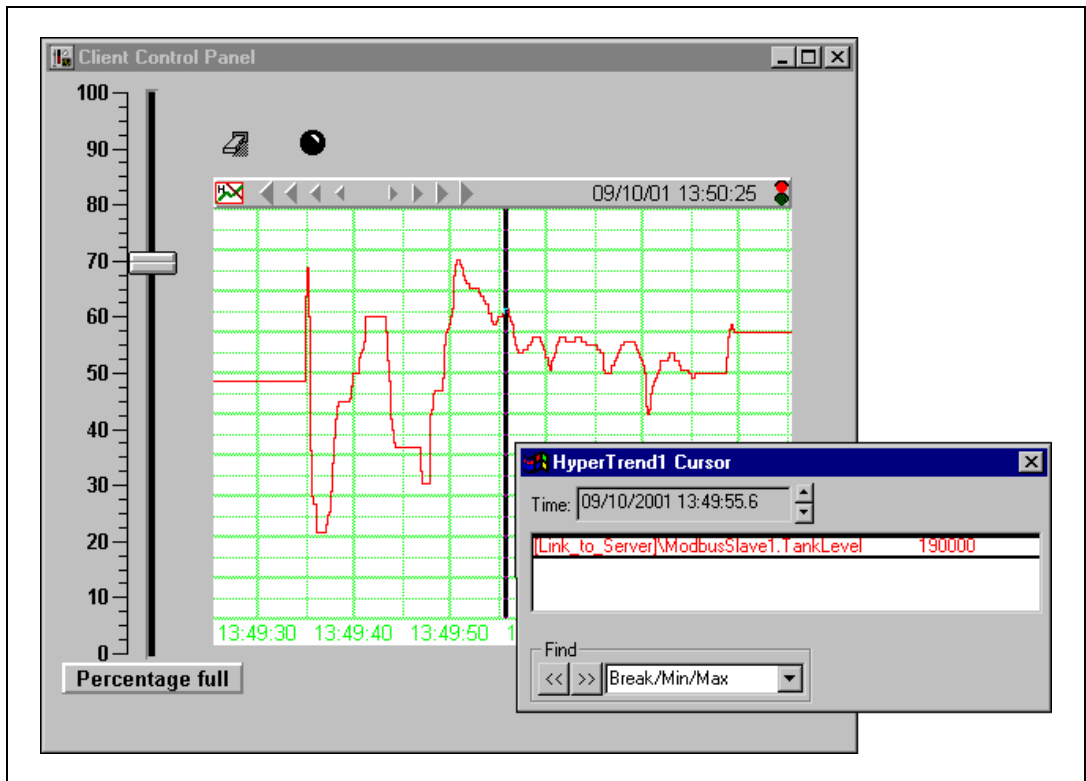
- Right-click in the green **URL** field to activate the **URL Editor**.
- Ensure the **Path Mode** is **Relative**, then under your computer name in the left tree view, select the `ModbusSlave1` object under `Link_to_Server`. Select the `TankLevel` data member in the **Contents** list. Click the **Paste** button. The path in the green field should be `[Link_to_Server]\ModbusSlave1.TankLevel`.
- Click **OK**.
- Set **Numeric maximum** to 250000 to match the scaled value of the `TankLevel` data member.

12. Click **OK** in the **Add Item** dialog box and again in the **Create HyperTrend** dialog box.
13. Drag your new HyperTrend object from the Object Explorer to your client process control panel. Use the sizing handles to adjust the size of the chart. Arrange your client process control panel to resemble the following figure. You can add the scale shown by selecting **Insert» Scale**. You can add the Percentage full label by selecting **Insert» Text/Plate/Inset**.



View Your HyperTrend Data

1. Press <Ctrl-Space> to toggle out of edit mode. Move the Pot slider up and down and notice the trace change on the graph.
2. Click the **HyperCursor** icon in the center of the top of the HyperTrend object. The HyperCursor icon is replaced by a solid line down the center of the chart, and the HyperTrend1 Cursor dialog box appears, as shown in the following figure.



3. Use the **Time** control on the dialog box to scroll back to the time you noted when you changed the TankLevel value.
4. Select **File»Save All** from the Lookout menu to save both your processes. Make sure that your client process is saved in the Lookout folder, so that you can successfully export it as a Web Client.

Review—Creating a Client Process

A Lookout client process interacts with Lookout servers. The client process is capable of running on any Lookout computer on your network without modification. To ensure this portability, a Lookout client application should not include driver objects, and it should always use remote connections to a server process.

Use Networked Client Process

If you have access to a second computer on your network, you can run your new client on that computer and try out Lookout's easy-to-use networking. This exercise shows how a client process developed in a server computer can be distributed across any machine in a network. The client process works with absolutely no additional development.

1. Install Lookout on a client computer.
2. Copy your client process files to the `Lookout` directory on the client computer. If you did not change the name of your process when saving, you should have the following four files that comprise your client process: `Client.l4p`, `Client.l4t`, `Client.lks`, and `Client.lka`.



Note Refer to the *Lookout Help* for more information about Lookout file types.

3. On the client computer, launch Lookout, select **File»Open**, and open `Client`.
4. Operate the Pot object slider on your client computer. The Pot controls in the server and client processes running on the first computer should respond.
5. Notice the red X over the switch, which indicates a data quality problem. This will be explained later in the [Correct Problems with Data Quality](#) section.



Note If you do not see any traces on your HyperTrend, you may need to synchronize your computers. This will be explained later in the [Synchronize Computer Clocks](#) section.

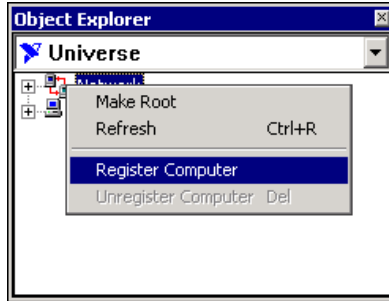
Register Your Network Computers

While Lookout processes can communicate with each other across the network without any special preparations, you may need to register other computers running Lookout in order to browse across the network for development purposes.

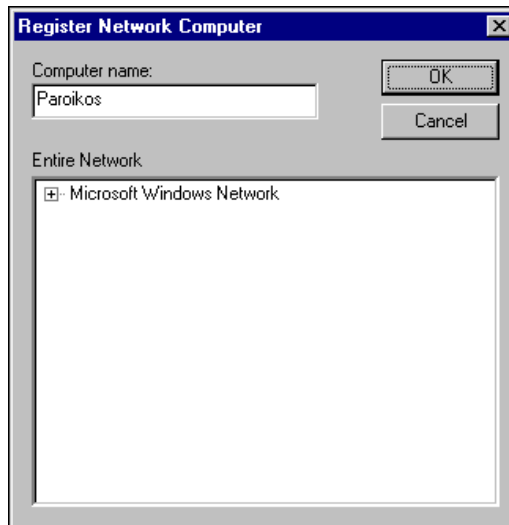
1. On the client computer, press `<Ctrl-Space>` to put Lookout in edit mode. Select **Object»Object Explorer** if the Object Explorer is not already running.
2. Click the name of your client computer in the window at the top of the Object Explorer, and select **Universe** from the pull-down list.

You can now browse every computer registered as running Lookout on your network.

3. Register your server computer (the one running your server process) by right-clicking **Network** and selecting **Register computer**.



4. In the **Register Network Computer** dialog box that appears, type the name of your server computer into the **Computer name** field, as shown. If you prefer, you can browse for your computer name in the network tree view available in the **Entire Network** field.



5. Click **OK**.
6. Expand the **Network** node of the tree view in the Object Explorer. You should see both your client computer (the computer you are currently working on) and the computer running your server process.

Correct Problems with Data Quality

The red X superimposed on the client computer's Switch object is an example of the Lookout data quality feature, which alerts you when your process is receiving data that has some problem. Complete the following steps to fix the data quality problem.

1. Right-click the switch with the red X over it and select **Object» Properties**.
2. Right-click in the green URL field to change the computer-relative path to an absolute path.
3. In the **URL Editor** dialog box, navigate to your server computer under the `Network` branch. Expand the view to select `ModbusSlave1` under your server process.
4. In the **Contents** field, select 1-9999 and click **Paste**. The new path is an absolute path connection to that data member.
5. Click **OK** twice. The red X should be gone.

Synchronize Computer Clocks

You might notice some time lag in operating your Pot control and seeing the change in your HyperTrend chart on your server computer, which can happen when your networked computers do not have their clocks synchronized. To provide for accurate data logging, complete the following steps to have Lookout synchronize your computers.

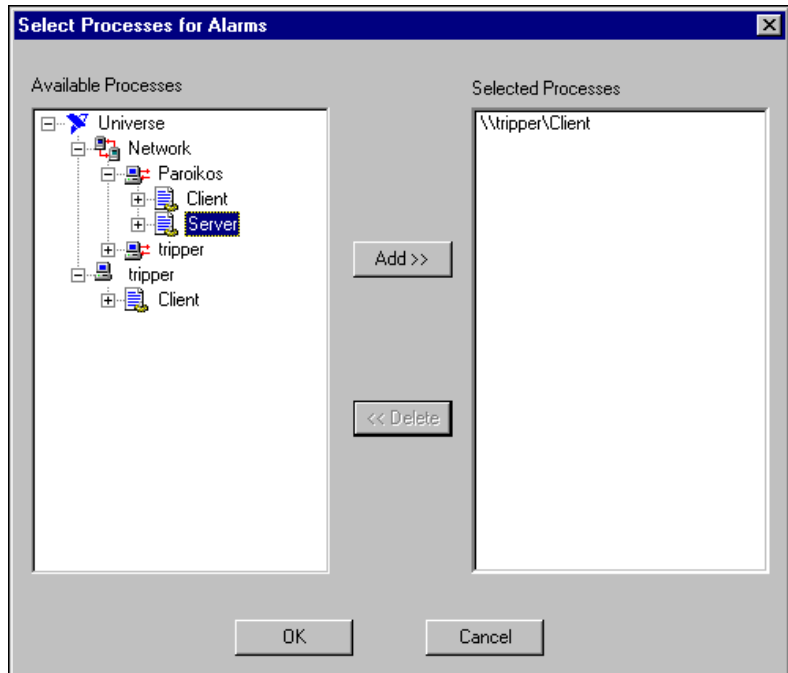
1. On the client computer, select **Options»Time Synchronization** or click the date/time display in the status bar. The **Time Synchronization Settings** dialog box appears.
2. Click **Add**. The Add Time Server dialog box appears.
3. Enter the name of your server computer in the **Computer name** field. You can also browse for your computer in the **Entire Network** list.
4. Click **OK**. The Time Synchronization Settings dialog box reappears.
5. Set **Sleep time** to 10. With this setting, your computers resynchronize every 10 seconds.
6. Click **OK**. Your computers are now synchronized.

Show Networked Alarms and Events

If you operate your Pot slider on your server computer, you may notice that the alarms you trigger on your server computer do not appear in the **Alarms** window on your client computer. To monitor and acknowledge alarms

from a networked computer, you must select the processes you want to monitor as follows.

1. On your client computer, select **Alarms»Select Processes**. The following dialog box appears.



2. Expand the tree view to show the processes running on your server computer. Select the *Server* process, and click the **Add** button. Click **OK**.

Your client computer can now monitor alarms from your server computer.

Review—Networking

Networking a Lookout application is as easy as copying your client process files to any networked computer. Then you can resolve any data quality problems, synchronize your system clocks, register computers, and access alarm and event information.

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