INVENSYS LEARNING SERVICES

Training Manual

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MES 2012 – Performance

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Learning Services

Module 1 – Introduction

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Module Objectives

- List the objectives of the course and describe the agenda
- Summarize the product offerings provided with the Wonderware Software Solutions
- Summarize the main purpose and core features of the software
- Describe the hardware recommendations, software requirements, and licensing

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and course agenda. It also includes a description of Wonderware solutions and products.

Course Description

The MES 2012 – Performance course is a 2-day, instructor-led class designed to provide a working knowledge of the features and functionality of Wonderware MES Software/Performance. The course provides lectures and hands-on labs to supply and reinforce the knowledge necessary to use Wonderware MES Software/Performance. The class will demonstrate how to configure and deploy a data collection system to analyze and report equipment utilization, availability, quality, and performance using the Application Server object.

Objectives

Upon completion of this course, you will be able to:

- Use Wonderware MES Client to define the information necessary to collect Overall Equipment Efficiency (OEE) and performance data
- Use MES Software/Performance as a central downtime information repository and reporting tool
- Retrieve and report the downtime data and analyze OEE

Audience

Application developers, engineers, system integrators, consultants, and other individuals who need to use MES Software/Performance in their manufacturing or other processes

Prerequisites

The prerequisites for this course are:

- Completion of an Application Server course
- Completion of an InTouch for System Platform course

Course Outline

Module 1 – Introduction

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and course agenda. It also includes a description of Wonderware solutions and products.

Section 2 – System Platform Overview

This section describes the fundamental concepts and architecture of the ArchestrA System Platform.

Section 3 – Wonderware MES Software/Performance Overview

This section explains the functionality, architecture, and component hierarchy of Wonderware MES Software/Performance.

Section 4 – Wonderware MES Software/Performance Components

This section describes the components of the Wonderware MES Software/Performance architecture.

Section 5 – System Requirements and Licensing

This section describes the hardware recommendations, software requirements, and licensing for Wonderware MES Software/Performance.

Module 2 – Wonderware MES Client Overview

Section 1 – Wonderware MES Client

This section describes the interface of the Wonderware MES Client application.

Section 2 – Security

This section describes the security settings in Wonderware MES Software, including security groups, users, group privileges, and security parameters.

Module 3 – Performance Model

Section 1 – Modeling Overview

This section provides an overview of manufacturing activity modeling and describes the production model for the simulated manufacturing plant used in this course.

Section 2 – Entity Model Builder

This section discusses the Entity Model Builder and explains how it is used.

Module 4 – Utilization

Section 1 – Utilization Overview

This section discusses utilization and how to define utilization states and reasons.

Section 2 – Utilization Capability Object Overview

This section discusses the Utilization Capability Object (UCO) and explains its functionality and usage.

Section 3 – Utilization Split

This section discusses the **Utilization Split** button and editor, and also explains their functionality and usage.

Module 5 – Overall Equipment Effectiveness

Section 1 – OEE Overview

This section provides the definition of Availability, Performance, and Quality, and gives the formula for OEE calculation.

Section 2 – Shifts and Shift Schedules

This section provides an overview of shifts and shift schedules, and also the impact of shift schedules on the OEE calculations.

Section 3 – UCO and OCO Configuration for OEE Calculation

This section provides an overview of the production attributes and the production counters and their effect on OEE calculations.

Module 6 – Visualization

Section 1 – Visualization Overview

This section describes some of the MES .NET client controls for Wonderware MES Software/ Performance, as well as the basic configuration and settings needed for the controls to function.

Section 2 – Importing .NET Controls for Performance

This section discusses the common .NET controls for Wonderware MES Software/ Performance and how to import them.

Module 7 – Reports

Section 1 – ArchestrA Reports

This section describes the steps to generate and view various Downtime Analysis and OEE reports in Wonderware Information Server.

Module 8 – Application Maintenance

Section 1 – Middleware Maintenance

This section discusses the tools that are used to configure middleware components.

Section 2 – Database Maintenance

This section discusses the mechanisms that are used to create, back up, and upgrade databases.

Section 3 – Data Archival, Purge, and Restore

This section discusses the tools that are used for data archival, purge, and restore (APR) of MES data.

Wonderware Software Solutions

Wonderware is the market leader in real-time operations management software, including Supervisory Human Machine Interface (HMI), GeoSCADA, Mobile Operations, Production Management, Manufacturing Execution System (MES), Performance Management, and Enterprise Manufacturing Intelligence (EMI) workflow. It is also the leader in integration with asset management, supply and demand chain, and Enterprise Resource Planning (ERP) applications. Wonderware is a brand offering of the Invensys Operations Management Division.

Wonderware software delivers significant cost reductions associated with designing, building, deploying, and maintaining secure and standardized applications for manufacturing and infrastructure operations. Wonderware solutions enable companies to synchronize their production and industrial operations with business objectives, obtaining the speed and flexibility to attain sustained profitability.

More than one-third of the world's plants and facilities run Wonderware software solutions in dozens of industries worldwide, such as:

- Automotive
- Chemical & Pharmaceutical
- Consumer Packaged Goods
- Discrete Manufacturing
- Electrical Power
- Facilities Management
- Food & Beverage
- Mining and Metals
- Oil and Gas
- Process Manufacturing
- Water and Wastewater

Wonderware software solutions deliver manufacturing and operational performance improvements that help reduce the amount of project-specific work that is required to develop integrated information and automation applications across entire operational enterprises. Wonderware software solutions can be implemented in the context of existing systems, at a company’s own pace, and to the extent that the company chooses.

These solutions leverage a powerful, layered software architecture that enables a variety of features and capabilities, such as visualization, optimization and control of plant floor data collection, data storage, and analysis.

Wonderware offers the following software solutions:

- **Manufacturing Execution Systems** – Wonderware MES software helps customers track the transformation of products from raw materials through finished goods. The software gathers in-process data, such as yields, throughput, equipment efficiencies, material consumption, and product quality. It also provides functionality, such as inventory management, work order/Bill of Material management, real-time reporting, and analysis, for a full view into operational efficiencies.

  Leveraging the ArchestrA software architecture (see page 1-8), Wonderware MES solutions are completely scalable and configurable. This enables a unique, incremental approach to operational improvements, where low-risk deployment of increased application functionality can be realized one step at a time.

  Wonderware MES solutions help to substantially reduce lead time and manufacturing costs, increase production throughput and product quality, and reduce efforts involved in compliance and governance.

- **Enterprise Manufacturing Intelligence** – EMI software solutions empower companies to analyze their overall operational Key Performance Indicators (KPIs), using simple, yet powerful, data analysis, reporting, and visualization tools.

  KPIs such as production, costs, process capability, equipment downtime, and quality and variance data can be collected, aggregated, and displayed using Wonderware EMI software solutions. A powerful, yet secure, web interface, with intuitive, drill-down dashboards, helps deliver this information to the full range of plant workers, tailored to their specific information requirements.
- **HMI/Supervisory Control and Data Acquisition (SCADA)** – HMI/SCADA solutions often impose complex demands on software architecture. Wonderware InTouch HMI visualization software, coupled with the award-winning ArchestrA technology-based ArchestrA System Platform, is uniquely positioned to meet these challenges.

  The HMI/SCADA software solutions are easy to use, implement, and configure, and offer simplified maintenance, high security and availability, and virtually unlimited scalability.
- **Data Historian** – Wonderware Historian Server software leverages the state-of-the-art ArchestrA System Platform, industry-leading historian technology, web-based reporting capabilities, and renowned open data source connectivity from Wonderware. The resulting Historian solution is unlike any other data archiving and reporting solution found in the market today. With blazing speed, broad scalability, highly efficient data storage and retrieval, high availability, and simple one-click historization setup, the Wonderware Historian Server software has an industry reputation for low total cost of ownership.

  Preconfigured web-based reports and data analysis capabilities derive immediate value from data captured by the Wonderware Historian Server.
- **Batch Management** – Wonderware batch management solutions perform repeatable and consistent execution of batching processes across all hybrid industries, whether it is Electronic Batch Records (EBR) systems in regulated industries, Paper-On-Glass capabilities in paperless production environments, or automated recipe management for supervisory systems.

  From simple batch processes, where only the formula changes for different products, to the most complex batch processes requiring dynamic allocation of shared equipment, Wonderware has a solution. Each of these solutions ensures reduced lifecycle costs and investment protection by leveraging the ArchestrA architecture.
- **Product Quality Management and Statistical Process Control** (**SPC**) – Delivering products with high “quality”—defined as “meeting specifications at the lowest possible cost”—is a top priority for manufacturers and industrial operations. Quality has many aspects, and Wonderware applications provide valued, integrated Quality Management functionality to tens of thousands of companies worldwide.

  Starting with Wonderware MES, which provides the most sophisticated, integrated quality management and enterprise-wide SPC, to Historian Server, which provides incremental solutions to store volumes of process data for quality analysis, Wonderware applications consistently meet quality needs. The Wonderware InTouch HMI software offers real-time data monitoring and alarming. Historian Client trends data. MES Software provides specification management, genealogy, BOM enforcement, OEE, downtime monitoring, and quality data documentation and monitoring. System Platform monitors data levels, and application templates can deliver nearly any quality capability. InBatch software collects information on batch quality and recipe settings. The capability list goes on.
- **Mobile Solutions** – Wonderware Mobile Solutions enable manufacturers and producers to manage the processes and procedures used to ensure all field tasks required to achieve reliable operations are executed consistently.

Software running on rugged handheld computers enables field operators to collect data on noninstrumented machinery and to receive contextual information and guidance based on conditions encountered in the field. This helps ensure the consistent execution of best operating practices.

Collected data can also be used for process analysis and production reporting, as well as integrated into existing back-end systems and plant data historians.

- **Workflow** – Workflow solutions allow customers to take their standard operating procedures, in-house knowledge base, and standard practices and make them part of everyday operations. Workflow can overlay any Wonderware product to provide visibility, collaboration, enforcement of procedures, and documentation of results.

For more information on Wonderware software solutions and products, visit the Wonderware website at http://www.wonderware.com.

ArchestrA Technology

ArchestrA is a comprehensive automation and information software architecture designed to integrate and extend the life of legacy systems by leveraging the latest, open industry standards and software technologies. It also unifies the Invensys Operations Management products that make up the InFusion ECS. ArchestrA “industrializes” Microsoft .NET and other Microsoft technologies to provide an even more productive toolset for building critical operations management software solutions for manufacturing, production, and facilities operations. The result exposes services needed by manufacturing and industrial infrastructure, such as common name space, object management, industrial security, high availability and redundancy, plant connection, enterprise connection, client interface, web portal, and systems management.

Using ArchestrA technology, applications can be rapidly assembled using software objects rather than being "programmed." Templates can be created for almost any purpose, and then used to build new applications, simply through reassembly and slight modifications, saving time and lowering development costs. Offerings built on ArchestrA empower decision makers to achieve their business goals without abandoning prior investments in systems or intellectual property.

ArchestrA technology helps reduce application engineering effort and deployment, increase efficiency, provide optimization and standardization, and enable integration of distributed automation systems and applications from virtually any vendor. Geographically dispersed applications (from a few hundred to one million I/O, and from a single node to hundreds of stations) can be rapidly and securely implemented.

The ArchestrA architecture leverages advanced software technologies to fill the gap between ERP systems and control systems. This architecture provides the following:

- **Framework**, which supports common services and a core set of system objects
- **Domain Objects**, which are industry-specific objects
- **Object Development Toolkit**, which enables third parties to create new domain objects customized for specific needs

The supervisory control and manufacturing information environment is served by a variety of systems, including HMI, Distributed Control Systems (DCS), SCADA, Process Information Management systems (PIM), MES, batch and recipe management systems, and advanced control/simulation systems. The ArchestrA Framework supports core services that are required by most of these different types of supervisory control and manufacturing information systems.

These core services include the following:

- Integrated Development Environment (IDE)
- Version management

- License management and centralized deployment
- System diagnostics and system administration
- Internationalization
- Data visualization and monitoring
- Event-based processing, scripting, and calculation capabilities
- Alarm and event management, historization, and security
- Data acquisition and field device integration
- Interobject communications and name service
- Reporting and ad-hoc query capability
- Support for industry standards, such as OPC and SQL

The ArchestrA architecture consists of the following:

- **Configuration and Deployment-Related Components** that are required for centralized deployment of the runtime components. These components are installed like any Windows application and include the following:
  - Centralized object repository (called Galaxy Repository)
  - Integrated Development Environment (IDE)
  - Object deployment services (called Bootstrap)
- **Runtime Components** that are centrally deployed and administered. These components include the following:
  - PCs with core infrastructure (called Platforms)
  - Key software applications (Engines)
  - Objects (Framework Objects) that expose framework-related functionality

Wonderware Individual Software Products

Wonderware software solutions offer robust, best-of-breed software components that empower customers to effectively develop and manage their automation and information applications in continuous, discrete, process, hybrid, and batch manufacturing environments. All the latest Wonderware software offerings leverage the latest ArchestrA technology and offer increased functionality and flexibility, as well as extensive connectivity.

ArchestrA System Platform

ArchestrA System Platform provides a single and scalable platform for all the SCADA, Supervisory HMI, MES, and EMI software-solutions needs of industrial automation and information personnel.

At the center of the ArchestrA System Platform is the “plant model,” which is the logical representation of the physical processes being controlled and supervised. ArchestrA object technology makes configuration, logging, delivery, and maintenance of real-time and historical information point-and-click simple.

Within the System Platform is a high-performance process historian with production history archiving, efficient data compression, and autoconfiguration of historical archiving that eliminates duplicate effort. The platform also contains an industrial web information server that dramatically simplifies the organization and delivery of operations information for use across all functions in an organization.

Wonderware InTouch HMI

InTouch software provides graphic visualization that takes operations management, control, and optimization to a completely new level. The InTouch HMI reputation stands above all the rest. What the industry now knows as HMI all began with InTouch software more than 20 years ago. No other HMI can match InTouch software for industry-leading innovation, architectural integrity, unequaled device integration and connectivity, uninterrupted software version migration path, and truly legendary ease of use.

All this leads to well-designed standards-driven systems that maximize productivity, optimize user effectiveness, increase quality, and lower development, maintenance, and operational costs, helping to make a company the best it can be.

Wonderware Development Studio

Wonderware Development Studio consists of a suite of cooperative tools designed to enable the rapid construction and maintenance of Wonderware applications.

The heart of the Development Studio is the ArchestrA IDE. Within the ArchestrA IDE, engineers can design, develop, test, and maintain any industrial application.

Without leaving the ArchestrA IDE, the user can develop vibrant and sophisticated graphics, and incorporate those into effective HMI, SCADA, MES, or Operations Intelligence applications.

Once development is ready for delivery, a single click is all it takes to deploy applications, objects, and associated logic to anywhere in the enterprise namespace.

ArchestrA Workflow Software

ArchestrA Workflow software is an advanced workflow application that enables companies to digitize manual and automated processes that include people or systems, or both. This sophisticated Business Process Management (BPM) application enables companies to model, execute, analyze, and improve processes inside and outside their organization to drive higher levels of collaboration, productivity, and innovation.

With ArchestrA Workflow, companies can institutionalize work processes that manage normal, unscheduled, or disruptive events within their operations environment, providing the *Right People* with the *Right Information* at the *Right Time*.

Wonderware Dream Reports

Wonderware Dream Reports provide the most intuitive and easy-to-use reporting solution available on the market today, giving the power to quickly and easily create reports from Wonderware InTouch HMI and many other data sources. It requires no IT or programming skills to design, schedule, and produce appealing and informative dynamic reports. It is easy to configure Dream Reports through simple drag-and-drop operations within the Report Studio. The design Studio also provides ease-of-use features, such as intelligent report objects and dialog boxes.

Wonderware Dream Reports will help to significantly reduce report development time, simplify report modifications, and empower users to transform raw data into great looking, information-filled reports. Custom reports can be created easily, quickly, and inexpensively, with scheduling tools to help deliver them to anyone, anywhere, anytime.

The Wonderware Dream Reports solution, along with Wonderware Information server or an included web portal, extends the availability of reports throughout an enterprise network and beyond.

Wonderware Historian Server

The Wonderware Historian Server is a high-performance, real-time database for historical information. It combines the power and flexibility of a relational database with the speed and compression of a true process historian, integrating the office with the factory floor or any industrial operation.

Wonderware Historian Server is designed to collect a wide variety of plant data, at full resolution and very high data rates, ensuring that decision makers at all levels will have the historical information they need to drive vital productivity improvement initiatives. Wonderware Historian Server offers unparalleled scalability and can be configured as a single data collection and aggregation system or as part of a larger, tiered architecture offering the ability to implement sophisticated summary and replication systems.

Wonderware Historian Client

Wonderware Historian Client provides rich data analysis and reporting capabilities to maximize the value of information stored in the Wonderware Historian Server.

Wonderware Historian Client is integrated with Microsoft Office components to deliver data-trend and numerical data analysis using Microsoft Excel, comprehensive data reporting using Microsoft Word, and the capability to publish real-time and historical plant information to the web or company intranet site using Wonderware Information Server.

Plant knowledge workers using information derived from the Wonderware Historian Server can quickly troubleshoot problems, study potential process inefficiencies and eliminate the time-consuming process of locating the data. Wonderware Historian Client makes the delivery and visualization of this information easy to implement and deploy.

Wonderware Information Server

The Wonderware Information Server offers an easy solution for aggregating and presenting plant production and performance data over the web or company intranet.

Plant personnel, with a minimum of training, can install, configure, and implement a highly effective plant information website without the need for custom web programming.

Using Information Server, large amounts of process data can be aggregated into highly informative production reports tailored to the information needs of plant personnel.

Content from the Wonderware Information Server can be incorporated into other web portals, making existing corporate IT portals more informative and valuable.

Wonderware Intelligence Software

Wonderware Intelligence Software enables companies to gather, store, and report on both historical and real-time operational data, using a dashboard to present KPIs that are used to visualize, tune, and maximize their operations.

The Intelligence Data Model is the foundation for transforming data into actionable information by adding context (equipment, product, work orders, material, personnel, and so on). This data in context helps to answer operational questions, such as:

How much product is available per site today?

How many work orders contained a specific raw material ingredient last week?

Wonderware MES/Operations Software

Wonderware MES/Operations software capabilities provide a scalable and configurable MES designed to help manufacturers across a wide range of industries improve their operational efficiency, manufacturing responsiveness, and brand integrity.

The incremental, low-risk approach to building MES from Wonderware allows MES to be implemented in steps, from basic functionality, including work order management, bill of materials, specifications, data collection, and traceability (track/trace/genealogy), to enhanced capabilities, such as inventory management, certifications, labor, and production steps.

Wonderware MES software fully leverages the ArchestrA System Platform and Invensys InFusion Enterprise Control System (ECS) for integration, development, and reporting, as a result of the underlying ArchestrA technology. This approach reduces deployment and maintenance costs, while facilitating rapid development and scaling of the application throughout the enterprise.

Wonderware MES/Performance Software

Wonderware MES/Performance software capabilities provide a software solution for collecting, tracking, and communicating real-time equipment performance and efficiency information, scalable from machine/equipment level information to line/plant enterprise KPIs.

Wonderware MES/Performance software delivers critical equipment downtime and efficiency information to operators and decision makers who can then take immediate action to improve plant performance and productivity, equipped with the most up-to-date operational results.

Wonderware MES software is highly configurable, fully leveraging the ArchestrA System Platform and Invensys InFusion ECS for integration, development, and reporting, as a result of the underlying ArchestrA technology. This approach reduces deployment and maintenance costs, while also facilitating rapid development and scaling of the application throughout the enterprise.

Wonderware MES/Quality Software

Wonderware MES/Quality software capabilities provide historical documentation of quality sample data and SPC monitoring of the sample data collected.

Wonderware MES/Quality software helps manufacturing companies configure, manage, and implement quality specifications that reduce the cost and increase the efficiency and accuracy of capturing and monitoring critical quality information on the plant floor. Information is captured and monitored either directly from process equipment or by operators using sample plan procedures.

Wonderware MES/Quality software incorporates electronic records of operational performance and quality sampling procedures for compliance with internal, governmental, or safety regulations that require tighter quality control and improved quality procedure management in many manufacturing industries.

Wonderware QI Analyst

Wonderware QI Analyst SPC software is an important part of any quality management program. Performing both online and historical SPC, QI Analyst supports real-time process monitoring and alarms, as well as historical reports to view process “health” over any period of time. Real-time SPC, analysis, and reporting are equally easy. By storing process data in the QI Analyst database and linking to external data sources, users can leverage enterprise-wide SPC to reduce variation, reduce costs of manufacturing, and increase productivity.

Wonderware InBatch Software

Wonderware InBatch flexible batch management software optimizes the management of any batch process. InBatch software automates recipe management using a graphical procedure environment featuring Sequential Function Charts (SFC). Consistent with the ISA S88 flexible batching standard, InBatch software offers comprehensive batch execution and equipment history, material genealogy, stringent security, web-based reporting, and the ability to facilitate the design and implementation of systems that are compliant with FDA 21 CFR Part 11 regulations.

Wonderware SCADAlarm

SCADAlarm alarm and event-notification software provides a telecommunications link to industrial automation software systems. It seamlessly integrates with the comprehensive Wonderware product family and has built-in browsers to enable fast configuration of information from ArchestrA System Platform and InTouch HMI software.

Wonderware Toolkits

Wonderware Toolkits provide powerful extensibility to InTouch HMI and System Platform applications by enabling developers to extend the capabilities of Wonderware products to meet specific system integration needs. The Toolkits promote adherence to industry standards, provide additional customization and intellectual property protection, and enhance the ability to interface Wonderware products with other software and hardware.

Wonderware offers the following Toolkits:

Toolkit	Enables developers to:
ArchestrA Object Toolkit	Extend the ArchestrA architecture with objects that provide specific application or device integration functionality.
GRAccess Toolkit	Create programmatic access to and interaction with System Platform Galaxy configuration data.
MXAccess Toolkit	Create programmatic access to runtime data in a System Platform Galaxy.
DAServer Toolkit	Build custom device integration servers more easily.
Historian Toolkit	Create high-value industrial applications that integrate with data sources from the System Platform and other data sources.
Alarm Toolkit	Produce custom-distributed alarm providers and consumers.
Wizard Toolkit	Produce their own Wizards for inclusion in InTouch HMI.
Script Toolkit	Develop custom InTouch scripts.

Wonderware Device Integration Servers

Connectivity to plant/facility devices is key to real-time information management. Wonderware maximizes choices with the broadest possible communication options for industrial automation and information devices. In collaboration with more than 100 third-party interface developers, Wonderware provides the largest selection of connectivity options to hundreds of control systems, such as PLCs, RTUs, DCSs, flow controllers, loop controllers, scales, gauges, bar code readers, and other hardware devices. Wonderware has also fully embraced the openness of OPC technology, exposing data via OPC from Wonderware products as an OPC Client, as well as providing the means to connect to any third-party OPC Server.

Device integration can be maintained more easily using Device Integration Objects (DI Objects) within the ArchestrA System Platform for seamless connectivity to any data source. Wonderware also offers the DAServer Toolkit, which empowers companies to create their own connectivity server.

Wonderware Enterprise Integration Application

The Wonderware Enterprise Integrator enables fast and reliable information exchange between Wonderware MES Software, ArchestrA System Platform, and enterprise systems.

Typical integration scenarios include connecting business systems with Wonderware MES, InBatch, or Intelligence and other shop floor applications.

The Wonderware Enterprise Integrator modular design allows any application to be integrated, so that one consistent approach to enterprise integration is adopted, eliminating isolated silos of information and high-maintenance point-to-point integration scenarios.

Wonderware IntelaTrac

Wonderware IntelaTrac is the industry-leading mobile workforce and decision support system.

IntelaTrac includes configurable software and ruggedized mobile hardware solutions that enable workflow, data collection, and general task management for plant operations, maintenance management, production tracking, and compliance applications. IntelaTrac is capable of exploiting integrated barcode and RFID reader technology found in many of today's leading mobile devices. This enables precise location verification of critical field tasks supporting regulatory compliance and continuous improvement initiatives.

IntelaTrac is also a key component of a complete plant-intelligence solution that connects all of your wired and stranded assets. This enables an even broader visibility into the performance of your assets than ever before. The IntelaTrac asset-centric approach makes tracking asset performance straightforward, which supports Reliability Centered Maintenance initiatives.

Section 2 – System Platform Overview

This section describes the fundamental concepts and architecture of the ArchestrA System Platform.

Introduction

The ArchestrA System Platform is a strategic industrial application platform built on the ArchestrA technology, which uses Wonderware Application Server as its foundation. Designed to suit the needs of industrial automation and information personnel, System Platform provides a single, scalable software platform for Geographically Distributed SCADA (Geo-SCADA), Supervisory HMI, and Production and Performance Management software solutions. System Platform is a unified bundle of previously available Wonderware software products, including Wonderware Application Server, Wonderware Historian, Wonderware Information Server, and Device Integration products.

System Platform contains an integral core set of capabilities and services to support sustainable production and operations performance improvement through a comprehensive set of six capability areas:

- **Industrial domain services** for industrial computing functions that are not provided by commercial operating systems or products
- **Software and device connectivity services** for easy communication to virtually any plant or business information source
- **Information and data management services** for management of real-time and historical information
- **Information delivery and visualization services** for functions that provide information to the right users at the right time, and in the form in which they expect
- **Application development services** for easy and intuitive development of modular industrial software solutions that can be easily changed to meet future needs
- **System management and extensibility services** for easy management, expansion, and modification of the application or the computing architecture

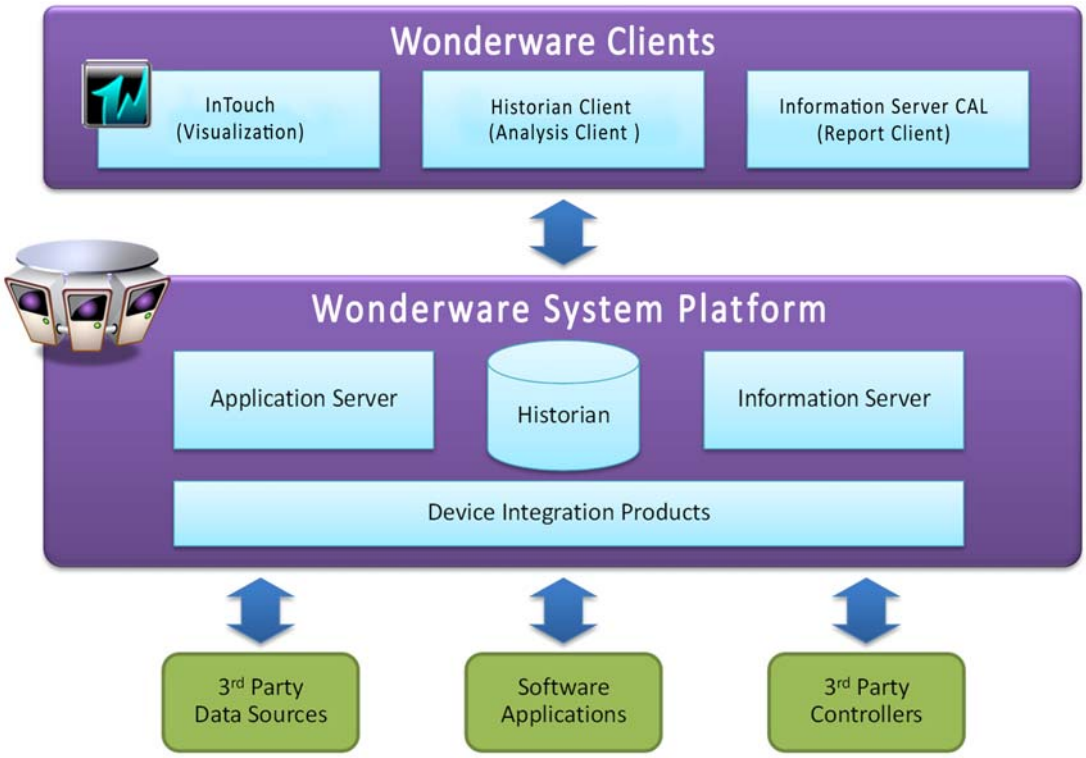
The ArchestrA technology on which System Platform is built is a comprehensive plant automation and information architecture designed from the outset to extend the life of legacy systems by leveraging the latest software technologies. For more information, see “ArchestrA Technology” on page 1-8.

In the ArchestrA environment, software applications can be rapidly assembled rather than programmed. New applications also can be created simply through the reassembly of existing applications. The ArchestrA Integrated Development Environment (IDE) provides a centralized environment for development, deployment, and maintenance of scalable, secure, and standardized information and automation applications.

ArchestrA System Platform Architecture

The ArchestrA System Platform consists of a variety of software components, including:

- **Application Serve**r for system-wide, real-time data acquisition, alarm and event management, centralized security, data manipulation, remote deployment, and collaborative engineering
- **Historian** plant data historian
- **Information Server** for Internet/intranet visualization and content management
- **Device Integration Products** for field device connectivity with third-party data sources, software applications, and third-party controllers
- Wonderware Clients that include:
  - **InTouch** Human-Machine Interface (HMI) software as a visualization client for the system platform
  - **Historian Client** trending and analysis software
  - **Reporting Client-Access Licenses** (CAL) for Information Server to enable information-sharing and reporting over the web



Section 3 – Wonderware MES Software/Performance Overview

This section explains the functionality, architecture, and component hierarchy of Wonderware MES Software/Performance.

What Is MES?

According to MESA International, Manufacturing Execution System (MES) delivers information that enables production activities in a plant to be optimized from order launch to finished goods.

What Is Wonderware MES Software/Performance?

Wonderware MES Software/Performance provides solutions to track, analyze, and improve equipment, line, or plant downtime and Overall Equipment Effectiveness (OEE). It optimizes the overall asset utilization within a manufacturing enterprise by collecting and providing accurate and consistent data that is derived from any user-configured downtime event.

Wonderware MES Software/Performance enables systems to be configured in a variety of ways to accomplish the most efficient data collection and analysis of any downtime event. It can be adapted to any production environment's parameters. It enables events that require their statuses to be monitored consistently to be accurately defined and customized within the production process.

Wonderware MES Software/Performance

The objectives of Wonderware MES Software/Performance are:

- Reduce capital expenditures by identifying the most productive assets for continued operation
- Increase the capacity using the existing assets by identifying the causes of unplanned downtime and improving operator involvement
- Reduce production costs by lowering labor costs (overtime, new hires, and less shifts), scrap, and rework
- Reduce time-to-market for plant or production line startup

Key Features of Wonderware MES Software/Performance

There are several key features associated with Wonderware MES Software/Performance. Some of these include:

- Utilization Capability Object (UCO)
  - A single, configurable software object that can be added to the real-time data processing plant model to access MES data, exchange real-time information from control systems or plant automation devices, configure downtime, and collect OEE information
- Operations Capability Object (OCO)
  - A single, configurable software object that can be added to the real-time data processing plant model to access MES data, exchange real-time information from control systems or plant automation devices, and configure production counters

- Better integration with ArchestrA
  - Synchronization of the plant model from ArchestrA IDE to the MES database (MESDB)
  - Synchronization of users from the Galaxy to MESDB
- .NET controls
  - Utilization control (to display utilization events)
  - Counts and durations control
  - OEE KPI controls
  - Production progress control
  - Login capabilities in the controls
- Reporting services reports
- Handling of work orders for OEE
  - Items and processes
  - Simple utilization and simple OEE
- Improved features with utilization .NET control
  - Filtering, usability, selection, and refreshing
- Configuration of plant model in Application Server
  - Configuration
  - Templates
- Entry of production rates for entities, items, and process

Another key feature is the ability to configure performance definitions through MES Client. MES Client contains the following basic modules for ease of configuration:

- User Groups and Users
- Shift and Shift Schedule
- Site
- Physical Entities
- Languages
- Utilization States
- Utilizations
- General Parameters

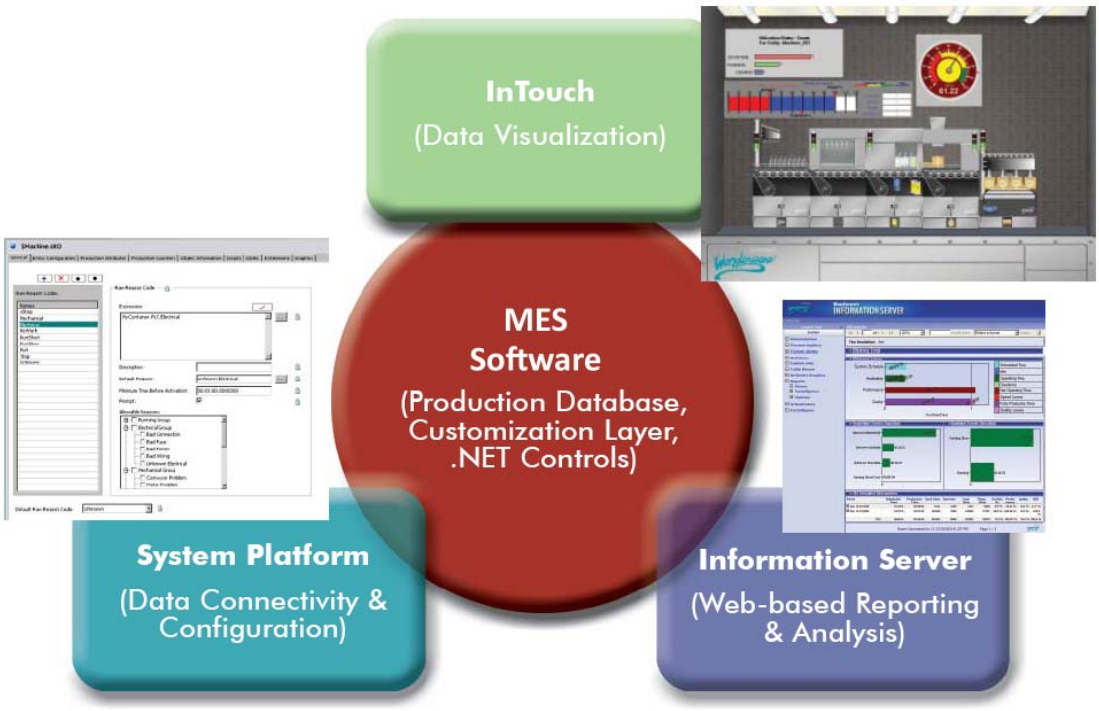
Section 4 – Wonderware MES Software/Performance Components

This section describes the components of the Wonderware MES Software/Performance architecture.

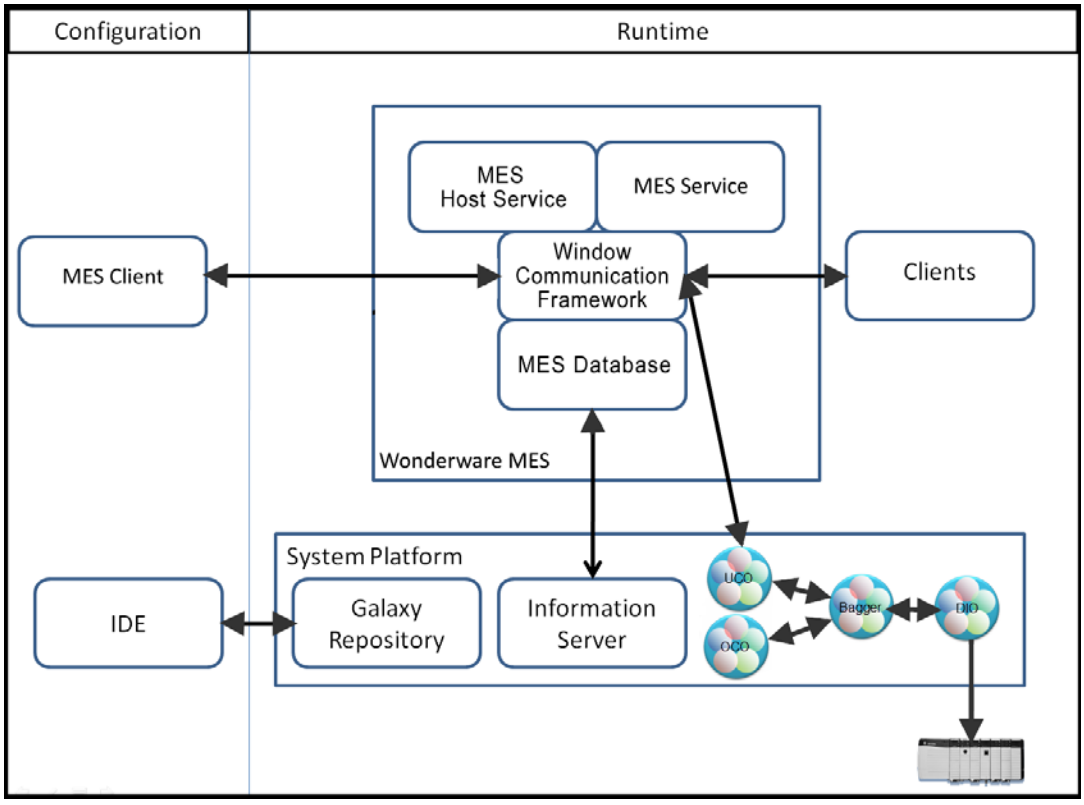
Introduction

The overall architectural solution associated with Wonderware MES Software/Performance leverages:

- Wonderware InTouch software as the HMI component
- ArchestrA System Platform for the application development environment
- Wonderware MES Software/Performance to track, analyze, and manage the overall effectiveness of your plant
- Wonderware Information Server as the web portal for viewing reports

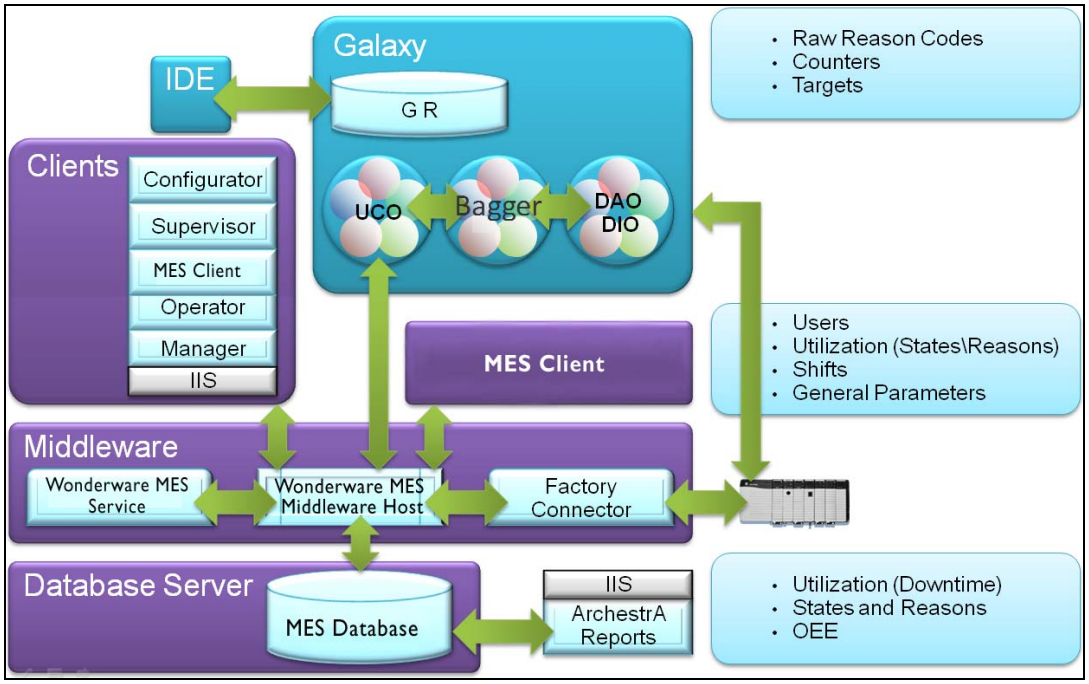


The following figure shows the logical elements of the Wonderware MES Software/Performance solution set.



Wonderware MES Software/Performance Components

The following figure shows the components of Wonderware MES Software/Performance and how they relate to each other.

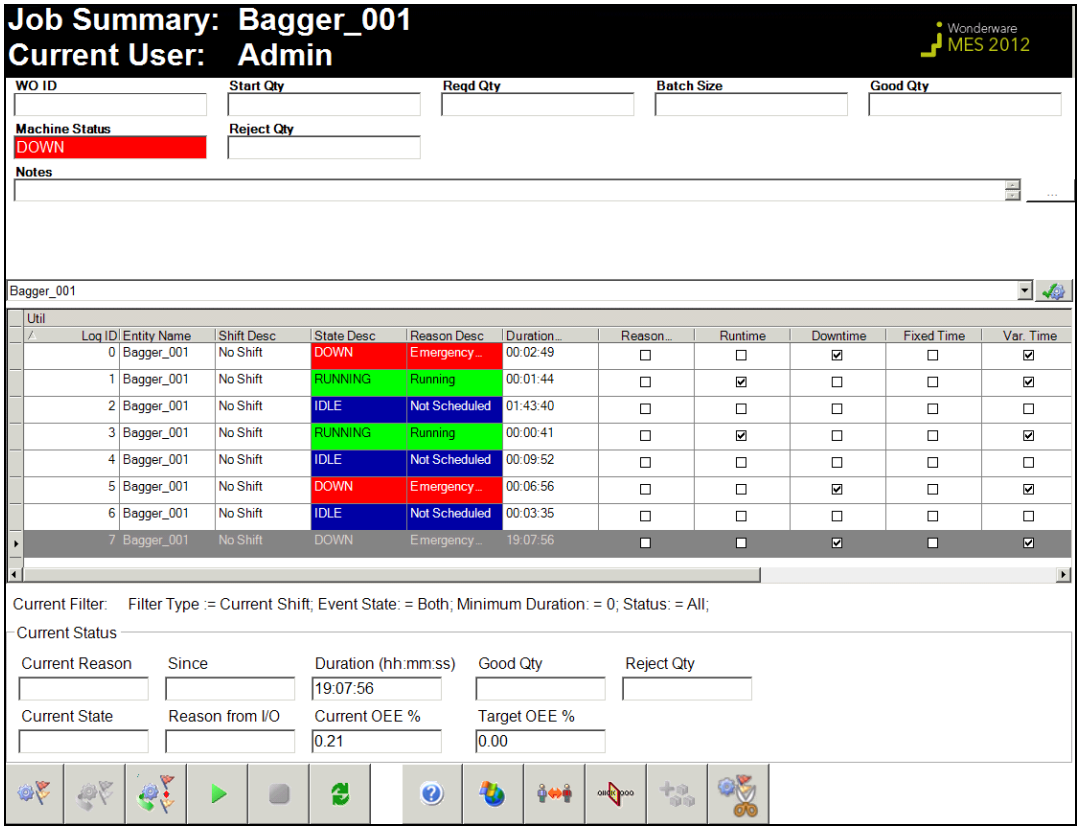


Runtime Overview

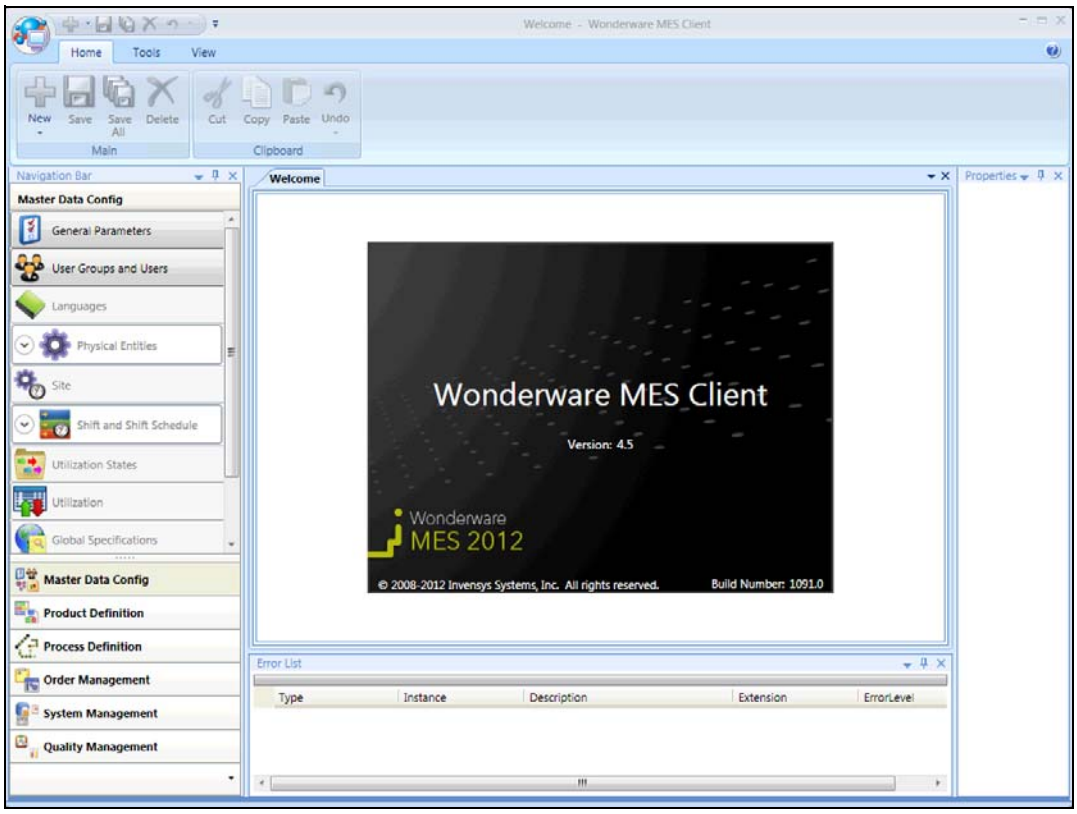
There are three types of clients, which are based on roles:

- Operator
- First Line Supervisor and Production Planner
- Reports

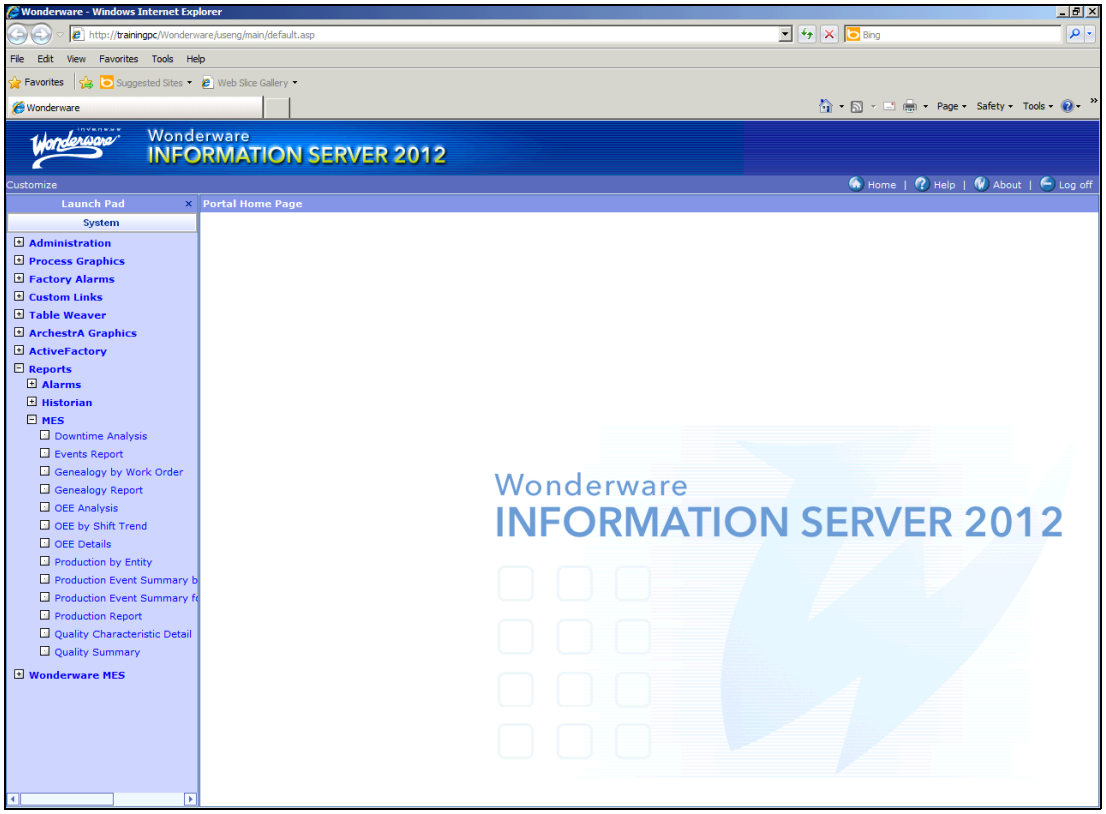
The operator, First Line Supervisor, and Production Planner interact with the MES application using InTouch.



The developer uses the MES Client to configure MES.



Plant managers use Wonderware Information Server to generate and view reports.



Section 5 – System Requirements and Licensing

This section describes the hardware recommendations, software requirements, and licensing for Wonderware MES Software/Performance.

Hardware Recommendations

The recommended hardware requirements are listed below.

Middleware/Database Server

- Computer with dual-core processor with 2-gigahertz (GHz) or faster clock speed, or single-core processor with 3-GHz or faster clock speed; dual-core processor recommended for optimal performance
- 2 gigabytes (GB) or more of RAM (1 GB minimum supported; may limit performance of some features)

Wonderware Information Server

- Computer with 2-GHz or faster processor clock speed
- 1 GB or more of RAM

All Systems (Client Applications)

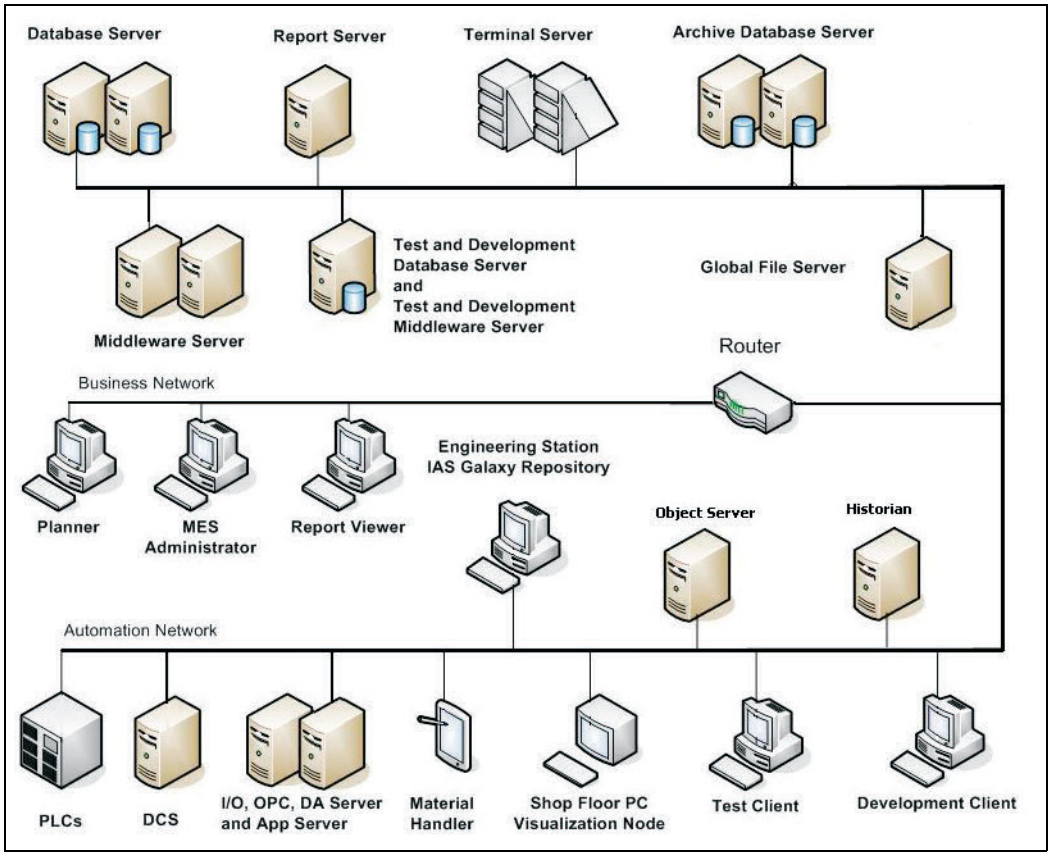
- 30 GB of available disk space
- CD-ROM or DVD drive
- Monitor, keyboard, and mouse or compatible pointing device

Note: For more information on hardware requirements, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at https://wdn.wonderware.com.

Example of Hardware Architecture

The figure below shows an example of a hardware configuration that includes all available hardware that can be deployed in a Wonderware MES Software/Performance environment. It is not a minimum configuration. Different options for combining servers should be considered, including virtualization of servers.

The database server and middleware server components can be in the same computer, but typically, for larger systems, they will be in separate computers.



Software Requirements

Wonderware MES Software requires the following software:

- Microsoft .NET Framework

  Note: Wonderware MES automatically installs the .NET Framework if it is not installed on the computer.

- ArchestrA IDE
- Wonderware Information Server (only for MES reports)
- SQL Server or Oracle
- Wonderware InTouch
- Wonderware Application Server

System Requirements

The following table lists the supported systems for Wonderware MES components:

	Client Components	Database MESDB	Middleware	MES Reports
Windows Server	Yes	Yes	Yes	Yes
Windows Vista (32 and 64 Bit)	Yes	Yes	Yes	No
Windows XP (32 Bit Only)	Yes	Yes	Yes	No
WIndows 7 (32 and 64 Bit)	Yes	Yes	Yes	Yes
SQL Server or Oracle		Yes		
.NET Framework	Yes	Yes	Yes	Yes

Note: For more information on software requirements, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at https://wdn.wonderware.com.

Licensing

Wonderware MES Software/Performance uses the Wonderware licensing system. For instructions on installing or updating a license, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at https://wdn.wonderware.com.

Note: During installation, you only install Wonderware MES. There is not a separate installer for Wonderware MES Software/Performance. The Performance, Operations, and Quality features are enabled through licensing.

For more information on licensing and licensing requirements, contact your local distributor.

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Learning Services

Module 2 – Wonderware MES Client Overview

Section 1 – Wonderware MES Client 2-3

Section 2 – Security 2-11

Lab 1 – Configuring Security and General Parameters 2-17

Module Objectives

- Describe the interface of the Wonderware MES Client application
- Explain the MES security model

Section 1 – Wonderware MES Client

This section describes the interface of the Wonderware MES Client application.

MES Client Overview

Wonderware MES Client allows you to configure MES system-wide general parameters, such as security, and specific information required for the Operations, Performance, or Quality software. The information configured in MES Client is used to prepare a system ready to collect the plant process information from operators and production equipment on the plant floor.

The information collected and stored from the production processes can be used to control and improve the overall operation management and performance of the plant. MES Client offers a collection of modules, grouped by the function and role of the user, to allow the configuration and monitoring of your plant operations.

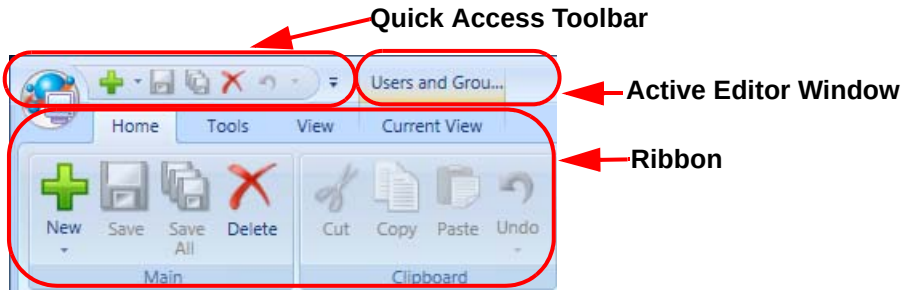
You can use MES Client to:

- Define users and user groups
- Define the shift schedules for various machines
- Assign passwords, privileges, and entity access rights to different users to limit their access to different areas in MES Client
- Define global system parameters
- Define custom attributes
- Configure global specifications
- Configure physical entities
- Configure language strings
- Configure items and item classes
- Specify item states and grades
- Configure work orders and jobs
- Configure processes, operations, standard operations, and dynamic routing processes
- Manage jobs
- Maintain the MES database (MESDB)
- Edit and resubmit rejected messages

MES Client User Interface

MES Client can display large amounts of data in an organized way.

The top of the application displays a **Quick Access** toolbar and ribbon similar to the Microsoft Office suite of products.



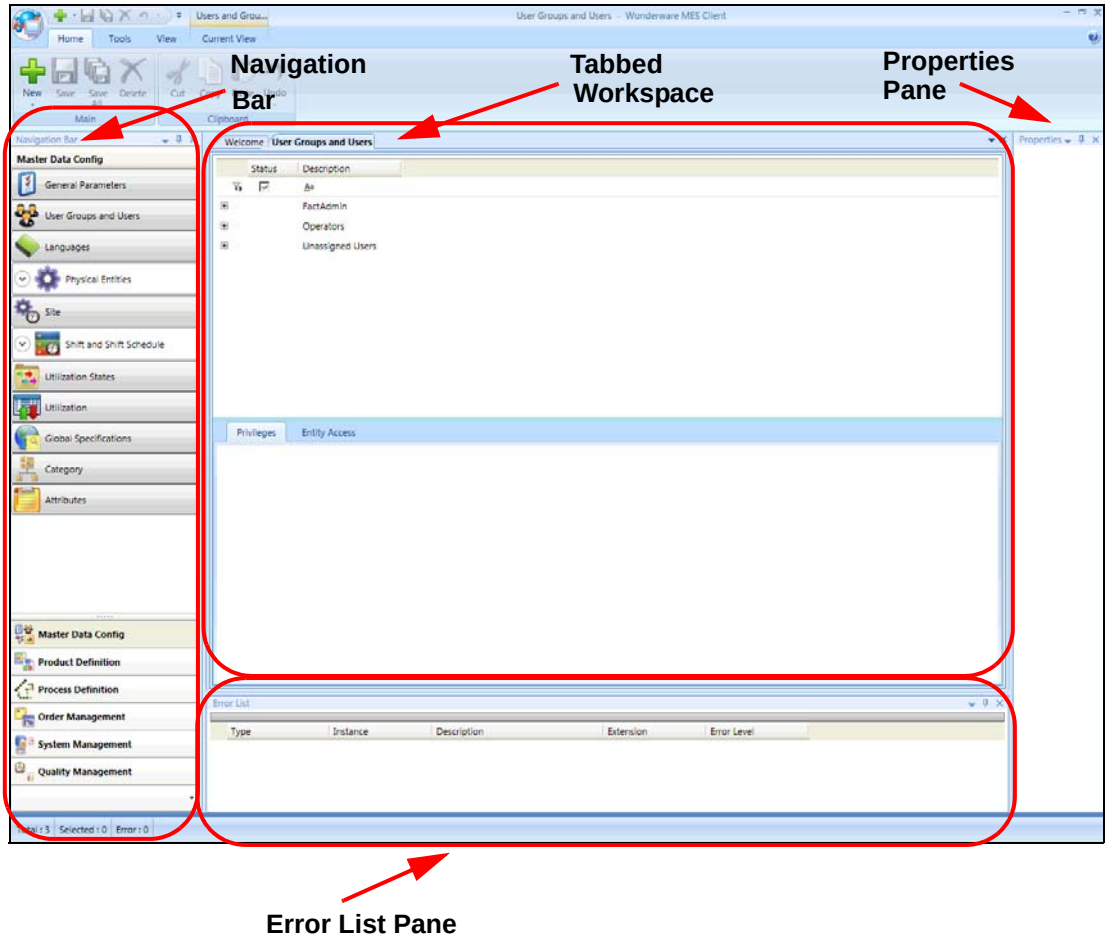
Quick Access Toolbar – Located at the very top of the Client application is the **Quick Access** toolbar. From this customizable toolbar, you can quickly access common commands, such as **New**, **Save**, **Cut**, **Paste**, or **Delete**.

Active Editor Window – The name of the active editor window is displayed to the right of the Quick Access toolbar.

Ribbon – The ribbon includes the following tabs:

- **Home –** Includes options, such as **New**, **Save**, **Cut**, or **Copy**
- **Tools** – Includes options for switching languages
- **View** – Includes options for customizing the interface of MES Client
- **Current View** – Includes options for customizing the view of the active editor window

The following figure highlights the different areas within the main MES Client window:



In MES Client, you can auto hide the **Navigation Bar**, the **Properties** pane, and the **Error List** pane, so that the panes are reduced to a tab that appears on the side of the application.

Navigation Bar

You access the modules in MES Client in the **Navigation Bar**.

Select a group at the bottom of the **Navigation Bar** to show the associated module at the top of the pane. Select a module from a group to display the active editor window within the tabbed workspace.

The following default groups are available in MES Client:

- Master Data Config
- Product Definition
- Process Definition
- Order Management
- System Management
- Quality Management

These are all discussed on the following pages.

Master Data Config

The following table describes the modules available in the **Master Data Config** group:

Module Name	Description
General Parameters	Specify the system parameters for the MES applications
User Groups and Users	Configure users and user groups and provide privileges and access rights to the specified user groups
Languages	Configure languages for the MES applications
Physical Entities	Add and configure entities
Site	Configure sites and the region details for an entity
Shift and Shift Schedule	Configure the shift days, timings, and shift breaks for an entity on the plant floor
Utilization States	Specify the utilization status of an entity; you can select and apply different colors to each status
Utilization	Specify various reasons for the defined utilization states
Global Specifications	Specify global specifications for an entity class, item class, entity, and item
Category	Assign items to item categories
Attributes	Specify the attribute of an item, item class, work order, job, and so on; you can also specify the attribute's data and entry types

Product Definition

The following table describes the modules available in the **Product Definition** group:

Module Name	Description
Items	Specify an item; you can also apply filters to the item classes
Item Classes	Configure an item class, and specify details for an item class, such as produced, consumed, and obsolete
Units of Measure	Specify the units of measure for an item
Item Grades	Specify various grades of an item, such as approved, on hold, or rejected; you can select and apply different colors to each grade
Item States	Specify the state of an item, such as work in progress and finished goods; you can select and apply different colors to each state
Item Reasons	Configure item reasons for an item; you can link the BOM version, BOM item, and entities to a specified reason and create a group of item reasons, and also link the classes and entities to the item reasons group
Attributes	Specify the attribute of an item and item class; you can also specify the data and entry types

Process Definition

The following table describes the modules available in the **Process Definition** group:

Module Name	Description
Processes	Configure processes, operations, and data log properties; you can link processes to items; you can indicate specifications, steps, and attributes for an operation and also assign certification to an operation
Dynamic Routing Usage	Configure a dynamic routing process
Standard Operations	Configure a standard operation and data log properties; you can indicate specifications, steps, and attributes for a standard operation and also assign certification to a standard operation
Attributes	Specify the attributes for operations and processes; you can also select the data and entry type

Order Management

The following table describes the modules available in the **Order Management** group:

Module Name	Description
Work Orders and Jobs	Configure a work order and job state; you can add files and URLs to a work order and also configure steps and step groups for a job
Queue	View all jobs configured in MES Client; you can split jobs and view the job queue diagram and also link different jobs
Attributes	Specify the attributes for the work order and jobs; you can also select data and entry type

System Management

The following table describes the modules available in the **System Management** group:

Module Name	Description
Database Information	Maintain the version details of the MESDB, manage historical table details, and maintain the database server
Database Maintenance	Maintain the MESDB; you can create and run the archive, purge, and restore jobs
Rejected Message	View, edit, resubmit, and delete the MES command messages that are rejected by the middleware while using the **Without Response** communication mode

Quality Management

The following table describes the modules available in the **Quality Management** group:

Module Name	Description
Sample Plan Frequency	Define sample plan frequencies, which are used to determine when the samples are collected
Sample Plan	Specify a group of sample plan frequencies that apply to one or more Quality Management specifications
Characteristic	Define the parameters of a product or process that has to be measured The two **Characteristics** are variables and attributes. Variables are measurements that can assume any value, limited by an upper or lower bound, or both. Attributes always occur in integer amounts.
QM Specification	Specify a set of values that apply to **Characteristics**, with a defined context in which these values are applicable
Attributes	Specify the attributes for sample and results You can also select data and entry type.

Tabbed Workspace

When you select a module from the **Navigation Bar**, the configuration editor window appears in the tabbed workspace. If you have multiple editors open, the tabbed workspace shows a tab for every editor. You can display different windows by clicking the corresponding tab within this area.

Columns within the tabbed workspace can be configured as follows:

- Rearrange columns: Drag and drop the column from the editor window to the desired location.
- Sort columns in ascending or descending order: Click the column heading; an up or a down arrow appears, indicating whether the column is sorted in ascending or descending order
- Change the widths of columns: Drag the column heading to the desired width
- Stack and order columns: Drag and drop a column onto another column; the columns are stacked when left and right arrows appear on both sides of the selected column

The **Items** editor window can be configured as follows:

Applying Filters – The **Filter** option in the **Navigation Bar** lists all the available items. Changing the width of a column in the active editor window does not save the filter and column width configuration. The configuration is saved if you change a column's position, add or remove a column, apply grouping to the grid, or change the sort order.

Arranging Columns – You can arrange the item's information. The **Field Chooser** option limits and organizes the display of data fields from all qualifying records. The **Field Chooser** option allows you to choose the information about each item that will be shown in the **Items** section.

Properties Pane

When you click an item in the active editor window, its properties appear in the **Properties** pane and can be configured there.

Error List Pane

The **Error List** pane shows the errors that occurred during configuration. Only configuration errors are shown in the **Error List** pane. All runtime errors are shown in the **ArchestrA Logger**. The following information is shown:

- **Type**: Describes the type of error
- **Instance**: Describes the reason for the error
- **Description**: Shows the description of the error
- **Extension**: Shows the name of the module with the error
- **Error Level**: Shows the severity level of the error, for example, whether the error is critical or only a warning

Section 2 – Security

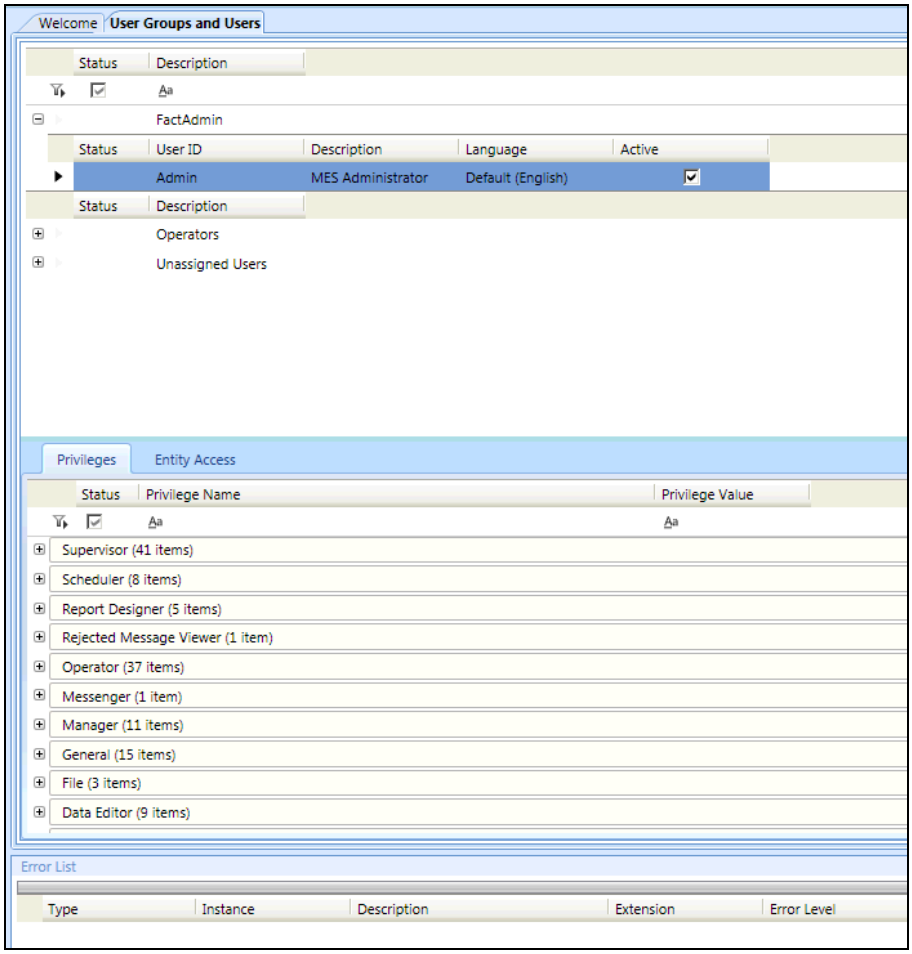
This section describes the security settings in Wonderware MES Software, including security groups, users, group privileges, and security parameters.

Security Overview

To use Wonderware MES Software/Performance, you have to be a defined user who is a specific member of a user group. The user group carries access rights to the system clients, process entities, and certifications. The individual user account is configured to define passwords, default labor costs, and language preferences. You set up and modify the users and user groups in MES Client.

In the **User Groups and Users** module, which is in the **Master Data Config** group of MES Client, you can create a user group and assign special privileges and entity access rights that enable the user to access the functions and entities in MES applications.

The top of the pane displays groups, with the users listed beneath the groups. The bottom of the pane displays the privileges assigned to each group and the entity access assigned for each user.



Privileges

Privileges define the actions that a user can perform. A user group must have specific privileges to access the corresponding component in MES Client. These privileges are grouped as **Configurator**, **Supervisor**, **Operator**, **Manager**, **Report Designer**, and **DataEditor**. The **Privileges** tab in MES Client also defines general privileges, such as file, view, edit, and download levels.

You cannot modify privileges for individual users. You can only specify privileges for a user group.

You configure privileges for a user group by first selecting the user group you wish to modify in the active editor window, and then selecting the **Privileges** tab.

Configure Security Settings

The security settings are available in the **General Parameters** module, which is in the **Master Data Config** group of MES Client. The table below describes the different security options that are available in this module.

Field	Description
Allow default entity logon	A Yes/No list that defaults to **No** If set to **Yes**, it shows an **Always log on to these entities** check box on the entity login dialog box. If selected, on subsequent log ins, the user will be automatically logged in to the entities that are selected.
Allow default user login	A Yes/No list that defaults to **No** If set to **Yes**, it shows an **Always log on as this user** check box on the **Operator** login. If selected, on subsequent log ins, the user will be automatically logged in as this user.
Automatic Login	A Yes/No list that defaults to **No** If set to **Yes**, the system automatically logs in as an OS user. If set to **No**, the system prompts for a user name and password. **Note:** Only OS users and user groups can automatically log in to the system. You must select a domain for an OS user group while configuring it. If the selected user is not a domain user, the error message **OS User group is not configured** appears while logging in to MES Client.
Default BOM substitution level	A numeric field that defines the initial security level when a substitution item is created
Default document download level	A numeric field that defines the initial security level for downloadable documents
Default document edit level	A numeric field that defines the initial security level for editing documents
Default document print level	A numeric field that defines the initial security level for printing documents
Default document view level	A numeric field that defines the initial security level for viewing documents
Default report view level	A numeric field that defines the initial security level for viewing reports
Default specification access level	A numeric field that defines the initial security level when a specification is assigned to an operation or item

Field	Description
Maximum duration in minutes for consecutive logins (0=forever)	A numeric field that defines the length of time during which failed log-in attempts are to be considered consecutive
Minimum password length	A numeric field that defines the fewest number of characters a password may contain
Number of days a password is valid (0 = passwords are always valid)	A numeric field that defines the number of consecutive days a password will be active, after which a new password must be selected
Number of failed login attempts before deactivation (0=never)	A numeric field that defines the number of times an incorrect password may be entered before terminating the program
Passwords	A drop-down list that has two options: **Unique** and **Non-unique** If you select **Unique**, the prompt will be only for a password, not a user ID. If you select **Non-unique**, the prompt will be for both the user ID and password. **Note:** The **Unique** password is supported only if the **Native** option is selected in the **Security Mode** list.
Seconds of inactivity before automatic logoff (0=never)	A numeric field that defines the number of seconds of inactivity before the user is automatically logged off the module **Operator** will display the **Switch User** window that requires the user to enter a password before returning to the **Operator** screen. **Note:** You must restart the application after changing these settings.
Seconds of inactivity before automatic switch user (Operator; 0 = never)	A numeric field that defines the number of seconds of inactivity before the user is automatically switched **Operator** will display the **Switch User** window that requires the user to enter a password before returning to the **Operator** screen. **Note:** You must restart the application after changing these settings.
Security Mode	A drop-down list that has three options: **Native**, **OS Users**, and **OS Group** If **Native** is selected, the MESDB configuration is used to authenticate the user. If **OS User** is selected, the individual OS users are authenticated through active directory within the domain. If **OS Group** is selected, the OS user groups are authenticated through active directory within the domain. **Note:** You cannot change the security settings for a user if a process is checked out.
Switch user requires password	A Yes/No drop-down list If **Yes** is selected, a password must be reentered before the session is reactivated.

Authentication Methods

You can configure users, user groups, OS users, and OS user groups in the **User Groups and Users** module. You can create a user group if you have selected the **OS Group** or **Native** option in the security mode of the **General Parameters** module.

If the security setting in the **General Parameters** module is set as **OS Group**, the log in window does not appear, and the application runs without user authentication.

You must use a domain user (not a local user) in the **Network Account** utility if you are using the OS-based security. If the selected user is not a domain user, the following error message appears while logging in to MES Client: **OS User group is not configured**.

MES offers three different user validation methods. They are as follows:

Native

In the **Native** mode, the users and groups are defined in the MESDB using MES Client, with no limitations to either of these attributes. In this mode, you can define user names and group names. Any password or name requirement is controlled by the MES options defined in the **General Parameters** module.

OS Group

In the **OS Group** mode, the groups are the sole criteria for defining privileges and allowable entities. MES Client must have access to a domain controller to use the groups from the domain. Once these groups are imported and validated, and privileges are assigned, any users in these domain groups will have the appropriate privileges in the MES applications. The accounts and passwords are validated and maintained by the domain controllers. The advantage of this mode is that you do not have to create groups within the MESDB or validate/authenticate them, as the operating system is responsible for that task. The MES applications pass the login information to the operating system for authentication. The users log in by entering their user names in the form of domain name/user name.

OS User

In the **OS User** mode, the users from a domain are assigned to groups within the MESDB. The groups are not the same as domain groups and are not validated by the domain controller for privileges. When defining the users in MES Client, the software must have access to the domain controller to use the users from the domain. Once these groups are imported and validated, and privileges are assigned by placing the operating system users in groups in the MESDB, only the operating system users placed in groups will have the appropriate privileges in the MES applications.

The accounts and passwords are validated and maintained by the domain controllers. The advantage of this mode is that you do not have to use the grouping defined in the domain; you can create groups within the MESDB or validate/authenticate them, as the operating system is responsible for that task. The MES applications pass the login information to the operating system for authentication. When users log in, they enter their user name in the form of domain name/user name.

Exporting Users and Roles from Application Server

After you install MES, you can export ArchestrA users and roles to the MESDB using the **Export Users and Roles to the MESDB** IDE extension. Although this is not a comprehensive user/role synchronization tool, it provides the convenience of not having to reenter each ArchestrA user/role into the MESDB.

Note: You must be using **Galaxy**, **OS User**, or **OS Group** ArchestrA security to use this feature.

To export users and roles, the ArchestrA security mode must match the MES security mode, as follows:

ArchestrA	MES
Galaxy	Native
OS User	OS User
OS Group	OS Group

MES Client automatically logs in when the current OS user is verified.

You can export the ArchestrA IDE users and roles to the corresponding users and groups, with the following conditions:

- Group permissions (privileges) are left blank (no permissions granted).
- New users are initially disabled because they have a randomly generated password. An administrator must enable the user and change the user's password before the user can log on.
- The ArchestrA default user and default role are not created.
- OS users and groups have the domain name removed.

Newly created users and groups will have the same parent/child relationships as the associated ArchestrA users and roles.

You cannot export individual users or roles in the ArchestrA IDE. All users and roles in the ArchestrA Galaxy will be exported to the corresponding users and groups in the MESDB.

To export users and roles to the MESDB, you will use the ArchestrA IDE **Galaxy** menu's **Export Users and Roles to MESDB** option. A progress dialog box will display the status, errors, and percent complete of the export. The status and error information log also will be created in the ArchestrA system management console. A more detailed log of the export is available in the **WWLogger** when you select the **LogTrace** flag.

Your exported users and groups are available in the MES Client **User Groups and Users** module**.**

Lab 1 – Configuring Security and General Parameters

Introduction

In this lab, you will create users and user groups in Wonderware MES Client. First, you will create a new user, **Admin**, in the default **FactAdmin** user group. Next, you will create and configure an **Operators** group and **Operator** user. Then, you will disable the automatic logoff feature.

Objectives

Upon completion of this lab, you will be able to:

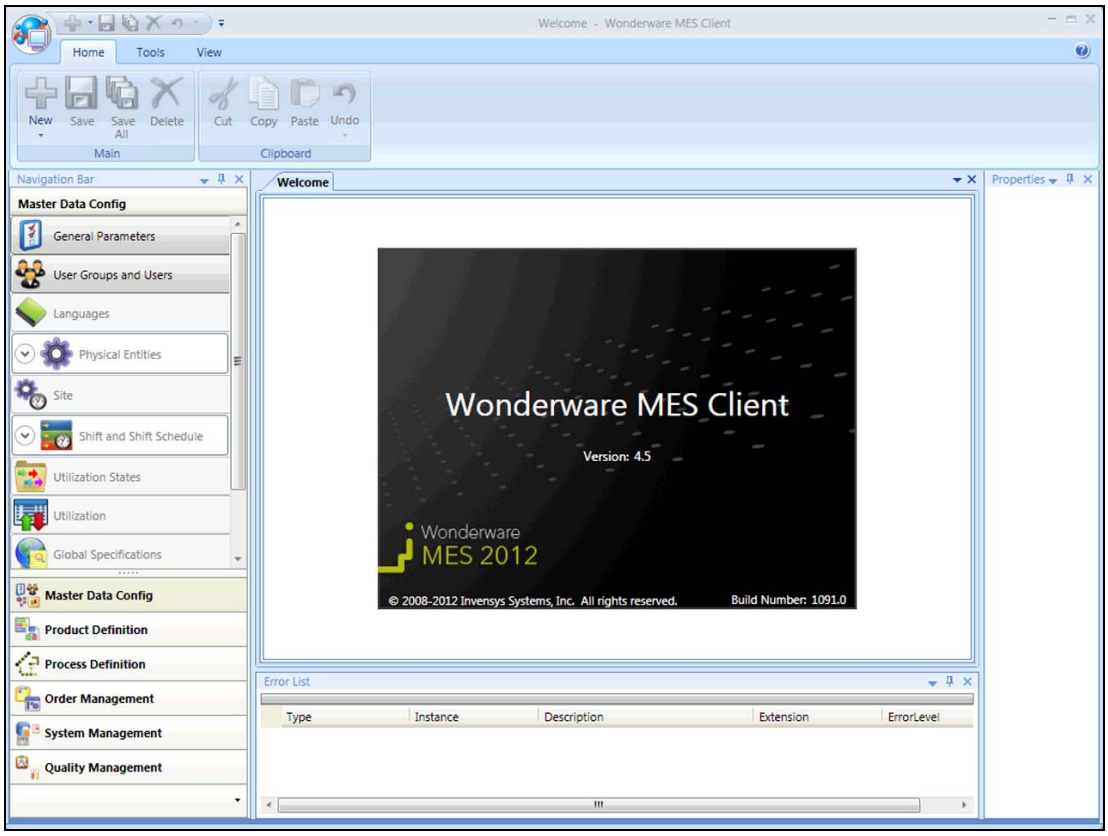
- Create user groups
- Assign privileges to user groups
- Create users
- Configure automatic logoff

Create the Administrator User

First, you will create the administrator user in MES Client.

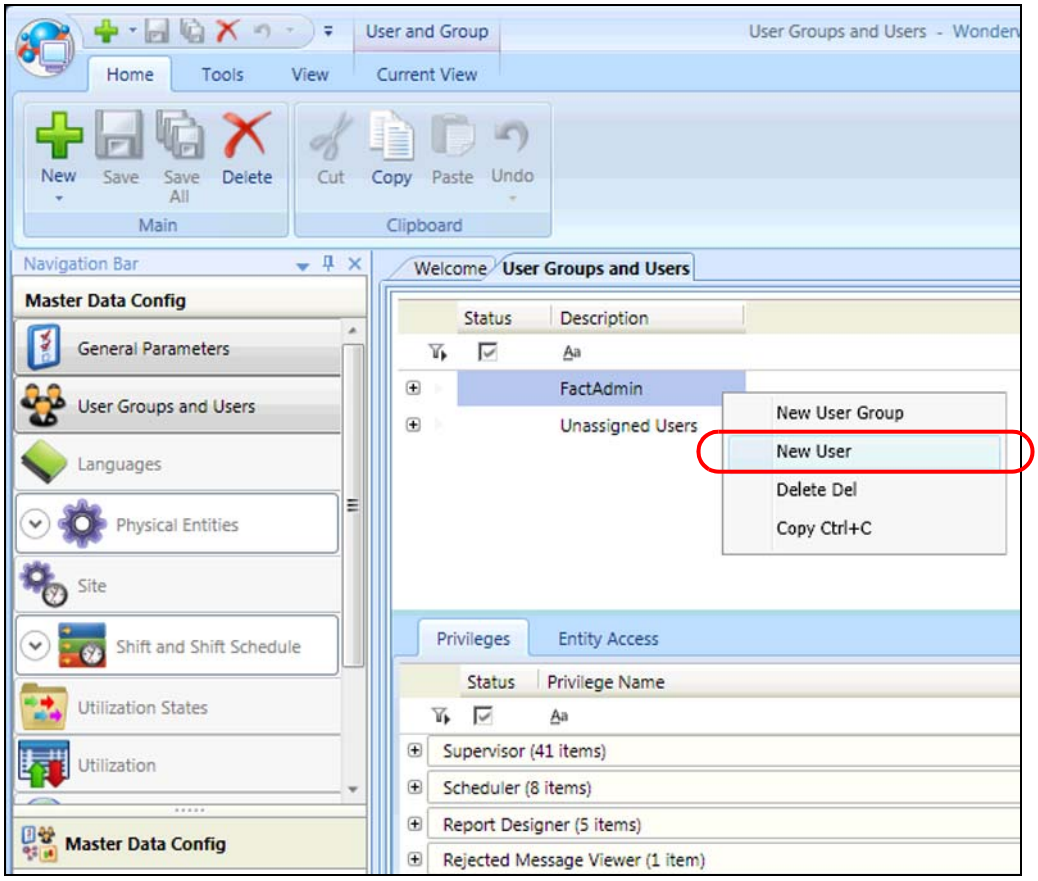
1. Open MES Client (**Start | All Programs | Wonderware | MES | MES Client**).

   The **Wonderware MES Client** window appears.

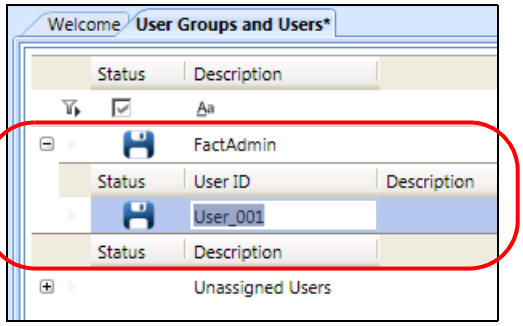


2. In the **Navigation Bar**, in the **Master Data Config** group, click **User Groups and Users**.

3. On the **User Groups and Users** tab, select and right-click the **FactAdmin** user group, and then select **New User**.

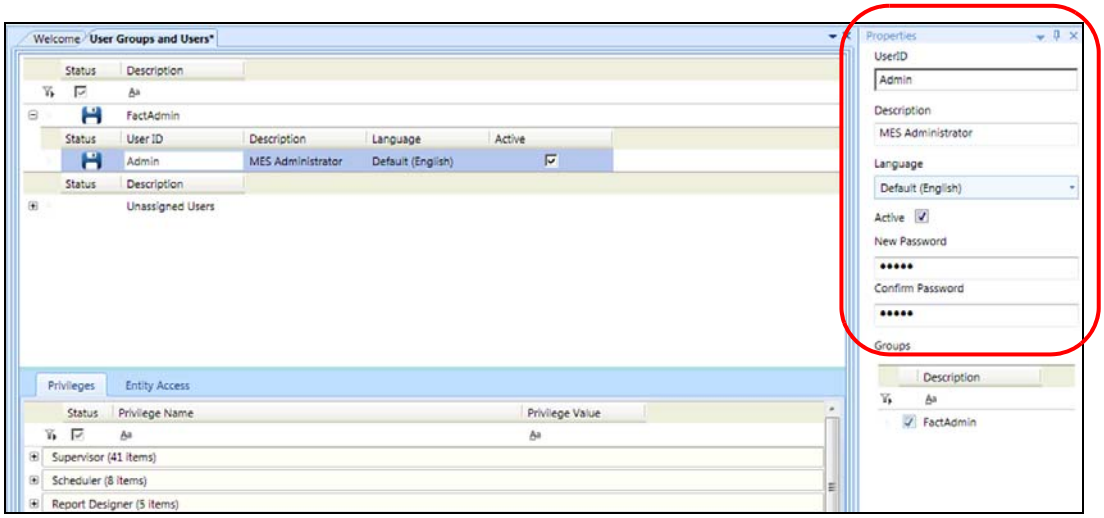


A new user is created and automatically assigned to the selected user group, **FactAdmin**.

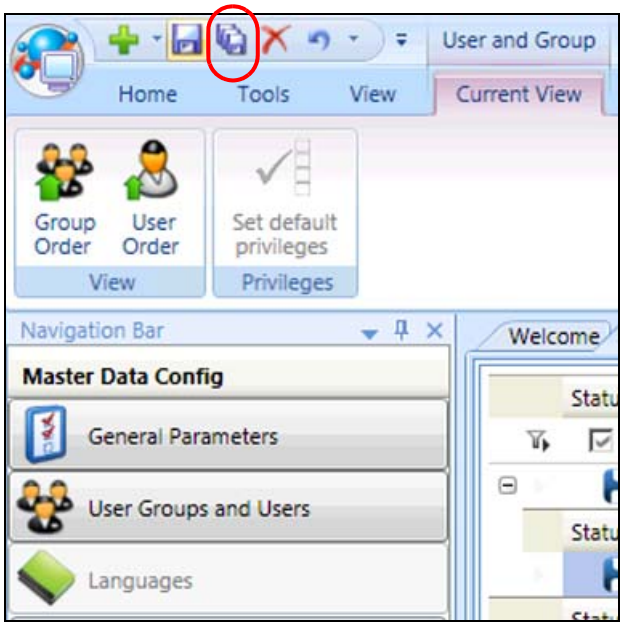


4. In the **Properties** pane, configure the new user as follows:

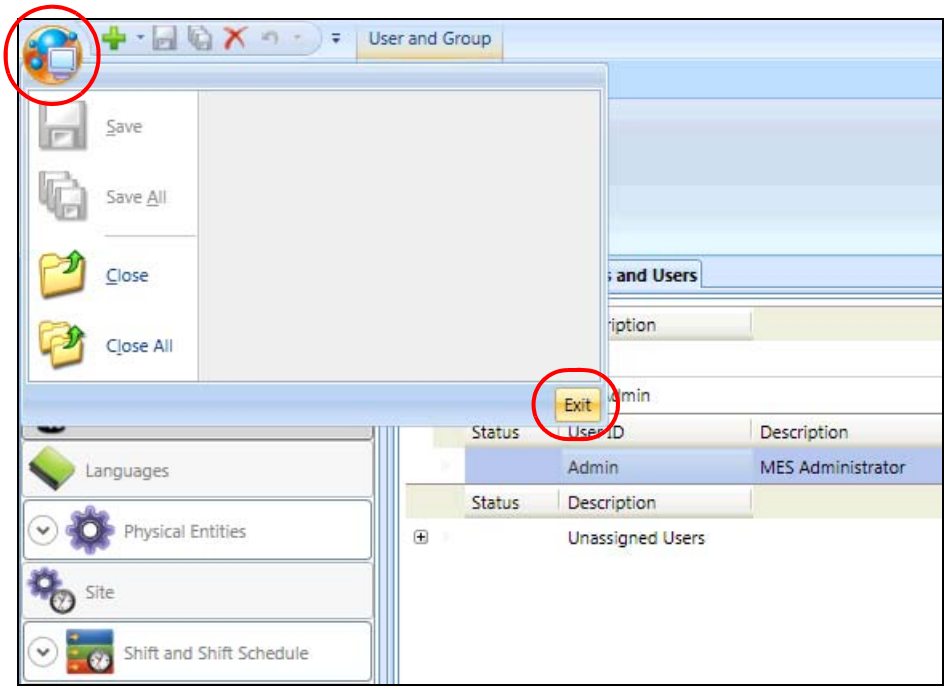
   User ID: Admin
   Description: MES Administrator
   New Password: admin
   Confirm Password: admin



5. At the top-left of the window, click the **Save All** button.



6. At the top-left corner of the window, click the **Application Button**, and then click **Exit** to close MES Client.



After creating the administrator user, security is enabled in the MES database (MESDB). You will be required to log in to MES Client.

Create the Operators User Group

Next, you will log in to the system as an administrator. You will create a user group and assign privileges for use in later labs.

7. Open MES Client.

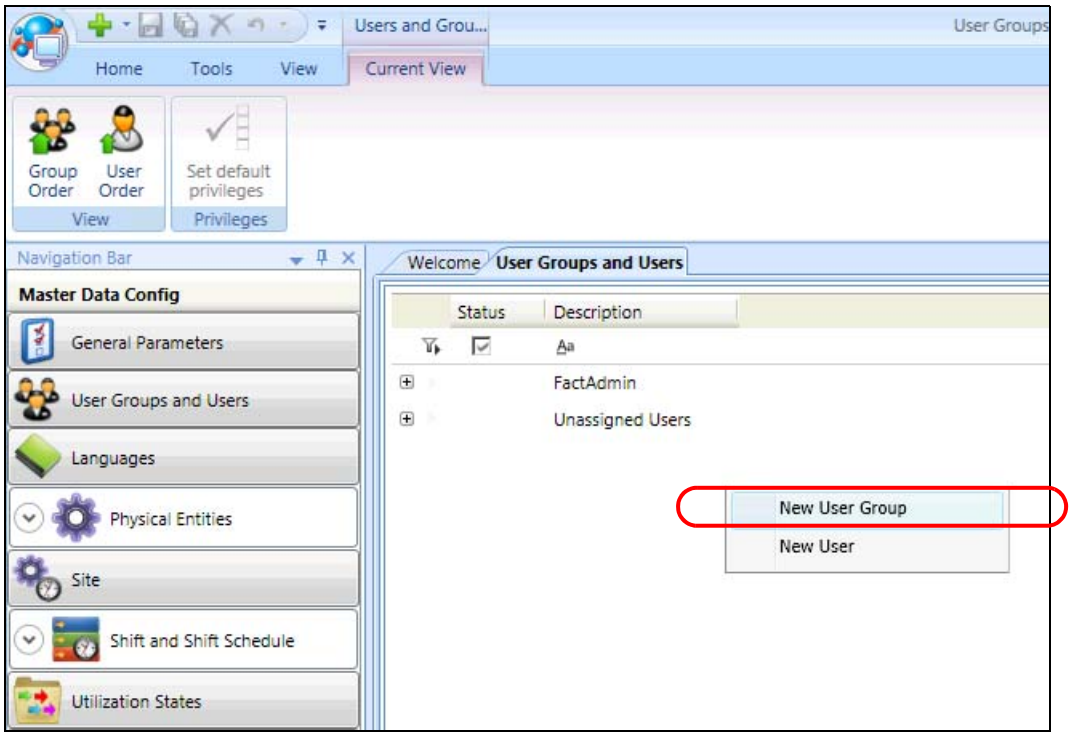
   A login dialog box appears.

8. Log in as an administrator using the following credentials:

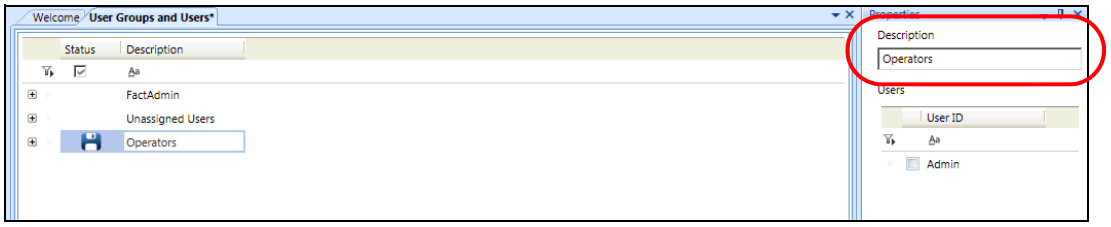
   User Name: Admin
   Password: admin

9. In the **Navigation Bar**, in the **Master Data Config** group, click **User Groups and Users**.

10. On the **User Groups and Users** tab, right-click anywhere in the empty workspace and click **New User Group**.



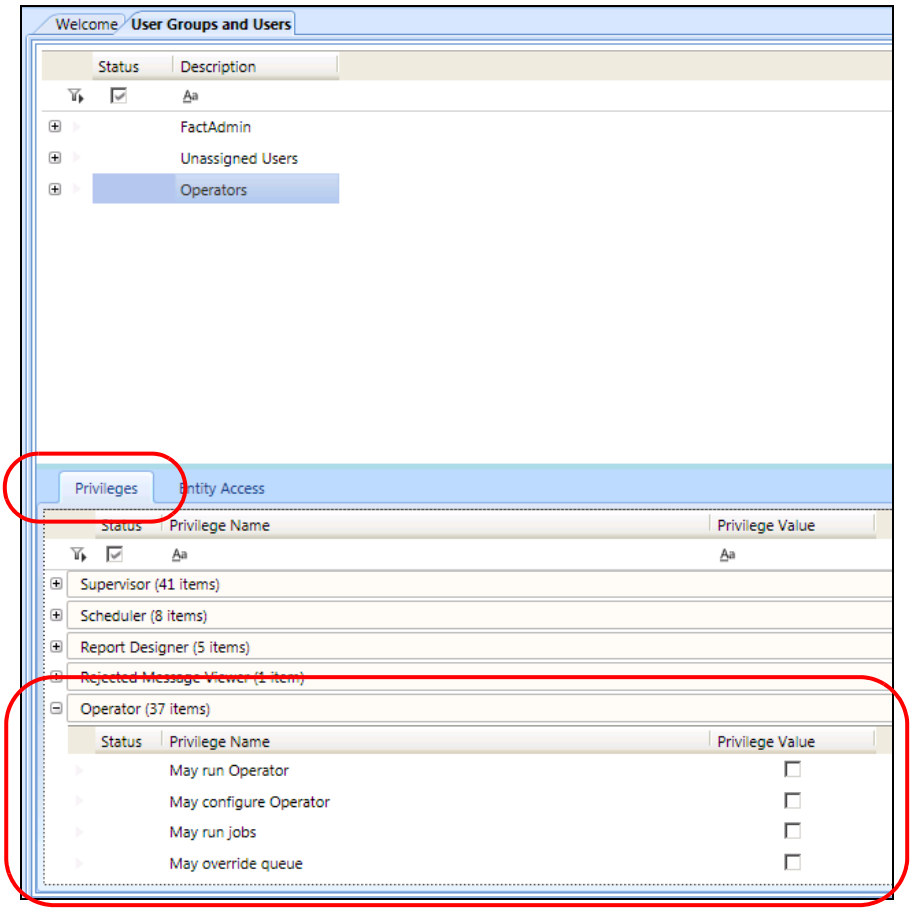
11. In the **Properties** pane, in the **Description** field, enter **Operators**.



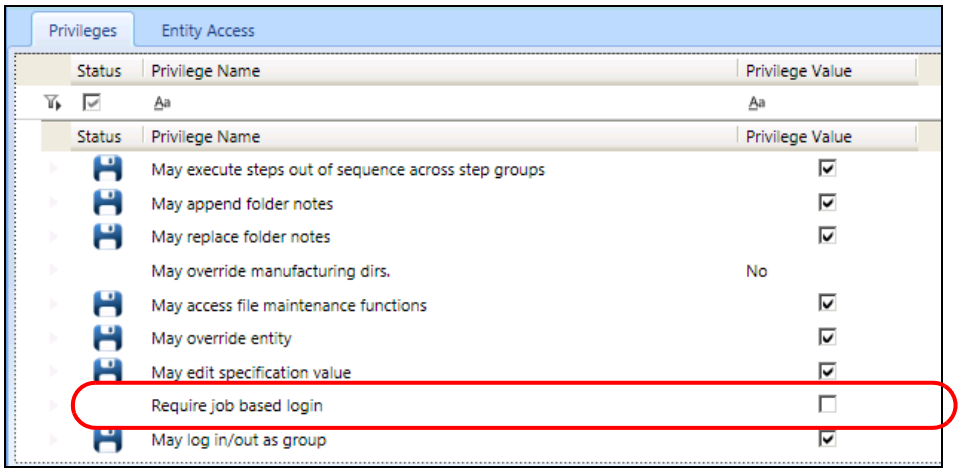
12. Save the configuration.

Now, you will assign appropriate privileges to the **Operators** user group.

13. On the **Privileges** tab, expand the **Operator** privilege group.



14. Under **Privilege Value** on the right, check each check box**,** except **Require job based login**.

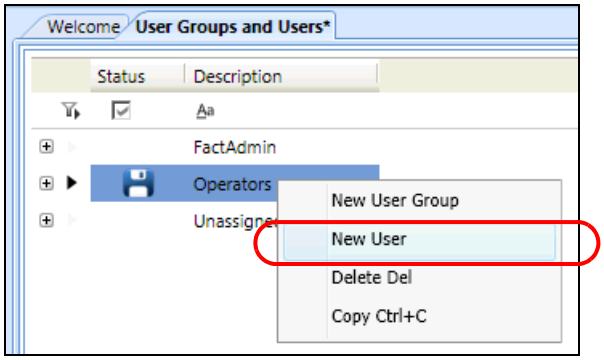


15. Save all configurations.

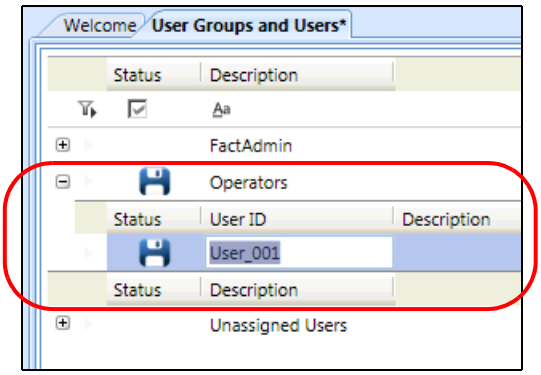
Create the Operator User

Now, you will create a new user in the **Operators** group you created.

16. On the **User Groups and Users** tab, right-click the **Operators** user group, and then select **New User**.

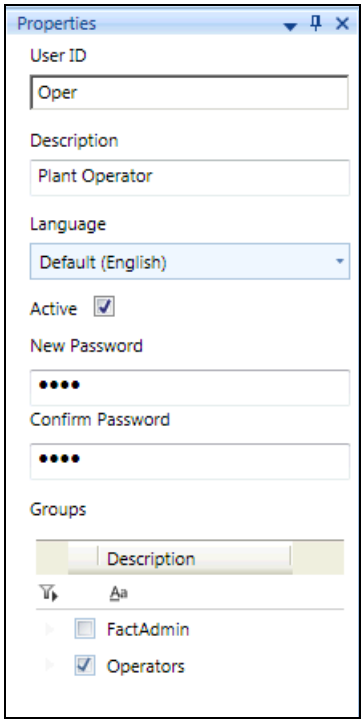


A new user is created and automatically assigned to the selected user group, **Operators**.



17. In the **Properties** pane, configure the new user as follows:

User ID:	Oper
Description:	Plant Operator
New Password:	oper
Confirm Password:	oper

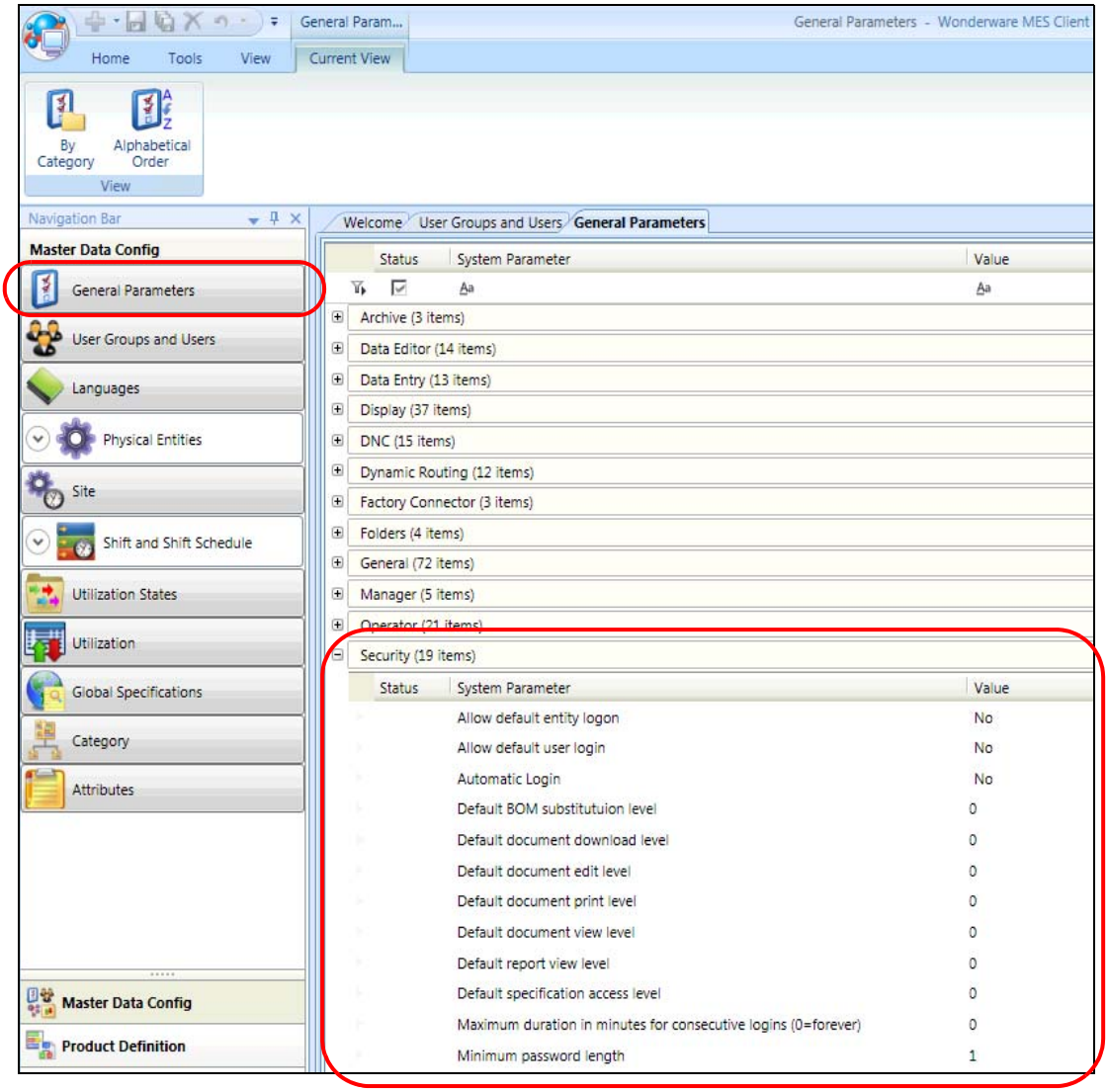


18. Save all configurations.

Configure Automatic Logoff

Next, you will disable the automatic logoff feature.

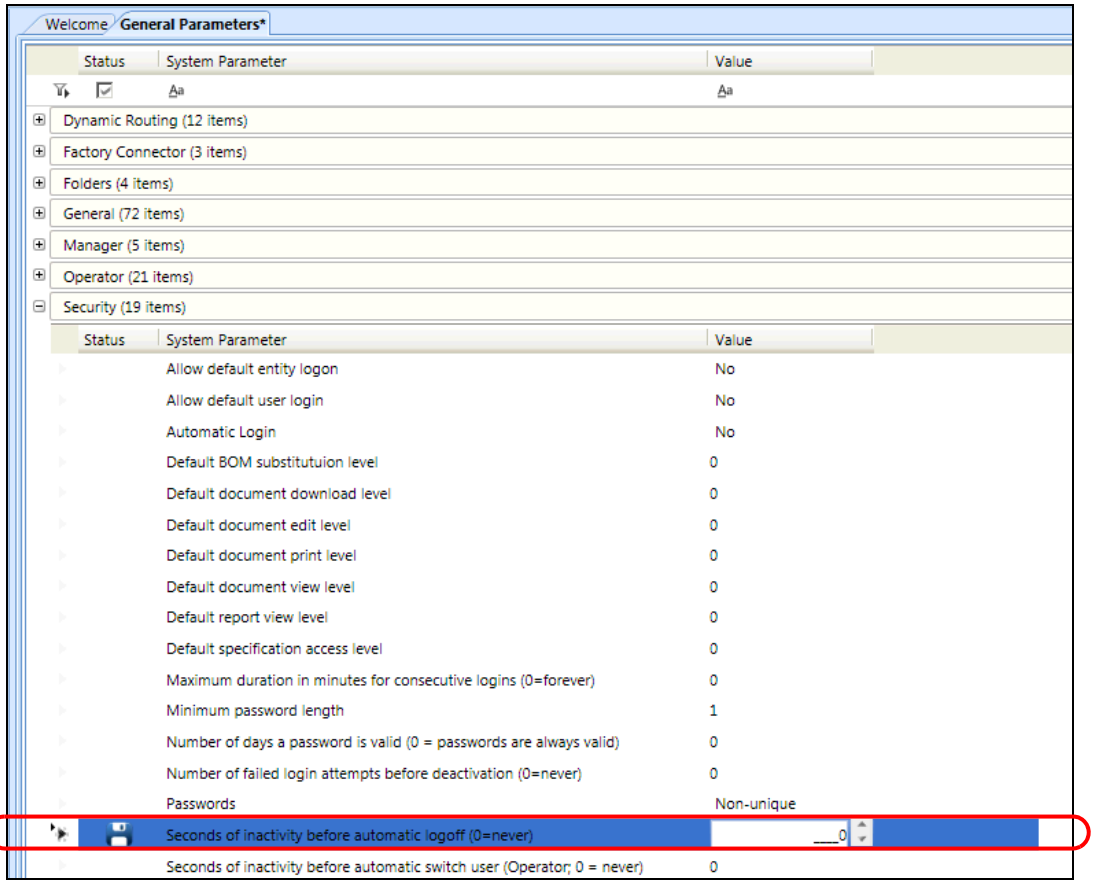
19. In the **Navigation Bar**, in the **Master Data Config** group, click **General Parameters**.
20. On the **General Parameters** tab, expand **Security**.



21. In the **Seconds of inactivity before automatic logoff (0=never)** field, set **Value** to **0**.

    This option is used to automatically log off a user after some time of inactivity. In this example, the inactivity time is set to **0** seconds so that the automatic log off (time-out) feature is disabled.

Note: The automatic log off feature is disabled to prevent you from being logged off while working on labs. An automatic log off feature is normally used in the plant environment.



22. Save the configuration and close MES Client.
23. Reopen MES Client and log in as **Admin**.

    Restarting MES Client is necessary for the changes you made to the system parameters to take effect.

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Learning Services

Module 3 – Performance Model

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Module Objectives

- Create an Application Server Galaxy and configure it to collect production activity information for the MES system
- Describe the function and use of the Entity Model Builder

Section 1 – Modeling Overview

This section provides an overview of manufacturing activity modeling and describes the production model for the simulated manufacturing plant used in this course.

What Is Modeling?

A plant model is the logical representation of the physical layout and supervisory processes of a manufacturing plant. To capture the MES data that defines a physical manufacturing process, Wonderware software must be configured to support such data. This is known as modeling and is one of the most important exercises in building a successful system.

You should always start with careful planning. Obtaining accurate Process and Instrumentation Diagrams (P&IDs) of the process, before configuring the process model, is very helpful. You can use the P&IDs to determine the components and capabilities of the process.

The goal of the process model is to mirror the real world as closely as possible. You should begin by collecting basic information about the plant layout, the different operations in the process, and the flow of materials.

Concepts and Terminology

To create a model, you need to tell Wonderware MES Software/Performance where you are making products, what products you are making, and how you are making them. These are the minimum configuration elements required for tracking production activities in your plant and for creating rules to be enforced.

To answer the questions of where, what, and how, you will use the following configuration elements in the software:

- **Physical Entities** – Explain where the product will be made

  Physical entities are physical assets in the plant for which you need to track or report information. Physical entities could be an entire plant, a production line, a piece of equipment, or even a module inside a machine. Physical entities are also known as areas, equipment, or machines.

- **Items** – Explain what needs to be made

  Items refer to any material that you use in your processes. Items could be input or raw materials, final product, WIP materials, scraps, or any other material that you want to track in your application.

- **Processes and Operations** – Explain how to make the products

  An operation (also known as a phase or a segment) is a task or set of tasks that needs to be successfully completed to make a product. A process (also known as a route) is the method of producing the product. The process defines all the operations and entities required to produce a specific item.

The Process

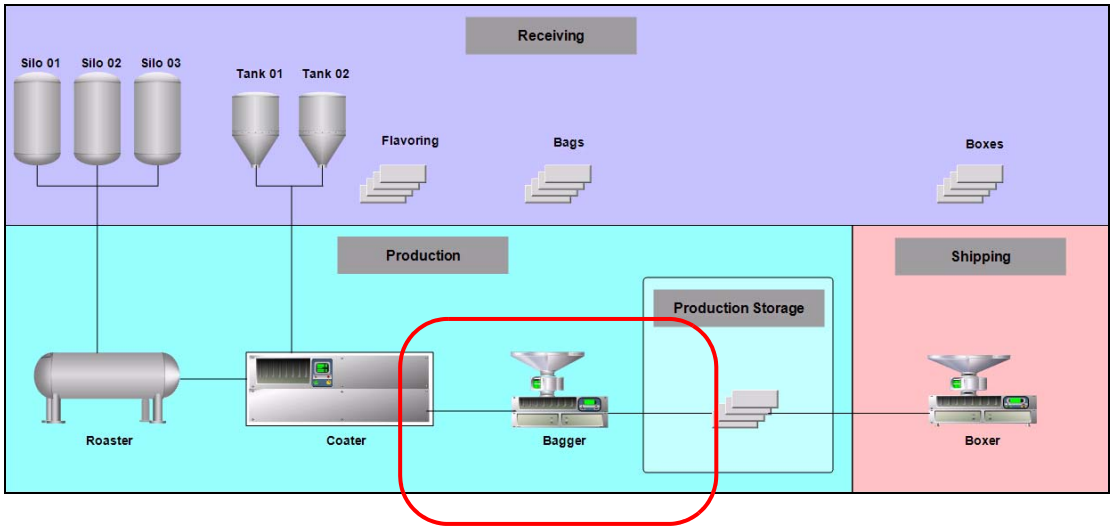
The MES 2012 classes use a simulated plant built specifically for these classes. This plant sells bags of mixed nuts (peanuts, cashews, and almonds).

To manufacture the bags, the plant runs a single process: roast the input materials, separate them into two tanks, coat them with barbecue flavoring, bag them, and box them in preparation for shipping.

The process involves three key areas:

- Receiving
- Production
- Shipping

These key areas or plant components are displayed in the image below. The MES 2012 – Performance training class will only focus on the **Bagger** equipment in the **Production** area.



After the required amount of mixed nuts have been roasted and coated, the plant runs a process to bag the mixed nuts. This process consists of one single operation in the **Bagger** unit. This unit fills the empty 1-ounce bags with the seasoned mixed nuts and then seals them before sending the bags to be boxed and shipped.

Lab 2 – Creating a Galaxy

Introduction

In this lab, you will use a **Base_Application_Server.cab** galaxy type to create a Galaxy in the ArchestrA IDE. Then, you will import objects from a .aaPKG file. The imported objects represent the basic components of a plant structure. In later labs, you will use this Galaxy and its components to build the MES Entity Model and evaluate the performance of the **Bagger** equipment.

Objectives

Upon completion of this lab, you will be able to:

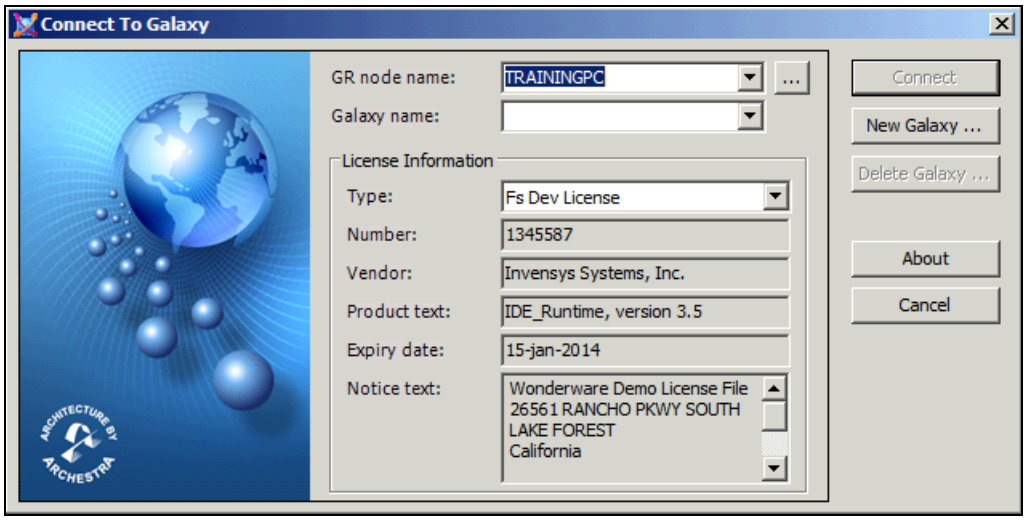
- Create a Galaxy to reflect your plant model
- Configure a platform instance and deploy the Galaxy

Create the Galaxy

First, you will create the Galaxy you will use in subsequent labs.

1. Open the ArchestrA IDE (**Start | All Programs | Wonderware | ArchestrA IDE**).

   The **Connect To Galaxy** dialog box appears.



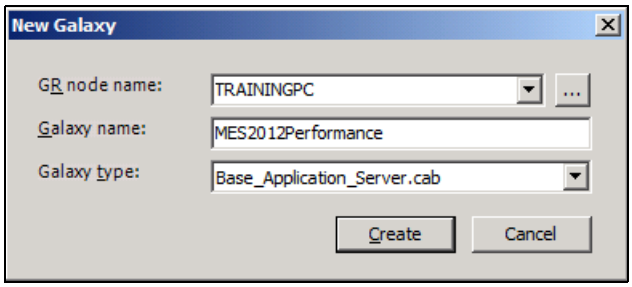
   The **GR node name** displays the name of your computer. In this example, the node name is **TRAININGPC**.

2. Click **New Galaxy**.

   The **New Galaxy** dialog box appears.

3. Configure the **New Galaxy** dialog box as follows:

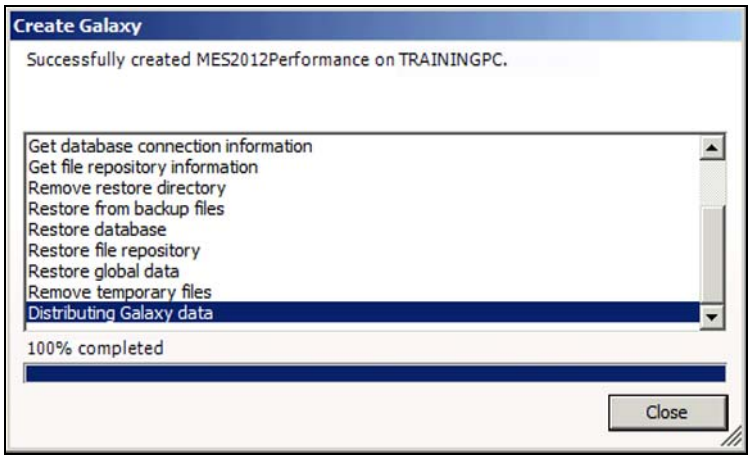
   GR node name: *<your computer name>* (*default*)
   Galaxy name: MES2012Performance
   Galaxy type: Base_Application_Server.cab (*default*)



4. Click **Create**.

   The **Create Galaxy** dialog box appears with the progress of the Galaxy creation.

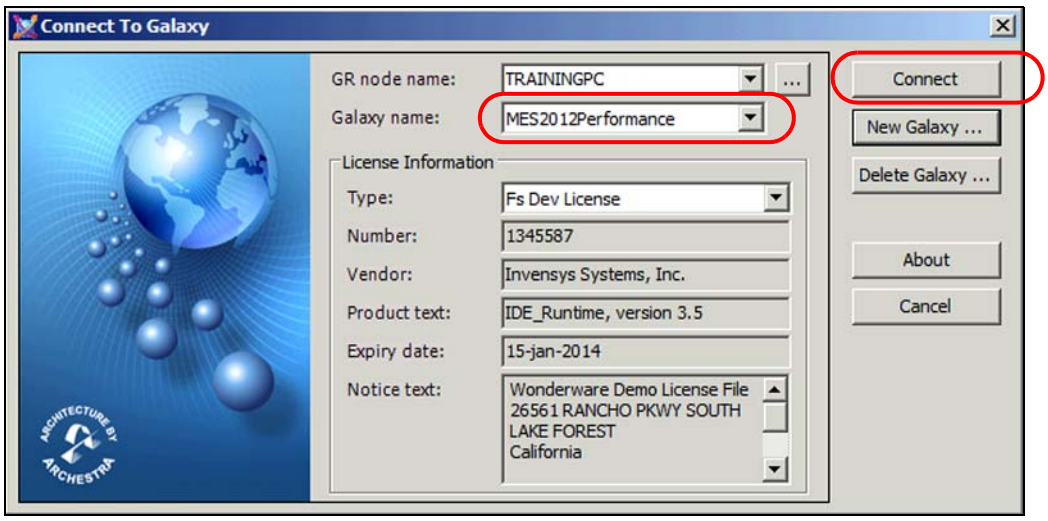
   When the process is complete, the status bar displays **100% completed**.



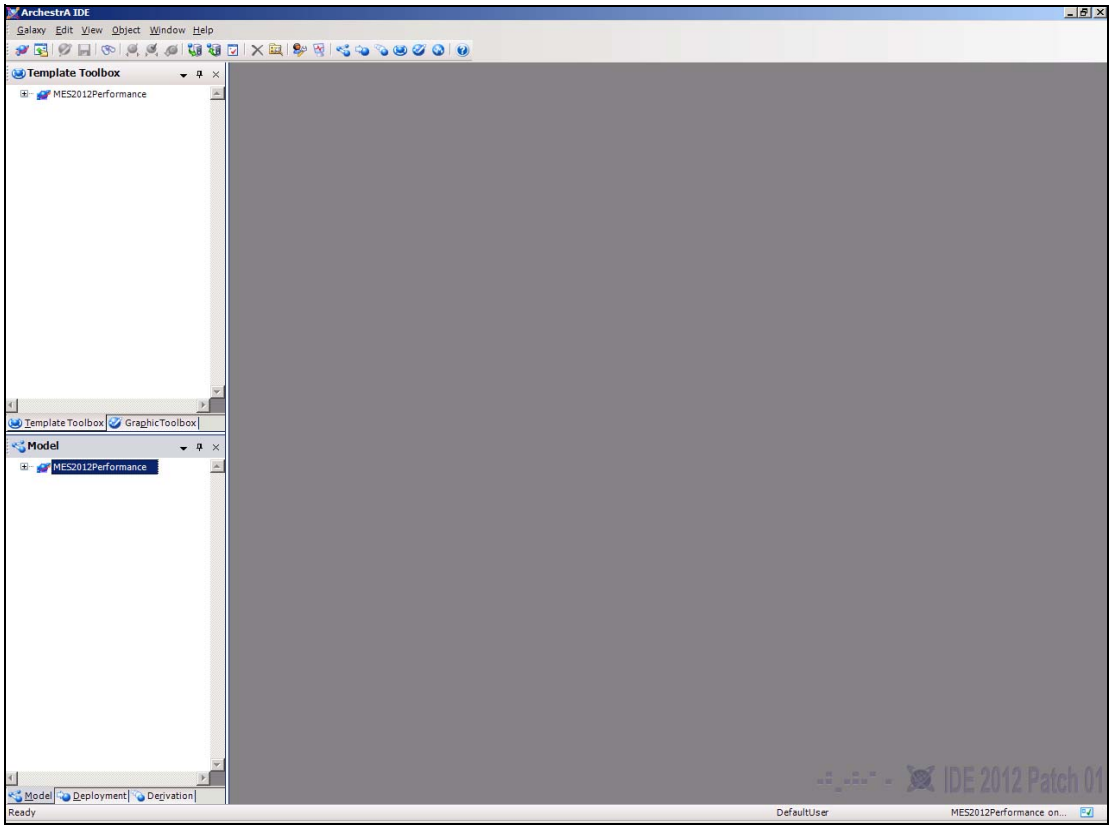
5. Click **Close**.

   The newly created Galaxy now appears in the **Galaxy name** field.

6. Click **Connect**.



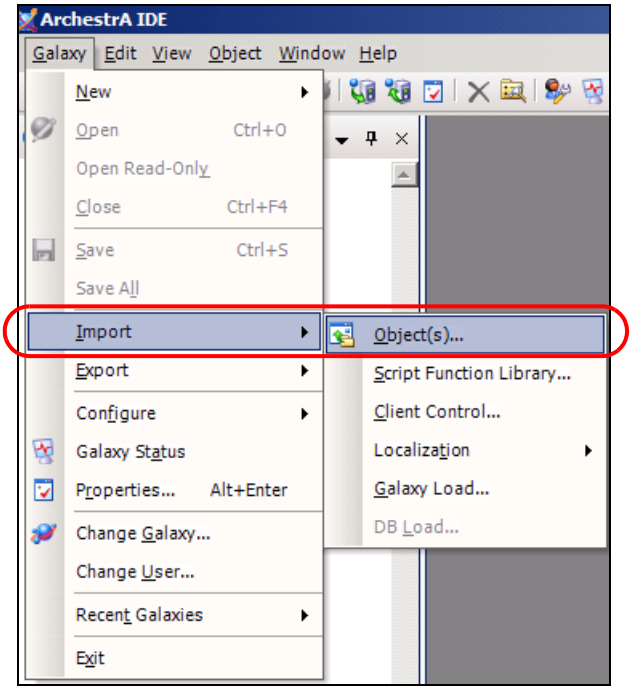
The **Connect To Galaxy** dialog box closes and the ArchestrA IDE opens.



Import Objects into the Galaxy

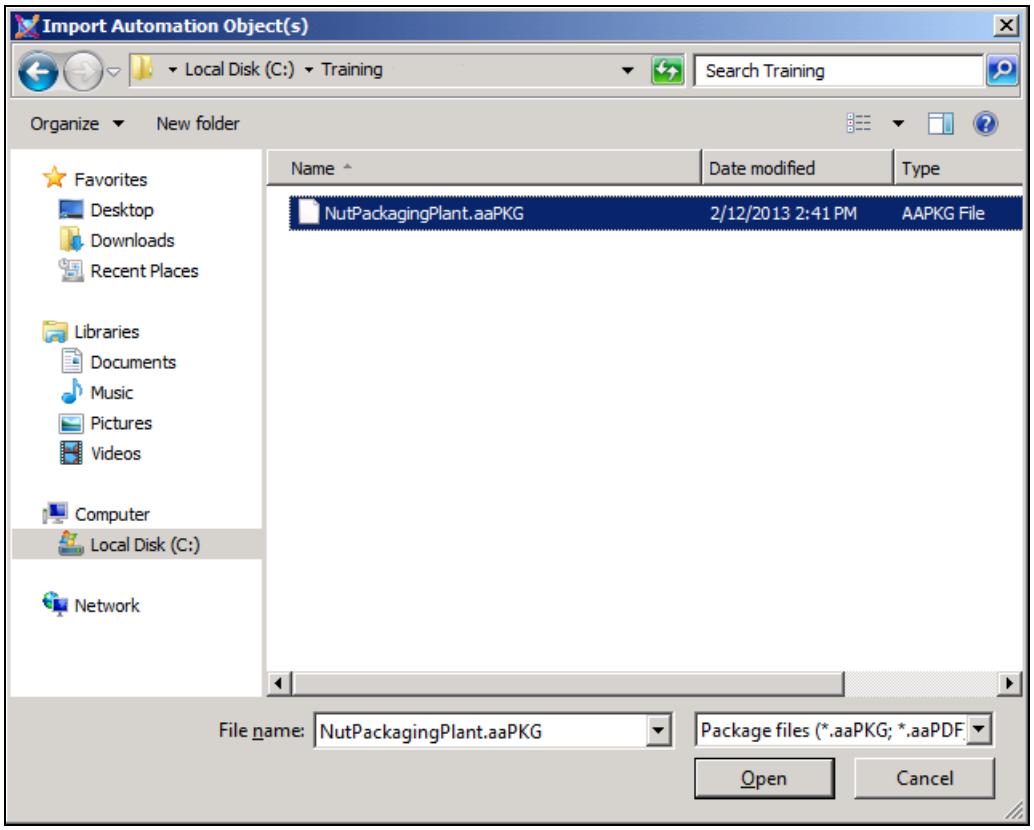
Now, you will import a package file that simulates a nut packaging plant.

7. On the **Galaxy** menu, click **Import | Object(s)**.



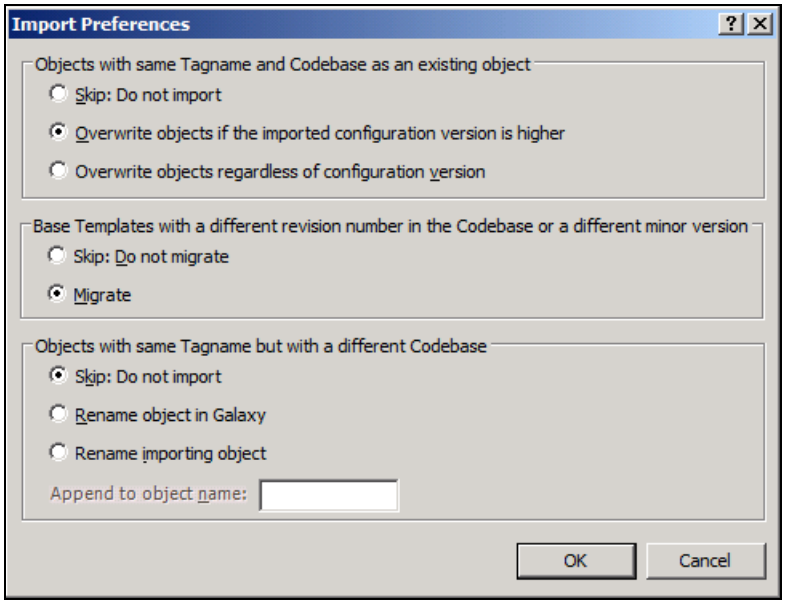
The **Import Automation Object(s)** dialog box appears.

8. Navigate to **C:\Training** and select the **NutPackagingPlant.aaPKG** file.



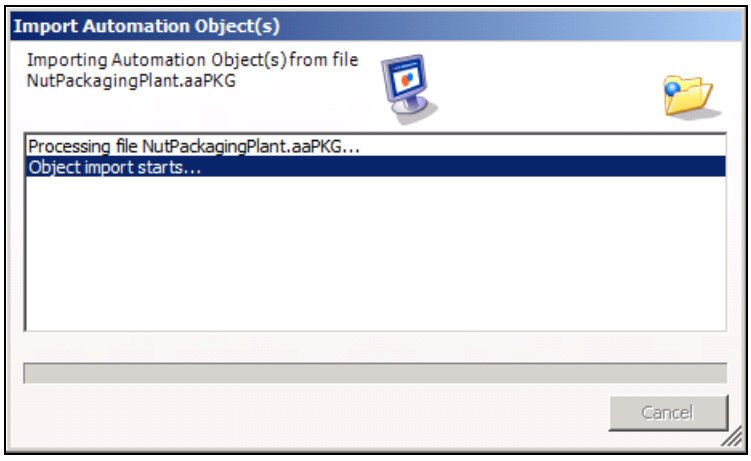
9. Click **Open**.

The **Import Preferences** dialog box appears.



10. Leave the default settings and click **OK**.

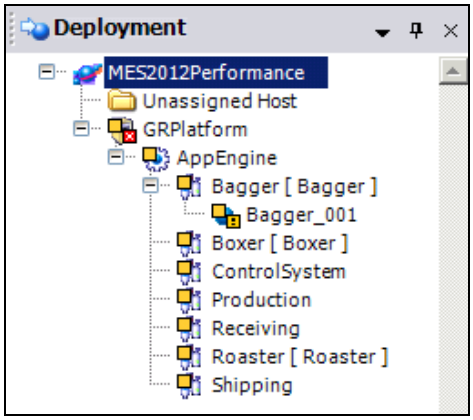
    The **Import Automation Object(s)** dialog box appears.



    When the process is complete, the **Import completed** message appears.

11. Click **Close**.

12. In **Deployment** view, fully expand the **MES2012Performance** Galaxy to view the imported objects.



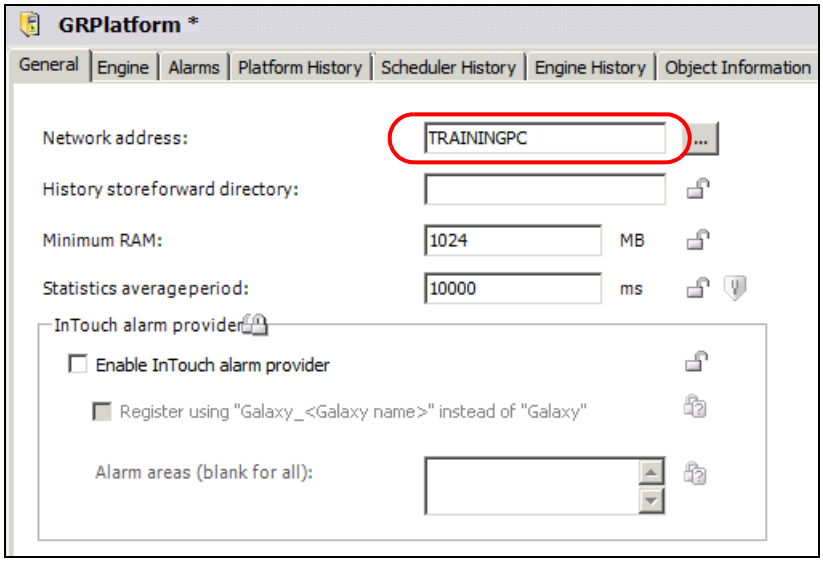
    The red box with the “x” indicates that you have to configure the **GRPlatform**.

Configure and Deploy the Platform

Next, you will configure the **GRPlatform**, and then deploy it.

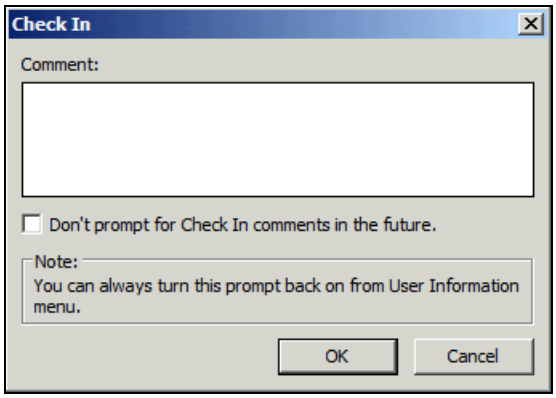
13. In **Deployment** view, double-click **GRPlatform**.
14. On the **General** tab, in the **Network address** field, enter your node (computer) name.

    In this example, the node name is **TRAININGPC**.



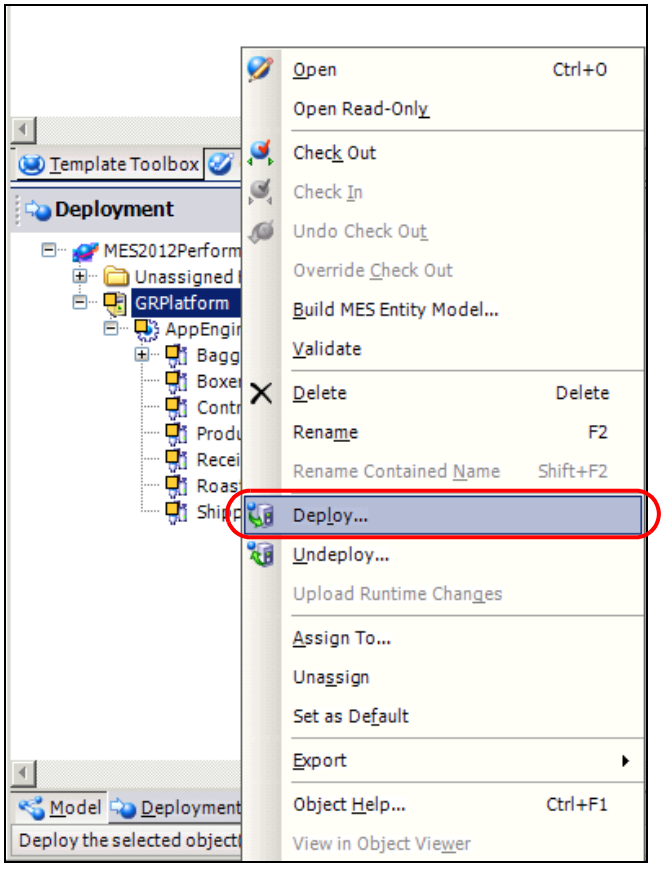
15. At the top-right of the window, click the **Save and Close** button to save and close the editor.

    The **Check In** dialog box appears.

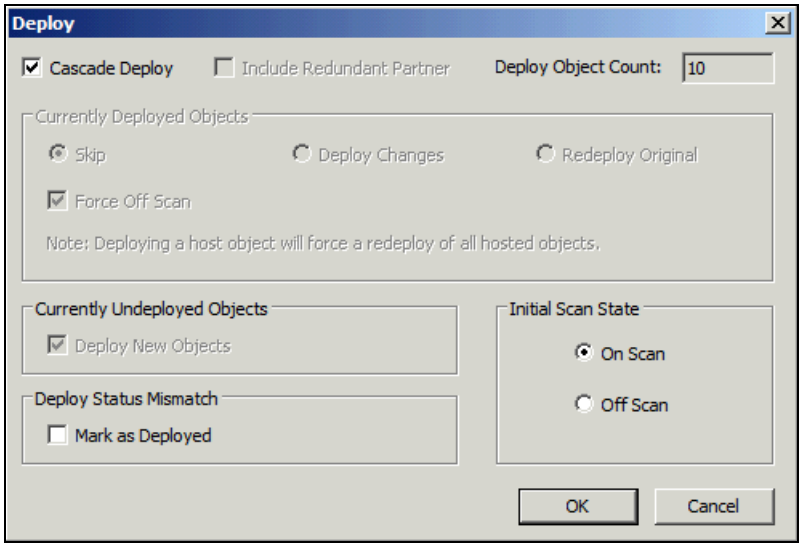


16. Click **OK** to check in the object.

17. In **Deployment** view, right-click **GRPlatform** and select **Deploy**.

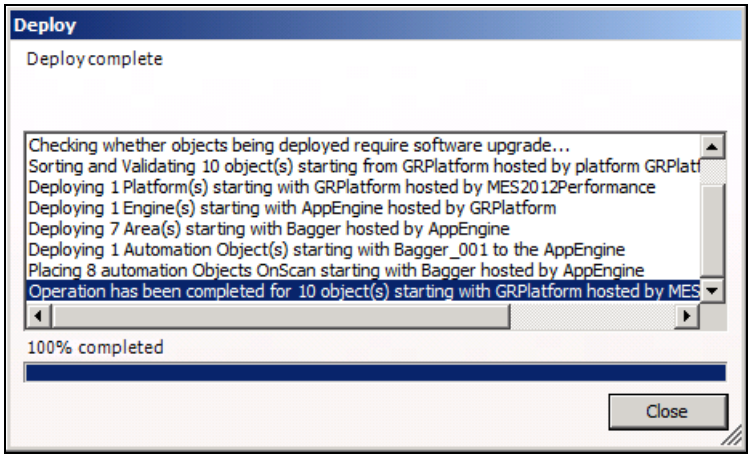


The **Deploy** dialog box appears.



18. Leave the default settings and click **OK**.

When the process is complete, the status bar displays **100% completed**.



19. Click **Close**.

Section 2 – Entity Model Builder

This section discusses the Entity Model Builder and explains how it is used.

What Is an Entity?

Entities are the plant assets that are used for production, consumption, and storage of goods. For example, an entity could be a building, a location within a building, a single machine, or an assembly line. You can log on to entities and modify the information associated with them.

Physical Entities

A physical entity can represent locations, such as a building, an area, a machine, an assembly line, or a storage bin. A physical entity is important in the logical presentation, collection, and reporting of data related to the manufacturing of a product. Within the system, users log in to entities to define, process, and maintain plant information.

Overview of the Entity Model Builder

Entity Model Builder is an ArchestrA IDE extension for creating entities from the ArchestrA equipment model, which uses the UCO for configuring utilization/OEE support.

The main goal of the Entity Model Builder is to create structured entities in MES, based on the **Model** view of the Application Server Galaxy, and automatically configure them for OEE or utilization support. An ArchestrA application object instance is considered an entity that is capable of capturing utilization and tracking OEE when the UCO is added as a child. Information configured in the child UCO is used to configure an entity within MES. The Entity Model Builder then creates and maintains the entity model within MES. This eliminates the need to manually create and configure entities in MES to match the ArchestrA IDE equipment model.

With the installation of the UCO into the ArchestrA IDE Galaxy, an ArchestrA application object becomes capable of capturing utilization and OEE. Inserting and properly configuring the UCO as a child object to an existing application object allows the user to export this information into MES to create corresponding entities using the Entity Model Builder IDE Extension.

Set Up the Entity Model Builder

You install the Entity Model Builder as a part of the Wonderware MES installation.

Before you can install the Entity Model Builder, you must have the ArchestrA IDE installed on a node.The middleware or middleware proxy must also be installed on the ArchestrA IDE node.

Create Entities with the Entity Model Builder

In the ArchestrA IDE **Model** view, you add a UCO below any application object that you want to create in MES as an entity with utilization/OEE capabilities.

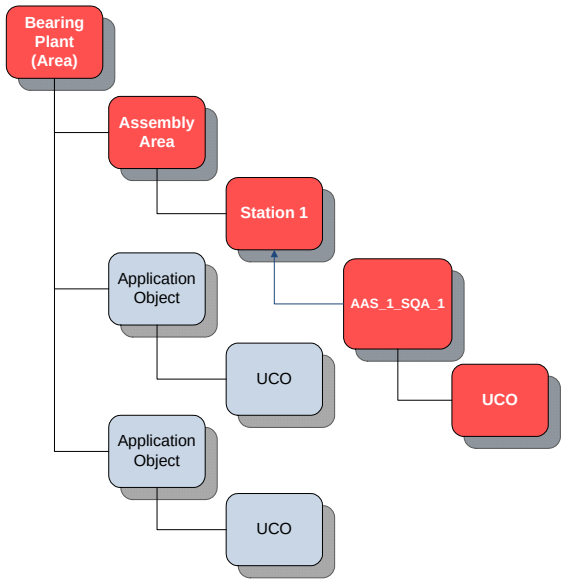
When you place the UCO object as a child to an application object in the ArchestrA IDE equipment model, the Entity Model Builder creates an entity in MES for the parent application object. The basic equipment structure in the Galaxy is duplicated in the entity model.

When you select a UCO or any parent application object in the ArchestrA IDE equipment model tree and run the Entity Model Builder, their parent objects, up to and including the object area and their associated properties, are replicated in MES Client.

Note: Entities configured in the UCO may collect and display the utilization data in the **Operator** module. Utilization is licensed for each entity. If you exceed the number of entities that can capture utilization, a warning message appears.

Entity Creation Example

In the following example, if the UCO selected is a child of the AAS_1_SQA_1 object, the Entity Model Builder creates only the objects above it up to the Bearing Plant (Area).



Since the other UCOs in the same equipment model are not directly a part of the selected equipment tree hierarchy, they are not included in the entity creation because it is not a part of the direct parent/child equipment structure.

You can also select any parent application object that has a UCO child attached to it to create the same structure in MES Client.

Note: If you select multiple application objects, the Entity Model Builder creates all of them.

If the selected application object is not a UCO, does not have a UCO below it, and is not a part of a utilization/OEE configuration hierarchy, then the Entity Model Builder does not create any entities.

Note: The Entity Model Builder creates only new entities and new entity hierarchies that do not exist. To delete an entity, you must delete it from MES Client.

If MES Client already has the selected utilization/OEE entity created in its database, the Entity Model Builder will overwrite it with your new utilization/OEE properties.

Although the Entity Model Builder never deletes an existing entity or removes any capabilities (including utilization/OEE capabilities), it can reparent entities at any level to reflect new structural changes to the ArchestrA equipment model hierarchy.

A new entity model is defined in the MESDB with the same structure as in the ArchestrA IDE **Model** view. The utilization/OEE configuration information is extracted from the UCOs and stored in the corresponding MES entities.

When you select a UCO or any parent application object in the ArchestrA IDE equipment model tree and run the Entity Model Builder, the parent objects up to and including the object area and their associated properties are replicated in MES Client.

Note: Prior to running the Entity Model Builder, you should be sure that you are not running any MES applications. Entity configuration changes coming from an MES application could overwrite the entity changes performed by the Entity Model Builder. To ensure that you are using the UCO configured entity changes, run the Entity Model Builder after shutting down the MES applications.

Entity Names

When the Entity Model Builder creates entities, it bases the new entity names on the TagName attribute in the source application object.

From the example above, the Entity Model Builder produces four entities using the TagNames accordingly, with the final entity from the UCO child having utilization/OEE tracking capabilities.

```
+ Bearing_Plant (Area)
   + Assembly_Area
      + Station1
         + AAS_1_SQA_1
```

Entity Capabilities and Properties

The Entity Model Builder creates new entities with the following configured capabilities or features:

- Scheduling jobs
- Running jobs
- Capturing utilization
- Tracking OEE

The following performance parameter information is extracted from the UCO objects and written to the corresponding entities:

- Target utilization percent
- Target OEE percent
- Target performance percent
- Target quality percent
- Default production rate
- Default production unit
- Raw reason codes

Create a New Entity

You create a new entity in the ArchestrA IDE, where you right-click a UCO or its parent object and select **Build MES Entity Model**. You can also select **Build MES Entity Model** in the ArchestrA IDE **Object** menu.

Note: You cannot cancel the entity creation process, so you should verify that the right parent UCO is selected before building the entity.

If you have more than one UCO under a single parent application object, the UCO entities will not be created and an error will be displayed in the progress dialog box.

When the Entity Model Builder writes a UCO's utilization/OEE information to the parent application object's corresponding entity, the Entity Model Builder validates the UCO and marks it as being synchronized with the MES. You can then deploy the new entity in the ArchestrA IDE.

Modify Entities

You can use the Entity Model Builder to modify or update your entities with any of the following changes made to the objects in the ArchestrA IDE:

- Change the configuration of any UCO
- Add a UCO at higher levels in the utilization capability tree
- Move an application object to a higher level in a utilization capability tree (reparenting)
- Rename an application object at a higher level in the utilization capability tree

  This creates a new entity and then the old entity's children (if any) are reparented.
- Add an application object as a part of a utilization capability tree that has the same name as an entity that is manually configured by the configurator

  The existing entity's children (if any) are reparented.
- Move a UCO to another parent application object; the old parent is no longer considered an entity (although it still exists in the MES)

  This creates a new entity and possibly all associated parent entities.

Note: If you remove an entity in your ArchestrA IDE equipment model, it does not get deleted in the MES.

If you have not made any changes to the ArchestrA equipment model, the Entity Model Builder will check to ensure that the utilization/OEE configuration in the ArchestrA equipment model also exists in the entity model. If there are any differences, the MES configuration is updated to match the ArchestrA configuration.

Note: If you made utilization/OEE parameter changes outside the ArchestrA IDE equipment model, those changes will be overwritten by the Entity Model Builder the next time you run it.

Lab 3 – Building the MES Entity Model

Introduction

In this lab, you will first import the Utilization Capability Object (UCO) and Operations Capability Object (OCO) from the MES installation into the Galaxy. Next, you will create derived templates and instances, which you will use to build the MES Entity Model from the ArchestrA IDE into the MES database (MESDB). Then, you will assign the MES groups access privileges to the MES entities.

Objectives

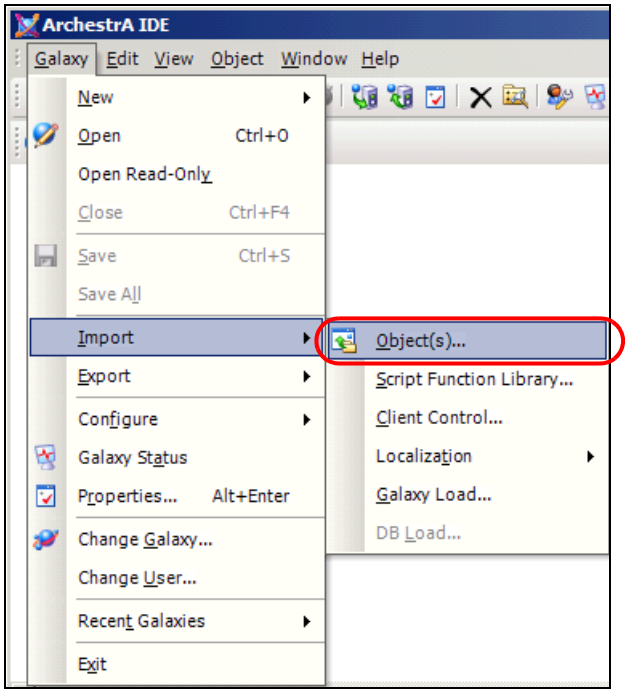
Upon completion of this lab, you will be able to:

- Import UCO and OCO object templates into a Galaxy
- Use the MES objects to define an MES Entity Model in the Galaxy
- Grant MES groups entity access privileges

Import the UCO and OCO

First, you will import the UCO and OCO templates into the Galaxy. You will use the OCO template in later labs.

1. In the ArchestrA IDE, on the **Galaxy** menu, click **Import | Object(s)**.



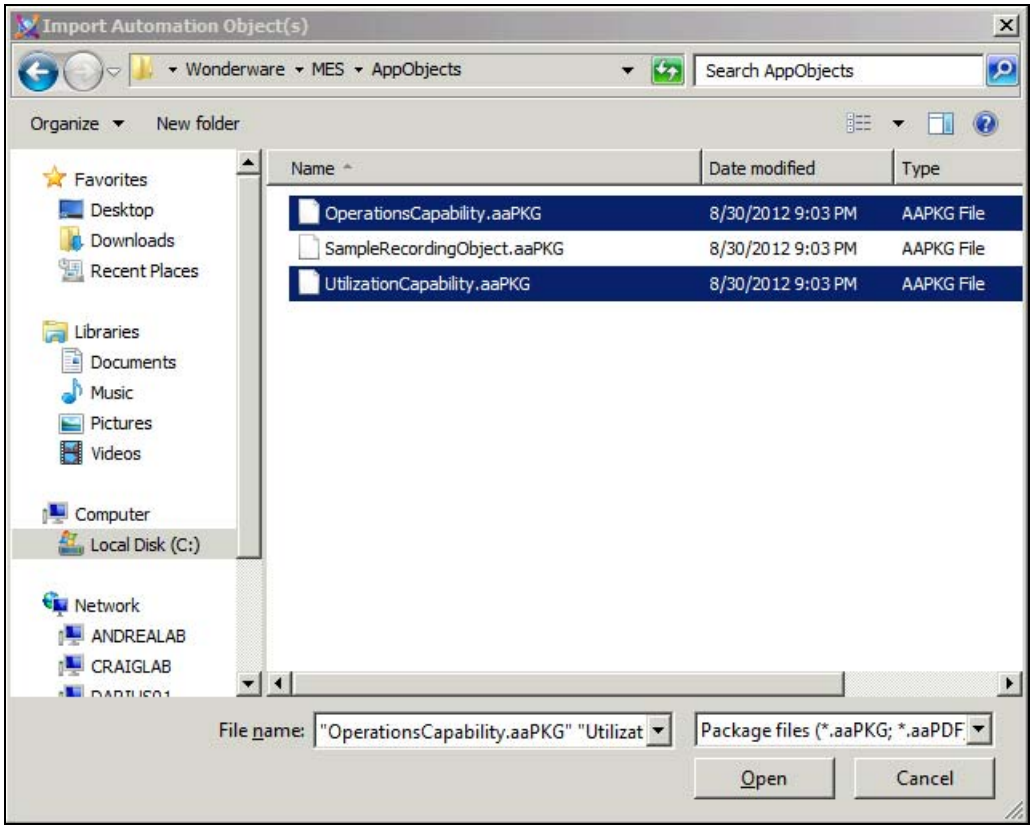
The **Import Automation Objects** dialog box appears.

2. Navigate to:

   C:\Program Files(x86)\Wonderware\MES\AppObjects

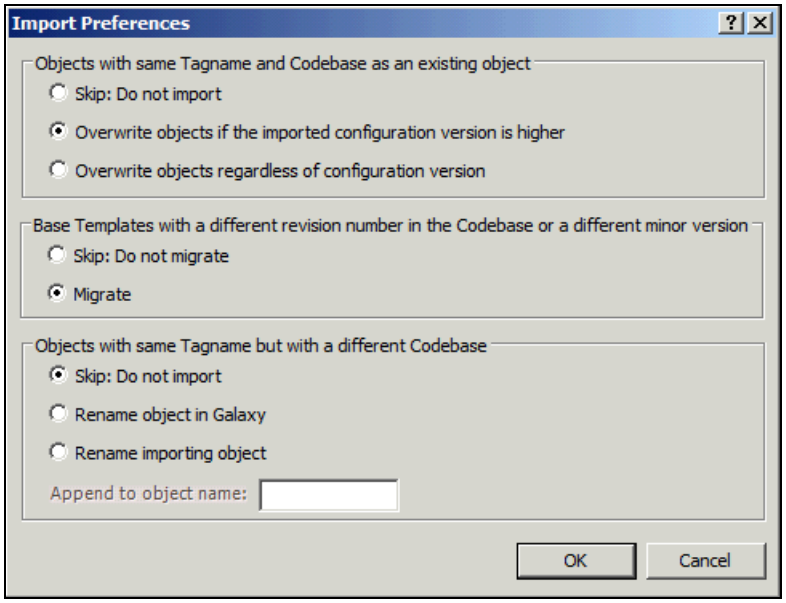
Note: For a 32-bit operating system, the path may be **C:\Program Files\Wonderware\MES\AppObjects**

3. Select the **OperationsCapability.aaPKG** and **UtilizationCapability.aaPKG** files.



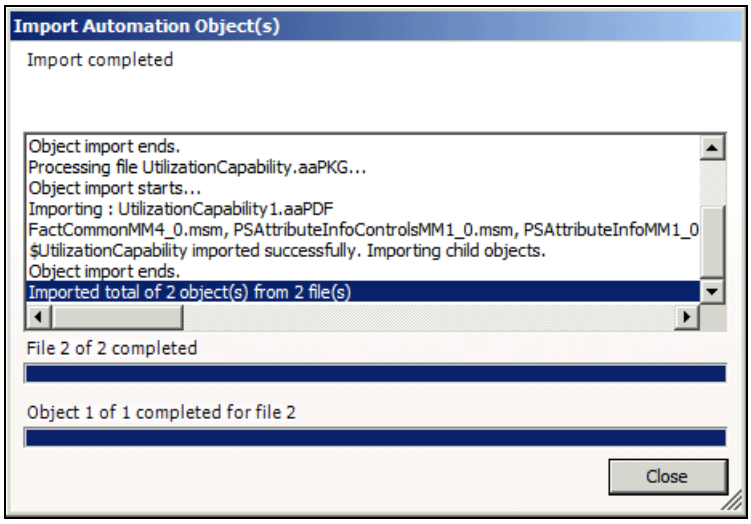
4. Click **Open**.

The **Import Preferences** dialog box appears.



5. Leave the default settings and click **OK**.

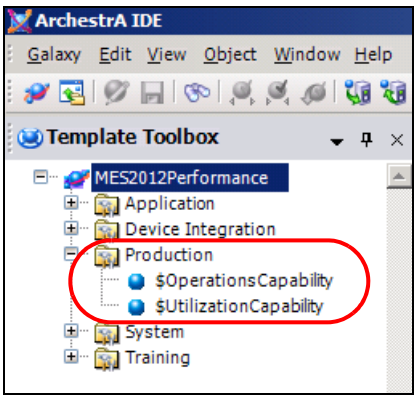
   When the process is complete, the **Import completed** message appears.



6. Click **Close**.

7. In **Template Toolbox**, expand **MES2012Performance** and the **Production** toolset.

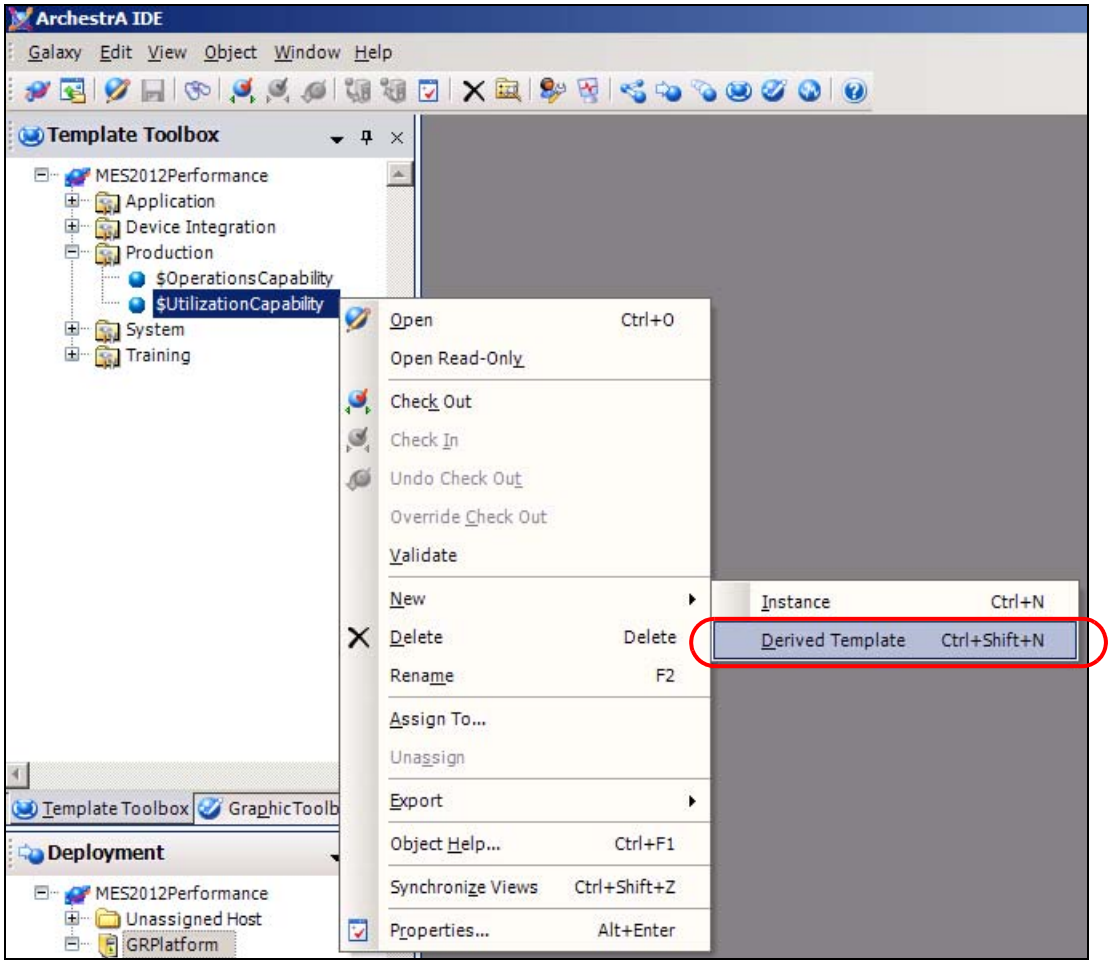
   The **$UtilizationCapability** and **$OperationsCapability** objects have been imported into the **Production** toolset.



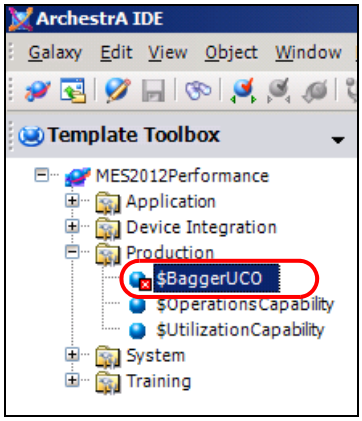
Create Derived Templates and Instances from UCO and OCO Templates

Now, you will create a UCO and an OCO derived template and place them in the **$Bagger** template as contained objects. Next, you will create a derived instance from the derived UCO and OCO templates. Then, you will place the instances in the **Bagger** instance to define the entity model.

8. In **Template Toolbox**, right-click the **$UtilizationCapability** object and select **New | Derived Template**.

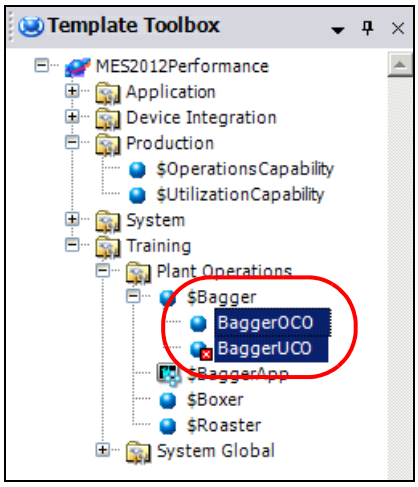


9. Rename the derived template **$BaggerUCO**.

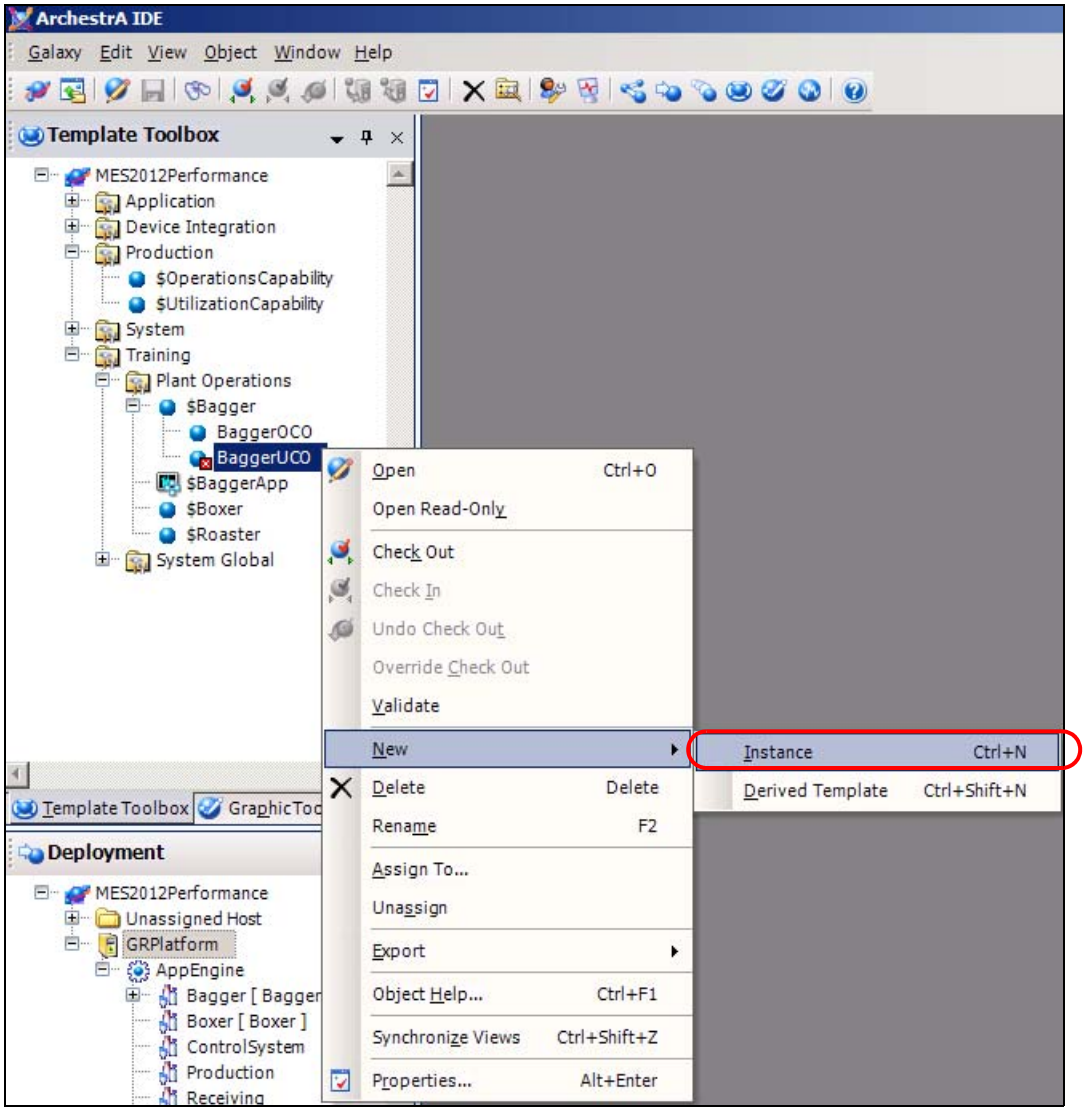


Note: The new template shows an error because no raw reason codes have been defined in the template and a default reason has not been set. You will define these in a subsequent lab.

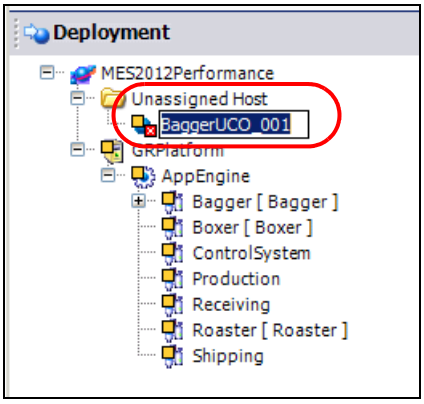
10. Create a derived template for the **$OperationsCapability** object.
11. Rename the derived template **$BaggerOCO**.
12. Expand the **Training** and **Plant Operations** toolsets, and then drag **$BaggerOCO** and **$BaggerUCO** to the **$Bagger** template.



13. Select and right-click **$Bagger.BaggerUCO** and select **New | Instance**.

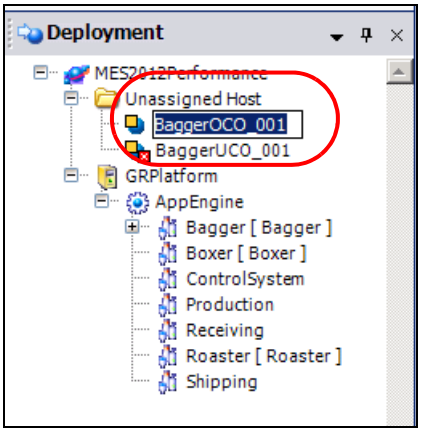


In **Deployment** view, the **BaggerUCO_001** instance is created under the **Unassigned Host** folder.

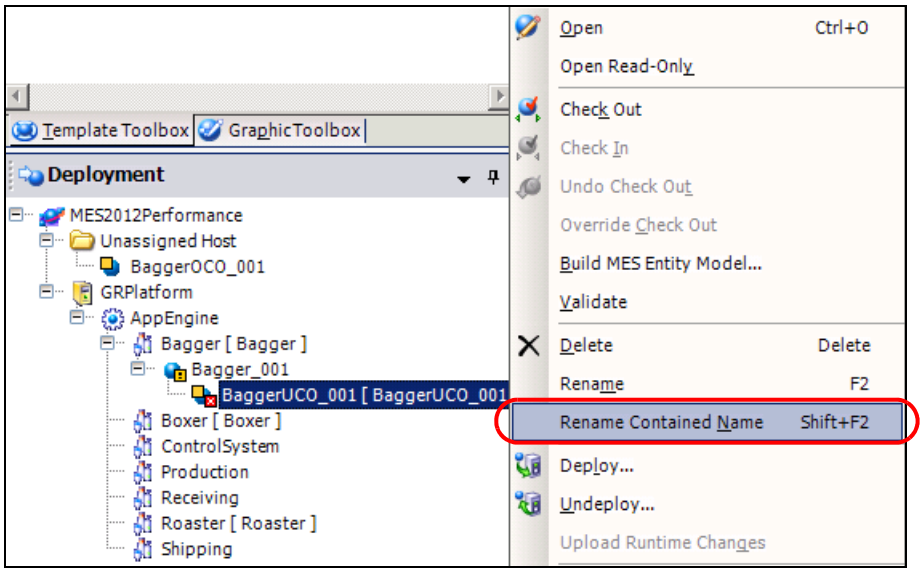


14. Retain the default name of the newly created instance and press **Enter**.
15. Create an instance for **$Bagger.BaggerOCO**.

    The **BaggerOCO_001** instance is created in the same location.

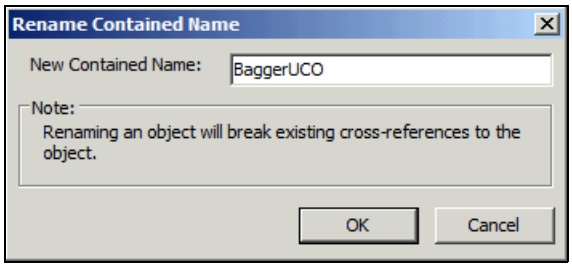


16. Drag the **BaggerUCO_001** instance to **Bagger_001**.
17. Right-click **BaggerUCO_001 [BaggerUCO_001]** and select **Rename Contained Name**.



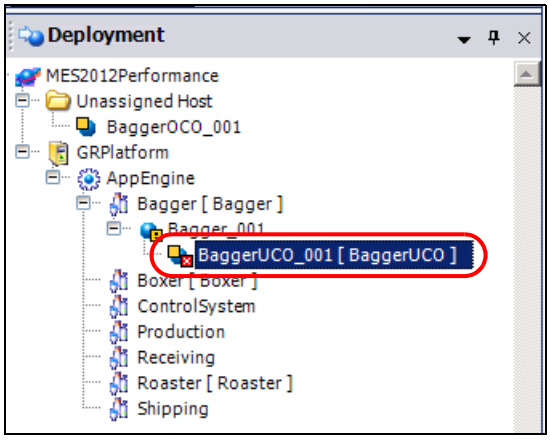
The **Rename Contained Name** dialog box appears.

18. In the **New Contained Name** field, rename the contained name to **BaggerUCO**.



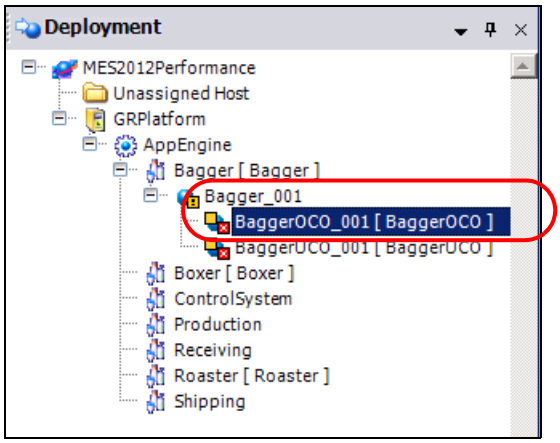
19. Click **OK**.

The new contained name appears in brackets.



20. Repeat Steps 16 and 17 for **BaggerOCO_001**.
21. Rename the contained name to **BaggerOCO** and click **OK**.

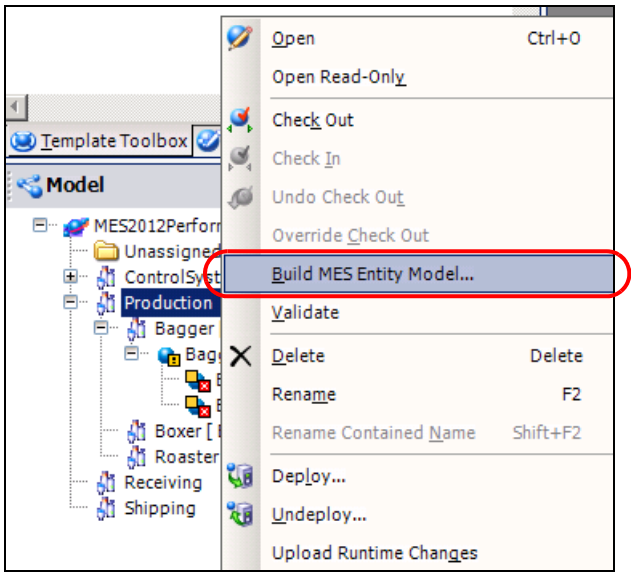
    The new contained name appears in brackets.



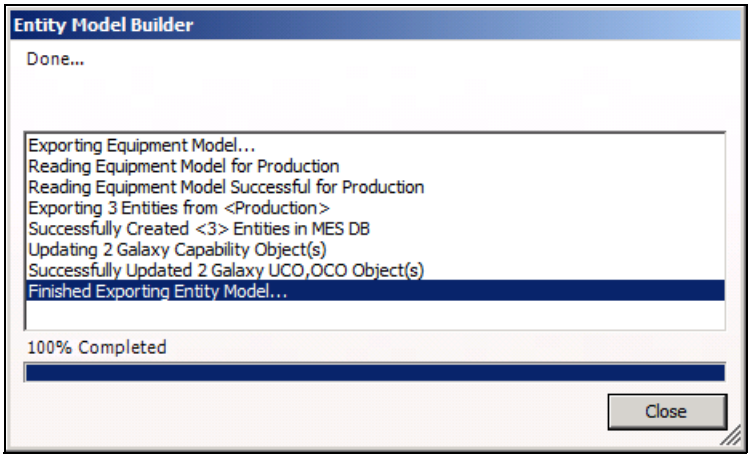
Build the MES Entity Model

Now, you will use the MES function extension in the ArchestrA IDE to build an MES Entity Model in the MESDB.

22. In **Model** view, right-click the **Production** area object and select **Build MES Entity Model**.



When the process is complete, the status bar displays **100% Completed**.



23. Click **Close**.

Assign Access Permissions to Entities

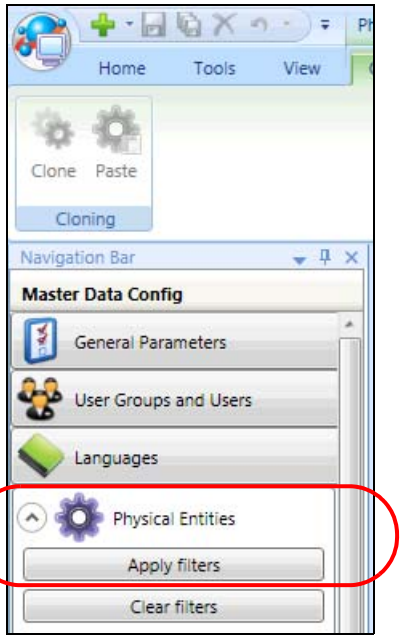
The MES Entity Model is now available in the MESDB. Next, you will give user groups permission to access the entities they will use.

24. Open MES Client, if needed, and log in as an administrator using the following credentials:

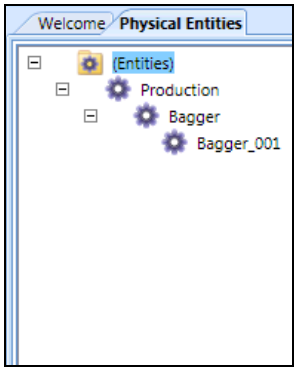
    User Name: Admin

    Password: admin

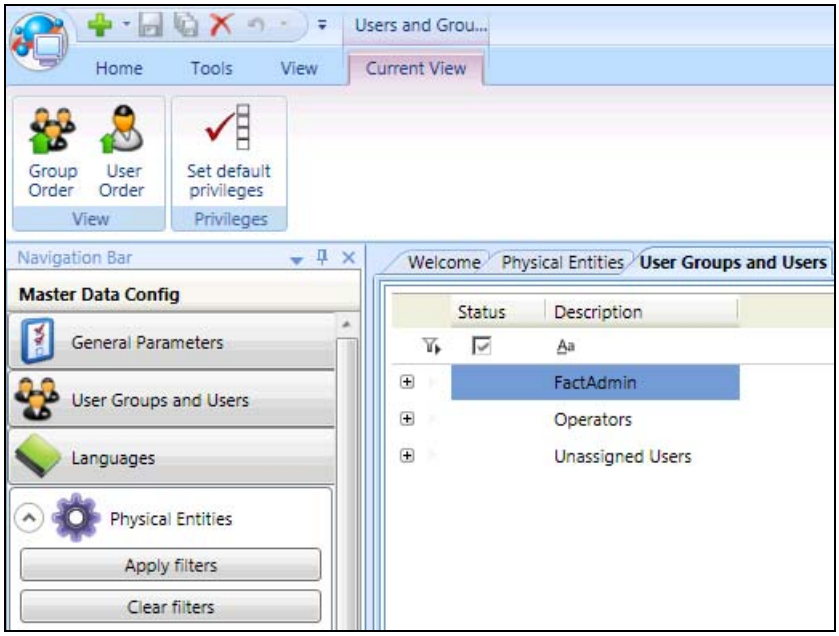
25. In the **Navigation Bar**, in the **Master Data Config** group, click **Physical Entities**, and then click **Apply filters**.



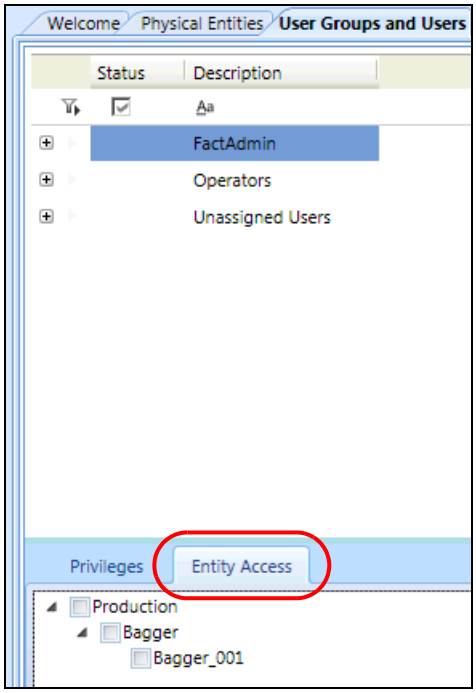
26. On the **Physical Entities** tab, fully expand the **[Entities]** entity to verify that the model was created.



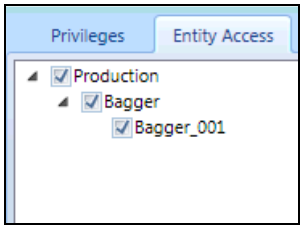
27. In the **Navigation Bar**, in the **Master Data Config** group, click **User Groups and Users**.
28. On the **User Groups and Users** tab, click the **FactAdmin** user group.



29. Click the **Entity Access** tab and fully expand **Production**.

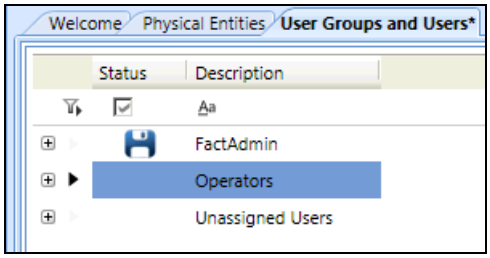


30. Check the **Production** check box to give access privileges to the **FactAdmin** user group.



Notice that **Bagger** and **Bagger_001** are automatically checked after checking **Production**.

31. On the **User Groups and Users** tab, click the **Operators** user group.



32. Repeat Steps 29 and 30 to give access privileges to the **Operators** user group.
33. Save all configurations.

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Learning Services

Module 4 – Utilization

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Module Objectives

- Provide an overview of utilization
- Provide an overview of the Utilization Capability Object (UCO)

Section 1 – Utilization Overview

This section discusses utilization and how to define utilization states and reasons.

Utilization Overview

The perfect state of equipment in a plant is **RUNNING**. However, plant equipment is not available sometimes for a variety of reasons. Therefore, additional equipment states exist and need to be defined. Examples of some of these states are:

- No product
- Belt stuck
- Tank overflow
- Cleaning

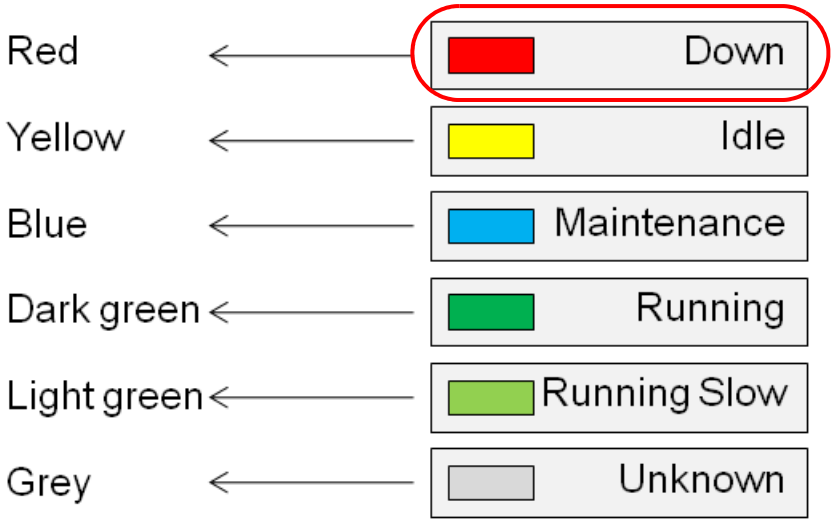
To track equipment utilization, a reason is categorized by its effect on the equipment's availability. This availability is calculated based on three time components named OEE Time:

- Runtime (positive effect on availability)
- Neither (no effect on availability)
- Downtime (negative effect on availability)

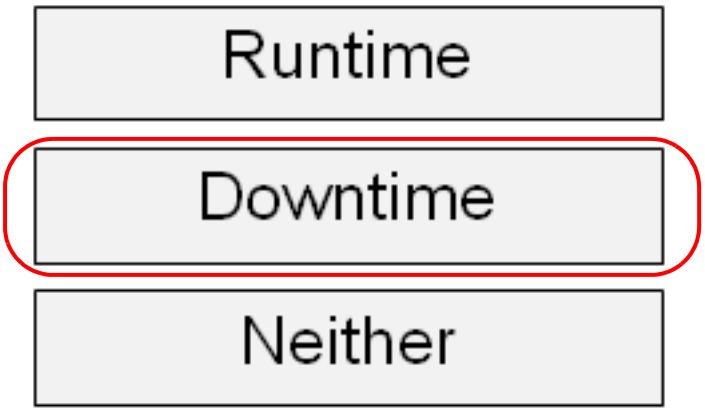
You can define utilization states and choose a color to represent a particular state of the equipment when it is affected by any of the listed reasons. For example:

State	Color Representation
Down	Red
Idle	Yellow
Maintenance	Blue
Running	Dark green
Running Slow	Light green
Unknown	Gray

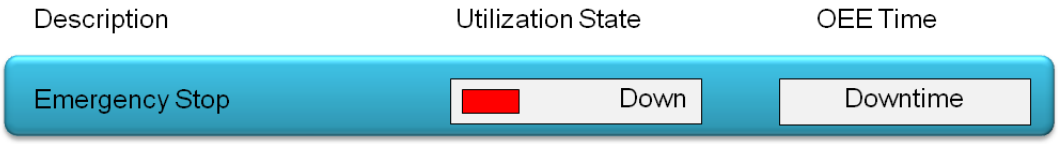
The reasons can then be defined with a reason name, utilization state, and OEE time. For example, a condition may exist that causes a change of state, such as an emergency stop. A user-defined phrase and color are used to indicate the state of the equipment when it is in this condition. In this case, it is described as **Down**.



You then have to determine how this condition affects the availability of the equipment. In this case, it is stated as **Downtime**.

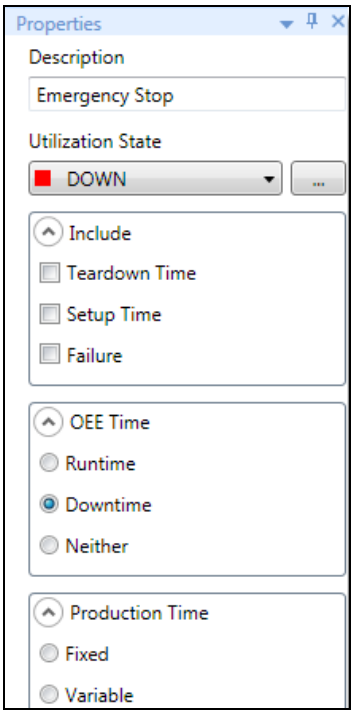


So the description, utilization state, and OEE time for the **Emergency Stop** state would be defined as follows:



The condition that caused the state change

When defining the reason, you will use MES Client as shown below:



Lab 4 – Creating Utilization States and Reasons

Introduction

In this lab, you will first use MES Client to create and configure utilization states, reason groups, and reasons to define and measure the equipment/entity utilization. Next, you will associate each reason in the reason group with a utilization state and an OEE time. Then, you will use InTouch to manually select a utilization reason to enter for the **Bagger** entity.

Objectives

Upon completion of this lab, you will be able to:

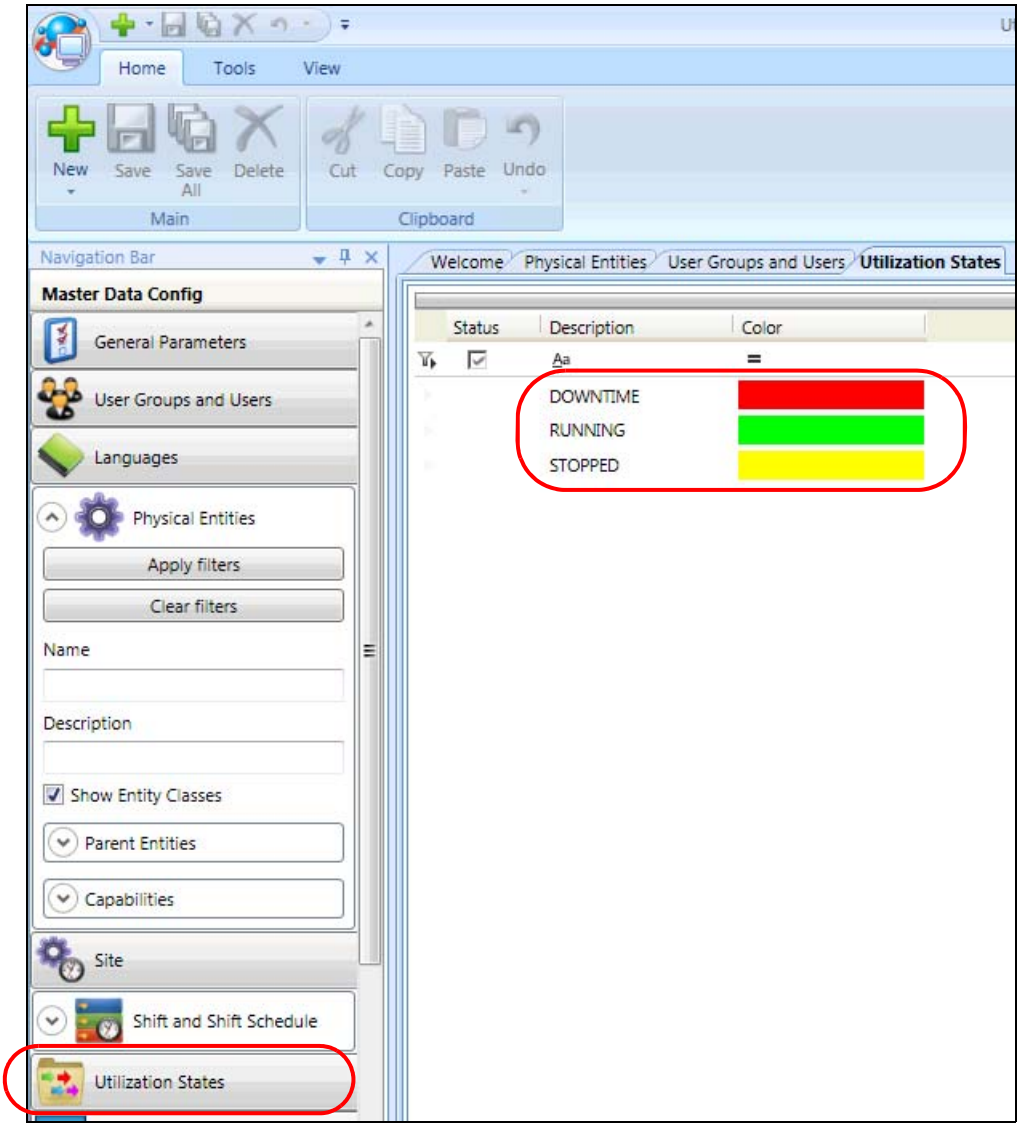
- Create utilization states, reason groups, and reasons
- Create equipment utilizations
- Manually change the equipment utilization state

Configure Utilization States

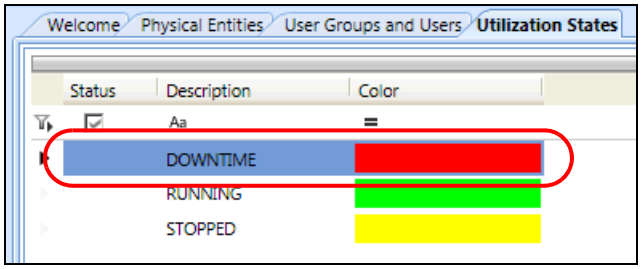
First, you will define and create a list of utilization states for all equipment in the plant.

1. In MES Client, in the **Navigation Bar**, in the **Master Data Config** group, click **Utilization States**.

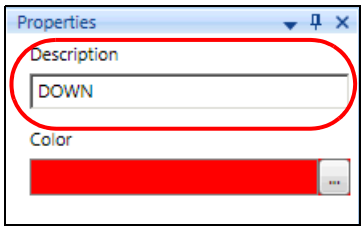
   A list of the default utilization states appears.



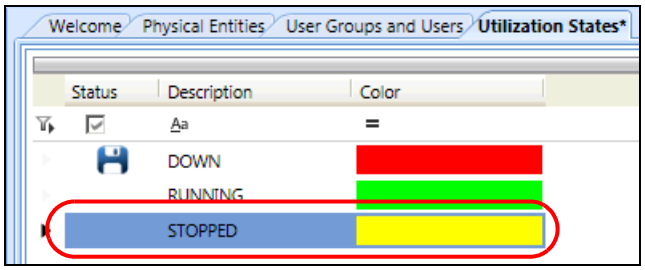
2. On the **Utilization States** tab, click the **DOWNTIME** utilization state.



3. In the **Properties** pane, change **Description** to **DOWN**.

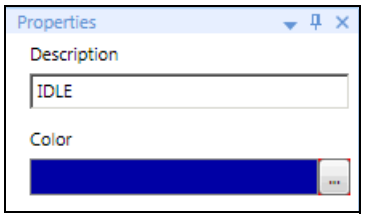


4. On the **Utilization States** tab, click the **STOPPED** utilization state.



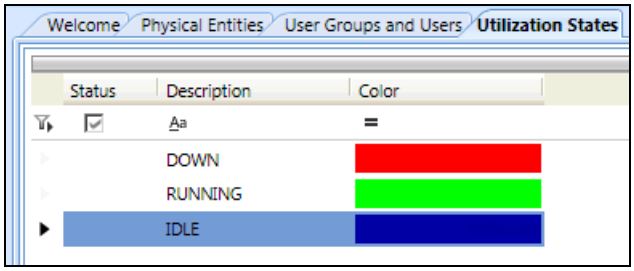
5. Configure the **STOPPED** utilization state as follows:

   Description: IDLE
   Color: *Blue*



6. Save all configurations.

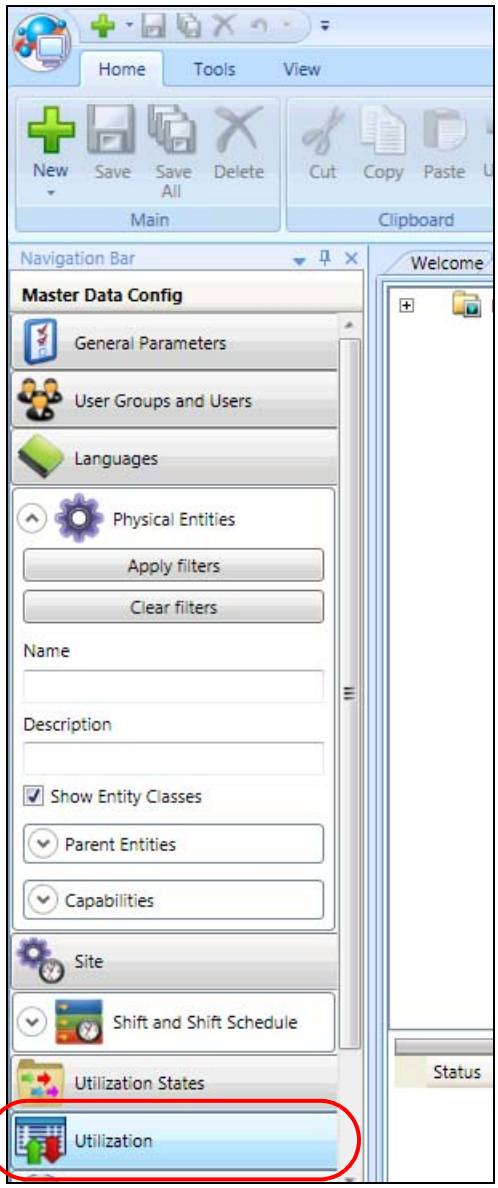
   The utilization states appear similar to the following:



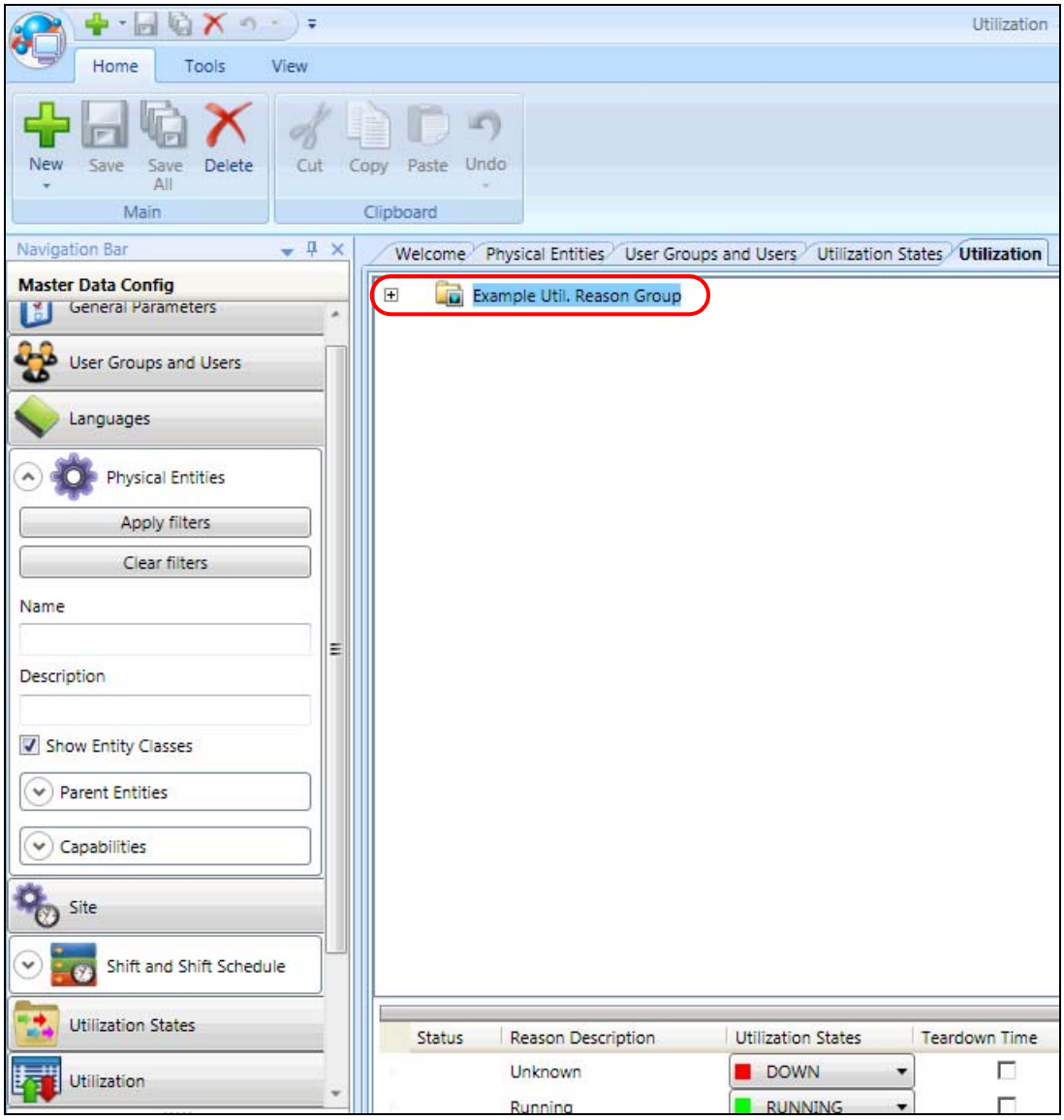
Configure Reason Group and Reasons

Next, you will create and configure reason groups and reasons. Then, you will associate each reason with one utilization state and one OEE time to define all equipment utilizations.

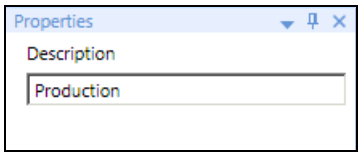
7. In the **Navigation Bar**, in the **Master Data Config** group, scroll down, if needed, and click **Utilization**.



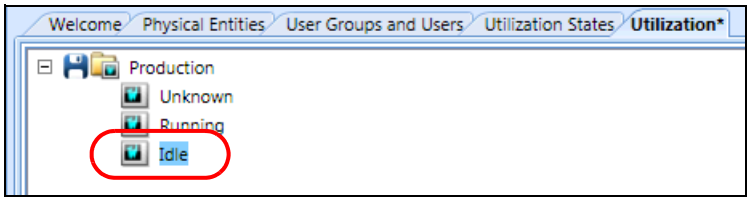
8. On the **Utilization** tab, click **Example Util. Reason Group**.



9. In the **Properties** pane, change **Description** to **Production**.

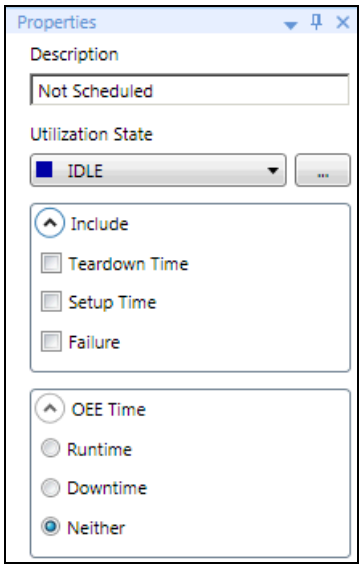


10. On the **Utilization** tab, expand **Production** and click **Idle**.



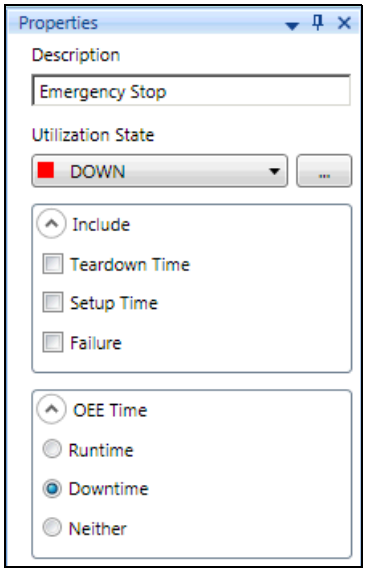
11. In the **Properties** pane, configure **Idle** as follows:

Description:	Not Scheduled
Utilization State:	IDLE (*default*)
OEE Time:	Neither (*default*)

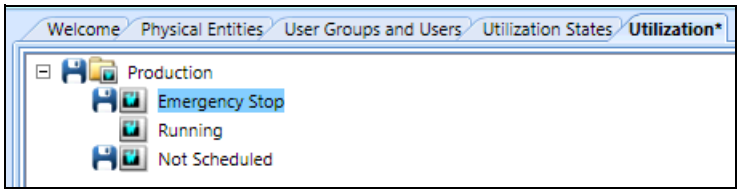


12. Select the utilization reason **Unknown** and configure it as follows:

Description:	Emergency Stop
Utilization State:	DOWN (*default*)
OEE Time:	Downtime (*default*)



The reason group and reasons appear as shown below:

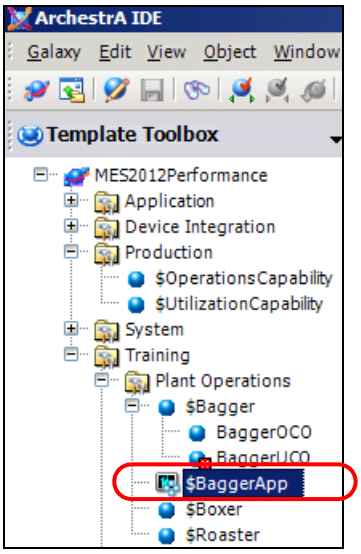


13. Save all configurations.

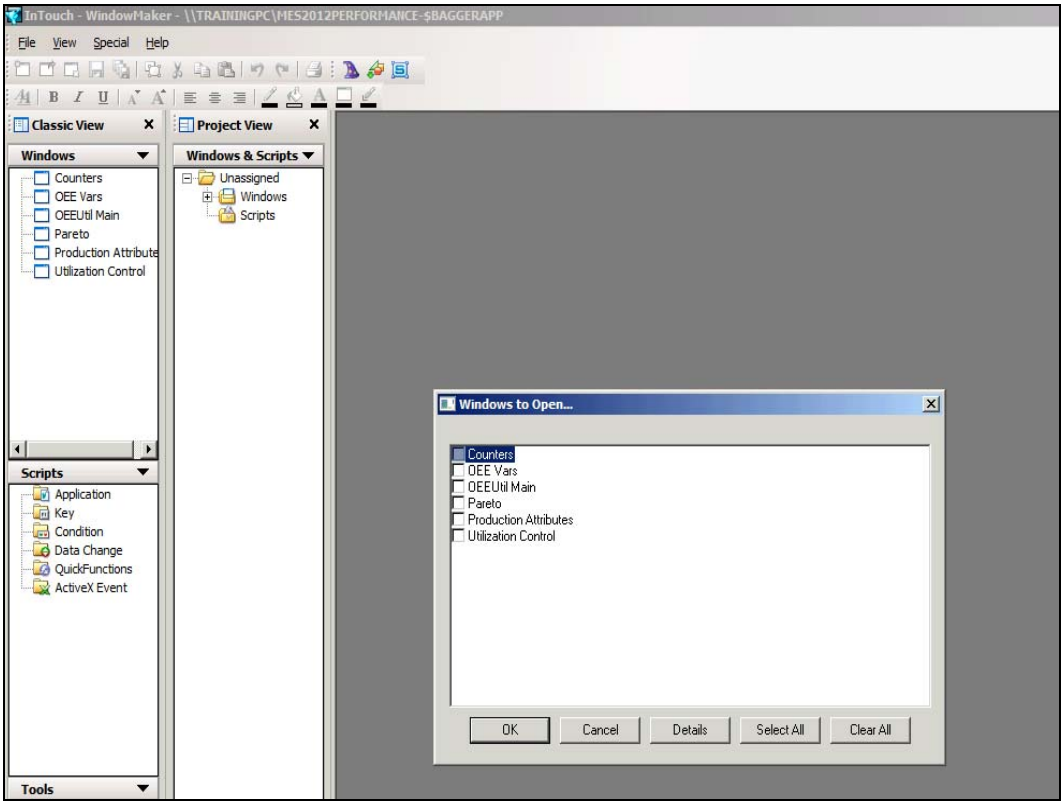
Manually Change the State of the Bagger Entity

Now, you will use a visualization control in InTouch to manually change the state of the **Bagger** entity. You will use InTouch to manually change the utilization states using a prebuilt window. In a subsequent lab, you will learn how to create this window and configure the controls used in the graphic.

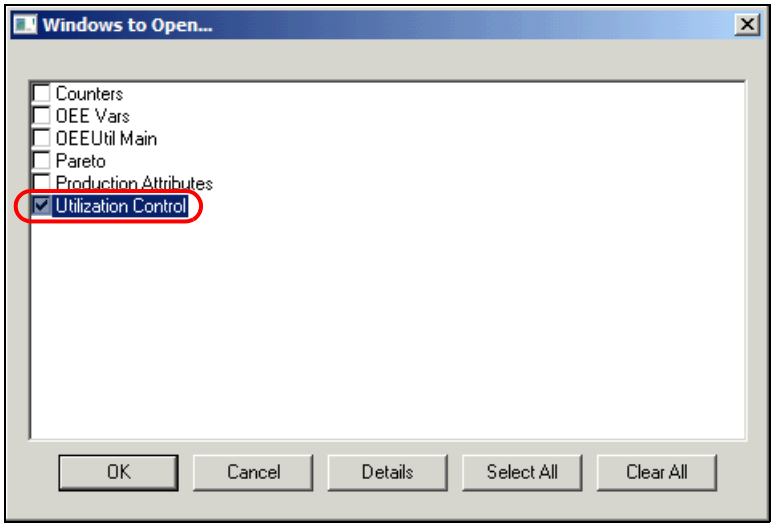
14. In the ArchestrA IDE, **Template Toolbox**, expand **Training** and **Plant Operations**, if needed, and then double-click the **$BaggerApp** InTouch application template.



After a few moments, WindowMaker opens.

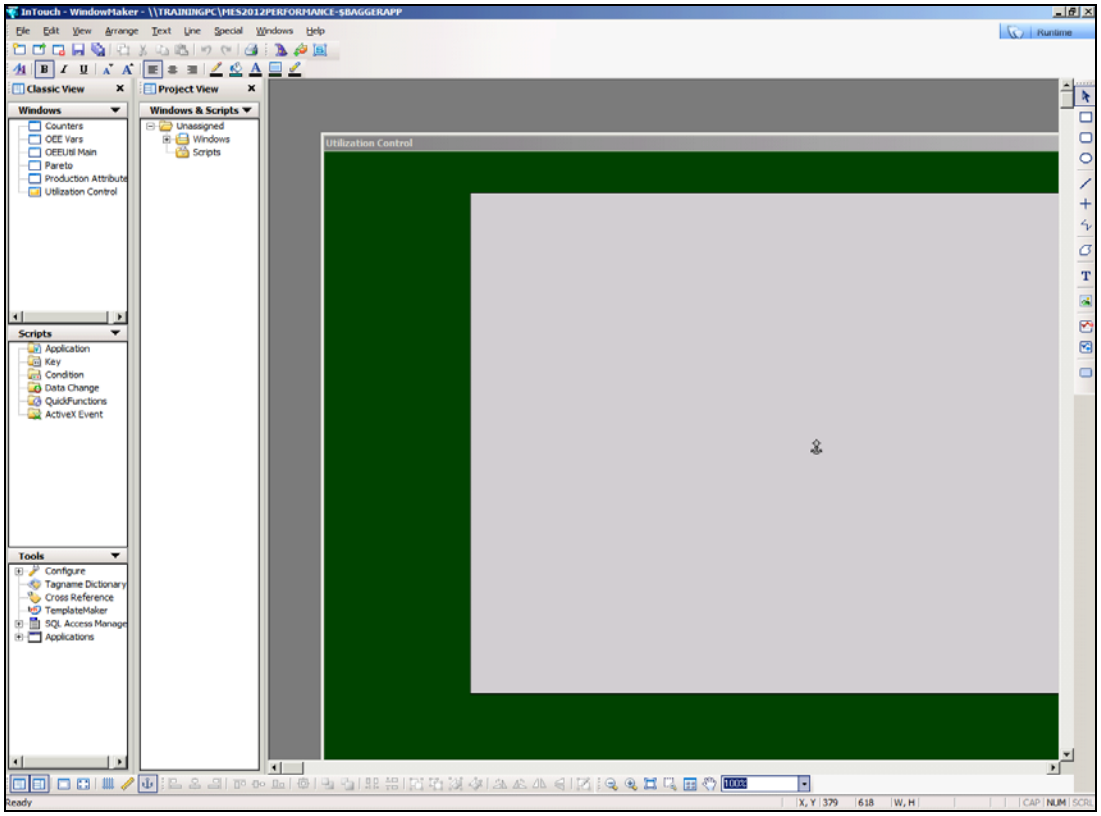


15. In the **Windows to Open** dialog box, check **Utilization Control**.

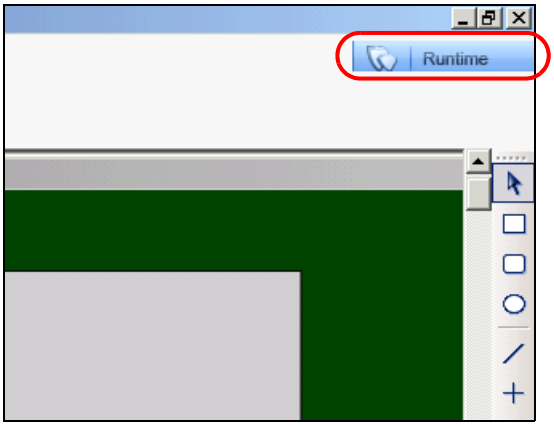


16. Click **OK**.

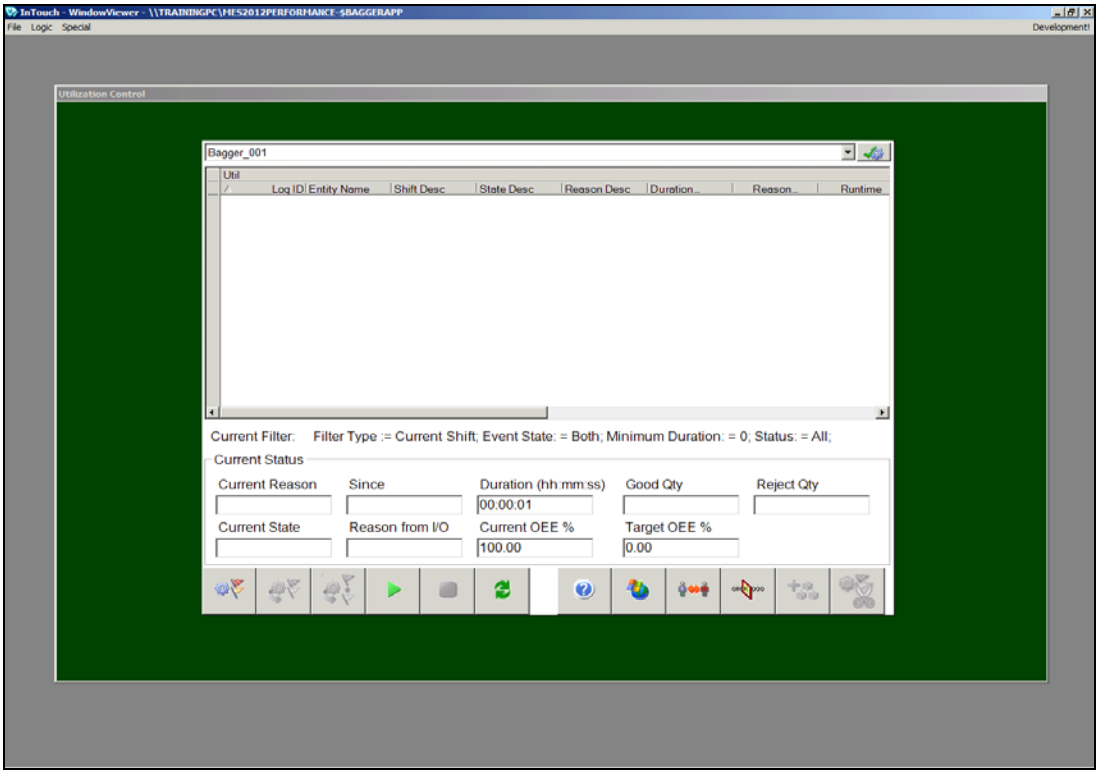
    The **Utilization Control** window opens.



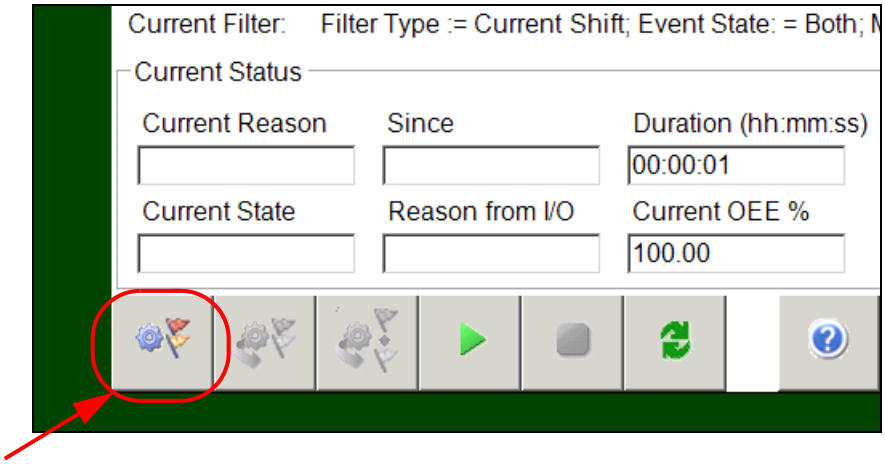
17. At the top-right corner of WindowMaker, click **Runtime** to switch to WindowViewer.



WindowViewer opens.

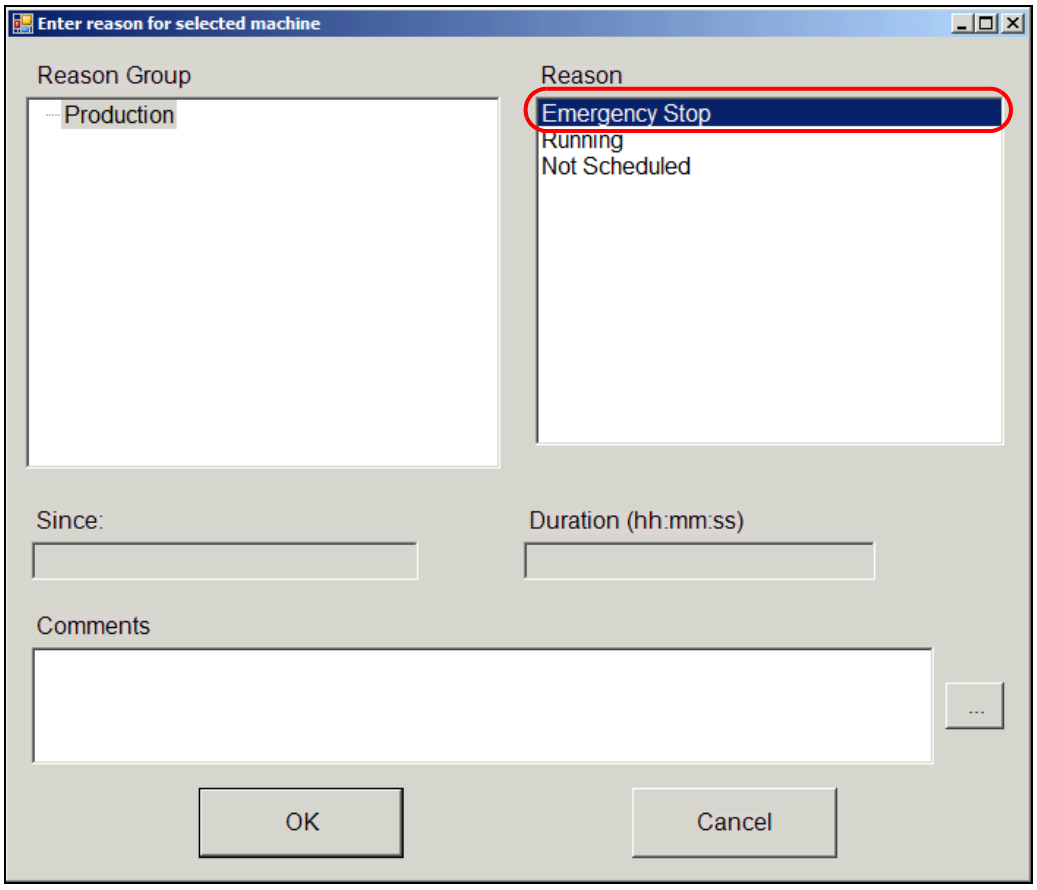


18. On the button bar, click the **Enter a reason for selected machine** button.



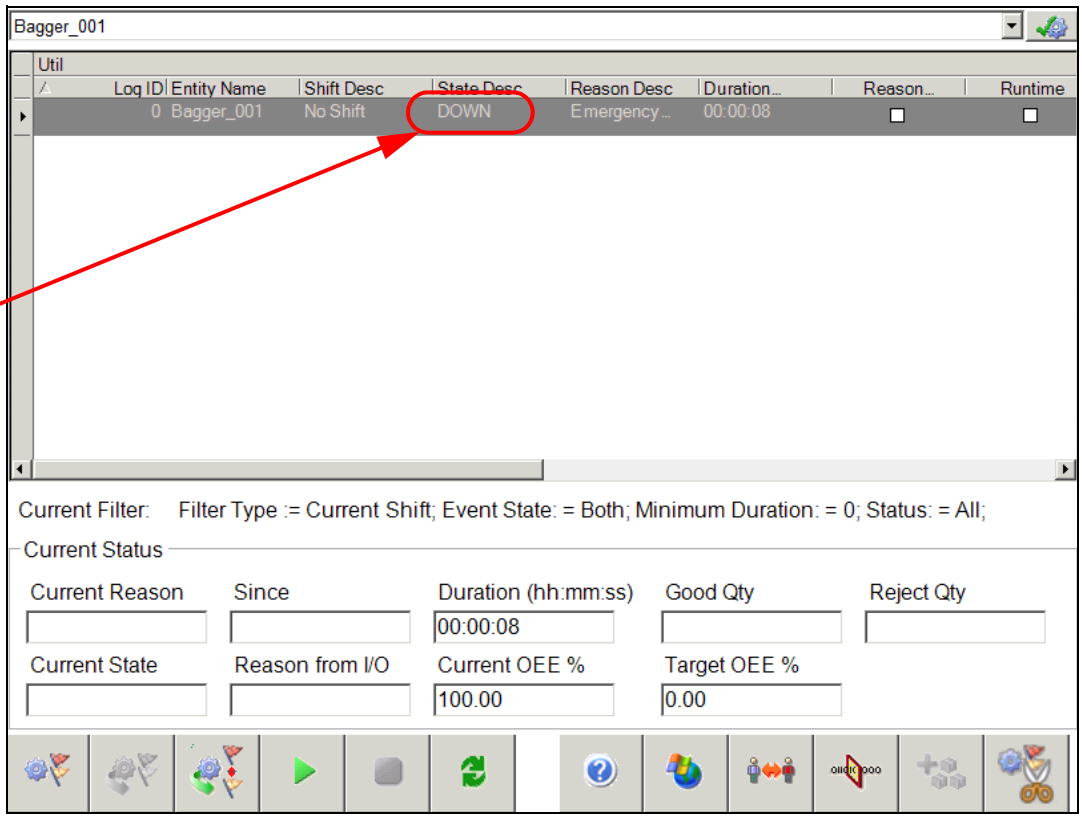
The **Enter reason for selected machine** dialog box appears.

19. In the **Reason** list, select **Emergency Stop**.



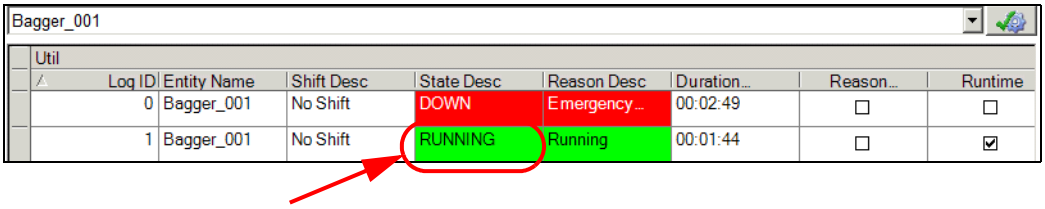
20. In the **Comments** field, enter a comment (optional).
21. Click **OK**.

Notice that the **State Desc** of the **Bagger_001** utilization entry is **DOWN**.



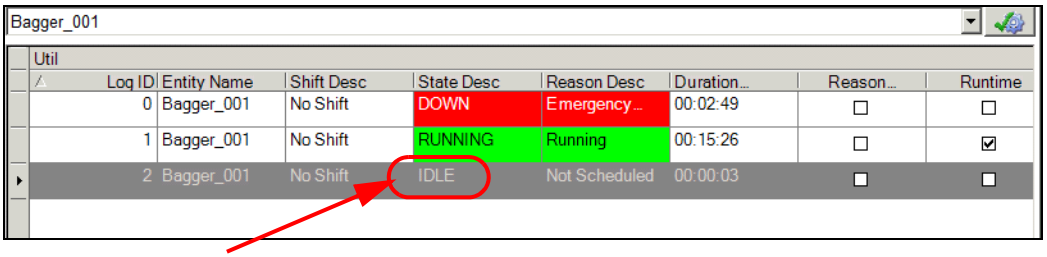
22. Repeat Steps 18 through 21 for the reason **Running**.

    Notice that a new **Bagger_001** utilization entry has been added with a **State Desc** of **RUNNING**.



23. Repeat Steps 18 through 21 for the reason **Not Scheduled.**

    Notice that a new **Bagger_001** utilization entry has been added with a **State Desc** of **IDLE**.



24. Close WindowViewer.
25. Close WindowMaker.

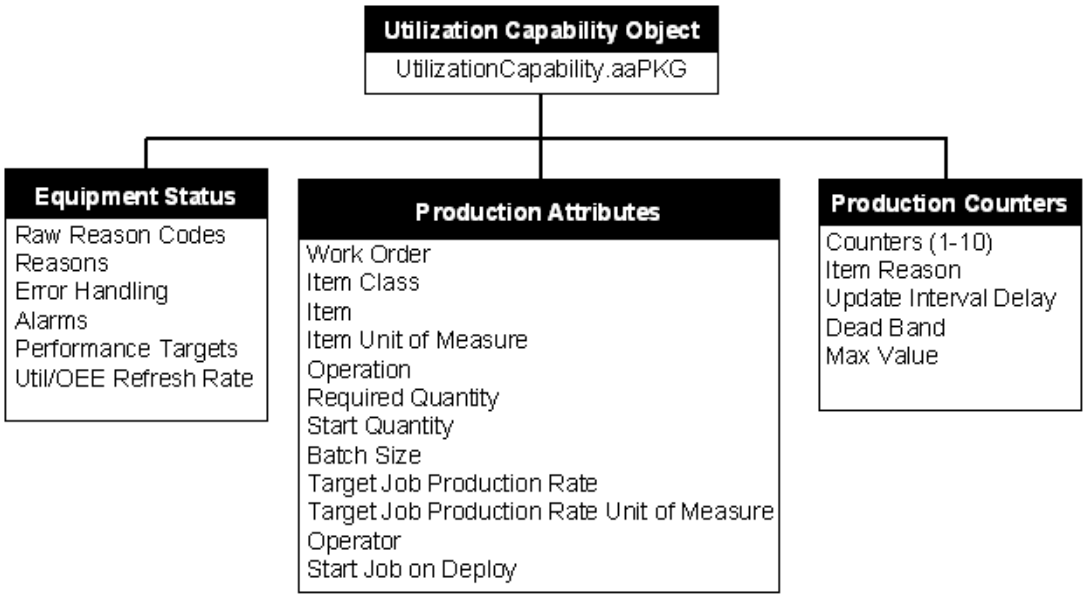
Section 2 – Utilization Capability Object Overview

This section discusses the Utilization Capability Object (UCO) and explains its functionality and usage.

Overview of the UCO

The UCO provides primarily two functions inside a Galaxy. It helps Entity Model Builder to create entities and the entity model in MES. It also provides runtime equipment status production information to the MES. Once the UCO is deployed, you will be able to:

- Monitor the equipment's performance and log utilization events on the entities associated with it
- Set production attributes for the jobs running on the associated entities
- Add production counts for the jobs running on associated entities



By containing a UCO object in an Application Server object, Entity Model Builder will identify the Application Server object as an MES entity and create it in the MES database along with the model matching the **Model** view in the Galaxy. During the process, MES capabilities associated with Performance are assigned to the entity.

Functional Components of the UCO

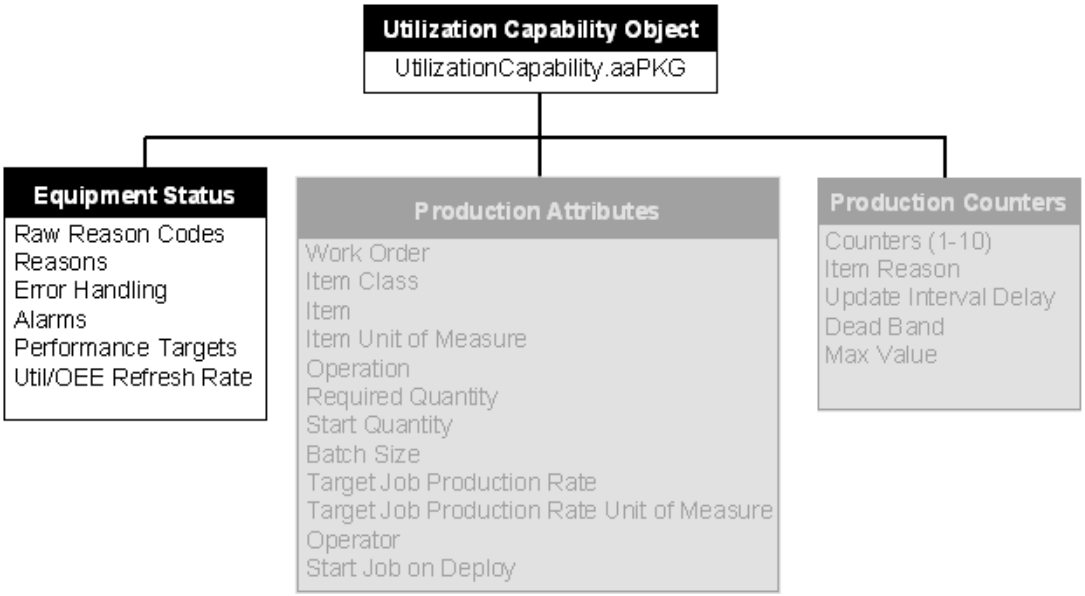
The UCO in runtime has three specific functions:

- Capture equipment status and send it to the MES as utilization
- Store the production target information for Availability, Performance, Quality, and OEE
- Provide the job-related attributes for production and production count to MES

Please note that the production counters in the OCO object have been improved over those in the UCO object, so it is considered a best practice to use the production counters in the OCO. The OCO and UCO can coexist, but you should not configure the production counters in both. See **OCO Production Counters** on page 4-29.

Capture Utilization and Provide OEE Performance Targets

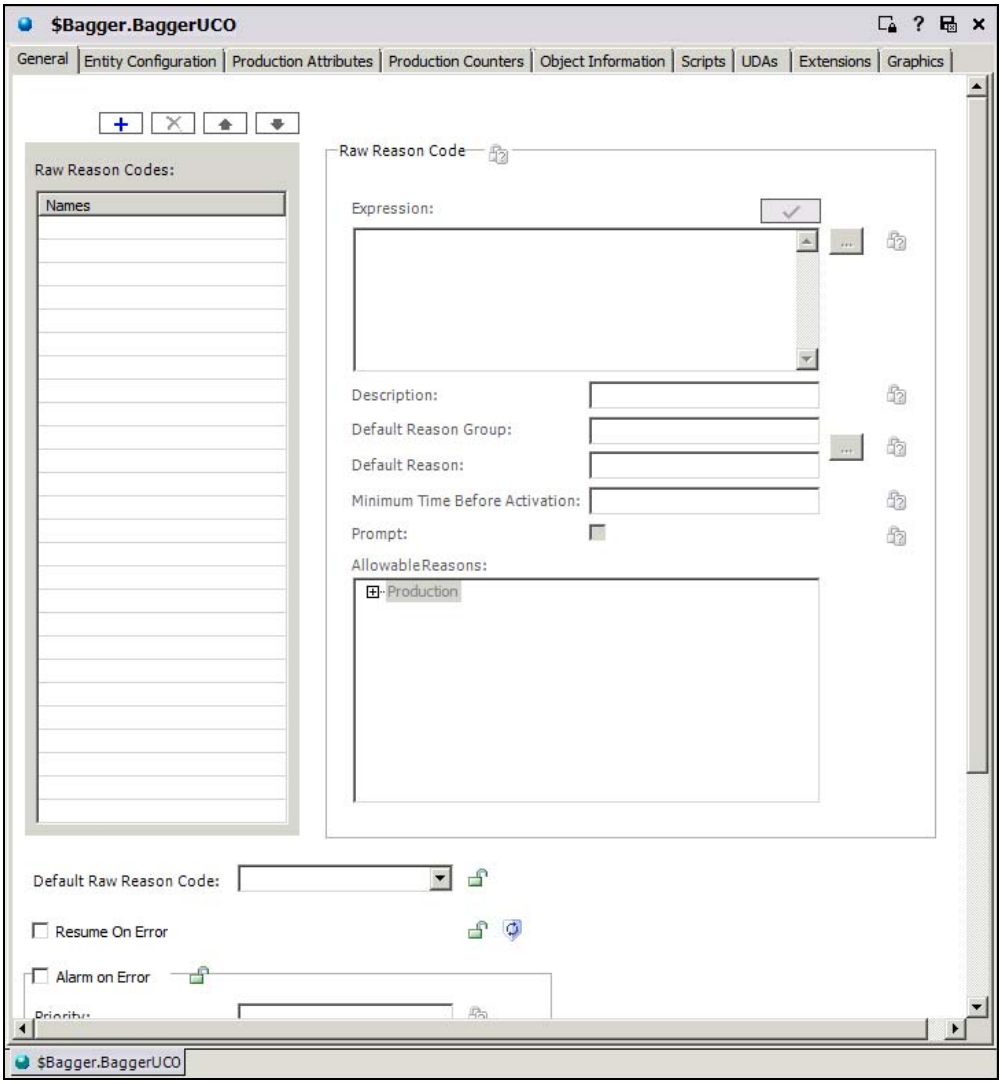
Before you can send equipment utilization to MES, you must first create and configure raw reason codes on the **General** tab of the object editor. You will configure the OEE performance targets that are provided to MES on the **Entity Configuration** tab.



UCO Editor

The UCO has three specific areas that can be configured in the ArchestrA IDE UCO object editor:

- Raw reason codes on the **General** tab
- Entity configuration on the **Entity Configuration** tab
- Production attributes on the **Production Attributes** tab



General

The **General** tab is used to configure the raw reason codes, raw reason code reasons, alarms, and contextual comment for a UCO.

Active raw reason codes are determined by the configuration of:

- Evaluated expression
- Minimum activation
- Priority

If none of the raw reason code expressions are true, the default raw reason code will be the active raw reason code.

Selecting a default raw reason code allows it to become an active raw reason code when none of the other raw reason codes' expression is true. This raw reason code becomes the active raw reason code even if its expression is false.

The default raw reason code is set as the active raw reason code from the point at which the former active raw reason code expression is declared false. This is the case even if the default raw reason code expression is false. The raw reason code that was not the default is not recorded as being active for the period when its expression was false.

If none of the listed raw reason codes is considered an appropriate default raw reason code, you must add a new raw reason code, make its expression condition always false, and select it as the default raw reason code. In this case, the location of the new default raw reason code in the list does not matter.

Raw Reason Codes

This pane displays a list of all the raw reason codes that exist (if any) and is where you can add, rename, and delete raw reason codes.

This list is also used to manage the priority of the raw reason codes by the order in which they are listed; the top raw reason code has the highest priority.

Expression

This text box lists an expression that will determine the status (true or false) of the raw reason code.

Description

This field lists the description of the raw reason code.

Default Reason/Default Reason Group

The **Default Reason** field allows you to select a utilization reason from the MESDB in the reason group tree. When you select a **Default Reason**, the **Default Reason Group** is automatically populated with the raw reason code.

Minimum Time Before Activation

This field lists how long a raw reason code's expression has to remain true before it becomes an active raw reason code.

Prompt

You select this option only when you want to prompt the production operation user to select a reason from a list of allowable reasons when the raw reason code becomes active.

Allowable Reasons

The reason code you select from this reason group tree determines what the production operation user can select when prompted to select an allowable reason after a raw reason code condition becomes true.

Default Raw Reason Code

You must specify a default raw reason code, which becomes true (even if its condition is false) when no other raw reason code condition is true.

Resume on Error (ResumeOnError)

When unchecked, if the UCO object has an error, the raw reason codes' expressions will not be evaluated and the default raw reason code will become true. When checked, if the UCO object has an error, the object will not be evaluated for the current scan, but will be evaluated on the next scan.

Alarm on Error

Selecting this option generates alarms, including:

- Expression errors
- Client session errors
- Utilization event errors
- Entity naming errors
- OEE and Util value errors

Priority

This field sets the priority of the generated alarms.

Alarm Message

This field provides the alarm message for an alarm.

Spare Comments

There are four spare attributes that can be used to provide additional context when logging utilization events at runtime. The contextual statement is limited to 80 characters.

Spare1, Spare2, Spare3, Spare4

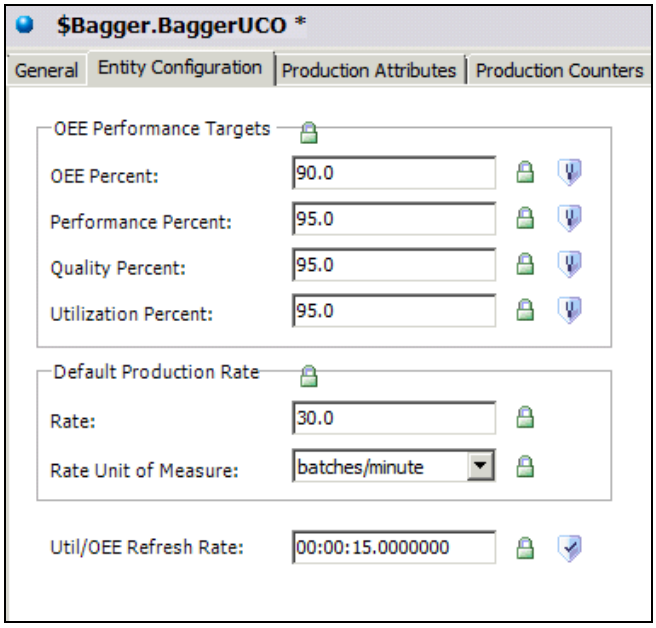
Use these attributes to enable the user to provide additional context for utilization events, which will be logged with the utilization event data.

A security classification for each individual spare comment can be set on the configuration screen.

Entity Configuration

The **Entity Configuration** tab allows you to configure the performance targets and default production rates for the MES entity. These attributes are:

- Target OEE percent
- Target performance percent
- Target quality percent
- Default production rate
- Default production unit
- Utilization/OEE refresh rate



OEE Performance Targets

This is the OEE performance targets information.

OEE Percent (TargetOEEPercent)

This is the OEE target value, used for display only.

Performance Percent (TargetPerformancePercent)

This is the Performance target value, used for display only.

Quality Percent (TargetQualityPercent)

This is the Quality target value, used for display only.

Utilization Percent (TargetUtilizationPercent)

This is the Availability target value, used for display only.

Default Production Rate

This is the default production rate and default unit of measure.

Rate (DefaultProductionRate)/Rate Unit of Measure (DefaultProductionRateUoM)

The **Default Production Rate** value is only used in calculating Performance and OEE when no production rate is provided from the job. The default unit of measure is only used when no unit of measure is given in the job.

The default production rate unit of measure options are:

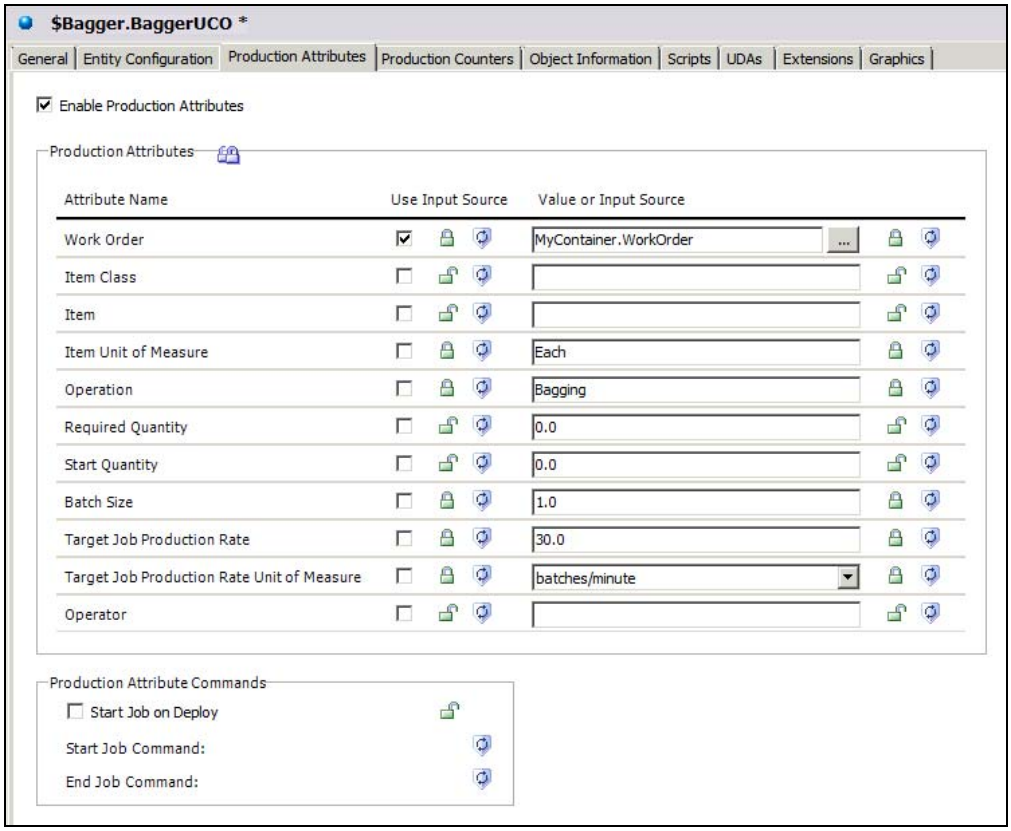
- hours/batch (default)
- minutes/batch
- seconds/batch
- batches/hour
- batches/minute
- batches/second

Util/OEE Refresh Rate (UtilOEEDataRefreshRate)

This is the rate at which the utilization and OEE data are refreshed in the UCO. The minimum value is 15 seconds.

Production Attributes

The **Production Attributes** tab allows you to configure the production attributes for the entity.



Each attribute can be configured to get its value from another ArchestrA attribute or by directly setting the production attribute. The production attributes available are:

- Work Order
- Item Class
- Item
- Item Unit of Measure
- Operation
- Required Quantity
- Start Quantity
- Batch Size
- Target Job Production Rate
- Target Job Production Rate Unit of Measure
- Operator

In addition, you can configure the UCO to start and stop a job when deployed.

Production Attributes

Enable Production Attributes (EnableProductionAttributes)

This option must be checked to enable the use of production attributes in the UCO.

Use Input Source (UseInputSource)

Selecting this option for a production attribute allows you to get the production attribute value from another ArchestrA attribute or define the input source.

Input Source (InputSource)

This option allows you to define the input source for the production attribute if the **Use Input Source** option is selected.

Production Attribute Commands

Start Job on Deploy (ProdAttrs.StartJobOnDeploy)

When selected, the UCO automatically starts the current job when deployed.

Start Job Command (ProdAttrs.StartJobCmd)

This is used to configure security for the ProdAttrs.StartJobCmd.

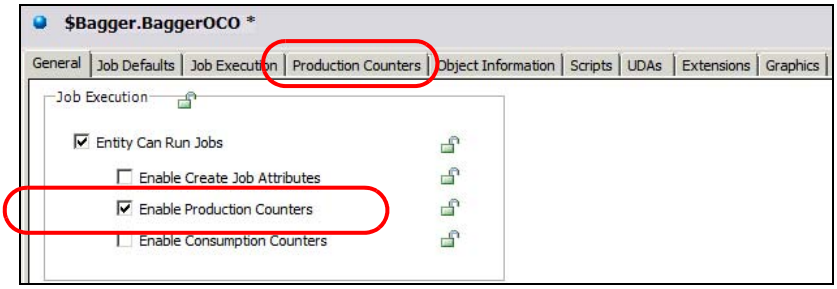
End Job Command (ProdAttrs.EndJobCmd)

This is used to configure security for the ProdAttrs.EndJobCmd.

Production Counters from OCO

Production counters are available in both the UCO and OCO, but do not use the production counters simultaneously in both objects when the UCO and OCO are living side-by-side as children to the same entity object. Use only one. This class will configure production counters in the OCO.

You enable the production counters on the object editor's **General** tab, after which the tab is added to the editor.

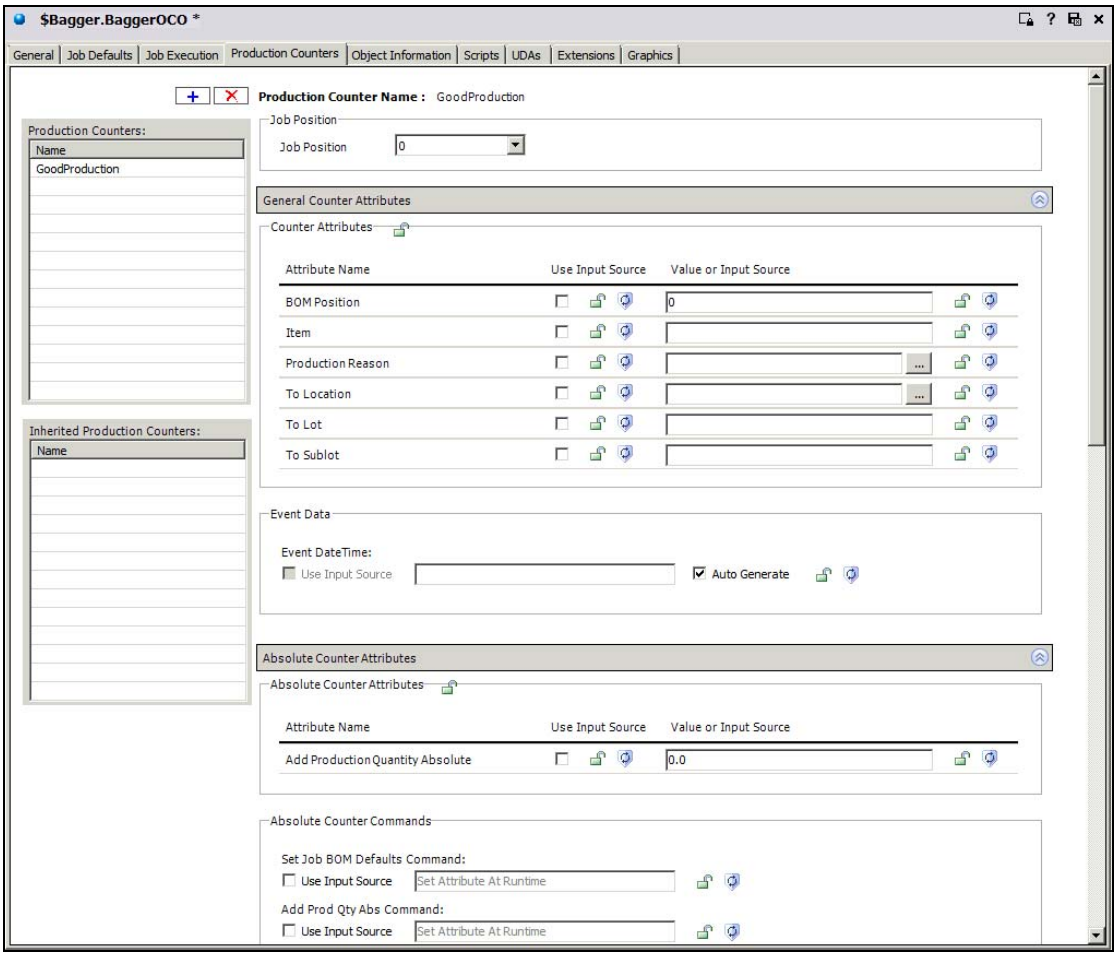


The **Production Counters** tab allows you to create new production counters, or modify or delete existing production counters.

On the **Production Counters** tab, you can configure:

- General counter attributes
- Absolute counter attributes
- Rolling counter attributes
- Counter extension attributes

You can configure attributes only after you create a new instance or select an existing instance.



Production Counter Instance

You will click the **Add** button [+], and then enter the name of the new production counter. After you press **Enter**, the production counter instance name appears in the **Production Counter Name** field at the top of the object editor.

Job Position

This number indicates the job position running on the entity. You must specify job positions if you want to simultaneously run multiple jobs on an entity. When you run a job at the specified job position, the configured production counters are used to log the produced item count. You can configure production counter attributes for each job position.

General Counter Attributes

You can configure the following information:

- Item
- Production reason
- Storage location to store produced quantities
- Lot and sublot numbers of produced items
- Date and time to log a production transaction

The Item that is configured in this section is used as the production item for the job. You can override the production item by configuring a different item and BOM position other than the current BOM position configured for the job.

A zero value for the BOM position indicates a produced item and a negative value indicates a by-product.

BOM Position

Enter the BOM position of the item or provide a reference.

Item

Enter the item name or provide a reference.

Production Reason

Provide a reference to a production reason attribute or select an item reason from the list of item reasons defined in the MES system. This attribute is required.

To Location

Provide a reference to a location to store items that are produced while running a job.

Lot

Enter the lot number associated with the items being produced or provide a reference.

SubLot Number

Enter the sublot number associated with the items being produced or provide a reference.

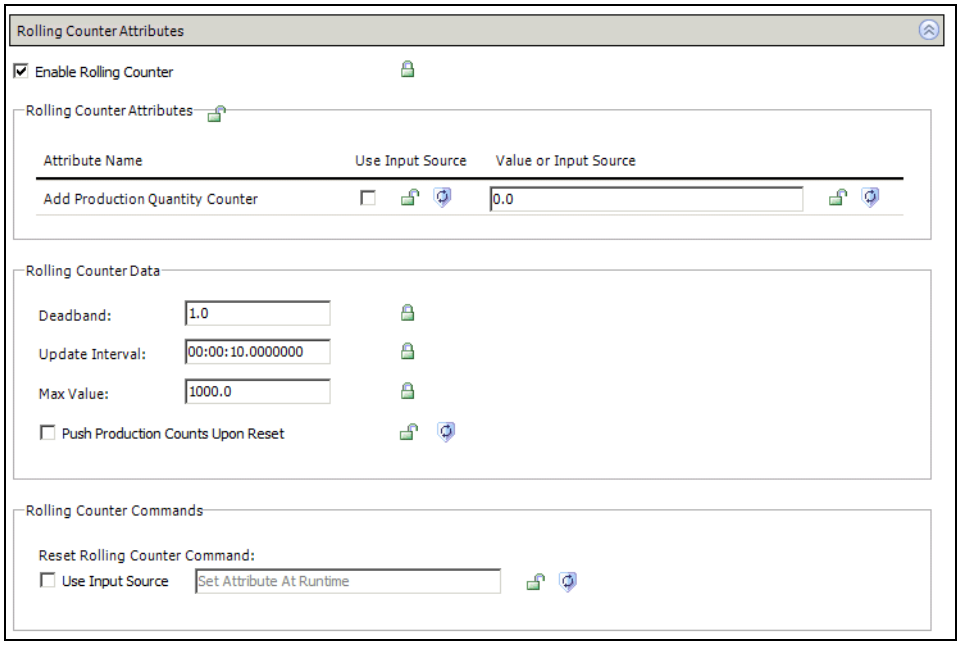
Absolute Counter Attributes

You can configure absolute counter attributes to specify the quantity of produced items.

Rolling Counter Attributes

You can configure a rolling counter to count the number of items produced and update the production count when items are being produced at runtime. A rollover counter is typically used in manufacturing operations where a value for production or consumption is needed. This counter is a device like a PLC or other counting device that resets its value to zero, either through manual or automatic action. The counter resetting would normally be for a counter that may contain only four digits or maybe is an integer that can only be as large as 32,767. Therefore, at a certain point, the counter would reset to a lower number between update intervals in the OCO. The OCO understands this resetting and knows how to calculate the counts required based on the last known value and the current value. The OCO also handles when a counter needs to reset at the start of a shift, so that the production crew know their production for the shift.

Note: The rolling counter option is disabled if you do not have any production counter instances or you do not select a production counter instance.



To enable the rolling counter option, in the **Rolling Counter Attributes** area, check the **Enable Rolling Counter** check box.

To configure rolling counter attributes, in the **Add Production Quantity Counter** field, enter the quantity or provide a reference.

You must specify this initial quantity to start the production count. This quantity is updated when the items are produced at runtime.

Note: You must specify the justified required values for all the rolling counter attributes to avoid the excessive production being reported. This affects performance of the database and may cause reporting issues.

In the **Rolling Counter Data** area, in the **Deadband** field, enter the minimum quantity value increase from the last update from this counter that must occur before logging the new quantities recorded by the counter. The default value is 1.

Note: It is recommended that you specify a value greater than 0 for the **Deadband** attribute to avoid logging off every production.

In the **Update Interval** field, enter the time interval that must pass after logging the previous production and before logging the new quantities recorded by the counter. The default value is 00:01:00.0000000 (1 minute of elapsed time for each production).

Note: It is recommended that you do not specify the 00:00:00 value for the **Update Interval** attribute.

In the **Max Value** field, enter the maximum quantity value that the counter can record. For example, if the maximum value is set to 100 and the counter value is 98, when the counter is next updated, and the counter value is 5, the production value is set to 7.

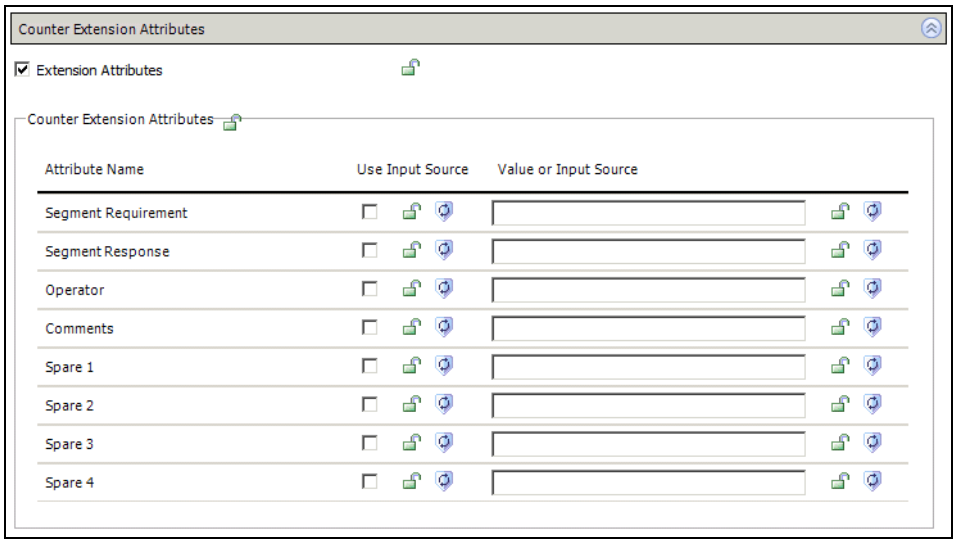
Note: Do not configure the maximum value as 0 because the counter will never reset.

Note: The rolling counter logs production data only when the values configured for the **Deadband** and **Update Interval** attributes are reached.

Check the **Push Production Counts Upon Reset** check box to log the pending production count recorded after resetting the counter. The count recorded is the value since the last update before the reset occurs. If you do not check this check box and the reset command is triggered, the counter value is set to 0 and the recorded counts are not logged.

Production Counter Extensions

Production counter extensions are used to capture any additional data for each production transaction.



To enable the production counter extensions, in the **Counter Extension Attributes** area, check the **Extension Attributes** check box.

To specify values of production counter extension attributes, in the **Counter Extension Attributes** area, do the following:

1. In the **Segment Requirement** field, enter the segment requirement ID or provide a reference to a segment requirement attribute.
2. In the **Segment Response** field, enter the segment response ID or provide a reference to a segment response attribute.
3. In the **Operator** field, enter the operator name or provide a reference to an operator attribute.
4. In the **Comments** field, enter the comments you want to log with the production or provide a *reference to comments* attribute.
5. In the field corresponding to the **Spare 1**, **Spare 2**, **Spare 3**, or **Spare 4** attribute, enter the additional data you want to record with the production or provide a reference.

UCO Runtime Behavior

The following describes some of the runtime behavior (for details, please refer to the user's guide):

- During each scan cycle, the UCO object evaluates each expression associated with a raw reason code to determine if a raw reason code transition has occurred.
- When a raw reason code transition occurs, the published attributes for the entity are:
  - The new raw reason code
  - The raw reason code description
  - The raw reason code default reason
  - The time that the raw reason code was entered

    Time entered represents the time during which the expression is true (not the time when any configured delay has expired).
  - The length of the time the raw reason code has been active

    The time in the raw reason code attribute is updated to reflect the elapsed time since the last raw reason code transition.
  - The configured minimum activation time
  - The previous raw reason code
- When a raw reason code becomes active (its expression is true and its delay has expired), all other potential raw reason code delay timers are reset.
- Production attributes will be logged (set) if the ProdAttrs.StartJobCmd trigger attribute is set as true.

Note: Although the time entered is stored as a UTC value in the attribute, some clients, such as object viewer, convert the time value to the local time for display purposes.

Note: If the raw reason code changes faster than can be logged to the MESDB, some utilization events could be skipped. If the UCO is busy logging a prior raw reason code change, and a new raw reason code change is detected, it is cached. If an additional raw reason code change is detected while the UCO is still logging the original change, the cached change is skipped, and the newest raw reason code becomes the cached raw reason code. The raw reason code data that is skipped is logged as a warning in the logger.

Runtime Error Codes

The following table displays the error codes that may appear in the ErrorCode attribute.

Error Code	Description
4	Failed to connect to the middleware (check connection and settings)
3	Expression Error: Evaluation Error(s)
2	Expression Error: Compilation Error(s)
1	Expression Error: Invalid Reference(s)
0	No Error
-1	Unknown Error (the ErrorMessage contains more detailed information)
-101	Error starting the MES Client session
-102	Error creating the MES Client session
-111	Utilization Event Error: Busy, cannot process request (object is currently processing a utilization event)
-112	Utilization Event Error: Caught exception while processing utilization event (see ErrorMessage attribute for more information)
-121	Entity name specified by the UCO container does not exist
-131	Set OEE Target Value: Busy, cannot process request (object is currently processing an OEE Target value)
-141	Set Util Target Value: Busy, cannot process request (object is currently processing a utilization target value)

Lab 5 – Creating and Configuring Raw Reason Codes in the UCO

Introduction

In this lab, you will first create and configure raw reason codes in the **$BaggerUCO** template to check for the reason codes you created in a previous lab. Next, you will rebuild the entity model to pass the new configuration of the raw reason codes in the UCO to the entity in the MES database (MESDB). Then, you will monitor and track the utilization states as you simulate different equipment reason conditions.

For the **$Bagger** template object, the UDAs you will use to simulate each reason condition have been preconfigured. These include:

UDA	Condition	Data Type
Trigger.NoSched	Not Scheduled	Boolean
Trigger.Running	Running	Boolean
Trigger.EStop	Emergency Stop	Boolean

You will use these UDAs in the **Expression** condition when you configure the raw reason codes in the **$BaggerUCO** template object.

Objectives

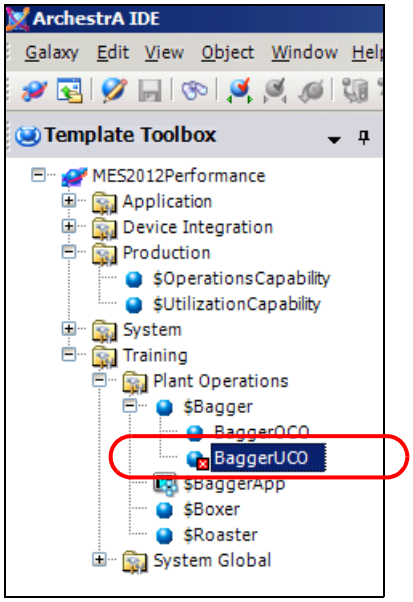
Upon completion of this lab, you will be able to:

- Create raw reason codes in the UCO
- Rebuild the MES Entity Model
- Track and monitor the utilization and utilization percentage in an InTouch application

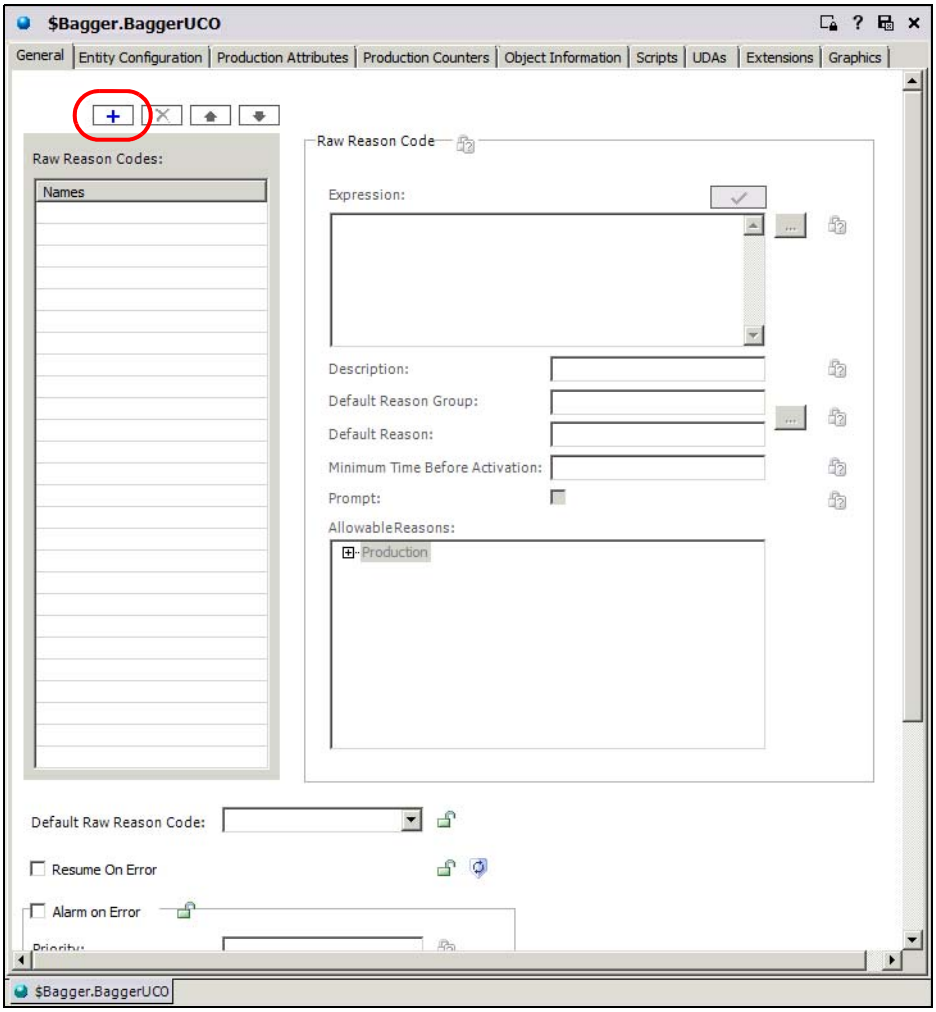
Create Bagger Raw Reason Codes

First, you will create and configure raw reason codes in the UCO object in the Galaxy, and then link the plant floor conditions to the utilization reasons you created in the MESDB.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **$Bagger.BaggerUCO**.



2. On the **General** tab, click the **Add** button + to add a raw reason code.



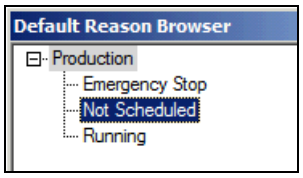
3. Name the raw reason code **NoSched** and press **Enter**.
4. Configure the following raw reason code attributes as shown below:

Raw Reason Code:	*Locked*
Expression:	MyContainer.Trigger.NoSched
Description:	Not Scheduled for Production

5. To the right of the **Default Reason** field, click the ellipsis button to see the list of reason groups and reasons.

Note: When you select a **Default Reason**, the **Default Reason Group** is automatically populated with the raw reason code.

6. In the **Default Reason Browser** list, select the **Not Scheduled** reason.

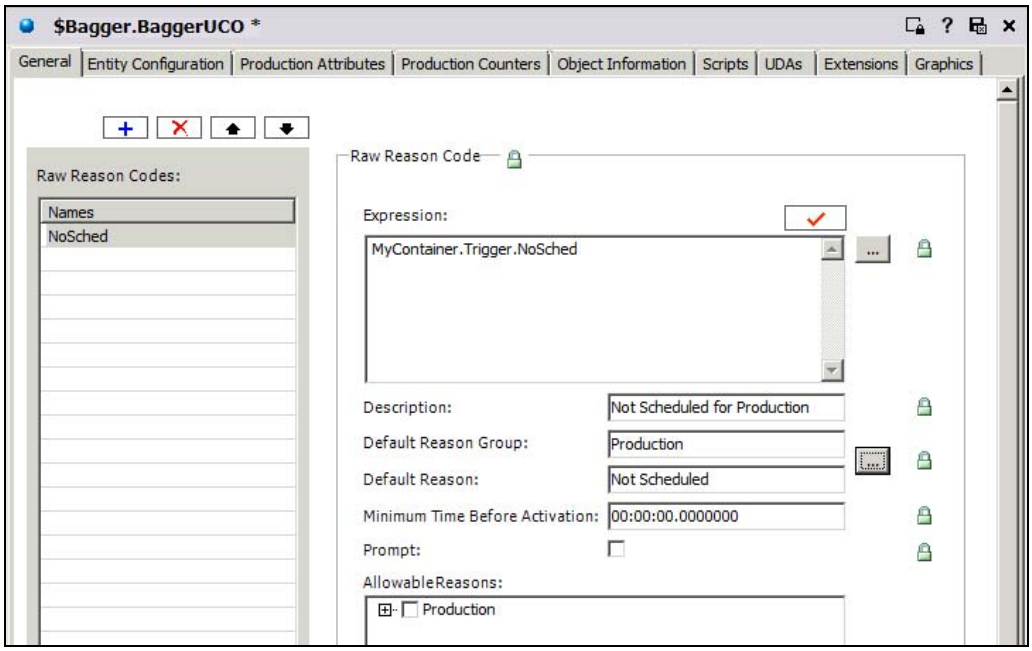


7. Click **OK**.

   The **Not Scheduled** reason is added to the **Default Reason** field and the **Production** reason group is added to the **Default Reason Group** field.

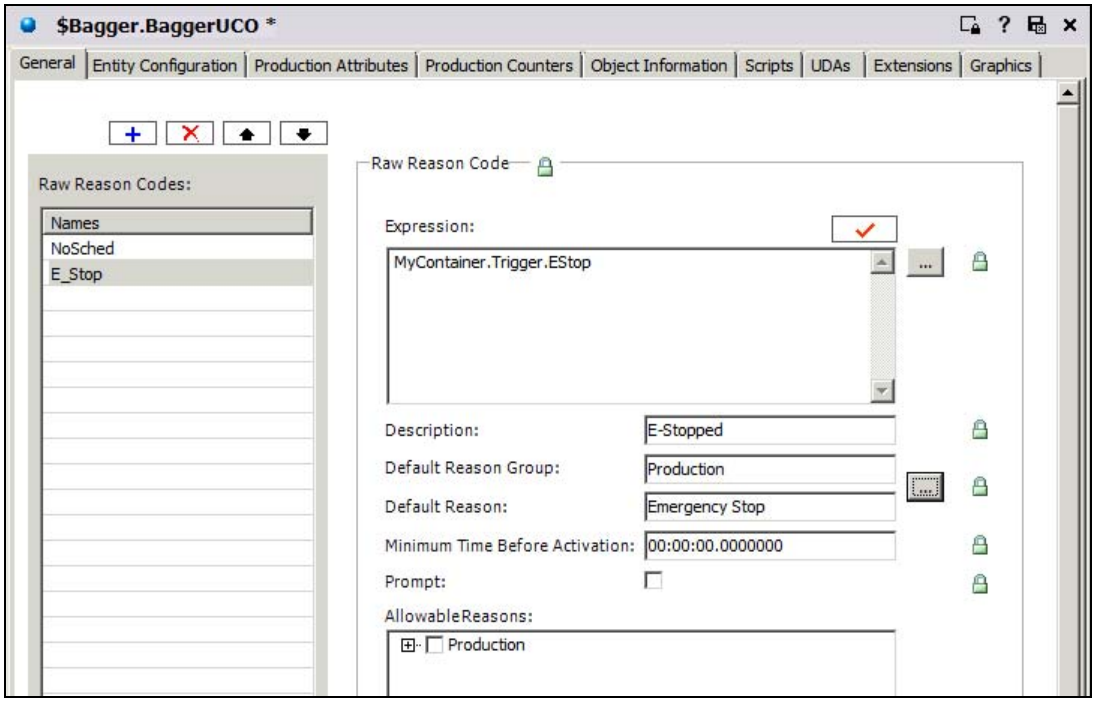
8. Confirm the following raw reason code attributes are configured as shown below:

Minimum Time Before Activation:	00:00:00.0000000 *(default)*
Prompt:	*Unchecked (default)*
Allowable Reasons:	*Unchecked* (*default*)



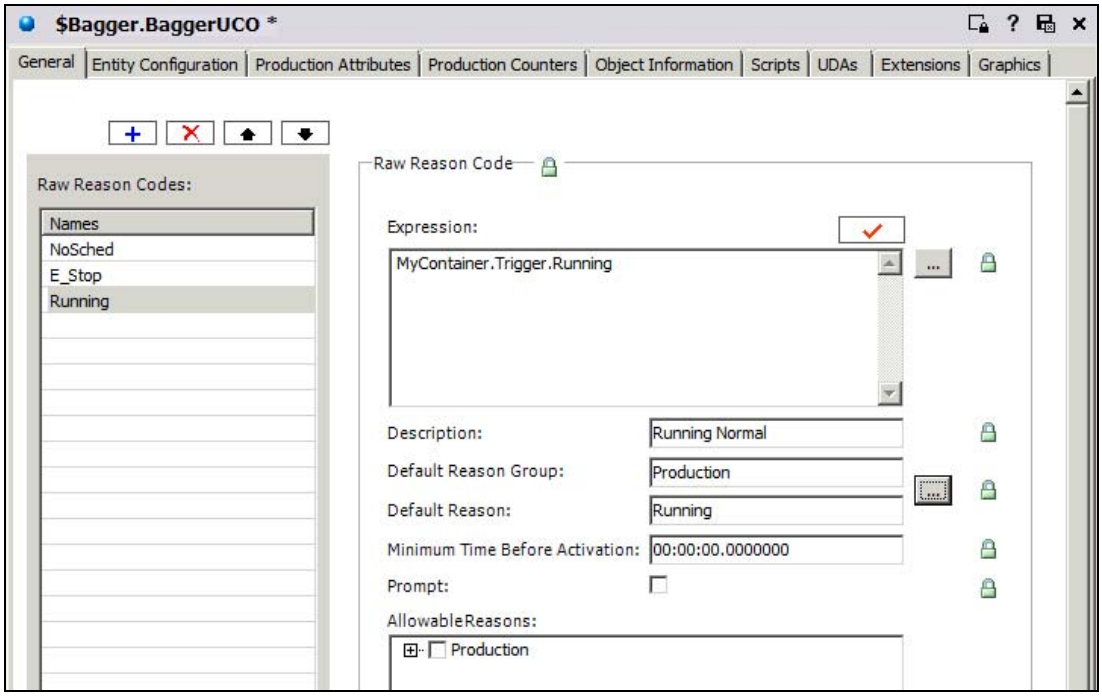
9. Create a second raw reason code named **E_Stop** and configure it as follows:

Raw Reason Code:	*locked*
Expression:	MyContainer.Trigger.EStop
Description:	E-Stopped
Default Reason:	Emergency Stop
Default Reason Group:	Production
Minimum Time Before Activation:	00:00:00.0000000 *(default)*
Prompt:	*unchecked* (*default*)
Allowable Reasons:	*unchecked* (*default*)



10. Create a third raw reason code named **Running** and configure it as follows:

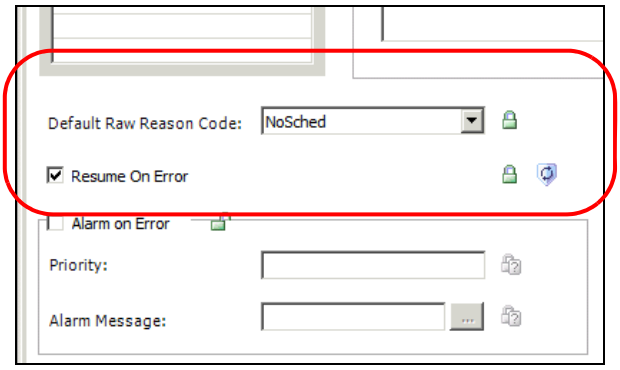
Raw Reason Code:	*locked*
Expression:	MyContainer.Trigger.Running
Description:	Running Normal
Default Reason:	Running
Default Reason Group:	Production
Minimum Time Before Activation:	00:00:00.0000000 *(default)*
Prompt:	*unchecked* (*default*)
Allowable Reasons:	*unchecked* (*default*)



Note: The order of the raw reason codes is important because they will be evaluated in this order on each scan.

11. On the lower portion of the tab, configure the listed options as follows:

Default Raw Reason Code:	NoSched and *locked*
Resume On Error:	*checked* and *locked*

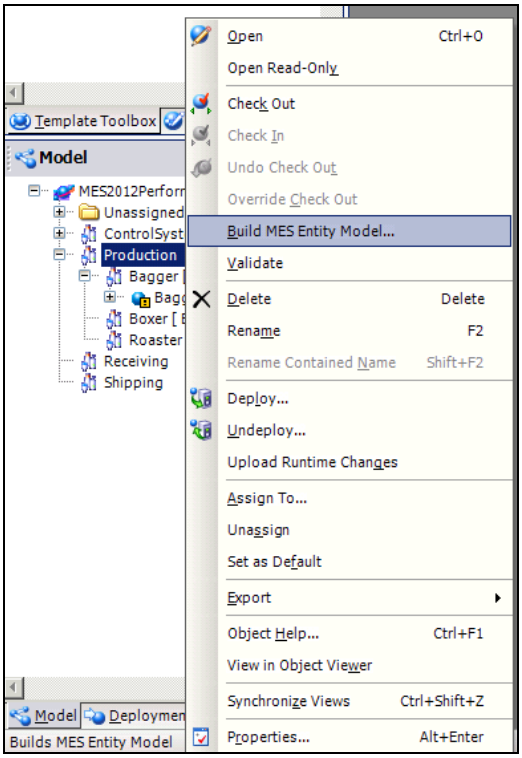


12. Save and check in **$Bagger.BaggerUCO**.

Synchronize the MES Entity Model

You have made changes in the configuration of the object that must be reflected in the MESDB. Next, you will synchronize the entity model.

13. In **Model** view, right-click **Production** and select **Build MES Entity Model**.



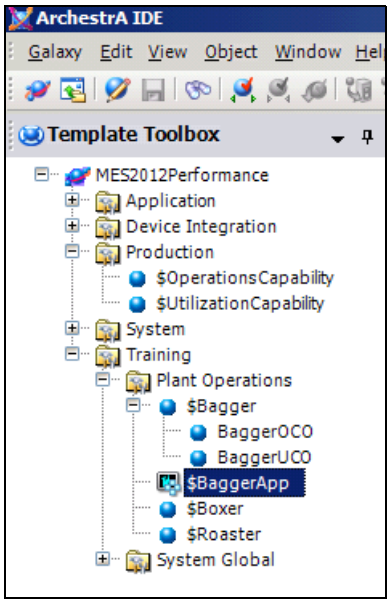
Note: The exclamation mark on **Bagger_001** will disappear when the attributes for **BaggerUCO_001[BaggerUCO]** are created.

14. When the process is complete, click **Close**.
15. Deploy the **BaggerUCO_001** instance.

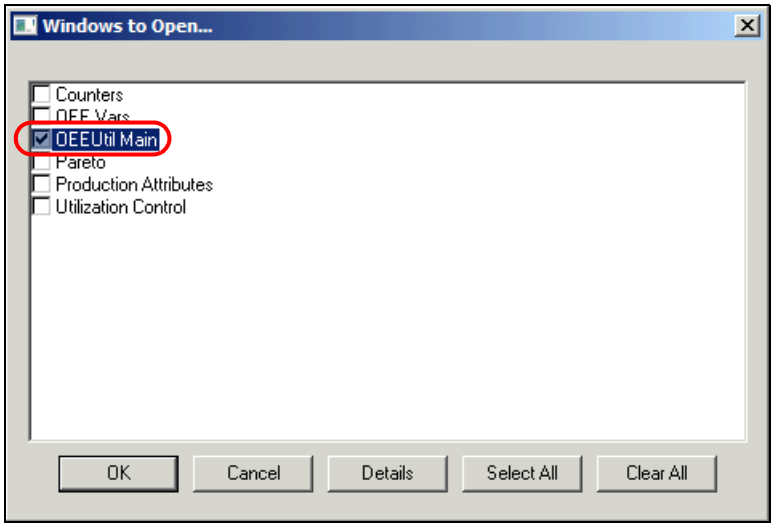
Test the Raw Reason Code Conditions

Now, you will simulate each raw reason code condition in an InTouch window to verify the automatic entry of utilization reasons into the MESDB.

16. In **Template Toolbox**, double-click the **$BaggerApp** InTouch application template, if InTouch is not open.

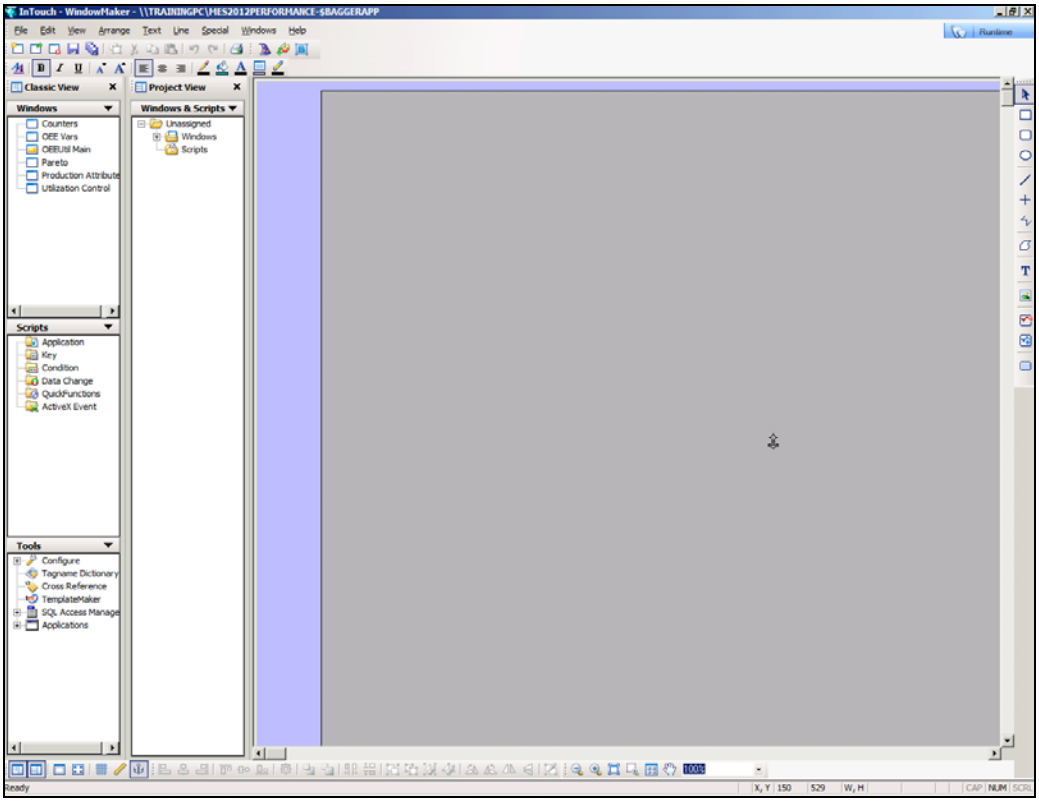


17. In the **Windows to Open** dialog box, check **OEEUtil Main**.

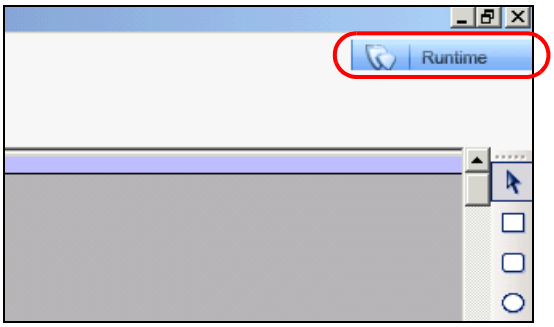


18. Click **OK**.

WindowMaker opens.

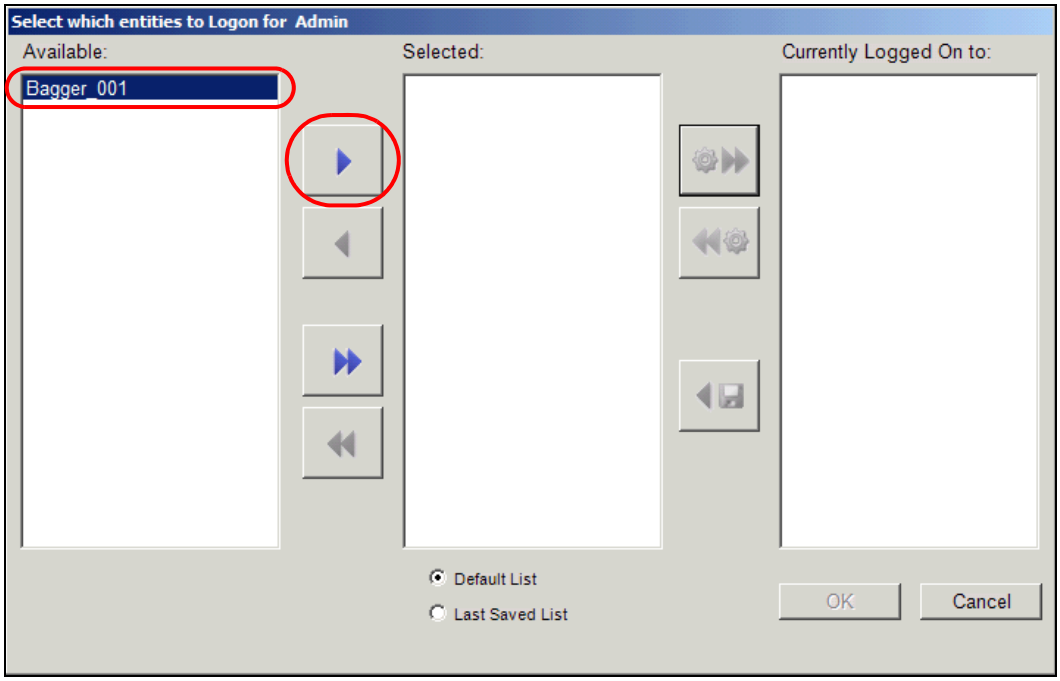


19. Click **Runtime**.

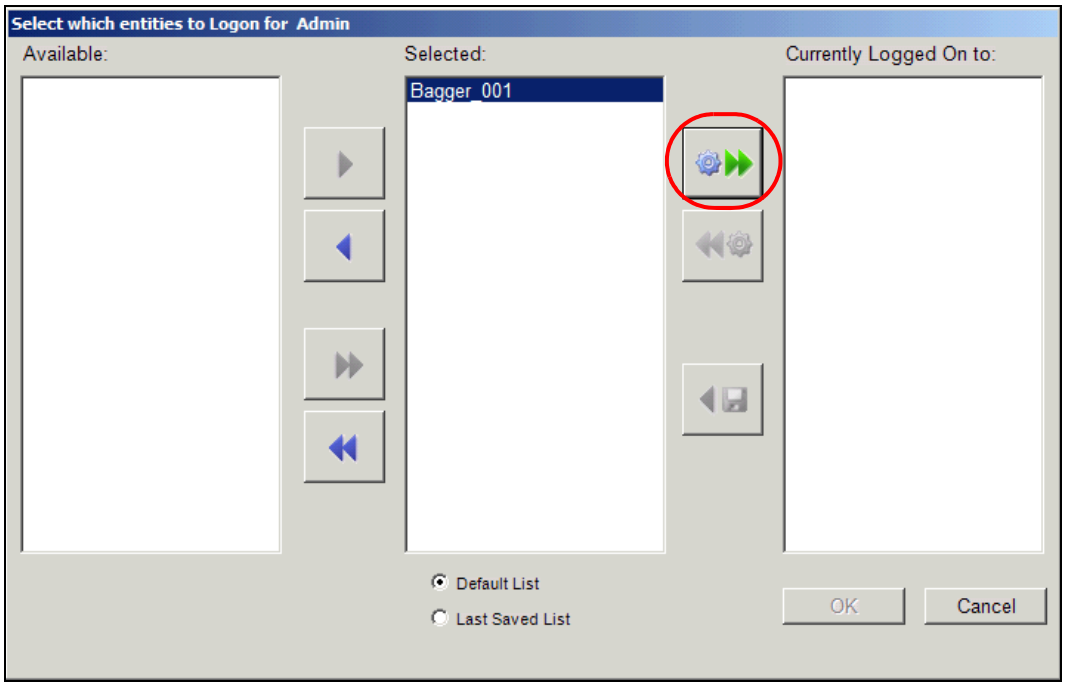


WindowViewer opens.

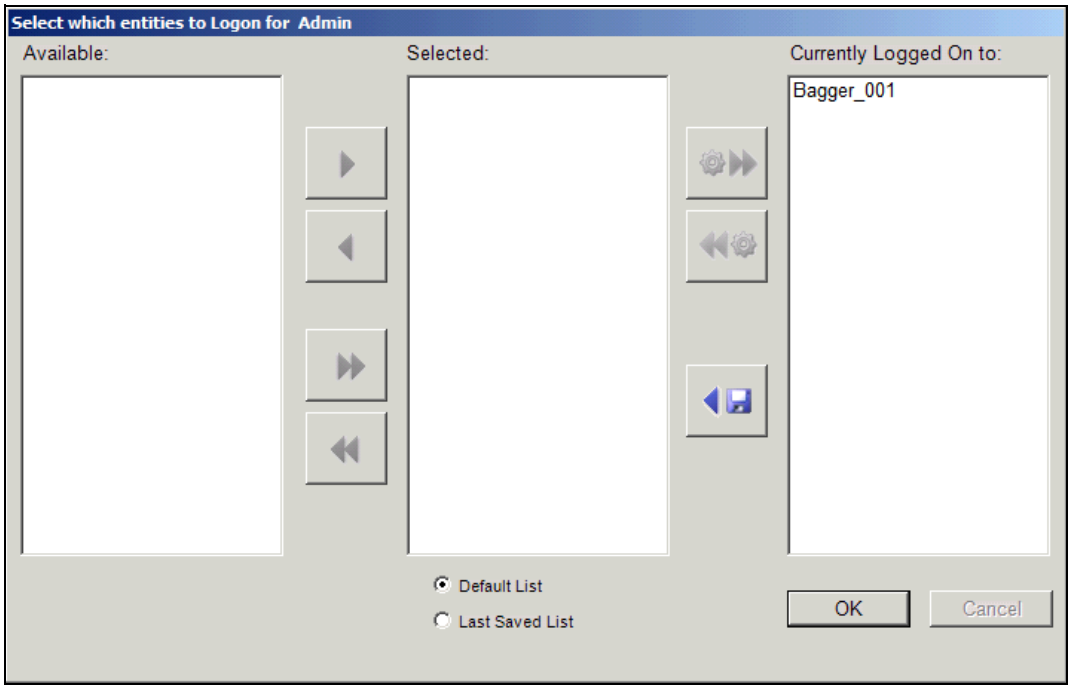
20. In the **Select which entities to Logon for Admin** dialog box, select **Bagger_001** and click the right-arrow button.



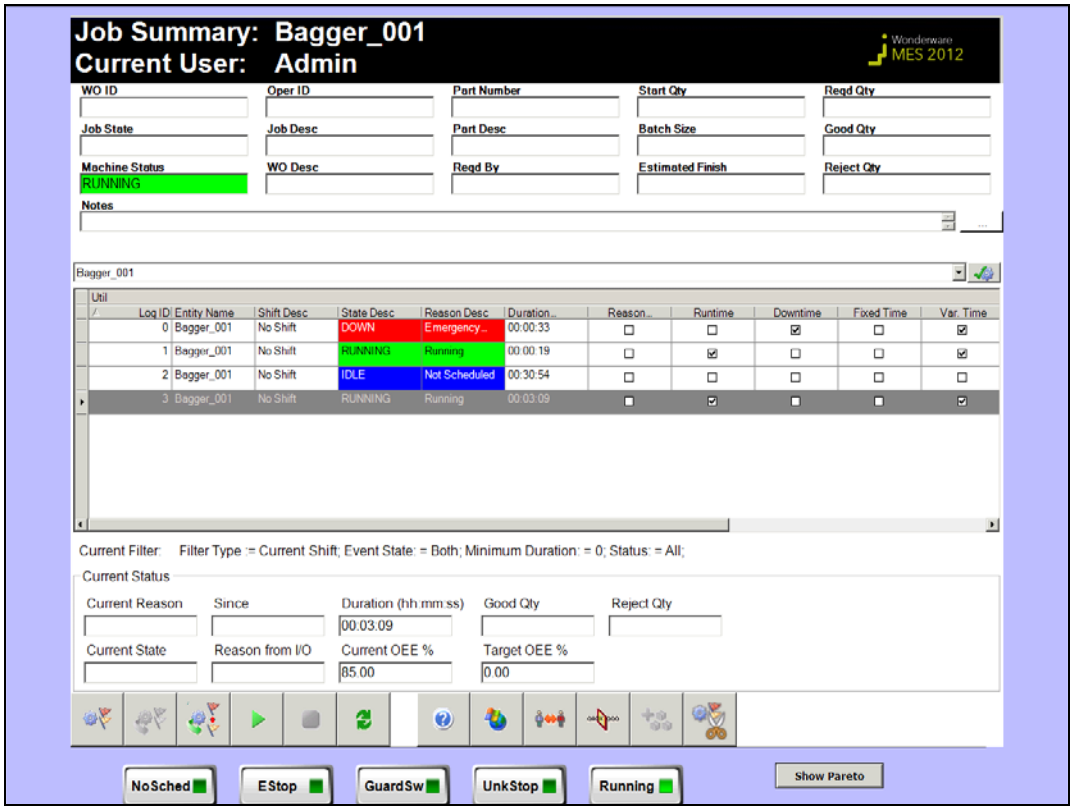
21. Click the double-right-arrow button.



22. Click **OK** to log in to the **Bagger_001** entity.

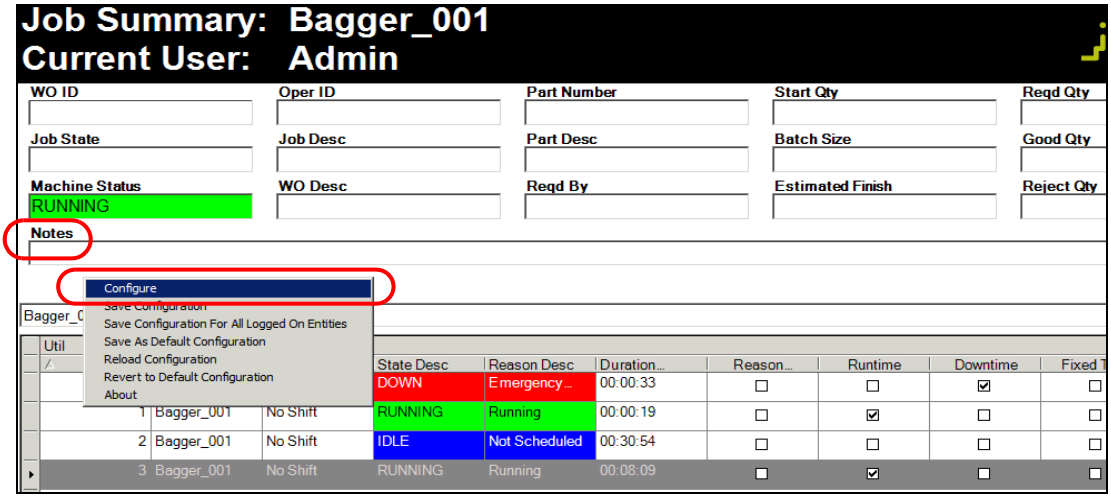


The **OEEUtil Main** window opens in WindowViewer.

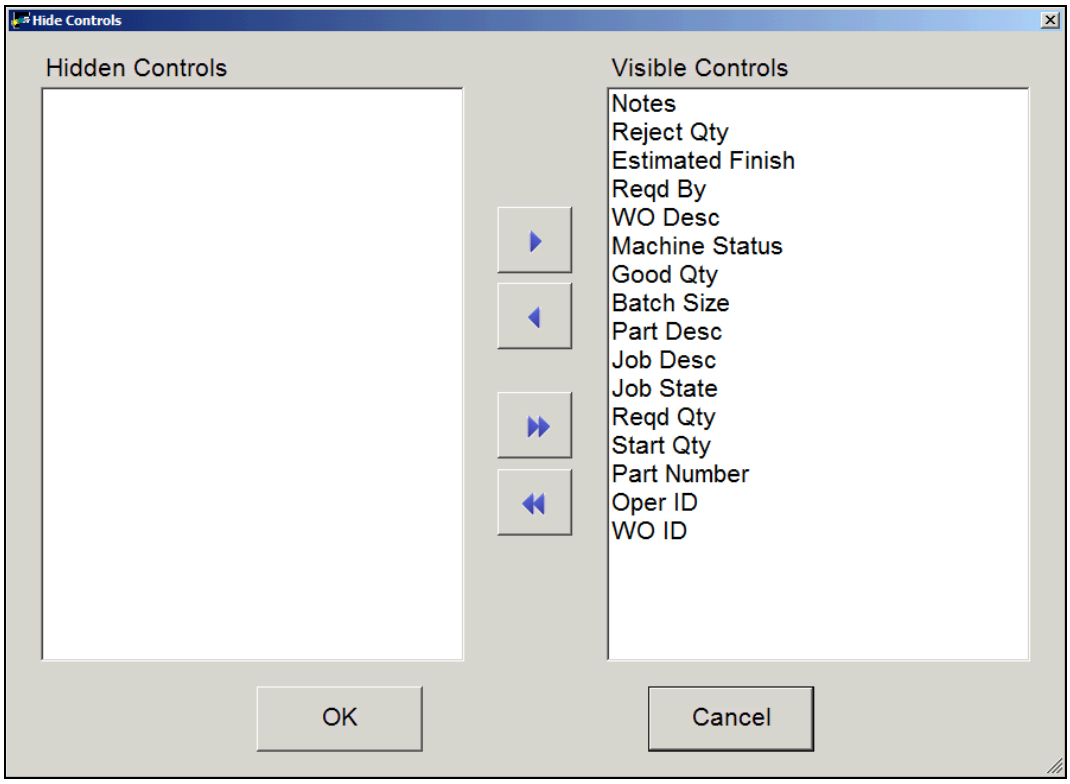


Next, you will hide fields that you will not use in MES/Performance.

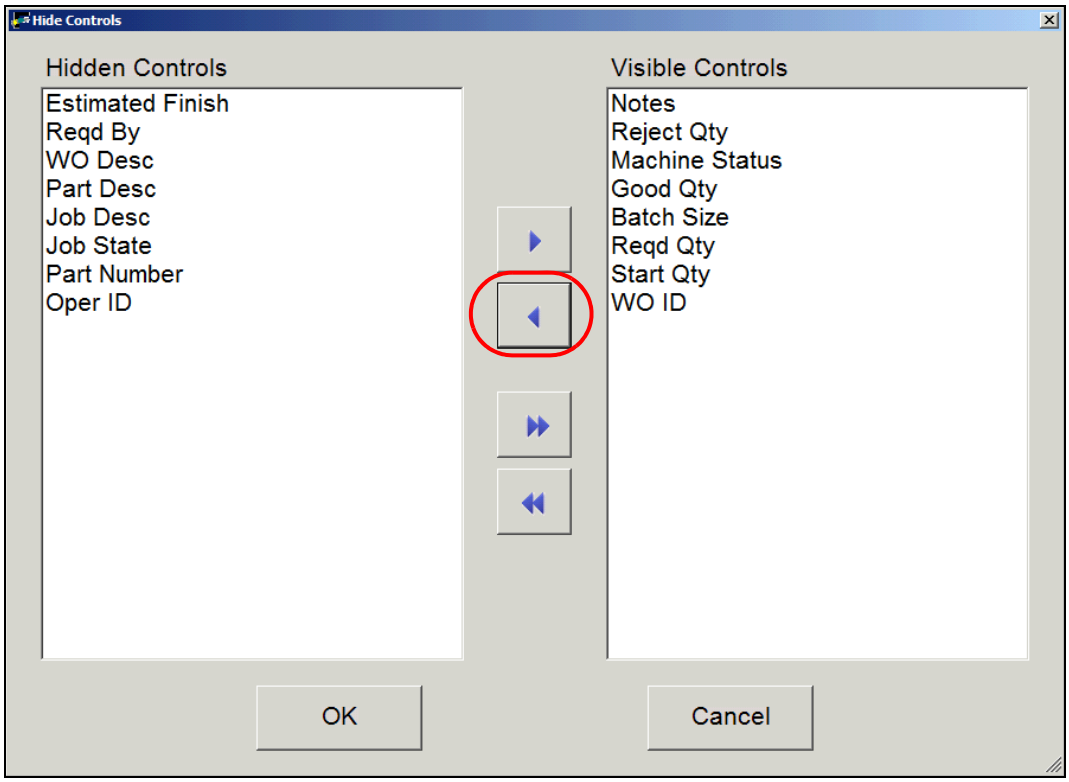
23. In the **OEEUtil Main** window, right-click the empty space directly below the **Notes** field and select **Configure**.



The **Hide Controls** dialog box appears.

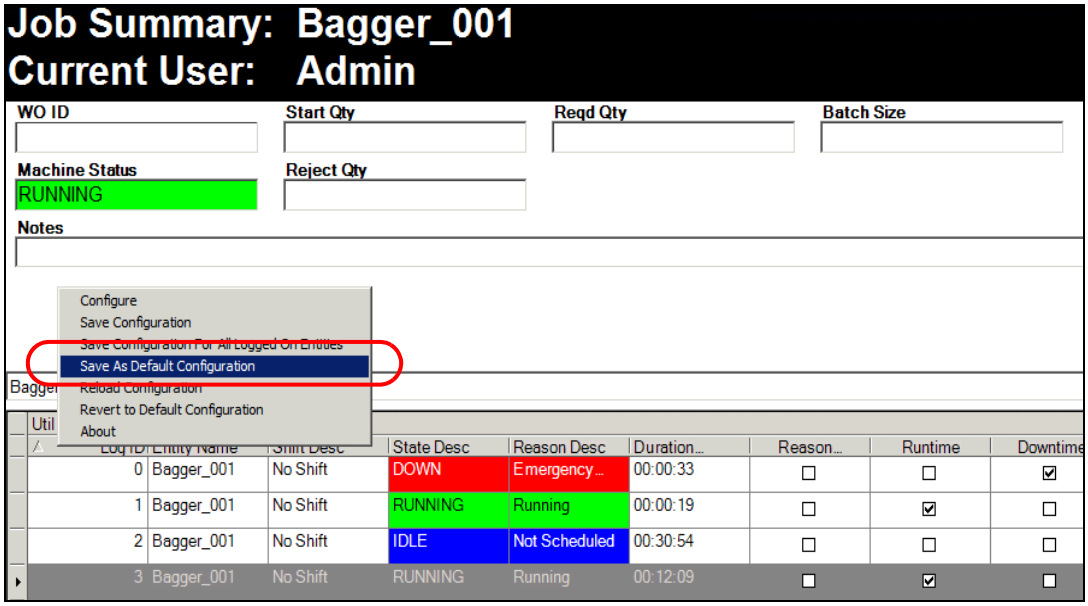


24. Move the following controls to the **Hidden Controls** pane:
    - Estimated Finish
    - Reqd By
    - WO Desc
    - Part Desc
    - Job Desc
    - Job State
    - Part Number
    - Oper ID



25. Click **OK**.

26. In the **OEEUtil Main** window, right-click the empty space directly below the **Notes** field and select **Save As Default Configuration**.



Next, you will switch on the buttons at the bottom of the **OEEUtil Main** window to simulate raw reason code conditions. You will turn these buttons on one at a time to see each new condition. You will also turn the switches on in combination.

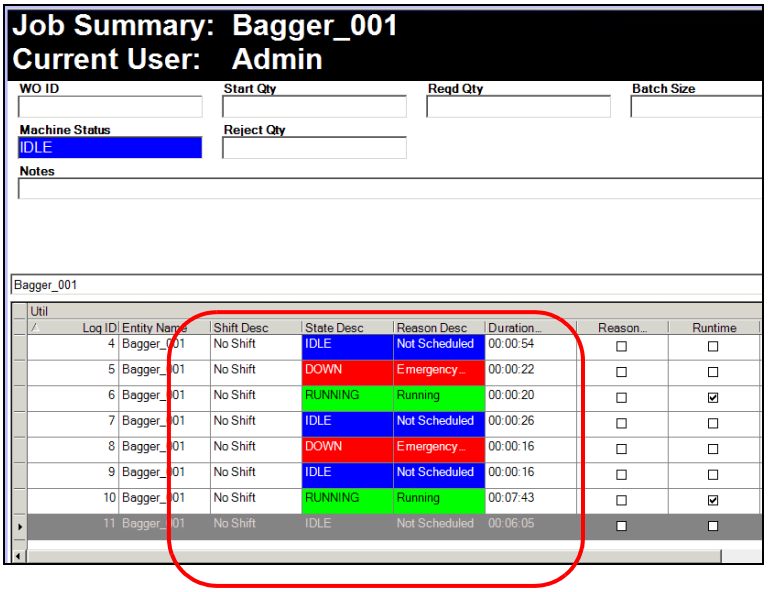
27. At the bottom of the **OEEUtil Main** window, click the buttons to turn them on and off, as indicated in the table below.

    The color on the buttons becomes bright green when they are on and dark green when they are off.

Note: Be patient when clicking the buttons, as there is a delay in the response because of default refresh rates. Remember that the switches are scanned in the order in which they are listed in the UCO, so earlier listings have priority.

NoSched	EStop	Running	Expected Utilization Reason
ON	OFF	OFF	Not Scheduled
OFF	ON	OFF	Emergency Stop
OFF	OFF	ON	Running
ON	ON	OFF	Not Scheduled
OFF	ON	ON	Emergency Stop
ON	OFF	ON	Not Scheduled
OFF	OFF	OFF	Not Scheduled

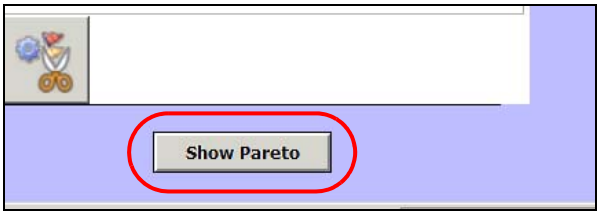
Notice that in the **Util** table in the middle of the window, the new utilization entries are added at the bottom of the list.



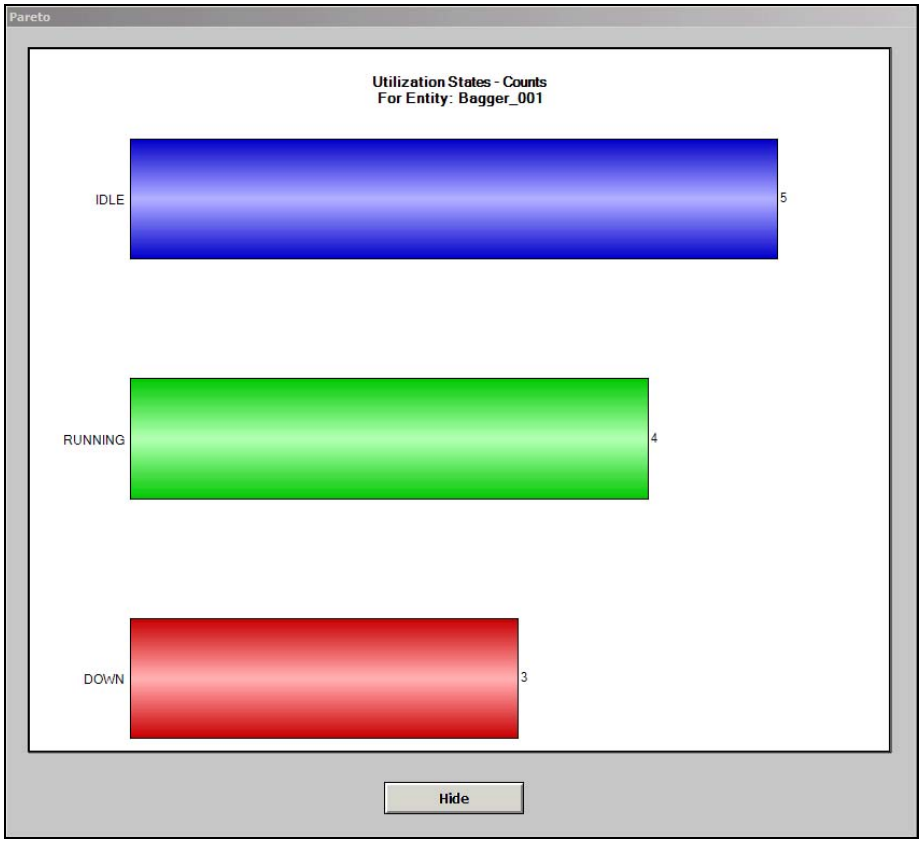
Monitor and Track Utilization States and Utilization Reasons

Now, you will use a Pareto chart to view utilization states and reasons.

28. Click the **Show Pareto** button to see the list and number of reason codes.



The **Pareto** window appears similar to the following:



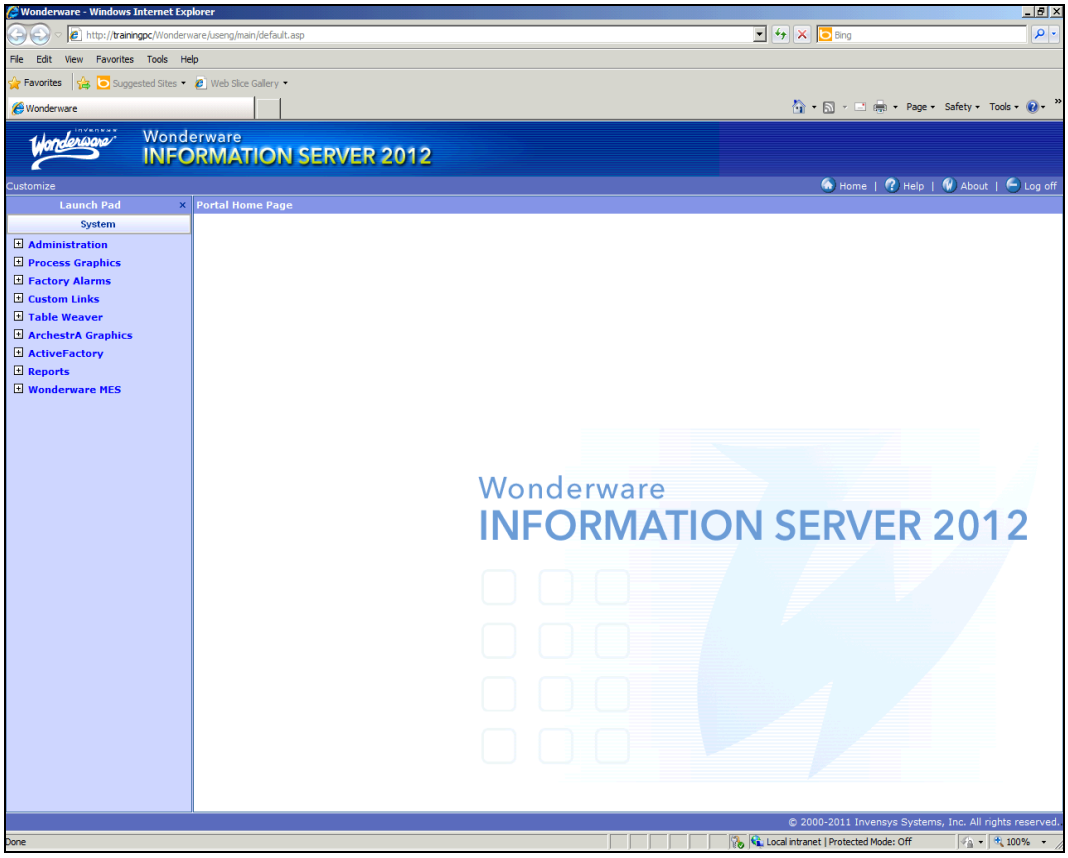
Note: Your report may be different, depending on the actions you took during runtime.

29. Hide the **Pareto** window.
30. Close WindowViewer.
31. Close WindowMaker.

View Report

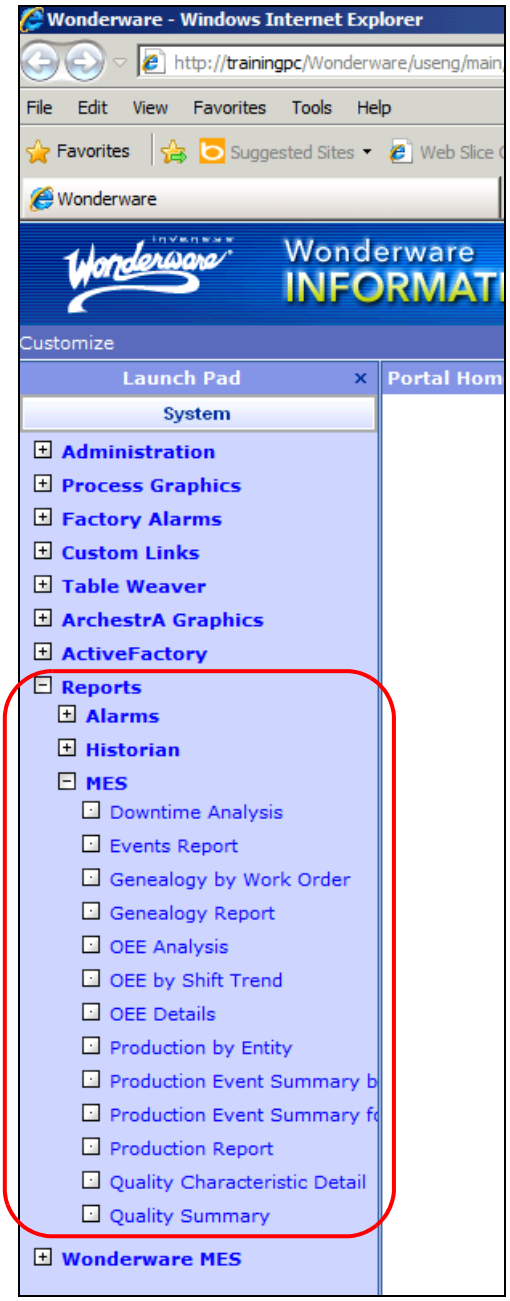
Next, you will use the Wonderware Information Server to view your **Downtime Analysis** report.

32. Open Wonderware Information Server (**Start | All Programs | Wonderware | Information Server | Home Page**).



33. Expand **Reports** and **MES**.

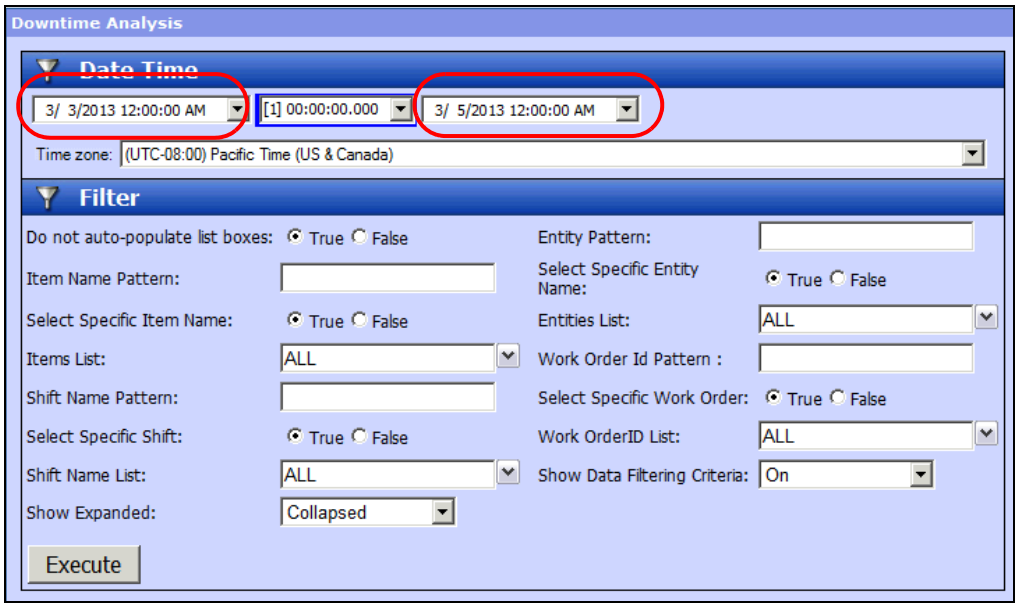
Note: After you click **Reports**, there might be a delay. Do not click **Reports** again.



34. Under **MES**, click **Downtime Analysis**.

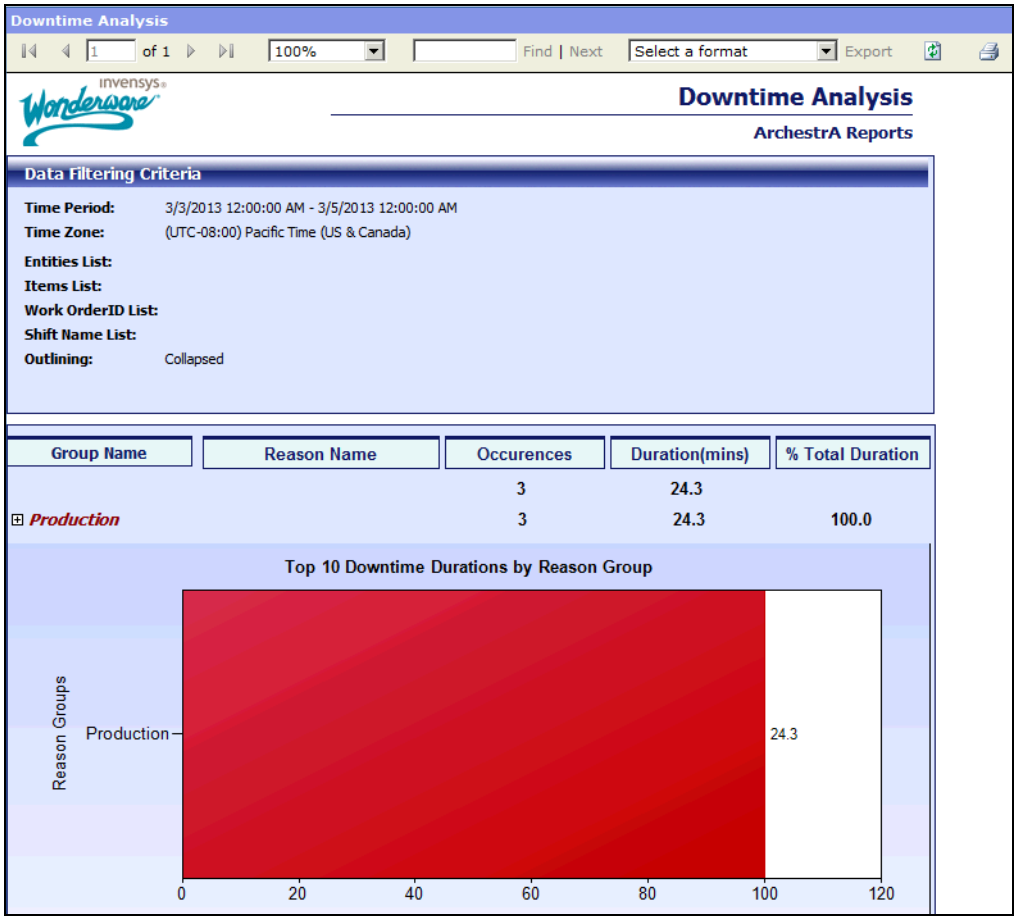
    After a few moments, the **Downtime Analysis** window appears.

35. In the **Date Time** pane, ensure one day in the past is displayed and select one day in the future.



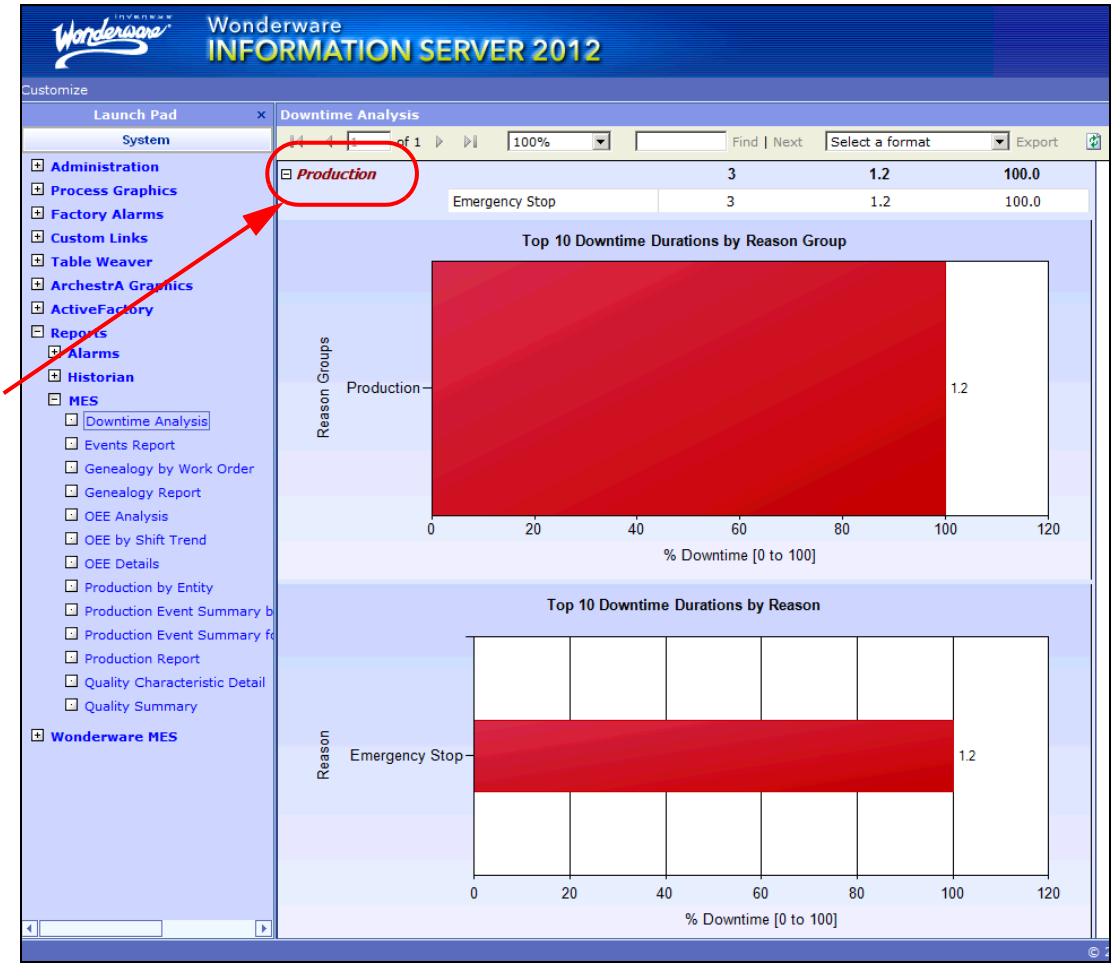
36. Click **Execute** to generate the report.

The **Downtime Analysis** report will appear similar to the following:

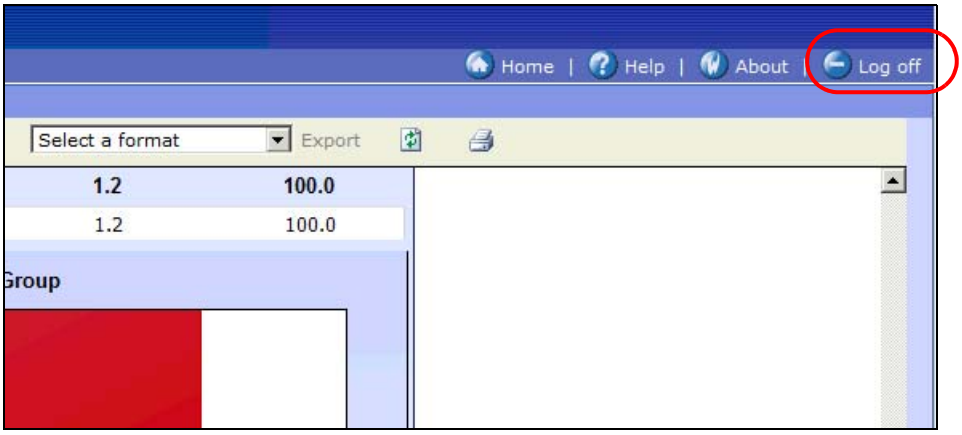


Note: Your report may be different, depending on the actions you took during runtime.

37. Expand **Production** to see the reason list.



38. In Internet Explorer, in the top-right portion of the window, click **Log off** and close the browser window.



Lab 6 – Adding Utilization States and Reasons

Introduction

In this lab, you will first create additional utilization states and utilization reasons in the MES database. Then, you will add more raw reason codes in the **$BaggerUCO** template. Next, you will use the InTouch application to simulate each raw reason code condition. Finally, you will use a Pareto chart to monitor and verify the utilization states and utilization reasons.

Objectives

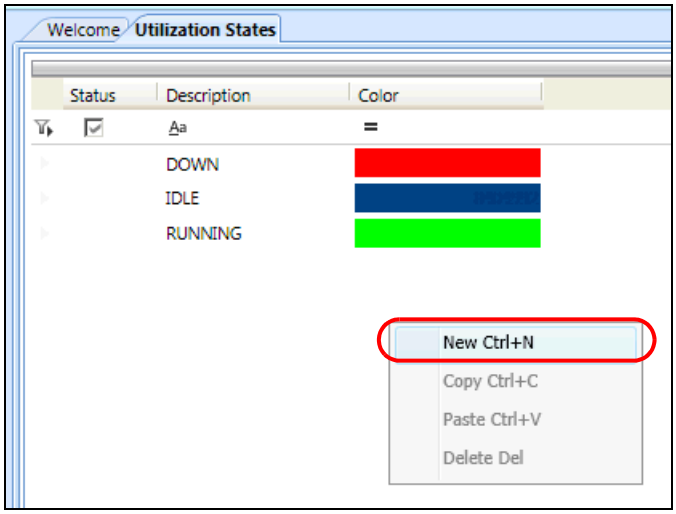
Upon completion of this lab, you will be able to:

- Create utilization states
- Create reasons and reason subgroups
- Create complex expression, delay, prompt, and allowable raw reason codes
- Track and monitor utilization state and utilization reason counts in InTouch

Create Additional Utilization States

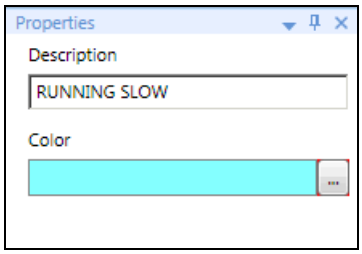
First, you will create an additional utilization state for your equipment.

1. In the MES Client, in the **Navigation Bar**, in the **Master Data Config** group, click **Utilization States**, if needed.
2. On the **Utilization States** tab, right-click the empty workspace and click **New**.



3. In the **Properties** pane, configure the new utilization state as follows:

Description:	RUNNING SLOW
Color:	*Light Blue*

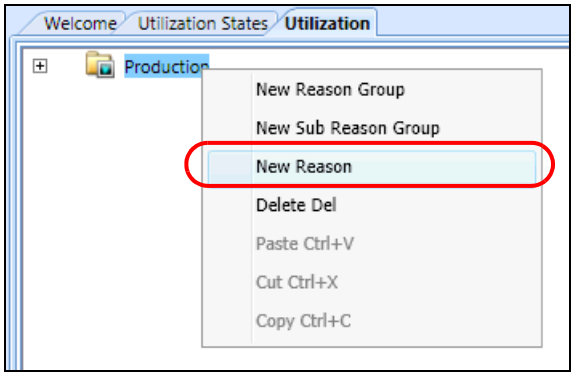


4. Save the configuration.

Create Sub Reason Groups and Reasons

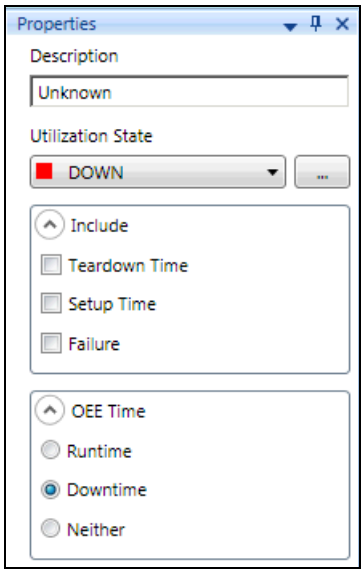
Next, you will create additional utilization reasons and a reason subgroup, so that the utilization list reflects plant floor conditions.

5. In the **Navigation Bar**, in the **Master Data Config** group, click **Utilization**, if needed.
6. On the **Utilization** tab, right-click the **Production** reason group and select **New Reason**.



7. Configure the new reason as follows:

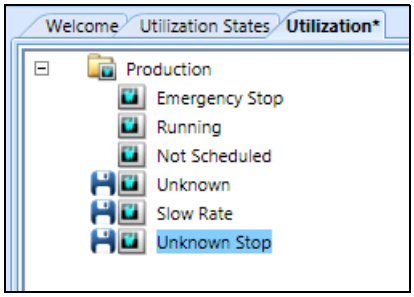
Description:	Unknown
Utilization State:	DOWN *(default)*
OEE Time:	Downtime



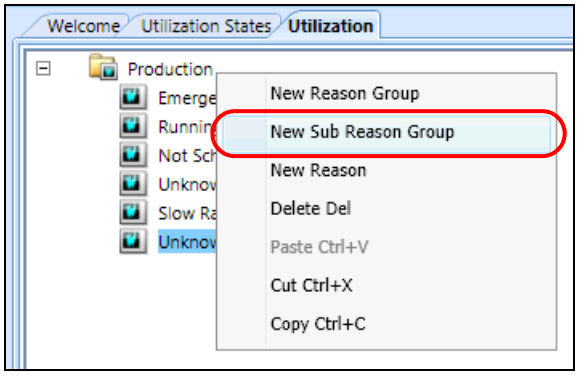
8. Add the following new reasons to the **Production** reason group:

Description	Utilization State	OEE Time
Slow Rate	RUNNING SLOW	Runtime
Unknown Stop	DOWN *(default)*	Downtime

Your reason group and reasons appear similar to the following:



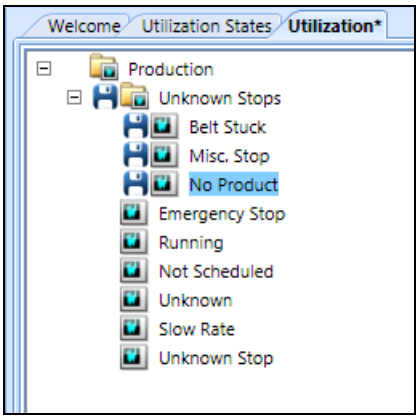
9. Save all configurations.
10. Right-click **Production** and select **New Sub Reason Group**.



11. Name the new sub reason group **Unknown Stops**.
12. Right-click **Unknown Stops** and create additional reasons in the **Unknown Stops** subgroup, and configure them as follows:

Description	Utilization State	OEE Time
Belt Stuck	DOWN *(default)*	Downtime
Misc. Stop	DOWN *(default)*	Downtime
No Product	DOWN *(default)*	Downtime

Your reason groups and reasons appear as follows:



13. Save all configurations.

Create Additional Raw Reason Codes

Next, you will add more raw reason codes and link them to the newly created utilizations in MES to reflect the plant floor conditions.

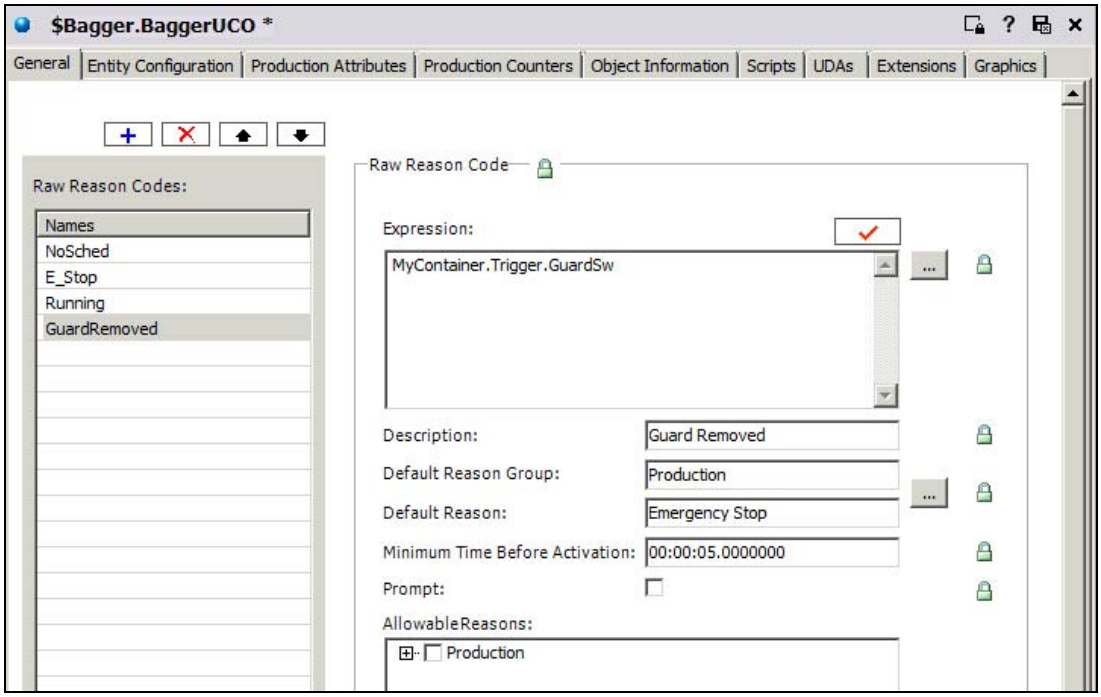
14. In the ArchestrA IDE, **Template Toolbox**, double-click **$Bagger.BaggerUCO**.
15. On the **General** tab, create a raw reason code named **GuardRemoved**.
16. Configure the following raw reason code attributes as shown below:

Raw Reason Code:	*Locked*
Expression:	MyContainer.Trigger.GuardSw
Description:	Guard Removed

17. To the right of the **Default Reason** field, click the ellipsis button to see the list of reason groups and reasons.
18. In the **Default Reason Browser** list, select the **Emergency Stop** reason and click **OK**.

    The **Emergency Stop** reason is added to the **Default Reason** field and the **Production** reason group is added to the **Default Reason Group** field.
19. Configure the following raw reason code attributes as shown below:

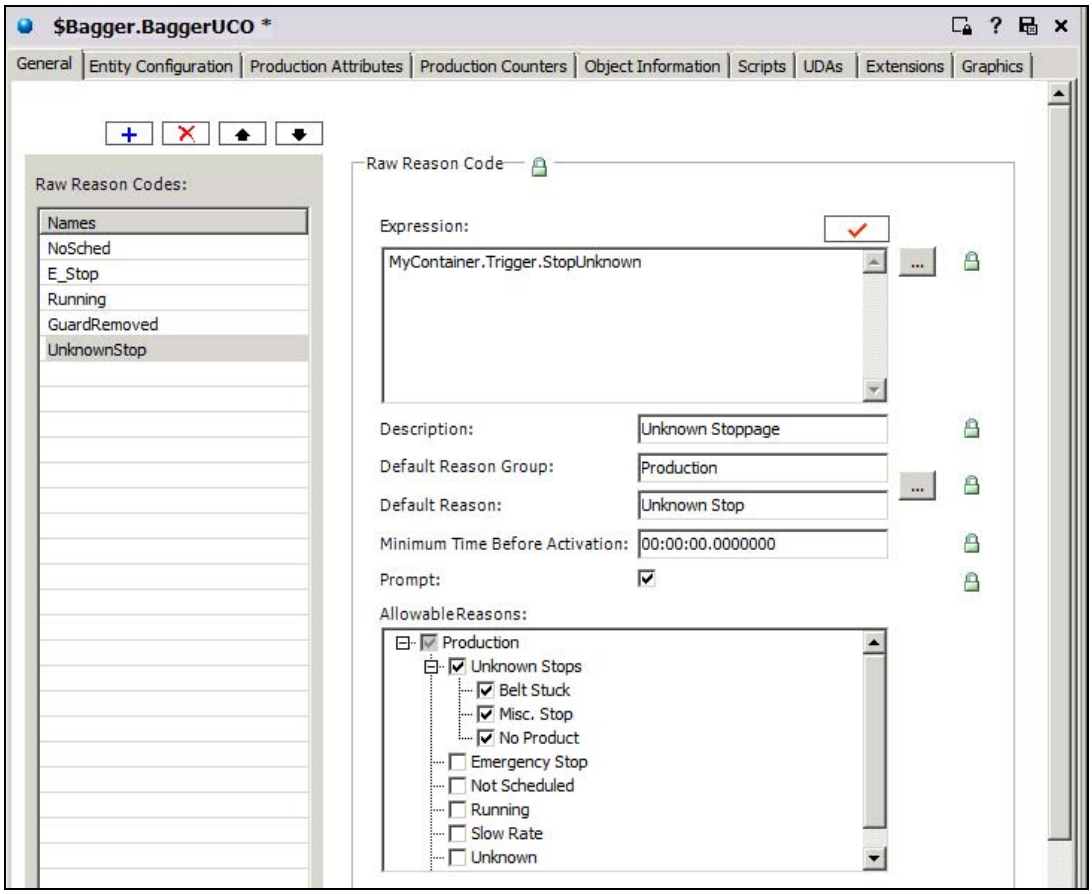
Minimum Time Before Activation:	00:00:05.0000000
Prompt:	*unchecked* (*default*)
Allowable Reasons:	*unchecked* (*default*)



20. Create another raw reason code named **UnknownStop** and configure it as follows:

Raw Reason Code:	*locked*
Expression:	MyContainer.Trigger.StopUnknown
Description:	Unknown Stoppage
Default Reason:	Unknown Stop
Default Reason Group:	Production
Minimum Time Before Activation:	00:00:00.0000000 *(default)*
Prompt:	*checked*

21. Under **Allowable Reasons**, fully expand **Production** and check **Unknown Stops**.



When the raw reason code condition with **Prompt** checked becomes true, the **Job Summary** banner will start to blink on the InTouch screen. This is to alert the operator to choose one of the allowable utilization reasons.

Checking the options in **Allowable Reasons** enables the **Enter reason required for selected machine** button on the button bar when the raw reason code condition becomes true, and displays only the specified allowable reasons for operator selection.

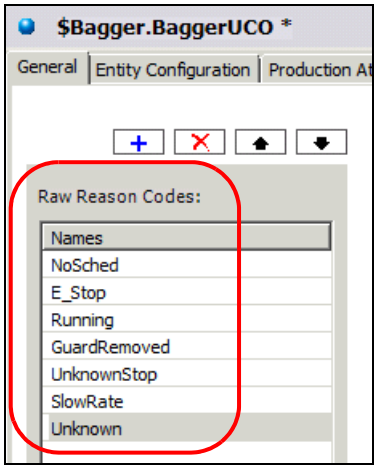
22. Add a **SlowRate** raw reason code and configure it as follows:

Raw Reason Code:	*locked*
Expression:	MyContainer.Trigger.Running AND MyContainer.Trigger.ProdRate < 20
Description:	Slow Production Rate
Default Reason:	Slow Rate
Default Reason Group:	Production
Minimum Time Before Activation:	00:02:00.0000000
Prompt:	*unchecked (default)*
Allowable Reasons:	*unchecked (default)*

23. Add an **Unknown** raw reason code and configure it as follows:

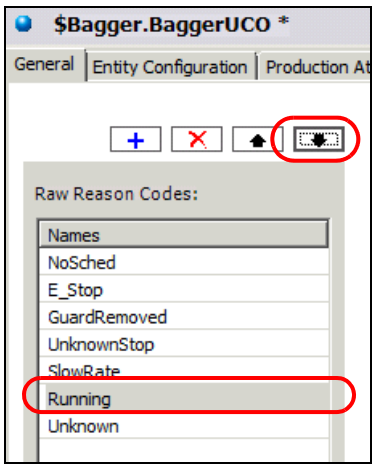
Raw Reason Code:	*locked*
Expression:	NOT MyContainer.Trigger.Running
Description:	State of Machine Unknown
Default Reason:	Unknown
Default Reason Group:	Production
Minimum Time Before Activation:	00:00:00.0000000 *(default)*
Prompt:	*unchecked (default)*
Allowable Reasons:	*unchecked (default)*

The raw reason codes appear as follows:



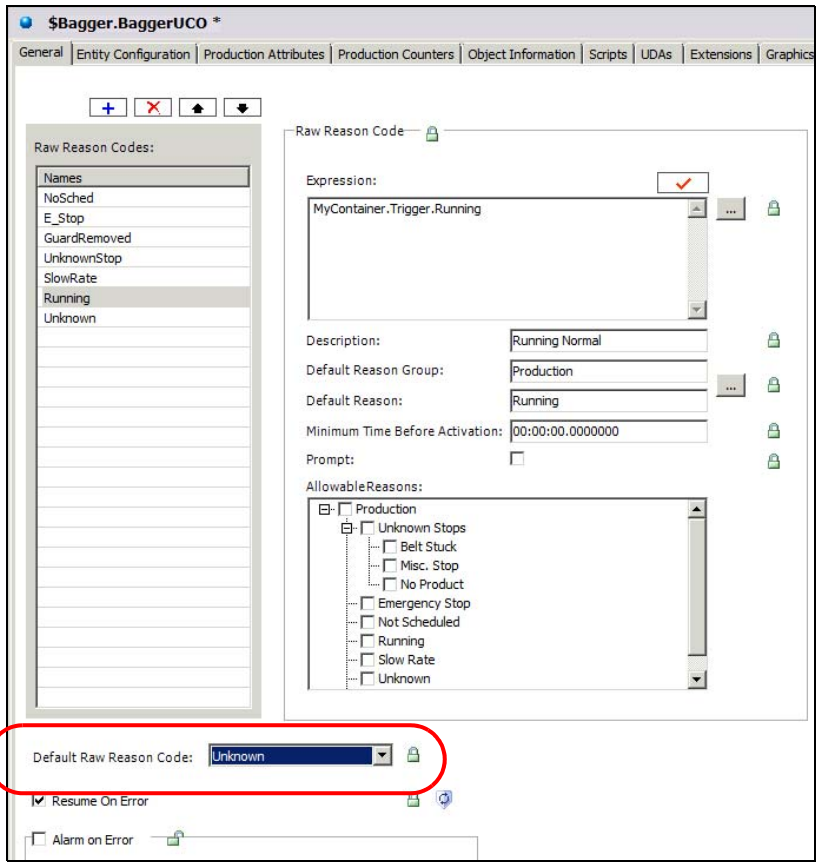
24. In the **Raw Reason Codes** list, select the **Running** raw reason code and click the down arrow to move it below the **SlowRate** raw reason code.

    Your list will match the following:



Note: The order of the raw reason codes is important because the raw reason codes will be evaluated in this order on each scan.

25. Change the **Default Raw Reason Code** to **Unknown**.



26. Save and check in **$Bagger.BaggerUCO**.

Synchronize the Entity Model and Deploy the UCO Object

You have made changes in the configuration of the UCO object. Its corresponding entity in MES must be updated to reflect the changes. Next, you will synchronize the entity model and deploy the objects.

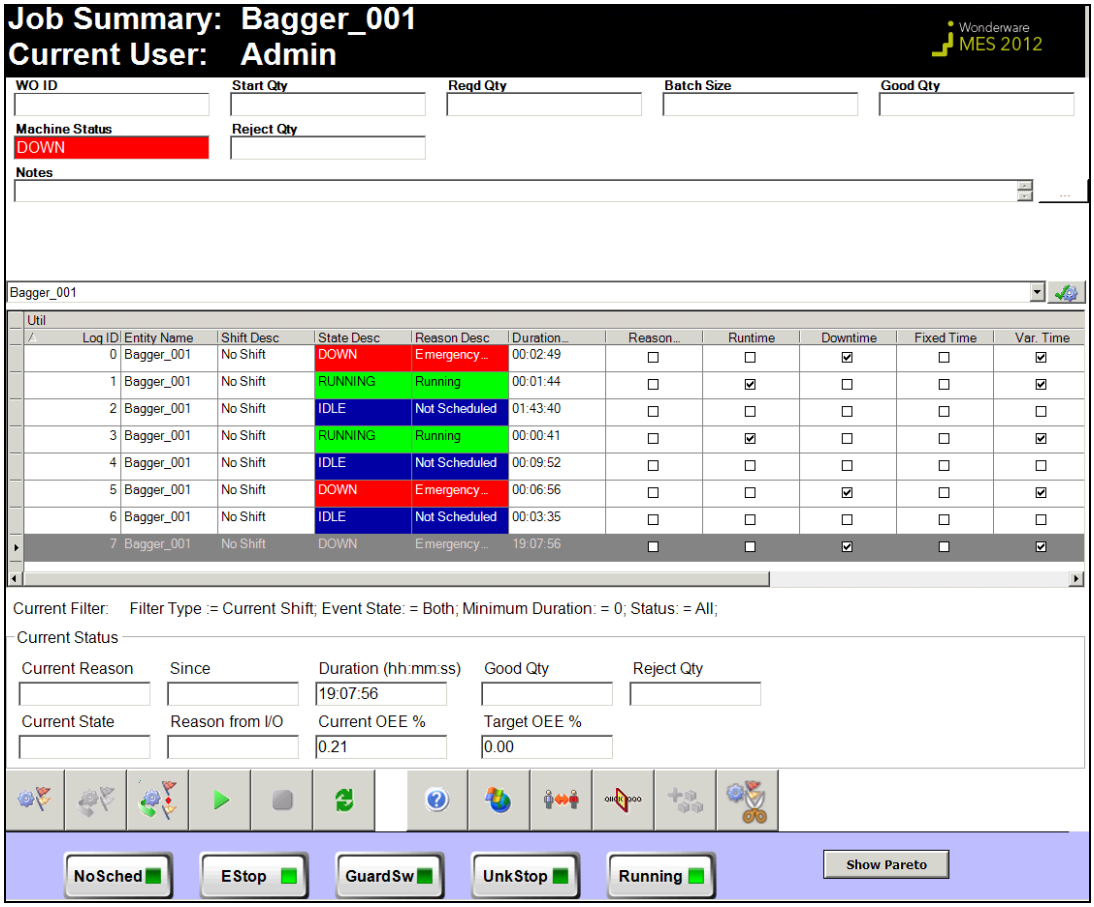
27. Rebuild the entity model from the **Production** area.
28. Deploy the **BaggerUCO_001** object.

Verify the Application

Now, you will simulate each of the new raw reason code conditions in InTouch, and then monitor and track the utilization states and utilization reasons.

29. In **Template Toolbox**, expand the **Training** toolset, if needed, and double-click the **$BaggerApp** InTouch application template.
30. In the **Windows to Open** dialog box, select **OEEUtil Main** and click **OK**.
31. Switch to WindowViewer.
32. Log on the **Bagger_001** entity.

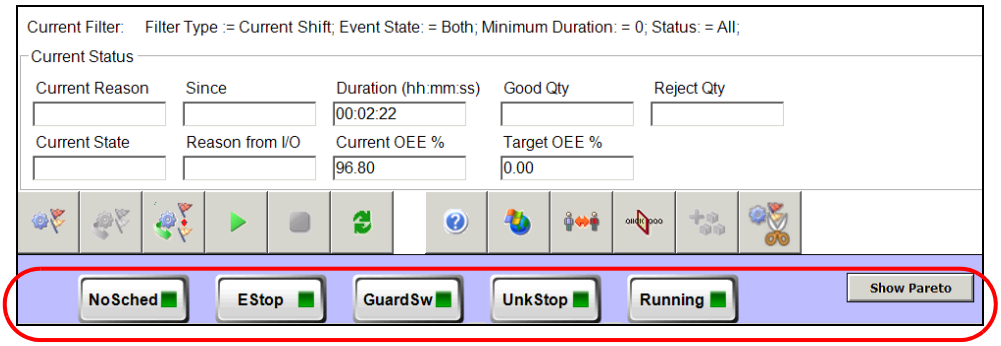
    The **Job Summary: Bagger_001** control with the **Util** records appears in WindowViewer.



Add a Prompted Reason

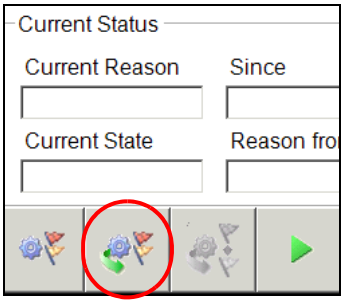
Next, you will simulate the raw reason code condition with **Prompt** checked, and manually select a utilization reason.

33. Ensure that all raw reason code conditions are off (the buttons at the bottom of the window are off).

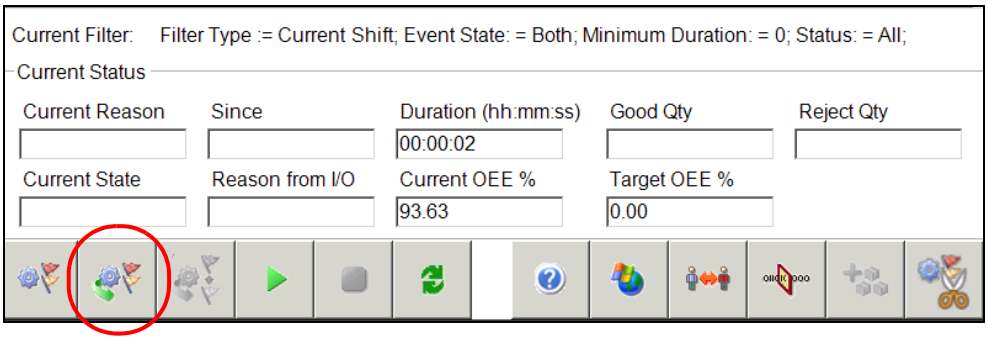


34. Click the **UnkStop** button to activate an unknown stop.

    The banner at the top of the **JobSummaryControl** will start blinking and the **Enter reason-required for selected Util record** button is enabled.

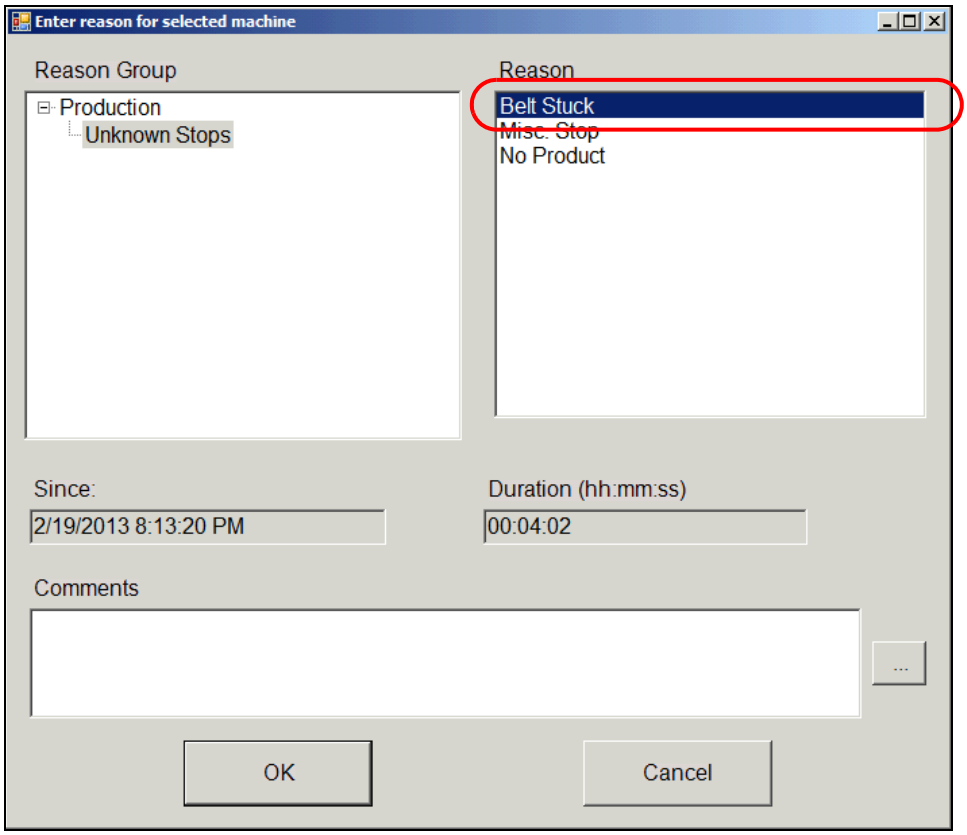


35. On the button bar, click the **Enter reason-required for selected Util record** button.



The **enter reason for selected machine** window appears.

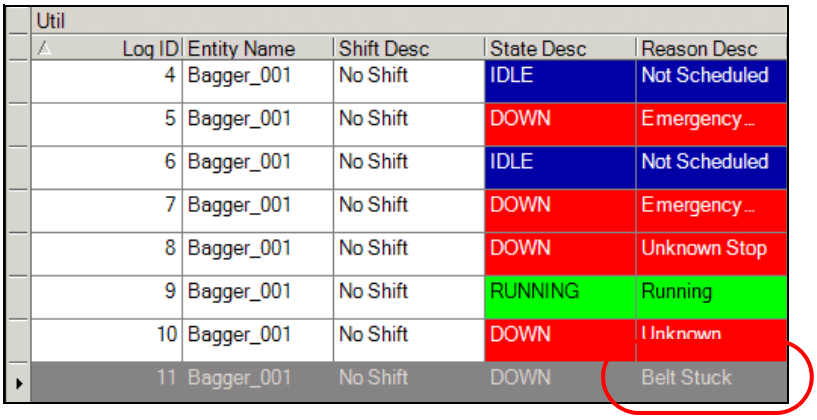
36. Expand **Production** and click **Unknown Stops**.
37. In the **Reason** list, select **Belt Stuck** and add a comment (optional).



Note: You will be able to see only those reasons that are previously defined as allowable reasons for the selection.

38. Click **OK**.

Notice that a new utilization has been added with a **Reason Desc** of **Belt Stuck**, and the banner stops blinking.



Util

Log ID	Entity Name	Shift Desc	State Desc	Reason Desc
4	Bagger_001	No Shift	IDLE	Not Scheduled
5	Bagger_001	No Shift	DOWN	Emergency...
6	Bagger_001	No Shift	IDLE	Not Scheduled
7	Bagger_001	No Shift	DOWN	Emergency...
8	Bagger_001	No Shift	DOWN	Unknown Stop
9	Bagger_001	No Shift	RUNNING	Running
10	Bagger_001	No Shift	DOWN	Unknown
11	Bagger_001	No Shift	DOWN	Belt Stuck

Simulate Other Reason Code Conditions

Now, you will simulate other raw reason code conditions to allow the Galaxy to automatically enter utilization reasons into the MES database.

39. At the bottom of the window, click the buttons to turn them on and off, as indicated in the table below.

    The color on the buttons becomes bright green when they are on and dark green when they are off.

Note: Be patient when clicking the buttons, as there is a delay in the response because of default refresh rates. Remember that the switches are scanned in the order in which they are listed in the UCO, so earlier listings have priority.

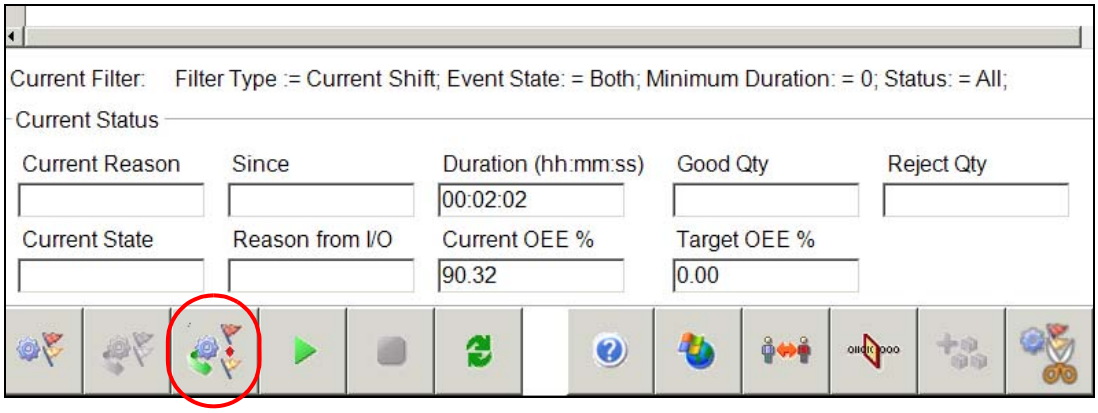
NoSched	EStop	GuardSw	UnkStop	Running	Expected Utilization Reason
OFF	OFF	OFF	OFF	ON	Running
OFF	OFF	ON	OFF	ON	Emergency Stop
OFF	OFF	ON	OFF	OFF	Emergency Stop*
OFF	OFF	ON	OFF	ON	Emergency Stop*
OFF	OFF	OFF	OFF	ON	Running
OFF	OFF	OFF	OFF	OFF	Unknown

Note: *This **Emergency Stop** is the same reason as in the previous step. No new utilization reason will be generated in this step.

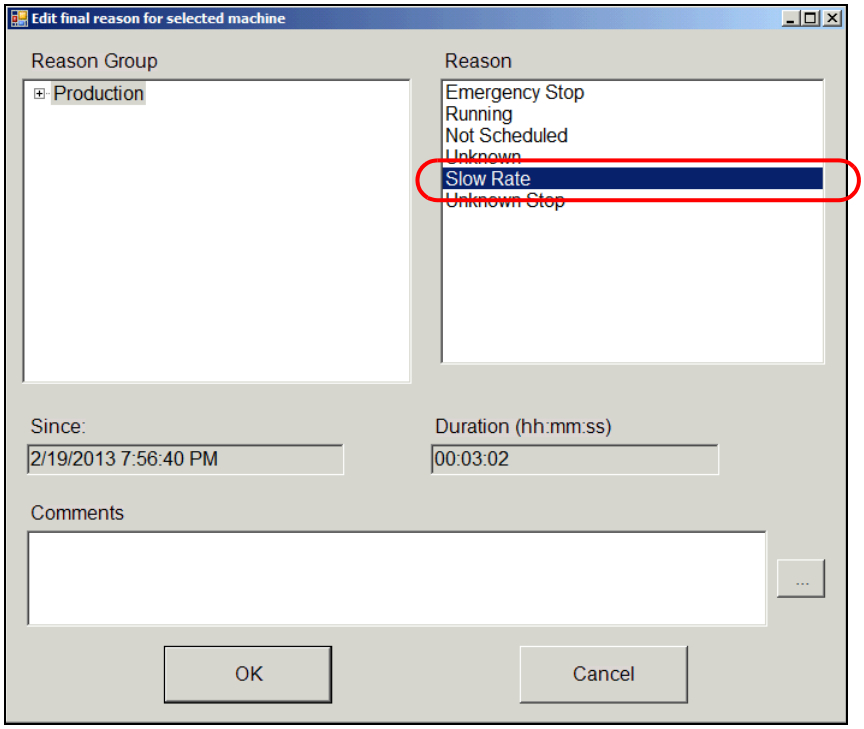
Edit an Existing Reason

You will use the button bar control to manually edit a previously recorded state of the **Bagger_001** entity.

40. In the **Util** table, select a record with **Emergency Stop** as the **Reason Desc**.
41. On the button bar, click the **Edit final reason for selected Util record** button.

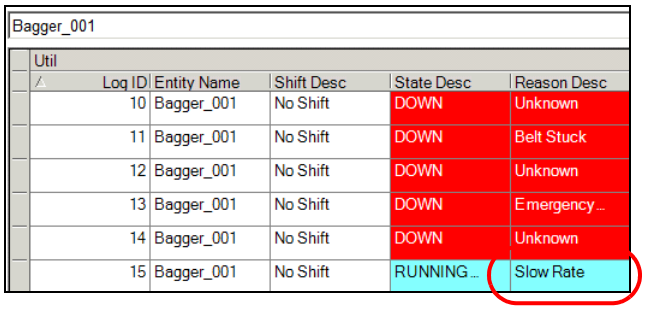


42. In the **Reason** list, select **Slow Rate** and add a comment (optional).



43. Click **OK**.

    Notice that **Reason Desc** has changed to **Slow Rate**.

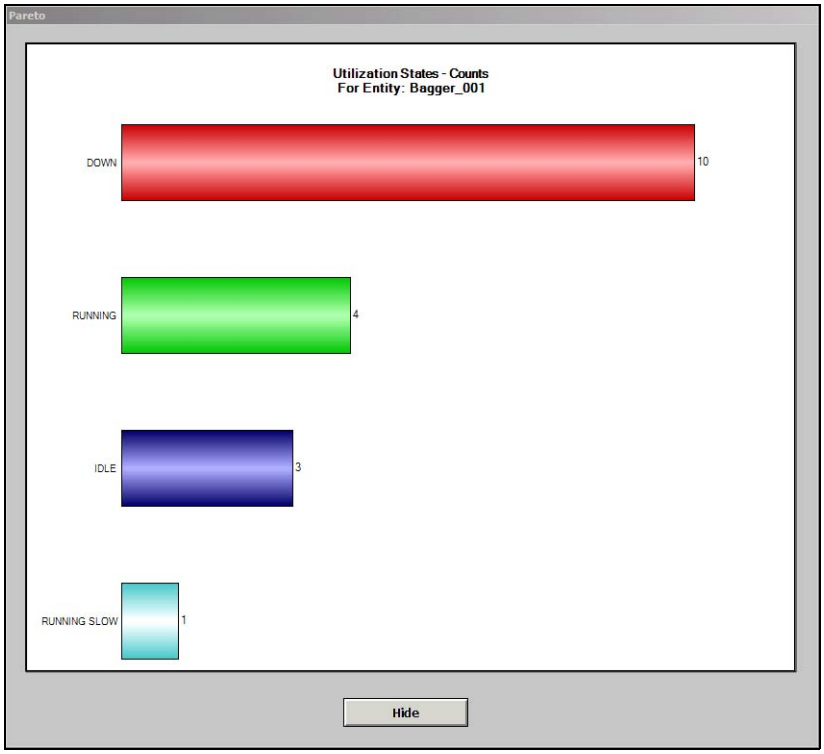


Show Pareto

Now, you will access a Pareto chart that shows the leading causes of utilization state changes.

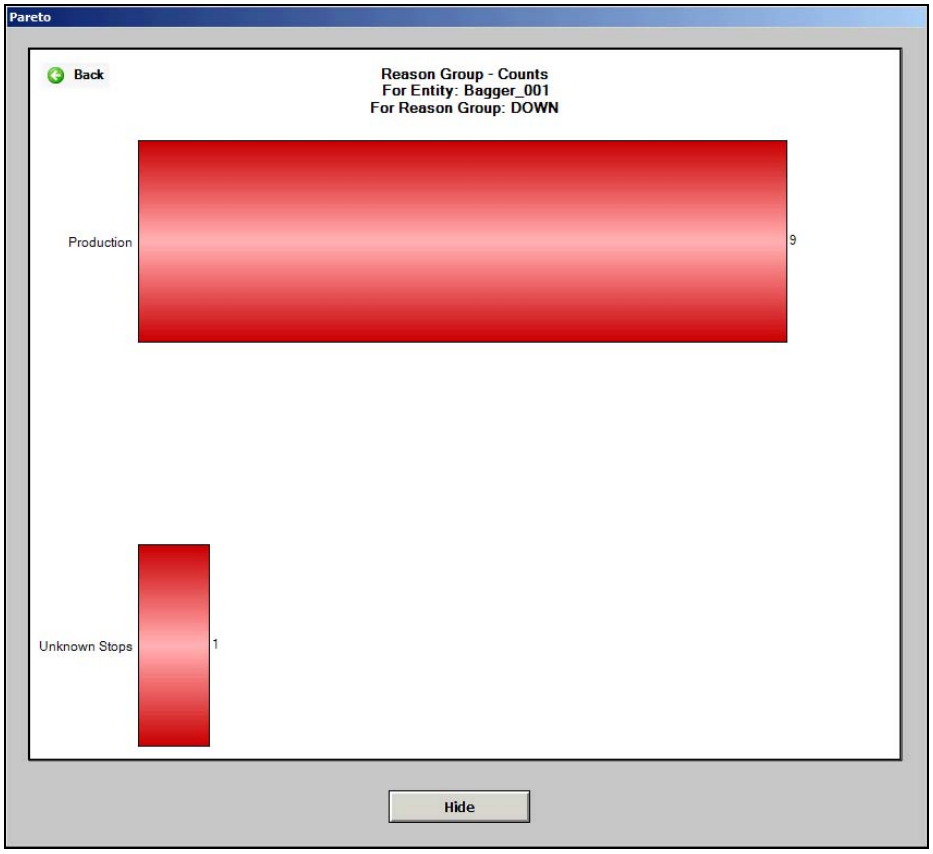
44. Click the **Show Pareto** button to see the list and the number of reason codes.

    The **Pareto** window appears similar to the following:

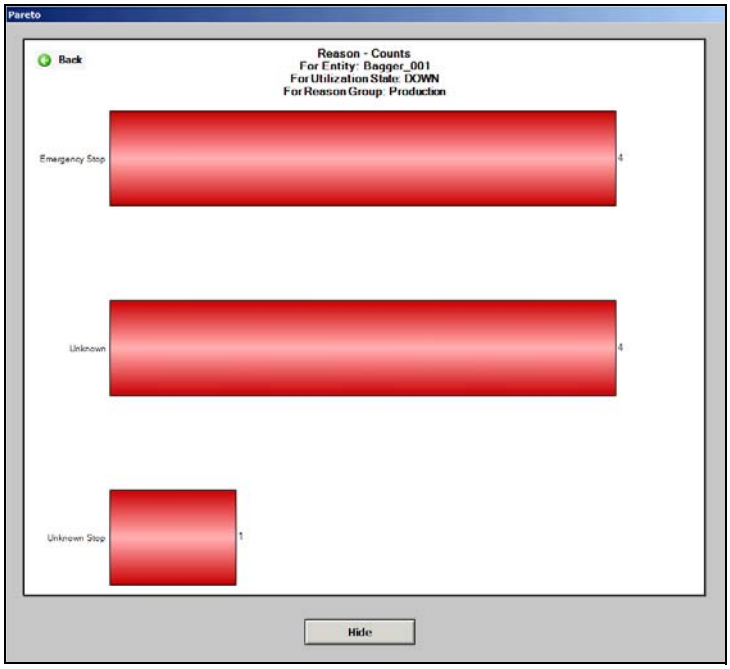


Note: Your report may be different, depending on the actions you took during runtime.

45. Click the **Down** utilization state to display utilization reason groups.



46. Click the **Production** utilization reason group to display utilization reasons.



47. Hide the **Pareto** window.

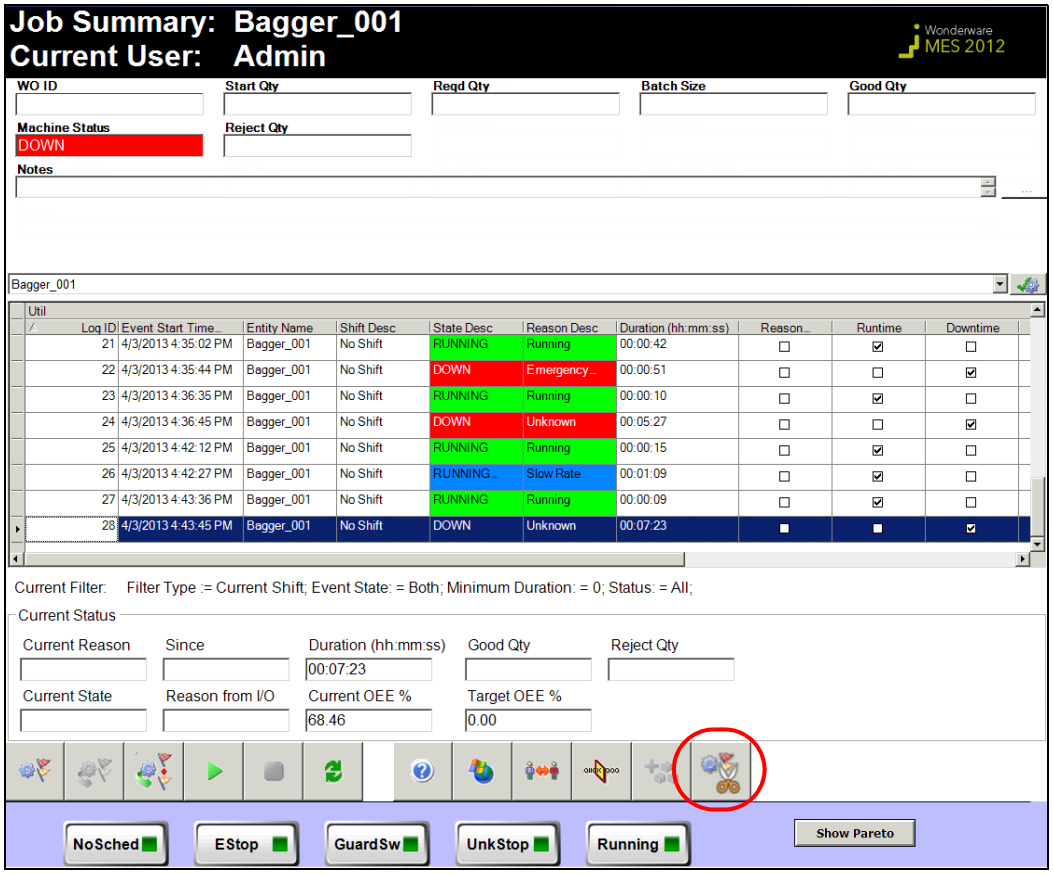
Section 3 – Utilization Split

This section discusses the **Utilization Split** button and editor, and also explains their functionality and usage.

Overview of the Utilization Split Function

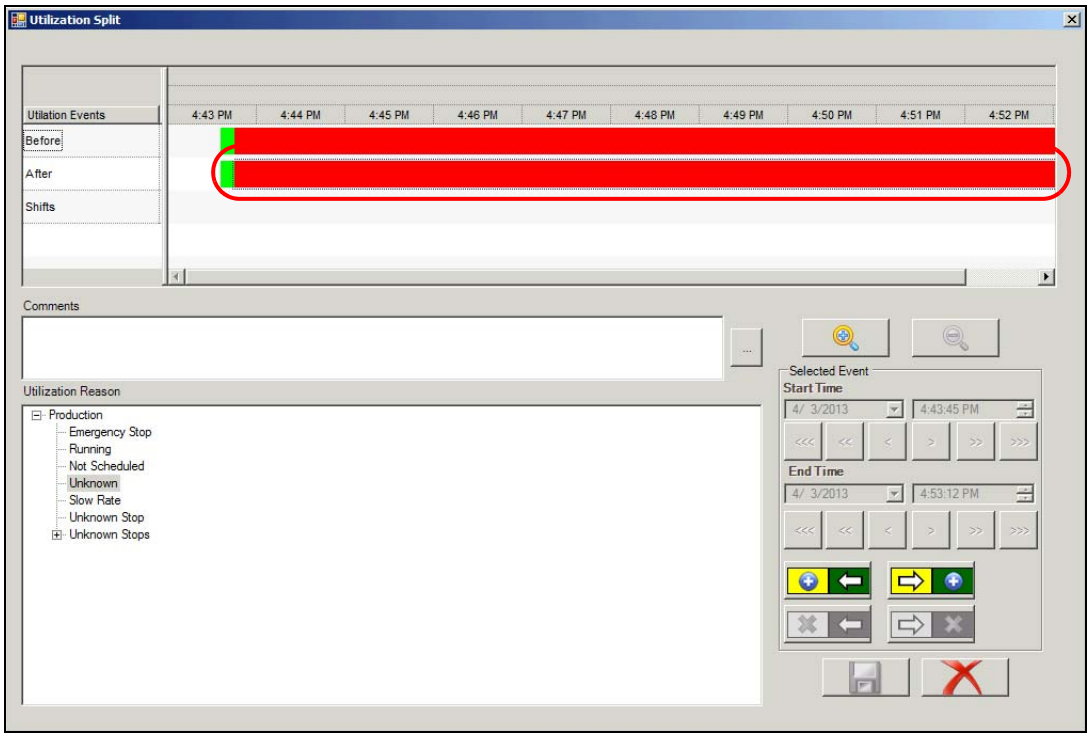
The **Utilization Split** function allows users to split utilizations from a **Util** table when an actual reason in the field does not match the utilization reason entered in MES. This function allows users to manually correct or split the utilization.

The **Utilization Split** button on the button bar opens the **Utilization Split** editor, which is used to split a utilization into two or more segments.

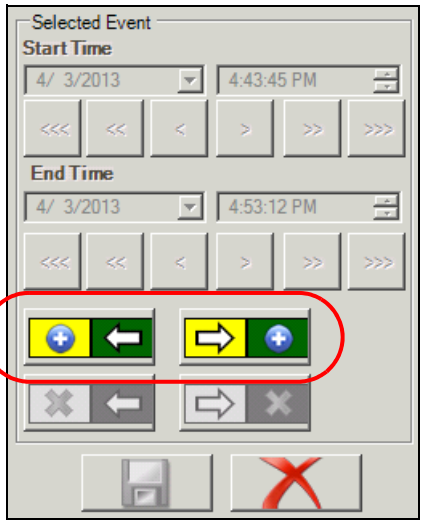


Using the Tool

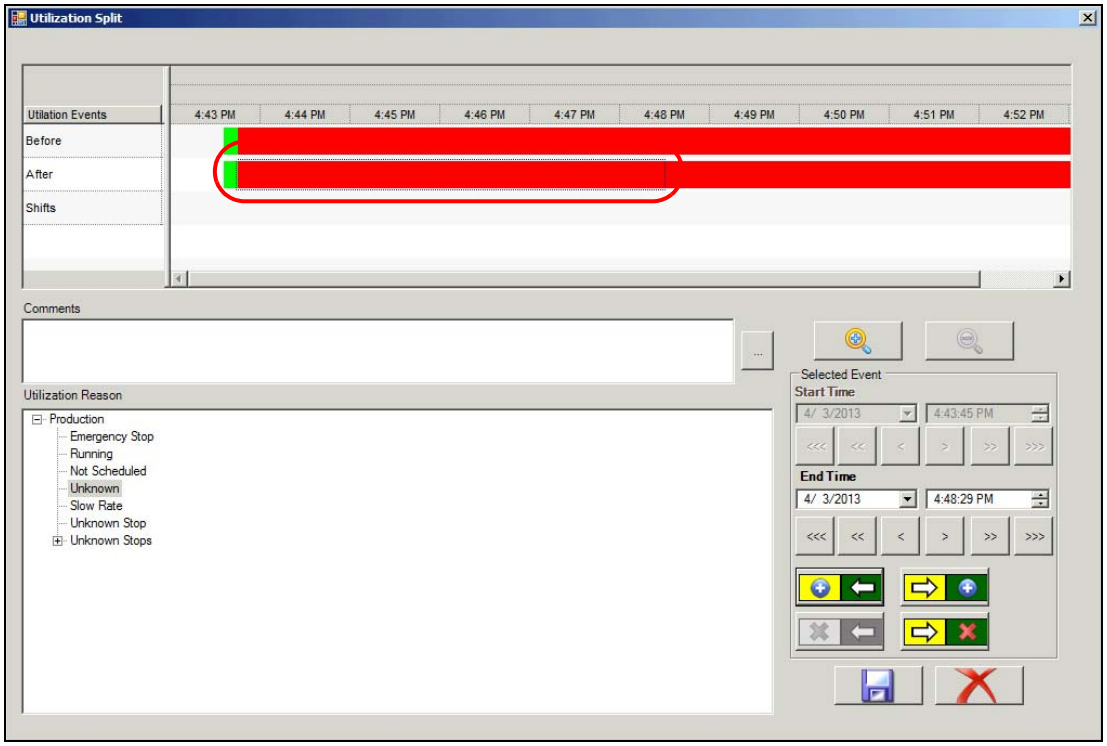
When you click the **Utilization Split** button, the **Utilization Split** editor appears with a dotted rectangle outline around the original utilization segment of the utilization color bar.



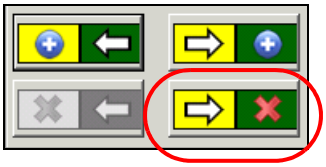
You use the arrow buttons with colors to split the selected utilization either at its beginning or end, or at both.



The original utilization is split into two segments of equal time if you click either of the arrow buttons only once.



Depending on which button you clicked, the corresponding button you would use to cancel the change will be enabled.



You can further split the utilization by clicking one of the top buttons again. You can also click both the forward and backward arrow buttons (one at a time) to create a split utilization in the middle of the original utilization.

After the split, you can use the following buttons to adjust the start or end time, or both, of the split utilization.

The backward arrows adjust the start time of the new split utilization. The forward arrows adjust the end time of the new split utilization.

The single arrow increases or decreases the time by a second.

The double arrow increases or decreases the time by a minute.

The triple arrow increases or decreases the time by an hour.

Next, you select the actual utilization reason for the split segment from the utilization reason list in the editor.

After you have adjusted the start or end time, or both, of the split segment and selected the actual utilization reason, click the **Save** button to add the split segment as a new utilization to the MES and **Util** table. The original utilization in the **Util** table will not be replaced, but its start or end time will be updated accordingly.

If the split segment is in the middle of the original utilization, a second new utilization will be added to the **Util** table as part of the split from the original utilization.

Whenever two adjacent utilizations have the same utilization reason as a result of the split, they will be automatically merged by the software. A warning notifying of the merge will appear.

Lab 7 – Splitting Utilization

Introduction

In this lab, you will first use the **Utilization Split** function to split an existing utilization into two or more segments. Next, you will adjust the start or end time of the new segment. Then, you will apply a different utilization reason to the split segment.

Objectives

Upon completion of this lab, you will be able to:

- Split a utilization
- Adjust the start and end times of split utilizations
- Select a different utilization reason for split segments

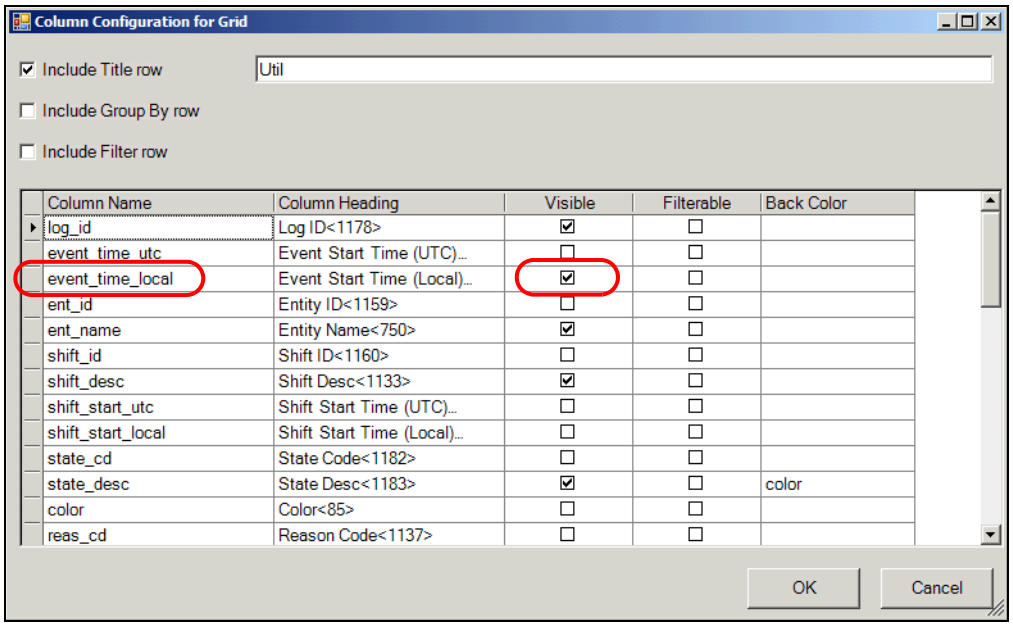
Split the Utilization

First, you will split the utilization into two segments.

1. In WindowViewer, in the **OEEUtil Main** window, right-click the **Util** table and select **Configure**.

   The **Column Configuration for Grid** window appears.

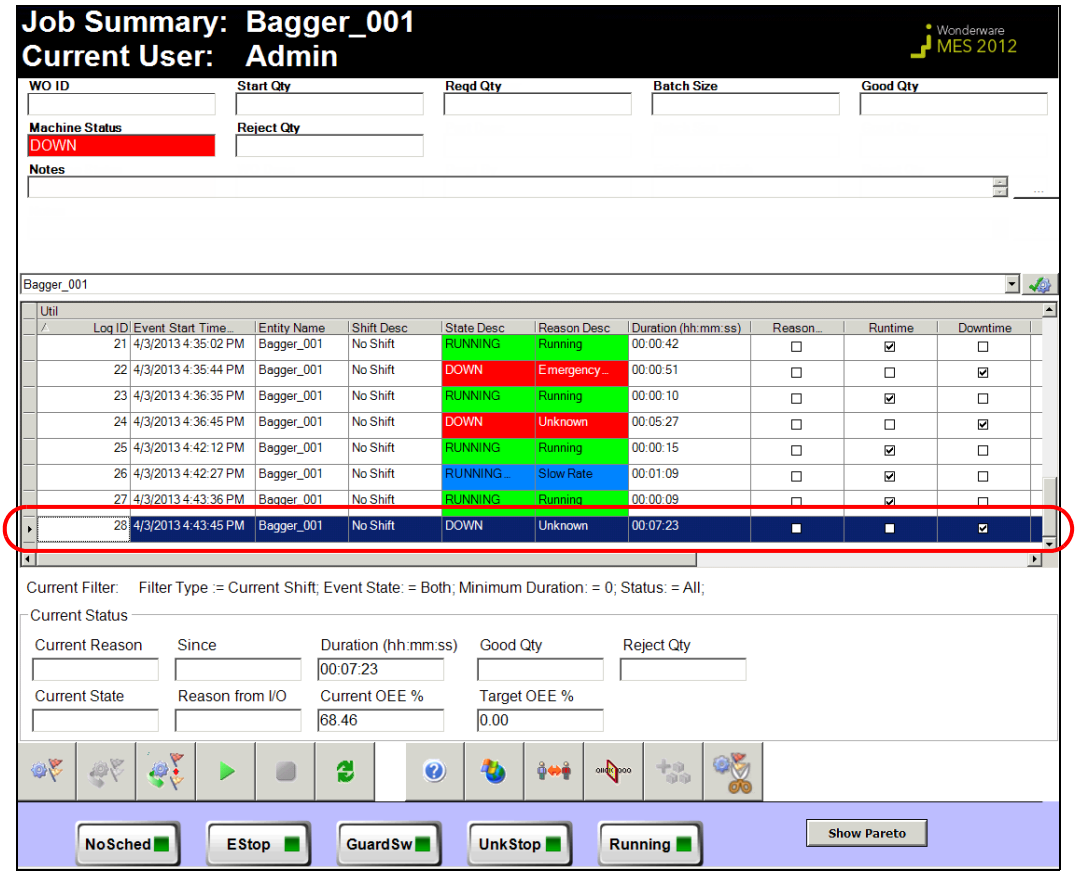
2. For **event_time_local**, check **Visible**.



3. Click **OK**.
4. Right-click the **Util** table and select **Save As Default Configuration**.

5. In the **Util** table, in the **Duration** column, find and select a utilization with at least a 1-minute duration that you can split.
6. Write down the **Log ID**, **Event Start** time, and **Duration**.

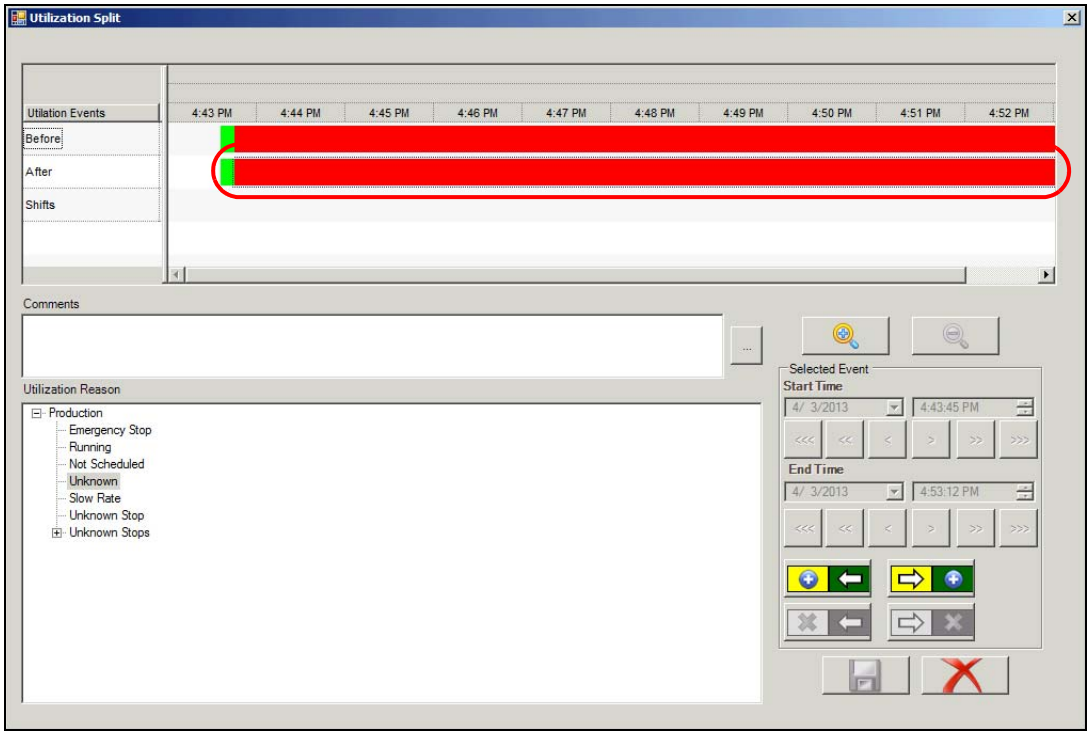
   You will check these again after the split.



7. On the button bar, click the **Utilization Split** button.

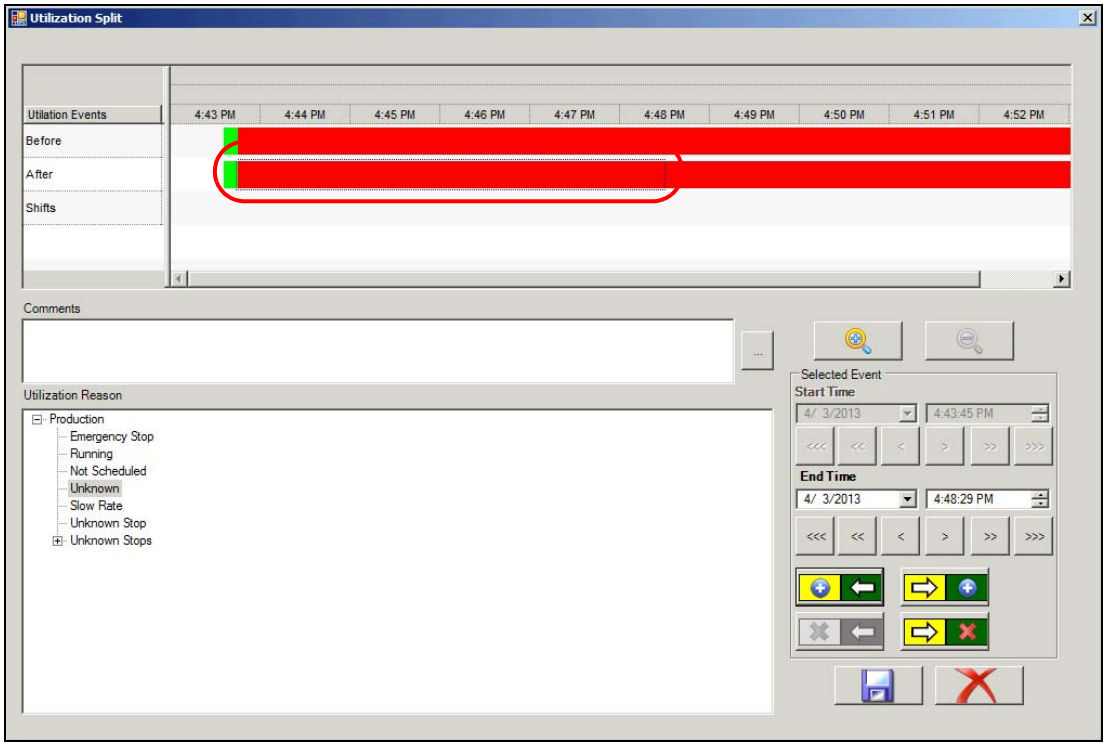
8. In the **Utilization Split** dialog box, find the dotted rectangle outline around a segment of the utilization color bar.

   This segment represents the original utilization in the **Util** table.



9. Click the **Split the event with the new event Prior to** button.

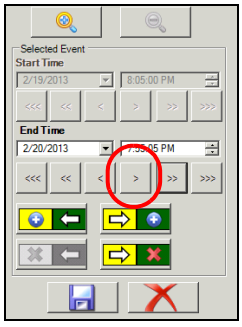
The original utilization is split into two segments of equal time, but only one segment is highlighted with the dotted rectangle. The highlighted segment is the new segment to be inserted.



Adjust the End Time for the New Utilization

Next, you will adjust the end time because you clicked the **Split the event with the new event Prior to** button.

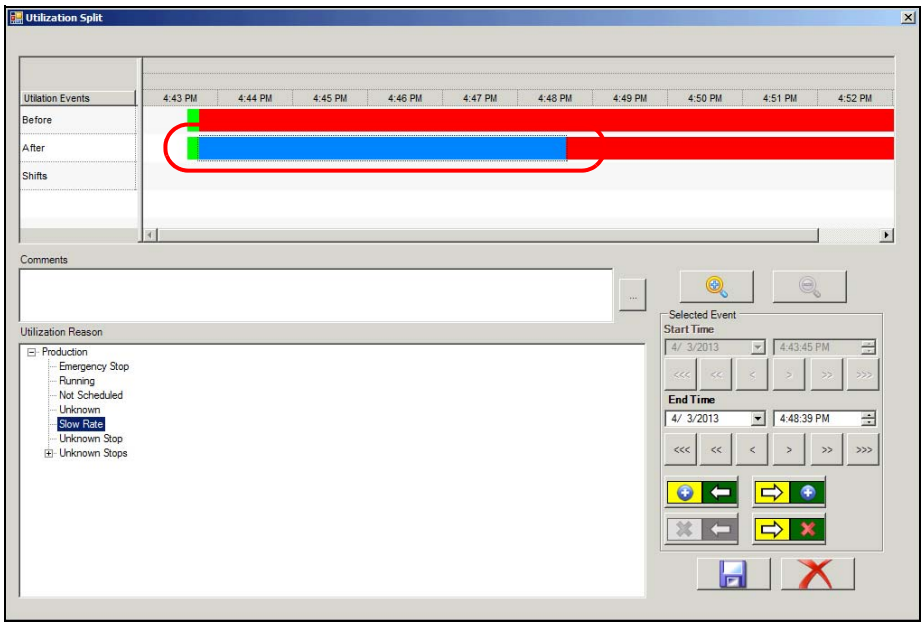
10. Click the single-right-arrow button several times to increase the **End Time** by 10 seconds.



11. Write down the new end time.

12. In the **Utilization Reason** list at the bottom-left of the window, select a different utilization reason for the highlighted utilization event.

    Notice that the highlighted utilization color code is updated accordingly.



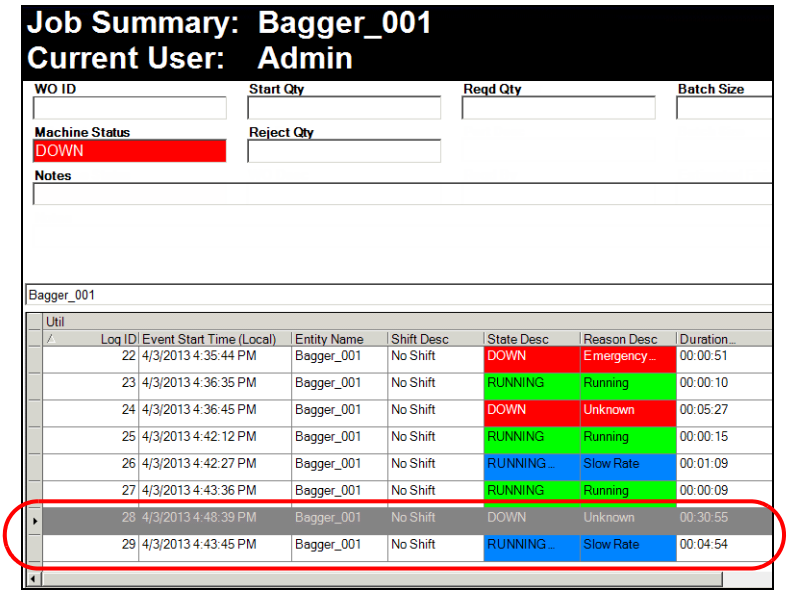
13. Click the **Save** button to insert the new utilization.

Note: If the changed utilization is the same as the utilization adjacent to it, you will get a message that the two utilizations will be automatically merged.

On the original utilization, notice that the original start time has changed to the new end time, and duration has been adjusted.

A new entry has been added to the **Util** table with a new **Log ID**.

The start time for the original utilization will be the start time for the new utilization.



Log ID	Event Start Time (Local)	Entity Name	Shift Desc	State Desc	Reason Desc	Duration
22	4/3/2013 4:35:44 PM	Bagger_001	No Shift	DOWN	Emergency ...	00:00:51
23	4/3/2013 4:36:35 PM	Bagger_001	No Shift	RUNNING	Running	00:00:10
24	4/3/2013 4:36:45 PM	Bagger_001	No Shift	DOWN	Unknown	00:05:27
25	4/3/2013 4:42:12 PM	Bagger_001	No Shift	RUNNING	Running	00:00:15
26	4/3/2013 4:42:27 PM	Bagger_001	No Shift	RUNNING ...	Slow Rate	00:01:09
27	4/3/2013 4:43:36 PM	Bagger_001	No Shift	RUNNING	Running	00:00:09
28	4/3/2013 4:48:39 PM	Bagger_001	No Shift	DOWN	Unknown	00:30:55
29	4/3/2013 4:43:45 PM	Bagger_001	No Shift	RUNNING ...	Slow Rate	00:04:54

Learning Services

Module 5 – Overall Equipment Effectiveness

Section 1 – OEE Overview 5-3

Section 2 – Shifts and Shift Schedules 5-7

Lab 8 – Configuring Shift Schedules 5-11

Section 3 – UCO and OCO Configuration for OEE Calculation 5-19

Lab 9 – Tracking OEE 5-27

Module Objectives

- Describe the definition and formula for OEE calculation
- Describe shift creation and schedule configuration
- Describe UCO and OCO configuration to track production information for OEE calculation

Section 1 – OEE Overview

This section provides the definition of Availability, Performance, and Quality, and gives the formula for OEE calculation.

Introduction

The efficiency calculation implemented in Wonderware MES Software/Performance is based on the industry standard OEE efficiency methodology.

OEE Contributing Factors

The OEE calculation is a product of a system's availability, performance, and quality efficiencies:

Availability

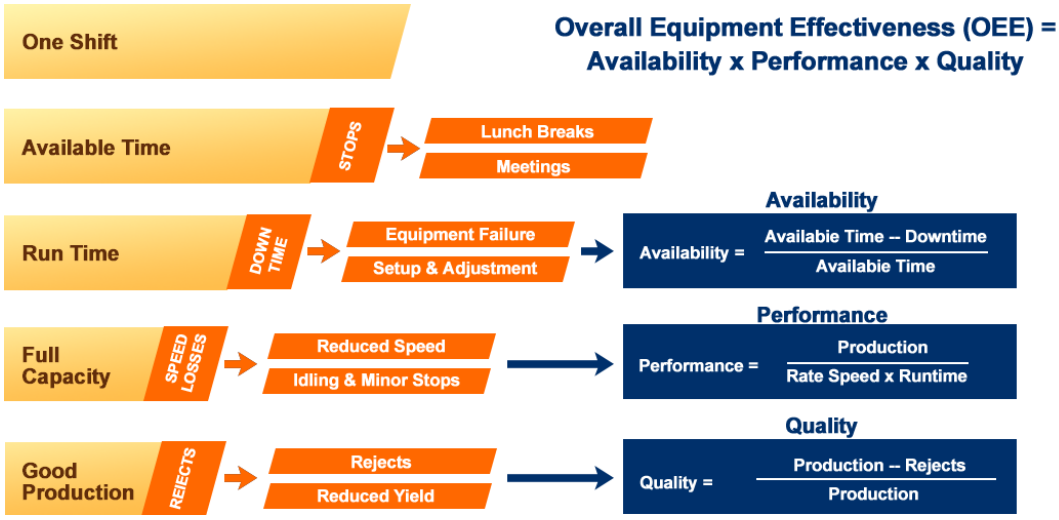
- Shift schedule
- Downtime events

Performance

- Default production rate
- Actual production rate

Quality

- Good production counts
- Rejected production counts



OEE Calculation Description

The following information describes the specifics of the OEE calculation and its implementation details. The OEE calculation is over a given interval, as shown below.

```
OEE% = Availability% * Performance% * Quality%
```

In OEE calculations, the term “interval” will be used to describe the period of time when an efficiency calculation is desired.

In Wonderware MES Software/Performance, an interval may be a record interval, a day, a shift, or a user-defined date range.

Availability% Calculation

The availability component of OEE measures a system's availability during the scheduled operation time for a given interval.

Downtime events that are categorized as **System Not Scheduled** do not count against the availability efficiency.

Downtime events categorized as **Availability Loss** do count against the availability efficiency.

```
Availability% = RunTime / Net Operating Time
```

Run Time: This is defined as the total interval duration without the **System Not Scheduled** downtime events and without the **Availability Loss** downtime events.

```
RunTime = Interval Duration - System Not Scheduled Events - Availability Loss Events
```

Net Operating Time: This is defined as an interval duration without the **System Not Scheduled** downtime events.

```
Net Operating Time = Interval Duration - System Not Scheduled Events
```

Performance% Calculation

The performance efficiency component of OEE measures a system's performance during the runtime in a given interval.

Downtime events categorized as **Performance Loss** do not directly affect the performance calculation; however, the production loss due to the downtime events indirectly affects the calculation by lowering the total output.

```
Performance% = Total Output / Target Output
```

Total Output: This is measured by calculating the total units produced from the physical process during the given interval and includes both good and defective units.

Target Output: This is calculated by using the theoretical rate input for the OEE calculation. The target output is defined as the number of units that should be produced in the runtime.

Quality% Calculation

The quality efficiency component of OEE measures a system's output quality while producing units during a given interval.

```
Quality% = Good Output / Total Output
```

Good Output: Good output is determined by subtracting the defective or bad parts from the total output during a given interval.

```
Good Output = Total Output - Total Defects
```

Total Output: Refer to **Total Output** in the **Performance% calculation** section.

Product Count (Units) Considerations

Product or unit counts for good, bad, and total units are obtained from the process counters, such as a meter, photo eye, etc. The units' counts are calculated by taking the difference of the running counters from the beginning and end of the record interval or by user manual entry through a console.

Unit count and, therefore, efficiency can be affected by the physical location of the unit counters in relation to the physical system(s). When attempting to measure the efficiency of a long, complex system such as an entire production line, the individual record interval efficiencies may also be influenced by the physical location of the unit counters in relation to the location where the downtime events are occurring.

Downtime Event Considerations

The availability and performance components of OEE are affected directly and indirectly by downtime events that occur and the OEE type categorization of such events. When using the OEE calculations, it is important to note the following software behavior when planning a system's configuration.

Configure Entities

An entity must be given adequate capabilities in MES to track OEE. These capabilities include:

- Can track OEE
- Can capture utilization
- Can schedule jobs and can run jobs

The following table shows the capabilities assigned to the entities used in the lab:

Entity Capabilities	Translated Capabilities	Production	Bagger	Bagger_001
Jobs can be scheduled	Schedule Jobs		X	X
Jobs can be run on entity	Run Jobs			X
Utilization can be captured	Downtime			X
Labor can be captured on this entity	Labor			
This entity can transfer part programs	DNC			
Can this entity track OEE	OEE			X
This entity has its own shift schedule	Shift schedule	X		
Material can be stored at this entity	Inventory			
Data can be logged from this entity	Data logging			

Entity Capabilities	Translated Capabilities	Production	Bagger	Bagger_001
Shipments can be made from this entity	Shipping			
Material can be received from this entity	Receiving			

Section 2 – Shifts and Shift Schedules

This section provides an overview of shifts and shift schedules, and also the impact of shift schedules on the OEE calculations.

Overview

You can use the **Shift and Shift Schedule** module in the **Master Data Config** group to define the shift names and shift schedules for entities. You can create as many shifts as you need for the varied work schedules in your organization.

When you open MES Client and click the **Shift and Shift Schedule** module, the following are displayed in the editor window:

- List of all the existing shifts
- List of the entities for which you can define the shift schedules
- Shift schedules for the selected entities

Note: You can define only one shift schedule for an entity. Shift schedules are inherited by the children entities. You should define a shift for the top parent entity, so that any changes in the parent entity updates the children entities.

Note: You need to create a shift before creating a shift schedule for an entity.

When you open the **Shift and Shift Schedule** module, the **Current View** tab appears on the ribbon. In the **Current View** tab, the following options are available:

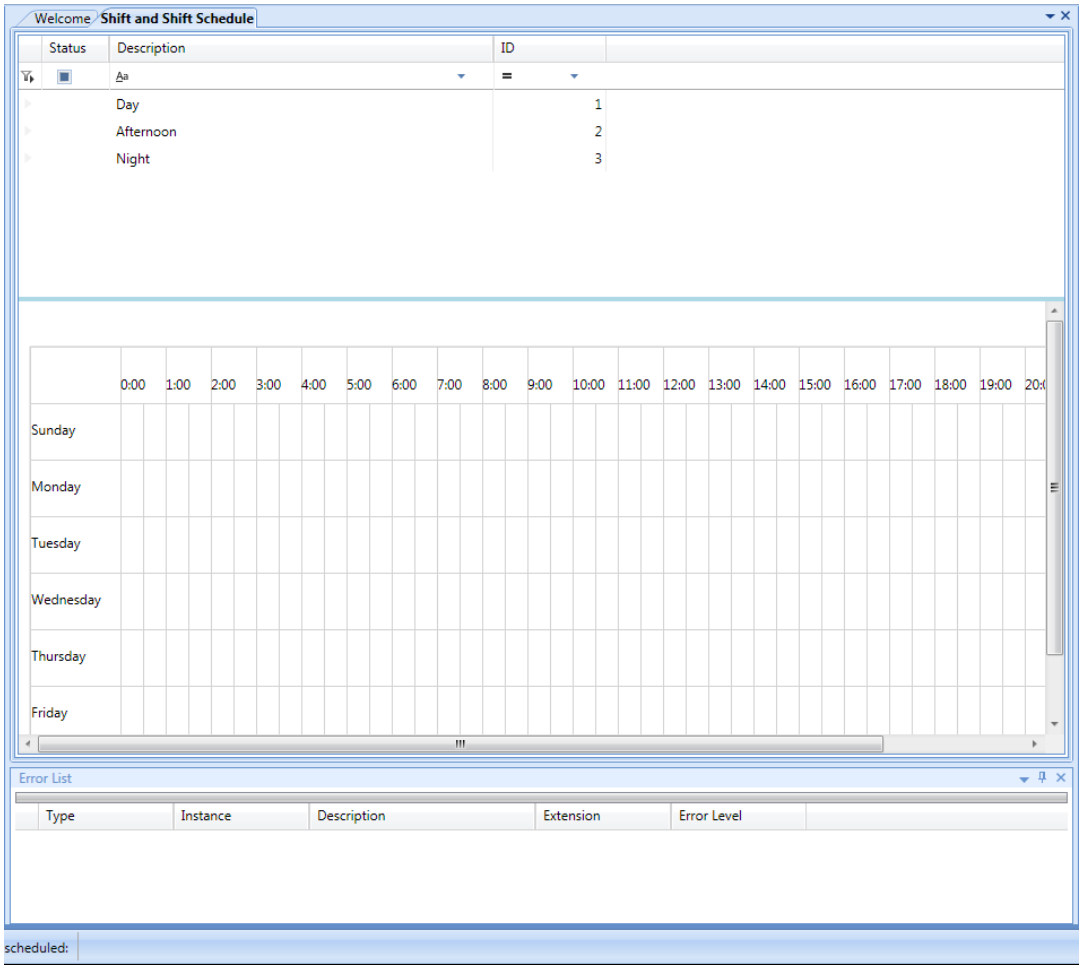
- **Toggle View**, which allows you to change the view of the **Shift Schedule Editor** section between the days of the week and time
- **Zoom**, which allows you to zoom in or zoom out in the **Shift Schedule Editor** section
- **Add Schedule**, which allows you to select an entity to add a shift schedule

Shift

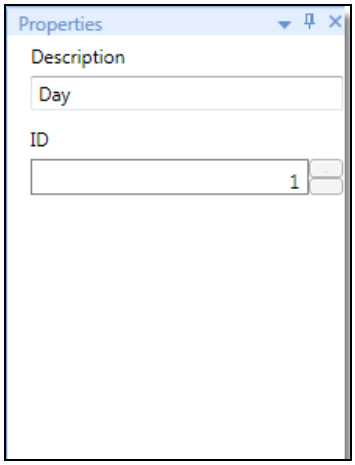
To define the names of the work shifts, you will use MES Client. You can define a number of shifts to customize the organization's work schedule. For example, a conveyor line can be scheduled for two shifts a day, day shift and night shift. A day shift can be scheduled from 7:00 a.m. to 3:00 p.m. and a night shift can be scheduled from 11:00 p.m. to 7:00 a.m.

When you click the **Shift and Shift Schedule** module in the **Navigation Bar**, the editor window displays information about the status, ID, and description of all the existing shifts. By default, the following shifts are already created:

- Day
- Afternoon
- Night



When you open any of these shifts for editing, the **Properties** pane displays the shift details.

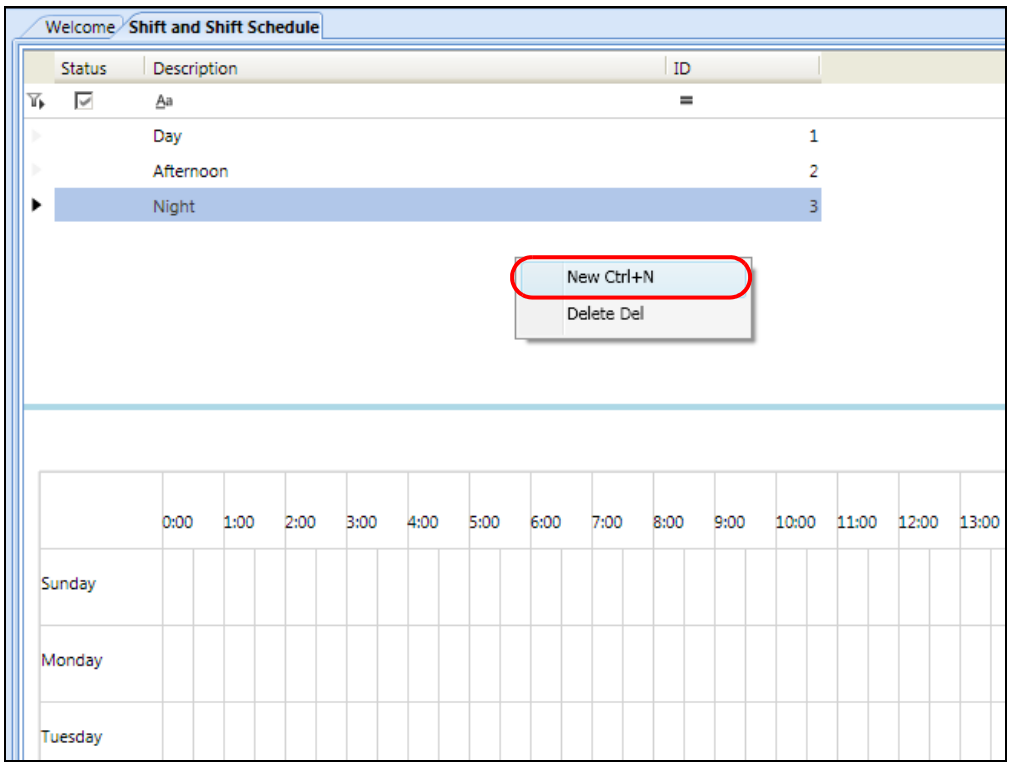


The first field corresponds to the shift description (a name associated with a shift) and the second numeric field corresponds to the shift ID (an integer that uniquely identifies a shift). When creating a new shift, you can enter a value for the shift ID, but cannot edit the shift ID value later.

Create Shifts

You create a shift in the MES Client **Shift and Shift Schedule** editor window by right-clicking in the empty workspace and selecting **New**.

Note: You can also create a shift on the ribbon.



You then enter the description and ID for the new shift in the **Properties** pane before saving the shift. The shift ID must be a unique positive integer.

You also edit shifts in the **Properties** pane by changing the description.

Create Shift Schedule

You create a shift schedule in the bottom portion of the MES Client **Shift and Shift Schedule** editor window. You specify the start and end times of a shift for each day, and include breaks. A shift schedule defined in an entity cascades down to its child entities until a different schedule is defined for a child entity.

Lab 8 – Configuring Shift Schedules

Introduction

In this lab, you will create and configure shift schedules in MES Client to be used for calculating OEE.

Objective

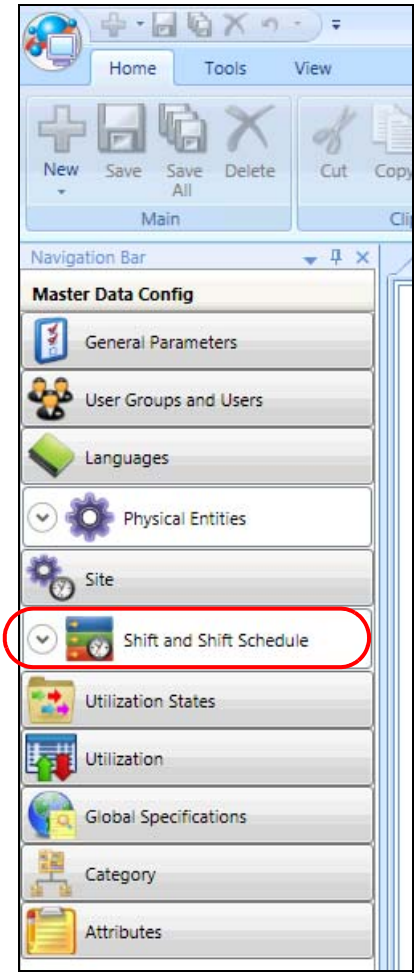
Upon completion of this lab, you will be able to:

- Create and configure shift schedules
- Associate shift schedules with specific entities

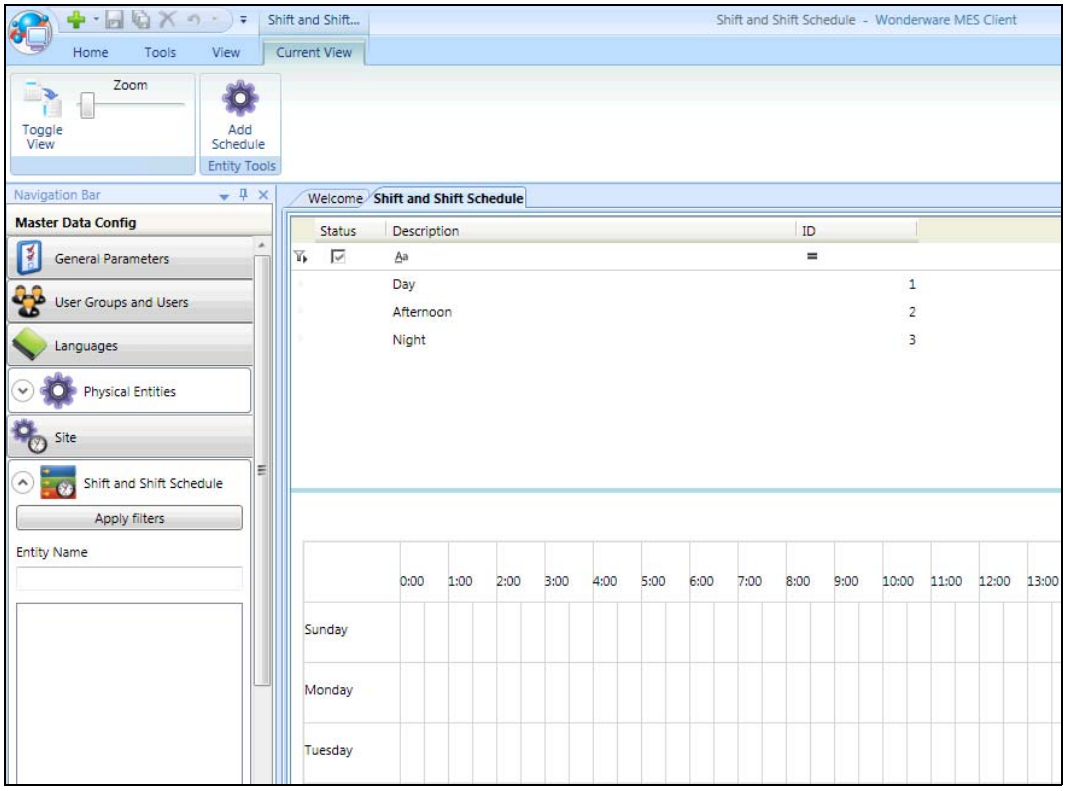
Configure Shift Schedules

First, you will configure shift schedules in MES Client.

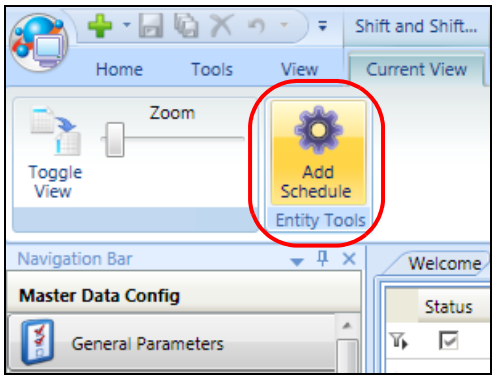
1. In MES Client, in the **Navigation Bar**, in the **Master Data Config** group, click **Shift and Shift Schedule**.



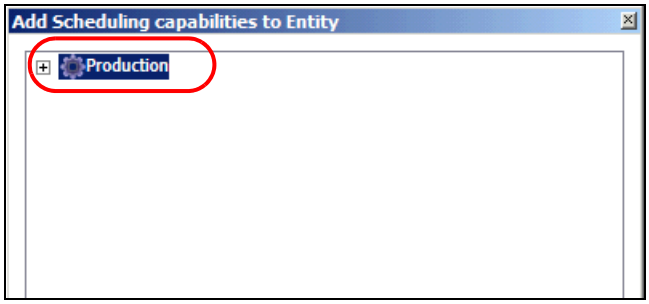
The **Shift and Shift Schedule** editor window appears.



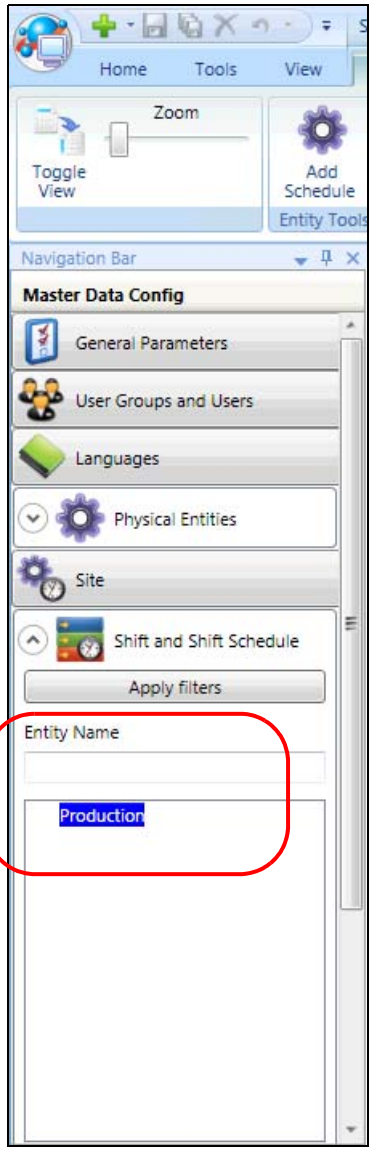
2. On the ribbon bar, **Current View** tab, click the **Add Schedule** button.



3. In the **Add Scheduling capabilities to Entity** dialog box, select the **Production** entity and click **OK**.

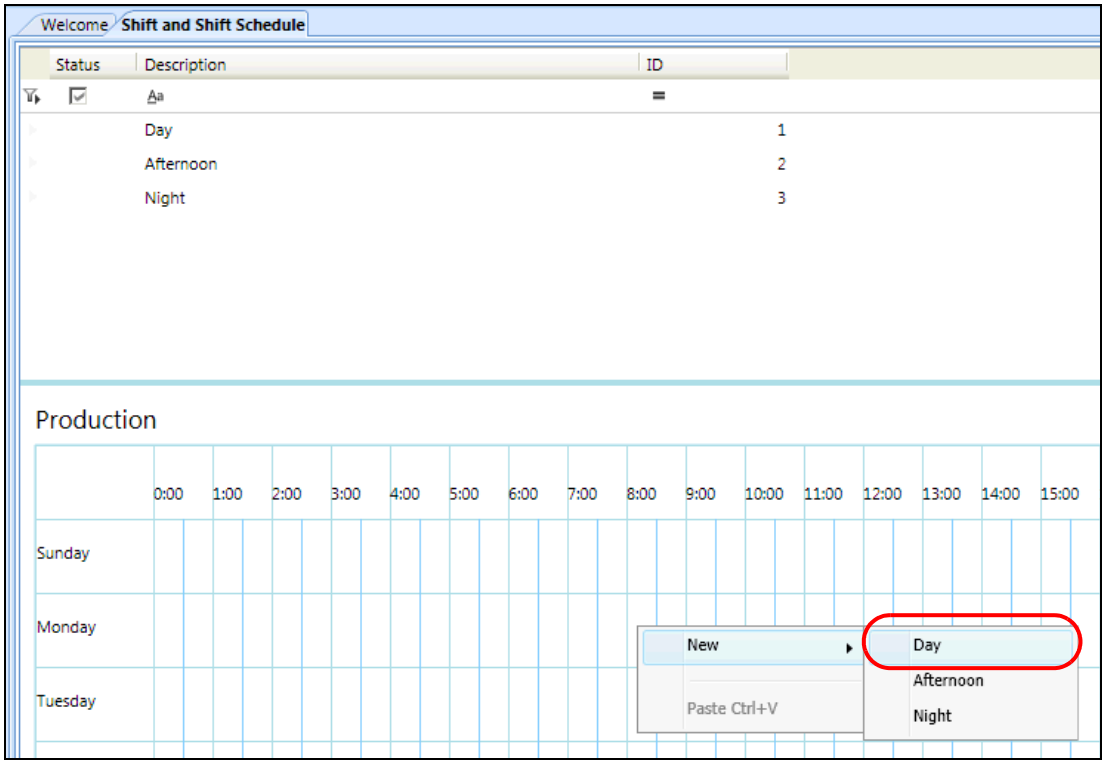


The **Production** entity now appears in the **Shift and Shift Schedule** module, in the **Entity Name** box, and is selected by default.

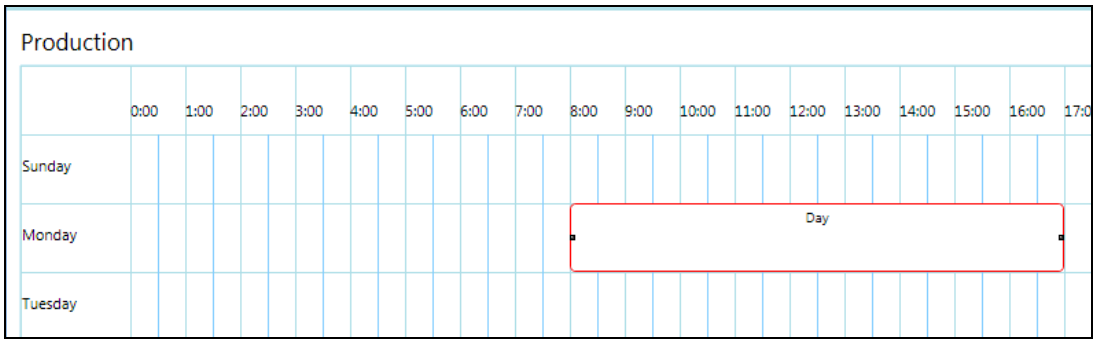


Defining a shift schedule at the **Production** level causes the defined shift schedule to cascade to all lower entities.

4. In the **Shift and Shift Schedule** chart, on the **Monday** row, right-click the **8:00** column and select **New | Day**.



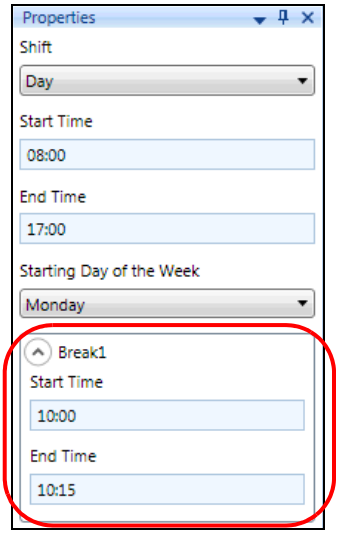
5. Expand the **Day** shift to cover **08:00** to **17:00**.



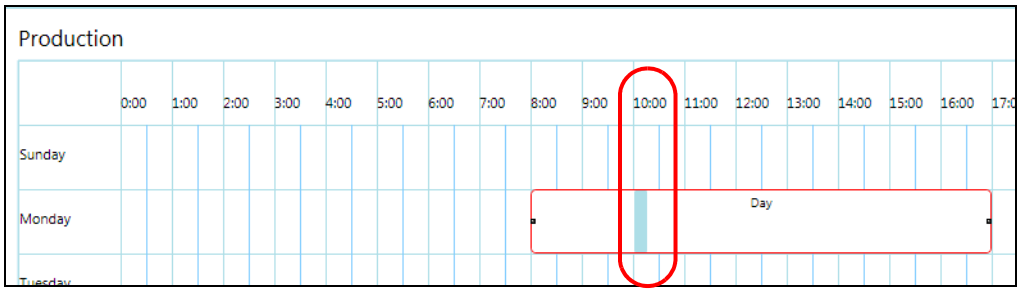
Add Breaks

Next, you will continue to configure the shift schedule by adding breaks.

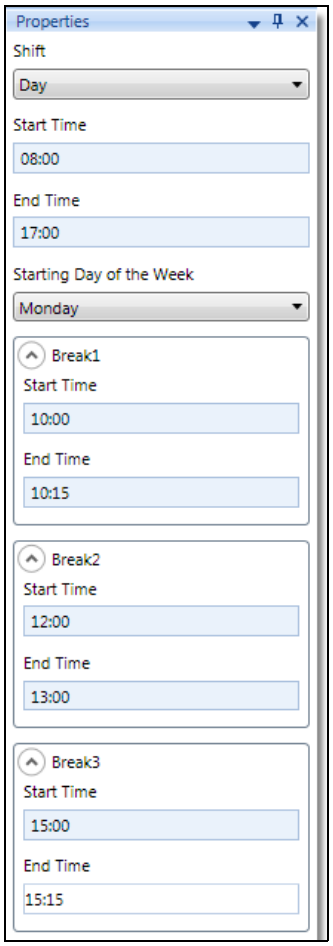
6. In the **Properties** pane, use the **Break1** fields to add a 15-minute break with a **Start Time** of **10:00** and **End Time** of **10:15**.



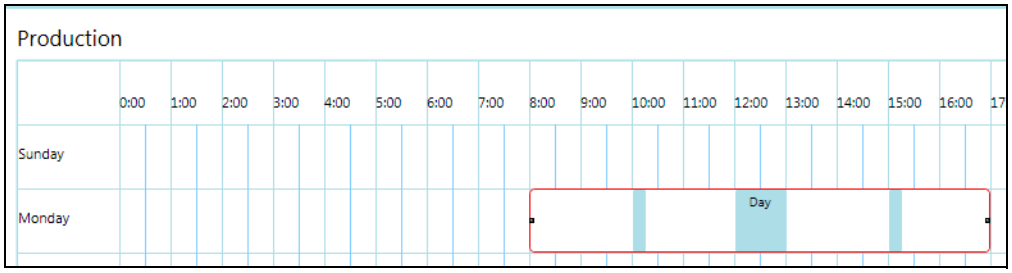
Notice that the **Production** schedule chart shows a break from 10:00 to 10:15.



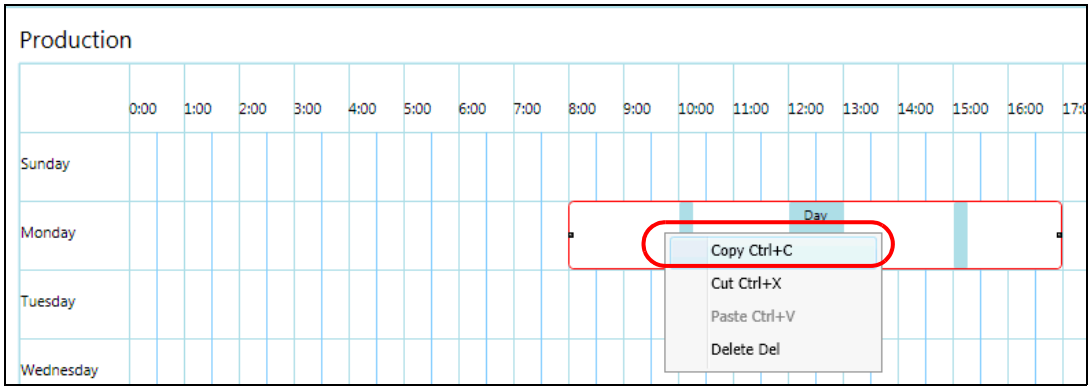
7. In the **Properties** pane, in the **Break 2** fields, add 1 hour for lunch at **12:00**.
8. In the **Properties** pane, in the **Break 3** fields, add a 15-minute break at **15:00**.



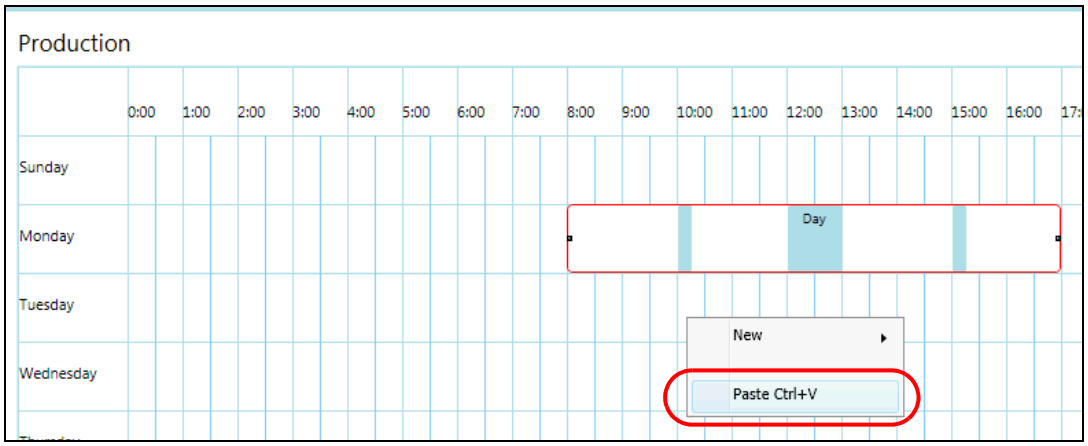
Notice that the **Production** schedule chart shows all three breaks that are defined for the shift.



9. On the shift schedule chart, right-click the block created for **Monday** and select **Copy**.

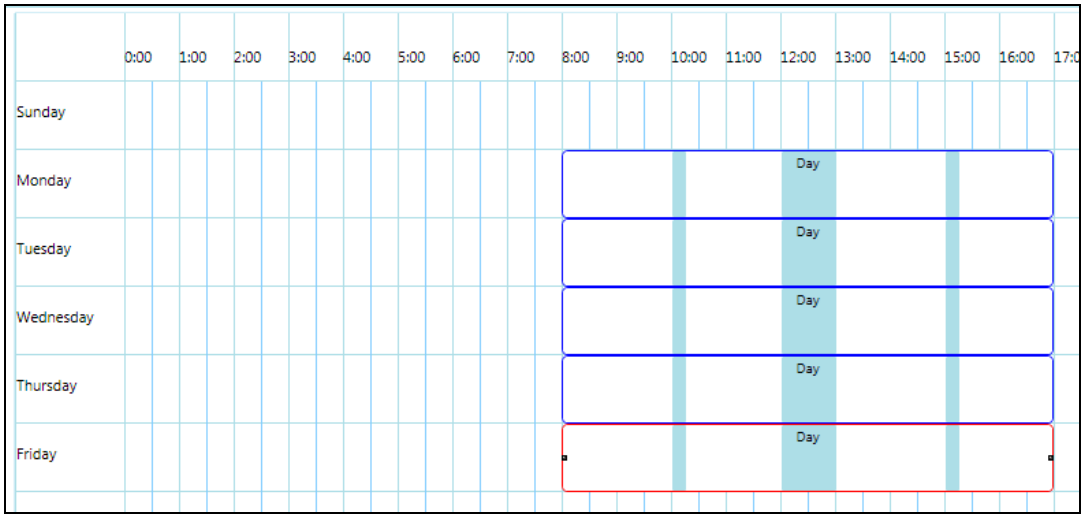


10. Right-click the row for **Tuesday** and select **Paste**.



11. Repeat the previous step for **Wednesday**, **Thursday**, and **Friday**.

    Your shift schedule chart now appears as follows:



12. Save all configurations and close the **Shift and Shift Schedule** tab.

Section 3 – UCO and OCO Configuration for OEE Calculation

This section provides an overview of the production attributes and the production counters and their effect on OEE calculations.

Production Counters in OCO

The following table shows the key attributes for production counters configured in the OCO.

Attribute Name	Data Type	Comment
AbsCounterAttributes		
AddProdQtyAbs	Double	Absolute Count Input
AddProdQtyCmd	Boolean	Absolute Count Submit
Incremental Counter Attributes		
AddProdQtyCounter	Double	Incremental Count Input
AddProdQtyCounter.UpdateInterval	Elapsed Time	Incremental Update Interval
AddProdQtyCounter.Deadband	Double	Deadband for Cntr
AddProdQtyCounter.MaxValue	Double	Rollover Value for Cntr
Shared Attributes		
ErrorCode	Integer	Error Code (Enumeration)
ErrorMessage	String	Error Code (Message)
Production Reason	Integer	Product Item Reason

Target Attributes from UCO

The following table shows the key attributes used in calculating performance.

Attribute Name	Data Type	Comment
TargetJobProdRate	Double	Desired Production Rate
TargetJobProdRateUoM	String	CustomEnum Desired Production Rate Unit of Measure

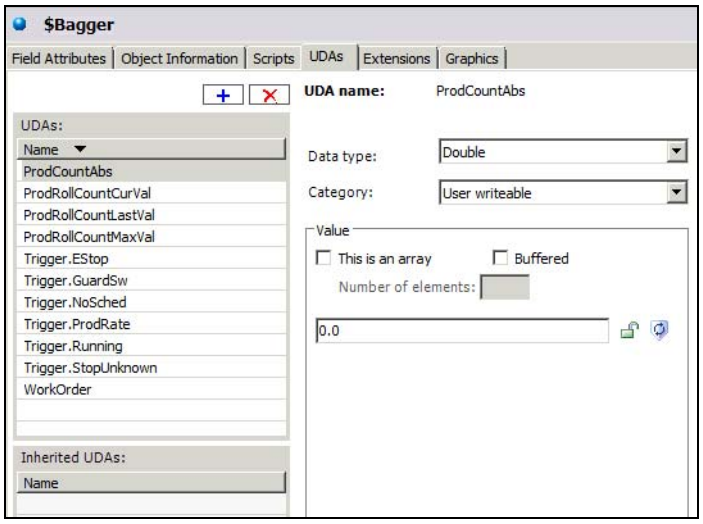
Production Attributes

The following table shows a list of production attributes in the UCO.

UDA	Data Type
Work Order	String
Item Class	String
Item	String
Item Unit of Measure	String
Operation	String
Required Quantity	Double
Start Quantity	Double
Batch Size	Double
Target Job Production Rate	Double

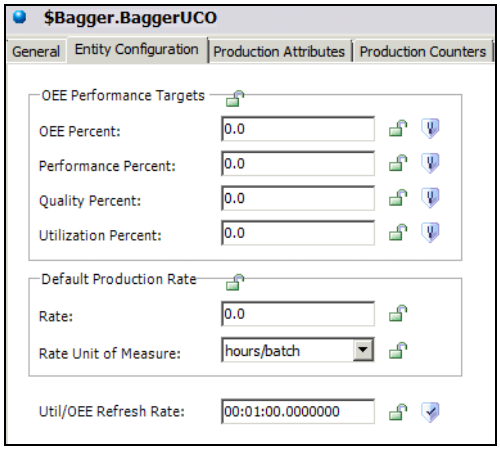
UDA	Data Type
Target Job Production Rate Unit of Measure	CustomEnum
Operator	String

Note: BatchSize cannot be zero or a job will not start.



Entity Configuration Tab

The **Entity Configuration** tab configures the performance targets and default production rates for the jobs.



OEE Percent

Provide the OEE target value, used for display and reference only.

Performance Percent

Provide the Performance target value, used for display and reference only.

Quality Percent

Provide the Quality target value, used for display and reference only.

Utilization Percent

Provide the downtime target value, used for display and reference only.

Default Production Rate

The default production rate is only used when a production rate is not provided for the job. The production rate is used in calculating Performance.

Production Rate Unit of Measure

The production rate unit of measure, in conjunction with the production rate is used, in calculating the utilization and performance for the associated entity in the MES.

Util/OEE Refresh Rate

Set the rate at which the utilization and OEE data will be refreshed. The minimum value is 15 seconds.

Production Attributes

For the production attributes, a **Work Order** and **Batch Size** are required for a job to start; others are optional.

Production Attributes Tab

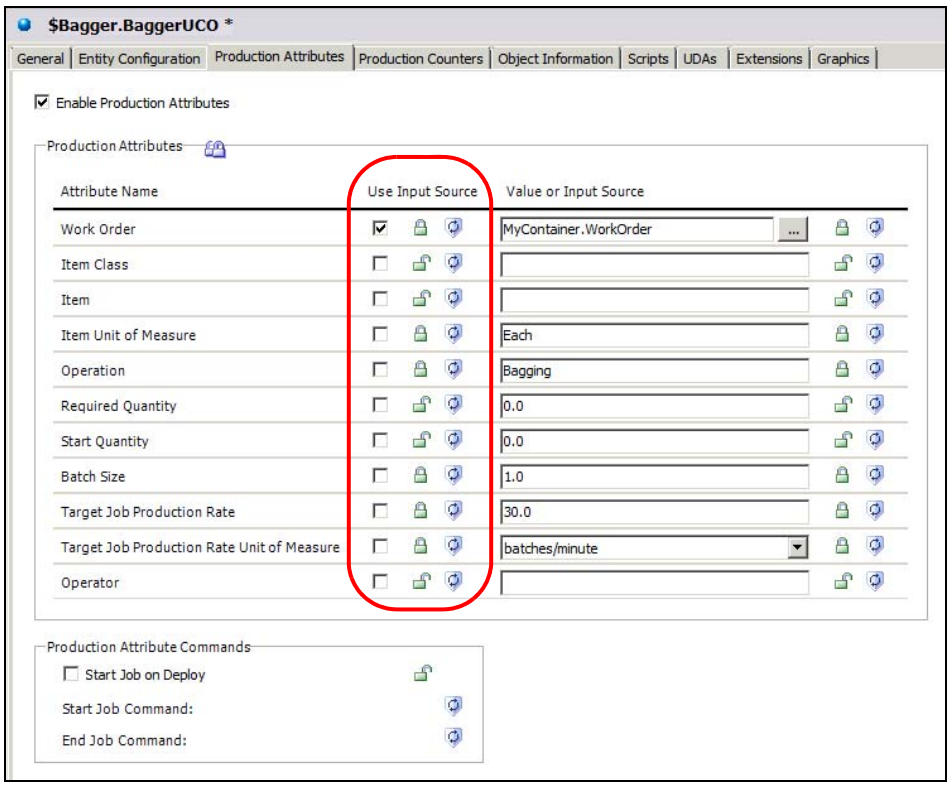
Some of the attributes on this tab are required for a job to start, and others are optional.

Enable Production Attributes

Enabling of the production attributes allows you to configure the attributes to be associated with the MES entity for which the UCO is being configured. Once enabled, you can use those attributes and specify their input source.

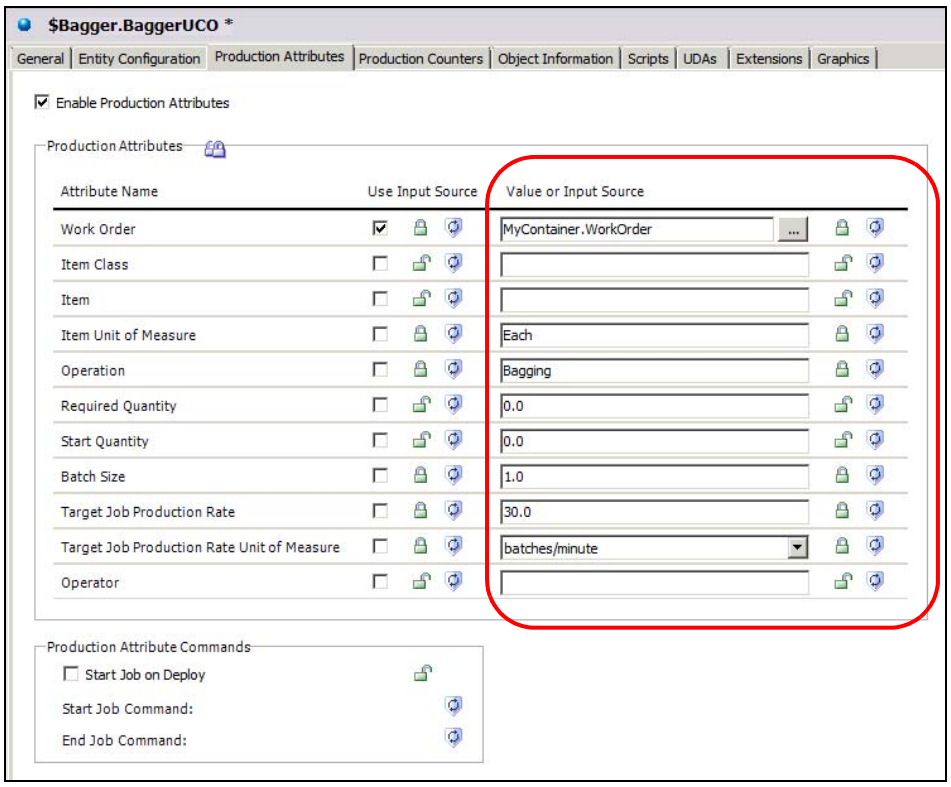
Specify Attribute Input Source

Once you have enabled the use of production attributes, you will select the attribute input source for each production attribute.



Specify Input Source or Value

If you want to pull the input source value from another attribute at runtime, you will need to provide an attribute reference in the **Input Source** field.

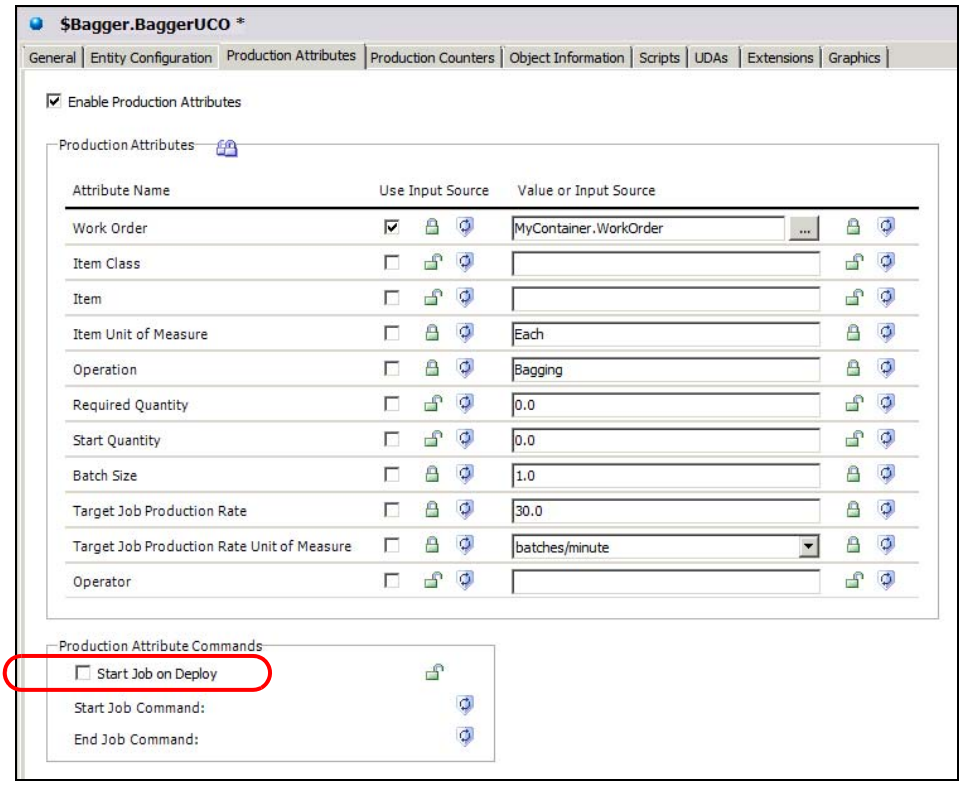


Note: If the **Use Input Source** option is not checked, the value in the **Value or Input Source** field will be treated as constant.

Configure to Start on Deploy

With this option checked, the UCO object will automatically start the current job after deployment. This attribute (ProdAttrs.StartJobOnDeploy) can only be set at the time of configuration.

By default, the option is not selected (false).



Set Product Attribute Start/End Command Security

There are two product attribute triggers that can be used to start a job (ProdAttrs.StartJobCmd) and end the jobs that are currently running on the entity (ProdAttrs.EndJobCmd).

These triggers have security settings that can be set at the time of configuration.

OCO Production Counters

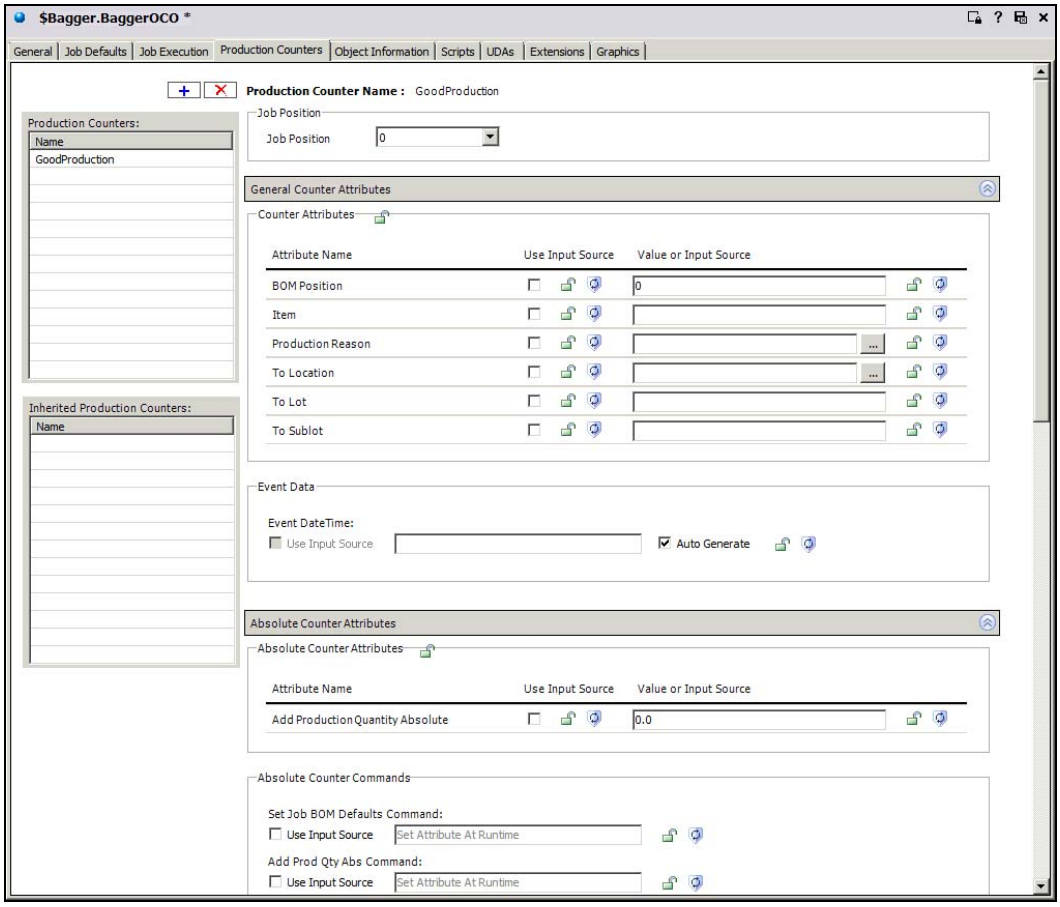
The production counters are configured on the **Production Counters** tab.

Production Counters Tab

The **Production Counters** tab allows you to create new production counters, or modify or delete existing production counters.

On the **Production Counters** tab, you can configure:

- General counter attributes
- Absolute counter attributes
- Rolling counter attributes
- Counter extension attributes



Note: When an object instance (child) inherits another object's production counter configuration, the number of counters cannot be modified within that instance (child).

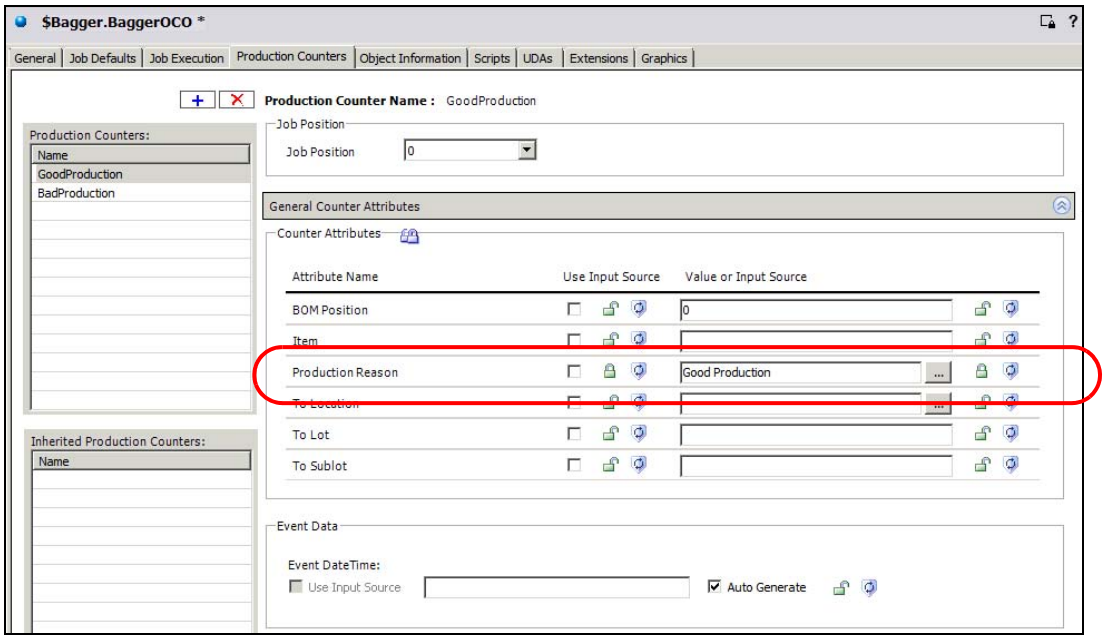
Configure Individual Production Counters

See **Production Counters from OCO** on page 4-29 for details on configuring the production counters.

Select a Production Reason for Each Counter

Once you have your production counters listed, you must select a production reason for each counter by selecting the ellipsis button on the right and selecting an appropriate reason from the configured **Product Reason** list.

Note: We will not add and configure product reasons, but use the default **Product Reason** in MES.



Note: To select a production reason, you must be able to communicate with the MESDB through the middleware. If you do not have the middleware loaded on the same node where the OCO is being used, you must install the middleware proxy.

Once a rollover option (cumulative) is enabled, the following attributes are enabled, and must be configured:

- **Update Interval Delay** – Enter a time period, for example, 30 seconds, as the count reading interval for the cumulative counter.
- **Deadband** – Enter an integer as deadband for the cumulative counter.

  Update Interval and **Deadband** serve the same purpose of preventing data logging too often. You may configure either one or both. If both are configured, the logging will only occur when both conditions are met.

  Production from the previous count must be equal to or greater than the **Deadband** value before the production count is logged in the MES.
- **Max Value** – Enter an integer value that matches the rollover value of the actual cumulative counter in the production process. This value will specify the maximum value counted by the runtime production counter before rolling it.

Lab 9 – Tracking OEE

Introduction

In this lab, you will first configure the UCO template object for OEE performance targets and production attributes. Then, you will configure the production counters in the OCO template.

Objectives

Upon completion of this lab, you will be able to:

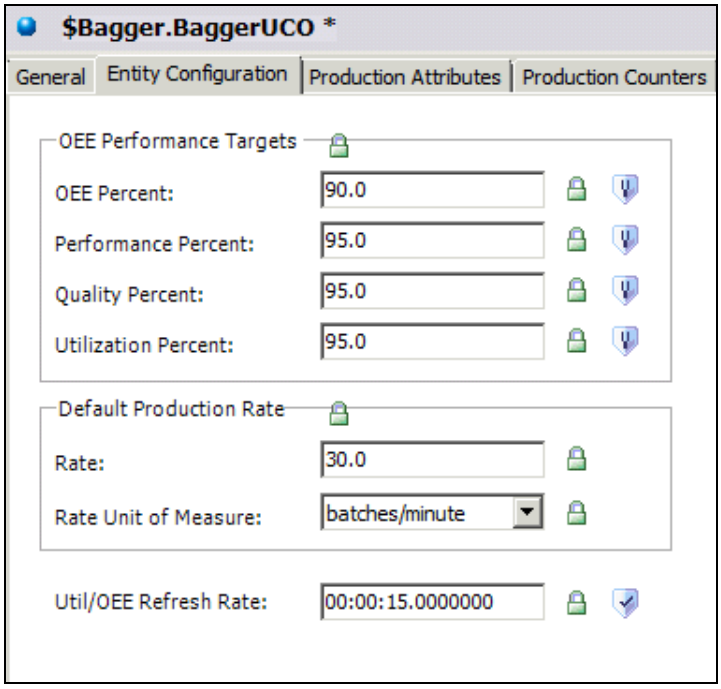
- Configure the UCO object to manage job attributes
- Configure the OCO object to collect both good and bad product counts

Configure OEE Performance Targets

First, you will configure the performance targets according to the process and production design.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **$Bagger.BaggerUCO**.
2. Configure the **Entity Configuration** tab as follows:

OEE Performance Targets	*locked*
OEE Percent:	90.0
Performance Percent:	95.0
Quality Percent:	95.0
Utilization Percent:	95.0
Default Production Rate	*locked*
Rate:	30.0
Rate Unit of Measure:	batches/minute
Util/OEE Refresh Rate:	00:00:15.0000000 and *locked*



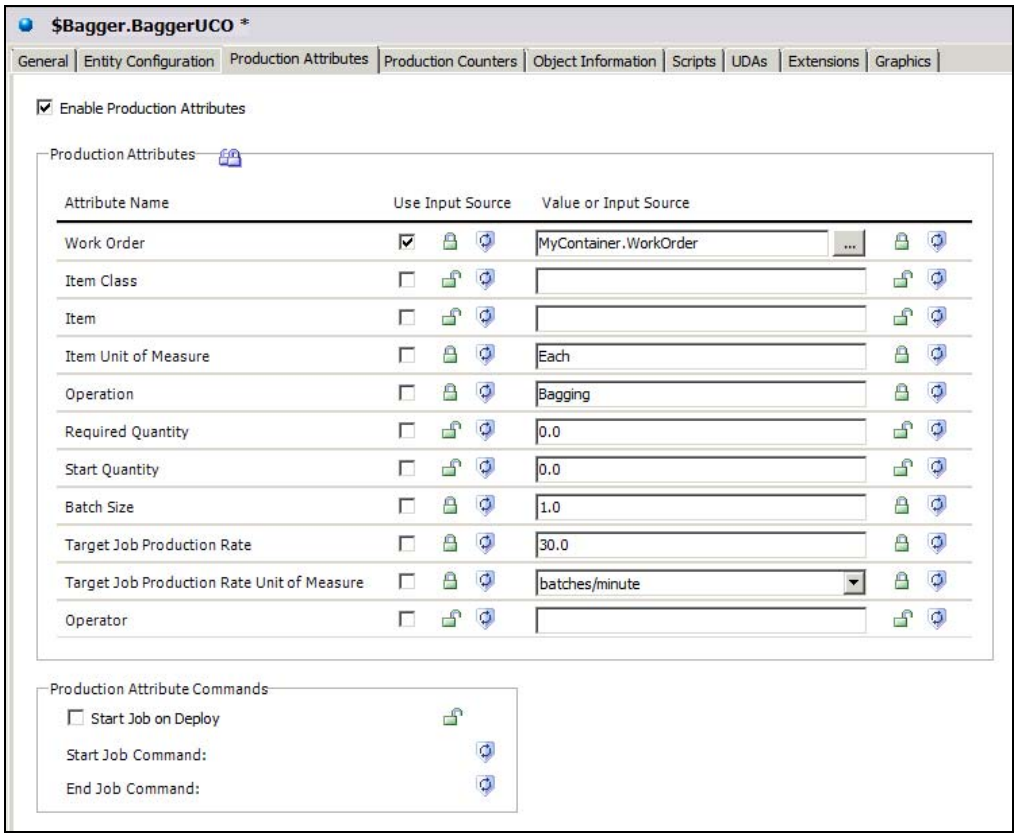
Note: The values of the **OEE Performance Targets** are for reference only. They do not affect the current OEE calculations.

Configure the UCO Production Attributes

Next, you will configure the production attributes of the **BaggerUCO** object to enable the start and stop of a work order.

3. On the **Production Attributes** tab, check the **Enable Production Attributes** check box.
4. Configure the listed attributes as follows:

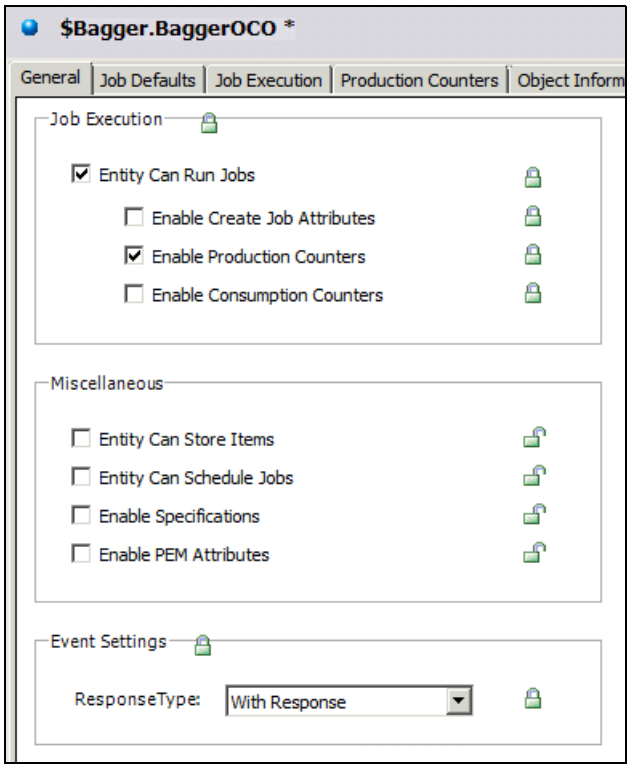
Attribute Name	Use Input Source	Value or Input Source
Work Order	*checked* and *locked*	MyContainer.WorkOrder *(default)* and *locked*
Item Unit of Measure	*unchecked* and *locked*	Each and *locked*
Operation	*unchecked* and *locked*	Bagging and *locked*
Batch Size	*unchecked* and *locked*	1.0 *(default)* and *locked*
Target Job Production Rate	*unchecked* and *locked*	30.0 and *locked*
Target Job Production Rate Unit of Measure	*unchecked* and *locked*	batches/minute and *locked*



5. Save and check in **$Bagger.BaggerUCO**.
6. In **Template Toolbox**, double-click **$Bagger.BaggerOCO**.

7. On the **General** tab, configure the listed options as follows:

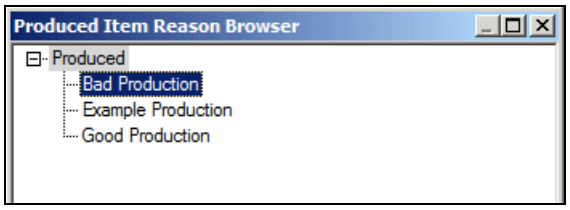
Job Execution	*locked*
Entity Can Run Jobs:	*checked*
Enable Production Counters:	*checked*
Event Settings	
ResponseType:	With Response *(default)* and *locked*



8. On the **Production Counters** tab, click the **Add** button and enter **GoodProduction**.
9. Repeat Step 8 to add another production counter called **BadProduction**.

10. In the **Production Counters** list, select **GoodProduction**.
11. In the **General Counter Attributes** group, click the **Production Reason** ellipsis button.

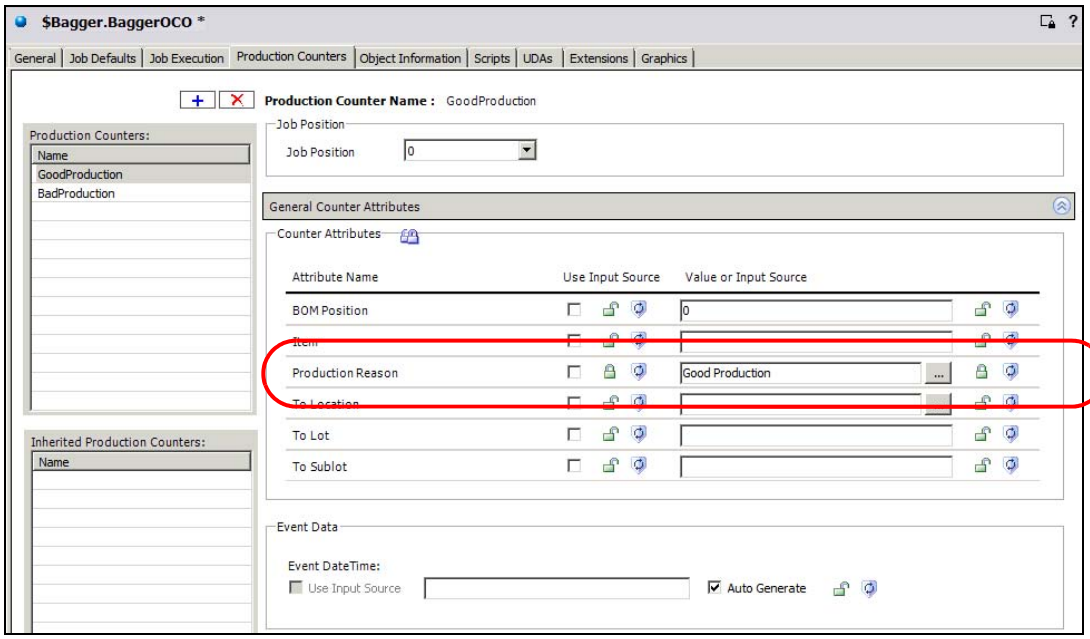
    The **Produced Item Reason Browser** window appears.



12. In the **Produced Item Reason Browser** list, select **Good Production** and click **OK**.

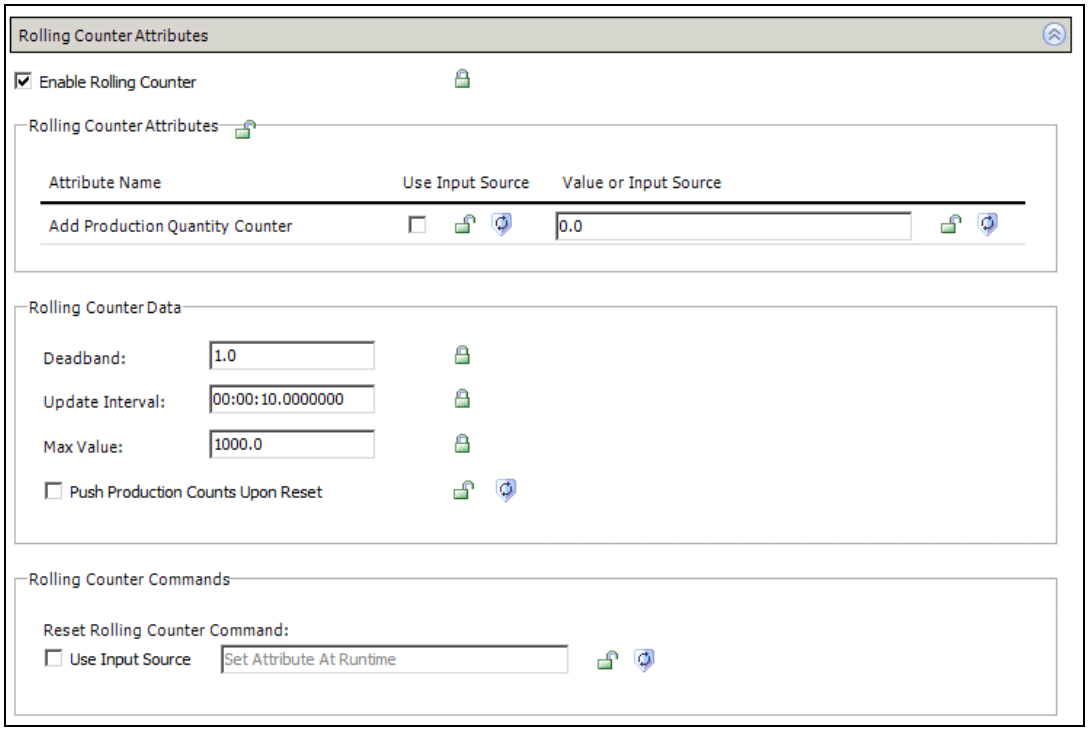
    Good Production is added to the **Value or Input Source** field.

13. Lock the **Production Reason**, **Use Input Source** attribute, and then lock the **Good Production** value.



14. Scroll down and in the **Rolling Counter Attributes** area, check **Enable Rolling Counter** and lock it.
15. Configure the **Rolling Counter Data** area as follows:

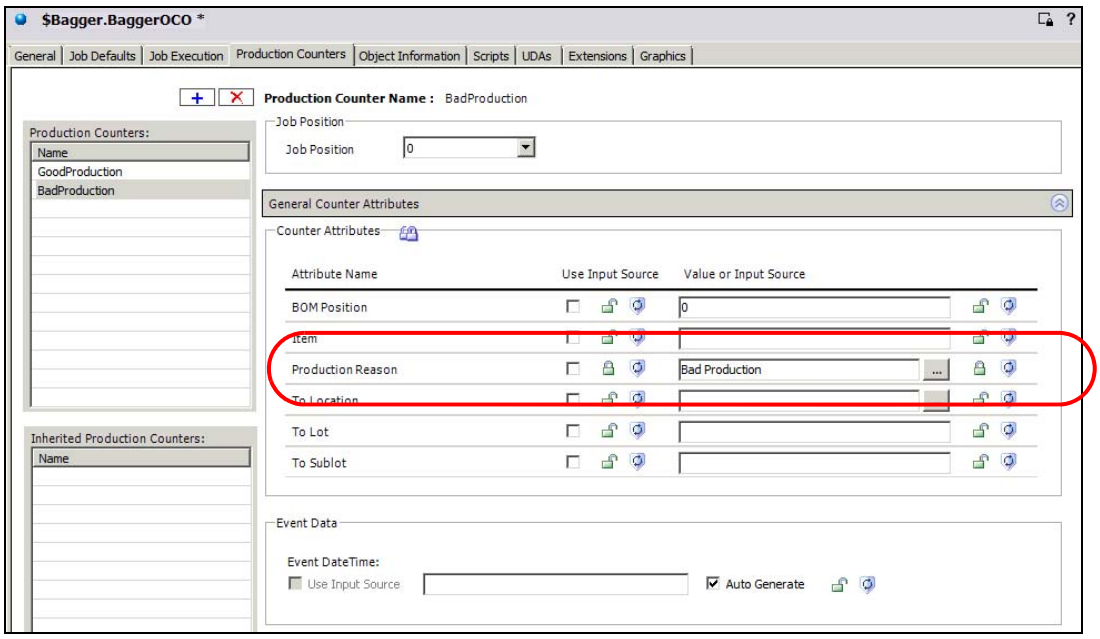
Deadband:	1.0 *(default)* and *locked*
Update Interval:	00:00:10:0000000 and *locked*
Max Value:	1000.0 and *locked*



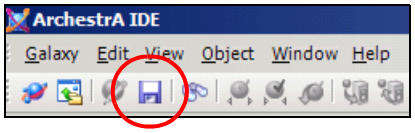
16. In the **Production Counters** list, select **BadProduction**.
17. In the **General Counter Attributes** group, click the **Production Reason** ellipsis button.

    The **Produced Item Reason Browser** window appears.
18. In the **Produced Item Reason Browser** list, select **Bad Production** and click **OK**.

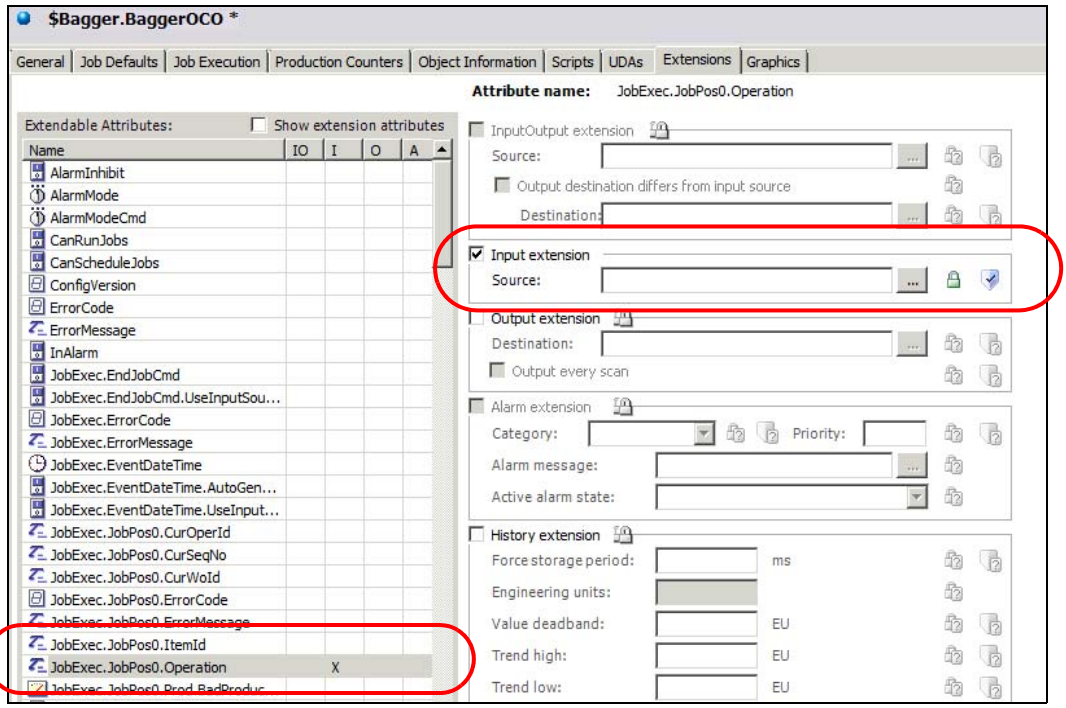
    Bad Production is added to the **Value or Input Source** field.
19. Lock the **Production Reason**, **Use Input Source** attribute, and then lock the **Bad Production** value.



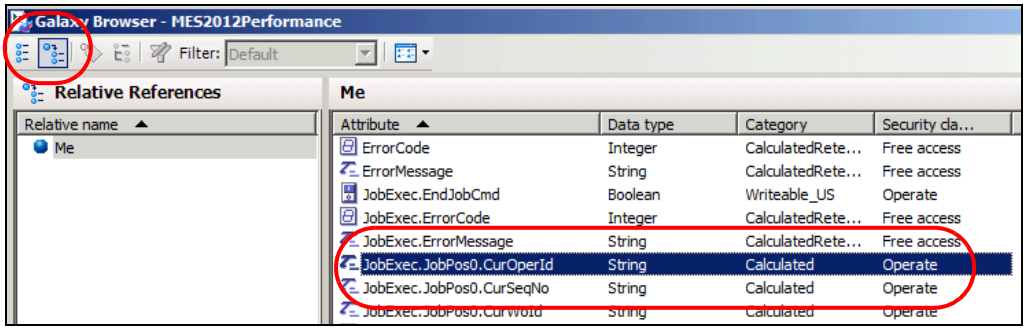
20. On the ArchestrA IDE toolbar, click the **Save** button.



21. On the **Extensions** tab, in **Extendable Attributes**, select **JobExec.JobPos0.Operation**.
22. Check and lock **Input extension**, and then click the ellipsis button.

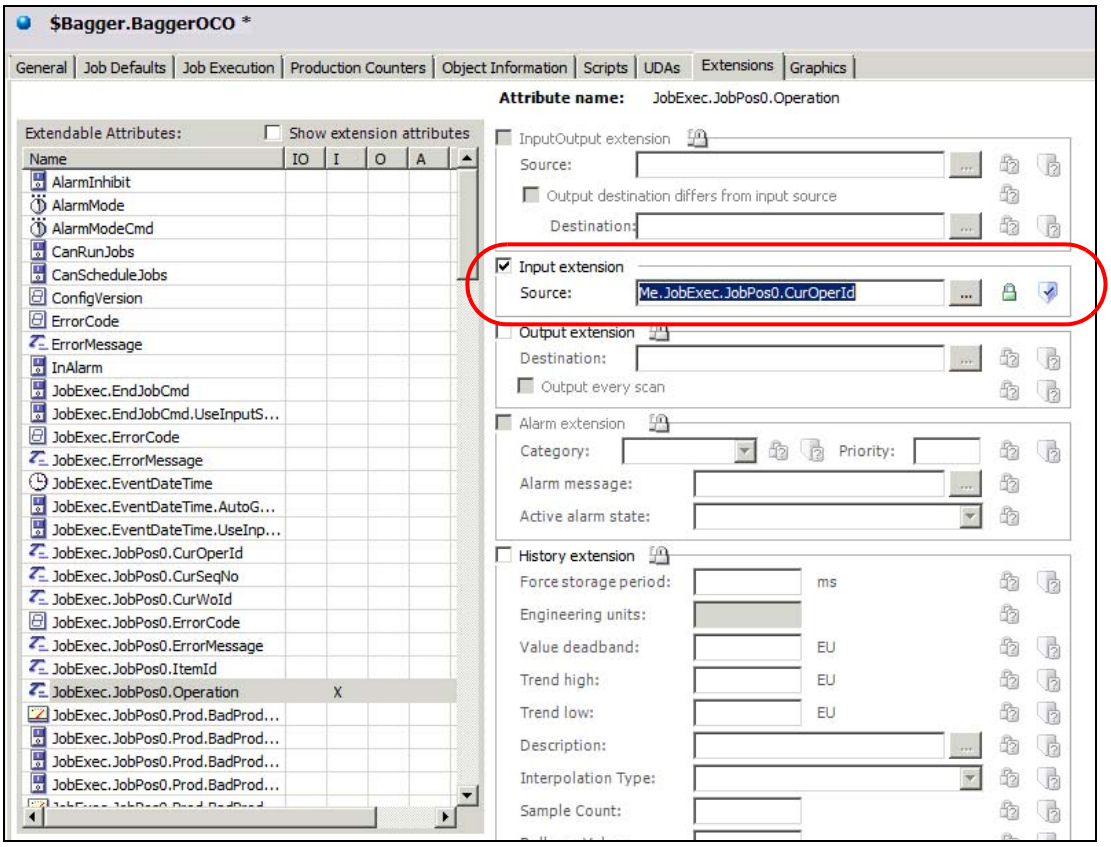


23. In the **Galaxy Browser**, click the second button from the left, **Relative References**.
24. In the **Relative name** pane, click **Me**.
25. In the right **Me** pane, select **JobExec.JobPos0.CurOperId**.



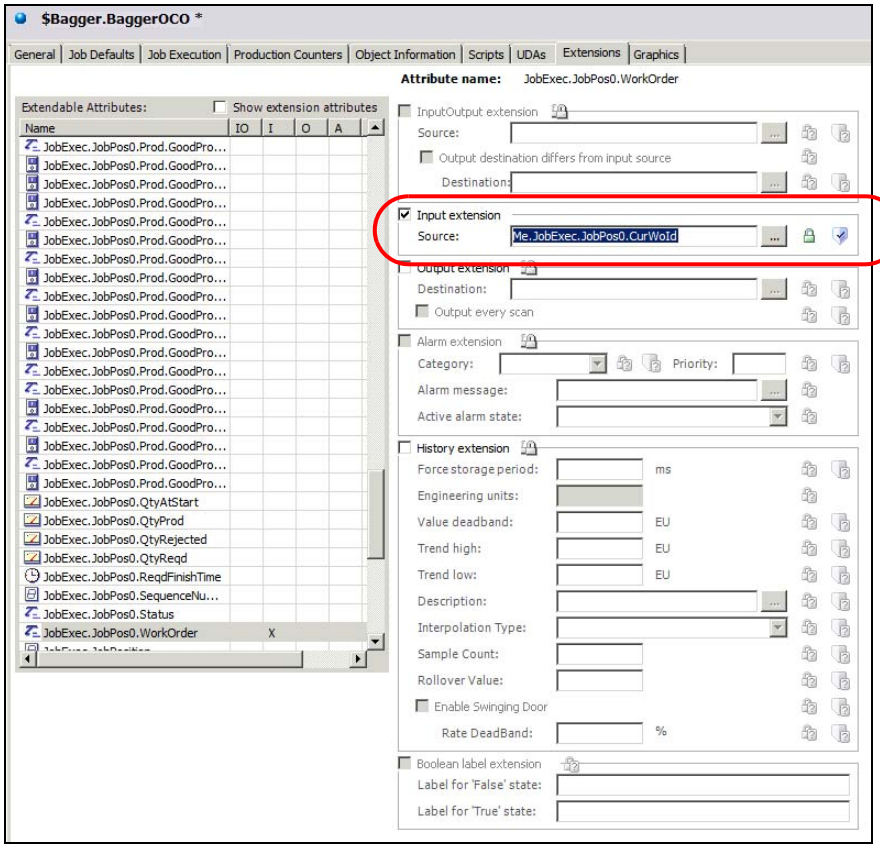
26. Click **OK**.

    The extension is added to **Input extension** in the **Source** field.



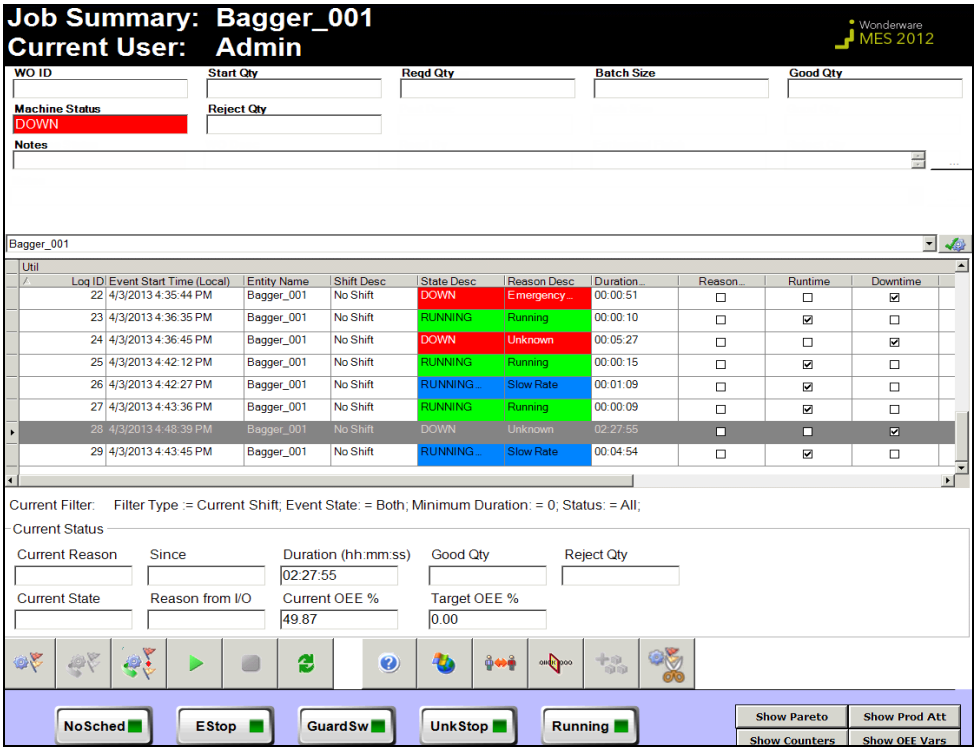
27. In **Extendable Attributes**, scroll down and select **JobExec.JobPos0.WorkOrder**.
28. Check and lock **Input extension**, and then click the ellipsis button.
29. In the **Galaxy Browser**, click **Relative References**.
30. In the right **Me** pane, select **JobExec.JobPos0.CurWoId** and click **OK**.

    The extension is added to **Input extension** in the **Source** field.



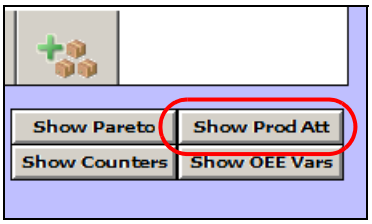
31. Save and check in the object.
32. Rebuild the entity model from the **Production** area.
33. Deploy both **BaggerUCO_001** and **BaggerOCO_001** instances.

34. In WindowViewer, open the **OEEUtil Main** window, if needed.



35. Turn off the **Running** button if it is on.

36. In the bottom-right corner of the window, click the **Show Prod Att** button.

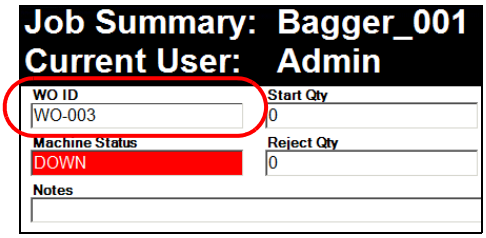


The **Production Attributes** window appears.

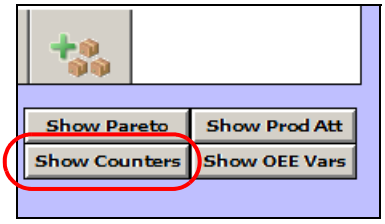
37. In the **WorkOrder** field, enter **WO-003** and press **Enter**.

38. Click the **Start Job** button.

    Notice that the **WO ID** changes to **WO-003**.

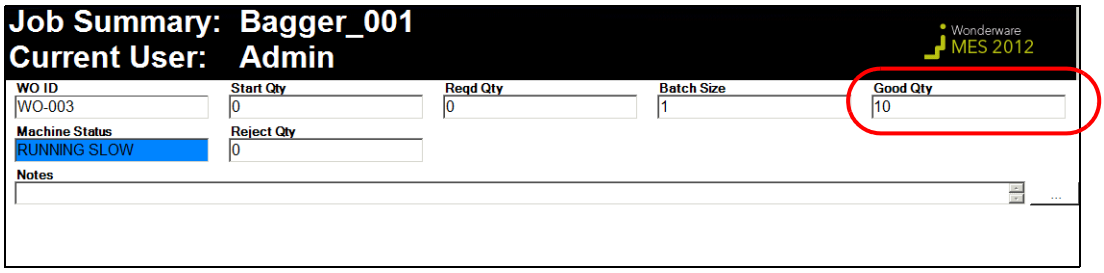


39. Leave the **Production Attributes** window open.
40. In the bottom-right portion of the window, click **Running** and ensure that all other buttons are off.
41. Verify that the **Machine Status** changes to **RUNNING**.
42. Click the **Show Counters** button.

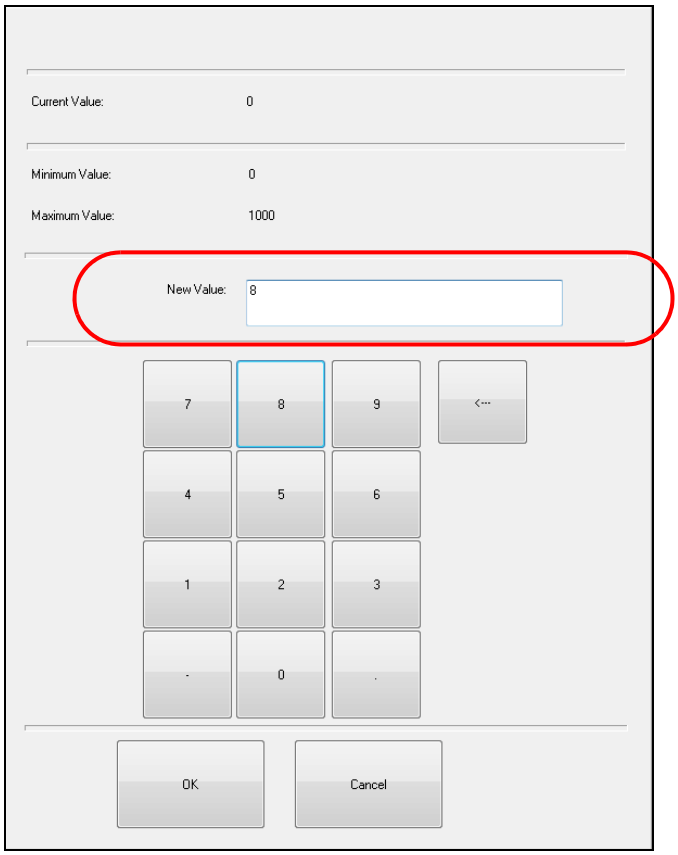


The **Counters** window appears.

43. Under **Good**, click the **Manual Add** button several times to increase the **Good** count to **10**.
44. Wait until the number in the **Job Summary**, **Good Qty** field updates.

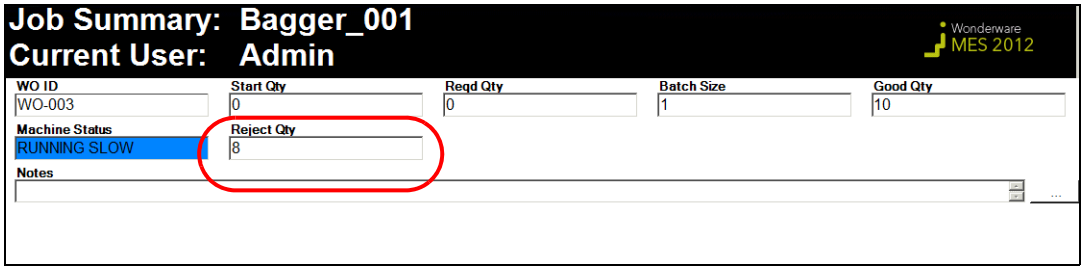


45. In the **Counters** window, click the number under **Bad**.
46. In the **New Value** field, enter **8**.



47. Click **OK**.
48. Click the **Commit Bad Count** button.

    Notice that **Reject Qty** has changed.



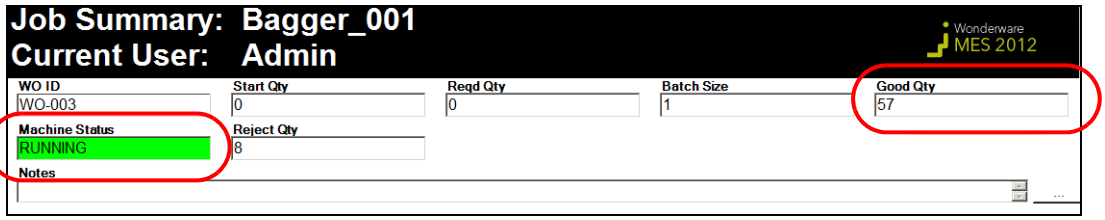
49. Under **Enable/Disable Auto Counter**, click the green button with **I** to turn on **AutoCount**.

50. Under **Bags Per Minute**, select **30**.

    The **Good** number in the **Counters** window increases at 30 per minute.

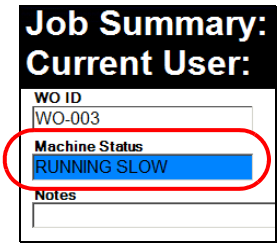
51. Verify that **Good Qty** is also increasing.

52. If the **Machine Status** is **Running Slow**, wait approximately 2 minutes and verify that the **Machine Status** changes to **Running**.



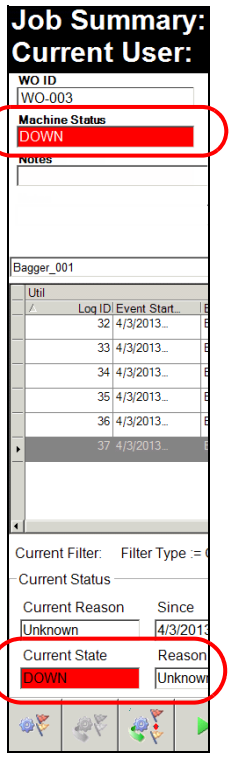
53. Under **Bags Per Minute**, select **15**.

54. Wait approximately 2 minutes and verify that the **Machine Status** changes to **RUNNING SLOW**.



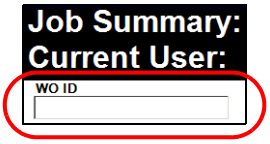
55. Hide the **Counters** window.

56. Turn off **Running**.
57. The **Machine Status** changes to **DOWN**. At the bottom-left corner of the window, the **Current State** also changes to **DOWN**.

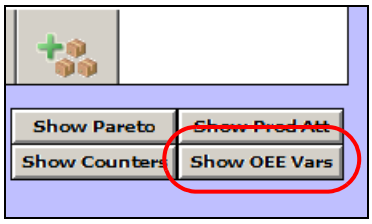


58. In the **Production Attributes** window, click **End Job**.

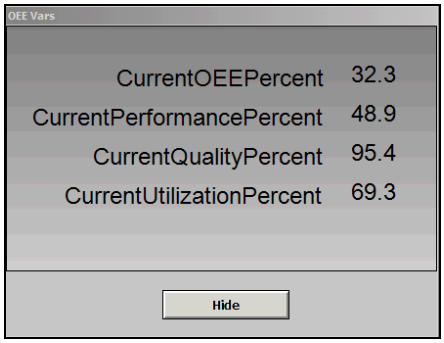
    The **WO ID** field becomes blank.



59. Hide the **Production Attributes** window.
60. Click the **Show OEE Vars** button.



61. Observe the performance.



62. Hide the **OEE Vars** window.
63. Close WindowViewer.
64. Close WindowMaker.

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Learning Services

Module 6 – Visualization

Section 1 – Visualization Overview 6-3

Section 2 – Importing .NET Controls for Performance 6-7

Lab 10 – Using Utilization Controls 6-11

Lab 11 – Using OEE Controls 6-25

Module Objective

- Use .NET client controls for visualization in Wonderware MES Software/Performance

Section 1 – Visualization Overview

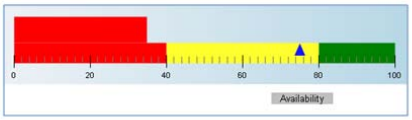
This section describes some of the MES .NET client controls for Wonderware MES Software/ Performance, as well as the basic configuration and settings needed for the controls to function.

Introduction

Using prepackaged MES .NET client controls provides visualization to the MES system for both plant floor operation and operation supervision.

The following describes some of the commonly used controls provided by MES software:

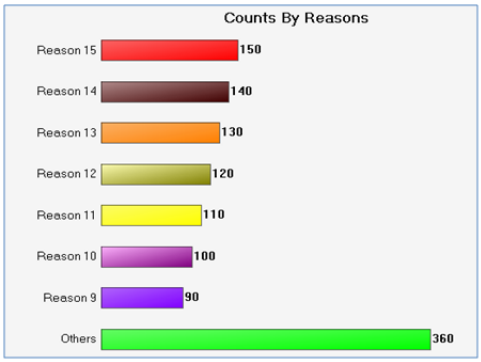
- **OEE KPI Control:** This control shows the actual values of OEE, Quality, Availability, and Performance for an entity. It also shows the associated target values.

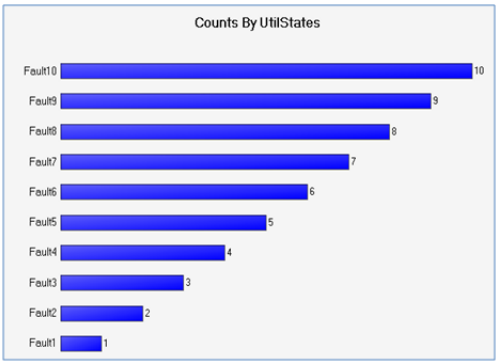


Factelligence	
AppendSaveConfigNa	True
AutoLoginUser	True
AutoLogonEnt	True
ButtonBarName	**ButtonBar1**
Filter	**ThisHour, Hour**
TypeFilter	ThisHour
FilterTime	Hour
FilterDuration	0
FilterStartTime	0
FilterEndTime	0
IgnoreRefreshEvents	False
LoginUserID	
LoginUserPassword	
LogOnEntName	
LogOnSite	
SaveConfigName	

Misc	
Controlstatus	**Normal**
ControlStyle	**BarGraph**
DisplayType	**Availability**
FilterDefaultsFromDB	**False**
FilterEnabled	**False**
FirstZoneColor	**Red**
FirstZoneCutoff	**40**
SecondZoneColor	**Yellow**
SecondZoneCutoff	**80**
TargetValue	**75**
ThirdZoneColor	**Green**

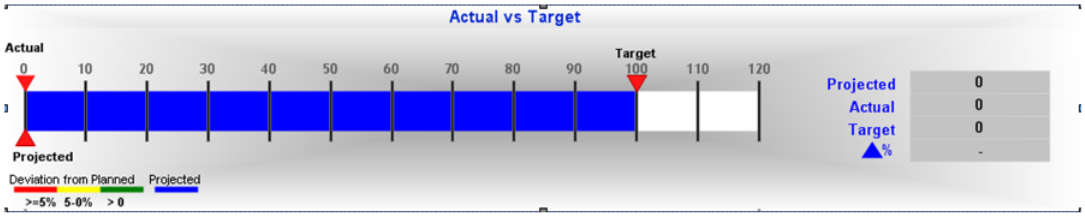
- **Counts/Duration KPI Control:** This control displays a Pareto chart of either the counts or duration of an entity's utilization states, reason groups, or reasons.





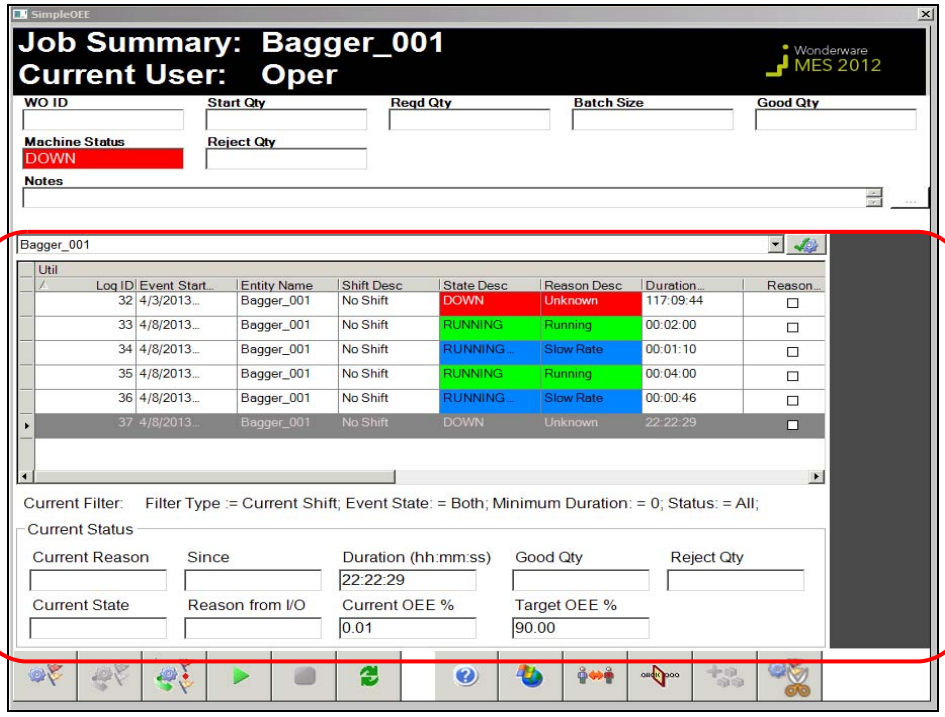
- **Production Progress Control:** This control displays a production's real-time progress towards a preset target for the current shift. The control will not display data if there is no job for the current shift or no shift scheduled for the current time.

  This control also displays the production progress deviation from the target in percent, as well as projected OEE and the production finish time.



Misc	
BatchSize	1
Controlstatus	Normal
DisplayProjectedDetai	True
FirstZoneColor	Red
FirstZonePercent	5
ProjectedProduction	0
SecondZoneColor	Yellow
SecondZonePercent	0
TargetBarColor	Blue
TargetRateFromDB	False
TargetRateUnits	BatchesPerSecond
TargetSelection	TargetQuantity
TargetSelectionValue	0
TargetUnreachable	False
ThirdZoneColor	Green

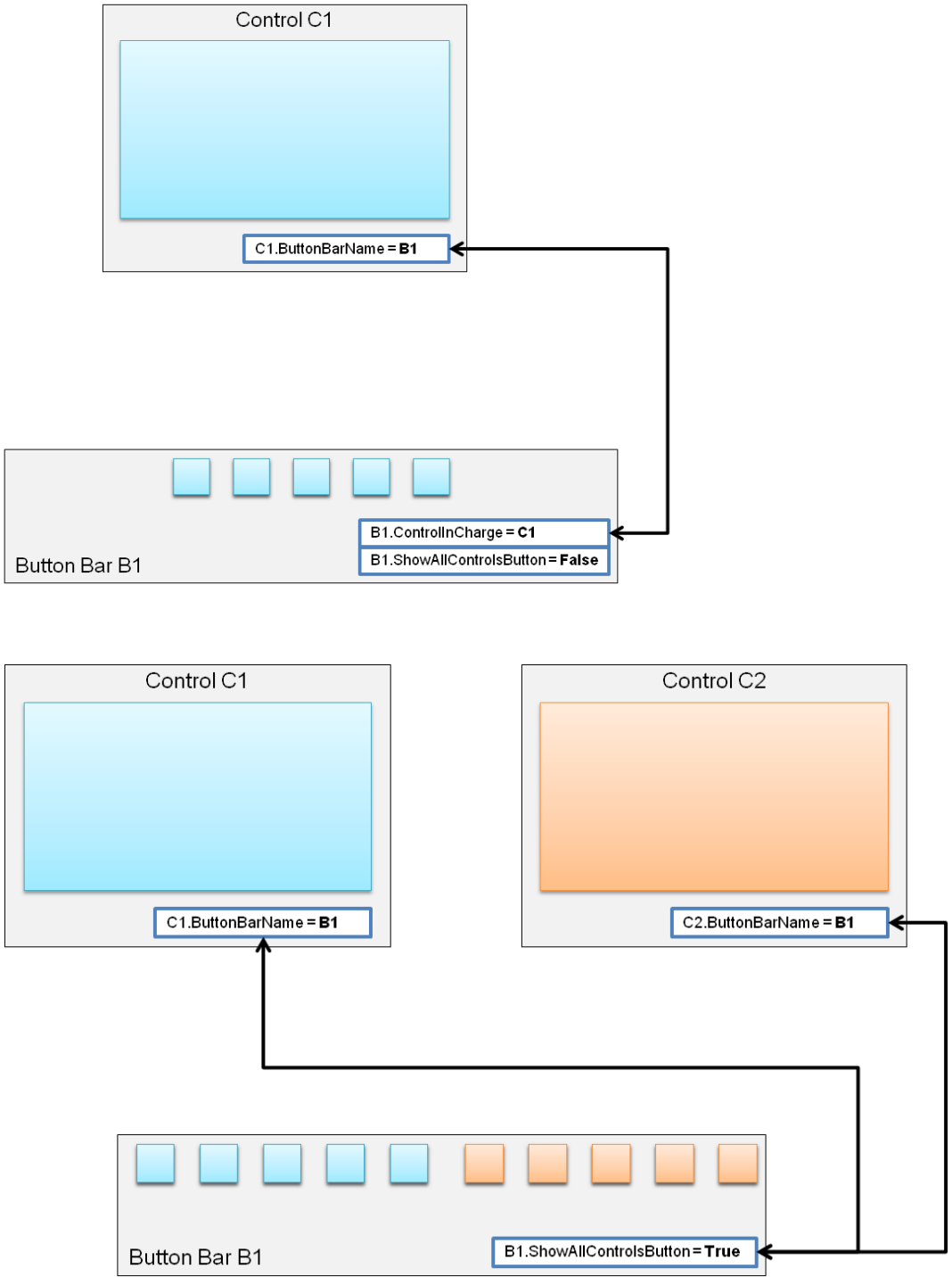
- **Utilization Control:** The following shows the utilization control in the InTouch window.



1

The following describes the basic configuration requirements for the utilization controls to function when embedded in an ArchestrA symbol and subsequently in an InTouch window.

Button Bar Control: This control provides a set of buttons used to send commands to other controls that are already embedded in an ArchestrA IDE symbol. However, a symbol containing only a button bar control cannot provide any functionality.



Section 2 – Importing .NET Controls for Performance

This section discusses the common .NET controls for Wonderware MES Software/Performance and how to import them.

Client Controls

Client controls must be imported into the Galaxy before they can be used. General steps for importing and using the client controls are provided below:

- Import a .NET Dynamic Link Library (.DLL) file that contains one or more client controls.
- Browse and embed one or more client controls into a new or existing symbol. The client controls appear as elements.
- View and edit the exposed client control properties.
- Bind the client control properties to ArchestrA attributes' symbol custom properties or InTouch tags. Perform this using the data binding animation.
- Configure scripts for client control events using the events animation.

Import Client Controls

You can import client controls from .DLL files. The client controls can be imported from a single or multiple .DLL files. You can also import client controls that have been exported previously to an ArchestrA IDE package (.aaPKG) file.

To import a client control, you must have security permissions to import graphic objects.

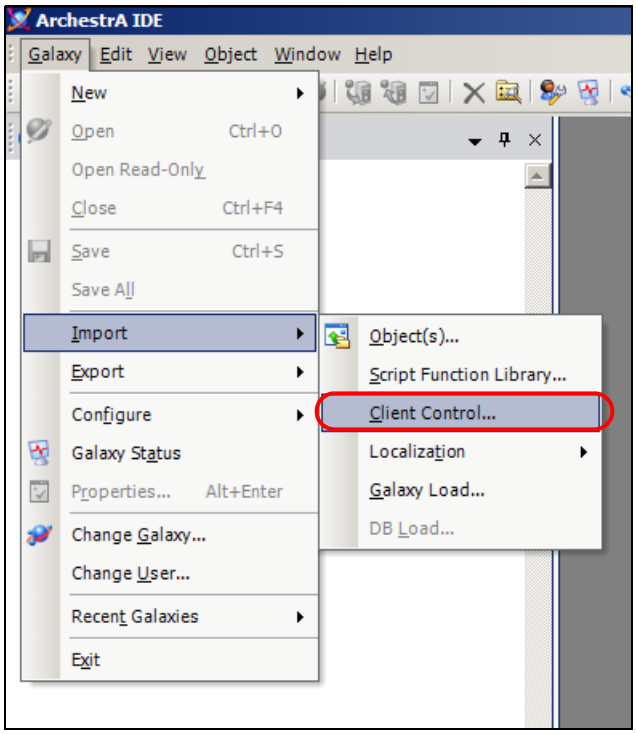
Note: While importing client controls, if you select .DLL files that do not contain client controls, the import process ignores the selected file and proceeds to the next available .DLL file.

If you import a newer version of a client control that you are already using in the ArchestrA IDE or InTouch HMI as an embedded ArchestrA symbol, you need to restart the ArchestrA IDE and InTouch HMI.

After importing the controls, you can organize them the same way you organized ArchestrA symbols.

How to Import Client Controls

You import the client controls using the ArchestrA IDE **Galaxy** menu.



The controls are provided in the **C:\Program Files (x86)\Wonderware\MES\Controls** folder. You will be using the following .NET client controls in your applications:

- **Fact.Controls.ButtonBar.dll**
- **FactMES.Controls.CountsOrDurationControl.dll**
- **FactMES.Controls.JobSummary.dll**
- **FactMES.Controls.OEEKPIControl.dll**
- **FactMES.Controls.ProductionProgressControl.dll**
- **FactMES.Controls.Utilization.dll**

Note: When you created the Galaxy for this class in a previous lab, these controls were automatically imported into the Galaxy.

Lab 10 – Using Utilization Controls

Introduction

In this lab, you will first use MES .NET client controls to create an ArchestrA symbol. Then, you will embed the symbol in a new InTouch window. Next, you will use this newly built InTouch window in WindowViewer to display the MES entity OEE information.

Objectives

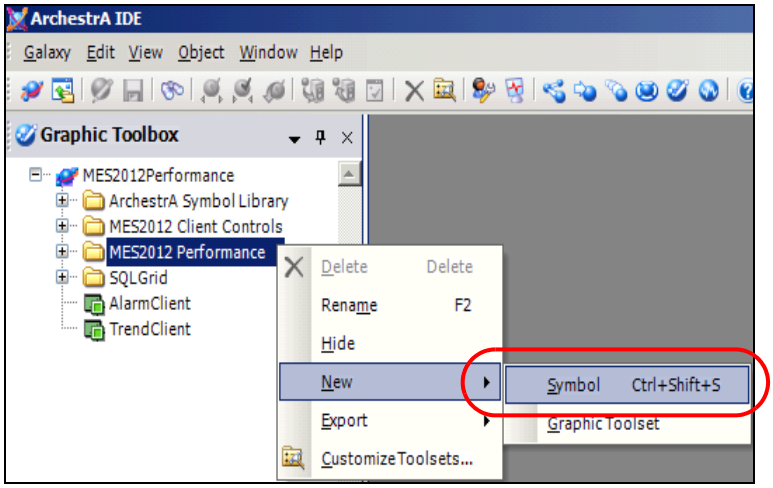
Upon completion of this lab, you will be able to:

- Use MES .NET **JobSummaryControl**, **ButtonBar**, and **UtilizationControl** client controls to create new ArchestrA symbols

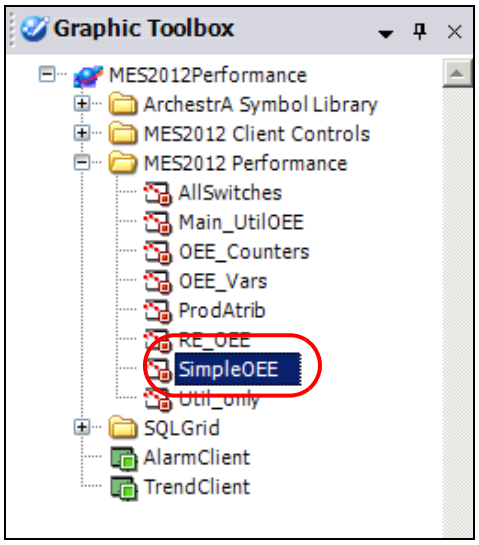
Create a New Symbol

First, you will create a new symbol that will be used to display utilizations and OEE.

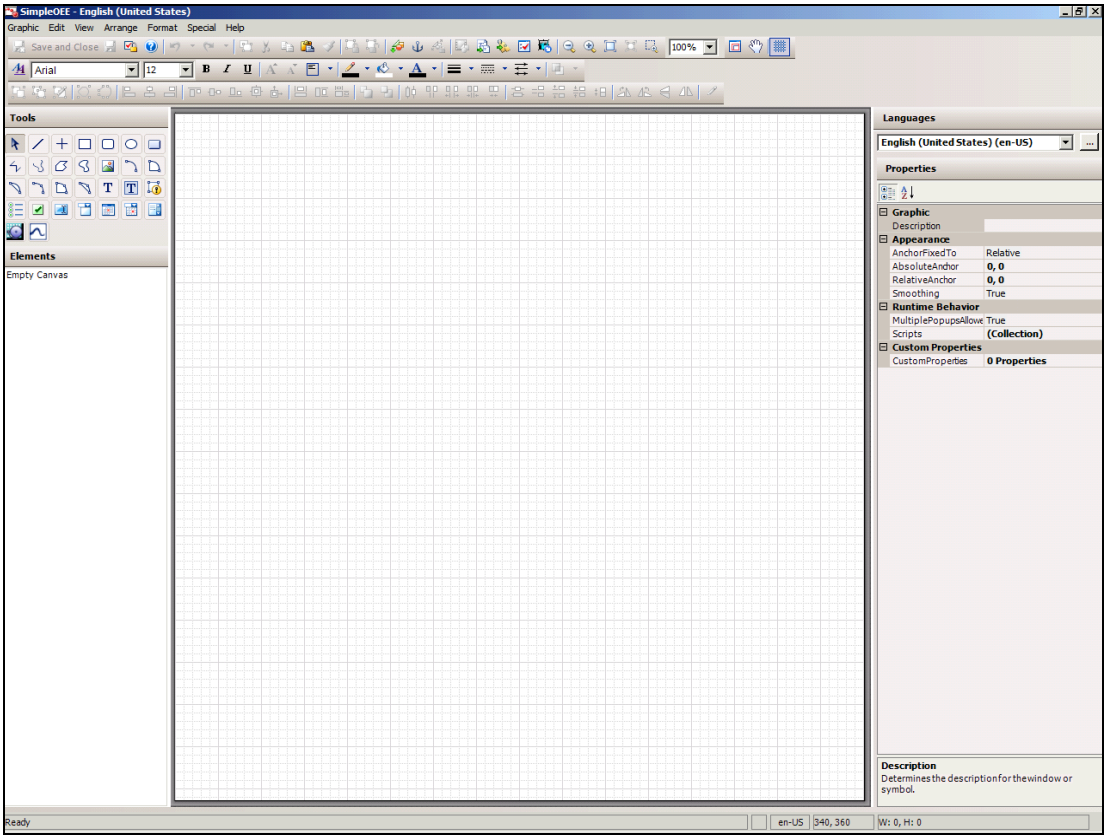
1. In the ArchestrA IDE, **Graphic Toolbox**, expand **MES2012Performance**, and then right-click the **MES2012 Performance** toolset and select **New | Symbol**.



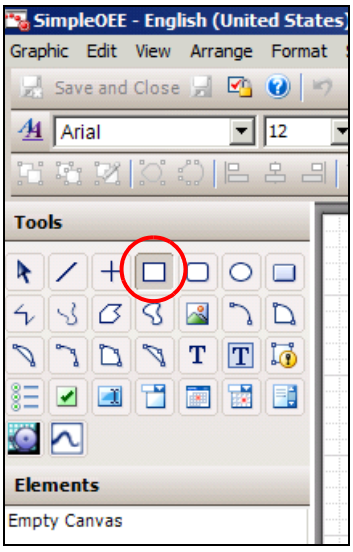
2. Rename the symbol **SimpleOEE**.



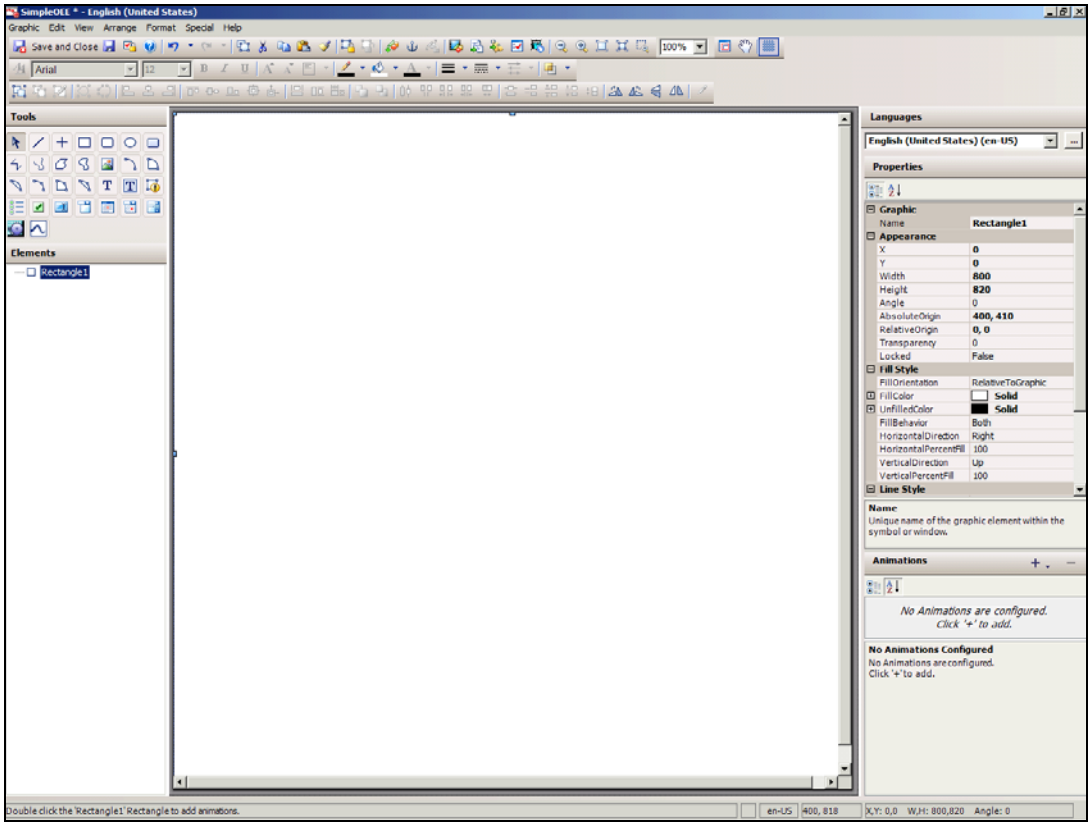
3. Double-click the **SimpleOEE** symbol to open the ArchestrA symbol editor, and then maximize the window.



4. In the **Tools** pane, select the rectangle tool.



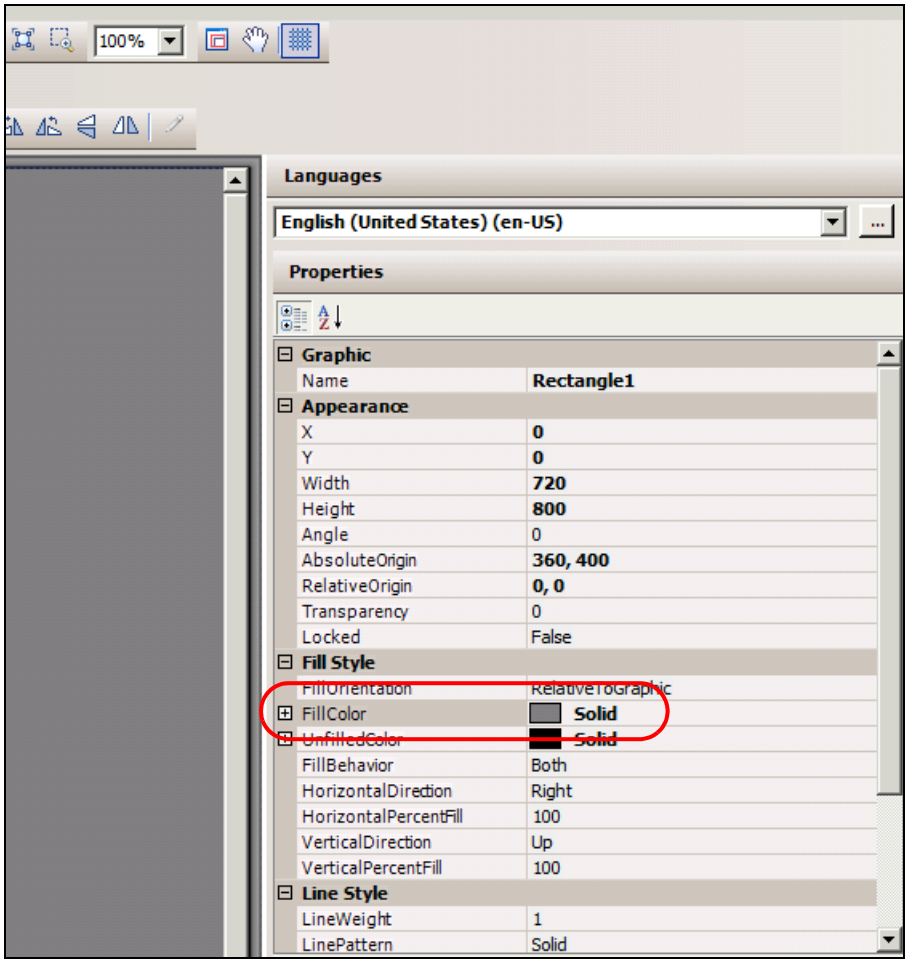
5. Draw a rectangle that fills the canvas.



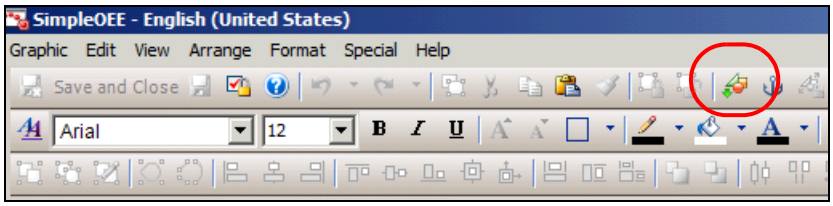
The rectangle is used to create a background for the ArchestrA symbol. The background will help the ArchestrA symbol dock during embedding.

6. In the **Properties** pane, change the **FillColor** to dark gray.

   By changing the color of the symbol, you will easily locate the controls that you will add to the symbol later.

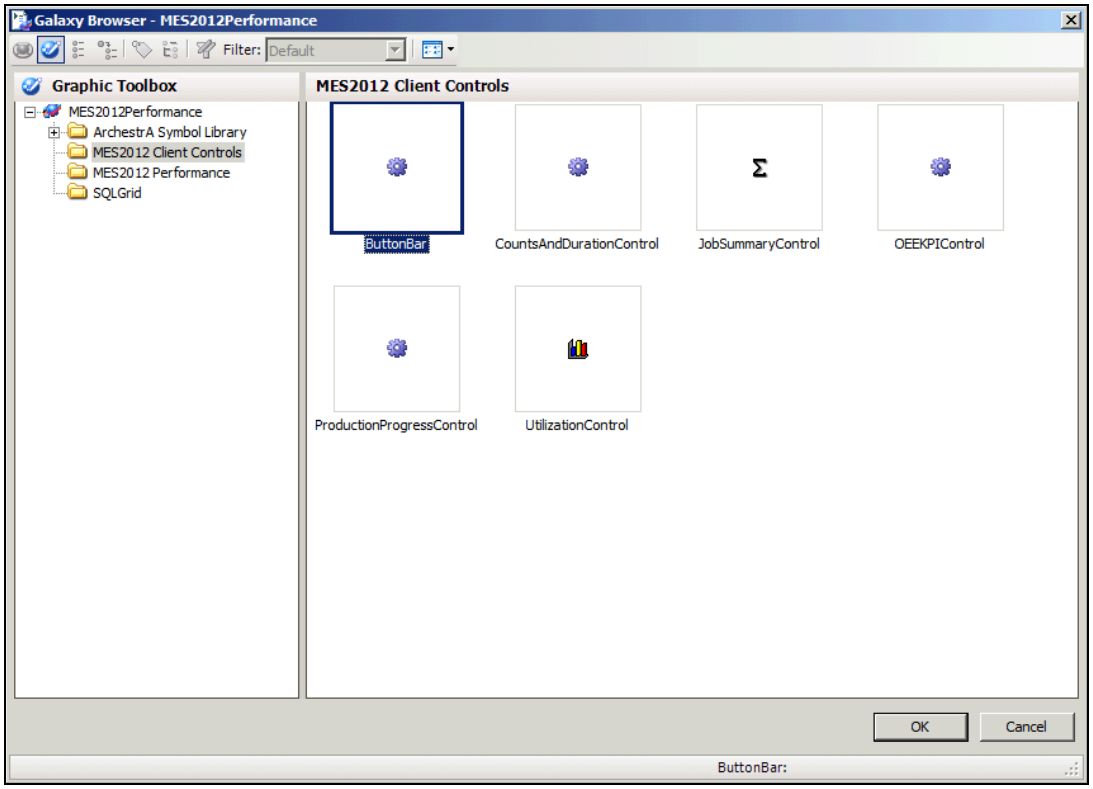


7. On the toolbar, click the **Embed Graphic** button.



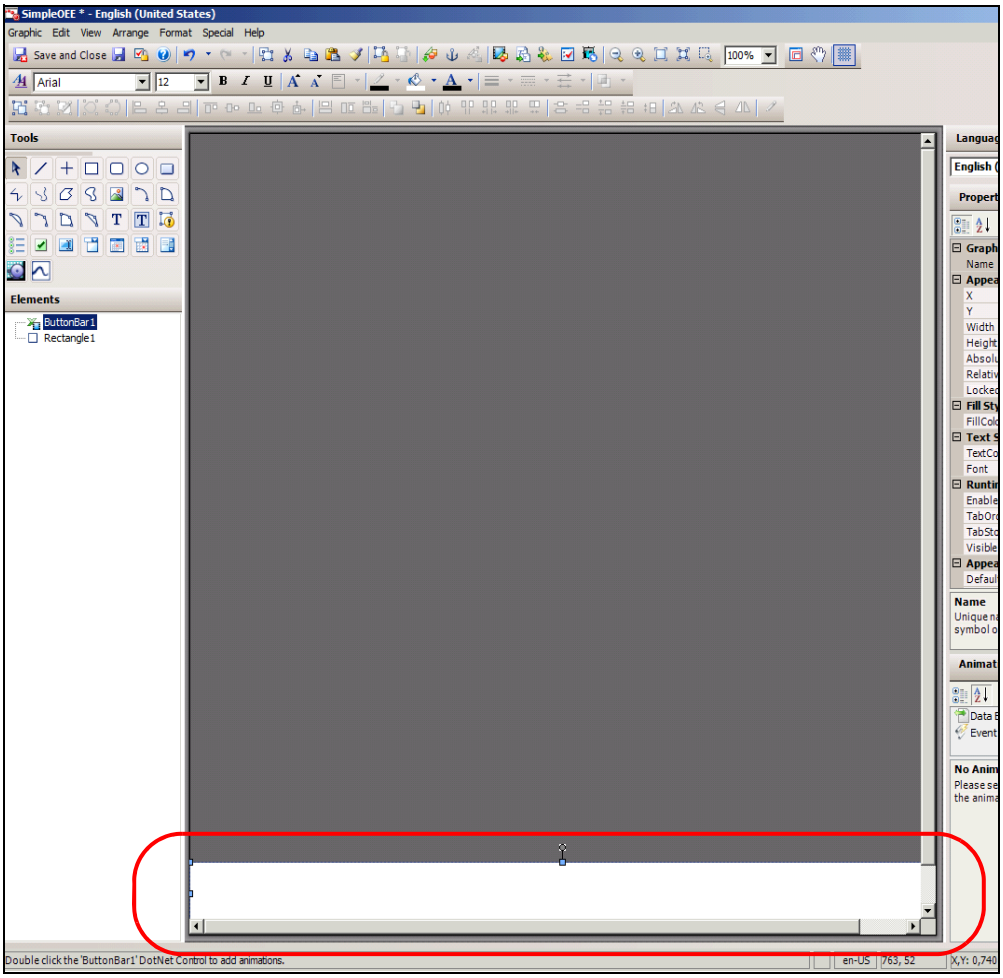
8. In the **Graphic Toolbox**, under the **MES2012Performance** Galaxy, click **MES2012 Client Controls**.

9. In the right pane, select **ButtonBar**.



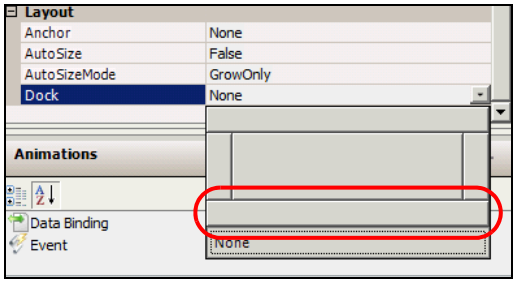
10. Click **OK**.

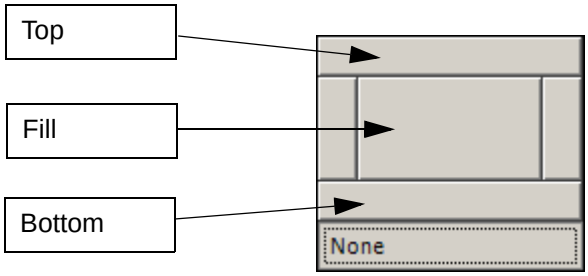
11. Place the control inside the rectangle at the bottom.
12. Expand the control to the right, if needed.



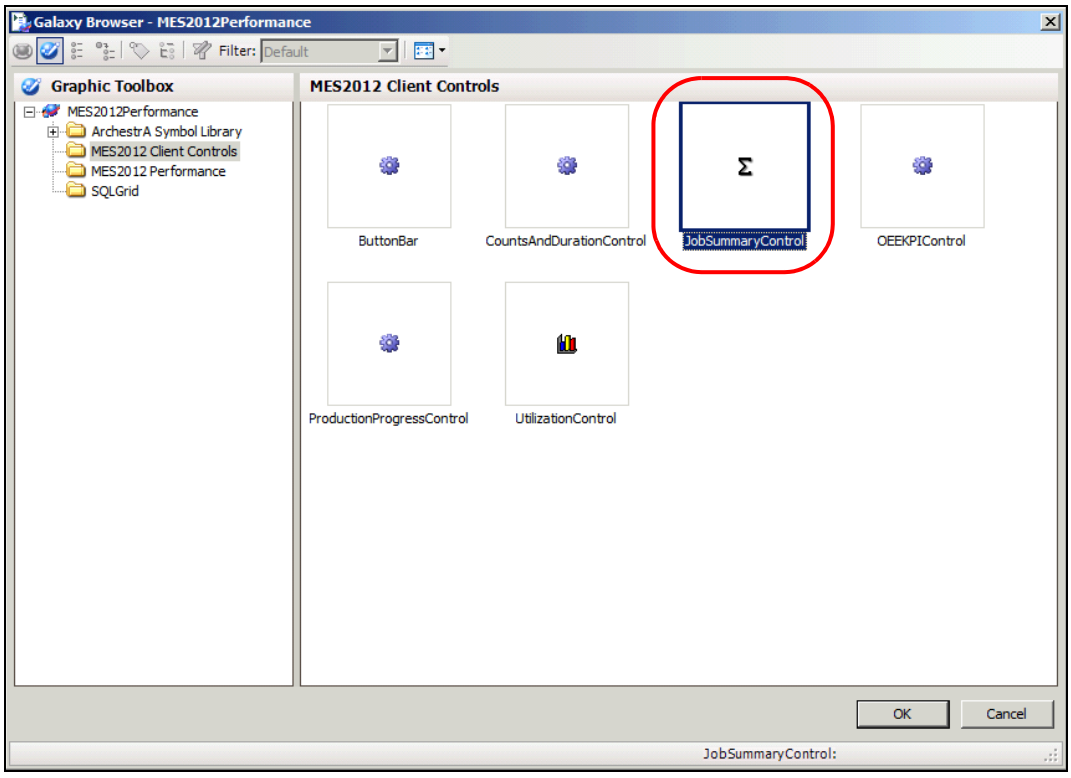
13. With the control still selected, in the **Properties** pane, scroll down to the **Layout** section and set the **Dock** property to **Bottom**.

Note: The **Dock** property drop-down list does not display the word *Bottom*. It displays a graphic that represents the different docking properties.



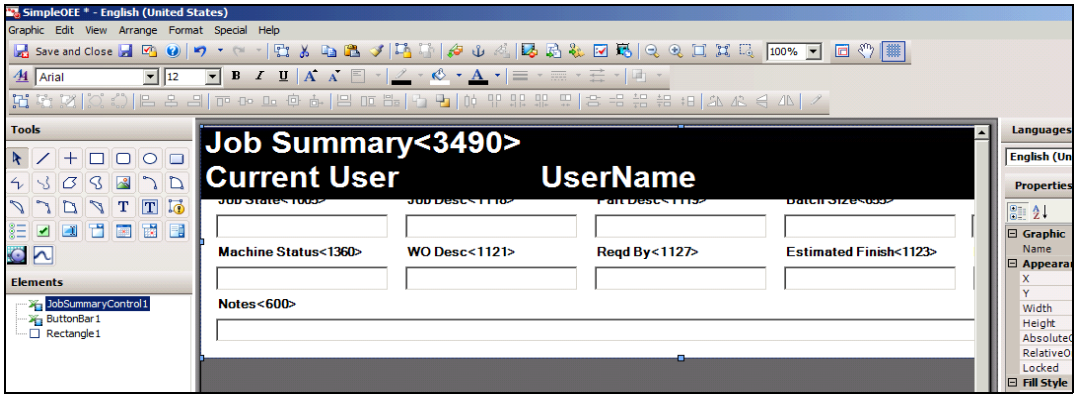


14. On the toolbar, click the **Embed Graphic** button.
15. In the **MES2012 Client Controls** pane**,** click **JobSummaryControl**.

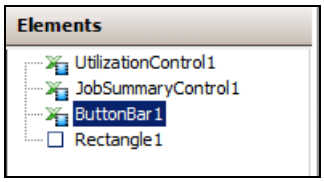


16. Click **OK**.

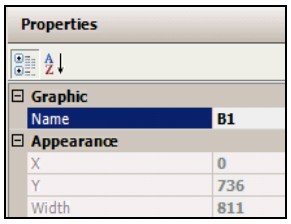
17. Place the control at the top of the rectangle and resize the bottom edge of **JobSummaryControl** to just underneath the **Notes** field.



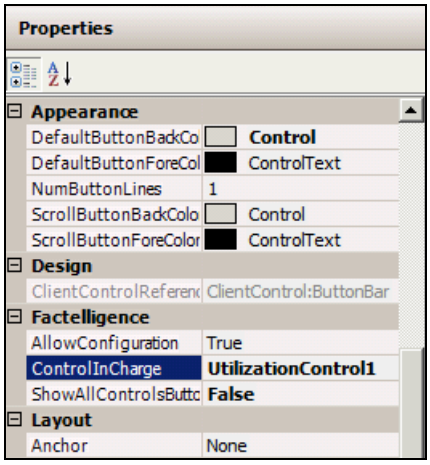
18. In the **Properties** pane, scroll down to the **Layout** section and set the **Dock** property to **Top**.
19. On the toolbar, click the **Embed Graphic** button.
20. In the **MES2012 Client Controls** pane, select **UtilizationControl** and click **OK**.
21. Place the control in the middle of the rectangle.
22. Manually adjust the size of the **UtilizationControl1** object to take up the space between the bottom of the **Job Summary** control and top of the **Button Bar** control.
23. In the **Elements** pane, select **ButtonBar1**.



24. Under **Properties**, change the name to **B1**.



25. Scroll down to the **Factelligence** section, **ControlInCharge** field, and enter **UtilizationControl1**.

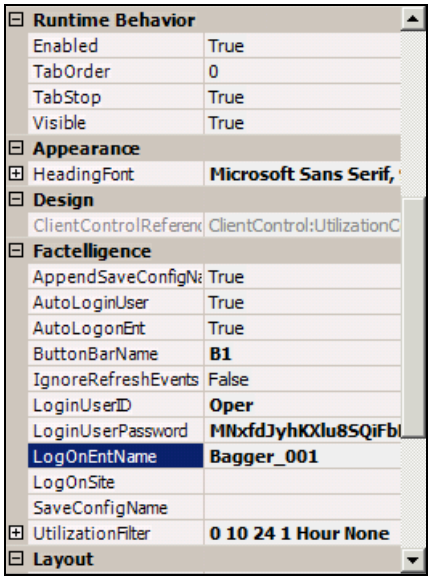


26. In the **Elements** pane, select **UtilizationControl1**.
27. In the **Properties** pane, scroll down to the **Factelligence** section and configure it as follows:

ButtonBarName:	B1
LoginUserID:	Oper
LoginUserPassword:	oper

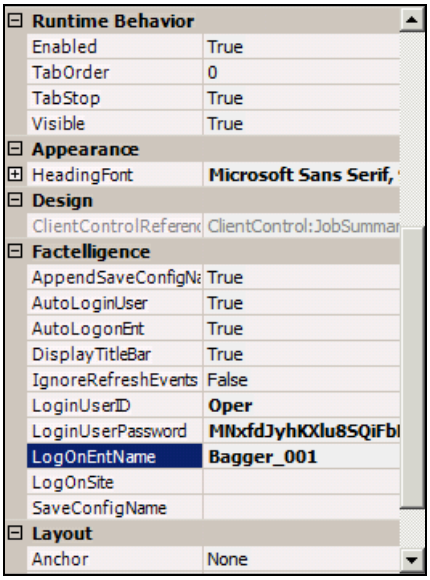
Note: The password **oper** will be encrypted after you move to another field.

LogOnEntName:	Bagger_001

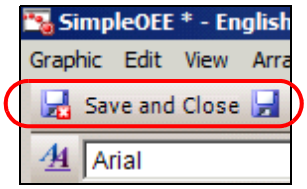


28. In the **Elements** pane, select **JobSummaryControl1**.
29. In the **Properties** pane, configure the **Factelligence** section as follows:

LoginUserID:	Oper
LoginUserPassword:	oper
LogOnEntName:	Bagger_001



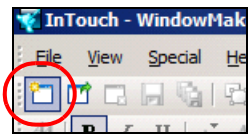
30. At the top-left of the toolbar, click the **Save and Close** button and check in the symbol.



Add the Symbol to an InTouch Window

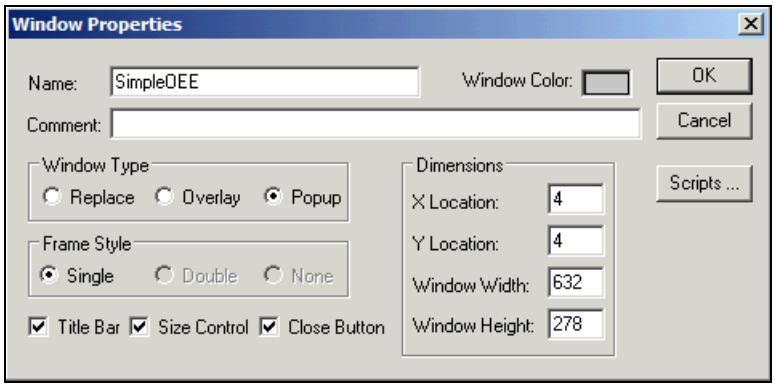
You will create a window in InTouch to host your new symbol.

31. In the ArchestrA IDE, **Template Toolbox**, open the **$BaggerApp** InTouch application, if needed.
32. In the **Windows to Open** dialog box, click **Cancel**.
33. On the toolbar, click the **New Window** button.

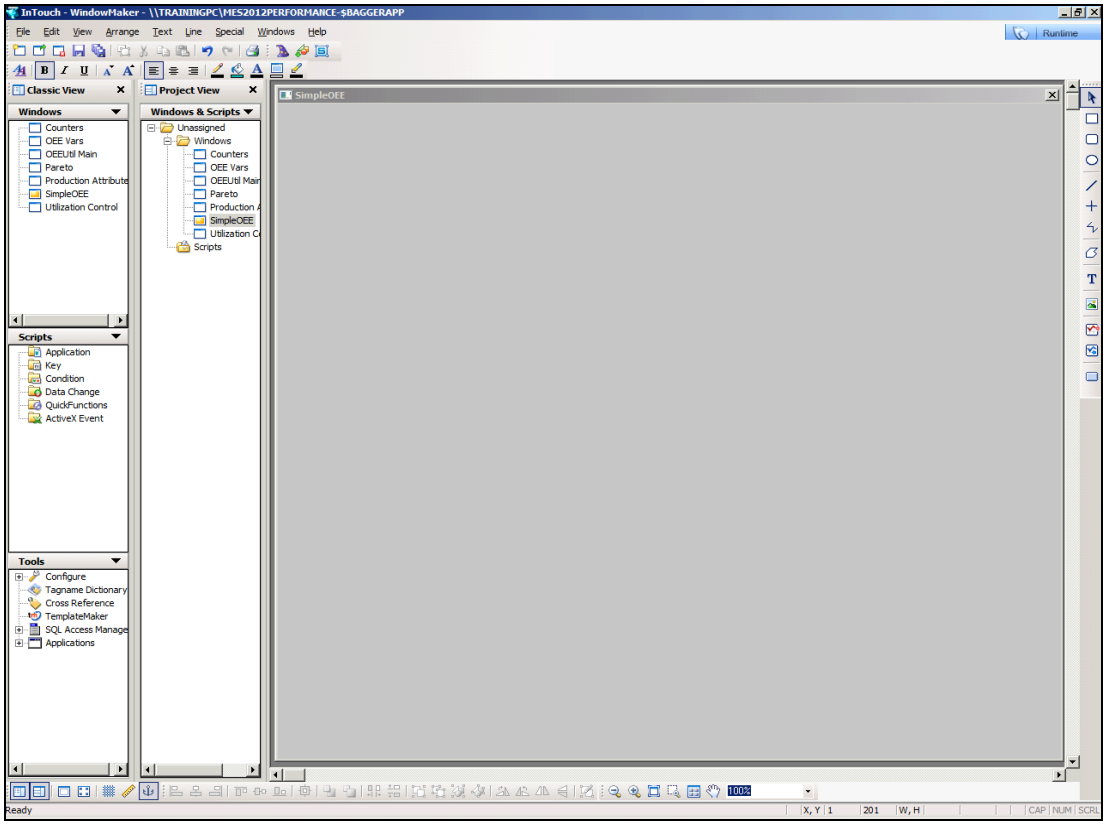


The **Window Properties** dialog box appears.

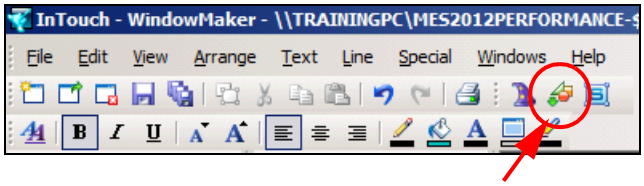
34. In the **Name** field, enter **SimpleOEE**.
35. In the **Window Type** area, click **Popup**.



36. Click **OK**.
37. Expand the **SimpleOEE** window to fit most of the development area.

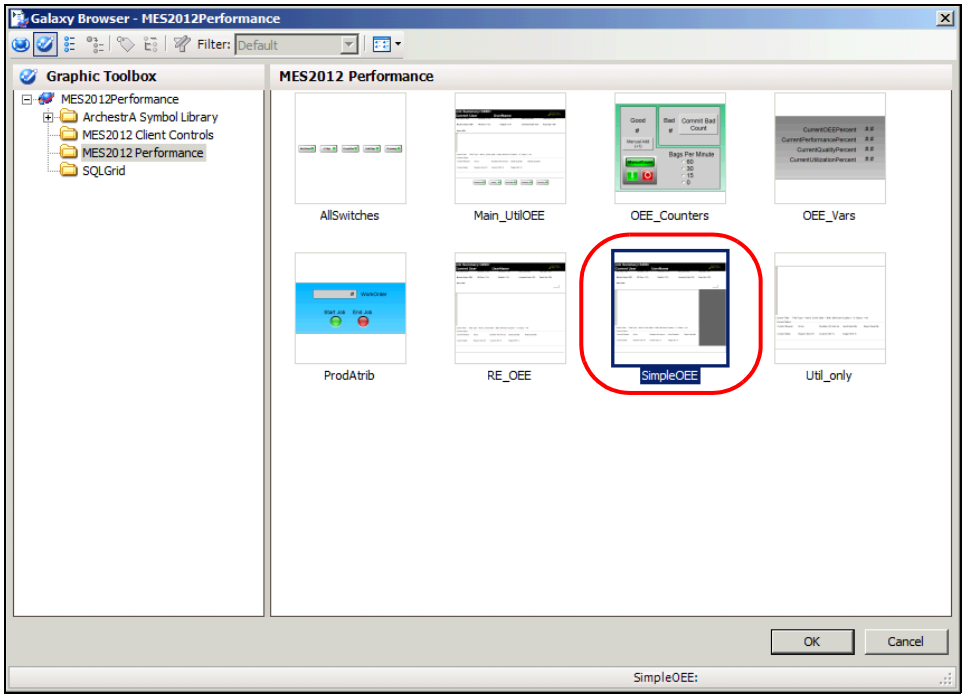


38. On the toolbar, click the **Embed ArchestrA Graphic** button.



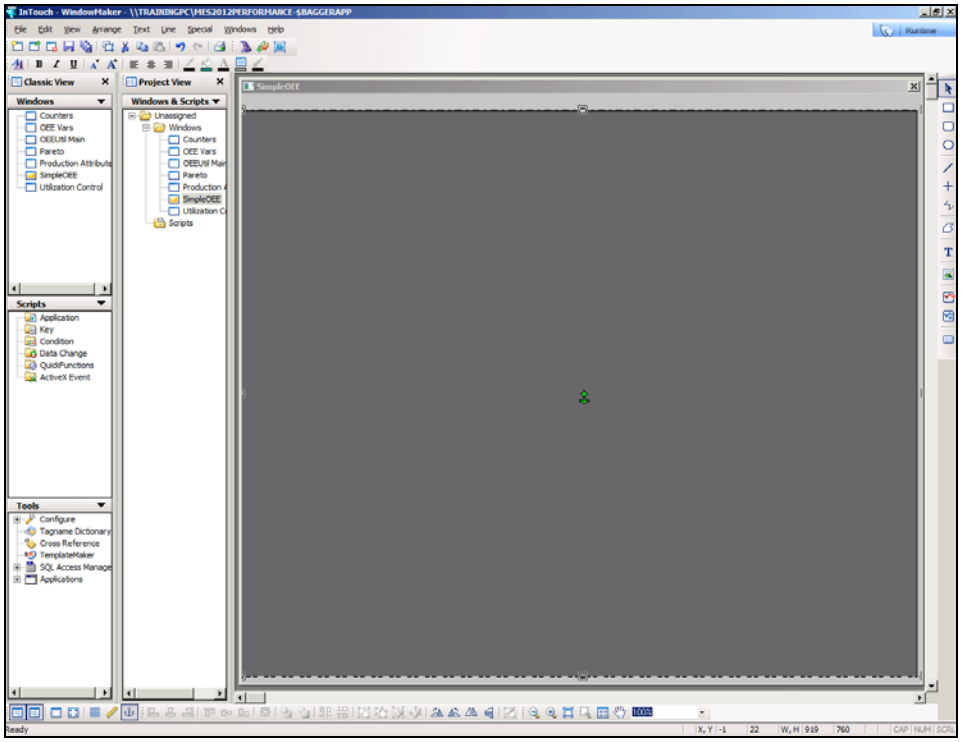
39. In the **Graphic Toolbox**, under the **MES2012Performance** Galaxy, click **MES2012 Performance**.

40. In the right pane**,** click **SimpleOEE**.

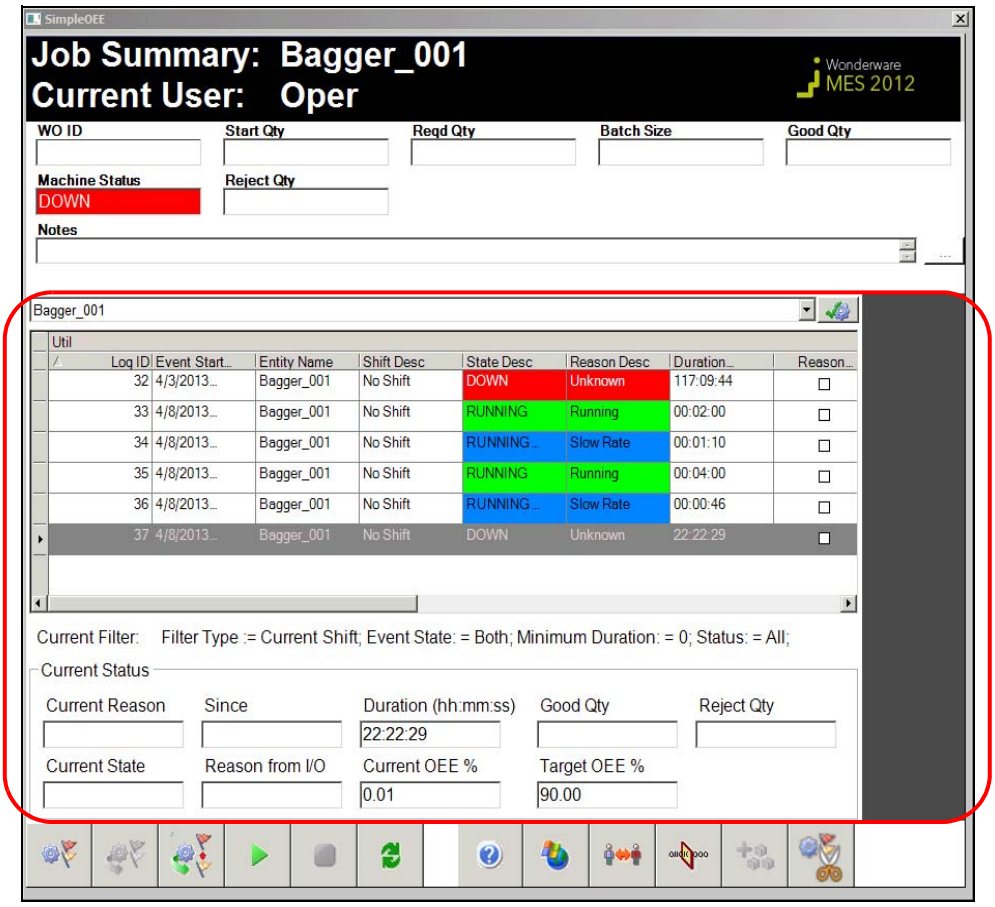


41. Click **OK**.

42. Place the control at the top of the window and drag the bottom-right corner of the control to fit into the window.



43. Click **Runtime**.
44. Verify that the newly built window displays utilizations and OEE data for the **Bagger_001** entity.



45. Close WindowViewer.
46. Close WindowMaker.

Lab 11 – Using OEE Controls

Introduction

In this lab, you will first use OEE-related MES .NET client controls to create an ArchestrA symbol. Next, you will embed the symbol in a new InTouch window. Then, you will use WindowViewer to view OEE information in different client controls.

Objectives

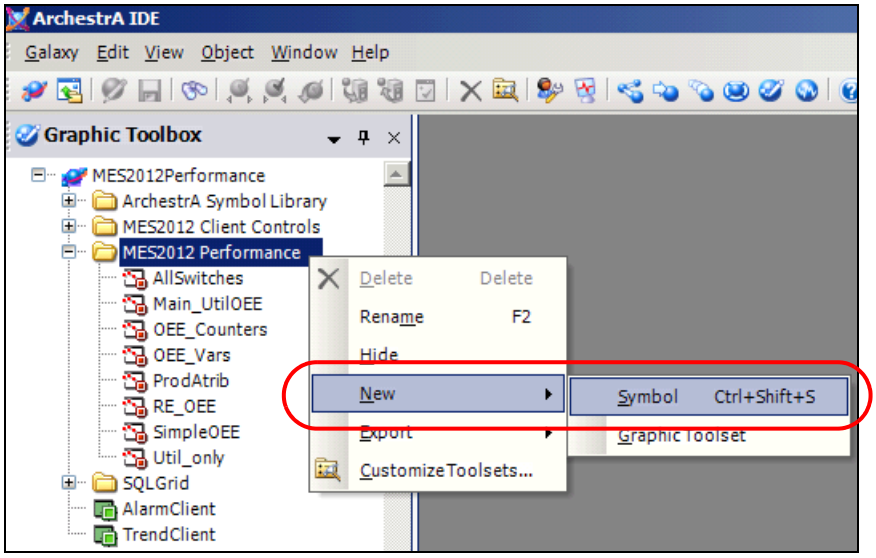
Upon completion of this lab, you will be able to:

- Use MES .NET **ProductionProgressControl**, **OEEKPIControl**, and **CountsAndDurationControl** client controls to create new ArchestrA symbols
- Display OEE information in an InTouch window

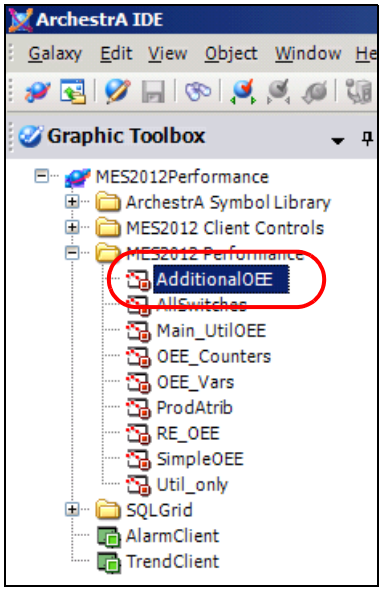
Create a New Symbol

First, you will create a new symbol to display OEE information.

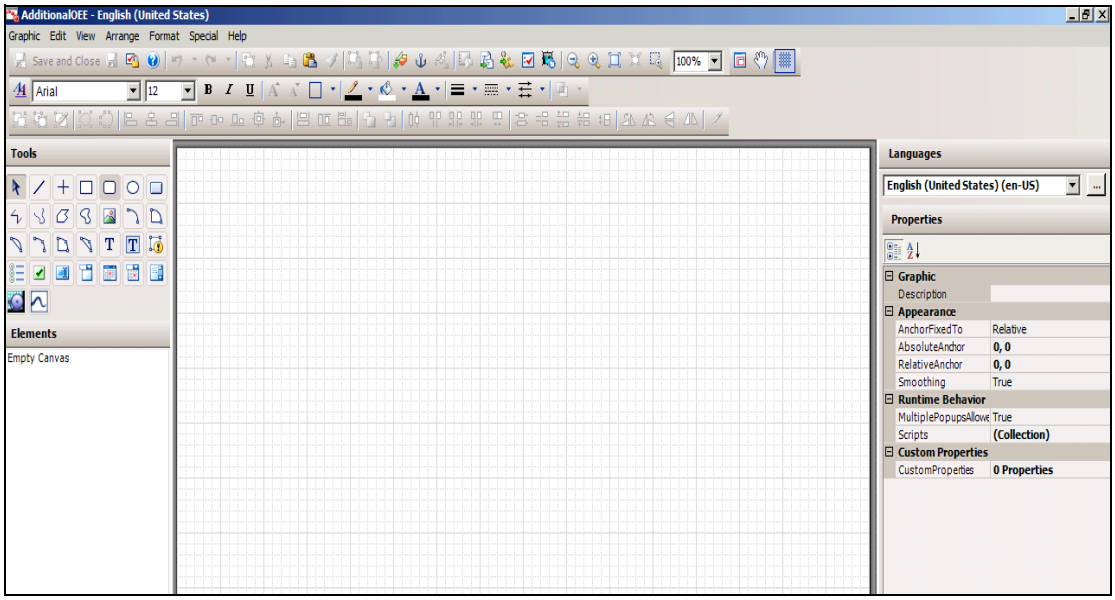
1. In the ArchestrA IDE, **Graphic Toolbox**, under the **MES2012Performance** Galaxy, right-click **MES2012 Performance** and select **New | Symbol**.



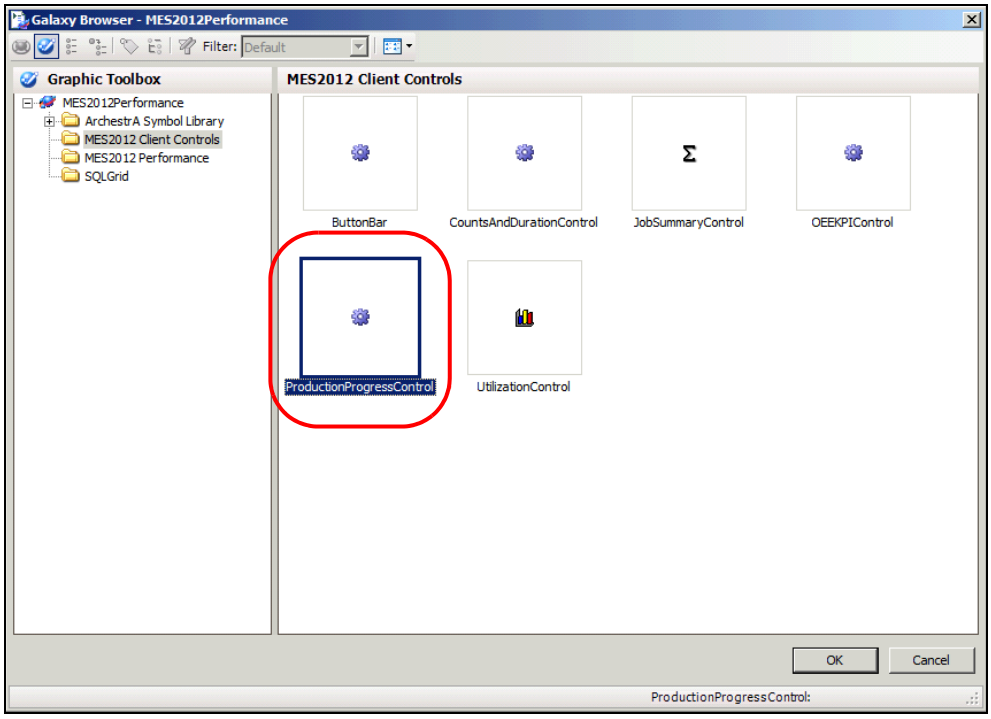
2. Rename the symbol **AdditionalOEE**.



3. Double-click the **AdditionalOEE** symbol to open the ArchestrA symbol editor.

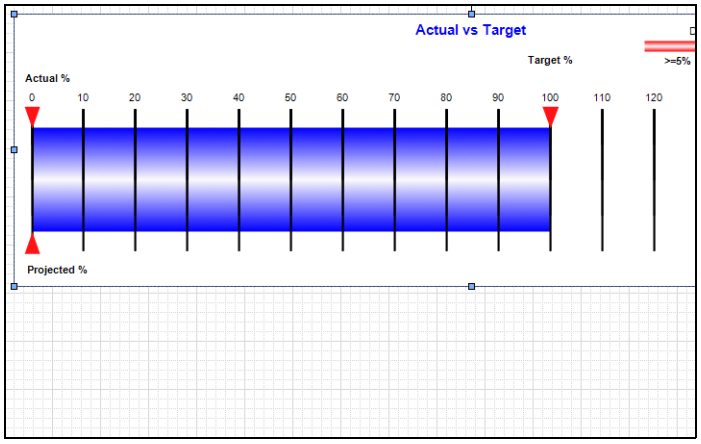


4. On the toolbar, click the **Embed Graphic** button.
5. In the **Graphic Toolbox**, click **MES2012 Client Controls**.
6. In the right pane**,** click **ProductionProgressControl**.



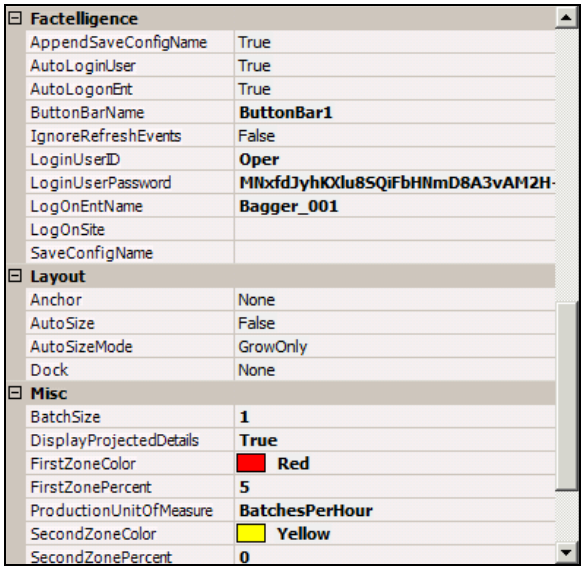
7. Click **OK**.

8. Place the control at the top of the canvas.

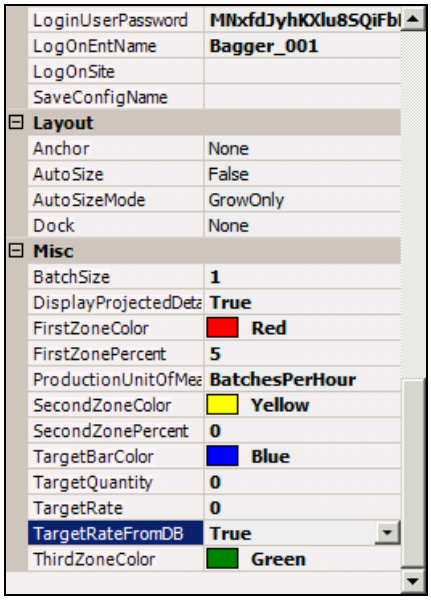


9. In the **Properties** pane, in the **Factelligence** section, configure the properties as follows:

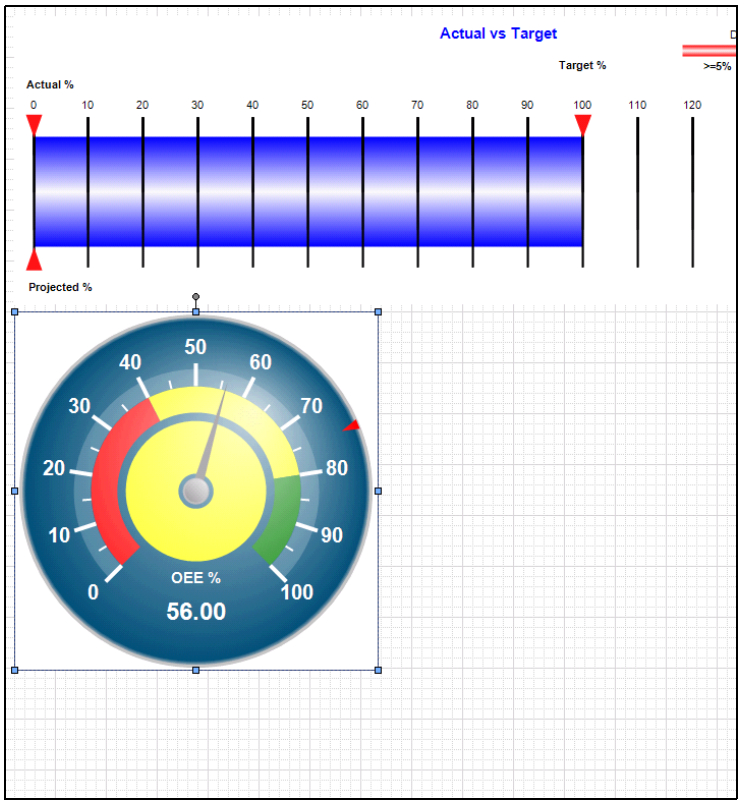
LoginUserID:	Oper
LoginUserPassword:	oper
LogOnEntName:	Bagger_001



10. In the **Misc** section, change **TargetRateFromDB** to **True**.



11. On the toolbar, click the **Embed Graphic** button.
12. Select the **OEEKPIControl** control and click **OK**.
13. Place the control on the left portion of the canvas below the **ProductionProgressControl1** control.



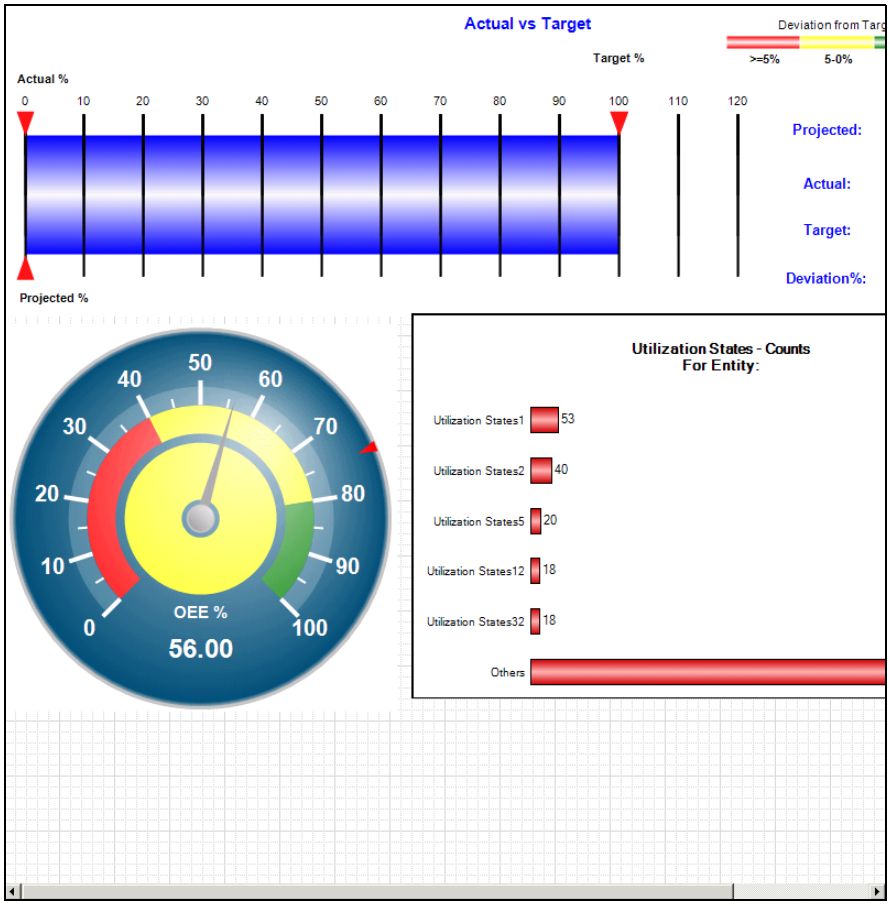
14. In the **Properties** pane, in the **Factelligence** section, configure the properties as follows:

Display Entity:	Bagger_001
LoginUserID:	Oper
LoginUserPassword:	oper
LogOnEntName:	Bagger_001

15. On the toolbar, click the **Embed Graphic** button.
16. Select **CountsAndDurationControl** and click **OK**.
17. Place the control on the right portion of the canvas below the **ProductionProgressControl1** control.
18. In the **Properties** pane, in the **Factelligence** section, configure the properties as follows:

LoginUserID:	Oper
LoginUserPassword:	oper
LogOnEntName:	Bagger_001

19. Resize the control to align its bottom with the bottom of the **OEEKPIControl** control and its right side with the right side of the **ProductionProgressControl** control.

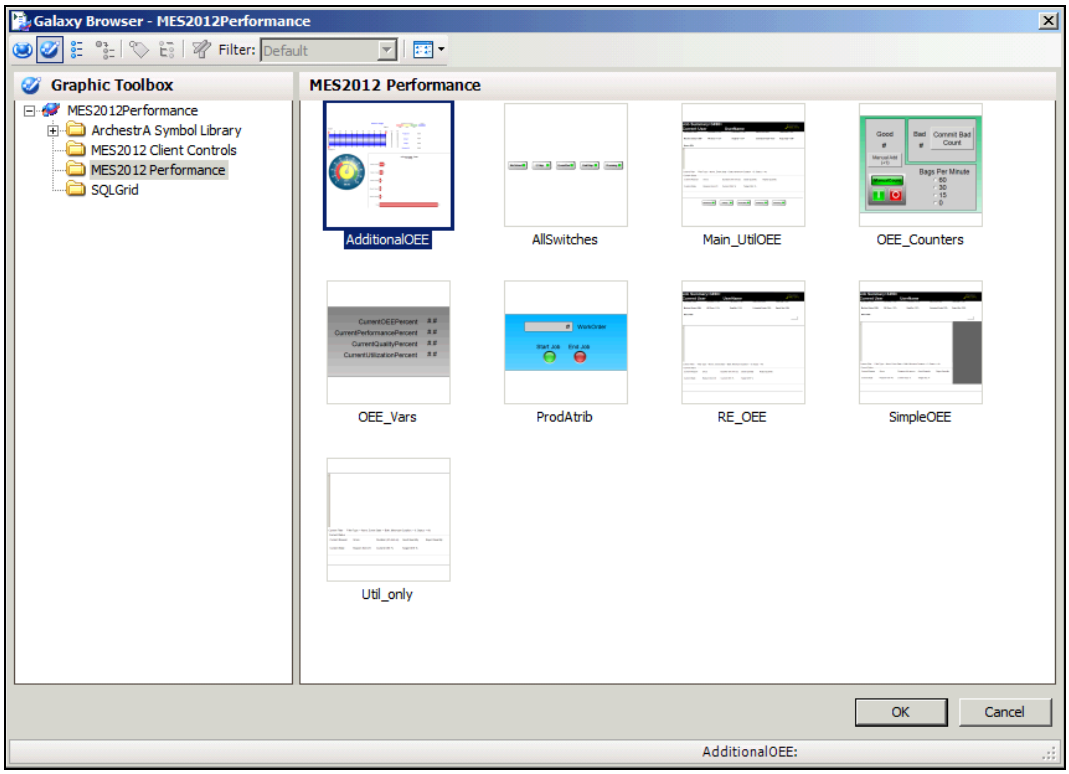


20. On the toolbar, click the **Save and Close** button and check in the symbol.

Add the Symbol to an InTouch Window

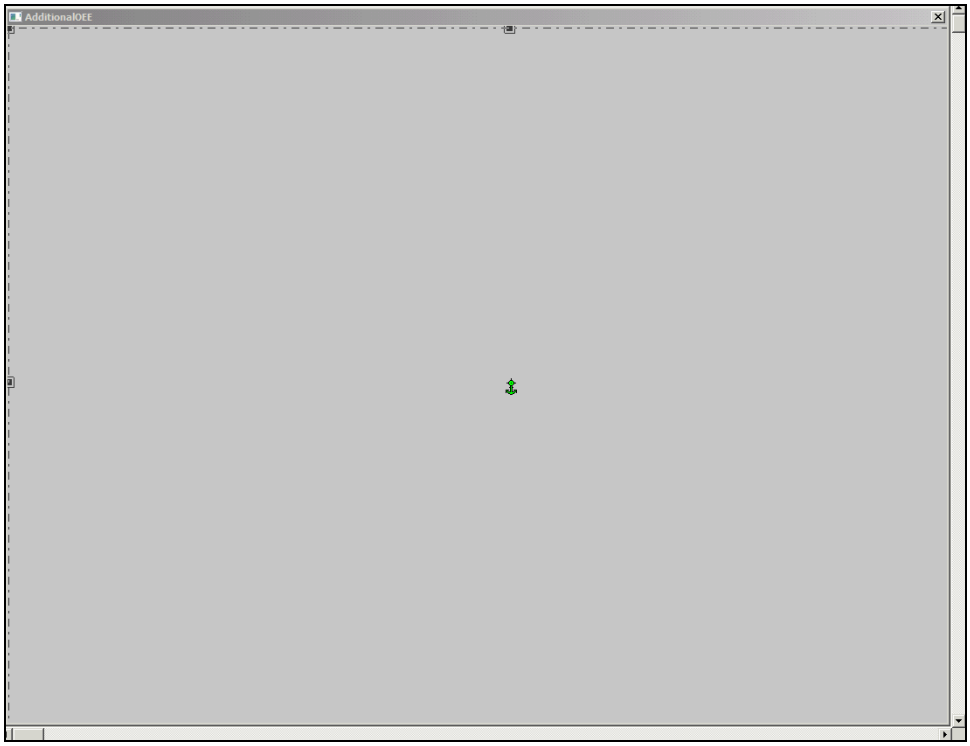
Now, you will create a window in InTouch to host your OEE ArchestrA symbol.

21. In the ArchestrA IDE, **Template Toolbox**, open the **$BaggerApp** InTouch application template, if needed.
22. In the **Windows to Open** dialog box, click **Cancel**.
23. In WindowMaker, create a **Popup** window named **AdditionalOEE**.
24. Resize the window to fill the development area.
25. Click the **Embed ArchestrA Graphic** button.
26. In the **Graphic Toolbox**, under the **MES2012Performance** Galaxy, click **MES2012 Performance**.
27. In the right pane**,** click **AdditionalOEE**.



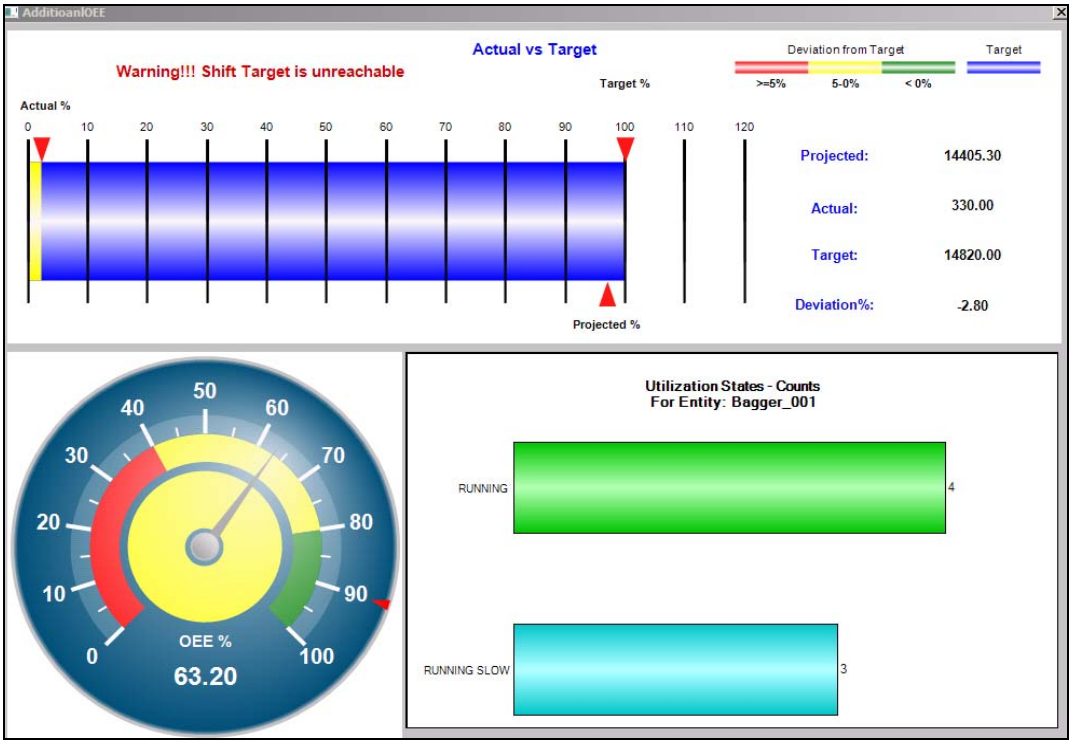
28. Click **OK**.

29. Place the control in the top-left portion of the window.



30. Save and close the **AdditionalOEE** window.
31. Open the **OEEUtil Main** window, if needed.
32. Click **Runtime**.
33. In WindowViewer, log on **Bagger_001**, if needed.
34. Click the **Show Prod Att** button.
35. In the **WorkOrder** field, enter **WO-004** and press **Enter**.
36. Click **Start Job**.
37. Click **Running** to turn it on if it is off and ensure that the other buttons are off.
38. Click the **Show Counters** button.
39. In the **Counters** window, turn on **AutoCount**.
40. Under **Bags Per Minute**, select **30**.
41. On the WindowViewer **File** menu, click **Open Window**.
42. Click **AdditionalOEE** and click **OK**.

43. Verify that the window displays OEE data and utilization state counts.



44. Observe the **Actual**, **Target**, and **Projected** production progress values; production progress **Deviation** from target; and OEE and utilization counts.

45. In the **Counters** window, adjust the production speed to see the effect of production speed on these values.

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Learning Services

Module 7 – Reports

Section 1 – ArchestrA Reports **7-3**

Module Objectives

- Use Wonderware Information Server to generate and view reports for Wonderware MES Software/Performance

Section 1 – ArchestrA Reports

This section describes the steps to generate and view various Downtime Analysis and OEE reports in Wonderware Information Server.

Introduction

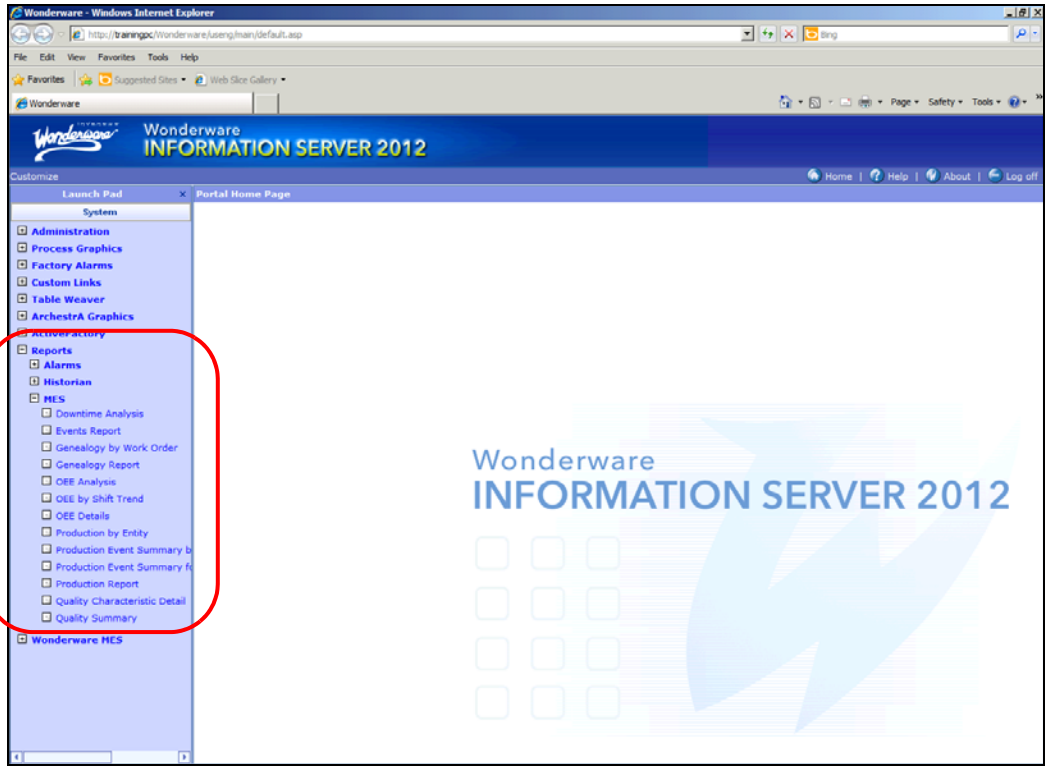
Wonderware MES Software provides a complete set of ArchestrA reports for MES. These reports are published to Wonderware Information Server during MES software installation. The installation also publishes a set of Table Weaver configurations to Wonderware Information Server.

ArchestrA Reports for Performance

The reports for Wonderware MES Software/Performance provide Downtime Analysis and OEE information. The following is a list of the Wonderware MES Software/Performance ArchestrA reports:

- Downtime Analysis
- OEE Analysis
- OEE by Shift Trend
- OEE Details
- OEE Analysis by Period

To access these reports, you must first launch Internet Explorer and log in, if needed, to the Wonderware Information Server portal page. On the launch pad of the page (normally in the left pane), you can access the reports through the **Reports** node. Expand the **MES** node to list all the MES reports.



Downtime Analysis Report

The Downtime Analysis report shows downtime data over a given period of time for selected parameters.

If a downtime event is extended across the start or end time, the given start and end times will be extended automatically to include the event.

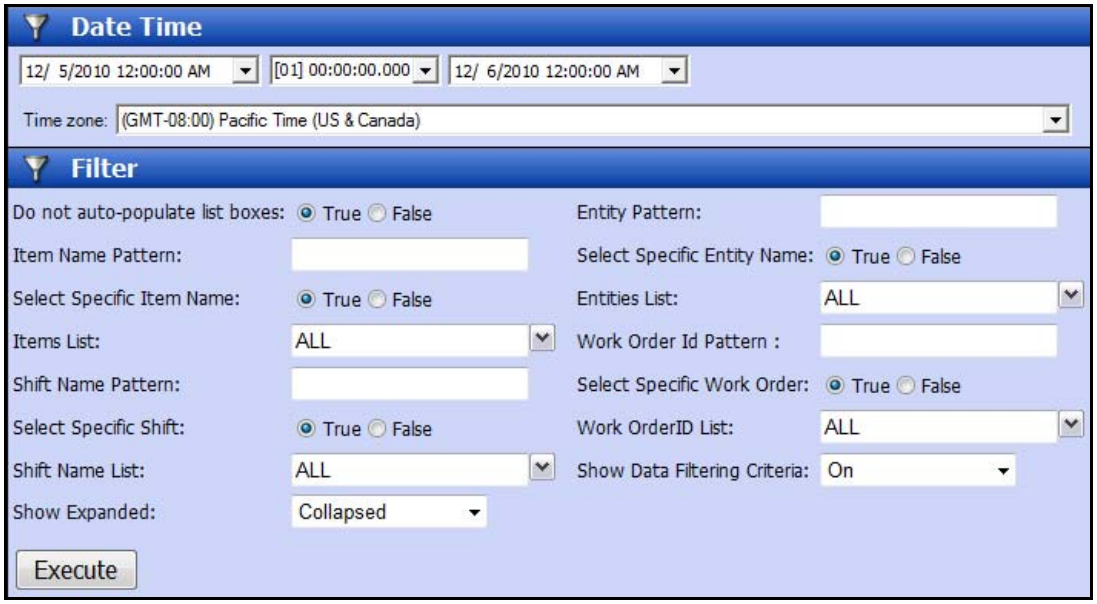
The Downtime Analysis report shows the time, number of occurrences, overall duration, and percentage of total time logged for each downtime state reason, grouped by state group.

For each reason group, two bar graphs show the top 10 durations by reason group and the top 10 durations by reason.

Show Downtime Analysis Report

The steps below instruct you how to retrieve a Downtime Analysis report.

1. Open the **Wonderware Information Server** portal.
2. In the **System** pane, expand **Reports\MES\Downtime Analysis**.



3. In the **Downtime Analysis** pane, if you would like to use filters, enter the following:
   - **Entity Pattern:** Entity name
   - **Item Name Pattern:** Produced item name
   - **Shift Name Pattern:** Shift name
   - **Work OrderID List:** Work order ID

   Note: You can also select specific values from the corresponding drop-down lists. You will have to set the **Do not auto-populate list boxes** option to **False** to be able to select values from drop-down lists.

4. Click **Execute**.

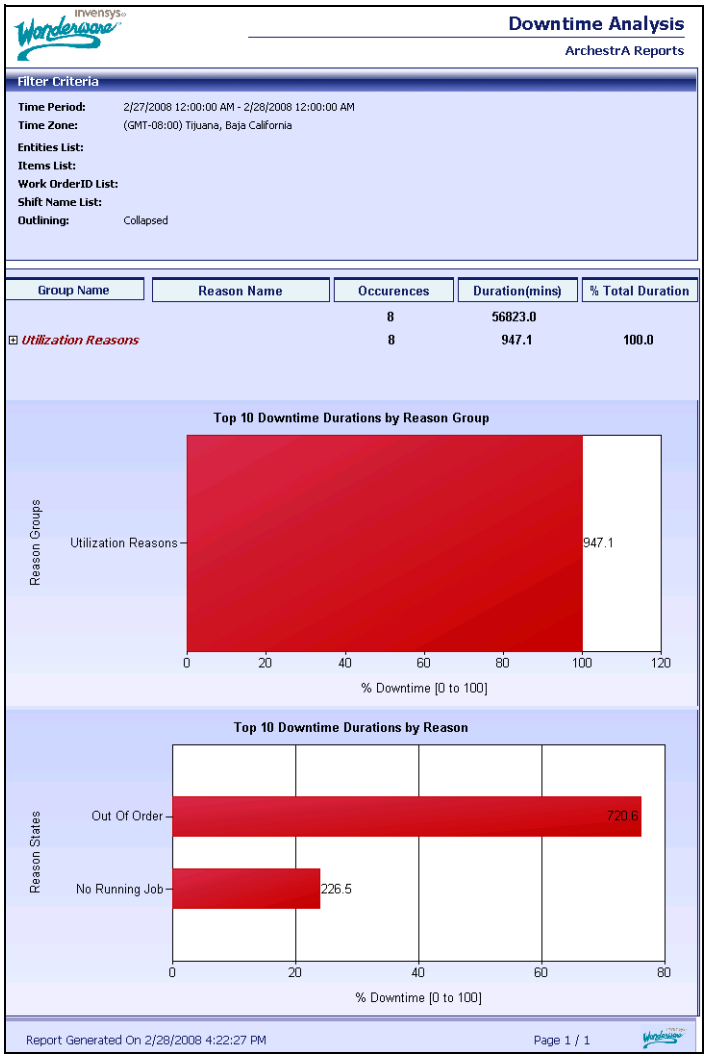
   The report is generated and shows a tree of reason groups and the following information:
   - **Reason Group Name**
   - **Freq:** Total count of occurrences over the specified time period
   - **Duration:** Total downtime (resolution in minutes) for the specified time period
   - **% of Total:** Percentage of total downtime over the specified time period

5. Click a reason group in the tree to show more detail in the table.

   The table shows the following details:
   - **Reason State**
   - **Freq:** Total count of occurrences over the specified time period
   - **Duration:** Total downtime (resolution in minutes) for the specified time period
   - **% of Total:** Percentage of total downtime over the specified time period

Below the table, a bar chart shows the top 10 downtime durations sorted by reason group. The bar chart maps the reason groups on the x-axis with the percentage downtime on the y-axis of the bar chart.

Below the bar chart, another bar chart shows the top 10 downtime durations sorted by reason state. The bar chart maps the reason states on the x-axis with the percentage downtime on the y-axis of the bar chart.



OEE Analysis Report

The OEE Analysis report displays the OEE data for a selected group of entities for a specified period of time.

The report shows:

- An Efficiency Analysis Bar chart displaying the four Key Performance Indicators (KPIs) for every entity that matches the filter criteria

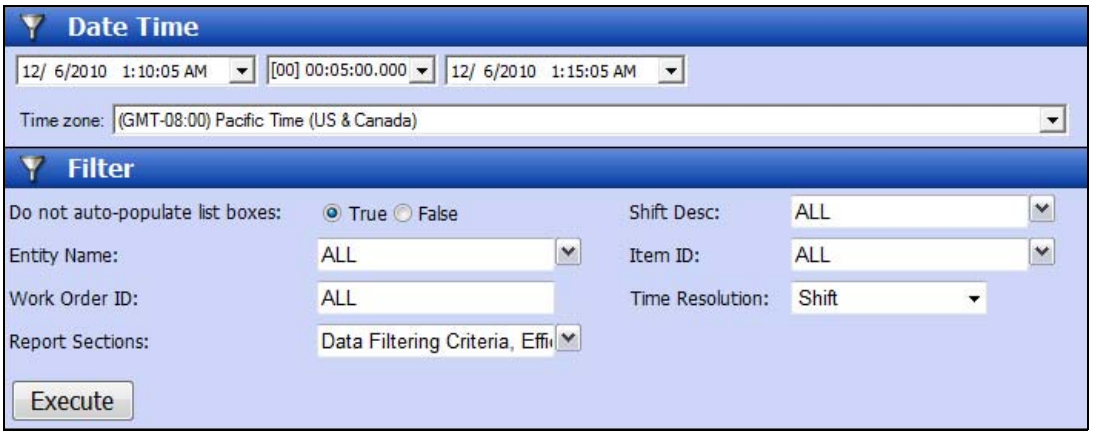
  The four KPIs are:

  - % OEE
  - % Utilization
  - % Performance
  - % Quality
- An OEE Trend Line chart displaying the OEE% separately for each entity for the specified time period

Show OEE Analysis Report

The steps below instruct you how to retrieve an OEE Analysis report.

1. Open the **Wonderware Information Server** portal.
2. In the **System** pane, click **Reports\MES\OEE Analysis**. This will display the **Date Time** and **Filter** sections.

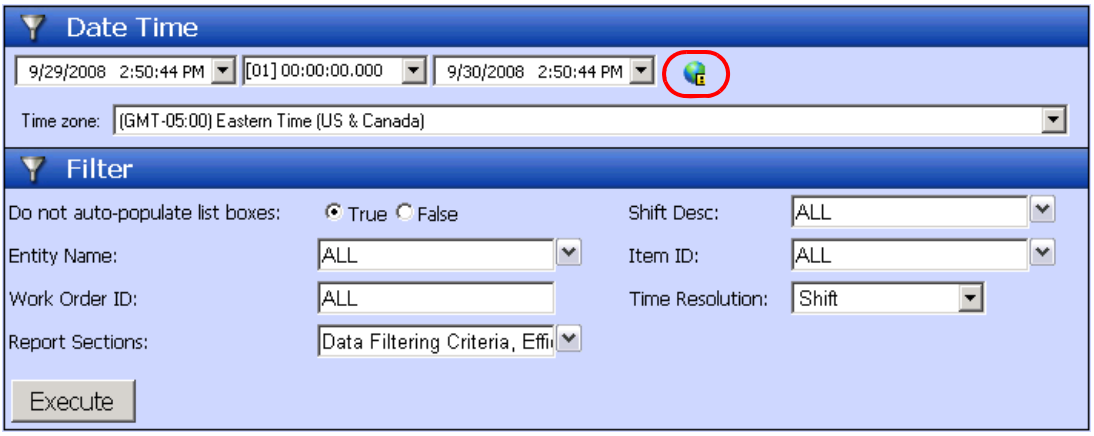


3. In the **Date Time** section, enter the **Start Time** and **End Time**, or enter the **Start Time** and select the **Relative Time Range**, for the report.

Note: If the selected start time for the report is not an entire hour, the report uses the collected statistical data from the beginning of the hour. Similarly, if the selected end time is not an entire hour, the report goes forward and uses the collected statistical data up to the beginning of the next hour.

4. Select the **Time Zone**.

   This converts the times of your **Date Time & Filter** query result into the time zone that you have selected. A globe/exclamation icon in the **Date Time** section indicates the change of the default time zone.



5. In the **Filter** section, specify values for the following (optional):
   - **Entity Name**
   - **Work Order ID**
   - **Shift Desc**
   - **Item ID**

   You can also select values directly from the database by specifying the corresponding command (optional).
   - **Entity Name:** Default **ALL** command
   - **Work Order ID:** Default **ALL** command
   - **Shift Desc:** Default **ALL** command
   - **Item ID:** Default **ALL** command

   To select values directly from the database, you set the **Do not auto-populate list boxes** option to **False**.

   Click the drop-down arrow next to the list field to display your available database values.

   Note: If the size of the database is too large, fetching list fields can affect overall performance. To avoid this, the **Do not auto-populate list boxes** option is set to **True** by default.

   ---

6. In the **Report Sections** drop-down list, select one or more sections that the report will display:
   - All (Default)
   - Data Filtering Criteria
   - Efficiency Analysis
   - OEE Trend
7. In the **Time Resolution** drop-down list, select one of the options:
   - Day
   - Shift (Default)
   - Hour

To properly report OEE Analysis and OEE Details when configuring the **Time Resolution** selection, you must consider two general system parameters that determine whether the system will go into Shift or Hour storage mode for recording production (good and reject):

- Maintain distinct good production records
- Maintain distinct reject production records

By default, these two parameter attributes are set to **True**. In such a situation, all production data, either good or rejected, is stored in the specified buckets on an hourly basis.

If you change both parameters' attributes to **False**, the system will follow the shift data storage mode. All production is then stored in the first hourly bucket in the database for that shift, regardless of how many hours there are in a shift.

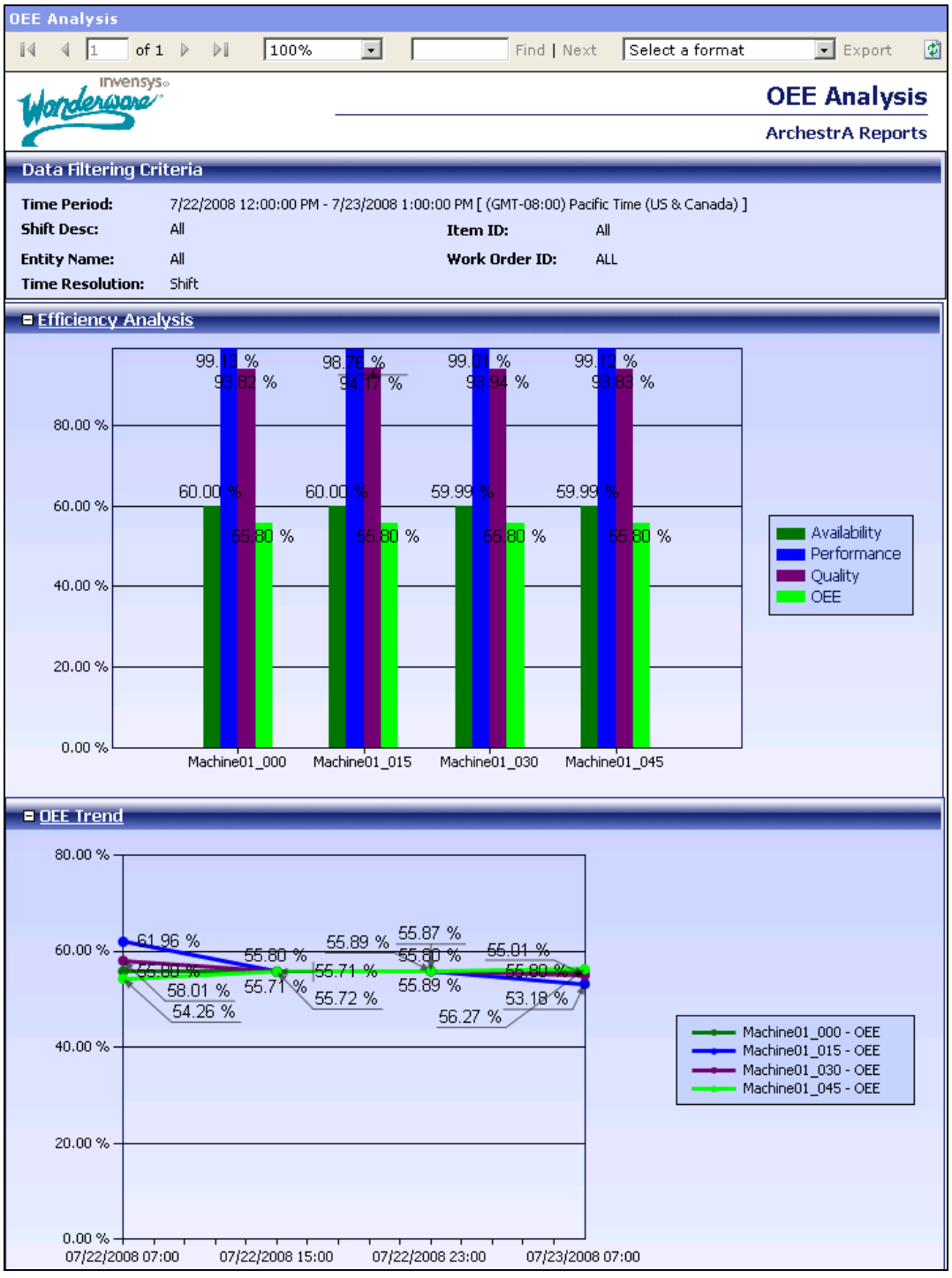
Note: The OEE Analysis and OEE Details reports displays some invalid data if the **Time Resolution** is set to **Hour** and the data storage mode is set to **Shift**.

When the data storage mode is set to **Shift**, the **Time Resolution** is set only to **Shift** or **Day**.

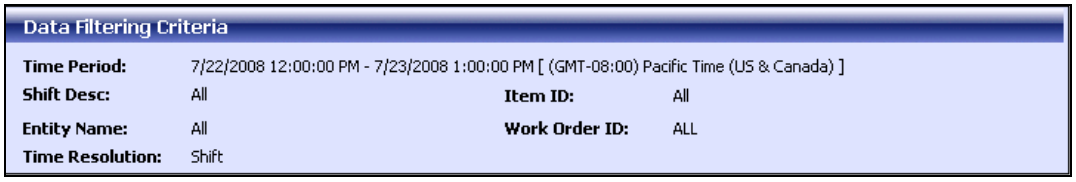
The OEE Analysis and OEE Details report correctly display the four KPIs if the data is recorded while in the hour data storage mode.

8. Click **Execute**.

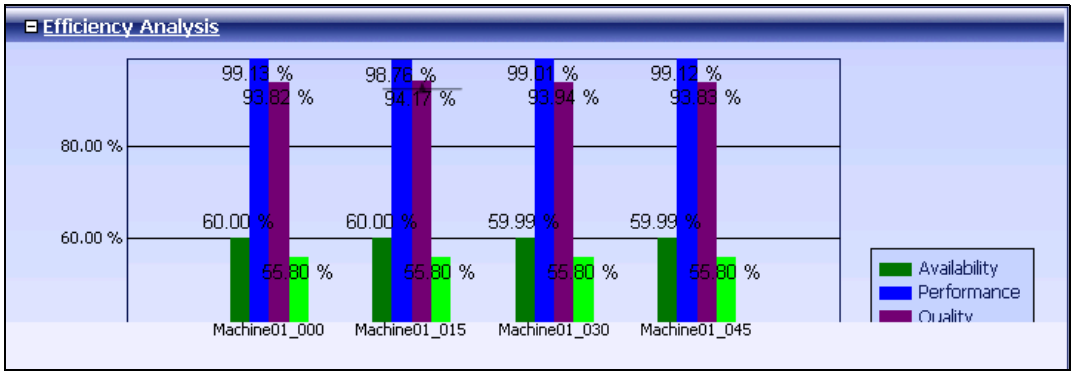
   The report appears.



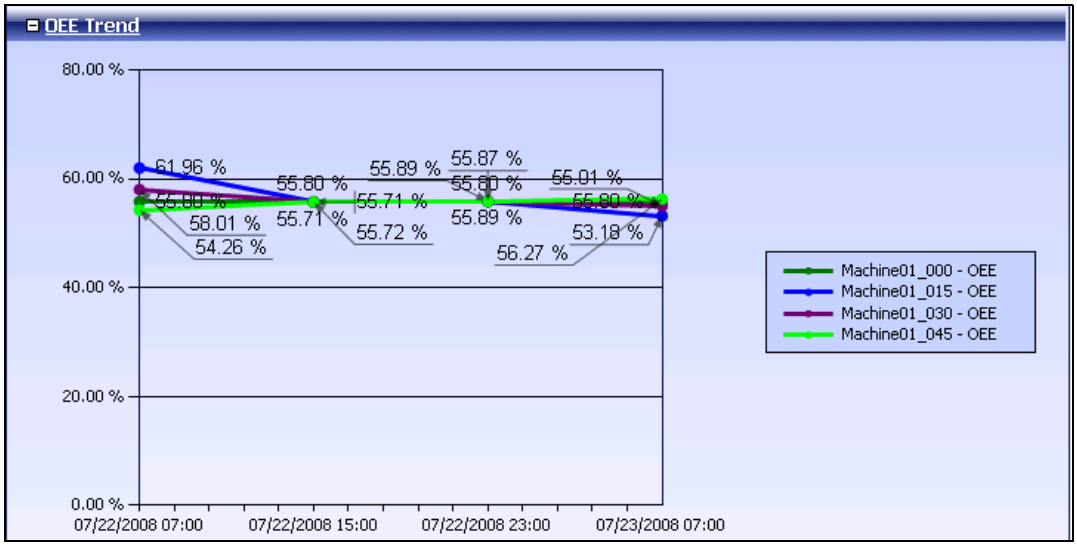
Data Filtering Criteria: This section of the report displays the data filtering criteria used for the report.



Efficiency Analysis: This section of the report displays the four KPIs calculated for each entity that matches the filter criteria. The report is generated using a bar chart.



OEE Trend: This section displays a line chart that shows a separate OEE% trend for each entity based on the value configured for the **Time Resolution** option.



Time Duration Format

All report items that display time durations display the time in **hh:mm:ss** format unless identified differently in the column header or chart label.

- Days are converted to hours and are shown as hours (hh) with at least two digits
- Minutes (mm) are displayed with two digits
- Seconds (ss) are displayed with two digits

For example:

- 2 days, 15 hours, 45 minutes, and 36 seconds will be displayed as: 63:45:36
- 36 seconds will be displayed as: 00:00:36
- 45 minutes and 36 seconds will be displayed as: 00:45:36

Supporting Tabular Data

You can retrieve additional detailed information from each chart. By clicking the chart titles, or entity bars or lines represented in the charts, you will be redirected to more detailed supporting information.

OEE Analysis by Period Reports

By clicking the **Efficiency Analysis** or **OEE Trend** chart titles you will be redirected to a detailed **OEE Analysis by Period** report.

This tabular data represents the data used to compile the chart and can be exported for use in other applications.

OEE Analysis

1 of 1 | 100% | Find | Next | Select a format | Export

Period Start	Shift Desc	Entity Name	Period Last Hour	Schedule Time	Production Time	Good Units	Total Units	Theoretical Count
7/22/2008 3:00:00 PM	Afternoon	Machine01_000	7/22/2008 10:00:00 PM	05:50:00	03:30:00	3255.00	3465.00	3500.00
7/22/2008 11:00:00 PM	Night	Machine01_000	7/23/2008 6:00:00 AM	06:39:59	04:00:00	3720.00	3975.00	4000.00
7/23/2008 7:00:00 AM	Morning	Machine01_000	7/23/2008 2:00:00 PM	05:53:59	03:33:59	3276.00	3486.00	3566.39
7/22/2008 3:00:00 PM	Afternoon	Machine01_015	7/22/2008 10:00:00 PM	05:35:44	03:29:59	3255.00	3465.00	3499.72
7/22/2008 11:00:00 PM	Night	Machine01_015	7/23/2008 6:00:00 AM	06:39:23	04:00:00	3720.00	3930.00	4000.00
7/23/2008 7:00:00 AM	Morning	Machine01_015	7/23/2008 1:00:00 PM	06:03:47	03:30:00	3255.00	3465.00	3500.00
7/22/2008 3:00:00 PM	Afternoon	Machine01_030	7/22/2008 10:00:00 PM	05:20:44	03:20:44	3021.00	3231.00	3345.56
7/22/2008 11:00:00 PM	Night	Machine01_030	7/23/2008 6:00:00 AM	05:49:26	03:29:24	3255.00	3465.00	3490.00
7/23/2008 7:00:00 AM	Morning	Machine01_030	7/23/2008 1:00:00 PM	06:03:50	03:39:49	3489.00	3699.00	3663.61
7/22/2008 3:00:00 PM	Afternoon	Machine01_045	7/22/2008 10:00:00 PM	05:05:43	03:05:44	2811.00	2991.00	3095.56
7/22/2008 11:00:00 PM	Night	Machine01_045	7/23/2008 6:00:00 AM	06:39:29	03:59:26	3720.00	3960.00	3990.56
7/23/2008 7:00:00 AM	Morning	Machine01_045	7/23/2008 1:00:00 PM	06:03:48	03:43:48	3444.00	3699.00	3730.00

Once displayed, you can then save this data to a file type of your choice for use in other applications.

OEE by Shift Trend Report

You use the OEE by Shift Trend report to display data used to calculate the OEE of a given entity for all shifts that started within the given time period.

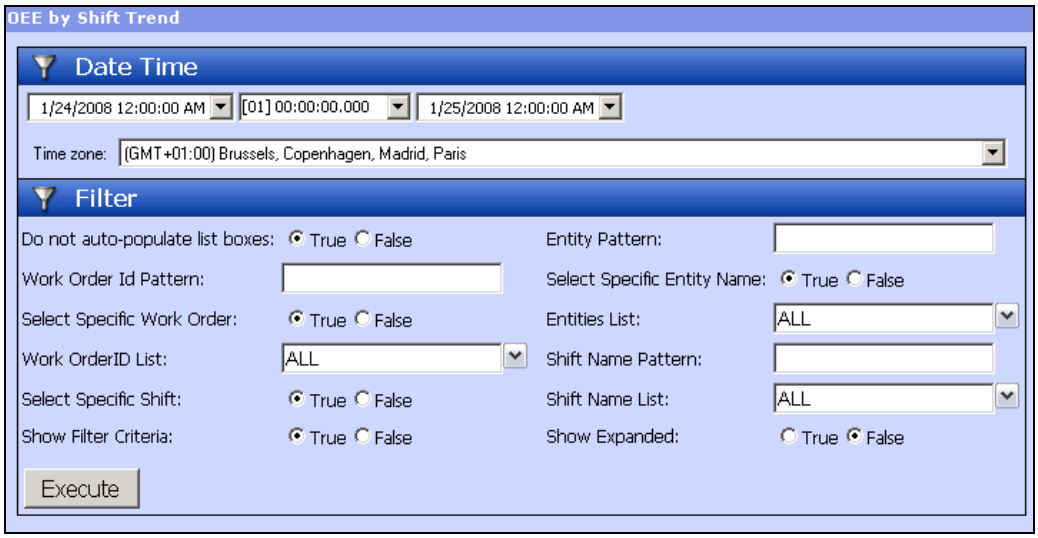
The report shows the following KPIs as a table and a line chart. Both are grouped by entity, day, and shift over a specified time period:

- % OEE
- % Utilization
- % Performance
- % Quality

Show OEE by Shift Trend Report

The steps below instruct you how to retrieve a Shift Trend report.

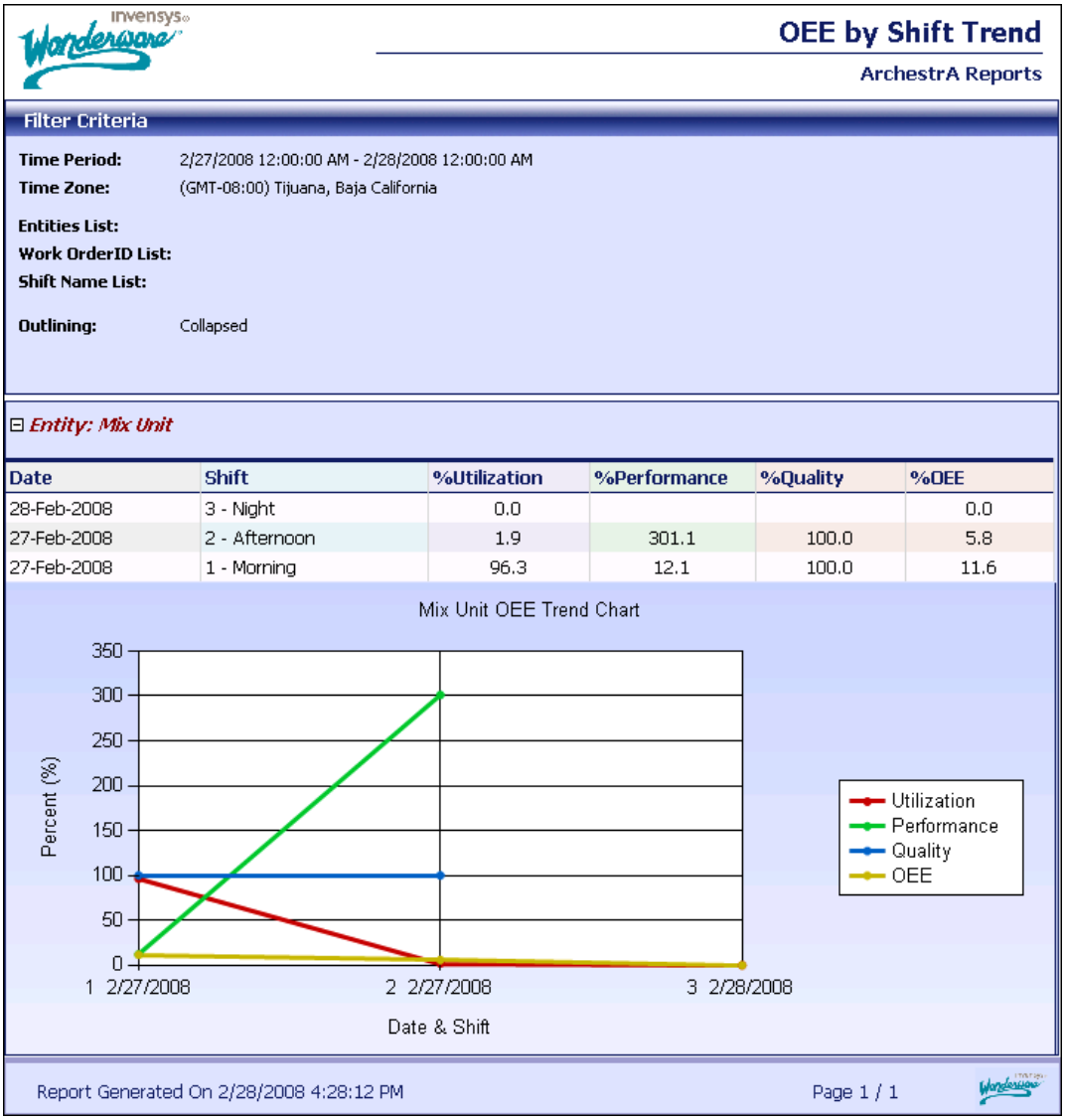
1. Open the **Wonderware Information Server** portal.
2. In the **System** pane, click **Reports\MES\OEE by Shift Trend**.



3. In the right pane, specify the following (optional):
   - **Work OrderID Pattern:** Specify the Work Order ID
   - **Entity Pattern:** Specify the entity name
   - **Shift Name Pattern:** Specify the shift name
4. Click **Execute**. The report is generated and shows a tree of entities that match the filter.
5. Click an entity in the tree to show more details related to the four KPIs through a table and a chart.

   For each day and shift combination, the table shows the following data:
   - Date
   - Shift
   - %Util
   - %Perf
   - %Quality
   - %OEE

Below the table, a line chart shows the KPIs as data series. It maps the date and shift combinations on the x-axis with the OEE percentages on the y-axis of the line chart.



OEE by Shift Trend

ArchestrA Reports

Filter Criteria

Time Period: 2/27/2008 12:00:00 AM - 2/28/2008 12:00:00 AM
Time Zone: (GMT-08:00) Tijuana, Baja California
Entities List:
Work OrderID List:
Shift Name List:
Outlining: Collapsed

Entity: Mix Unit

Date	Shift	%Utilization	%Performance	%Quality	%OEE
28-Feb-2008	3 - Night	0.0			0.0
27-Feb-2008	2 - Afternoon	1.9	301.1	100.0	5.8
27-Feb-2008	1 - Morning	96.3	12.1	100.0	11.6

Report Generated On 2/28/2008 4:28:12 PM Page 1 / 1

OEE Details

The OEE Details report is used to display the OEE for entities grouped by shift, day, or hour for a specified period of time.

The report shows:

- **Efficiency trend** displaying the four KPIs for a selected time period:
  - % OEE
  - % Utilization
  - % Performance
  - % Quality

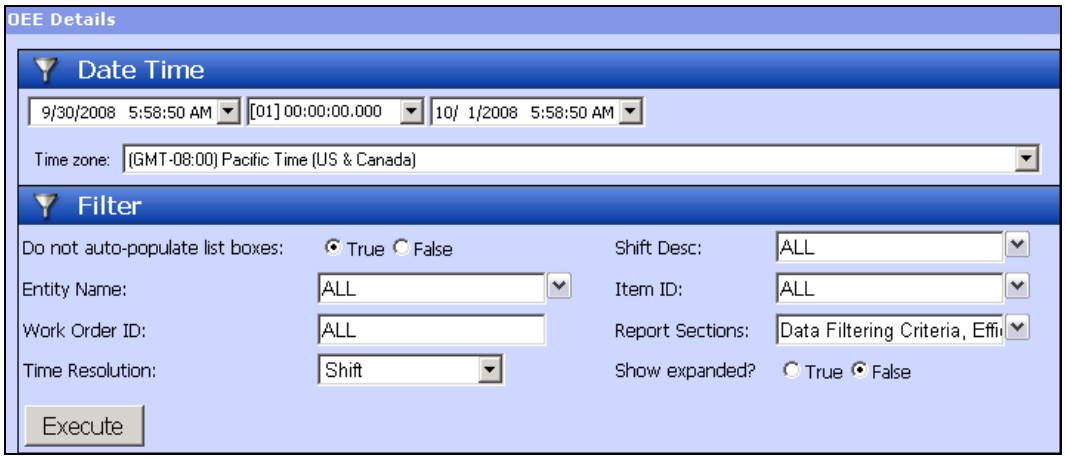
- **Efficiency Losses Bar chart** showing total utilization time grouped in eight categories:
  - Idle Time
  - Scheduled Time
  - Operating Time
  - Downtime
  - Net Operating Time
  - Fully Productive Time
  - Speed Losses
  - Quality Losses
- **Downtime Events Duration Bar chart** showing total duration by reason code for all downtime events
- **Runtime Events Duration Bar chart** showing total duration by reason code for all runtime events
- **OEE Detailed Information table**

Show OEE Details Report

The steps below instruct you how to retrieve an OEE Details report.

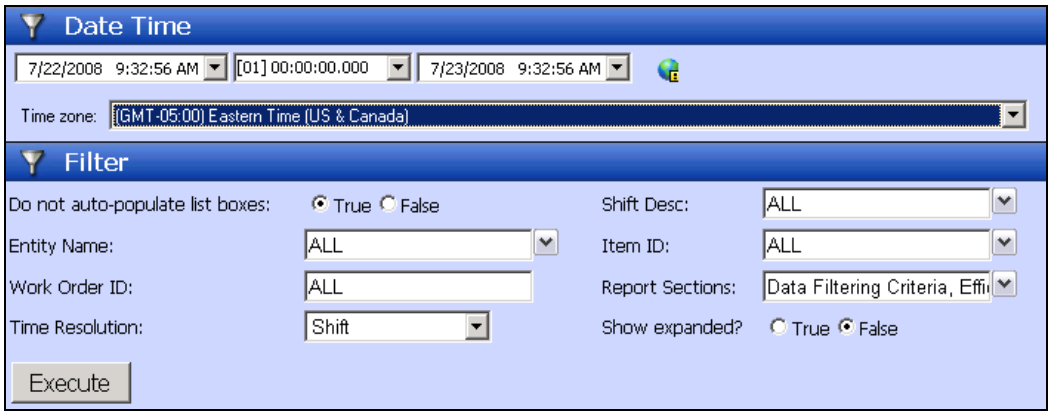
1. Open the **Wonderware Internet Server** portal.
2. In the **System** pane, click **Reports\MES\OEE Details**.

   The **Date Time** and **Filter** sections appear in the main pane.



3. In the **Date Time** section, enter the **Start Time** and **End Time**, or enter the **Start Time** and select the **Relative Time Range**, for the report.
4. Select the **Time Zone**.

This will convert the times of your **Date Time & Filter** query result into the time zone that you select.



5. In the **Filter** section, enter the specific values for the following (optional):
   - Entity Name
   - Work Order ID
   - Shift Desc
   - Item ID

   You can also select values directly from your database by using the default **ALL** command.

   You can select values from your database in the above-mentioned list boxes by changing the **Do not auto-populate list** boxes option to **False**.

   Click the drop-down arrow next to the list field to display your available database values.

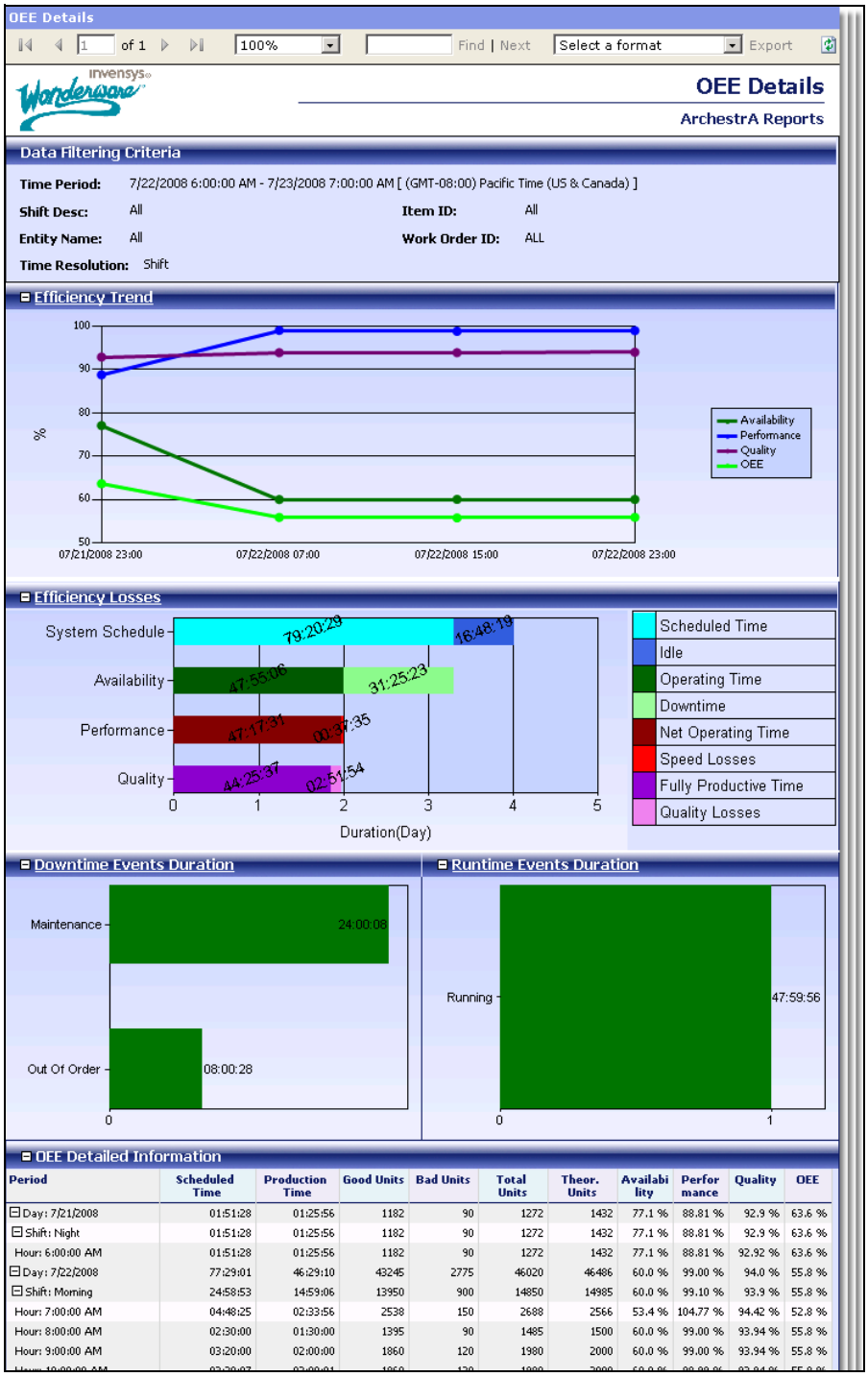
   Note: Depending on the size and variety of your database, displaying list fields could affect overall performance if you have a large number of databases. To avoid this, the **Do not auto-populate list boxes** filter option is set to **True** by default.

6. In the **Report Sections** selection, select the reports sections you want to display:
   - All (Default)
   - Data Filtering Criteria
   - Efficiency Trend
   - Efficiency Losses
   - Event Categories
   - OEE Detailed Information

   Show Expanded: You may select to choose between having your generated reports open in two different views: fully expanded or collapsed.
   - Set the value to **True** to display the generated reports fully expanded.
   - Set the value to **False** to have the generated reports collapsed in the report tree result to be individually opened for viewing.

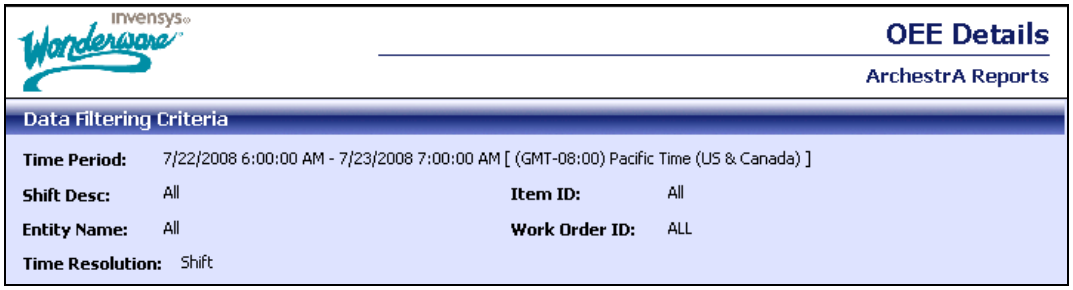
7. Click **Execute**.

The report appears.

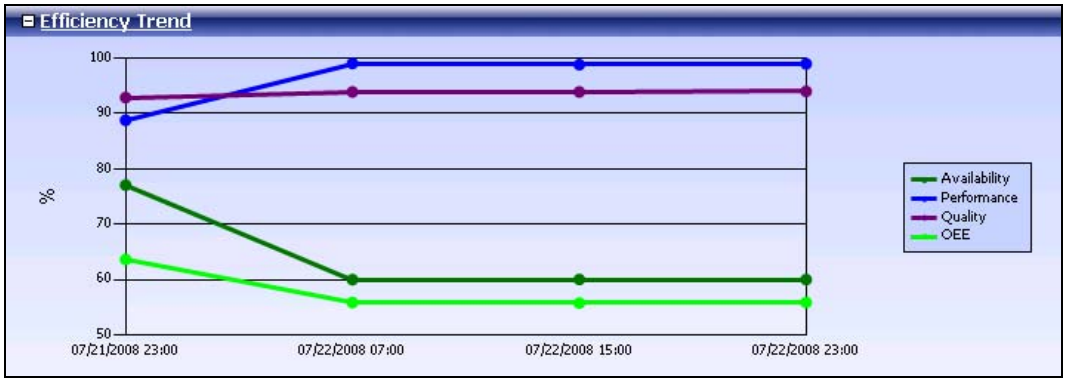


Period	Scheduled Time	Production Time	Good Units	Bad Units	Total Units	Theor. Units	Availability	Performance	Quality	OEE
Day: 7/21/2008	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.9 %	63.6 %
Shift: Night	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.9 %	63.6 %
Hour: 6:00:00 AM	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.92 %	63.6 %
Day: 7/22/2008	77:29:01	46:29:10	43245	2775	46020	46486	60.0 %	99.00 %	94.0 %	55.8 %
Shift: Morning	24:58:53	14:59:06	13950	900	14850	14985	60.0 %	99.10 %	93.9 %	55.8 %
Hour: 7:00:00 AM	04:48:25	02:33:56	2538	150	2688	2566	53.4 %	104.77 %	94.42 %	52.8 %
Hour: 8:00:00 AM	02:30:00	01:30:00	1395	90	1485	1500	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 9:00:00 AM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %

Data Filtering Criteria: This section of the report displays the criteria you specified for the report.



Efficiency Trend chart: This section of the report displays a line chart that displays the four KPIs over a specified time range calculated for each period as defined for the Time Resolution parameter.



To properly report OEE Analysis and OEE Details when configuring the **Time Resolution** selection, you must consider two general system parameters that determine whether the system will go into Shift or Hour storage mode for recording production (good and reject):

- Maintain distinct good production records
- Maintain distinct reject production records

If these two parameter attributes are set to **True/Yes** (Default), the system will go into hourly data storage mode. All production (good or reject) is then stored in the respective hourly buckets.

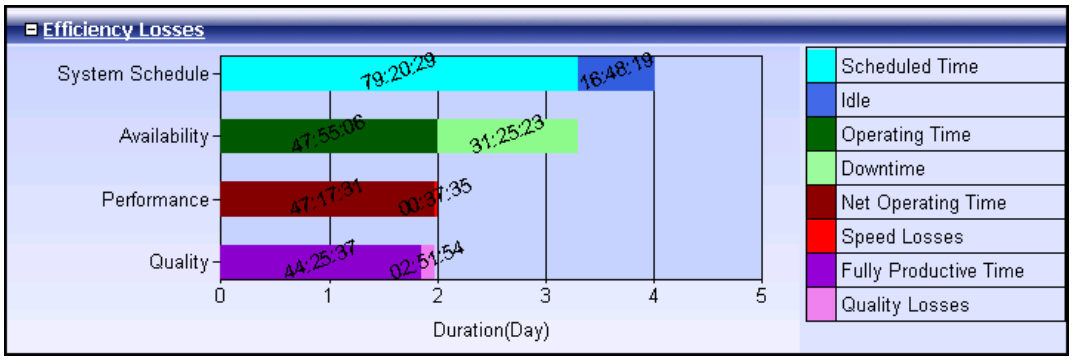
By changing the two parameters attributes to **False/No**, the system will go into shift data storage mode. All production is then stored in the first hourly bucket in the database for that shift, regardless of the number or hours in a shift.

Note: The OEE Analysis and OEE Details reports will display some invalid data if the **Time Resolution** is set to **Hour** and the data storage mode was **Shift** while generating the data in the Factelligence database.

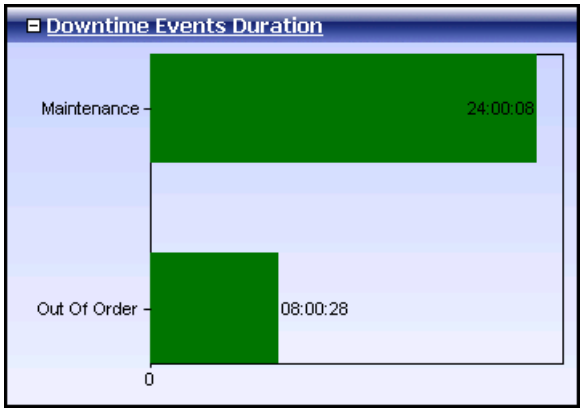
In **Shift** mode, it is recommended that you only set **Time Resolution** to **Shift** or **Day** (**Shift** is the default value).

Efficiency Losses Bar Chart: The chart shows eight horizontal bars corresponding to the total duration calculated from the following production events:

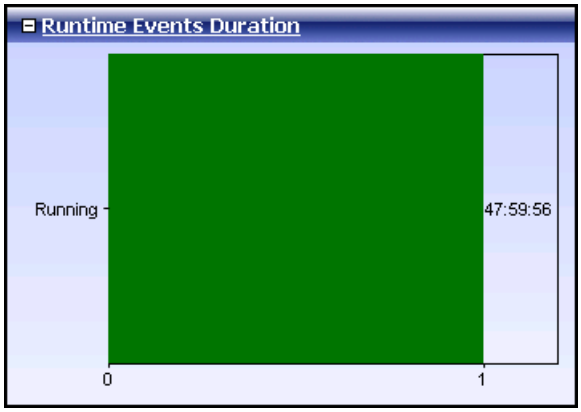
- Idle Time
- Scheduled Time
- Operating Time
- Downtime
- Net Operating Time
- Fully Productive Time
- Speed Losses
- Quality Losses



Downtime Events Duration Bar Chart: This chart shows horizontal bars corresponding to the total duration of events grouped by reason code, where each one of the reason codes corresponds to a downtime utilization state.



Runtime Events Duration Bar Chart: This chart shows horizontal bars corresponding to the total duration of events grouped by reason code, where each one of the reason codes corresponds to a runtime utilization state.



OEE Detailed Information Table: The **OEE Details** table shows the detailed information for each time period along with summary information grouped for each day. The table displays:

- Period
- Scheduled Time
- Operating Time
- Good Units
- Bad Units
- Total Units
- Availability%
- Performance%
- Quality%

OEE%

OEE Detailed Information

Period	Scheduled Time	Production Time	Good Units	Bad Units	Total Units	Theor. Units	Availability	Performance	Quality	OEE
⊟ Day: 7/21/2008	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.9 %	63.6 %
⊟ Shift: Night	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.9 %	63.6 %
Hour: 6:00:00 AM	01:51:28	01:25:56	1182	90	1272	1432	77.1 %	88.81 %	92.92 %	63.6 %
⊟ Day: 7/22/2008	77:29:01	46:29:10	43245	2775	46020	46486	60.0 %	99.00 %	94.0 %	55.8 %
⊟ Shift: Morning	24:58:53	14:59:06	13950	900	14850	14985	60.0 %	99.10 %	93.9 %	55.8 %
Hour: 7:00:00 AM	04:48:25	02:33:56	2538	150	2688	2566	53.4 %	104.77 %	94.42 %	52.8 %
Hour: 8:00:00 AM	02:30:00	01:30:00	1395	90	1485	1500	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 9:00:00 AM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 10:00:00 AM	03:20:07	02:00:01	1860	120	1980	2000	60.0 %	98.99 %	93.94 %	55.8 %
Hour: 11:00:00 AM	03:20:01	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 12:00:00 PM	02:30:02	01:29:57	1395	90	1485	1499	60.0 %	99.06 %	93.94 %	55.8 %
Hour: 1:00:00 PM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 2:00:00 PM	01:50:18	01:25:12	1182	90	1272	1420	77.2 %	89.58 %	92.92 %	64.3 %
⊟ Shift: Afternoon	26:41:51	16:01:14	14880	960	15840	16021	60.0 %	98.87 %	93.9 %	55.7 %
Hour: 3:00:00 PM	04:49:40	02:34:47	2538	150	2688	2580	53.4 %	104.20 %	94.42 %	52.6 %
Hour: 4:00:00 PM	03:19:59	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 5:00:00 PM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 6:00:00 PM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 7:00:00 PM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 8:00:00 PM	03:20:01	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 9:00:00 PM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 10:00:00 PM	01:52:11	01:26:27	1182	90	1272	1441	77.1 %	88.28 %	92.92 %	63.2 %
⊟ Shift: Night	25:48:17	15:28:50	14415	915	15330	15481	60.0 %	99.03 %	94.0 %	55.9 %
Hour: 11:00:00 PM	04:47:47	02:33:30	2538	150	2688	2558	53.3 %	105.07 %	94.42 %	52.9 %
Hour: 12:00:00 AM	02:30:04	01:30:00	1395	90	1485	1500	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 1:00:00 AM	03:19:59	01:59:59	1860	120	1980	2000	60.0 %	99.01 %	93.94 %	55.8 %
Hour: 2:00:00 AM	03:20:00	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 3:00:00 AM	03:20:01	02:00:01	1860	120	1980	2000	60.0 %	98.99 %	93.94 %	55.8 %
Hour: 4:00:00 AM	03:19:58	02:00:00	1860	120	1980	2000	60.0 %	99.00 %	93.94 %	55.8 %
Hour: 5:00:00 AM	03:19:56	01:59:59	1860	105	1965	2000	60.0 %	98.26 %	94.66 %	55.8 %
Hour: 6:00:00 AM	01:50:32	01:25:21	1182	90	1272	1423	77.2 %	89.42 %	92.92 %	64.2 %
Total:	79:20:29	47:55:06	44427	2865	47292	47918	60.4 %	98.69 %	93.9 %	56.0 %

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Module 8 – Application Maintenance

Section 1 – Middleware Maintenance 8-3

Section 2 – Database Maintenance 8-5

Section 3 – Data Archival, Purge, and Restore 8-7

Module Objectives

- Discuss the tools that are used for data archival, purge, and restore
- Describe the mechanisms that are used to create, back up, and upgrade databases
- Provide an overview of the tools that are used to configure middleware components

Section 1 – Middleware Maintenance

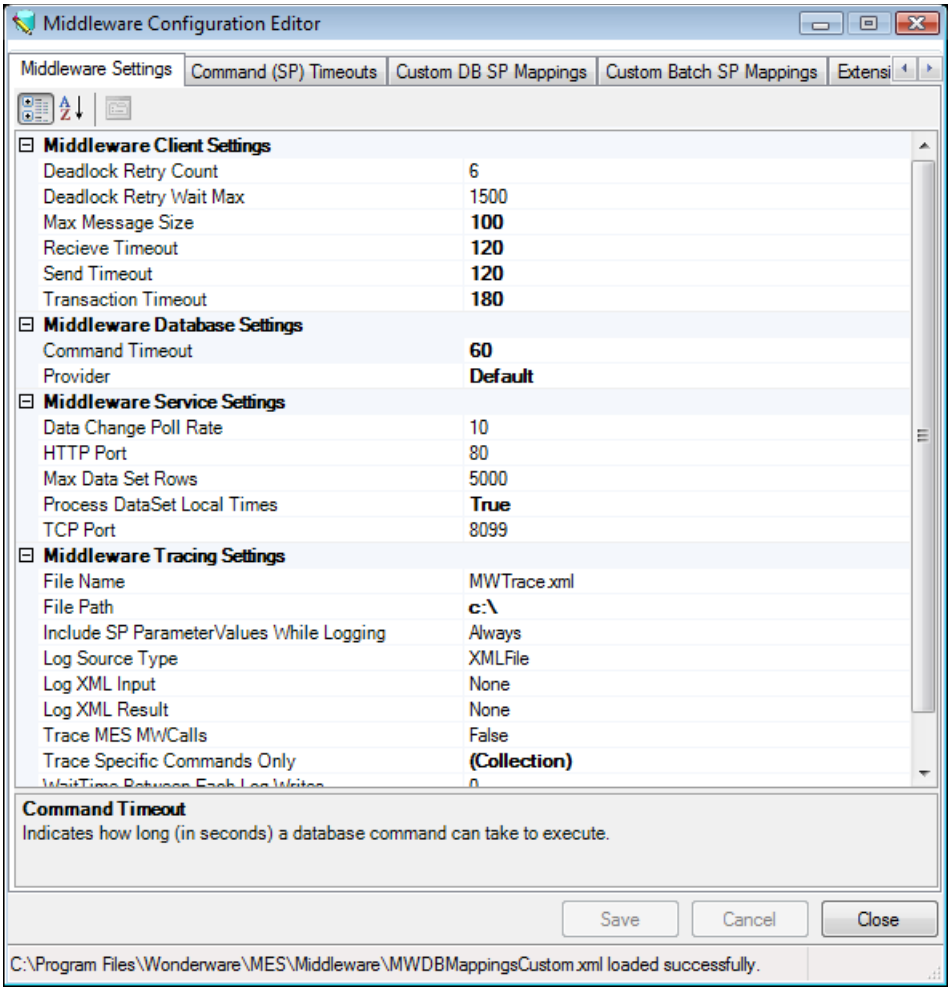
This section discusses the tools that are used to configure middleware components.

Overview

You can configure the custom mapping file that middleware uses while processing commands. The Middleware Configuration Editor allows you to edit the database and middleware communication configuration items. The Middleware Configuration Editor runs on the middleware server. It allows you to modify custom settings used to map the middleware components and change how messages are processed by the middleware.

To open the Middleware Configuration Editor, select **Start** | **All Programs** | **Wonderware** | **MES** | **Utilities** | **Middleware Configuration Editor**.

The **Middleware Configuration Editor** window appears.



The **Middleware Configuration Editor** window allows you to configure the following settings:

- Middleware settings
- Command (SP) timeouts
- Custom DB SP mappings
- Custom batch SP mappings
- Extensibility hooks

You must restart the **MES Middleware Host** service if you change these settings. In some cases, you have to restart the client services that are already running. You can use this tab to configure the middleware settings. The middleware settings affect the communication of the MES Middleware Host with the clients and the MESDB.

When you make any changes to the client settings, you must restart all running clients before they detect the changes. Also, changes to the HTTP or TCP ports require you to restart all running clients.

You can configure a timeout command value in the Wonderware MESDB. This is necessary for a procedure that runs longer than the default command time. If clients consistently get timeout errors from the database when calling a specific middleware method, they may have to increase the timeout for the specific method.

The **Command (SP) Timeouts** tab shows the stored procedures or methods and the corresponding timeout values under the **Method Name** and **Timeout value** columns respectively.

A method name consists of two parts, object part and the command part, which are generally linked with a period. A method name, which follows the **object.command** format, is mapped to a corresponding stored procedure name by the middleware. The method name is derived from the **Object/Cmd/MsgType** elements in the XML message, which is sent to the middleware. If the **MsgType** is **exec** or **getspec**, the method name is created by combining the object and command with a period (ex.ent.add). If the **MsgType** is **getall**, **getbykey**, or some other value, the method name is created by combining the object and the **MsgType** with a period (ex.ent.getbykey).

You can use the **Middleware Settings** tab to configure the custom mapping for a stored procedure in the Wonderware MESDB. The Wonderware MES Middleware Service accepts the XML commands that have the Object/Command/MsgType identifier.

The middleware generates an automatic mapping between the Object/Command/MsgType identifiers and their associated stored procedures. You can configure these mappings on this tab.

You can use this tab to configure the custom mapping for the custom batch-oriented stored procedures in the Wonderware MESDB.

These custom stored procedures accept XML as their first parameter and process the XML internally. The stored procedures process the XML commands in batches.

The **Custom DB SP Mappings** tab shows the method names and the corresponding stored procedure names in the **Custom Method Name** and **Custom Stored Procedure Name** columns, respectively.

The difference between this mapping and the mapping defined by the **Custom DB SP Mapping** tab is managed by a set of stored procedures that must have an input parameter named xml_source or in_xml_source. The stored parameter is passed for the entire XML command.

Section 2 – Database Maintenance

This section discusses the mechanisms that are used to create, back up, and upgrade databases.

Database Creation

The **Database Configuration Utility** allows you to create or modify the MESDB as a standalone operation, which is external to the MES installation setup. This utility is run after the Wonderware MES installation is completed.

You can use the **Database Configuration Utility** to:

- Create a new, or modify an existing, database in either SQL Server or Oracle
- Run custom scripts and store procedures for the new or existing database

You can also use the utility to migrate the existing MESDB. During migration, the database name is used for migration.

You can use the **Database Configuration Utility** to copy all the embedded resources used for the configuration of the database to the **FactDbResources** directory. This option is useful when you encounter problems during the running of the default database script files. You can also save a copy of the database scripts at a specific location on your computer. If you select the **Dump Database Scripts to Disk** option, you cannot run the scripts manually. You must run the **Database Configuration Utility** to create the database by running the scripts from the local disk drive automatically.

To create a database with modified configuration, you can use the saved database scripts on your computer, edit the scripts, and then rerun the scripts to create the database based on the specified modifications.

If you run the utility again after saving a copy of the scripts on the disk, the utility always uses the saved scripts and displays the **Local script files is being used** warning message. If you want to use the embedded resources in the database configuration, you must delete the **FactDbResources** folder before running the utility.

Upgrade to Wonderware MES 2012

You can upgrade to Wonderware MES 2012 only from a version that is higher than version 3.4. To upgrade from a version older than 3.4 to the current version of the software, you must first uninstall the previous version, and then install the new version. The MES Database Configuration Utility delivered with this release supports migration of databases from version 3.1 and later. Migration from versions earlier than 3.1 requires updating the database to version 3.1 manually. Custom modifications to any version of the Factelligence database may not be supported by the utility and may prevent migration.

You must save a copy of the existing middleware configuration file, Middleware.cfg, before uninstalling the existing Wonderware MES version. After the installation is complete, replace the newly created Middleware.cfg file with the original file to restore all connectivity and passwords. Ensure that you restart the MES Middleware Host application after replacing this file.

Backing Up the Database

While you are upgrading the Wonderware MES from a previous version, you can click **Backup** in the **Wonderware Database Configuration Utility** dialog box to create a backup of the previous database. This creates a copy of the database, migrates the existing database to the specified location, and retains the data. If you do not want to migrate, the existing database is renamed and new database is created.

Section 3 – Data Archival, Purge, and Restore

This section discusses the tools that are used for data archival, purge, and restore (APR) of MES data.

Overview

In the MES database (MESDB), the table containing the transaction data grows rapidly and continuously. To keep the size of the MESDB within manageable limits, you have to archive or purge data, or do both, at regular intervals. You can archive the data in tables and their associated tables, and then restore them. In certain cases, you may need to purge the data from the MESDB.

You can use the **Database Maintenance** module in the MES Client to archive, purge, and restore the data in the MESDB. This module allows you to create, run, delete, modify, and view the APR jobs.

The **Database Maintenance** module is in the **Navigation Bar**, under the **System Management** group.

You can create and manage APR jobs by opening the **Database Maintenance** module in the editor window. The **Database Maintenance** editor allows you to:

- Create new jobs
- Run jobs
- View jobs
- Modify jobs
- Delete jobs
- Access job logs

You can manually run the archive and purge jobs in the MESDB to archive or purge data, or do both. You can run the restore jobs in the nonproduction database. You can also manually select from the APR jobs that are already defined to be run for the MESDB. When you select a job, all the configuration information for that specific job appears. You can review and modify the job specifications before running it.

If you run an archive job or an archive purge job, a directory is created with the job name (if it does not exist) in the **DB Maintenance Service** (at the configured root path).

Under the job directory, a time-stamped .zip file is created that contains a .csv file for each archived table. The .zip file also contains a manifest file. A log file with the same name is created along with the .zip file.

You can remove an existing job from the **Database Maintenance** module. Before removing the job, ensure that the job is not running.

If you run a purge job or a restore job, the following is created in the **DB Maintenance Service** (at the configured root path):

- A directory with the job name, if it does not already exist
- Under the job directory, a time-stamped log file

You can schedule the APR job using the **Windows Task Scheduler** on the APR server. This allows the APR jobs to run automatically at a predetermined time or on a regular basis, such as daily, weekly, or monthly.

You must configure the scheduled job on the same computer as the APR server using the **Windows Task Scheduler**. The proxy must be configured to send requests to this service for the command line program to send its requests.

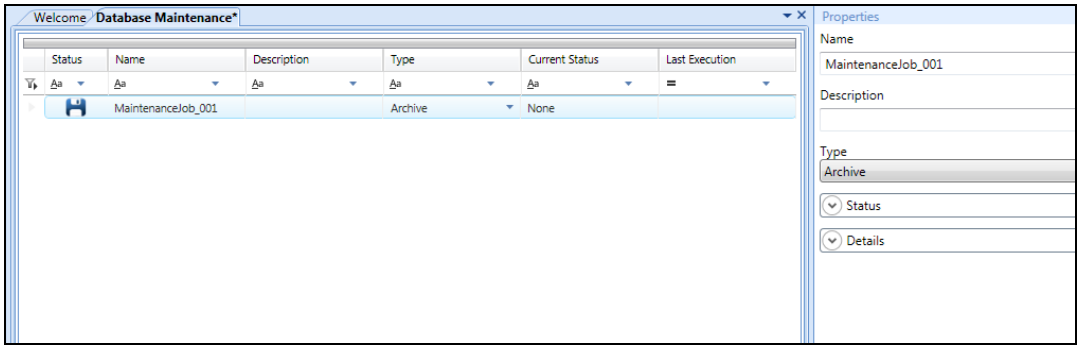
Archive Jobs

You can create a new *archive job* to run a defined archive operation. This job will retrieve the selected records from the MESDB and record them in an archive file. You can also configure the archive jobs to purge the archived records following the successful completion of the archive operation.

Create an Archive Job

1. In the **Navigation Bar**, click the **Database Maintenance** module.
2. Right-click the empty workspace in the editor window and select **New** to create an archive job.

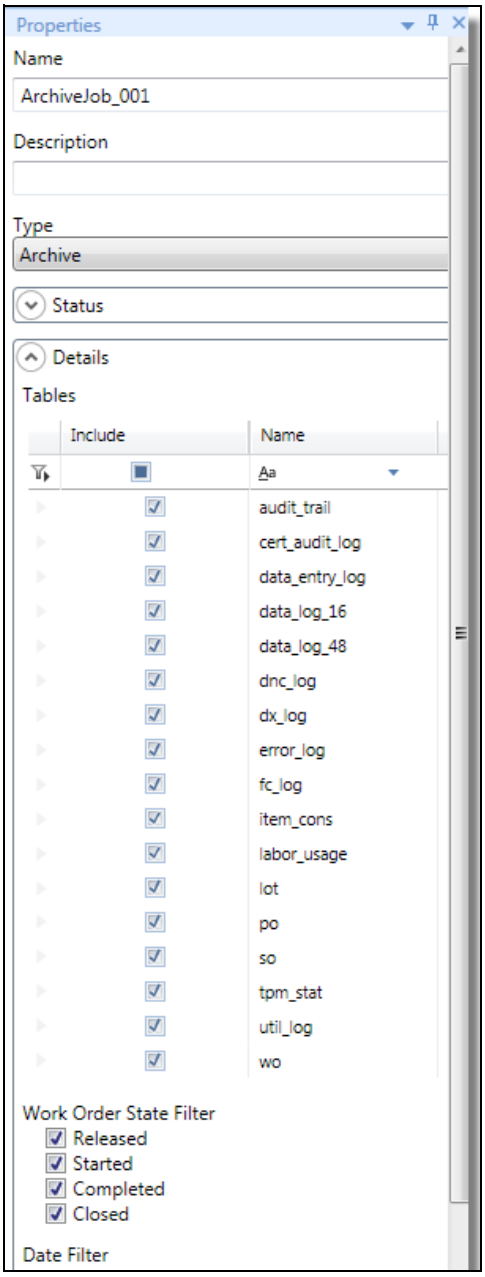
   A new archive job is added to the **Database Maintenance** editor window.



3. In the **Properties** pane, specify a name in the **Name** box.
4. Add a brief description of the job in the **Description** box.

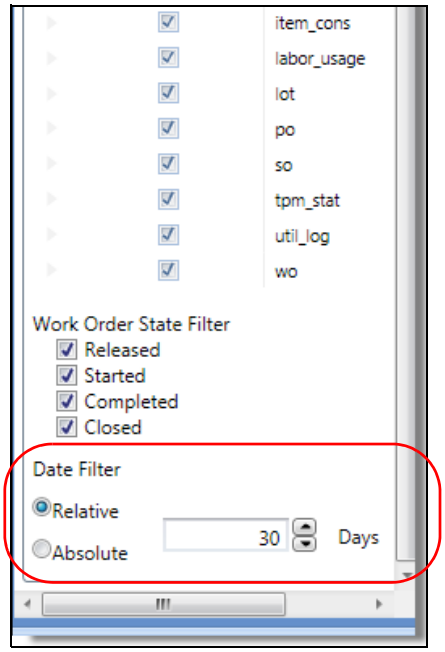
Note: In the **Properties** pane, the job type is set to **Archive** by default. You can change the job type in the **Type** box by setting it to **Archive Purge**, **Purge**, or **Restore**.

5. Click the **Details** option to view and select the tables from which the data needs to be archived.



Note: You can select the **Work Order State Filter** status by selecting one of these available options: **Released**, **Started**, **Completed**, and **Closed**.

6. Under **Date Filter,** select the **Relative** option.



Note: The **Relative** option is set to **30** days by default. This implies that data older than 30 days will be archived. You can also set the **Date Filter** option to **Absolute** and specify a time period for which you would like to restore the data before archiving the rest of the data.

Purge Jobs

You can create a *purge job* to run a purge operation. This job will remove records from an active, production MESDB to free up resources on the database server. The purge operation can be done independently or as a follow up to an archive job.

Note: When you create a new job, the job type is set to **Archive** by default. To create a purge job, in the **Properties** pane, in the **Type** box, set the job type to **Purge**.

Restore Jobs

You can create a *restore job* to run a restore operation. This job will insert records from an archive file into the MES Restore DB. The restore DB must already exist and will not be created as part of the restore operation.

Note: To create a restore job, in the **Properties** pane, in the **Type** box, set the job type to **Restore**. Before creating a restore job, ensure that an archive file is available from a previously archived job.

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Appendix A – Wonderware MES Software Installation Notes

Introduction

This appendix provides an explanation of the Wonderware MES Software components that may be selected for installation. The appendix does not supply step-by-step installation instructions. Refer to the *Installation.pdf* file in the **MES\Docs** folder on the Wonderware MES Software DVD.

Wonderware MES Software Components

Wonderware MES software is composed of software components that can be distributed across a network environment. Therefore, each component can be individually installed on a platform connected through one or more networks.

Based on the components' role type, they can be grouped into the following main categories:

- Database Servers
- Middleware and MES Service
- Client Applications
- MES Integration Tools and Components

These categories are described below.

Database Servers

There can be multiple database servers in an MES system, but at least one production database server is required as a central data repository to collect MES production data. Supported database servers are SQL Server and Oracle.

Middleware and MES Service

MES Middleware service is a process that handles all client transactions to the MES database. Depending on the network topology and the number of client connections, MES Middleware can be installed on more than one platform per one MES database instance.

MES Service is responsible for schedule-based tasks, such as cleaning up shifts and sessions, and requires only one installation per MES database instance. It is typically installed and runs on the MES production database.

Client Applications

Client applications include configuration, maintenance, and production shop floor tools. These clients communicate with MES Middleware or through Middleware Proxy to complete the transactions. The commonly used clients are Configurator, Data Editor, MES Client, Supervisor, and Operator.

Middleware Proxy is a utility that helps MES clients connect to MES Middleware. Middleware Proxy is only needed when MES Middleware is located on a remote computer (not on the MES Client).

MES Integration Tools and Components

Entity Model Builder is an ArchestrA IDE extension used to help build MES entities from Application Server.

The software components used to integrate MES with Application Server and InTouch are MES Application Objects (UCO, OCO, and SRO) and MES .NET client controls.

Factory Connector, while running as a Window service, is used to connect data sources directly to MES.

Wonderware MES Solution Design

When an MES solution requires a distributed installation of components across a network or networks, the configuration of the MES components becomes an important factor affecting the performance of the system.

When designing the MES solution and selecting hardware, refer to the *Wonderware MES Deployment Guide* for guidelines and best practice information regarding the design and configuration of the MES components, as well as hardware requirements. This document can be downloaded from https://wdn.wonderware.com. The *ReadMe* file in the **MES\Docs** folder on the Wonderware MES Software DVD also contains the minimum hardware requirements and software compatibility information.

Below is a summary of important considerations for the solution design:

- Network Topology and Location of the MES Components
  - Control Network – MES will not be on this network
  - Plant Production Network
  - Plant Business Network
  - Corporate WAN
- Location of Report Server (WIS) – Plant Production or Plant Business, or DMZ (between Production and Business)
- MES Service and MES Middle Host
  - MES Service – Only one installation, normally on the Database Server
  - MES Middleware Host – Can be multiple, depending on the number of client connections and type of connection
  - Report Server – Requires a separate MES Middleware Host if the query is large and frequent
  - MES Middleware Host – Normally recommended to be run on Application Server
- Middleware Proxy – Needed only when the client is on a different computer from the MES Middleware Host
- Recommendation
  - 50 to 100 clients per MES Middleware Host
  - 200 to 300 MES application objects per platform
  - 30 to 50 MES application objects per engine
  - Separate MES Middleware Hosts for Application Server objects and MES clients

Installation Prerequisites

Before installing the MES software, check the information in the *ReadMe* file and run the *PreRequisites.exe* application on the DVD to install prerequisite software, such as Microsoft .Net Framework library, if necessary.

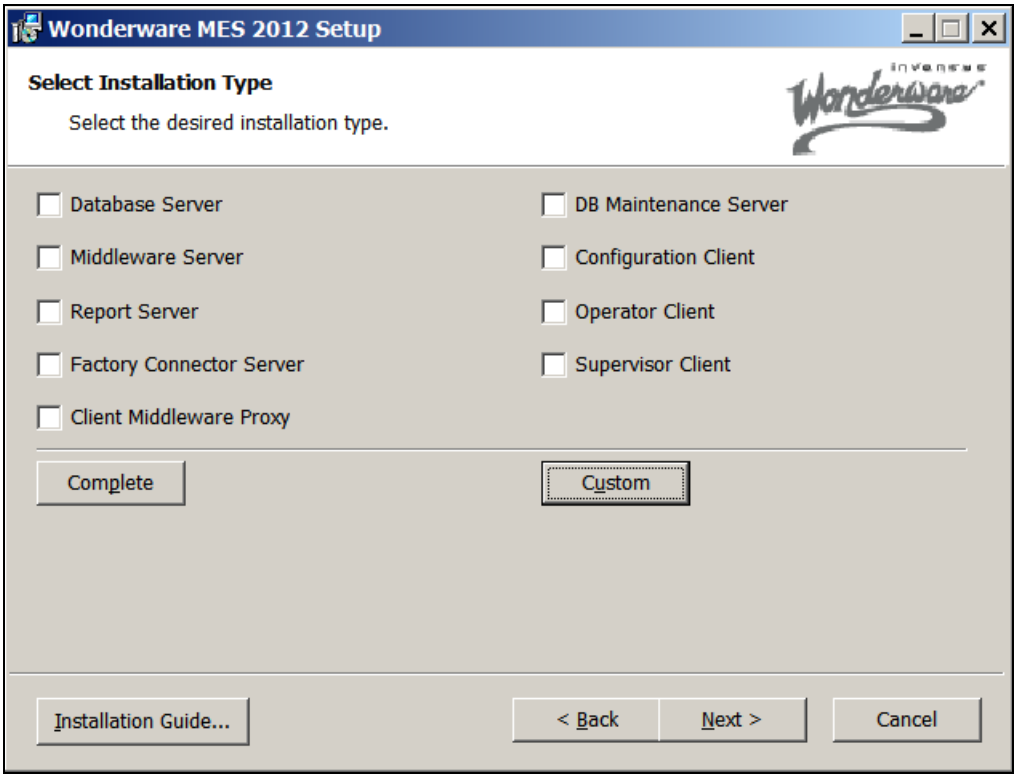
Installation

For installation details, refer to the *Installation.pdf* file in the **MES\Docs** folder on the Wonderware MES Software DVD.

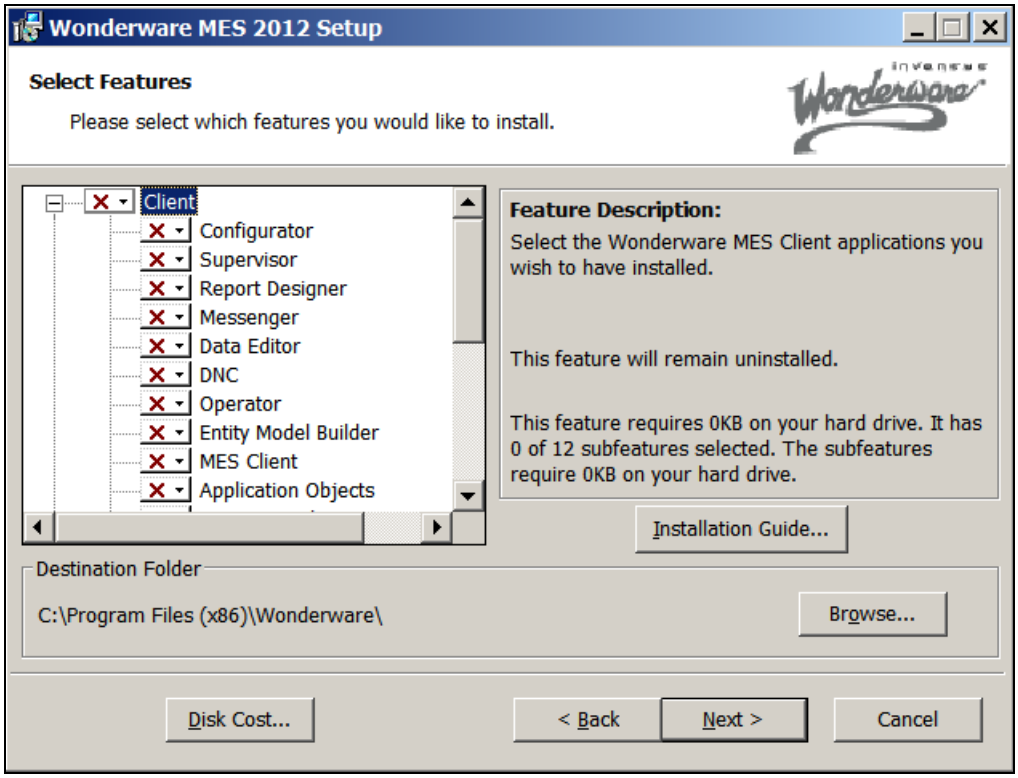
Important Notes Regarding the Installation

Please review the following notes before installing the software:

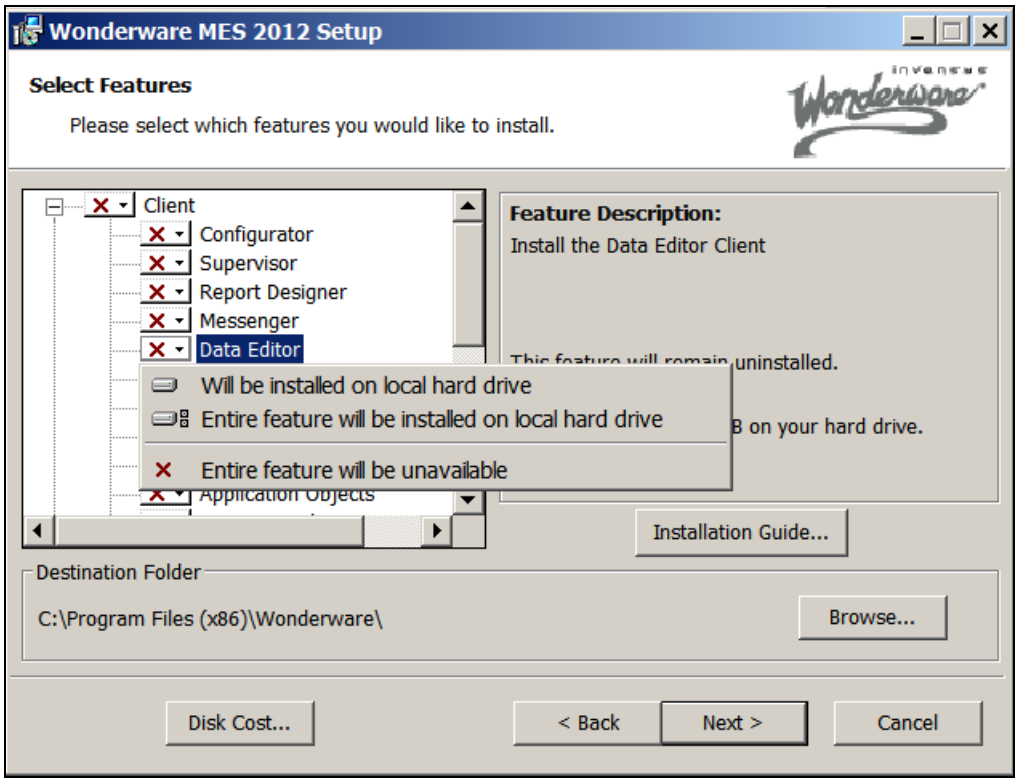
- In a distributed installation environment, install the server components before the client components.
- In the following dialog box, choose the components to install or click **Complete** to install all the components on the same computer.



- To choose specific components to install, click **Custom** in the **Select Installation Type** dialog box shown above to display the following dialog box.

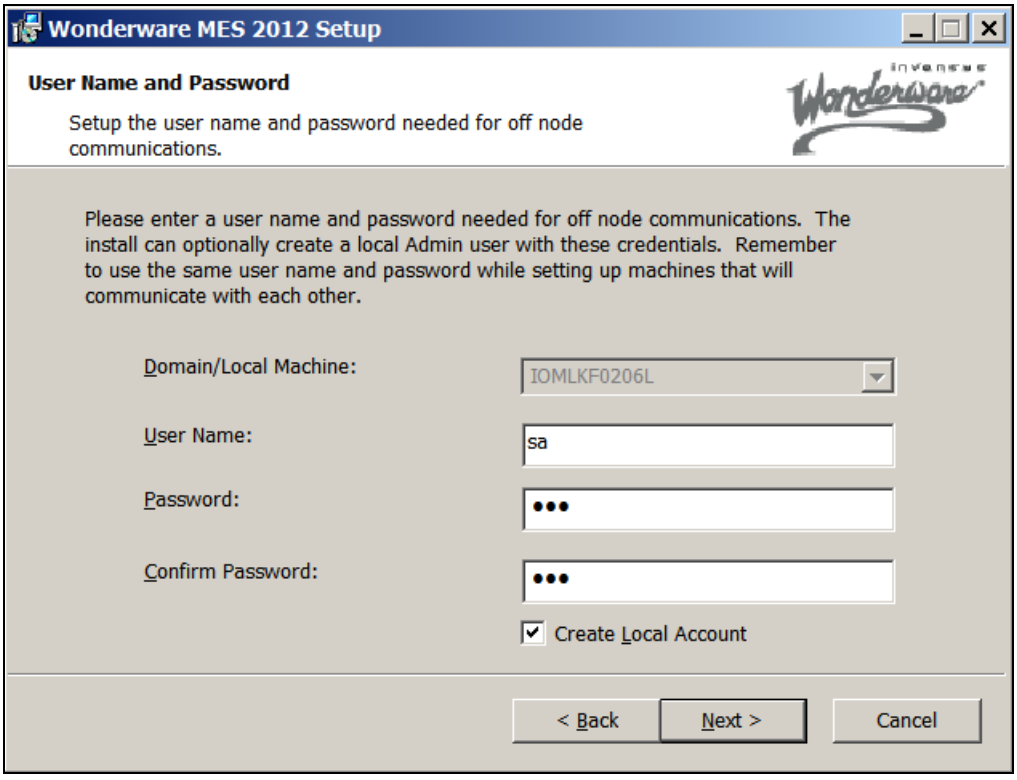
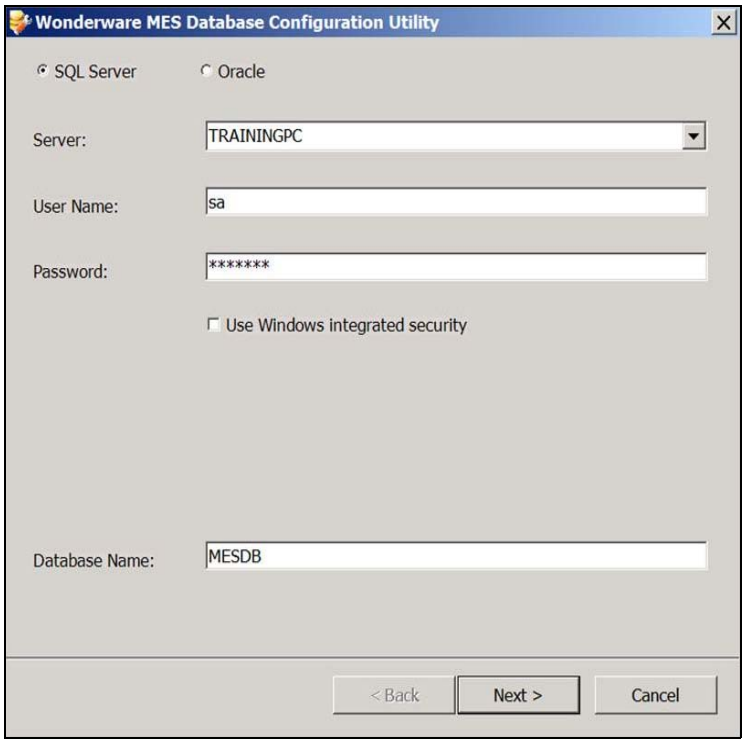


- Select each individual feature to install.



- If the ArchestrA user account has not been configured before on the computer, the following dialog box will appear during installation. Use the dialog box to provide an OS user account for the Wonderware MES Setup.

Note: To use the OS security (either User or OS Group) for MES, the MES computers must be part of the domain and the user account for Wonderware MES Setup must use a domain user (not a local OS user).



- In the following dialog box, choose the authentication mode for the connection to the database server. Using **SQL Server** for example, the password will be recorded in the MES database. The recorded password will not change even if the SQL user's password is updated in the SQL user profile. The recorded password is required to access the **Database Connection Editor** utility.