

Alarm Analytics Training Manual

Version 9.11

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Getting Started

1

1.1 Objectives

After completing this chapter, you should know how to:

- Set up your system for Alarm Analytics installation.
- Install Alarm Analytics.

1.2 Introduction to Alarm Analytics

Alarm Analytics captures and analyzes all alarm and event information to identify frequent alarms, chattering alarms, cross-correlated alarms, and many more alarm-related issues. This module also records, analyzes, and displays operator-initiated process changes, which then yield significant insight into the performance of the entire system.

The Engineering Equipment and Materials Users' Association (EEMUA) defined a set of templates to provide the most useful analyses and representations of alarm data. ICONICS Alarm Analytics uses these requirements to create fourteen analytic algorithms, which can be used to create customized reports in order to determine downtime, problem machines, alarm causality, and the general efficiency of a plant.

To use Alarm Analytics, you need a valid ICONICS license with the Alarm Analytics option bit enabled in the ICONICS License Utility. Please see the ICONICS Software Licensing documentation for information about how to authorize an ICONICS software license. You can also register for a license online at www.iconics.com/support/licenseproduct.asp. Alarm Analytics also requires ReportWorX and the AlarmWorX32 Logger. The Alarm Analytics standalone installation includes all of these applications.

The Alarm Analytics module contains many specific report templates with advanced alarm key performance indicators (KPIs):

- Alarm Distribution by Interval
- Alarm Distribution by Interval with Priority
- Alarm Distribution by Priority
- Alarm Rate Distribution by Interval
- Alarm Tag Chattering
- Alarm Tag Frequency
- Alarms from Worst Actors by Interval
- Average Alarm Rate per Minor Interval/Major Interval
- Cross Correlation Analysis
- Operator Changes by Interval
- Operator Response Time
- Standing Alarms at Time
- Standing Alarms by Interval
- Standing Alarms Duration

An example Alarm Analytics report is shown in Figure 1.1.

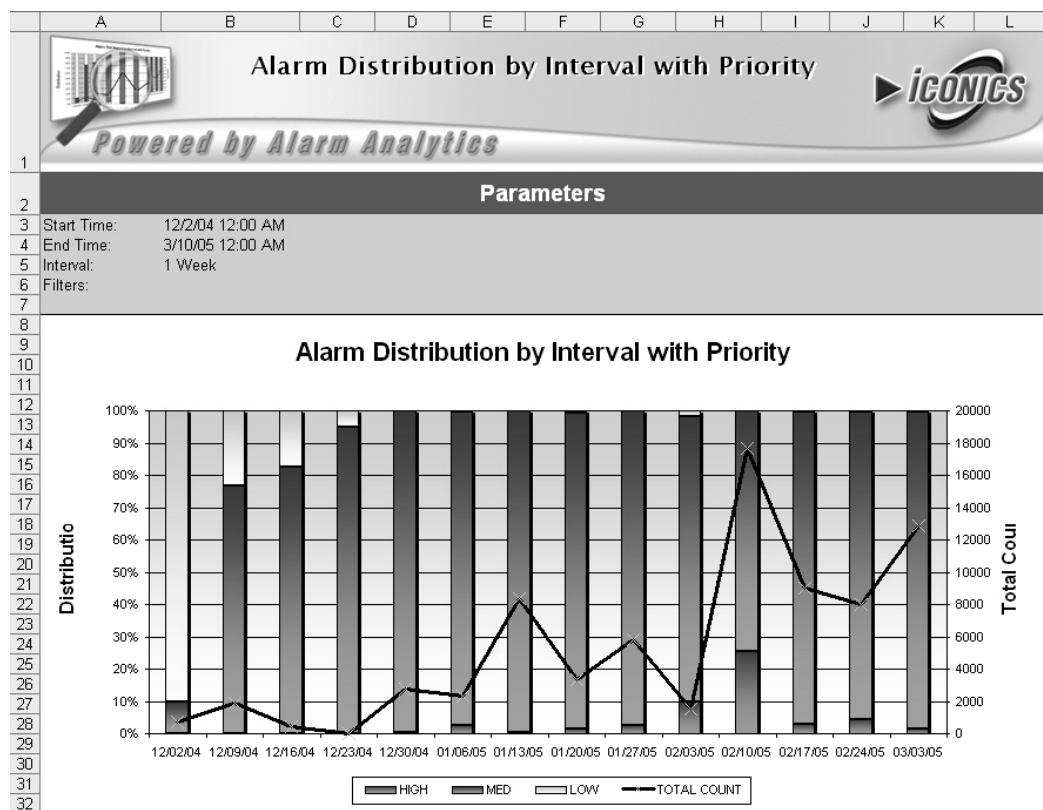


Figure 1.1 - Sample Alarm Distribution Report

1.3 Alarm Analytics Installation

This section describes the system requirements and steps for installing Alarm Analytics. Be sure to close all other applications before installing Alarm Analytics.

1.3.1 System Requirements

To use this software, you must have the following *minimum* system requirements:

- 2.0 GHz processor with 512 MB - 1 GB RAM
- At least 100 MB of free hard disk space is required to install Alarm Analytics (does not include space required for prerequisite components or the Microsoft .NET Framework)
- DVD drive for installation
- VGA video card (256 or more colors for best results).
- Microsoft Windows XP Professional, Windows Server 2003, Windows Vista SP1, or Windows Server 2008 with the latest service packs.

NOTE: PortalWorX, Unified Web Interface, and MobileHMI will be installed in 32-bit compatibility mode on the 64-bit versions of these operating systems, and due to limitations in Internet Information Services (IIS) 5.1 and 6.0, they may not be capable of running side-by-side with 64-bit applications such as GENESIS64 or other 3rd party applications.

- Microsoft® Internet Information Services (IIS) 5.1 or later (requires approximately 20 MB disk space).

NOTE: If you install IIS after installing Microsoft .NET Framework, you must run the aspnet_regiis.exe file with the "-i" argument in the Microsoft.NET\Framework\v2.0.50727 directory in the Windows folder of your operating system.

- Microsoft .NET Framework Version 2.0 and 3.0

NOTE: If Microsoft .NET Framework is not detected on your machine during ReportWorX installation, it will be installed automatically.

- Microsoft® SQL Server® 2000, MSDE 2000, SQL Server Express, or SQL Server 2005 with latest service packs.

NOTE: If Microsoft SQL Server is not detected on your machine during ReportWorX installation, you have three options: you can cancel the installation at this point and install SQL Server locally yourself; you can allow SQL Server Express to be automatically installed from the BizViz DVD; or you can

designate a remote instance of SQL Server, in which case you will not be forced to install SQL Server Express locally.

- Microsoft Excel 2000 or higher with the latest service packs.
- ICONICS Alarm Analytics license. To use Alarm Analytics, you need a valid ICONICS license with the Alarm Analytics option bit enabled in the ICONICS License Utility. Please see the ICONICS Software Licensing documentation for information about how to authorize an ICONICS software license. You can also register for a license online at www.iconics.com/support/licenseproduct.asp.

1.3.2 Alarm Analytics Installation Procedure

To run the Alarm Analytics stand-alone installation, you can insert the product DVD and select the **Alarm Analytics** installation from the software selection menu.

NOTE: If ReportWorX is already installed, you do not need to install Alarm Analytics separately.

The **Alarm Analytics Setup** dialog box appears, as shown in Figure 1.2. Click on the **Next** button to continue.

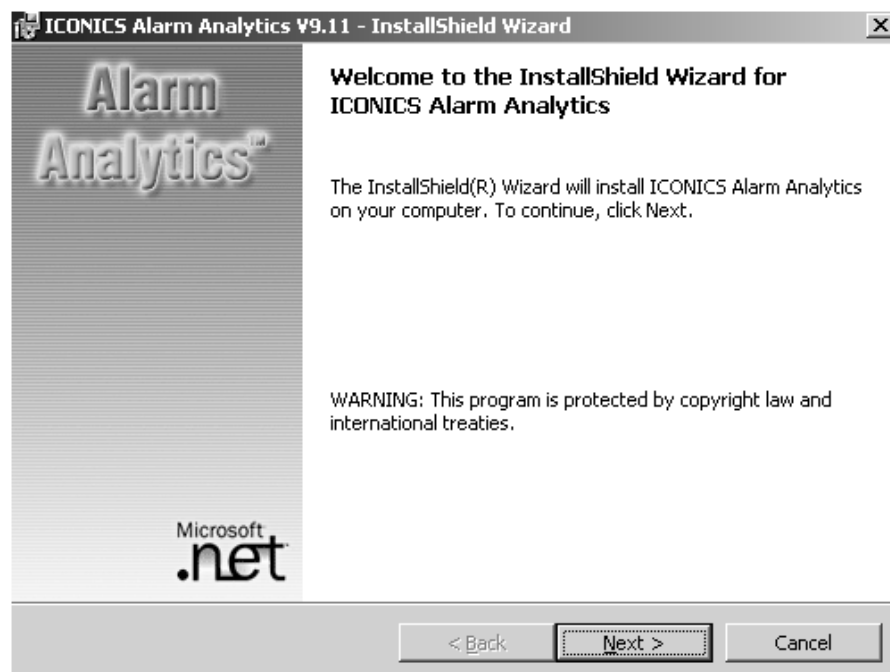


Figure 1.2 - Alarm Analytics Setup

NOTE: This setup procedure will also install a PDF converter/printer driver behind the scenes.

The **License Agreement** dialog box appears, as shown in Figure 1.3. Select **I accept the terms of the license agreement** and click on the **Next** button to continue.

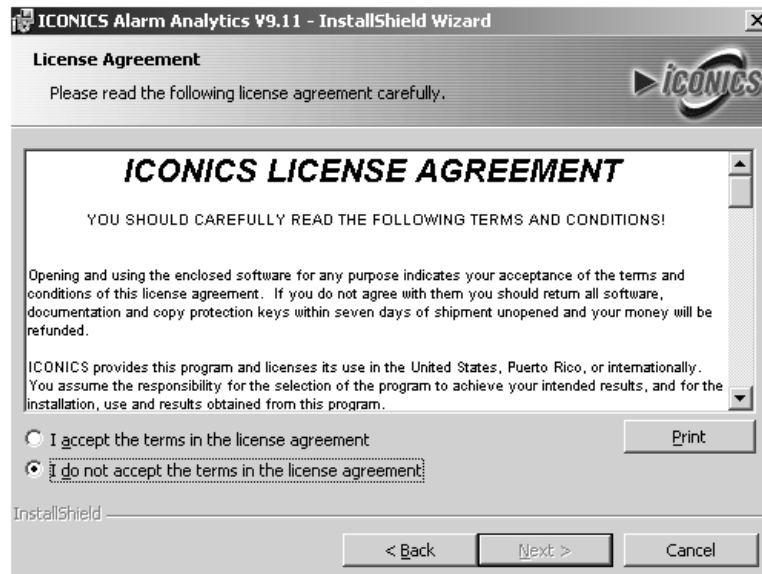


Figure 1.3 - Reviewing Installation Requirements

The **Customer Information** dialog box appears, as shown in Figure 1.4. Enter your **User Name** and company name. We recommend that you select to install the application for **Anyone who uses this computer (all users)**. Click on the **Next** button to continue the installation.

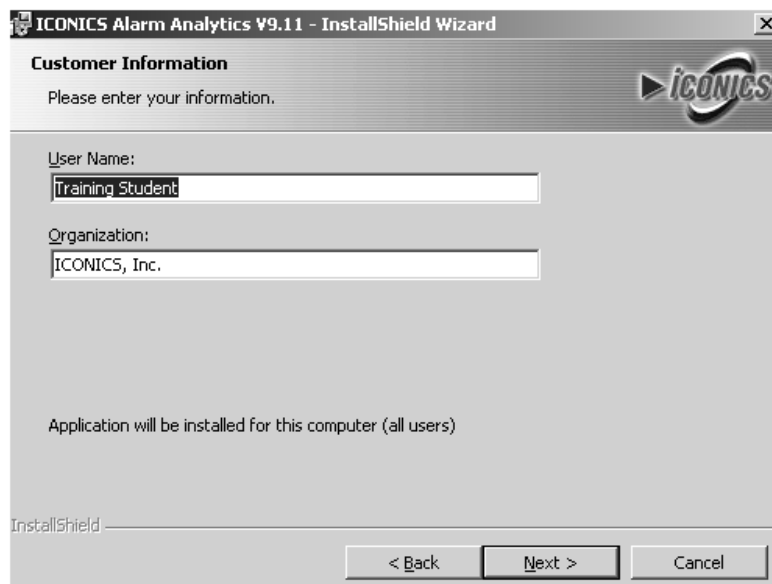


Figure 1.4 - Customer Information

The **ReportWorX Customization Wizard** appears, as shown in Figure 1.5. Click on the **Next** button to continue.



Figure 1.5 - ReportWorX Customization Wizard

The **ReportWorX User Configuration Wizard** dialog box appears, as shown in Figure 1.6. Here you must create a user account for managing the ReportWorX service. By default, we will give you a choice to create the BizVuz_User in the **Administrators** group to run the ReportWorX server. If you have already installed other BizViz applications, you can select the user that you've previously used. This will reduce DCOM errors. Once you have chosen a user and entered the password information for the user account, click on the **Next** button to continue with the installation.

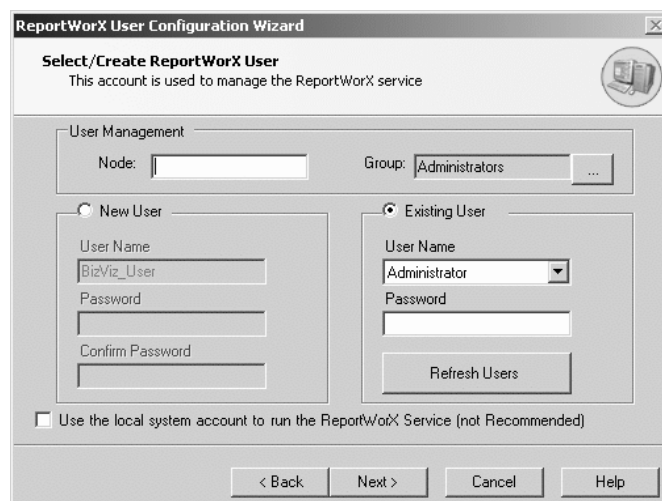


Figure 1.6 - ReportWorX User Configuration Wizard

The **Configuration Database Wizard** will walk you through a few steps to create your ReportWorX configuration. First, select the location of your SQL Server: on a local or a remote computer, and then click on the **Next** button to continue.

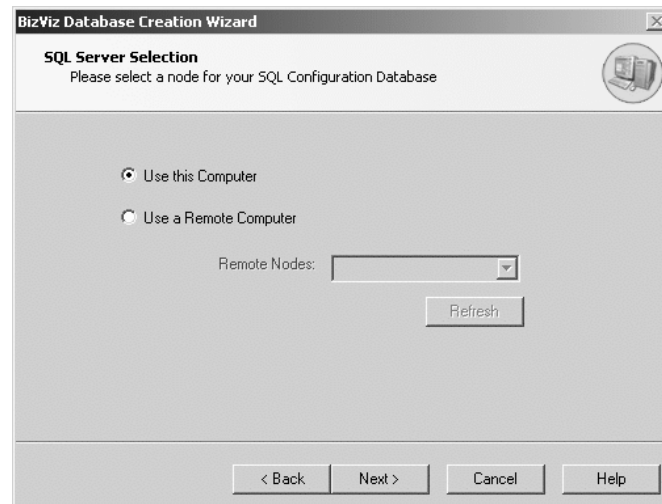


Figure 1.7 - Selecting Location of SQL Server

In the next screen, select the proper authentication mode to log into your SQL Server, as shown in Figure 1.8.



Figure 1.8 - Logging into SQL Server

You have two options for creating your new database, as shown in Figure 1.9. You can either create a new Microsoft SQL database, or you can add the ReportWorX configuration database structure to an existing database in MS SQL Server. There is also an option to include or exclude the ReportWorX samples in the configuration database. Here we will assume that you will choose the first

option (to create a new database). Select **I want to create a new Microsoft SQL Server database on local node**, and then click the **Next** button to continue.

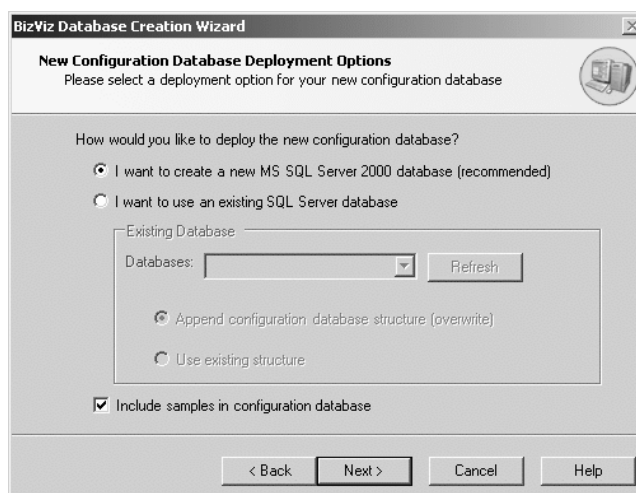


Figure 1.9 - Creating a New SQL Server Database

Choose the settings for the SQL Server database parameters, as shown in Figure 1.10. The default options should be adequate for most applications with a small to medium size load. In the **SQL Server** field, select the SQL Server on which to create a new database. Type a name for the database in the **Database Name** field. In the **Database Path** field, choose a directory path for the new database. You can browse for a directory by clicking on the ... button to the right of this field. Or you can use the default database file path.

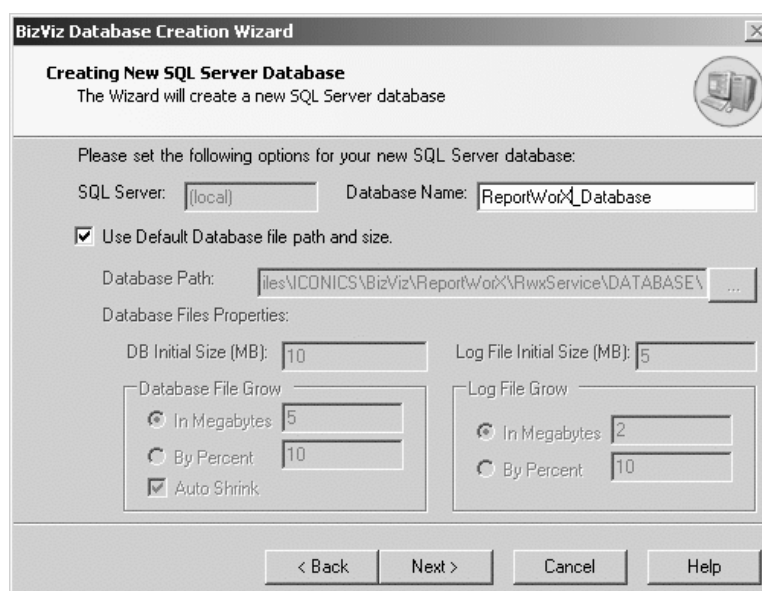


Figure 1.10 - Database Parameters

NOTE: Usually you have only one instance of SQL Server running on the local node (in this case the **SQL Server** field has only one option: "(local)"). However, it is possible to run multiple SQL Server instances on the local node, in which case the **SQL Server** field lists all those SQL Server instances: "(local)" for the default instance and "node_name\instance_name" for all others. Again, all those are local SQL Servers.

Under the **Database File Properties** section, specify an initial size for the database, which should be as large as possible. You can also specify a **Database Growth** option (in megabytes) or as a percentage of the total size. MSDE servers are capable of increasing the database size on the fly to store more data. However, if this operation occurs frequently, the overall system performance may decrease. Choosing an initially large database size and a corresponding database growth option can drastically improve system performance. To shrink the size of the new database, check the **Auto Shrink** check box.

Under the **Log File Properties** section, you can also modify the settings for the database transaction log file. Specify a **Log File Growth** option (in megabytes) or as a percentage of the total size. Again, a sufficient initial size setting can greatly improve performance.

Once you are done, click on the **Next** button to create the new SQL Server database. The Wizard creates the new SQL Server database, as shown in Figure 1.11. When it is finished, it will tell you if the operation has completed successfully. Click on the **Next** button to continue.

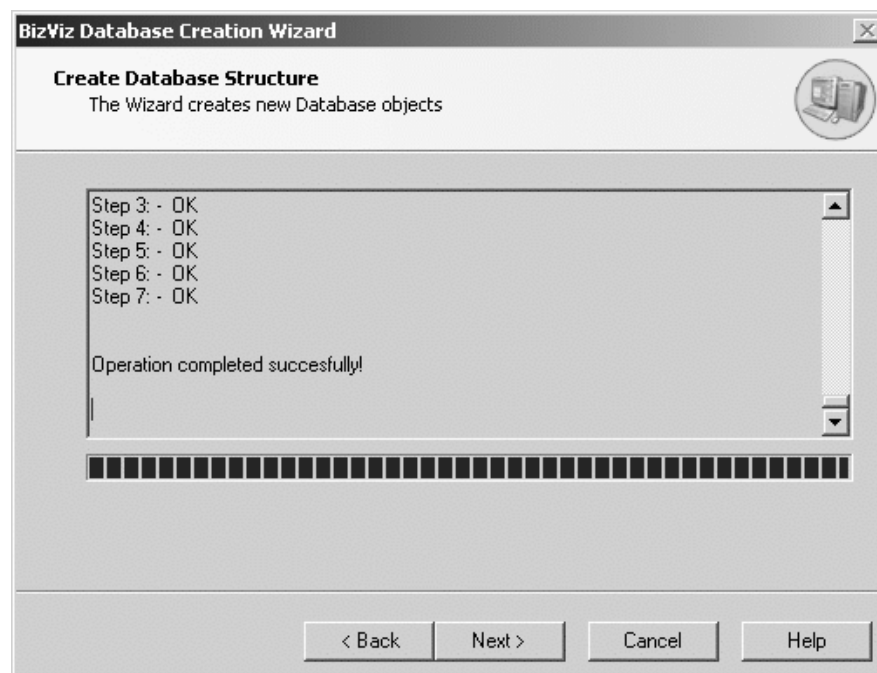


Figure 1.11 - Status of Database Creation

The ReportWorX Configurator uses Universal Data Link (.udl) files to connect to the Microsoft SQL database. These .udl files contain OLE database connection information that allows the Configurator to create and manage connections to OLE databases. Enter a name and directory path for the new .udl file in the **Data Link File Name** field, as shown in Figure 1.12. You can browse for a directory by clicking on the ... button to the right of this field. Click on the **Next** button to continue. If you want this new database to be the active configuration database, check the **Make Database Active** option.

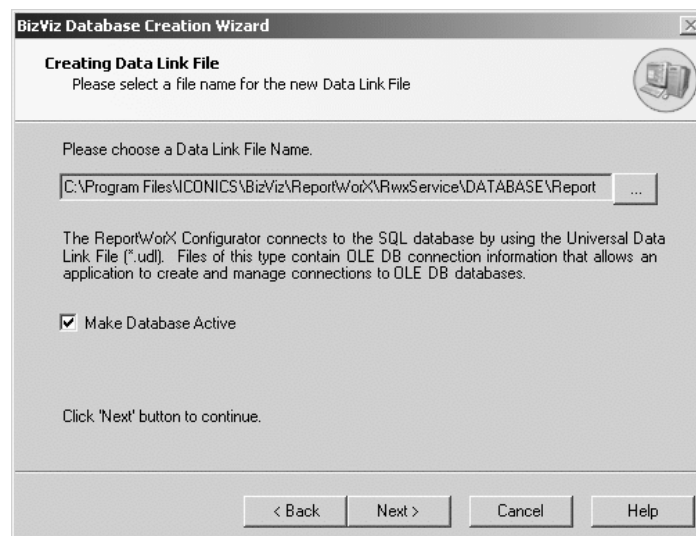


Figure 1.12 - Creating a UDL File

Once the Universal Data Link has been created, a summary appears, as shown in Figure 1.13. Click on the **Finish** button to complete the database creation.



Figure 1.13 - Completing the Database Creation

When the installation has finished, click the **Finish** button as shown in Figure 1.14. At this point, you will be prompted to restart your machine. You must restart your machine before you can use the application.



Figure 1.14 - Alarm Analytics Installation Completed

After restarting, the **Post-Installation Steps** wizard will run automatically, as shown in Figure 1.15. This wizard may require you to insert your Microsoft Office CD, depending on the user that you specified during the ReportWorX Customization Wizard.

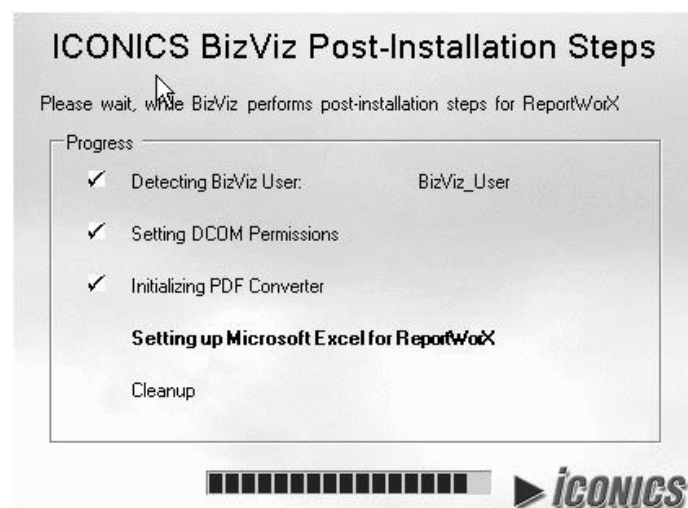


Figure 1.15 - Post-Installation Steps

The Post-Installation takes the following steps:

- **Detecting BizViz User:** ReportWorX verifies that your ReportWorX Service account has been added. You can verify this yourself if you go to the Windows Control Panel and select Administrative Tools → Services.

This opens the Windows Services Control Manager. Right-click on the ICONICS ReportWorX service and select Properties from the pop-up menu. Go to the Log On tab in the Properties dialog box to view the current user account.

- **Setting DCOM Permissions:** The ReportWorX Service will interface with the ICONICS GenRegistrar Server for licensing and event reporting tasks. It is important that the user account under which the ReportWorX Service is running has access to the GenRegistrar server as well to other COM servers such as OPC, ICONICS Language Server, etc. ReportWorX makes the necessary changes to the default DCOM settings to give the ReportWorX Service account the required DCOM permissions.
- **PDF Converter Initialization:** ReportWorX gives the account under which the ReportWorX Service will run access to the ICONICS PDF printer driver installed by ReportWorX, as well as to any printer that the ReportWorX service will use for printing reports:
- **Microsoft Excel Setup:** ReportWorX uses Microsoft Excel as a report template design tool as well as the final report-formatting engine. Thus, it is critical that Excel run under the dedicated ReportWorX Service account. If you did not install Excel before installation Alarm Analytics, you can install it after. However, before to log in as the user running the ReportWorX service and open Excel so that it can configure some settings.

Lab: Running Alarm Analytics Reports

1

1.1 Quick Lab Overview

In this Lab, you will launch the Unified Web Interface from the ReportWorX Configurator and then execute an Alarm Analytics report using the Unified Web Interface. Once the report has executed successfully, you will view the report in the Unified Web Interface.

1.1.1 Task Checklist

In this Quick Lab, you will complete the following tasks:

- Start the ReportWorX Engine.
- Execute and view an Alarm Analytics report using the Unified Web Interface.

1.1.2 Support Files

To complete this Quick Lab, you do not need any additional files.

1.2 Executing an Alarm Analytics Report

1. Start the ReportWorX Configurator by selecting **Start → Programs → ICONICS BizViz → ReportWorX → ReportWorX Configurator**.
2. Click on the stoplight to start the ReportWorX engine if it is red. The stoplight should turn green when the engine is started.
3. Click on the **Visualize Reports**  button on the ReportWorX Configurator toolbar to launch the Unified Web Interface with Internet Explorer.

4. Expand **ReportWorX** → **Alarm Analytics Reports**, and then click on **Alarm Distribution by Interval with Priority**.
5. Choose the following parameters, as shown in Figure L1.1.

Start time: February 2, 2006

End time: March 2, 2006

Sampling interval: n Days

n: 3

Figure L1.1 - Choosing Parameters

6. Click on the **Execute** button and wait while the server processes the request, as shown in Figure L1.2.



Figure L1.2 - Executing the Report

7. When the report is finished executing, select the **Alarm Analytics Report** folder. You should see your **Alarm Distribution by Interval with Priority** report here with a green check mark, indicating that it ran successfully, as shown in Figure L1.3.

		Report Name	Executed At	Executed By
		Alarm Distribution by Interva...	9/20/2006 10:0...	NICOLED-V9\I...

Figure L1.3 - Report Completed Successfully

8. Click on the Excel icon to examine your finished report, as shown in Figure L1.4.

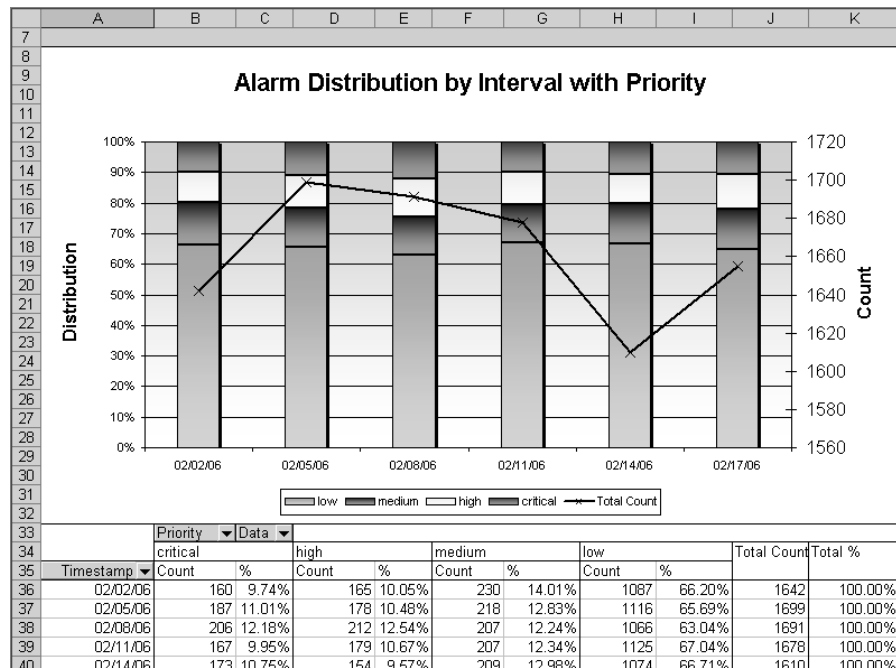


Figure L1.4 - Finished Report

That completes Lab 1. In the next chapter, you will configure an Alarm Analytics report using the ReportWorX Template Designer.

Configuring Alarm Analytics Reports 2

2.1 Objectives

After completing this chapter, you should know how to:

- Identify the different types of Alarm Analytics reports.
- Configure an Alarm Analytics report using the Alarm Analytics Configuration Wizard in the ReportWorX Template Designer.

2.2 Overview of Alarm Analytics Configuration

The general concept of alarm analytics is to generate reports based on specific types of data coming from a connected alarm logger database. The following types of Alarm Analytics reports are configured in the ReportWorX Template Designer. Example reports for the following analytics are included in the sample ReportWorX configuration.

- **Alarm Distribution by Interval:** This analytic calculates and displays the number of transitions into alarm per interval over a time range.
- **Alarm Distribution by Interval with Priority:** This builds on the previous Alarm Distribution by Interval chart to include the EEMUA specified priorities of “critical”, “high”, “medium” and “low”. The user may specify the OPC Severity bands that correspond to the EEMUA priorities.
- **Alarm Distribution by Priority:** This analytic takes a complete count of all transition to alarm over the entire period from Start Time to End Time, and then breaks down that count into bins of predefined priority. This analytic is essentially the “Alarm Distribution by Interval with Priority” analytic with only one long interval.
- **Alarm Rate Distribution by Interval:** This analytic is similar to “Alarm Distribution by Interval”, but adds a little more complexity. It reports on how many blocks of time had a certain amount of alarms within a larger

time span. For example, it could be configured to show how many 1-hour blocks had between 5 and 10 alarms each day for a week. Day 1 may have two 1-hour blocks with that amount, but day 3 might have eight.

- **Alarm Tag Chattering:** This analytic shows the alarm tags that go in and out of alarm repeatedly in a short period of time. This behavior is referred to as “chattering”. If an alarm repeats within a user-specified time window, it is considered a chattering alarm.
- **Alarm Tag Frequency:** This analytic generates a master list of all alarms logged over the given time period with the corresponding number of times each one went into the alarm state. The most recent alarm description appears for convenience. The results are sorted such that the alarm that went into an alarm state the most appears at the top.
- **Alarms from Worst Actors by Interval:** This analytic is a combination of the “Alarm Tag Frequency” and the “Alarm Distribution by Interval” analytics. The top alarms (the number of which is specified by the user) from the Alarm Tag Frequency analytic are considered the worst actors. The number of transitions into alarm per a certain interval is then calculated for these worst actors.
- **Average Alarm Rate per Minor Interval/Major Interval:** This analytic is essentially identical to the Alarm Distribution by Interval analytic except each interval is divided into minor intervals.
- **Cross Correlation Analysis:** This analytic finds alarms that could be related. For example, if Alarm B always (or usually) occurs within some time after Alarm A, then alarms A and B are probably related.
- **Operator Changes by Interval:** This analytic is identical to the “Alarm Distribution by Interval” analytic in all ways but one. The difference is that this analytic only tracks operator changes. Operator changes are defined as OPC Tracking events made from GraphWorX32.
- **Operator Response Time:** This analytic shows the time it took for each alarm to be acknowledged and to return to normal. The minimum, maximum, and average times for each alarm are shown.
- **Standing Alarms at Time:** This analytic reports on the standing alarms at a given time. Standing alarms are active or unacknowledged alarms (basically, alarms that would show up in the AlarmWorX32 Viewer).
- **Standing Alarms by Interval:** This analytic reports the number of standing alarms at the end of each interval. Essentially, it takes a snapshot of the end of each interval and reports the number of active or unacknowledged alarms.
- **Standing Alarms Duration:** This analytic shows the number of hours each alarm was active over a time period.

The first few configuration steps are similar for all types of Alarm Analytics reports. Once you are in the Excel Template designer, right-click on the template and select **Connect to New Data Source → Alarm Analytics**, as shown in Figure 2.1. From this menu, you can configure the different report template types for Alarm Analytics.

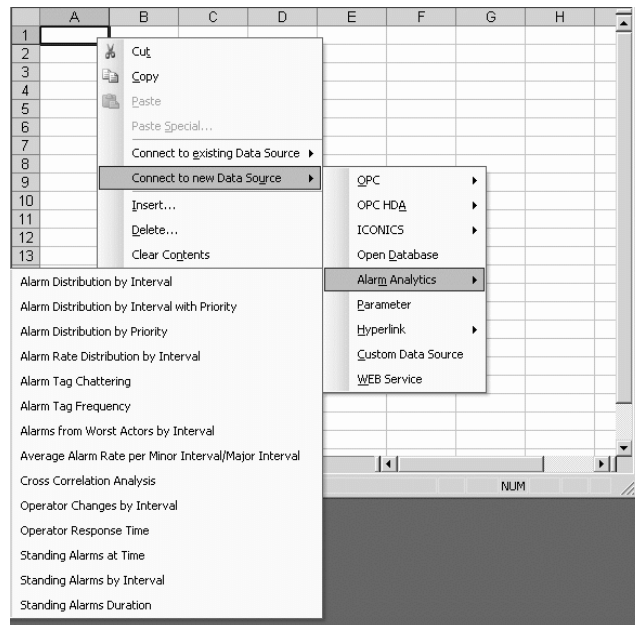


Figure 2.1 - Configuring Alarm Analytics

The next step is the same for all types of Alarm Analytics configurations: you must connect to an alarm logger database, which will supply logged alarm data for the reports. In the **Alarm Analytics Connection Configuration Wizard**, shown in Figure 2.2, click on the **Browse** button.

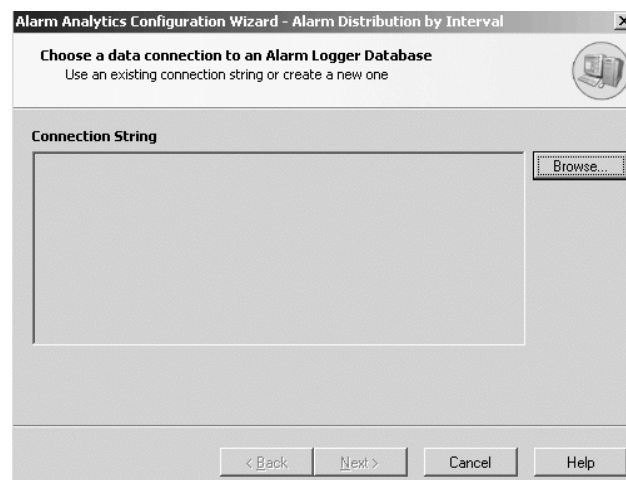


Figure 2.2 - Alarm Analytics Configuration Wizard

In the **Database Connections Browser**, right-click on the database type and select **Insert New Connection**, as shown in Figure 2.3.

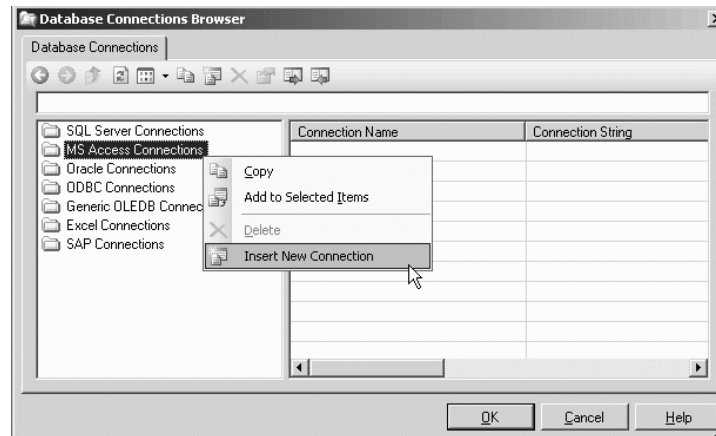


Figure 2.3 - Connecting to an Alarm Logger Database

In the **Data Link Properties** dialog box, click on the ... button to browse for a database, as shown in Figure 2.4.

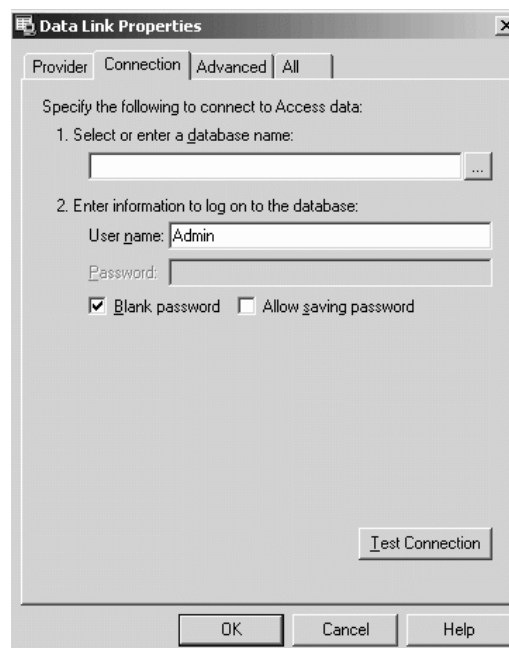


Figure 2.4 - Data Link Properties

Select the database file in the file browse and click on OK to select it. The alarm logger database connection is displayed In the **Alarm Analytics Connection Configuration Wizard**, as shown in Figure 2.5. Click on the **Next** button to continue.

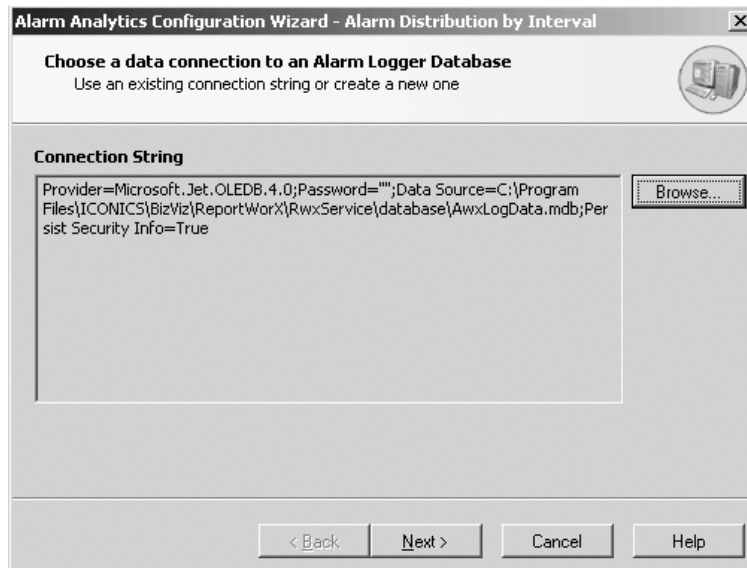


Figure 2.5 - Alarm Logger Database Connection Established

Once the database connection has been established, the next steps are similar for many types of Alarm Analytics configurations: select a table in the database that will supply data for the report, as shown in Figure 2.6. You can optionally provide additional filtering and columns. Click on the **Next** button to continue.

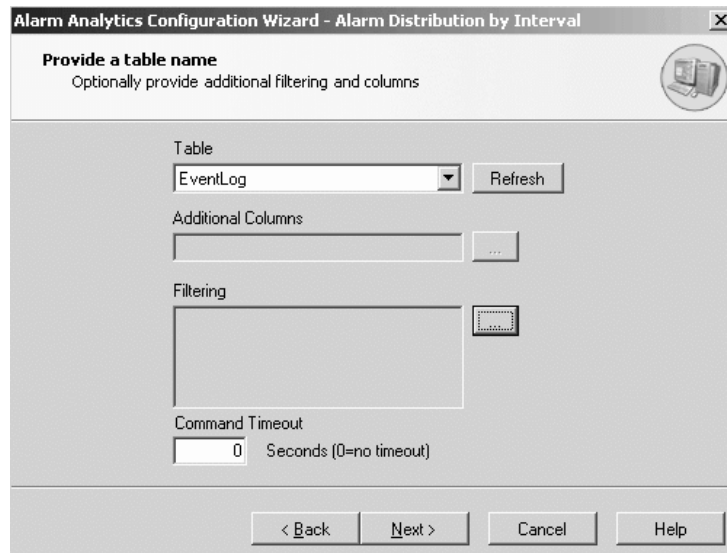


Figure 2.6 - Selecting a Database Table

Note: Please refer to the Data Source Connections documentation for more information about database filtering.

Next, you need to specify a **Start Time** and an **End Time** for the alarm logger data, as shown in Figure 2.7. Here you can specify exact dates and times to start and end the report (**User- Configured**). Alternatively, you can have the alarm logger database automatically determine the start and end times using existing parameters or user-defined parameters. Click on the **Next** button to continue.

Alarm Analytics Configuration Wizard - Alarm Distribution by Interval

Start Time and End Time
Please supply start and end time parameters for your report

Start Time

☐ Automatic Default Value

☒ User-Configured Friday , May 26, 2006 12:17:51 AM

Description: Starting time for the Report

☐ Use Existing Parameter

End Time

☐ Automatic Default Value

☒ User-Configured Friday , May 26, 2006 12:17:51 AM

Description: Ending time for the Report

☐ Use Existing Parameter

< Back Next > Cancel Help

Figure 2.7 - Specifying a Time Frame

Note: Please refer to the Parameter Browser documentation for more information about configuring parameters.

From this point on, the configuration steps are different for each type of Alarm Analytics report; these subsequent steps are described in the ReportWorX Template Designer Help documentation.

Lab: Creating Alarm Analytics Reports 2

2.1 Quick Lab Overview

In this Lab, you will launch the ReportWorX Template Designer from the ReportWorX Configurator and then configure an Alarm Analytics report using the Alarm Analytics Configuration Wizard. Once the report has executed successfully, you will view the report.

2.1.1 Task Checklist

In this Quick Lab, you will complete the following tasks:

- Start the ReportWorX Template Designer.
- Configure an Alarm Analytics report using the Alarm Analytics Configuration Wizard.

2.1.2 Support Files

To complete this Quick Lab, you do not need any additional files.

2.2 Configuring an Alarm Analytics Report

1. Start the ReportWorX Configurator by selecting **Start → Programs → ICONICS BizViz → ReportWorX → ReportWorX Configurator**.
2. Right-click on **Report Tools → Report Templates** and select **New → Template Folder**; name this folder MyAnalytics.
3. Right-click on the **MyAnalytics** folder and choose **New → Report Template**.
4. Select **Create Blank Template** and click on **OK**.

5. Name this template **MyOperatorResponseTime**, and then click on the ... button next to the first version to open the template for editing.
6. In the ReportWorX Template Designer, select a range of cells. Right-click on them and select **Connect to new Data source → Alarm Analytics → Operator Response Time**
7. On the first page of the Alarm Analytics Configuration Wizard, select **Browse**.
8. Right-click on **MS Access Connections** and select **Insert New Connection**
9. Click the ... button and browse to C:\Documents and Settings\All Users\ICONICS\Examples32\AlarmAnalytics.mdb.
10. Select the Alarm Analytics database in the Database Connections Browser, and then click on **Next** to proceed to the Alarm Analytics Configuration Wizard.
11. Select the table you want to report on. In this case, leave it with the default of **EventLog**, as shown in Figure L2.1.

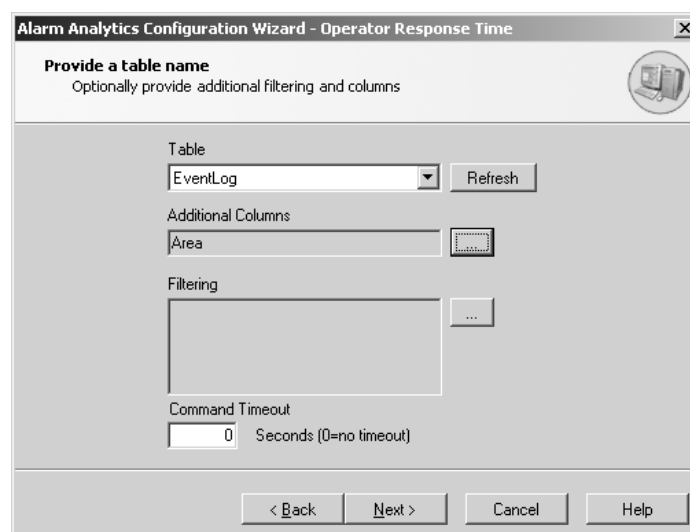


Figure L2.1 - Table and Name Filtering

12. The **Additional Columns** item is a way to add more columns into the schema of the analytics. Click on the ... button, check **Area**, and click **OK**.
13. Click on the **Next** button.
14. On the next page, we will configure our parameters for the start and end times. Select **User-Configured** for both parameters. For the **Start Time**, select

January 1, 2006 with a time of 12:00:01 AM. For the **End Time**, select June 30, 2006 at 11:59:59 PM, as shown in Figure L2.2, and then click on **Next** when you are finished.

The dialog box is titled "Alarm Analytics Configuration Wizard - Operator Response Time". It has a close button (X) in the top right corner. The main heading is "Start Time and End Time" with the instruction "Please supply start and end time parameters for your report". There is a small icon of a computer monitor in the top right of the main area. The "Start Time" section has two radio buttons: "Automatic" (unselected) and "User-Configured" (selected). To the right of the "User-Configured" radio button is a "Default Value" label and a dropdown menu showing "Sunday , January 01, 2006 12:00:01 AM". Below this is a "Description:" label and a text box containing "Starting time for the Report". There is a checkbox labeled "Use Existing Parameter" which is unchecked, followed by an empty text box and a small "..." button. The "End Time" section has two radio buttons: "Automatic" (unselected) and "User-Configured" (selected). To the right of the "User-Configured" radio button is a "Default Value" label and a dropdown menu showing "Friday , June 30, 2006 11:59:59 PM". Below this is a "Description:" label and a text box containing "Ending time for the Report". There is a checkbox labeled "Use Existing Parameter" which is unchecked, followed by an empty text box and a small "..." button. At the bottom of the dialog are four buttons: "< Back", "Next >", "Cancel", and "Help".

Figure L2.2 - Start and End Time

15. Pick **Average Return to Normal** for the default Sort By parameter as shown in Figure L2.3, and click on **Next**.

The dialog box is titled "Alarm Analytics Configuration Wizard - Operator Response Time". It has a close button (X) in the top right corner. The main heading is "Operator Response Time" with the instruction "Supply default sorting for the output table." There is a small icon of a computer monitor in the top right of the main area. The "Sort By" section has a "Default Value:" label and a dropdown menu showing "Average Return to Normal". To the right of the dropdown menu is a "Description:" label and a text box containing "Sort By". There is a checkbox labeled "Use Existing Parameter" which is unchecked, followed by an empty text box and a small "..." button. At the bottom of the dialog are four buttons: "< Back", "Next >", "Cancel", and "Help".

Figure L2.3 - Default Sorting of Operator Response Time

16. Give this data source a name (like "Alarm Analytics Test") and click on **Finish**.
17. The Layout Manager will appear. Add columns to the layout until you have enough to show all of the analytic values. Then go to the **Runtime Options** tab and select **Auto Expand**, if it is not already selected. Click on **OK** exit the Layout Manager.

18. Save the changes you have made by selecting **ReportWorX → Commit Changes**, then close Excel.
19. Create a new report and name it **MyReport**. Select the **MyOperatorResponseTime** template for this report and check the **Enabled** check box.
20. Click on the **Execute Now** button to run it.
21. Use Monitor View or the Unified Web Interface to view your new Alarm Analytics report.