

Productivity Analytics Training Manual

Version 9.20

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Introduction to Productivity Analytics

1

Productivity Analytics is a BizViz tool that reports on real-time and historical availability, performance, and quality for your plant's assets. Your ability to analyze downtime is essential to being able to properly evaluate and understand the events that stop or interrupt your plant's production. The tools in Productivity Analytics will help you find the causes of downtime as a means for maximizing your plant's production efficiency. With Productivity Analytics, you get:

- Reports and charts that visualize historical or real-time data so you can find recurring production problems and underutilized equipment
- Tools for creating consoles and live views that provide a complete picture of your current plant performance
- A configurator for defining your assets and their productivity specifications
- Role-based security for users

This course aims to provide you with the necessary knowledge to utilize all the different products in the solution to build meaningful views of your assets. By the end of this course, you should be able to do the following:

- Design and create a sample application with Productivity Analytics.
- Configure Shift Schedules for your sample productivity Analytics application.
- Define Assets and KPIs associated with the assets.
- Activate and run the Productivity Analytics Service to collect data.
- Create runtime views of Productivity Analytics.
- Use GraphWorX32 to create operator interfaces to deploy in the web interface.
- Develop and administer a reporting (ReportWorX) application that users can interact with locally or via the Web.

Before we can start our discussion of Productivity Analytics, we need to define some terms and ideas. By the end of this chapter, you should know and understand the following concepts:

- Key Performance Indicators (KPIs)
- Overall Equipment Effectiveness (OEE)
- The uses for Productivity Analytics
- System and license requirements
- How to install Productivity Analytics

1.1. *Introduction to Productivity Analytics*

Before we start with the details of how to use Productivity Analytics, you should know the concept behind Productivity Analytics which will, in turn, aid your design and implementation of the solution.

As you may already know, Productivity Analytics is designed to help you measure the effectiveness of your manufacturing process and to pinpoint where processes could improve. Because the product measures the effectiveness of your processes, you will need to define the metrics that are important to evaluating your processes. These metrics are often referred to as Key Performance Indicators (KPIs), which can be financial or non-financial. They should quantify objectives that reflect the strategic performance of your organization.

Some examples of KPIs are: mean time to repair, equipment setup time, inventory level, and product defect rate. Your industry may use different KPIs than these, but every KPI you use should be a quantifiable measurement. Notice the examples we listed – they are measurable and can be quantified based on some measured unit. More importantly, you can define an *ideal* for these KPIs, which will help you visualize the gap between organization goals and the performance of your current processes.

A very specialized KPI is Overall Equipment Effectiveness (OEE), which was first introduced in Japan in the late 1960s for the automotive industry. It provides a framework in measuring the efficiency and effectiveness of a process by breaking down the process into three fundamental components: Availability, Performance, and Quality.

Each of these components is measured in percentages (e.g., percent of a machine's availability over a scheduled workweek) and is used in the calculation of the OEE. The standard OEE calculation is this:

$$\text{OEE (\%)} = \text{Availability (\%)} * \text{Performance (\%)} * \text{Quality (\%)}$$

However, this is not to say that OEE calculations are standardized. Each component of the OEE calculation is typically calculated differently from one manufacturer to the next. No two manufacturers use the same exact formula for such calculations for their assets.

In Productivity Analytics, **availability** is calculated using its downtime for events such as personnel breaks, maintenance, machine faults, and even idling. An asset's availability can be calculated using (for example) only the asset, only its child assets, some of its child assets, or any combination of these. You can even remove availability from the equation altogether. The options for calculating an asset's **performance** and **quality** are equally flexible, and are configured by you to reflect your plant's operations.



It is often challenging to collect all of the data that is required for calculating the OEE's components. It is also a challenge to discern the data's usefulness. Productivity Analytics is designed to help you do both. Let us start by taking a quick look at the product architecture.

1.1.1. Productivity Analytics Architecture

Productivity Analytics consists of two major parts: Productivity Analytics Data Services and Productivity Analytics Web Interface. These parts should be installed together on a single computer. Figure 1.1 shows the relationship between the data services and the web interface.

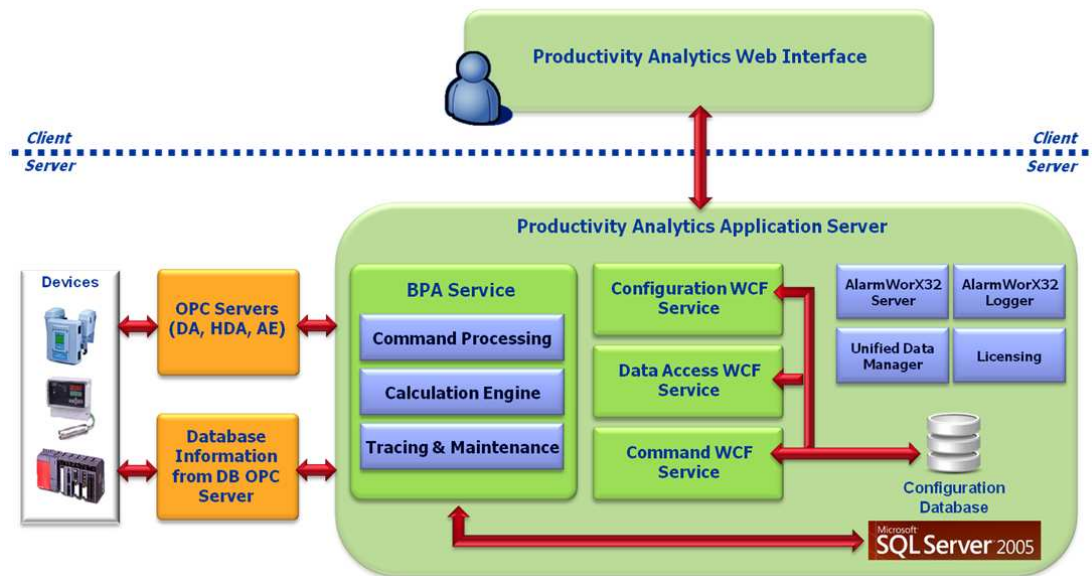


Figure 1.1 - Productivity Analytics Architecture

As a solution package, Productivity Analytics includes the following components:

- AlarmWorX32 Server and AlarmWorX32 Logger – collects downtime data so that availability can be measured
- Unified Data Manager (UDM) – propagates performance and quality data
- Productivity Analytics Windows Service – hosts performance and quality data collection, the OEE calculation engine, and server-side utilities
- Productivity Analytics Web Service
- Productivity Analytics Unified Web Interface
- Microsoft SQL Server C# components (Common Language Runtime or CLR integration) – hosts data flow, downtime data collection, runtime charts, and reporting logic

Aside from Productivity Analytics, ICONICS also offer other products such as GraphWorX32, Database OPC Server, ReportWorX, and many others to create a single-solution package that enables you to visualize, trend, alarm, and report on your facility's assets.

On the server side are data services and the web server, and on the client side is the Web Interface which allows you to access reports and visualize your data. Productivity Analytics integrates easily to third-party portals while providing a robust mechanism for service-oriented architecture.

1.1.1.1. Data Services

Productivity Analytics hosts two data service engines:

- The UDM trigger performance and quality **Data Collection engine**.
- The core calculation and OEE computation **Analytics engine**.

The Data Collection Engine processes values, events, and associated variables using:

- Native UDM trigger-related value data logging support,
- AlarmWorX32 OPC AE Server, and
- AlarmWorX32 Logger.

UDM trigger-related values and AlarmWorX32 enter event data into a series of Event Staging tables.

The Analytics Engine is used for complex processing of data in the staging tables. Staging events are processed immediately. Incoming asset, configuration, cause, security, production, and scheduling data are relevant as a Performance, Quality, or Downtime information. As such, they are transformed and stored into a collection of Performance, Quality, and Downtime tables which are monitored and analyzed to provide live summary data. Summarized data is made available to clients by ReportWorX, MobileHMI, and PortalWorX.

The Analytics engine also archives and removes historical data.

1.1.1.2. Web Interface

Clients can access configuration data (such as asset definitions, configuration options, and production information) and live analytic data results using the ICONICS Unified Web Interface (UWI) in Internet Explorer. The Unified Web Interface shown in Figure 1.2, can house other providers in addition to Productivity Analytics, including



ICONICS ReportWorX, ICONICS BridgeWorX, ICONICS XML Plug-in, and any custom plug-in you want to add or third-party software.



Figure 1.2 - Unified Web Interface with Productivity Analytics as the Provider

1.1.1.3.A Variety of Charts and Reports for Runtime Use

Productivity Analytics offers a variety of predefined charts and reports that you can add to role-based views for users to access using the UWI. Reports can be used for:

- Viewing operational performance
- Discovering underutilized equipment
- Pinpointing recurring problems
- Managing downtime events and attributing reject reasons to quality-related events using two audit reports available in Productivity Analytics

1.2. System Requirements

Productivity Analytics requires the following:

- Pentium 4 system with 2 GB of RAM and a minimum of 60 GB of hard disk space
- One of the following Microsoft operating systems¹, with the latest service packs installed:
 - o Windows Server 2008 R2
 - o Windows 7²
 - o Windows Server 2008
 - o Windows 2003 Server
 - o Windows Vista³
 - o Windows XP⁴
- Microsoft Internet Information Server (IIS) version 6 or later

¹ The operating systems that we list here can be x86 (32-bit) or x64 (64-bit) systems.

² For Windows 7, we support Windows 7 Professional, Windows 7 Enterprise, and Windows 7 Ultimate.

³ For Windows Vista, we support Windows Vista Business, Windows Vista Enterprise, and Windows Vista Ultimate

⁴ For Windows XP, we support Windows XP Professional.

- Microsoft SQL Server 2005 with the latest service packs installed
- Microsoft .Net Framework 2.0, 3.0, and 3.5

NOTE: The BizViz FrameWorX installer checks to make sure that at least Microsoft SQL Server 2005 Express and versions 2.0 and 3.0 of Microsoft .Net Framework are installed. If any are not installed, the BizViz FrameWorX installer prompts you to install it before you install any BizViz component. Note that if the BizViz FrameWorX installer does not detect Microsoft SQL Server 2005, it installs Microsoft SQL Server 2005 Express.

- Microsoft Internet Explorer version 6.0 or later
- IP addresses – Currently, fixed (or static) IP addresses are required on all networked computers so that machine IP based permissions work properly. A machine's permissions are based on its fixed IP address.

1.3. *License Requirements*

An ICONICS license is required for Productivity Analytics. Productivity Analytics version 9.20 can use both software and hardware keys. If you do not have an ICONICS license for Productivity Analytics, you can use Productivity Analytics to look at sample data in **demo mode**, which limits you to the following:

- 2 hours of runtime
- 20 assets
- 100 downtime definitions
- 1 runtime client
- 1 developer client

1.4. *Installation*

Productivity Analytics is installed as part of the BizViz suite, but can be installed as a standalone product as well. If you wish to just install Productivity Analytics without the other BizViz products, you can install the standalone from the installation disk. Once that installation completes, also make sure that you install the Unified Web Interface from the BizViz installation disk. All of these steps are described in the *BizViz Getting Started* guide, located on your ICONICS BizViz DVD.



Lab: Offsite Training Installation and Confirmation

L1

In this section, you will look at the process for installing Productivity Analytics and confirming its installation.

Estimated time to complete this lab: 60 minutes

1.1. Task Checklist

In this lab, you will complete the following tasks

- Install GENESIS32
- Install Productivity Analytics
- Apply the training support files
- Confirm the installation

1.2. Support Files

You will need the following files to complete this lab:

- The installation DVD
- AcmeSeutical_DWXConfig.mdb
- AcmeGASConfig.csv
- LanguageAliasingTranslation.txt
- TrainingCourse.sim
- PainReliefEuropeMap.gdf
- PainReliefUSMap.gdf
- PainReliefWorldMap.gdf
- TrainingCourseV9.20.sdf

1.3. Installation

If you are attending this training course at one of our training facilities and are using one of our provided machines, you may read this section to familiarize yourself with it, but you do not need to complete it in the lab. Instead, you can go to “Confirming

Productivity Analytics Installation” on page 1-12. If, however, you are using a computer of your own, please follow this lab to install the products necessary for this class and make sure that the installation completed successfully.

1.3.1. *Installation Prerequisites*

Before we install any ICONICS applications, it is generally a good idea to make sure that the required software has already been installed on the computer. In order for a successful installation, we recommend that you have the following already installed on the computer:

- Internet Information Services (IIS)
- The latest .Net Framework – the GENESIS32 and the BizViz installation will try to detect this component and install it if it is not there. However, this takes time (up to an hour) to install. Therefore, we recommend installing this beforehand.
- SQL Server 2005 Express or higher – the BizViz installation will try to detect this component and install it if it is not there. However, this does break the flow of your installation process. Therefore, we recommend installing this beforehand.

Depending on your operating system, the IIS installation may require your Operating System’s installation disk. You should obtain this from your IT personnel. In addition, the path where IIS needs to be installed varies by Operating System. You may want to ask your instructor its required location on the Operating System you will be using.

1.3.2. *Installing GENESIS32*

We will start by installing GENESIS32. Since this course will teach you how to build HMI (Human-Machine Interface) displays, we will need to install GraphWorX32, which is part of the GENESIS32 suite.

1. Insert the GENESIS32 installation disk.
2. When the splash screen comes up, click on the **GENESIS32** link, which is circled in Figure L1.1.





Figure L1.1 - Installation Splash Screen

3. You will then see a dialog in the lower-right corner preparing for the installation. Once that completes, you should see the Welcome screen as shown in Figure L1.2.

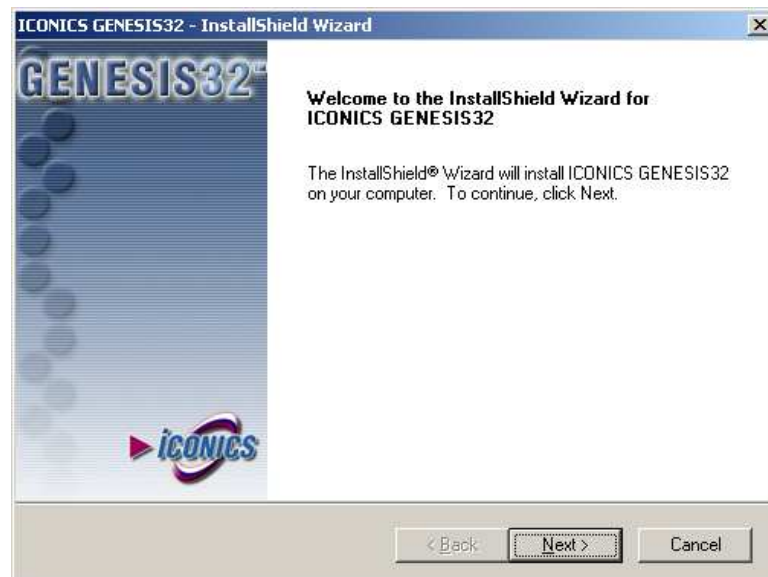


Figure L1.2 - Welcome Screen

4. Click on **Next** to continue the installation.
5. On the License Agreement screen, read through the agreement and select **I Accept the terms of the license agreement** at the bottom and click on **Next** to continue.



Figure L1.3 - License Agreement

6. On the Setup Type screen, leave the selection at **Typical** and click on **Next**.
7. On the Start Copying Files screen, the default selection installs Licensing, Workbench32, and WebHMI. You can leave this setting as-is and click on **Next**.

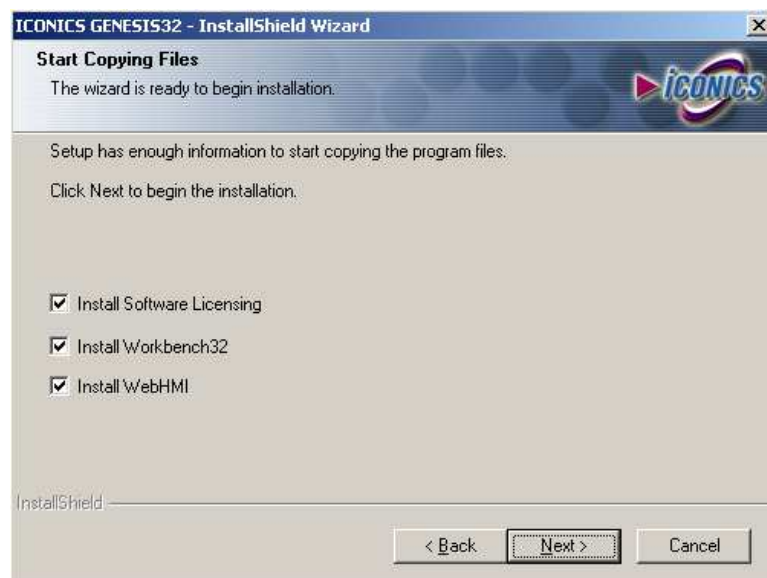


Figure L1.4 - Start Copying Files



8. The Setup Status window will show you the progress of the installation. During this step, the Application Setup Utility will launch. You can choose to create the new “ICONICS_USER” (see Figure L1.5) or choose an existing user on the system.
9. Regardless of the user you choose, you must provide a password. Enter the password twice, in the appropriate fields, and click on **OK** to close the dialog.

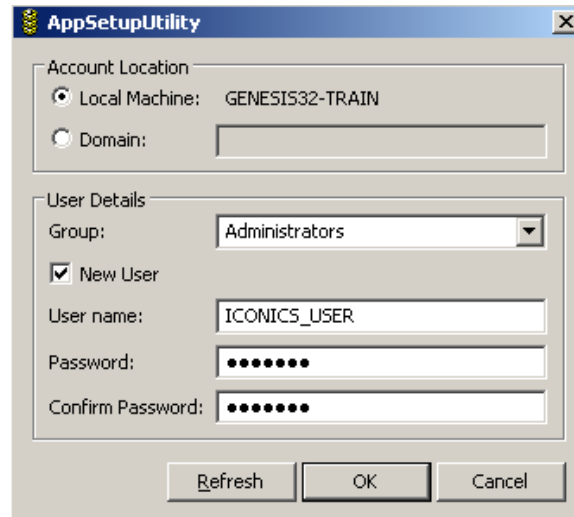


Figure L1.5 - Application Setup Utility

10. The installation will continue. Once it completes, you should see the Installation Complete dialog shown in Figure L1.6, which may ask you to restart the computer.

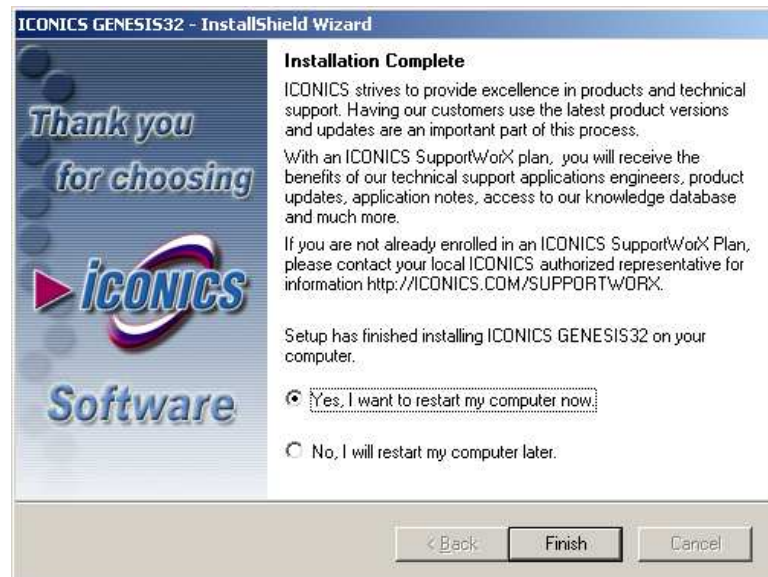


Figure L1.6 - Installation Complete

11. Leave the selection as **Yes, I want to restart my computer now** and click on **Finish** to restart the system.

12. Once the system restarts, you are ready for the next installation steps.

1.3.3. *Installing Productivity Analytics*

1. Insert the BizViz installation disk.
2. When the splash screen comes up, click on the **BizViz Suite Installation** link, which is circled in Figure L1.7.



Figure L1.7 - BizViz Installation Splash Screen

3. The ICONICS BizViz requirement window comes up. Click on **Install** to install the prerequisite.

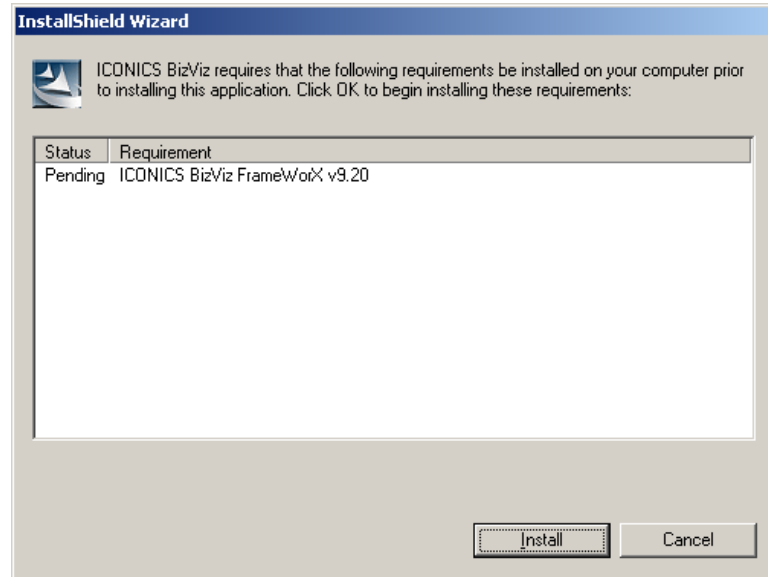


Figure L1.8 - BizViz Requirements

4. When the installation completes, you may receive a message saying that you need to restart the computer. Click on **Yes** to restart the computer.
5. Once the computer restarts, launch the installation splash screen and click on the **BizViz Suite Installation** link again.
6. This time, you should see the preparation setup screen on the lower-right of your screen. When it finishes, the BizViz installation Welcome screen should appear.

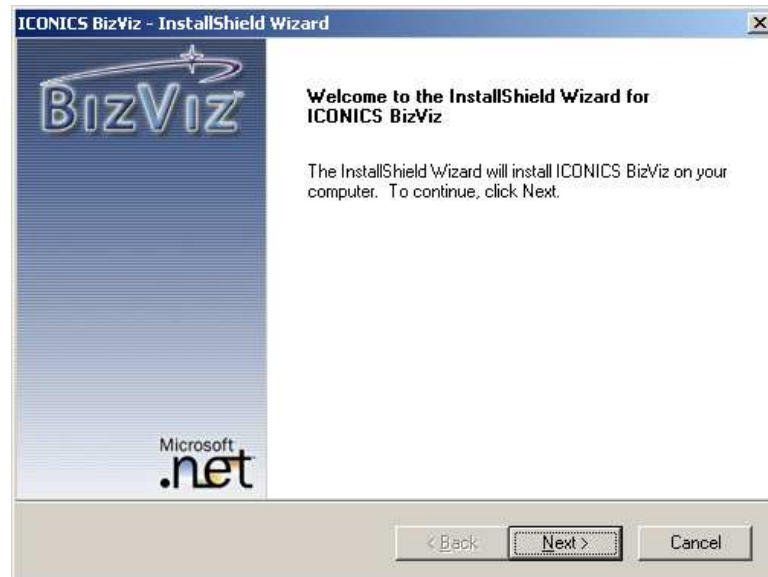


Figure L1.9 - BizViz Installation Welcome Screen

7. Click on **Next** to begin the installation process.

8. On the License Agreement screen, read the license agreement and choose the **I accept the terms of the license agreement** option and click on **Next**.

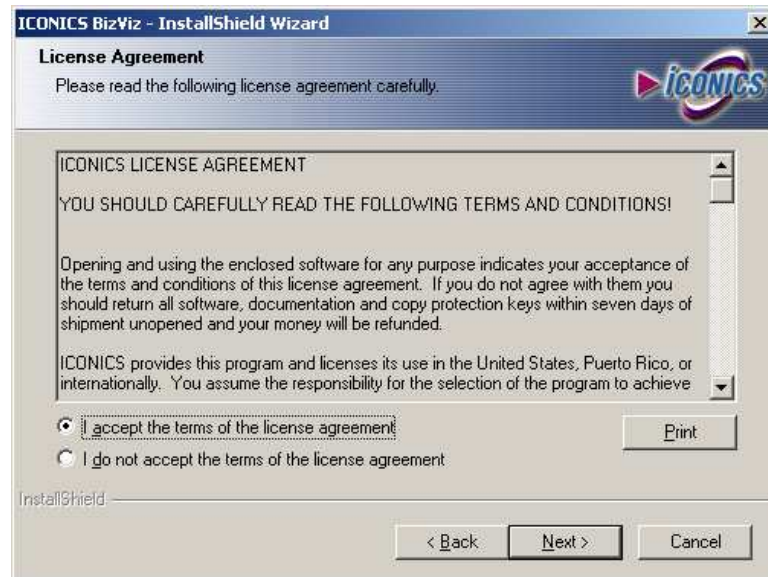


Figure L1.10 - BizViz License Agreement

9. In the next screen, you can choose the installation location. In this lab, we will let it install to the default location. Click on **Next** to continue.
10. The Select Features screen allows you to choose which components of BizViz to install. We will use the default installations and click on **Next**.

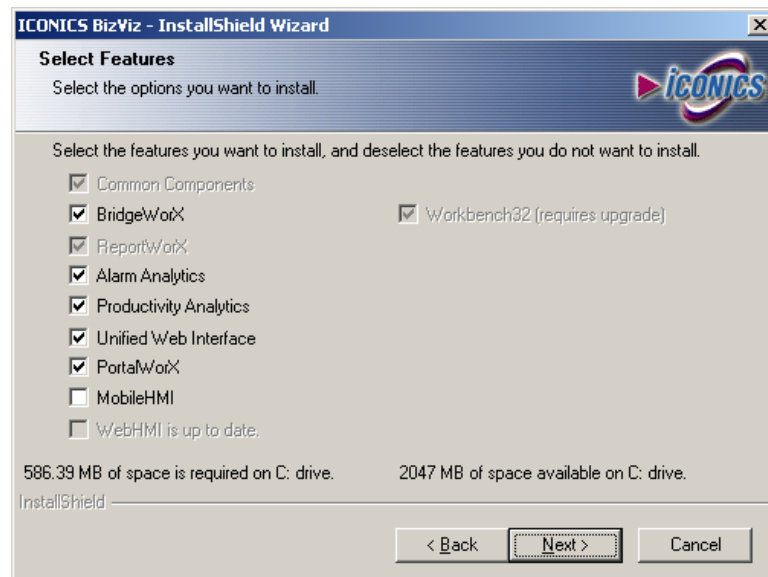


Figure 1.11 - BizViz Installation: Select Features

11. Click on **Next** again to begin the installation.



12. During the installation, the BizViz Database Creation Wizard will appear, as shown in Figure L1.12.



Figure L1.12 - BizViz Database Creation Wizard: Welcome Screen

13. Click on **Next** to proceed.
14. On the Set Database Setting Here screen, you can check the databases you wish to skip the creation of, but for this lab we will create all of the databases. Click on **Next** to continue.

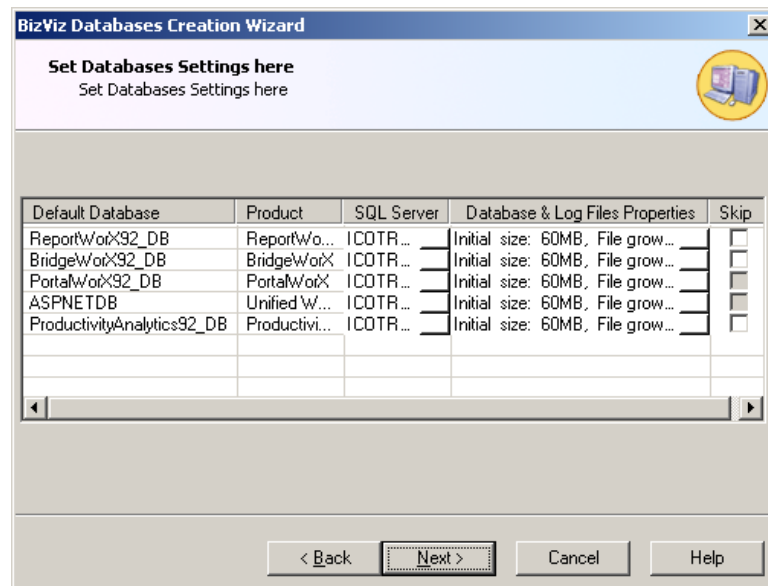


Figure L1.13 - Set Database Setting

15. The installation continues. When it completes the database creation, you will see the Create Database Structure screen, shown in Figure L1.14.

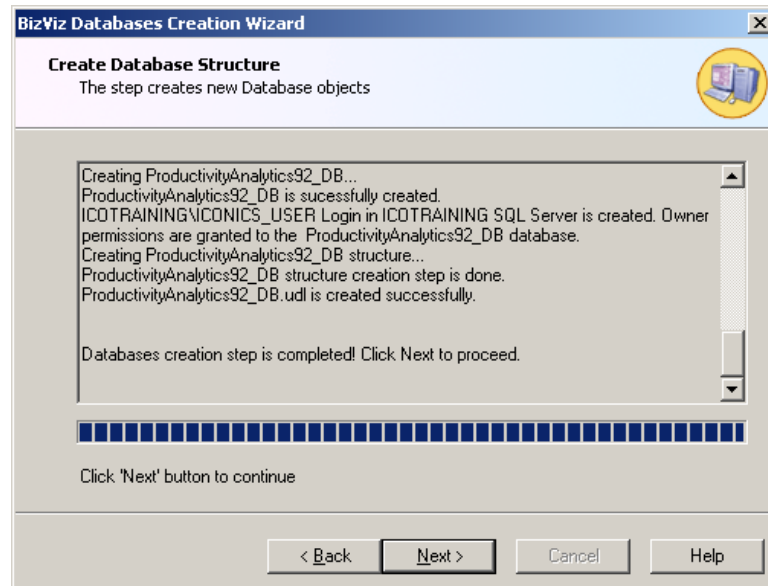


Figure L1.14 - Create Database Structure

16. Click on **Next** and you will receive a summary of the database creation. Click on **Finish** to continue the installation.



Figure L1.15 - Database Creation Confirmation Screen

17. The installation continues. When it finishes, you will receive the Installation complete screen. Leave the option as **Yes, I want to restart the computer now** and click on **Finish** to complete the installation.



Figure L1.16 - BizViz Installation Complete

18. Once your computer restarts, the BizViz installation is done.

1.4. Training Support Files

There are a few support files that you will need in order for the training to run smoothly. Again, if you are using one of the provided training computers, you do not need to do the steps in this section.

1. Open Windows Explorer and navigate to C:\
2. Create a folder here called “Training”. This folder will be your project folder and you will store all of the training files into this folder.
3. Copy the following files in to into this directory:
 - Acmesetual_DWXConfig.mdb
 - AcmeGASConfig.csv
 - LanguageAliasingTranslation.txt
 - TrainingCourse.sim
 - PainReliefEuropeMap.gdf
 - PainReliefUSMap.gdf
 - PainReliefWorldMap.gdf

NOTE: Ask your instructor for these files if you do not have them.

4. We will need to move a file into a system location. Depending on your operating system, the location could be different. Browse to one of the following directories, and copy **TrainingCourseV9.20.sdf** into this directory.
 - a. *For Windows Server 2003 and prior operating systems:*
C:\Documents and Settings\All Users\ICONICS\Symbols\2_Training
 - b. *For Windows Vista and later operating systems:*
C:\ProgramData\ICONICS\Symbols\2_Training
5. Start DataWorX32 Configurator by going to Start → Programs → ICONICS GENESIS32 → DataWorX32 → DataWorX32.
6. Once DataWorX32 is open, click on File → Open and browse to C:\Training and select the Acmeseutical_DWXConfig.mdb and click on **Open**.
7. Select File → Make Active.
8. Click on the traffic light to start DataWorX32.
9. Close the DataWorX32 Configurator.
10. Start the ICONICS Simulation Server configurator by going to Start → Programs → ICONICS Tools → Simulator OPC Server.
11. Go to File → Open and browse to C:\Training.
12. Select the TrainingCourse.sim file and click on **Open**.
13. Click on File → Save to save the configuration.
14. Close the Simulator Configurator.

1.5. Confirming Productivity Analytics Installation

Now that we are done with the installation, let us check that everything was installed properly.

1.5.1. Installed File Folders

First, we will confirm that the required files for Productivity Analytics and future labs are installed.



1. Open a Windows Explorer, and go to **\Program Files\ICONICS\BizViz\Productivity Analytics\Examples**, as shown in Figure L1.17.

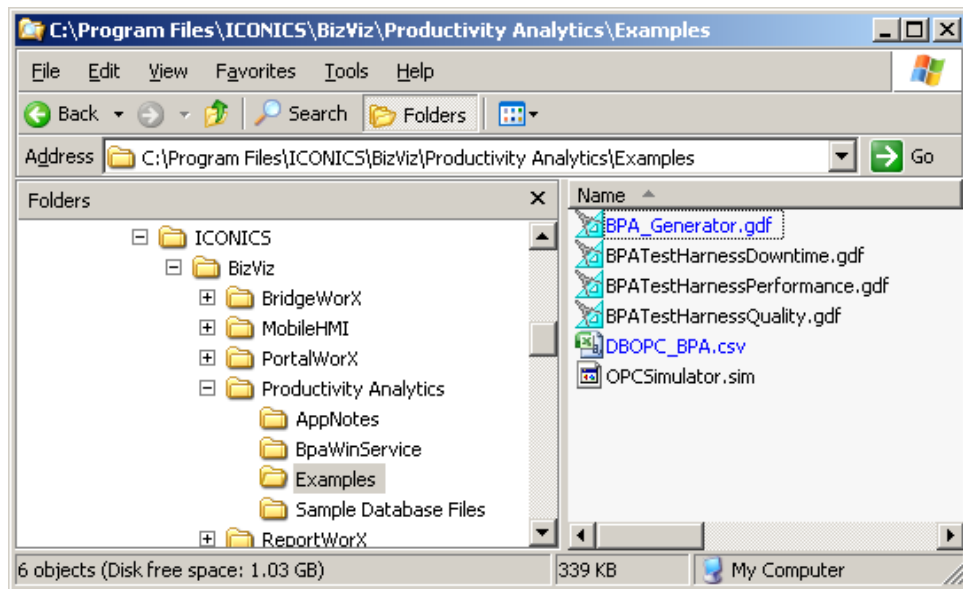


Figure L1.17 Productivity Analytics Folder

2. In the **Examples** folder, confirm you have the following four files:
 - BPATestHarnessDownTime.gdf
 - BPATestHarnessPerformance.gdf
 - BPATestHarnessQuality.gdf
 - OPCSimulator.Sim
3. Open the Sample Database Files folder and make sure you have all 15 files, as shown in Figure L1.18.

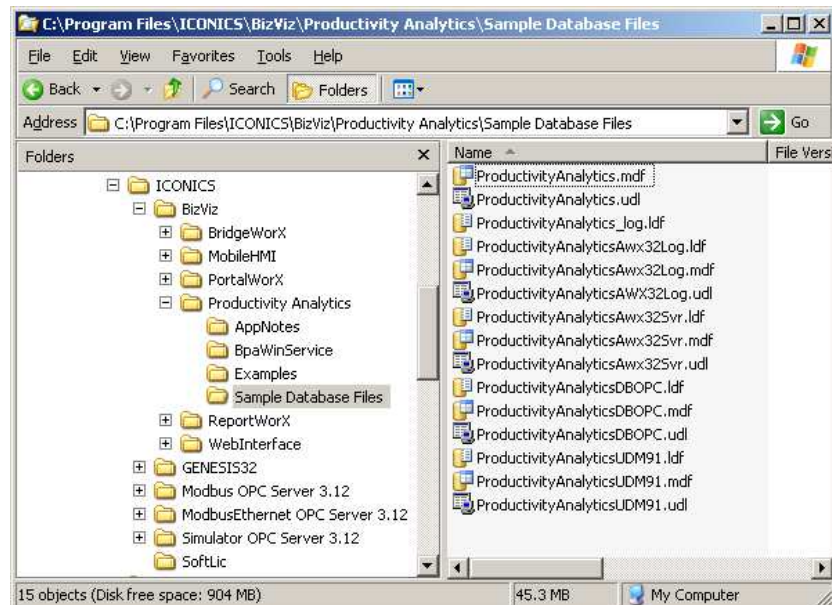


Figure L1.18 - Sample Database Files

NOTE: If you are missing any of these files, please ask your instructor for them before continuing with the labs.

1.5.2. Confirm Web Service Installation

Next, we will confirm the installation of the BPAWebControls and BPAWebService so that we can access Productivity Analytics from the Unified Web Interface.

1. In Windows Explorer, go to the C:\Program Files\ICONICS\BizViz\WebInterface\WebApplications folder.
2. Make sure you have both the **BpaWebControls** and **BpaWebService** folders, as shown in Figure L1.19.

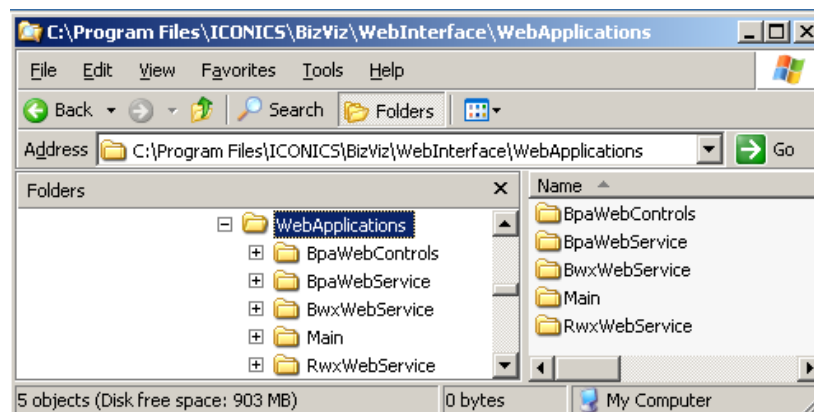


Figure L1.19 – Confirming WebApplications Folders



1.5.3. Confirm NT Event Posting is Enabled

In order to be able to receive meaningful debug information from Productivity Analytics, we must ensure that NT Event Posting for the Productivity Analytics Windows Service is enabled.

1. Go to Start → Programs → ICONICS Tools → MonitorWorX to open it.
2. Click on Menu → NT Event Reporting Options. This will open the NT Event Log Options dialog box.
3. Scroll down to **Productivity Analytics** and confirm that it has a checkmark in its checkbox, as shown in Figure L1.20.

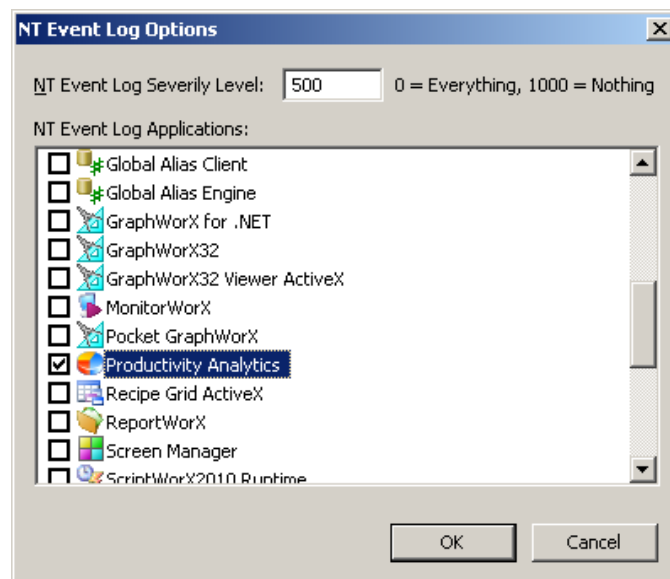


Figure L1.20 - Confirming NT Posting is Enabled

NOTE: You can achieve the same thing by using the License Monitor Event's tab.

1.5.4. Productivity Analytics Service Configurator

For the last part of the lab, we will launch the Productivity Analytics Service Configurator and make sure it is working properly.

1. Go to Start → Programs → ICONICS BizViz → Productivity Analytics → Productivity Analytics Service Configurator. This will launch the Productivity Analytics Service Configurator.

2. Check the lower left corner of the Productivity Analytics Service Configurator and make sure it says “Retrieved database connection information,” as shown in Figure L1.21.

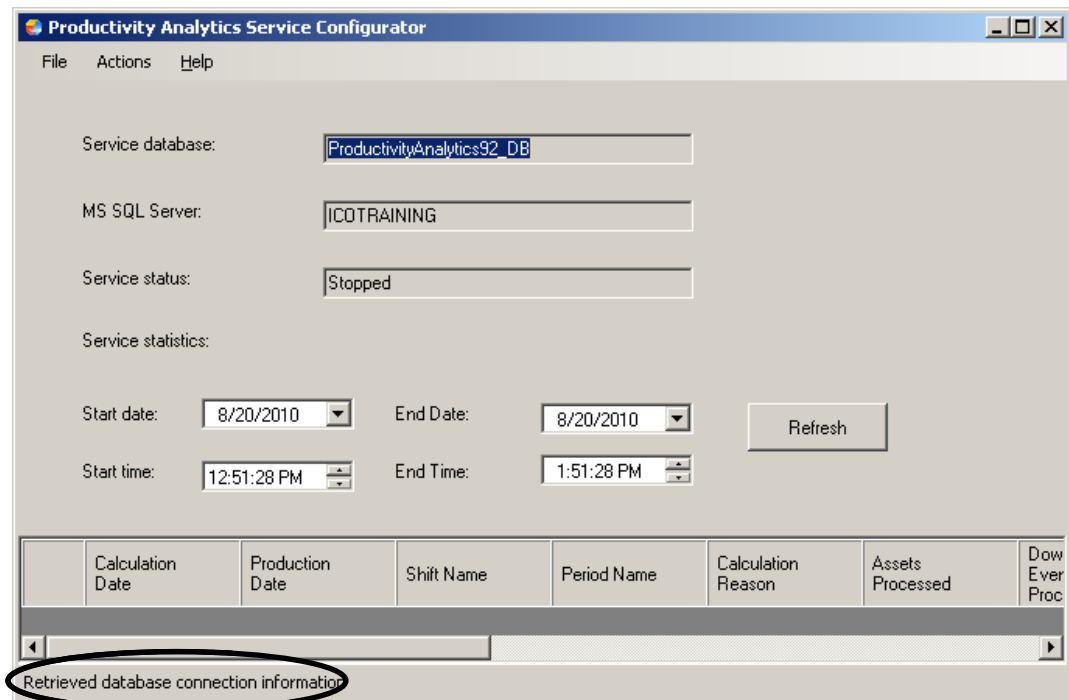


Figure L1.21 - Productivity Analytics Service Configurator

This completes Lab 1. In the next lab, we will change the configurations you currently see in the Productivity Analytics Service Configurator.

Review: Introduction to Productivity Analytics

R1

1.1. Chapter Objectives

You should now know and understand the following topics:

- Key Performance Indicator (KPI)
- Overall Equipment Effectiveness (OEE)
- The uses for Productivity Analytics
- System and license requirements
- How to install Productivity Analytics

1.1 Summary

Productivity Analytics is a BizViz tool for reporting on real-time and historical availability, quality, and down-time of productivity assets. It consists of Productivity Analytics Data Services and Productivity Analytics Web Interface; these parts should be installed together on one computer.

The Data Collection engine collects UDM trigger-related values and AlarmWorX32 events into a series of event staging tables. The Analytics engine processes the incoming data into summary tables that provide performance, quality, downtime, and traceability to Productivity charts, and reports for users to see online. The Analytics engine also archives and removes historical data.

Productivity Analytics is installed as part of the BizViz suite, but can be installed as a standalone product by following the steps in the *BizViz Getting Started* guide, located on your ICONICS BizViz DVD. Although a license is required, Productivity Analytics can run without a license on a limited basis using sample data in demo mode. Runtime users view charts and reports using the Unified Web Interface in Internet Explorer.

1.2 Terms

AlarmWorX32 Logger	AlarmWorX32 OPC AE Server	Availability
Key Performance Indicators	Overall Equipment Effectiveness	Performance
PortalWorX	Productivity Analytics	Quality
ReportWorX	Unified Data Manager	Unified Web Interface

1.3 Test Your Knowledge

In this chapter, we looked at the installation and licensing of Productivity Analytics. Before continuing to the next chapter, make sure you can answer the questions below:

1. How is the OEE calculated by Productivity Analytics?
 - a. $OEE (\%) = Availability (\%) * Performance (\%) * Quality (\%)$
 - b. The calculation of Availability can be unique for each asset
 - c. Availability is based on an asset's downtime
 - d. The calculations of Performance and Quality are based on your configuration
 - e. All of the above
2. True or False: If you don't have an ICONICS license for Productivity Analytics, there is no way to run it to see how it works.
3. True or False: Productivity Analytics is the only BizViz tool that opens in the Unified Web Interface.
4. True or False: The Data Collection engine logs UDM trigger-related values and AlarmWorX32 events into staging tables.
5. True or False: Productivity Analytics charts and reports provide downtime (availability) data as well as performance and quality data.
6. True or False: Data summarized by Productivity Analytics cannot be made available to other clients.



Productivity Analytics Configurator

2

We are now ready to begin configuring Productivity Analytics. The first thing we need to do is add configuration permissions to the Unified Web Interface. We will do this through the Productivity Analytics Configurator. By the end of this chapter, you should be familiar with the following concepts:

- The features and uses for the Productivity Analytics Service Configurator
- How to setup the configuration databases
- Initial administration requirements for defining users, groups, and machines
- How to review database connections
- Productivity Analytics' sample data

2.1. Productivity Analytics Service Configurator

The Productivity Analytics Service Configurator is a tool that runs on the server. Using the Configurator you can review service information for your Productivity Analytics installation, maintain the server, and review events.

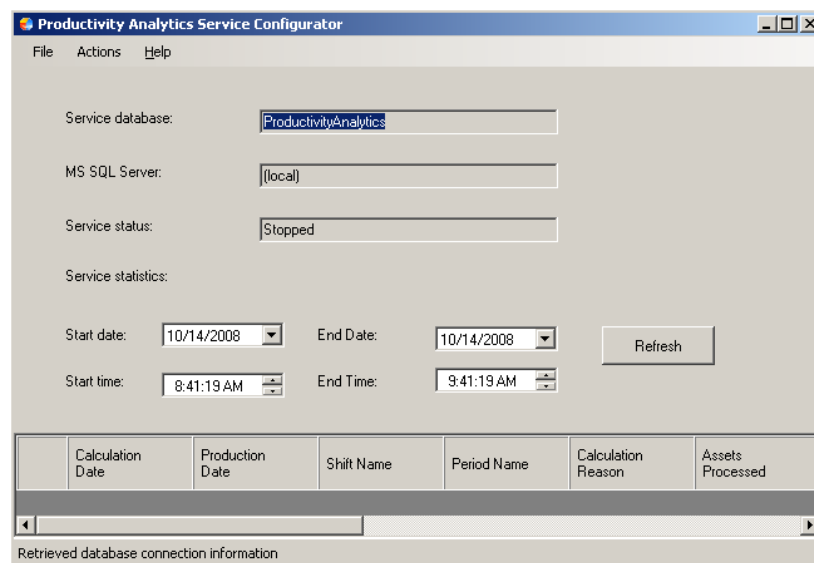


Figure 2.1 - Productivity Analytics Service Configurator

Figure 2.1 shows the Productivity Analytics Service Configurator. You must be on the server machine where you installed Productivity Analytics to access this configurator.

To launch it, go to Start → Programs → ICONICS BizViz → Productivity Analytics → Productivity Analytics Service Configurator.

This tool has an interface and menus that you can use to manage the server and the services. We will describe each of the configurator's features in this chapter.

2.2. *Licensing*

You can review the terms of your license from the Productivity Analytics Service Configurator menu by selecting Help → License Status. Also, after you have started to use Productivity Analytics in the Unified Web Interface, you can review your license by right-clicking on the Productivity Analytics provider in the navigation tree, then selecting License Monitor.

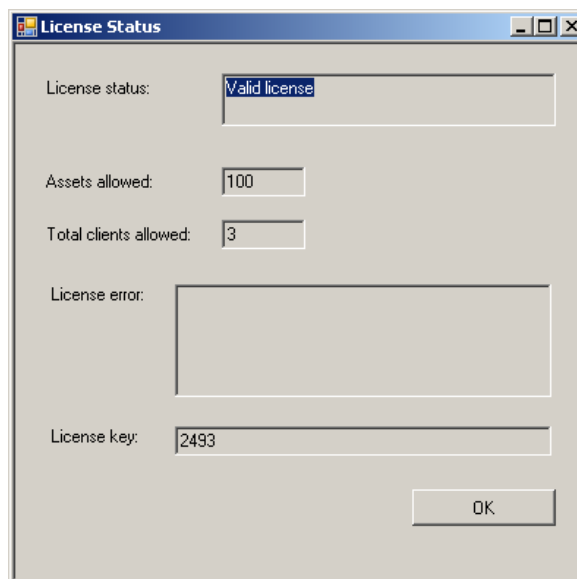


Figure 2.2 - License Status Dialog

2.3. *Database Management*

There are a few different configuration databases that you can manage using the Productivity Analytics Service Configurator. As you may have suspected, one is the Productivity Analytics configuration database. However, in order for Productivity Analytics to obtain meaningful data, it must also rely on AlarmWorX32 Logger (which relies on an alarm server) for information and the Unified Data Manager for Triggers. So that you have a centralized location for configuring databases, you must also create configuration databases for these additional, dependent applications. Let us take a closer look.



2.3.1. Productivity Analytics Configuration Database

On the File menu, shown in Figure 2.3, the New Configuration Database menu option is used for creating a new configuration database for Productivity Analytics. Selecting this menu option launches a wizard that will aid you in creating your configuration database. Once your configuration database is created, you will not use this menu option again unless you need to recreate your existing configuration database or start a new configuration from scratch.

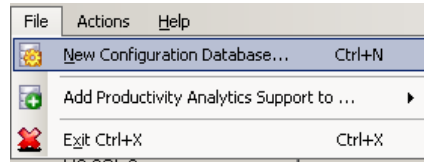


Figure 2.3 - Create a New Productivity Analytics Configuration Database

2.3.2. Dependent Configuration Databases

Ultimately, you will need to configure a system from scratch for using your own production data. When you choose to use your own data set, it is at that point that you will also have to define a configuration database to collect your production data. As mentioned before, Productivity Analytics relies on the logged alarm data and triggers to produce meaningful analytics. Therefore, you must create the following configuration databases which must be in the MS SQL Server 2005 format:

- Alarm Server Database
- Alarm Logger Database
- Unified Data Manager Database

You can use the Productivity Analytics Service Configurator to create these configuration databases. From the File menu of the Productivity Analytics Service Configurator, select **Add Productivity Analytics Support to** and choose the application in which you want to create the configuration database. The menu options, shown in Figure 2.4, launch their respective configuration database wizards.

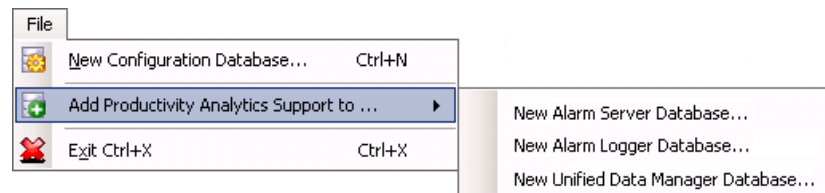


Figure 2.4 - Database Management Menu Options

In the Welcome screen that appears, click on Next. The wizard prompts you for information about your configuration database. Enter the information in each dialog and then click on Next to continue. When you are done, click on Finish.

NOTE: For more information on each of the dependent applications and how to create a configuration, please refer to the Help files or application notes of each of the respective applications.

Once you finish creating the configuration database, the database creation wizard closes and returns you to the Productivity Analytics Server Configurator window.

2.3.3. Data Flow

By now, you may be wondering how the different configurations and pieces in Productivity Analytics work together. As we mentioned before, the Productivity Analytics Service utilizes and hosts the following applications:

- AlarmWorX32 OPC AE Server
- AlarmWorX32 Logger
- Unified Data Manager (UDM) trigger Performance and Quality data collection engine
- The core calculation and OEE computation analytics engine, which provides data aggregation and data summarization services
- Overall product maintenance task support

In normal operations, the alarm server generates downtime events recorded by the alarm logger; these events allow for the calculation of availability. The UDM provides triggers to start the performance and quality data collection engine. As a result, with the asset definitions, configurations, and production information configured and maintained using the Unified Web Interface, the Productivity Analytics service can generate reports on availability, performance, and quality of configured assets.

In this section, we will talk about the services listed above in the context of how Productivity collects data. The three phases of Productivity Analytics data flow are:

- Data collection
- Event staging
- Summarization of OEE data, by period

Let us take a look at each of these phases. Keep in mind that a more detailed representation of the data flow is provided in Appendix B, where the Productivity Analytics Database Structure is described. For our purposes though, an overview of the data flow is shown in Figure 2.5.



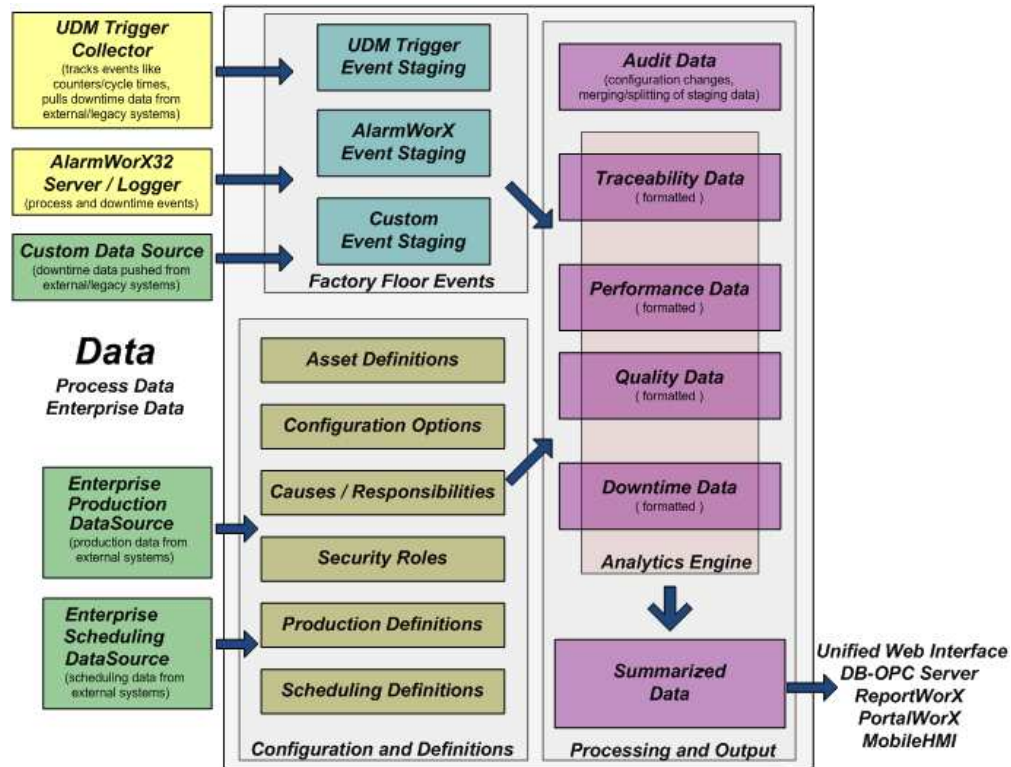


Figure 2.5 - Data Flow System Diagram

2.3.3.1. Data Collection

In the first phase, the **data collection service** extracts the necessary shift schedules and production information from the enterprise database and establishes the information as production and scheduling data. Then, the following components collect data as events occur:

- **AlarmWorX32 Server** captures and logs most of the downtime process information from the factory floor by converting process information into downtime events. The **AlarmWorX32 Logger** stores events into Productivity Analytics' event staging tables.
- **UDM Trigger data collection** captures performance- and quality-related process information using UDM support for trigger-related values and previous values, then populates the staging performance and quality event tables with that data.
- **Custom data collection** is made possible through the optional use of BridgeWorX. Where applicable, the service extracts downtime data from external and legacy systems and logs the information into custom data tables available in the Productivity Analytics database, using a process called *custom staging*.

2.3.3.2.Event Staging

In the next phase, Productivity Analytics data collection components insert event data into a series of **event staging tables**, which are a collection of performance, quality, and downtime staging tables. Each event is immediately processed – relevant asset, configuration, cause, security, production, and scheduling information is merged with the staging event.

2.3.3.3.Summarization

In the final phase, the calculation engine processes factory floor events from the downtime, quality, and performance staging tables to produce summarized performance and quality values for each period of the current shift schedule and production date.

The calculation engine also monitors incoming events in the following way:

- It tracks the currently-active shift and period to provide current information about production in order to make production adjustments occurring in production. It accommodates changes to production shift schedules (extending period end times and adding new periods) as long as the changes occur in the future.
- It performs a final summarization of the on-going shift and period and marks it as closed. The calculation engine processes a shift as soon as it is over, even if an alarm is still active.
- For closed shifts and periods, it detects changes to the related (formatted) log tables with downtime, performance, and quality information and re-summarizes the corresponding period information.
- It removes historical information that exceeds the retention limit.

The summarized data can be viewed using the operator runtime views and related charts and graphs that have been created using Productivity Analytics. Because the calculation engine monitors incoming values, the latest “real time” values are available for viewing. All output data (audit, performance, quality, downtime, traceability, and summarized data) is available.

Summarized data is made available to clients via ReportWorX, MobileHMI, and PortalWorX. Also, configuration and live analytic data results can be browsed using the Unified Web Interface in Internet Explorer. The OPC Data Mining Server (DBOPC Server) can provide live data values to GraphWorX32 and other OPC DA clients.



2.4. Administration

Now that we understand how the pieces we need to create a configuration database for work, let us continue with the additional Productivity Analytics Service Configurator options that need to be set up.

The administration option in the Productivity Analytics Service Configurator allows you to add the users, user groups, and machines that are allowed to access the service. Be aware that in the Configurator you are defining users, but you not setting up security for users and the administrator of the Productivity Analytics Service.

NOTE: You should not confuse this with the security that is available in the Unified Web Interface, where you will configure users' application actions and access to views.

2.4.1. Adding Users

From the Actions menu, you can click on Manage Users to define Productivity Analytics users. Clicking this menu item launches the dialog, shown in Figure 2.6.

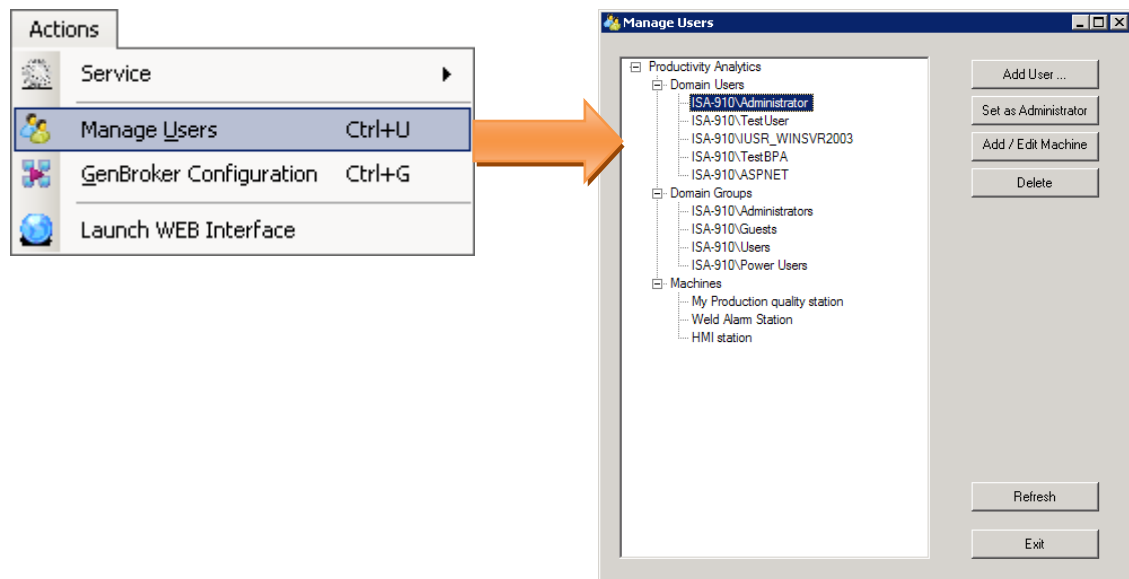


Figure 2.6 - Managing User Security

This dialog displays a list of imported users, groups, and machines. To add a user for Productivity Analytics, you can click on the Add User... button, which launches the Add User dialog shown in Figure 2.7. Using this dialog, you can import user accounts from the local machine, or from the domain to which the machine belongs, into Productivity Analytics.

If you want to import a group from the domain, you must select the Domain Groups option, fill out the domain name, and provide a domain user that can query the active

directory. However, if you are logged in to the system as such a user, you can skip this last part in providing a domain user.

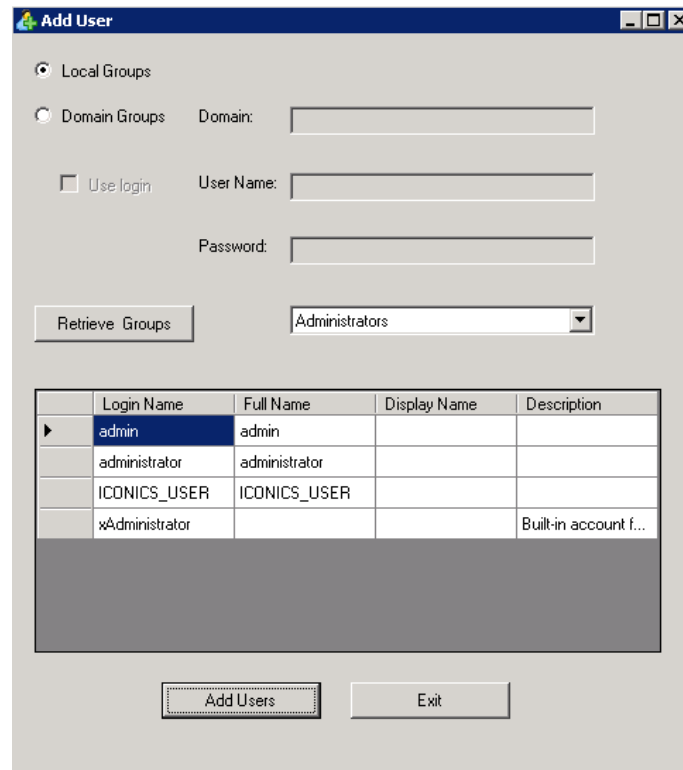


Figure 2.7 - Add User Dialog

Clicking on the Retrieve Groups button will refresh the drop-down list with the user groups from the local machine or domain. You can select a group and then select all the users you want to add to it, and click on the Add Users button at the bottom of the dialog. If you change your mind about adding users, simply click on the Exit button to close the dialog.

Once users are imported, you return to the Manage Users dialog where you select at least one of the imported users as the default Productivity Analytics administrator. To do this, select the user and click on the Set as Administrator button; the administrator's ID gets highlighted to indicate the user's elevated security privilege status. Ideally, the ID you select should be one that you will use initially to log in to the Unified Web Interface.

You will need **at least one user with administrator privileges** before you can access some of the application and view-specific security. Anyone you set as an administrator is granted all application actions, and permissions to access all runtime views. An administrator also has the ability to use the Security Administration form in the Unified Web Interface to assign application actions to users and grant users access to runtime views.



2.4.2. Adding Machines

Also in the Manage User dialog, you can add a machine by clicking the Add / Edit Machine button. This allows you to add or edit a machine, such as a client, in your Productivity Analytics configuration.

NOTE: Currently, fixed (or static) IP addresses are required on all networked computers so that machine IP based permissions work properly. A machine's permissions are based on its fixed IP address.

Clicking on the Add / Edit Machine button will launch the **Add/Edit Machine** dialog shown in Figure 2.8.

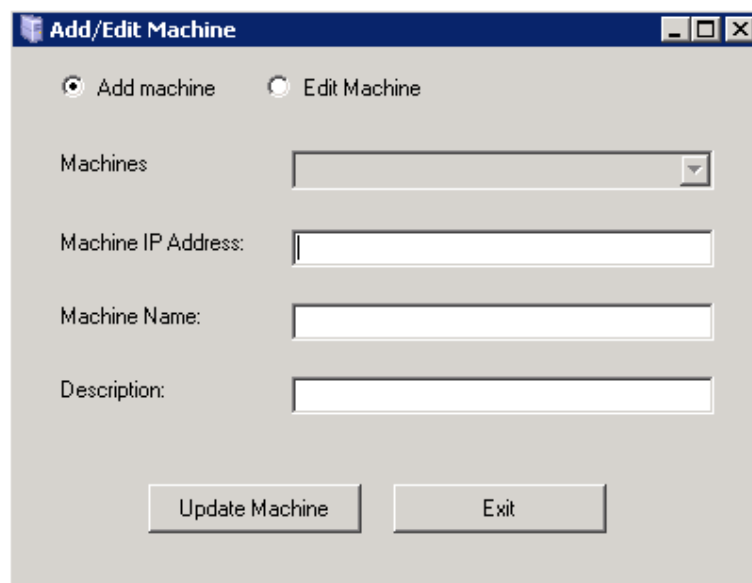


Figure 2.8 - Add or Edit a Machine

Notice that you have to choose an option that specifies whether you are adding a machine or editing a machine. Then enter the necessary machine information then click on the Update Machine button before clicking Exit to close the dialog box and return to the Manage Users dialog box. An Exit button closes the Manage Users dialog, too.

2.5. Start and Stop the Service

Next, you'll want to start the Productivity Analytics service. It can be started and stopped from the Productivity Analytics Service Configurator. Click on Actions → Service → Start, as illustrated in Figure 2.9 to start the service. When the service is running, you can select Stop instead, if you want to stop the service.

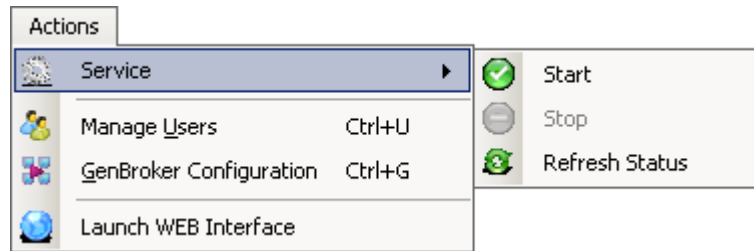


Figure 2.9 - Start the Service

In order for asset availability data to be collected, the AlarmWorX32 Logger needs to be started, too. You can do this by using the AlarmWorX32 Logger Configurator or by setting the AlarmWorX32 Logger service to auto-start when the system starts up.

Tip! To preview the Productivity Service calculation and operations (statistics), use the Productivity Analytics Service Configurator to enter starting and ending dates and times that specify the time interval you want to search for, and then click the Refresh button.

2.6. Service Health Monitoring Tools

Once you start the service, you will want to monitor the service to make sure it is collecting and processing data. Productivity Analytics provides performance profiling, benchmarking, and troubleshooting tools you can use to view information about your operation. This information helps you load-balance the system and respond to any error conditions.

Using the Productivity Analytics runtime object, you can monitor, profile, and troubleshoot Productivity Analytics calculation engine issues on a per-run basis. The service provides the following:

- Summarization calculations of past shifts are available in case the service was not operating during a certain production period.
- Runtime statistical information about operations as well as operation status and error visualization allow flexible analysis of operations.
- Runtime error information logged in a table in the Productivity Analytics database is available through the Unified Web Interface.
- Runtime statistics are available in Windows Performance viewer, MonitorWorX, and within the Unified Web Interface.

The service also integrates with the following ICONICS tools:

- The **GenEvent** Server exposes all events sent to it via the OPC Alarm and Events (AE) interface; events can be viewed in **AlarmWorX32 Viewer**.
- **MonitorWorX** provides graphical monitoring and a centralized diagnostics area including the runtime status for active servers and nodes as well as Productivity Analytics errors.
- **TraceWorX32** can provide online diagnostics and tuning for Productivity Analytics. TraceWorX32 can track the runtime activity for Productivity Analytics and log the runtime data to a log file based on user-configured trace levels.

2.7. The Web Interface

From the Productivity Analytics Service Configurator, you can also launch Productivity Analytics in the Unified Web Interface. From the Actions menu, select Launch WEB Interface, as shown in Figure 2.10.

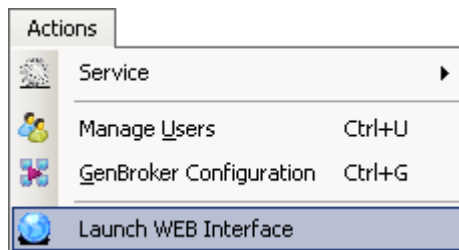


Figure 2.10 - Launch Productivity Analytics in the Unified Web Interface

Alternatively, you can open an Internet Explorer browser and go to the following URL:
<http://serverName/UWI>

In the Unified Web Interface, shown in Figure 2.11, you can configure assets and shift schedules, as well as create views. We will discuss how to do these in detail in the upcoming chapters.

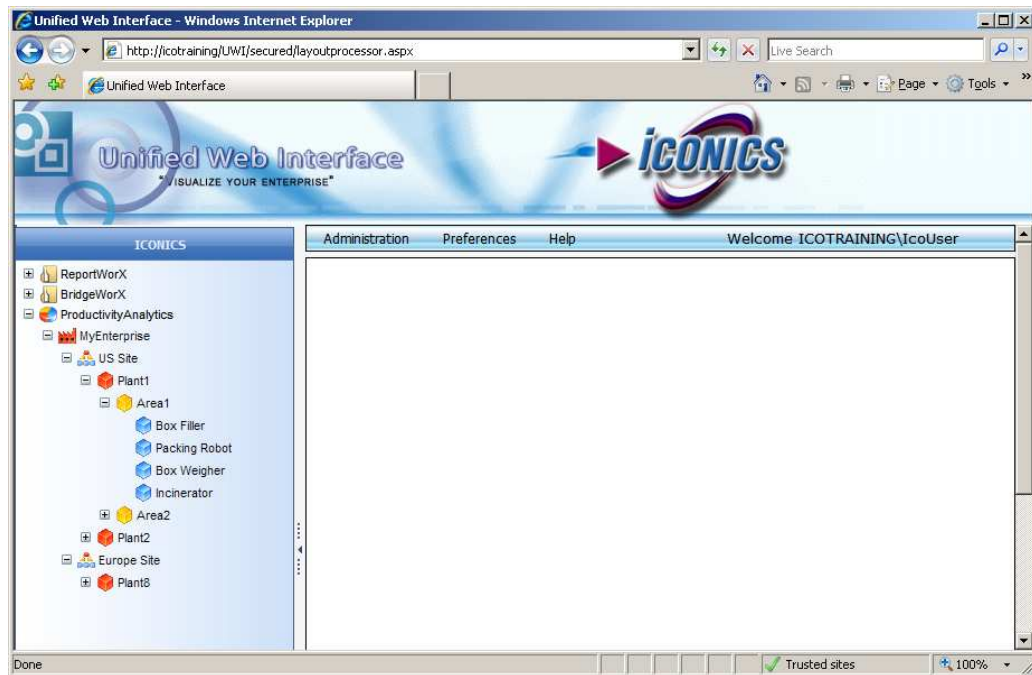


Figure 2.11 - Productivity Analytics in the Unified Web Interface

NOTE: If Productivity Analytics does not appear in the ICONICS tree, it is because you have to add it to the Unified Web Interface as a provider. The Unified Web Interface online Help and the Unified_Web_Interface.pdf guide (available on your Productivity Analytics DVD) can tell you how to add a provider.

2.7.1. Required Settings in Internet Explorer

We will need to make sure your Windows Internet Explorer ActiveX options are set correctly. If the settings are improperly configured, you will continually get a warning message while viewing schedules in the Runtime Editor, or while configuring shift templates. The warning message will appear as a bar at the top of your browser or it will appear as a popup as shown in Figure 2.12.

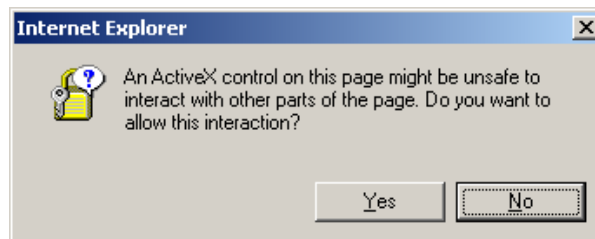


Figure 2.12 - ActiveX Message

You can use the following procedure to prevent the ActiveX error message from occurring. From the Start menu, select Settings → Control Panel → Internet Options. This displays the Internet Options dialog.



Select the Security tab, and then click on **Trusted Sites**, as shown in Figure 2.13.

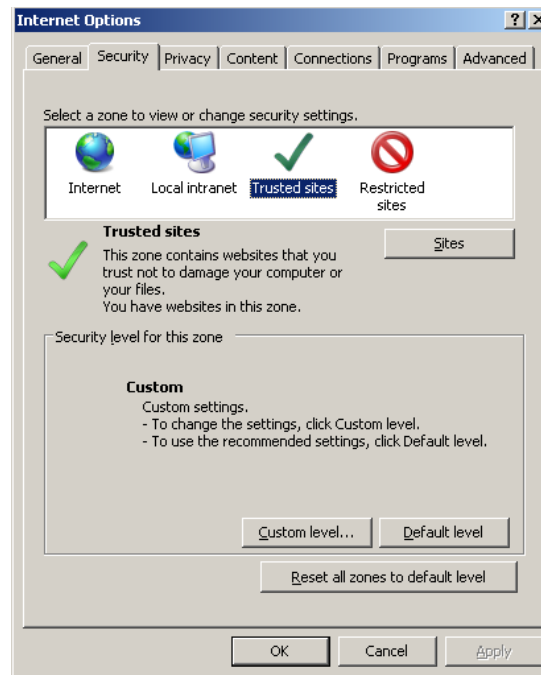


Figure 2.13 - Internet Options: Security Tab

Next, click on the Sites button. The Trusted Sites dialog box appears, as shown in Figure 2.14.

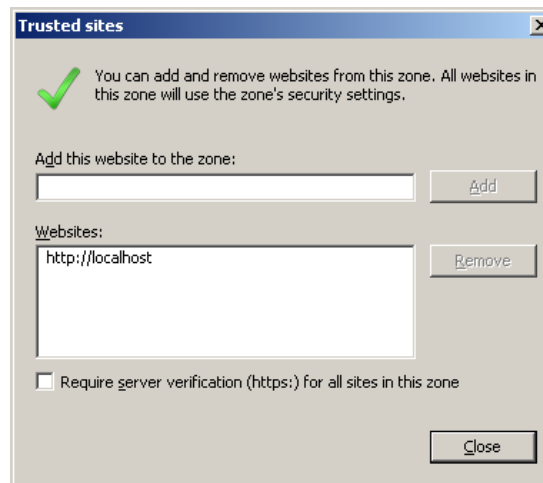


Figure 2.14 - Trusted Sites

In the Add This Web Site to the Zone field, type in the name of the server, then click on the Add button. This adds the server to the list of trusted web sites.

Click on the Close button to close the Trusted Sites dialog and return to the Internet Options dialog box. While still on the Security tab, click on the Custom Level button.

The Security Settings - Trusted Sites dialog appears as shown in Figure 2.15. Scroll down to the following options:

- Download signed ActiveX controls
- Initialize and script ActiveX controls not marked as safe for scripting

Select Enable for both options as shown in Figure 2.15. Click on OK when you are done. The window closes and returns you to the Internet Options dialog.

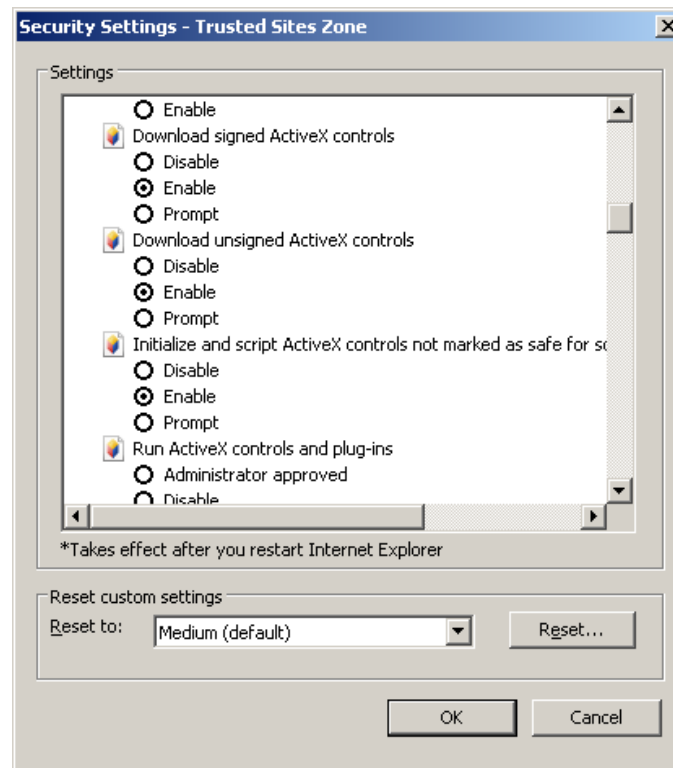


Figure 2.15 - Security Settings: Trusted Site Zone

Next, click on the Advanced tab as shown in Figure 2.16. Scroll down to the security section and put a checkmark in the Allow Software to Run or Install Even if the Signature is Invalid checkbox. Also put a checkmark in the Allow Active Content to Run in Files on My Computer checkbox.

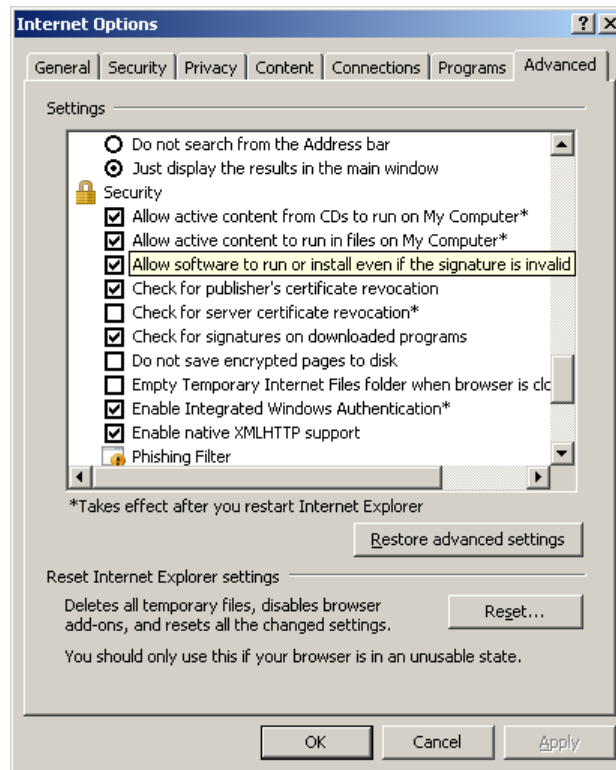


Figure 2.16 - Internet Options: Advanced Tab

Click on OK to save your changes and close the Internet Options dialog. Setting these options requires restarting Internet Explorer. You should now be all set with Internet Explorer settings and you should not run into any warning messages while configuring Productivity Analytics in the Unified Web Interface.

2.8. Service Runtime Statistics

Once you are up and running with Productivity Analytics, you can use the Productivity Analytics Service Configurator to review collected events. Use the start and end date and time fields to limit the range of information that displays in the table at the bottom of the configurator.

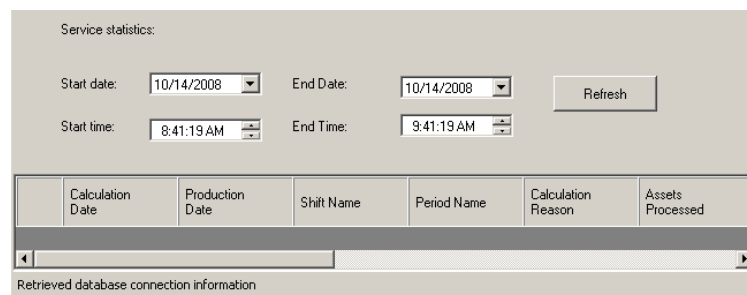


Figure 2.17 - Service Runtime Events

If you are looking at events as they are logged live, you can click on the Refresh button to update the display events as they occur. Keep in mind that it can take a few minutes for an event to show up in the table.

2.9. *Sample Productivity Analytics Data*

The installation of Productivity Analytics places sample data on the machine. This sample data lets you use Productivity Analytics immediately, in a trial scenario, to familiarize yourself with Productivity Analytics before configuring and using your own data.

You can find most of the sample configuration files in the Examples and Sample Database Files folders of the Productivity Analytics installation folder.

To use the sample data, you must setup Productivity Analytics to use the proper configuration database so you can access the sample data. To check which configuration database is currently in use for the dependent applications you can use the General Applications Options Database Connections tab, as shown in Figure 2.18, to review the database connections.

NOTE: During installation of Productivity Analytics you created your own configuration databases which are now configured for use. To use sample data, you will switch away from these databases. Later, when you are ready to go into production, you can switch back to these databases.

To access this tab in the Unified Web Interface, right-click on **Productivity Analytics** in the navigation tree, then click on Options, which opens the General Availability Options form. Then select the **Database Connections** tab.

The screenshot shows the 'Database Connections' tab in the Unified Web Interface. The window has a title bar with tabs: General, Database Connections (selected), Downtime Management, Responsibilities, and Calc. The main content area is titled 'Database Connections Configuration' and contains three sections:

- AlarmWorX32 Server Connection:** A text box for the 'Connection String' containing 'Data Source=(local);Initial Catalog=ProductivityAnalyt'. To the right are 'Load Configurations' and 'Create New' buttons. Below the text box is a 'Select a configuration:' label and a dropdown menu showing 'ProductivityAnalytics'.
- AlarmWorX32 Logger Connection:** A text box for the 'Connection String' containing 'Data Source=(local);Initial Catalog=ProductivityAnalyt'. To the right are 'Load Configurations' and 'Create New' buttons. Below the text box is a 'Select a configuration:' label and a dropdown menu showing 'ProductivityAnalytics'.
- Unified Data Manager Connection:** A text box for the 'Connection String' containing 'Data Source=(local);Initial Catalog=Productivit'.

At the bottom of the window are 'Apply' and 'Cancel' buttons.

Figure 2.18 - Database Connections in the Unified Web Interface



Connection strings are added here when the databases are created using the Productivity Analytics Service Configuration form. They are formulated as ADO.NET native SQL Server connection strings. For example:

```
Data Source=(local);Initial  
Catalog=ProductivityAnalytics91_Database;Integrated  
Security=True
```

It is important that you do not change the settings on this tab unless you are knowledgeable of SQL Server databases. The online help for the Unified Web Interface provides information about each field on this tab.

If you find the connection string is pointed to a different database than the one you expect, you should check that the respective application is using the correct active configuration database. If it is, then you can click the Load Configurations button to reload the connection string.

Since the AlarmWorX32 Server and Logger configurations allow for multiple configurations in a single configuration database, you must select a configuration after reloading the connection string. Alternatively, you can create a new configuration by clicking the Create New button.

NOTE: Detailed instructions for how to use the sample data is available in the **Unified_Web_Interface.pdf** guide on your ICONICS BizViz installation DVD.



Lab: Productivity Analytics Configuration Databases

L2

For the rest of the labs, we are going to be setting up a system for AcmeSeutical, which is a pharmaceutical company that specializes in painkillers. The company wants to install a system that would tell them how well each of their international lines are doing and where they can improve the process.

As we learned in the last chapter, in order to setup Productivity Analytics, there are a few different configuration databases that we need to first setup. In this lab, we will set up the necessary configuration databases for AcmeSeutical, to provide them with the analytic solutions they are looking for.

Estimated time to complete this lab: 45 minutes

2.1. Task Checklist

In this lab, you will complete the following tasks:

- Use the Productivity Analytics Service Configurator to create configuration databases
- Create an Alarm Server Configuration database and associate it with Productivity Analytics
- Create an Alarm Logger Configuration database and associate it with Productivity Analytics
- Create a Unified Data Manager Configuration database and associate it with Productivity Analytics
- Configure Productivity Analytics users
- Configure Productivity Analytics provider and database connections

2.2. Support Files

You will need the following file(s) to complete this lab:

- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl

2.3. Creating Associated Databases

The Productivity Analytics installation creates a configuration database called “ProductivityAnalytics92_DB” by default. This will be the database for the Productivity Analytics Configuration. Recall that we also need to have an alarm server, alarm logger, and Unified Data Manager configuration databases to complete the system. We will create these databases in this section.

1. Launch the Productivity Analytics Service Configurator by going to Start → Programs → ICONICS BizViz → Productivity Analytics → Productivity Analytics Service Configurator.
2. Select File → Add Productivity Analytics Support to → New Alarm Server Database.

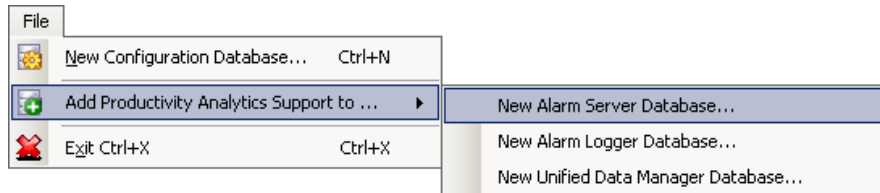


Figure L2.1 - Adding Alarm Server Support

3. The **Database Wizard** dialog will appear. You will notice that as we add support to the different applications that this wizard will appear for each application. Click on Next to proceed.
4. In the SQL Server Selection screen, leave the option as **Use this Computer** and choose the SQL Server instance that you want to use.

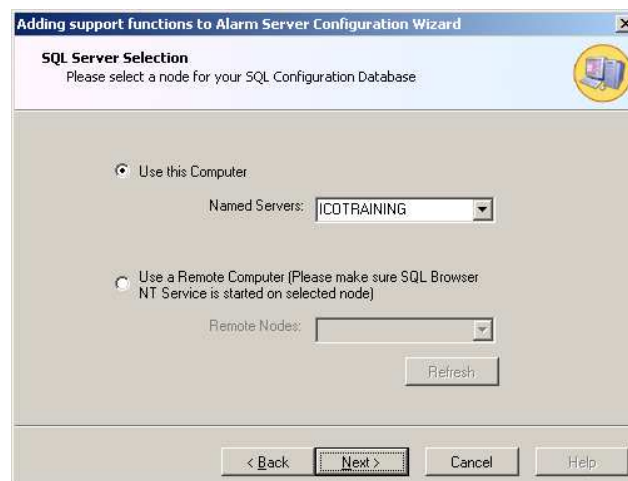


Figure L2.2 - SQL Server Selection

NOTE: If you are using a computer provided by training, the name server should be “(local)” or the name of the computer (in most cases, IcoTraining). If you are using your own computer, you may need to ask your IT department for it. If you installed the SQL Server Express during installation, the server instance could very well be *ServerName\SQLEXPRESS* where *ServerName* is the name of your computer.

- Click on Next to proceed.
- In the Database Security Login screen, you can leave the option to use **Windows Integrated Security** and click on Next.



Figure L2.3 - Database Security Login

- In the Create new SQL Server Database screen, uncheck the **Use Default Database file path and size** option.
- Click on the Browse button next to the Database Path field and browse to C:\Training in the **Browse for Folder** dialog. Click on OK to select the folder and close the dialog.
- Leave everything else as default and click on Next.

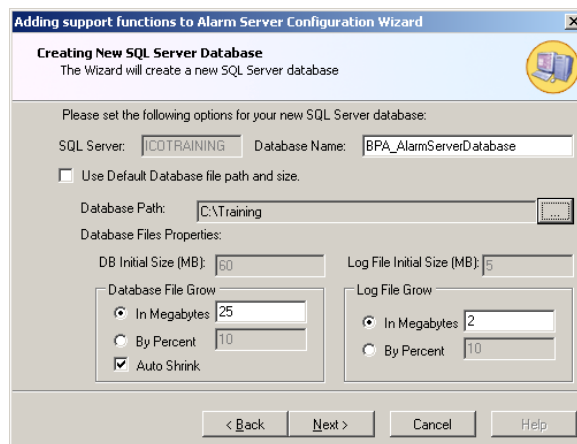


Figure L2.4 - Creating New SQL Server Database

10. The Create Database Structure screen scrolls through the steps that the wizard is completing to create the Alarm Server Configuration database. When it is done, you should see a message saying, “Operation completed successfully!” If it says otherwise, please let your instructor know. Click on Next to continue.

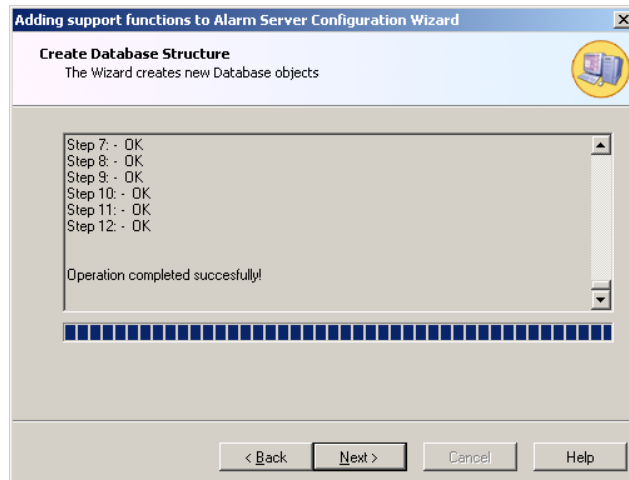


Figure L2.5 - Create Database Structure

11. The Create Data Link File screen prompts you for where the Universal Data Link (UDL) file will reside. This is usually the same location where your database file (.mdf) resides. The UDL file stores the connection to the database that we just created and is used for application to connect to the actual database. You can leave everything as default here and click on Next.

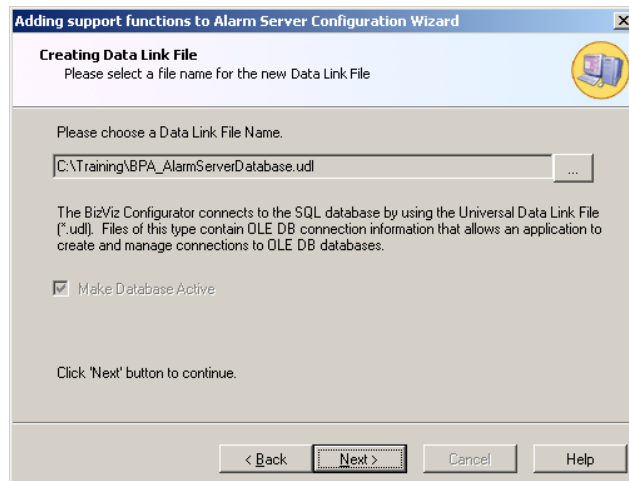


Figure L2.6 - Creating Data Link File

12. The completion screen shows you a summary of the operations. Click on Finish to acknowledge the completion and close the dialog.



Figure L2.7 - Operation Completed

13. We have now completed the alarm server support. We will need to do the same for the Alarm Logger and Unified Data Manager. Repeat steps 2-12 two more times, each selecting the appropriate database to create.
14. When you are done, you should see list of files shown in C:\Training as shown in Figure L2.8.

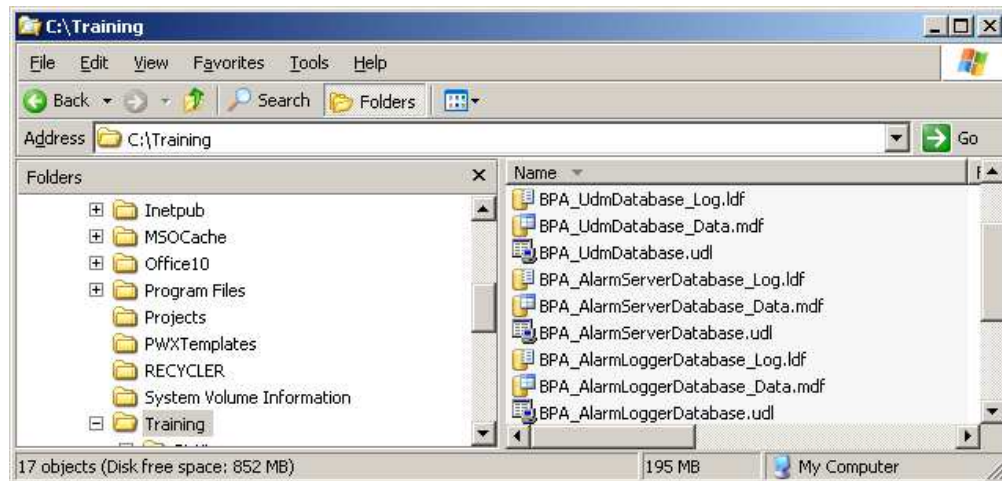


Figure L2.8 - List of Database Files and UDL Files in the Training Folder

2.4. Configuring Users

In this part of the lab, we will configure users from the Productivity Analytics Service Configurator.

1. If you closed the Productivity Analytics Service Configurator, open it again by going to Start → Programs → ICONICS BizViz → Productivity Analytics → Productivity Analytics Service Configurator.
2. Select Actions → Manage Users to open the Manage Users dialog, as shown in Figure L2.9.

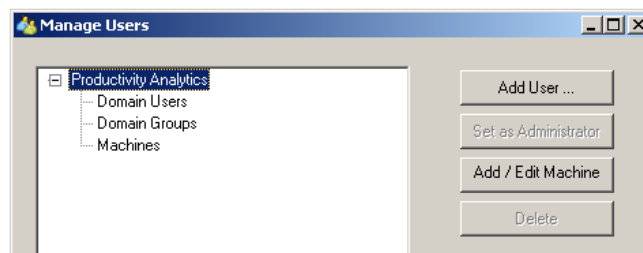


Figure L2.9 - Manage Users Dialog

3. Click on the **Add User** button. The Add Users dialog will appear.
4. Make sure that **Local Groups** is selected and then click on the **Retrieve Groups** button. You will notice the drop-down list is now populated with groups from the local machine and the user list shows the list of users in the Administrators group.

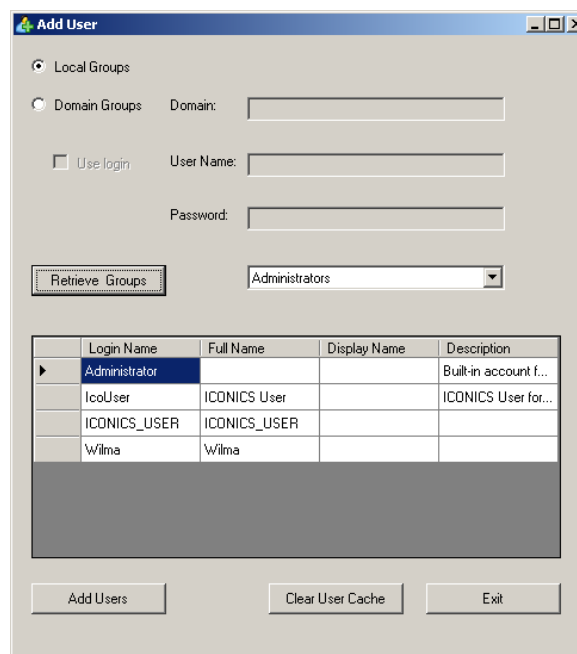


Figure L2.10 - Add User Dialog

5. From the Administrators group, highlight *all* of the users in this group by holding down the **Ctrl** key clicking and clicking to the left of each user's Login Name field.
6. With all the users in the Administrators group selected, click the **Add Users** button.
7. Next, add all the users from the **Operators** group and the **Engineers** group. Select the group, then select all of the users in the group, and then click on the **Add Users** button.
8. Click on **Exit** to close the dialog.
9. Back on the **Manage Users** dialog, the users you selected appear in the Domain Users section, and the Administrators, Engineers, and Operators groups appear in the Domain Groups section, as shown in Figure L2.11.

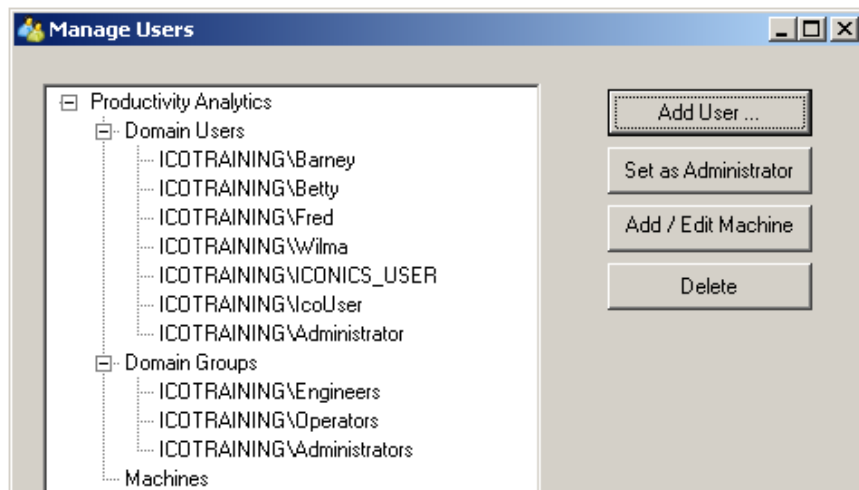


Figure L2.11 - New Users Added

10. Select the **IcoUser** user and then click on the **Set as Administrator** button. Notice that the user is now highlighted which indicates that it is an administrator.

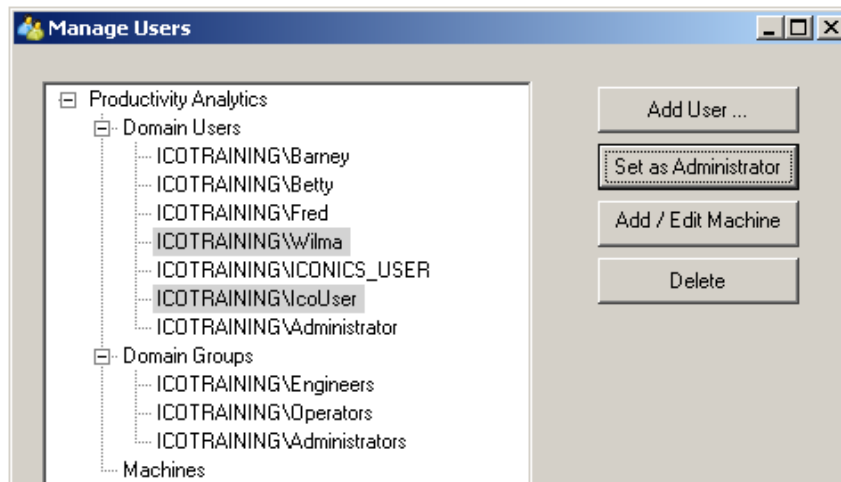


Figure L2.12 - Set User as Administrators

NOTE: If you are *not* using one of the provided training machines, you should set the currently logged-in Window's user as the Administrator.

11. Set Wilma as an administrator as well.
12. Click on the **Exit** button to close the Manage Users dialog.

2.5. Productivity Analytics Provider

For the last part of this lab, we will use the Unified Web Interface to add the Productivity Analytics Service Provider and confirm the required connections to the AlarmWorX32 Server, AlarmWorX32 Logger, and Unified Data Manager databases.

1. Open the Productivity Analytics Service Configurator, if it is not already open, and select Actions → Launch WEB Interface.
2. In the navigation tree on the left side there should be three providers: ReportWorX, BridgeWorX, and Productivity Analytics. If you are missing any of these providers, please let your instructor know.
3. Right-click on the **ProductivityAnalytics** provider and select **Options**, as shown in Figure L2.13. If the only item you see in the right-click menu is License Monitor, then you should go back to the Productivity Analytics Service Configurator and verify that your currently logged-in user has Administrative privileges.



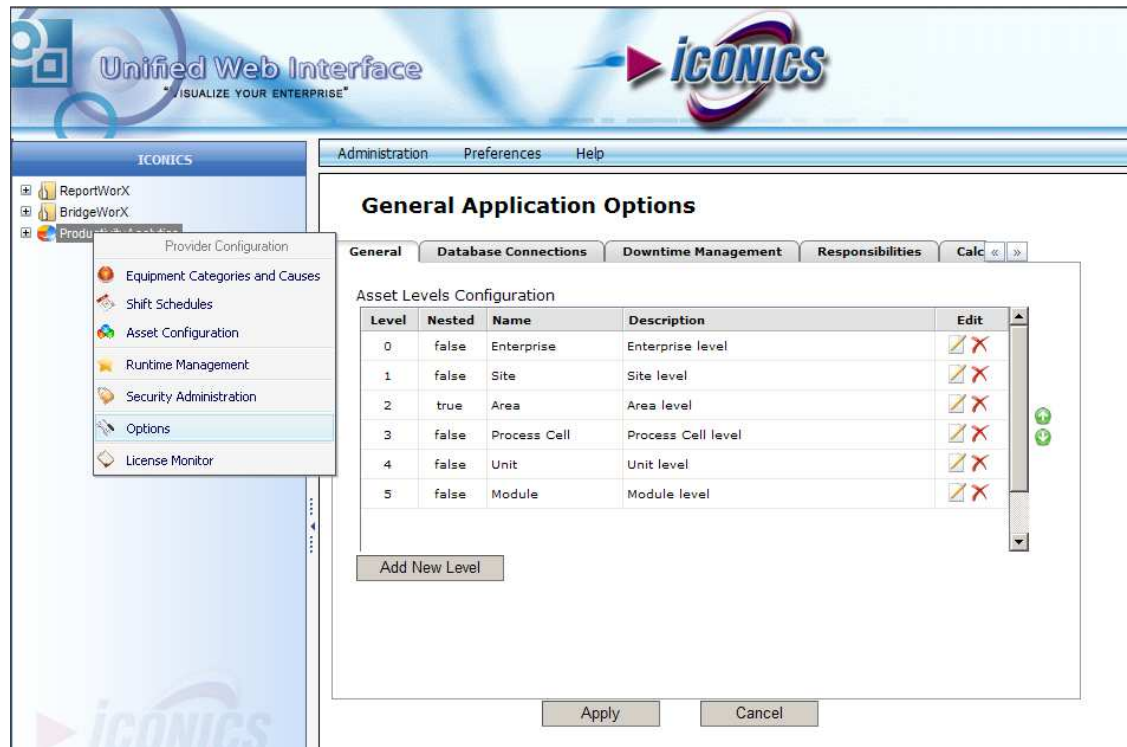


Figure L2.13 - Accessing Options Menu from the Unified Web Interface

4. Click on the Database Connections tab.
5. Make sure that the AlarmWorX32 Server Connection string is:


```
Initial Catalog=BPA_AlarmServerDatabase;Data Source=ICOTRAINING;Integrated Security=SSPI
```
6. Since this is a new configuration database, we will need to make a configuration for it. Click on the **Create New** button in the AlarmWorX32 Server Connection section.
7. A dialog will pop up for you to enter the name of the configuration. Change the name to "BPA_AcmeAlarmServerConfig" and click on OK to close the dialog.

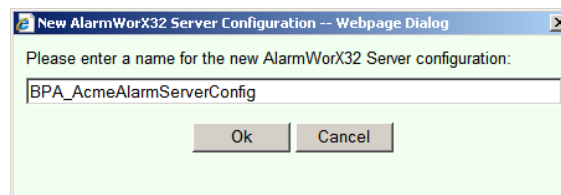


Figure L2.14 - Create New Alarm Server Configuration

8. Make sure that the AlarmWorX32 Logger Connection string is:


```
Initial Catalog=BPA_AlarmLoggerDatabase;Data Source=ICOTRAINING;Integrated Security=SSPI
```

9. Since this is a new configuration database, we will need to make a configuration for it. Click on the **Create New** button in the AlarmWorX32 Logger Connection section.
10. A dialog will pop up for you to enter the name of the configuration. Change the name to “BPA_AcmeAlarmLoggerConfig” and click on OK to close the dialog.

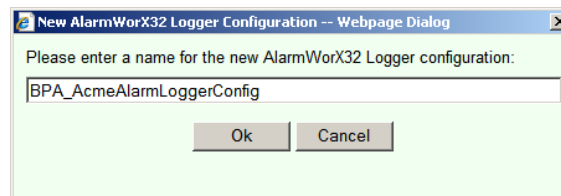


Figure L2.15 - Create New Alarm Logger Configuration

11. Make sure that the Unified Data Manager Connection string is:

Initial Catalog=BPA_UdmDatabase;Data Source=ICOTRAINING;Integrated Security=SSPI

12. Your Database Connection may now look like Figure L2.16. Click on the Apply button to save the changes.

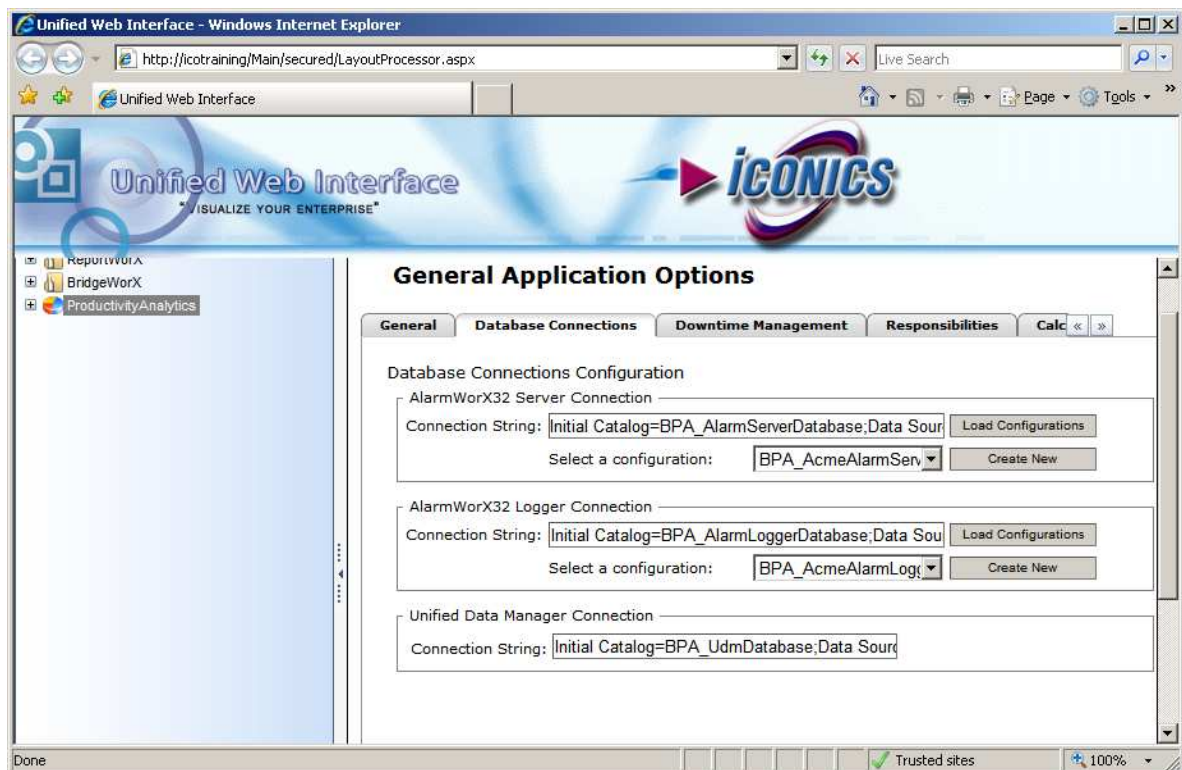


Figure L2.16 - Database Connection Tab

Review: Productivity Analytics Service Configurator

R2

2.1. Chapter Objectives

You should now know and understand the following topics:

- The features and uses for the Productivity Analytics Service Configurator
- How to setup the configuration databases
- Initial administration requirements for defining users, groups, and machines
- How to review database connections
- Productivity Analytics' sample data

2.2. Summary

The Productivity Analytics Service Configurator is a tool that runs on the server, which you use to review service information for your Productivity Analytics installation, maintain the server, and review events.

During the initial setup of Productivity Analytics, you can use sample data that comes with the installation or add your own data into the database created during installation. If you decide to use your own set of data, be sure to configure all the different components that work together to create the Productivity Analytics solution. The different components are used in the following manner:

- The AlarmWorX32 OPC AE Server and AlarmWorX32 Logger, which capture process information from the factory floor, convert process information into events, which are stored in the Productivity Analytics staging tables.
- The Unified Data Manager (UDM) trigger Performance and Quality data collection engine, which captures performance- and quality-related process information using UDM support for trigger-related values and previous values, then populates the staging performance and quality event tables with that data.
- Optional custom data collection facilitated by BridgeWorX.
- The core calculation and OEE computation analytics engine, which provides data aggregation and data summarization services as well as product maintenance support.

Productivity Analytics provides performance profiling, benchmarking, and troubleshooting tools you can use to view operational information that helps you load balance the system and respond to any error conditions.

Before you can set up your assets in Productivity Analytics, you must define users using the Productivity Analytics Service Configurator. You must set a system administrator to whom the system automatically grants all permissions in the Unified Web Interface.

Once you have completed this initial setup, you can start the services and launch Productivity Analytics in the Unified Web Interface. In here, you can review security permissions for users as well as review your database connections.

2.3. Terms

Calculation Engine

Custom Staging

2.4. Test Your Knowledge

In this chapter, we discussed the initial steps for setting up Productivity Analytics. Before continuing to the next chapter, make sure you can answer the questions below:

1. True or False: Instructions for using sample data and for configuring your databases are provided in the Unified_Web_Interface.pdf guide, which you can find on your BizViz installation DVD.
2. True or False: Once you add users and identify at least one administrator in the Productivity Analytics Service Configurator's Add User dialog, you have completely set up user security and privileges.
3. True or False: You can view summarized data using ReportWorX, MobileHMI, and PortalWorX
4. True or False: You can review and modify database connections from the Unified Web Interface.



5. You must create the configuration database for which of the following applications?
 - a. Alarm Server
 - b. Alarm Logger
 - c. Unified Data Manager
 - d. Global Aliasing
 - e. Data Mining OPC Server
 - f. All of the above
 - g. Only A, B and C
 - h. Only B, C, and D
 - i. Only A, B, and E
 - j. None of the Above
6. You can use which of the following versions of MS SQL Server to create the databases?
 - a. MSDE
 - b. SQL 2000
 - c. SQL 2005 Express
 - d. SQL 2008 Express
 - e. All of the above
 - f. Only A and B
 - g. Only C and D
 - h. None of the above
7. True or False: You cannot use the Productivity Analytics Service Configurator window to launch Productivity Analytics in the UWI.
8. True or False: Productivity Analytics uses the ICONICS AlarmWorX32 Server and AlarmWorX32 Logger to generate and record downtime events.
9. Which of the following applications are utilized and hosted by Productivity Analytics?
 - a. AlarmWorX32 Server
 - b. AlarmWorX32 Logger
 - c. Unified Data Manager
 - d. Core Calculation and OEE Computation Analytics Engine
 - e. Unified Web Interface
 - f. All of the above
 - g. Only A, B, C, and D
 - h. Only A, B, C, and E
 - i. None of the above
10. True or False: You cannot launch the Unified Web Interface from Internet Explorer.



Shift Scheduling

3

Productivity Analytics uses *shift schedules* that you define in order to recognize *downtimes*. A shift schedule is nothing more than a data range with an applied *shift template*.

Most of your configuration will be done inside the shift template. A shift template is a pattern of workdays in a calendar week. It consists of a base shift model that identifies the number of hours in a shift, the number of shifts in a workday, and the number of workdays in a workweek. Once you define a schedule pattern, you can set up each workday. Inside a workday, you can define four different types of time blocks: the workday, the workday's shifts, each shift's periods, and each period's details. When you have defined a template, you can simply assign a shift schedule using the desired shift template.

After completing this chapter, you should know the following concepts:

- Shift schedules
- Shift templates
- Assigning shift templates to shift schedules

3.1. Configuring Shift Templates

To create a shift schedule, you must start by creating a shift template. A shift template is simply a pattern of workdays that you want to apply to a certain number of weeks in the schedule. One template can represent a typical workweek, while another template represents a seasonal fluctuation in demand. A template can represent 1 week, 2 weeks, or more. You can create any number of shift templates, and then apply them to the schedule to define shifts over a period of time so that asset availability can be calculated accurately.

You create a shift template using the Shift Schedules form. While in the Unified Web Interface, right-click on **Productivity Analytics** in the **ICONICS** tree, then select **Shift Schedules**.

NOTE: Before you can use this form, you must make sure your internet settings are correct on the machine that you are using. If internet settings are not set correctly, the form may display incorrectly.

The Shift Schedules form looks like Figure 3.1. From this form, you can manipulate the different shift templates that you have. Once you have defined your templates, you will be able to choose a template from a list of them in the block on the left. Information such as the name and the description of the template will appear in the fields on the right.

Shift Schedules

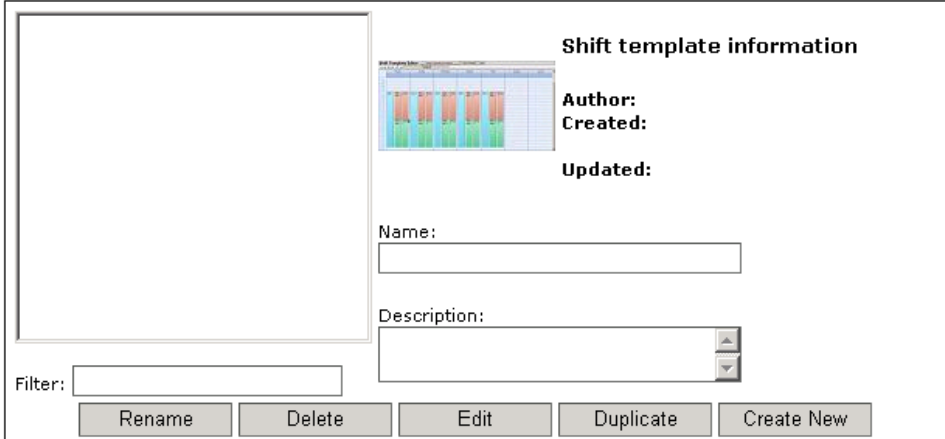


Figure 3.1 - Shift Schedules Form

All existing shift templates are listed in the big box at the left. You can use the **Filter** field to find a template if there's a long list of templates. Every template whose name contains the string that you type in the Filter field will appear in the box. For example, type *PL* in the Filter field so that only those templates that have "PL" in their names display. The more letters you type, the more the filter will limit what appears.

You can use the **buttons** to rename, delete, edit, duplicate, or create a template.

3.1.1. Create a New Shift Template

You can create a new shift template by clicking on the Create New button in the Shift Schedules form. Once you click on this button, a gray panel appears below the original form, where you can configure the new shift. The panel, shown in Figure 3.2, prompts you for *general* information about the shifts for the template you want to create.

Type the **Name** of the template you are creating. Choose a name that makes the template's use obvious, such as 1-Week Shift Cycle, or Summer Shift Model. Then type a **Description** of the template. You cannot change the description once you have saved the template, so you should include enough information in it so that its use is obvious to you and anyone else who might need to use it.



Select the **Base shift model** you want to base the template on. The format is in hours/days/shifts. For example, the model that is selected in Figure 3.2 means the schedule is for a sixteen-hour day with two shifts for a five-day week. Notice that a representation of the shift model is pictured to the right of your selection.

The form is titled 'Form to Create a New Shift Template'. It contains the following fields and controls:

- Name:** A text input field.
- Description:** A text input field with a small icon on the right.
- Workday Start Time:**
 - Hour:** A dropdown menu showing '00:00'.
 - Minute:** A dropdown menu showing '0'.
- Base shift model:** A dropdown menu with the following options:
 - 16hrs/5days/2shifts (highlighted)
 - 16hrs/7days/2shifts
 - 24hrs/5days/2shifts
 - 24hrs/7days/2shifts
 - 24hrs/5days/3shifts
 - 24hrs/7days/3shifts
- # of Weeks:** A text input field showing '1'.
- Period Length:** A text input field showing '240' followed by the text 'minutes'.
- Visual Representation:** A small icon to the right of the 'Base shift model' dropdown showing a calendar with colored bars representing shifts.
- Buttons:** 'Cancel' and 'Next' buttons at the bottom right.

Figure 3.2 - Form to Create a New Shift Template

The **Workday Start Time** section allows you to set the time of day at which the workday begins. It contains two fields: Hours and Minute.

The number you enter in the **# of Weeks** field determines the length of the shift cycle you are defining for the template. For example, if shifts are the same from week-to-week, enter 1 to define a one-week cycle; when you apply the template to a schedule, the template's one-week cycle will be applied across the date range that you are creating in the schedule. If shifts alternate one-week on and one-week off, enter 2 to define a two-week cycle; the template's two-week cycle will be applied across the date range. Remember: this is not the schedule you are defining; it's a template you'll use for a schedule later on.

The **Period Length** defines the length of a period. You should know that a period is the smallest unit in a schedule that Productivity Analytics will summarize data for. Therefore, you should set the period according to how often you would like to see data summarized. For example, if you would like data to summarize every hour, then you should set the Period Length to sixty (60) minutes.

Clicking on the **Next** button opens the Shift Template Editor so you can define details about the shifts in this particular template. Let us take a look at the type of details you can enter using the Shift Template Editor.

3.2. The Shift Template Editor

The Shift Template Editor, shown in Figure 3.3, lets you design the details of a template's workweek graphically, using blocks that span hourly time slots.

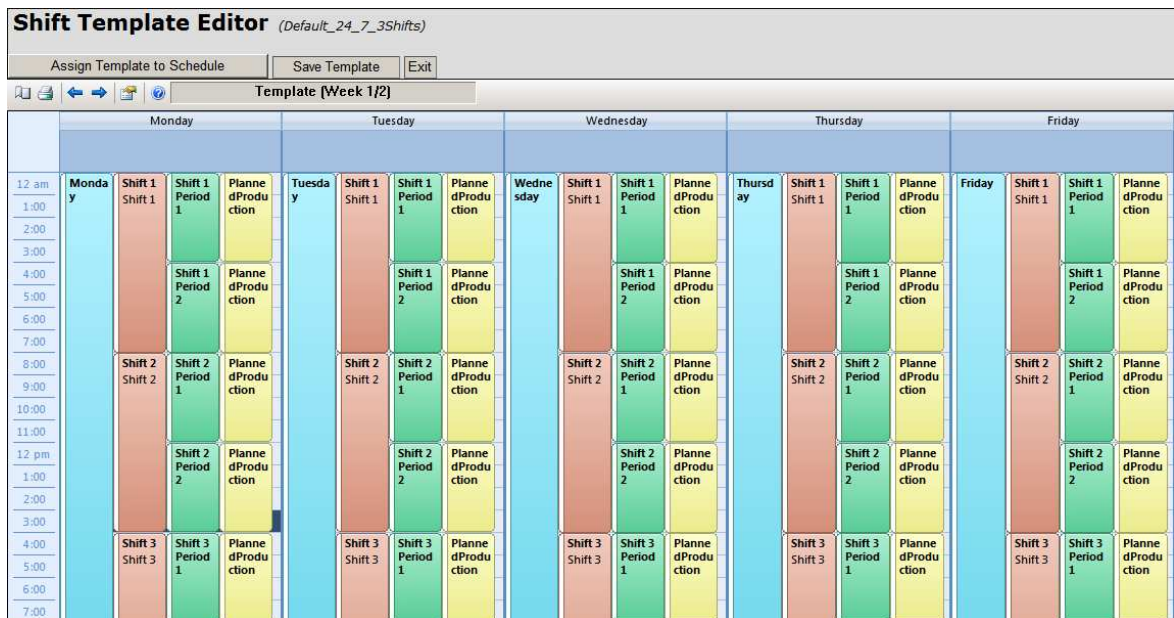


Figure 3.3 - The Shift Template Editor

3.2.1. The Grid in the Shift Template Editor

In the Shift Template Editor, there is a *column* for each day and a *row* for each hour in the template. These columns and rows form a grid. It is over this grid that you define workdays, shifts, periods, and period detail. The underlying structure of the grid looks something like Figure 3.4.

	Monday	Tuesday
5:00		
6:00		

Figure 3.4 - The Grid Segments Days (Vertically) and Hours (Horizontally)

When you right-click inside the blue grid, a pop-up menu appears as shown in Figure 3.5, allowing you to change the level of detail in the grid you can see by selecting the **cell length in minutes**. Choosing smaller increments in minutes gives you the ability to “zoom” in for adding detail and working in more precisely-defined time frames. Using this menu, you can also **change the time zone** for the template or **add a production day** to the week.

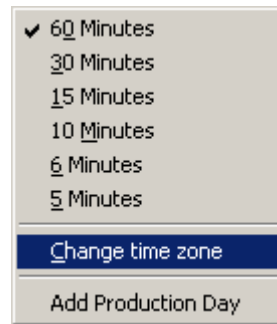


Figure 3.5 - The Grid's Right-Click Menu

You may need to change the time zone if you need to create schedules for personnel or equipment working in a different time zone. Use the **Time Zone** dialog as shown Figure 3.6 to specify the necessary time zone.

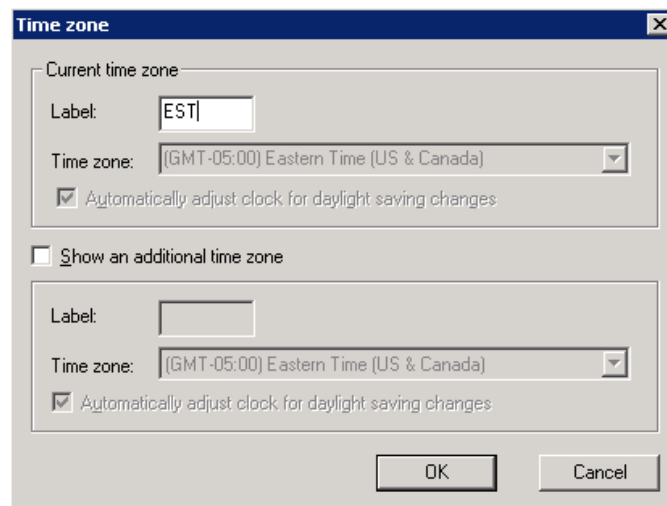


Figure 3.6 - Specifying a Time Zone for a Shift Template

If you select the option to add a production day, the Configure New Event dialog appears, as shown in Figure 3.7. This option lets you to add a production day if the shift model isn't a seven-day workweek. You can specify the start time, week number, and day of the week that you wish to insert into the template. If production day occurs every week, your Week # should remain as 1.

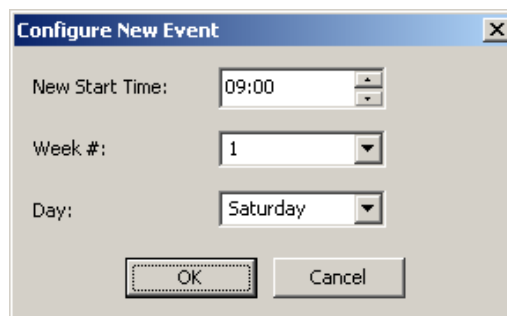


Figure 3.7 - Adding a Production Day

3.2.2. Shift Template Editor's Event Types

Overlaying the grid, there are **four colored columns** that represent a workday. They are the day itself, the day's shifts, each shift's periods, and each period's details. In the grid, each vertical day (in blue), shift (in pink), period (in green), and period detail (in yellow) spans the horizontal hours of its duration. To change the length of any of these columns, you can drag the top or bottom to the length you want.

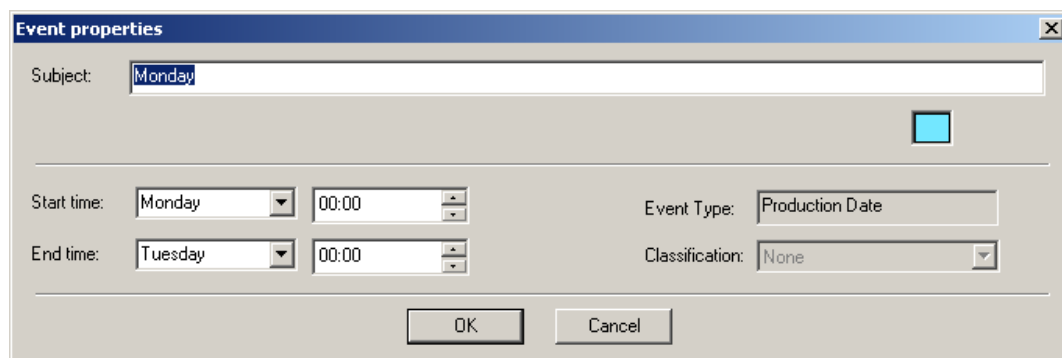
You should know that these columns are in a **hierarchical order from left to right** (day, shift, period, then period details). What this means is that a child column cannot expand outside its parent column's time span. For example, you currently have a period detail that extends from 7:00 AM to 12:30 PM. You need to expand this detail to start at 5:00 AM and go to 1:00 PM. Before you expand it, you will need to make sure that it's Day starts at 5:00 AM or earlier and goes to 1:00 PM or later. Then, you will need to do the same for its shift and period, since they are also parents of the period detail. Once you have taken these steps, you can modify the period details time range.

We will look more closely at each of the event types in the sections below.

3.2.2.1. Production Day

The first column, in sky-blue, illustrates the day itself. By default, the top of the column falls in the grid at the time when the day begins, which you defined back in the Shift Template Form in the Work Day Start fields. By the same reason, the bottom of the column falls where the day ends. But you can change the day's start or end time by dragging the top or bottom edge of the column up or down.

Right-clicking on a day's cell pops up a menu that gives you the following options: Delete Event, Create Copy, Expand All, Properties, and Add New Shift. Clicking **Properties** opens the dialog shown in Figure 3.8, where you can add information about that day of the week in the template.



The screenshot shows a dialog box titled "Event properties". It has a "Subject" field with the text "Monday". Below this, there are two rows for time settings. The first row is "Start time:" with a dropdown menu showing "Monday" and a time field showing "00:00". The second row is "End time:" with a dropdown menu showing "Tuesday" and a time field showing "00:00". To the right of these, there is an "Event Type:" field with the text "Production Date" and a "Classification:" dropdown menu with the text "None". At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

Figure 3.8 - Event Properties for a Day

3.2.2.2. Shift

The second column, in salmon color, illustrates the day's shifts. By default, the number of and duration of shifts is determined by the shift model chosen in the Shift Template Form, but you can change the number of and duration of the shifts for any day. To add a shift, right-click on the Day column to its left, then select **Add new shift**.

Right-clicking on a shift pops up a context menu that gives you the following options: Delete Event, Expand Event, Expand All, Create Copy, Properties, and Add New Period. Clicking on **Properties** opens the dialog shown in Figure 3.9, where you can add information about that shift for that day of the week in the template.

Figure 3.9 - Event Properties for a Shift

3.2.2.3. Period

The third column, in green, illustrates each shift's periods. The number of Shifts you see depends on the Period Length you specified in the New Shift Template form. You can change the number of and duration of each period in the template as well. A period can be classified as **PreShift**, **Planned Production**, or **Overtime**. To add a period for a shift, right-click on the Shift column to its left, then select **Add new period**.

Tip! It is assumed that there are no gaps between periods in a shift. Also, keep in mind that many runtime reports and charts plot shift information by period.

Right-clicking on a period pops up a menu that gives you the following options: Delete Event, Expand Event, Expand all, Create Copy, Properties, and Add New Period Detail. Clicking on **Properties** opens the dialog shown in Figure 3.10 where you can add information about that period of that shift for that day of the week in the template.

Event properties

Subject: Shift 1 Period 1

Start time: Monday 00:00

End time: Monday 04:00

Event Type: Period

Classification: Planned Production

OK Cancel

Figure 3.10 - Event Properties for a Period

3.2.2.4. Period Detail

The fourth column, in yellow, illustrates each period's details. By default, there is one detail per period, which spans the duration of the period, but you can change the number of and duration of details. A period detail can be **planned production** (the default), a **break**, or **overtime**; the column is automatically named for the classification you choose. To add a period detail, right-click the Period column to its left, then select **Add new period detail**.

Right-clicking on a period detail pops up a menu that gives you the following options: Delete Event, Expand Event, and Properties. To change the time or reclassify the period detail, click on **Properties**, which opens the dialog as shown in Figure 3.11, where you can add detailed information for that period in the template.

Event properties

Subject: Planned Production

Start time: Monday 00:00

End time: Monday 01:00

Event Type: Period Detail

Classification: Planned Production

OK Cancel

Figure 3.11 - Event Properties for a Period's Details

3.2.2.5. Common Context Menu Items

By now, you have probably noticed that the right-click context menu contains similar items for Days, Shifts, Shift Periods, and Period Details. Common menu items are:

- **Delete Event:** removes the event from the shift template.
- **Expand Event:** expands the currently selected event to the next one in the template.
- **Expand All:** expands all events to the next one in the template. This allows you to easily create a template by inserting events where the template should start and expanding the template later.
- **Create Copy:** creates a copy of the selected event. When you select this option, you will see the **Configure New Event** dialog as shown in Figure 3.7. You can use this dialog to specify the time, week number, and day where the new event should occur.

3.2.3. Shift Template Editor Toolbar

Across the top of the Shift Template Editor is a toolbar. From this toolbar, you can perform different functions. Most of functions are self-explanatory. For example, you can use the print icon to print the template, use the arrows to navigate to the previous or next week, and use the question mark to open the online Help.



Figure 3.12 - Shift Template Editor Toolbar

There are two buttons that may require a bit more explanation. The first button in the toolbar is **Print Setup** , which opens the **Calendar Page Setup** dialog, as shown in Figure 3.13, where you can set up the calendar page for printing.

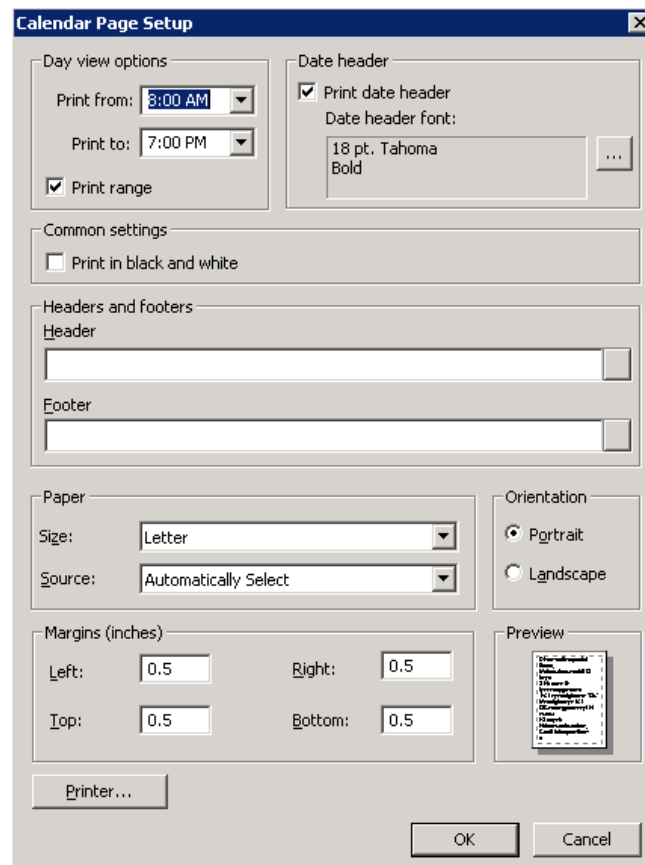


Figure 3.13 - Calendar Page Setup Dialog

The **Expand**  button expands and contracts the toolbar depending on its current state. The expanded toolbar looks like Figure 3.14.

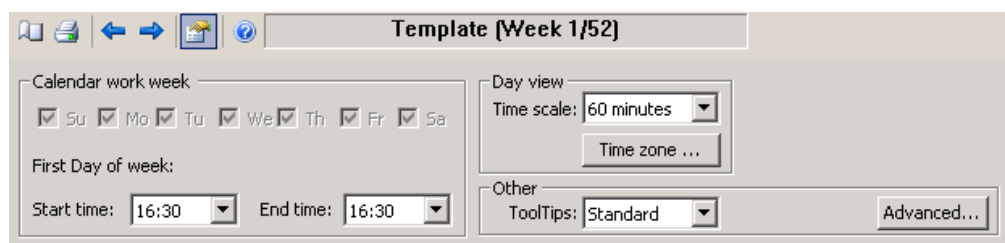


Figure 3.14 - Expanded Toolbar in the Shift Template Editor

The Advanced button (shown in the lower right of Figure 3.14) opens the **Advanced Calendar Control Option** dialog, shown in Figure 3.15, where you can specify some additional options for use when you work with shift templates.

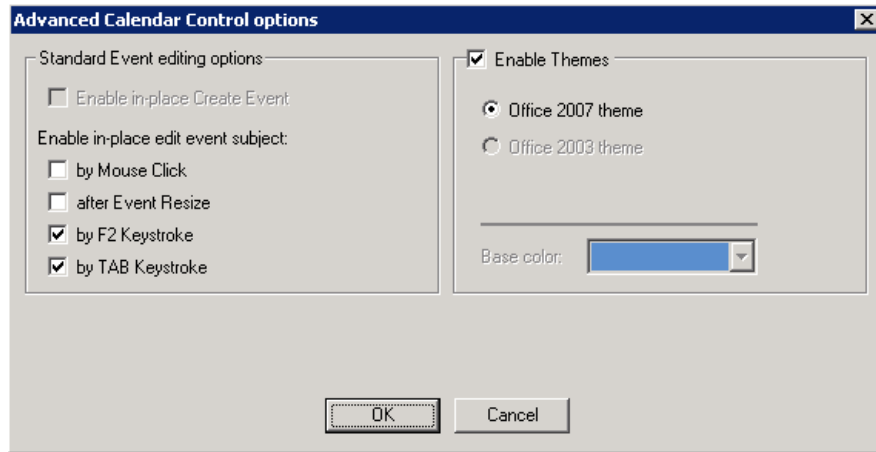


Figure 3.15. Advanced Calendar Control Options Dialog

3.3. Assigning Shift Templates to Schedules

The Shift Assignment Editor appears when you click on the **Assign Template to Schedule** button on the Shift Template Editor.

The Shift Assignment Editor, shown in Figure 3.16, is where you apply a template to the calendar to create a schedule. In the example below, the Foxboro Plant Schedule is being applied to the month of April. You can apply a template to any span of time; it overwrites shift information (if any) that was previously defined for the time span.

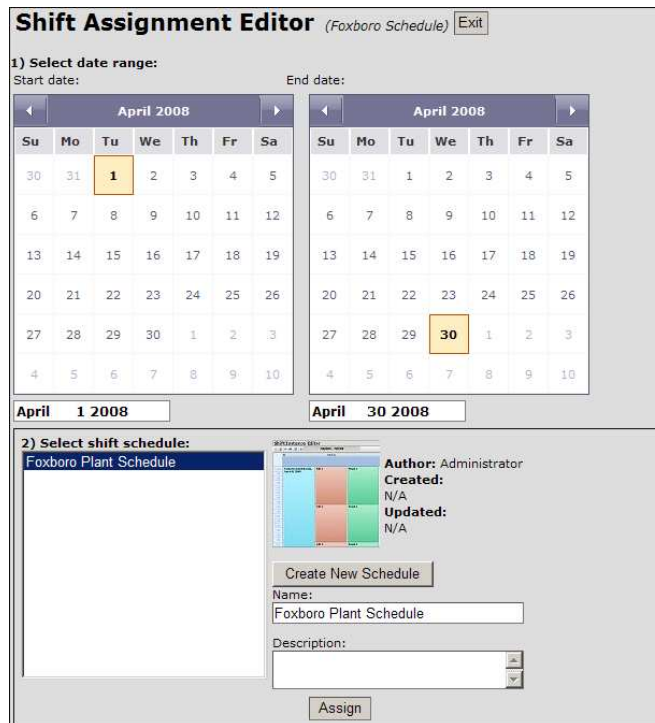


Figure 3.16 - Shift Assignment Editor

Use the Shift Assignment Editor to enter the following:

- **Select a date range:** Using the two interactive calendars in the Select Data Range section, you specify a start date and an end date where the template applies to the schedule. For example, if the template contains a shift model that you use for a busy seasonal fluctuation, this is where you specify the dates of that fluctuation. These dates establish the period to which you want to apply the model. The template will overwrite everything in the schedule that falls between these dates and includes these dates.

Notice that in the Start Day calendar today's date cannot be selected. We specifically designed this so that you cannot choose today as the starting date. The reason is that, at the moment when you choose the assign the template, the plant could be in the middle of a production period; applying a template in the middle of production could lead to undesired results. Therefore, the start date of the schedule can only be tomorrow or later.

NOTE: When you are applying the template to an existing schedule, it is very important that you make sure you specify the correct date range, because there is no "undo" function once you apply the template.

- **Select shift schedule:** To apply the template to an existing schedule, select the schedule from the list of schedules in the box. Or you can create a new schedule by typing a Name and Description, and then clicking the **Create New Schedule** button; then you can select the schedule from the list.

After you have selected a date range and schedule, click on the **Assign** button. This applies the template to the schedule.

You can assign *multiple* templates to create a schedule. Each template that you assign overlays anything that is already in the schedule for the date range. For example, a shift schedule template is applied to a set of dates to establish the template's shifts for those dates, such as in the three shift templates listed in the example below. The three shift templates look something like the following:



One template reflects the year's regular schedule of 2-shift days.



A second template reflects the year-end upswing in production and a change to 3-shift days.



A third template handles plant closings.

Let us look at how these three shift templates may be applied. First, the Regular Shift Model template reflects the year's regular schedule. Therefore, it is assigned first; in this case, it is assigned to the entire calendar year, as shown in Figure 3.17.



Figure 3.17 - Regular Schedule for the Year

The Year-End Shift Model template reflects the year-end upswing in production; therefore, it is assigned to the months of November and December, as shown in Figure 3.18.



Figure 3.18 - Year-end Schedule

The Plant Closing template handles plant closings, and it is assigned to the week that the plant is closed, as shown in Figure 3.19.



Figure 3.19 - Schedule When the Plant Closes

After the three sample templates above have been applied to the calendar, the year's shift schedule looks like the one represented in Figure 3.20, with a mid-year plant closing and a year-end increase in the number of shifts.



Figure 3.20 - A Shift Schedule with Three Templates



Lab: Shift Scheduling

L3

AcmeSeutical runs their plants twenty-four hours a day over three shifts, five days a week. In this lab, we will configure such a schedule for them. We will later apply this schedule to the assets in the production line.

Estimated time to complete this lab: 30 minutes

3.1. Task Checklist

In this lab, you will complete the following tasks:

- Configure a shift template
- Assign a shift template to a schedule
- Execute a stored procedure to create today's schedule

3.2. Support Files

You will need the following files to complete this lab:

- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl

3.3. Creating a Shift Template

Before we can create a schedule, we create a shift template that provides the recurrence pattern in a schedule.

1. Launch the Unified Web Interface if you closed it from the previous lab. Remember that you can launch it from the Productivity Analytics Configurator. You can also book mark the page or make it the home page for IE.
2. Right-click on the **ProductivityAnalytics** provider and select **Shift Schedules**, as shown in Figure L3.1

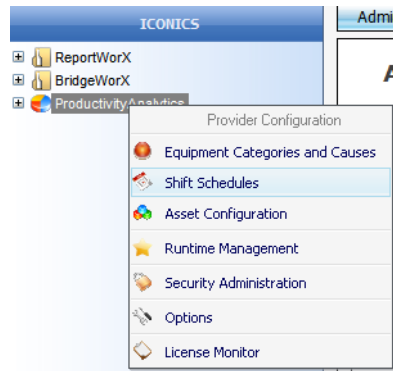


Figure L3.1 - Opening the Shift Schedules Configurator

3. In the Shift Schedules form that appears, click on the **Create New** button. This will display several options for you in the lower half of the form.
4. Using the lower half of the form, enter “NormalShiftTemplate” in the Name field and enter a description if you wish.
5. Select **24hrs/5days/3shifts** from the Base Shift Model list. This will create a 24-hour workday for five days a week, with three shifts per day.
6. Set the **Hour** field in Workday Start Time to “7:00”.
7. Change the **Period Length** to “60” minutes. Your Shift Schedule form may look like Figure L3.2.

 A screenshot of the 'Shift Schedules' form. The top section, 'Shift template information', includes fields for 'Name' (containing 'NormalShiftTemplate'), 'Description', and a 'Filter' box. Below these are buttons for 'Rename', 'Delete', 'Edit', 'Duplicate', and 'Create New'. The bottom section contains a 'Base shift model' dropdown menu with options: '16hrs/5days/2shifts', '16hrs/7days/2shifts', '24hrs/5days/2shifts', '24hrs/7days/2shifts', '24hrs/5days/3shifts' (selected), and '24hrs/7days/3shifts'. To the right of this menu is a small shift schedule diagram. Below the dropdown are fields for 'Workday Start Time' (Hour: 07:00, Minute: 0) and '# of Weeks' (1). The 'Period Length' is set to 60 minutes. At the bottom right are 'Cancel' and 'Next' buttons.

Figure L3.2 - Shift Schedules

8. Click on Next to proceed.

NOTE: If you receive a message saying that the ActiveX control on the page might be unsafe to interact with, click on Yes in the message box to allow interaction.

9. The page loads with the Shift Template Editor. Notice that on Monday, the shift starts at 7:00 AM as we have configured. There are three shifts in each day and each shift contains eight one-hour periods.
10. To give you more practice with the Shift Template Editor, we are going to add a half-hour break for each shift.
11. Right-click on the fifth shift **period detail** for Monday, Shift 1, Period 5, and then select Properties to bring up the Event Properties dialog, shown in Figure L3.3. The Subject should display Planned Production; if it doesn't, try again.
12. Change the **Start time** to 11:30 and click on OK to close the dialog.

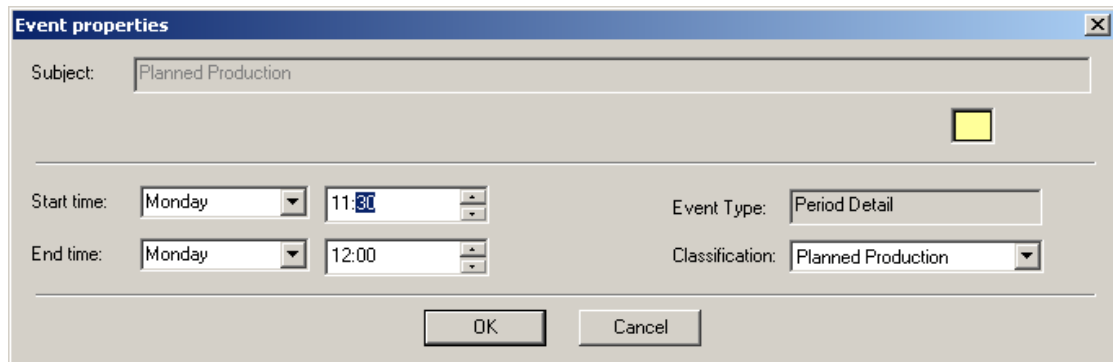


Figure L3.3 - Shift 1 Period 5 Period Details Time Change

13. Notice that Period details now look a bit strange. That is because the time range for each row is 60 minutes and the period detail is set to only thirty minutes.
14. Right-click in the Monday column and choose 30 Minutes from the popup menu. Notice that the rows expand and each row now represents a 30-minute period.

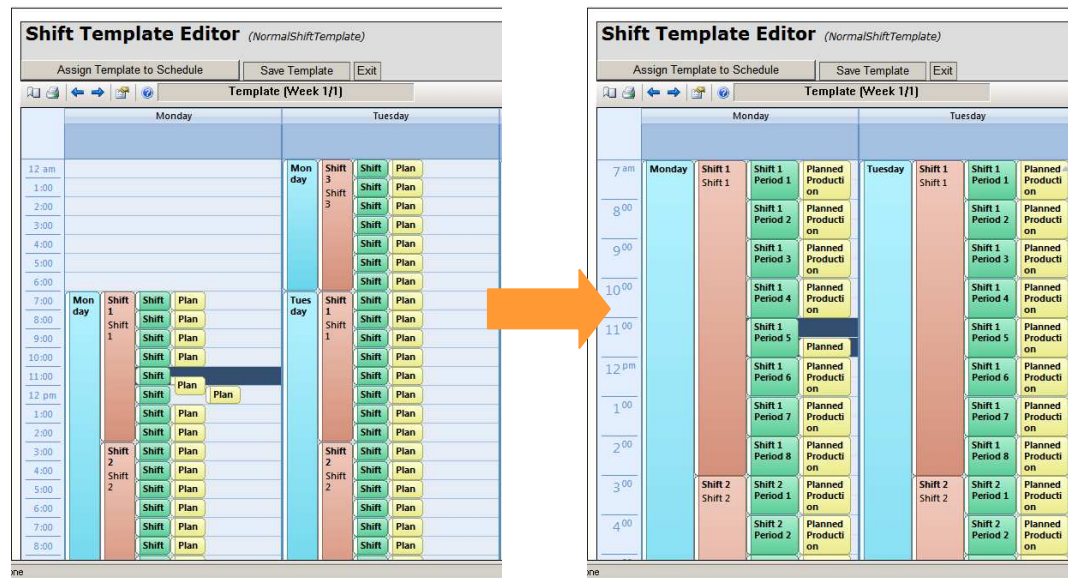


Figure L3.4 - Shift Template Editor with 30-Minute Rows

15. Notice also that there is an empty row now that there is a half-hour period missing. Click in this empty detail area to select it.
16. Right-click on the Shift 1, Period 5 and select **Add new period detail**.
17. In the Event Properties dialog, change the **End time** to **11:30** and change the **Classification** selection to **Break**, as shown in Figure L3.5, and then click on OK to close the dialog.

Figure L3.5 - Shift 1 Period 5 Break Detail

18. Notice that there is a break period detail in Period 5 now. This configuration will still give us data summarization of every hour, but will not count the Break against the OEE.
19. Now we are going to make this same change this for all other shifts in the template. Let's get started:

20. Delete Period 5 from all shifts by selecting the period and pressing the Delete key. You should delete a total of 14 blocks.
21. Select Shift 1, Period 5 on Monday (this is the period where we added the break). Right-click on it and select **Create copy**.
22. In the Configure New Event dialog, change the Day to “Tuesday” as shown in Figure L3.6 and click on OK.

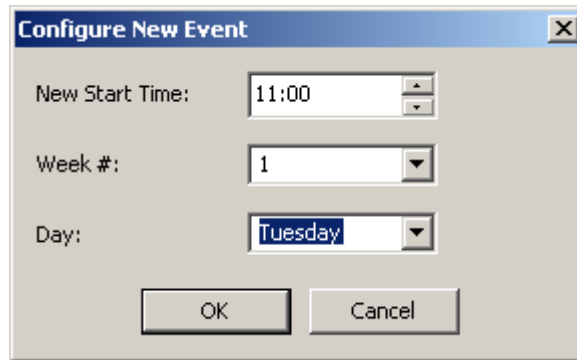


Figure L3.6 - Configure New Event: Create Copy

23. You should now notice that Shift 1 Period 5 on Tuesday contains the same period with two period details.
24. Repeat steps 21-23 for the other period 5s changing the Day and Start Time accordingly. To copy the period to other shifts, you will have to change the New Start Time field to the period’s starting time in those shifts, using a 24-hour clock.
25. Click on **Save Template** when you are done.

3.4. Assigning a Template to a Schedule

1. In the Shift *Template* Editor, click on the **Assign Template to Schedule** button. This should load the Shift *Assignment* Editor.
2. In the Start date calendar, choose tomorrow’s date. This should be the default selected value.
3. In the End date calendar, choose the last Sunday in the current month.
4. In the Select shift schedule section, type in “AcmeSeutical Schedule” in the Name field. You can provide an option description if you wish.
5. Click on the **Create New Schedule** button to create the schedule.

- When the page reloads, you should see the newly created schedule in the Select Shift Schedule list.

Shift Assignment Editor (*NormalShiftTemplate*) Exit

Created schedule "AcmeSeutical Schedule"

1) Select date range:

Start date:

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

August 24 2010

End date:

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

August 29 2010

2) Select shift schedule:

AcmeSeutical Schedule

Author: Administrator
Created: N/A
Updated: N/A

Create New Schedule

Name: AcmeSeutical Schedule

Description:

Assign

Figure L3.7 - Shift Assignment Editor

- Select the schedule and click on the Assign button.
- You may receive a message letting you know that any conflicting events that have not yet started on the selected dates will be deleted. Click on the OK button.
- When the process to create the schedule completes, you should see a message at the top of the page, as shown in Figure L3.8, to indicate the success or failure of the template assignment.

Shift Assignment Editor (*NormalShiftTemplate*) Exit

Shift template successfully assigned to "AcmeSeutical Schedule"

1) Select date range:

Figure L3.8 - Template Assigned to Schedule

- Click on the Exit button at the top of the Shift Assignment Editor page to close the editor.

3.5. *Creating a Schedule for Today's Lab*

Since the Productivity Analytics training is scheduled for one day, and the schedule we just created in this lab will not go into effect until tomorrow, we will use a stored procedure to create a schedule for today.

1. Go to Start → Programs → Microsoft SQL Server 2005 → SQL Server Management Studio.
2. In the tree explorer on the right, expand Databases → Productivity Analytics → Programmability → Stored Procedures → dbo.TestHarnessInsertShiftSchedule.
3. Right-click on dbo.TestHarnessInsertShiftSchedule and select Execute Stored Procedure.
4. In the Value field enter **today's** date in *MM/DD/YYYY* format. Then click the OK button. You should see a 0 (zero) in the results to indicate that the schedule was inserted successfully.
5. Then close the Microsoft SQL Server Management Studio.

In the next lab we will edit an existing asset that inherits the shift schedule we just created.



Review: Shift Scheduling

R3

3.1. Chapter Objectives

You should know and understand the following topics:

- Shift schedules
- Shift templates
- Assigning shift templates to shift schedules

3.2. Summary

Productivity Analytics uses *shift schedules* to determine the availability of equipment as well as downtimes. A shift schedule is created using *shift templates* that you apply to days or weeks in the calendar.

A shift template is primarily just a pattern of workdays in a calendar week. It consists of a base shift model that identifies the number of hours in a shift, the number of shifts in a workday, and the number of workdays in a work week. A template can represent a typical workweek, a seasonal fluctuation in demand, or a vacation schedule. You can have any number of shift templates which you apply to the schedule so that asset availability can be calculated accurately.

A workday is made up of four different types of blocks: the workday, the workday's shifts, each shift's periods, and each period's details. You arrange these blocks in a grid in the Shift Template Editor and can modify them in the Shift Schedule Editor after you apply a template.

Periods in a shift can be classified as pre-shift periods, planned production periods, or overtime periods. Inside a period, you can designate period details as being planned production, a break, or overtime.

3.3. Terms

Downtime
Shift Schedule

Shift Period
Shift Template

Shift Period Detail
Workday

3.4. *Test Your Knowledge*

In this chapter, we discussed how you can configure shift templates and shift schedules. Before continuing to the next chapter, make sure you can answer the questions below.

1. True or False: There are several base shift models to choose from when you are creating a shift template.
2. What are some of the user-friendly features for building a shift template?
 - a. You can build the template on a grid using drag-and-drop
 - b. You can build day length, shift length, period length, and period details separately
 - c. You can save and reuse a shift template
 - d. You can enter planned downtime events
 - e. All of the above
 - f. None of the above
3. How many different shift templates can be assigned to a shift calendar?
 - a. No limit
 - b. No limit, but templates cannot overlap
 - c. Five if templates overlap, 10 if they don't overlap
 - d. Five per month
4. True or False: Often times, runtime reports and charts plot shift information by period.
5. True or False: A shift can have only one period.
6. A shift period can be classified as which of the following?
 - a. A preshift period
 - b. A planned production period
 - c. A overtime period
 - d. A break period
 - e. All of the above
 - f. Only A, B, and C
 - g. Only, B, C and D
 - h. None of the above
7. True or False: A period can have period details for planned production, breaks, and overtime.
8. True or False: A shift template is assigned to a shift schedule one week at a time.



Asset Hierarchy

4

The purpose of Productivity Analytics is to track and analyze equipment and plant performance at your company. To do this with Productivity Analytics requires some flexibility because each manufacturing process uses its own, specialized equipment. Furthermore, your company's equipment is different from that used in other industries that also use Productivity Analytics. You will also recall that Productivity Analytics calculates OEE, and no two manufacturers use the same calculation for the different components of OEE. Productivity Analytics offers you the flexibility you need to define the calculations based on your company's equipment and its processes.

In this chapter, we will discuss how to define your assets to Productivity Analytics, as well as how to define OEE calculations for your assets. By the end of the chapter, you should be familiar with the following concepts:

- Assets
- Asset levels
- Inserting assets into the asset tree
- General asset properties

4.1. Asset Levels in the Asset Tree

In Productivity Analytics, an *asset* is a resource for which you want to monitor performance, availability, and/or quality, and you have the means for doing this using alarms defined in AlarmWorX32. You can define *physical assets* (such as robots, production lines, and plants) and *logical assets* that group physical assets into a hierarchy, which can be used for reviewing availability, performance, and quality on a broader scale.

Assets are embedded into a hierarchical reporting structure called an *asset tree*. Each tier of the asset tree is reserved for one type of asset. You decide what type of asset each *level* holds. The following figure shows a sample tree of assets defined in Productivity Analytics.

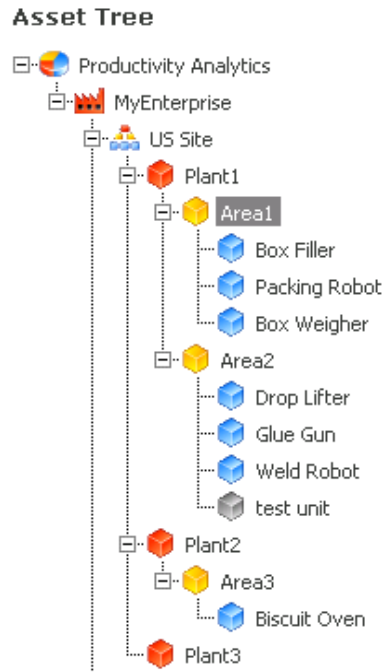


Figure 4.1 - Partial Asset Tree in the Unified Web Interface

When you configure your assets, you specify the asset level each asset belongs to. Doing this controls the structure of the asset tree by preventing you from accidentally assigning child assets to a parent in a level lower than it, and it also controls whether an asset level can have multiple tiers of assets at that level.

When Productivity Analytics is first installed, there are six predefined asset levels:

- Level 0 is the Enterprise level
- Level 1 is the Site level
- Level 2 is the Area level
- Level 3 is the Process Cell level
- Level 4 is the Unit level
- Level 5 is the Module level

You can use these levels, rename them, delete them, move them, and add more levels.

You identify asset levels for your assets by using the General Applications Options General tab. To access this tab, right-click on **ProductivityAnalytics** in the ICONICS panel, then click on **Options**. This opens the General Availability Options form with the General tab on top. Figure 4.2 shows the form for configuring levels (on the right) alongside a completed asset tree as it appears in the Unified Web Interface (on the left). You cannot define assets until you have set up these levels for your asset tree.

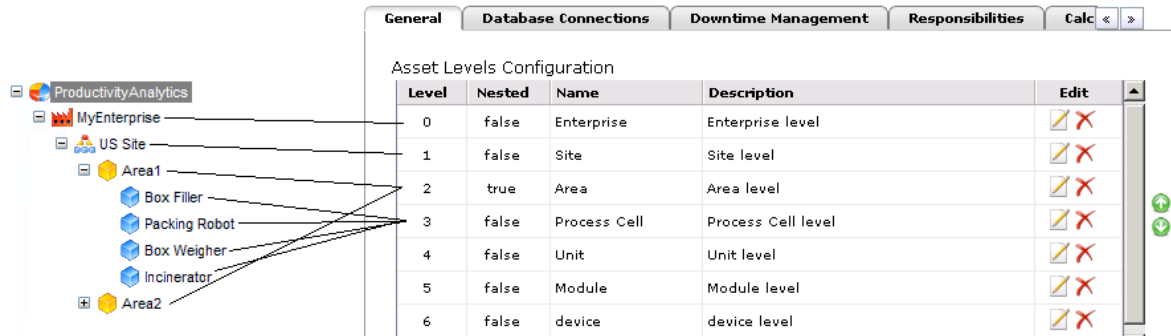


Figure 4.2 - Levels of Assets

Keep in mind that each asset level identifies a type of logical or physical asset that may or may not contain other assets that you want to track. For example, the enterprise level is made up of sites, each site level is made up of areas, and each area level has process cells.

Also, be aware that the asset tree cannot skip an asset level. However, a level can repeat itself for more than one tier if you identify the level as one that can be *nested*. For example, in Figure 4.2, level 2, the Area level is a nested level. This means that under Area1 in the asset tree, you can add a sub item to Area1 that is on the same level as Area1. Other levels that are not nested will only allow you to go down the level hierarchy.

4.2. Adding Assets

As we mentioned at the beginning of the chapter, assets are resources that you want to monitor. In this section, we will discuss how to add assets and associate different calculations to the assets to gain information on their performance, availability, and quality.

4.2.1. Adding Assets to the Asset Tree

To add assets to each level of the asset tree, you use the Asset Configuration Form. While in the Unified Web Interface, right-click **Productivity Analytics** in the navigation tree, then select **Asset Configuration**. The child assets of the selected level are shown on this form, as shown in Figure 4.3.

Asset Tree

- Productivity Analytics
 - MyEnterprise
 - US Site
 - Plant1
 - Area1 (Selected)
 - Box Filler
 - Packing Robot
 - Box Weigher
 - Area2
 - Drop Lifter
 - Glue Gun
 - Weld Robot
 - Test Unit
 - Plant2
 - Area3
 - Biscuit Oven
 - Plant 3
 - Europe Site
 - Plant8
 - Welding Station

Area1 Assets

Name	Enabled	Description	Shift Model	Level	Edit
Box Filler	true		Inherit Shift Model	Unit	
Packing Robot	true		Inherit Shift Model	Unit	
Box Weigher	true		Inherit Shift Model	Unit	
	☐		Inherit Shift Mod	Unit	

Page 1 of 1 (3 items)

Buttons: Add Asset, Duplicate Asset, Copy Asset to...

Figure 4.3 - Assets for the Selected Area1

In this form, you can add child assets and configure, edit, or delete each of the assets shown. Clicking on the **Delete** icon removes the asset. Clicking on the **Edit** icon allows you to change the asset's name, description, shift model, and level as well as toggle the Enable bit for the asset. When you are done editing the asset, click on the **Apply** icon to save the changes. You can also cancel the changes by clicking on the **Cancel** icon.

Each of the fields that you can edit is also available in the asset's Properties dialog. You can bring up this dialog by clicking on the **Configure** icon. Alternatively, you can bring it up by right-clicking on the asset in the navigation tree and selecting the **Configure** option in the popup menu. Once you have selected to configure an asset, the Asset Properties form opens. There are four tabs on this form:

- The **General** tab allows you to configure general information about the asset.
- The **Availability** tab allows you to configure the aspects that affect the asset's availability.
- The **Performance** tab allows you to specify how the asset's production performance is to be calculated.
- The **Quality** tab allows you to specify how to calculate the asset's production quality.

In this chapter, we will focus only on the asset's *general* settings.

4.2.2. General Asset Properties

When you select to configure an asset, by default the Asset Properties' General tab appears, as shown in Figure 4.4.

Asset: Box Filler

General | Availability | Performance | Quality

☒ Asset Enabled

Name: Description:

Level: Custom Identifier:

Shift Model

Shift Schedule:

Modification History

Last Modification: Created:

Modified by:

Figure 4.4 - General Tab in the Asset Form

Here, you can change the asset's name and description, as well as see its level in the asset tree and its modification history.

You can also determine if you want to enable this asset. The Asset Enabled checkbox at the top of the form allows you to toggle when the asset is available. If you check this option, the asset is enabled and data is being collected for it; but if the checkbox is unchecked, the asset is disabled. You can easily distinguish disabled assets in the asset tree because they are grayed-out.

The **custom identifier** is the code or ID used for the asset in the external system from which you are collecting the asset's downtime information. This field is required if you are using asset data from an *external* or *legacy* system. The custom identifier is limited as follows:

- There is a 32-character limit. You can use alphanumeric characters of any type, including special characters.
- The identifier is case sensitive; enter it exactly as it is defined for the asset in the external or legacy system.

If you are using an external or legacy system and you do not enter the asset's identifying code or ID from that system, no downtime information will be provided to Productivity Analytics for the asset.

Specifying the asset's **shift schedule** is also important. You can select *any existing schedule* defined in Productivity Analytics. However, if the asset is a child asset that uses the shift schedule of its parent asset, it is important that you select **Inherit Shift Model** as the shift schedule. For example, a machine uses its plant's shift schedule; therefore, it is important to select Inherit Shift Model, *not* the parent's shift schedule, as the child asset's schedule.

4.2.3. Batch Details

Although we will not yet talk about the Asset Properties form's Availability, Performance, and Quality tabs, there is one single commonality among them. At the bottom of each of these tabs there is a section called Batch Details. Let us look at the type of batch information you would enter for an asset whose batch information you want to capture and report.

Availability, performance, and quality are reported on an asset-by-asset basis. However, if the asset produces *batches*, you can configure the asset's batch information on the Availability tab, as well as on the Performance and Quality tabs. This allows the asset's availability, performance, and quality to be reported on a batch-by-batch basis. If you want to use batch reporting for an asset, you switch on batch reporting by putting a checkmark in the **Batch Enabled** checkbox.

The **Batch Name** is a logical grouping of all batches to be viewed in charts and reports that show the asset's information. It represents the common name for all **batch IDs** belonging to it. For example, a batch name might be something like "Family size oatmeal packs" while a batch ID might be something like "FSOP - 2008428-100000". In the **Batch Start** and **Batch End** fields, you must enter the OPC tags that identify the start and end of a batch for this asset.

Once you've configured the asset's batch information on the Availability tab, there is a nice ease-of-use feature on the Performance and Quality tabs. These tabs have a **Copy From Availability** button that lets you copy the Batch Detail information, saving you the effort of having to reenter it. You can change it once you've copied it if you need to.

With this information configured in the appropriate tabs, you will be able to view Availability, Performance, and Quality reports for specific batches for the asset.



Lab: Configuring the Asset Tree

L4

We know that AcmeSeutical is an international company. In this lab, we will build an asset tree for them in order to monitor the performance of each production location. In order for us to build the asset tree, we need to first find out the different assets each location has in order to add them to our monitoring system.

Estimated time to complete this lab: 45 minutes

4.1. Task Checklist

In this lab, you will complete the following tasks

- Define the different asset levels
- Define the different assets

4.2. Support Files

You will need the following files to complete this lab:

- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl
- AcmeSeutical_DWXConfig.mdb

4.3. Defining Asset Levels

Before we can build an asset tree for AcmeSeutical, we should understand the current system is structured. In most cases, the HMI/SCADA system in place already has a hierarchy that we can use.

1. Launch DataWorX32 Configurator by going to Start → Programs → ICONICS GENESIS32 → DataWorX32 → DataWorX32.
2. When the configurator comes up, you should see a configuration similar to the one shown in Figure L4.1.

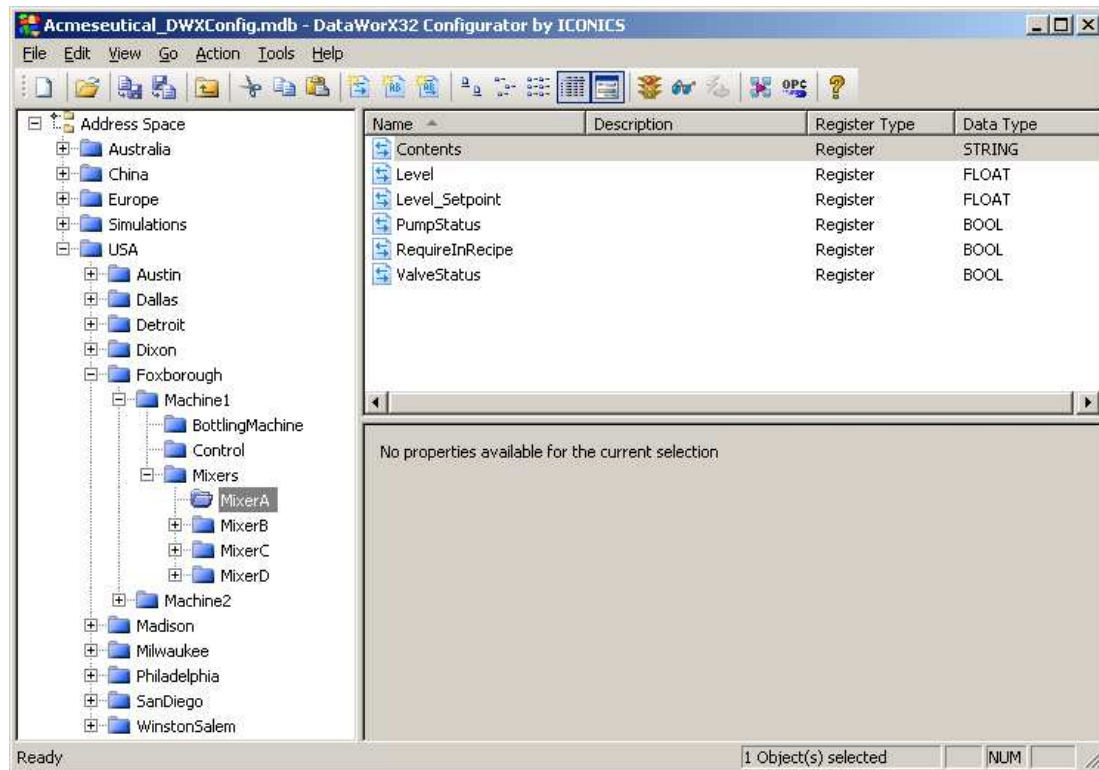


Figure L4.1 - Acmeseutical DataWorX32 Configuration

3. As you can see, Acmeseutical already has a hierarchy that we can easily adopt.
4. Open the Unified Web Interface if you closed it from the previous lab.
5. Right-click on **ProductivityAnalytics** in the navigation tree and choose **Options**.
6. On the General tab, you will see the default asset levels that were configured in the default Productivity Analytics configuration.
7. For the most part, these levels make sense, but we will change one. Click on the **Edit**  icon for level 3, Process Cell.
8. Change the Name of this level to “Production Line” and the Description to “Production Line Level” and then click on the line’s Apply  icon.
9. The General tab should now look similar to Figure L4.2.

General Application Options

General Database Connections Downtime Management Responsibilities Calc

Asset Levels Configuration

Level	Nested	Name	Description	Edit
0	false	Enterprise	Enterprise Level	
1	false	Site	Site Level	
2	false	Area	Area Level	
3	false	Production Line	Production Line Level	
4	false	Unit	Unit Level	
5	false	Module	Module Level	

Add New Level

Figure L4.2 - Asset Levels Configuration

10. Click on the Apply button to save the changes.

4.4. Building an Asset Tree

We are now ready to build an asset tree base on the existing AcmeSeutical hierarchy.

1. Open the UWI if you closed it.
2. Right-click on **ProductivityAnalytics** in the navigation tree and select **Asset Configuration**.
3. The Asset Configuration form loads on the right-hand pane.
4. In the Assets section, click on the **Add Asset** button.
5. Notice that, by default, the new asset contains “AcmeSeutical Schedule” as the Shift Model and the Level is Enterprise.
6. Change the name of this asset to “AcmeSeutical”. Leave the Enabled field unchecked since we do not want to summarize any data on this level and click on the Apply icon.

Asset Configuration

Asset Tree

- Productivity Analytics
- AcmeSeutical

Assets

Name	Enabled	Description	Shift Model	Level	Edit
AcmeSeutical	false	AcmeSeutical Schedule	AcmeSeutical Schedule	Enterprise	

Figure L4.3 - Enterprise Level Asset

7. Click on **AcmeSeutical** in the Asset Tree section and then click on the **Add Asset** button to add a child asset at the plant level.
8. In the new asset that appears in the list, set the name to “USA”, check the **Enabled** field and click on the Apply  icon.
9. Repeat steps 7-8 and add the assets listed in Table L4.1.

Table L4.1 - Inserting Sites

Name	Enabled
Australia	true
China	true
Europe	true

10. Select **USA** in the Asset Tree section and click on **Add Asset** to add a new child asset.
11. Name the new asset “Foxborough”, check the **Enabled** checkbox, and click on the Apply  icon.
12. Select **Foxborough** in the Asset Tree section and click on Add Asset to add a child asset to Foxborough.
13. Name the new asset “Machine1”, check the **Enabled** checkbox, and click on the Apply  icon.
14. Select **Machine1** in the Asset Tree section and click on Add Asset to add child assets to Machine1.
15. Name the new asset “BottlingMachine”, check the **Enabled** checkbox, and click on the Apply  icon.
16. Click on the Add Asset button again and name this asset “Mixers”, check the **Enabled** checkbox, and click on the Apply  icon.
17. Select **Mixers** in the Asset Tree section and click on Add Asset to add child assets to Mixers.
18. Name the new asset “MixerA”, check the **Enabled** checkbox, and click on the Apply  icon.
19. Repeat steps 17-18 to add “MixerB”, “MixerC”, and “MixerD” as additional child assets for Mixers.
20. Your asset configuration should look similar to Figure L4.4.



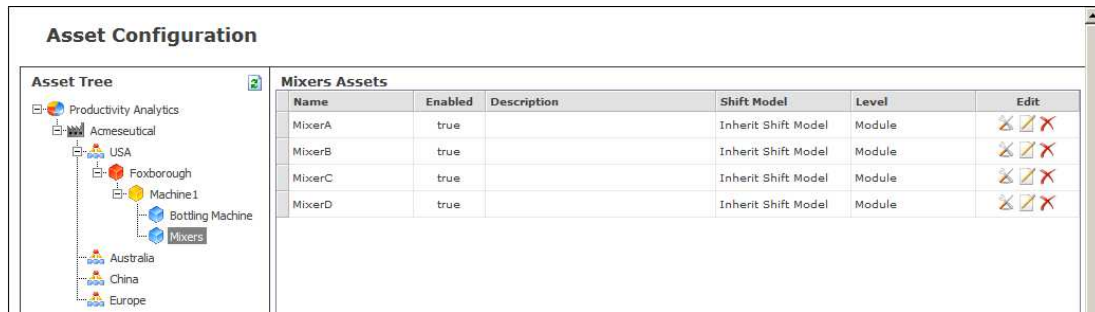


Figure L4.4 - Asset Configuration

21. Select **Foxborough** in the asset tree, and then select **Machine1** in the Foxborough Assets section.
22. The Duplicate Asset button should now become available at the bottom of the form. Click on the button.
23. Change the asset name from “Copy of Machine1” to “Machine2” and check the **Enabled** option.
24. Click on the Apply icon.
25. Notice in the Asset Tree that the child assets to Machine1 were also duplicated. The duplicated child assets are disabled (grayed-out). You can rename these assets and enable them if you wish.

NOTE: Although the individual Mixers are not shown in the asset tree, they are still copied child items. Therefore, you will need to enable them as well.

26. Your finished asset tree should look similar to Figure L4.5.

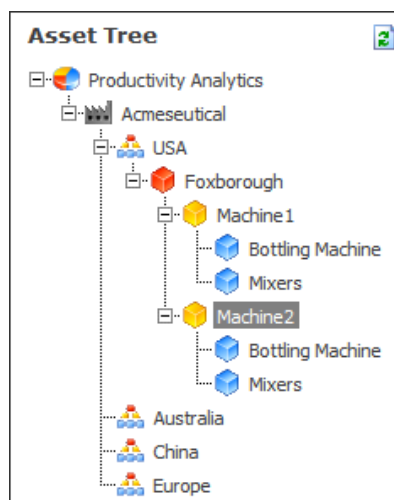


Figure L4.5 - Asset Tree

27. If you find yourself with extra time, you can try to build a complete asset tree using the assets listed in Table L4.2. You do not have to enable all of the assets; however, data will not be collected for assets that are disabled.

Table L4.2 - Area Level Assets

Parent	Name	Level
USA	Austin	Area
USA	Dallas	Area
USA	Detroit	Area
USA	Dixon	Area
USA	Madison	Area
USA	Milwaukee	Area
USA	Philadelphia	Area
USA	San Diego	Area
USA	Winston Salem	Area
Australia	Sydney	Area
China	Hong Kong	Area
Europe	Czech	Area
Europe	Germany	Area
Europe	Italy	Area
Europe	Netherlands	Area
Europe	UK	Area

28. After you add the Area-level assets, you can try using the “Copy Assets to” feature to insert Machine1 into each area. Your finished Asset Tree will look similar to Figure L4.6

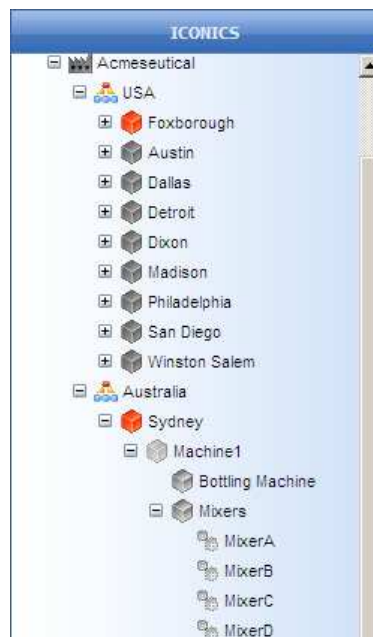


Figure L4.6 - Complete Asset Tree

Review: Asset Hierarchy

R4

4.1. Chapter Objectives

You should know and understand the following topic:

- Assets
- Asset levels
- Inserting assets into the asset tree
- General asset properties

4.2. Summary

In Productivity Analytics, an *asset* is a resource for which you want to monitor performance, availability, and/or quality, such plant equipment and machinery. Assets are embedded into a hierarchical reporting structure called an *asset tree*. Each tier of the asset tree is reserved for one type of asset; you decide what type of asset each *asset level* holds, and whether at a given level assets can be *nested*.

Assets are added to the asset tree one level at a time. As soon as you define an asset at one level, you can define its child assets on the next level. To simplify the definition of assets, there are easy-to-use features that let you duplicate child assets and copy the child assets of one parent asset to another parent asset.

Assets can inherit schedules from their parent assets, or they can have any other schedule that is defined in Productivity Analytics.

Also, you can configure assets so that their batch data is available on a batch-by-batch basis, when appropriate and necessary.

4.3. Terms

Asset
Logical Asset

Asset Level
Nested Asset Level

Asset Tree
Physical Asset

4.4. *Test Your Knowledge*

In this chapter, we discussed the asset hierarchy. By now, you should know how to define different asset levels as well as build an asset tree. Before you continue to the next chapter, make sure you can answer the questions below.

1. What must you do to configure a child asset to use the same shift schedule as its parent in the Asset form's General tab?
 - a. Leave the asset's shift schedule field empty
 - b. Select Inherit Shift Model as the asset's shift schedule
 - c. Type the name of the shift schedule
 - d. Associate the child to the parent that uses the shift schedule
2. What makes a nested asset level different from one that is not nested?
 - a. A nested asset level can have multiple tiers of assets
 - b. A nested asset level can repeat anywhere in the asset tree
 - c. A nested asset level can have assets from other asset levels
 - d. A nested asset level can reside in another asset level
3. True or False: You can move an asset level up and down the asset tree.
4. True or False: You cannot report an asset's OEE information by batch.
5. True or False: You cannot skip asset levels when adding assets to the asset tree.
6. If an asset is not enabled, what happens?
 - a. Data is not gathered for it
 - b. It is grayed out in the asset tree
 - c. It cannot be saved
 - d. Both A and B
 - e. Both B and C
 - f. All of the above
7. When you are collecting the asset's downtime information from an external or legacy system, what code must you enter for the asset on the General tab of its Asset Properties dialog?
 - a. The Configure icon
 - b. The Custom Identifier
 - c. The Description field
 - d. The External Code



Asset Availability

5

In the previous chapter, we learned how to build an asset tree that represents your organization's hierarchy as well as the different equipment in a production line. The next step to calculating OEE is to define downtime events for the different assets in the asset tree so that their availability can be calculated. In this chapter, we will discuss how Productivity Analytics tracks and calculates availability. By the end of the chapter, you should understand the following concepts:

- Types of downtime events
- Equipment categories
- Downtime causes
- Downtime responsibilities

5.1. Downtime Event Types

When you configure an asset's availability, you identify its *downtime events*. Each downtime event has an *event type*. Downtime events are categorized into types so that your users can isolate the types of events they want to focus on.

For example, your users may want to be able to see runtime events for breakages, or power outages, or repairs. With that in mind, you can define these three categories as event types, and then use those event types when configuring asset downtime events.

Figure 5.1 shows the Downtime Management tab of the Options form, which is where you define event types. To access it, right-click on **Productivity Analytics** in the navigation tree, then select **Options** to open the General Availability Options form. From here, you can select the **Downtime Management** tab.

Event Type	Description	Edit
Fault	Fault	
Blocked	Blocked	
Starved	Starved	
Idle	Idle	

Add Event Type

Figure 5.1 - Downtime Event Types

Notice that there are four predefined event types shown in Figure 5.1. You can use event types to categorize different events that lead to production stoppage. The predefined ones are:

- **Fault** – Used when the asset is unable to produce anything due to machine breakdown, power failure, etc.
- **Blocked** – Used when the product is held up and cannot proceed to the next stage. This can happen due to numerous rejections in which the product is blocked from going down the production line.
- **Starved** – Used when there is insufficient raw material or tooling. This could also happen if the prior production stage is not producing fast enough for the subsequent stages.
- **Idle** – Used when there is an unexpected break in production. When an asset is idling, this usually means that there is a blocked asset on the production line.

You can edit or delete the above-mentioned event types as well as create your own. You can define any number of event types. Keep in mind that only one event type can be assigned to any downtime event that you configure for an asset, but you can add new event types and change them for an asset's downtime at any time. Downtime events that occur after you change their event type will be associated with their new event types in runtime views.

5.2. *Responsibilities*

When you configure an asset's downtime events, you can identify who is responsible for responding to events. To do this, you must define *responsibility* records. A responsibility record consists simply of a point of contact for handling events for your assets. You must predefine all of your points of contact as responsibility records so that you can later associate them with assets' downtime events. If you include asset responsibilities on reports, anyone reviewing a report knows who to contact in response to a given downtime event for the asset.

To open the Responsibilities tab, you can right-click on **Productivity Analytics** in the navigation tree and select **Options** to open the General Availability Options form. Click on the **Responsibilities** tab on in this form, which is shown in Figure 5.2.



Name	Description	Edit
Plant1 Area1		
Plant1 Area2		
Plant2 Area1		
Plant2 Area2		
New Responsibility 1		

Add New Responsibility

Figure 5.2 - Responsibilities Tab in the General Applications Options Form

To add a new Responsibility, you can click on the Add New Responsibility button. In the new line that comes up, you can fill in the necessary information to create this responsibility. In the Name field, use a name that easily identifies the contact or the responsibility. Your plant's needs determine how you do this; names like "Maintenance" or "Electrician" may be detailed enough for you. If you have multiple plants, you may need to include the location in the name, as in "Maintenance Foxboro". You may have preferred vendors that you contract with, and include your preference in the name, such as "Electrical Boston 1st choice".

Although there is no restriction on what you can put in the responsibility's description field, the types of information you might want to include are *phone numbers* and other contact information like *business hours*, *contacts' names*, *instructions* or the location of instructions for handling a downtime event, or any other information that may help when a situation arises.

When you are done configuring the responsibility record, click on the Apply button to save the settings. As responsibilities change or evolve, you can delete a responsibility record by clicking on the Delete button to remove it.

5.3. Equipment Categories and Causes

A downtime *cause* is, basically, the reason for a downtime event. Causes can include equipment failure, equipment malfunction, scheduled maintenance, lunch breaks, retooling, and the like.

When you configure your assets, you will be assigning *default causes* to assets' downtime events so that Productivity Analytics can calculate operating time, scheduled downtime, and unscheduled downtime based on those default causes. Users will then be able to use the Downtime Audit report to review assets' downtime events and specify the *actual cause* of the asset's downtime. This allows users to get accurate information about the causes of downtime events and take action toward preventing them.

Productivity Analytics requires you to *categorize* your downtime causes by equipment type or by using any other category that is appropriate for your system. Equipment categories can have subcategories. For example, the category “Robots” can have subcategories of “Weld Robots” and “Packing Robots” as illustrated in Figure 5.3.

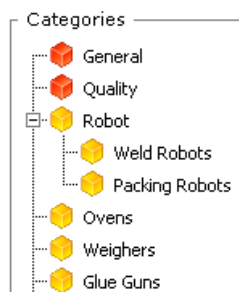


Figure 5.3 - Categories Displayed in the Unified Web Interface

Two system categories are predefined in Productivity Analytics: **General** and **Quality**. You cannot delete these predefined categories, but you can add causes to them and you can create additional categories with their own causes. The two predefined categories are:

- The **General category** contains downtime causes that are common to *all* assets and are inherited by all other categories, including the Quality category.
- The **Quality category** contains quality-related causes. They display in the Default Cause drop-down list in the Quality tab for an asset.

You might define additional categories based on machine types or production lines. As you define a category's causes, you can see all of the other causes that the category inherits. Any category that you define inherits causes from the General and Quality categories as well as those causes in its parent categories.

When defining a cause, you can indicate whether the cause is scheduled. For example, routine maintenance is scheduled but a power outage is not. You can also indicate that the cause is attributable to a machine, to a user, or to both. These settings help users to distinguish between planned and unplanned downtime, and to isolate reasons for downtime events.



To access the Equipment Categories and Causes form, right-click on **Productivity Analytics** in the navigation tree of the Unified Web Interface, then select **Equipment Categories and Causes**. Figure 5.4 shows sample causes for the Weld Robots subcategory. Note the inherited categories and causes at the bottom of the form.

Cause Assignment

Current Category Causes

Name	Assignable to	Scheduled	Description	Edit
User Fault	User	false	User	
Machine Fault	Machine	false	Machine	
User & Machine Fault	User and Machine	false	User and machine	
User Scheduled Break	User	☒	Scheduled break	

Inherited Causes

General

- Unassigned
- Retooling
- Lunch Break
- General Maintenance
- Equipment Fault

Robot

Figure 5.4 - Causes in Effect for the Weld Robots Equipment Category

5.4. Asset Availability Configuration

Productivity Analytics calculates an asset's availability is calculated based on its *downtime events*. A downtime event identifies a point in time at which an asset stops producing during a scheduled shift. While some downtime is *scheduled* ahead of time, other downtime is not. An alarm defined in AlarmWorX32 identifies the beginning of any downtime event that occurs. You configure the asset's availability by identifying its downtime events, both *scheduled* and potentially *unscheduled*, using the asset's Availability tab, which is shown in Figure 5.5. This is where you use the downtime events, event types, causes, and responsibility records that you have defined.

To go to this tab, right-click **Productivity Analytics** in the navigation tree, then select **Asset Configuration**. The asset tree appears, just like it did when we accessed the General tab in the prior chapter. To review, in the tree, select the asset whose child assets you want to configure. The child assets load into the form at the right. You can then click the **Configure** icon of the child asset you are configuring. This opens the Asset Properties form. Then click the **Availability** tab.

Asset Properties -- Web Page Dialog

Asset: TEST ROBOT

General Availability Performance Quality

Downtime Processing: Asset Events only ☐ Include in Rollup Calculation Category: Robot

Events Machine Cause Translations

Enabled	Event Name	Event Type	Tag	Responsibility	Machine Assigned Cause Tag	Default Cause	Value	Commands
true	TEST ROBO...	Fault	...OBOT Fault 1\\	Plant1 Area1	1	Unassigned	1	[X] [Y]
☒	New Event 1	Fault		Plant1 Area1		Unassigned		[X] [Y]

Add Event

Batch Details

☐ Batch Enabled

Batch ID: Batch Start:

Batch Name: Batch End:

Apply Cancel

Figure 5.5 - Asset form's Availability tab

Use an asset's Availability tab to define all of the events or alarms that can account for the asset's downtime. When defining an asset's downtime events, be sure you include an event for each OPC tag that specifically addresses that asset's downtime, which can include events such as machine faults, personnel breaks, scheduled maintenance, unscheduled maintenance, and sitting idle.

Each event corresponds to a related alarm defined in the AlarmWorX32 Server configuration database and indirectly contributes, along with shift schedules, to the calculation of the Performance Time Duration variables that are used in performance calculations.

NOTE: Remember that Performance is defined by how well the production line is performing or how many units the line produced in a given schedule. Therefore, the availability of the asset affects its performance. We will discuss the Time Duration Variables in more detail when we discuss Performance tracking of the assets in the next chapter.

First, notice the Category drop-down list at the top of the Availability tab. You specify a category for every asset. The category's use will become more apparent later when we discuss runtime views. For now, simply understand it as a feature that will make it easier to display data for the asset.

Now, let us look at how to create downtime events and how they are use in calculating availability.

5.4.1. Downtime Events

Notice that there are two sub-tabs on the Availability tab: the Events sub-tab and the Machine Cause Translations sub-tab. To configure your downtime events, you will need to use the Events sub-tab, shown in Figure 5.6. This is where you list the downtime events for an asset.

Events		Machine Cause Translations					
Enabled	Event Name	Event Type	Tag	Responsibility	Machine /	Default (Value	Commands
true	Blocked Fault	Blocked	... Box Filler Fault 1	Plant1 Area1	37	Unassi... 1	 
true	Starved Fault	Starved	... Box Filler Fault 2	Plant1 Area1	98	Unassi... 1	 
true	General Fault	Fault	... Box Filler Fault 3	Plant1 Area1	0	Unassi... 1	 
Add Event							

Figure 5.6 - Asset's Downtime Events

You can click the Add Event button to add a new event. You can click on the Edit  icon to change settings for an event or on the Delete  icon to remove an event.

The Enabled column provides a checkbox to *enable* (true) or *disable* (false) the event. Only enabled events are included in availability calculations. Use this column to disable events that are not currently valid downtime events for the asset.

For each event, you will need to specify a name, an event type, and the OPC tag that records the duration of the downtime event. You can select the tag by clicking on the browse button (that is, the ellipsis button) in the column to the right of the Tag column. This brings up the Unified Data Browser where you can choose the tag.

In the Responsibility column, you can assign responsibility for responding to the downtime event. The column's drop-down list is populated with the responsibilities that you configured in the Asset Options form (refer to section 5.2).

If the event is a machine event, for the Machine Assigned column you must specify the machine code that is typically the cause of the event. You can enter a value or browse for the OPC tag that contains the value. If there is more than one machine code that can cause the event, specify the machine code you want used as the *default*. Later, users can replace the default cause with the actual cause of the event when they review the Downtime Audit Report in their runtime views.

You can translate the event's machine codes to words by using the Machine Cause Translations tab. This helps your runtime users because, in reports, it inserts word

descriptions of machine codes (which you define here on this tab) rather than the codes themselves.

Event Name	MachineCauseID	Cause
Hydraulic Pressure Fault	1	Unassigned
Power Fault		Unassigned

Figure 5.7 - Translate Machine Codes to Words

If the event is not a machine event, there is no need for you to use the Machine Cause Translations sub-tab. Instead, on the Events sub-tab, the Machine Assigned column must be zero (0) so that the cause selected in the Default Cause column will be used. Later, runtime users can replace the default cause with the actual cause of the event when they review the Downtime Audit Report and the Quality Audit Report in their runtime views. We will get to these reports later in this course.

The Value column stores the value, or the OPC tag containing the value(s), that signals the beginning of the event. That is, it signals that a fault has occurred to trigger the event. For example, if an event happens to occur during a power failure and you have a tag that turns to the state of 1 (true) when it happens, you would enter 1 in the Value column to indicate that 1 means there is a power failure. However, if an OPC tag defines the fault, you can browse for the tag by clicking on the browse button to the right of the value column.

NOTE: Productivity Analytics uses the event value to create alarms. That is, the value you provide here is understood to identify an active *downtime* state for the event. Productivity Analytics considers *any value other than the one specified here* to identify an active *running* state for the event.

5.4.1.1. Calculating Availability

Once you have configured assets' downtime events, you need to decide how to use these downtime events for calculating each asset's availability. Any asset can have parent and child assets associated with it. You will need to decide if you want child assets' downtime events to be included in the calculation of the availability of each parent asset.

Figure 5.8 shows the top of the Asset Availability tab where the Downtime Processing drop-down list and the Include in Rollup Calculation checkbox are located.



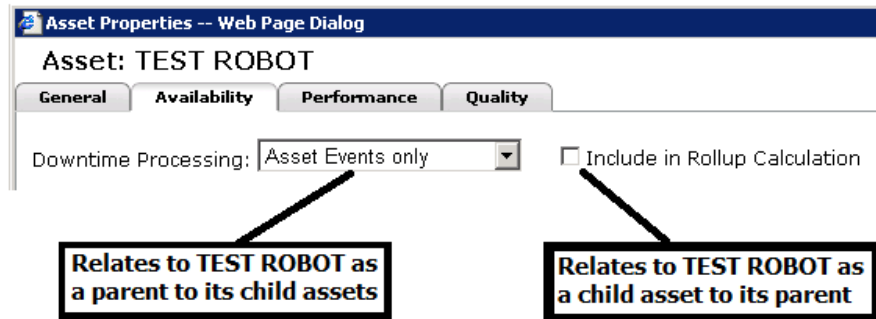


Figure 5.8 - Preview of Two Asset Availability Fields for TEST ROBOT

Let us take the bottom-up approach and first discuss the **Include in Rollup Calculation** option. This is a simple checkbox that, when checked, indicates that the availability of the asset should be rolled up to its parent. You will need to check this box for each asset whose availability is to be rolled into its parent's availability.

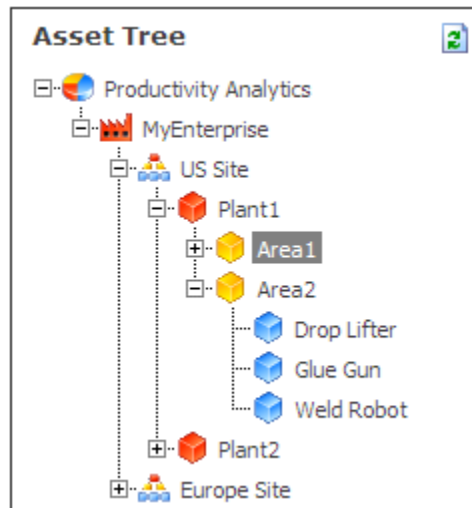


Figure 5.9 - Sample Asset Tree

Consider the Asset Tree shown in Figure 5.9. If the availability of Area2 depends on all three child assets (Drop Lifter, Glue Gun, and Weld Robot), then to include availability of these child assets in the calculation of Area2's availability, you will need to check the **Include in Rollup Calculation** option for each of the assets listed under Area2.

Once you have specified whether the availability of child assets will roll up to the parent, you must indicate for each parent asset (Area2 in our example) to calculate availability taking into consideration of its children's availability. To do this, you can select the appropriate option in the **Downtime Processing** drop-down list. The options for downtime processing include:

Downtime Processing Option:		Description:
Asset Events Only	 Area2	The asset's downtime events only
Child Assets Events Only	 Drop Lifter  Glue Gun  Weld Robot	The child assets' downtime events only
Child and Asset Events	 Area2  Drop Lifter  Glue Gun  Weld Robot	The asset's and its child assets' downtime events
Disabled		Availability is not calculated for the asset at all

In our example, Area2 is only a logical asset—as an asset, it does not have physical downtime events. In this case, to calculate the downtime for Area2, we can select the **Child Assets Event Only** option to calculate the area's availability. Because the availability of Area2 is calculated using only the availability of its child assets, we do not need to configure downtime events for Area2.

Note: An additional Downtime Processing option is also available. The **Independent Events** option calculates the asset's rolled-up availability *percentage* by dividing the Total Actual Operating Time of all machines that are rolled up to the asset by the Total Planned Operating Time of all machines that are rolled up to the asset. This would be an appropriate selection for Area2, also.

If, on the other hand, we had used the example of a parent of child assets in an assembly or production line, the parent's setting could be **Child Assets Event Only** or **Child and Asset Events**, while the child assets would be set to **Asset Events** only.

Keep in mind that the **Downtime Processing** and **Include in Rollup Calculation** settings do *not* change totals saved in the database for individual assets; they are only reflected in parent totals displayed in runtime views and reports. An asset's totals are always stored at the asset level; these two options determine whether those totals are rolled up when calculating availability.



Lab: Asset Availability

L5

In the previous lab, we created an asset tree for AcmeSeutical, but that alone will not produce OEE. We will need to track the different components of OEE, namely, availability, performance, and quality. In this lab, we will setup availability tracking for AcmeSeutical.

Estimated time to complete this lab: 60 minutes

5.1. Task Checklist

In this lab, you will complete the following tasks:

- Define equipment categories and causes
- Configure responsibilities
- Configure asset availability
- Add availability events
- Start the Productivity Analytics service

5.2. Support Files

You will need the following files to complete this lab:

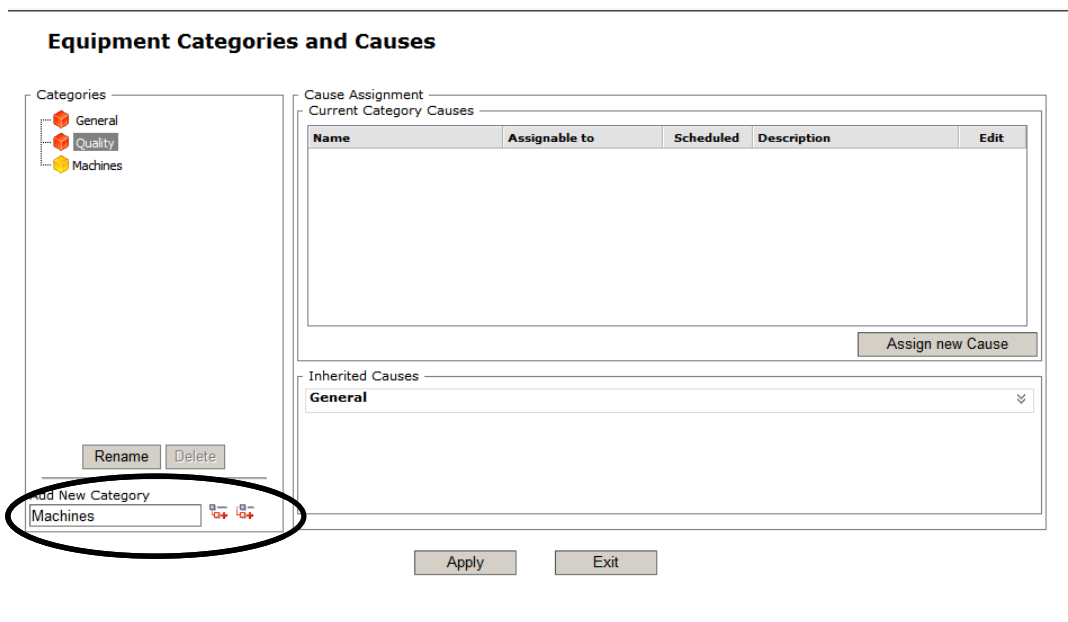
- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl
- AcmeSeutical_DWXConfig.mdb
- ACMEPillMachine.gdf

5.3. Defining Equipment Categories and Causes

The DataWorX32 configuration gives us a clue to the different equipment that AcmeSeutical uses for their production line. We will use this information to build our equipment categories and causes.

1. In the UWI, right-click on **ProductivityAnalytics** and select **Equipment Categories and Causes**.

2. The Equipment Categories and Causes configuration form loads in the right-hand pane.
3. General and Quality are default categories that will be in every project. We will need to define our own categories here.
4. Notice in the DataWorX32 configuration, as shown in Figure L5.1, there are folders such as Machines, Mixers, and Bottling Machines. These will be some of our equipment categories.
5. In the **Add New Category** textbox, type in “Machines” and click on the Add Sibling Node  icon to its right.



Equipment Categories and Causes

Categories

- General
- Quality
- Machines

Rename Delete

Add New Category

Machines  

Cause Assignment

Current Category Causes

Name	Assignable to	Scheduled	Description	Edit
------	---------------	-----------	-------------	------

Assign new Cause

Inherited Causes

General

Apply Exit

Figure L5.1 - Adding a Category

NOTE: If nothing happens when you click on the Add Sibling Node icon, click on an existing category (e.g., General or Quality) and then click on the icon again.

6. A natural cause for the machine to be down would be a power failure. Let us add that as a cause now.
7. With **Machines** selected in the Categories list, click on the **Assign New Cause** button.
8. A new line appears in the Current Category Causes list with the name “Machines_1”.
9. Click on the Edit  icon for this cause and change the name to “Power Failure”.
10. From the **Assignable To** drop-down list, select **Machine**.

11. Click on the Apply  icon to save the changes.
12. Repeat steps 7-11 to add the causes shown in Table L5.1.

Table L5.1 - Machines Downtime Causes

Name:	Assignable to:	Scheduled:
Maintenance	User and Machine	true
E-Stop	User and Machine	false
Break	User	true

13. Your configuration may now look similar to Figure L5.2.

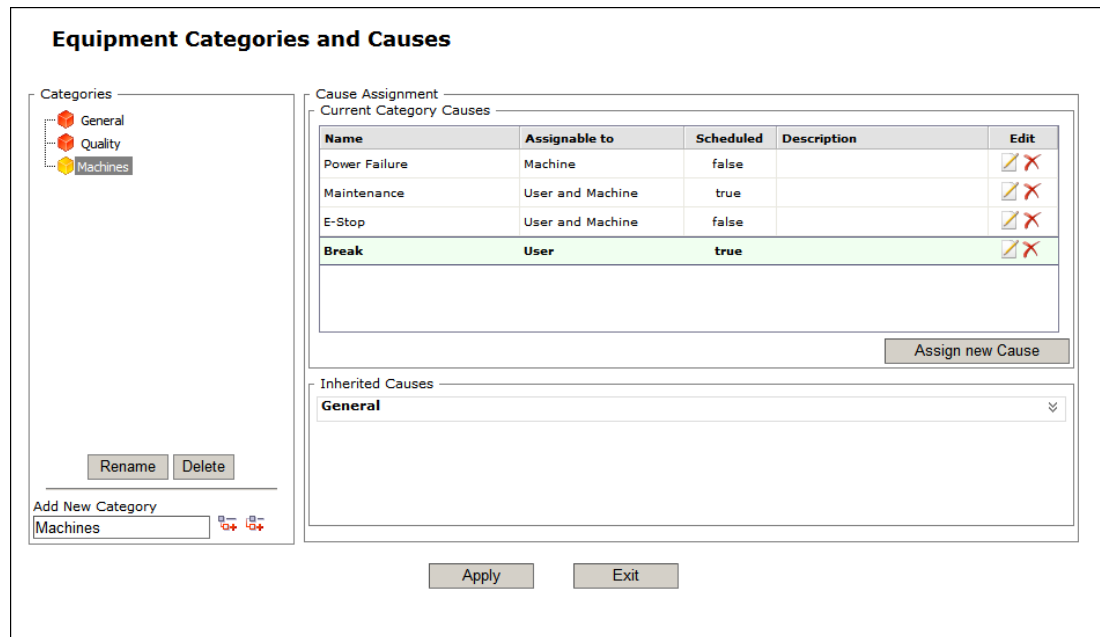


Figure L5.2 - Machines Downtime Causes

14. With the Machines category still selected, in the Add New Category textbox type in “Bottling Machines” and click on the Add Child Node  icon.
15. Selecting the Bottling Machines category. Notice that the Inherited Causes section lists both General and Machines. Because Bottling Machines is a child item of Machines, it inherits all the causes from Machines.
16. Add the downtime causes for Bottling Machines listed in Table L5.2.

Table L5.2 - Bottling Machines Downtime Causes

Name:	Assignable to:	Scheduled:
Out of Bottles	User and Machine	false
Waiting for Product	Machine	false

17. Add a sibling node to the Bottling Machines category and call it “Mixers”.
18. Add the downtime causes for Mixers shown in Table L5.3.

Table L5.3 - Mixers Downtime Causes

Name:	Assignable to:	Scheduled:
Pump Stopped	User and Machine	false
Valve Closed	User and Machine	false
Empty Mixer	User and Machine	false

19. Click on the Apply button when you are done. Your configuration may look similar to Figure L5.3.

Equipment Categories and Causes

Categories

- General
- Quality
- Machines
 - Bottling Machines
 - Mixers

Rename Delete

Add New Category

Mixers

Cause Assignment

Current Category Causes

Name	Assignable to	Scheduled	Description	Edit
Pump Stopped	User and Machine	false		
Valve Closed	User and Machine	false		
Empty Mixer	User and Machine	false		

Assign new Cause

Inherited Causes

- General
- Machines

Apply Exit

Figure L5.3 - Equipment Categories and Causes

5.4. Configuring Responsibilities

Next we will configure responsibility records for our assets.

1. In the UWI, right-click on **ProductivityAnalytics** in the navigation tree and select **Options**.
2. Click on the **Responsibilities** tab.
3. Click on the **Add New Responsibility** button.

4. In the new line that is added in the Responsibilities section, type in “Foxborough Machine1” in the Name section.
5. In the Description, type in “Engineer: Barney 555-555-5555” and click on the Apply  icon.
6. Repeat steps 3-4 to create another responsibility called “Foxborough Machine2”.
7. Click on the Apply button to save the changes.

5.5. Configuring Availability

We are now ready to configure availability for our assets.

1. In the UWI, right-click on **ProductivityAnalytics** in the navigation tree and select **Asset Configuration**.
2. In the asset tree, navigate to Acmeseutical → USA → Foxborough → Machine1 → Mixers.
3. In the Mixers Assets section, select **MixerA** and click on the **Configure**  icon to bring up the Asset Properties dialog.
4. Select the **Availability** tab.
5. Put a checkmark in the **Include in Rollup Calculation** checkbox.
6. In the Category drop-down list, select **Mixers**.
7. In the Events sub-tab, click on the **Add Event** button.
8. Type in “Pump Off” in the Event Name column.
9. Click on the ellipsis button at the right of the event’s Tag column to bring up the Data Browser (the UDB).
10. On the OPC DA tab, browse to Internet → OPC Direct → *ComputerName* → ICONICS.DataWorX32.8 → Registers → USA → Foxborough → Machine1 → Mixers → MixerA → PumpStatus, and select PumpStatus as shown in Figure L5.4. The field at the top of the UDB should contain a tag like the following:
\\Icotraining\ICONICS.DataWorX32.8\USA.Foxborough.Machine1.Mixers.MixerC.PumpStatus

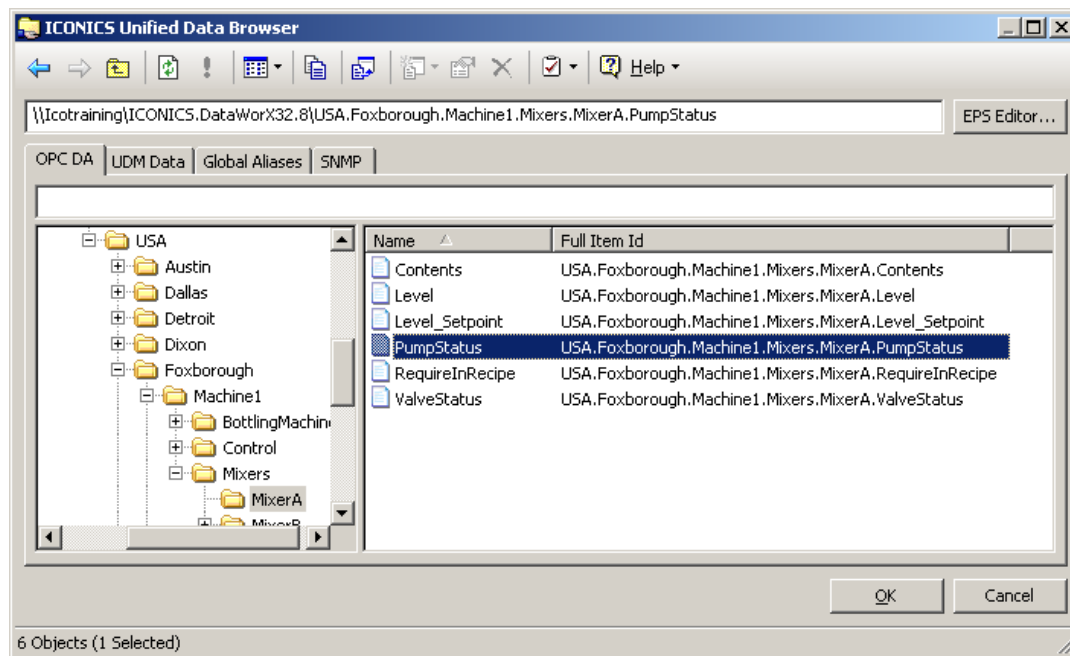


Figure L5.4 - Unified Data Browser with PumpStatus Tag

11. Click on OK to select the tag and close the UDB.
12. Change the Responsibility column to **Foxborough Machine1**. If the words are cut off in the drop-down list, you can widen the column first by placing the cursor on the edge of the column so that the cursor becomes a horizontal double arrow. Just click and drag your mouse to widen the column.
13. Set the Default Cause column to **Pump Stopped** and type "0" in the Value column.

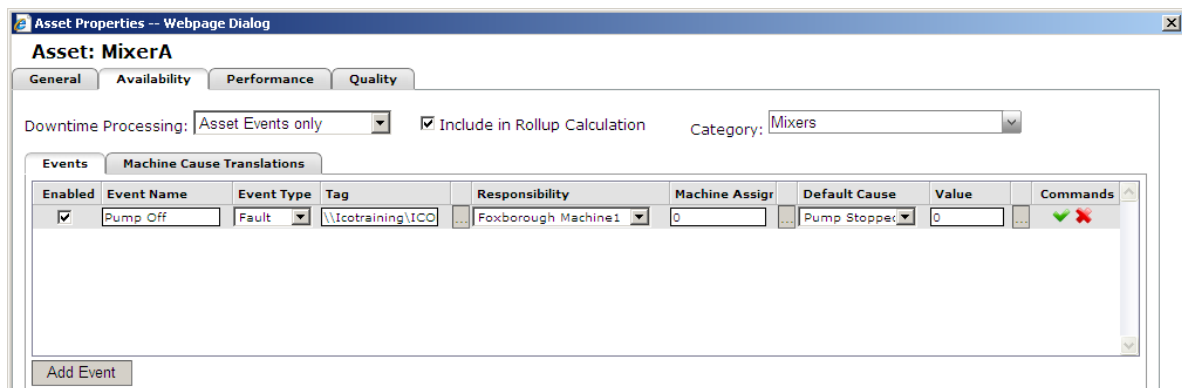


Figure L5.5 - Pump Off Downtime Event

14. Click on the Apply  icon to save the changes.
15. Repeat steps 7-14 to add the two additional downtime events listed in Table L5.4.



Table L5.4 - MixerA Downtime Events

Event Name	Type	Tag	Responsibility	Default Cause	Value
Valve Closed	Fault	\\Icotraining\ICONICS.DataWo rX32.8\USA.Foxborough.Mach ine1.Mixers.MixerA.ValveStat us	Foxborough Machine1	Valve Closed	0
Tank Empty	Starved	\\Icotraining\ICONICS.DataWo rX32.8\USA.Foxborough.Mach ine1.Mixers.MixerA.Level	Foxborough Machine1	Empty Mixer	0

16. Your configuration may now look similar to Figure L5.6.

The screenshot shows the 'Asset Properties -- Webpage Dialog' for 'Asset: MixerA'. The 'Availability' tab is selected. The 'Downtime Processing' dropdown is set to 'Asset Events only', and the 'Include in Rollup Calculation' checkbox is checked. The 'Category' dropdown is set to 'Mixers'. Below this, there is a table with columns: Enabled, Event Name, Event Type, Tag, Responsibility, Machin, Default Cause, Value, and Commands. The table contains three rows of data for 'Pump Off', 'Valve Clo...', and 'Tank Empty' events. At the bottom, there is an 'Add Event' button and a 'Batch Details' section with checkboxes for 'Batch Enabled' and input fields for 'Batch ID', 'Batch Name', 'Batch Start', and 'Batch End'. 'Apply' and 'Cancel' buttons are at the bottom right.

Figure L5.6 - MixerA Availability Configuration

17. Click on the Apply button at the bottom of the dialog and then close the dialog by clicking on the Cancel button.
18. Repeat steps 3-17 for MixerB, MixerC, and MixerD, changing the OPC Tag accordingly for each mixer.
19. In the asset tree, navigate to Acmeseutical → USA → Foxborough → Machine1.
20. Select **BottlingMachine** and click on the Configure  icon to bring up the Asset Properties dialog.
21. On the **Availability** tab, put a checkmark in the **Include in Rollup Calculation** checkbox.
22. Set the Category to **Bottling Machines**.

23. Click on the Add Event button to add a downtime event.
24. Name this event “Conveyor Stopped”.
25. Set the tag to
“\\Icotraining\ICONICS.DataWorX32.8\USA.Foxborough.Machine1.BottlingMachine.BeltSpeed”.
26. Set the Responsibility to **Foxborough Machine1**.
27. Change the Default Cause to **Power Failure** and set the Value to “0”.
28. Click on the Apply  icon to save the changes.
29. Click on the Apply button to save the changes and then click on the Cancel button to close the dialog.
30. With Machine1 still selected in the asset tree, click on the Configure  icon for **Mixers** to bring up the Asset Properties dialog.
31. On the **Availability** tab, change Downtime Processing to **Child Asset Events Only** and put a checkmark in the **Include in Rollup Calculation** checkbox.
32. Change the Category to **Machines**.
33. Unlike the mixers we added downtime events to earlier, this asset is a *logical* asset that serves as a grouping for real assets; therefore, we will not add any downtime events. Click on the Apply button to save the changes and click on the Cancel button to close the dialog.

Asset: Mixers

General

Availability

Performance

Quality

Downtime Processing: Child Assets Events only
☒ Include in Rollup Calculation
Category: Machines

Events

Machine Cause Translations

Enabled	Event Name	Event Type	Tag	Responsibilit	Machine Assi	Default Caus	Value	Commands

Add Event

Batch Details
☐ Batch Enabled

Batch ID: ... Batch Start: ...

Batch Name: ... Batch End: ...

Apply

Cancel

Figure L5.7 - Mixers Availability Configuration



34. In the asset tree, navigate to Acmeseutical → USA → Foxborough.
35. Click on the Configure  icon for **Machine1** to open the Asset Properties dialog.
36. On the **Availability** tab, change the Downtime Processing to **Child and Asset Events** and put a checkmark in the **Include in Rollup Calculation** checkbox.
37. Change the Category to **Machines**.
38. Click on the Add Event button in the Events sub-tab.
39. Name the new event “Machine Down” and leave the Event Type as **Fault**.
40. Set the Tag column to read:
“\\Icotraining\ICONICS.DataWorX32.8\USA.Foxborough.Machine1.Status”.
41. Set the Responsibility to **Foxborough Machine1**.
42. Change the Default Cause to **Power Failure** and enter “0” as the value.
43. Click on the Apply  icon to save the changes.

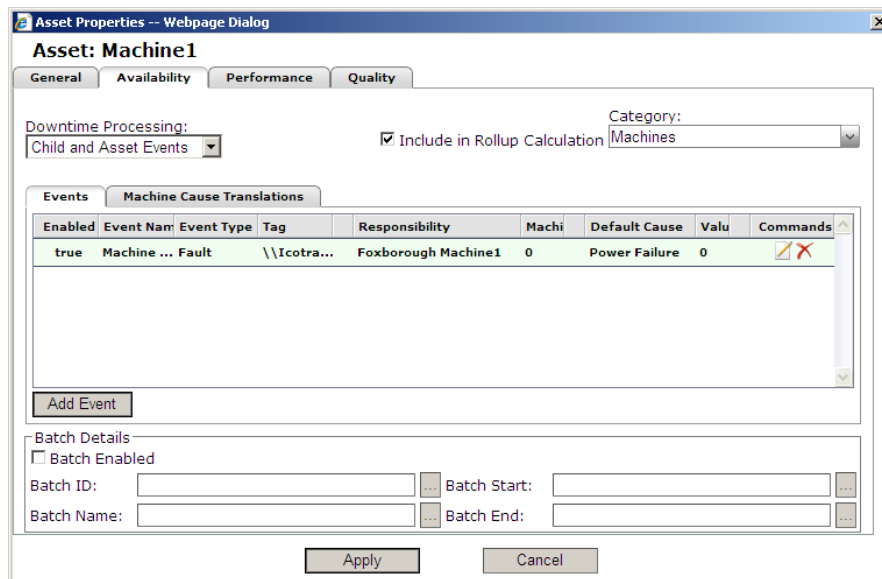


Figure L5.8 - Machine1 Availability Configuration

44. Click on the Apply button to save the changes and click on the Cancel button to close the dialog.
45. In the asset tree, navigate to Acmeseutical → USA.
46. Click on the Configure  icon for **Foxborough** to bring up the Asset Properties dialog.

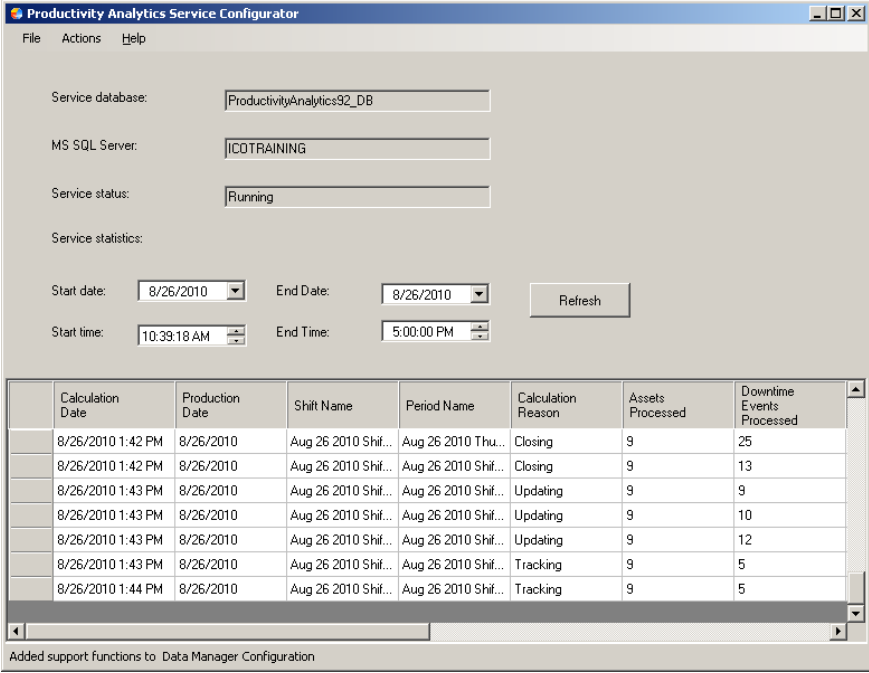
5.6. Generating Availability Data

In order for us to track the downtime events, we will need to start the Productivity Analytics service as well.

1. Launch the Productivity Analytics Service Configurator from Start → Programs → ICONICS BizViz → Productivity Analytics → Productivity Analytics Service Configurator.
2. Select Action → Service → Start to start the service.
3. Set the Start Date to today's date and the Start time to now.
4. Set the End Date to today's date and the End Time to 5:00 PM.
5. Click on the **Refresh** button. If you do not see anything come up, wait for another minute and click on the button again.

NOTE: The statistics that you see here update every minute and until there are data in the tables for processing, you will not see any updates.

6. Since there are some downtime events (alarms), you should see some values in the Downtime Events Processed column. This tells us that the Productivity Analytics service is tracking downtime data.



The screenshot shows the 'Productivity Analytics Service Configurator' window. It has a menu bar with 'File', 'Actions', and 'Help'. Below the menu bar, there are input fields for 'Service database:' (ProductivityAnalytics92_DB), 'MS SQL Server:' (ICOTRAINING), and 'Service status:' (Running). Under 'Service statistics:', there are dropdowns for 'Start date:' (8/26/2010) and 'End Date:' (8/26/2010), and spinners for 'Start time:' (10:39:18 AM) and 'End Time:' (5:00:00 PM). A 'Refresh' button is located to the right of the date dropdowns. At the bottom, there is a table with 8 columns: Calculation Date, Production Date, Shift Name, Period Name, Calculation Reason, Assets Processed, and Downtime Events Processed. The table contains 8 rows of data. Below the table, there is a status bar that reads 'Added support functions to: Data Manager Configuration'.

Calculation Date	Production Date	Shift Name	Period Name	Calculation Reason	Assets Processed	Downtime Events Processed
8/26/2010 1:42 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Thu...	Closing	9	25
8/26/2010 1:42 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Closing	9	13
8/26/2010 1:43 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Updating	9	9
8/26/2010 1:43 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Updating	9	10
8/26/2010 1:43 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Updating	9	12
8/26/2010 1:43 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Tracking	9	5
8/26/2010 1:44 PM	8/26/2010	Aug 26 2010 Shif...	Aug 26 2010 Shif...	Tracking	9	5

Figure L5.10 - Productivity Analytics Service Configurator with Downtime Events

7. Open the ACMEPillMachine.gdf display from C:\Training. Feel free to click on the production control to start and stop the production. This should generate downtime data as well. After you have stopped the production control, check the **Productivity Analytics Service Configurator** to see your downtime being processed. Keep in mind that it may take up to a minute for that new information to come into the service configurator.



Review: Asset Availability

R5

5.1. Chapter Objectives

You should know and understand the following topics:

- Types of downtime events
- Equipment categories
- Downtime causes
- Downtime responsibilities

5.2. Summary

A *downtime event* defines the beginning and end time when an asset stops producing products. Downtime events such as lunch breaks can be *scheduled*, and do not count against the asset's OEE calculation. *Unscheduled* downtimes, however, do count against the asset's OEE. You can define the different equipment categories and downtime causes in Productivity Analytics. It is in this definition that you identify scheduled downtimes.

Before you start configuring asset downtimes, you define *downtime event types*. Downtime events are categorized into types so that users can isolate and report on types of events. Four are already predefined in Productivity Analytics: Fault, Blocked, Starved, and Idle. You should also define *Responsibility* records in Productivity Analytics, which are records that identify phone numbers and other contact information like business hours, contacts' names, instructions or the location of instructions for handling a downtime event, or any other information that may help when a downtime event occurs.

A *downtime cause* is the reason for a downtime event, such as equipment failure or retooling. You assign *default causes* to assets' downtime events which can be replaced, if necessary, after an outage by actual causes using online, interactive reports in Productivity Analytics. You must also *categorize* your downtime causes by equipment type or other categories. Two system categories, General and Quality, cannot be deleted.

You use the Asset Properties dialog to identify each asset's scheduled and potential downtime events. A downtime event consists of a name, the event type, the data source

that monitors the state of the asset, the value that indicates the asset is offline, the Responsibility record, and the default cause of the downtime event. You can also define a machine-assigned cause if there is a data source that indicates the downtime cause for a machine outage.

For each asset, you must also identify how (or whether) its *availability is calculated*. First you must identify its role as a child asset by specifying whether its availability is included in its parent asset's availability calculations. And then you must specify its role as a parent asset by specifying the availability totals that are used in its availability calculation.

5.3. *Terms*

Child Asset	Default Cause	Downtime
Downtime Cause	Downtime Event	Parent Asset
Responsibility	Rollup Calculation	

5.4. *Test Your Knowledge*

In this chapter, we discussed how to configure availability for assets in the asset tree. Before you continue to the next chapter, make sure that you can answer the following questions.

1. What are some possible uses for a responsibility record?
 - a. Employee or contractor contact information
 - b. A contact's business hours
 - c. Instructions for handling downtime events
 - d. Repair instructions
 - e. All of the above
 - f. Only A and B
 - g. Only B and C
 - h. None of the above



2. Which of the following are default downtime event types configured in Productivity Analytics?
 - a. Fault
 - b. Blocked
 - c. Starved
 - d. Idle
 - e. All of the above
 - f. None of the above
3. True or False: You can use machine codes in an OPC data source to define the downtime cause of a downtime event.
4. True or False: You can roll up an asset's downtime calculation into its parent.
5. True or False: You can track a logical asset's downtime even if you do not specify any downtime event in the asset downtime configuration.
6. Which of the following are the default downtime categories in Productivity Analytics?
 - a. General
 - b. Availability
 - c. Performance
 - d. Quality
 - e. All of the above
 - f. Only A and C
 - g. Only A and D
 - h. None of the above
7. Which of the following are available ways of calculating downtime?
 - a. Only asset downtime events
 - b. Only child asset downtime events
 - c. Both asset and its child asset downtime events
 - d. All of the above
 - e. None of the above



Asset Performance

6

Recall that OEE is calculated using three separate components: Availability, Performance, and Quality. In the previous chapters, we saw how Productivity Analytics tracks availability and downtime events. But we still need to learn two more pieces of information before we can calculate OEE. They are Performance and Quality.

Productivity Analytics comes with two types of calculations: Performance and Quality. Predefined formulas are provided for each type of calculation. Once you have a general understand of each of the calculations, you can tailor them to suit your needs. You can also rename the existing calculations and add new calculations. In this course, you will see how to define your own calculations as well as understand the predefined calculations and the variables that are available for different calculations.

In this chapter, we will focus on the **performance** calculations. By the end of the chapter, you should be familiar with the following topics:

- Defining performance calculations
- Variables used for calculating performance
- Ways to track performance

6.1. Performance Calculations

The following performance calculations come with Productivity Analytics. These types of calculations are available for computing performance for any asset.

Cycle Time:	$\frac{\text{BPA.IdealCycleTime}}{\text{BPA.OperatingTime} / \text{BPA.TotalItems}}$
Throughput Time:	$\frac{\text{BPA.TotalItems} / \text{BPA.OperatingTime}}{\text{BPA.Ideal Throughput}}$
Actual and Target:	$\frac{\text{BPA.ActualTarget}}{\text{BPA.IdealTarget}}$

The variables used in these calculations, along with additional variables, are available to you for altering the performance calculations. There are two types of variables used in performance calculations: *quantity* variables and *time duration* variables. Let us look at these variables and how each variable obtains its value for an asset.

6.1.1. Quantity Variables

Quantity variables are populated by the OPC tags that you configure for each asset, except for the **BPA.TotalItems** variable, which is calculated by Productivity Analytics. An example of a quantity variable is the **BPA.IdealTarget**, which is the asset's ideal target quantity, stored in the configuration database when you defined the asset. Quantity variables used in performance calculations include:

- **BPA.IdealTarget** – The ideal quantity per reported count, this variable is typically populated by a value you enter for the asset or (less typically) by an OPC tag that stores the asset's ideal. It is used exclusively for Actual and Target calculations.
- **BPA.ActualTarget** – The actual quantity per reported count, this variable is typically populated by an OPC tag for the asset. It is used exclusively for Actual and Target calculations.
- **BPA.IdealCycleTime** – The ideal cycle duration, this variable is typically populated by a value you enter for the asset or (less typically) by an OPC tag that stores the asset's ideal. It is used exclusively for Cycle Time calculations.
- **BPA.ActualCycleTime** – The actual cycle duration, this variable is typically populated by an OPC tag for the asset. It is used exclusively for Cycle Time calculations.
- **BPA.IdealThroughput** – The ideal throughput quantity, this variable is typically populated by a value you enter for the asset or (less typically) by an OPC tag that stores the asset's ideal. It is used exclusively for Throughput Time calculations.
- **BPA.ActualThroughput** – The actual throughput quantity, this variable is typically populated by an OPC tag for the asset. It is used exclusively for Throughput Time calculations.
- **BPA.TotalItems** – The total actual quantity produced, this variable is the only variable in this list that is calculated by Productivity Analytics.

6.1.2. Time Duration Variables

Time duration variables are calculated by Productivity Analytics, and are based on the *shift schedule* and an *asset's downtime events*. They are also influenced by the *causes* assigned to the downtime events, as causes are defined as scheduled or unscheduled. Time duration variables used in production calculations are:

- **BPA.PlannedProductionTime** – The production duration that was planned or scheduled for the asset



- **BPA.OperatingTime** – The actual production duration for the asset
- **BPA.ScheduledDowntime** – The asset's planned downtime (for example, scheduled maintenance)
- **BPA.UnScheduledDowntime** – The asset's unplanned downtime

6.1.3. Configuring Performance

Now that we know the different variables and formulas used for performance calculations, let us look at where these formulas are stored. You can use the General Applications Options **Calculations** tab to define your arithmetic operations for calculating *performance*. You can also use this form to define *quality* calculation expressions.

Name	Description	Type	Expression	Edit
Cycle Time C...	Performance calc...	Performance	x= {{BPA.IdealCycleTime}} / ...	[Edit] [Delete]
Throughput Ti...	Performance calc...	Performance	x= ({{BPA.TotalItems}}) / {{...}}	[Edit] [Delete]
Total and Bad...	Quality calculatio...	Quality	x= ({{BPA.TotalItems}} / {{BPA.OperatingTime}}) / {{BPA.IdealThroughput}}	[Edit] [Delete]
Good and Tot...	Quality calculatio...	Quality	x= {{BPA.GoodItems}} / {{BPA.IdealThroughput}}	[Edit] [Delete]
Good,Total a...	Quality calculatio...	Quality	x= {{BPA.GoodItems}} / ({{BPA.TotalItems}} - {{BPA.BadItems}})	[Edit] [Delete]
Total, Bad an...	Quality calculatio...	Quality	x= ({{BPA.TotalItems}}) - {{BPA.BadItems}}	[Edit] [Delete]
Actual and Ta...	Performance calc...	Performance	x= ({{BPA.ActualTarget}}) / {{BPA.ActualTarget}}	[Edit] [Delete]
New Calculation		Performance		[Add] [Delete]

Add New Calculation

Figure 6.1 - Calculations for Performance and Quality

Calculations are defined and edited using the **Expression Editor** as shown in Figure 6.2. You can bring up this editor by clicking on the ellipsis ... button.

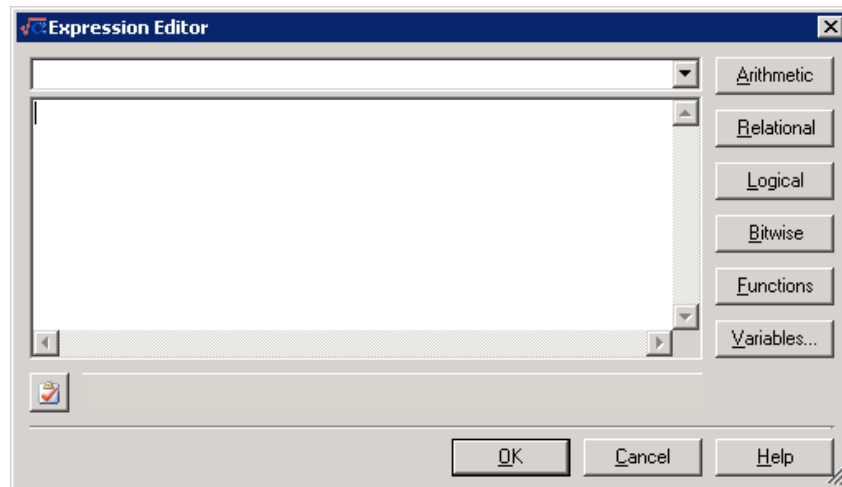


Figure 6.2 - The Expression Editor for Editing Calculations

In the Expression Editor, clicking the buttons on the right gives you access to *syntactical expressions* you can use in your calculations. Clicking the **Variables** button gives you access to the performance and quality variables used in calculations, which are shown in Figure 6.3. (We will look at quality variables in the next chapter.)

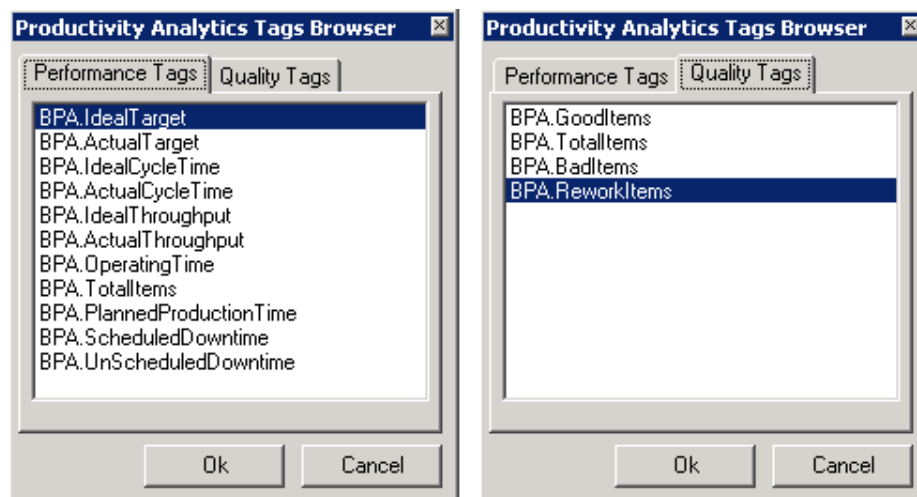


Figure 6.3 - Productivity Analytics Tag Browser

6.2. Asset Performance

The information you supply on the Performance tab populates the following performance variables, which are used in performance calculations, as we saw earlier:

- BPA.IdealTarget – The ideal quantity per reported count
- BPA.ActualTarget – The actual quantity per reported count
- BPA.IdealCycleTime – The ideal cycle duration



- BPA.ActualCycleTime – The actual cycle duration
- BPA.IdealThroughput – The ideal throughput quantity
- BPA.ActualThroughput – The actual throughput quantity
- BPA.TotalItems – The total quantity produced

Asset: Biscuit Oven

General Availability **Performance** Quality

Performance

☒ Performance Calculation Enabled

Performance Calculation method: Cycle Time Calculation

Calculations

Using: Cycle Time Seconds Pulse

Ideal: PA.Developer.PerfCounters.Oven Output Target ...

Actual: PA.Developer.PerfCounters.Oven Output Actual ...

Rollover: ...

Batch Details

☒ Batch Enabled Copy from Availability

Batch ID: A.Developer.Batch.BatchID ... Batch Start: oper.Batch.BatchStartTime ...

Batch Name: eveloper.Batch.BatchName ... Batch End: loper.Batch.BatchEndTime ...

Figure 6.4 - Asset form Performance Tab

If you want to calculate the performance of an asset, you must put a checkmark in the **Performance Calculation Enabled** option at the top of the asset's Performance tab. Note that Productivity Analytics will collect any asset data specified on this tab even if you haven't enabled the asset's performance calculation.

NOTE: Please refer to Section 6.1 for the types of performance calculations.

The **Performance Calculation Method** drop-down list is where you identify the calculation for measuring this particular asset's performance. How you populate the fields in the Calculations section depends on the calculation method that have you chosen. The calculation can compute either *cycle time*, *throughput time*, or the *actual and target count*.

After choosing the Performance Calculation Method, you can identify the OPC tags that will supply data for the calculation, starting with the three-part **Using** field. To simplify our discussion over the next few sections, we will refer to the *first* Using field as the **calculation method**, the *second* Using field as the **interval**, and the *third* Using field as the **calculation rate**, as shown in Figure 6.5.

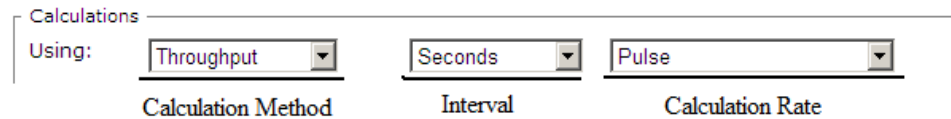


Figure 6.5 - Defining Using Fields

The first field (the calculation method) is always populated in accordance with the selected Performance Calculation Method. You cannot change the option in this field; it changes only when you change the Performance Calculation Method field. So let us next look closely at the Performance Calculation Method options and how you configure them.

6.2.1. Cycle Time

If the calculation method field displays **Cycle Time**, this means you chose Cycle Time Calculation as the Performance Calculation Method, and that the asset's OPC tags record the duration of a cycle. Therefore, you must enter the following information for the Using fields and other fields that become available for this method:

- For the **interval**, specify whether the asset's cycle time duration is measured in Seconds, Minutes, or Hours.
- In the **Ideal** field, type in the ideal cycle time for the asset. If you store the asset's ideal time in an OPC tag, you can specify the tag instead of a number. This value is used to populate the BPA.IdealCycleTime variable if the variable is used in the asset's performance calculation.
- In the **Actual** field, specify the OPC tag that captures the actual duration of the asset's cycle time. This value is used to populate the BPA.ActualCycleTime variable if the variable is used in the asset's performance calculation.

For example, if the ideal cycle time for this asset is 90 minutes, you would select Minutes as the interval, enter 90 in the Ideal field, and in the Actual field select the OPC tag that captures the asset's actual cycle time in minutes.

6.2.2. Throughput Time Calculation

If the calculation method displays **Throughput**, this means you chose Throughput Time Calculation for the Performance Calculation Method. You must enter the following information for the Using fields and other fields for this method:

- For the **interval**, specify whether the asset's throughput performance is captured in Seconds, Minutes, or Hours.



- For the **calculation rate**, choose one of the following options to describe the counter total that is captured. This defines how Productivity Analytics will use the OPC tag defined in the actual field in a calculation.
 - Pulse** – The counter records a quantity of 1 for each pulse. The total number of pulses determines the total count. A pulse could be any change in an OPC tag.
 - Differential** – The counter records the exact quantity made for the duration of the count. For example, a count of 100 is recorded each time the count reaches 100, or a count is recorded every hour and then the counter resets to 0 (zero).
 - Cumulative no Rollover** – The counter records a running total, and the counter never resets to 0 (zero). For example, each hour the count is recorded.
 - Cumulative with Rollover** – The counter contains a running total, but the counter resets to 0 (zero) occasionally or on a regular basis. If you select this option, in the **Rollover** field you must specify the tag that captures the rollover amount, or type the rollover quantity if the quantity is always the same.
- In the **Ideal** field, type the ideal throughput quantity. If you have this quantity in a tag, you can specify the tag if you wish. This value is used to populate the BPA.ActualThroughput variable if the variable is used in the asset's performance calculation.
- In the **Actual** field, specify the tag that captures the actual throughput quantity. This value is used to populate the BPA.IdealTarget variable if the variable is used in the asset's performance calculation.

6.2.3. Actual and Target Calculations

If the calculation method displays **Target**, this means you chose the Actual and Target Calculation as the Performance Calculation Method, which reports the raw count per shift or batch. You must enter the following information for the Using fields and other fields for this method:

- For the **calculation rate**, choose one of the following options to describe the counter total that is captured: Pulse, Differential, or Cumulative No Rollover. (Although you have the option to select Cumulative With Rollover, this choice in this case is irrelevant.)

NOTE: Actual and Target calculations contain the same set of counters as the Throughput Time calculations. Since they are identical, we will not describe them

again. You should keep in mind, though, that the Cumulative With Rollover counter is *not* applicable for the target calculations.

- In the **Ideal** field, type the ideal quantity of each reported count. If you have this quantity in a tag, you can specify the tag if you wish. This value is used to populate the BPA.IdealTarget variable if the variable is used in the asset's performance calculation.
- In the **Actual** field, specify the tag that captures the actual quantity of each reported count. This value is used to populate the BPA.ActualTarget variable if the variable is used in the asset's performance calculation.



Lab: Asset Performance

L6

In the previous labs, we configured AcmeSeutical assets to track their availability, and we are well on our way to calculating OEEs. However, in order to calculate OEE, we will need to set up tracking for Performance and Quality. In this lab, we will configure AcmeSeutical assets to track performance.

Estimated time to complete this lab: 20 minutes

6.1. Task Checklist

In this lab, you will complete the following tasks:

- Enable performance for an asset
- Set up ideal vs. actual performance calculation
- Generate performance data

6.2. Support Files

You will need the following files to complete this lab:

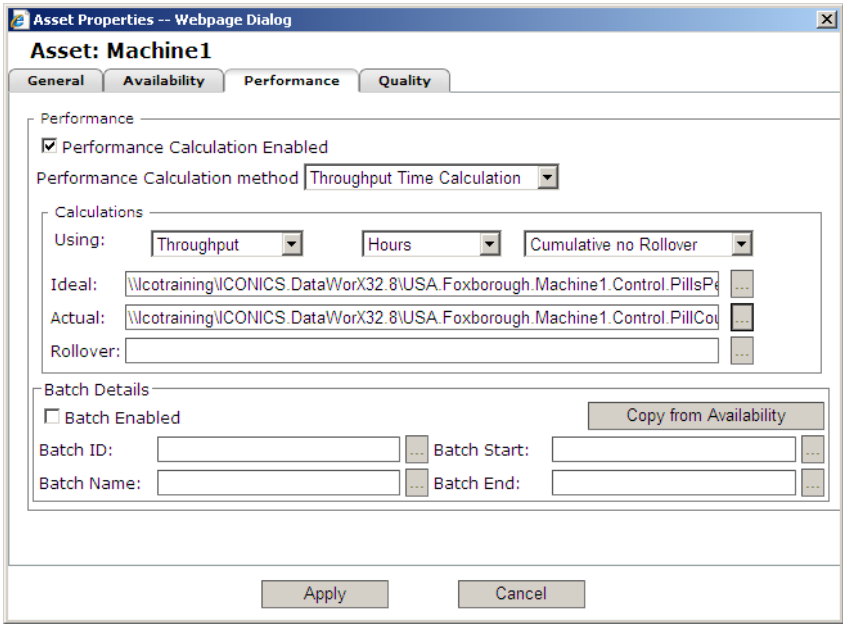
- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl
- BPA_UdmDatabase.mdf
- BPA_UdmDatabase.udl
- ACMEPillMachine.gdf
- ACMEBottleMachine.gdf
- ACMEMixers.gdf
- ACMERecipes.gdf

6.3. Asset Performance Configuration

In order to add performance calculation, we will need to go back into the asset configuration.

1. Launch the UWI if you closed it from a previous lab.

2. Right-click on **ProductivityAnalytics** in the navigation tree and select **Asset Configuration**.
3. In the Asset Tree, browse to Acmeseutical → USA → Foxborough.
4. Select **Machine1** in the Foxborough Assets section and click on its Configure  icon to bring up the Asset Properties dialog.
5. Go to the Performance tab and put a checkmark in the **Performance Calculation Enabled** checkbox.
6. For the Performance Calculation Method, select **Throughput Time Calculation**.
7. In the Using fields, choose **Throughput**, **Hours**, and **Cumulative no Rollover**.
8. Click on the ellipsis ... button to the right of the Ideal field to bring up the UDB.
9. Browse for the tag
“\\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.PillsPerhour” and double-click it to select it.
10. Click on the ellipsis ... button to the right of the Actual field to bring up the UDB.
11. Browse for the tag
“\\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.PillCount” and double-click it to select it.
12. Your configuration should look similar to Figure L6.1.



Asset Properties -- Webpage Dialog

Asset: Machine1

General Availability **Performance** Quality

Performance

☒ Performance Calculation Enabled

Performance Calculation method: Throughput Time Calculation

Calculations

Using: Throughput Hours Cumulative no Rollover

Ideal: \\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.PillsPerhour

Actual: \\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.PillCount

Rollover:

Batch Details

☐ Batch Enabled

Copy from Availability

Batch ID: Batch Start:

Batch Name: Batch End:

Apply Cancel

Figure L6.1 - Performance Configuration for Machine1



13. Click on Apply to save the changes, then click on Cancel to close the dialog.
14. If you have more time, feel free to add the same performance information for Machine2 in Foxborough as well as other machines in other areas.

6.4. *Generating Performance Data*

1. Make sure that the Productivity Analytics service is still running.
2. Open the ACMEPillMachine.gdf and go into runtime. Make sure that the production has NOT started yet.
3. Switch display to the ACMERecipes.gdf to select a recipe then go back to the ACMEPillMachine.gdf.
4. Fill up each mixer by clicking on it and opening the valves of the mixer.
5. When the mixers have some contents in them, start the production.
6. Browse to the ACMEBottleMachine.gdf display. You should see some information in regard to the number of pills produced and the number of pills rejected.
7. Go into the Productivity Analytics Service Configurator and check that you have some Performance data.



Review: Asset Performance

R6

6.1. Chapter Objectives

You should know and understand the following topics:

- Defining performance calculations
- Variables used for calculating performance
- Ways to track performance

6.2. Summary

Productivity Analytics provides default Performance calculation formulas. You can use these default ones or change them according to your preference. The performance calculations use two types of variables: quantity and time duration. Each of these variable types can affect the performance calculation.

Once you have defined the performance calculation formulas, you can configure an asset to calculate performance. This is done using the Asset Configuration. In the configurator, you can choose the calculate performance method of Cycle Time, Throughput Time Calculation, or Actual and Target Calculation.

6.3. Terms

Actual and Target Calculation
Performance Calculation
Throughput Time Calculation

Cycle Time Calculation
Quantity Variables
Time Duration Variables

6.4. Test Your Knowledge

In this chapter, we discussed how you can track performance using Productivity Analytics. You should be able to answer the following questions now.

1. True or False: For performance calculations, the *ideal* count and the *actual* count are both available as variables.

2. Which types of performance calculations are available in Productivity Analytics?
 - a. Throughput Count, Actual and Target Rate, and Cycle Time
 - b. Cycle Count, Differential, and Pulse
 - c. Rollover, Cumulative, Pulse, and Cycle Count
 - d. All of the above
 - e. None of the above
3. Which time duration variables can you capture using Productivity Analytics?
 - a. Planned production time
 - b. Operating time
 - c. Scheduled down time
 - d. Unscheduled down time
 - e. All of the above
 - f. None of the above
4. Which quantity variables can you capture using Productivity Analytics?
 - a. Actual quantity, cycle duration, and throughput quantity
 - b. Ideal quantity, cycle duration, and throughput quantity
 - c. The total quantity produced
 - d. A and B only
 - e. A and C only
 - f. All of the above
5. True or False: Ideal quantities cannot be captured using OPC tags.
6. Shift schedules are used for calculating which variables?
 - a. Time duration variables
 - b. Unscheduled down time
 - c. Actual cycle time
 - d. A and B only
 - e. B and C only
 - f. All of the above
7. Arithmetic operations for calculating performance are defined on which Productivity Analytics form?
 - a. The asset's Performance tab
 - b. The General Applications Options Calculations tab
 - c. The Shift Schedule form
 - d. Arithmetic operations for performance are predefined and cannot be changed



Production Quality

7

By now, we have two pieces necessary to calculate OEE. The last piece of information that we need is **quality**. While downtime and performance are all related to the asset itself, quality relates to the *outcome* of the product produced by the asset. In this chapter, we will look at how Productivity Analytics tracks quality information in a production line. By the end of the chapter, you should understand the following:

- Available quality calculations
- Quality variables
- Configuring quality for an asset

7.1. Quality Calculations

The following types of quality calculations are provided with Productivity Analytics. These types of calculations are available for computing quality for any asset.

Total and Bad items:	$\frac{\text{BPA.TotalItems} - \text{BPA.BadItems}}{\text{BPA.TotalItems}}$
Good and Total items:	$\frac{\text{BPA.GoodItems}}{\text{BPA.TotalItems}}$
Good, Total, and Rework items:	$\frac{\text{BPA.GoodItems}}{\text{BPA.TotalItems} - \text{BPA.ReworkItems}}$
Total, Bad, and Rework items:	$\frac{\text{BPA.TotalItems} - \text{BPA.ReworkItems} - \text{BPA.BadItems}}{\text{BPA.TotalItems} - \text{BPA.ReworkItems}}$

OPC tags that you define for each asset typically populate quality variables. There is one exception; the BPA.TotalItems variable. As mentioned before, this variable is calculated by Productivity Analytics. The variables used in quality calculations are:

- **BPA.GoodItems** – The quantity of *good* items that were reported
- **BPA.BadItems** – The quantity of *unusable* items that were reported
- **BPA.ReworkItems** – The quantity of *rework* items that were reported
- **BPA.TotalItems** – The *total* number of items produced (the only variable in this list that is calculated by Productivity Analytics)

7.2. Configuring Quality

To measure the quality of the products produced by an asset, including the identifying causes (reject reasons) that might be assigned at the asset, use the asset's Quality tab as shown in Figure 7.1.

Asset Properties -- Webpage Dialog
Asset: Machine1

General Availability Performance **Quality**

Quality Processing: Asset Counts only ☐ Include in Rollup Calculation Quality Calculation method: Total and Bad items calculation

Name	Type	Tag	Rollover	Counter Options	Default Cause	Commands
TOTAL	Total	\\Icotraining\ICONI		Pulse	Unassigned	[Add] [Delete]
BAD	Bad	\\Icotraining\ICONI		Pulse	Unassigned	[Add] [Delete]
REWORKED	Rework	\\Icotraining\ICONI		Pulse	Unassigned	[Add] [Delete]
New Event 4	Good			Pulse	Unassigned	[Add] [Delete]

Add New

Batch Details
☐ Batch Enabled Copy from Availability

Batch ID: Batch Start:
 Batch Name: Batch End:

Apply **Cancel**

Figure 7.1 - The Quality Tab

The Quality Processing drop-down list is where you specify how an asset's quality is calculated. You can choose:

- Asset Counts only
- Child Asset Counts only
- Child and Asset Counts
- Disabled (if you don't want the asset's quality to be calculated)

These options work like those in the Downtime Processing drop-down list. By selecting Asset Counts only, you would calculate the quality of products produced only by the asset. But if the production line contains discrete parts, you may want to roll up the quality calculation of child assets only or add child asset quality to the parent asset's calculation to give you a product quality overview of the entire line. Putting a checkmark into the Include in Rollup Calculation checkbox include the child asset's calculation in the parent's calculation.

From the Quality Calculation Method drop-down list, you can choose the calculation you want to use for measuring quality. Then, add at least one line to the table for each variable in the calculation. The value of each line's Type maps to a quality variable that identifies one count in the quality calculations. Options are:

- Good (populates the BPA.GoodItems variable)
- Bad (populates the BPA.BadItems variable)
- Rework (populates the BPA.ReworkItems variable)
- Total (populates the BPA.TotalItems variable)

By definition, the total quantity of items is made up of the quantity of good (usable) items, plus the quantity of bad (rejected) items, plus the quantity of reworked (refinished) items. You only need three of these variables to calculate the fourth. You can, however, define a line for each tag that captures detail, regardless of the number of lines required. Enter the tag into the Tag column.

The Counter Option identifies the tag's counter:

- If the counter records a quantity of 1 for each pulse, select **Pulse**; the total number of pulses determines the count for the quality type.
- If the counter records the exact quantity of this quality type for the duration of the count, select **Differential**.
- If the counter contains a running total of items of this quality type, and the counter never resets to 0 (zero), select **Cumulative no Rollover**.
- If the counter contains a running total of items of this quality type, but the counter *does* reset to 0 (zero) occasionally or on a regular basis, select **Cumulative with Rollover**. If you select this option, you must also use the **Rollover** field to specify either the *quantity* at which the counter resets or the *tag* that records the counter quantity before it resets.

The Default Cause is the probable cause of the event; for bad or reworked items, it is the *typical* reject reason. Because it is unlikely that you need to record a cause for good items or the total quantity of items, use the default cause of Unassigned for those types of events. An operator or administrator can specify the *actual* cause later during runtime. The causes in the drop-down list are the causes defined for the Quality category in the Equipment Categories and Causes form.



Lab: Production Quality

L7

In this lab, we will configure the last piece information necessary for OEE calculation. By completing this information, we will have configured a complete system for AcmeSeutical to track OEE.

Estimated time to complete this lab: 30 minutes

7.1. Task Checklist

In this lab, you will complete the following tasks:

- Enable quality tracking
- Configure quality tracking for Machine1
- Generate data related to production quality

7.2. Support Files

You will need the following files to complete this lab:

- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl
- BPA_UdmDatabase.mdf
- BPA_UdmDatabase.udl
- ACMEPillMaching.gdf
- ACMEBottleMachine.gdf
- ACMEMixer.gdf

7.3. Production Quality

In order to add performance calculation, we will need to go back into the asset configuration.

1. Launch the UWI if you closed it from a previous lab.
2. Right-click on **ProductivityAnalytics** in the navigation tree on the left-hand side and select **Asset Configuration**.

3. In the Asset Tree, browse to Acmeseutical → USA → Foxborough.
4. Select Machine1 in the Foxborough Assets section and click on its Configure  icon to bring up the Asset Properties dialog.
5. Go to the Quality tab and select **Asset Counts only** from the Quality Processing drop-down list.
6. Make sure the Quality Calculation Method is set to **Total and Bad items calculation**.
7. Click on the Add New button to add a new quality type.
8. Name this new quality “Total Pills” and change the Type to **Total**.
9. Click on the ellipsis ... button to the right of the Tag column to bring up the UDB.
10. Browse to find the tag
“\\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.PillCount” and double-click on it.
11. Back in the Asset Properties dialog, in the Counter Options column select **Cumulative**.
12. Click on the Apply  icon to save the changes.
13. Click on the Add New button again and name the new quality “Bad Pills”.
14. Set the Type to **Bad** and click on the ellipsis ... button to the right of the Tag column to bring up the UDB.
15. Browse to find the tag
“\\Icotraining\\ICONICS.DataWorX32.8\\USA.Foxborough.Machine1.Control.Rejected” and double-click on it.
16. Back in the Asset Properties dialog, in the Counter Options column select **Cumulative**.
17. Click on the Apply  icon to save the changes.
18. Your configuration should now look similar to Figure L7.1. Click on the **Apply** button to save the changes and then click on **Cancel** to close the dialog.



Asset Properties -- Webpage Dialog
Asset: Machine1

General Availability Performance **Quality**

Quality Processing: Asset Counts only ☐ Include in Rollup Calculation Quality Calculation method: Total and Bad items calculation

Name	Type	Tag	Rollover	Counter Options	Default Cause	Commands
Total Pills	Total	\\T39\\ICONICS.DataWork		Cumulative	Unassigned	
Bad Pills	Bad	\\T39\\ICONICS.DataWor		Cumulative	Unassigned	

Batch Details

☐ Batch Enabled

Batch ID: ... Batch Start: ...

Batch Name: ... Batch End: ...

Figure L7.1 - Quality Configuration for Machine1

19. We are now done with the Quality configuration. If you have more time, you can configure Quality for Machine2 as well as machines in other locations.

7.4. Generating Data Related to Quality

1. Since production has been running from the last lab, you should now have quality-related data without doing anything.
2. If you do not see any quality data, stop the Productivity Analytics Service and stop the production. Then restart the Productivity Analytics Service and restart production. This should allow for data generation.



Review: Production Quality

R7

7.1. Chapter Objectives

You should know and understand the following topics:

- Available quality calculations
- Quality variables
- Configuring quality for an asset

7.2. Summary

Productivity Analytics collects quality information to support the calculation of OEE. Productivity Analytics comes with four different types of quality calculations, which you can choose when you configure an asset's quality tracking.

Regardless of the quality calculation used for a given asset, you must provide Productivity Analytics with the total number of parts produced. This information is used in all quality calculations.

In the same way you can roll up downtime events from child assets to parent assets, you can do the same with quality. Using the Quality Processing option and the Include in Rollup Calculation option, you can specify how to calculate quality counts for products produced by the asset.

7.3. Terms

Quality Calculation

Quality Event

7.4. *Test Your Knowledge*

In this chapter, we discussed how you could configure Productivity Analytics to obtain and calculate quality information. You should be able to answer the following questions now.

1. What variables are used in quality calculations?
 - a. Good items, Bad items, and Total items
 - b. Total items, Rework items, and Good items
 - c. Good items, Bad items, Rework items, and Total items
 - d. None of the above
2. How is the Default Cause used?
 - a. It is the probable cause of a quality event
 - b. It can be overridden by the operator at runtime
 - c. By default, the default cause of Unassigned is used
 - d. A and B only
 - e. B and C only
 - f. All of the above
3. Where do you define quality event causes that appear in the Default Cause drop-down list?
 - a. In the Equipment Categories and Causes form's Quality category
 - b. In the asset's Quality tab
 - c. In the General Applications Options Calculations tab
 - d. None of the above
4. To modify quality calculations, which Productivity Analytics form do you use?
 - a. In the Equipment Categories and Causes form's Quality category
 - b. In the asset's Quality tab
 - c. In the General Applications Options Calculations tab
 - d. You cannot modify quality calculations
5. True or False: Asset quality calculations cannot be disabled.
6. True or False: The count for rework items is not included in the Total item count.
7. True or False: BPA.TotalItems is the only quality variable that is calculated by Productivity Analytics.



Runtime View Management

8

Once you have configured your assets, you are ready to configure runtime views that contain the reports, charts, and other objects that display asset information. In Productivity Analytics, a view is a runtime window that contains any combination of reports, charts, and ICONICS products such as AlarmWorX32, GraphWorX32, and TrendWorX32 that provide access to current and historical downtime, performance, and quality-related events.



Figure 8.1 - Productivity Analytics Charts, Reports, and Objects

Any of these objects can be used in views that are configured for specific purposes for users or sets of users. For example, a view might include:

- Reports and charts for system administrators.
- Comparison reports for use by plant managers who want to see downtime and quality-related events for all assets in a plant.
- Reports of recent or current downtime and quality-related events to which operators can attribute actual causes for the events.
- Charts and reports that managers use to analyze historical downtime and quality-related events.

By the end of this chapter, you should be familiar with the following topics:

- The steps for creating various types of views
- Security privileges for views
- Runtime access for views
- How to work with runtime views

8.1. Overview of Runtime Views

In each view, anyone who has permission can add reports and charts to the view and identify the purpose of each report or chart. Any individual report's or chart's use includes, but is not limited to, the following options:

- A product line's batches
- One specific asset
- Any asset where the view is accessible
- An asset and its child assets
- All assets in the asset tree

A second level of privileges can provide some users with a more *limited* ability to change the layout of a view.

8.1.1. Runtime Access to Views

A typical view is created with particular assets in mind. For this reason, you must assign a view to the assets for which the view is designed. Doing this makes the view accessible from those assets and no others. A view can be assigned to any combination of the following:

- *All assets that belong to a **category**.* You can specify more than one category. For example, the view applies to all robot assets, or all oven assets.
- *All assets in an **asset level*** in the asset tree. You can specify more than one asset level; for example, you can assign the view to all Area (level 2) assets.
- ***Individual** assets* of your choosing. You can assign a view to an unlimited number of individual assets. For example, the view applies to Plant 1 only, to only the Biscuit Oven in Area 3 of Plant 2, or to the ovens in all areas of Plant 2.

Assigning a view can be simple (such as to Plant 1 only) or complex (such as to any combination of the options listed above). It all depends on why you've created the view and what assets or batches it is intended to highlight.



In an additional facet of security, an administrator with permission to provide user access then specifies the runtime users and user groups who can access the view.

8.1.2. Ease-of-Use Features for Views

Several options are available to you when you configure a report, chart, or ICONICS object in a view. Although each object in a view has its own characteristics, there are some common features. In addition to identifying the content of the report or chart, you can add:

- **Runtime filtering.** Let runtime users determine the range of time to display in the chart or report. Depending on the chart or report, there may be additional options that runtime users can adjust when you turn on runtime filtering.
- **Data refresh.** Automatically refresh the report or chart data at a regular interval, but let users pause the automatic refresh.
- **Styles.** Choose a style for charts that consists of a color scheme, a two- versus three-dimensional display, and a vertical or horizontal orientation.
- **Labels and more.** Turn on a chart's labels, its legend, and tool tips.
- **Report columns and page size.** Hide report columns and specify the number of lines per report page.
- **ICONICS object size and borders.** Set the size of objects in the view and select the border.
- **Enable runtime management features.** The Downtime Audit Report and the Quality Audit Report each come with a special switch that allows runtime users to enter data. When you enable the switch, users can adjust events in the database when using that particular report. For the Downtime Audit Report, users can modify event times, split events, add a responsibility identifier, and replace default causes with actual ones. For the Quality Audit Report, users can replace default reject reasons with the real ones.

8.2. Creating Sample Views

As mentioned earlier, views are graphics representation of your asset information. A view can show the schedule of your asset, or OEE and KPI information. In this section, we will look specifically at how to create some commonly-used views.

8.2.1. A View that Displays a Schedule

In this section we'll look at an example of how you can create a view that displays a schedule. These steps are designed to introduce you to views. Once you understand the basic steps to setting up views, you can create your own views that display your own production information.

To set up views for viewing information about assets, from the navigation tree right-click on **ProductivityAnalytics**, and then select **Runtime Management**. The Runtime Management form appears. Click on the Create New button, which expands the form as shown in Figure 8.2.

The screenshot shows the 'Runtime Management' form. The top section, titled 'View information', contains a table with columns 'Levels', 'Categories', and 'Assets'. Below the table is a note: 'bold indicates that the item is associated as the default view'. There are input fields for 'Name:' and 'Description:'. Below these are buttons: 'Filter:', 'View Name' (dropdown), 'Rename', 'Delete', 'Edit', and 'Create New'. An arrow points from the 'Create New' button to an expanded dialog box below. The dialog box has a 'Name:' field with 'Foxboro Runtime Schedule' and a 'Description:' field with 'Shows the Foxboro schedule.'. It also has a 'Layout:' section with a list of options: 'Full Page Vertical' (selected), 'Header, Left Column, Body', 'Header, Body, Right Column', 'Header, Left Column, Right Column, Footer', and 'Header, 3 Columns, Footer'. At the bottom of the dialog are 'Cancel' and 'Next' buttons. A note on the right says 'Clicking Create New expands the dialog box.'

Figure 8.2 - Expanded Runtime Management Form

NOTE: If you have views already, they appear in the top-left box. You can choose a view and add to it if you like. In this example, however, we will be creating a new view.

At the bottom of the form, enter the name of the view you are creating and select the layout of the view. When selecting a layout, you should choose it knowing what you want to add to each zone and why. As we are creating a view for a schedule and for the sake of simplicity, we selected **Full Page Vertical** as the layout.



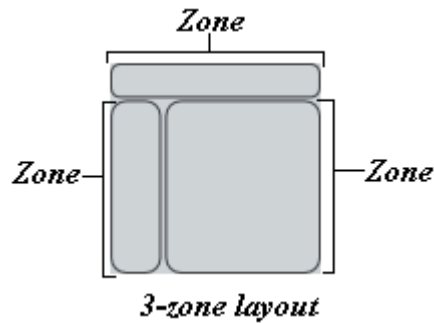


Figure 8.3 - Zones in a Layout

NOTE: The Full Page Vertical layout consists of just one zone. Other layouts consist of multiple zones into which you can place reports, charts, or graphics of your choosing. When you select a layout, it is illustrated to the right of the Layout box. Try selecting each layout in the list to see an illustration of each one.

Once you have entered a name and optional description, and have chosen a layout for the new view, click Next to bring up the **Runtime View editor** shown in Figure 8.4.

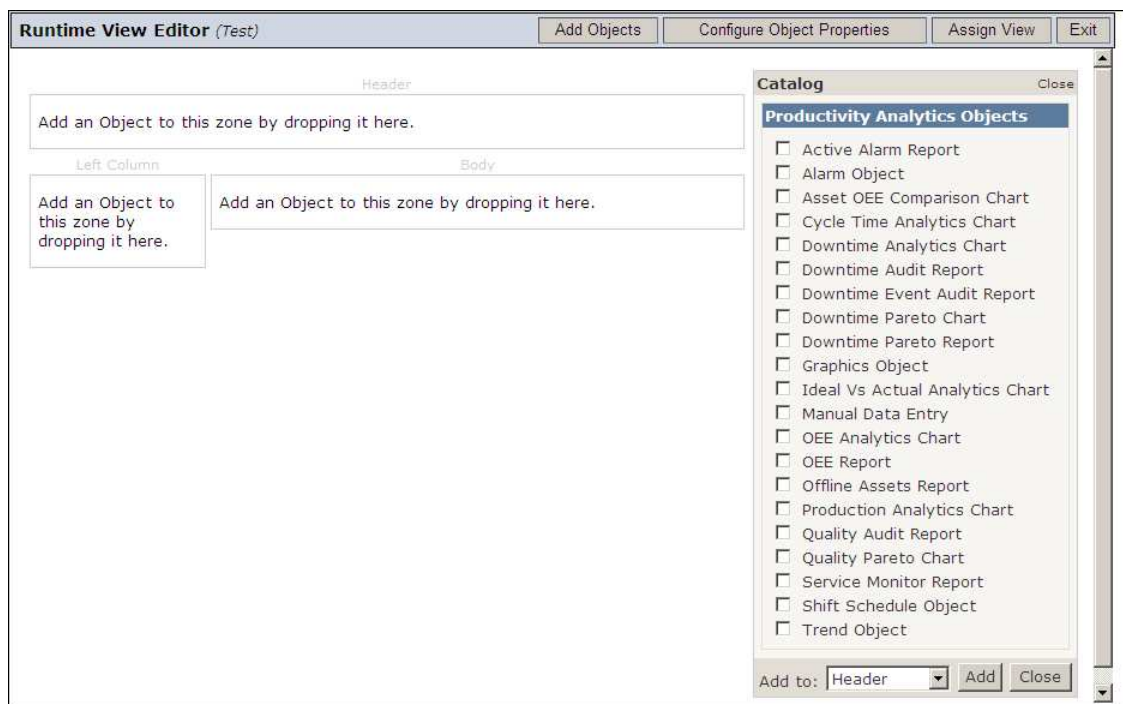


Figure 8.4 - The Runtime View Editor

Put a checkmark next to the object you are adding to the view. In this case, put a checkmark in the Shift Schedule Object checkbox and click the Add button.

NOTE: If you had chosen a view with multiple zones, you would see the zones on the left. Once you add an object to a zone, you can drag it to another zone.

The Runtime View Editor displays the zone with a drop-down list and an option for creating a new object. The form should look similar to Figure 8.5. In this example, the drop-down list contains a list of preconfigured schedules from which we can select. We can also create a new schedule by clicking on the **Create New Schedule** hyperlink.

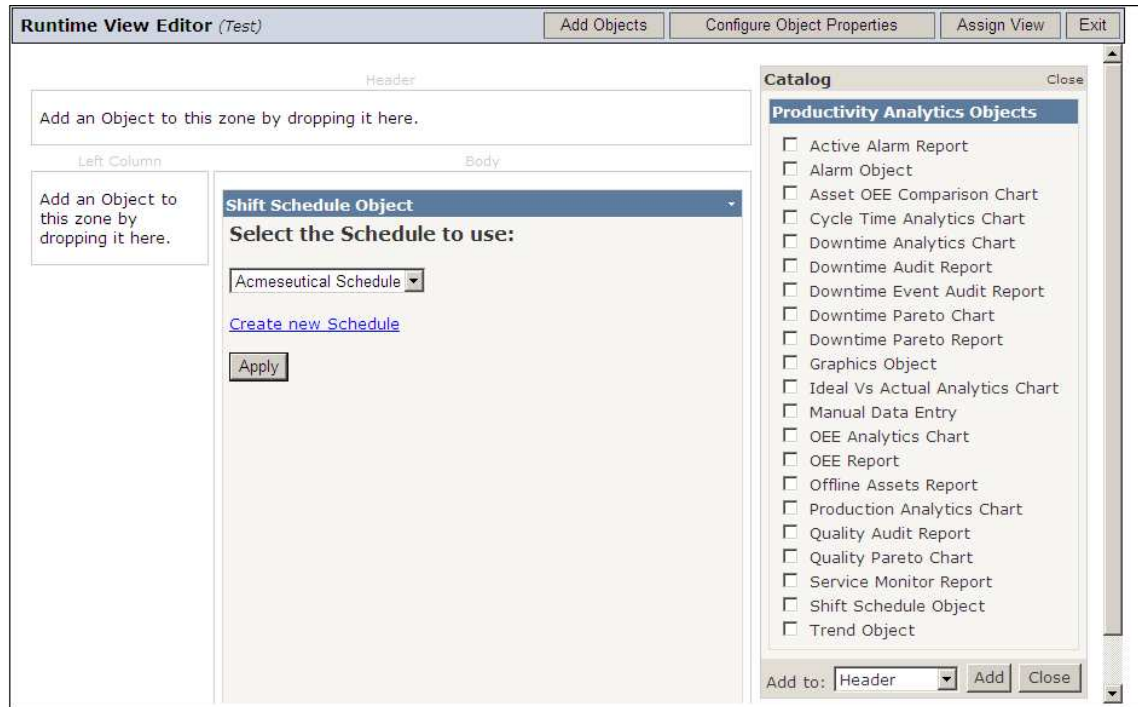


Figure 8.5 - A Zone in the Runtime View Editor

Select the schedule from the drop-down list and click on the Apply button. The Runtime Editor shows the schedule, and looks similar to Figure 8.6.

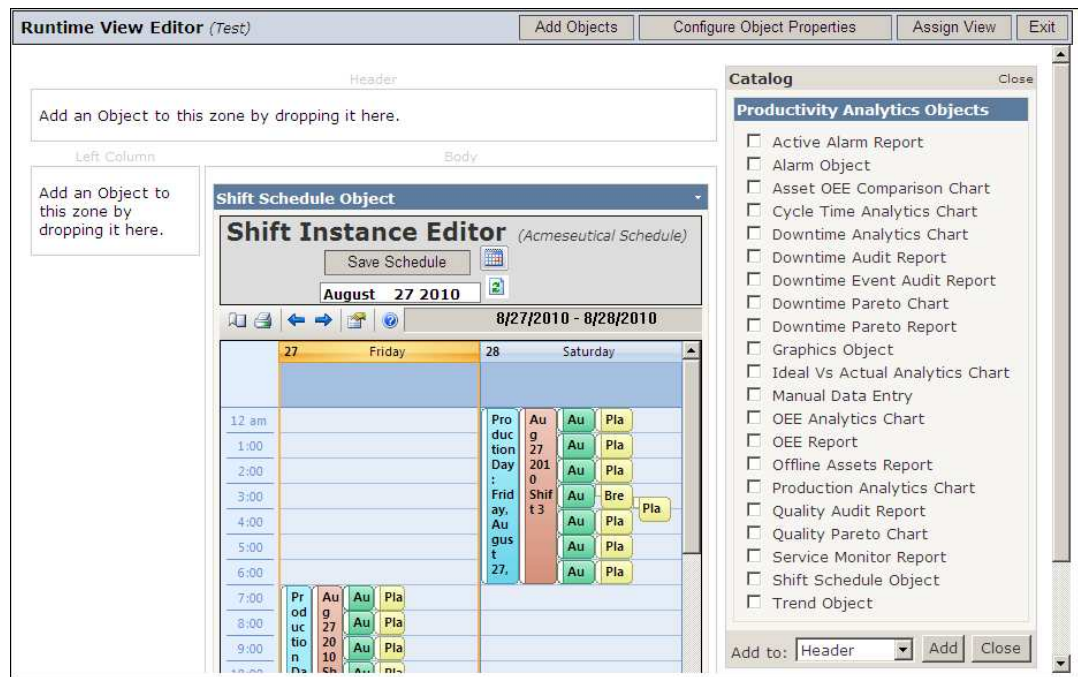


Figure 8.6 - Runtime Editor with Schedule Selected

Click on the **Configure Object Properties** button to enter the edit state. You may find more options once you enter this state.

Before any users can see the view, you have to assign the view to a designated asset, category, level, or any combination of the three. To do this, click on the **Assign View** button. This opens the Runtime View Editor which displays the options for applying the view to assets, as shown in Figure 8.7.

Runtime View Editor (Foxboro Runtime Schedule)

Add Objects Configure Object Properties

Assign View Exit

Associated Views **Default Views**

Select the Levels, Categories, and/or Assets with which you would like this view to be associated.

Levels	Categories	Assets
☐ Enterprise ☐ Site ☐ Area ☐ Process Cell ☐ Unit ☐ Module	☐ General ☐ Quality ☐ Robot ☐ Weld Robots ☐ Packing Robots ☐ Ovens ☐ Weighers ☐ Glue Guns	Productivity Analytics MyEnterprise US Site Plant1 Area1 Box Filler Packing Robot Box Weigher Incinerator Area2 Plant2 Europe Site

Assign

Figure 8.7 - Assigning a View

Here you can select the levels, categories, and assets you would like to associate with the view. There is no limit to the number of objects you can select. The view becomes available to all objects that you select. In the example shown in Figure 8.7, we assigned the view to several assets in Plant1 (in the Assets column on the right). Note that when you are assigning a view that holds a schedule, it is important that you select only the assets that use this schedule.

Once you click the Assign button, you are done. Before you go on, you must use the Security Administration Form to give access to the runtime users who need access to the view at runtime. We will go over the details on how to do this after we create an additional view for OEE and KPI information.

Note that *you* automatically have access to any view that *you* create.

8.2.2. A View that Displays Asset OEE and KPI Information

Let us next create a view that displays OEE and KPI information. This will be very much like the process for adding a schedule to a view, except that this time we will be adding a chart and a report: the OEE Analytics Chart and the OEE Report.



Right-click **ProductivityAnalytics**, and then select **Runtime Management**. The Runtime Management form appears. Click on the Create New button, which expands the form, as shown in Figure 8.8.

View information

Assigned to:

Levels	Categories	Assets

bold indicates that the item is associated as the default view

Name:

Description:

Filter: View Name

Name: Layout:

Description:

Layout:

- Full Page Vertical
- Header, Left Column, Body
- Header, Body, Right Column
- Header, Left Column, Right Column, Footer
- Header, 3 Columns, Footer

Figure 8.8 - Creating a View of OEE and KPI Information

As mentioned previously, you should give the view a name and optional description, and select the desired layout. Once you are done, click on the Next button to continue.

Next, in the Runtime View Editor, select the reports and charts you want to add to the selected zone. In this case, there is one zone and the OEE Analytics Chart and the OEE Report are selected.

Runtime View Editor (Test1)

Page Content:

Add an Object to this zone by dropping it here.

Catalog

Productivity Analytics Objects

- ☐ Active Alarm Report
- ☐ Alarm Object
- ☐ Asset OEE Comparison Chart
- ☐ Cycle Time Analytics Chart
- ☐ Downtime Analytics Chart
- ☐ Downtime Audit Report
- ☐ Downtime Event Audit Report
- ☐ Downtime Pareto Chart
- ☐ Downtime Pareto Report
- ☐ Graphics Object
- ☐ Ideal Vs Actual Analytics Chart
- ☐ Manual Data Entry
- ☒ OEE Analytics Chart
- ☒ OEE Report
- ☐ Offline Assets Report
- ☐ Production Analytics Chart
- ☐ Quality Audit Report
- ☐ Quality Pareto Chart
- ☐ Service Monitor Report
- ☐ Shift Schedule Object
- ☐ Trend Object

Add to:

Figure 8.9 - Select Objects to Add to a Zone

Click on Add to add the selected objects to the zone. It will look similar to Figure 8.10.

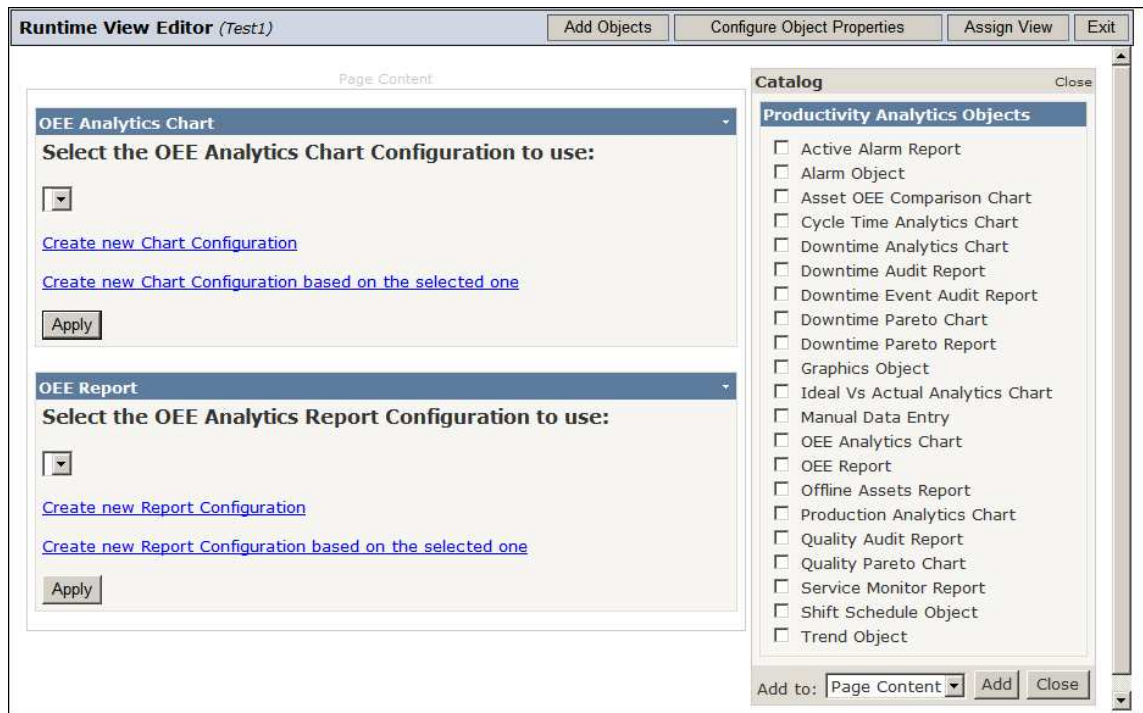


Figure 8.10 - Added Chart and Report to the Zone

To configure the OEE Analytics Chart, click on the chart's **Create New Chart Configuration** hyperlink. The chart configurator opens with its General tab on top.

OEE Chart Configurator

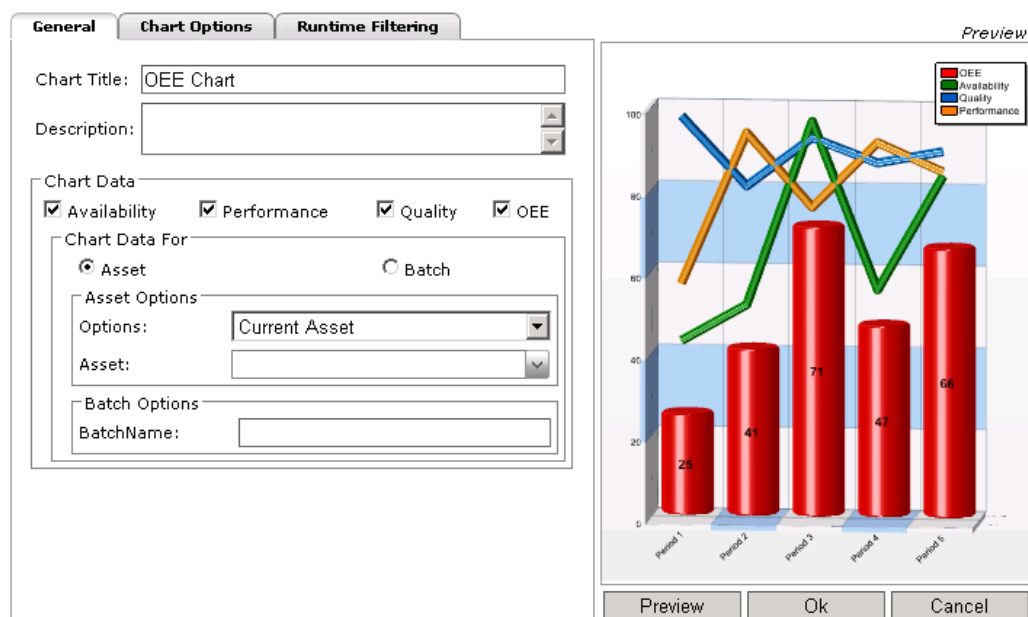


Figure 8.11 - OEE Chart Configurator: General Tab

Specify a chart title and description. Of the Availability, Performance, Quality, and OEE checkboxes, specify which type or types of information you want graphed in the chart. If you enable filtering on the Runtime Filtering tab (this is the *default* for the chart), runtime users will be able to change these selections. If you disable filtering, runtime users will see only the type(s) of data you select here.

In the **Chart Data For** section, specify whether runtime users will choose the content of the chart by Asset (the default) or by Batch. This option affects how data displays and how runtime users can choose the content. You can select Asset or Batch; let us take an individual look at each of these options.

To make the chart available for assets, choose **Asset** in the Chart Data For box, then from the Options drop-down list you must also specify the types of assets you want runtime users to be able to see in the chart. This option controls the default content of the chart as well as runtime filtering. Table 8.1 shows a list of the options that are available and their effects during runtime.

Table 8.1 - Asset Options Dropdown Options

If you choose this option:	When a runtime user selects the view, the chart lists information for:	If filtering is <i>enabled</i> , runtime users can choose any of these other assets:
Current Asset	The current asset	<i>No others</i> . This limits runtime users to the assets that the view is assigned to.
Specific Asset	The asset you select in the Asset drop-down list	<i>No others</i> . This limits users to the specified asset. If you choose this option, we recommend you identify the asset in the chart's title (on the General tab).
Children Assets	The current asset	<i>Child assets of the current asset</i> . This limits users to the assets that the view is assigned to and their child assets.
All Assets	The current asset	<i>Any asset in the asset tree</i> , not just the assets the view is assigned to.

If you are *disabling* filtering on the Runtime Filtering tab, select the Current Asset or Specific Asset option. If you are *enabling* filtering, choose the option that suits the chart you are configuring.

To make the chart available for production batches, choose **Batch** in the Chart Data For box. If you also enable filtering on the Runtime Filtering tab runtime users can choose a batch to view in the chart. Leaving the BatchName field empty lets runtime users look at batches for *any* product family and at *any* location.

Alternatively, you can limit the batches to one particular product line or product family by specifying its batch name in the BatchName field. The BatchName is the ID or qualifier your company uses to logically group production batches together for a product family or product line. Together, the batch name and batch ID uniquely identify a batch. Assuming filtering is enabled, runtime users can select a batch ID from a dropdown list that lists all complete batches for the specified time frame, but limits them to a batch name if you enter a batch name here.

Any BatchName you enter cannot exceed 64 characters in length (including special characters), cannot begin with a special character, and is case-sensitive. If you do specify a BatchName, we recommend that you identify the product line that the chart is limited to in the chart's title or, at the very least, in the chart's description. For example, you might enter a title of "A1 Containers Downtime by Period".

Tip! When assigning a view with a batch-named chart in it, you may want to make sure the view is assigned to the individual assets (such as plants) where the product family is produced. Note that a chart configured to include batch information does **not** limit its content to any asset.

On the Chart Options tab, you can modify the colors and shapes that display in the graph. On the Runtime Filtering tab, you can indicate how you want the content of the chart to be filtered. Both tabs are shown in Figure 8.12.

The figure consists of two side-by-side screenshots of a software configuration window. The left window is titled 'Chart Options' and the right window is titled 'Runtime Filtering'. Both windows have tabs for 'General', 'Chart Options', and 'Runtime Filtering'. The 'Chart Options' window shows settings for visual styles, legend, title, label, and tooltip. The 'Runtime Filtering' window shows settings for enabling runtime filtering, default time range options, data aggregate options, and auto refresh options.

Figure 8.12 - The Chart Options (Left) and Runtime Filtering (Right) Tabs

Click on OK when you have configured the chart. The view goes into loading mode, and returns to the **Runtime View Editor**. In the chart's box in the view, select the chart you just created from the drop-down list.

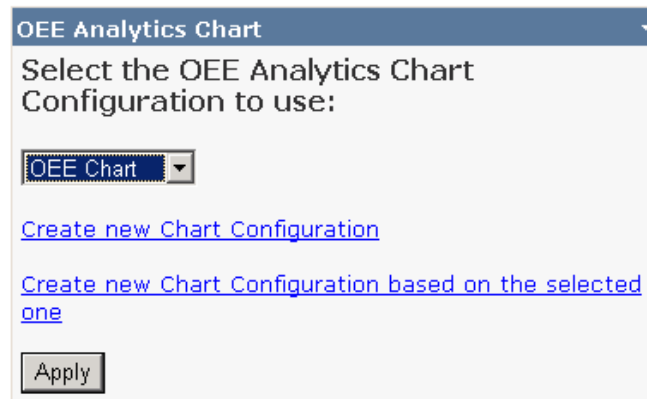


Figure 8.13 - Select the Chart

Click on Apply. The chart you created appears in that spot in the zone. The **Runtime View Editor** looks something like Figure 8.14. Note that the chart you see here (in configuration mode) uses static sample data to show how the chart may look in runtime mode. When you actually enter runtime mode, the chart will populate with the data collected by Productivity Analytics.

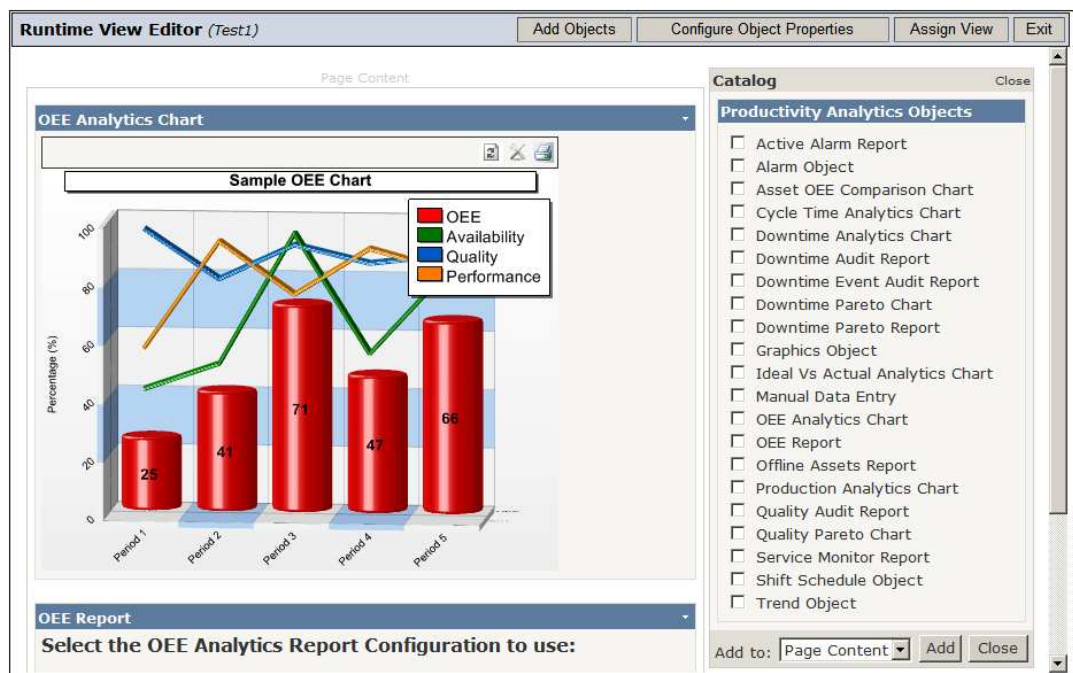


Figure 8.14 - The OEE Chart in the Runtime View Editor

Now we are going to configure the OEE Analytics Report at the bottom of the zone. Scroll down to the OEE Analytics Report box in the **Runtime View Editor**. It will look like Figure 8.15. Notice that the OEE Chart still appears at the top of the zone.

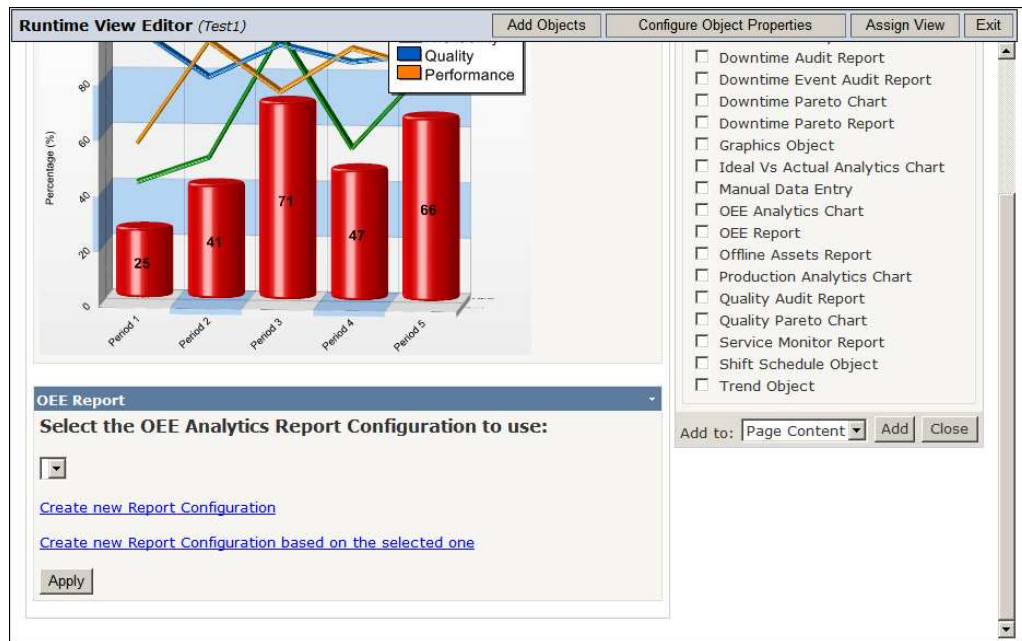


Figure 8.15 - OEE Analytics Report Viewer

To create a new version of the report for sole use in this view, in the OEE Report box click on the **Create New Report Configuration** hyperlink. The OEE Report Configurator appears with its General tab on top. The configurator looks like Figure 8.16. Notice how a sample report format displays to the right of the tabs, with a Preview button underneath it. At any time while you are configuring a report or chart, you can preview your choices by clicking this button.

OEE Report Configurator

Figure 8.16 - OEE Report Configurator: General Tab

The General tab is the same for reports as it is for charts; therefore, we would complete this tab following the same guidelines we used for completing the OEE Chart.

The Report Options tab, shown in Figure 8.17, lists not only the Palette Style and Page Size; it also lists every column available on the report. The Runtime Filter tab for reports is the same as it is for charts.

Figure 8.17 - The Report Options (Left) and Runtime Filtering (Right) Tabs

When you have finished configuring the report, click on OK. The view goes into  Loading... mode then returns to the Runtime View Editor. In the OEE Report box, select the OEE Report that you just created from the drop-down list.

Figure 8.18 - Select the OEE Report

Click on Apply. The report appears in the view and looks something like the report at the bottom of Figure 8.19.

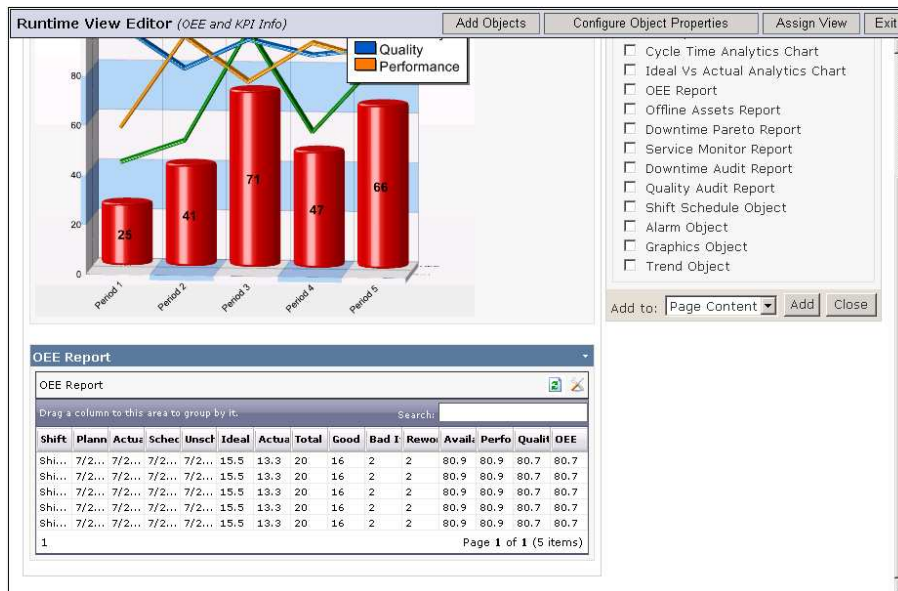


Figure 8.19 - The OEE Report in the Runtime View Editor

Now we can assign the view to assets. Click on the Assign View button. In this case, we will assign it to the General category so that it can be accessed from every asset that belongs to a category.

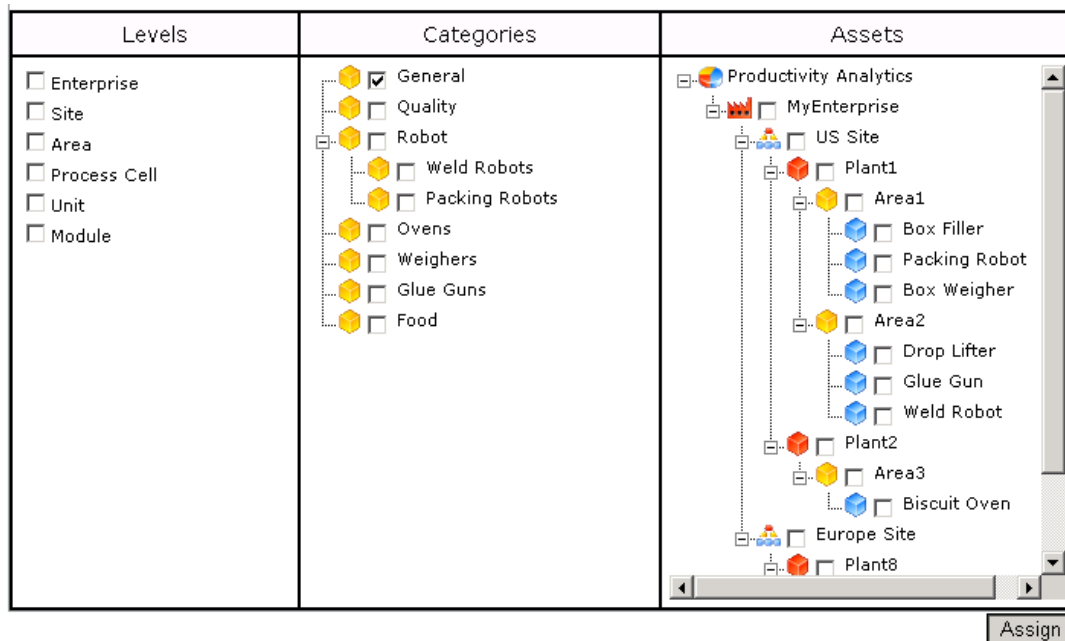


Figure 8.20 - Assigning to the General Category

When you click on Assign, the Runtime Management screen appears and the new view now appears in the list of views. When you select the view, you can see that it is assigned to the General category, as shown in Figure 8.21.

Runtime Management

View information

Assigned to:

Levels	Categories	Assets
	General	

bold indicates that the item is associated as the default view

Name: OEE and KPI Info

Description:

Filter: View Name

Rename Delete Edit Create New

Figure 8.21 - List of Views in Runtime Management

At this point, you can give users access to the view. We will take a look at how security is administered through the Unified Web Interface next.

8.3. User Roles and Security

Access to Productivity Analytics actions and views can be configured individually for each user, domain, and networked machine by using the Security Administration form shown in Figure 8.22. To access this form, right-click on **ProductivityAnalytics** in the navigation tree of the Unified Web Interface, then select **Security Administration**.

User Application Actions

Application Security Actions

- Shift Definitions
- Layout Management
- Asset Management
- Security Administration
- Application Options
- Runtime Object Configurat...
- Equipment Categories

Add Application Action

User Runtime Views

Application Runtime Views

- downtime report
- downtime_sample
- performance
- Shifts
- H3CF
- full page
- quality

Add Runtime View

Figure 8.22 - Security Administration Form

NOTE: Currently, fixed or static IP addresses are required on all networked computers so that machine IP based permissions work properly. A machine's permissions are based on its fixed IP address.

Actions added to the top **User Application Actions** panel in the Security Administration form provide permissions for using those actions. To add an action for a user, select the user in the tree control on the left-hand side, then select the action from the Add Application Action drop-down list, and then click on the Add Application Action button. You would need to do this for each user that you want to add the application action to; alternatively, you can add the application action to the user group or machine.

The following Productivity Analytics actions are predefined:

- **Layout Management** lets the user modify existing views by making use of existing object configurations. This action is useful for users who want to be able to switch objects in their runtime views, especially in views that have been created for one user or a limited group of users who have similar roles. A user who has this action cannot create a new view, cannot change the layout of the view, cannot create new runtime objects, and cannot change the content of runtime objects. This option provides more-limited access than the Runtime Object Configuration option, which we will look at next.
- **Runtime Object Configuration** lets the user add, modify, and delete runtime views and the object configurations that display in runtime views. There is no restriction on what the user can do when configuring runtime views. This option grants more permissions than its counterpart, the Layout Management option.
- **Equipment Categories** lets users access the Equipment Categories and Causes form, and lets them add, modify, and delete categories and causes by using that form.
- **Shift Definitions** gives the user complete access to the functions available from the Shift Schedules menu item. These actions include adding, modifying, and deleting shift schedule templates and shift schedules. (It does not, however, include adding a shift schedule to a runtime view.)
- **Application Options** gives the user complete access to the tabs available from the General Options menu item.
- **Asset Management** lets the user create and modify the asset tree, add assets, and configure assets.
- **Security Administration** lets the user access all the functions available on the Security Administration form.

Views added to the bottom of the Security Administration form, in the **User Runtime Views** panel, provide permissions for accessing those views. To add a view to this list,



select it from the Add Runtime View drop-down list then click on the Add Runtime View button. Before you can give permission to access it, you will have to add the view first, though.

These two panels, **User Application Actions** and **User Runtime Views**, display the configured permissions for the user, group, or machine selected in the **Productivity Analytics Roles** tree on the left.

8.3.1. Permissions by User, Domain Group, and Machine

In runtime, each user starts with no security rights at all. Productivity Analytics builds the user's access rights by using an *additive security model* based on the user and the machine where the user is logged-in.

You can set up user access by machine, by domain group, or by user. Setting up security by machine puts overriding limitations on a machine, and is useful if you have a common workstation that operators must share. Otherwise, setting up security limitations for a domain group and then overriding those limitations for individual users may be of better use to you

The effective permission for the logged-in user is one that combines all permissions available for the user, the user group, and the machine. This creates a union of permissions for the user's login session on that machine. For example, if the user who logs in has permission for the Runtime Object Configuration, the group the user belongs to has the Shift Definition permission, and the machine the user logged into has Asset Management permission, then this user will have all three permissions.

8.3.2. Adding View Permission

Since you can add permissions to a view only after creating the view, we will now go back and add permissions to the views we created in the previous sections. Right-click on **ProductivityAnalytics** in the navigation tree and select **Security Administration**.

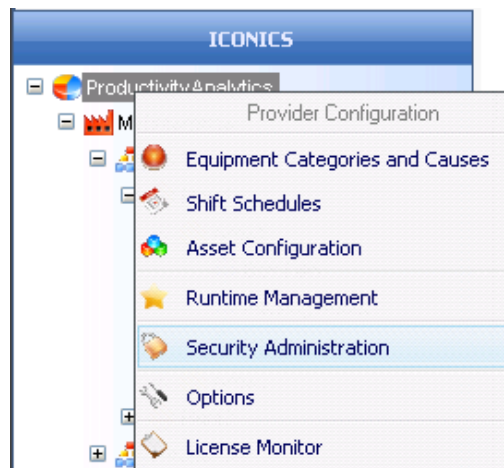


Figure 8.23 - Configuring Security

The Security Administration form appears. In this form, select the user you want to assign the view to in the tree control on the left, then in the bottom panel of the form, select the view and click on Add Runtime View.

Security Administration

 The screenshot shows the 'Security Administration' form. On the left is a tree control under 'Productivity Analytics Roles' with 'Domain Users' expanded, showing 'T9\admin', 'T9\ICONICS_USER' (selected), and 'T9\Administrator'. Below this are 'Domain Groups' and 'Machines'. The main area has two panels. The top panel, 'User Application Actions', contains a table of application security actions with a 'Delete' column. The bottom panel, 'User Runtime Views', contains a table for assigning runtime views to the selected user. A callout box points to the 'Add Runtime View' button and the view selection dropdown, with text: 'The bottom panel is where you provide user access to runtime views. Select a view from the list, then click the Add Runtime View button.' The dropdown menu is open, showing a list of views including 'schedule', 'OEE', 'Production downtime', 'Quality Mgmt', 'Downtime Audit Report', and 'OEE and KPI Info'.

User Application Actions		Delete
Application Security Actions		
Security Administration		X
Layout Management		X
Shift Definitions		X
Equipment Categories		X
Runtime Object Configurat...		X
Application Options		X
Asset Management		X

User Runtime Views		Delete
Application Runtime Views		
Add Runtime View schedule OEE Production downtime Quality Mgmt Downtime Audit Report OEE and KPI Info		

Figure 8.24 - Assigning User Access to views

You can give users access to an unlimited number of views. When a user adds a view, the view is automatically added to the table for that user, as shown in Figure 8.25.

User Runtime Views

Application Runtime Views
OEE and KPI Info
schedule

Figure 8.25 - Views the User Can Access

NOTE: The user who adds the view automatically has permissions to use it during runtime and is added into the user's list of views. To assign the view to other users, you must log in as a user who has Security Administration application actions and assign the view to each user or user group.

Click on Apply when you are done. Any user who has permission can look at the view during runtime. Figure 8.26 shows what the OEE view that we created looks like in runtime.

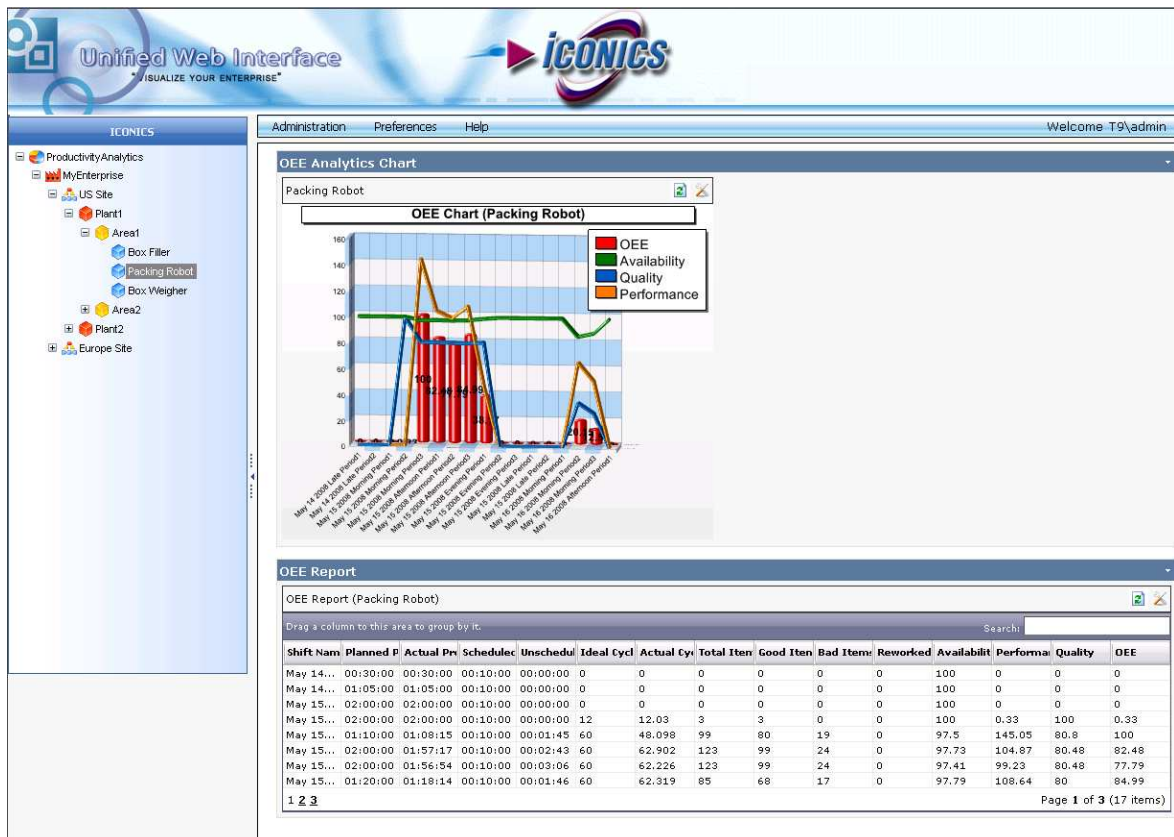


Figure 8.26 - The OEE View as It Appears at Runtime

8.4. Viewing Information in Runtime

Views are assigned to assets in the asset tree. You can access any view you have been given permission to access.

In order to access your runtime views from the asset tree, expand the navigation tree to see your assets, and then click on the asset for which you want to display information. This displays the runtime view that is assigned as the default view for that asset (assuming you have permission to access the asset's default view). Note that this behavior occurs when you perform a left mouse click action.

Alternatively, you can right-click on the asset. A pop-up menu, shown in Figure 8.27, lists the views that are assigned to the asset and that you have permission to access. The default view is listed in bold text. Click on any view and it will open in the content area to the right.

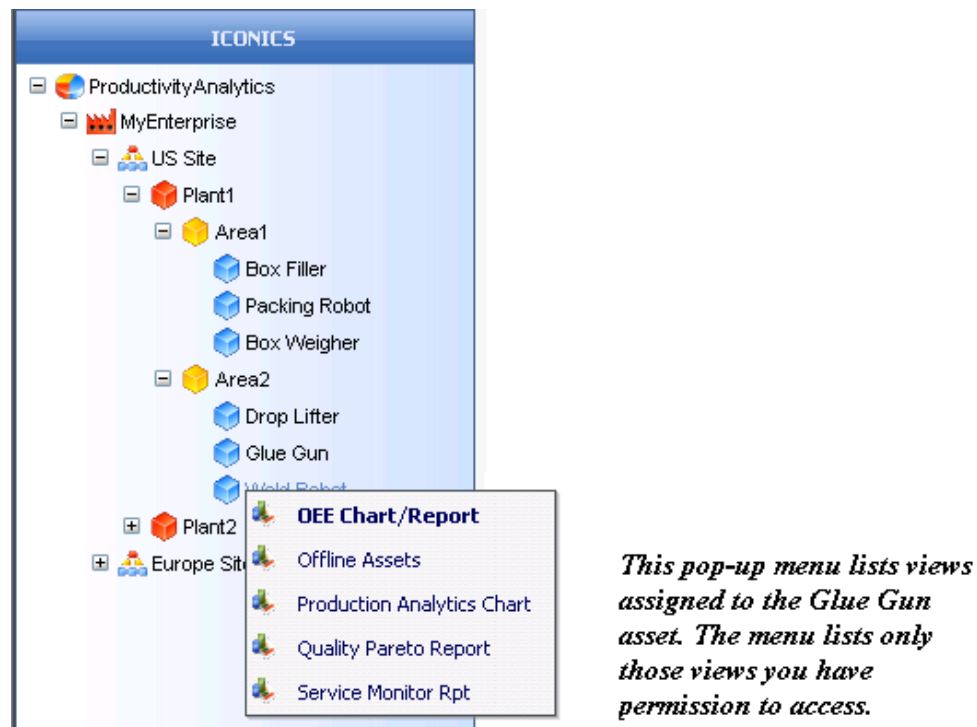


Figure 8.27 - An Asset's Right-click Pop-up Menu

8.4.1. Features of Reports and Charts

Reports and charts have several features which we will look at runtime features from the point-of-view of a runtime operator. The sample chart below shows some of them.

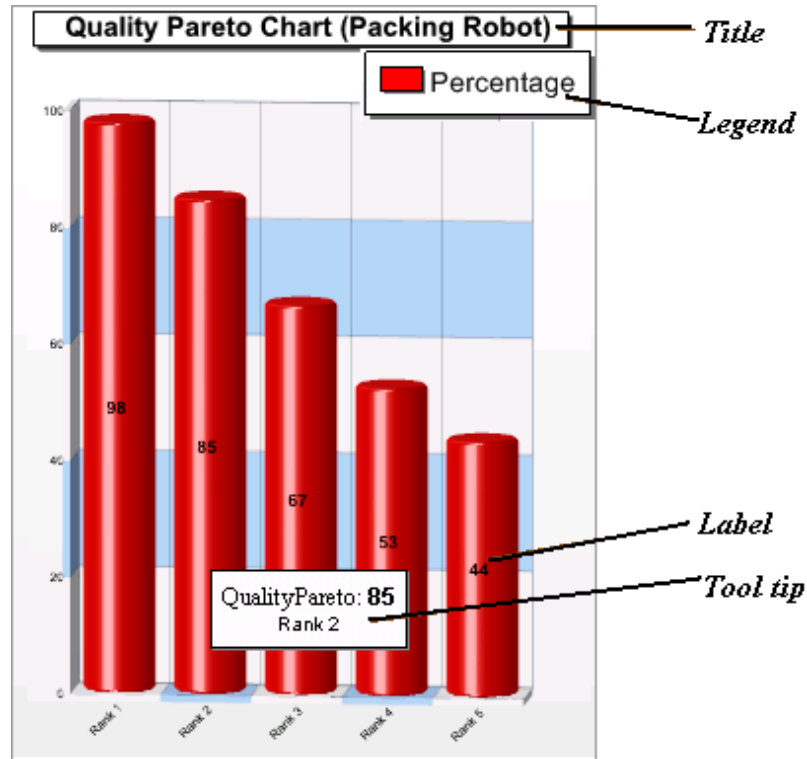


Figure 8.28 - Hidden Extras in a Chart

- **Filters** let you narrow or broaden the content of a report or chart.
- **Auto-refresh** lets you update data for current shifts and periods.
- **Titles, legends, labels, and tool tips** explain graphical information in charts, like the one shown in Figure 8.28
- The data in some reports may span several **pages**. In these cases, the report displays a line that looks like Figure 8.29, at the bottom of the report body.

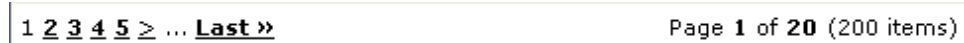


Figure 8.29 - Pages

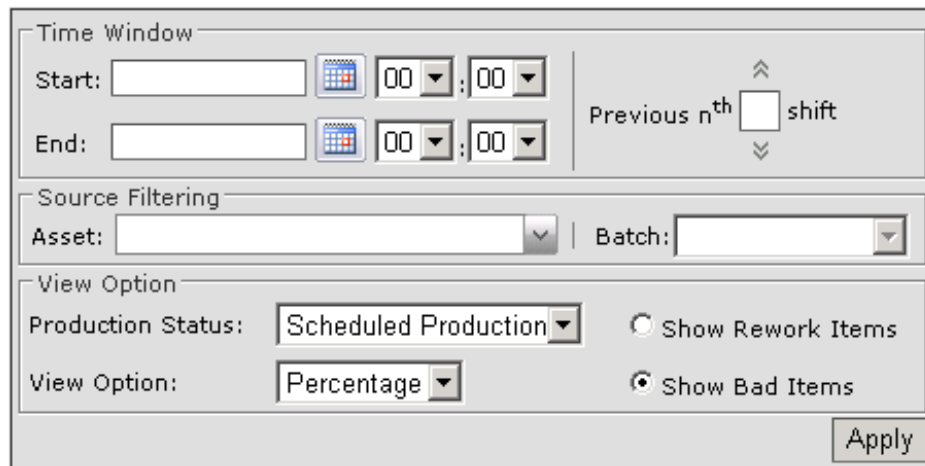
- Click on a page number, the > and < arrows to page forward or backward through page numbers, or click **Last >>** or << **First**.
- Many reports have a **search bar** above the report columns that you can use to search for information and sort the report. To sort the information, drag the column you want to sort by into the search bar. Doing this will group events under headings in the report, which you can expand and collapse. It also

overrides the page size limit configured into the report, and puts all the events onto one page.

If you do not see these features in a report or chart but would like to see them, it is because they haven't been added using the tools we looked at earlier when creating views.

8.4.1.1. Runtime Filters

Some reports and charts may be configured to allow runtime users to filter the data in the report. Each report and chart has its own unique filter which, if enabled, can be accessed from the report by clicking the report's Toggle Runtime Configurator  icon. The filter opens above the report or chart. Options in a filter might include only a time window, but may also include other information. One of the more elaborate filters, which is available with the Quality Pareto Chart, looks like Figure 8.30.



The figure shows a 'Sample Filter' dialog box with three main sections: 'Time Window', 'Source Filtering', and 'View Option'.
 - **Time Window:** Contains 'Start:' and 'End:' labels, each followed by a date picker icon and a time selection field (HH:MM). To the right is a 'Previous nth shift' label with a text input field and up/down arrows.
 - **Source Filtering:** Contains an 'Asset:' dropdown menu and a 'Batch:' dropdown menu.
 - **View Option:** Contains a 'Production Status:' dropdown menu (set to 'Scheduled Production'), a 'View Option:' dropdown menu (set to 'Percentage'), and two radio buttons: 'Show Rework Items' (unselected) and 'Show Bad Items' (selected).
 An 'Apply' button is located at the bottom right of the dialog.

Figure 8.30 - Sample Filter

Each report and chart has its own filtering capabilities, but only if filtering is enabled in the report's or chart's configuration. To use the filter in a runtime report or chart, fill in any applicable fields then click on Apply.

Most filters let you choose a time frame. Many filters also let you choose a shift. In Figure 8.30, notice the up and down arrows above and below the Previous Nth Shift prompt; you can click these to choose a shift number, or you can enter a number in the field. 0 (zero) is the current shift, 1 (one) is the previous shift, and so on. The shift can change while you view the report; if this happens, you will have to change the value in the filter to continue to display information for the shift you were looking at.

NOTE: Although a filter may prompt you for a shift, some reports or charts can be configured to show days, shifts, or periods. If a report or chart was configured to show days or periods, the value you enter in the filter will display a previous *n*th day or

period, even though you are prompted for a shift. If using this field in the filter yields confusing results, you may need to confer with your administrator for clarification on how the report or chart was configured.

Many other filters let you choose an asset or batch; the assets you can choose from and the batches you can choose from are pre-configured for the report or chart.

In the Asset drop-down list, **None** may be an option, depending on how the report or chart was configured. Choosing None has no affect in a report or chart that shows only one asset at a time; but in a report that lists more than one asset, choosing None adds all eligible assets to the report. The same is true of the Batch drop-down list; to see all batches that are in the drop-down list in the report, choose None.

Still other filters let you choose additional information that is pertinent to the data you are reviewing. In Figure 8.30, runtime users have a choice of production status, view option, and rework or bad items. Filters for other reports or charts may provide similar or other options.

8.4.1.2. Refreshing the Data

Some reports and charts show current information that may require you to refresh information as it comes in; such a report is typically configured to refresh itself so that runtime users do not have to refresh the information. To refresh the data, click on the Refresh  icon at the top of the report or chart.

If a report or chart displays current information, it is possible that it was configured to automatically refresh the data. The auto-refresh can automatically refresh data as frequently as every five seconds, or once an hour, depending on how it was configured. You may not always want the data to refresh, especially if you are investigating a particular event, or are reviewing current information. When this is the case, you can pause the auto-refresh so that the data does not change.

If auto-refresh is configured for the chart or report, the Auto-Refresh checkbox  AutoRefresh appears at the top of the report in green. To pause the auto-refresh, remove the checkmark from the checkbox  AutoRefresh so that it appears with a salmon color.

As long as the checkmark is removed, data does not refresh automatically. Note, however, that you can still refresh data manually by clicking the Refresh  icon.

NOTE: Using the filter to focus on a time frame that is not current can disable the auto-refresh feature or turn it off. When this happens, you can turn it back on by clicking it to add the checkmark to the checkbox again.

8.4.1.3. *Change the Content of a View*

It is possible that you have access to a view where the content is not exactly what you need. If you have the permission, you can change the content of a view. If you do not have permission to change the content of views, you may want to ask the System Administrator to adjust your security permissions for the view.

8.4.1.4. *Managing Downtime Events*

Using a **Downtime Audit Report**, you can reassign downtime causes, delete events, and split downtime events. How this report is configured determines its content and how it is used.

The report is made up of the filter area at the top, the report in the middle, and the Downtime Management Console at the bottom. The lines in the report appear in red if they have not been modified in any way. As soon as you modify a line, its color changes to black. Figure 8.31 is a preview example, with the filter and the Downtime Management Console displayed.

In addition to the features highlighted in the figure, you can:

- **Assign actual causes and responsibilities** for the downtime event.
- **Select more than one event** on a page by holding down the **Ctrl** key on your keyboard while using your mouse to click the lines you want to select. Selected lines appear in yellow highlight.
- If the lines you have selected are all on one page, you can **Delete** them all at once, and **Mass-change** their causes and responsibilities.

NOTE: The administrator can configure the number of events that display on each page. Longer pages let you select and act on more events at one time. Although you can select lines across several pages, you cannot take any action on lines selected across several pages. You can release your multiple selections by clicking on any line without holding down the Ctrl key.



Downtime Audit Report

Downtime Audit Report 1 (Packing Robot)

Time Window
 Start: Jun 5 2008 12:00
 End: Jun 5 2008 13:00
 Previous nth shift
 0 is the current shift, 1 is the prior shift, and so on.

Source Filtering
 Asset: Packing Robot

View Option
 Production Status: Scheduled Production

AutoRefresh ☐
 Auto-refresh is paused.
 Click to refresh data.
 Click to show or hide the filter area.

Search bar Apply

Drag a column to this area to group by it.

Production Date	Period Name	Event Start	Event End	Duration	Event	User Cause
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:52:14 ...	6/5/2008 12:52:19 ...	00:00:05	Blocked	Robot Waiting
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:52:43 ...	6/5/2008 12:52:46 ...	00:00:03	Fault	Hydraulic Pressure Low
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:53:22 ...	6/5/2008 12:53:25 ...	00:00:03	Fault	Out of Tape
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:53:22 ...	6/5/2008 12:53:27 ...	00:00:05	Blocked	General Maintenance
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:54:03 ...	6/5/2008 12:54:06 ...	00:00:03	Fault	Hydraulic Pressure Low
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:54:18 ...	6/5/2008 12:54:27 ...	00:00:09	Starved	Out of Tape
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:54:39 ...	6/5/2008 12:54:44 ...	00:00:05	Blocked	General Maintenance
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:54:56 ...	6/5/2008 12:54:59 ...	00:00:03	Fault	Hydraulic Pressure Low
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:55:35 ...	6/5/2008 12:55:38 ...	00:00:03	Fault	Hydraulic Pressure Low
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:55:50 ...	6/5/2008 12:55:55 ...	00:00:05	Blocked	Robot Waiting
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:56:19 ...	6/5/2008 12:56:22 ...	00:00:03	Fault	Out of Tape
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:56:58 ...	6/5/2008 12:57:01 ...	00:00:03	Fault	General Maintenance
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:56:58 ...	6/5/2008 12:57:03 ...	00:00:05	Blocked	Robot Waiting
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:56:58 ...	6/5/2008 12:57:07 ...	00:00:09	Starved	General Maintenance
6/5/2008 12:00:00 ...	Jun 5 2008 Afternoon...	6/5/2008 12:57:43 ...	6/5/2008 12:57:46 ...	00:00:03	Fault	Robot Waiting

« First ... ≤ 4 5 6 7 Page 6 of 7 (96 items)

Info Panel
 Selected Records: 3

Split Downtime Record
 Start Time: End Time:
 Split Time: 2008 : :

Re-Assign Downtime Causes
 Cause: Responsibility:
 Reason:

Downtime Management Console (click to open/close)

To select more than one event, hold down the Ctrl key while selecting events with your mouse.

Click here to show or hide the console area.

Figure 8.31 - Sample Downtime Audit Report

- **Sort** the events by dragging a column you want to sort on into the search bar. Doing this overrides the page size limit and puts all events on one page. Keep in mind that the more events there are, the longer it will take for them to show up on the page.
- **Split** a downtime event into two by selecting the event you want to split, specifying the time at which you want to split it, then clicking the Split button. You might want to do this if the downtime event had two causes, or needed attention from two different areas of responsibility, or if you need to distinguish the event as two separate events for any reason.

8.4.1.5. Attributing Reject Reasons

Using a **Quality Audit Report**, you can assign actual reject reasons (causes) to quality-related events. How this report is configured determines its content and how it is used. It works much like the Downtime Audit Report. The report is made up of the filter area

at the top, the report in the middle, and the Quality Management Console at the bottom. The lines in the report appear in red if they have not been modified in any way. As soon as you modify a line, its color changes to black. Figure 8.32 is a preview example, with the filter and the Quality Management Console displayed.

Quality Audit Report

Quality Audit Report (Packing Robot)

Time Window
 Start: May 15 2008 00:00
 End: May 15 2008 23:00
 Previous nth 0 shift

Source Filtering
 Asset: Packing Robot

View Option
 Production Status: Scheduled Production

Search bar

Drag a column to this area to group by it.

Asset	Production Dat	Shift Name	Shift Type	Period Name	Period Type	Production Stat	Quality Name	Count	User Cause
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	1	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	0	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	1	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	0	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	1	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	0	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	1	Unassigned
Packing Robot	5/15/2008 1...	May 15 2008 ...	1	May 15 2008 ...	PlannedProd...	Scheduled Pr...	Scrap Parts	0	Unassigned

1 2 3 4 5 ≥ ... Last »

Page 1 of 21 (167 items)

Info Panel
 Selected Records: 2

Re-Assign Downtime Causes
 Cause: Unassigned
 Reason:
 Assign

Quality Management Console (click to open/close)

Annotations:
 - 0 is the current shift, 1 is the prior shift, and so on.
 - Click to refresh data.
 - Click to show or hide the filter area.
 - Search bar
 - To select more than one event, hold down the Ctrl key while selecting events with your mouse.
 - Click here to show or hide the console area.

Figure 8.32 - Sample Quality Audit Report

You can use the console area to assign the actual cause for the quality-related event. You can do this by selecting the event, then in the Re-Assign Downtime Causes section specify the Cause and/or Reason, then click on the Assign button to update the event.

You can select more than one event on a page by holding down the Ctrl key while clicking the mouse to select lines. Selected lines appear in yellow highlight. As long as the lines you selected are all on one page, you can mass-change their causes. Note, however, that although you can select lines across several pages, you cannot take any action on lines selected over several pages. You can release your multiple selections by clicking on any line without holding down the Ctrl key.

NOTE: Your administrator can configure the number of events that display on each page. Longer pages let you select and act on more events at one time. Alternatively, you can sort the events by dragging a column you want to sort by into the search bar. Doing this overrides the page size limit and puts all events on one page. Keep in mind that the more events there are, the longer it will take for them to show up on the page.



Lab: Creating a Runtime View

L8

Now that we have all collected all the information necessary for OEE calculation, we will visualize this information. In this lab, we will create views for AcmeSeutical operators to see OEE information.

Estimated time to complete this lab: 30 minutes

8.1. Task Checklist

In this lab, you will complete the following tasks:

- Create a Runtime view for a specific asset
- Assign users who can see this view

8.2. Support Files

You will need the following file(s) to complete this lab:

- ProductivityAnalytics92_DB.mdf
- ProductivityAnalytics92_DB.udl

8.3. Creating a New Runtime View for an Asset

In the first part of this lab, we will create a new runtime view to display the data we collected in the previous lab.

1. Open the Unified Web Interface if it is not already open.
2. Right-click on the **ProductivityAnalytics** provider in the navigation tree and select **Runtime Management**, as shown in Figure L8.1.

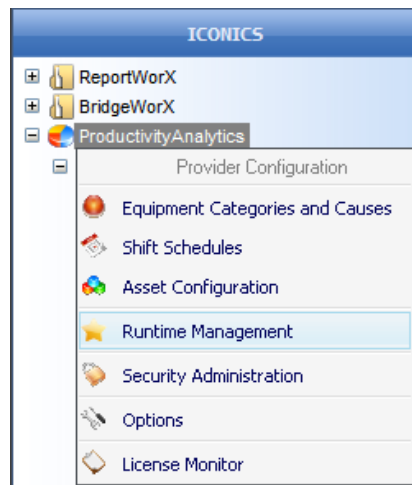


Figure L8.1 - Opening Runtime Management

3. Click on the Create New button to display options for creating a new runtime view.
4. Type “OEE Information” in the Name field and a description if you like.
5. Select the **Full Page Vertical** layout and then click the Next button. The page will refresh in the **Runtime View Editor**.
6. Put a checkmark in the box next to the **OEE Analytics Chart** item. Notice that **Page Content** is already selected from the Add To drop-down list at the bottom because it is the only area on the page that can have content added to it.
7. Click on the Add button. Your page should now look like Figure L8.2.

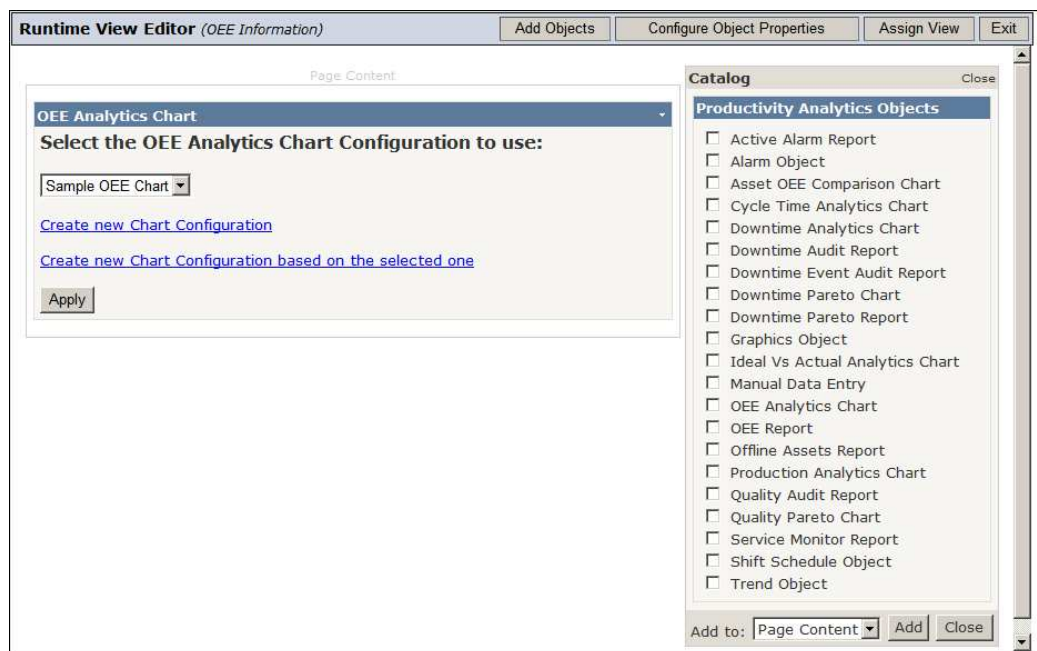


Figure L8.2 - New OEE Analytics Chart

8. Click on the **Create new Chart Configuration** link.
9. Type “OEE Chart” for the Title and enter a description if you like.

NOTE: You may click on the Preview button at any time. This refreshes the chart on the right to display your most recent changes.
10. Make sure **Availability**, **Performance**, **Quality**, and **OEE** are checked in the Chart Data section.
11. Make sure that in the Options drop-down list **Current Asset** is selected.
12. Your General tab for the OEE Chart Configurator should look like Figure L8.3.

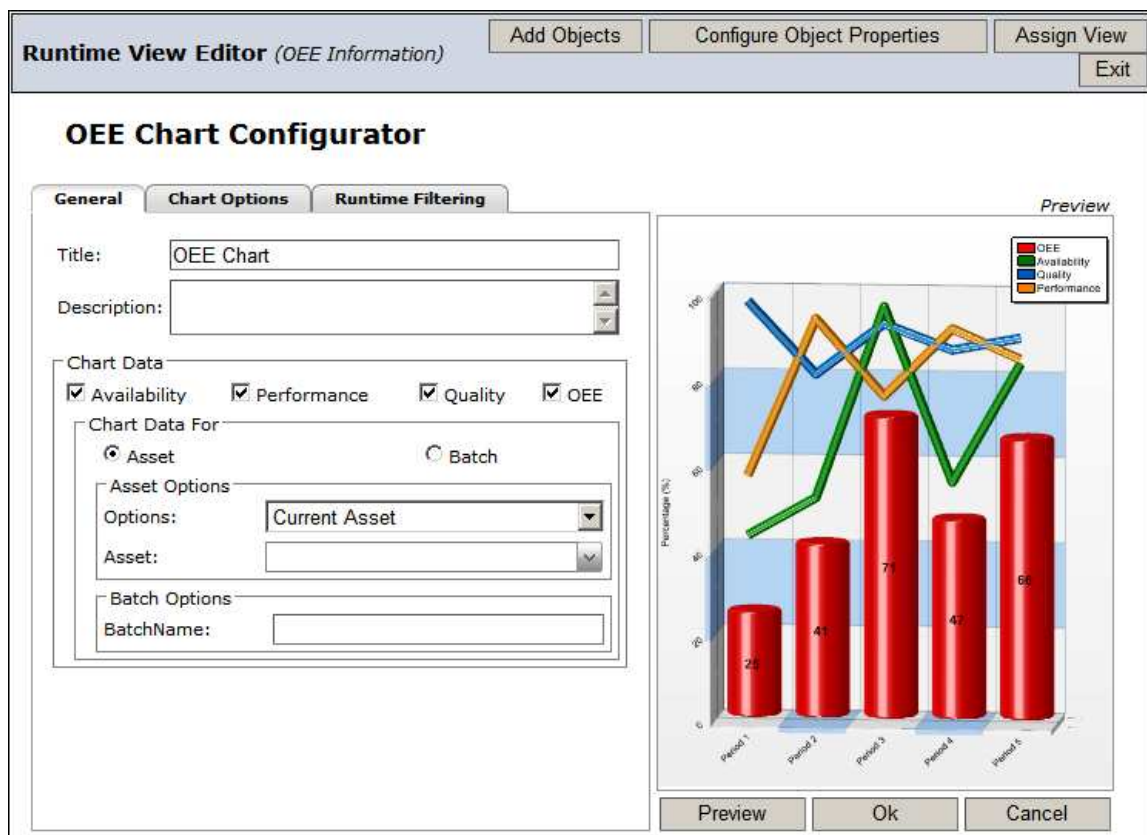


Figure L8.3 - OEE Chart Configurator: General Tab

13. Go to the Chart Options tab and from the Bar Style drop-down list select **Hexagon**.
14. Change the Palette Style to **Default** and click on the Preview button to see the effect of your changes. Your Chart Options tab should now look like Figure L8.4.

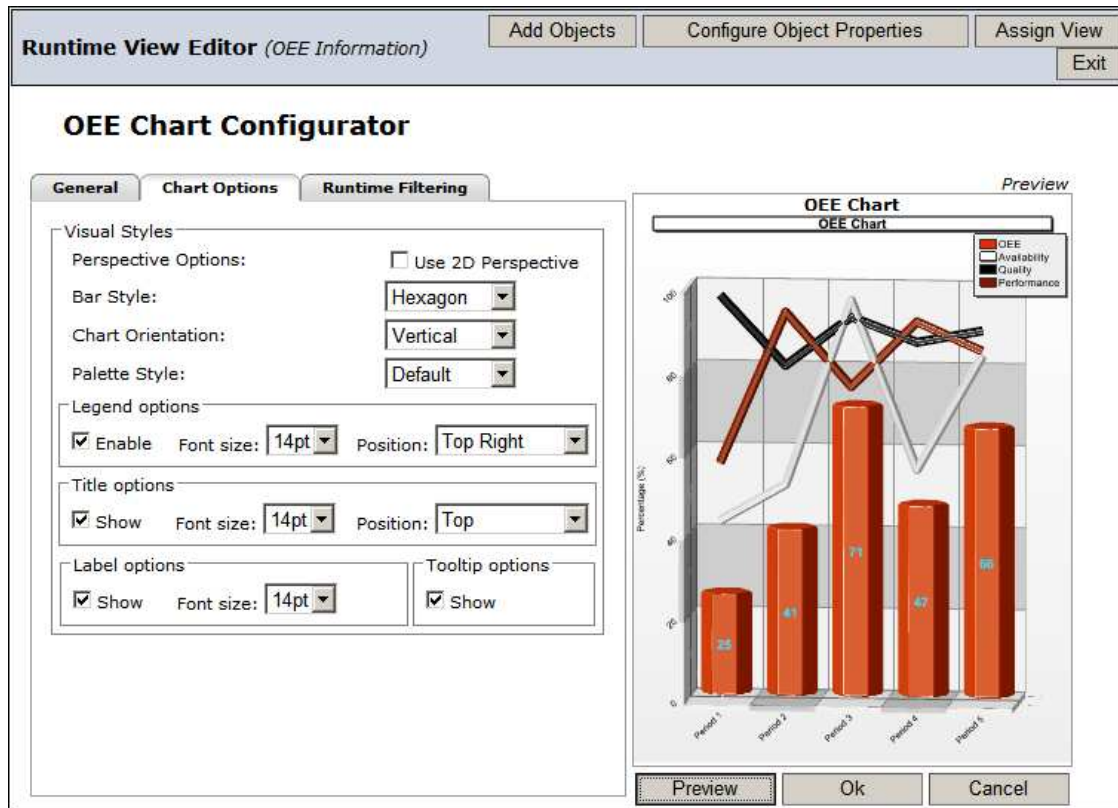


Figure L8.4 - OEE Chart Configurator: Chart Options Tab

15. Go to the Runtime Filtering tab, and note the selected default options. We do not need to change anything here. Simply click on OK to proceed.
16. You will be brought back to the main **Runtime View Editor** page. Click on Apply to use the OEE Analytics Chart configuration that we just created.
17. Now we will assign this runtime view to assets we added in a previous lab. Click on the Assign View button at the top of the page.
18. Since this view is generic and applies to the different machines, we will check the box next to “Machines” in the Categories Column, as shown in Figure L8.5.

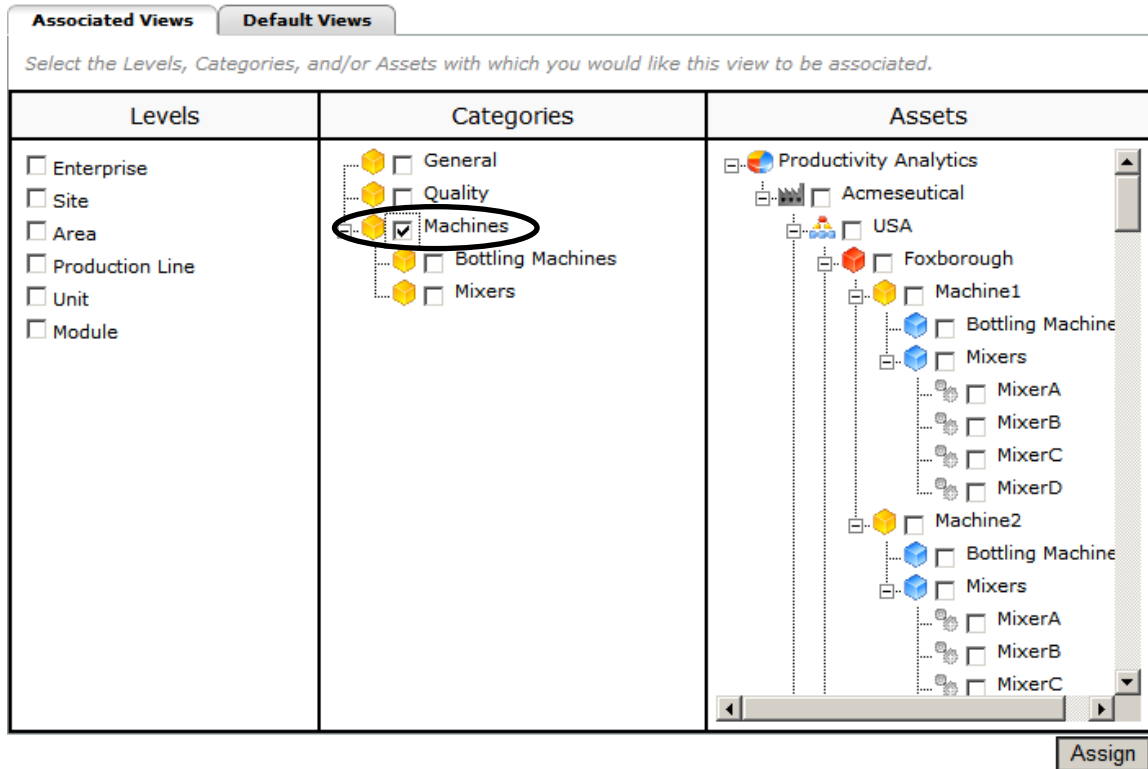


Figure L8.5 - Assigning the New View to All Machines

19. Click on the Assign button at the lower right. Now if you select any of the machines from the navigation tree, you should see the page update and display the OEE chart that we just configured, similar to the one in Figure L8.6.

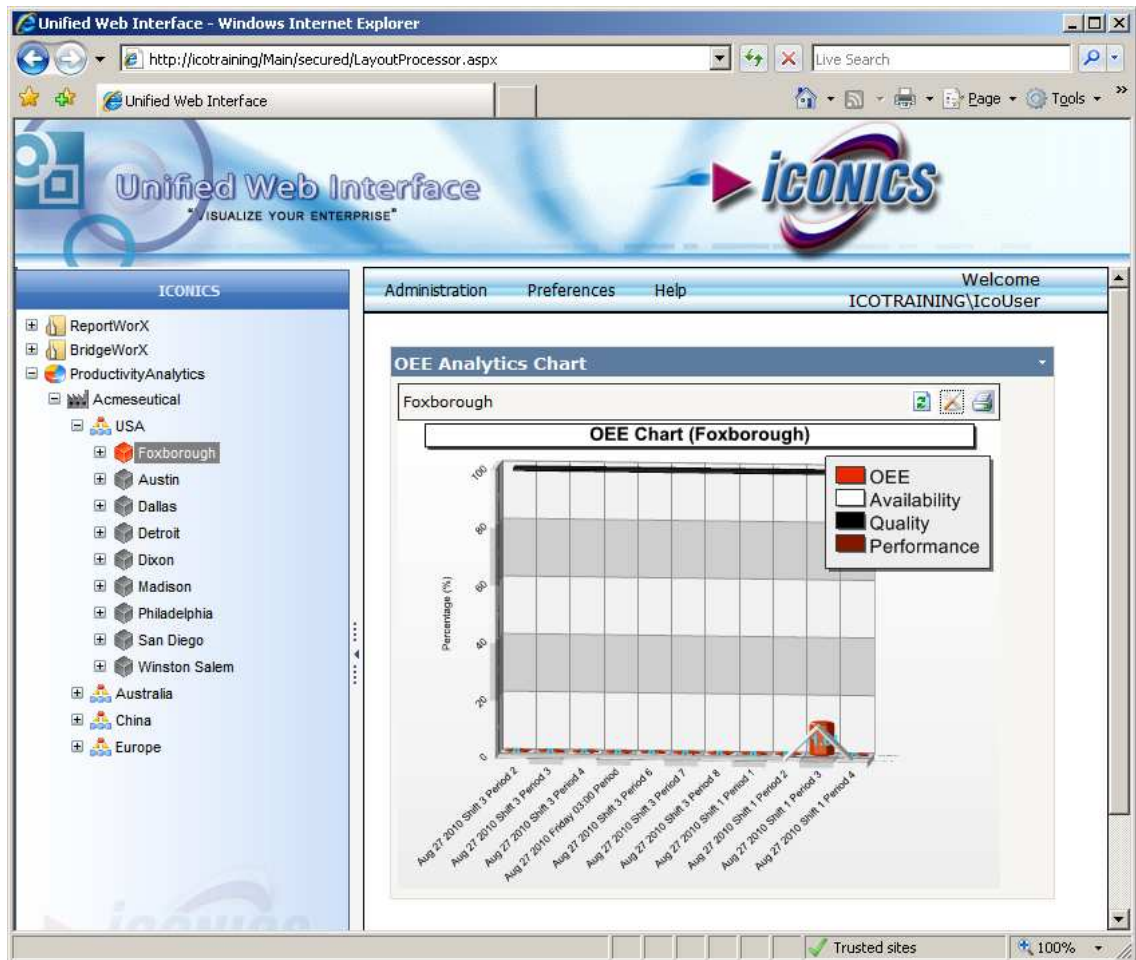


Figure L8.6 - Foxborough OEE Chart Runtime View

- Now that you have created a Runtime View for the machines, you may try to create other Runtime Views or enhance the current one with more objects for additional practice. Feel free to experiment with the variety of different objects that are available in the Productivity Analytics Object Catalog.

Review: Runtime View Management

R8

8.1. Chapter Objectives

You should now know and understand the following topics:

- The steps for creating various types of views
- Security privileges for views
- Runtime access for views
- How to work with runtime views

8.2. Summary

You can configure runtime views that contain the reports, charts, and other objects that display your asset information. A typical view is created with particular assets in mind, and is assigned to the assets it is designed for. Access to Productivity Analytics actions and views can be configured for each individual user, user domain, and networked machine by using the Security Administration form.

In this chapter, we went through the steps for configuring one view that displays a schedule and a second view that incorporates the OEE Analytics Chart and the OEE Analytics Report. We looked at views' zones and the list of charts and reports you can add to those zones. We looked at the ways in which you can configure and preview charts and reports in a view. We saw that some charts and reports can display asset totals or batch totals; can use date or shift filters; can aggregate data; can hide columns; and can automatically refresh. We also saw that a chart's or report's configuration can enable features that runtime operators may find useful.

User roles and security can grant additional permissions to runtime operators. Of particular interest to runtime operators are the permissions that can be granted for layout management or runtime object configuration, but additional security options control access to equipment categories, shift definitions, application options, asset management, and security administration. Furthermore, runtime access to each view must be managed via security controls; however, the user who creates a view is granted automatic access to the runtime view.

Of key interest are the features that are available in views at runtime, including filters, the search bar, and data refresh options. Also worth remembering are the Downtime Audit Report and the Quality Audit Report which can be configured so that runtime users can use them to update the Productivity Analytics database with critical information about historical events.

8.3. *Terms*

Additive Security Model	Application Security Actions	Data Refresh
Downtime Audit Report	Permissions	Quality Audit Report
Runtime Filter	Runtime View	

8.4. *Test Your Knowledge*

In this chapter, we discussed how to configure and use runtime views in Productivity Analytics. Before continuing to the next chapter, make sure you can answer the questions below.

1. True or False: You cannot create a view for use by one department only.
2. True or False: Any user who has access to a view that has a Downtime Audit Report can modify downtime events, their causes, and their responsibilities.
3. True or False: Turning off filtering makes a report or chart static and of no value.
4. True or False: Anyone who creates a view is automatically given permission to access that view.
5. True or False: A view can have several zones, and each zone can contain any number of reports, charts, and objects.
6. True or False: In a report or chart, you can limit the batch information to one product line or one product family.



7. If you want a user to be able to create and modify shift schedules and add them to views, which application action or actions do you assign to that user using the Security Administration form?
 - a. Shift Definitions
 - b. Application Options
 - c. Layout Management
 - d. Runtime Object Configuration
 - e. All of the above
 - f. Only A and B
 - g. Only A and C
 - h. Only A and D
 - i. Only B and C
 - j. None of the above
8. What can you add to a Productivity Analytics view?
 - a. Reports
 - b. Charts
 - c. ICONICS objects such as alarms, displays, and trends
 - d. Secured data content
 - e. All of the above
 - f. Only A, B and C
 - g. None of the above
9. What unique capabilities can be configured into the Downtime Audit Report?
 - a. The ability to override the default causes of downtime events with actual ones
 - b. The ability to delete events
 - c. The ability to make a mass change
 - d. The ability to filter and refresh data
 - e. All of the above
 - f. A and D only
10. What additional report(s) can be configured to allow runtime users to override default causes for events?
 - a. The Quality Audit Report
 - b. The Downtime Pareto Report
 - c. The Quality Pareto Report
 - d. The OEE Analytics Report
 - e. All of the above
 - f. A and D only
 - g. B and D only



Glossary

Actual and Target Calculation is a performance calculation that allows you to perform computations using an asset's raw count of logged, actual parts produced (as opposed to the asset's production ideal or target).

Additive Security Model is the system by which three accumulated levels of permissions give Productivity Analytics users access to runtime views and application actions. The three levels are: the user's Domain User account, the Domain Group that the user belongs to, and the Machine that the user has logged into.

AlarmWorX32 Logger is the ICONICS Alarm Logging application. Although this application is part of the ICONICS GENESIS32 Suite, it is installed with Productivity Analytics for data logging and analysis purposes. For more information, please visit <http://www.iconics.com/products/alarmworx32.asp>.

AlarmWorX32 OPC AE Server is the ICONICS alarm server engine. This can be installed using the ICONICS GENESIS32 installation DVD. For more information, please visit <http://www.iconics.com/products/alarmworx32.asp>.

Application Security Actions are permissions you can grant to Productivity Analytics domain users, domain groups, and machines. Actions are: Layout Management (of views), Runtime Object Configuration (for views), Equipment Categories, Shift Definitions, Application Options (on the General Options form), Asset Management, and Security Administration.

Asset is a resource for which you want to monitor performance, availability, and/or quality in Productivity Analytics. You can monitor these indicators using alarms defined in AlarmWorX32.

Asset Level is a tier of the *Asset Tree*. Each asset level is reserved for one specific type of asset. When you configure an asset, you specify the level that the asset belongs to.

Asset Tree is a hierarchy made up of *Physical Assets* and *Logical Assets* that you can use for reviewing asset availability, performance, and quality on a broad scale in Productivity Analytics.

Availability is the time that an asset is available for use. It is calculated using its downtime for events such as personnel breaks, maintenance, machine faults, and even idling.

Calculation Engine is the Productivity Analytics tool that summarizes performance and quality events, and removes old data that falls outside the retention period.

Child Asset is the definition of an asset's relationship to a higher-level asset in the *Asset Tree*. This relationship is relevant when rolling up totals to a higher-level asset, called a *Parent Asset*.

Custom Staging is the process of extracting downtime data from external and legacy systems and establishing it in the custom data tables available in the Productivity Analytics database.

Cycle Time Calculation is a performance calculation that allows you to perform computations using an asset's idea cycle time and actual cycle time.

Data Refresh is the way in which data displayed in runtime views is kept current. Reports and charts that display information for the current shift or the current period should be configured to automatically refresh the data at a specified interval or allow runtime users to refresh at will.

Data Trigger executes an event every time the value of the tag it is associated with changes to True or False. Productivity Analytics uses no other type of trigger. For each performance or quality event that you add to an asset, Productivity Analytics adds a data trigger.

Default Cause is the typical reason for a *Downtime Event*. You can set it to "unassigned" if the typical cause is unknown. Default causes configured for assets' events can be overridden with *actual causes* following an event.

Downtime is any time at which an asset is not in production. Scheduled downtime (such as a shift change) does not count against OEE totals, but unscheduled downtime (such as a power outage) does.

Downtime Audit Report is a Productivity Analytics report in which runtime users can reassign downtime causes, delete events, and split downtime events if this report is configured to allow user interaction.

Downtime Cause is the reason for a *Downtime Event*, or the reject reason for a quality-related event. A *Default Cause* can be changed to the actual cause after the event occurs.

Downtime Event is the record of a time in which an asset stopped production during a scheduled shift, as identified by an alarm defined in AlarmWorX32. Each downtime event is either scheduled or unscheduled.

Key Performance Indicators (KPIs) are the quantifiable metrics that reflect your organization's goals.

Logical Assets group *Physical Assets* into a hierarchical structure in the *Asset Tree* for easier management.

Nested Asset Level is an *Asset Level* that can repeat for more than one tier in the *Asset Tree*.

Overall Equipment Effectiveness (OEE) is a calculation that uses downtime (availability) data as well as performance and quality data to determine production efficiency



Parent Asset is the relationship of an asset in the asset tree to the *Child Assets* that are one level lower in the asset tree. The parent can be a physical asset or a grouping or category of assets.

Performance reveals an asset's production capabilities in terms of its cycle time, throughput, or actual-to-target comparisons.

Performance Calculation is an equation consisting of OPC tag value totals that reveal an asset's or batch's availability or downtime.

Permissions grant user access to Productivity Analytics actions and views via the *Additive Security Model*.

Physical Asset refers to actual equipment on the production floor, such as a robot. Compare to *Logical Asset*

PortalWorX provides a dashboard for viewing your HMI/SCADA information and your business information, as well as providing a central collaboration location for your entire enterprise. For more information, please visit <http://www.iconics.com/products/portalworx.asp>.

Productivity Analytics is a BizViz tool for reporting on real-time and historical availability, quality, and down-time of productivity assets. Users can open Productivity Analytics in the ICONICS Unified Web Interface with Internet Explorer.

Quality reveals the production numbers of an asset or batch in terms of product usefulness. The total items produced is the total number of good, bad, and rework items produced.

Quality Audit Report is a Productivity Analytics report in which runtime users can assign actual reject reasons (causes) to quality-related events if the report is configured to allow it.

Quality Calculation is an equation consisting of OPC tag value totals that reveal an asset's or batch's production quality.

Quality Event is the record of the quality of an asset's production. Quality events can be Good, Bad, Rework, or Total.

Quantity Variables are a variety of calculation components that hold the actual and ideal amounts produced for an asset. The total quantity produced is calculated by Productivity Analytics and is stored in the BPA.TotalItems variable.

ReportWorX is an application in the ICONICS BizViz Suite. You can use it to generate reports using data in your database, OPC Server, Web Service, etc. For more information, please visit <http://www.iconics.com/products/reportworx.asp>.

Responsibility is a Productivity Analytics record that contains information for handling a downtime event. The responsibility record can contain any information that is appropriate, such as phone numbers or instructions for handling the event.

Rollup Calculation is the method for applying a child asset's totals to its parent asset's totals. Child assets in an assembly or production line are typically rolled up, while machines that operate independently of each typically may not be.

Runtime Filter is a means for runtime users to select or limit the data that appears in a Productivity Analytics report or chart. A runtime filter is available only if the report or chart was configured to include it.

Runtime View is a viewable object that contains one or more reports, charts, or objects created in Productivity Analytics using ICONICS AlarmWorX32, TrendWorX32, or GraphWorX32, for use in monitoring current OEE information or reviewing historical OEE information.

Shift Period is smallest unit in a schedule that Productivity Analytics will summarize data for. Its length is determined by the shift template applied to the schedule. A shift period can be a pre-shift period, a planned production period, or overtime; and it can have its own period details. There are no gaps between periods in a shift.

Shift Period Details define and describe a *Shift Period*. A period can be classified as planned production, a break, or overtime.

Shift Schedule is the work calendar to which you apply a *Shift Template*. It consists of workdays, shifts, periods, and planned *Downtime*.

Shift Template is a pattern of workdays and shifts in a seven-day calendar week, which can be applied to a calendar to create a *Shift Schedule*. You can apply various templates to a calendar to create a shift schedule.

Throughput Time Calculation is a performance calculation that allows you to perform computations using an asset's ideal throughput and actual throughput.

Time Duration Variables are a variety of time-oriented calculation components computed by Productivity Analytics based on shift schedules and asset downtime events.

UDM is the *Unified Data Manager*.

Unified Data Manager is a core component of the ICONICS products. You can use it to modify default trigger values for your Productivity Analytics data triggers.

Unified Web Interface is part of the ICONICS core of products. You can use this to configure your assets and view your analytics. You can also use this to run ReportWorX reports and execute BridgeWorX transactions.

UWI is the *Unified Web Interface*.

Workday is a day for a production day is defined. Workdays are defined in the *Shift Schedule* as production days.



Answers

Questions Chapters	1	2	3	4	5	6	7	8	9	10
Chapter 1	E	False	False	True	True	False				
Chapter 2	True	False	True	True	G	G	False	True	H	False
Chapter 3	True	E	A	True	False	F	True	False		
Chapter 4	B	A	False	False	True	D	B			
Chapter 5	E	E	True	True	True	G	D			
Chapter 6	True	A	E	F	False	D	B			
Chapter 7	C	F	A	C	False	False	True			
Chapter 8	False	False	False	True	False	True	H	E	E	A



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