INVENSYS LEARNING SERVICES

Training Manual

Revision A
March 2013
Part Number 11-MM-10021

MES 2012 – Quality

Module 1 – Introduction

Module Objectives

- List the objectives of this course and describe the agenda
- Describe the main functions and features of the Wonderware MES Software/Quality
- List the components that comprise Wonderware MES Software/Quality

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and the course outline. It also includes a summary of the Wonderware Software Solutions product offerings.

Course Description

The MES 2012 – Quality course is a 2-day, instructor-led class designed to provide a fundamental understanding of the features and functionality of Wonderware MES Software/Quality. The course provides lectures and hands-on labs to supply and reinforce the knowledge necessary to use Wonderware MES Software/Quality to address the configuration and deployment of a data collection system, which allows for the analysis and reporting of Quality Management data using a Sample Recording Object.

Objectives

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

- Implement the concepts of Wonderware MES Software/Quality
- Describe the relationship of Wonderware MES Software/Quality to MES Software/Operations
- Use the Wonderware MES Client application to define Sample Plans and their frequency, characteristics, and Quality Management specifications
- Configure a Sample Recording Object
- Build the Sample Viewer Control
- Implant a Control Chart Interface using ArchestrA graphics
- Use Wonderware Information Server to view ArchestrA reports

Audience

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

Prerequisites

- Completion of an Application Server course
- Completion of an InTouch for System Platform course
- Completion of an MES – Operations course
- Manufacturing industry experience

Course Outline

Module 1 – Introduction

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and the course outline. It also includes a summary of the Wonderware Software Solutions product offerings.

Section 2 – System Platform Overview

This section explains the architecture, components, and services that comprise the System Platform and its Clients.

Section 3 – MES Software/Quality Overview

This section provides an introduction to Wonderware MES Software/Quality, as well as the concepts and terminology associated with it. The relationship to Wonderware MES Software/Operations will also be covered.

Section 4 – System Requirements and Licensing

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

Module 2 – MES Client Configuration

Section 1 – MES Client

This section describes the interface of the Wonderware MES Client application. The configuration within Wonderware MES Client for implementing Quality plans is also included.

Section 2 – System Platform Configuration

This section explains the necessary preparation of the System Platform. This section also describes the importing and implementation of the Sample Recording Object and the building of the Entity Model.

Section 3 – Further Preparation for MES Software/Quality

This section provides the MES database preparation needed prior to setting up the Quality functionality. This includes verifying the Entity Model, defining units of measure, and creating shifts.

Module 3 – MES Software/Quality Configuration

Section 1 – Sampling Configuration

This section explains the need for adequately building your Sample Plan and QM Specification in Wonderware MES Software/Quality. The requirements for a Sample Plan, including frequency, Characteristics, and quality management specifications are included.

Section 2 – The Sample Viewer Control

This section describes how to build and implement the Sample Viewer Control. This includes an explanation of how to use .NET controls as an ArchestrA graphic for use in an InTouch application and how to view a Basic Control Chart.

Section 3 – Automatic Data Collection

This section illustrates how to automatically collect System Platform data by configuring a Sample Recording Object in the Galaxy.

Section 4 – Additional Sample Plans

This section introduces Sample Plans for collecting data during shifts and Binary Attribute Characteristics.

Section 5 – Additional Features of the Sample Recording Object

This section explains how to implement the other features of the Sample Recording Object, including user information, lot identification, and notes.

Module 4 – Integration with MES Software/Operations

Section 1 – Building and Running a Basic Operation

This section reviews the basic concepts of Wonderware MES Software/Operations. This includes instanciating an Operations Capability Object, building the Entity Model, and building the Operation Model.

Section 2 – Building a Sample Plan for an Operation

This section further explains the integration between Wonderware MES Software/Operations and Wonderware MES Software/Quality by collecting Quality data with an Operations job.

Module 5 – MES Reporting Features

Section 1 – Control Charts

This section describes how to implement an SPC Control Chart using MES .NET controls. This includes how to interface with the control chart.

Section 2 – ArchestrA Reports

This section demonstrates how to access the Wonderware MES Software/Quality reporting elements using the ArchestrA Reports feature of Wonderware Information Server.

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:

- **Framewor**k, 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 explains the architecture, components, and services that comprise the System Platform and its Clients.

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, the 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 service**s 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 service**s for functions that provide information to the right user at the right time, and in the form in which they expect
- **Application development services** that provide easy and intuitive development of modular industrial software solutions that can be easily changed to meet future needs
- **System management and extensibility services** that provide easy management, expansion, and modification of the application or the computing architecture

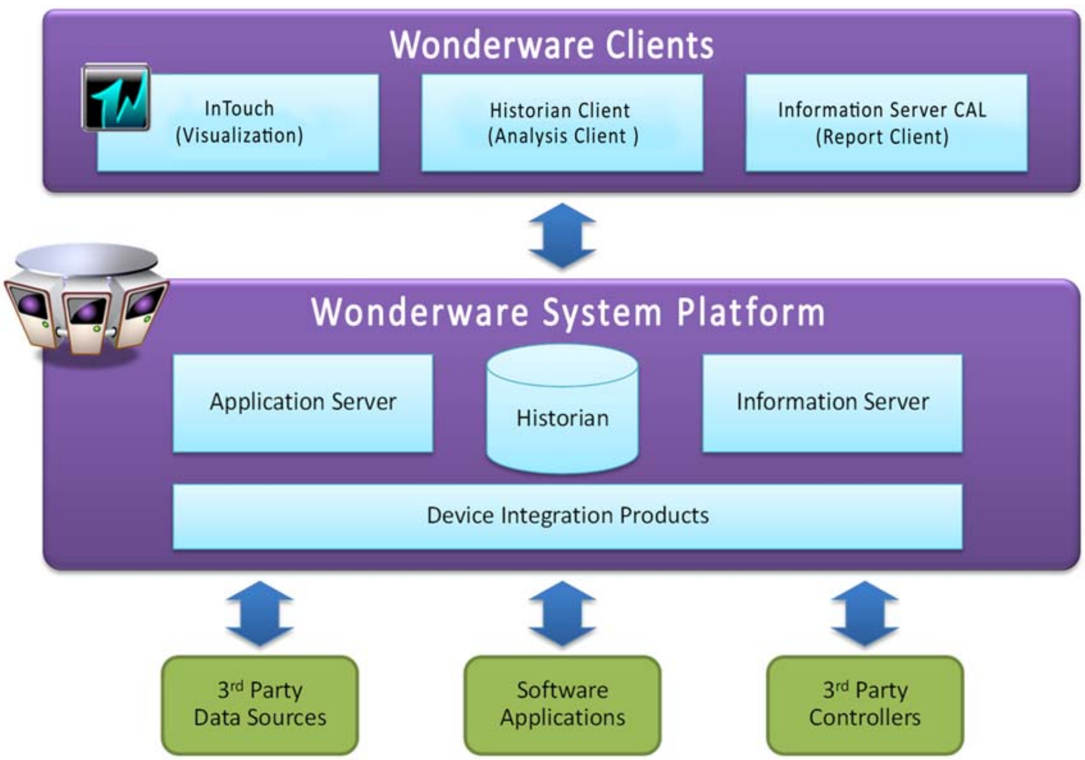
The ArchestrA technology on which System Platform is built is a comprehensive plant automation and information architecture designed from the outset to extend the life of legacy systems by leveraging the latest software technologies. For more information, see “ArchestrA Technology” on page 1-8.

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 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** for Information Server to enable information-sharing and reporting over the web

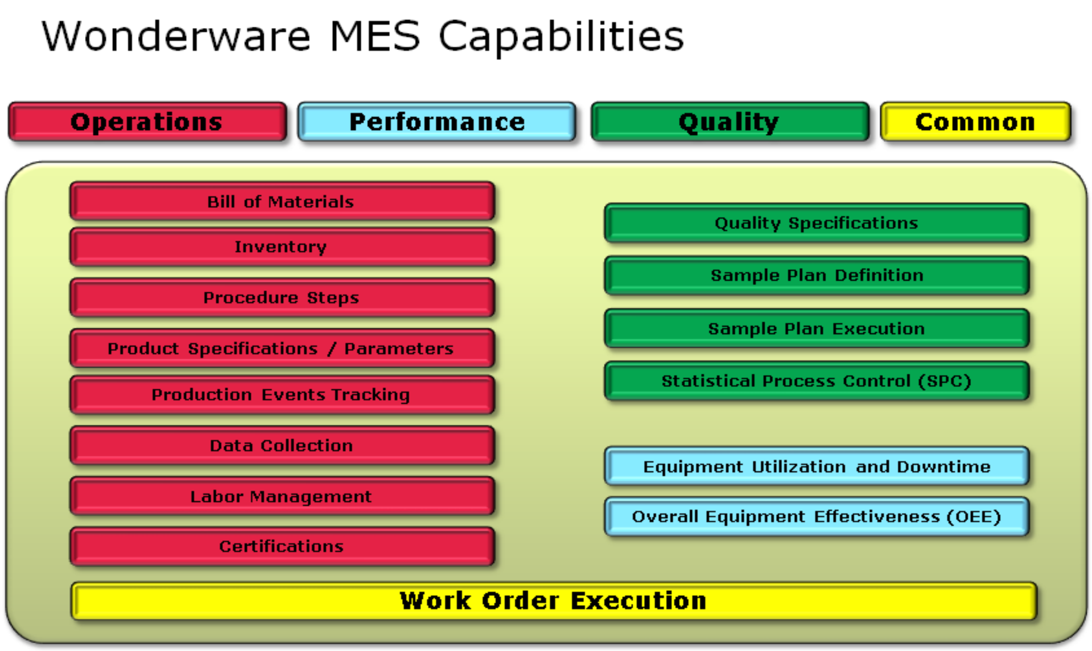


Section 3 – MES Software/Quality Overview

This section provides an introduction to Wonderware MES Software/Quality, as well as the concepts and terminology associated with it. The relationship to Wonderware MES Software/Operations will also be covered.

Overview of MES Software/Quality

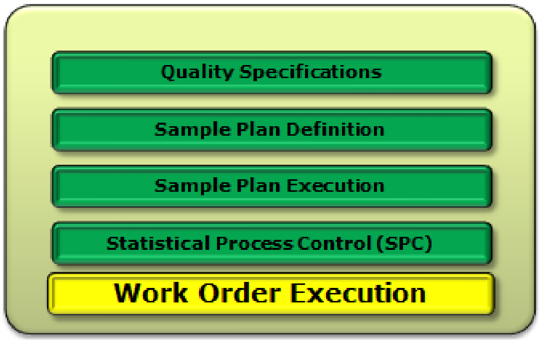
MES Software/Quality enhances the existing Operations and Performance Management in Wonderware MES Software by adding Quality Management (QM) capabilities, which aids in the collection of data. These include: Operational Quality Specification and Sampling Management in Work Order Execution context; plus SPC monitoring and reporting of sampled data.



MES Software/Quality Capabilities

The capabilities of Wonderware MES Software/Quality are to provide the following:

- Quality Specifications configuration for Products, Equipment, and Operations
- Sample Plan configuration used in Quality Specifications
- Automation of data sampling from:
    - Production equipment control systems
    - Operator procedure enforcement
- SPC monitoring of quality data, as well as limits and rules violation notifications
- Tracking of work order status to dynamically apply the right quality specification rules to secure compliance in data sampling



MES Software/Quality Build on ArchestrA System Platform

Wonderware MES software seamlessly integrates with other MES functions and runs on System Platform with capabilities to plant automation. This highly integrated approach delivers enterprise Quality Management interoperability.

ArchestrA System Platform provides the infrastructure for:

- Execution of MES functions
- Integration with automated equipment
- Integrates Manufacturing Operations Management (MOM) with Process Management/ Supervisory Control (ISA 95 L2 and L3)
- Enables Standardization of Equipment Operations and MES standards
- Reporting and information management

Quality Management Functionality

The functionality of Wonderware MES Software/Quality is to provide the following:

- Specification Management – definition of product and process specifications in the context of items, equipment, and operations
- Sample Plan Definition – what Characteristics to collect and when to collect them (e.g. time based, event based, etc.)
- Sample Plan Execution – execute sample plans, collect data (manual, auto, or combination), and show status
- SPC
  - Configurable Control Limits and Control Rules
  - SPC charts
  - Immediate Analysis and Feedback of Control Rule Violations

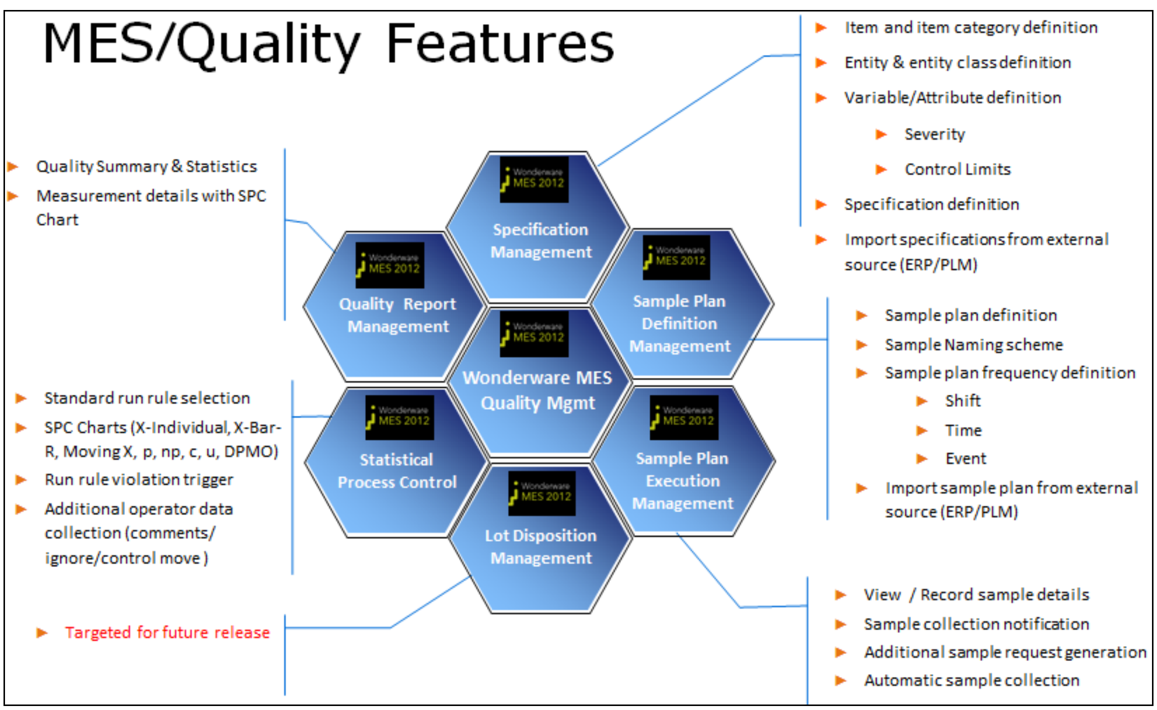
Quality Management Software Components

The components available for Quality Management are the following:

- MES Client Configuration Module
- Sample Viewer (data grid) .NET Control
- SPC Chart .NET Control
- Sample Recording Object (System Platform Object)
- Reporting Content
- MES Service update to generate samples based on frequency

MES Software/Quality Features

The following diagram displays the MES Software/Quality features at a glance:



MES Updates to Accommodate for Quality

The updates to the MES software to accommodate for QM are as follows:

- Updates to MES Client for configuring Sample Frequencies, Sample Plans, Characteristics, and QM Specifications
- New .NET grid control for visualizing runtime samples and manually entering in results
- New .NET SPC Chart control for visualizing results in an SPC Chart
- New Sample Recording Object for use within Application Server to automatically record results and display rule violations
- New Reporting content including an SPC Chart within the Wonderware Information Server (WIS) report
- Updates to the MES Service for generating runtime samples and preview of future samples
- Updates to the Middleware and stateless API in support of all the above
- Database procedures for calculating statistics, evaluating control rule violations, and determining the correct samples to generate

Section 4 – System Requirements and Licensing

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

Hardware Requirements

The minimal and recommended hardware requirements are listed below.

Middleware or 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)

Galaxy Repository

- 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.
- 4 gigabytes (GB) or more of RAM. (2 GB minimum supported; may limit performance of some features)

All Systems (Client Applications)

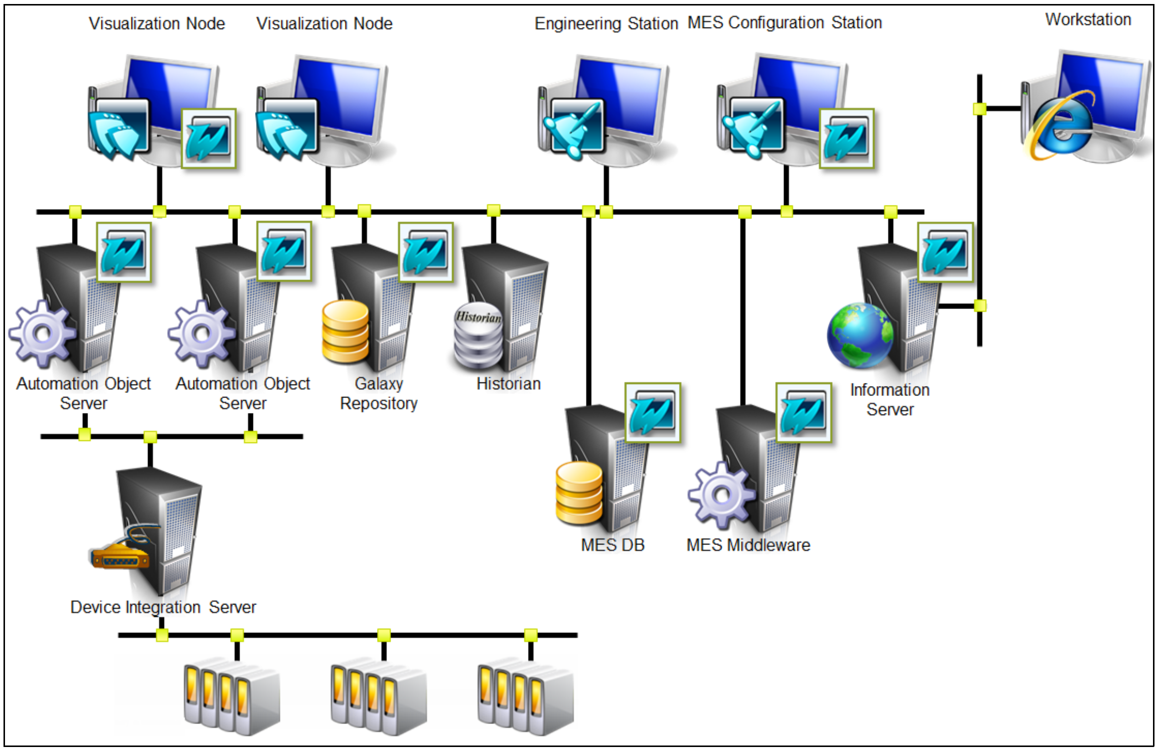
- 30 GB of available disk space
- Super VGA (1024 x 768) or higher resolution video adapter and monitor
- CD-ROM or DVD drive
- Keyboard and mouse or compatible pointing device

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

Hardware Architecture

The diagram below shows an example of a hardware configuration that includes all available hardware that can be deployed in a Wonderware MES Software/Quality environment. It is by no means a minimum configuration. Different options for combining servers should be calculated, including virtualization of servers.

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



Software Requirements

Wonderware MES 2012 requires the following software:

- Microsoft .NET Framework 3.5 SP1

Note: If this version of the .NET Framework is not installed on the computer, the Wonderware MES installation automatically installs the .NET Framework.

- The Entity Model Builder feature requires ArchestrA Integrated Development Environment (Application Server 3.1 SP2)
- The MES database requires MSDT and IIS 6.0
- Control Chart visualization requires InTouch 10.1 SP2
- The Wonderware Information Server Integration feature requires Wonderware Information Server version 3.0 or later. For more information, see *Wonderware MES Reports in Wonderware Information Server Guide*.

Operating System Requirements

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

Operating Systems		Type	Service Pack Level
Window Server 2003 R2	32-bit only	Standard or Enterprise	SP2
Windows Server 2008	32-bit & 64-bit	Standard or Enterprise	none, SP1, SP2
Windows Server 2008 R2	64-bit only	Standard or Enterprise	none, SP1
Windows Vista	32-bit & 64-bit	Business	none, SP1
Windows XP	32-bit only	Professional	SP3
Windows 7	32-bit & 64-bit	Professional or Enterprise	none, SP1

Note: The Microsoft Windows Vista operating system imposes hardware requirements that exceed the minimum requirements for Wonderware MES v4.5. If you intend to run selected components of the Wonderware MES v4.5 with Windows Vista, see the following Microsoft Web site for hardware requirements.

Database Requirements

The follow tables list the supported database systems for Wonderware MES components:

Microsoft SQL Server

Version		Type	Service Pack Level
Window SQL Server 2008 (with clustering)	32-bit & 64-bit	Standard or Enterprise	none, SP1, SP2, SP3
Windows SQL Server 2008 R2 (with clustering)	32-bit & 64-bit	Standard or Enterprise	none, SP1
Windows SQL Server 2012	32-bit & 64-bit	Standard or Enterprise	none

Oracle Database

Version	Type	Bit
Oracle Database 10g Release 2	Standard or Enterprise	32-bit & 64-bit
Oracle Database 10g Release 2	Standard Edition One	32-bit & 64-bit
Oracle Database 11g Release 2	Standard or Enterprise	32-bit & 64-bit
Oracle Database 11g Release 2	Standard Edition One	32-bit & 64-bit

Virtualization Support

Wonderware MES 2012 supports the following VMware platforms:

- ESX 3.5
- ESX 4.0
- ESX 4.1
- ESXi 4.1
- ESXi 5.0

Licensing

Wonderware MES Software/Quality uses the Wonderware licensing system. For instructions on installing or updating a license, see the MES ReadMe file, located in the root folder of the installation CD.

Note: During installation, you only install Wonderware MES. The Performance, Operations, and Quality features are enabled through licensing.

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

Module 2 – MES Client Configuration

Module Objectives

- Explain the MES Client interface and the MES security model
- Explain and implement the Sample Recording Object
- Configure the MES database

Section 1 – MES Client

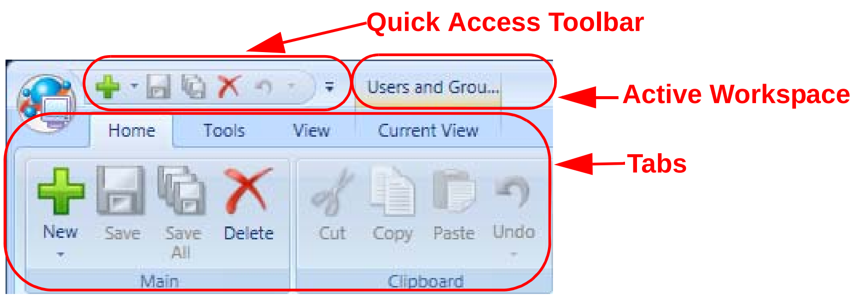
This section describes the interface of the Wonderware MES Client application. The configuration within Wonderware MES Client for implementing Quality plans is also included.

Navigation in Wonderware MES Client

Wonderware MES Client can display large amount of data in an organized way. The top of the window includes a customizable ribbon, and the bottom of the **Navigation Bar** includes drop-down options to customize the button groups.

Ribbon

The top of the page displays a ribbon similar to what you would see in the Microsoft Office suite of products. The ribbon is arranged as follows:



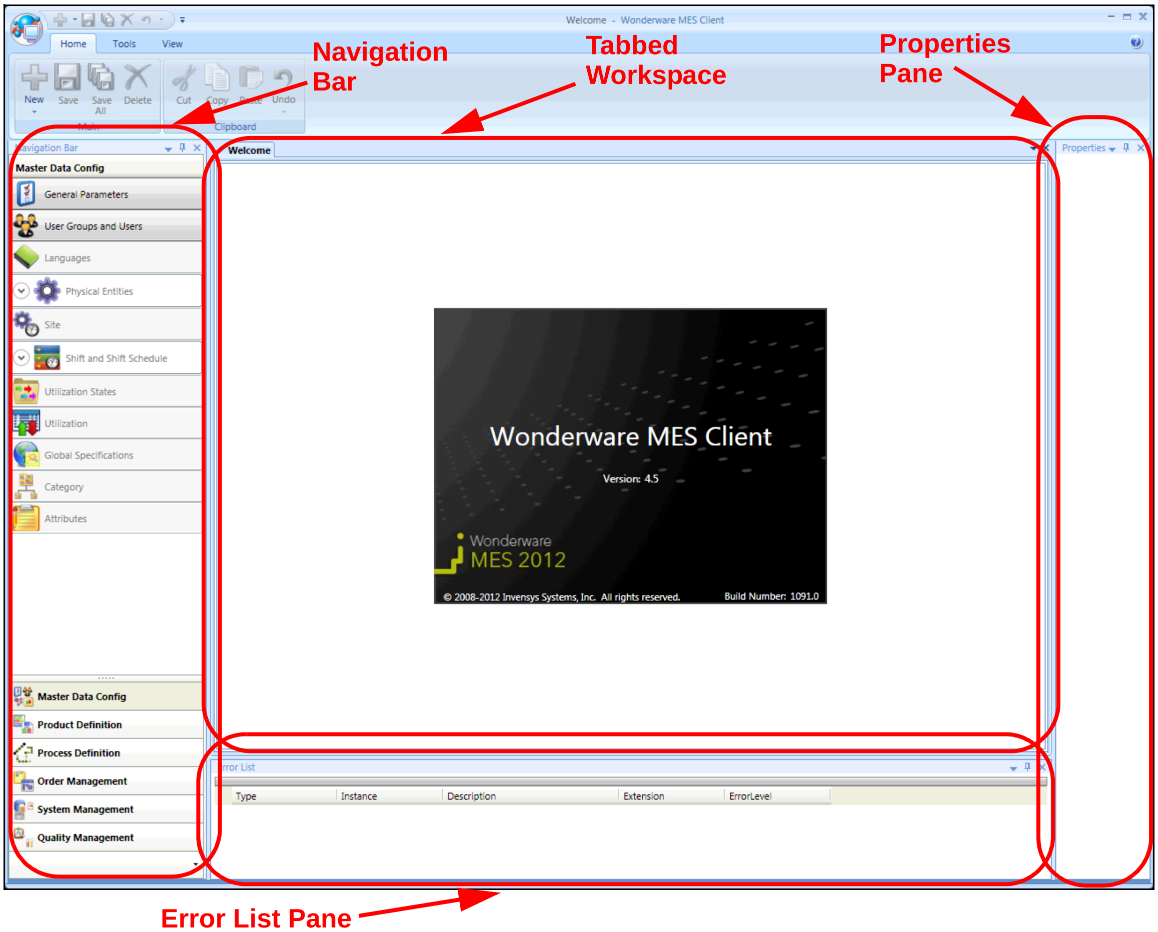
Quick Access Toolbar – Located at the very top of the section is the **Quick Access Toolbar**. From this menu, you can select options, such as, **New**, **Save**, **Save All**, **Delete**, or **Undo**. The **Quick Access Toolbar** can also be customized.

Active Workspace– The name of the active tab is displayed to the right of the **Quick Access Toolbar**.

Tabs – The tabs on the ribbon include the following:

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

The following figure highlights the different areas within Wonderware MES Client:



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

Navigation Bar

Select a group at the bottom of the **Navigation Bar** to show the associated modules at the top. Select a module from a group to display the module within the tabbed workspace. The following default groups are available in Wonderware MES Client:

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

Master Data Config Group

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

Module Name	Description
General Parameters	Allows you to specify the system parameters for the MES applications.
User Groups and Users	Allows you to configure users and user groups and provide privileges and access rights to the specified user groups.
Languages	Allows you to configure languages for the MES applications.
Physical Entities	Allows you to configure and maintain entity definitions in the system.
Site	Allows you to configure sites and the region details for an entity.
Shift and Shift Schedule	Allows you to configure the shift days, timings, and shift breaks for an entity on the plant floor.
Utilization States	Allows you to specify the utilization status of an entity. You can select and apply different colors to each status.
Utilization	Allows you to define utilization reason groups and reasons, and assign a status to each reason.
Global Specifications	Allows you to specify global specifications for an entity class, item class, entity, and item.
Category	Allows you to assign items to item categories. This enable the same QM specification to be shared by multiple items that are in the same category.
Attributes	Allows you to specify the attribute of an item, item class, work order, job, and so on. You can also specify its data and entry types.

Product Definition Group

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

Module Name	Description
Items	Allows you to specify an item. You can also apply filters to the item classes.
Item Classes	Allows you to configure an item class, and specify details for an item class, such as, produced, consumed, and obsolete.
Units of Measure	Allows you to specify the units of measure for an item.
Item Grades	Allows you to 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	Allows you to 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	Allows you to configure item reasons for an item. You can link the BOM version, BOM item, and entities to a specified reason. You can also create a group of item reasons, and link the classes and entities to the item reasons group.
Attributes	Allows you to specify the attribute of an item and item class. You can also specify the data and entry types for them.

Process Definition Group

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

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

Order Management Group

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

Module Name	Description
Work Orders and Jobs	Allows you to configure a work order and job state. You can add files and URLs to a work order. You can also configure steps and step groups for a job.
Queue	Allows you to view all jobs configured in Wonderware MES Client in their desired order of execution, and to change that ordering. You can split jobs and view a flow diagram. You can also link different jobs so they start and end together.
Attributes	Allows you to specify the attributes for the work order and jobs. You can also select data and entry type for them.

System Management Group

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

Module Name	Description
Database Information	Allows you to maintain the version details of the MES database, manage historical table details, and maintain the database server.
Database Maintenance	Maintains the MES database. Creates and executes the archive, purge, and restore jobs.
Rejected Message Viewer	Allows you to view, edit, resubmit, and delete the MES command messages that are rejected by the middleware while using the **Without Response** communication mode.

Quality Management Group

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

Module Name	Description
Sample Plan Frequency	Allows you to define sample plan frequencies, which are used to determine when the samples are collected.
Sample Plan	Specifies a group of sample plan frequencies that apply to one or more QM specifications.
Characteristic	Allows you to define Characteristics, the parameters of a product or process that has to be measured. Two types of Characteristics include 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	Specifies a set of values that applies to Characteristics with a defined context in which these values are applicable.
Attributes	Allows you to specify the attributes for sample and results. You can also select data and entry type for them.

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 editors by clicking the corresponding tab within this area.

Columns within the tabbed workspace can be configured.

- To rearrange columns, drag and drop the column from the editor window to the desired location.
- To sort a column in an ascending or a descending order, click the heading of the column. An up arrow or a down arrow will appear, indicating whether the column is sorted in ascending or descending order.
- To change the width of a column drag it to the desired width.
- To stack and order columns, drag and drop a column onto another column. The columns are stacked when left and right arrows appear on both the 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 width of a column in the editor window does not save the configuration of filter and column width. 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 tabbed workspace, 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 of the error
- **Error Level**: Shows the severity level of the error. For example, whether the error is critical or only a warning.

Security

To do anything in the Wonderware MES software system, 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 Wonderware MES Client.

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

The top of the pane displays groups, with the users listed beneath the groups. The bottom of the workspace 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 Wonderware MES Client. These privileges are grouped as **Configurator**, **Supervisor**, **Operator**, and so on. The **Privileges** tab in Wonderware 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.

After selecting the User Group that you wish to modify, configure privileges for a user group by selecting the **Privileges** tab in the bottom part of the tabbed workspace.

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 on 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 when attempting to log on to Wonderware 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 MES database using Wonderware 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. Wonderware MES Client must have access to a domain controller to use the groups from the domain. Once these groups are imported, 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 MES database or validate/authenticate them as the operating system is responsible for that task. The MES applications just pass the logon information to the operating system for authentication. A user logs in by entering their user name in the form of domainname/username.

OS User

In the **OS User** mode, the users from a domain are assigned to groups within the MES database. The groups are not the same as domain groups and are not validated by the domain controller for privileges. When defining the users in Wonderware MES Client, it must have access to the domain controller in order to use the users from the domain. Once these groups are imported, validated, and privileges are assigned by putting the operating system users in groups in the MES database, only the operating system users put 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, rather you can create groups within the MES database 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. A users logs in by entering their user name in the form of domainname/username.

Lab 1 – Setting Up and Enabling Security

Introduction

Before any system configurations can be performed, there needs to be at least one user created with administrative privileges. In this lab, you will create this user in MES Client.

There is a default user group, **FactAdmin**, in MES Client. This group has full privileges to perform administrative functions. You will create a new user, Admin, in the **FactAdmin** user group. Then, you will restart the client to log in with the new security settings.

Objectives

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

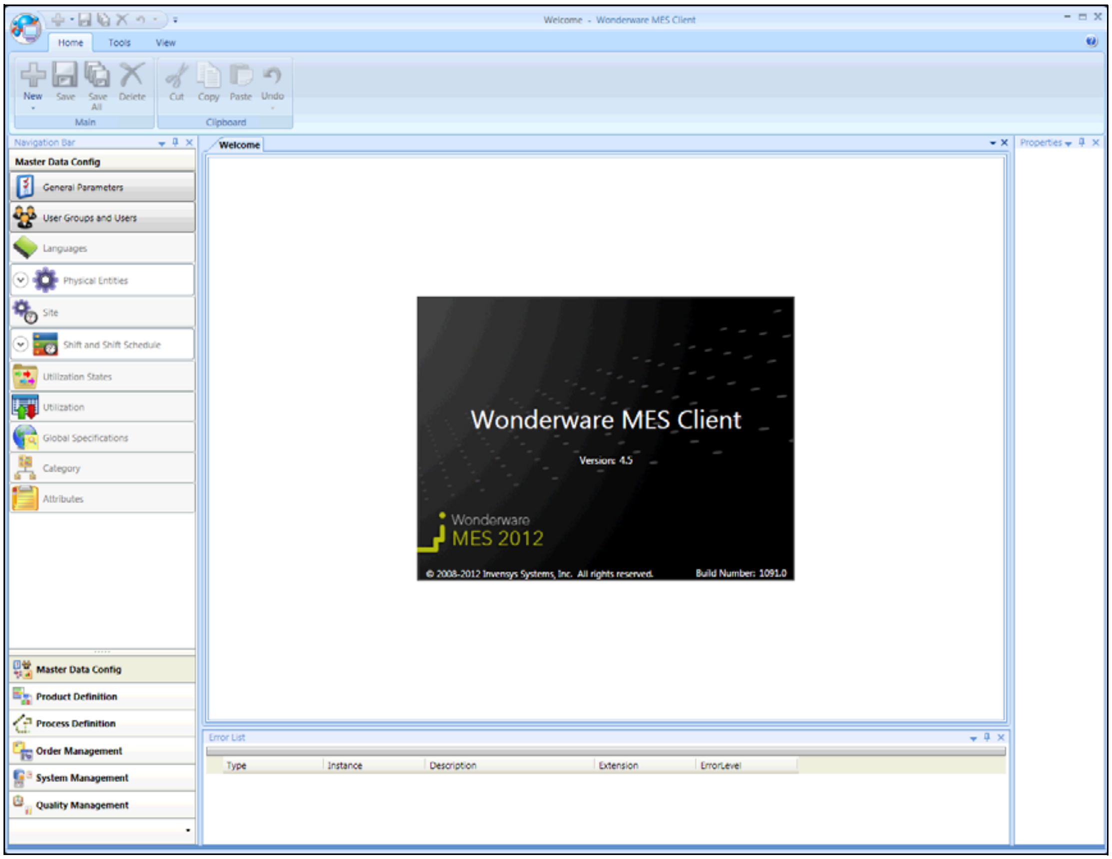
- Create a user
- Configure automatic logoff

Create an Administrator User

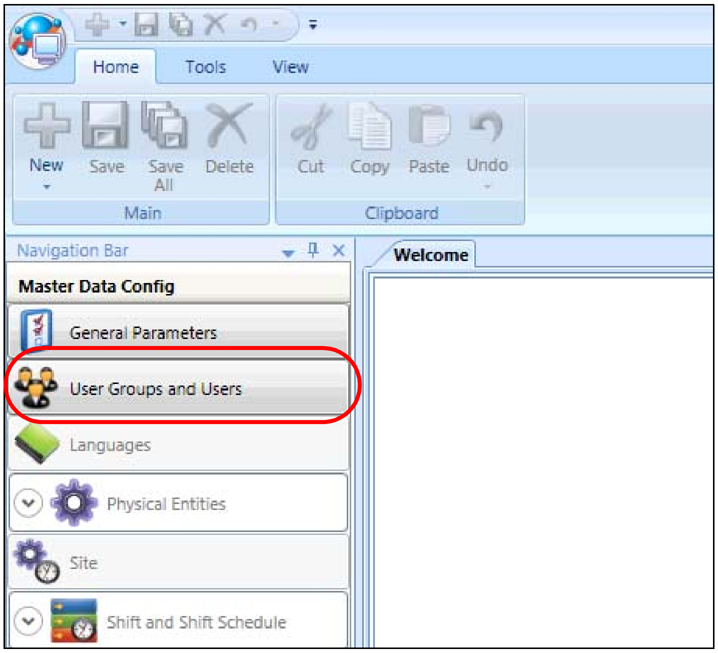
First, you will create an administrator user in MES Client.

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

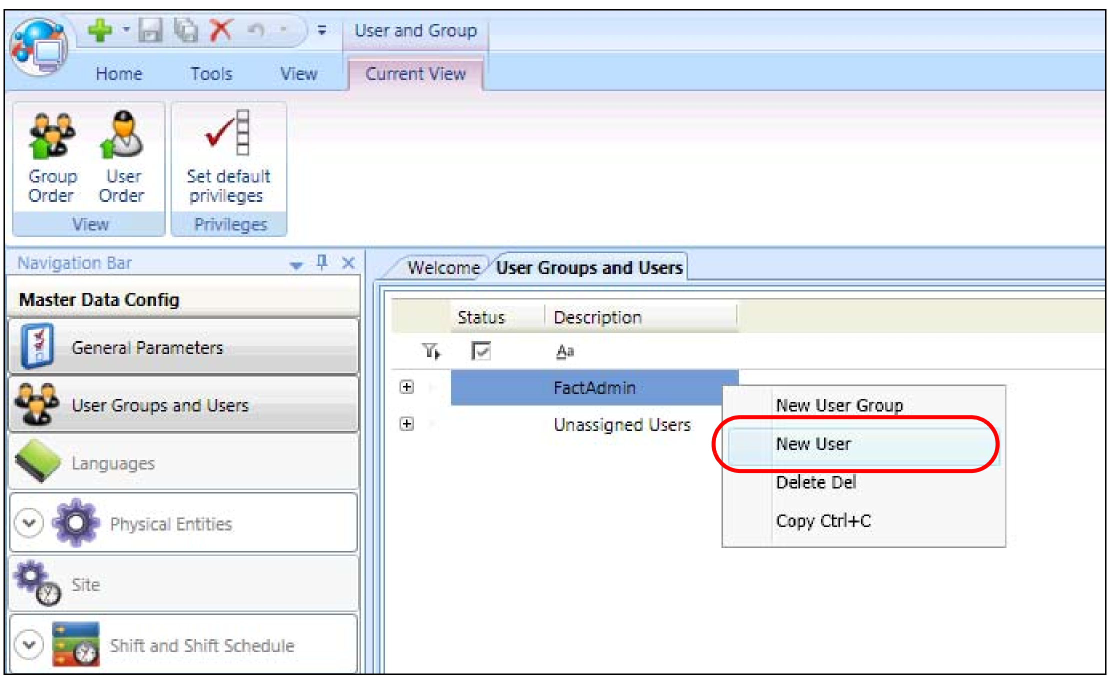
   After a few moments, the MES Client window appears.



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

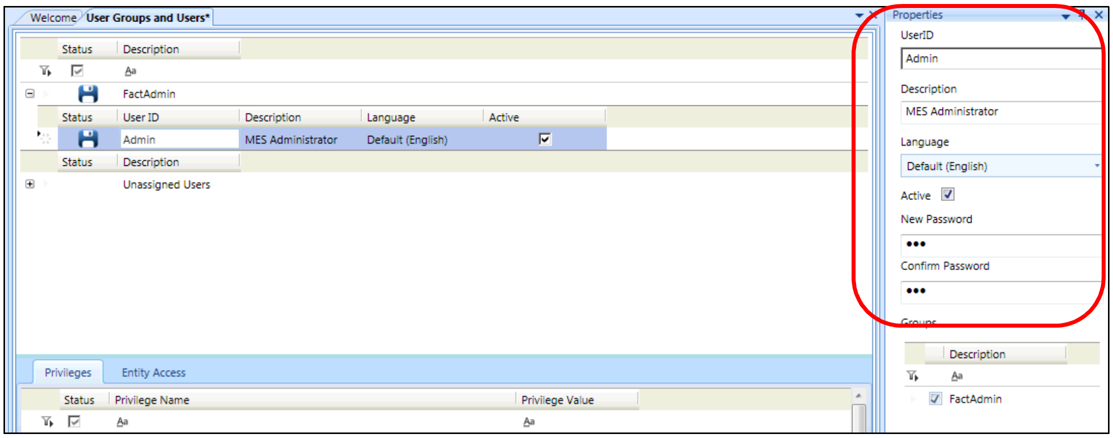


3. On the **User Groups and Users** tab, select and right-click the **FactAdmin** user group, and then select **New User**.

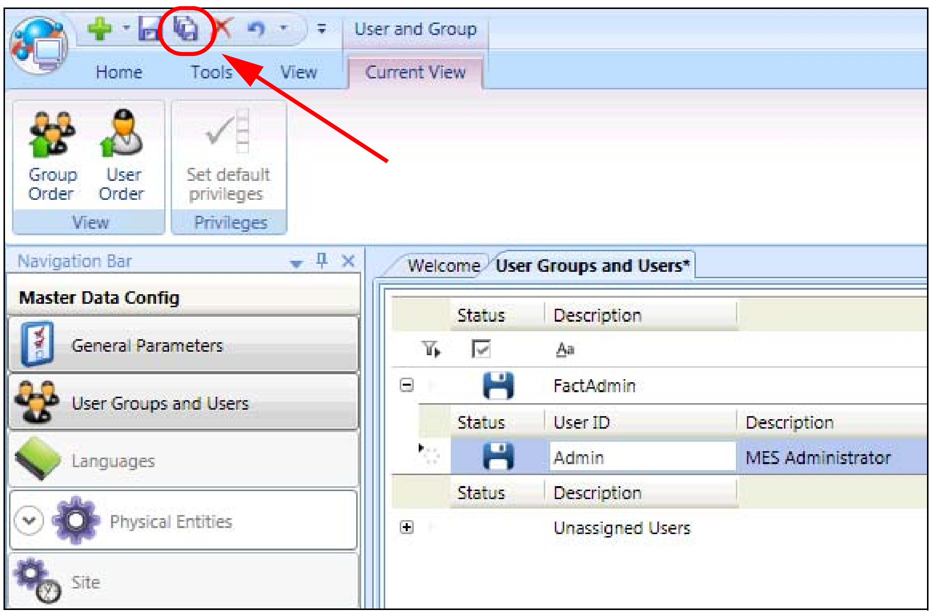


4. In the **Properties** pane, configure the new user as follows:

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



5. In the top-left corner, on the **Quick Access Toolbar**, click **Save All**.

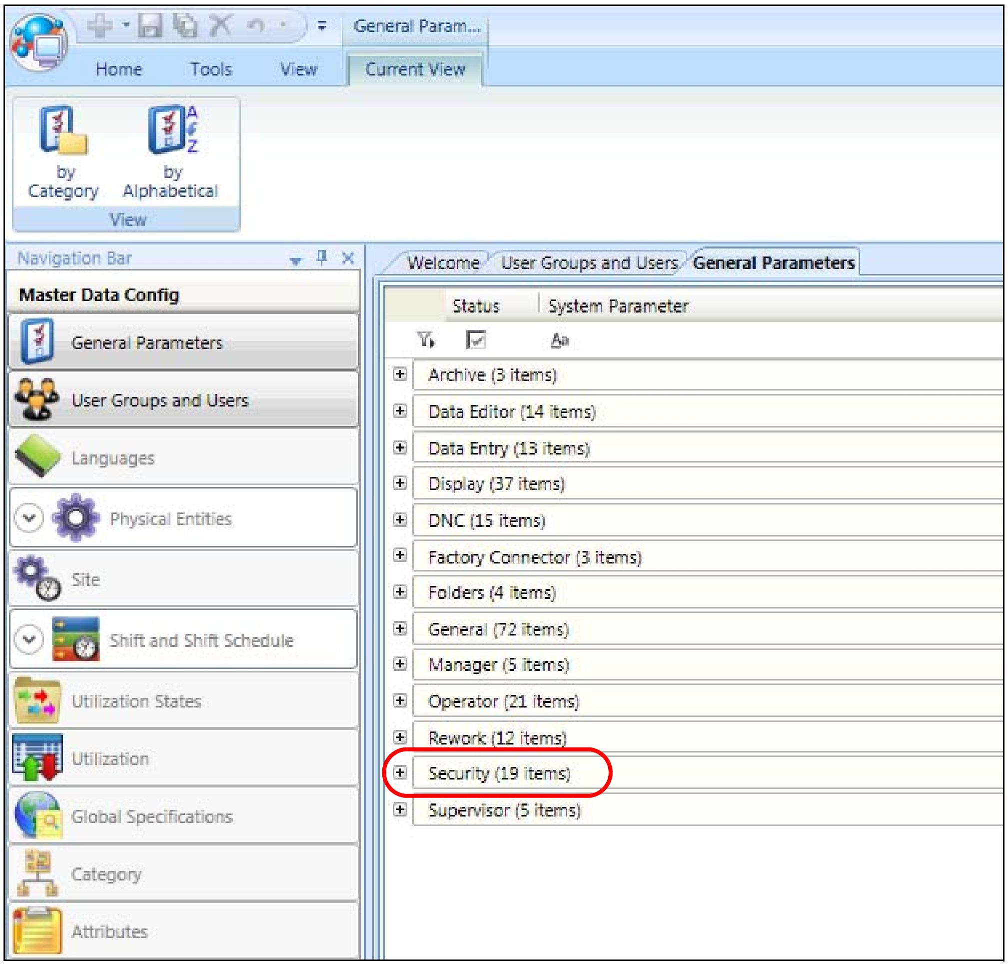


After creating the administrator user, security is enabled in the MES database.

Configure Automatic Logoff

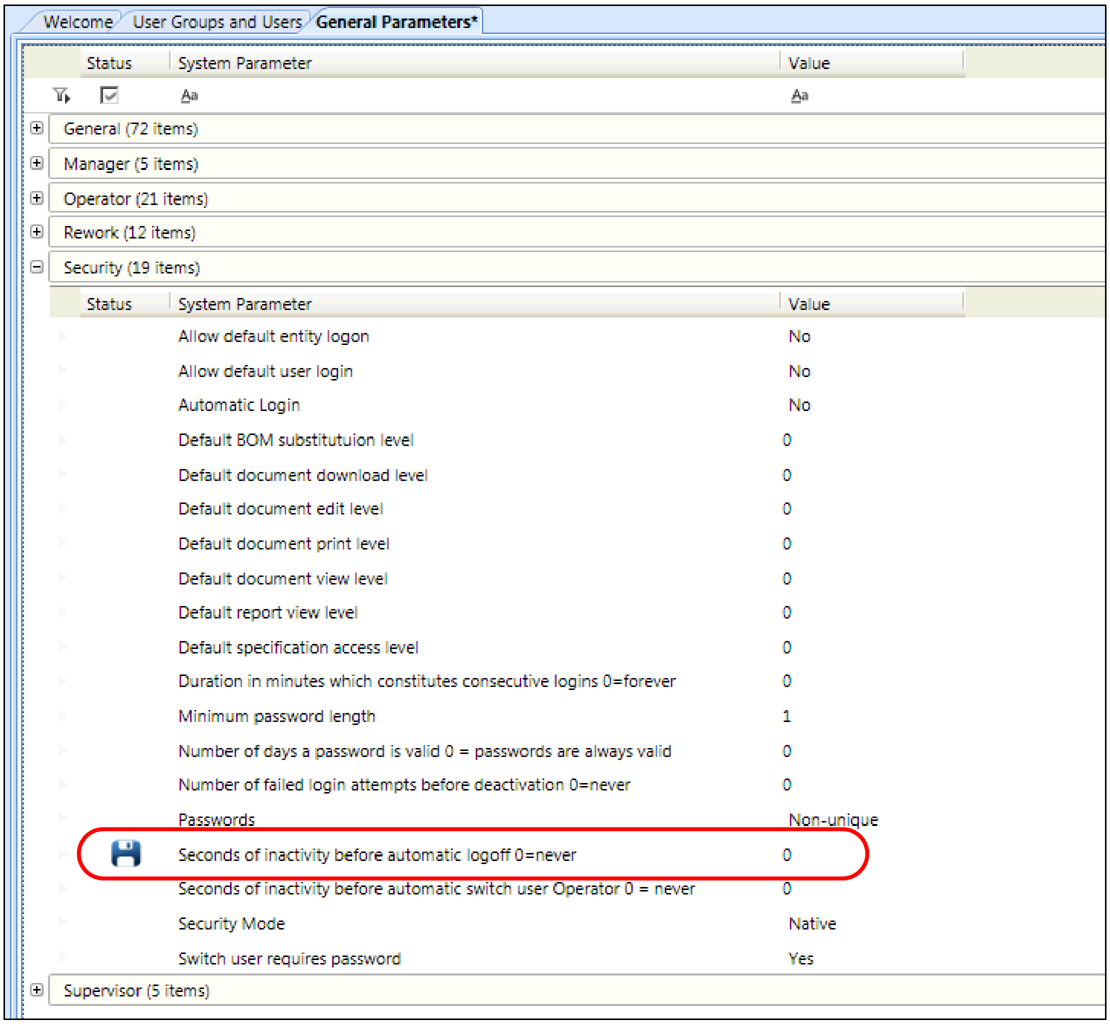
You will now disable the automatic logoff feature.

6. In the **Navigation Bar**, click **General Parameters**.
7. On the **General Parameters** tab, expand the **Security** option.



8. Scroll down to view all the **System Parameters**, and then in the **Seconds of inactivity before automatic logoff 0=never** field, set **Value** to **0**.

Note: 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. The automatic log off feature is disabled to facilitate application development in the classroom. The use of an automatic log off feature is normally utilized in the plant environment.

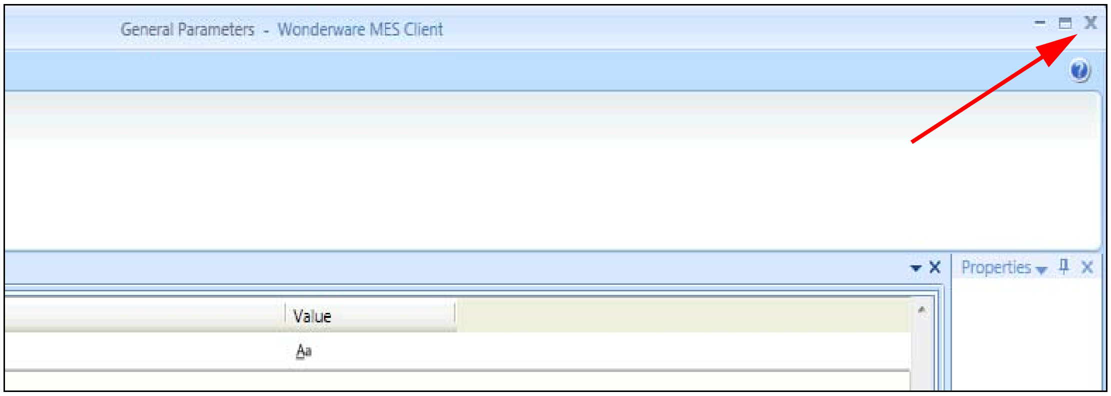


9. In the top-left corner, on the **Quick Access Toolbar,** click **Save All**.

Restart MES Client

Now, you will restart MES Client and log in as Admin. Restarting MES Client is necessary for the changes made to the system parameters to take effect.

10. In the top-right corner of the window, click **X** to close MES Client.



11. Open MES Client.

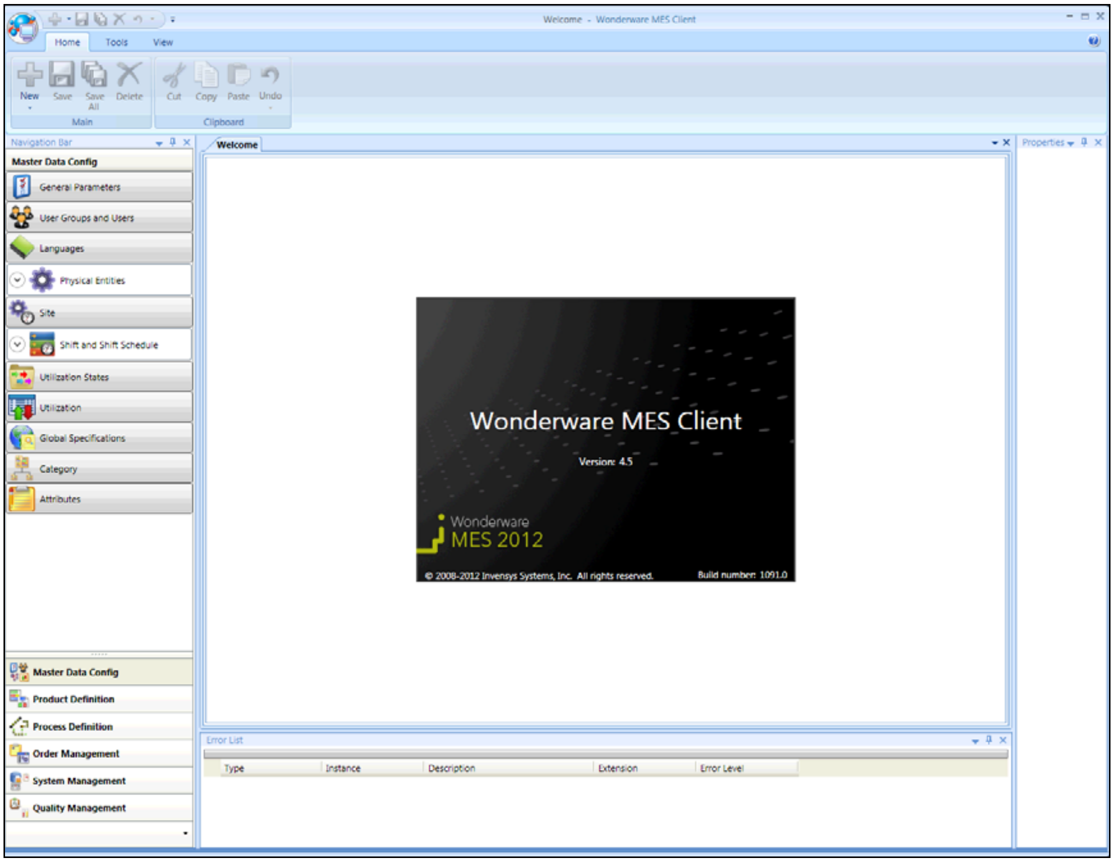
    A dialog box, prompting for the user name and password, appears.

12. Log in as an administrator using the following details:

    User Name: Admin

    Password: iom

The MES Client window appears.



Section 2 – System Platform Configuration

This section explains the necessary preparation of the System Platform. This section also describes the importing and implementation of the Sample Recording Object and the building of the Entity Model.

What is Modeling?

To capture the MES data that defines a physical manufacturing process, Wonderware software must be configured to support such data structures. 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 software 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:

Entities – Explain where the product will be made. Entities are physical assets in the plant that you need to track or report information for. Entities could be an entire plant, a production line, a piece of equipment, or even a module inside a machine. 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 products, WIP materials, by-products, scraps, or any other material that you want to track in your application.

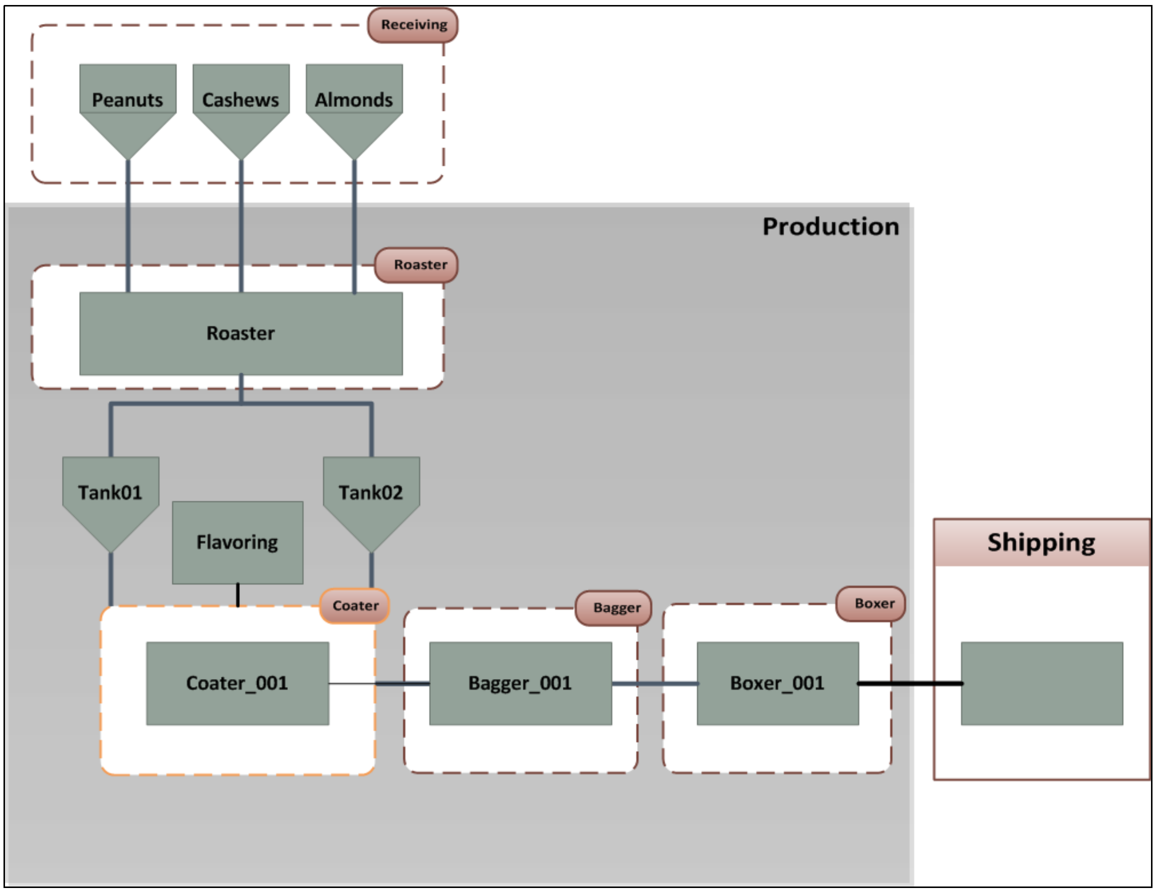
Processes and Operations – Explain how to make the products. An operation (also known as a phase or a segment) is a task or set of a tasks that needs to be successfully completed to make a product. A process (also known as a route) is the method of producing the product. The process defines all the operations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

Identify the Process

The process (the simulated plant built for MES courses) involves three key areas:

- Receiving
- Production
- Shipping

Keep these key areas or plant components in mind while building and configuring your application in the labs completed in this course to analyze, monitor, and manage the performance of your plant.



The Mixed Nuts Plant Process

During this training class, you are presented with the following scenario. You have been asked to create an MES application for a mixed nuts plant. As a part of the requirements for the project, you have been asked to implement a comprehensive operations model including: work order management and data collection. You must then integrate this MES application with an existing Wonderware System Platform application, which acquires and manages the real-time information provided by controllers, devices, and equipment in the plant.

To better understand the plant, you have collected basic information describing the plant layout, the different operations in the process, and the flow of materials. This section shows the result of that survey.

Process Operations

This is a representation of the operations used in the production of bags of mixed nuts and the progression of materials as they are stored, consumed, and produced.

This plant currently sells bags of mixed nuts. To manufacture the bags, this plant runs a single process. The process roasts the input materials, separates them into two tanks, coats them with barbeque flavoring, bags them, and boxes them in preparation for shipping.

This process begins by taking the input materials from the **Receiving** area. Then, once the mixed nuts have been roasted to the right temperature and coated, they are packaged into one-ounce bags. They are then boxed 100 at a time and sent to the **Shipping** area, ready to be sent out to customers.

Input materials are received in the **Receiving** area in the plant. This area has three silos for storing the three types of nuts that are used for the nut mix: peanuts, cashews, and almonds.

Once a new work order is issued by the ERP system, a series of four operations are run in the **Production** area to make the requested order of mixed nuts. The first two operations are responsible for the roasting and coating of the input materials. The last two operations are responsible for bagging the mixed nuts and boxing the mixed nut packages.

The first operation, called **Roasting**, roasts the mixed nuts at a specific temperature. This operation is run in the **Roaster** unit, and it produces perfectly roasted mixed nuts. These nuts are then separated equally into two tanks, **Tank01** and **Tank02**. The mixed nuts are then taken from one of the two tanks to the **Coater**, where they are coated with barbeque seasoning from the **Flavoring** unit. The output of this **Coating** operation is the one-ounce mix of seasoned nuts ready for packaging.

After the required amount of mixed nuts has been produced, 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 bags with the seasoned mix of nuts. The output of this **Bagging** operation is the one-ounce bags of mixed nuts that have been filled and sealed. Finally, the bags coming out of the **Bagger** are sent to the **Boxer** unit, where they are boxed with 100 bags per box. The boxes are then sent to **Shipping**, where they are eventually shipped to the customers.

This MES – Quality course will focus only on the following portions of the plant:

- **Roaster**: where you will check the quality for the nuts
- **Bagger**: where you will check the weight and quality of the bags
- **Boxer**: where you will check the total weight of the filled boxes

Sample Recording Object Overview

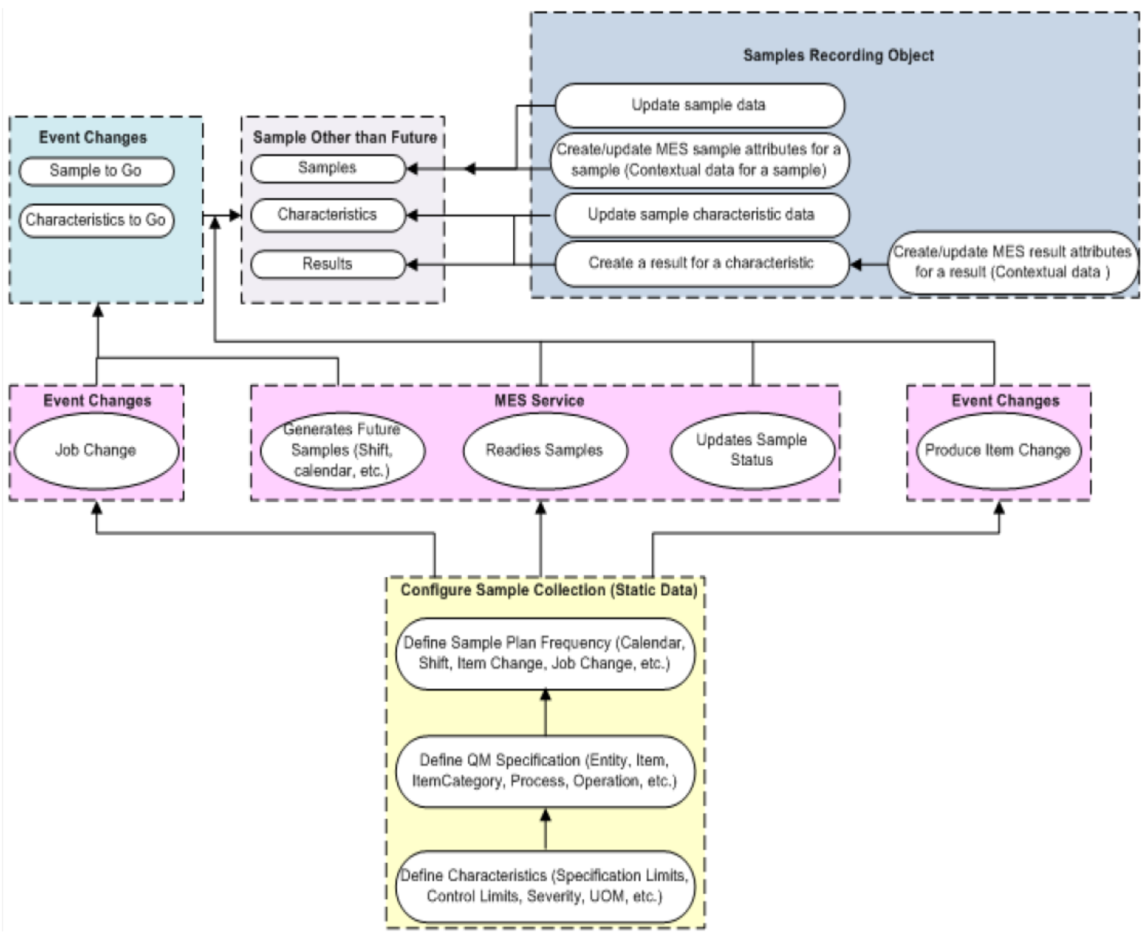
The Sample Recording Object (SRO) is an ArchestrA automation object that allows you to record data for one or more Characteristics and capture the following:

- Characteristic result data
- Contextual information related to a sample
- Contextual information related to a Characteristic within a sample

The SRO can read from I/O and record results against a Characteristic in a sample. It provides two-way communication between the user and the Wonderware MES database through the MES middleware.

The SRO can be used to:

- Configure delay timers
- Configure QM sample and Characteristic attributes



The MES Service is responsible for generating and managing frequency based samples. These are generated per entity based on frequencies, such as calendar time and shift patterns. Single samples can also be generated when a job starts or ends, or when the lot number changes.

When a sample is requested, the system sets the sample request time and the expiration time. When the status of the sample is **Ready**, the SRO can read from and write to the sample. When the sample is pulled (that is, when the operator physically collects material from the production line), the SRO updates the name of the operator and the time when the sample is pulled.

Importing the SRO

If you install the application server objects during the Wonderware MES installation, the SRO extension is copied to the following folder (destination folder may be different depending on your operating system):

C:\Program Files\Wonderware\MES\AppObjects

You can also manually copy the SRO extension from the following location on the installation CD to the computer hard disk:

<*drive letter*>:\MES\AppObjects

When the SRO object is saved at the specified location, you must import the SRO into the ArchestrA IDE. You can create a derived template from the imported SRO, and configure the same. You can then create child instances from the configured derived SRO template as per your requirement.

Overview of the Entity Model Builder

Entity Model Builder is an ArchestrA IDE extension for creating entities from your ArchestrA equipment model that uses the SRO for configuring quality management support. The basic equipment structure in the Galaxy is duplicated in the entity model.

The main goal of the Entity Model Builder is to export parts of the ArchestrA equipment model to Wonderware MES Client, and automatically configure them for quality management support. An ArchestrA application object instance is considered an entity that is capable of capturing and tracking quality data, when it has the SRO displayed under it (contained). Information configured in the contained SRO is used to configure an entity within MES. Exporting the ArchestrA equipment model to MES is triggered by the action of an ArchestrA IDE user, which is similar to triggering a deploy. Then, the Entity Model Builder creates and maintains the entity model within MES.

When you run the Entity Model Builder, the object containing the SRO and their parent objects up to and including the object area and their associated properties are replicated in Wonderware MES Client.

The Entity Model Builder also allows you to export ArchestrA users and user groups to the MES database (MESDB). The export activity is supported by various types of ArchestrA security settings, including **Galaxy**, **OS User**, and **OS Group**. The main purpose of this feature is to provide the convenience of not having to re-enter each ArchestrA group and user into the MES database. However, it is not meant to be a comprehensive user and group synchronization tool.

Installation of the Entity Model Builder also gives you the capability to export existing ArchestrA users and roles to MES to create corresponding MES users and groups.

With the installation of the SRO into your Galaxy, an ArchestrA application object becomes capable of capturing quality data. By inserting and properly configuring the SRO as a contained object to an existing application object, you can export this information into MES to create corresponding entities using the Entity Model Builder IDE Extension. This eliminates the need to manually create and configure entities in MES to match your ArchestrA IDE equipment model.

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.

Lab 2 – Setting Up the Galaxy

Introduction

In this lab, you will create a Galaxy in the ArchestrA IDE and import objects that represent the basic components of the sample plant layout. These components will be used to build the basic MES physical entities model. In later labs, you will use this Galaxy and its objects to evaluate the quality of plant production.

Objectives

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

- Create a Galaxy
- Import objects into a Galaxy
- Build and verify an Entity Model

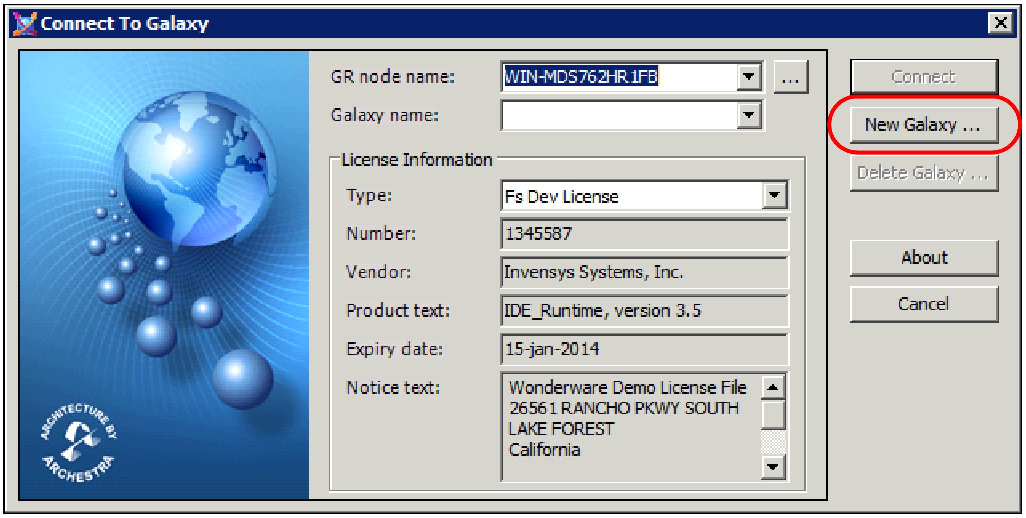
Create the Galaxy

First, you will create and configure the Galaxy. The Galaxy will be used throughout this course.

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

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

2. Click **New Galaxy**.



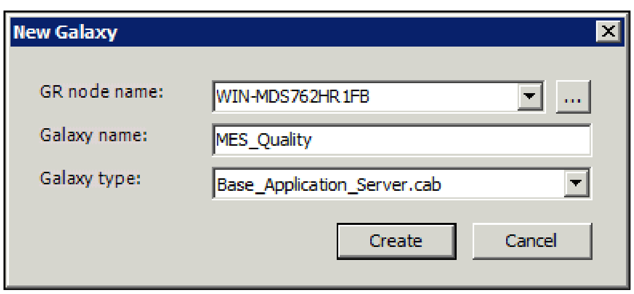
   The **New Galaxy** dialog box appears.

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

   GR node name: *<local node name>* (*default*) In this example, **WIN-MDS762HR1FB** is the local node name

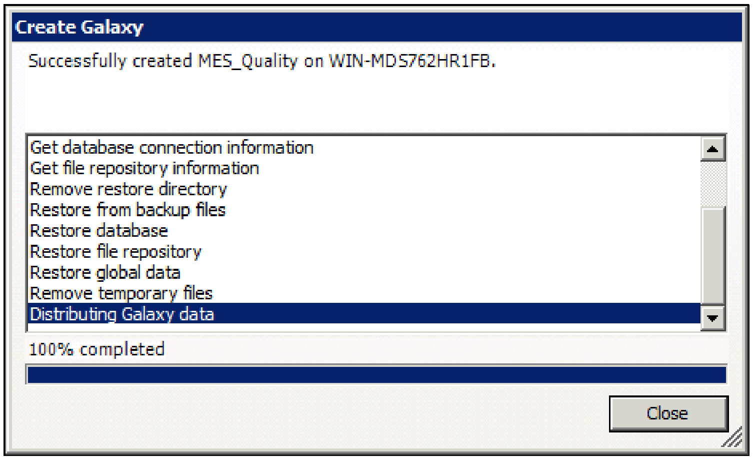
   Galaxy name: MES_Quality

   Galaxy type: Base_Application_Server.cab (*default*)



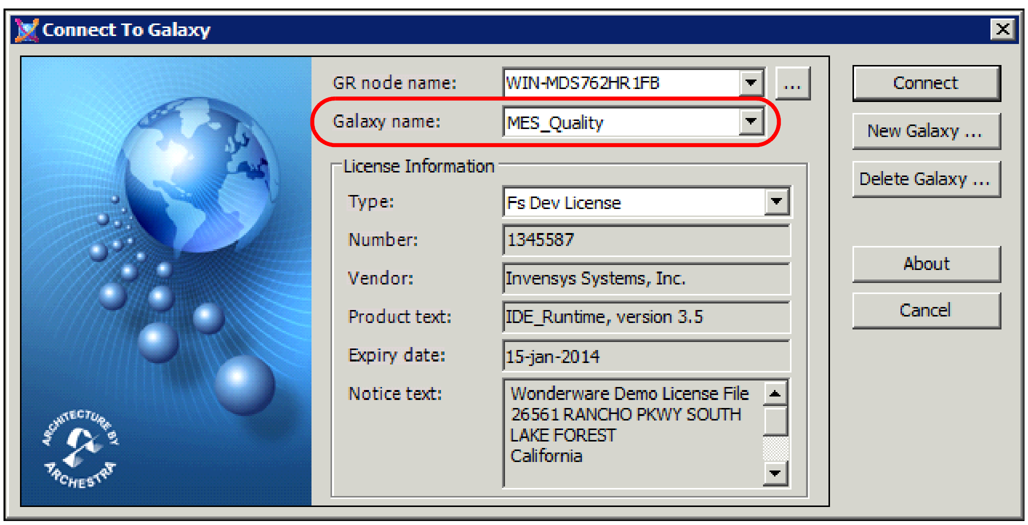
4. Click **Create**.

After a few moments, the **Create Galaxy** progress displays **100% completed** and the **Close** button is enabled.



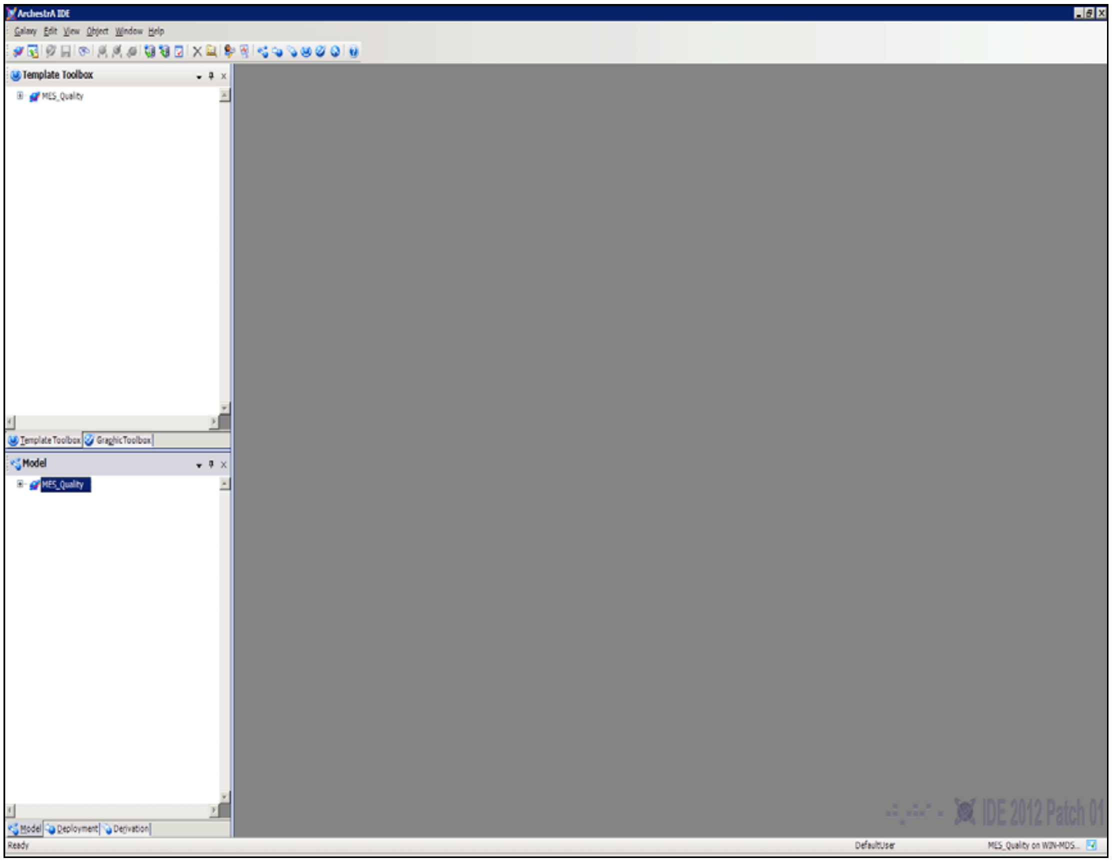
5. Click **Close**.

   In the **Connect To Galaxy** dialog box, **Galaxy name** drop-down list, the new Galaxy name appears.

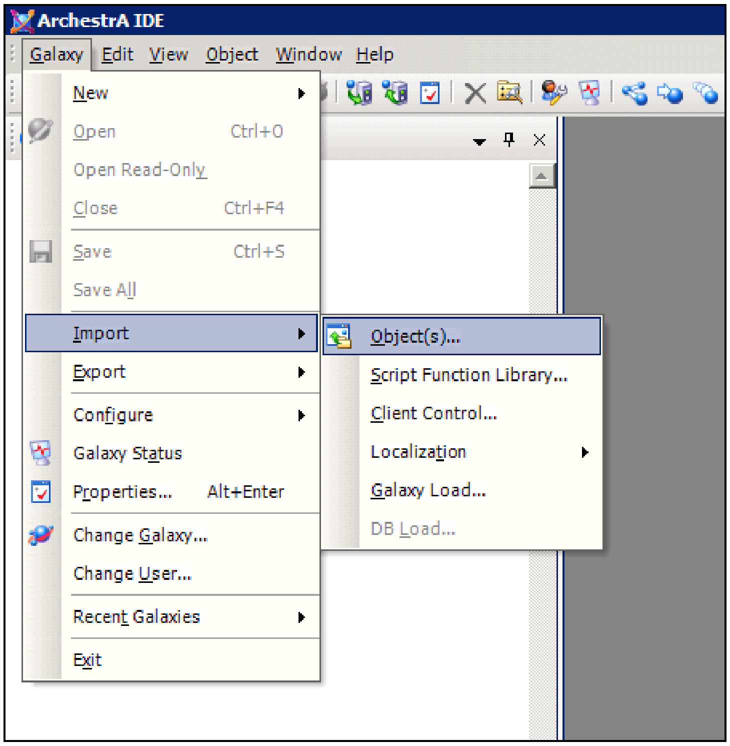


6. Click **Connect**.

After a few moments, the ArchestrA IDE opens.

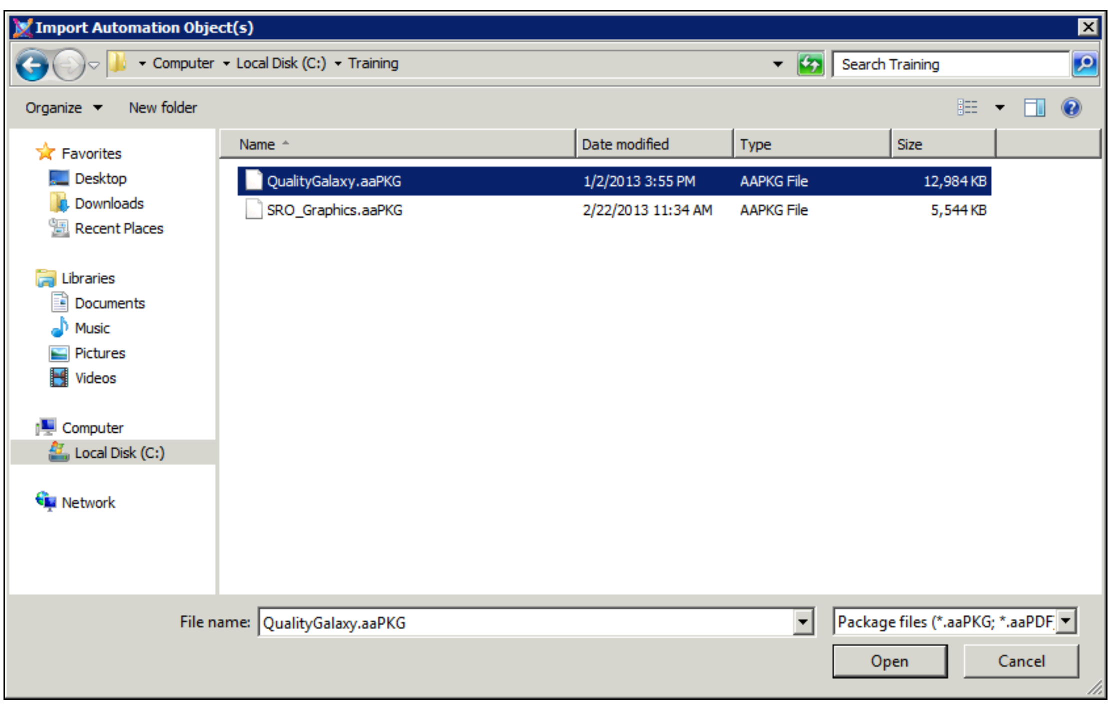


7. On the **Galaxy** menu, click **Import | Object(s)**.



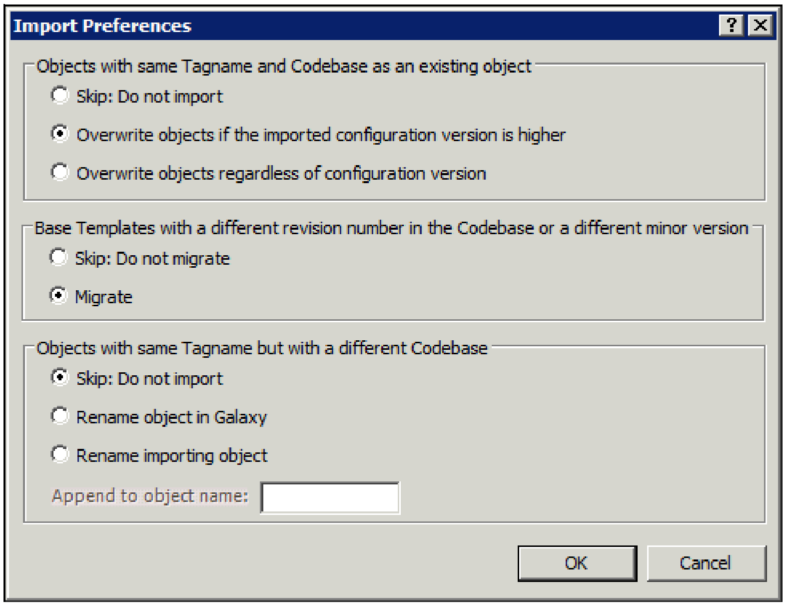
The **Import Automation Object(s)** dialog box appears.

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



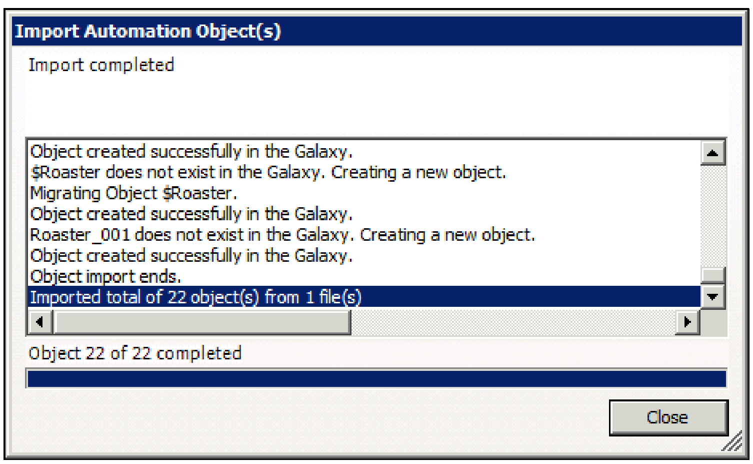
9. Click **Open**.

The **Import Preferences** dialog box appears.



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

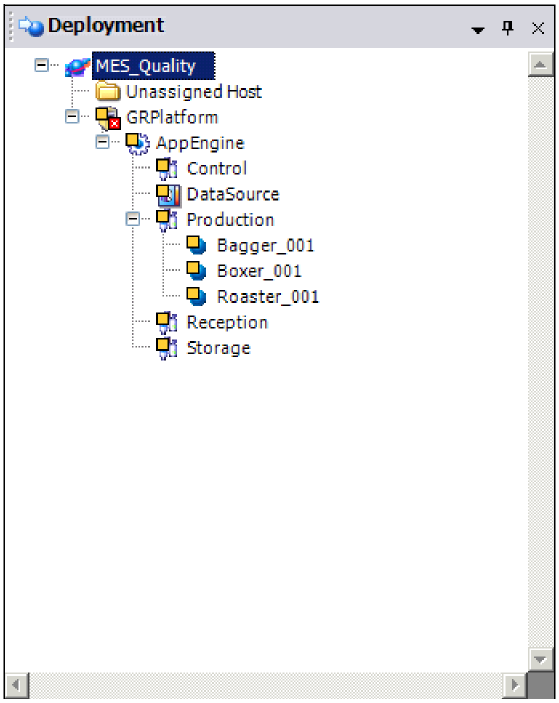
    After a few moments, the **Import Automation Object(s)** progress displays **Import completed** and the **Close** button is enabled.



11. Click **Close**.

12. Switch to the **Deployment** view, and then fully expand the tree.

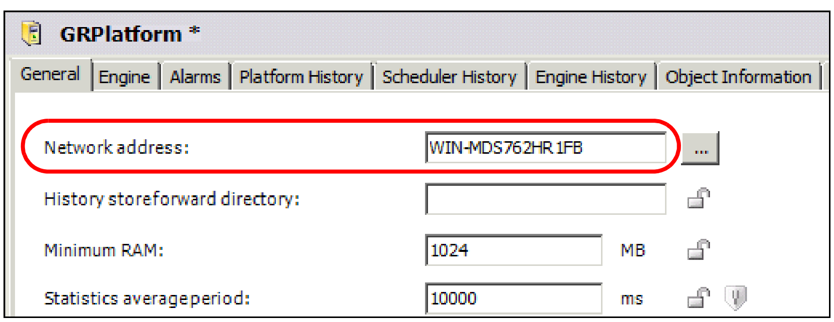
    The imported objects are displayed.



The red error icon next to **GRPlatform** indicates a configuration error.

You will now configure the platform with the local node name.

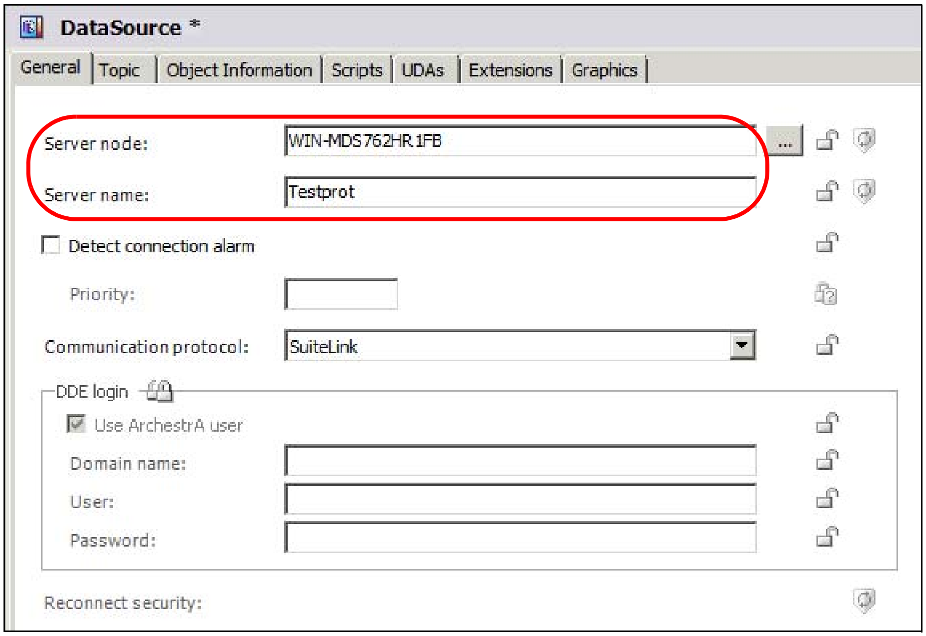
13. Double-click the **GRPlatform** object.
14. In the **GRPlatform** configuration editor, **Network address** field, enter your ***<local node name>***.



15. Save and close the configuration editor.

You will now configure the **DataSource** object to read data from the input source.

16. In the **Deployment** view, double-click the **DataSource** object.
17. In the **DataSource** configuration editor, **Server node** field, enter your ***<local node name>***.
18. In the **Server name** field, verify **Testprot** is entered.



19. Save and close the configuration editor.

Import the MES Objects

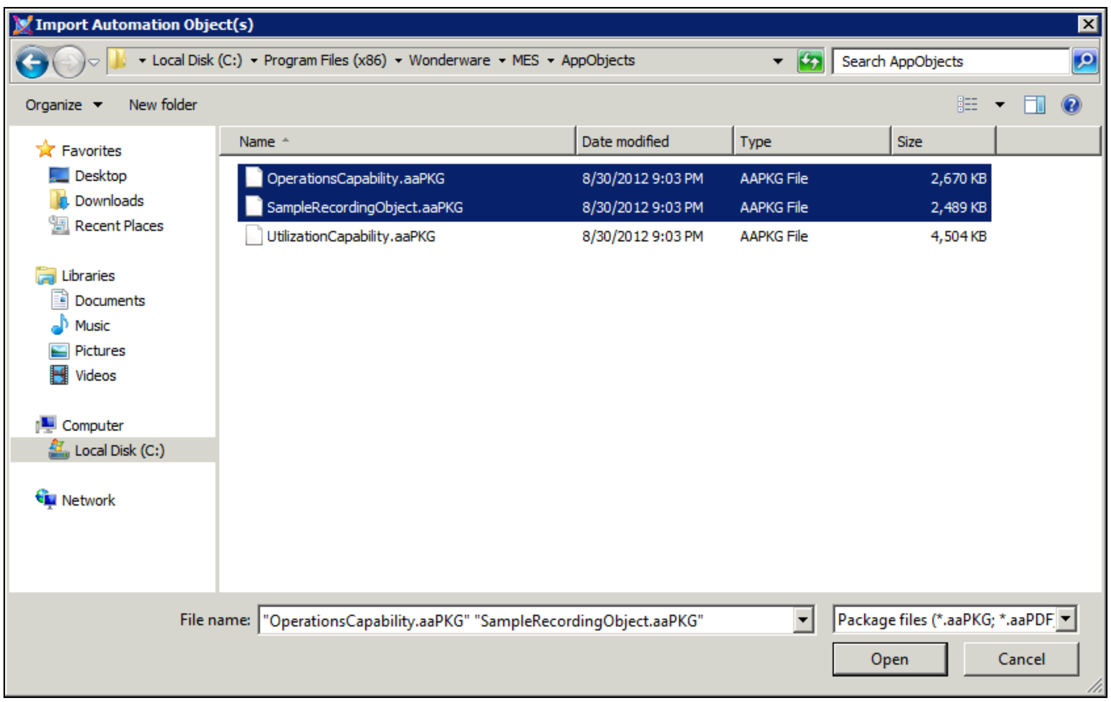
Next, you will import the Operations Capability Object and the Sample Recording Object. You will then create derived templates and instances from these objects to build the plant model to integrate with MES Client. You will use the Sample Recording Object now and the Operations Capability Object in a later lab.

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

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

21. Navigate to **C:\Program Files (x86)\Wonderware\MES\AppObjects** and select the following files:
    - **OperationsCapability.aaPKG**
    - **SampleRecordingObject.aaPKG**

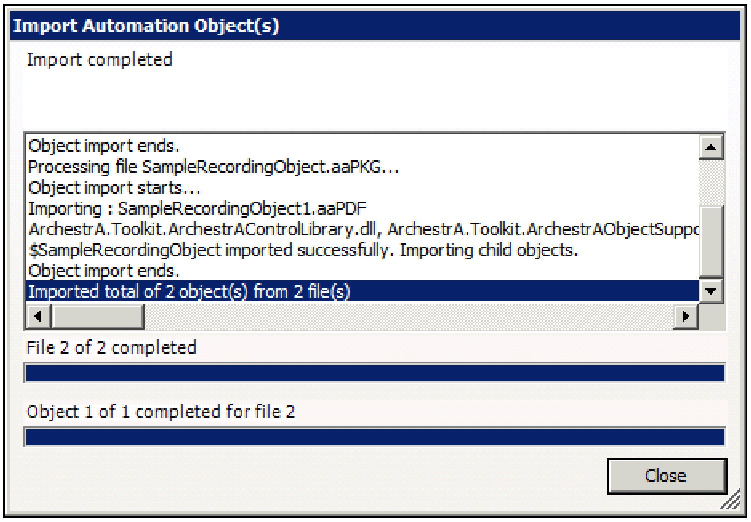
Note: The path to these files may differ slightly depending upon the operating system that you are using.



22. Click **Open**.

23. In the **Import Preferences** dialog box, leave the default settings and click **OK**.

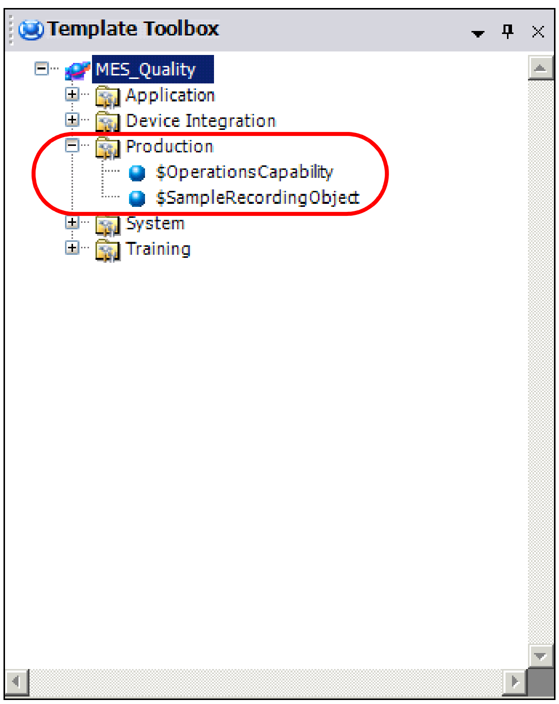
After a few moments, the **Import Automation Object(s)** progress displays **Import completed** and the **Close** button is enabled.



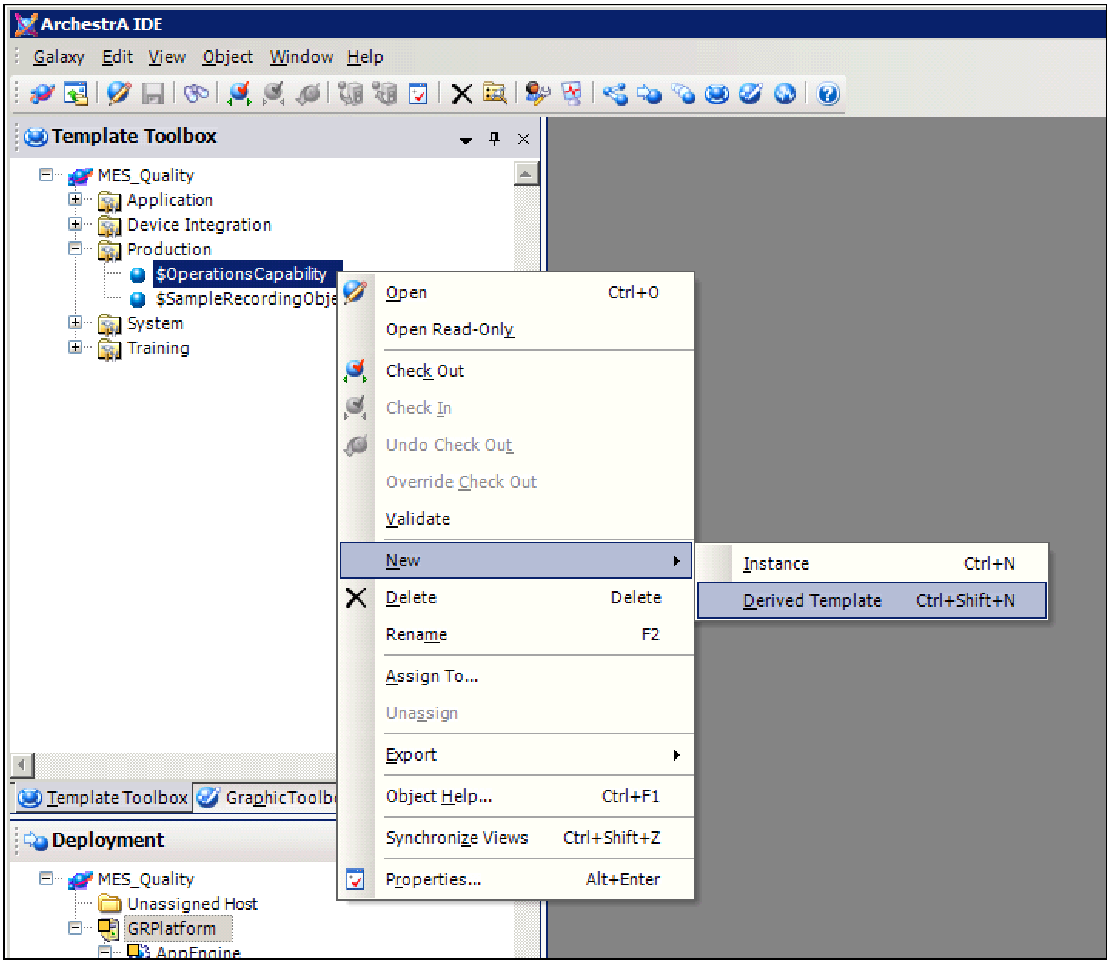
24. Click **Close**.

25. In the **Template Toolbox**, expand **MES_Quality** and **Production**.

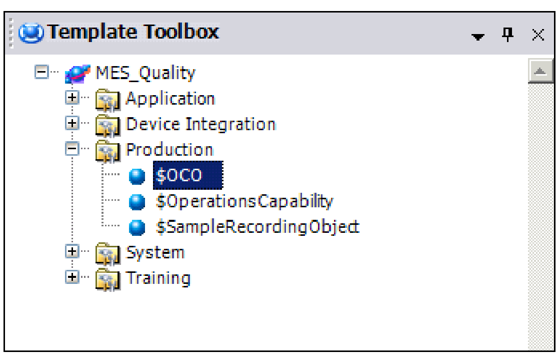
    The imported objects are displayed.



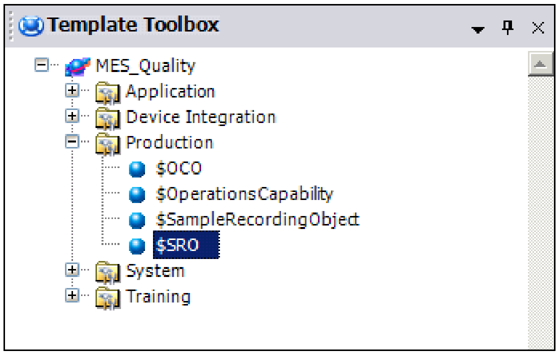
26. Right-click **$OperationsCapability** and select **New | Derived Template**.



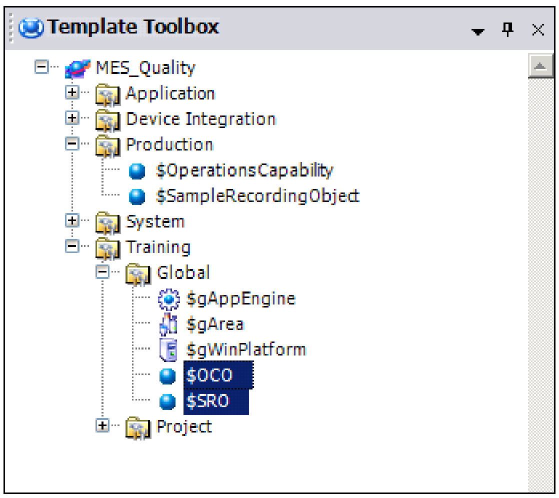
27. Rename the template **$OCO**.



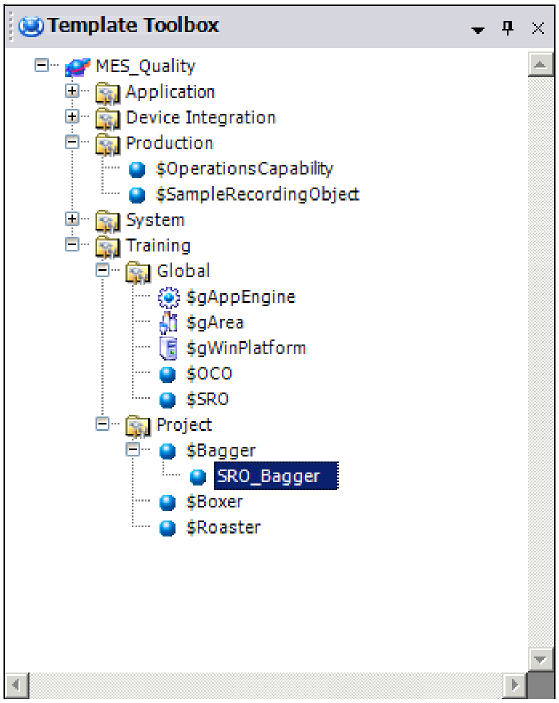
28. Right-click **$SampleRecordingObject** and select **New | Derived Template**.
29. Rename the template **$SRO**.



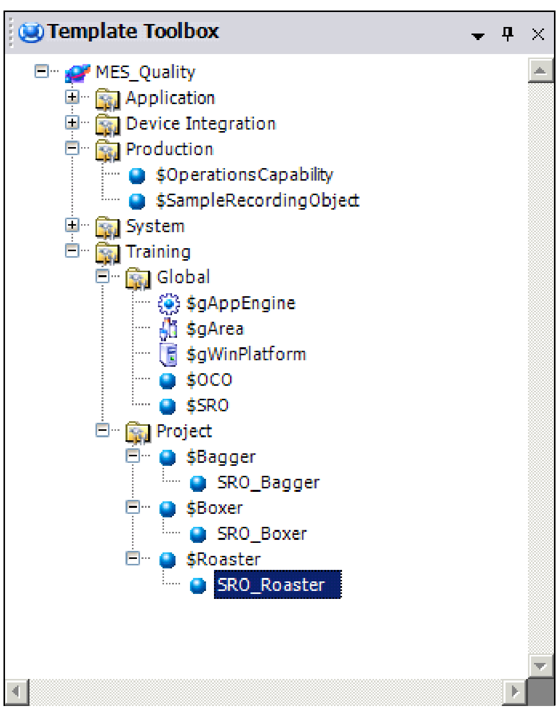
30. Expand **Training**, and then drag **$OCO** and **$SRO** to the **Global** toolset.



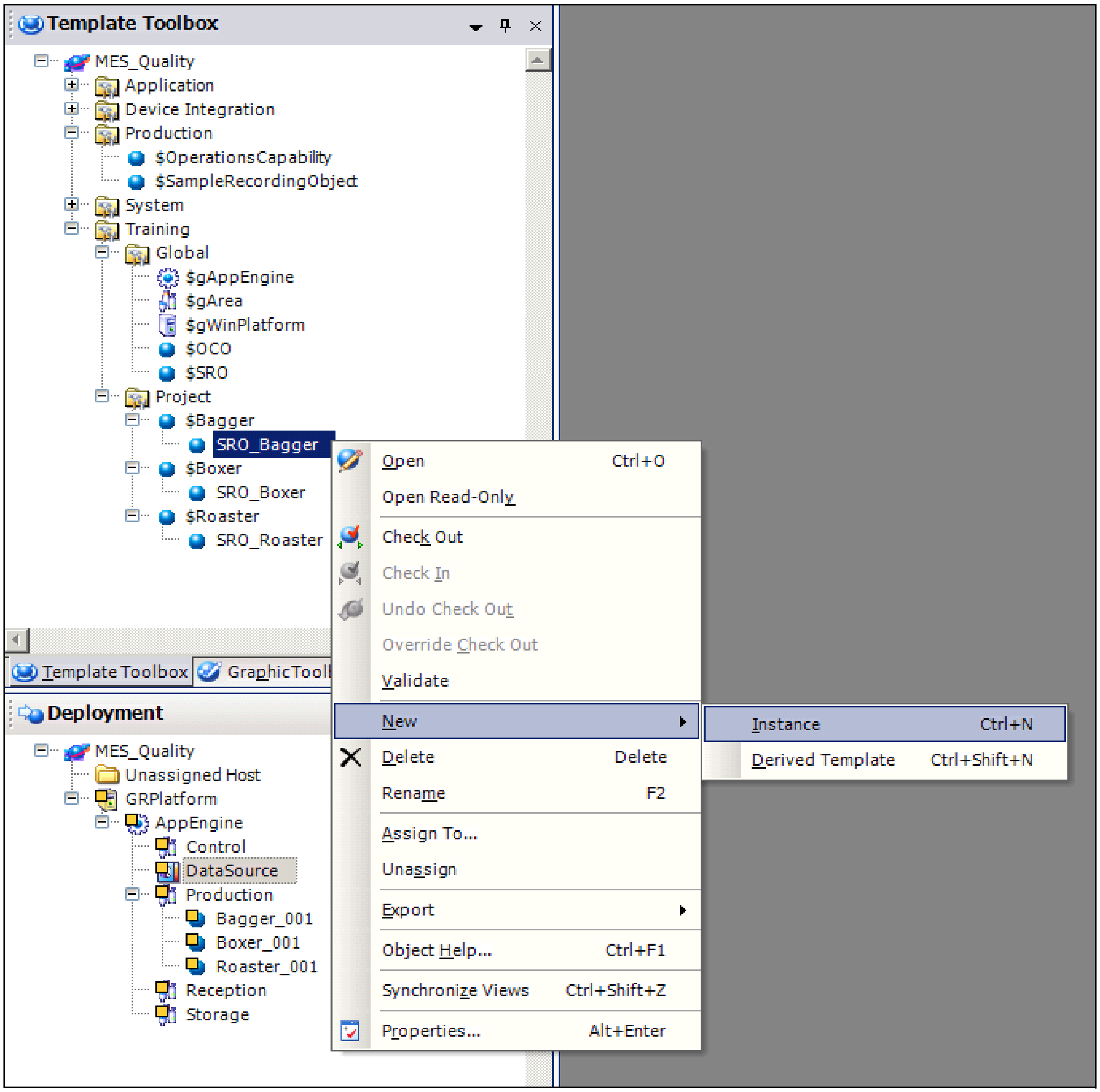
31. Click **$SRO**, and then right-click **$SRO** and select **New | Derived Template**.
32. Rename the template **$SRO_Bagger**.
33. Expand the **Training** and **Project** toolsets.
34. Drag **$SRO_Bagger** to **$Bagger**.



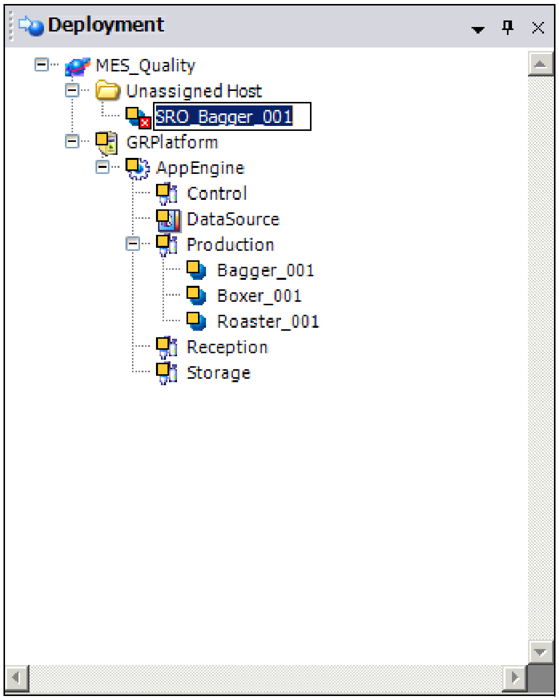
35. Repeat steps 31 through 34 two times to create new derived templates named **$SRO_Boxer** and **$SRO_Roaster**, and then assign them to **$Boxer** and **$Roaster**, respectively.



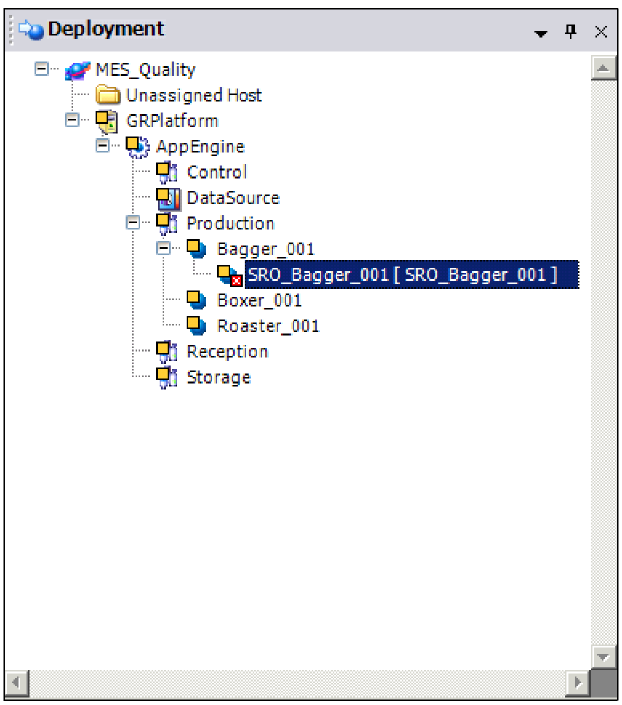
36. Right-click **SRO_Bagger** and select **New | Instance**.



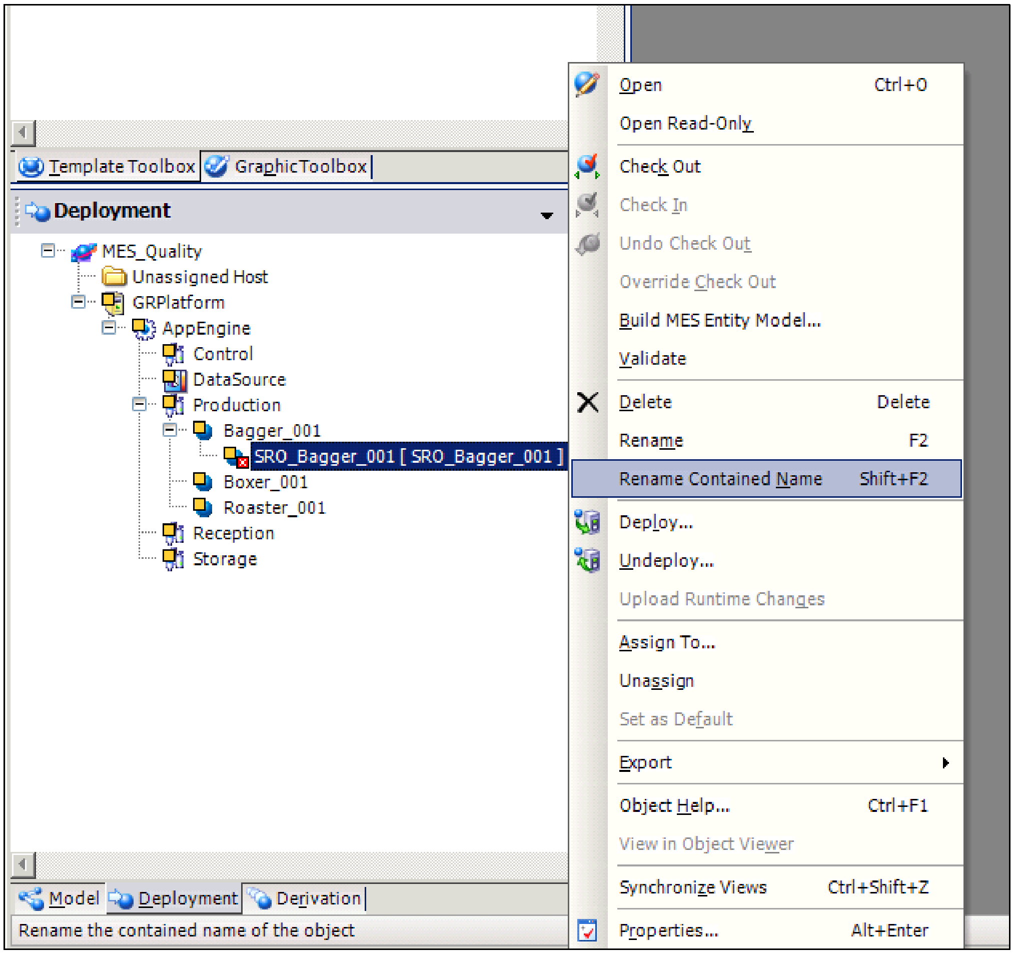
The new instance appears in the **Deployment** view, **Unassigned Host** folder.



37. Leave the default name and drag **SRO_Bagger_001** to **Bagger_001**.

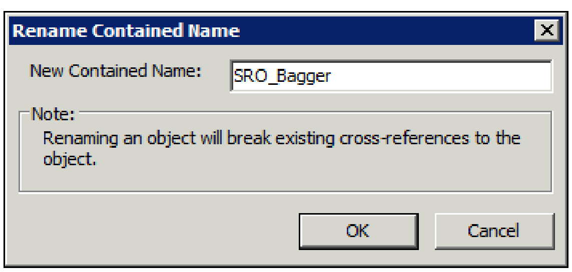


38. Right-click **SRO_Bagger_001** and select **Rename Contained Name**.



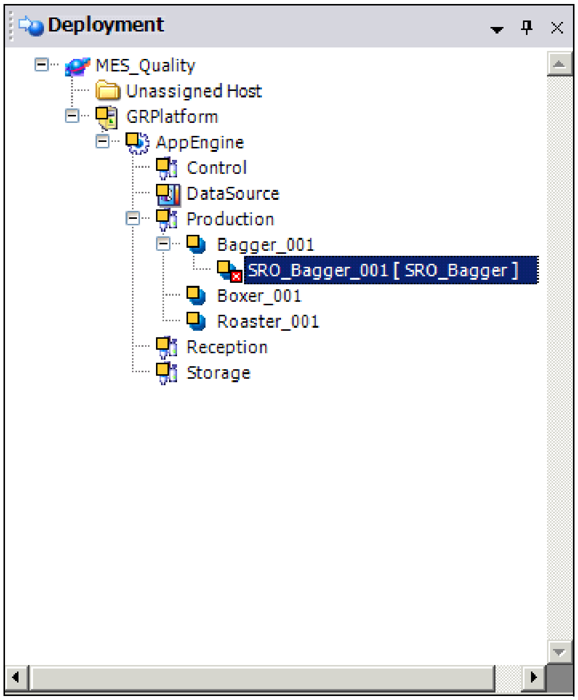
The **Rename Contained Name** dialog box appears.

39. In the **New Contained Name** field, enter **SRO_Bagger**.

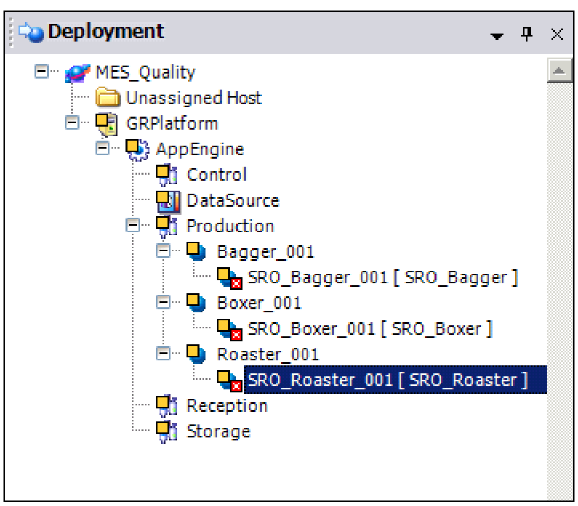


40. Click **OK**.

The new contained name appears.



41. Repeat steps 36 through 40 two times, one from **SRO_Boxer** and one from **SRO_Roaster** to create two new instances named **SRO_Boxer_001** and **SRO_Roaster_001**, and then assign them to **Boxer_001** and **Roaster_001** and rename the contained names **SRO_Boxer** and **SRO_Roaster**, respectively.

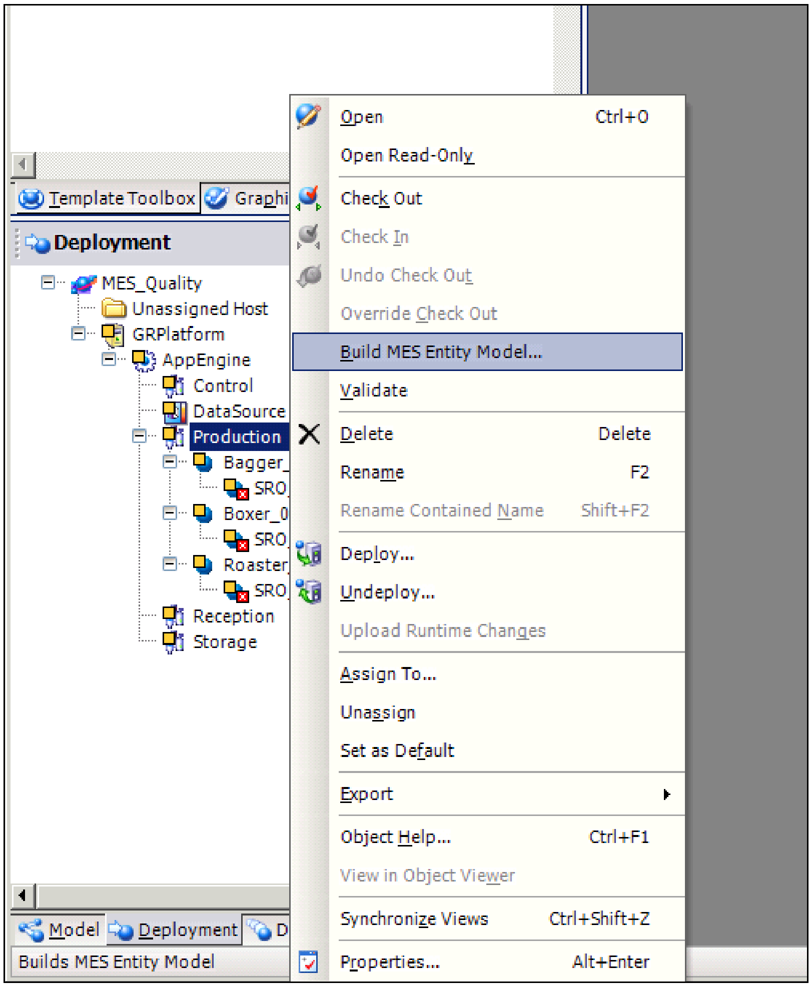


The red error icons next to the instances indicate that the MES Entity Model needs to be built. This synchronizes the ArchestrA IDE configurations with the MES database.

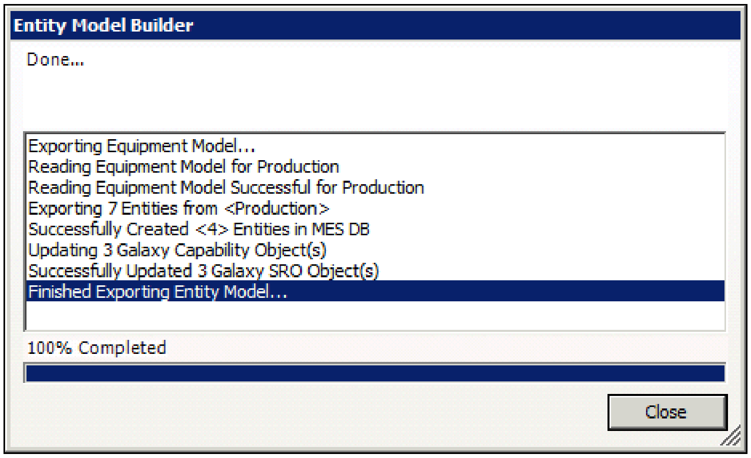
Build the MES Entity Model

You will now build the MES Entity Model and verify that the entities have been created in MES Client.

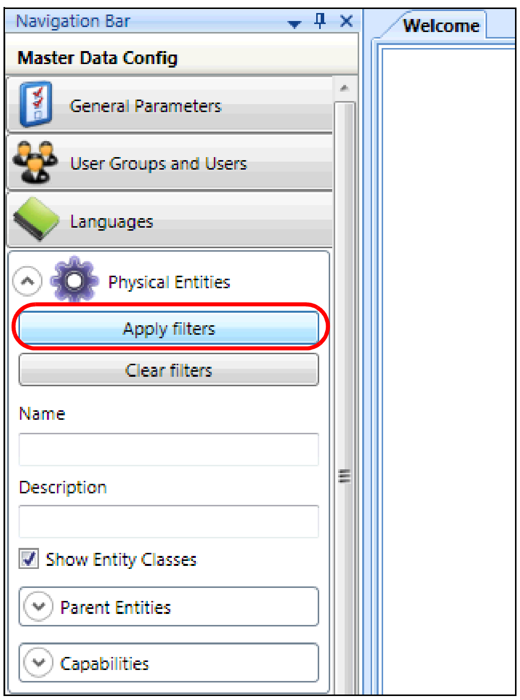
42. Right-click **Production** and select **Build MES Entity Model**.



After a few moments, the **Entity Model Builder** progress displays **100% Completed** and the **Close** button is enabled.

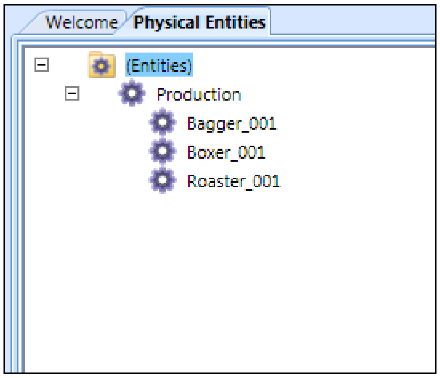


43. Click **Close**.
44. In MES Client, **Navigation Bar**, expand **Physical Entities** and click **Apply filters**.



45. On the **Physical Entities** tab, expand **(Entities)** and **Production**.

    The new entities are now displayed.



Section 3 – Further Preparation for MES Software/Quality

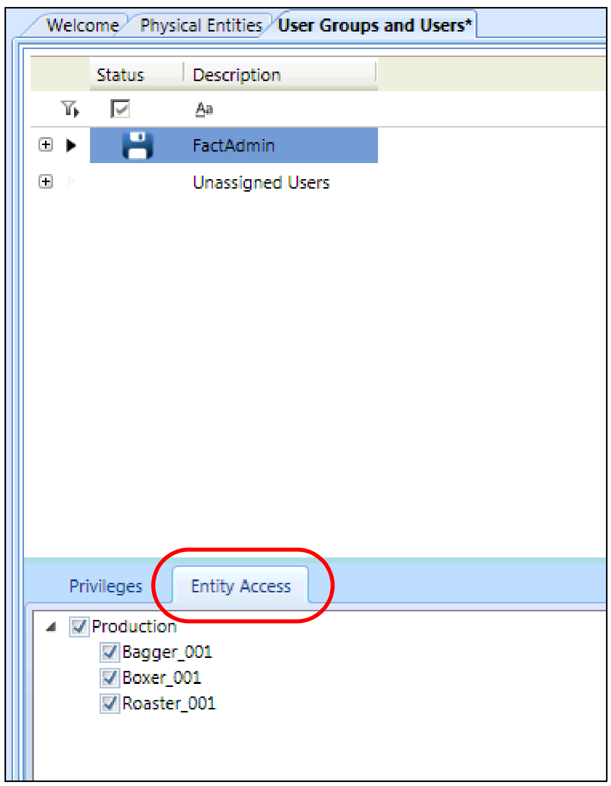
This section provides the MES database preparation needed prior to setting up the Quality functionality. This includes verifying the Entity Model, defining units of measure, and creating shifts.

Providing Entity Access

An entity refers to a component within the system that a user logs into and manipulate its data. An entity can be a building, a location within a building, a single machine, an assembly line, and so on.

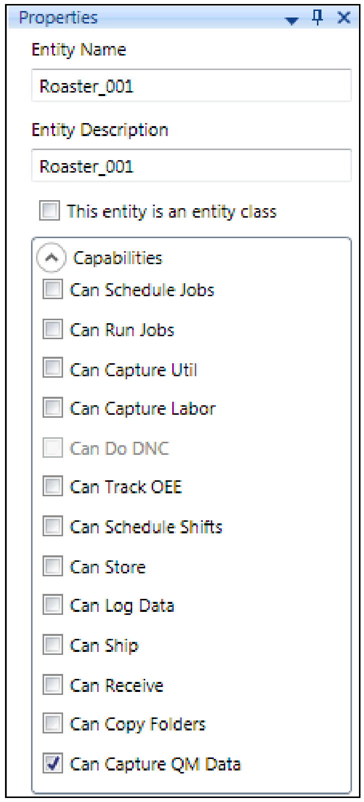
You can determine the entities that the members of a user group can access in the Wonderware MES applications, specifically the Inventory window in Wonderware MES Supervisor, the Queue module in Wonderware MES Client, and the Entity Login window in Wonderware MES Operator application. You can provide entity access only to a user group and not to an individual user.

The **Entity Access** tab shows all the entities that are defined in the Wonderware MES Client application. The entities are displayed in a tree structure within the tabbed workspace.



Entity Capabilities and Properties

Capabilities define which functions the entity can perform such as, scheduling jobs or storing materials.



The descriptions of the capabilities are as follows:

- **Can Schedule Jobs**: Select the check box if you want the entity to schedule jobs
- **Can Run Jobs**: Select the check box if you want the entity to run jobs
- **Can Capture Util**: Select the check box if you want the entity to capture utilization data
- **Can Capture Labor**: Select the check box if you want the entity to capture labor data
- **Can Do DNC**: Select the check box if you want the entity to communicate with machine tools
- **Can Track OEE**: Select the check box if you want the entity to capture OEE statistics
- **Can Schedule Shifts**: Select the check box if you want the entity to schedule shifts
- **Can Store**: Select the check box if you want the entity to serve as a storage location
- **Can Log Data**: Select the check box if you want the entity to log data
- **Can Ship**: Select the check box if you want to enable the entity for shipment
- **Can Receive**: Select the check box if you can receive materials at this entity
- **Can Copy Folders**: Select the check box if you want the entity to copy folders
- **Can Capture QM Data**: Select the check box if you want the entity to capture QM data

For object instances with an SRO attached, the Entity Model Builder enables these entities with the **Can Capture QM Data** capability.

Shift and Shift Schedules

You can use the **Shift and Shift Schedule** module in the **Master Data Config** group to define the shift names, shift timings, and shift breaks for any entity in the plant. You can define unlimited shifts to customize the work schedule for your organization.

When you open Wonderware MES Client and click the **Shift and Shift Schedule** module, the following are displayed in the tabbed workspace:

- 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 shift on the top of the entity hierarchy so that you change it only in the parent entity to update the children entities.

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

Note: For shift-based data collection, if no shift is defined, data cannot be entered.

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

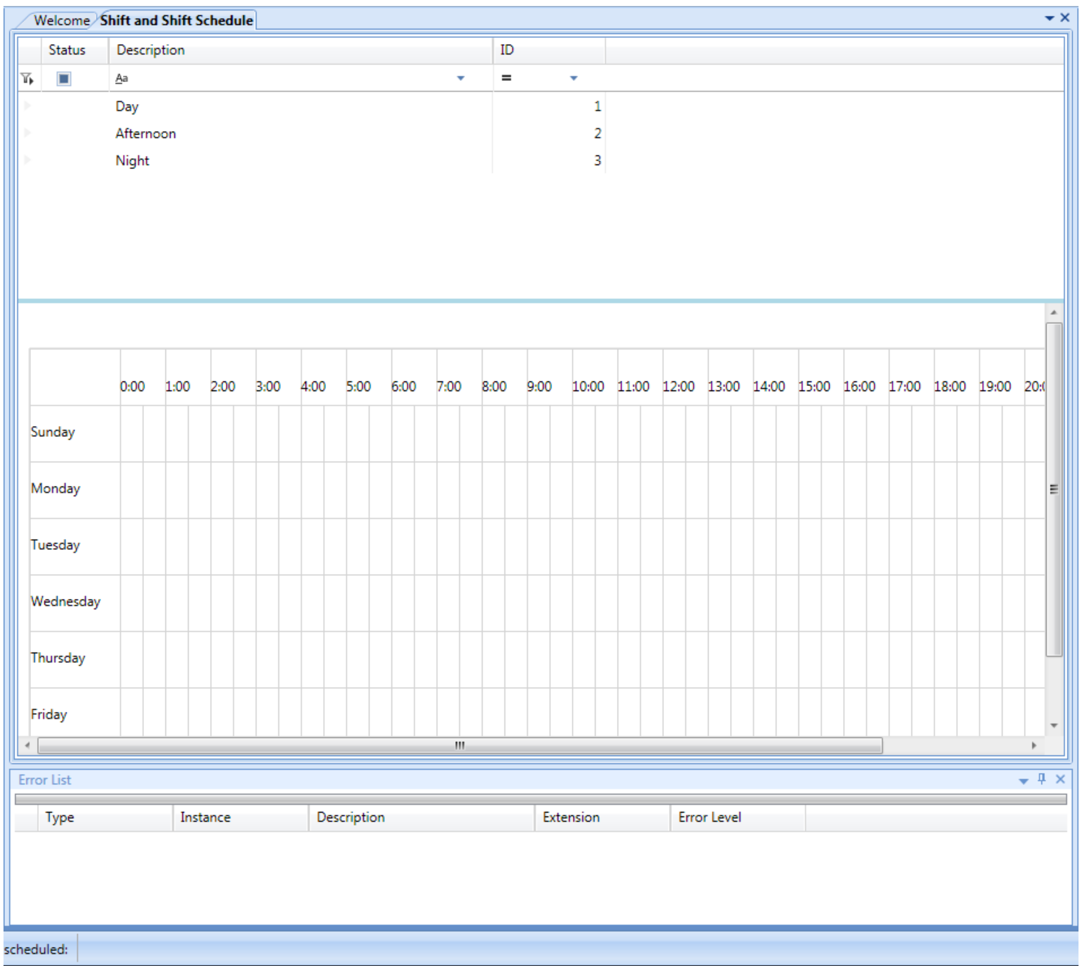
Shift

You can define the names of the work shifts, in Wonderware 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, a day shift and a night shift. The day shift can be scheduled from 7:00 A.M. to 3:00 P.M., and the night shift can be scheduled from 11:00 P.M. to 7:00 A.M.

Note: The **Shift Schedule Editor** displays the time columns based on a 24-hour clock, also known as military or astronomical time.

When you click the **Shift and Shift Schedule** module on the **Navigation Bar**, the workspace displays information about the status, ID, and description of all the existing shifts. By default, the following shifts are displayed:

- **Day**
- **Afternoon**
- **Night**



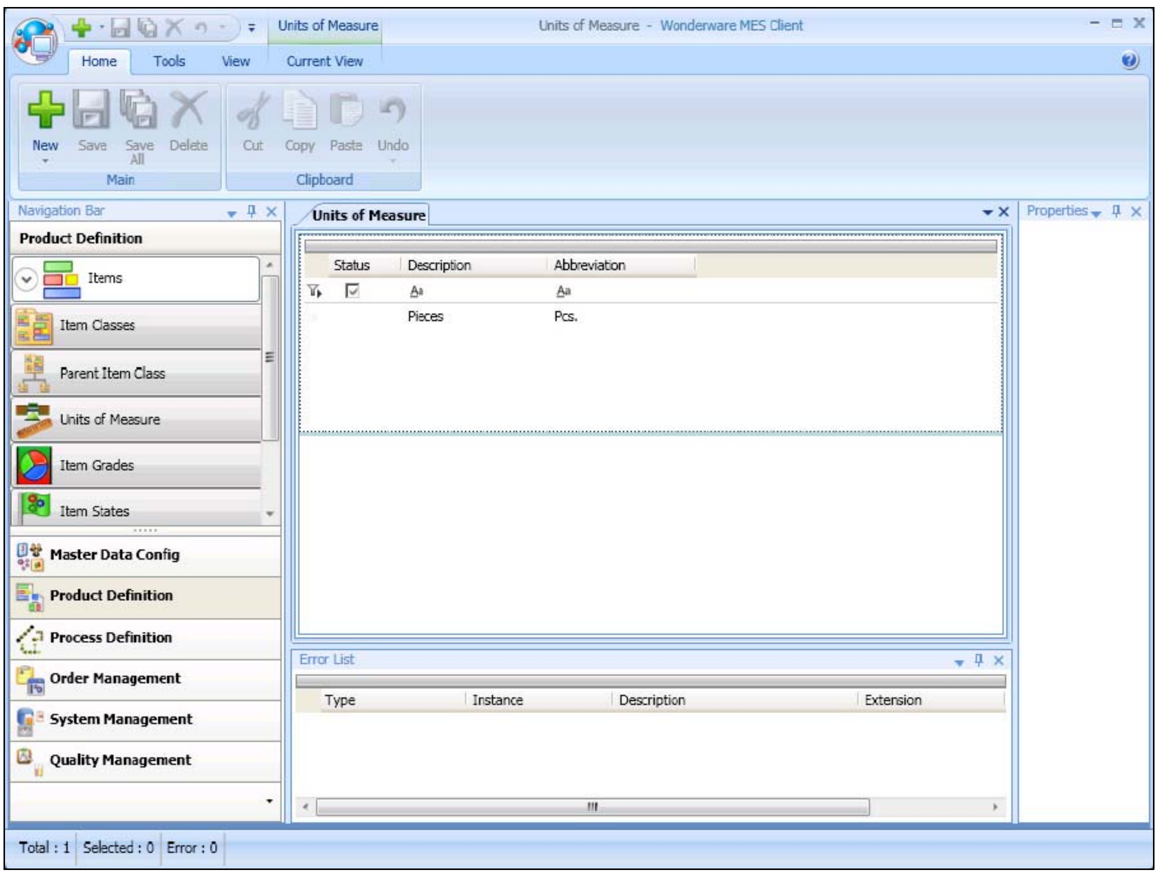
When you open any of these shifts for editing, the **Properties** pane displays the shift details.

The first text box corresponds to the shift description (a name associated with a shift) and the second numeric text box 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. Breaks can be defined here as well, but MES Software/Quality does not take these into consideration.

Units of Measure

You can use the **Units of Measure** module to create and maintain the Units of Measure (UOM). The UOM describes the quantities of items or the measurement units of Characteristics in the Wonderware MES Client application. You can also define a conversion method between two UOMs.

When you open the **Units of Measure** module, a list of all the existing UOMs is shown in the workspace. By default, the **Units of Measure** module is grouped under the **Product Definition** group in the **Navigation Pane** and displays **Pieces**.



Lab 3 – Configuring MES Client

Introduction

In a previous lab, you created the Admin user. In this lab, you will assign user access to the entities and enable certain capabilities within the entities using MES Client. Then, you will create shifts and units of measure, which will be used in the development of Sample Plans in later labs.

Objectives

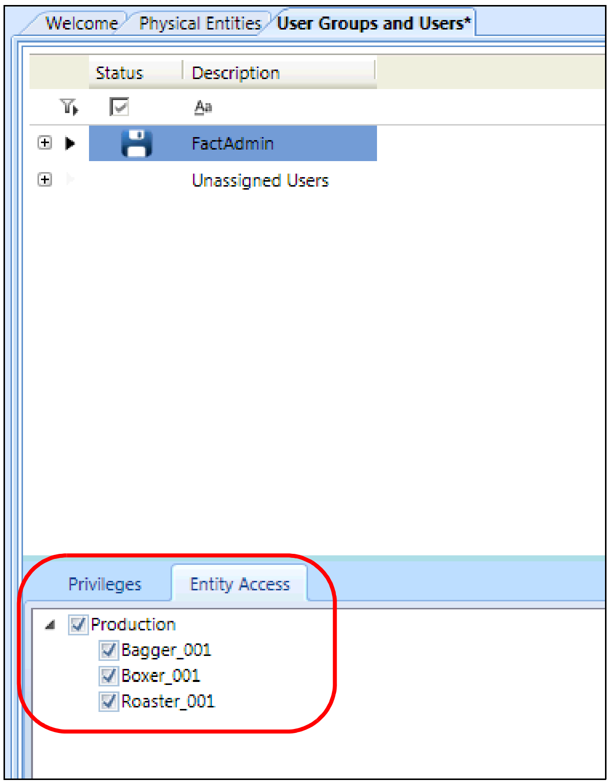
Upon completion of this lab, you will be able to:

- Assign entity access to a user
- Enable capabilities within an entity
- Create a shift and a unit of measure

Configure the Entities

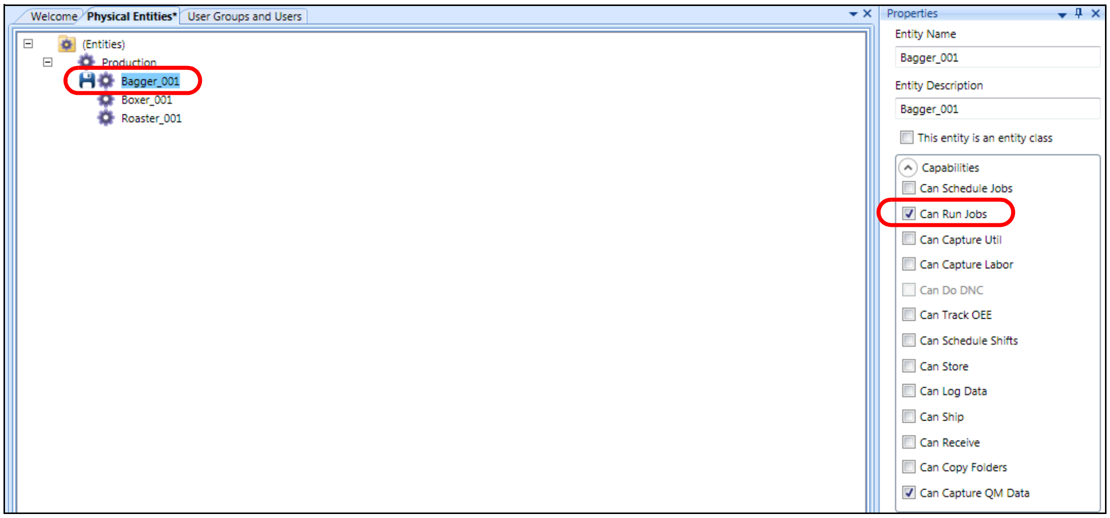
First, you will assign entity access to a user. This grants the user the ability to log on to the entity. You will then assign capabilities to each of the entities to enable functionality.

1. In MES Client, **Navigation Bar**, click **User Groups and Users**.
2. On the **User Groups and Users** tab, click **FactAdmin**.
3. On the **Entity Access** tab, check **Production**.
4. Expand **Production** and verify that all of the entities have been checked.

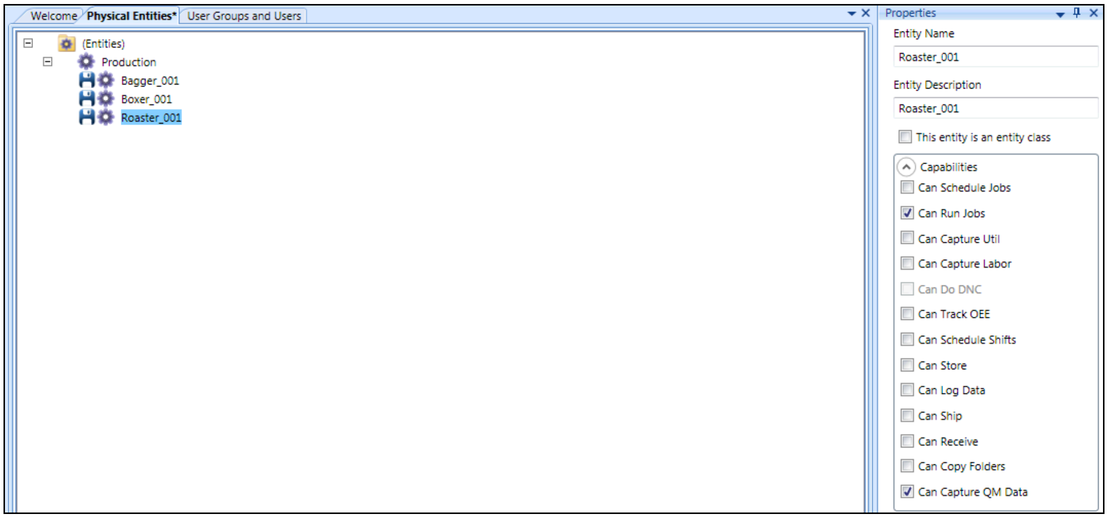


5. Click **Save All**.

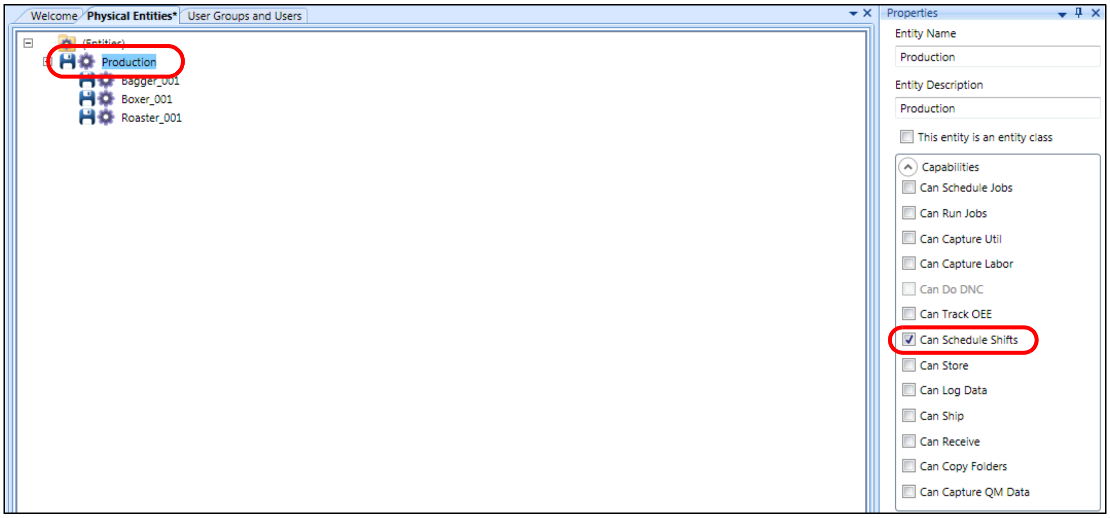
6. On the **Physical Entities** tab, click **Bagger_001**, and then in the **Properties** pane, check **Can Run Jobs**.



7. Check **Can Run Jobs** for both **Boxer_001** and **Roaster_001**.



8. Click **Production**, and then in the **Properties** pane, check **Can Schedule Shifts**.



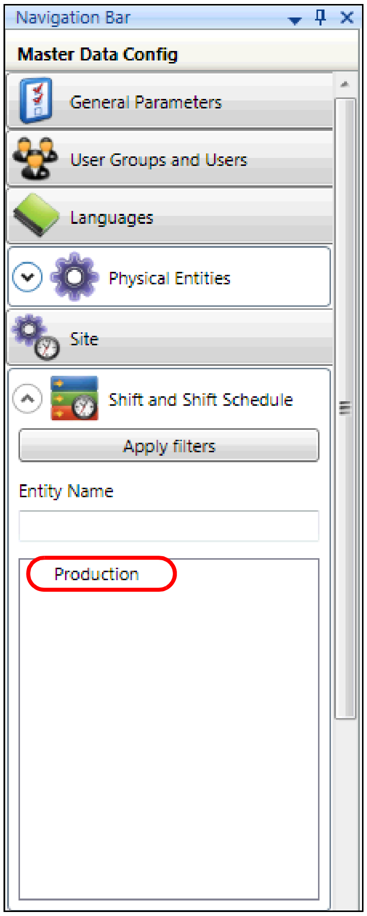
9. Click **Save All**.

Create the Shift Schedule

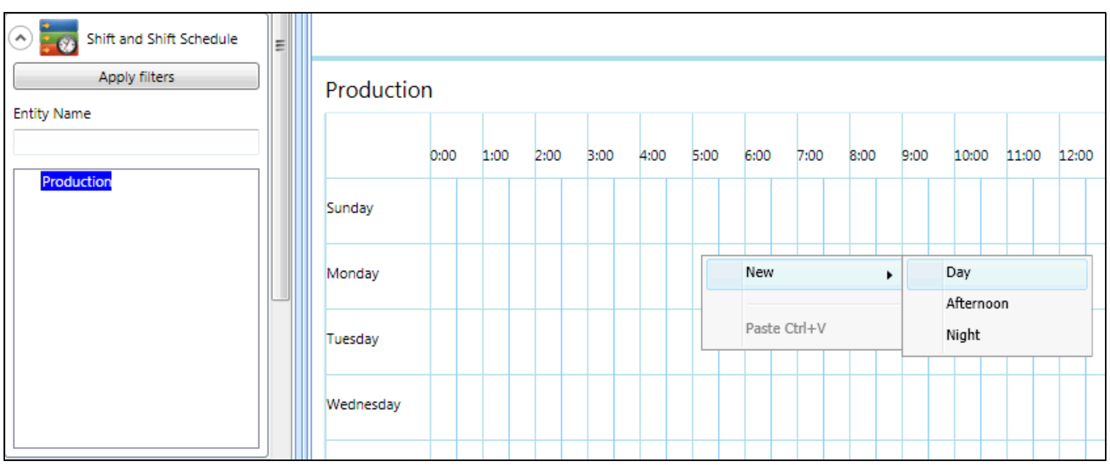
Now, you will create a shift schedule, which is necessary for capturing data during specific times. In later labs, the shift schedule will be needed for creating certain types of Sample Plans.

10. In the **Navigation Bar**, collapse the **Physical Entities** module, and then expand the **Shift and Shift Schedule** module.

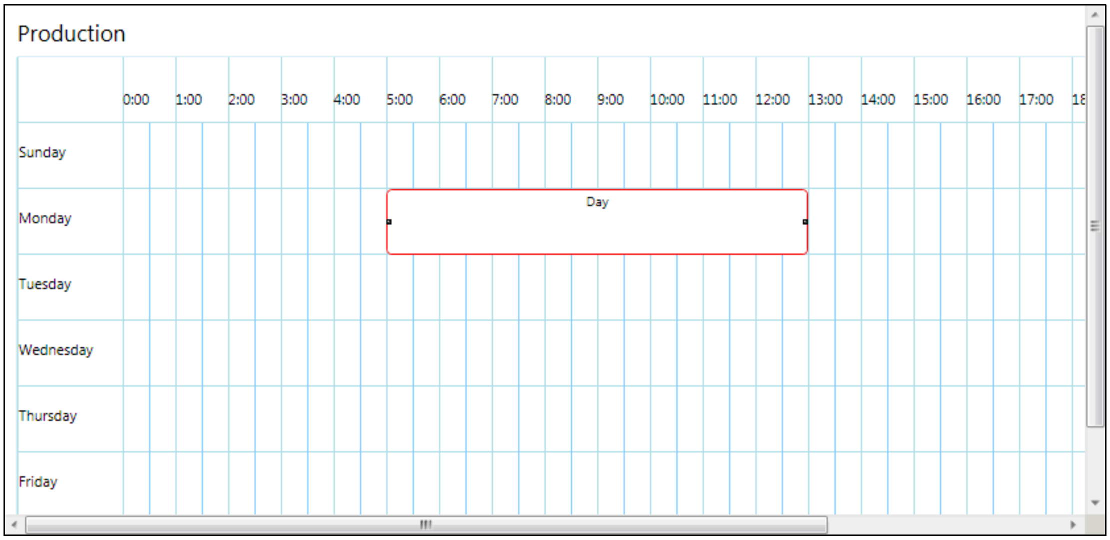
    The **Production** entity appears.



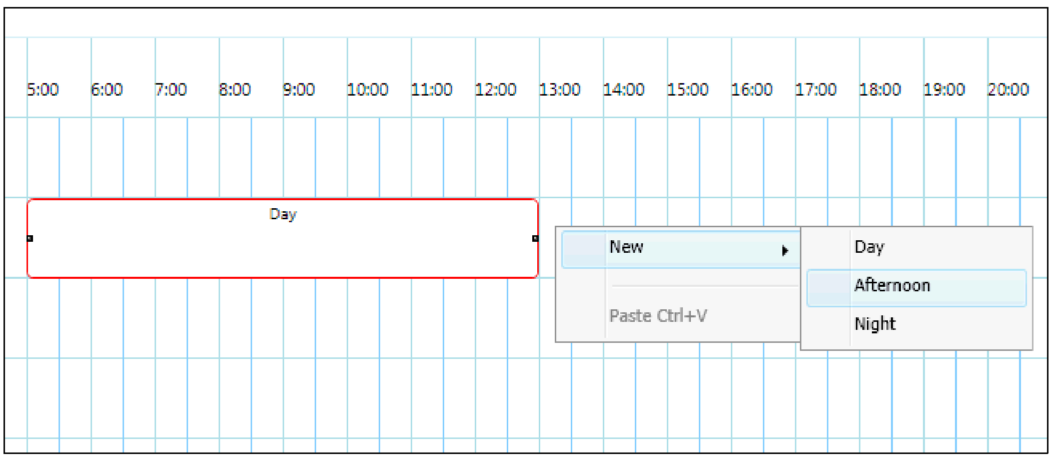
11. Click **Production**, and then right-click the **Monday 5:00** time slot and select **New | Day.**



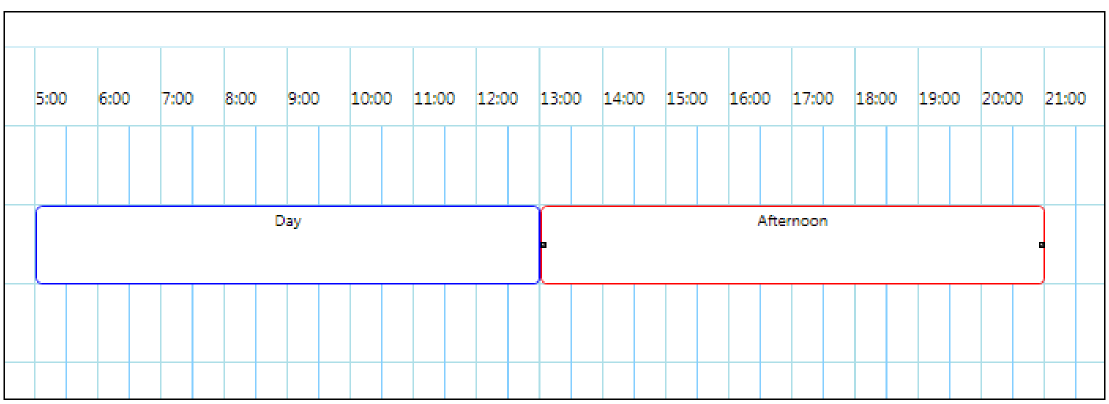
The new **Day** shift appears on the schedule.



12. Right-click the **Monday 13:00** time slot and select **New | Afternoon**.

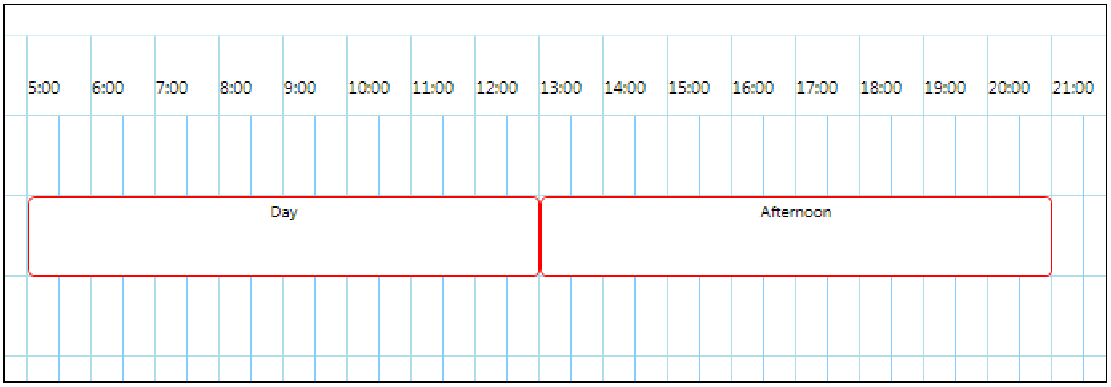


The new **Afternoon** shift appears on the schedule.

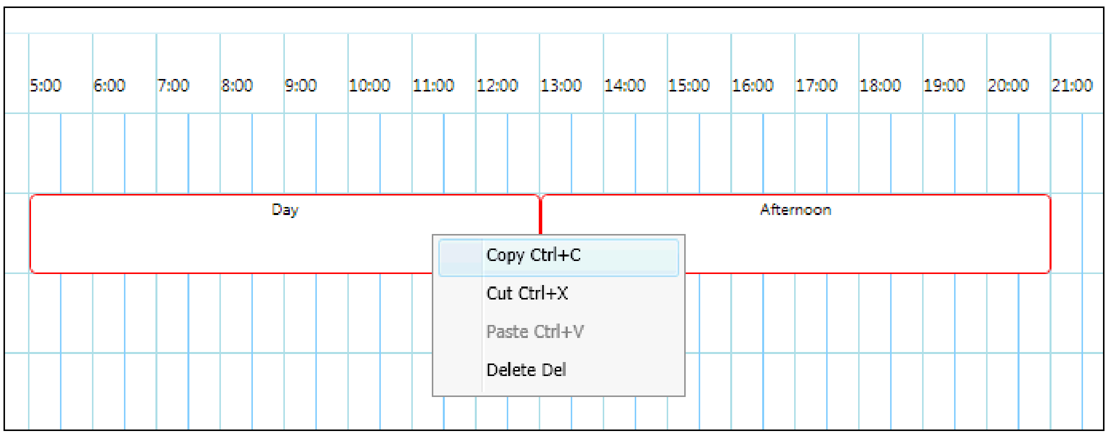


13. Press and hold the **Ctrl** key and click the **Day** shift.

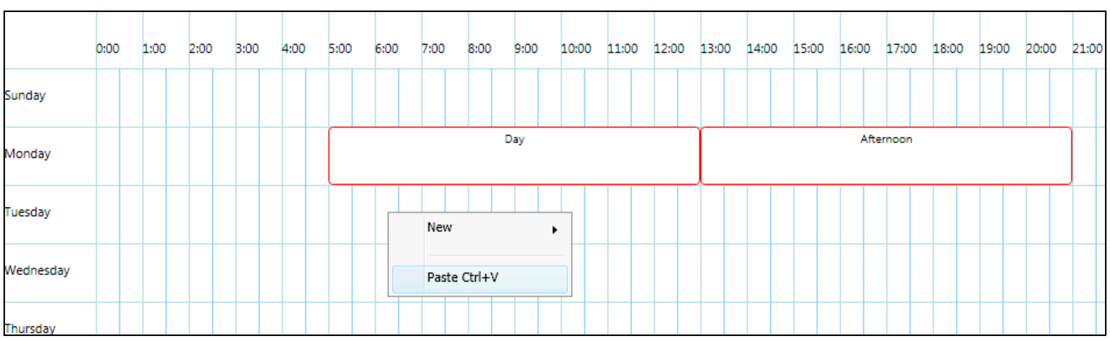
    Both shifts are now selected and highlighted in red.



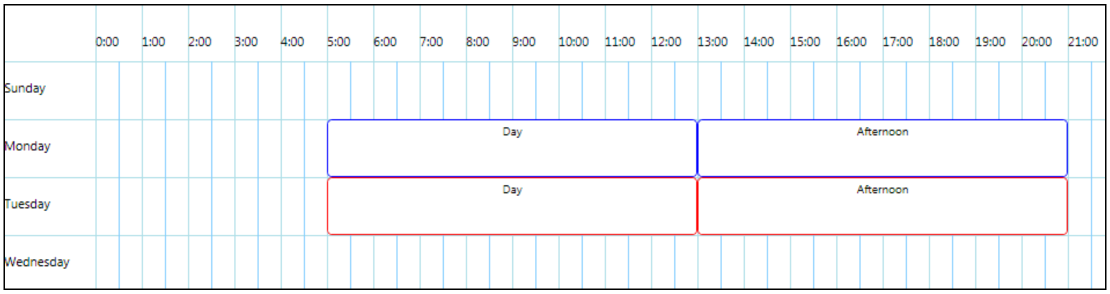
14. Right-click one of the shifts and select **Copy**.



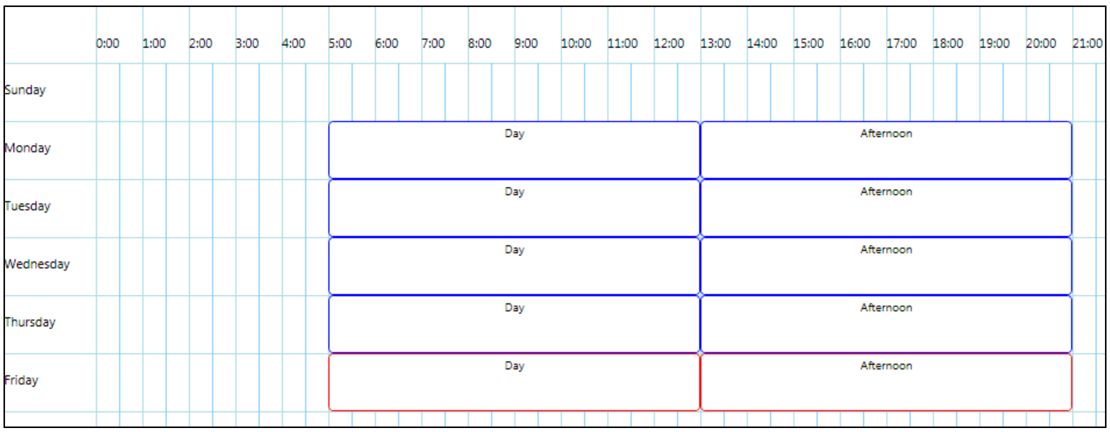
15. Right-click anywhere in the **Tuesday** row grid and select **Paste**.



The new shifts now appear on the schedule.



16. Repeat Step 15 three more times to create the same shifts for the rest of the work week.

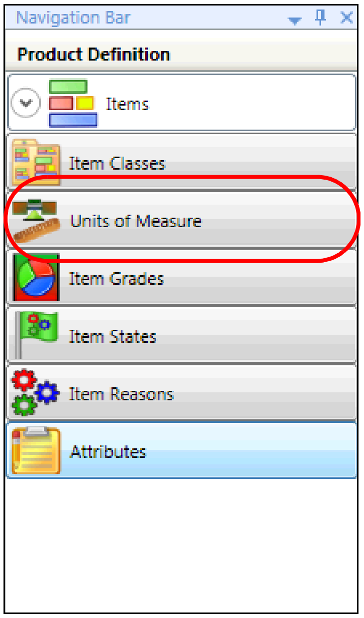


17. Click **Save All**.

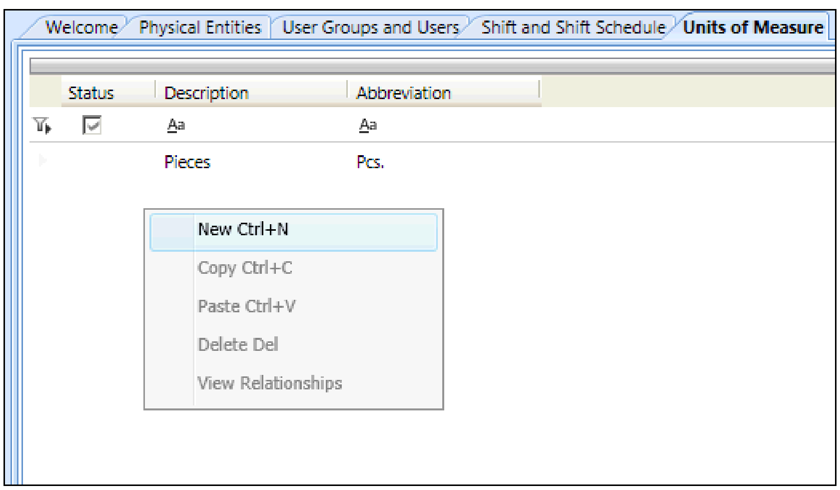
Create the Units of Measure

You will now create three new units of measure to be used in the creation of Sample Plans in later labs.

18. In the **Navigation Bar**, click the **Product Definition** group, and then click **Units of Measure**.



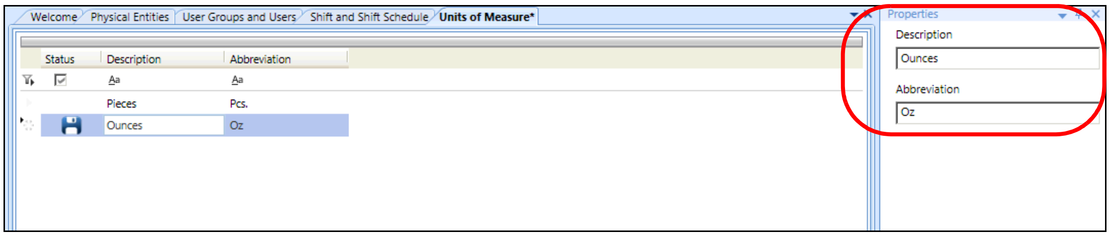
19. On the **Units of Measure** tab, right-click the empty workspace and select **New**.



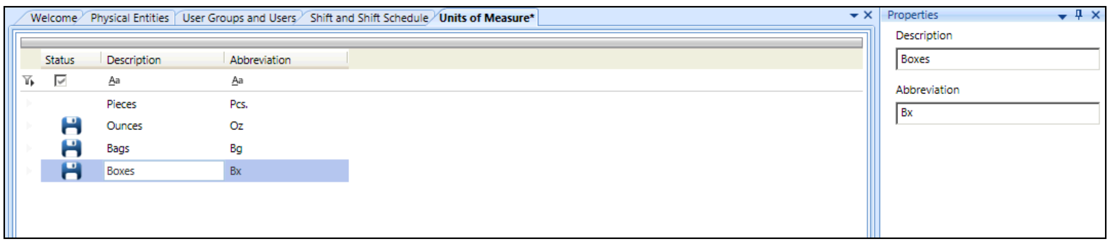
20. Configure the **Properties** pane as follows:

    Description: Ounces

    Abbreviation: Oz



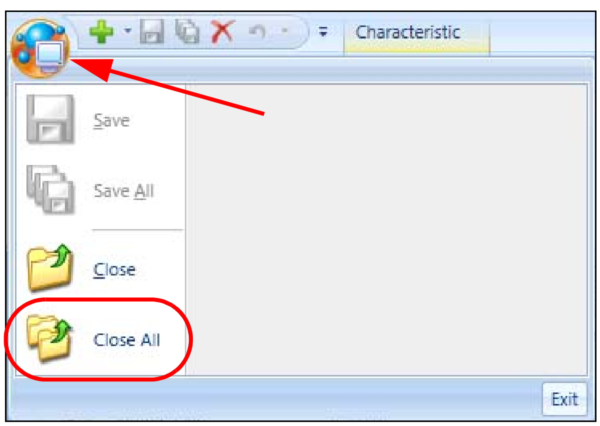
21. Repeat Steps 19 and 20 two more times to create two units of measure named **Bags** and **Boxes** with abbreviations **Bg** and **Bx**, respectively.



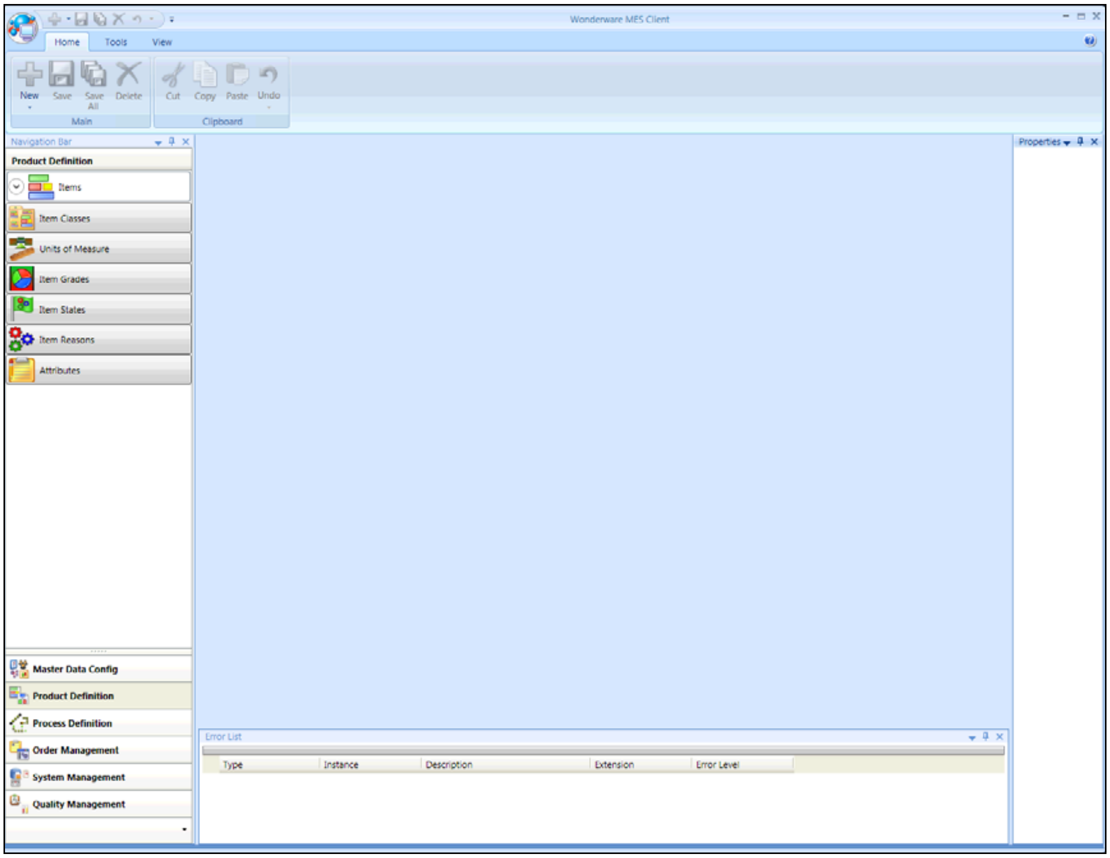
22. Click **Save All**.

You will now close all open tabs. This is for organizational purposes, including the visibility of the tabs within MES Client, as having too many open tabs causes some tabs to be off of the tabbed workspace area.

23. In the top-left corner, on the **Application Button** menu, click **Close All**.



The MES Client now displays no open tabs.



Module 3 – MES Software/Quality Configuration

Module Objectives

- Explain and build Sample Plans
- Explain and configure the Sample Viewer Control
- Configure automatic data collection
- Explain and configure SRO graphics

Section 1 – Sampling Configuration

This section explains the need for adequately building your Sample Plan and QM Specification in Wonderware MES Software/Quality. The requirements for a Sample Plan, including frequency, Characteristics, and quality management specifications are included.

Overview

When quality data needs to be captured, a Sample Plan needs to be determined. Sample Plans define what material is going to be sampled, what component of the material is going to be measured, and how often a sample is taken.

In MES Client, the following modules help to define the requirements of a Sample Plan:

- Sample Plan Frequency
- Sample Plan
- Characteristic
- QM Specification

Sample Plan Frequency

A Sample Plan Frequency is created to determine the interval for generating samples. You can create multiple Sample Plan Frequencies.

You can use the **Sample Plan Frequency** module to create, maintain, and remove sample plan frequency definitions. When you open the **Sample Plan Frequency** module, a list of all the existing Sample Plan Frequencies is shown in the workspace.

A Sample Plan Frequency is the given interval for collecting samples for measuring quality. A Sample Plan Frequency can be associated with multiple Sample Plans and a Sample Plan can have multiple Sample Plan Frequencies.

Sample Plan Frequencies are defined based on the following:

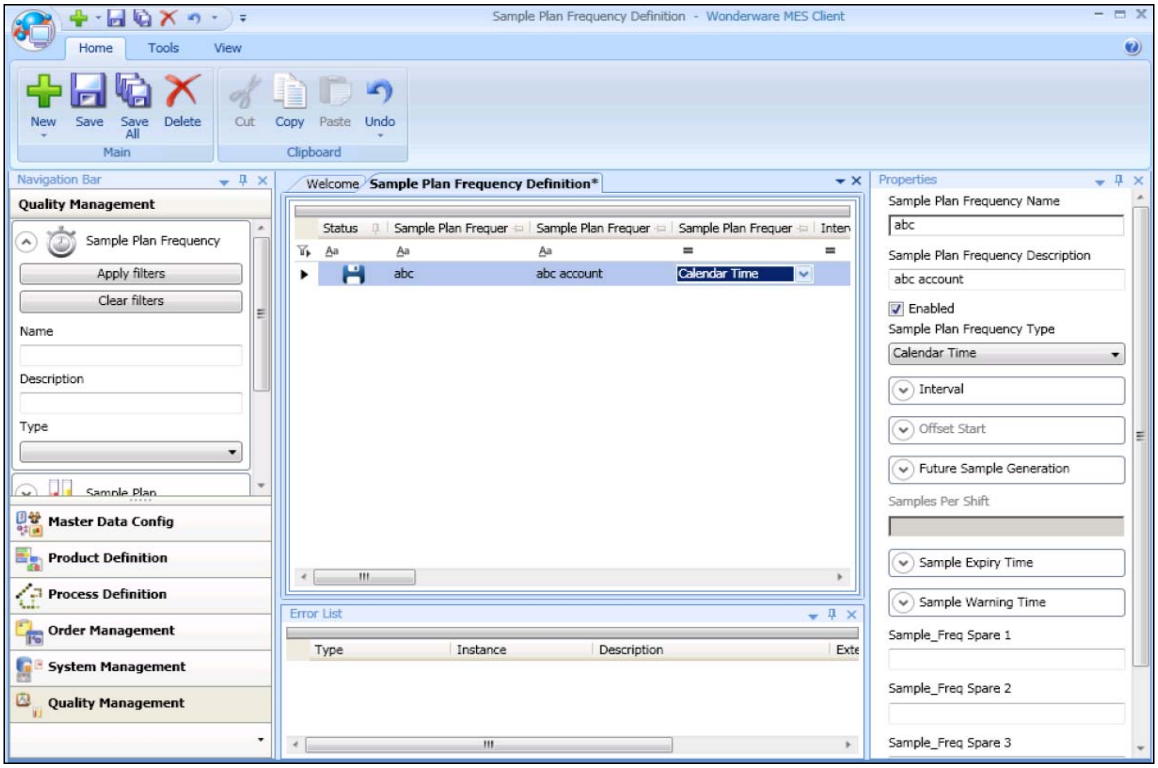
- Calendar or clock time
- Runtime of the entities
- Time pattern within the current shift
- Amount of production
- Occurrence of specific events

There can be multiple Sample Plan Frequencies at any given time. By default, the **Sample Plan Frequency** module is grouped under the **Quality Management** group in the **Navigation Pane**.

You can modify an existing Sample Plan Frequency, except under the following conditions:

- You cannot modify the type of a Sample Plan Frequency if it is linked to a Sample Plan.
- You cannot modify the Data Change event type of a Sample Plan Frequency if it is linked to a Sample Plan.

You can delete an existing sample Plan Frequency from the MES database if it is not linked to any Sample Plan.



The **Apply filters** button allows you to view a list of sample plan frequencies, which matches the filter options you enter. If no options are entered, the workspace displays all existing Sample Plan Frequencies.

The workspace shows names, descriptions, frequency types, and other details for all the existing Sample Plan Frequencies.

Future Shift Samples

If a Sample Plan Frequency is configured to generate future samples for a shift, then the QM Specification that uses this Sample Plan Frequency and it has the highest specificity (and is currently effective), generates future samples up to the end of the shift. If a QM Specification is effective during a shift rather than at the beginning, the exact sample time is delayed until the sample frequency becomes effective.

Data Change Frequency

Data change frequencies are not processed by the MES Service. These frequencies generate samples with the corresponding event through the middleware. In general, these are Wonderware MES Operations-type transactions that generates a new sample for an entity when the call is processed by the middleware.

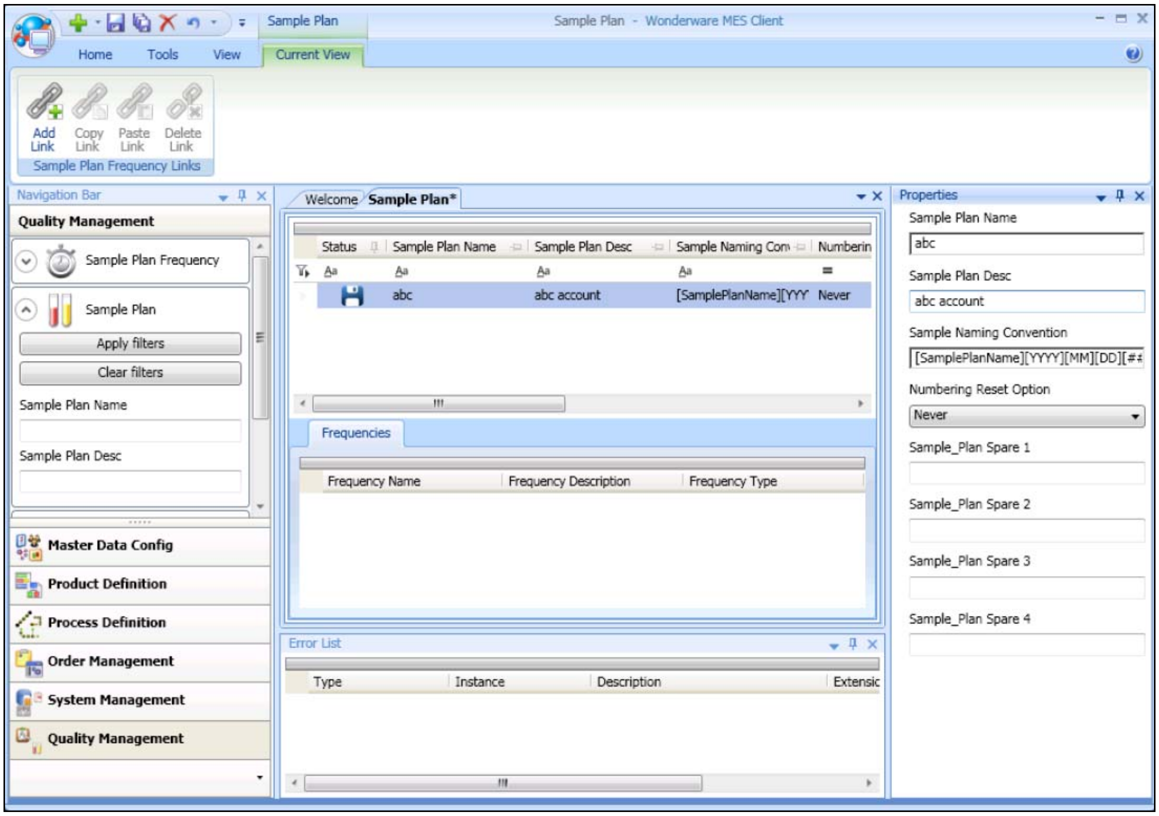
The Data Change frequency types are as follows:

- **Job Start / Job End**: Both of these frequencies are based on a job running on an entity. When a QM Specification has the context of an item or operation, or both, then a job must be active on the entity for the QM Specification to be active.
  - If the QM Specification has a Sample Plan that contains a job start frequency, the job start transaction generates a new sample on the entity
  - If the QM Specification has a Sample Plan that contains a job end frequency, the job end transaction generates a new sample on the entity
- **Lot number of main item produced changes**: This frequency is based on a job running on an entity. When the call is made to change the lot number of the main item produced, a new sample is generated on the entity. This event happens when the lot number is set for the job, not when the job produce transaction is called. The lot number produced is different from the previous lot number.
- **Manual**: This frequency definition is provided as a mechanism to indicate that the call will be used at runtime to generate an ad-hoc sample. It is not associated to any other MES Operations or Performance transaction. Since a QM Specification must include a Sample Plan and a Sample Plan must include a Sample Plan Frequency, the Manual frequency is provided so that a manual QM Specification can be defined in the system and used by the call.

Sample Plan

A Sample Plan is a collection of sample frequencies and the template for naming samples at runtime. The Sample Plan Frequency is the given interval to generate samples. It is also used to define the given time when samples are collected.

You can use the **Sample Plan** module to configure and to associate Sample Plan Frequencies to the Sample Plan. Sample Plans are constructed to generate samples at runtime. When you open the **Sample Plan** module, a list of all of the existing Sample Plans is shown in the workspace. This module is grouped under the **Quality Management** group in the **Navigation Pane**.



The workspace shows **Sample Plan Name**, **Sample Plan Desc**, **Sample Naming Convention**, and other details for all of the existing sample plans. A Sample Plan is created to collect user inputs at a given time. You can save multiple Sample Plans simultaneously. To save a Sample Plan, you need to link at least one Sample Plan Frequency to it.

A Sample Plan Frequency can be linked to a sample Plan on the **Frequencies** tab. Only one Sample Plan Frequency of a given type may be linked to the Sample Plan, except for data change events. Multiple data change events may be linked to the same Sample Plan as long as the data change events are for different events.

You can delete a Sample Plan if it is not linked to a QM Specification.

Naming Conventions

Naming conventions are defined in the **Sample Plan** module. The following table shows a list of the replaceable parameters that can be successfully replaced from the template sample name and examples using a specific date (03/15/2013).

Replaceable Parameter (Case Insensitive)	Value Returned	Example
[YYYY]	Year	2013
[MM]	Month of the year (integer)	03 (includes leading zero)
[Month]	Name of the month	March
[DD]	Day of the month	15 (includes leading zero)
[WW]	Week of the year	11 (includes leading zero)
[Day]	Day (in full) of the week	Friday
[WD]	Day of the week	6 (Sunday = 1)
[DY]	Day of the year	074 (includes leading zeros)
[EntityName]	Name of he entity	Bagger
[WorkOrderID]	Work Order ID	WO123456
[OperationID]	Operation ID	BaggerOperation
[SequenceNumber]	Job Sequence Number	0
[ItemID]	Item ID	Item123456
[CharacteristicName]	Characteristic Name	BagWeight
[QMSpecName]	QM Specification Name	BagQuality
[FrequencyName]	Frequency Name	FrequencyA
[SamplePlanName]	Sample Plan Name	NutQuality
[SegmentRequirementID]	Segment Requirement ID	SegmentRequirement
[SegmentResponseID]	Segment Response ID	SegmentResponse
[####]	Integer value returning the next highest number	0001 (including leading zeros)

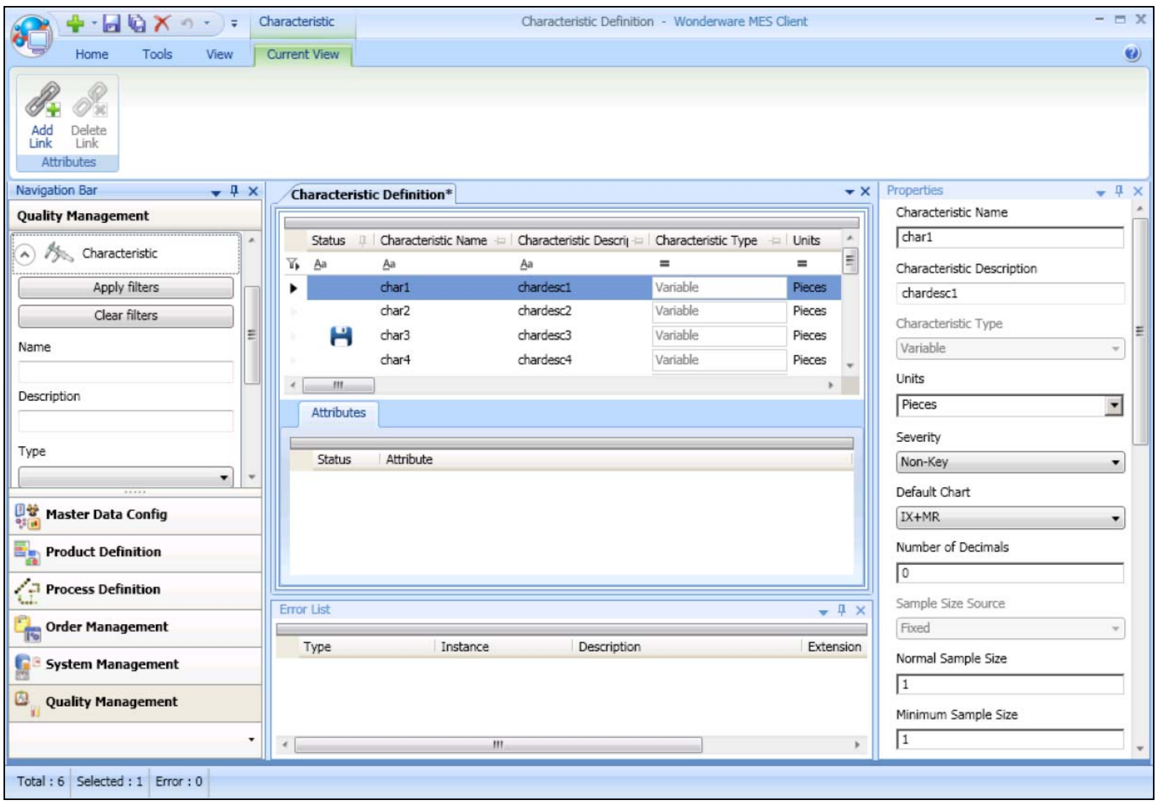
Characteristic

You can use the **Characteristic** module to create, maintain, and remove variable and attribute Characteristic definitions. When you open the **Characteristic** module, a list of all the existing variable and attribute Characteristics is shown in the workspace.

A Characteristic is an aspect of an item, process, or physical entity that can be measured. You can configure Characteristics for variables and attributes, and associate them with categories.

You can modify one or several Characteristics, but you cannot modify its type such as variable, counted attribute, and binary attribute. This is because when the Characteristic type is changed, the corresponding information also changes making it invalid. Once saved, you cannot modify the Characteristic type.

You can delete a Characteristic if it is not linked to any QM Specification that is currently effective.



The workspace shows the **Characteristic Name**, **Characteristic Description**, **Characteristic Type**, **Units**, and other details of the variables and attributes. By default, the **Characteristic** module is grouped under the **Quality Management** group in the **Navigation Pane**.

Characteristic Types

The Characteristic type specifies the type of Characteristic. The types of Characteristics are as follows:

- **Variable**: This type of Characteristic supports a floating point number to record product or process data such as temperature, pressure, diameter, etc.
- **Counted Attribute**: This type of Characteristic is used to enter a count of defects found on a unit
- **Binary Attribute**: This type of Characteristic is used to determine whether a condition exists or whether the unit being inspected is defective. This is a count of defective units for a specific flaw.

Characteristic Severity

The Characteristic severity specifies the severity options can be modified through language strings. The default options are:

- **Unused**: Specifies the Characteristic is not available for data entry at runtime and is not included in the new samples that are generated. It is retained for historical reasons.
- **Not Monitored**: Specifies the Characteristic is available for recording data at runtime, but no run rule violations are evaluated.
- **Non-Key**: Specifies the Characteristic is available for recording values and checking run rules.
- **Key**: Specifies the Characteristic is available for recording values and checking run rules. If a run rule is violated and there are no out-of-control conditions for a critical Characteristic nor out-of-spec conditions for either a key or critical Characteristic, the result is **Out Of Control - Key**.
- **Critical**: Specifies the Characteristic is available for recording values and checking run rules. If a run rule is violated and there are no out-of-spec conditions for a critical Characteristic, the result is **Out Of Control - Critical**.

Chart Types

The SPC Chart control supports displaying Characteristics of all types. The following is the list of chart types supported for specific Characteristic type:

- A Binary Attribute Characteristic can be displayed as a Percent Defective (**p**) chart or Number Defective (**np**) chart.
- A Counted Attribute Characteristic can be displayed as a Number of Defects (**c**) chart, Defects per Unit (**u**) chart, or Defects Per Million Opportunities (**DPMO**) chart.
- A Variable Characteristic can be displayed as a X Bar Range (**Xbar+Range**) chart, X Bar Sigma (**Xbar+Sigma**) chart, Moving Average Moving Range (**Moving Average+Range**) chart, Moving Average Sigma (**Moving Average+Sigma**) chart, or Individual X and Moving Range (**IX+MR**) chart.

Depending on the chart type and configuration of the variable Characteristic, the following are the additional limitations:

- X Bar: This chart plots samples that have multiple results per sample. If all the samples for the Characteristic have only one reading per sample, a blank chart is displayed.
- X Bar Range: This chart supports a fixed sample size. To accommodate this, the retrieval of the data will find the maximum sample size of all the retrieved samples and fill in the data set for all samples that have less than the maximum sample size "Dummy" values equal to the average of the specific sample. For example, if the maximum sample size is 5 and a sample only had 4 results, the system will create a 5th result equal to the average of the sample. This will not affect the plotting of the top or bottom chart. Because the sample size is artificially the same, all samples will have the same control limits applied to them.
- X Bar Sigma - This chart does support variable sample sizes so the control limits can change from point to point. To accomplish this, the chart sets limits based on a center line and standard mean (Use standard values option). If the Characteristic being plotted has fixed limits, these limits are transferred into a center line and a standard mean value. The chart will always plot symmetrical upper and lower control limits. The MES procedure that evaluates control rule violations will use the provided limits which may be single sided or asymmetrical. It is possible that the chart will indicate control rule violations that do not match what is in the database.
- Moving Average - This chart starts plotting with the first result received and adjusts the control limits accordingly until the number of points plotted is equal to the number of results used in the moving average calculation.

Quality Management Specification

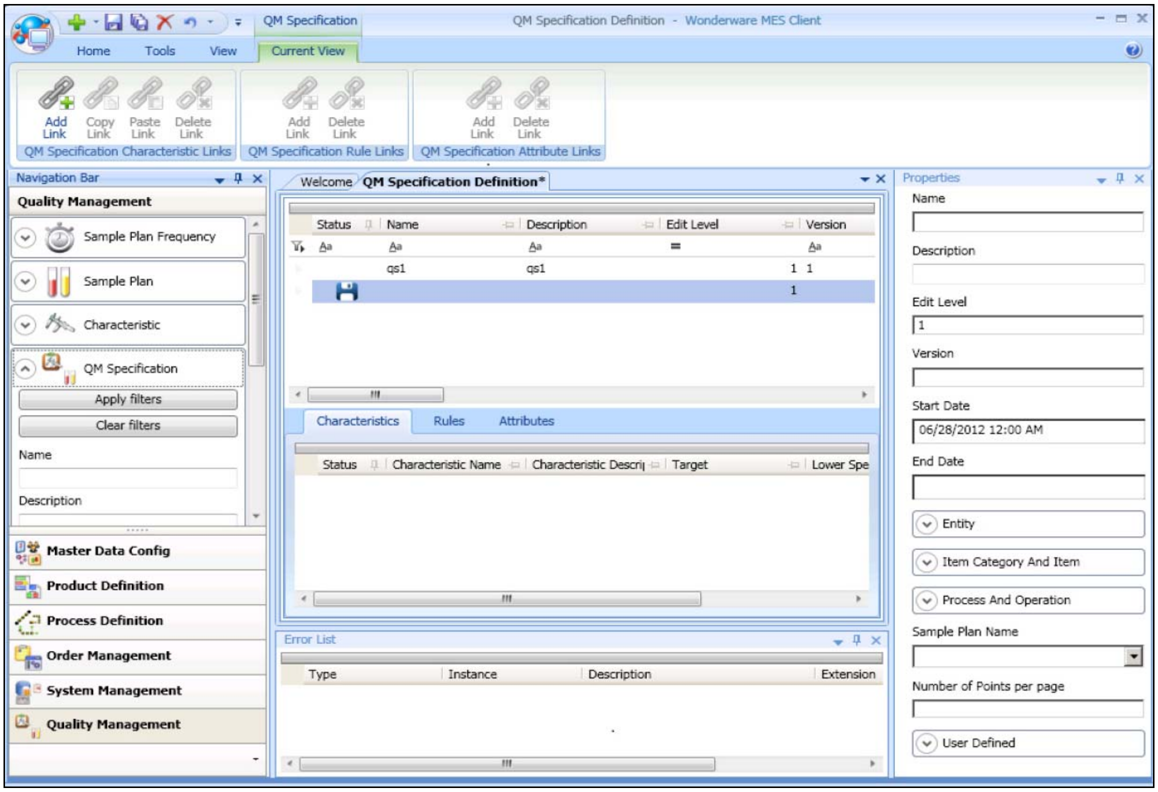
You can use the **QM Specification** module to create, maintain, and remove quality management specifications. When you open the **QM Specification** module and apply filters, a list of the QM Specifications are shown in the workspace.

A QM Specification is the specification for Statistical Process Control (SPC) analysis of various Characteristics linked to it. It also specifies the way sampling has to be carried out for each of the linked Characteristics.

The context data of a QM Specification decides how a linked Characteristic is going to be measured during runtime. For example, a Characteristic, such as temperature, can be measured in various contexts like item, entity, or operation. This means different samples have to be taken for different contexts for the same Characteristic. A QM Specification may have the combination of the contexts mentioned above that specifies how the samples are to be collected.

You can configure QM Specifications associated to variables and attributes. You can modify QM Specifications that are currently effective, and also those that are no longer effective.

You can delete a QM Specification from the database. An error message appears if you delete a QM Specification that is currently effective. An error message also appears if there is a sample or Characteristic linked to the QM Specification. This message shows the number of Sample/ Characteristic combinations that are assigned to the QM Specification. If both the error messages appear, they are combined into a single message. The error message allows you to continue to delete the QM Specification.



The workspace shows the **Name**, **Description**, **Edit Level**, **Version**, and other details of the QM Specification. A QM Specification can have multiple versions, where the active version is based on the start and end effective dates. By default, the **QM Specification** module is grouped under the **Quality Management** group in the **Navigation Pane**.

A version is considered active if the start effective date is among the QM Specification versions of same name and context and is equal to or less than the current time, and the end effective date is greater than the current time. The active QM Specification must have the recent start effective date that is less than the current date.

Multiple QM Specifications can be applied to various contexts, such as an entity, item, operation, or a combination of any of these. These QM Specifications can be active, and samples can be generated for any of them.

A QM Specification determines the Characteristics that are to be sampled and analyzed for various SPC charts and rules. You can assign or link multiple Characteristics to a QM Specification. If you want to save a QM Specification, you must link it to at least one Characteristic. You can link a Characteristic to a QM Specification on the **Characteristics** tab in the bottom portion of the workspace.

The set of control rules linked to a QM Specification represents the maximum set of control rules that you can apply to a Characteristic linked to the QM specification. The control rules are linked to the QM Specifications on the **Rules** tab in the bottom portion of the workspace.

Lab 4 – Creating the Bag Weight Sample Plan

Introduction

In this lab, you will create your first Sample Plan. The Sample Plan will be configured to request sample data for bag weights every five minutes with three to five measurements per sample. This data will be entered in the subsequent lab.

To do this, you will create a Sample Plan Frequency, a Sample Plan, and a Characteristic. You will then integrate them into a Quality Management (QM) Specification.

Objectives

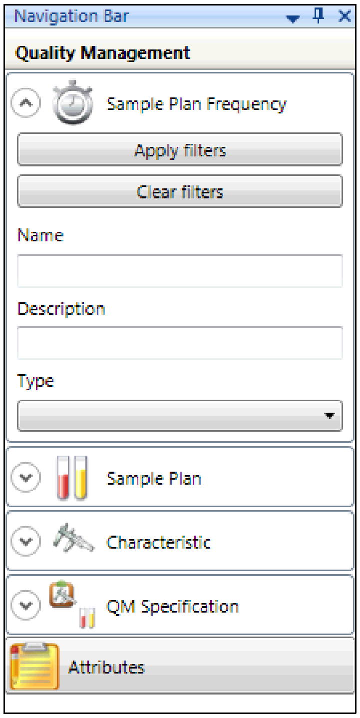
Upon completion of this lab, you will be able to:

- Create a Sample Plan Frequency
- Create a Sample Plan
- Create a Characteristic
- Create a QM Specification

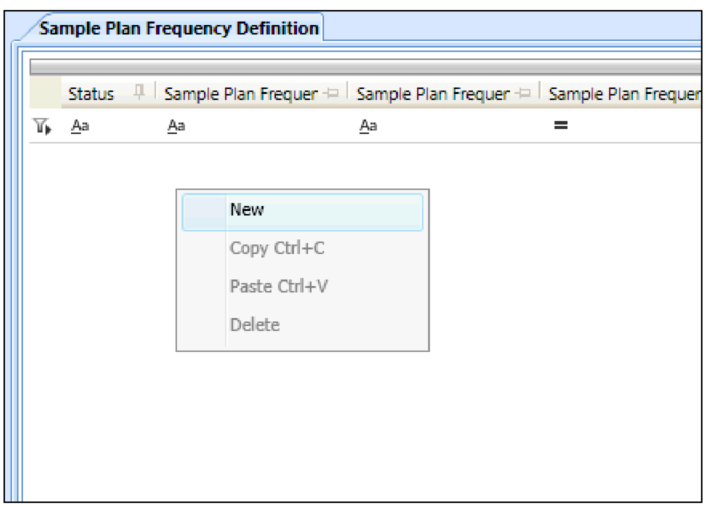
Create the Sample Plan Frequency

First, you will create a **Sample Plan Frequency**. This sets the rules for how and how often a sample will be collected.

1. In the **Navigation Bar**, select the **Quality Management** group.
2. Expand **Sample Plan Frequency** and click **Apply filters**.



3. On the **Sample Plan Frequency Definition** tab, right-click the empty workspace and select **New**.

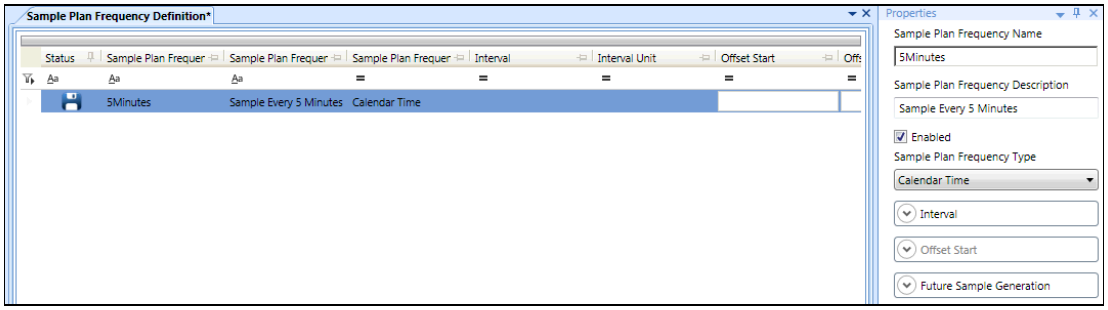


4. Configure the **Properties** pane as follows:

Sample Plan Frequency Name: 5Minutes

Sample Plan Frequency Description: Sample Every 5 Minutes

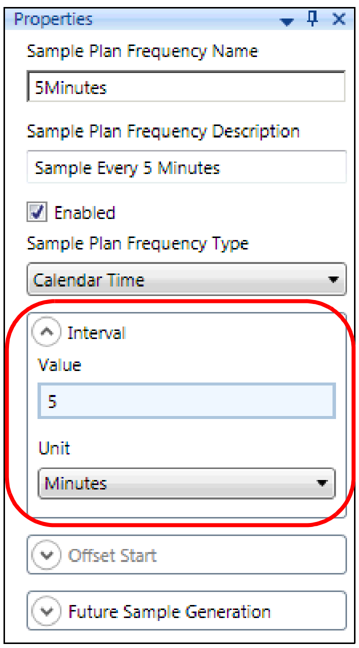
Sample Plan Frequency Type: Calendar Time (default)



5. Expand **Interval** and configure the options as follows:

Value: 5

Unit: Minutes

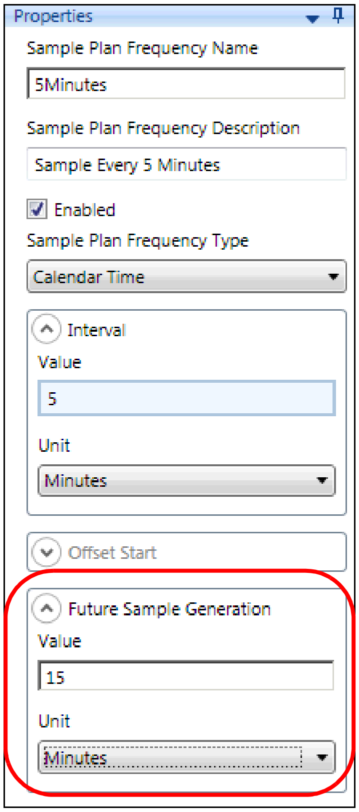


Note: In a production environment, the value associated with the **Interval** might dramatically impact the performance and capabilities of your application. Attempting to collect too many samples at too rapid of a rate may result in the loss of sample data. As a small system is in place for training purposes, you will be using a rapid collection rate that may not be appropriate for all implementations.

6. Expand **Future Sample Generation** and configure the options as follows:

   Value: 15

   Unit: Minutes

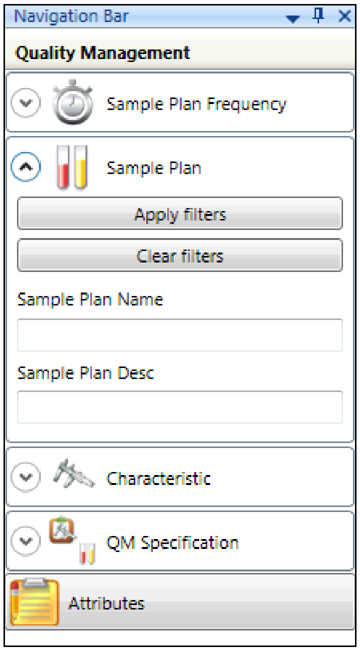


7. Click **Save All** and collapse the **Sample Plan Frequency** module.

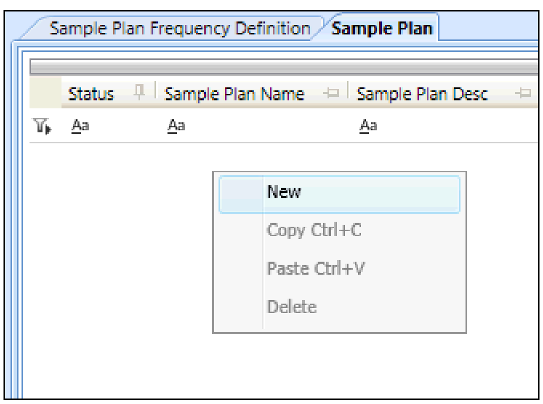
Create the Sample Plan

Next, you will create a **Sample Plan**. This establishes the naming convention for the samples, the numbering reset option, and links to the **Sample Plan Frequency**.

8. In the **Navigation Bar**, expand **Sample Plan** and click **Apply filters**.



9. On the **Sample Plan** tab, right-click the empty workspace and select **New**.

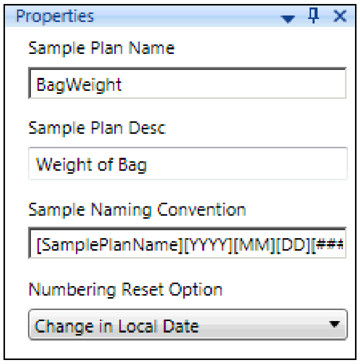


10. Configure the **Properties** pane as follows:

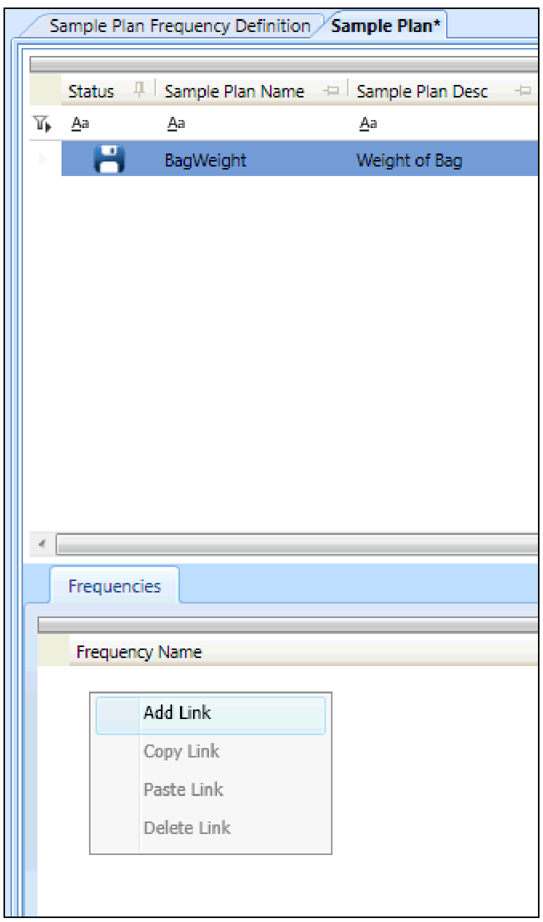
    Sample Plan Name: BagWeight

    Sample Plan Desc: Weight of Bag

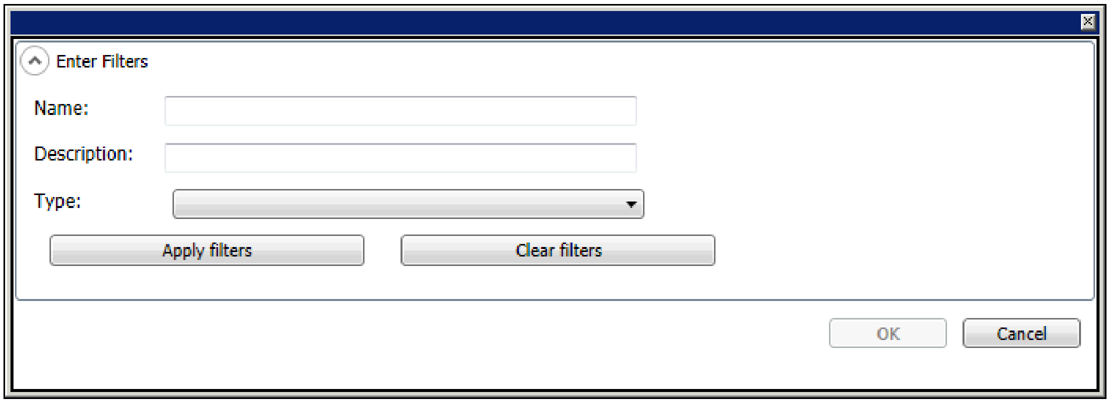
    Numbering Reset Option: Change in Local Date



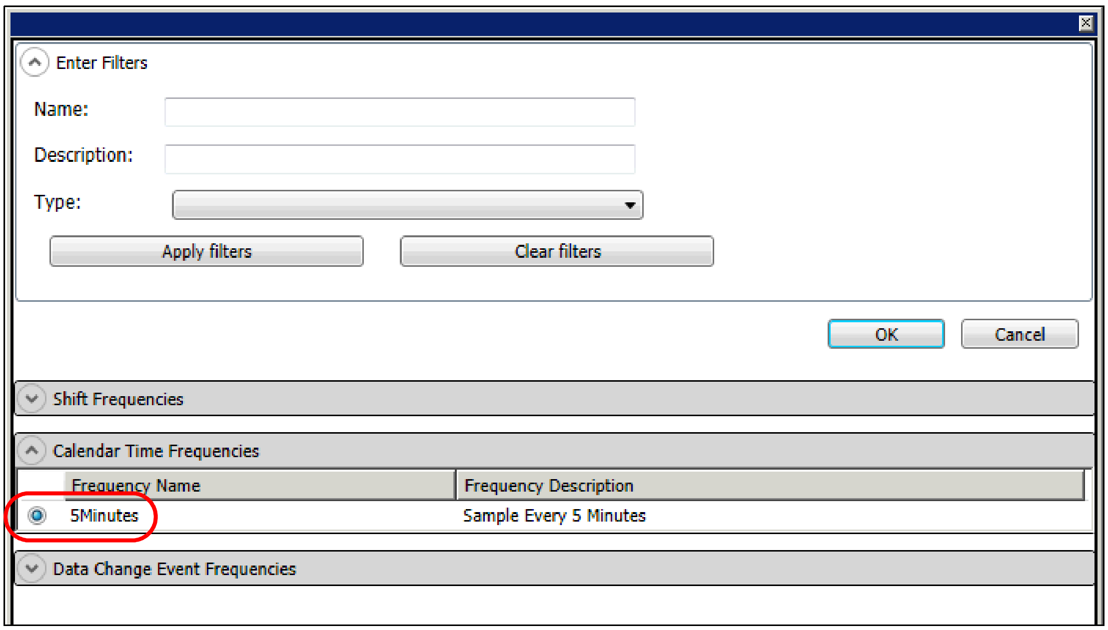
11. In the bottom portion of the workspace, on the **Frequencies** tab, right-click the empty workspace and select **Add Link**.



The **Enter Filters** dialog box appears.

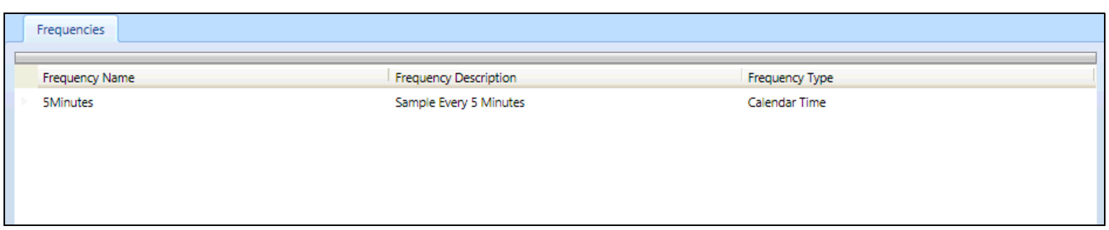


12. Click **Apply filters**.
13. Expand **Calendar Time Frequencies** and click the **5Minutes** option.



14. Click **OK**.

On the **Frequencies** tab, the new link appears.

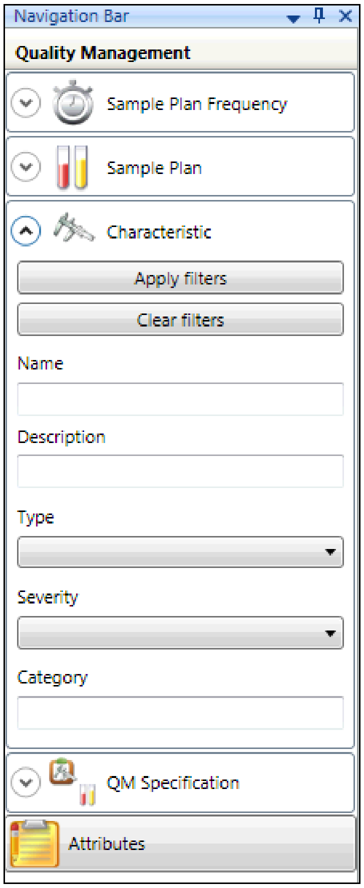


15. Click **Save All** and collapse the **Sample Plan** module.

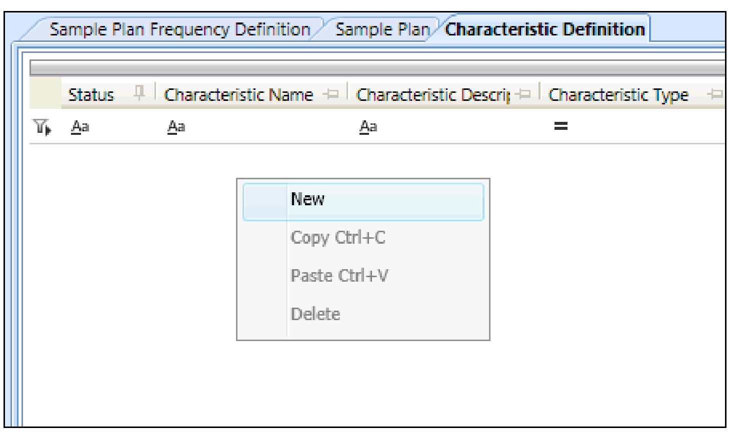
Create the Characteristic

You will now create a **Characteristic**. This defines the default statistical chart, unit of measure, and sample size.

16. In the **Navigation Bar**, expand **Characteristic** and click **Apply filters**.

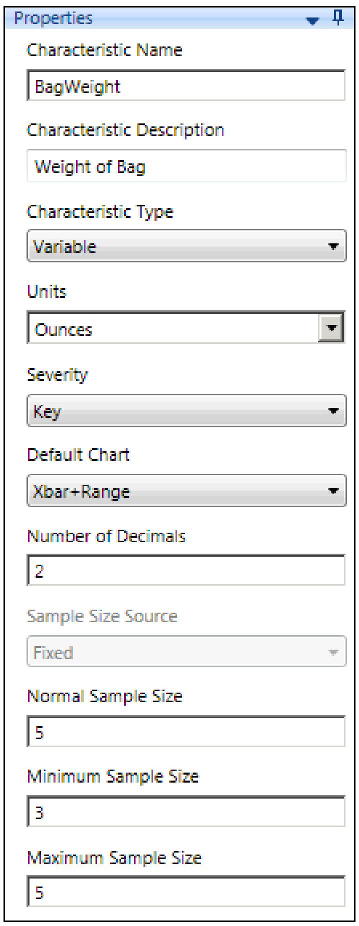


17. On the **Characteristic Definition** tab, right-click the empty workspace and select **New**.



18. Configure the **Properties** pane as follows:

Characteristic Name:	BagWeight
Characteristic Description:	Weight of Bag
Characteristic Type:	Variable (*default*)
Units:	Ounces
Severity:	Key
Default Chart:	Xbar + Range
Number of Decimals:	2
Normal Sample Size:	5
Minimum Sample Size:	3
Maximum Sample Size:	5

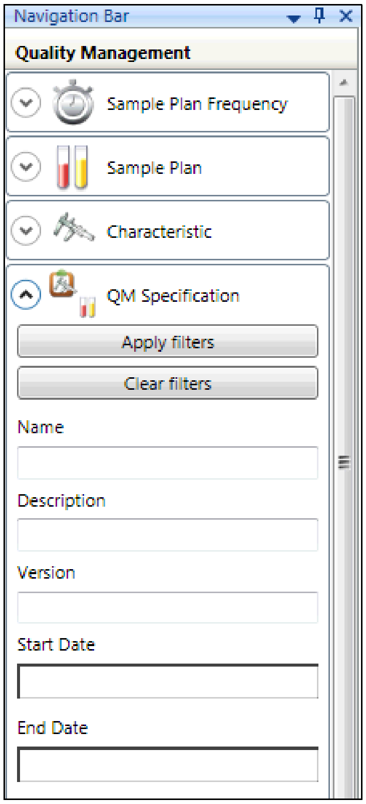


19. Click **Save All** and collapse the **Characteristic** module.

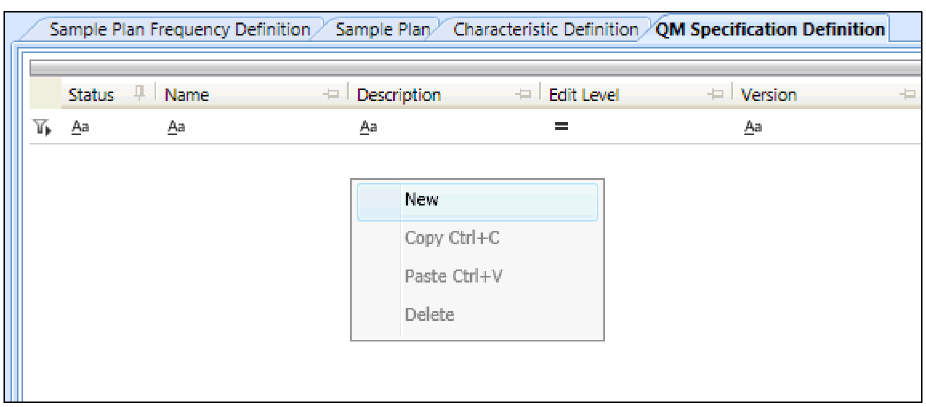
Create the Quality Management Specification

Finally, you will create a **QM Specification**. This integrates everything together by linking to the MES entity and the **Sample Plan**. Additionally, the **QM Specification** links to the Characteristic to define the target and specification limits, data entry limits, and control limits calculation rules.

20. In the **Navigation Bar**, expand **QM Specification** and click **Apply filters**.



21. On the **QM Specification Definition** tab, right-click the empty workspace and select **New**.



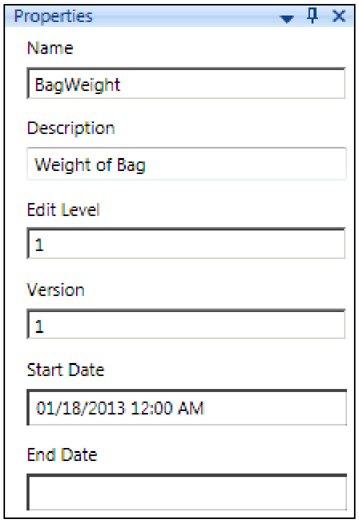
22. Configure the **Properties** pane as follows:

    Name: BagWeight

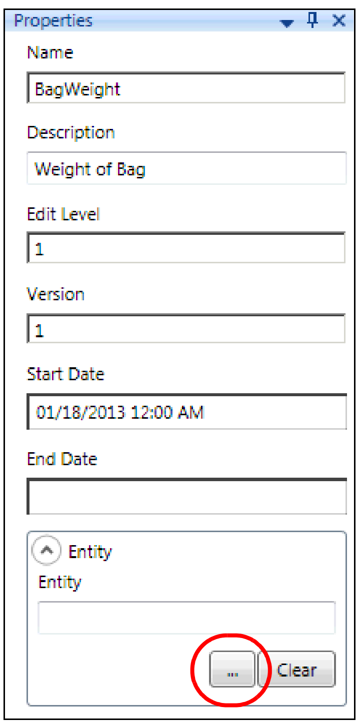
    Description: Weight of Bag

    Edit Level: 1 (*default*)

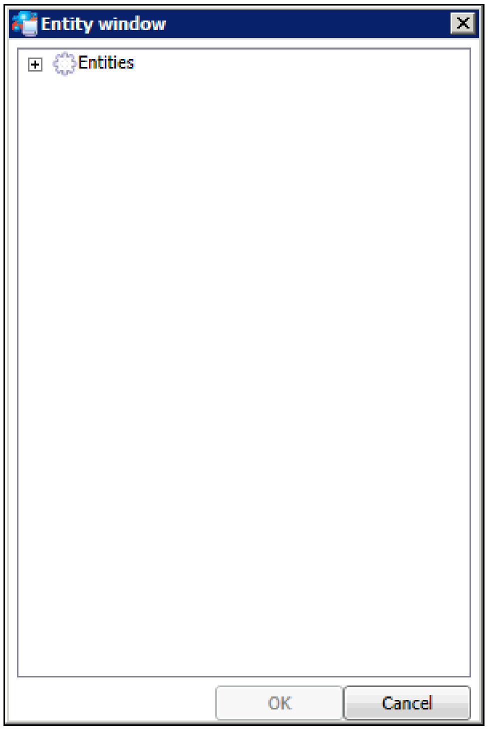
    Version: 1



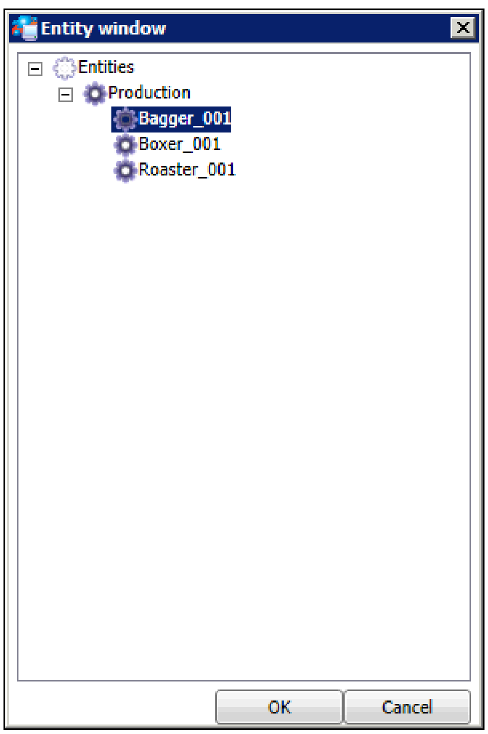
23. Expand the **Entity** area, and then click the ellipsis button.



The **Entity window** appears.

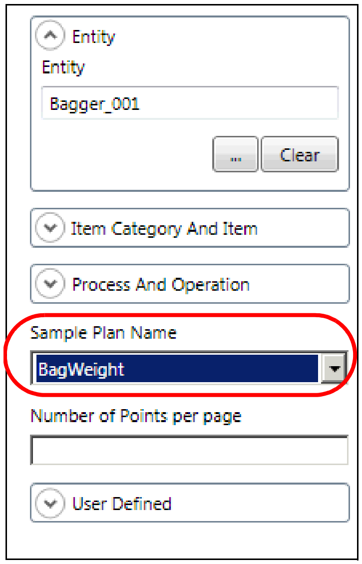


24. Expand **Entities** and **Production**, and then click **Bagger_001**.

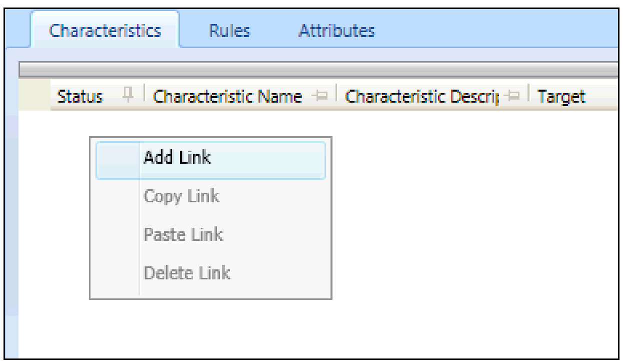


25. Click **OK**.

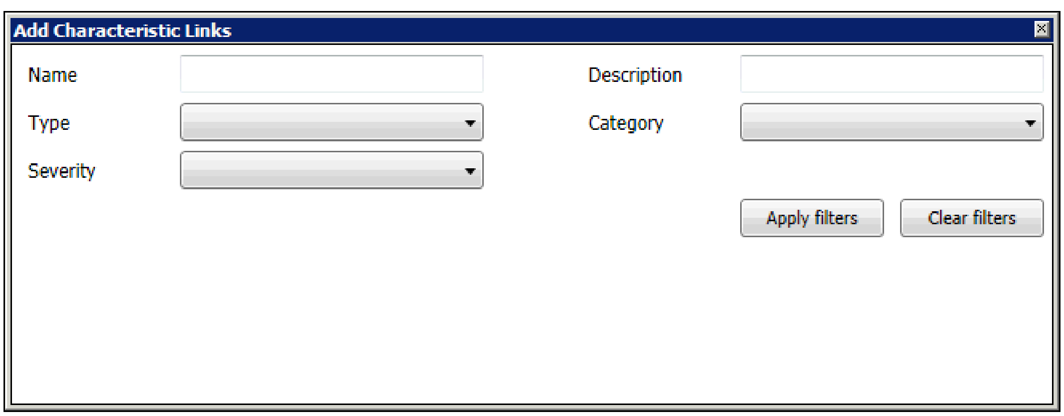
26. In the **Properties** pane, **Sample Plan Name** drop-down list, click **BagWeight**.



27. On the **Characteristics** tab, right-click the empty workspace and select **Add Link**.

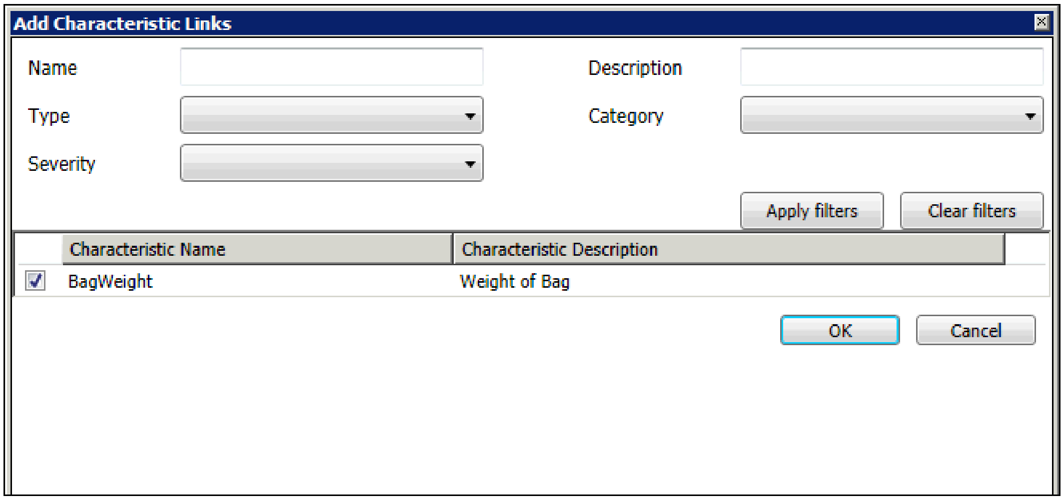


The **Add Characteristic Links** dialog box appears.



28. Click **Apply filters**.

29. Check **BagWeight**.



30. Click **OK**.

    The new link appears on the **Characteristics** tab.

31. In the **Properties** pane, expand **Specification/Limits** and configure the pane as follows:

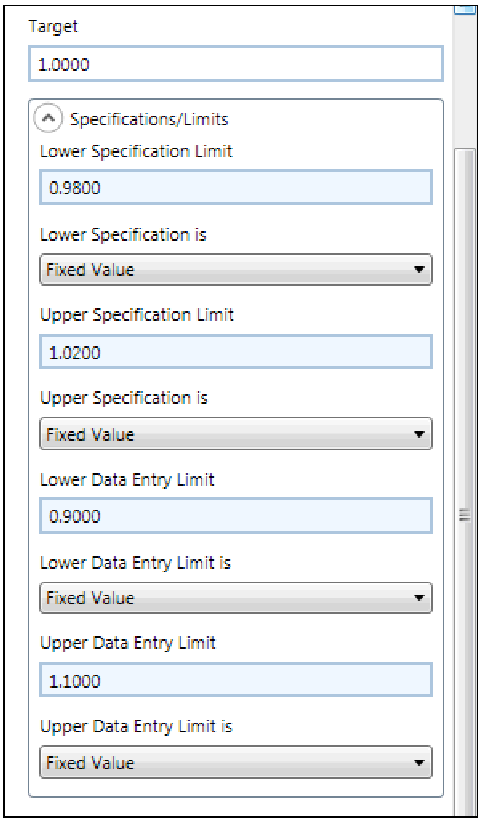
    Target: 1

    Lower Specification Limit: .98

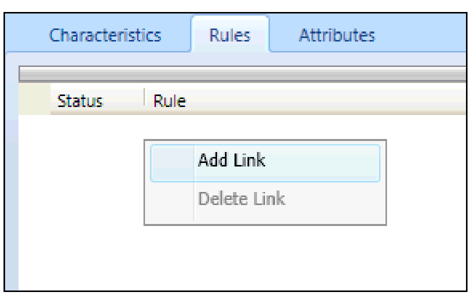
    Upper Specification Limit: 1.02

    Lower Data Entry Limit: .9

    Upper Data Entry Limit: 1.1

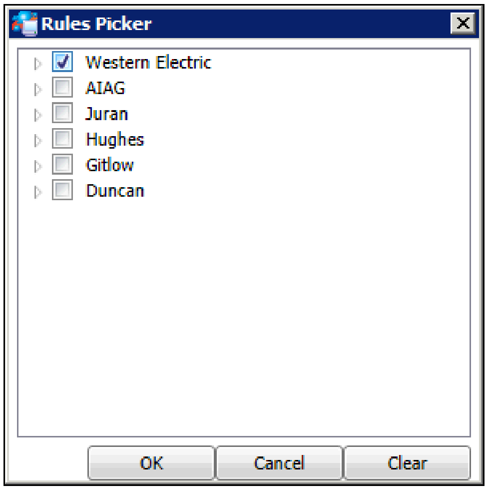


32. In the bottom portion of the workspace, click the **Rules** tab, and then right-click the empty workspace and select **Add Link**.



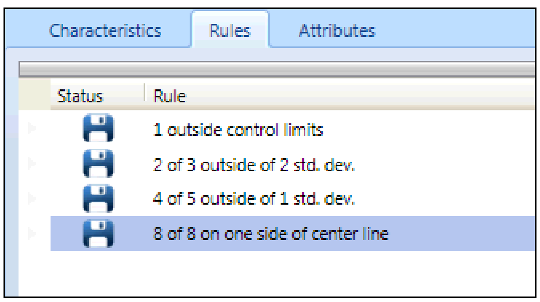
The **Rules Picker** dialog box appears.

33. Check **Western Electric**.



34. Click **OK**.

The **Rules** tab now displays the new rules.



35. Click **Save All**.

Note: The next lab will cover how to perform manual data entry for this QM Specification using the Sample Viewer Control.

Section 2 – The Sample Viewer Control

This section describes how to build and implement the Sample Viewer Control. This includes an explanation of how to use .NET controls as an ArchestrA graphic for use in an InTouch application and how to view a Basic Control Chart.

Introduction

This section shows you how to import the .NET controls into a Galaxy, configure them, and use them at runtime in an InTouch application. Hereafter, the word “control” refers to any of the .NET controls. .NET controls give you functionality to use in symbols.

Client Controls

Client controls provide you with the same functionality as .NET controls when they are used in symbols. To use the functionality provided by a client control, you must:

- Import a .NET Dynamic Link Library (.DLL) file that contains one or more client controls. The client control is imported into the **Graphic Toolbox**.
- 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.

Wonderware MES Software/Quality contains a set of .NET controls which facilitate the inclusion of production quality data in HMI applications based on ArchestrA, web-based information portals, and other third-party applications.

You can embed ArchestrA symbols containing these .NET controls directly into an InTouch application and use them at runtime in WindowViewer.

You can place multiple .NET controls into one single ArchestrA symbol. You can also place multiple instances of the same .NET control into one single ArchestrA control. There is no limit to the number of .NET controls you can embed into an ArchestrA symbol.

Importing the .NET Controls

The .NET Controls are installed at **C:\Program Files\Wonderware\MES\Controls** (this location may be different depending on the operating system that you are using) during the installation and all the control .dll files present in the **MES\Controls** directory are enclosed in the **MESControls.aaPKG** file. From the **C:\Program Files\Wonderware\MES\Controls** location, you can also import individual control .dll files.

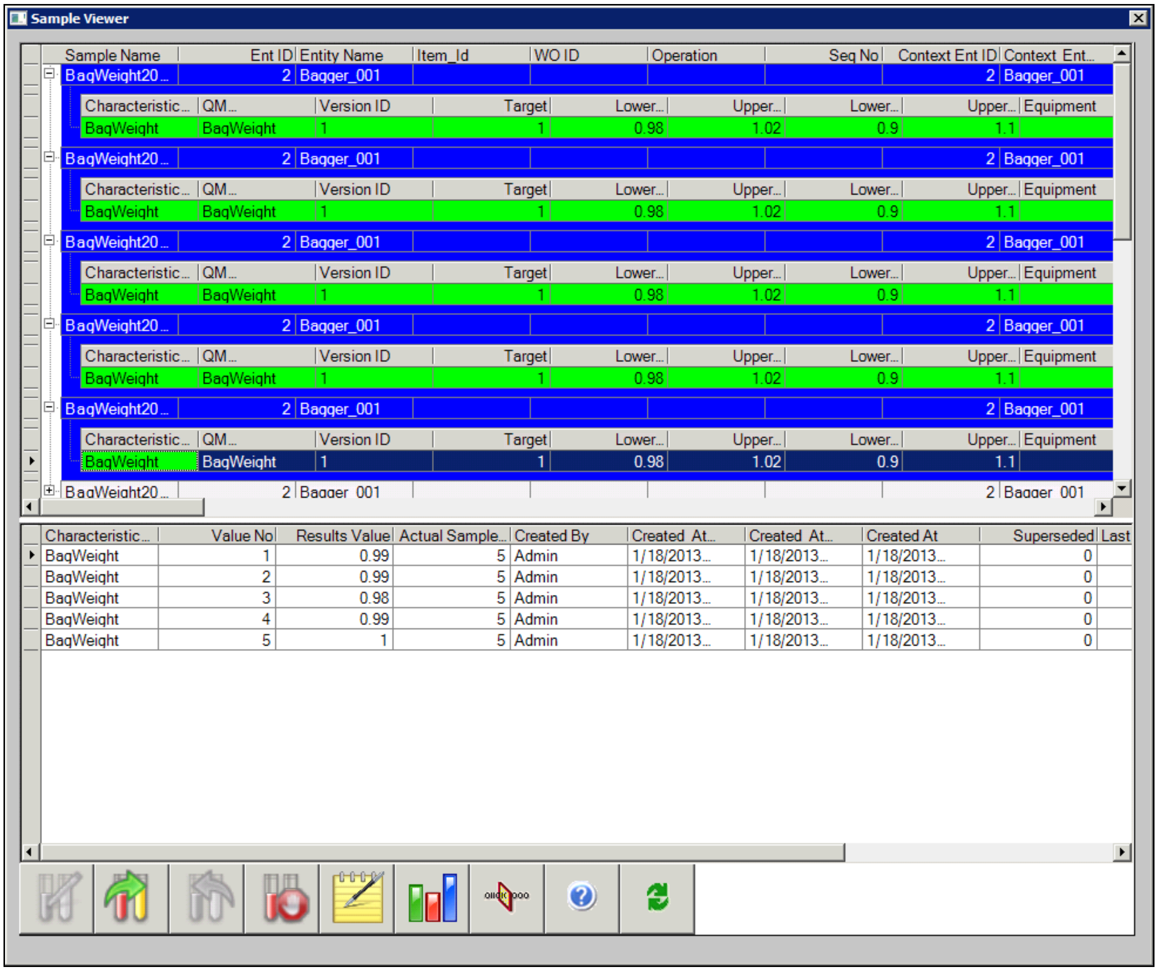
To import .NET control file(s), on the **Galaxy** menu, select **Import | Object(s)**. If you import a newer version of a .NET control that is already used in the ArchestrA IDE or in the InTouch HMI as an embedded ArchestrA Symbol, you need to restart the ArchestrA IDE or the InTouch HMI.To import a .NET control, you must have security permissions to import graphic objects.

After importing .NET controls, you can organize them in the **Graphic Toolbox** similar to the ArchestrA Symbols.

Sample Viewer Control

You can use a control from the Sample Viewer class to display the current, past, and the future samples and the Characteristics assigned to the samples. The Sample Viewer control also displays the results collected for the Characteristics in the lower grid.

The Sample Viewer control allows you to modify the existing results and add new results to the Characteristics which are associated with current and past samples.



The top grid displays a list of samples that meet the specified filter conditions. You can select a sample record to view the results in the lower grid, and expand it to view list of Characteristics in it. You can also view and hide the columns in the sample table in the Sample Viewer.

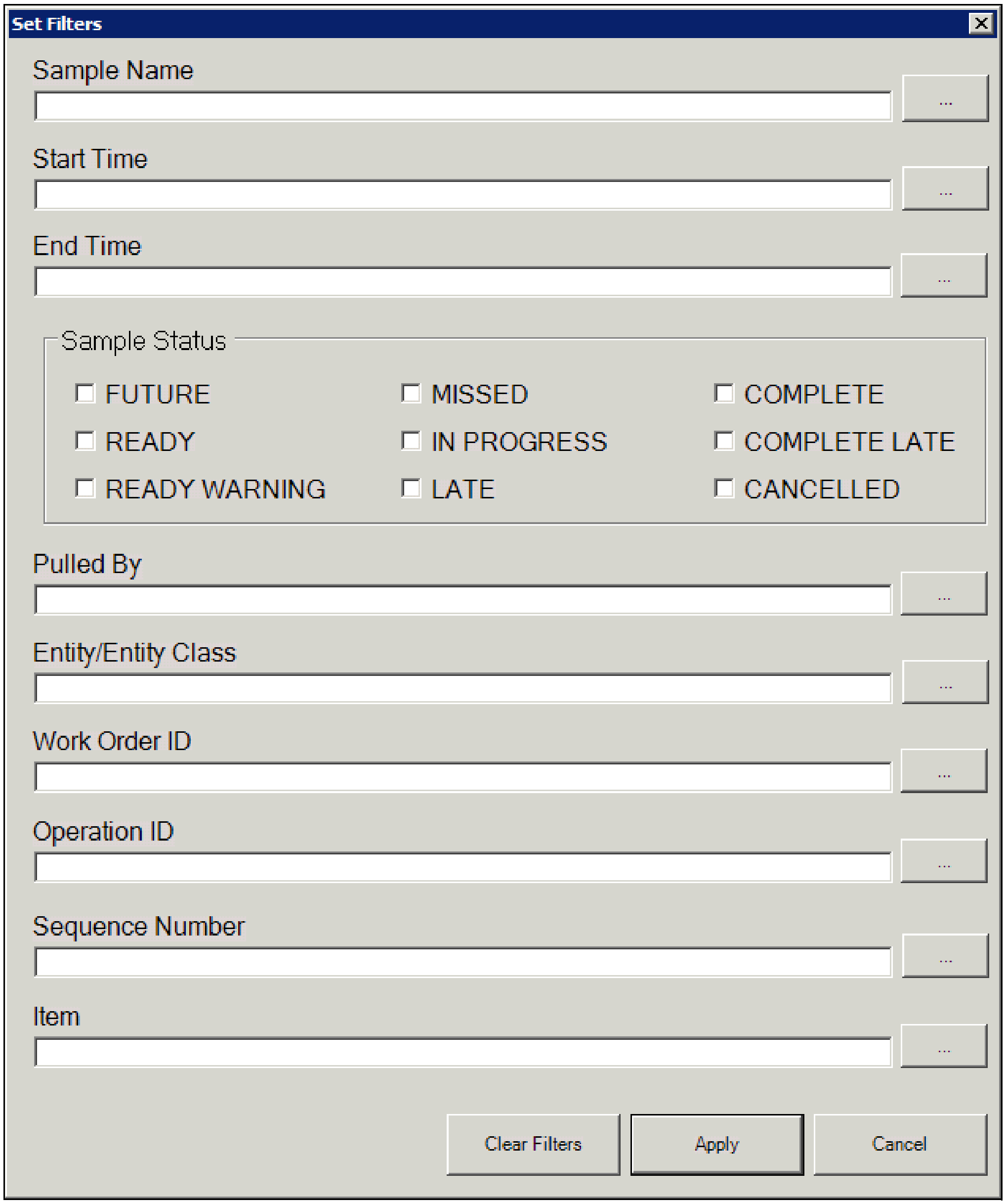
Each sample record in the top grid can be expanded to display the list of Characteristics and some additional information. A Characteristic within a sample can be selected to display only the result for the selected Characteristic in the bottom grid.

The Sample Viewer also launches the SPC Chart control to display the results of measurements taken for a particular Characteristic associated with a set of samples.

To use the Sample Viewer control, you must log on to a session. If the RequireEntityLogon property is set to True and you are not logged into one or more entities with the Can Collect QM Data capability, you must log into at least one entity that has the Can Collect QM Data capability selected.

Filtering the Data

The Sample Viewer allows you to set filters.



The following filters are available:

- **Sample Name**: Specifies the string that represents the name or part of the sample(s) to be displayed.
- **Start Time**: Specifies date and time that represent the minimum request time of the sample to be displayed.
- **End Time**: Specifies date and time that represent the maximum request time of the sample to be displayed.
- **Sample Status**: Specifies the set of check boxes that represents the status of the samples to be displayed.

  Each of the following sample statuses has a boolean value assigned to it:

  - Future
  - Ready
  - Ready Warning
  - Missed
  - In Progress
  - Late
  - Complete
  - Complete Late
  - Cancelled
- **Pulled By**: Specifies the details of the user who has marked a sample as pulled.
- **Entity Class** or **Entity**: Specifies the entity class or the entity to which the samples to be displayed are assigned. This depends on the setting of the EntityFilterRestriction property.
- **Work Order ID**: Specifies the work order of the job that generated the sample.
- **Operation ID**: Specifies the operation of the job that generated the sample.
- **Sequence Number**: Specifies the sequence number of the job that generated the sample.
- **Item**: Specifies the item or the item category to which the samples to be displayed are assigned.

When you apply the filter, the Sample Viewer is refreshed using the new filters to display the samples. The Sample Viewer displays the past, current, and future samples that match the filter criteria.

If you have a filter setting saved in the UI_Config database, it is fetched and used. The RequireEntityLogon property is used to control the EntityFilterRestriction property settings and to display the past, current, and future samples that match the filter criteria. The Characteristics associated with the sample and the results of the Characteristics are also displayed.

If the RequireEntityLogon property is set to False, you do not need to login to an entity. The information is displayed automatically from all the entities which have the Can Collect QM Data capability enabled. The Characteristics associated with the sample and the results for the Characteristics are also displayed.

Color Coding

The Sample Viewer allows the samples to be color-coded based on the sample status and result. Every status and result has a system parameter that specifies the color to be used for that particular status or result.

You can view and change the sample status and sample results colors under the **Master Data Config** group, **General Parameters** module, **System Parameter** section, and then expanding the **Display** group.


Display (37 items)

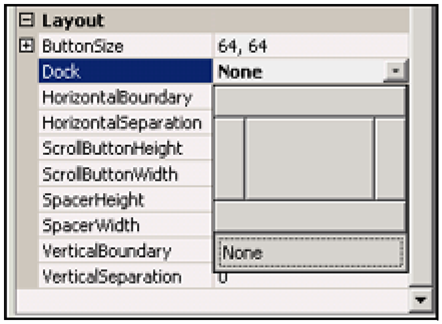
Status	System Parameter	Value
	Color for automatic collection column	
	Critical error color	
	Customer display	Customer Name
	Default language	Default (English)
	Default report maximum number of pages	20
	Dismiss production dialog upon entry	No
	Error color	
	Information message color	
	Item class display	Item Class ID/Item Class
	Item display	Item ID/Item Desc
	Items require filtering	No
	Cut-off time (in days) to limit the number of samples while calculating process st	0
	Number of samples to consider calculating process statistics	25
	Re-use concurrent link values to aid color coding.	Yes
	Sample Result Good Color	
	Sample Result OOC Color	
	Sample Result OOC Critcal Color	
	Sample Result OOC Key Color	
	Sample Result OOS Color	
	Sample Result OOS Critical Color	
	Sample Result OOS Key Color	
	Sample Result Pending Color	
	Sample Status Cancelled Color	
	Sample Status Complete Color	
	Sample Status Complete Late Color	
	Sample Status Future Color	
	Sample Status In Progress Color	
	Sample Status Late Color	
	Sample Status Missed Color	
	Sample Status Ready Color	
	Sample Status Ready Warning Color	
	Serious error color	
	Show only file name	No
	Storage entities require filtering	No
	User display	User ID
	Warning color	
	Warning level number of records for the Sample Characteristic filter dialog in SRO2000	

For more information on the description of each status and the default colors associated with them, see the *Wonderware MES .NET Controls Programmer's Guide*.

Docking the Controls Within a Symbol

Docking allows you to automatically position controls in relation to the other elements on the canvas. You can dock a control to the top, bottom, left, or right of a symbol. If you want to dock a control, you must draw a rectangle first; then you can dock the control to the rectangle. This establishes clear boundaries for the symbol and provides a reference for docking the control to the edges of the symbol. After selecting a dock position, the control is moved accordingly.

To dock a control, click the **Dock** property drop-down list, and then click the appropriate layout option to position the control in relation to the symbol.



Button Bar

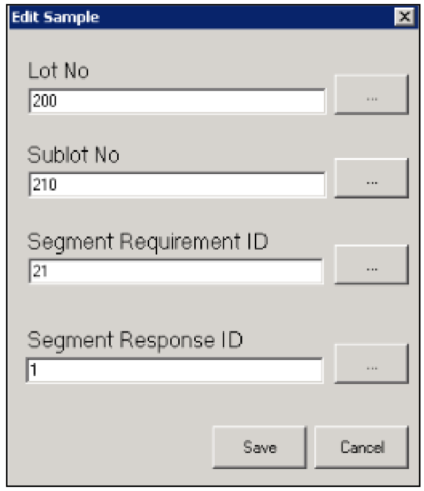
The Button Bar provides a control for hosting buttons. The buttons for multiple controls can be hosted in a single Button Bar control. You can set up the Button Bar control to show all the buttons for all controls or to show only the buttons for the currently active control.

The Button Bar control is an MES-wide control and it is not specifically tied to Quality. It is a special control that provides a set of buttons that can be used to send commands to any other control in the same ArchestrA symbol.

A symbol can contain a control but does not require the Button Bar control. But, a symbol containing only a Button Bar control does not provide any functionality.

The first six button are specific to the samples displayed in the Sample Viewer and possess different functionality. If you have the required permissions, the buttons will perform the following:

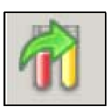
Edit Samples: To modify the selected sample. When clicked, the following dialog box appears:



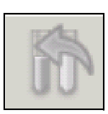
You can modify the following sample information:

- Lot
- Sublot
- Segment Requirement
- Segment Response

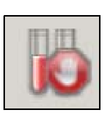
Note: You cannot modify future samples, samples that are marked as **Final**, or samples that are marked as **Missed**.



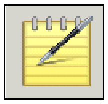
Pull Sample: To specify whether a sample has been pulled. A sample is said to be pulled when it is selected from the other samples for recording the time required for measurement. It is not necessary to tell the system that a sample was pulled to record measurements for it. A sample can be pulled only if it is yet to be pulled and the sample status is **Ready** or **Ready Warning**.



UnPull Sample: To specify whether a sample has not been pulled. A sample can be unpulled only if it is pulled and no results have been collected for the Characteristics associated with the sample.

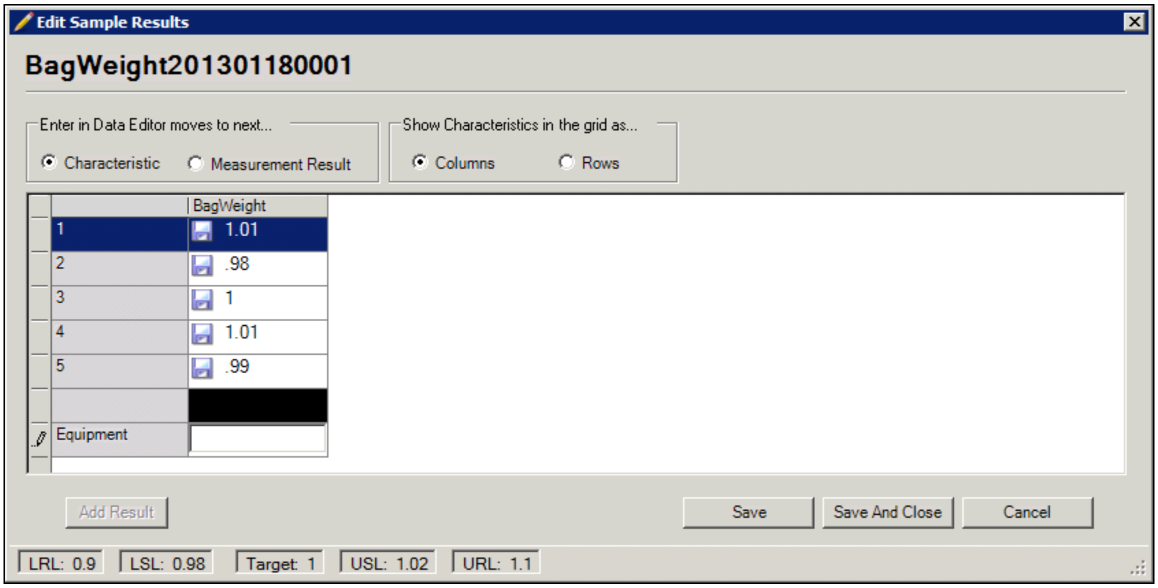


Toggle Sample Final Flag: Marks a sample as final or to remove the final flag from a sample. The Characteristic result records cannot be modified if a sample has been marked as final.



Edit Results: To modify the selected sample or the Characteristic within the sample. You can also select and modify existing results or add new results for the Characteristic.

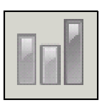
When clicked, the following dialog box appears:



Some samples may have multiple Characteristics, resulting into multiple data entry columns.

You cannot modify the results in the following cases:

- If the sample status is **Future** or **Missed**
- If the sample to which the Characteristic is associated, is marked as **Final**

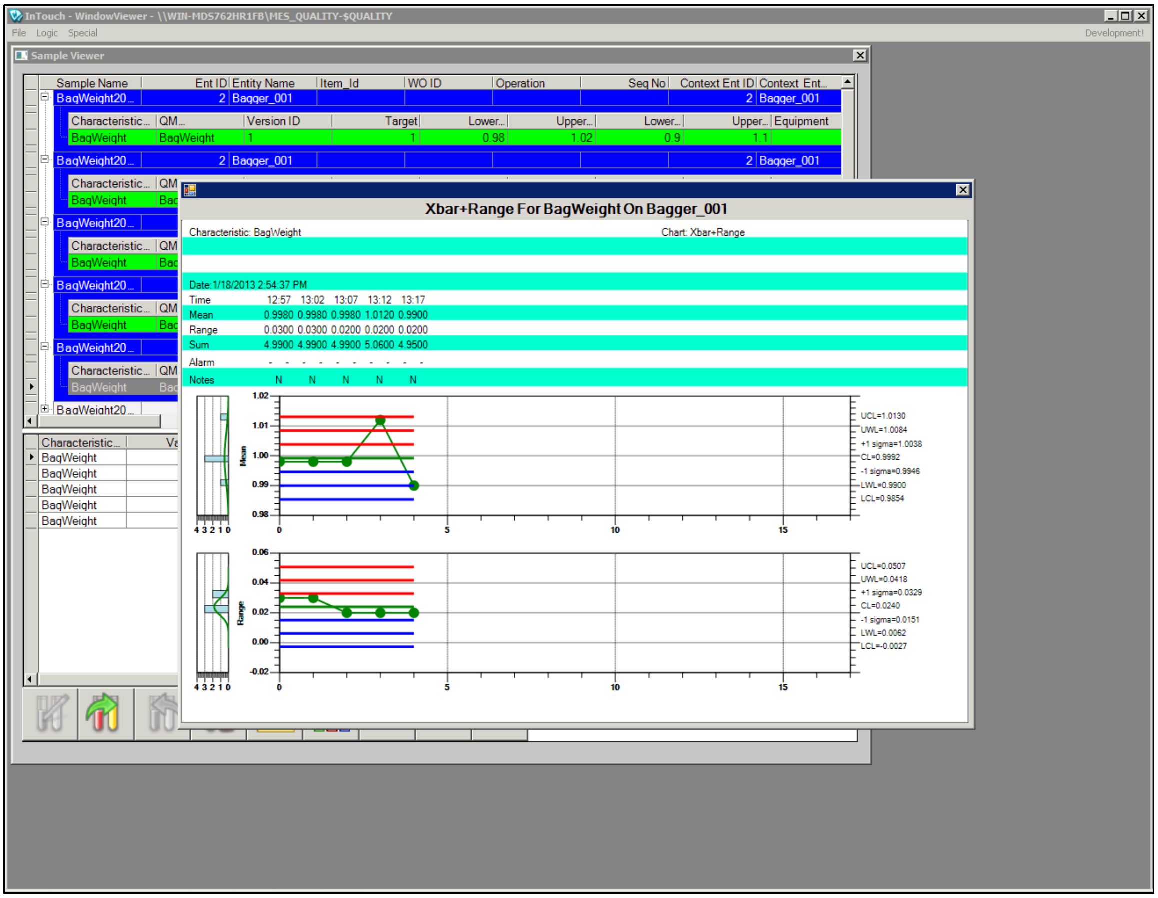


SPC Chart: To display an SPC chart to the operator. A Characteristic within a sample must be selected before SPC chart button is enabled. This will launch an SPC chart using the selected Characteristic with its configured chart type, chart filter options, SPC display settings, and control limits.

Lab 5 – Working with the Sample Viewer Control

Introduction

In the previous lab, you created a QM Specification in MES Client. In this lab, you will use the ArchestrA IDE and InTouch to build the Sample Viewer Control graphical interface and manually enter sample data. Then, you will view the data on the Sample Viewer control chart.



Objectives

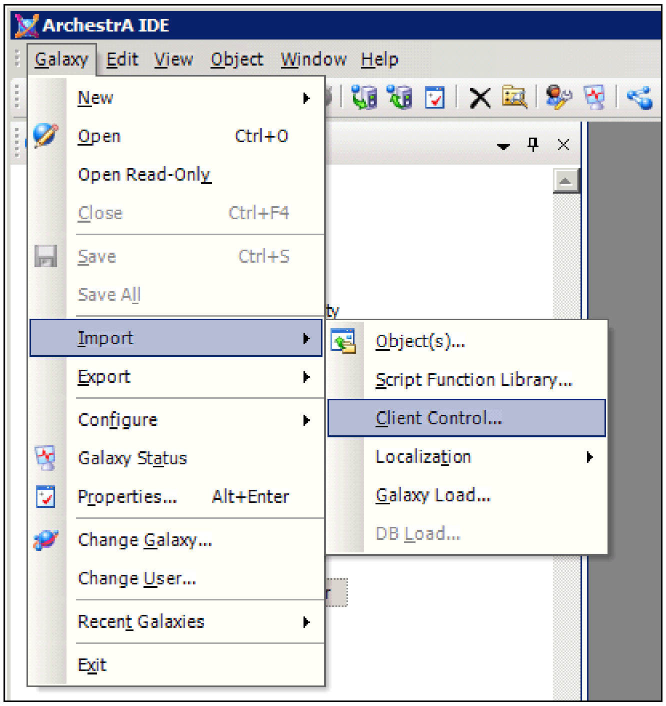
Upon completion of this lab, you will be able to:

- Import a .NET Client Control
- Create an InTouch application
- Create a Sample Viewer Control ArchestrA graphic
- Embed the Sample Viewer Control ArchestrA graphic in an InTouch window

Import the .NET Client Controls

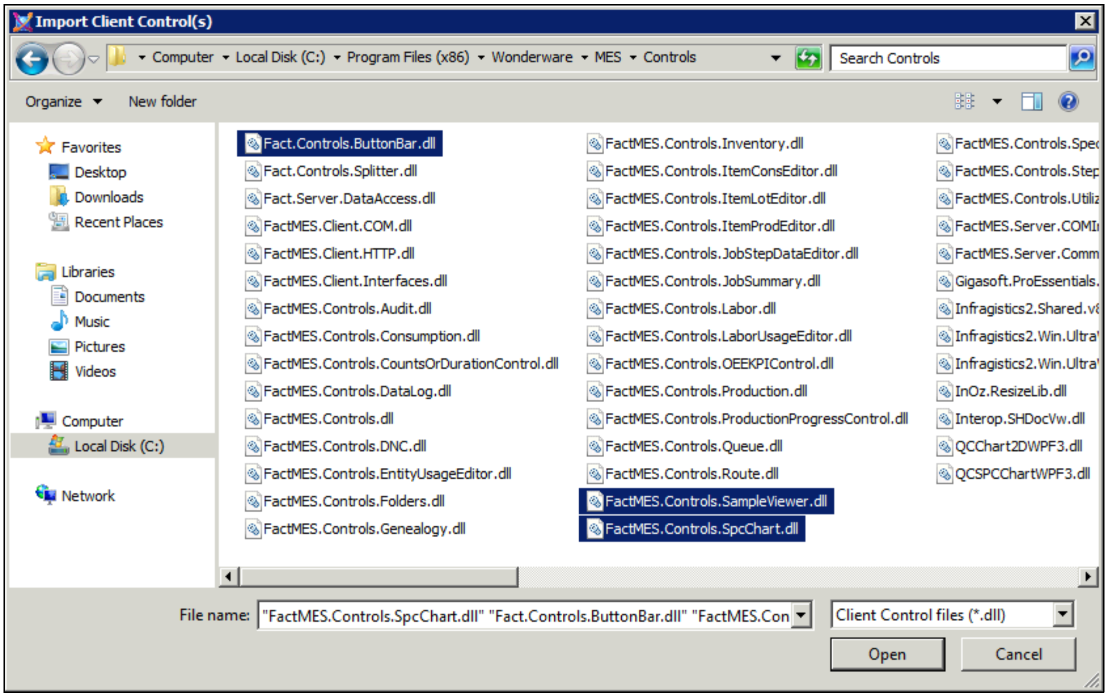
First, you will import the .NET client controls needed to build the Sample Viewer.

1. In the ArchestrA IDE, on the **Galaxy** menu, click **Import | Client Control**.



The **Import Client Control(s)** dialog box appears.

2. Navigate to **C:\Program Files (x86)\Wonderware\MES\Controls** and select the following files:
   - **Fact.Controls.ButtonBar.dll**
   - **FactMES.Controls.SampleViewer.dll**
   - **FactMES.Controls.SpcChart.dll**

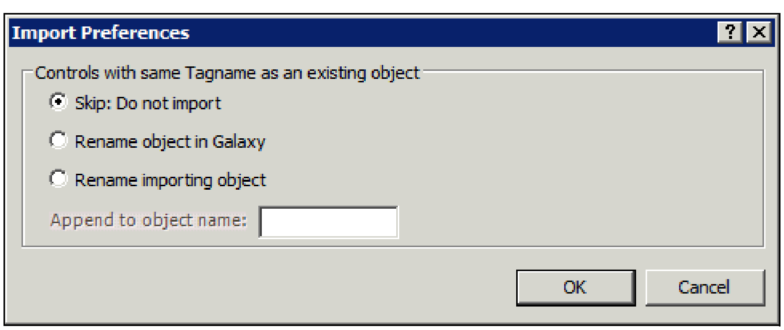


Note: The SPC chart control will be used in a later lab.

---

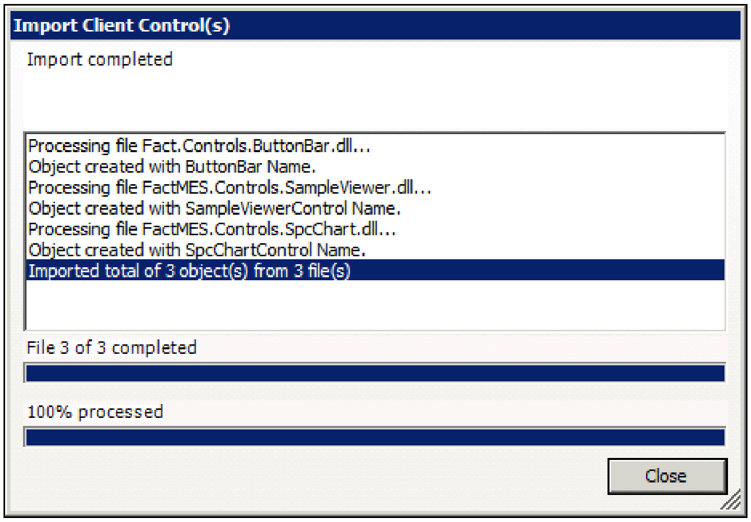
3. Click **Open**.

   The **Import Preferences** dialog box appears.

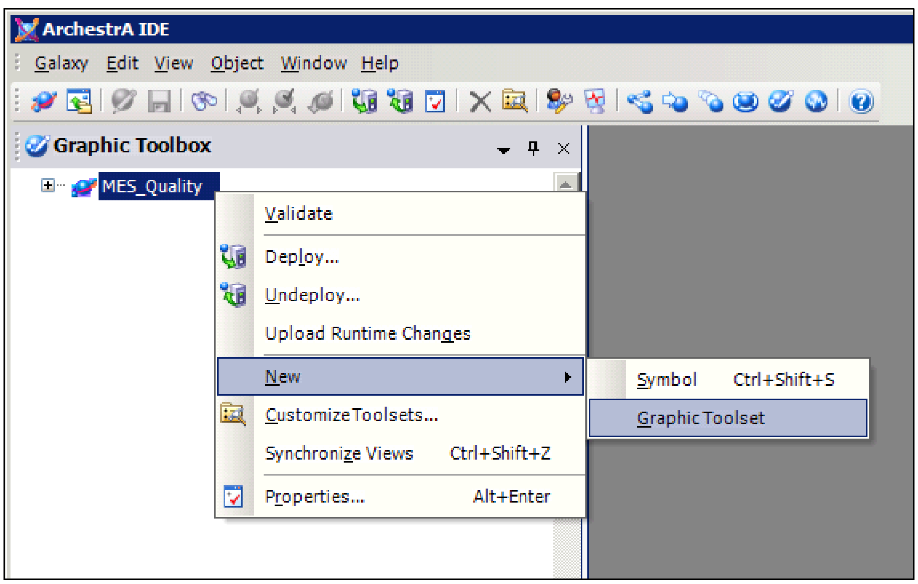


4. Leave the defaults and click **OK**.

When the **Import Client Control(s)** progress displays **Import completed**, the **Close** button is enabled.

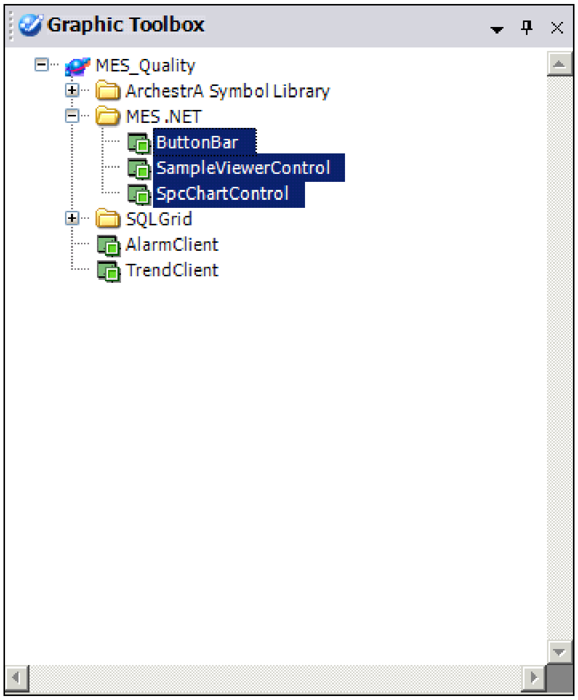


5. Click **Close**.
6. In the **Graphic Toolbox**, right-click **MES_Quality** and select **New | Graphic Toolset**.



7. Rename the toolset **MES .NET**.

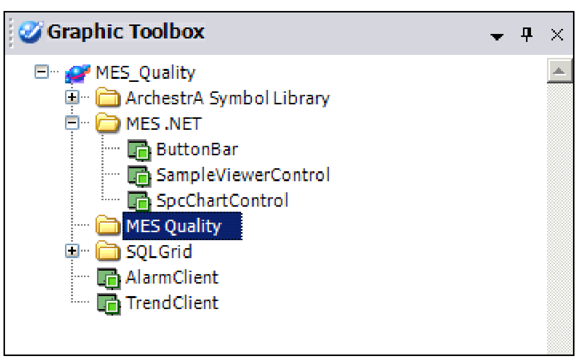
8. Drag the following controls to **MES .NET**:
   - **ButtonBar**
   - **SampleViewerControl**
   - **SpcChartControl**



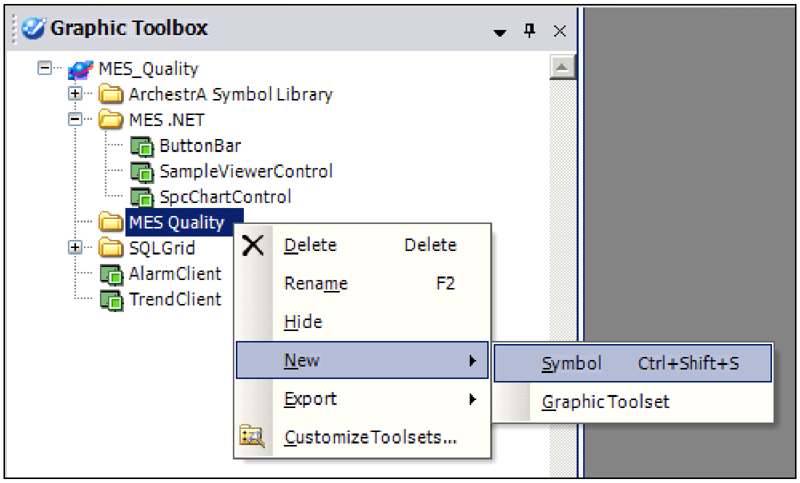
Create the Sample Viewer Control

Now, you will create the Sample Viewer Control graphic using the ArchestrA Symbol Editor.

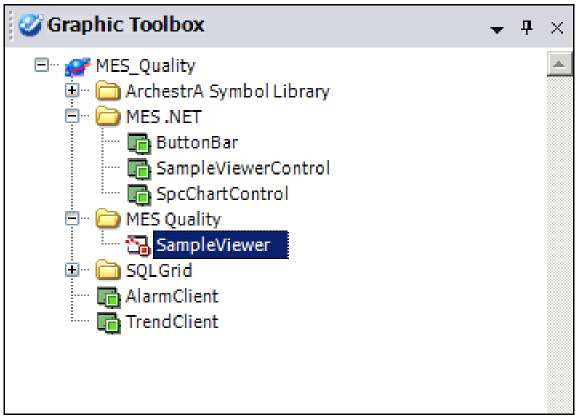
9. Create another graphic toolset named **MES Quality**.



10. Right-click **MES Quality** and select **New | Symbol**.

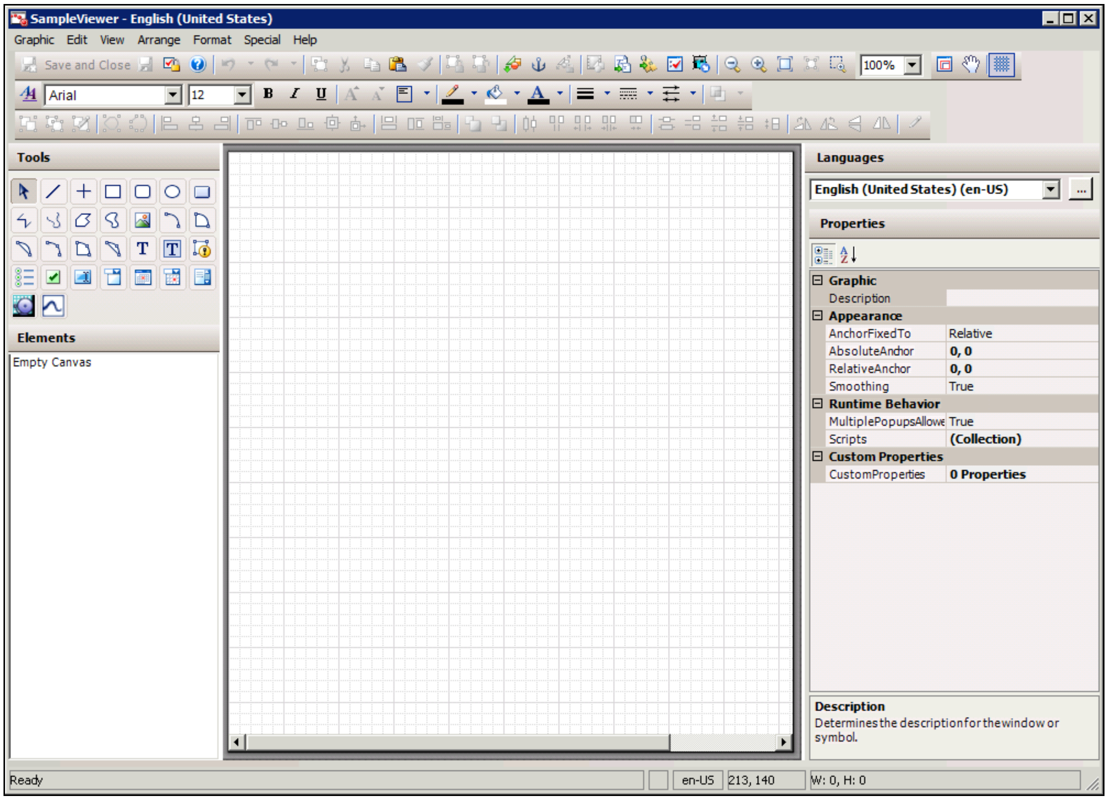


11. Rename the symbol **SampleViewer**.

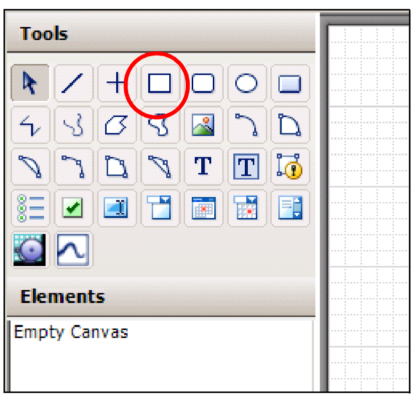


12. Double-click **SampleViewer**.

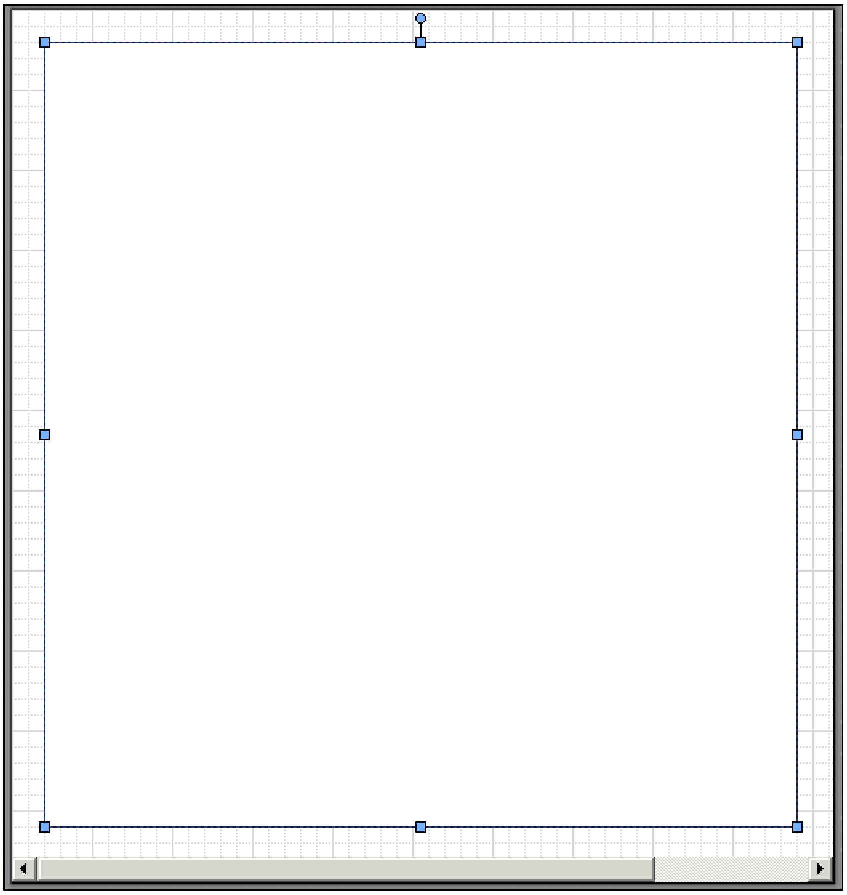
    The symbol editor appears.



13. In the **Tools** pane, click the **Rectangle** button.

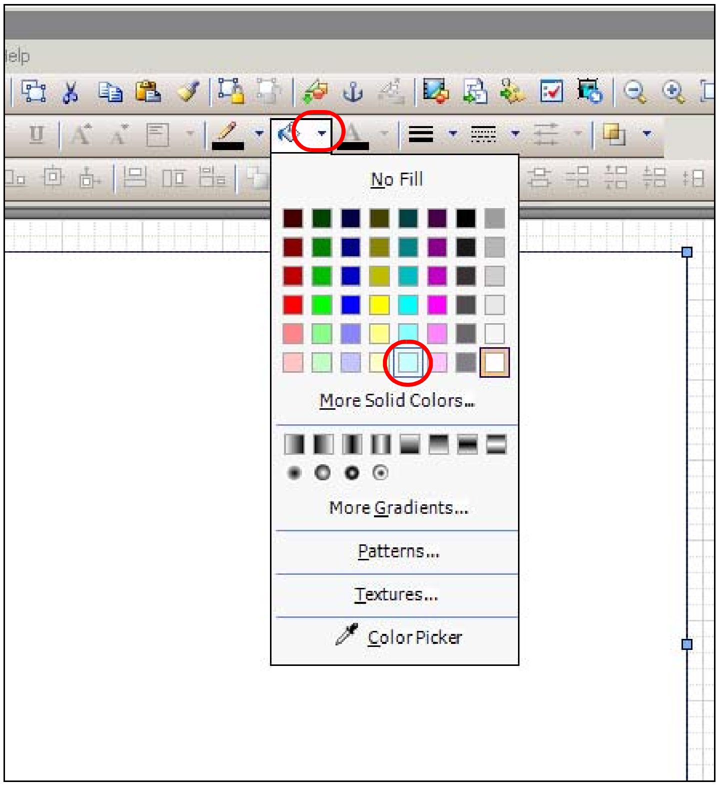


14. Click and drag on the canvas to create the rectangle and resize to make it fill the canvas.

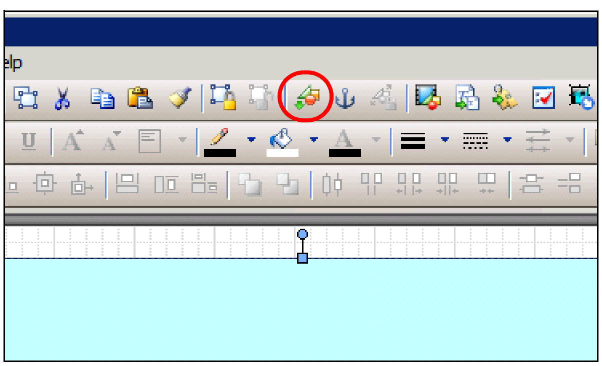


You will now change the background color of the rectangle to help keep track of the graphic as others are added.

15. On the toolbar, to the right of the **Fill Color** button, click the down arrow, and then click the light blue color.

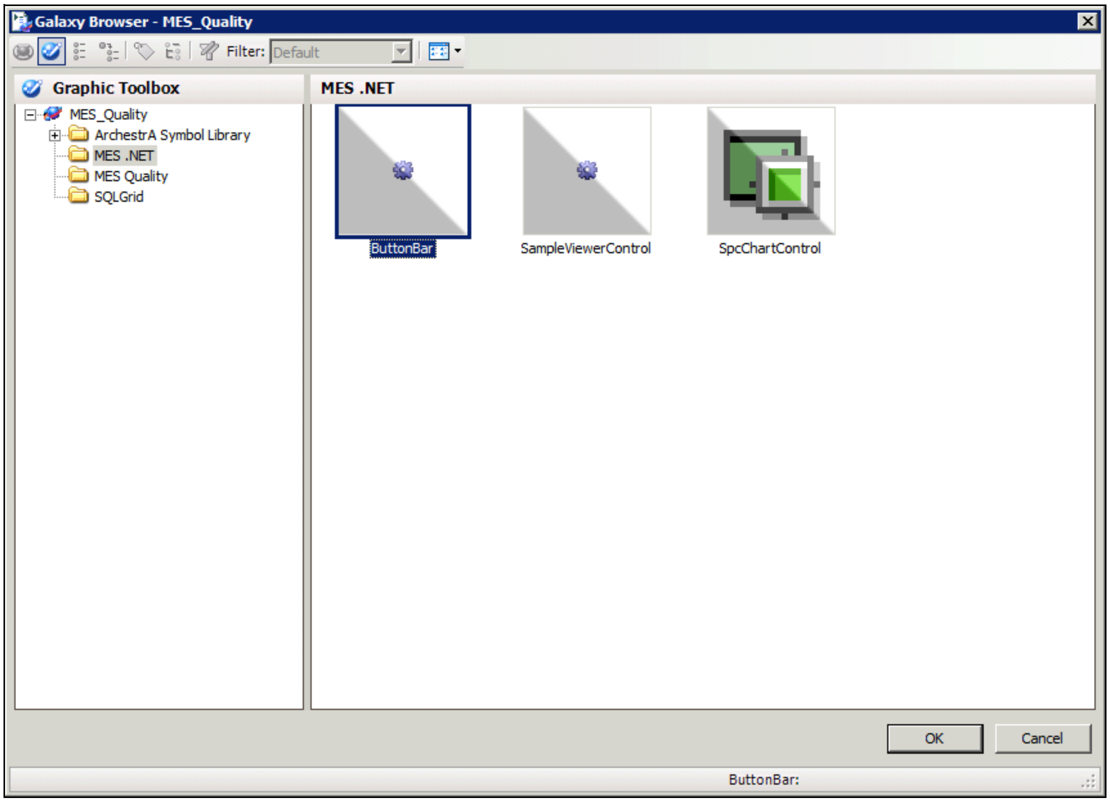


16. On the toolbar, click the **Embed Graphic** button.



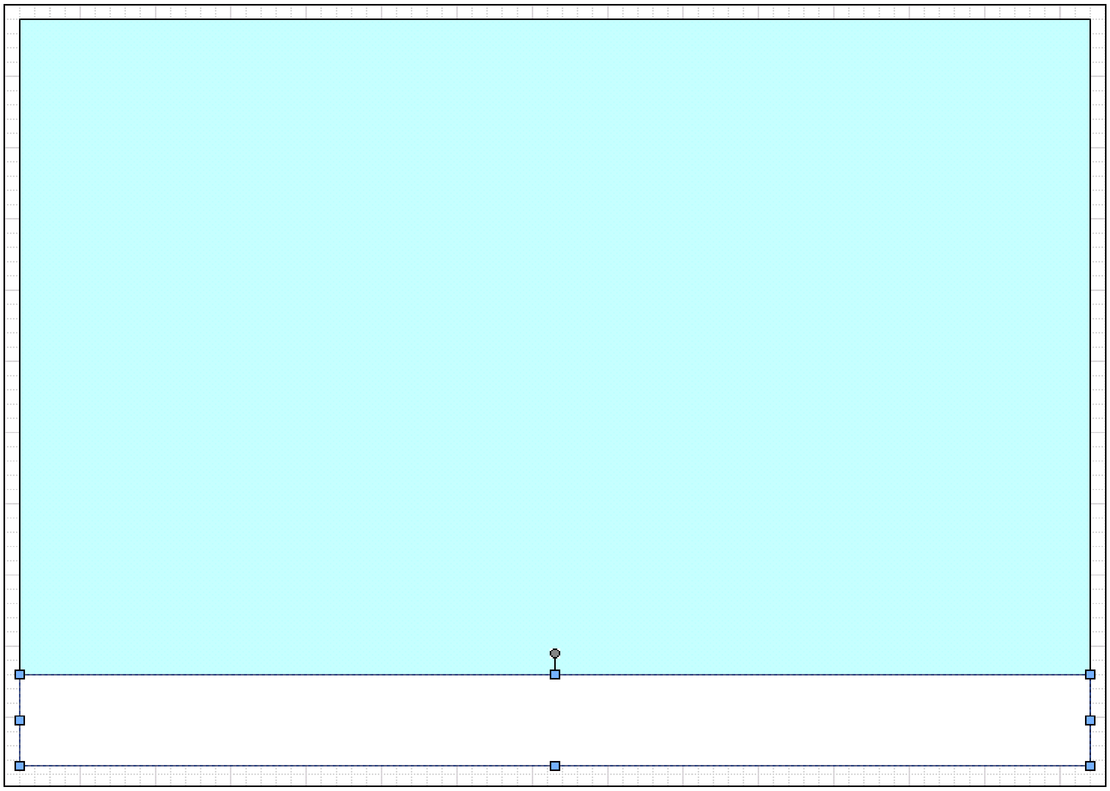
The **Galaxy Browser** appears.

17. In the **Graphic Toolbox** pane, click **MES .NET**, and then in the **MES .NET** pane, click **ButtonBar**.

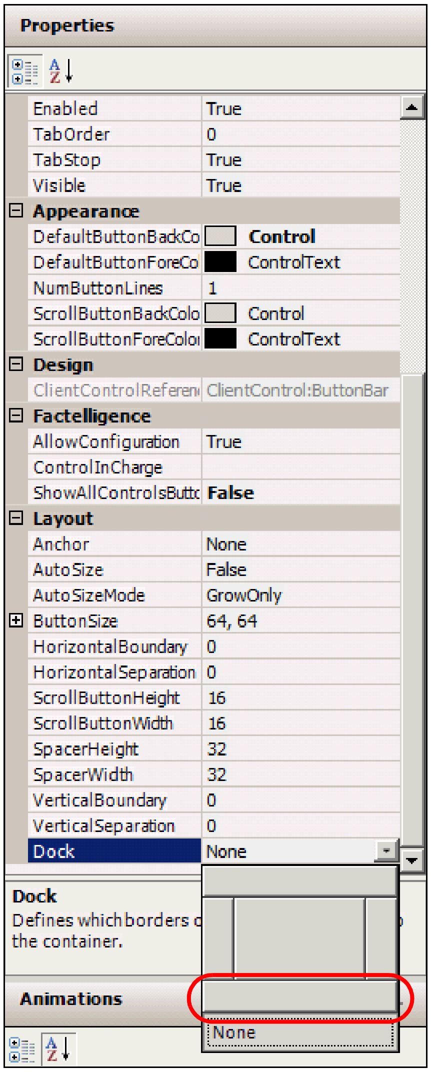


18. Click **OK**.

19. Place the **ButtonBar** graphic at the bottom of the rectangle.

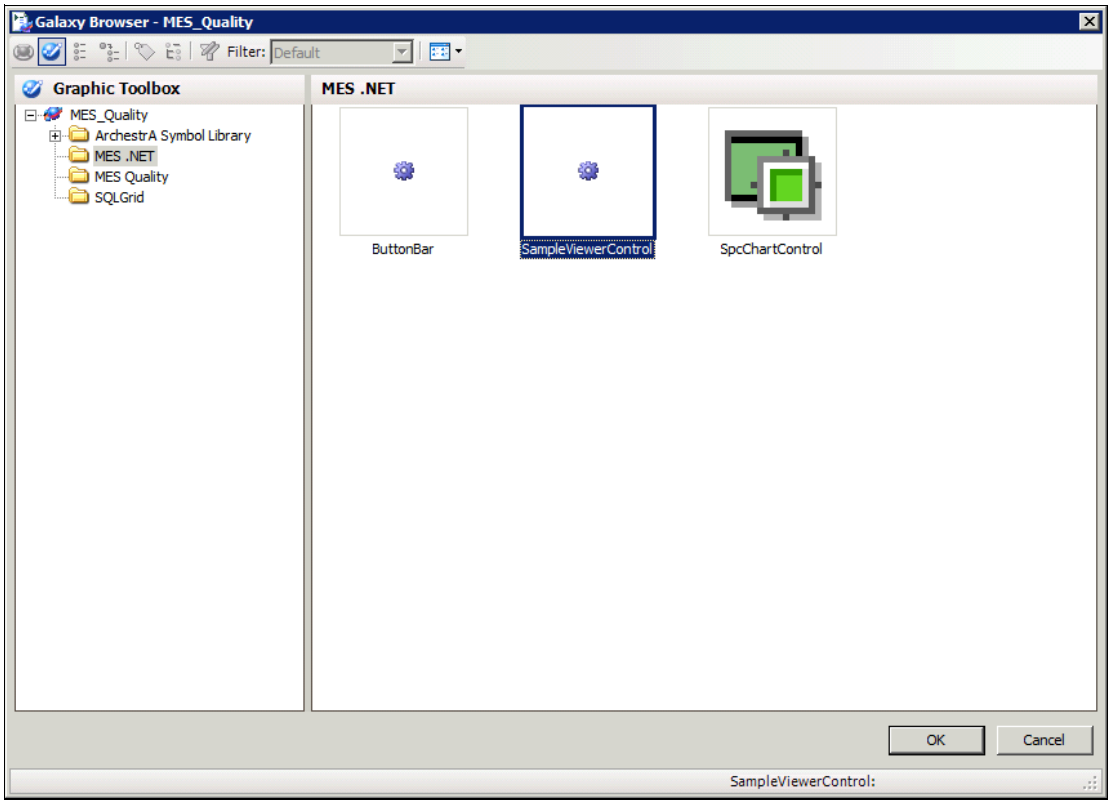


20. With the **ButtonBar1** graphic still selected, scroll down to the bottom of the **Properties** pane.
21. In the **Layout** group, **Dock** drop-down list, click the bottom dock button.



The graphic is now docked to the bottom of the rectangle.

22. Click **Embed Graphic**.
23. In the **Galaxy Browser**, **MES .NET** pane, click **SampleViewerControl**.



24. Click **OK**.
25. Click the top portion of the rectangle to place the graphic.

26. With **SampleViewerControl1** still selected, configure the **Properties** pane as follows:

    Factelligence

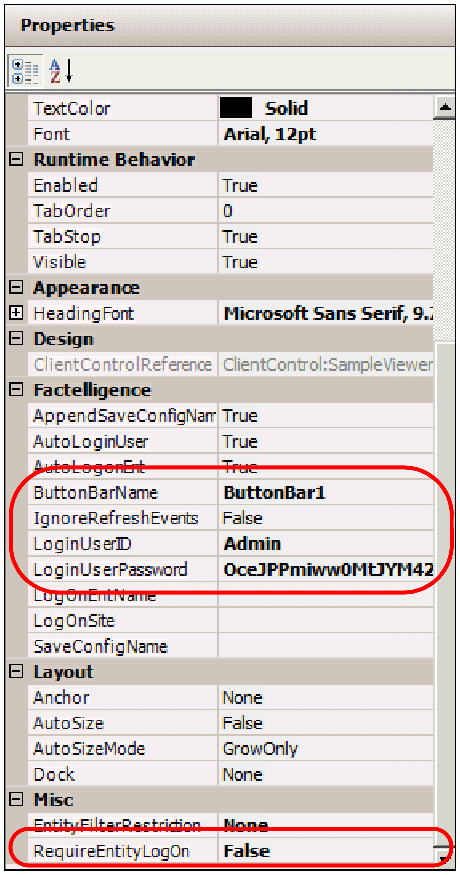
    ButtonBarName: ButtonBar1 (*default*)

    LoginUserID: Admin

    LoginUserPassword: iom

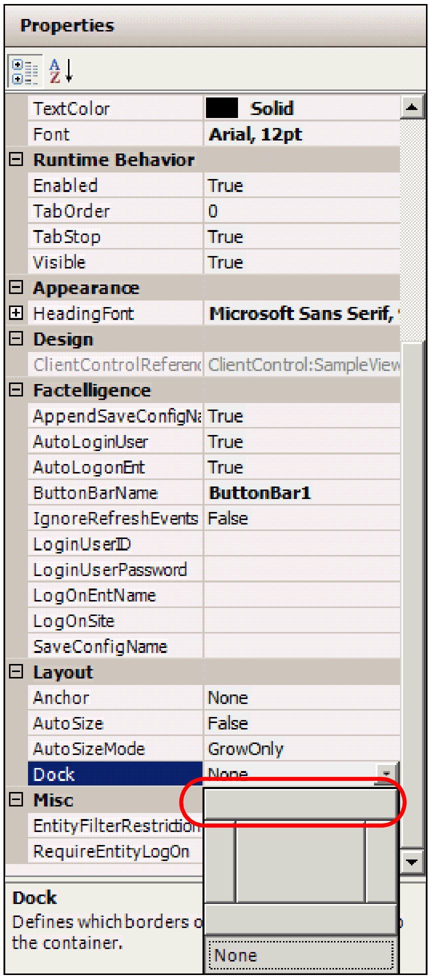
    Misc

    RequireEntityLogOn: False

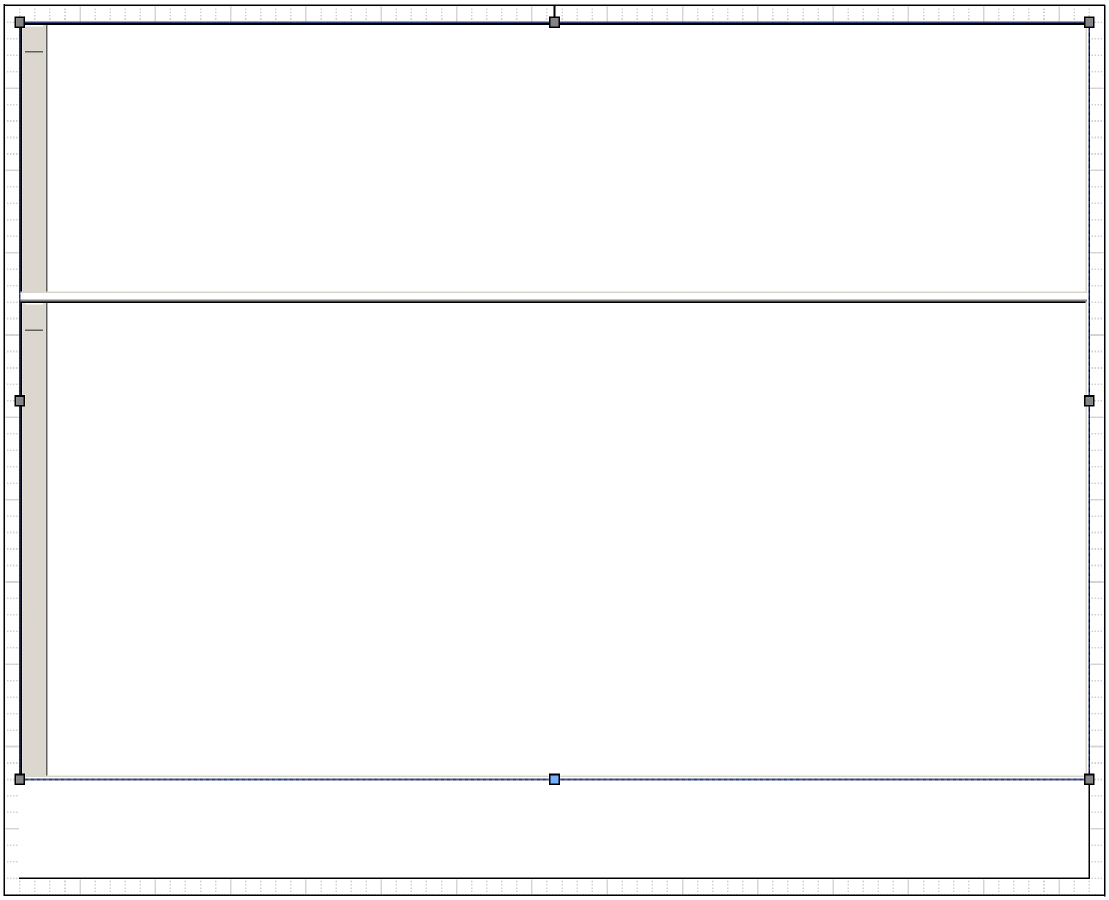


Note: The **LoginUserPassword** field will automatically encrypt the password.

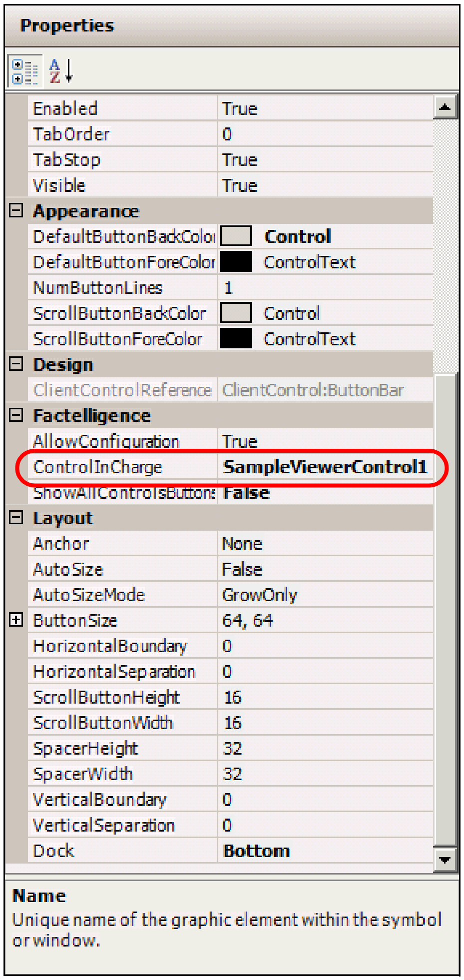
27. In the **Layout** group, **Dock** drop-down list, click the top dock option.



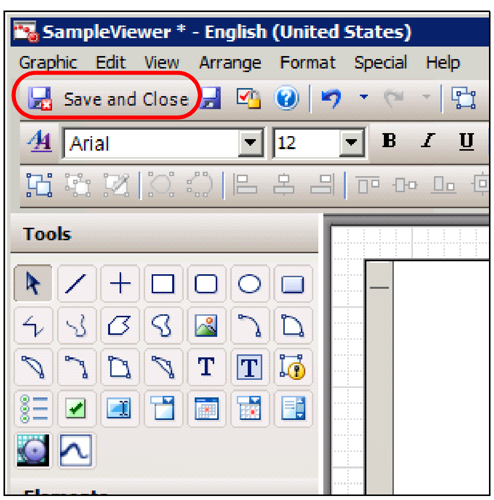
28. Adjust the height of the graphic to fit the rectangle above the button bar.



29. Click the **ButtonBar** graphic, and then in the **Properties** pane, **ControlInCharge** field, enter **SampleViewerControl1**.



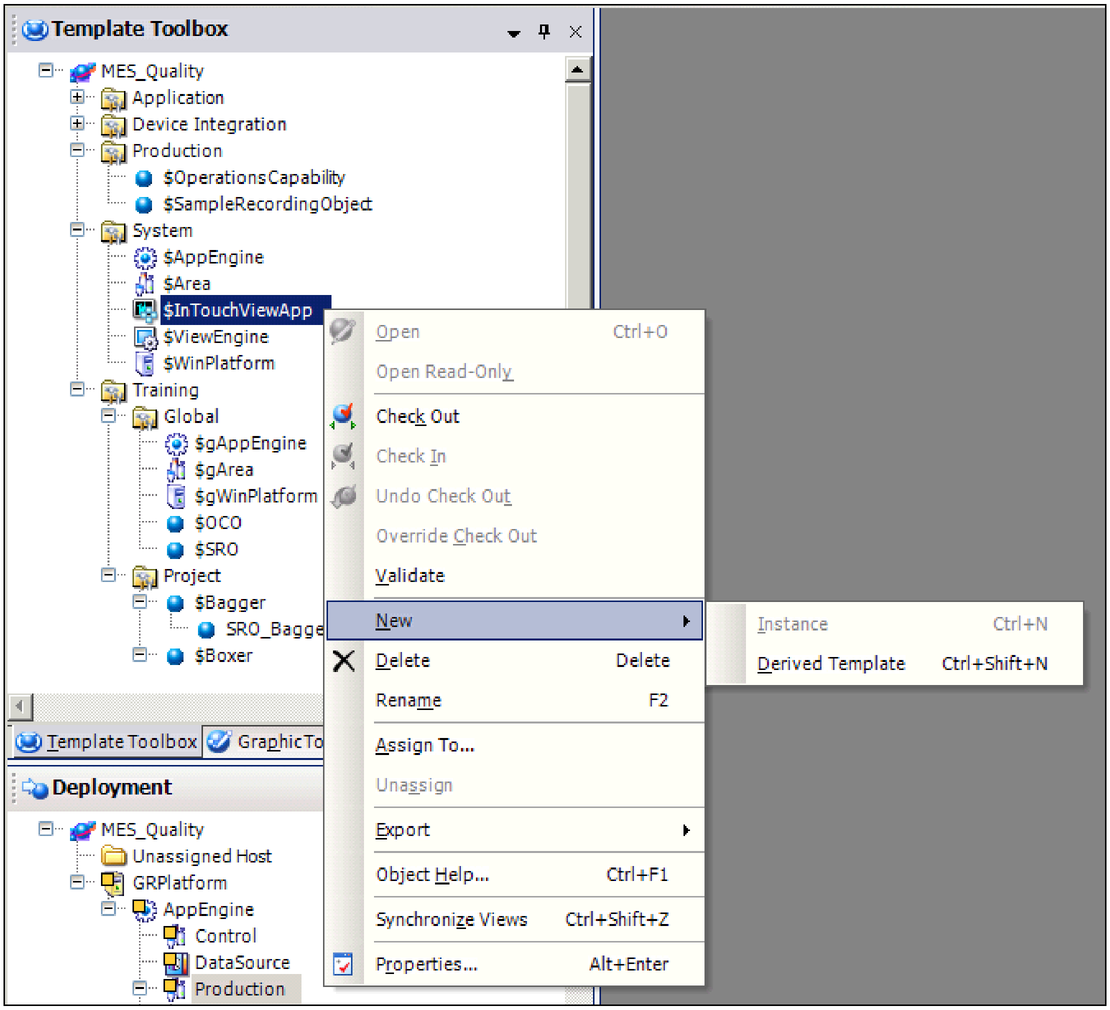
30. Click **Save and Close**.



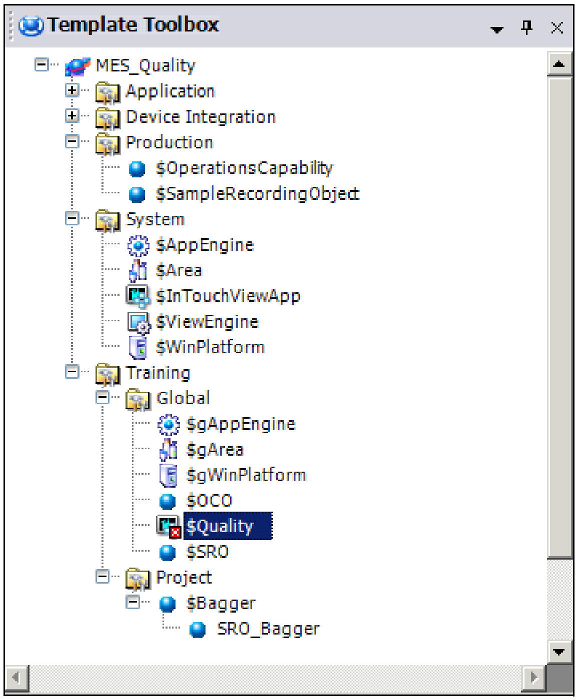
Create the InTouch Application

Next, you will create an InTouch application and embed the Sample Viewer Control graphic just created.

31. In the ArchestrA IDE, **Template Toolbox**, expand the **System** toolset, and the right-click **$InTouchViewApp** and select **New | Derived Template**.



32. Rename the template **$Quality** and drag it to the **Global** toolset.

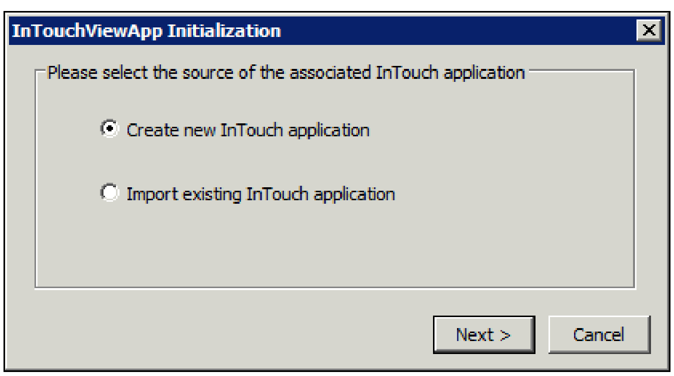


Embed the Sample Viewer Control in InTouch

Now, you will open InTouch and place the graphic just created.

33. Double-click **$Quality**.

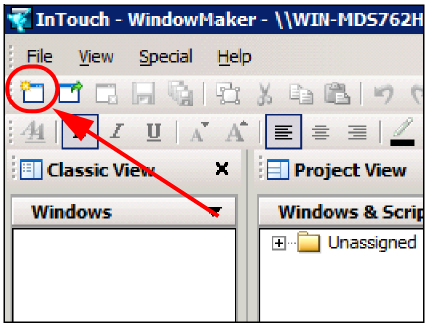
    The **InTouchViewApp Initialization** dialog box appears.



34. Leave the defaults and click **Next**.
35. In the next dialog box, leave the defaults and click **Next**.

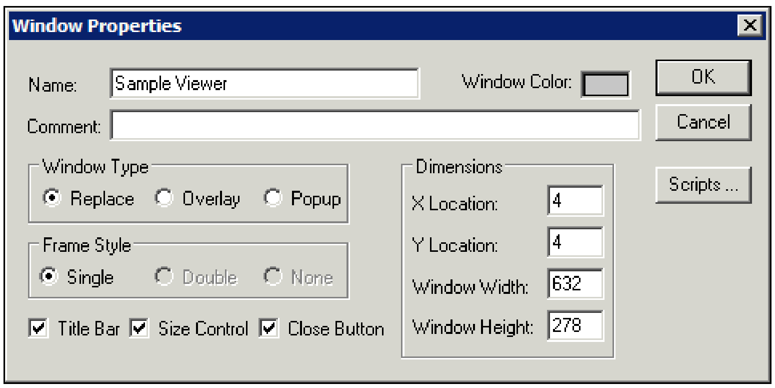
After a few moments, WindowMaker opens.

36. On the toolbar, click the **New Window** button.



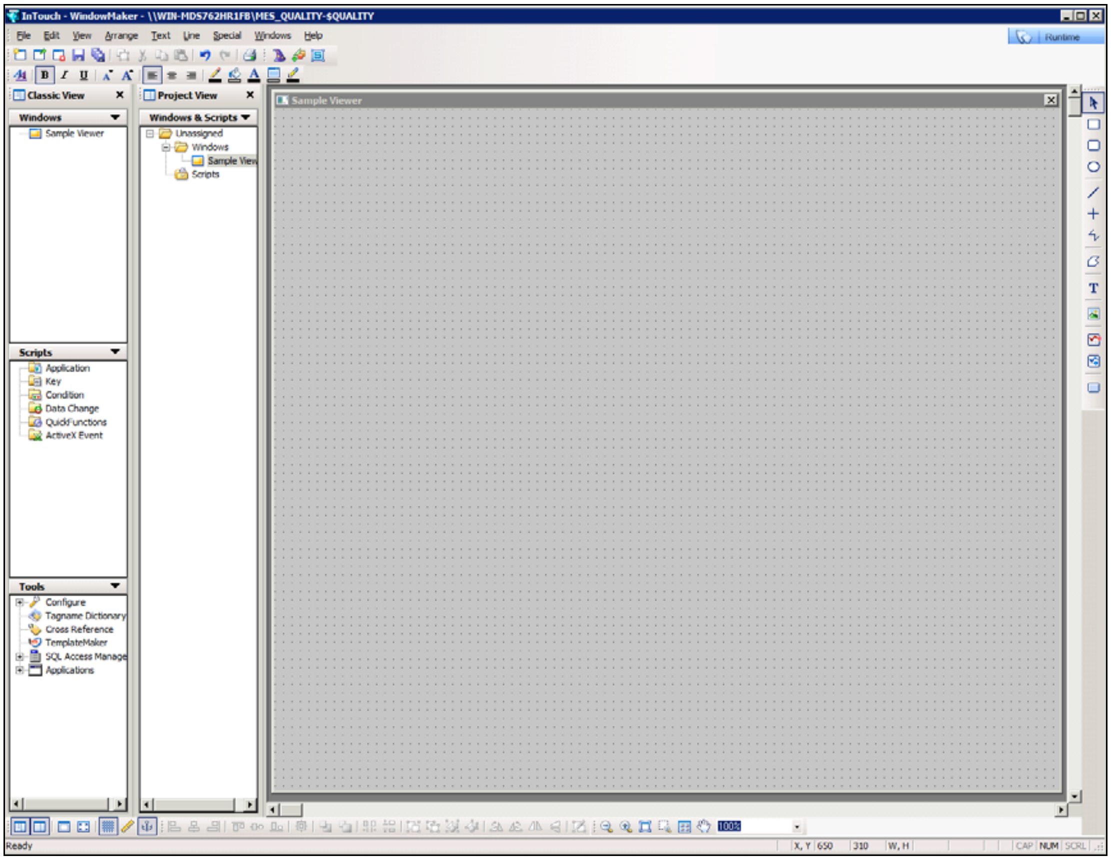
The **Window Properties** dialog box appears.

37. In the **Name** field, enter **Sample Viewer**.

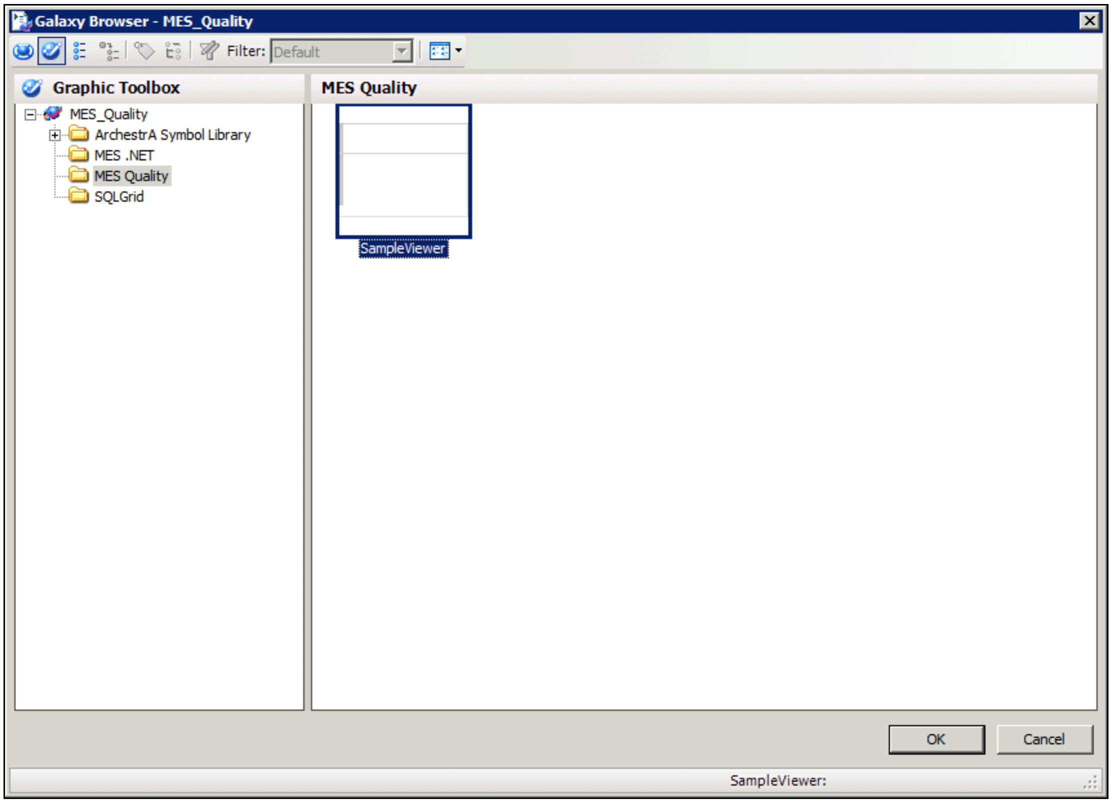


38. Click **OK**.

39. Resize the **Sample Viewer** window to fit the whole area.

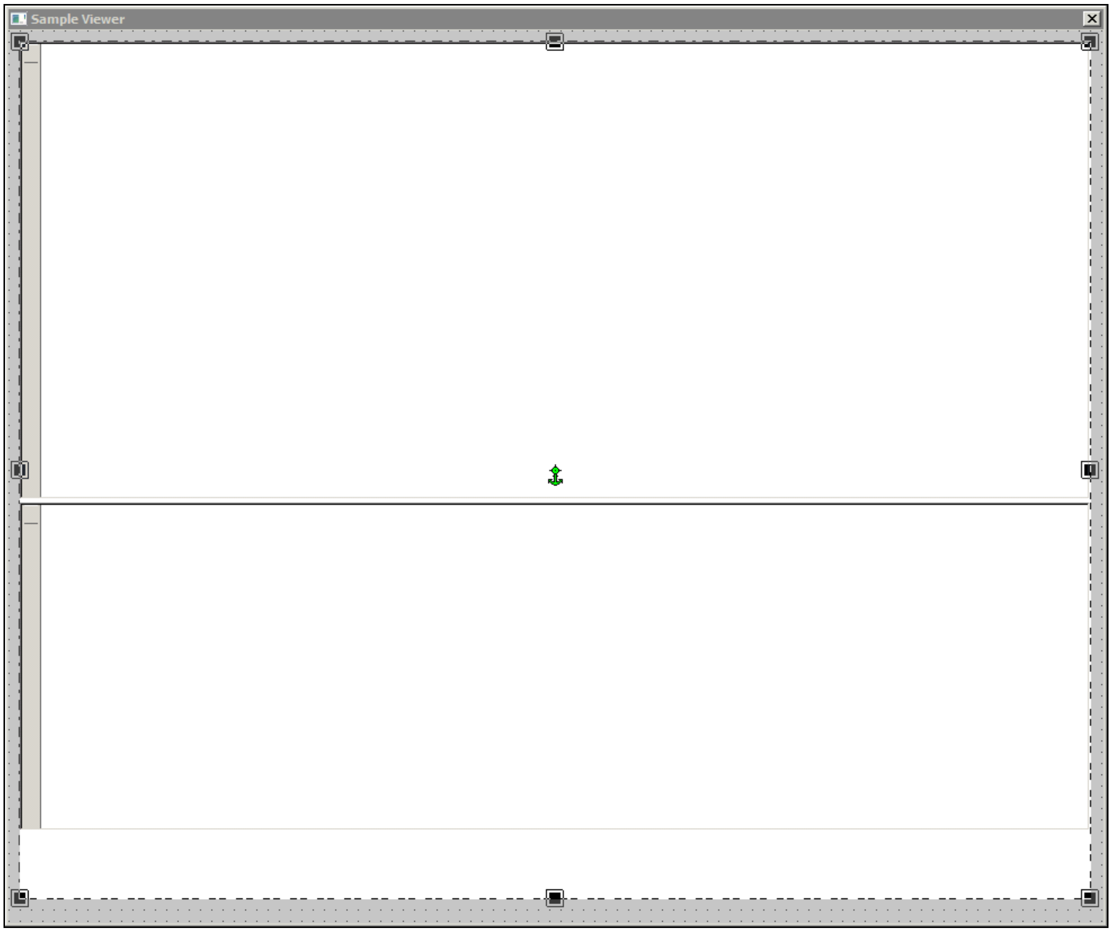


40. On the **Wizards/ActiveX** toolbar, click **Embed ArchestrA Graphic** .
41. In the **Galaxy Browser**, **Graphic Toolbox** pane, click **MES Quality**, and then in the **MES Quality** pane, click **SampleViewer**.



42. Click **OK**.

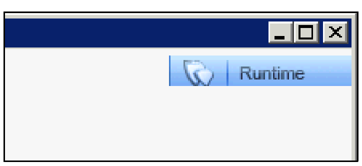
43. Click the **Sample Viewer** window to place the graphic and resize the window to fit the canvas.



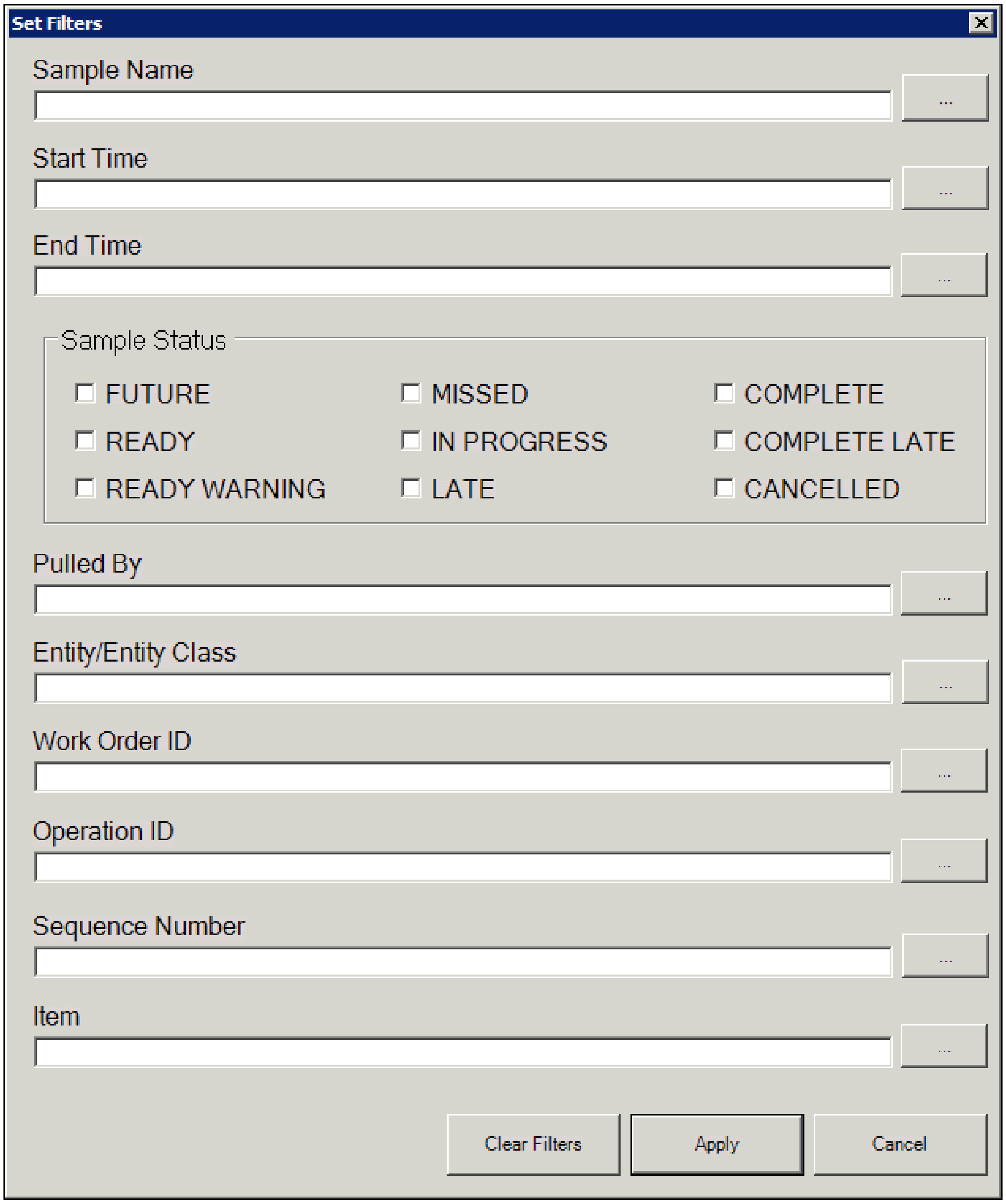
Enter Data in the Sample Viewer Control

You will now open WindowViewer and manually enter the data for the Sample Plan created in the previous lab.

44. In the top-right corner, click **Runtime**.



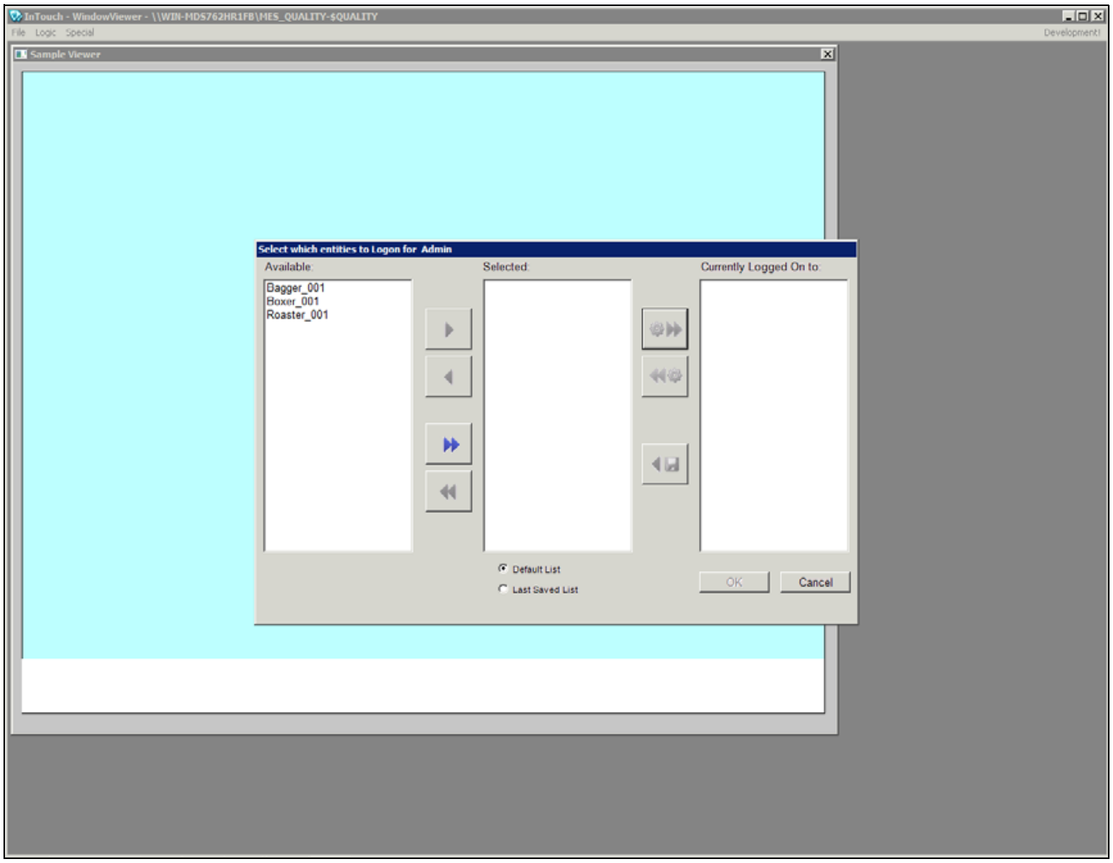
After a few moments, WindowViewer opens and the **Set Filters** dialog box appears.



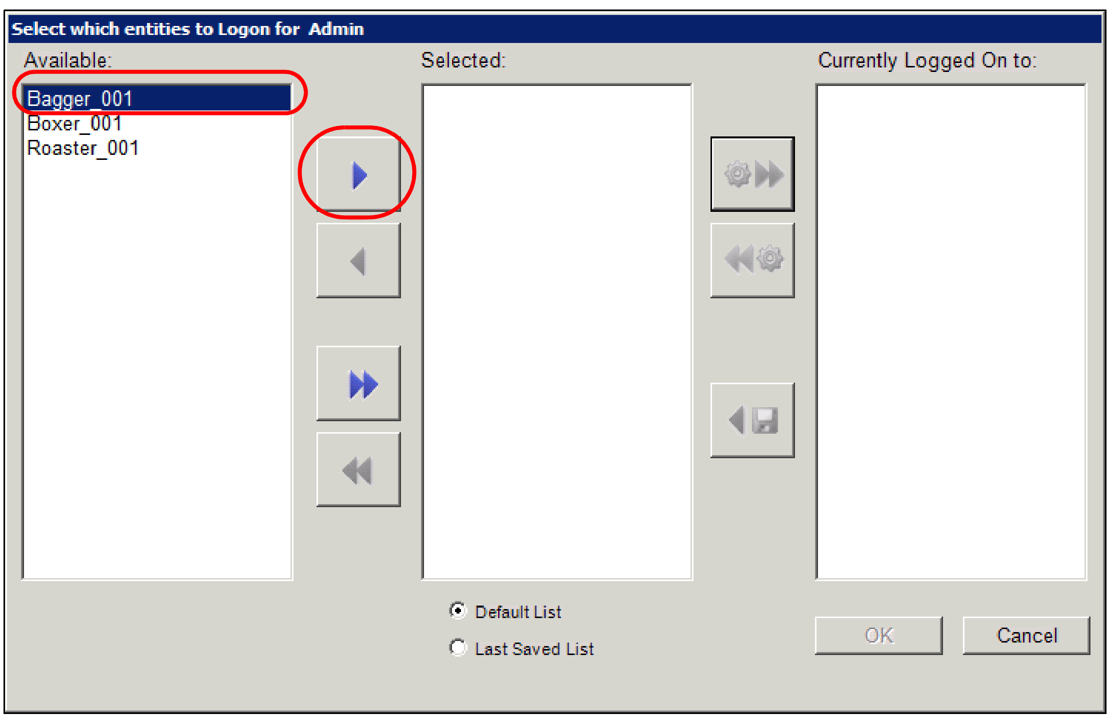
No filters are needed at this time, so you will bypass this dialog box.

45. Click **Apply**.

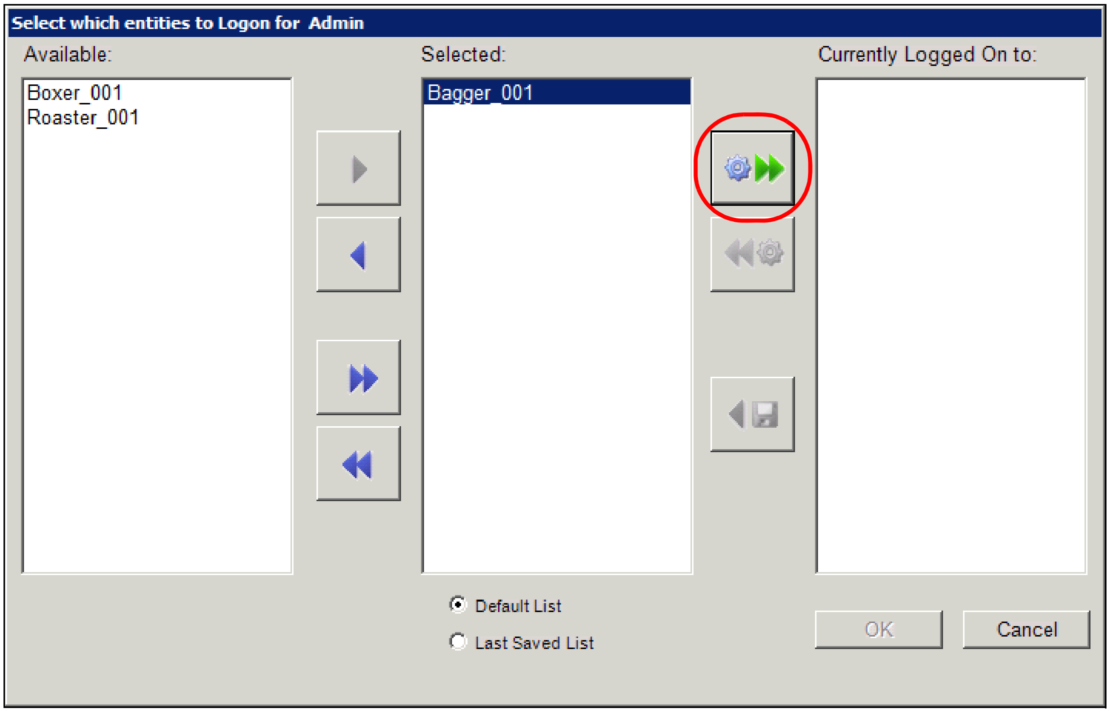
The **Select which entities to Logon for Admin** dialog box appears.



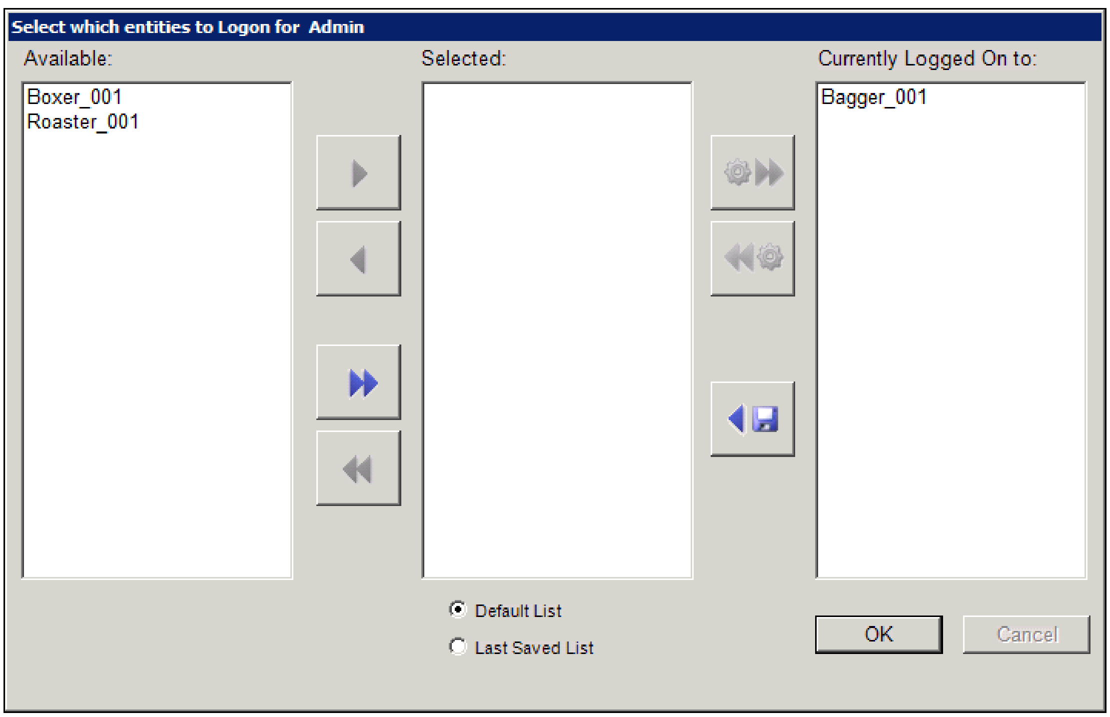
46. In the **Available** column, click **Bagger_001**, and then click the right-arrow button.



47. In the **Selected** column, click the double-right-arrow button.

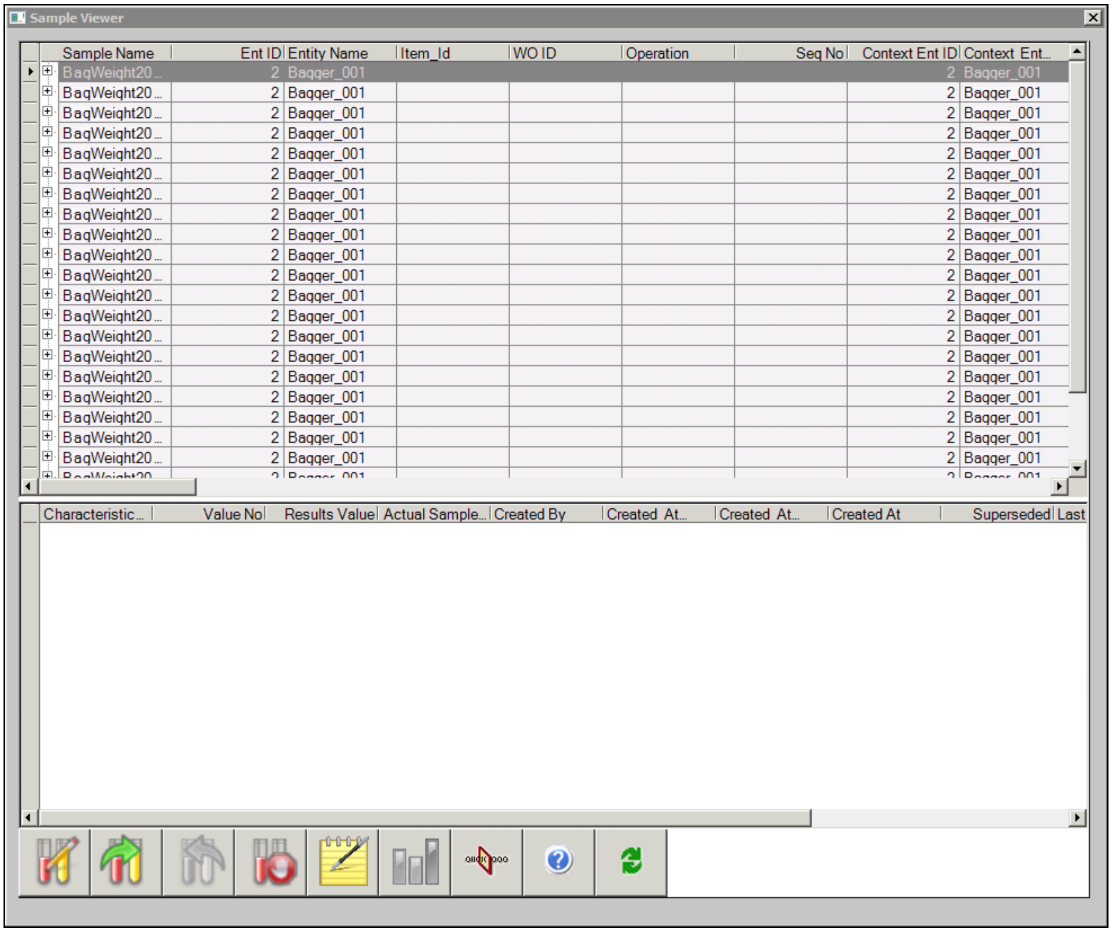


Bagger_001 now appears in the **Currently Logged On to** column.



48. Click **OK**.

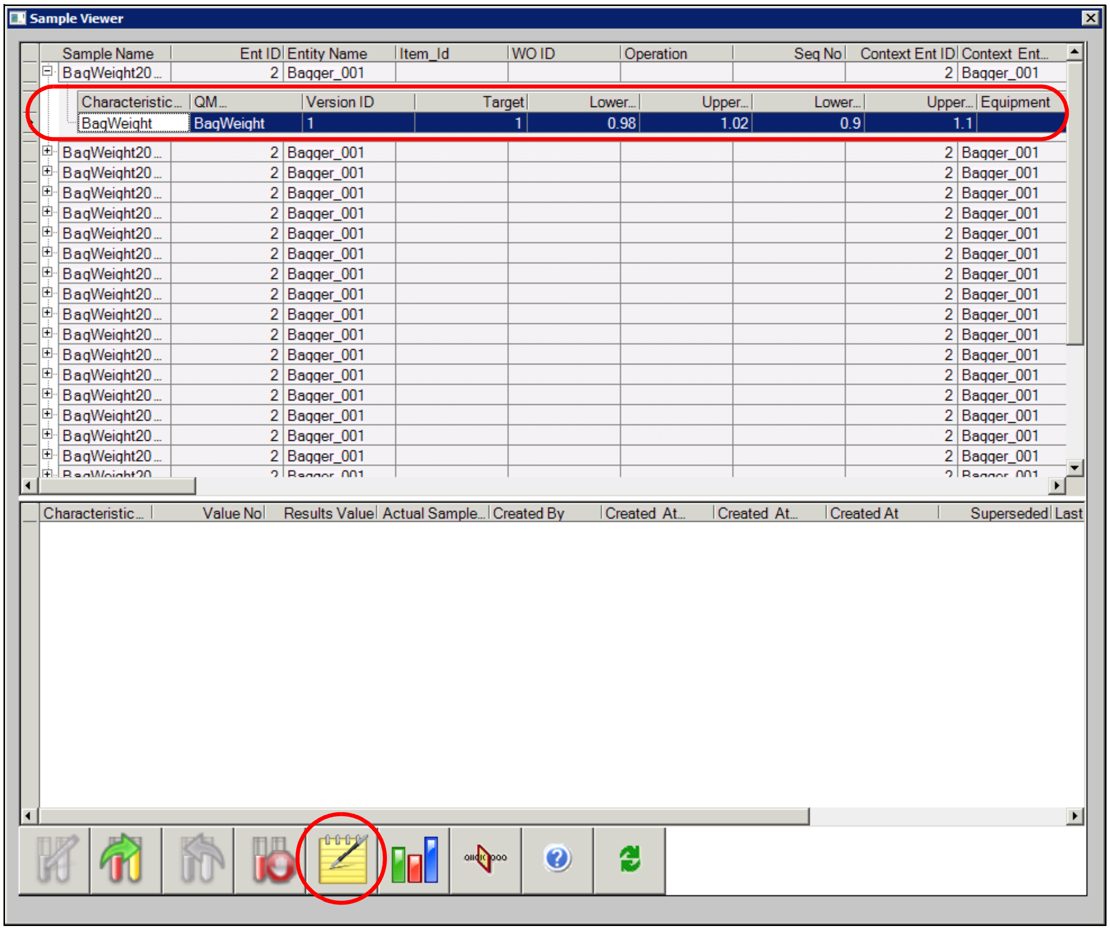
The **Sample Viewer** appears.



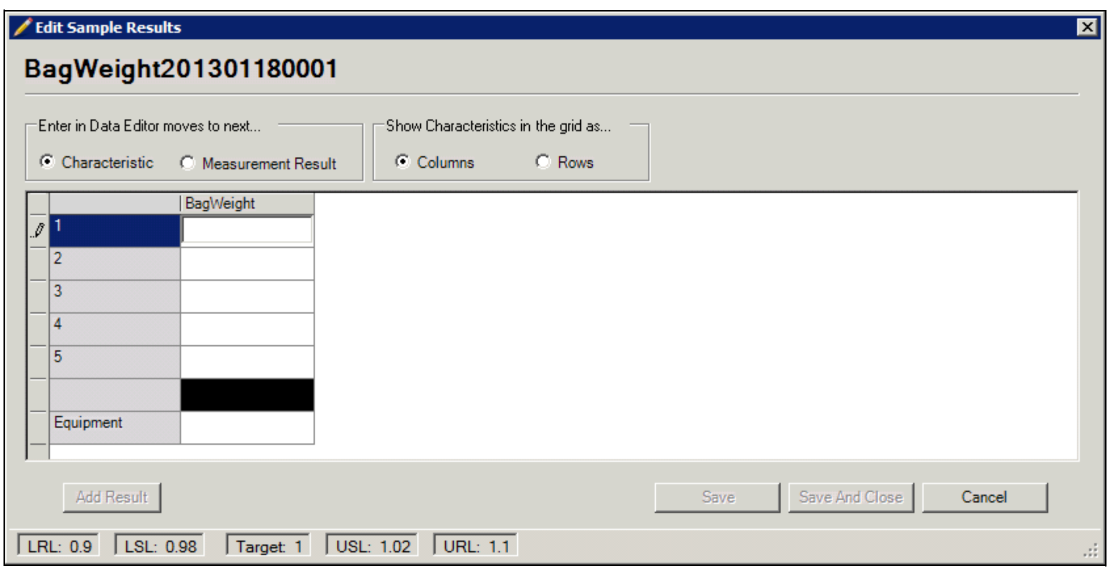
Note: The number of samples displayed may differ from the example above. You may have to scroll down to see all of the samples requested, including future sample requests.

You will now enter five measurements for the first sample requested.

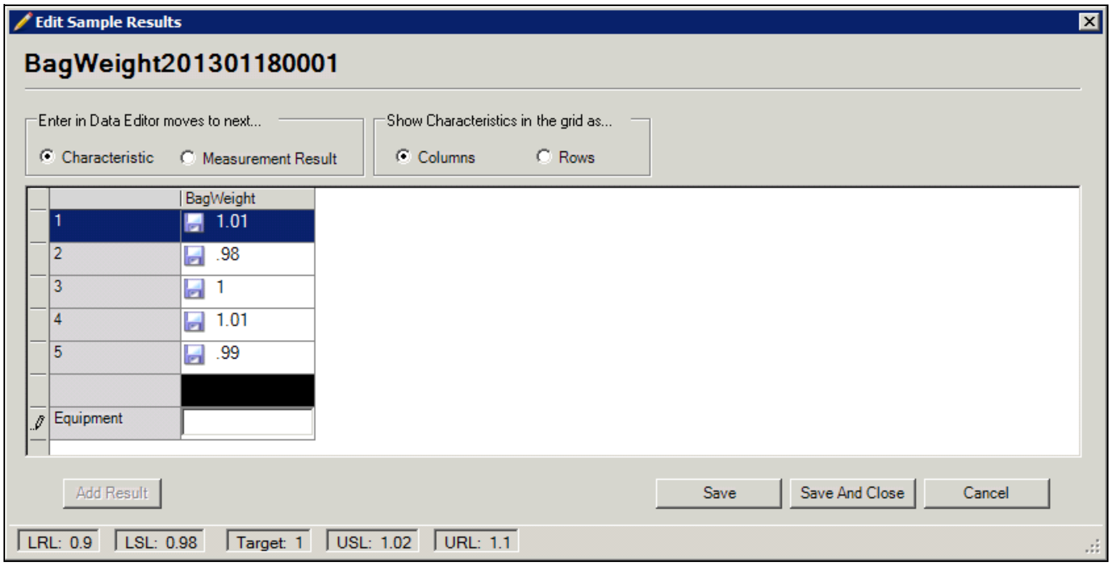
49. Expand the first sample and click the **BagWeight** Characteristic, and then on the button bar, click the **Edit Results** button.



The **Edit Sample Results** dialog box appears.

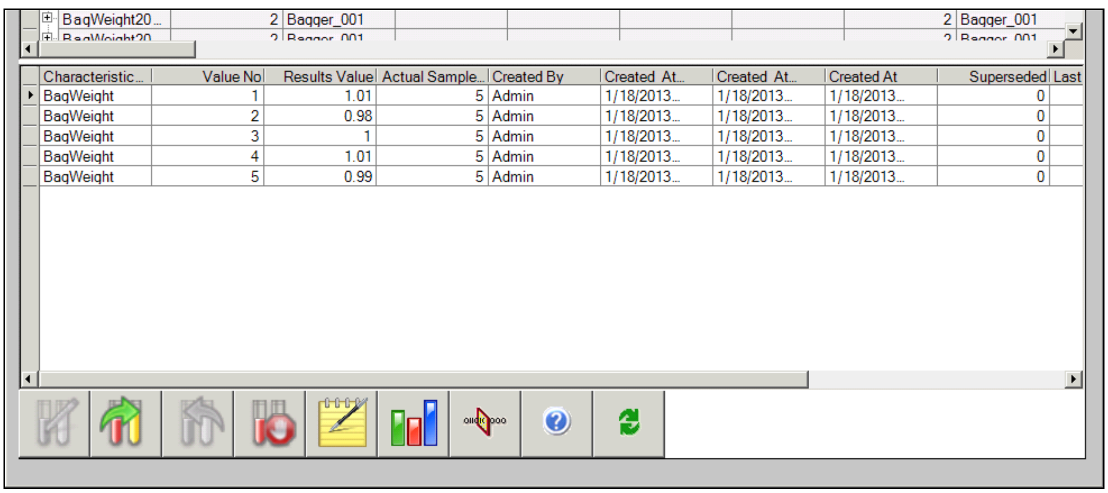


50. In the **BagWeight** column, enter values varied between .98 and 1.02.



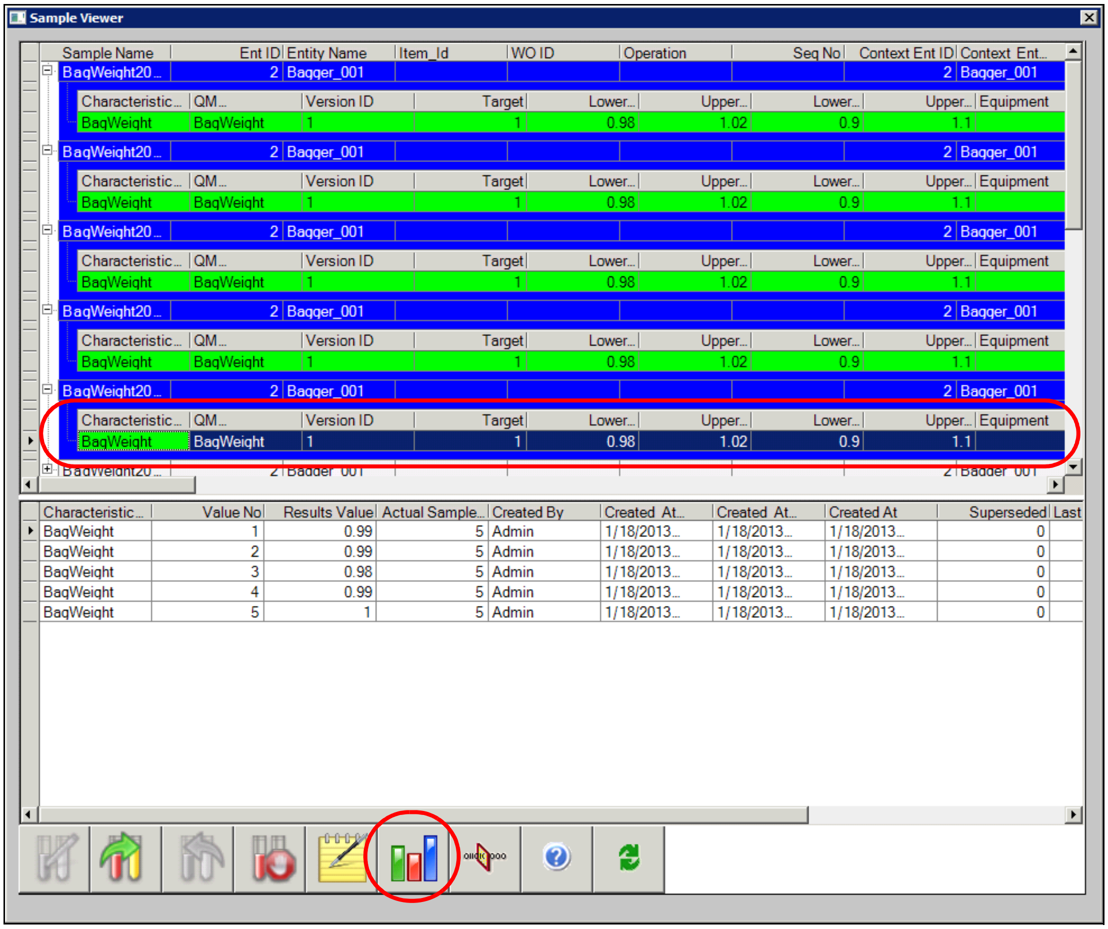
51. Click **Save And Close**.

    In the **Sample Viewer** bottom pane, the data is displayed.

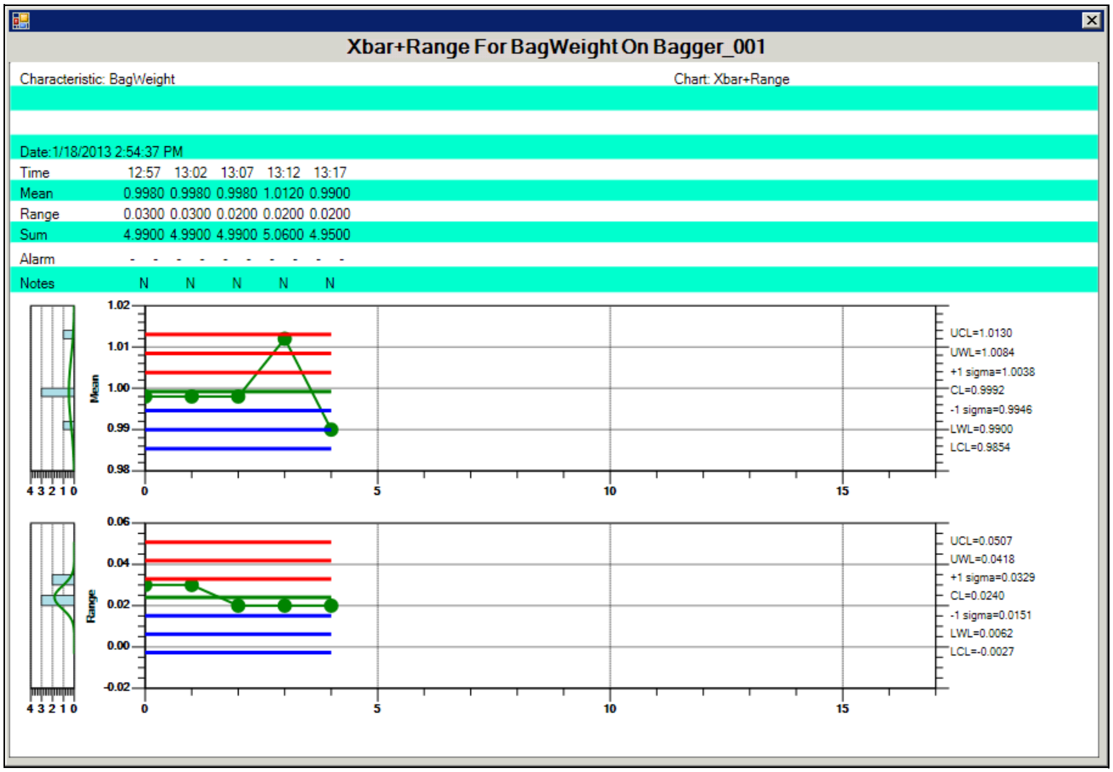


52. Repeat Steps 49 through 51 for the next two to four samples and enter varied data between .98 and 1.02.

53. Click one of the Characteristics where data has been entered (highlighted in green) and click the **SPC Chart** button.



The control chart appears and displays the data entered, in addition to the **Mean** and **Range** histograms.



54. Close the control chart.

Optional

55. In the **Sample Viewer** window, add additional sample data and return to the control chart. Enter some measurements outside of .98 and 1.02 to see the effect on the chart.

Section 3 – Automatic Data Collection

This section illustrates how to automatically collect System Platform data by configuring a Sample Recording Object in the Galaxy.

Configuring the SRO

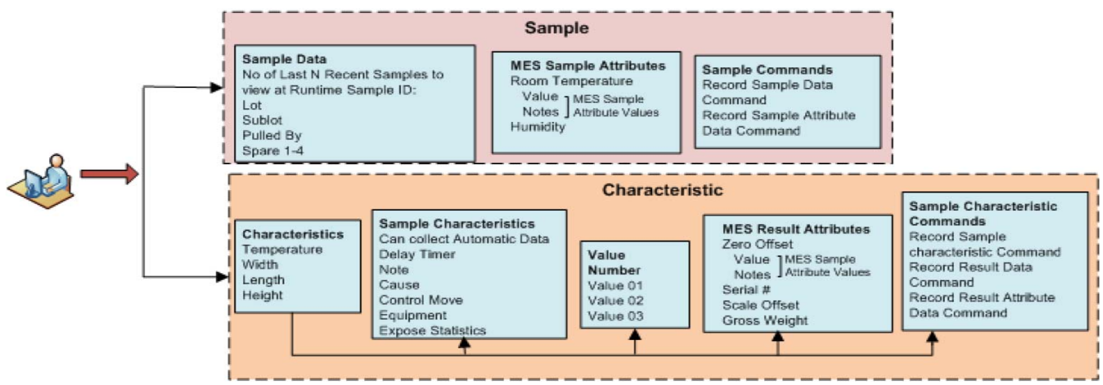
You can create derived templates and instances in your ArchestrA IDE equipment model. When you configure and lock any information in a derived SRO template in the ArchestrA IDE, the configured information is automatically propagated to all the child instances of the SRO template.

If you modify an SRO instance directly or indirectly through a template, an indicator appears adjacent to the SRO icon in the ArchestrA IDE, which indicates that the SRO object is invalid and is not synchronized with the MES database. You must run the Entity Model Builder to update the entity in the MES database per the changes in the SRO instance.

You must deploy the ArchestrA IDE equipment model to use the updated entity at runtime. You must also deploy the SRO OnScan to use the defined SRO configurations at runtime.

You can configure the SRO that is imported into the ArchestrA IDE in the same way as you configure other objects in the ArchestrA IDE. When you click the required SRO, the configuration pane for the SRO appears in the Configuration Editor.

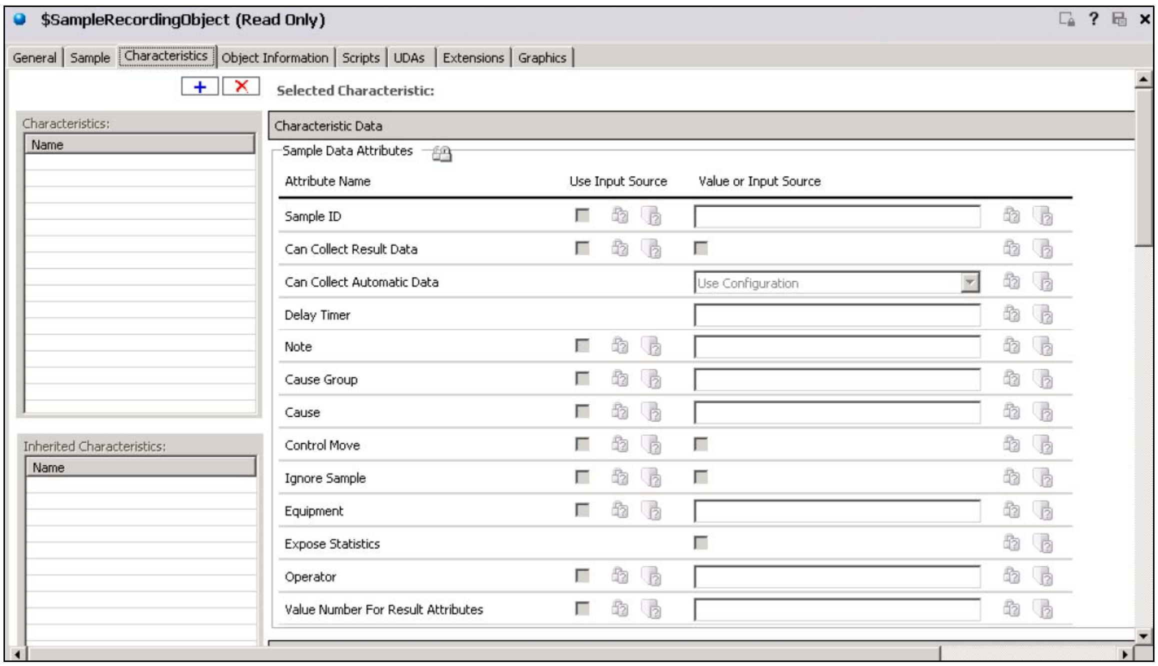
The below diagram displays the options available in the Configuration Editor.



The **Characteristics** tab within the SRO is used for interacting with the Characteristic results within a sample associated with the entity that is a part of the SRO instance. Any given sample can have more than one Characteristic to capture. The SRO can be configured to monitor multiple Characteristics at a time and to interact with the samples. Each Characteristic is monitored to do the following:

- Provide attributes for writing the contextual data that can be changed, such as notes and causes
- Provide ReadOnly attributes for fixed data, such as statistical results
- Provide attributes for writing Characteristic results

Characteristics may be captured automatically from an I/O source and may contain multiple measurements. You can configure one or more Characteristics in the **Characteristics** tab and map the individual attributes of a Characteristic to the I/O tags.



Automatic Characteristic Data Collection

Automatic Characteristic collection enables the automatic collection of data within the Sample Recording Object (SRO) and the time interval between measurements within a sample. When a sample transitions to the ready state, at runtime, the SRO records all Characteristics marked for automatic collection. If multiple measurements are required, an initial measurement is immediately recorded. This is followed by the measurements recorded at a specified time interval.

If you configure a Characteristic for automatic data collection in MES Client, you cannot manually enter data for this Characteristic available in the Sample Viewer.

Lab 6 – Configuring Automatic Data Collection

Introduction

In a previous lab, you created a QM Specification, which required manual data entry. In this lab, you will convert the Quality Management Specification to automatically collect data by configuring the Sample Recording Object in the ArchestrA IDE. To generate random values representing bag weights and other values, Testprot is used as a datasource. Testprot is a data simulator that is automatically installed with InTouch.

Objectives

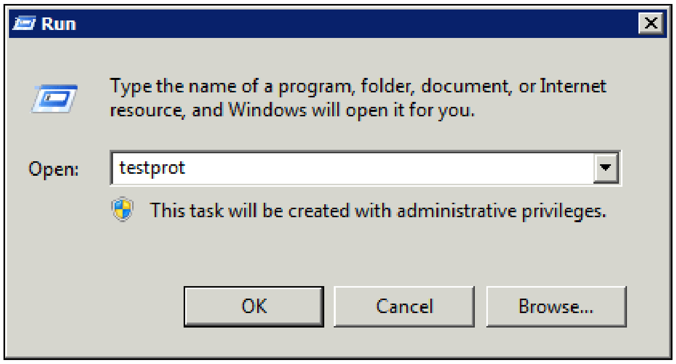
Upon completion of this lab, you will be able to:

- Verify connection to a data source in Object Viewer
- Configure a Sample Recording Object for automatic data collection
- Verify the data in the Sample Viewer Control ArchestrA graphic

Deploy the Galaxy and Verify the Data

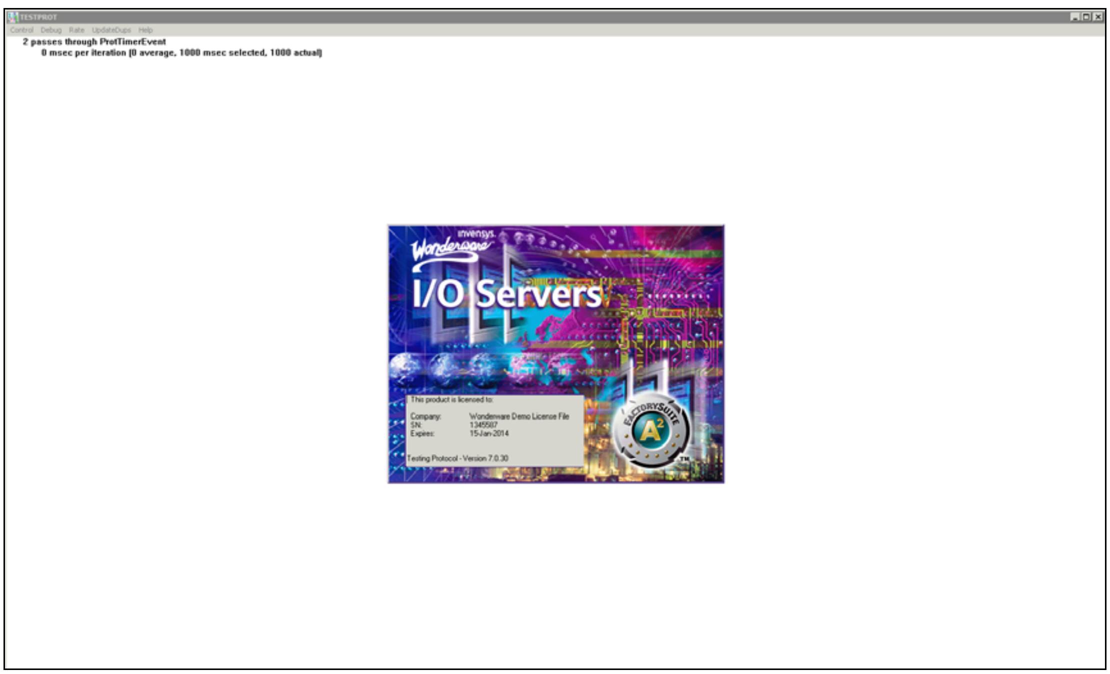
First, you will start the Testprot data simulator and deploy the Galaxy. Then, you will verify the data simulation in Object Viewer.

1. Open the Windows **Run** dialog box (**Start | Run**).
2. In the **Open** field, enter **testprot**.



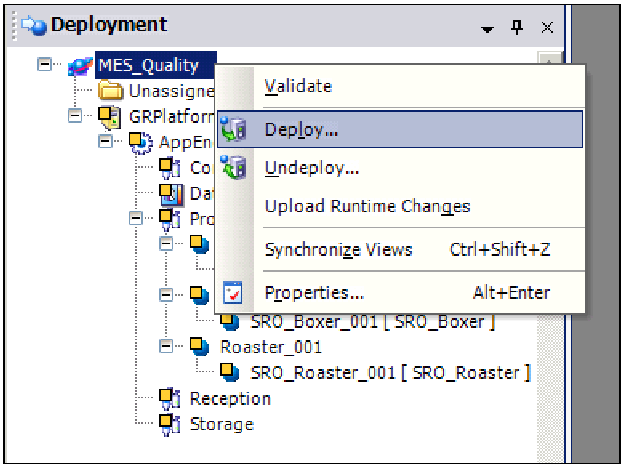
3. Click **OK**.

   TESTPROT opens.



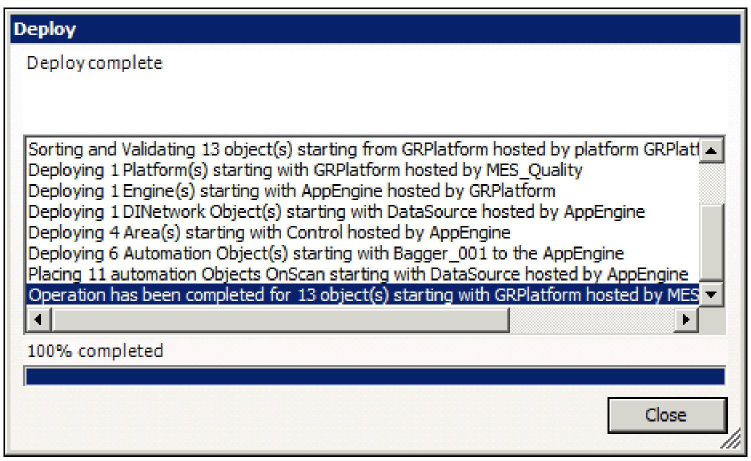
4. Minimize the TESTPROT window.

5. In the ArchestrA IDE, **Deployment** view, right-click **MES_Quality** and select **Deploy**.



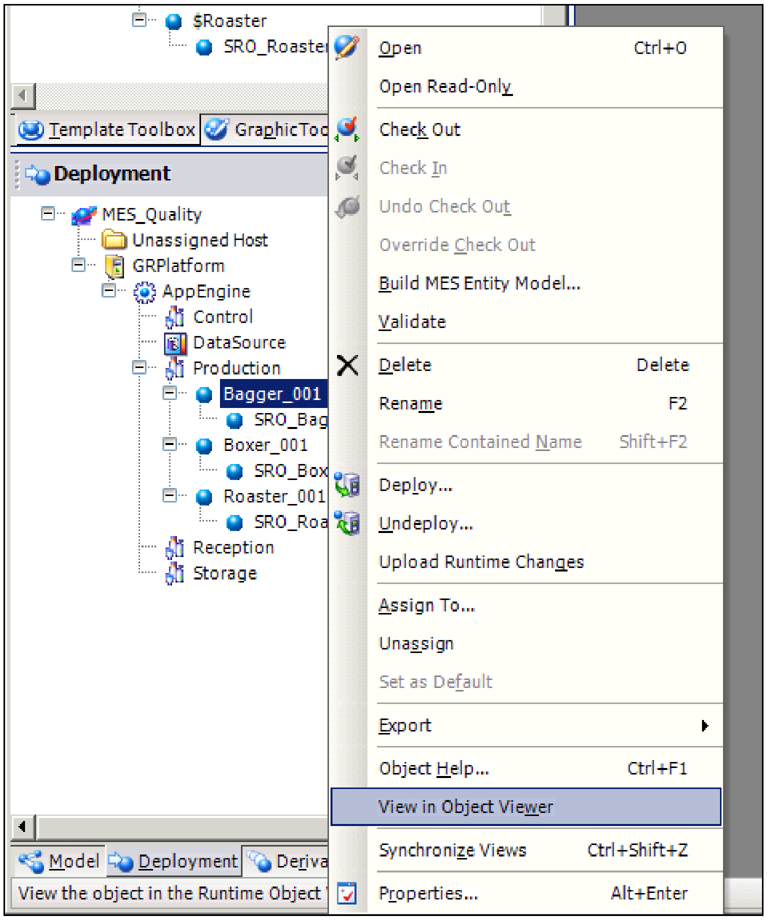
6. In the **Deploy** dialog box, leave the defaults and click **OK**.

   When the **Deploy** progress displays **Deploy complete**, the **Close** button is enabled.



7. Click **Close**.

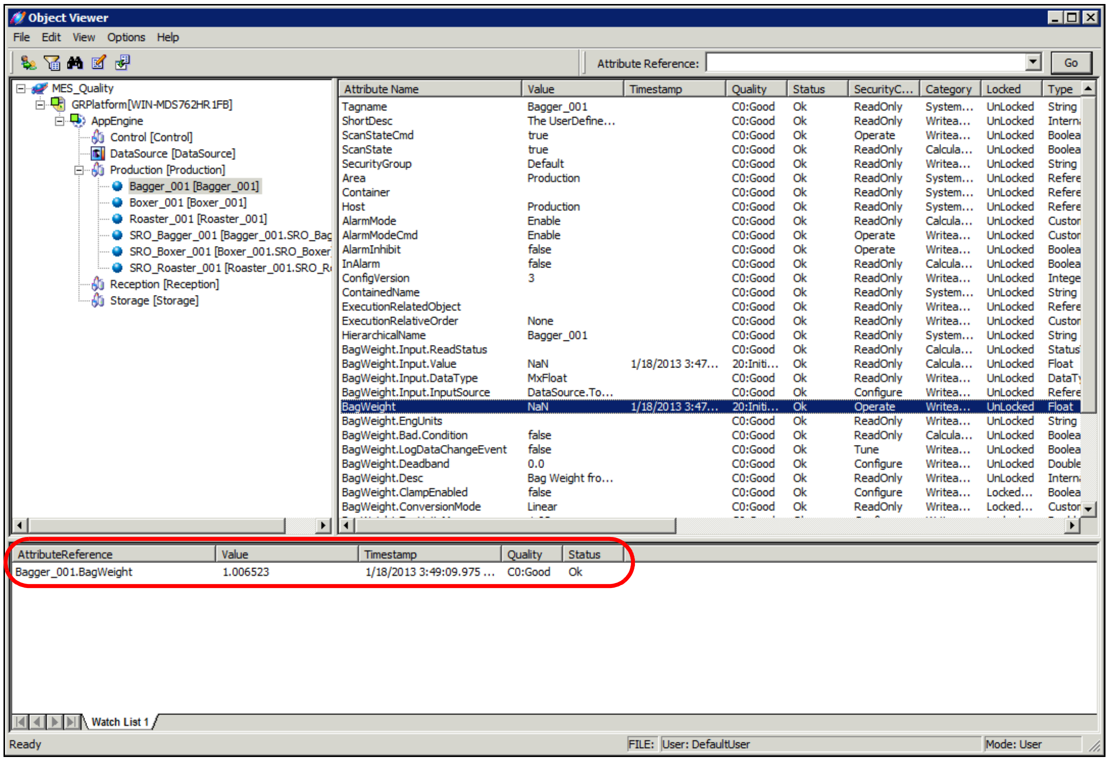
8. Right-click **Bagger_001** and select **View in Object Viewer**.



Object Viewer opens.

9. In the details pane, right-click **BagWeight** and select **Add to Watch**.

   In the watch window, the **Bagger_001.BagWeight** attribute appears.

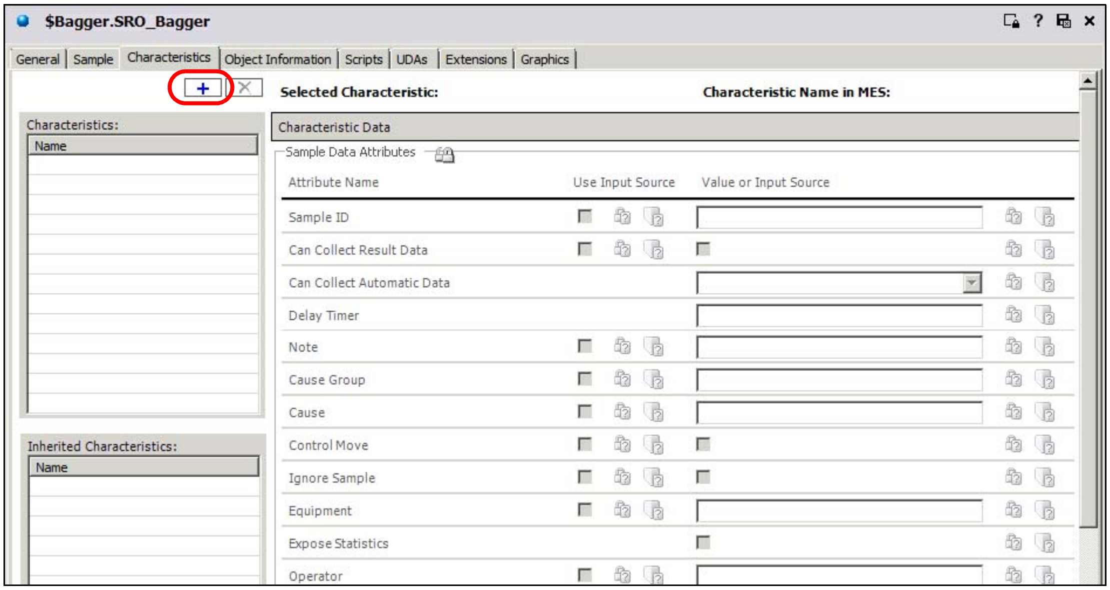


10. Verify that you are receiving good quality data and that the values are updating regularly.

Configure the Sample Recording Object

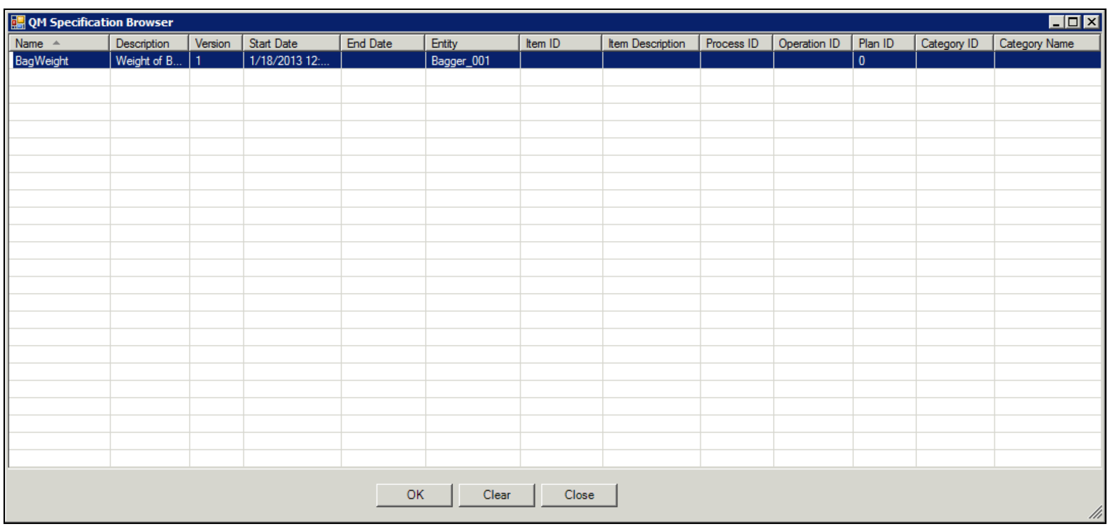
You will now configure the **SRO_Bagger** template to automatically collect bag weight data.

11. In the ArchestrA IDE, **Template Toolbox**, double-click **SRO_Bagger**.
12. On the **Characteristics** tab, click the **Add** button.



The **QM Specification Browser** appears.

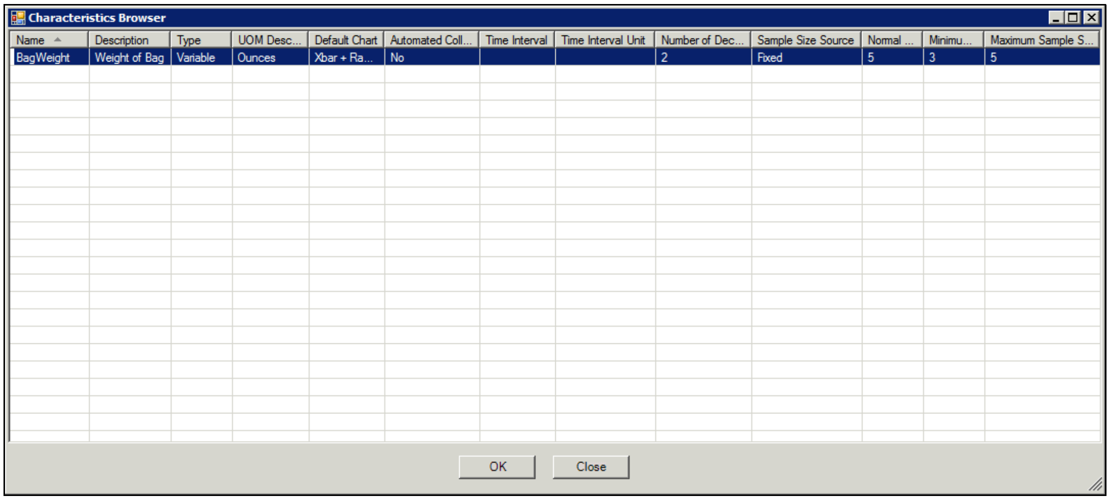
13. Click **BagWeight**.



14. Click **OK**.

The **Characteristics Browser** appears.

15. Click **BagWeight**.



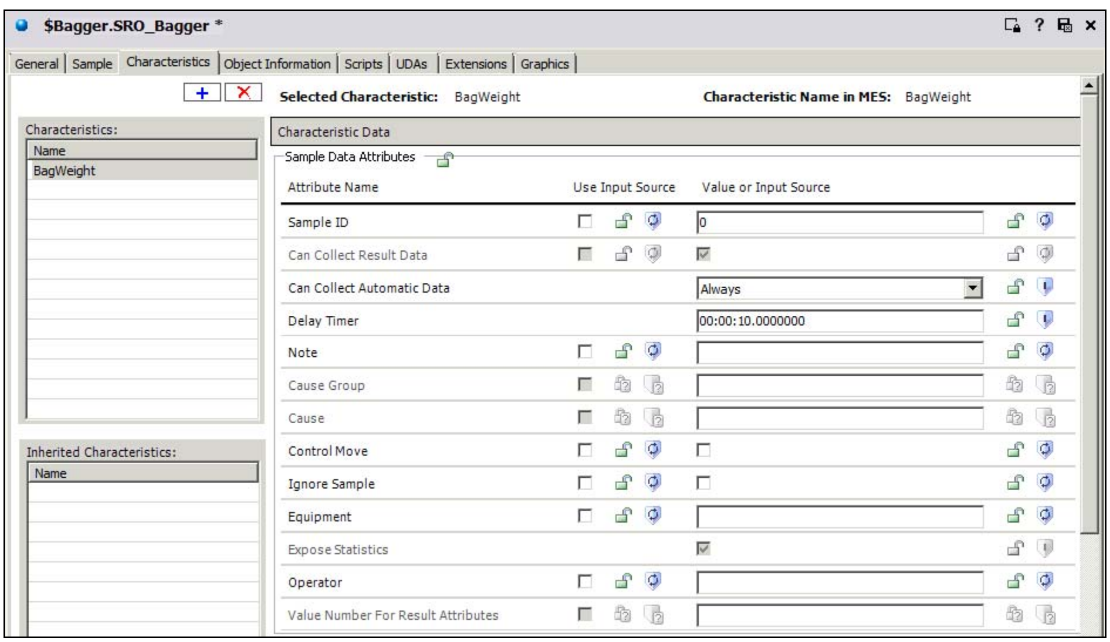
16. Click **OK**.

    In the **Characteristics** list, **BagWeight** appears.

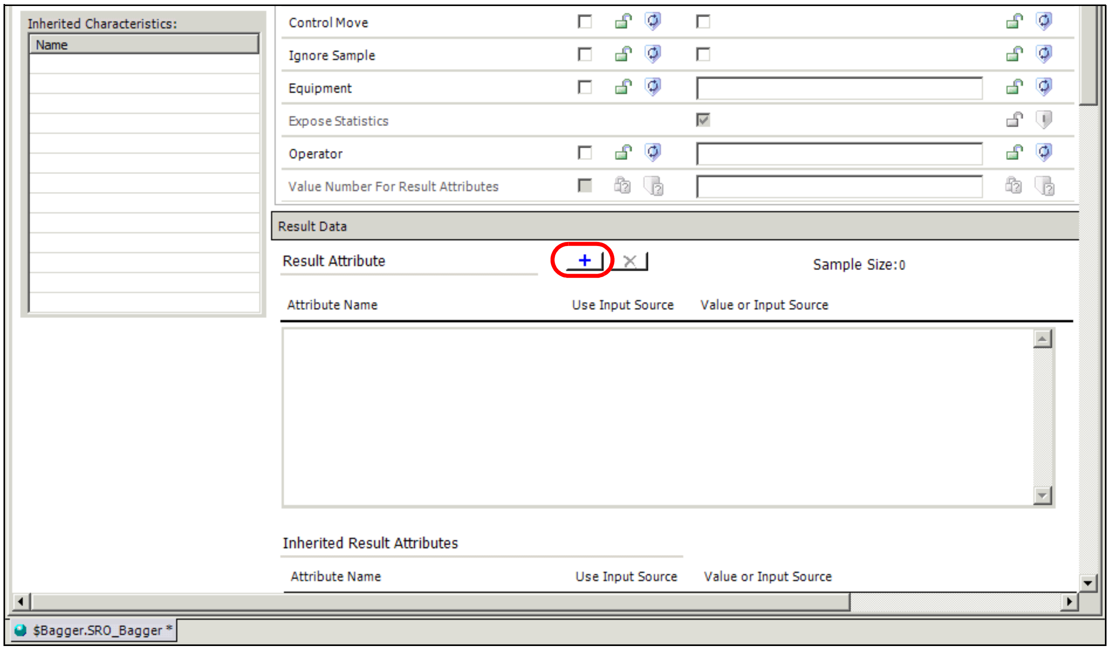
17. Configure the **Sample Data Attributes** area as follows:

    Can Collect Automatic Data: Always

    Delay Timer: 00:00:10.0000000



18. In the **Result Attribute** area, click **Add**.

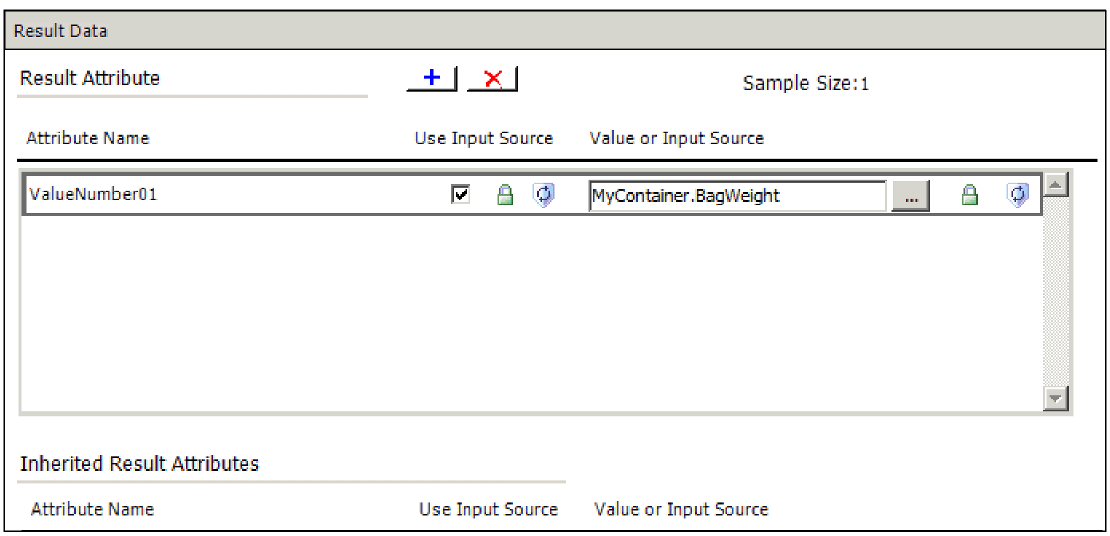


The **ValueNumber01** attribute appears.

19. Configure the attribute as follows:

Use Input Source: *checked* and *locked*

Value or Input Source: MyContainer.BagWeight and *locked*



20. Save and close the configuration editor.

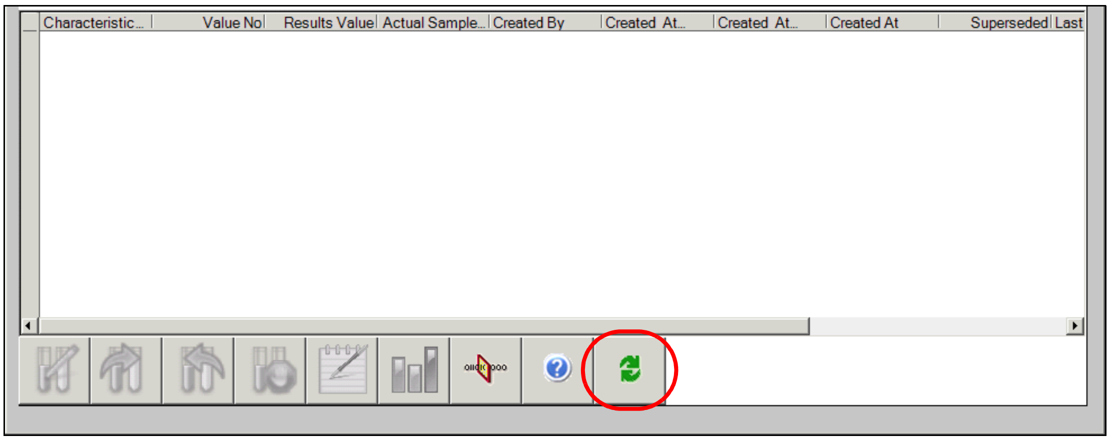
In the **Deployment** view, **SRO_Bagger_001** now indicates that it needs to be redeployed. You will now redeploy the object.

21. Right-click **SRO_Bagger_001** and select **Deploy**.
22. In the **Deploy** dialog box, leave the defaults and click **OK**.
23. When the **Deploy** progress displays **Deploy complete**, click **Close**.

Verify the Data in the Sample Viewer Control

Now, you will return to the Sample Viewer Control ArchestrA graphic to verify the automatic data collection.

24. In WindowViewer, **Sample Viewer** window, click the **Refresh** button.



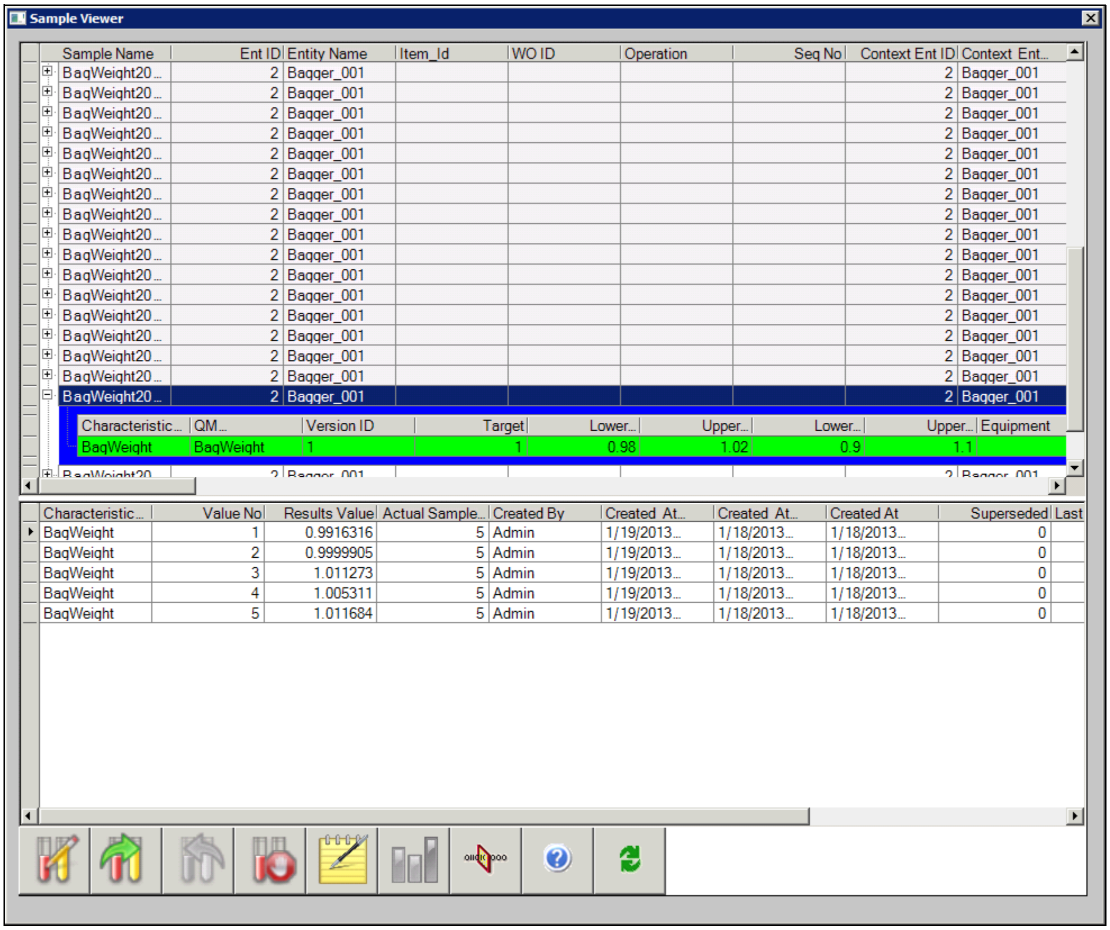
25. In the top pane, scroll to the bottom to view the latest samples.

    The automatic data collection is complete when the sample turns dark blue.

Note: Because the data is set to collect at defined intervals, you may have to refresh often before the data appears. You can view when a sample is scheduled to collect in the **Requested Time Local** column.

26. When the sample turns dark blue, expand the sample. This should be the fourth row from the bottom.

    The **BagWeight** Characteristic data appears in the bottom pane.



Section 4 – Additional Sample Plans

This section introduces Sample Plans for collecting data during shifts and Binary Attribute Characteristics.

Shift-based Sample Plan Frequency

You can enter the following optional details for shift frequency:

- In the **Interval** box, type the time interval for sampling.

Note: You may link a Sample Plan Frequency to QM Specifications, as definitions of shifts are tied to entities, either directly or by inheritance. The QM Specification must have at least the context of an entity, entity class, or item that has a shift schedule, so that the start and end of the shift can be determined.

- In the **Interval** unit list, click the unit of the interval. You can select any of the following:
  - **Seconds**
  - **Minutes**
  - **Hours**
  - **Days**
  - **Weeks**

For example, an interval of 2 hours and a shift that runs from 8:00:00 AM to 3:59:59 PM will have samples at 8, 10, 12, and 2, assuming that there are no start or end offset, and no samples per shift.

- In the **Offset Start** box, type the amount of time calculated from the start of a shift when the first sample is generated.

For example, if the shift starts at 8:00 AM and the Offset Start is 15 minutes, then the first sample occurs at 8:15 AM.

- In the **Offset End** box, type the amount of time calculated from the end of a shift when the last sample is generated.

For example, if the shift ends at 4:00 PM and the Offset End is 15 minutes, then the last possible sample occurs at 3:45 PM.

Note: Depending on other settings of the Shift Frequency Definition, there is no guarantee that a sample will occur at this time.

- In the **Sample Per Shift** box, type the number of samples that are generated in every shift. The minimum value that you can type is "2".

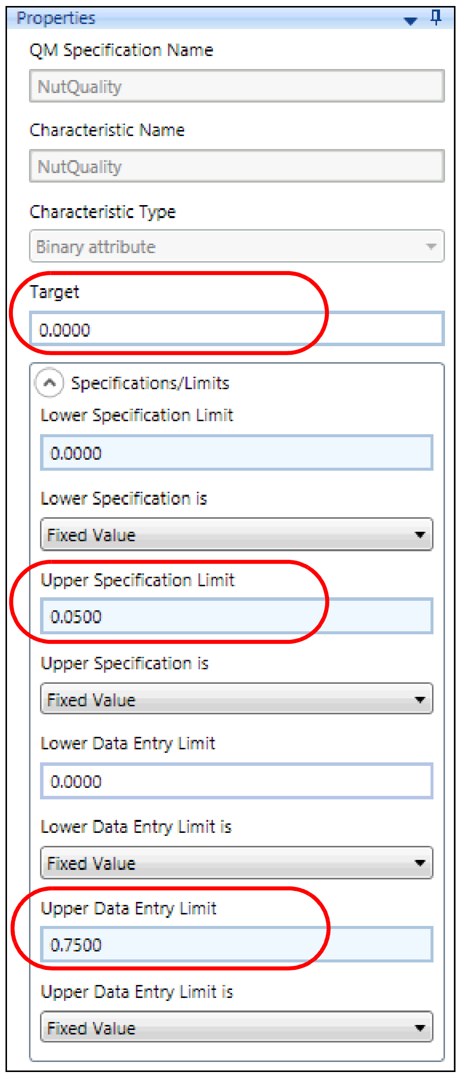
For example, a value of "2" for samples per shift, and no setting for the interval creates a sample at shift start plus offset start, if any, and a sample at shift end minus offset end, if any.

Binary Attribute-type Characteristics

A Characteristic that can only assume a *True* (1) or *False* (0) value. This indicates whether a unit being measured is defective in a particular Characteristic or not.

A binary attribute-type Characteristic can be displayed as a Percent Defective (**p**) chart or Number Defective (**np**) chart. For this reason, the Specification Limits for a Binary Attribute Characteristic are entered as a percentage in decimal form.

In this example, the **Target** is to have no defective items in the samples. However, you are expecting the defective percentage of the samples to be 5% or less (entered as **0.05** in the **Upper Specification Limit**) and at no time should the defective percentage be more than 75% (entered as **0.75** in the **Upper Data Entry Limit**).



Lab 7 – Creating the Nut Quality Sample Plan

Introduction

In a previous lab, you created the Bag Weight Sample Plan. In this lab, you will configure a Sample Plan to request sample data for the quality of the nuts produced by the roaster every 10 minutes during the current shift. The sample will be a random scooping of nuts ranging from 25 to 75 nuts. You will then record the number of burnt nuts in the sample and the sample size.

To do this, you will create the Nut Quality Sample Plan. You will then use **Sample Viewer** to enter and chart the data.

Objectives

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

- Create a shift-based Sample Plan Frequency
- Create a binary attribute-type Characteristic
- Enter binary data manually

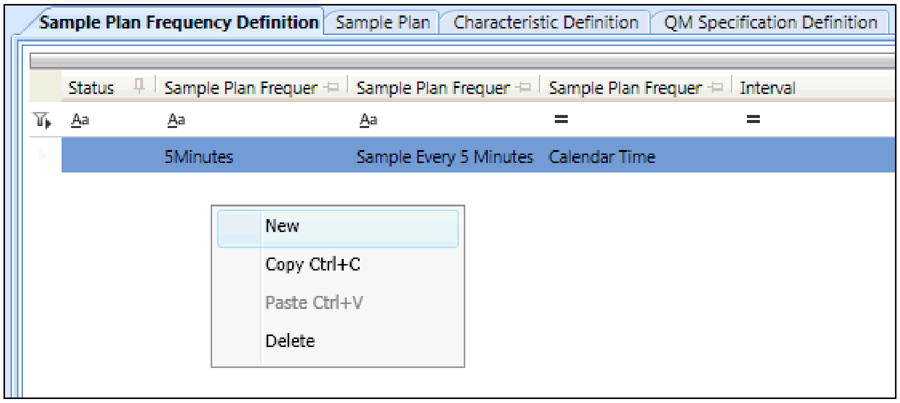
Create the Sample Plan Frequency

First, you will create the Sample Plan Frequency for sampling nut quality every 10 minutes during a shift.

1. Return to MES Client.

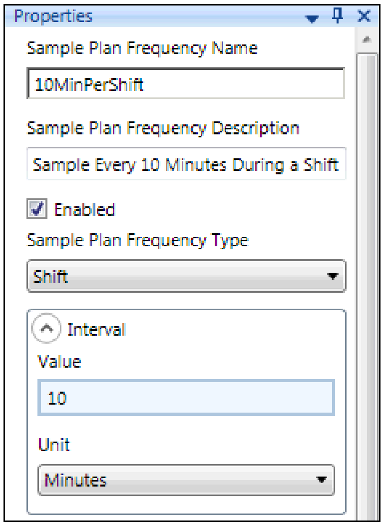
   If you closed the client, open MES Client.

2. In MES Client, on the **Sample Plan Frequency Definition** tab, right-click the empty workspace and select **New**.



3. Configure the **Properties** pane as follows:

   Sample Plan Frequency Name: 10MinPerShift
   Sample Plan Frequency Description: Sample Every 10 Minutes During a Shift
   Sample Plan Frequency Type: Shift
   Interval
   Value: 10
   Unit: Minutes



4. Click **Save All**.

Create the Sample Plan

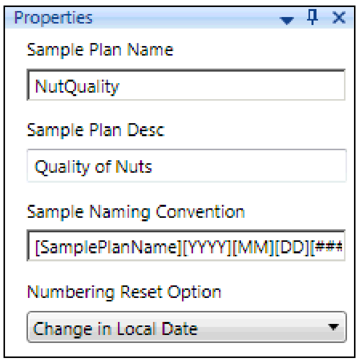
Next, you will establish the naming convention and numbering reset option for the nut quality samples. Then, you will link the **Sample Plan** to the **Sample Plan Frequency** created earlier in this lab.

5. On the **Sample Plan** tab, right-click the empty workspace and select **New**.
6. Configure the **Properties** pane as follows:

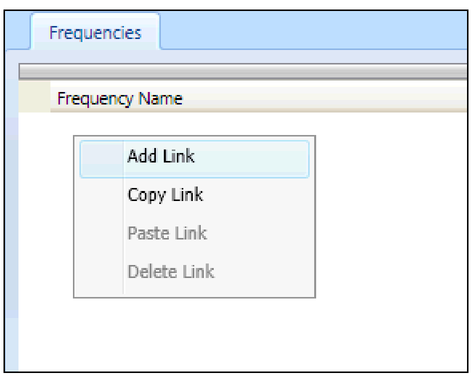
   Sample Plan Name: NutQuality

   Sample Plan Desc: Quality of Nuts

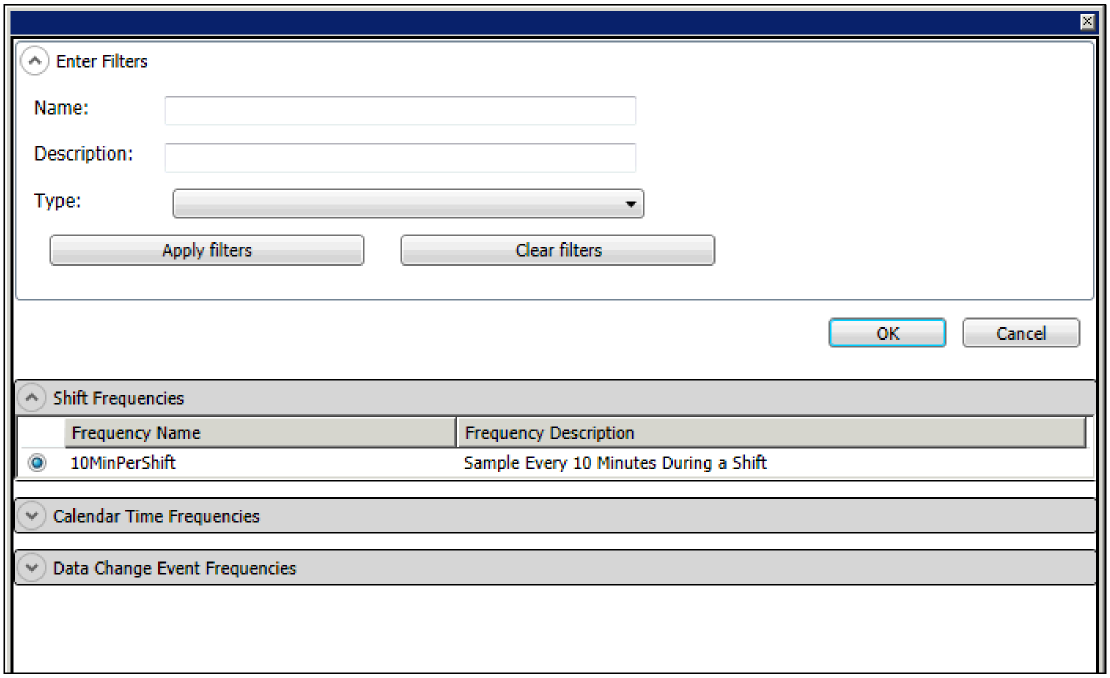
   Numbering Reset Option: Change in Local Date



7. On the **Frequencies** tab, right-click the empty workspace and select **Add Link**.



8. In the **Enter Filters** dialog box, click **Apply filters**.
9. Expand **Shift Frequencies** and click the **10MinPerShift** option.



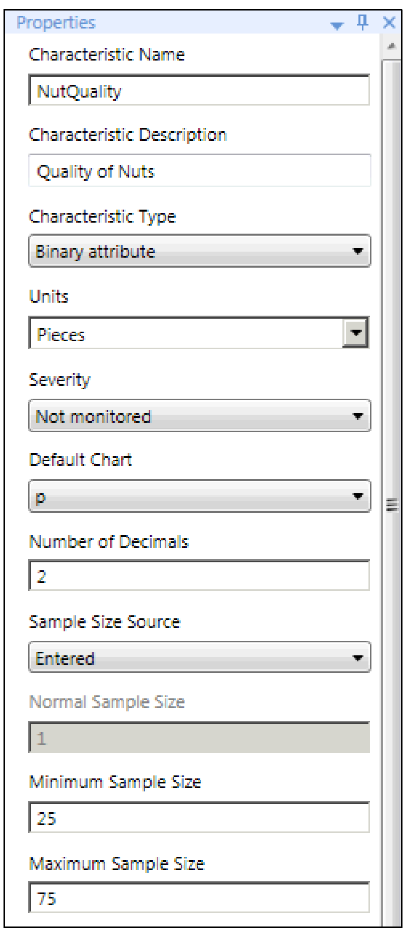
10. Click **OK**.
11. Click **Save All**.

Create the Characteristic

Now, you will define the default statistical chart, unit of measure, and sample size for the nut quality samples.

12. On the **Characteristic Definition** tab, right-click the empty workspace and select **New.**
13. Configure the **Properties** pane as follows:

Characteristic Name:	NutQuality
Characteristic Description:	Quality of Nuts
Characteristic Type:	Binary attribute
Units:	Pieces
Severity:	Not monitored (*default*)
Default Chart:	p (*default*)
Number of Decimals:	2
Sample Size Source:	Entered
Minimum Sample Size:	25
Maximum Sample Size:	75



14. Click **Save All**.

Create the Quality Management Specification

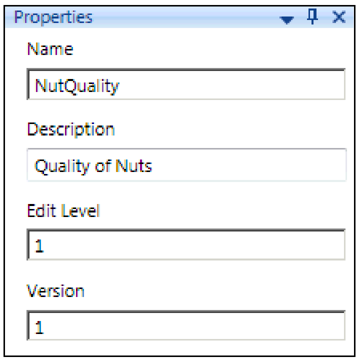
You will now integrate all of the previous configurations together by creating the **QM Specification** for the nut quality samples.

15. On the **QM Specification Definition** tab, right-click the empty workspace and select **New**.
16. Configure the **Properties** pane as follows:

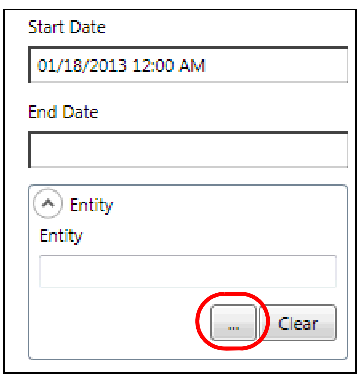
    Name: NutQuality

    Description: Quality of Nuts

    Version: 1

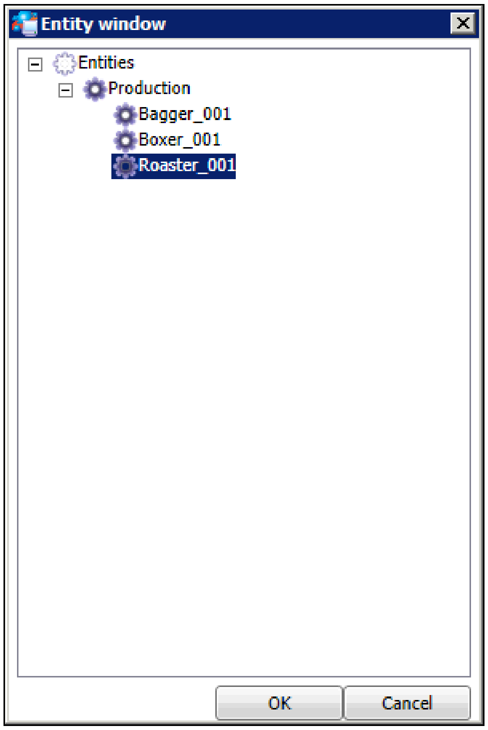


17. In the **Entity** area, click the ellipsis button.



The **Entity window** appears.

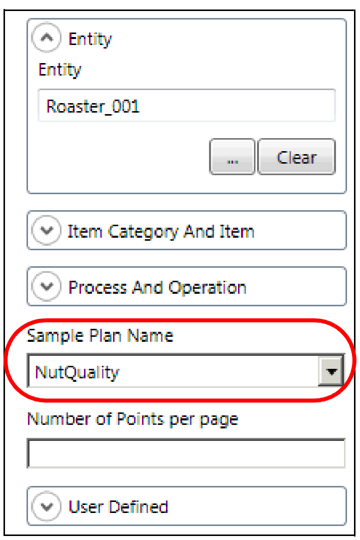
18. Expand **Entities** and **Production**, and then click **Roaster_001**.



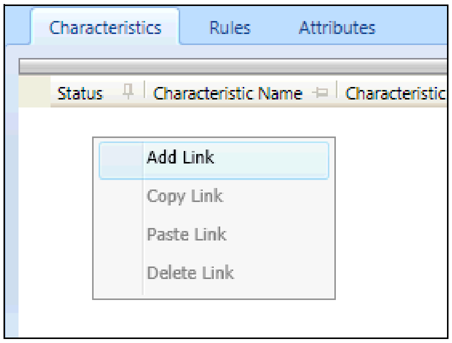
19. Click **OK**.

    In the **Entity** field, **Roaster_001** appears.

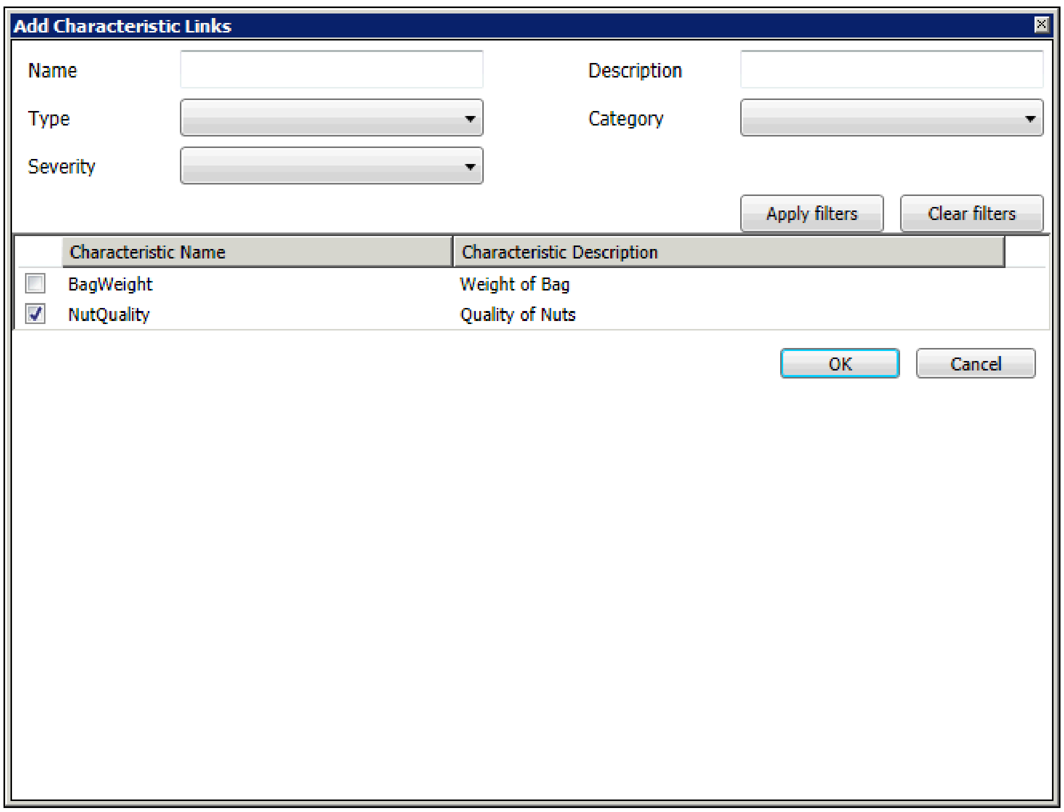
20. In the **Sample Plan Name** drop-down list, click **NutQuality**.



21. On the **Characteristics** tab, right-click the empty workspace and select **Add Link**.



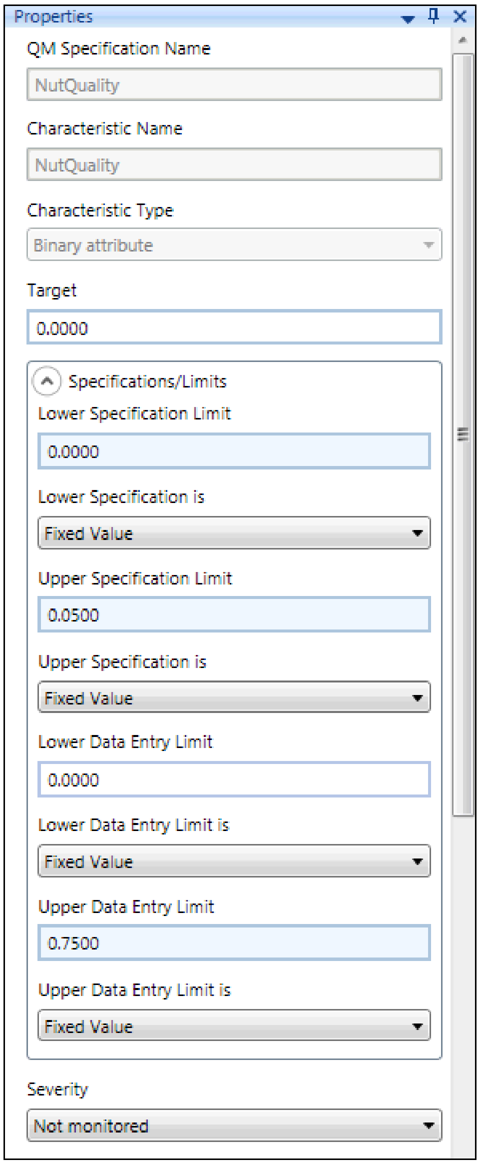
22. In the **Add Characteristic Links** dialog box, click **Apply filters**.
23. In the **Characteristic Name** column, check **NutQuality**.



24. Click **OK**.

25. Configure the **Properties** pane as follows:

Target:	0
Lower Specification Limit:	0
Upper Specification Limit:	.05
Lower Data Entry Limit:	0
Upper Data Entry Limit:	.75



Note: Because this is a binary attribute-type Characteristic, the specification limits are entered as percentages in decimal form.

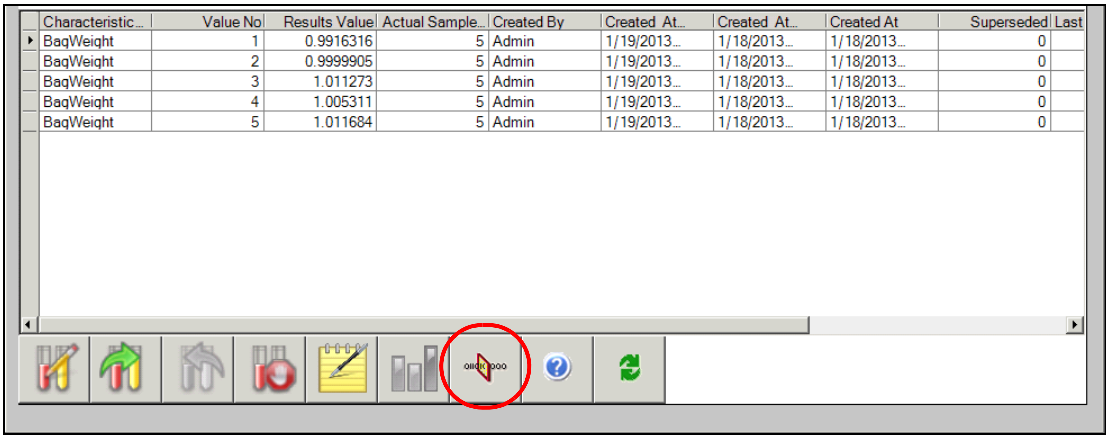
---

26. Click **Save All**.

Enter and Verify the Data in the Sample Viewer Control

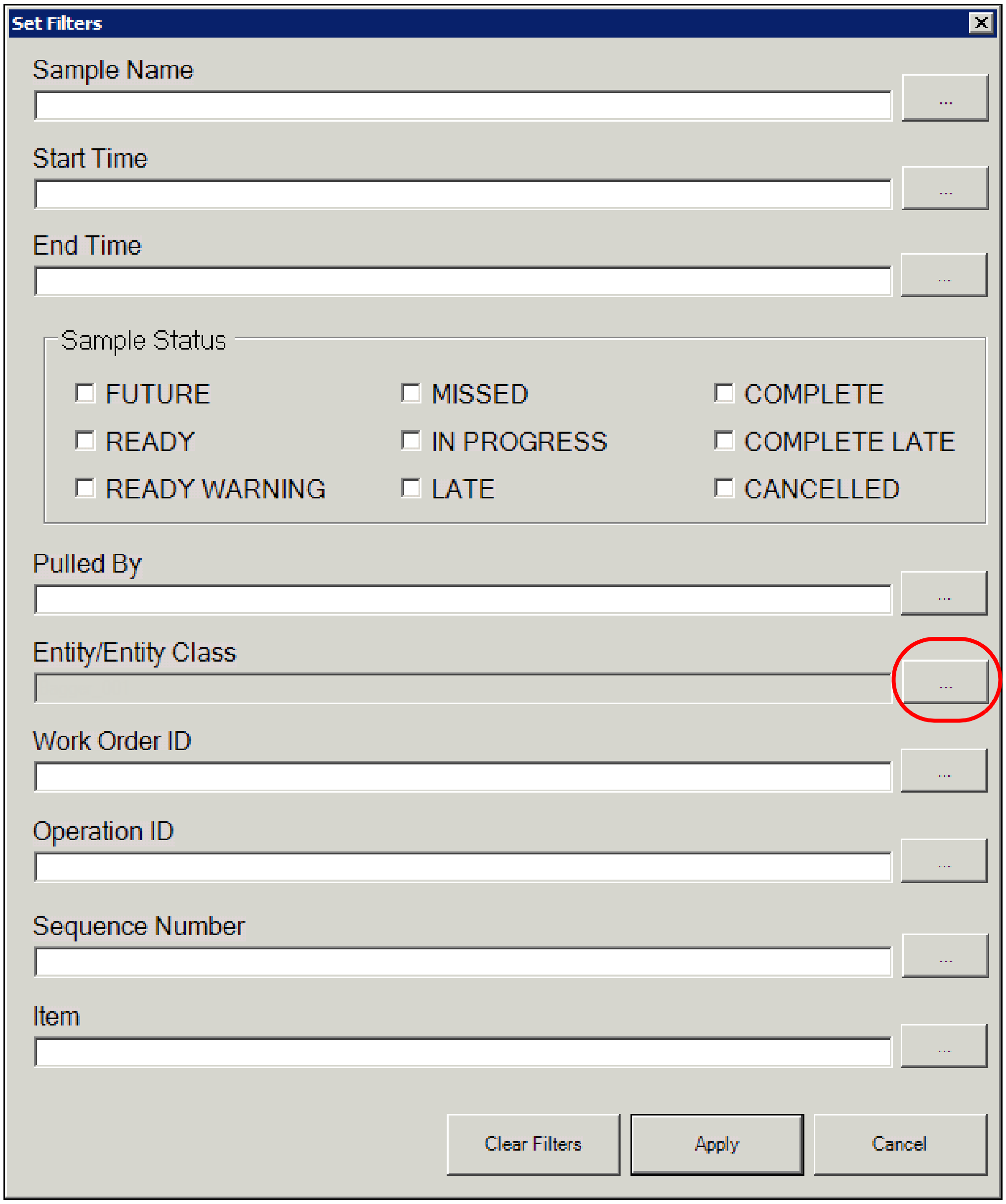
Now, you will enter the nut quality sample data and view the data in the Sample Viewer Control.

27. In WindowViewer, **Sample Viewer** window, click the **Filter** button.



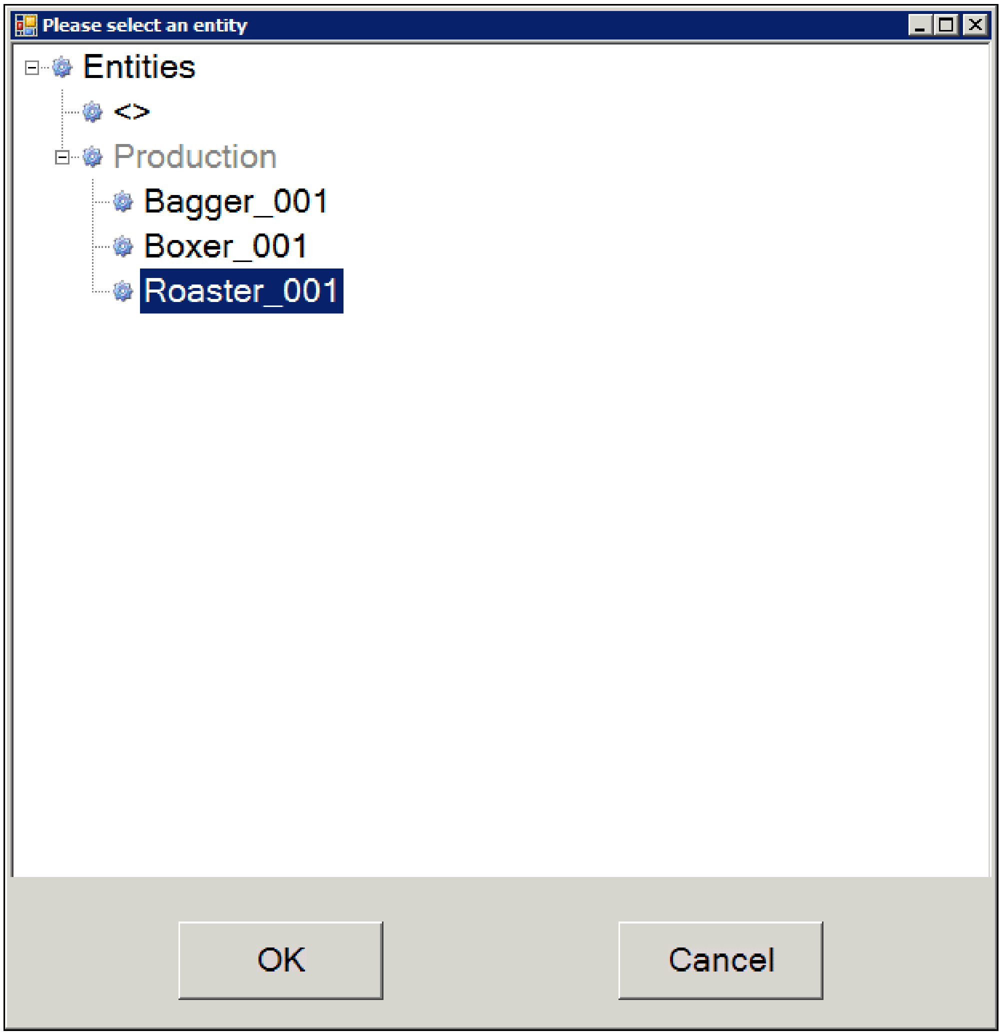
The **Set Filters** dialog box appears.

28. To the right of the **Entity/Entity Class** field, click the ellipsis button.



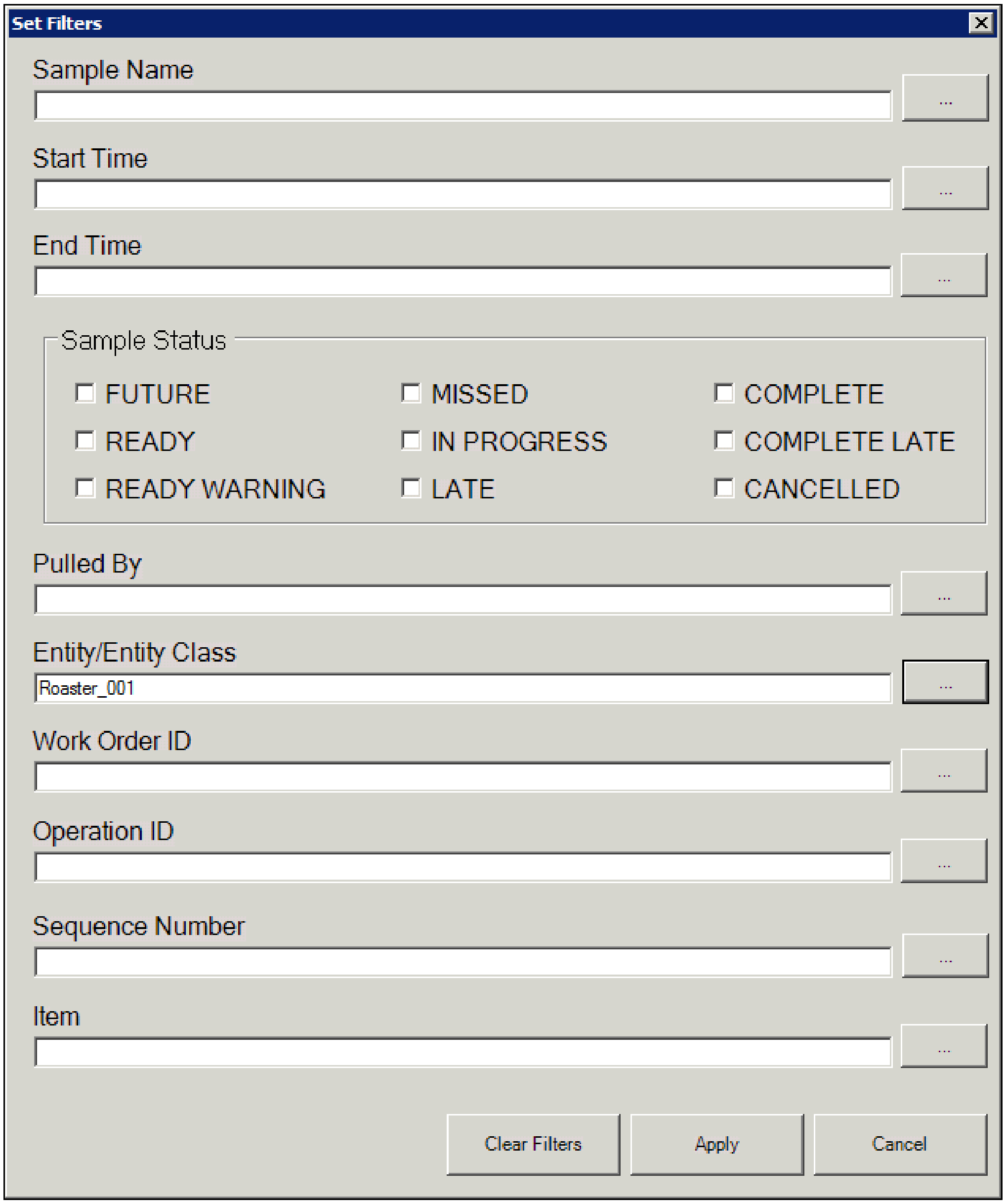
The **Please select an entity** dialog box appears.

29. Expand **Production** and click **Roaster_001**.



30. Click **OK**.

The **Roaster_001** entity appears in the dialog box.

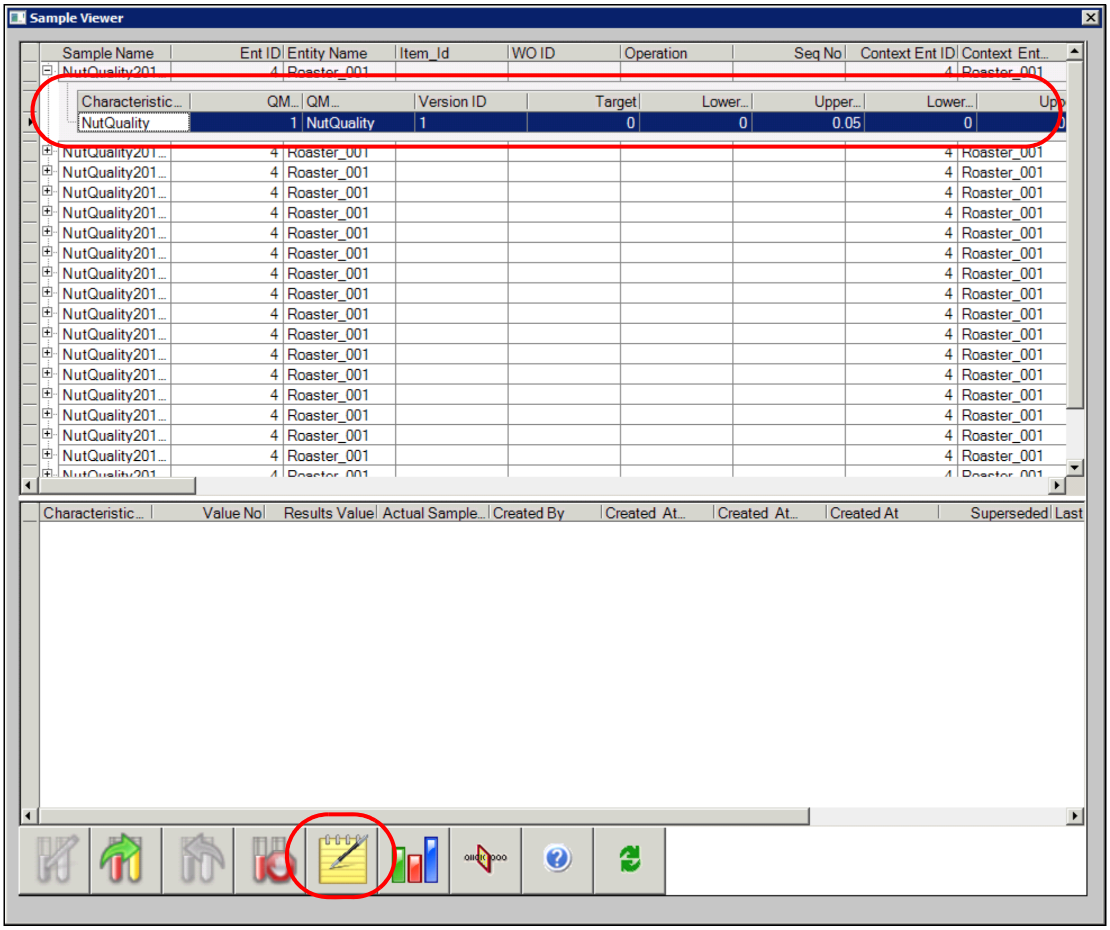


31. Click **Apply**.

The Sample Viewer Control appears and displays all samples, including future samples to the end of the current shift.

32. Expand the first sample and click the **NutQuality** Characteristic, and then click the **Edit Results** button.

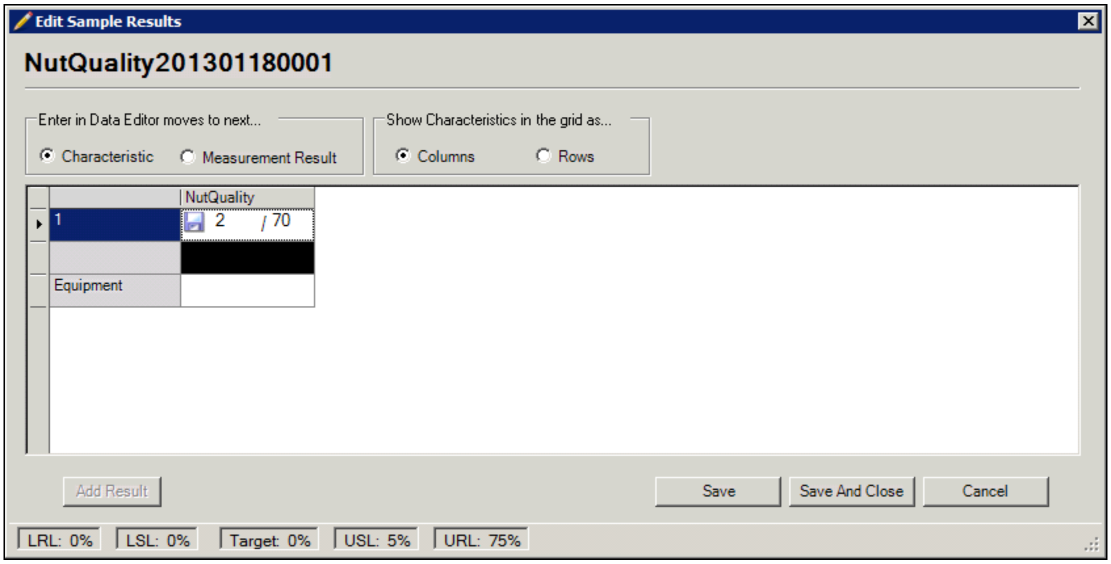
Note: The current sample may not be ready. Check the **Requested Time Local** column to see when the next sample is requested and wait until then to press **Refresh**.



33. In the **Edit Sample Results** dialog box, enter a defective amount of nuts and a total number of nuts sampled, and then press **Enter**.

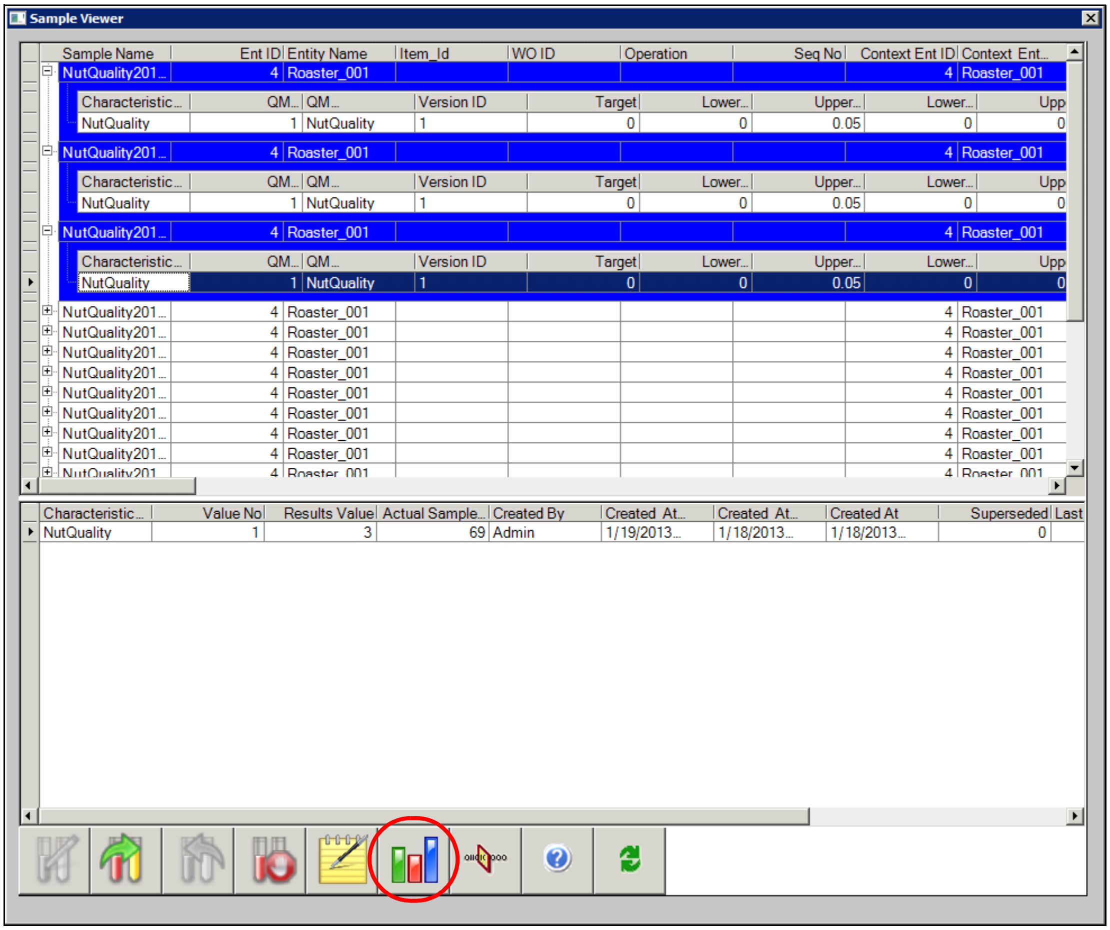
    In this example, there are **2** defective nuts out of a total sample size of **70**.

Note: Recall that the sample size must be between 25 and 75.

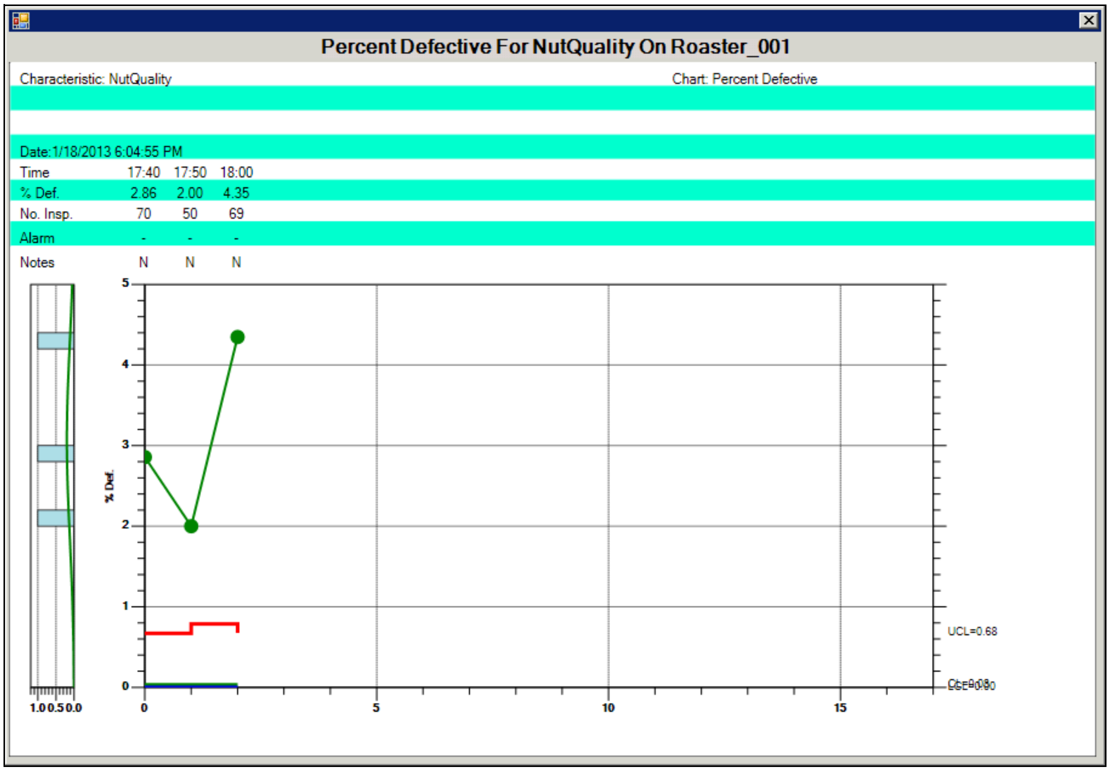


34. Click **Save And Close**.
35. Time permitting, repeat Steps 32 through 34 for more samples.

36. Select one of the dark blue Characteristics and click the **SPC Chart** button.



The control chart appears and displays the percentage of defective nuts for each sample.



37. Close the control chart.

Lab 8 – Creating the Bag Quality Sample Plan

Introduction

In previous labs, you created two Sample Plans using MES Client to check the bag weights and nut quality. In this lab, you will configure another Sample Plan to request bag quality data for 100 samples of 100 bags from the Bagger every shift. You will then record the number of defective bags from each sample, and then enter and view the data in a control chart.

Objectives

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

- Create a Quality Management Specification
- Filter the Sample Viewer Control display

Create the Sample Plan Frequency

First, you will create the **Sample Plan Frequency** to take a sample of the bag quality 100 times during each shift.

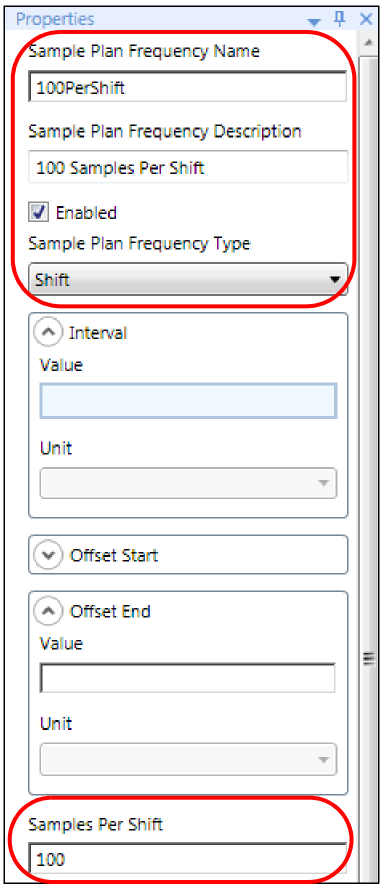
1. In MES Client, on the **Sample Plan Frequency Definition** tab, right-click the empty workspace and select **New.**
2. Configure the **Properties** pane as follows:

   Sample Plan Frequency Name: 100PerShift

   Sample Plan Frequency Description: 100 Samples Per Shift

   Sample Plan Frequency Type: Shift

   Samples Per Shift: 100



Note: In a production environment, the value associated with the **Sample Per Shift** might dramatically impact the performance of your application. Therefore, if you change this value to more than 10 samples per shift, understand its impact on your application. For training purposes, you will set the value to more than 10 samples per shift.

3. Click **Save All**.

Create the Sample Plan

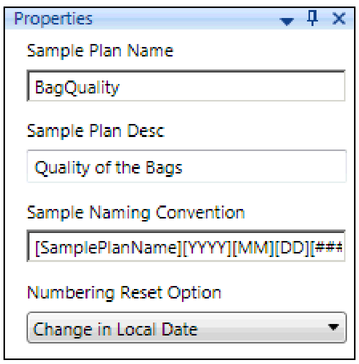
Now, you will establish the naming convention and numbering reset option for the bag quality samples. Then, you will link the **Sample Plan** to the **Sample Plan Frequency** created earlier in this lab.

4. On the **Sample Plan** tab, right-click the empty workspace and select **New**.
5. Configure the **Properties** pane as follows:

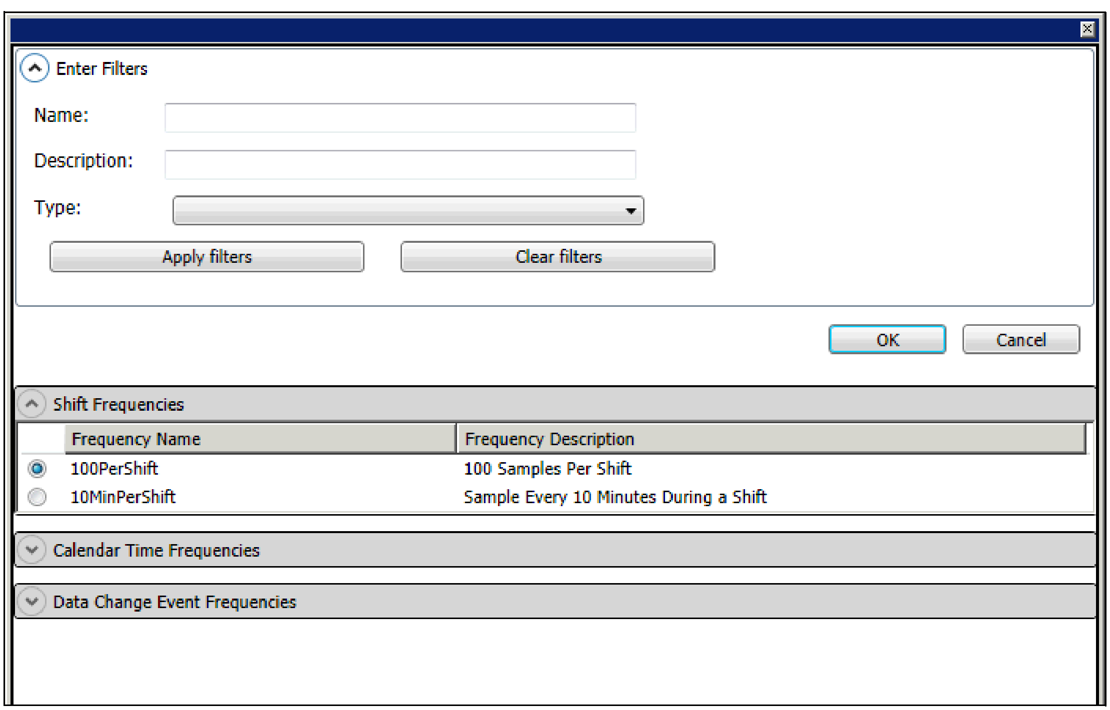
   Sample Plan Name: BagQuality

   Sample Plan Desc: Quality of the Bags

   Numbering Reset Option: Change in Local Date



6. On the **Frequencies** tab, right-click the empty workspace and select **Add Link**.
7. In the **Enter Filters** dialog box, click **Apply filters**.
8. Expand **Shift Frequencies** and click the **100PerShift** option.



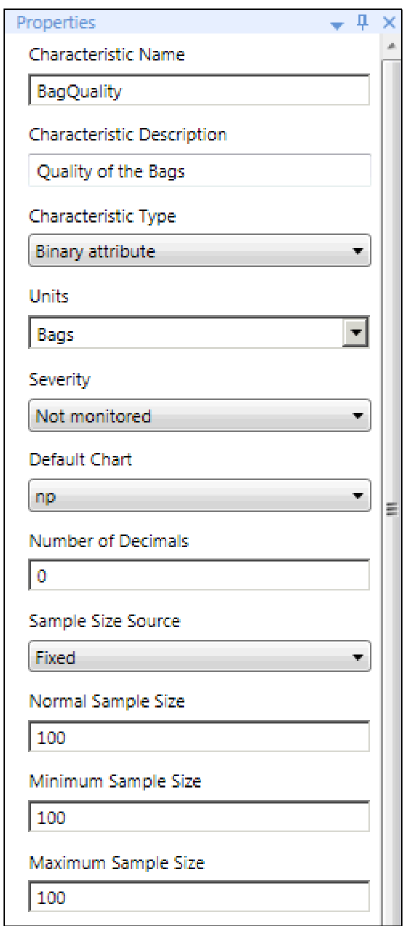
9. Click **OK**, and then click **Save All**.

Create the Characteristic

Next, you will define the default statistical chart, unit of measure, and sample size for the bag quality samples.

10. On the **Characteristic Definition** tab, right-click the empty workspace and select **New**.
11. Configure the **Properties** pane as follows:

Characteristic Name:	BagQuality
Characteristic Description:	Quality of the Bags
Characteristic Type:	Binary attribute
Units:	Bags
Severity:	Not monitored (*default*)
Default Chart:	np
Number of Decimals:	0 (*default*)
Sample Size Source:	Fixed (*default*)
Normal Sample Size:	100
Minimum Sample Size:	100
Maximum Sample Size:	100



12. Click **Save All**.

Create the Quality Management Specification

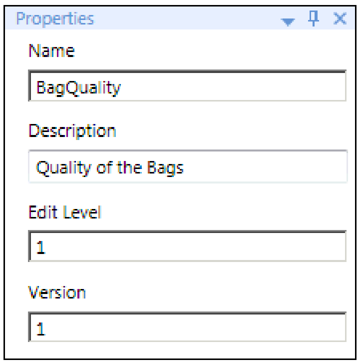
You will now integrate all of the previous configurations together by creating the bag quality **QM Specification**.

13. On the **QM Specification Definition** tab, right-click the empty workspace and select **New**.
14. Configure the **Properties** pane as follows:

    Name: BagQuality

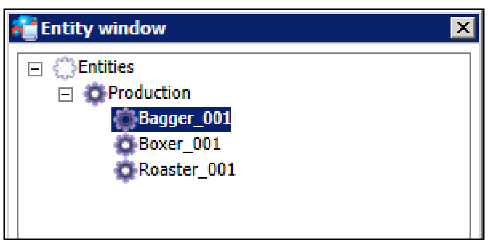
    Description: Quality of the Bags

    Version: 1

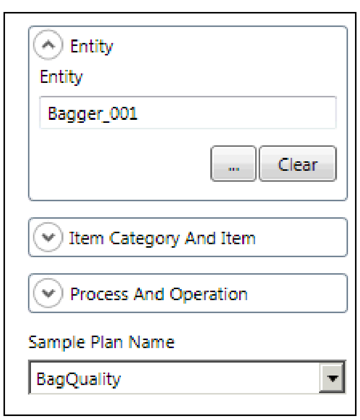


15. In the **Entity** area, click the ellipsis button.

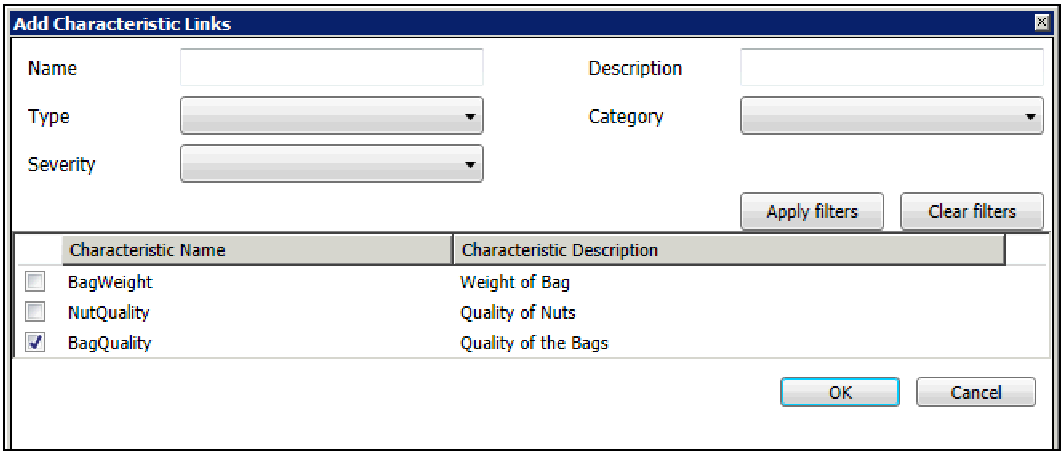
    In the **Entity window** expand Entities and Production, and then click **Bagger_001**.



16. Click **OK**.
17. In the **Properties** pane, **Sample Plan Name** drop-down list, click **BagQuality**.



18. On the **Characteristics** tab, right-click the empty workspace and select **Add Link**.
19. In the **Add Characteristic Links** dialog box, click **Apply filters**.
20. In the **Characteristic Name** column, check **BagQuality**.



21. Click **OK**.

22. Configure the **Properties** pane as follows:

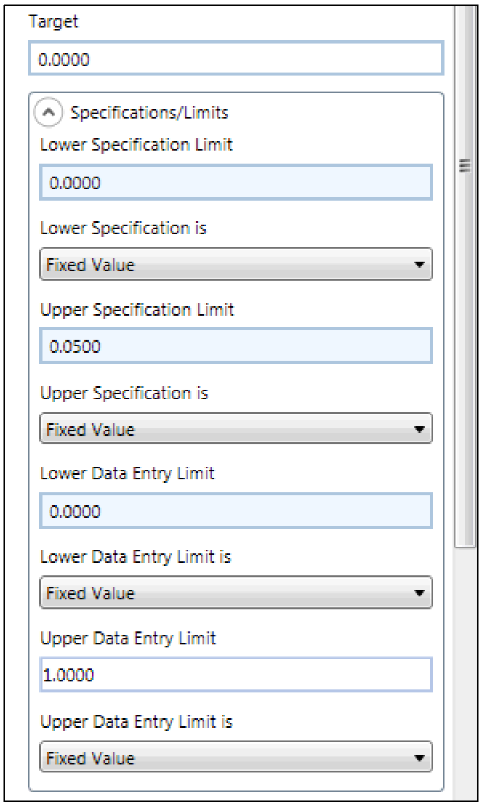
    Target: 0

    Lower Specification Limit: 0

    Upper Specification Limit: .05

    Lower Data Entry Limit: 0

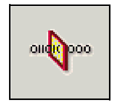
    Upper Data Entry Limit: 1



23. Click **Save All**.
24. Close all open tabs.

Enter and Verify the Data in the Sample Viewer Control

Now, you will enter the bag quality sample data and view the data in the Sample Viewer Control.

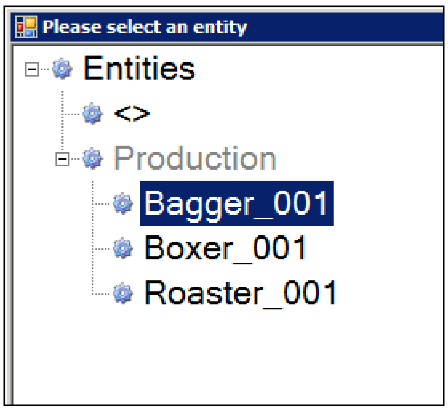
25. In WindowViewer, **Sample Viewer** window, click the **Filter**  button.

    The **Set Filters** dialog box appears.

26. In the **Entity/Entity Class** field, click the ellipsis button.

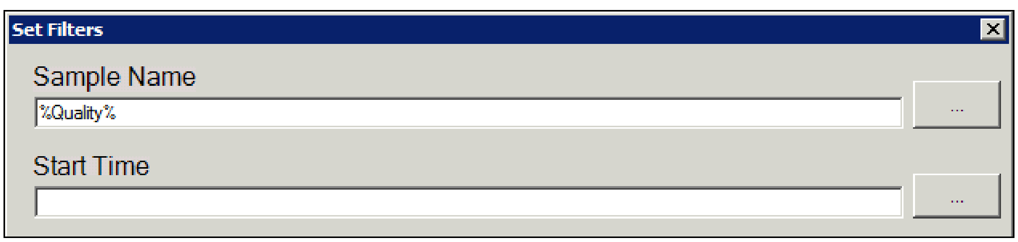
    The **Please select an entity** dialog box appears.

27. Expand **Production** and click **Bagger_001**.



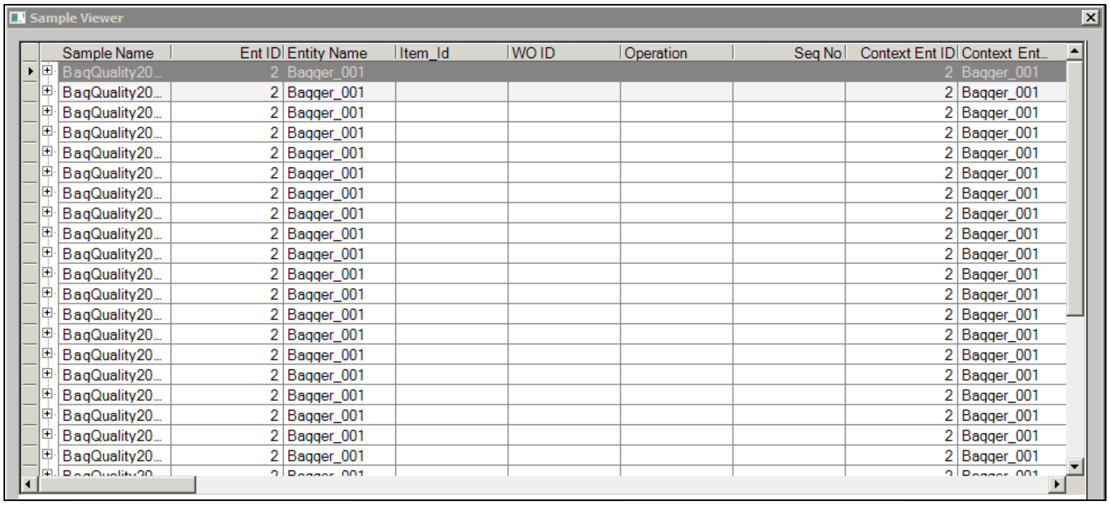
28. Click **OK**.

29. In the **Set Filters** dialog box, **Sample Name** field, enter **%Quality%**.



30. Click **Apply**.

The **BagQuality** samples appear in the **Sample Viewer** window.



You will now enter the number of defective bags found in each sample.

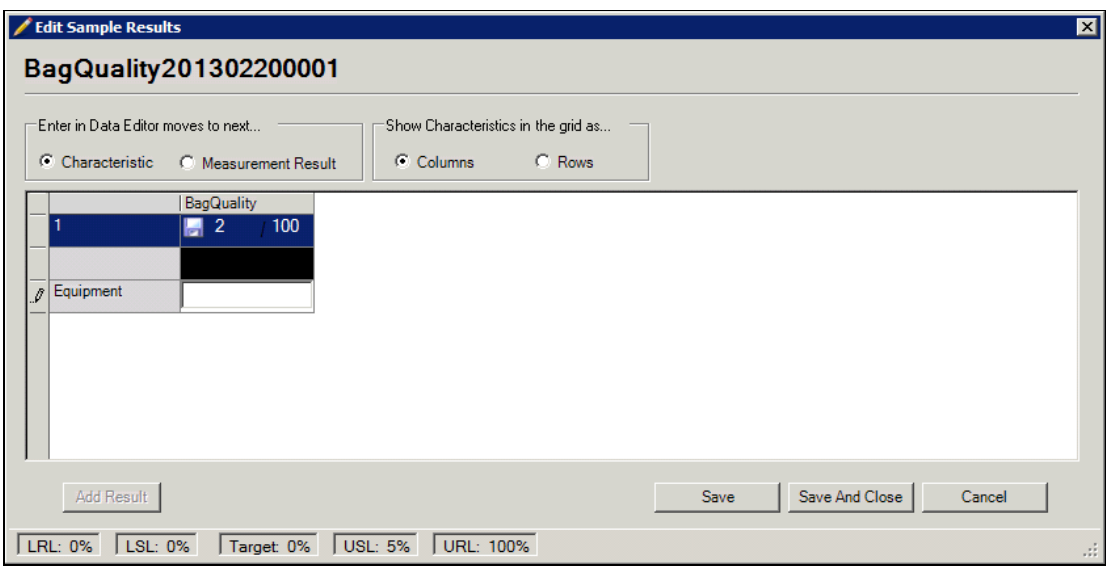
Note: You may have to wait to enter data. Scroll to the right to view the **Requested Time Local** column. This is the time when data can be entered for the given line item.

31. Expand the first sample and click the Characteristic, and then click the **Edit Results** button.

The np chart expects the number of defective bags to be five or less.

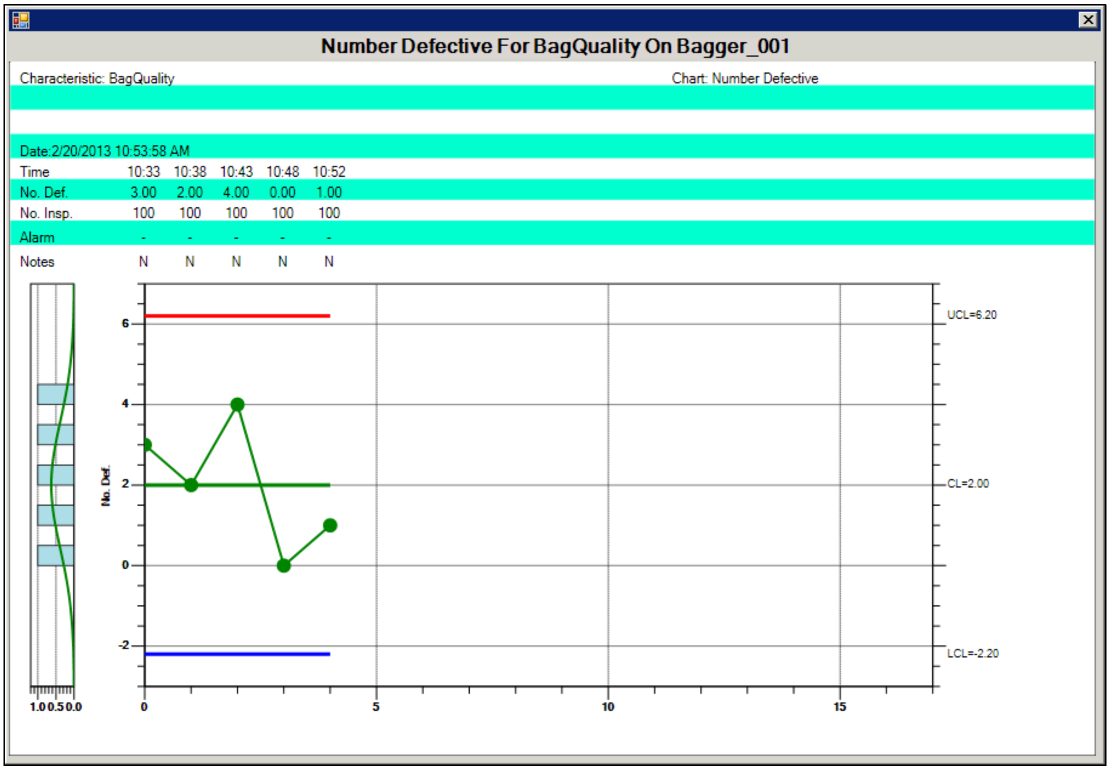
32. In the **Edit Sample Results** dialog box, **BagQuality** field, enter a number between zero and five.

    In this example, there are **2** defective bags out of the **100** in the sample.



33. Click **Save And Close**.
34. Time permitting, repeat Steps 31 through 33 for more samples.

35. Click the **SPC Chart** button to view the data on the chart.



36. When you have completed your data entries, close WindowViewer.

Section 5 – Additional Features of the Sample Recording Object

This section explains how to implement the other features of the Sample Recording Object, including user information, lot identification, and notes.

Overview

This following provides a description of the SRO attributes and graphics, their intended use, how to merge them into your application, and some overview of the scripting.

The MES Software/Quality ArchestrA graphics package provided with this course can also be found on the Wonderware Developer Network (WDN) and are made available as an example of how to interact with the SPC Chart .NET control properties and methods and how to display most of the Sample Recording Object attributes and commands. These graphics are provided as is with no guarantee of future updates to the objects. All of the code within these graphics is exposed and can be modified by the end user.

SRO Attributes

You can configure parameters that are common to the SRO on the **General** tab. The **General** tab contains the following attributes:

- **Response Type**: Specifies whether the calls to the middleware are to be executed synchronously or asynchronously. The values are as follows:
  - **With Response (Synchronous)**: When you select this value, the object waits for a response from the middleware after submitting a request to the middleware to write the data in the MES database
  - **Without Response (Asynchronous)**: When you select this value, a call from the middleware is sent to the message queue, and the object does not wait for a response
- **Default Delay Timer**: Specifies the duration between two consecutive measurement data for a Characteristic within a sample when collecting data automatically from the I/O. The Default Delay Timer value is used only when there is no value available from the MES database.
- **Auto Reset**: Specifies the behavior of the **Status** attribute. If you select this flag, the status attribute is reset to **Ready** after it completes its call to the middleware. This occurs if the result of the last call is successful. Otherwise, the status is reset to **Error**. If you do not select this flag, the **Status** attribute is reset to **Done** after it completes its call to the middleware. This occurs if the result of the last call is successful. Otherwise, the status displays **Error**. If the object has to execute another command, you must set the status to **Ready** in the code manually by using the **Reset Command**.

The **Sample** tab within the SRO is used for interacting with samples associated with the entity, which is a part of the SRO instance. At any given time, an entity can be associated with more than one active sample. Each monitored sample provides attributes, such as **Lot** and **Sublot** for writing the contextual data that can be changed for a sample.

You can also configure the following on the **Sample** tab:

- Data to be recorded for samples
- Commands to execute the recording of the data
- Number of samples to monitor at runtime

The **Sample Data Attribute** group is a collapsible pane and contains the following attributes:

- **Number of Recent Samples to View**: Specifies the number of recent samples that can be viewed at a given time. The minimum number you can view at a given time is 1, and the maximum is 20. When you increment this setting, the SRO generates 23 object attributes (RecentSample[N].XXX) to store information about the sample at runtime.
- **Sample ID**: Specifies the ID (an integer) of the sample for which the data is to be recorded in the MES database
- **Segment Requirement**: Specifies the S95 segment requirement value for the sample
- **Segment Response**: Specifies the S95 segment response value for the sample
- **Lot**: Specifies the lot number for the sample
- **Sublot**: Specifies the sublot number for the sample
- **Operator**: Specifies the user/operator who pulls the sample from the production line or finalizes the sample
- **Final**: Specifies a boolean value that indicates whether the sample data is final or not. After a sample is marked as final, the data and results for all the Characteristics cannot be modified.
- **Priority**: Specifies an integer value that identifies the priority for the sample
- In the **Spare1**, **Spare2**, **Spare3**, and **Spare4** boxes, type additional information, if any

The **Event Data** group specifies the date and time when the sample is pulled or finalized. This is a collapsible pane. You can do either of the following:

- Map the attribute to an I/O tag to read the value from it
- Check the **AutoGenerate** check box to automatically generate a date and time value in the object

The **Characteristics** tab within the SRO is used for interacting with the Characteristic results within a sample associated with the entity that is a part of the SRO instance. Any given sample can have more than one Characteristic to capture. The SRO can be configured to monitor multiple Characteristics at a time and to interact with the samples. Each Characteristic is monitored to do the following:

- Provide attributes for writing the contextual data that can be changed, such as notes and causes
- Provide **ReadOnly** attributes for fixed data, such as statistical results
- Provide attributes for writing Characteristic results

Characteristics may be captured automatically from an I/O source and may contain multiple measurements.

The **Characteristic Data** group is a collapsible pane and contains the following attributes:

- **Sample ID**: Specifies the ID of the sample record generated for the Characteristic which is to be recorded in the MES database
- **Can Collect Result Data**: Specifies whether the SRO can collect measurements for a Characteristic at runtime. If the status of this attribute is set to **False**, the measurement data for the Characteristic is not collected at runtime.
- **Can Collect Automatic Data**: Specifies whether the Characteristic should always collect automatic data, never collect automatic data, or use the specification configuration for a sample to determine whether it should collect automatic data at runtime. If the status of this attribute is set to **Never**, no automatic measurements are collected for the Characteristic. If the status of this attribute is set to **Always**, the Characteristic collects automatic measurements. If the status of this attribute is set to **Use Configuration**, the automatic data is collected during runtime, depending on the Characteristic and the QM specification that is used to generate a sample.
- **Delay Timer**: Specifies a value that identifies the time interval between each measurement data for a variable Characteristic. If there is a non-null value for the Characteristic's delay timer setting in the database, the attribute contains a default value from the MES database. You can change the default value in the **Configuration Editor**. This attribute is used when the status of the **Can Collect Automatic Data** is set to **Always** or **Use Configuration**, and there are more than one measurement per sample for the variable Characteristic. This setting does not apply to attribute Characteristics.
- **Note**: Specifies any additional information that you want to record in the MES database for the Characteristic within the specified sample
- **Cause Group**: Specifies a cause group for the Characteristic within the specified sample
- **Cause**: Specifies a cause for the sample Characteristic within the specified sample
- **Equipment**: Specifies a string that indicates the equipment used to measure the sample Characteristic data
- **Expose Statistics**: Specifies a boolean value that indicates whether the statistic object attributes for the Characteristic are exposed at runtime. If you enable this setting, many additional object attributes are exposed at runtime. The object attributes are updated when results are recorded.
- **Operator**: Specifies a value that identifies who measured the sample Characteristic. The user name provided does not have to be an MES user
- **Value Number For Result Attributes**: Specifies a value number that identifies the measurement data for the Characteristic sample. This identifies the particular measurement value (result) within a subgroup for which the result MES attributes are to be updated. For ungrouped variables (individuals) and attributes, the value number is always 1.

The **Result Data** group is a collapsible pane that provides fields for configuring multiple measurements for a sample for a variable Characteristic. It is initially populated with as many values as the normal sample size for the Characteristic. If the Characteristic is attached to one or more QM specifications, the QM specification with the highest normal sample size value (that is not null) is used. The maximum number of result attributes for a variable Characteristic is 99.

The **Result Data** group contains the following attributes:

- **ValueNumber.Value**: Specifies a value that is measured for the sample Characteristic. This exists only if the Characteristic type is binary or counted.
- **ValueNumber.ActualSampleSize**: Specifies the actual sample size for the sample Characteristic. This exists only if the Characteristic type is binary or counted.
- **Sample Size**: This is a display-only property that has a count of the number of result data entries time by adding or removing result data attributes. The sample size increments each time a new result data entry is added to the list (up to a maximum of 99) and decrements each time a result data entry is removed. The sample size does not represent on the normal or maximum sample size of the Characteristic or on the QM specification-linked overrides. It represents the maximum number of results that can be recorded at a time for a particular Characteristic. For example, if the desired sample size is 20, but there are only 5 devices to measure the Characteristic, each sample will be read in 4 sets of 5, and only 5 result data entries will be used (one to each tag that connects to a measuring device).

Sample Recording Object Graphics

The graphics package provided with this course contains six graphics for the SRO and an SPC Chart control. The details of the SPC Chart control are covered on page page 5-3.

Of the six SRO graphics, four are available as top level graphics to be added to a SRO and the remaining two are embedded in two of the top level graphics. The graphics relate to the properties available within the SRO. There is a graphic for the properties and commands available on the **Sample** tab of the object. There is a graphic for the Recent Sample properties that get exposed when the number of recent samples property on the **Sample** tab equals one or more. There are two graphics for the properties shown in the **Characteristic** tab. The first is for the properties at the Sample Characteristic level and the second is for recording results for the Characteristics within a sample.

These graphics are provided as independent graphics (symbols) when imported. However, they must be associated with a SRO to work correctly at runtime. The recommendation is to derive a master SRO template from the base SRO. The first step is to open your master SRO template, go to the **Graphics** tab, and add graphics that embed the provided symbols (QualitySamplePanel, QualityRecentSamplePanel, QualitySampleCharPanel, and QualityRecordDataPanel). You can choose to either create separate graphics (one for each of the four mentioned), or create one large graphic containing all four.

Quality Sample Panel

This graphic presents most of the properties and all the commands that are available on the **Sample** tab within the SRO. The graphic is designed with the expectation that none of the properties within the **Sample** tab have been mapped to an input source. It also assumes that the **Event Date Time** is marked for auto-generation as this property is not exposed in the graphic.

Design

The fields in the graphic have a User Input link to the corresponding SRO attribute through a link to me.sample.xxx, where xxx is the property name. If the SRO has an input source for any of these properties, the user will not be able to change the value at runtime as it will come from the mapped input source and not the input from the screen.

The commands write to the corresponding command attribute and to the right of the command is an indicator that shows the status of the command. If there is an error in issuing a command, the error will be displayed in the error message box. If there is an error (or if the SRO is not configured to auto-reset the object), the reset command can be called by clicking the reset button next to the error message.

Runtime

At runtime, the Sample ID must be set first to indicate what sample record is to be updated by the command. The Sample ID can be any valid sample in the database and does not have to be a sample that exists for the entity containing the SRO.

Fill in any of the other fields. There is no data checking on any of the fields including the Operator. The Operator does not have to be a valid MES User as this is a string value that gets recorded in the database. If user validation is desired, additional scripting will be required to log on the user with the stateless API.

The **Record Sample Data** button will update the sample with the provided Lot, Sublot, Segment Requirement ID, Segment Response ID, Priority, and Spare 1 values. If the Operator string is provided, then the **Record Sample Data** button will also mark the sample as Pulled by the operator at the current time.

The **Finalize Sample Data** button will toggle the final flag on the sample based on the setting of the **Finalize Sample** check box. It will fill in the **Finalized by** field with the name of the Operator provided and use the current time.

The **Clear** button will clear out all the values except Sample ID and Operator.

The **R** button next to the error message will reset the command group. If there is an error in the error message box, the sample group must be reset before calling another command. If the SRO is not configured to auto-reset the object, the sample group must be reset before calling another command.

Quality Recent Sample Panel

This graphic represents the attributes that get enabled when the **Number of Recent Samples to View** setting on the **Sample** tab in the SRO is set to one or greater. The graphic displays most of the attributes with the exception of the Characteristic names list (which is used in later graphics), the spare fields, and the enumeration numbers.

Design

The fields in the graphic have a Value Display link to custom properties that link to the corresponding SRO attribute through scripting. Initially, the custom properties map to me.RecentSample01.xxx, where xxx is the corresponding object attribute.

If the SRO has more than one recent sample exposed, then the **Next** and **Previous** buttons will move through the exposed RecentSampleYY attributes. The script does check the RecentSample.NumberofRecentSamplesToView property to know when it has hit the end of the list and restart at one. There is also an entry field to provide a specific Recent Sample group and use the **Refresh** button to get the values. All the buttons scripts make use of the SetCustomPropertyValue script function to redirect the custom properties in the graphic to the correct SRO attributes.

The Find Current Sample script cycles through all the RecentSampleYY.RequestedTime attributes to find the most current one. This script may need to be called twice when the graphic is first opened to allow time for all the attributes to be bound by the graphic.

Runtime

At runtime, this is a display only graphic. It initializes with the RecentSample01 attributes displayed.

The **Previous** and **Next** buttons are used to navigate through the exposed recent sample attributes.

The Find Current Sample is used to locate the Recent Sample with the most current Requested Time. When the graphic is first opened, this button will likely need to be pressed twice to bind to all the Requested Time attributes.

The **Refresh** button will read data from the provided recent sample object number which can be entered in the field to the left of the button. If the value provided is not a valid recent sample attribute, the script will read the largest available group.

The **R** button next to the error message will reset the command group. If there is an error in the error message box, the recent sample group must be reset before it will receive updates.

Quality Sample Characteristic Panel

This graphic represents the Characteristic data group of attributes that are enabled when Characteristics are added on the Characteristic tab in the SRO. The graphic is designed with the expectation that none of the properties within the **Characteristic** tab, **Characteristic Data** group, have been mapped to an input source. The graphics have some additional limitations for those Characteristics marked for automatic data collection. The graphic is designed to be used for all the Characteristics within the SRO but only one Characteristic at a time.

Design

The fields in the graphic have a User Input link to custom properties that correspond to the SRO attributes for the Characteristics. If the SRO has an input source for any of these properties, the user will not be able to change the value at runtime as it will come from the mapped input source and not the input from the screen.

The graphic has an on show script to populate the list box with the names of the Characteristics added to the SRO and contained in the SelectedCharNames object attribute. This will be the names exposed in the object and not necessarily the Characteristic name defined in the MES database as there are some restrictions in object attribute naming within ArchestrA. For example, if the MES Characteristic name has a space in the name, the object attribute will replace the space with an underscore. The list box in the graphic will show the ArchestrA object name with the underscore.

The graphic has a second script on data change of the selected Characteristic from the list box that calls SetCustomPropertyValue to direct all the custom properties to the corresponding Characteristic's object attributes. This includes an object attribute that contains the MES Characteristic name.

The graphic has a button script to clear all the values in the custom properties except the Sample ID and Operator.

The graphic has a **More Info** button that calls Show Graphic on the Quality Characteristic Output graphic and sends the name of the selected Characteristic from the list box to the Quality Characteristic Output graphic.

The **Record Sample Char Data** button writes to the corresponding command attribute and to the right of the command is an indicator that shows the status of the command. If there is an error in issuing the command, the error will be displayed in the error message box. If there is an error (or if the SRO is not configured to auto-reset the object), the reset command can be called by clicking the reset button next to the error message.

Runtime

At runtime, this graphic initially opens up with no Characteristic selected. It will populate the list box with the available Characteristics defined on the SRO.

To begin using the graphic, select one of the Characteristics in the list box which will map all the inputs to the appropriate custom properties and will display the MES Characteristic name.

The Sample ID must be set to indicate what sample record for the selected Characteristic is to be updated by the command. The Sample ID can be any valid sample in the database that contains the selected Characteristic and does not have to be a sample that exists for the entity containing the SRO. If the Characteristic selected is marked for automatic data collection in the SRO, then the Sample ID cannot be changed and will always be set to the most recent sample ID for the Entity and Characteristic. This is because the SRO constantly updates this property for automatically collected Characteristics.

The **Record Sample Char Data** button will update the sample Characteristic record with provided information. The Operator field is not used with this command as it is for recording results.

The **Clear** button will clear out all the values except Characteristic, Sample ID, and Operator.

The **R** button next to the error message will reset the command group. If there is an error in the error message box, the sample Characteristic group must be reset before calling another command. If the SRO is not configured to auto-reset the object, the sample Characteristic group must be reset before calling another command.

The **More Info** button will show additional information about the selected Characteristic. Please refer to the next section on the Quality Characteristic Output graphic.

Quality Characteristic Output

This graphic displays additional Characteristic attributes which are read from the configuration within the MES database. The graphic displays most of the attributes with the exception of the enumerations. It also displays the current control rule violations string which lists all SPC Control Rules evaluated for the most recent sample.

There is an On Show script that calls SetCustomPropertyValue to direct all the custom properties to the corresponding Characteristic's output object attributes. All the display fields have value displays to the custom property.

Quality Record Data Panel

This is the most complex graphic in the group and is built as an example of constructing a custom interface for manually entering in results similar to what is available in the Sample Viewer control. This graphic displays up to five Characteristics with up to five measurement results per Characteristic. It uses the number of results exposed for each Characteristic as defined in the SRO Characteristic tab under the Result data group. The graphic is designed with the expectation that none of the Characteristics are marked for automatic data collection. The exposed results in the SRO can be mapped to an input source but this is not necessary. The graphic is designed to handle both variable and attribute Characteristics.

The graphic is designed to be as flexible as possible so that it will work no matter how the SRO is implemented. It is possible that an SRO has many Characteristics exposed, but any specific sample will only contain a subset of those. For each Characteristic, the SRO may expose only one result attribute even though the sample requires multiple measurements per sample (typically an automatically collected variable). The graphic is limited to five Characteristics and five measurements per Characteristic, but the design and scripting can be modified to accommodate more.

Design

The graphic embeds five copies of the Quality Variable graphic which is described in the next section. These have a visibility link to only show them if there are enough Characteristics within the RecentSample01 Characteristic list.

There are five custom properties each for sample size and type as these are needed to determine how many bindings to do on the embedded Quality Variable graphics. More custom properties will need to be added to manage more input fields.

The graphic has an on show script to prepare the graphic for initialization. This script sets the Sample ID displayed on the screen to the RecentSample01.SampleID. The script also goes through the list of SRO Characteristic names (me.SelectedCharNames) and binds to the Characteristic's MES name with the SetCustomPropertyValue() script. The script also retrieves the list of MES Characteristics from the RecentSample01.CharacteristicNames object attribute and goes through the list (up to five) and binds the sample size and type custom properties with the SetCustomPropertyValue() script. This is necessary as it takes time for ArchestrA to bind to these values. The binding is done in the On Show script and another button script then uses all these values.

The **Initialize** button calls a script that completes all the bindings for the embedded Quality Variable graphics. The script starts the same as the On Show script to get the list of Characteristics exposed on the SRO and to get the list of Characteristics in RecentSample01. Depending if the Characteristic is a variable or attribute Characteristic, the script binds the appropriate custom properties in each of the embedded Quality Variable graphics. The script only binds the number of result values exposed for the variable Characteristics and binds the two result values for attribute Characteristics. For attribute Characteristics, the script does not bind reasonable limits or specification limits as it does for variable Characteristics. The script also counts how many Characteristics there are to enable the visibility of the Quality Variable graphics.

The Sample ID user input field initially is set to the RecentSample01.SampleID, but can be changed. When it is changed, then a data change script will run to propagate the Sample ID to all the Quality Variable graphics and to try to find the sample name from the recent samples exposed in the SRO If not found, the value display for the Sample Name will point to the highest recent sample on the object.

The Operator user input field will trigger a data change script to propagate the Operator to all of the Quality Variable graphics. The Operator is also displayed in the Quality Sample Characteristic Panel.

The **Save All** button calls a script that triggers a save on all the embedded Quality Variable graphics through the RecordResultDataCmd custom property on each of the embedded graphics.

All the errors from the embedded graphics are concatenated together in the error text box. If there is an error (or if the SRO is not configured to auto-reset the object), the reset command can be called by clicking the reset button next to the error message. This is sent to all the Characteristics.

Runtime

At runtime, this graphic initially opens up with no Characteristic data entry fields available. The initialization script will have completed and will show the Sample ID of the RecentSample01.SampleID (which may not be the most recent sample if more than one recent sample group is exposed).

To begin using the graphic, click the **Initialize** button which will map all the inputs to the appropriate custom properties of up to five Characteristics. The Characteristic name, unit of measure and up to five input fields will be shown for each Characteristic and a save button.

The Sample ID must be set to indicate what sample record for the Characteristics is to be updated by the record results command. The Sample ID can be any valid sample in the database that contains the same list of Characteristics and does not have to be a sample that exists for the entity containing the SRO. If any of the Characteristics have all the results collected (number of results is equal to the maximum sample size), then no new data can be recorded for the Characteristic.

Enter in values for the result fields and click the **Save** button for each Characteristic. For attribute Characteristics, the first value is the count of defects and the second value is the number of samples tested. For variable Characteristics, the input field will limit the value to between the upper and lower reasonable limits and will display in red if the value is outside the upper and lower specification limits.

The **Save All** button records the data for all the Characteristics at one time; there is no need to use the **Save** button for each Characteristic.

Quality Variable

This graphic is used by the Quality Record Data Panel to provide up to five input fields for recording results against a Characteristic. It consists of many custom properties that are set from the Quality Record Data Panel graphic.

At the top are two value displays for the Characteristic name and the unit of measures.

There are five user input fields to manage recording up to five results at one time. These have visibility links to hide those input fields that are not required based on the number of result attributes exposed in the SRO. For variable Characteristics, the number of exposed results is in the SampleSize property while attribute Characteristics always expose two results with a different name as described in the Quality Record Data Panel graphic. The text of the input field will also change to red if the value entered is outside the specification limits for the Characteristic (this only applies to variable Characteristics).

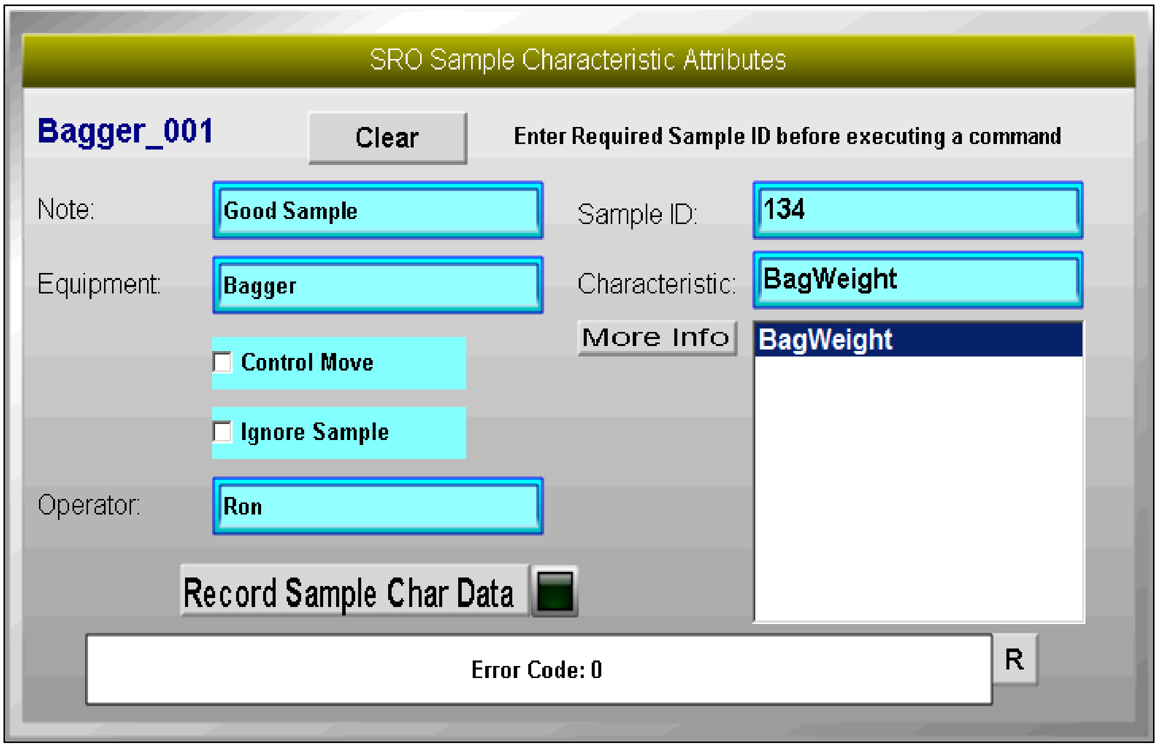
The **Save** button triggers the record result data command for the Characteristic.

Lab 9 – Exploring the Additional Features of the SRO

Introduction

In this lab, you will import the graphics that can be used to visualize and interact with the Sample Recording Object (SRO). The InTouch application will be used to interact with the SRO and to add additional Sample and Characteristic data.

This is not part of the default installation. Go to the Wonderware Developer Network (WDN) to download these graphics, as they could be updated.



Objectives

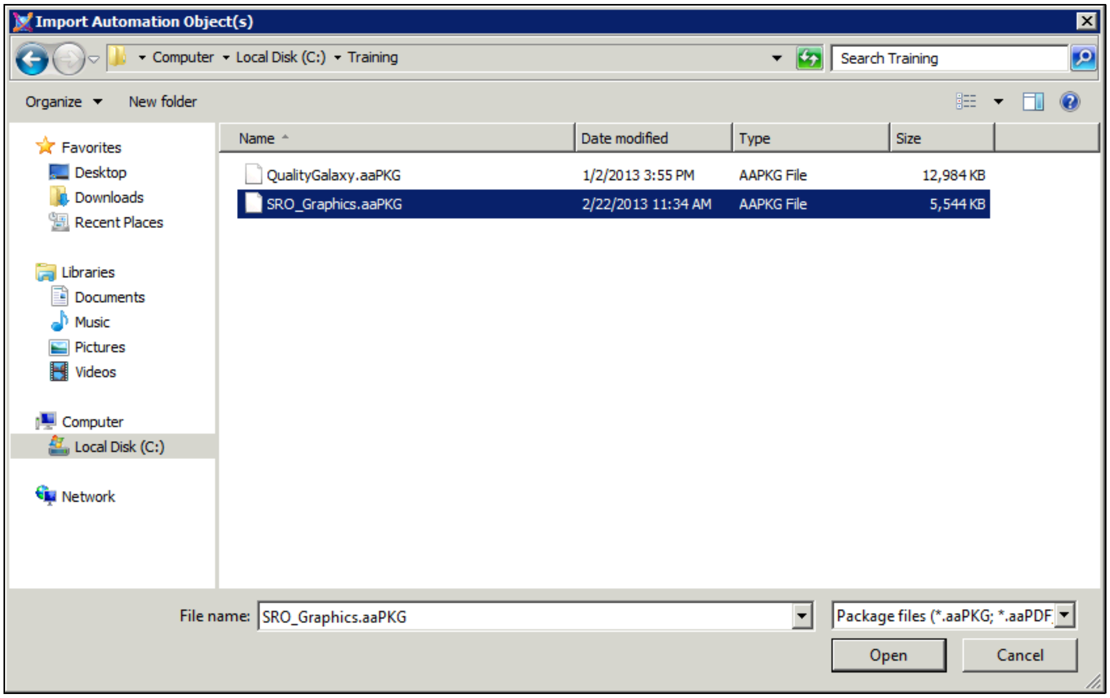
Upon completion of this lab, you will be able to:

- Import the ArchestrA graphics for the SRO
- Configure the SRO template to use the SRO graphics
- Embed the SRO graphics in InTouch
- Enter values through the graphics that are recorded in the SRO

Import the SRO Graphics

First, you will import the graphics needed to configure the SRO template.

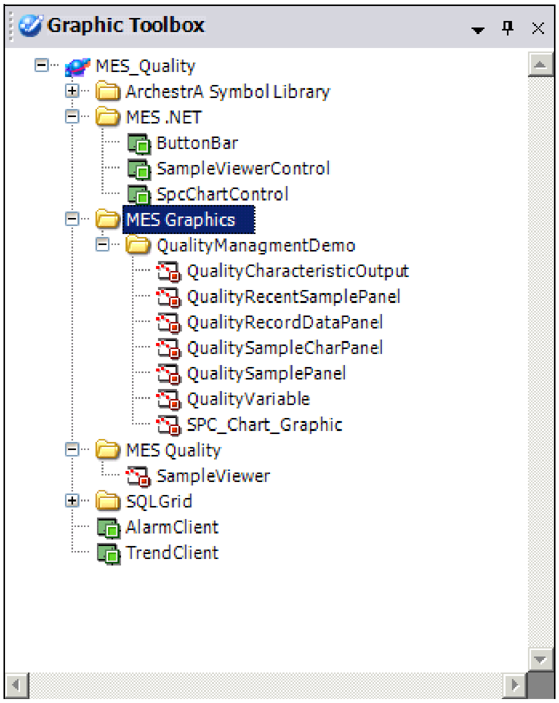
1. In the ArchestrA IDE, on the **Galaxy** menu, click **Import | Objects**.
2. In the **Import Automation Object(s)** dialog box, navigate to **C:\Training**, and then click **SRO_Graphics.aaPKG**.



3. Click **Open**.
4. In the **Import Preferences** dialog box, leave the defaults and click **OK**.
5. When the **Import Automation Object(s)** progress displays **Import completed**, click **Close**.

6. In the **Graphic Toolbox**, expand **MES Graphics** and **QualityManagmentDemo**.

   The imported graphics are displayed.



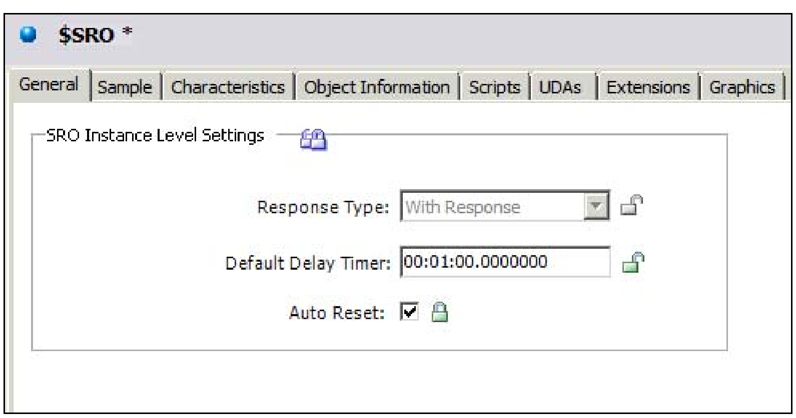
Configure the SRO

You will now use the imported graphics to configure the SRO template.

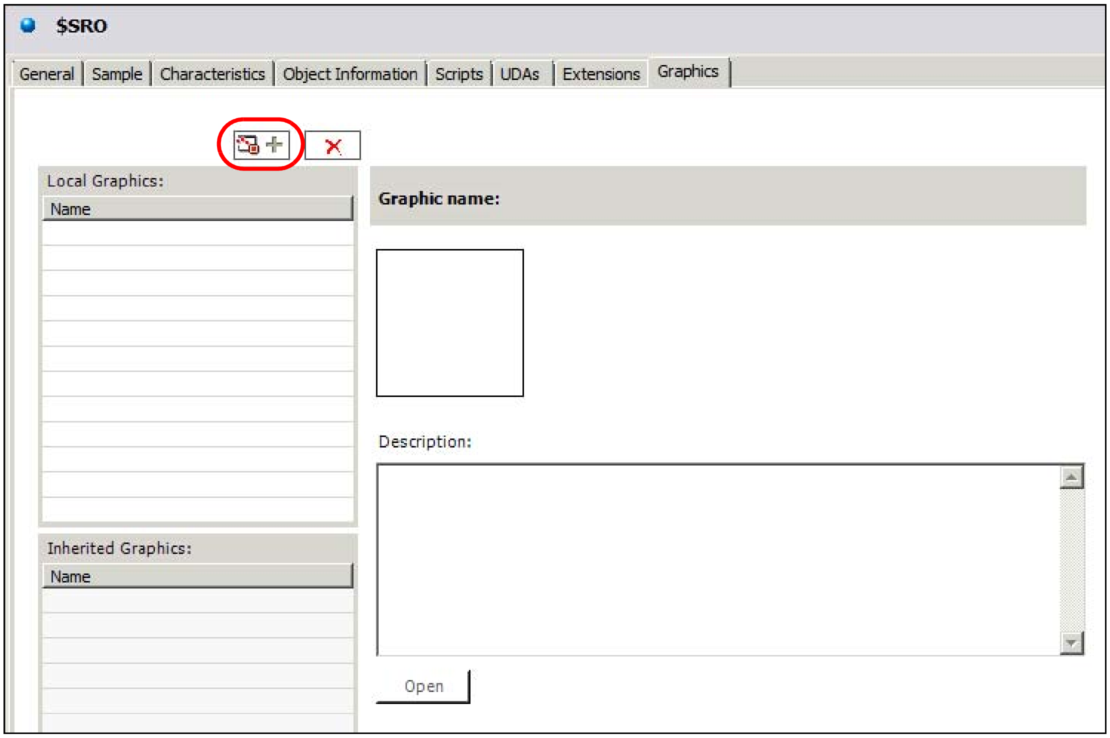
7. In the **Template Toolbox**, **Global** toolset, double-click **$SRO**.
8. In the configuration editor, on the **General** tab, configure the **SRO Instance Level Settings** area as follows:

   Default Delay Timer: 00:01:00.0000000 (*default*)

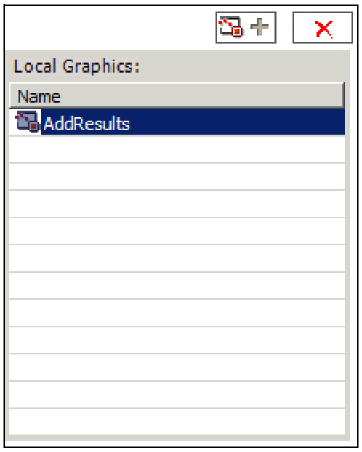
   Auto Reset: *checked* and *locked*



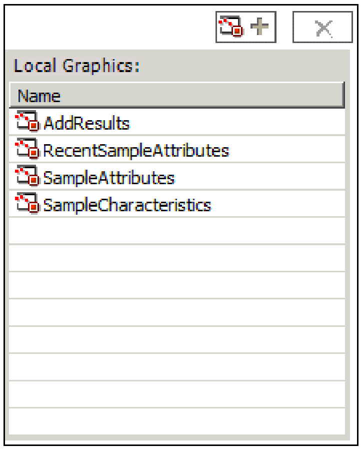
9. On the **Graphics** tab, click the **Add Symbol** button.



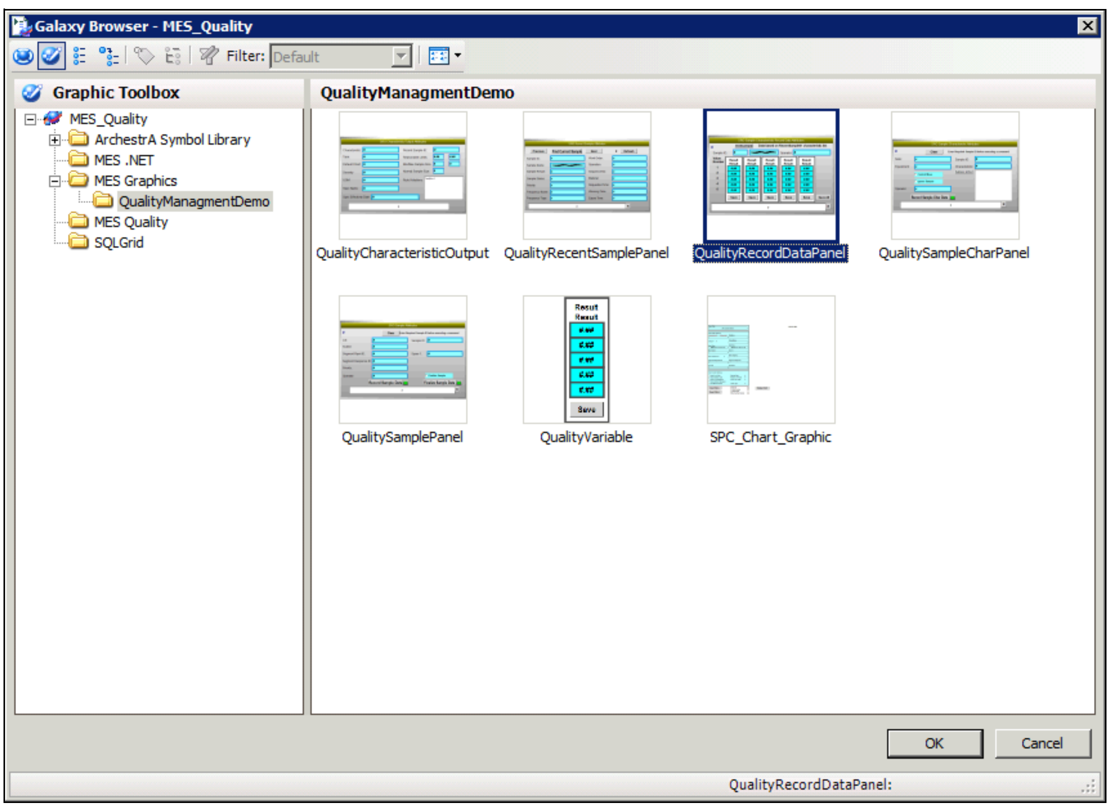
10. Name the symbol **AddResults**.



11. Create three more symbols with the following names:
    - **RecentSampleAttributes**
    - **SampleAttributes**
    - **SampleCharacteristics**

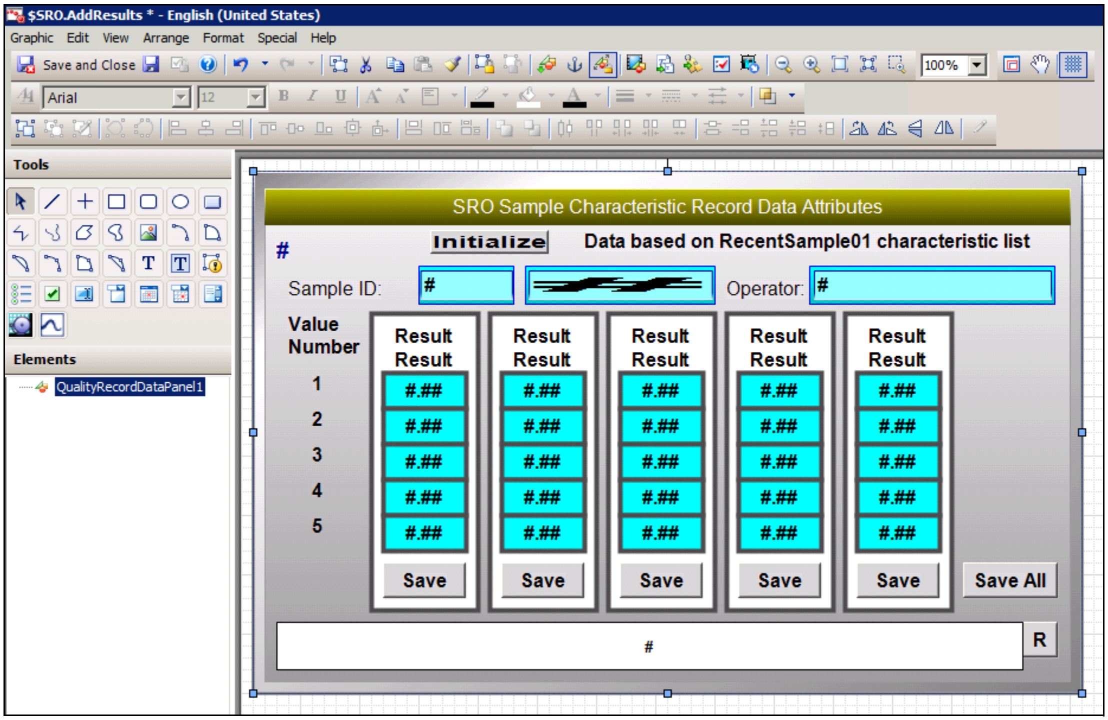


12. Open the **AddResults** local graphic.
13. In the **$SRO.AddResults** symbol editor, click **Embed Graphic**.
14. In the **Galaxy Browser**, **Graphic Toolbox**, expand **MES Graphics**, and then click **QualityManagmentDemo**.
15. In the **QualityManagmentDemo** pane, click **QualityRecordDataPanel**.

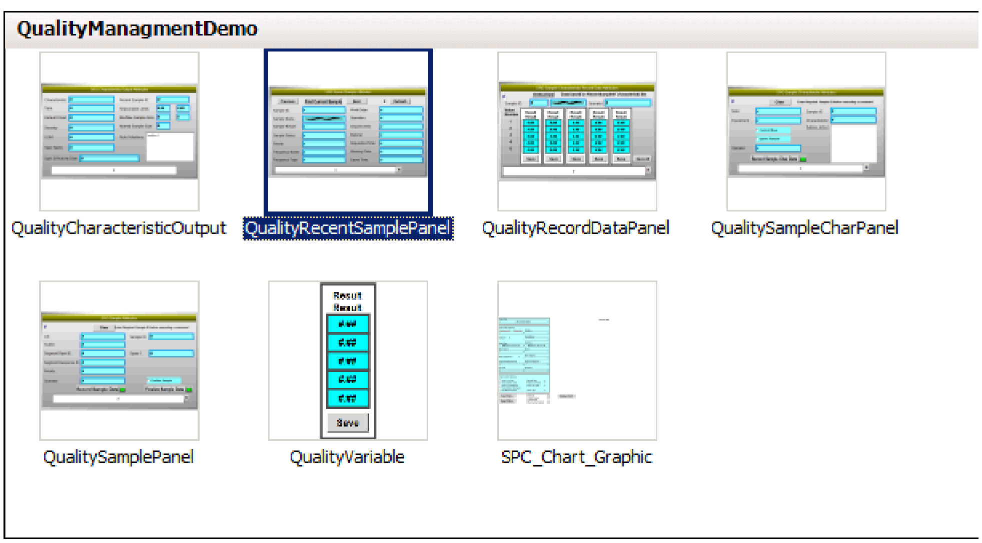


16. Click **OK**.

17. Click the canvas to place the graphic.

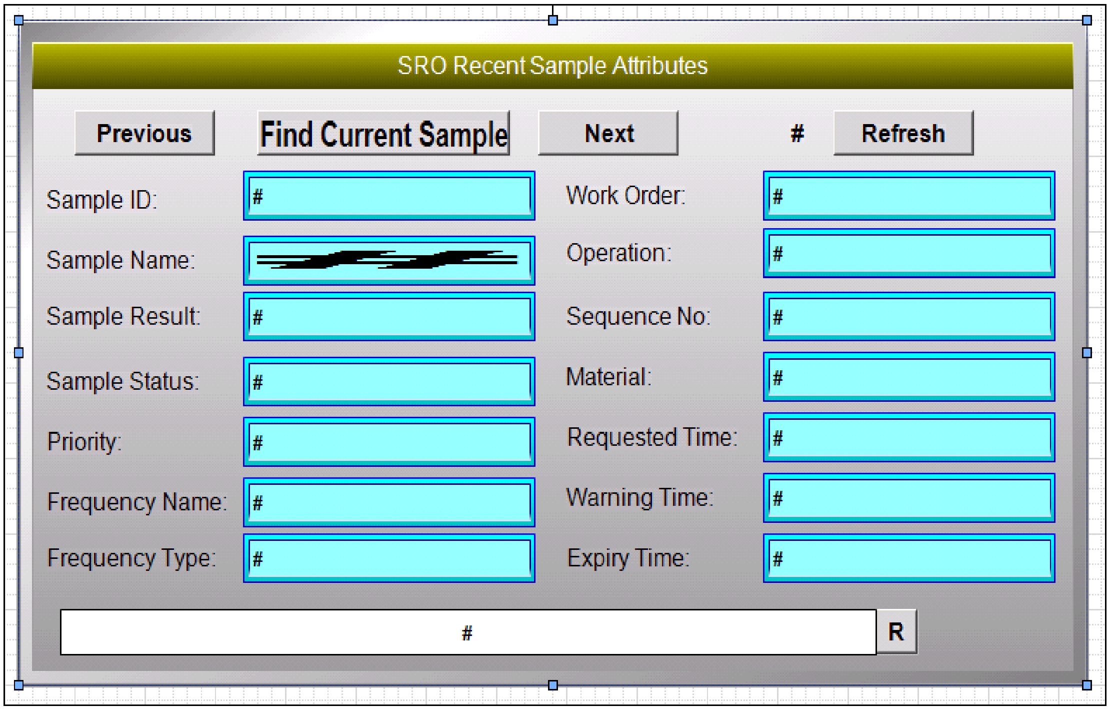


18. Click **Save and Close**.
19. Open the **RecentSampleAttributes** local graphic.
20. Click **Embed Graphic**.
21. In the **Galaxy Browser**, **QualityManagmentDemo** pane, click **QualityRecentSamplePanel**.



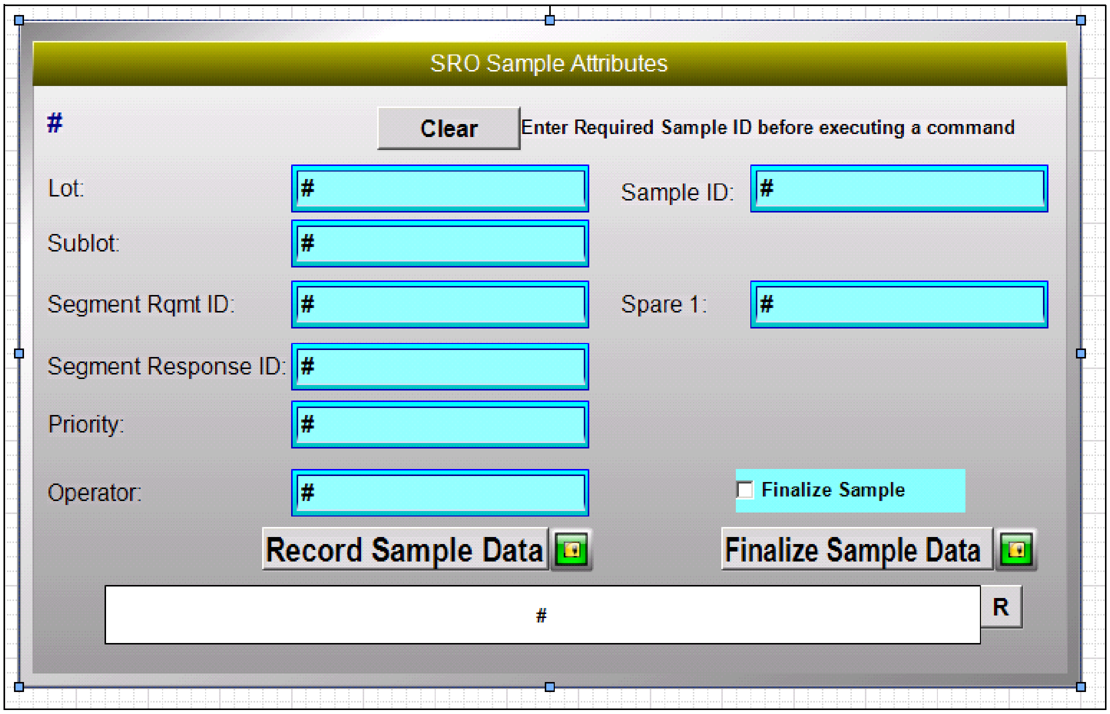
22. Click **OK**.

23. Click the canvas to place the graphic.

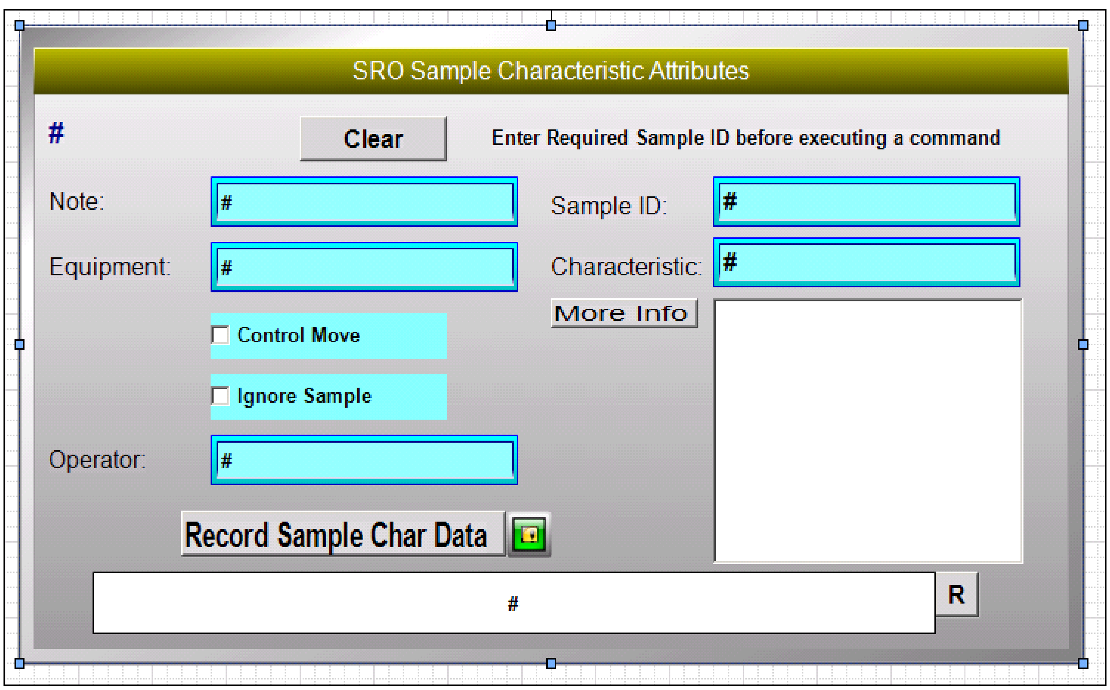


24. Click **Save and Close**.
25. Open **SampleAttributes**.
26. Click **Embed Graphic**.
27. In the **Galaxy Browser**, **QualityManagmentDemo** pane, click **QualitySamplePanel**.
28. Click **OK**.

29. Click the canvas to place the graphic.

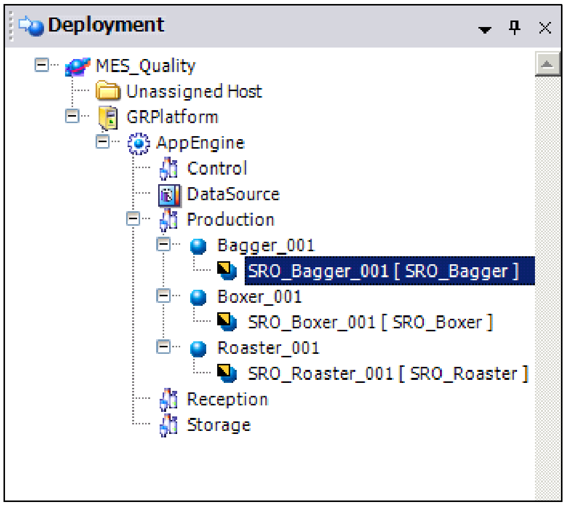


30. Click **Save and Close**.
31. Open **SampleCharacteristics**.
32. Embed **QualitySampleCharPanel**.



33. Click **Save and Close**.
34. Save and close the configuration editor.

The **Deployment** view displays that the three SRO instances need to be redeployed.

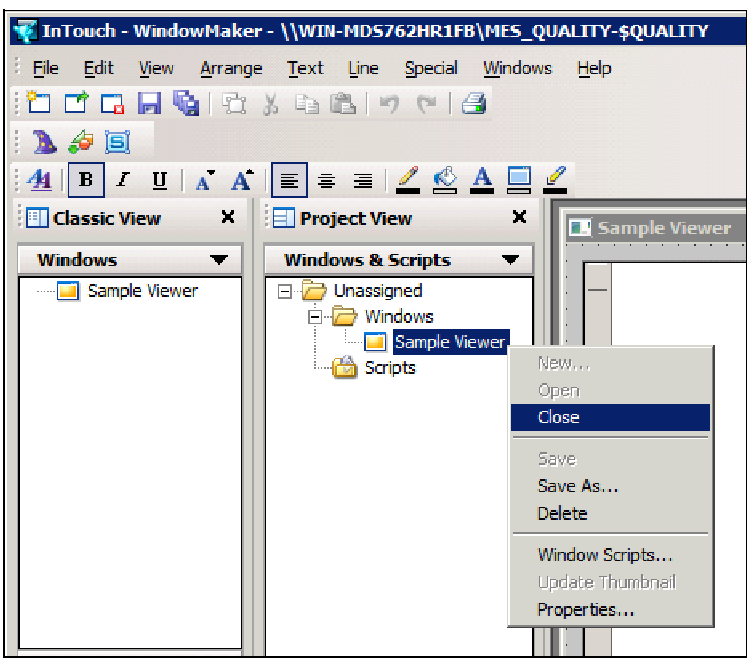


35. Redeploy the three SRO instances.

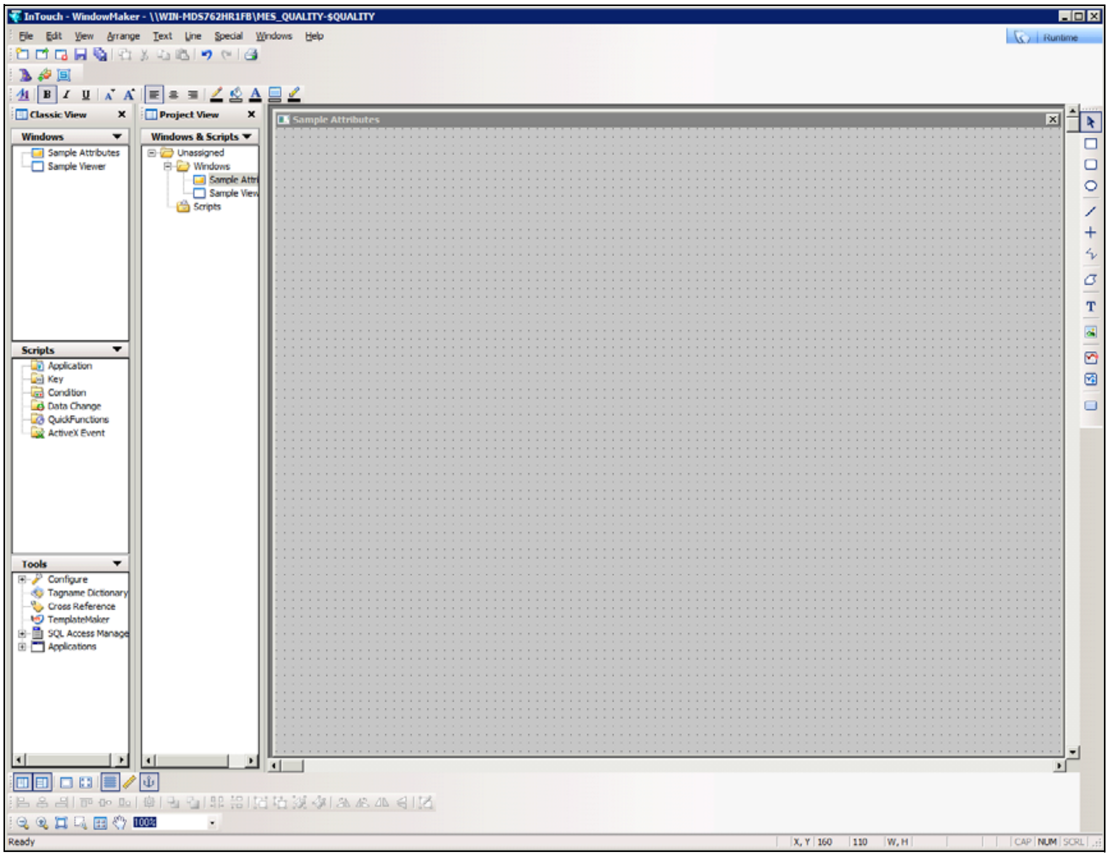
Create the Sample Attributes Window

Now, you will return to WindowMaker and create the **Sample Attributes** window. Then, you will switch to WindowViewer to enter sample data in **Sample Attributes** and verify the data in **Sample Viewer**.

36. In WindowMaker, **Project View** pane, **Windows & Scripts** area, right-click **Sample Viewer** and select **Close**, if necessary.

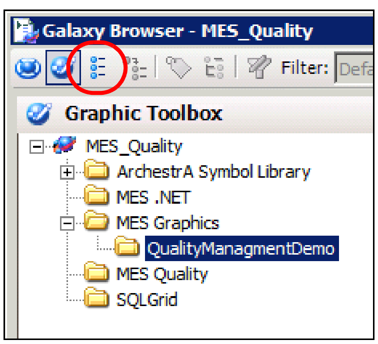


37. Create a new full size window named **Sample Attributes**.

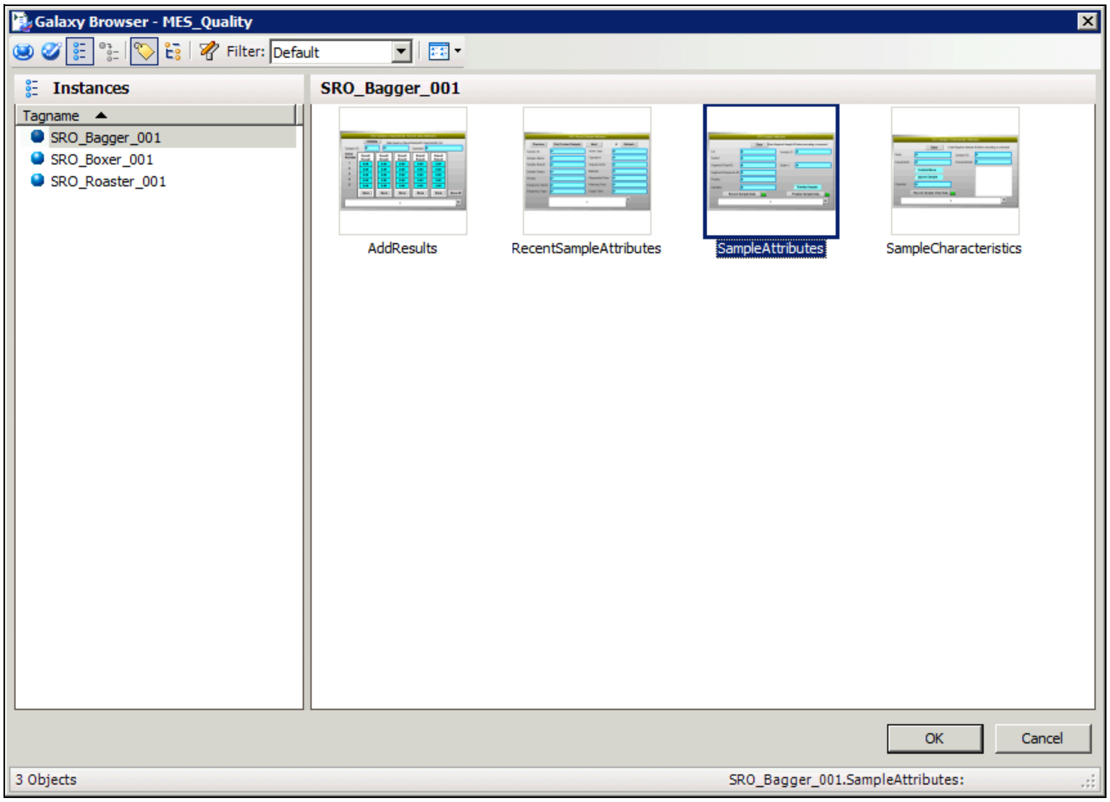


38. Click **Embed ArchestrA Graphic**.

39. In the **Galaxy Browser**, click the **Instances** button.

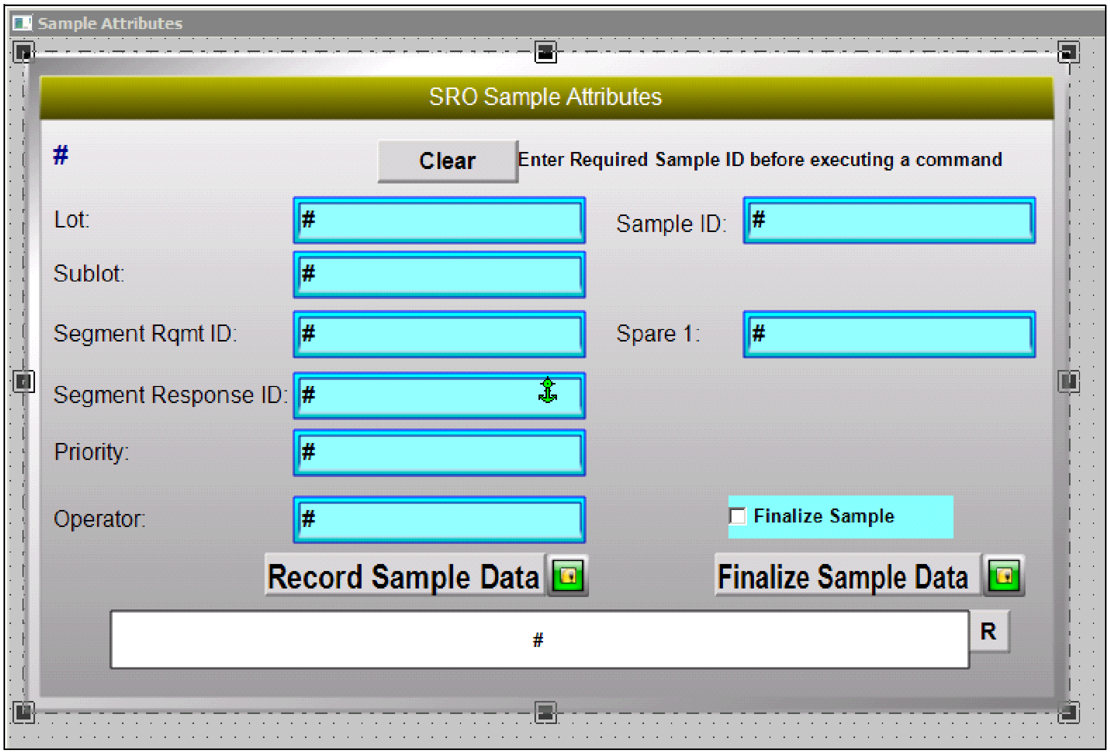


40. In the **Instances** pane, click **SRO_Bagger_001**.
41. In the **SRO_Bagger_001** pane, click **SampleAttributes**.



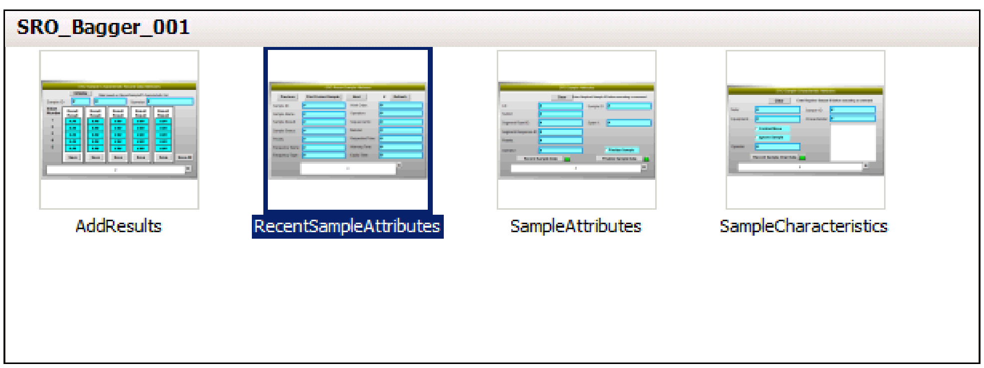
42. Click **OK**.

43. Click the canvas to place the graphic.



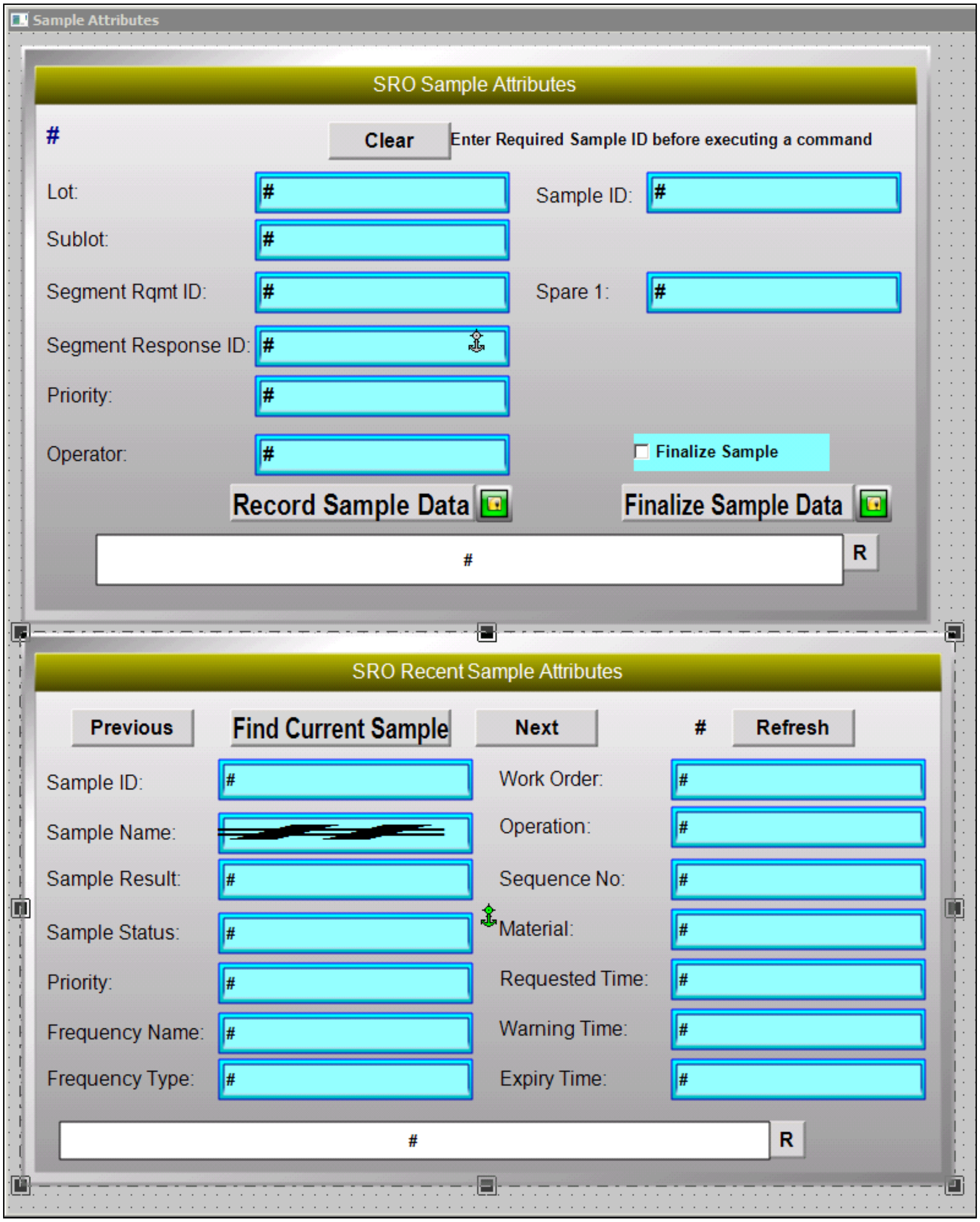
44. Click **Embed ArchestrA Graphic**.

45. In the **SRO_Bagger_001** pane, click **RecentSampleAttributes**.



46. Click **OK**.

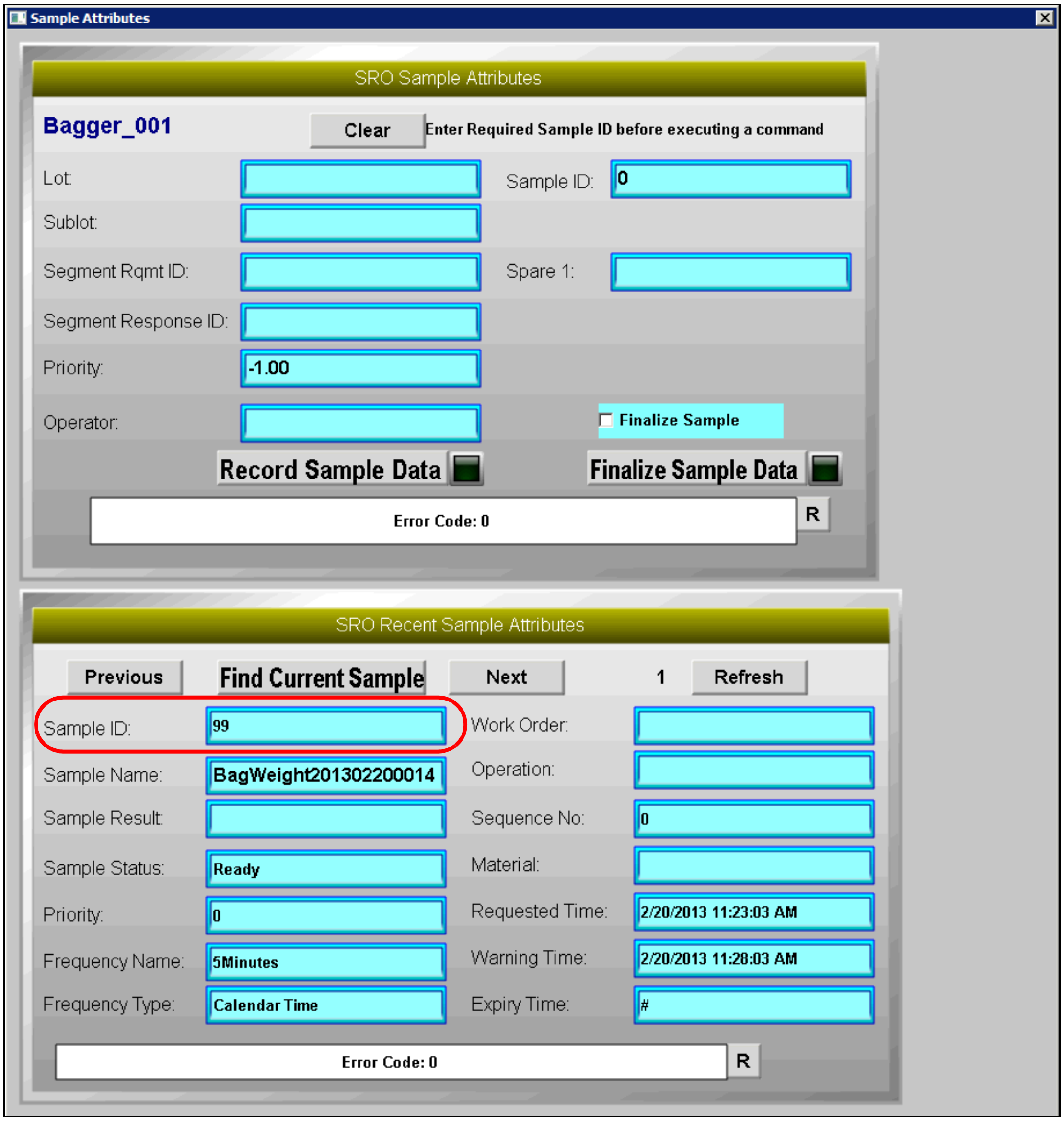
47. Below the **SRO Sample Attributes** graphic, click the canvas to place the graphic.



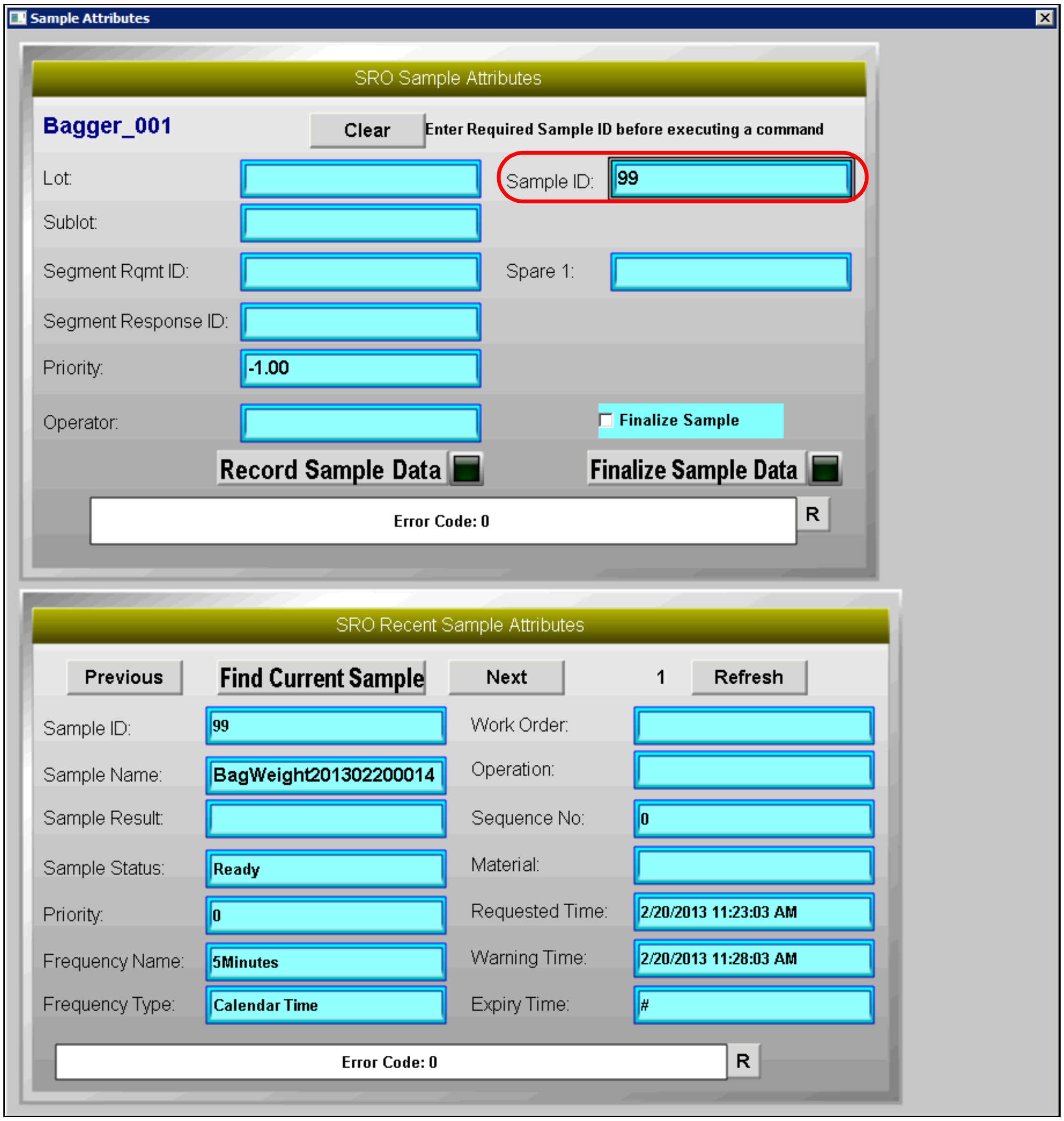
48. Click **Runtime**.

The **Sample Attributes** window appears.

49. In the **SRO Recent Sample Attributes** graphic, make note of the number that appears in the **Sample ID** field.

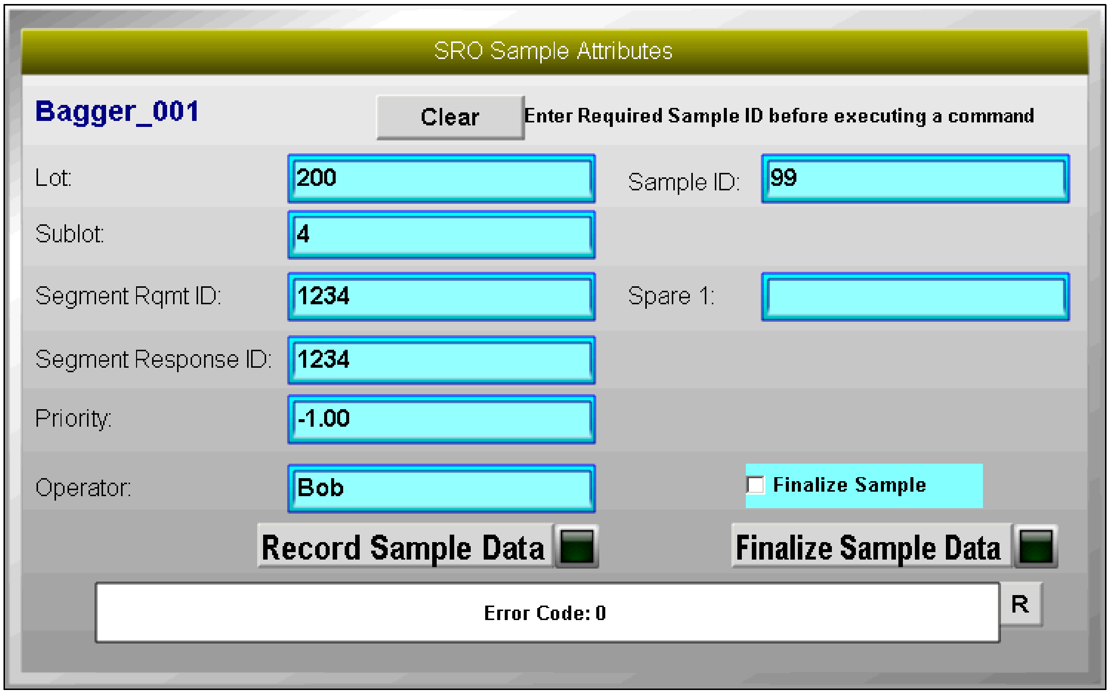


50. In the **SRO Sample Attributes** graphic, **Sample ID** field, enter the same number and press **Enter**.



51. Configure the rest of the **SRO Sample Attributes** graphic by entering values in the following fields:

Lot:	200
Sublot:	4
Segment Rqmt ID:	1234
Segment Response ID:	1234
Operator:	Bob



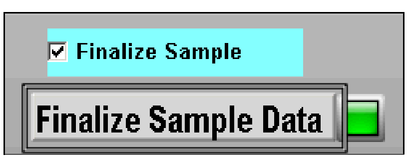
52. Below the **Operator** field, click the **Record Sample Data** button.

The green lamp to the right of **Record Sample Data** will light and then dim.

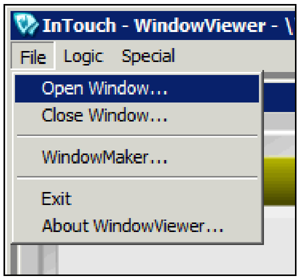
53. Check **Finalize Sample**.

54. Click the **Finalize Sample Data** button.

The green lamp to the right of **Finalize Sample Data** will light and then dim.

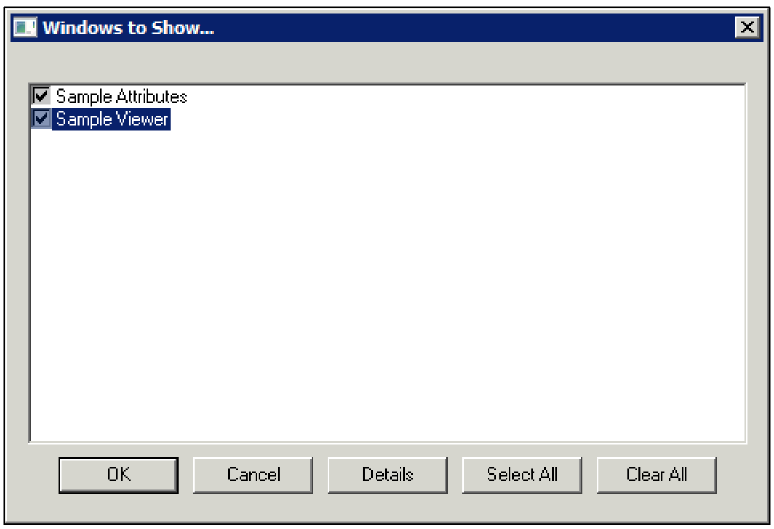


55. On the **File** menu, click **Open Window**.



The **Windows to Show** dialog box appears.

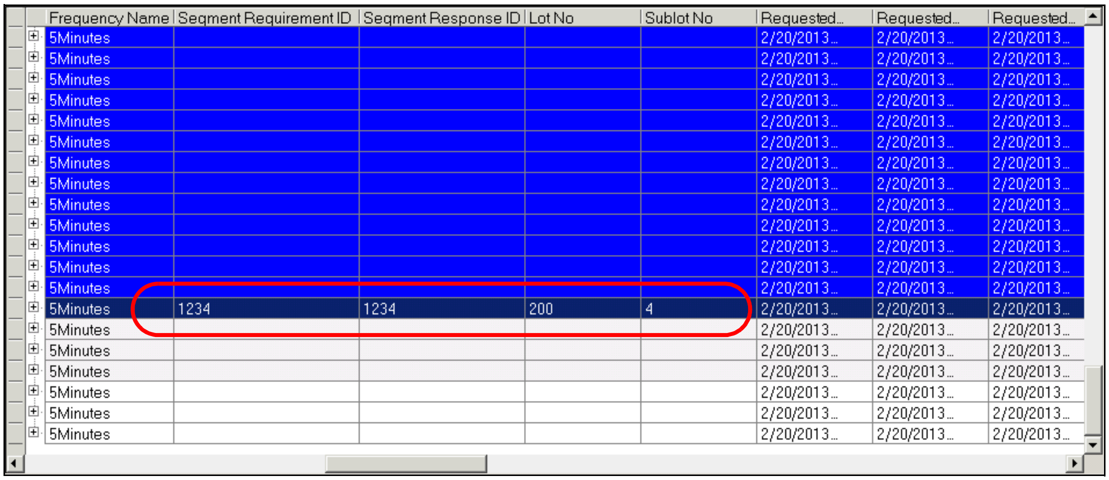
56. Check **Sample Viewer**.



57. Click **OK**.
58. In the **Set Filters** dialog box, set the **Entity/Entity Class** field to **Bagger_001**, and then click **Apply**.
59. Log on to **Bagger_001**.

60. In **Sample Viewer**, scroll to the sample that you edited.

61. Scroll right to the **Segment Requirement ID** column and verify the information has been recorded.



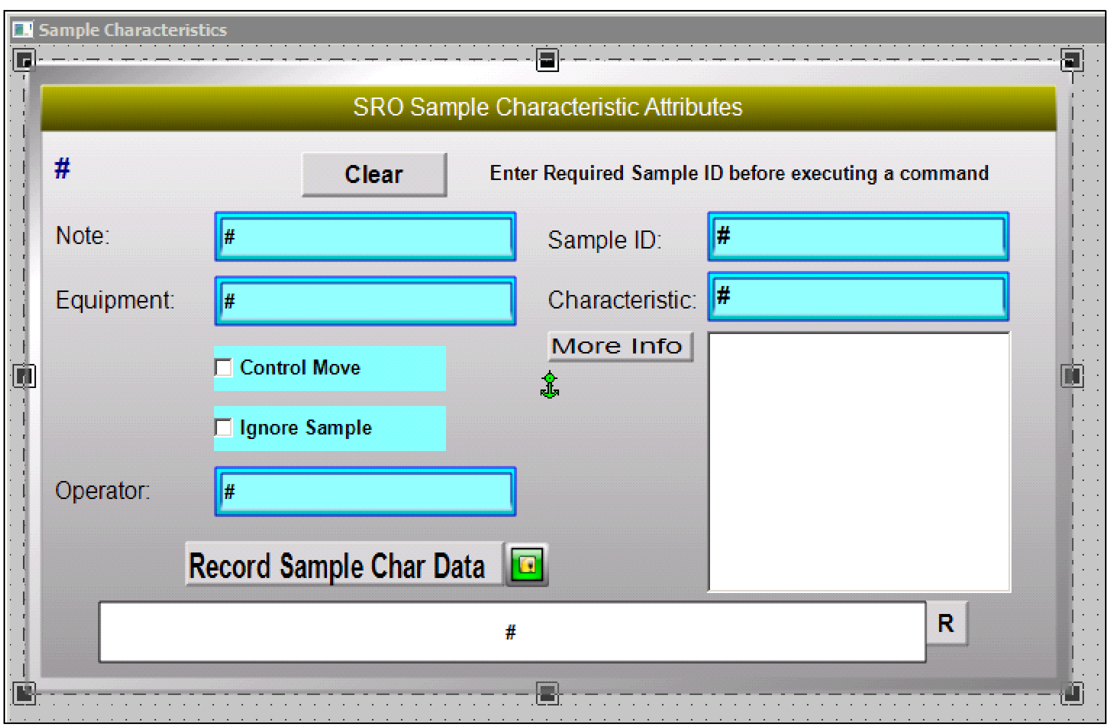
Frequency Name	Segment Requirement ID	Segment Response ID	Lot No	Sublot No	Requested...	Requested...	Requested...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes	1234	1234	200	4	2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...
5Minutes					2/20/2013...	2/20/2013...	2/20/2013...

Create the Sample Characteristics Window

Finally, you will return to WindowMaker and create the **Sample Characteristics** window. You will then switch to WindowViewer again to enter data in **Sample Characteristics** and verify the data in **Sample Viewer**.

62. In the upper-right corner, click **Development**.
63. In WindowMaker, right-click **Sample Viewer** and select **Close**.
64. Create a new full size window named **Sample Characteristics**.

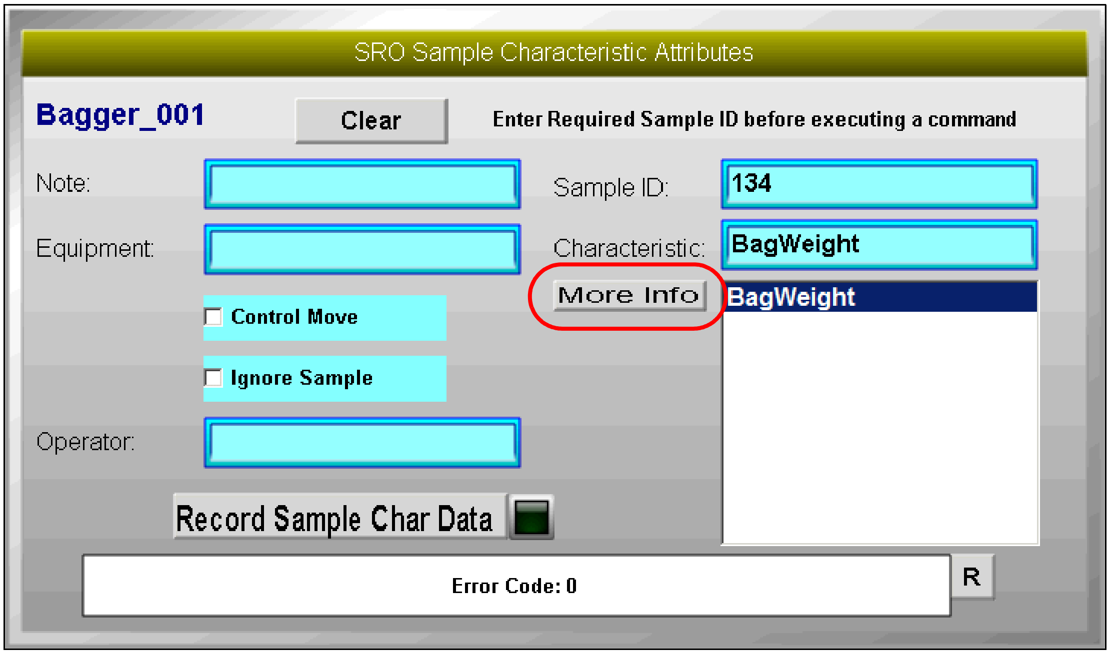
65. Embed the **SampleCharacteristics** graphic from **SRO_Bagger_001**.



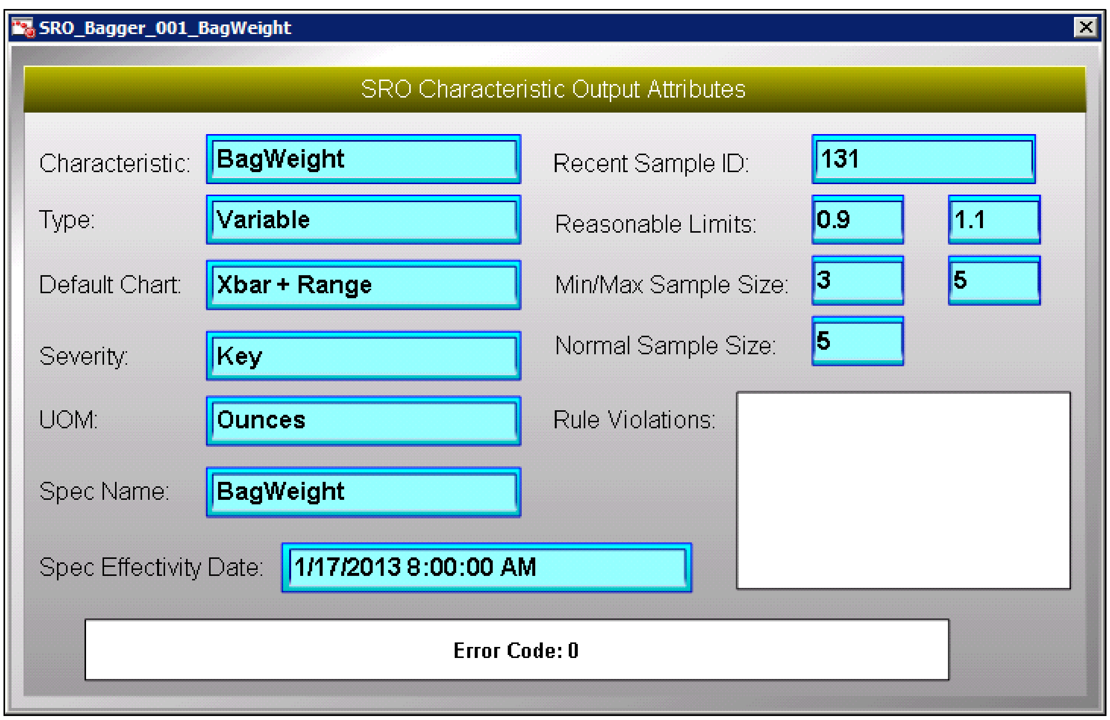
66. Click **Runtime**.

    In WindowViewer, **SRO Sample Characteristic Attributes** window, the most recent **Sample ID** appears.

67. Click the **More Info** button.



The **SRO_Bagger_001_BagWeight** window appears and displays the additional sample information.



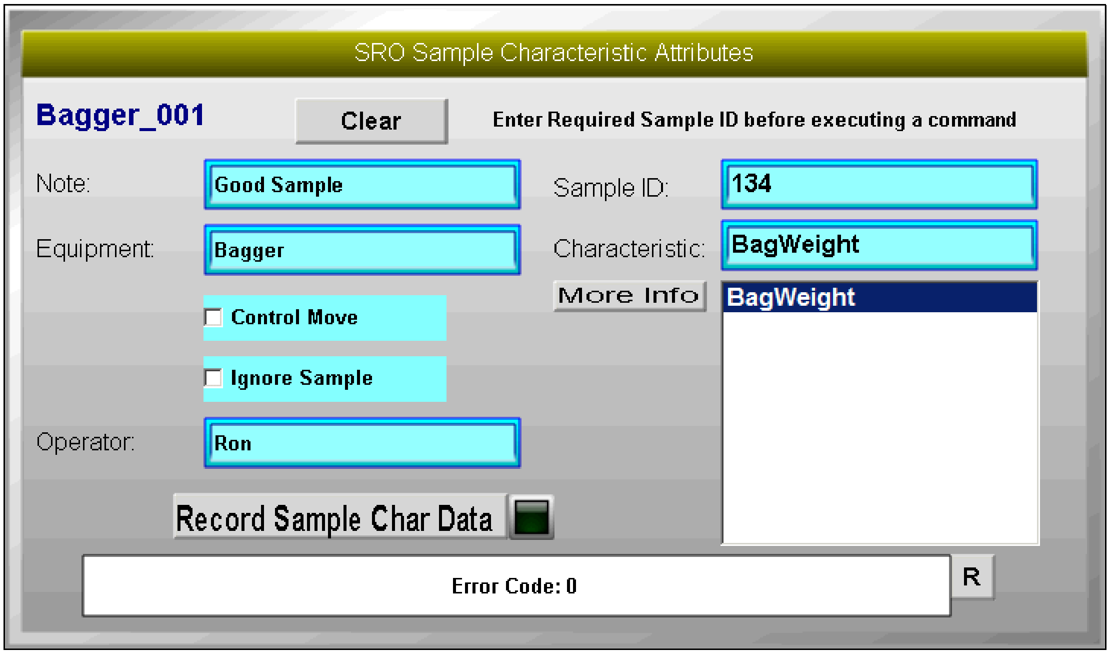
68. Close the **SRO_Bagger_001_BagWeight** window.

69. In the **SRO Sample Characteristic Attributes** graphic, ensure that the **BagWeight** Characteristic is selected, and configure the graphic as follows:

    Note: Good Sample

    Equipment: Bagger

    Operator: Ron



70. Click the **Record Sample Char Data** button.

    The green lamp to the right of the button will light and then dim.

71. On the **File** menu, click **Open Window**.
72. In the **Windows to Show** dialog box, check **Sample Viewer**, and then click **OK**.
73. **Set Filters** dialog box, set the **Entity/Entity Class** field to **Bagger_001**
74. In the **Sample Viewer** window, expand the last dark blue line item and scroll right.

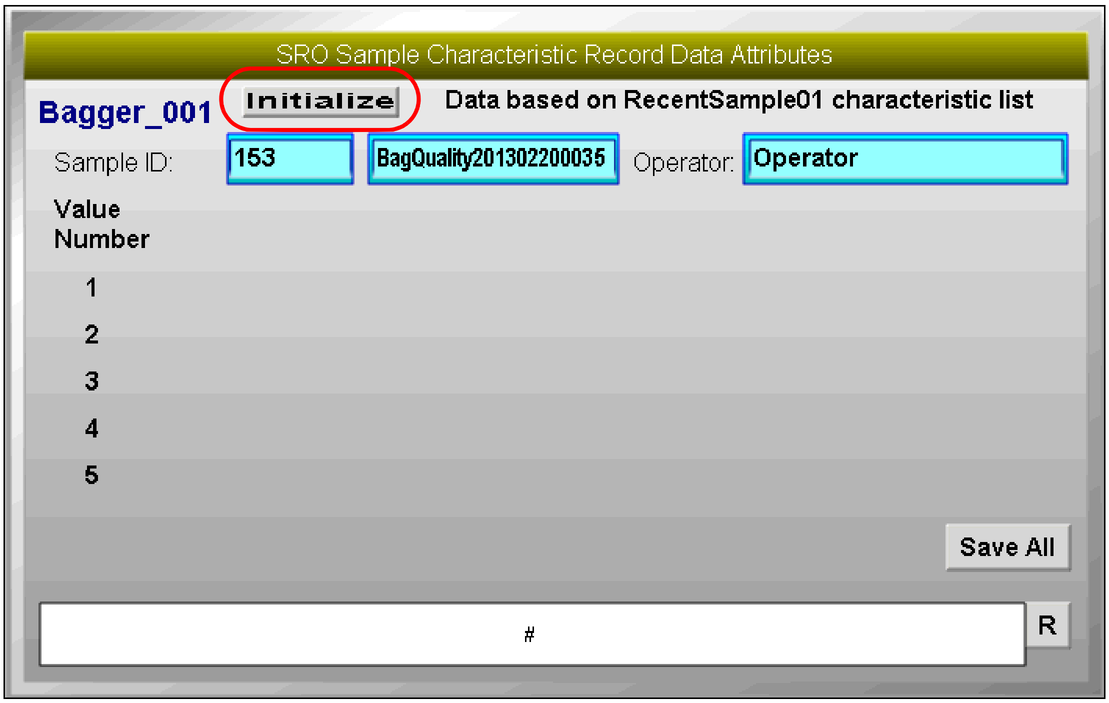
    In the **Equipment** cell, **Bagger** appears. In the **Created By** column, **Ron** appears.

Note: The information for the **Note** field is recorded in the MES database, but is not exposed in the Sample Viewer Control.

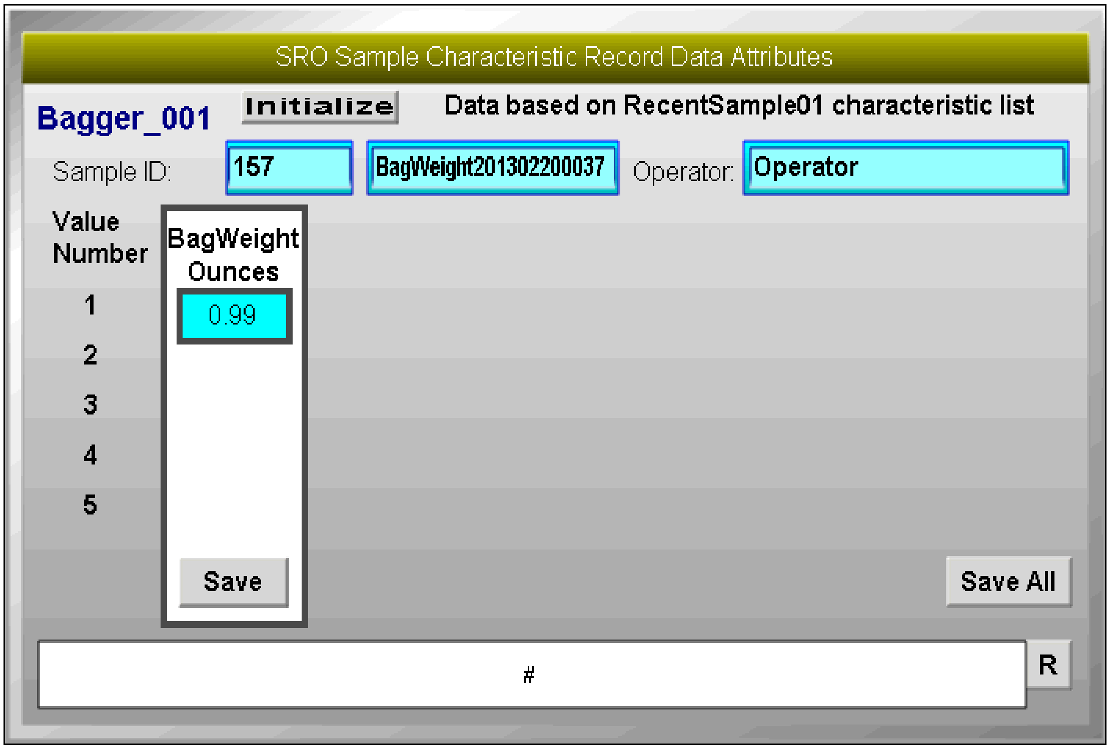
Optional

75. In the upper-right corner, click **Development**.
76. In WindowMaker, close **Sample Viewer**, and then create a new window named **Add Results**.
77. Embed the **AddResults** graphic from **SRO_Bagger_001**.
78. Click **Runtime**.

    The **Add Results** window appears.
79. Click the **Initialize** button.



The sample data appears in the graphic.



Note: This graphic is presented as a reference only and is not appropriate for a sample plan that is automatically collecting data.

Module 4 – Integration with MES Software/Operations

Module Objectives

- Describe the integration of MES Software/Quality with MES Software/Operations

Section 1 – Building and Running a Basic Operation

This section reviews the basic concepts of Wonderware MES Software/Operations. This includes instanciating an Operations Capability Object, building the Entity Model, and building the Operation Model.

Operations Capability Object

The Operations Capability Object (OCO) is an ArchestrA automation object that allows you to configure entities to perform the following tasks:

- Start, stop, and run jobs
- Record the amount of material that is produced or consumed while executing a job
- Store and transfer inventory items
- Load, upload, and download job specifications

You can add the OCO under an application object in the ArchestrA IDE and configure it. The configured OCO attributes are used by the Entity Model Builder to create an entity in the MES Database corresponding to the application object. The created entity can be used to perform different operations as per the information configured in the OCO.

The OCO extends the ArchestrA IDE equipment model to trigger events and log associated data into the MES Database.

This includes material events related to material consumption, material production, and material movement, as well as status events related to equipment, production data, and personnel.

On the **General** tab of the OCO editor, you can specify which capabilities the object will have. You can use this tab to configure different properties of an entity to perform some action, such as creating jobs for this entity, capturing production and consumption counts, and storing items.

The capabilities of an OCO correspond to the main options on the **General** tab:

- **Entity Can Run Jobs** – The Job Defaults and Job Execution tabs appear in the object editor. You can use the Job Defaults and Job Execution tabs to configure default attributes for a job and to execute jobs respectively.
- **Entity Can Store Items** – When you select this capability, new Storage Execution and Inventory Transfer tabs appear in the object editor to configure the storage execution and inventory transfer attributes. Select this capability to allow entity to store items for tracking inventory. If you do not select this capability, the entity cannot store items. When an entity is designated not to store items and track inventory, it cannot store items and track inventory outside the OCO as well.
- **Entity Can Schedule Jobs** – Select this capability to schedule jobs to the entity, and to indicate that jobs can be assigned to this entity, and a work queue is maintained. Child entities that do not have the option configured Can Schedule Jobs generally inherit their schedule from a parent entity.
- **Enable Specifications** – When you select this capability, a new **Specifications** tab appears in the object editor to manage the specification attributes. If you do not select this capability, you cannot use specification values for external input or output devices.
- **Enable Production Events Module (PEM) Attributes** – The PEM functionality within the OCO lets you monitor, report, and analyze production history and genealogy of lots, batches, and serial numbers without having to define the full MES model. The PEM functionality on the OCO delivers information defined in the ISA-95 Production Performance category. This category includes the Material Produced Actual, Material Consumed Actual, Material Consumable Actual, Personnel Actual, Equipment Actual, and Production Data. You can use PEM attributes for creating new work orders, jobs, or items and generating genealogy ID to trace all the source material of a product. When you select the Enable PEM Attribute capability, a new **PEM Attributes** tab appears in the object editor. You can use this tab to configure Common Data Attributes, Genealogy, Production Attributes, and Extended Production Attributes. Select this capability to add production and consumption, log consumable, capture production data, capture equipment data and capture personnel data.

Process Definition

Items are the basic units produced or consumed during production. Items can be referred to as a part, component, piece, and so on in different manufacturing environments. Define all products, components, and by-products as items for use in the Wonderware MES system.

You can create an item and assign it to an item class and move an item from one class to another and define certifications for an item. To create an item, select the **Items** module in the **Product Definition** group of the Wonderware MES Client. The workspace shows fields such as **Item ID**, **Item Description**, or **Item Class**.

You can also include the ability to associate a file with an item or assign a certification to an item that is configured in the Wonderware MES Configurator application in the **Items** module.

Item Classes

Items belong to item classes. An item class is a logical group of items that share common Characteristics, such as physical properties and whether they are produced, consumed, or both.

Use the **Item Classes** module to create and maintain an item class. Some examples of item classes are:

- Raw Materials
- WIP Materials
- Finished Goods

Each item can only exist in one item class. Therefore, the organization of the items into classes should be logical to make it easy to filter or search for the items.

When you open the **Item Classes** module, a list of all the existing item classes is shown in the workspace. By default, the **Item Classes** module is grouped under the **Product Definition** group in the **Navigation Bar**.

Processes and Operations

A process, also known as a route, is the method of producing an item. It is the defined path of manufacturing operations through the plant that will produce a specific final product or by-product. A process definition will link the item to be produced with operations, steps, specifications, physical entities, and routings that determine the flow of material between entities and operations.

An operation defines a task used in the production of an item. It defines the item or items consumed and produced as a result of the task. An operation includes one or more entities used to complete the task and may include labor and machine time estimates. It may also include job specifications and steps. When a work order is created, a job is created for each operation/entity combination.

Processes

A process is a logical representation of the performance of one or more operations utilizing one or more physical entities for the purpose of producing an item. You can create a process to define the production method to produce an item, and instantiate the work orders. Select the **Processes** module in the Wonderware MES Client **Process Definition** group to create and maintain a process and an operation.

A process describes operations and steps required to manufacture an item. A process links an item that needs to be produced with operations, steps, specifications, entities, and routings and determines the flow of material between entities and operations.

Work orders are used to manufacture an item. The use of processes in MES is optional as you can create a work order directly using the **Work Orders and Jobs** module. Processes are required in the Wonderware MES Client to assign certifications as you cannot assign a certification to a work order.

Operations

An operation represents a phase of a process and specifies the consumption and production proportion. One or more entities are utilized to perform an operation. An operation can have specifications and sub-operation step groups. Standard operations are used as templates in the Wonderware MES Client to quickly and easily create similar operation definitions throughout a process.

You can add an operation directly to a process without referring to a standard operation. Standard operations save configuration time when the same operation is used multiple times within a process or the same operation is used by multiple processes.

Select the **Standard Operations** module in the Wonderware MES Client **Process Definition** group to create and maintain a standard operation. Standard operations do not have items associated with them, so you cannot assign Bill of Material (BOM) definitions, BOM item specifications, or item specifications to a standard operation.

You must assign at least one entity to an operation. Each entity assigned to an operation has an estimated production rate, which you may set. The estimated production rate is used with the batch size to schedule an entity, while creating a work order from a process. The required finish date is assigned to the jobs in the last operation and the estimated production rate is used to determine the start time of a job. This process runs until all jobs get a start date and a finish date. If an operation is the first in a process, the batch size specifies the initial amount that is sent to an entity if there is more than one entity in the operation.

Linking Items to a Process

Production items can be linked to a process. Each item that is linked to a process has its own process status. By default, the status of a linked item is the same as the status of a process. The status of an item must have the minimum required status before a work order is created. An item can have the status as certified for the process while another item has the status as experimental.

By default, status of a process is assigned to an item. You cannot assign a higher status to an item than the status of linked process. If the status of a process is lower than status of the linked item, then status of all items that have higher status is lowered to match the status of the process. For example, if you change status of the process from **Approved** to **Disabled**, then status of all the items associated to that process is changed to **Disabled** regardless of the original status.

A process rank specifies the capability of a process to produce an item. If an item is linked to more than one process, the process with lowest rank for that item is considered as the most preferred process for producing the item.

Work Order Execution

A work order is a request for some quantity of an item to be produced on or before a due date. A work order may be generated in-house to restock inventory for an item that your company produces and then later uses as a component for another item.

A work order may be comprised from a collection of jobs that produce an item. A job is a list of steps or procedures that is executed to produce an item or a version of an item. Multiple jobs can be performed to produce a single item.

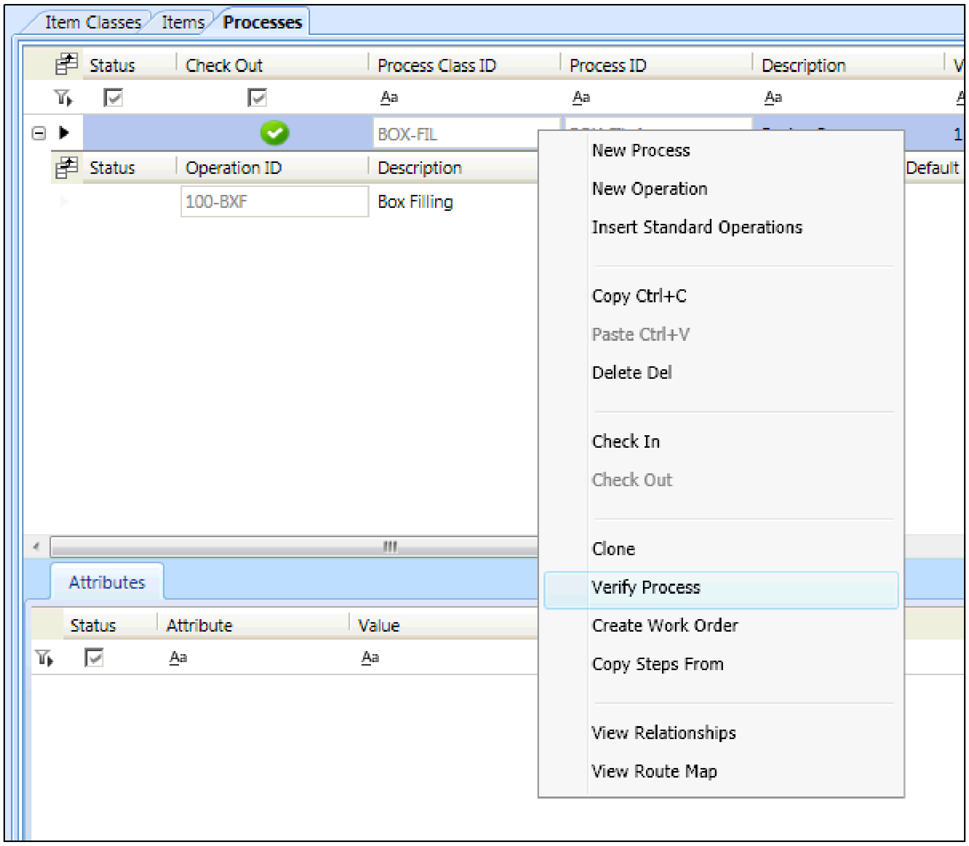
The **Work Order and Jobs** module is available by accessing the **Order Management** group in the Wonderware MES Client. When you open the **Work Order and Jobs** module, a list of all the existing work orders is shown in the workspace. Expand the work orders to see the job assigned to each of them.

You can also create a work order from a process. Processes are templates for work orders. All entities, step groups, steps, BOM, folders, data log, and certifications linked to the process becomes a part of the new work order.

You can import a work order from a ERP system. After importing a work order from a ERP, you may need to customize the work order for production. However, you can also use the W**ork Order and Jobs** module to create a work order with a process or ERP information.

Process Verification

You can verify the selected process for any invalid or circular links that allow you to create a work order properly.



If the process is valid, a confirmation message appears for the successful verified process.

If the process is not valid, an error message appears in the Error List Pane. You must fix any invalid or circular links to create a valid process.

Lab 10 – Building a Basic Operation

Introduction

MES Software/Quality can be used to capture data based on jobs run by MES Software/Operations. In this lab, you will use the MES Software/Operations functionality to configure the first part of this process. This is accomplished by first creating and configuring an Operations Capability Object. Then, you will use MES Client to create a process from which you will create a work order. Finally, you will use MES Operator to run the work order.

In the next lab, you will configure MES Software/Quality to capture data based on the configuration completed in this lab.

Objectives

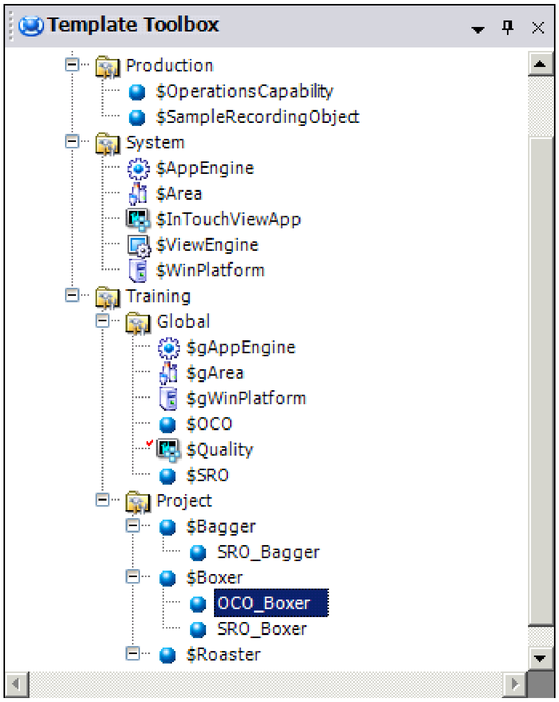
Upon completion of this lab, you will be able to:

- Create and configure an Operations Capability Object
- Configure a process using MES Client
- Create and run a work order

Create and Configure the OCO_Boxer Template

First, you will create a new derived template and configure the template to run and schedule jobs in MES Client.

1. In the ArchestrA IDE, **Template Toolbox**, **Global** toolset, right-click **$OCO** and select **New | Derived Template**.
2. Rename the template **$OCO_Boxer**, and then drag it to the **$Boxer** template.

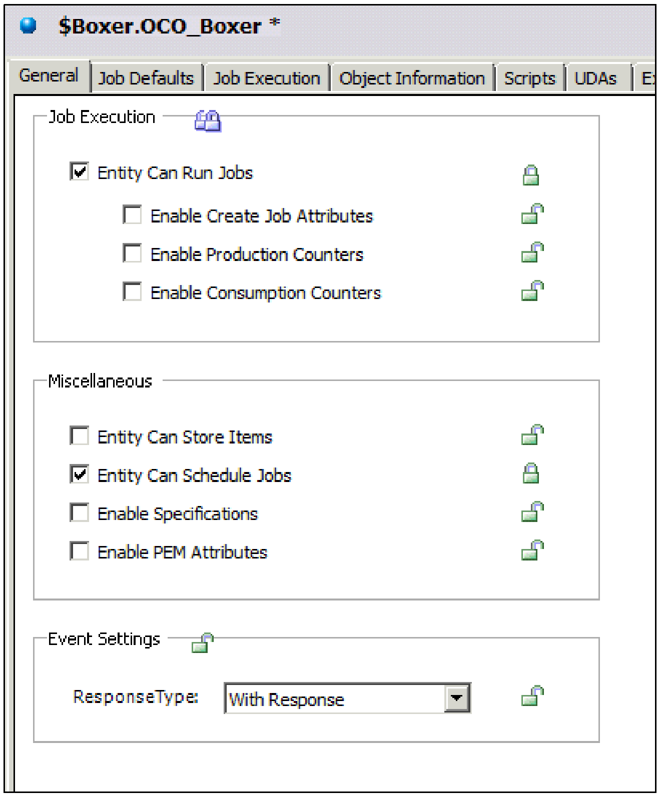


3. Double-click **OCO_Boxer**.

4. On the **General** tab, configure the **Job Execution** and **Miscellaneous** areas as follows:

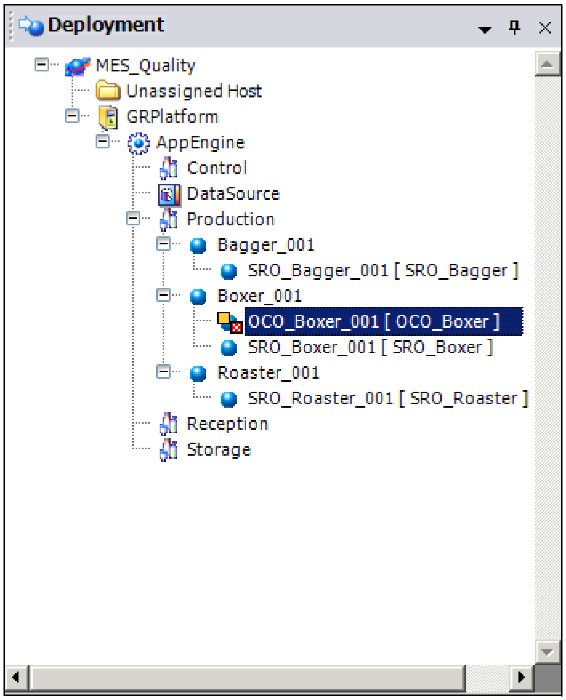
   Entity Can Run Jobs: *checked* and *locked*

   Entity Can Schedule Jobs: *checked* and *locked*



5. Save and close the configuration editor.

6. Create a new instance of **OCO_Boxer** and leave the default name.
7. In the **Deployment** view, drag **OCO_Boxer_001** to **Boxer_001**.
8. Rename the contained name **OCO_Boxer**.

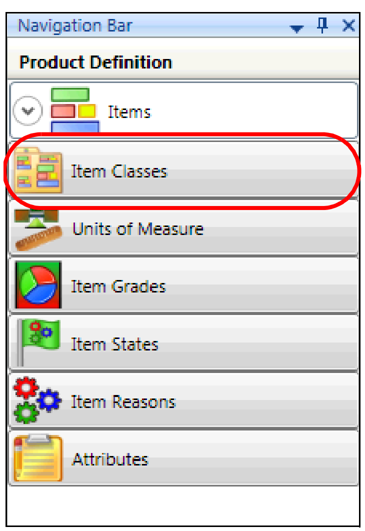


9. Rebuild the MES Entity Model.
10. Deploy **OCO_Boxer_001**.

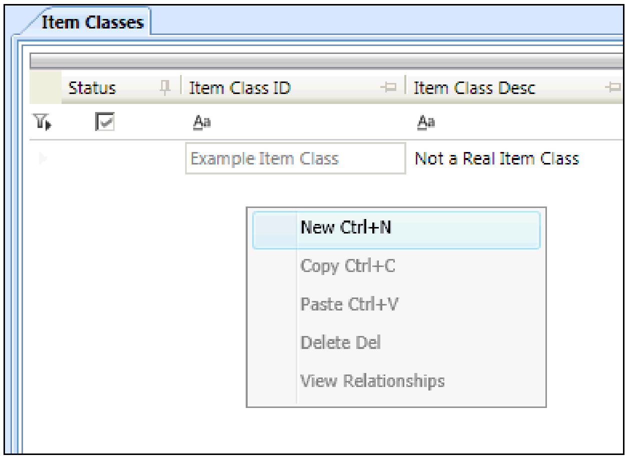
Configure MES Client

Now, you will return to MES Client to configure the items required to create a work order.

11. In MES Client, **Navigation Bar**, click **Product Definition**, and then click **Item Classes**.



12. On the **Item Classes** tab, right-click the empty workspace and select **New**.

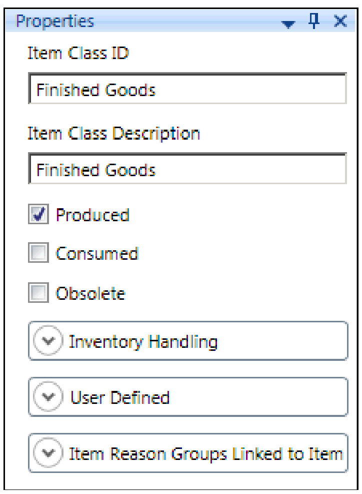


13. Configure the **Properties** pane as follows:

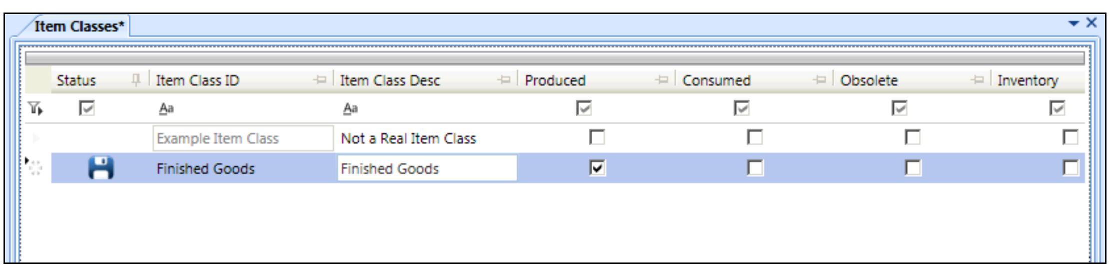
Item Class ID: Finished Goods

Item Class Description: Finished Goods

Produced: *checked*

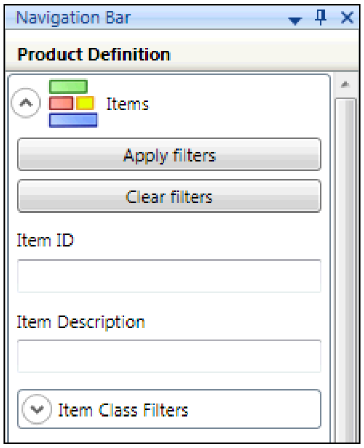


In the **Item Classes** tab, the new item class appears.



14. Click **Save All**.

15. In the **Navigation Bar**, expand **Items** and click **Apply filters**.

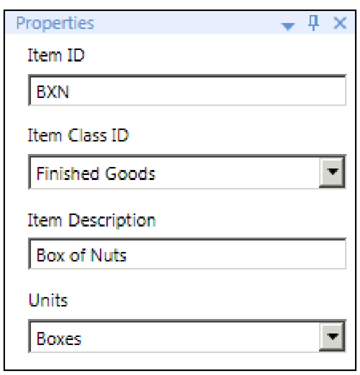


16. On the **Items** tab, right-click the empty workspace and select **New**.

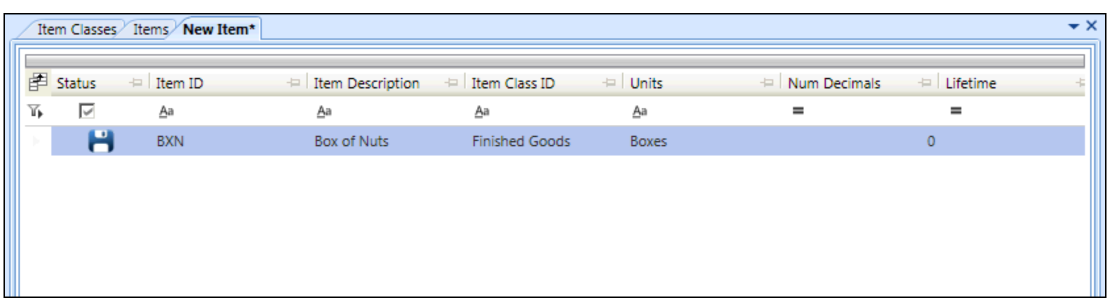
    The **New Item** tab appears.

17. Configure the **Properties** pane as follows:

    Item ID: BXN
    Item Class ID: Finished Goods
    Item Description: Box of Nuts
    Units: Boxes

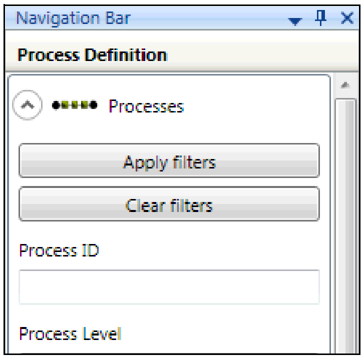


On the **New Item** tab, the new item appears.

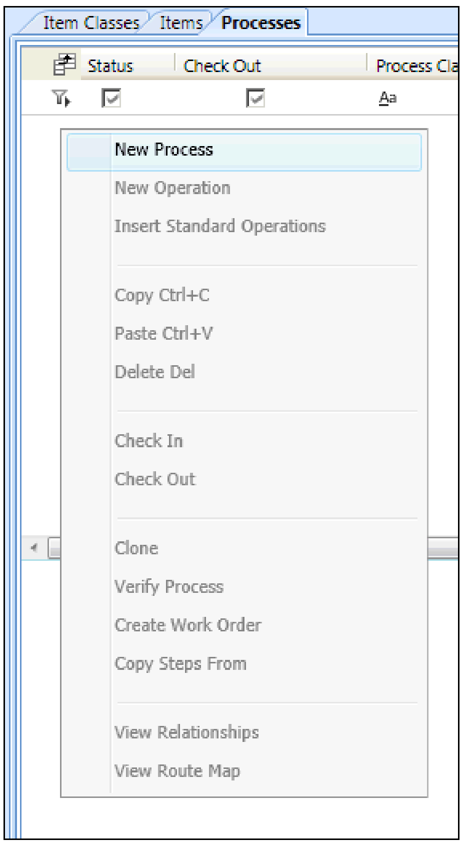


18. Click **Save All**.

19. In the **Navigation Bar**, click **Process Definition**.
20. Expand **Processes** and click **Apply filters**.

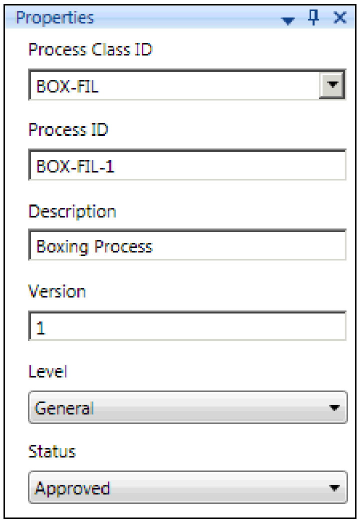


21. On the **Processes** tab, right-click the empty workspace and select **New Process**.

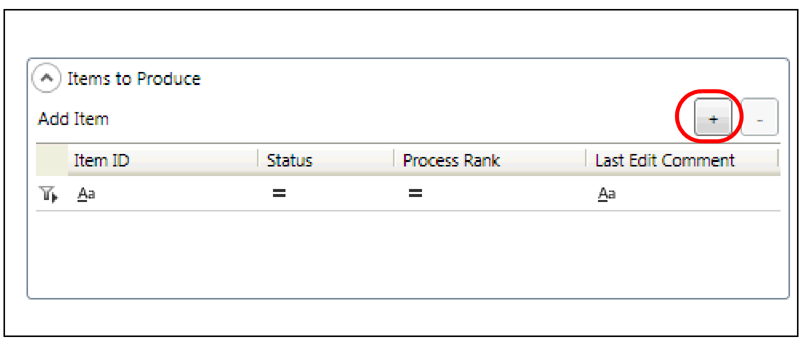


22. Configure the **Properties** pane as follows:

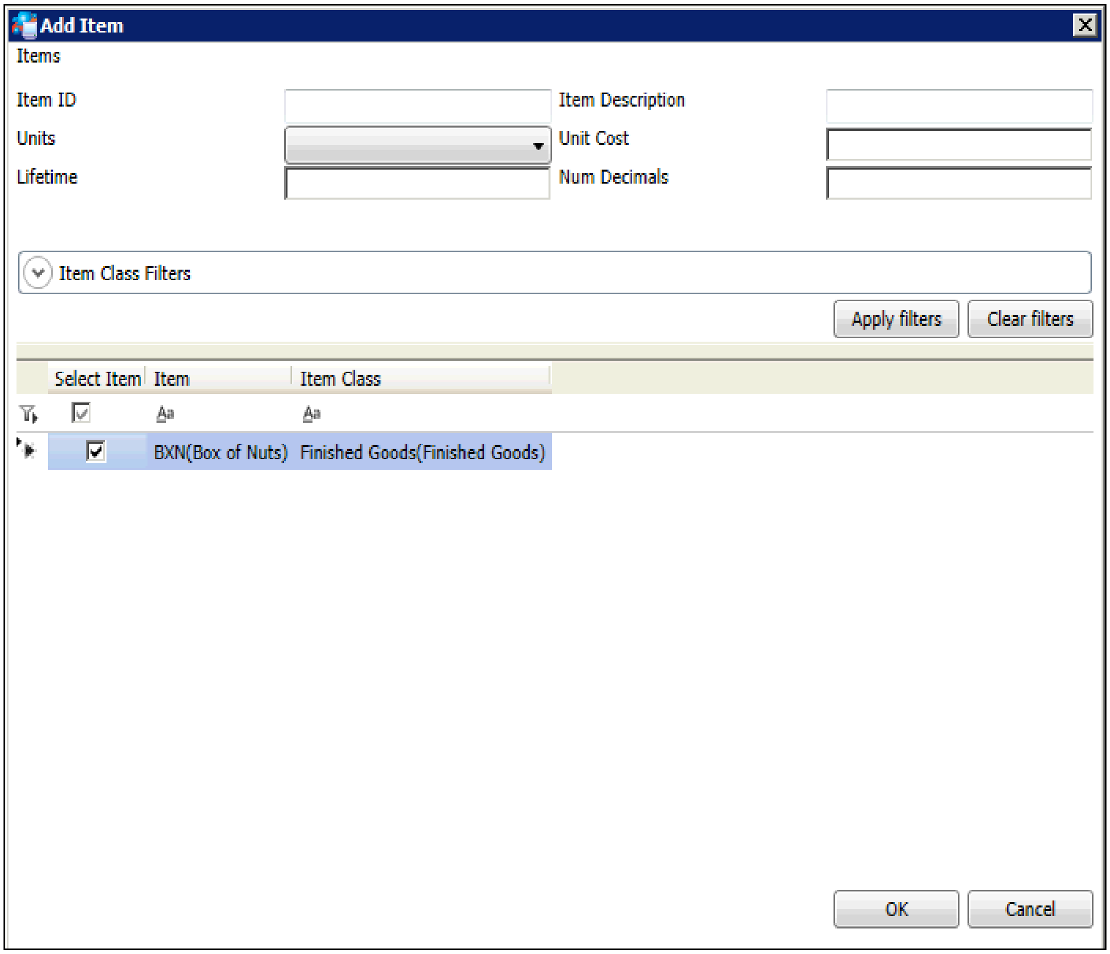
    Process Class ID: BOX-FIL
    Process ID: BOX-FIL-1 (*default*)
    Description: Boxing Process
    Status: Approved



23. In the bottom portion of the **Properties** pane, expand the **Items to Produce** area and click the **Add** button.

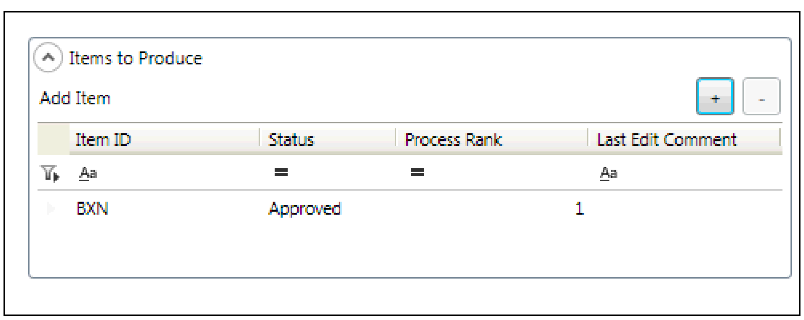


24. In the **Add Item** dialog box, click **Apply filters**.
25. Check the **BXN(Box of Nuts)** item.



26. Click **OK**.

    In the **Items to Produce** area, the selected item appears.

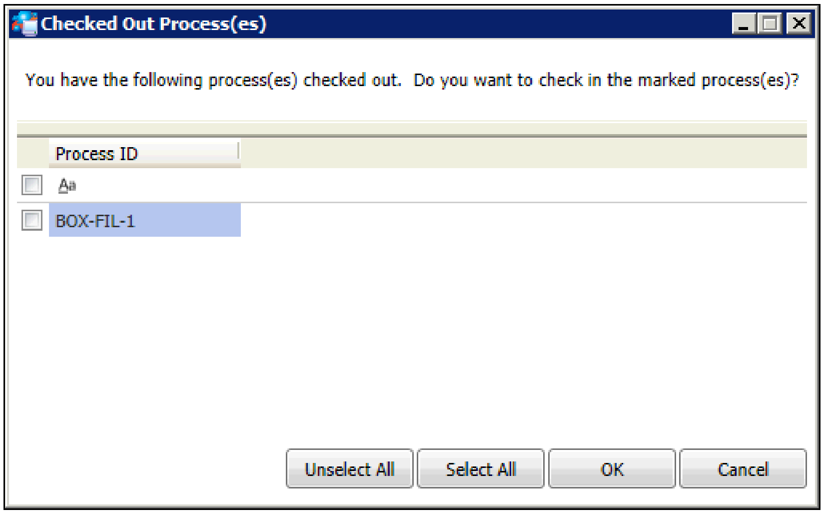


27. Click **Save All**.

The **Check Out Process(es)** dialog box appears.

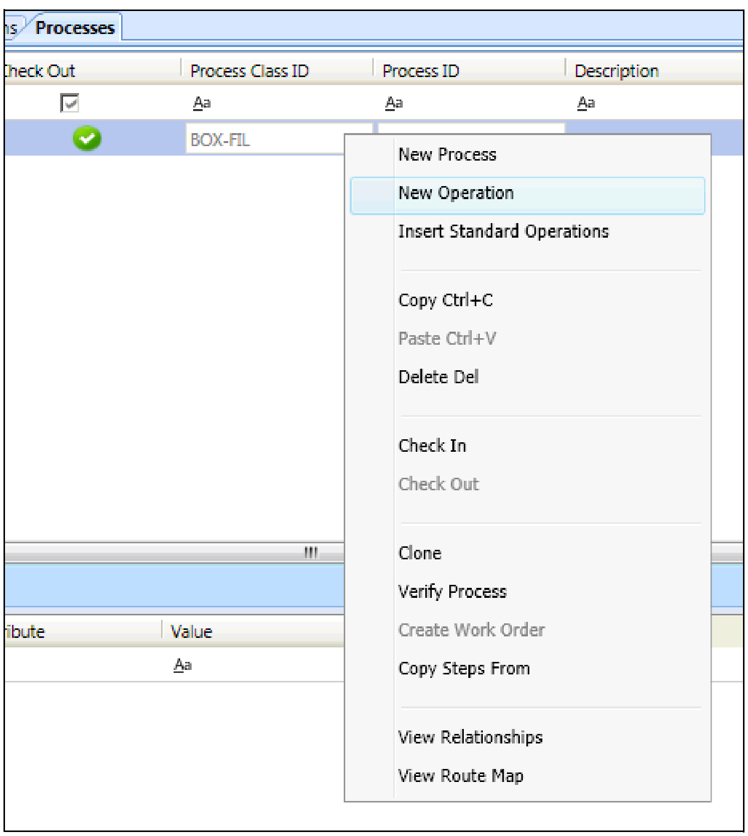
Since further configuration of the process is required, you will leave the process checked out.

28. Uncheck **BOX-FIL-1**.



29. Click **OK**.

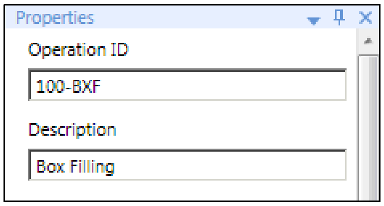
30. On the **Processes** tab, right-click the **BOX-FIL** process and select **New Operation**.



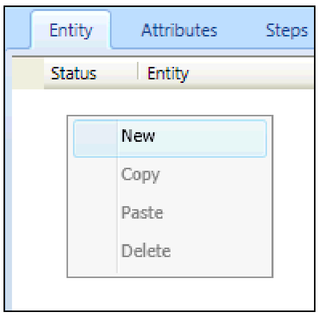
31. Configure the **Properties** pane as follows:

    Operation ID: 100-BXF

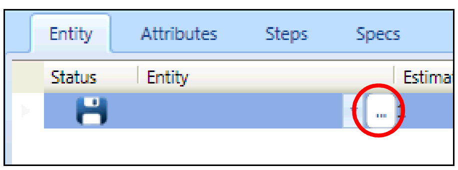
    Description: Box Filling



32. Click **Save All**.
33. On the **Entity** tab, right-click the empty workspace and select **New**.

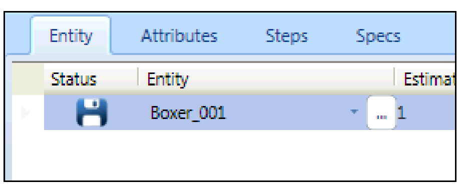


34. In the **Entity** field, click the ellipsis button.



35. In the **Entity window**, expand **Entities** and **Production**, and then click **Boxer_001**.
36. Click **OK**.

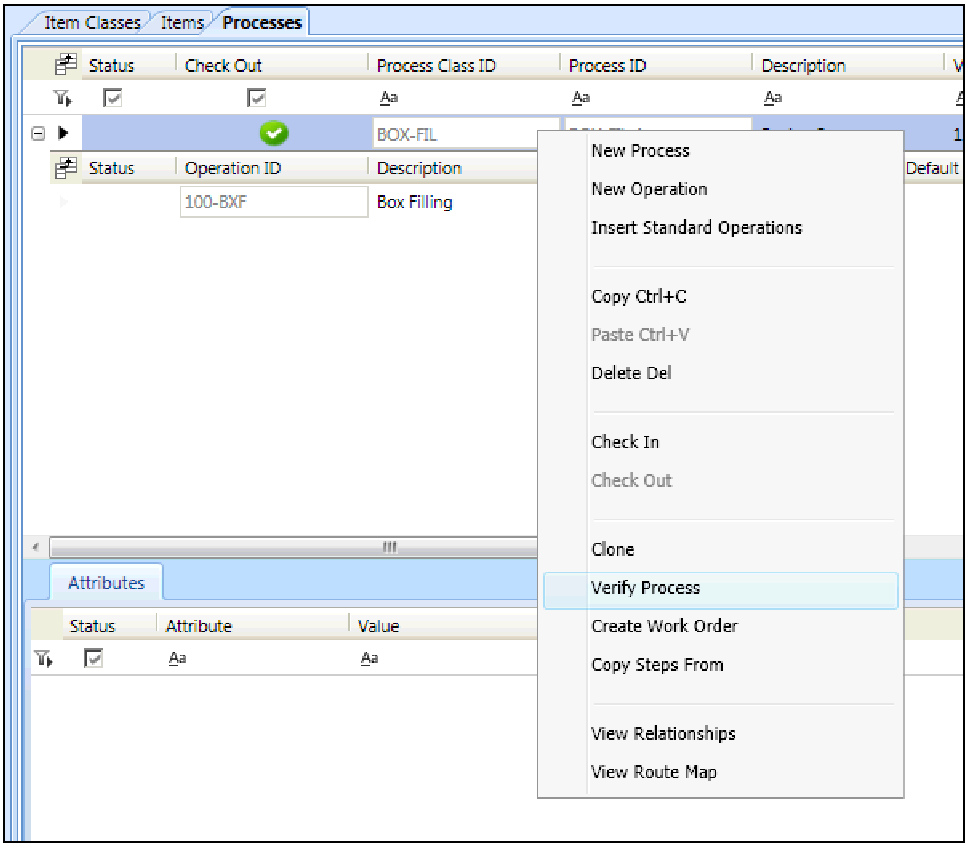
    On the **Entity** tab, **Boxer_001** appears.



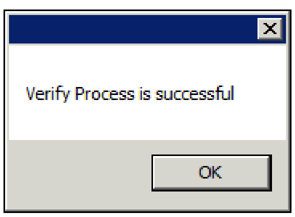
37. Click **Save All**.

Since the configuration of the process is now complete, you will verify and check in the process.

38. On the **Processes** tab, click **BOX-FIL**, and then right-click **BOX-FIL** and select **Verify Process**.



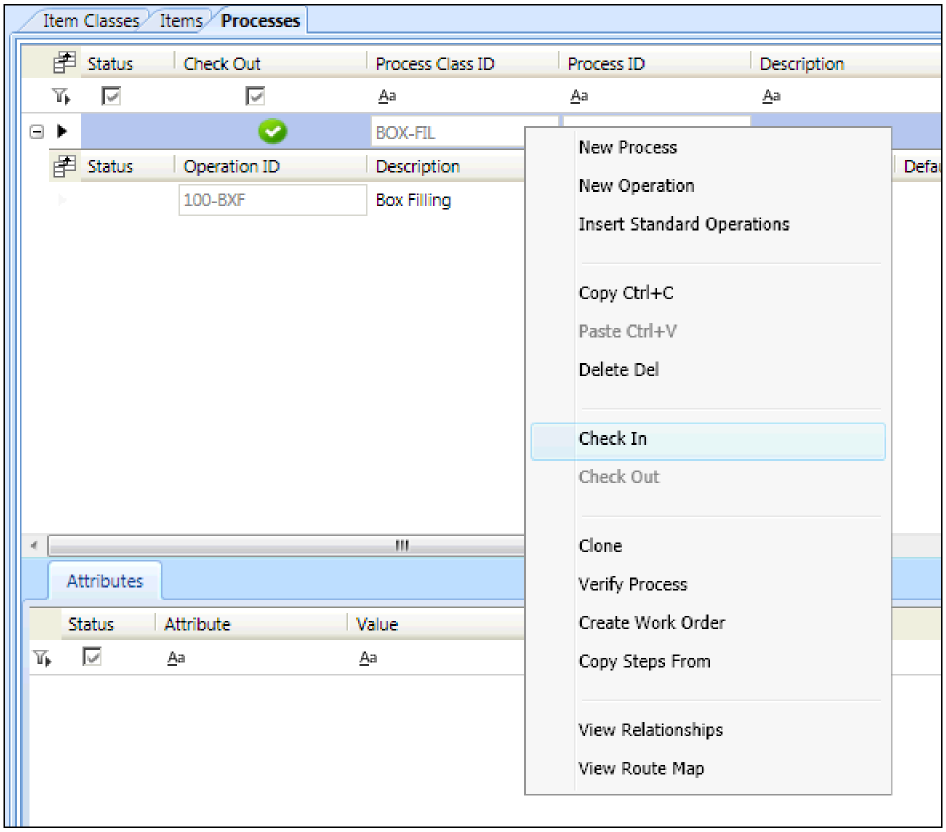
The confirmation dialog box appears.



39. Click **OK**.

Since the Process has been completed and verified, you will now check in the Process.

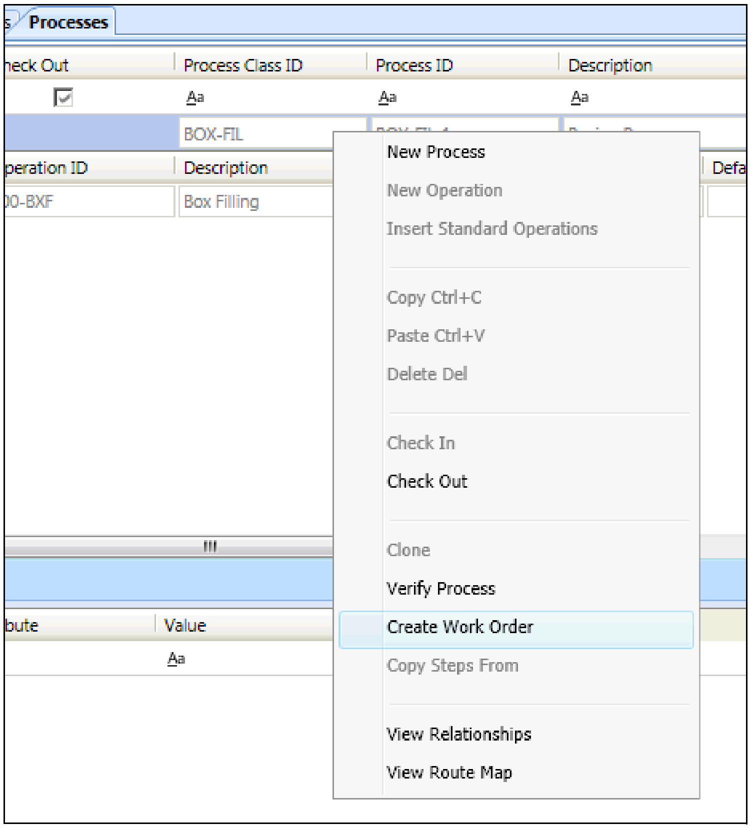
40. On the **Processes** tab, right-click **BOX-FIL** and select **Check In**.



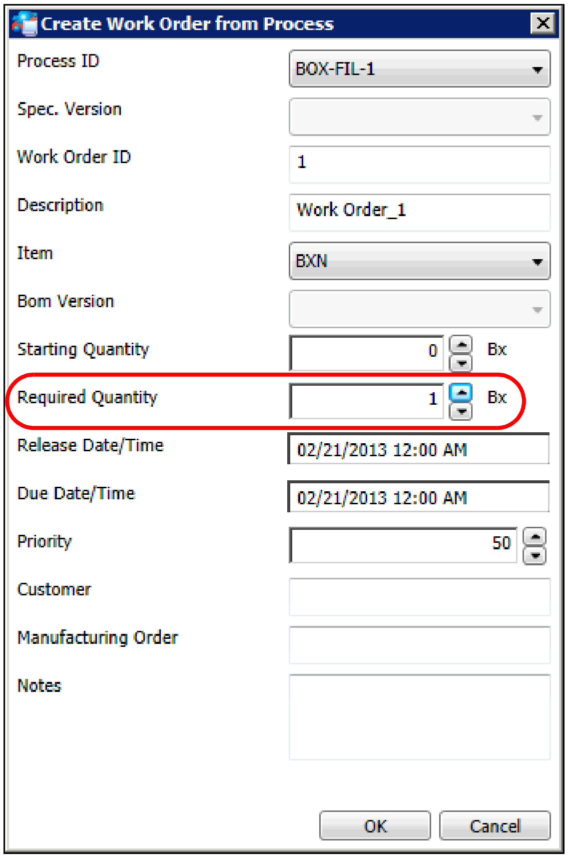
Create and Run the Work Order

In the previous steps, you used MES Client to configure a process. You will now create and run a work order.

41. On the **Processes** tab, right-click **BOX-FIL** and select **Create Work Order**.



42. In the **Create Work Order from Process** dialog box, **Required Quantity** field, enter **1**.



43. Click **OK**.

Now, you will run the work order.

44. Open MES Operator (**Start | All Programs | Wonderware | MES | Operator**).

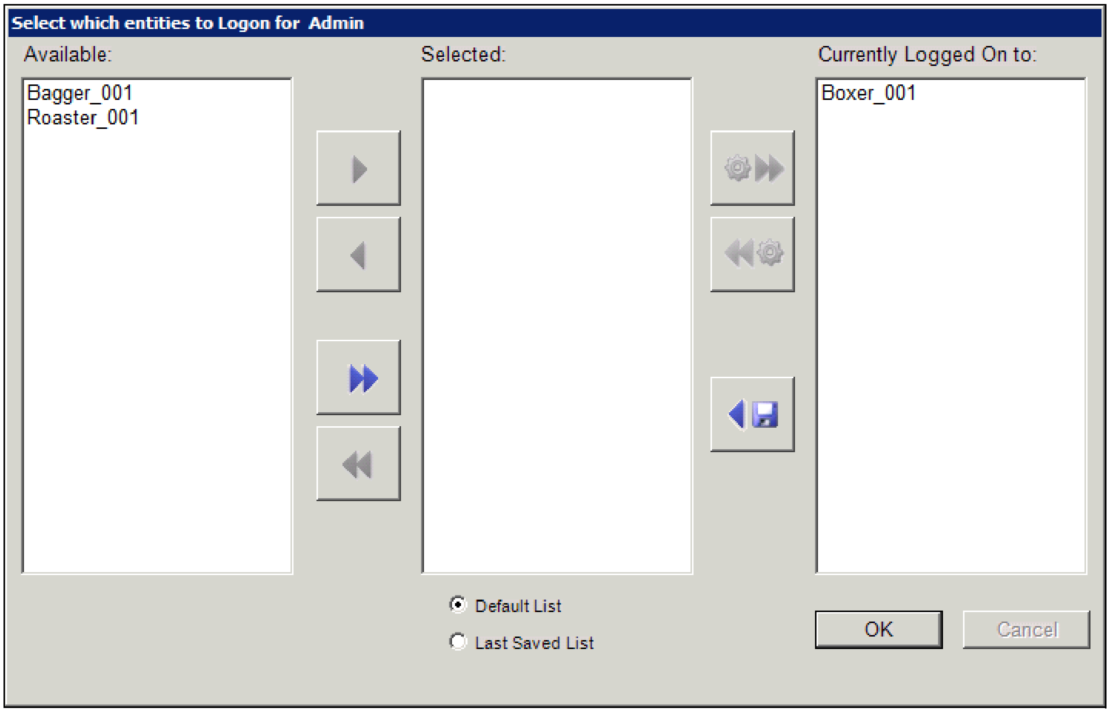
    After a few moments, MES Operator opens and prompts for credentials.

45. Log in with the following credentials:

    User Name: Admin

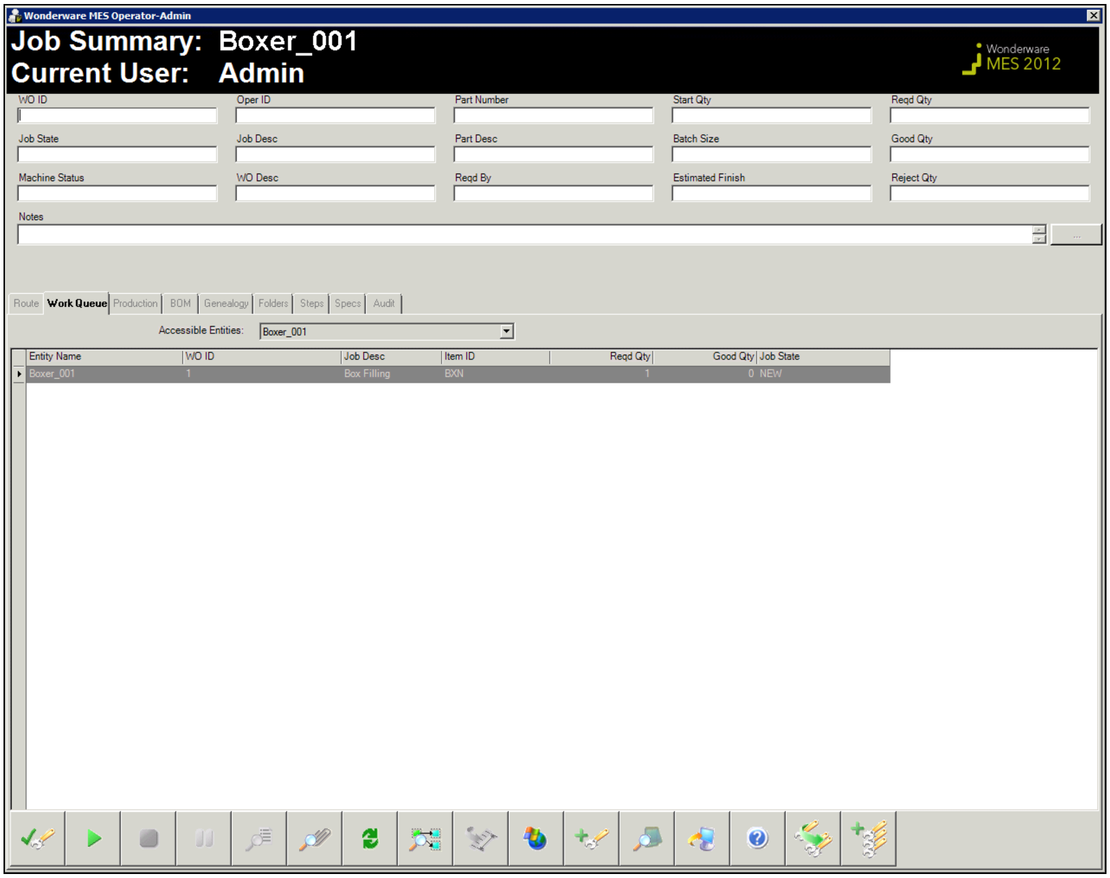
    Password: iom

46. In the **Select which entities to Logon for Admin** dialog box, move **Boxer_001** to the **Currently Logged On to** column.



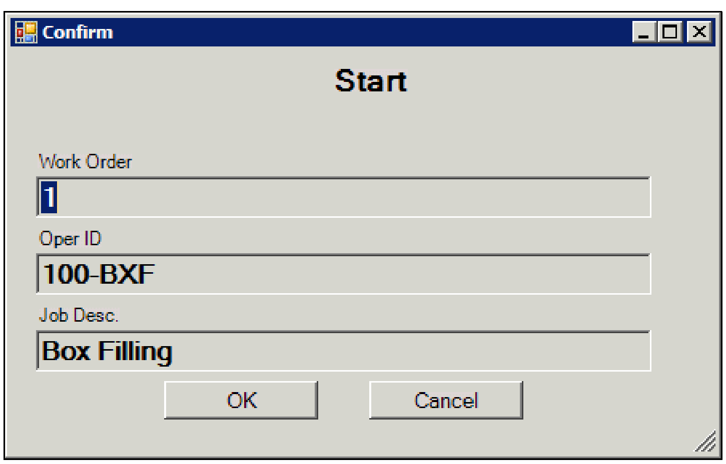
47. Click **OK**.

The MES Operator window appears.



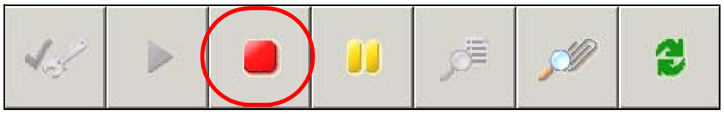
48. On the **ButtonBar**, click the **Start the selected job** button.

The **Confirm** dialog box appears.

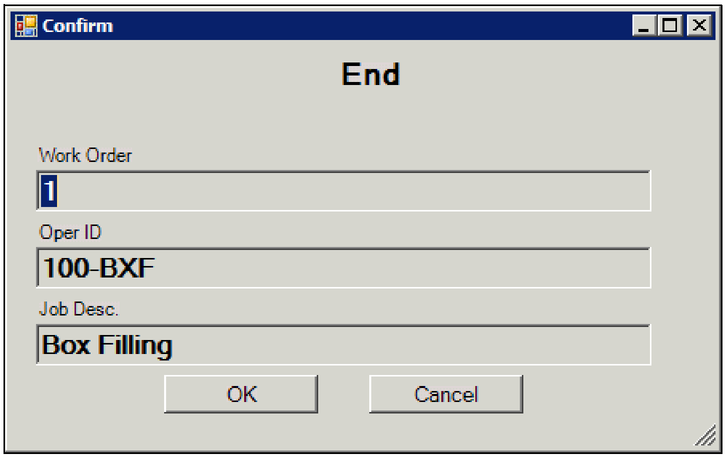


49. Click **OK**.

50. On the **ButtonBar**, click the **Stop the selected job** button.



The **Confirm** dialog box appears.



51. Click **OK**.

This completes the running of the work order.

52. In MES Client, close all open tabs.

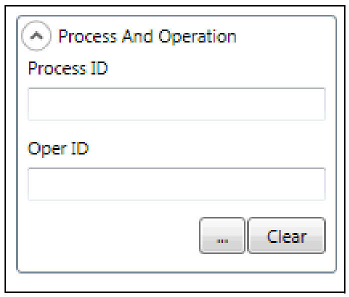
Section 2 – Building a Sample Plan for an Operation

This section further explains the integration between Wonderware MES Software/Operations and Wonderware MES Software/Quality by collecting Quality data with an Operations job.

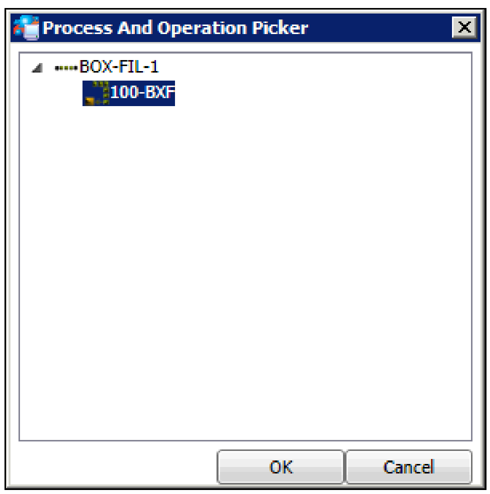
Linking a Process to a Quality Management Specification

A Process or Operation can be used to create quality samples. The samples are created when an Entity is running a work order at the specified operation.

With a Process defined in the MES Client, you can link a Process to a QM Specification, while creating the QM Specification Definition. Located in the **Properties** pane, there is an area titled **Process And Operation** where the link is created.



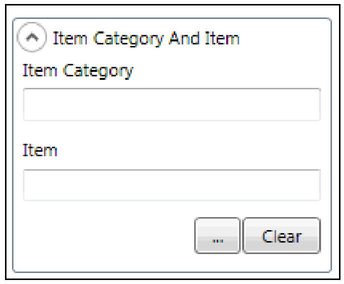
The ellipsis button displays the **Process And Operation Picker**. A list of all of the Processes and Operations created in the MES Client is displayed.



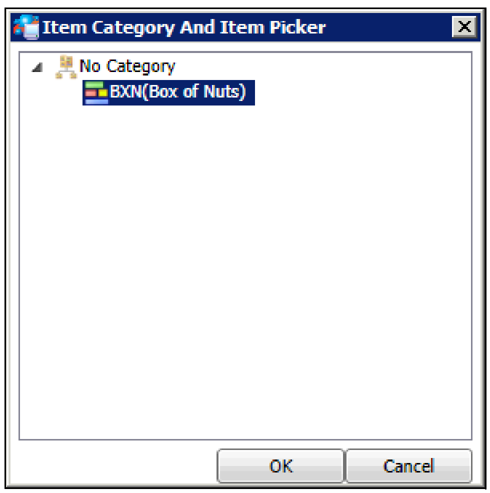
Linking an Item to a Quality Management Specification

An Item or Item Category can be used to define the quality samples. The samples are collected when an Entity with the Can Capture QM Data capability is running a work order and producing an item that matches the specified item or item category.

With an Item defined in the MES Client, you can link an Item to a QM Specification, while creating the QM Specification Definition. Located in the **Properties** pane, there is an area titled **Item Category and Item** where the link is created.



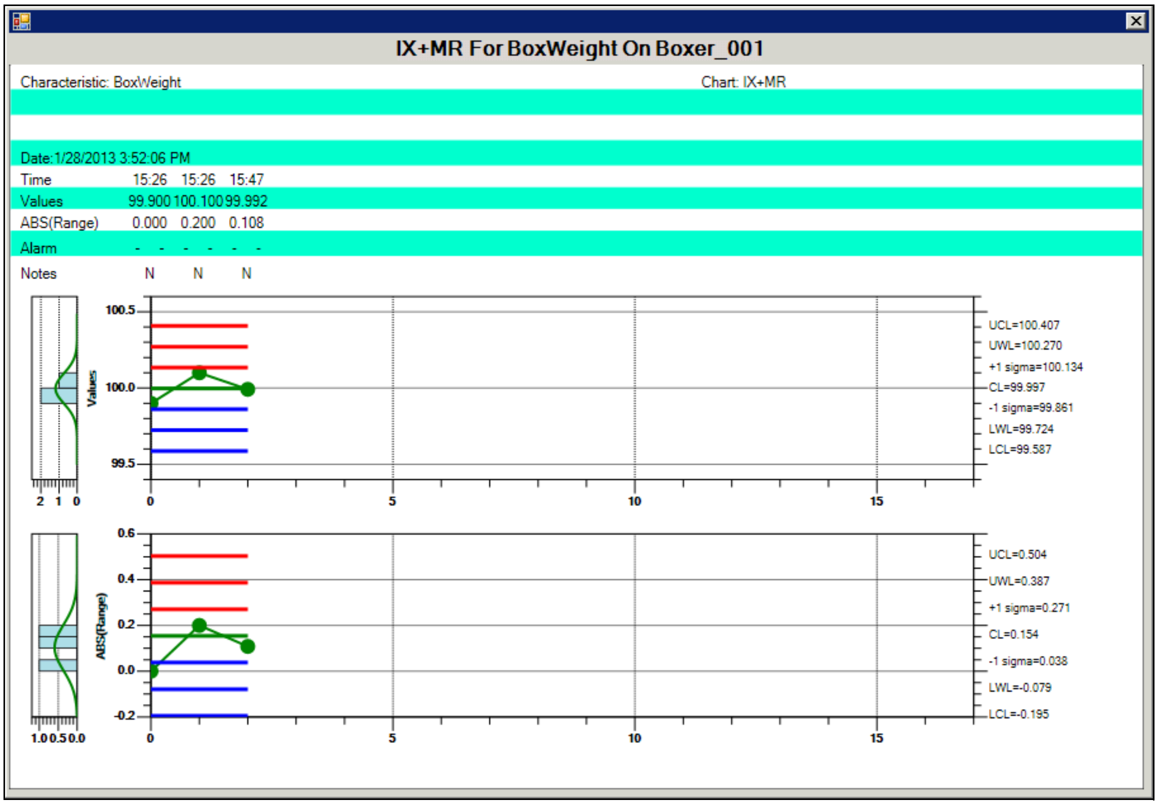
The ellipsis button displays the **Item Category And Item Picker**. A list of all of the Items and Categories created in the MES Client is displayed.



Lab 11 – Creating and Running the Box Weight Sample Plan

Introduction

In the last lab, you used the OCO and MES Client to create a work order to fill an empty box with 100 bags of mixed nuts. In this lab, you will create more work orders for the same and a Sample Plan configured to request the box weight of the boxes filled with the mixed nuts packages. Then, you will open a control chart and view the data.



Objectives

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

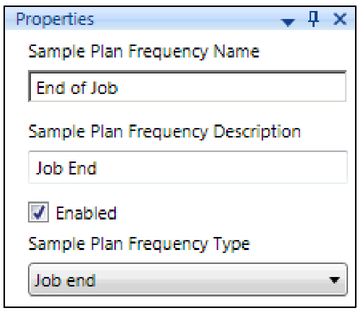
- Integrate a Sample Plan, work order, and automatic data collection
- Verify and chart the data

Configure the Box Weight Sample Plan

First, you will configure another Sample Plan to measure the weight of the boxes after being filled with the mixed nut bags.

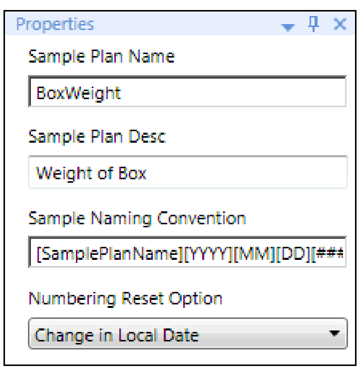
1. In MES Client, **Navigation Bar**, click the **Quality Management** group.
2. Expand **Sample Plan Frequency** and click **Apply filters**.
3. On the **Sample Plan Frequency Definition** tab, right-click the empty workspace and select **New**.
4. Configure the **Properties** pane as follows:

   Sample Plan Frequency Name: End of Job
   Sample Plan Frequency Description: Job End
   Sample Plan Frequency Type: Job end

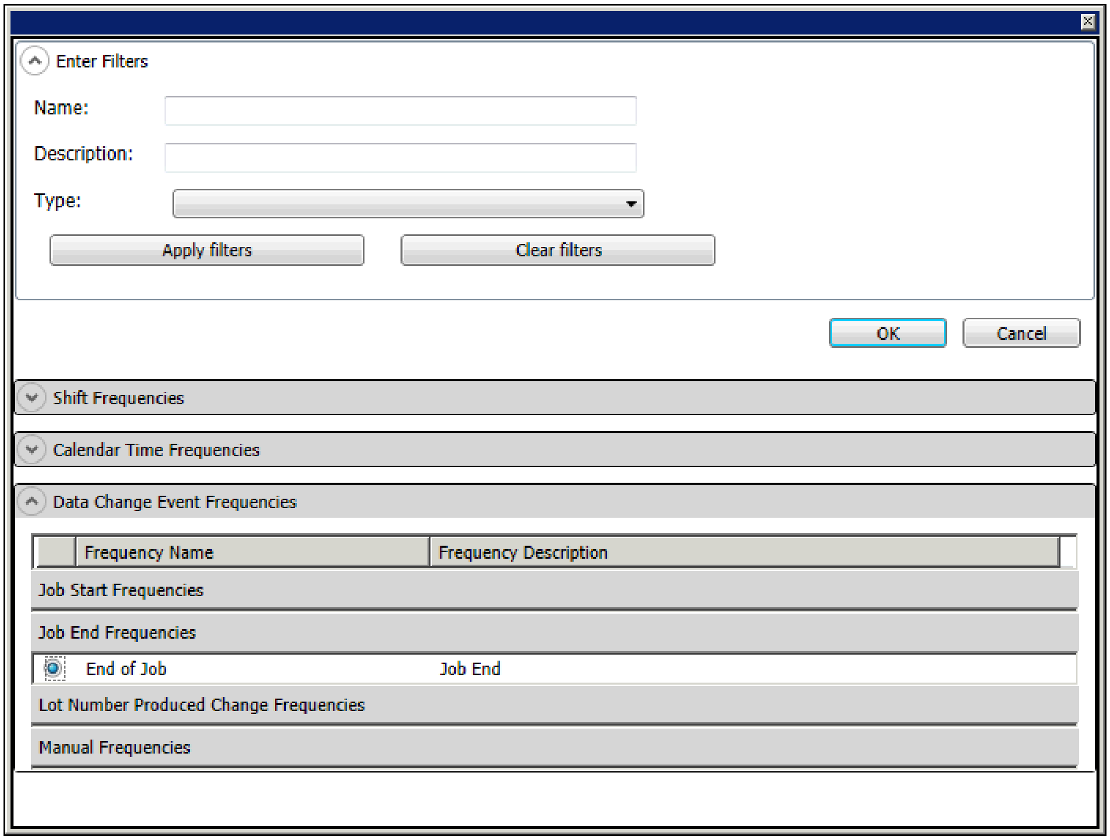


5. Click **Save All** and collapse the **Sample Plan Frequency** module.
6. In the **Navigation Bar**, expand **Sample Plan** and click **Apply filters**.
7. On the **Sample Plan** tab, right-click the empty workspace and select **New.**
8. Configure the **Properties** pane as follows:

   Sample Plan Name: BoxWeight
   Sample Plan Desc: Weight of Box
   Numbering Reset Option: Change in Local Date



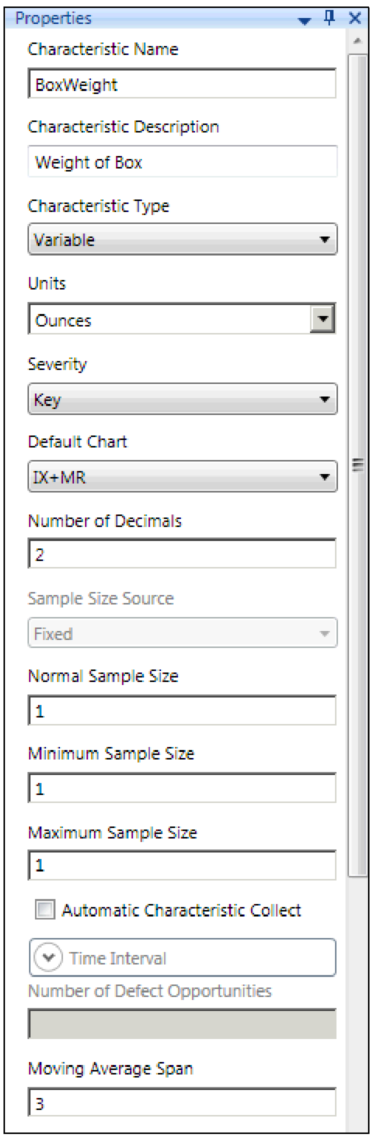
9. On the **Frequencies** tab, right-click the empty workspace and select **Add Link**.
10. In the **Enter Filters** dialog box, click **Apply filters**.
11. Expand **Data Change Event Frequencies** and click the **End of Job** option.



12. Click **OK**.
13. Click **Save All** and collapse the **Sample Plan** module.
14. In the **Navigation Bar**, expand **Characteristic** and click **Apply filters**.
15. On the **Characteristic Definition** tab, right-click the empty workspace and select **New**.

16. Configure the **Properties** pane as follows:

Characteristic Name:	BoxWeight
Characteristic Description:	Weight of Box
Characteristic Type:	Variable (*default*)
Units:	Ounces
Severity:	Key
Default Chart:	IX + MR (*default*)
Number of Decimals:	2
Normal Sample Size:	1 (*default*)
Minimum Sample Size:	1 (*default*)
Maximum Sample Size:	1
Moving Average Span:	3



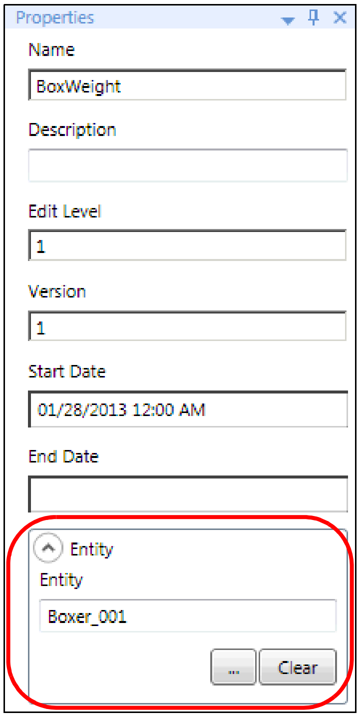
17. Click **Save All** and collapse the **Characteristic** module.

18. In the **Navigation Bar**, **QM Specification** module, click **Apply filters**.
19. On the **QM Specification Definition** tab, right-click the empty workspace and select **New**.
20. Configure the **Properties** pane as follows:

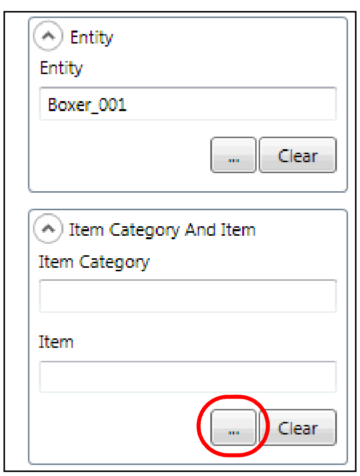
    Name: BoxWeight

    Version: 1

21. Expand the **Entity** area and select the **Boxer_001** entity.

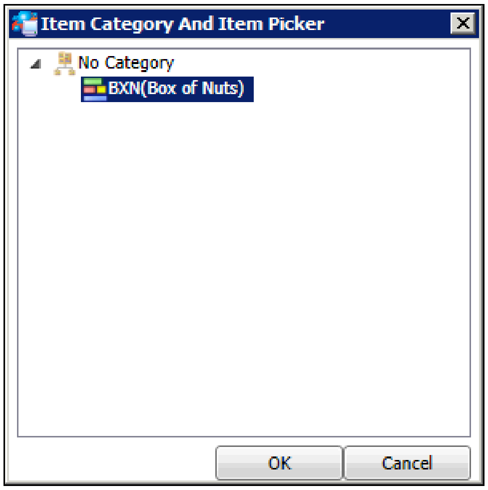


22. Expand the **Item Category And Item** area and click the ellipsis button.



The **Item Category And Item Picker** dialog box appears.

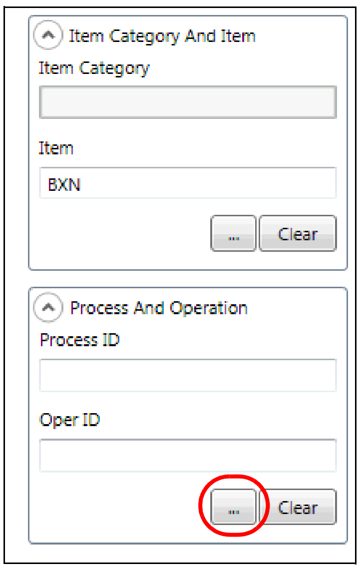
23. Expand the tree and click **BXN(Box of Nuts)**.



24. Click **OK**.

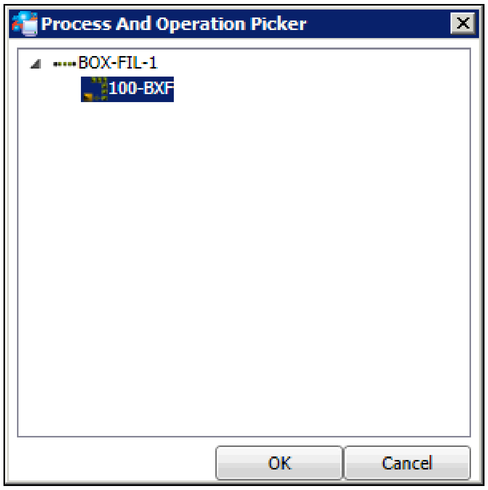
    In the **Item Category And Item** area, **BXN** appears.

25. Expand the **Process And Operation** area and click the ellipsis button.



The **Process And Operation Picker** dialog box appears.

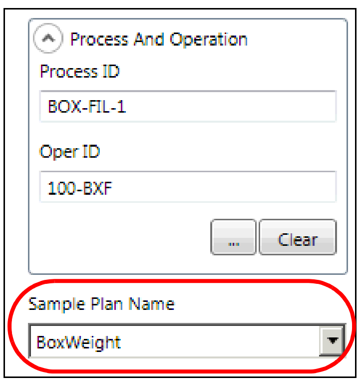
26. Expand the tree and click **100-BXF**.



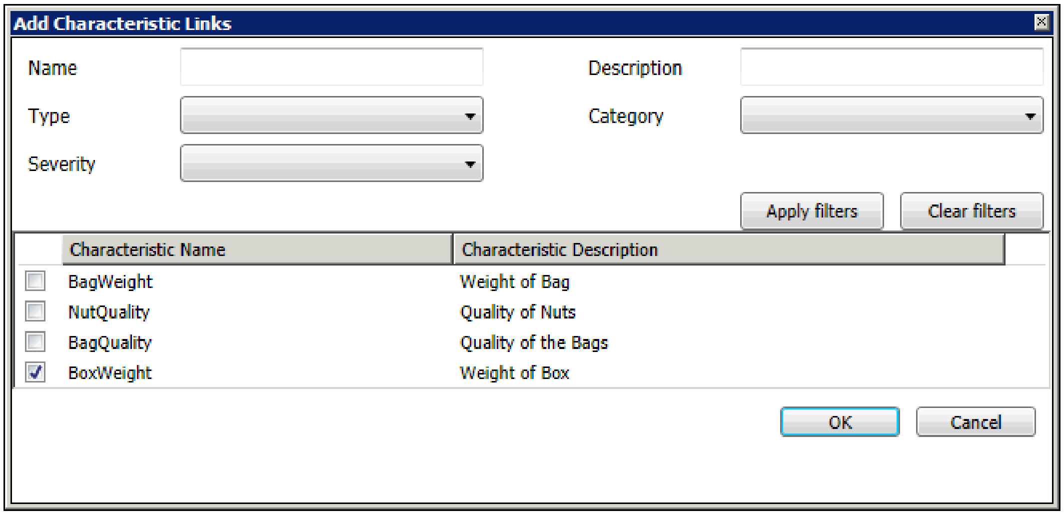
27. Click **OK**.

In the **Process And Operation** area, the **Process ID** and **Oper ID** appear.

28. In the **Properties** pane, scroll down, and then in the **Sample Plan Name** drop-down list, click **BoxWeight**.



29. In the bottom part of the workspace, On the **Characteristics** tab, right-click the empty workspace and select **Add Link**.
30. In the **Add Characteristic Links** dialog box, click **Apply filters**.
31. Check **BoxWeight**.



32. Click **OK**.

33. Expand **Specification/Limits** and configure the **Properties** pane as follows:

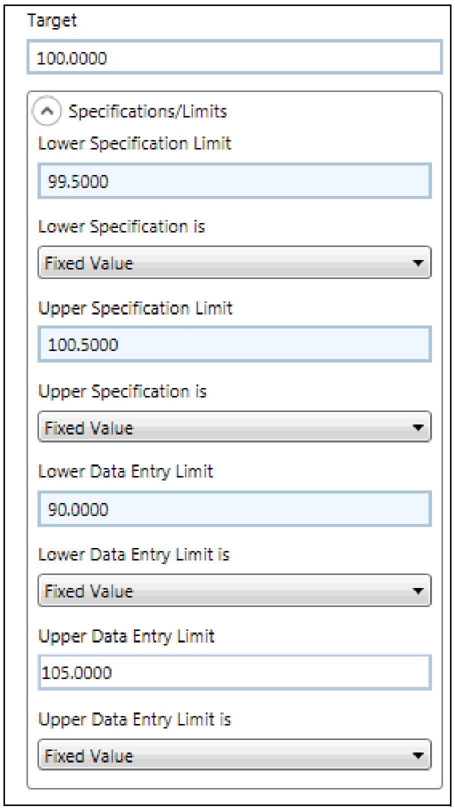
    Target: 100

    Lower Specification Limit: 99.5

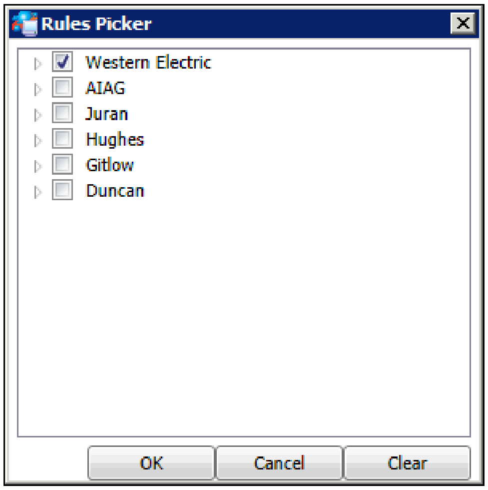
    Upper Specification Limit: 100.5

    Lower Data Entry Limit: 90

    Upper Data Entry Limit: 105



34. On the **Rules** tab, right-click the empty workspace and select **Add Link**.
35. In the **Rules Picker** dialog box, check **Western Electric**.

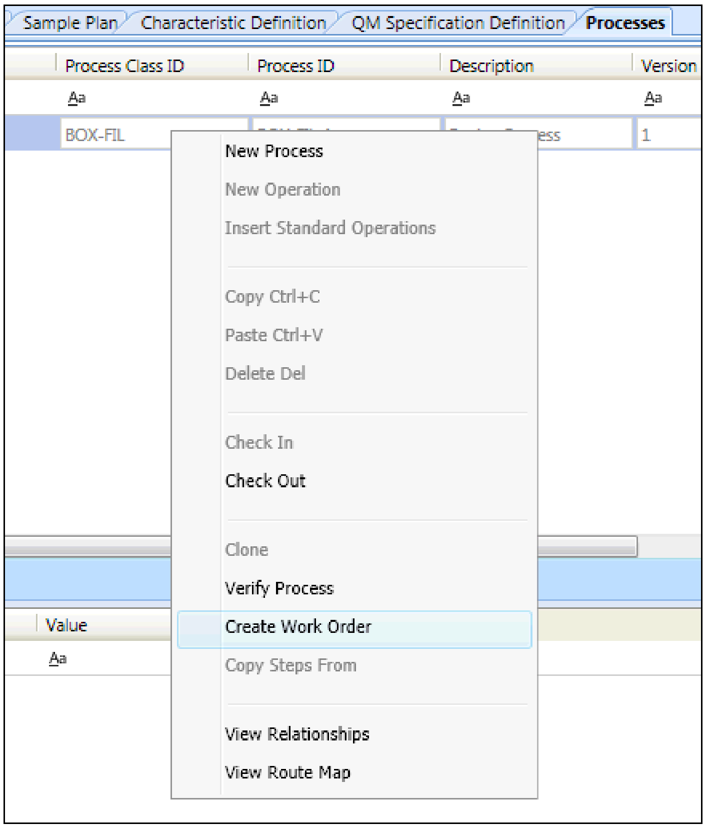


36. Click **OK**.
37. Click **Save All**.

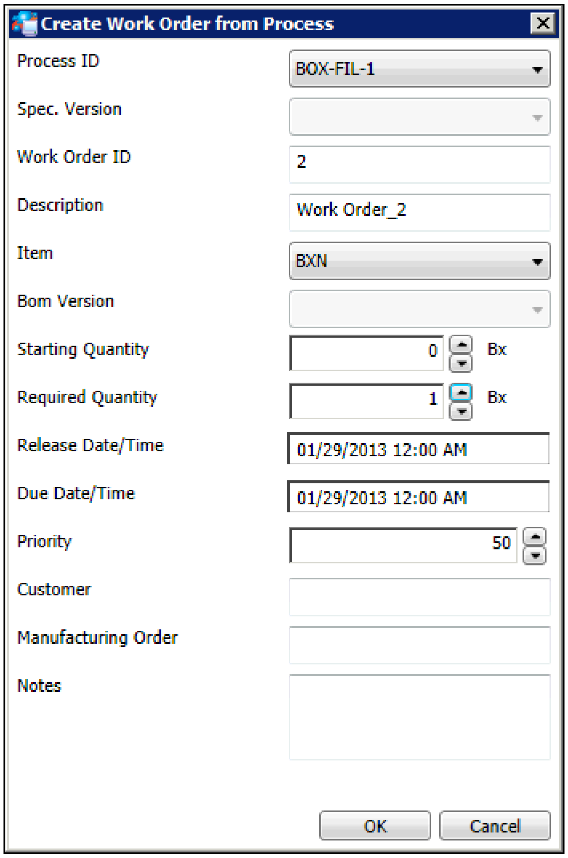
Create and Run the Work Order

You will now create a new work order and return to MES Operator to run the work order.

38. In the **Navigation Bar**, click **Process Definition**.
39. In the **Processes** module, click **Apply filters**.
40. On the **Processes** tab, right-click **BOX-FIL** and select **Create Work Order**.



41. In the **Create Work Order from Process** dialog box, **Required Quantity** field, enter **1**.

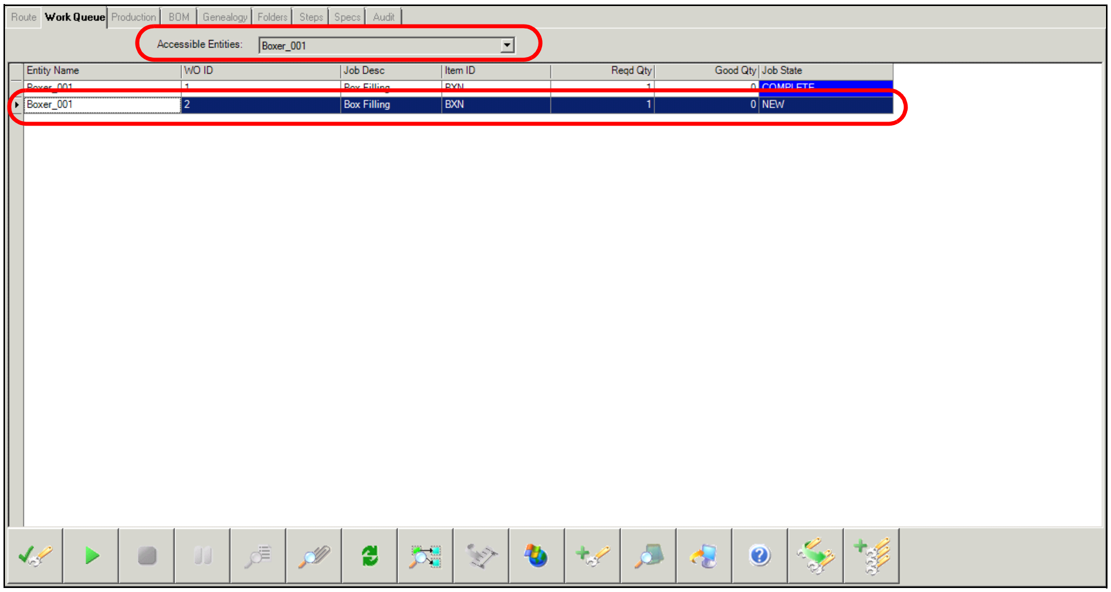


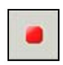
42. Click **OK**.

You will now return to MES Operator to run the work order.

43. In MES Operator, on the button bar, click the **Refresh** button.

44. On the **Work Queue** tab, in the **Accessible Entities** drop-down list, ensure **Boxer_001** is selected.
45. Click the second work order.



46. On the button bar, click **Start the selected job** .
47. In the **Confirm** dialog box, click **OK**.
48. On the button bar, click **End the selected job** .
49. In the **Confirm** dialog box, click **OK**.

Enter the Data in the Sample Viewer Control

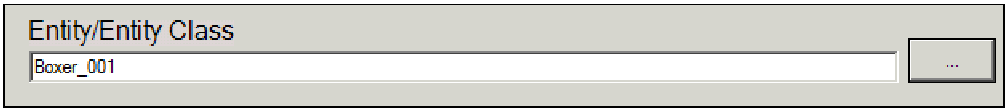
Next, you will return to **Sample Viewer** and enter the box weight data for both samples.

50. In WindowViewer, ensure **Sample Viewer** is showing, and then on the **ButtonBar**, click **Filter**.

If not showing, open **Sample Viewer.** The **Set Filter** dialog box appears automatically.

51. To the right of the **Entity/Entity Class** field, click the ellipsis button.
52. In the **Please select an entity** dialog box, expand **Production** and click **Boxer_001**.
53. Click **OK**.

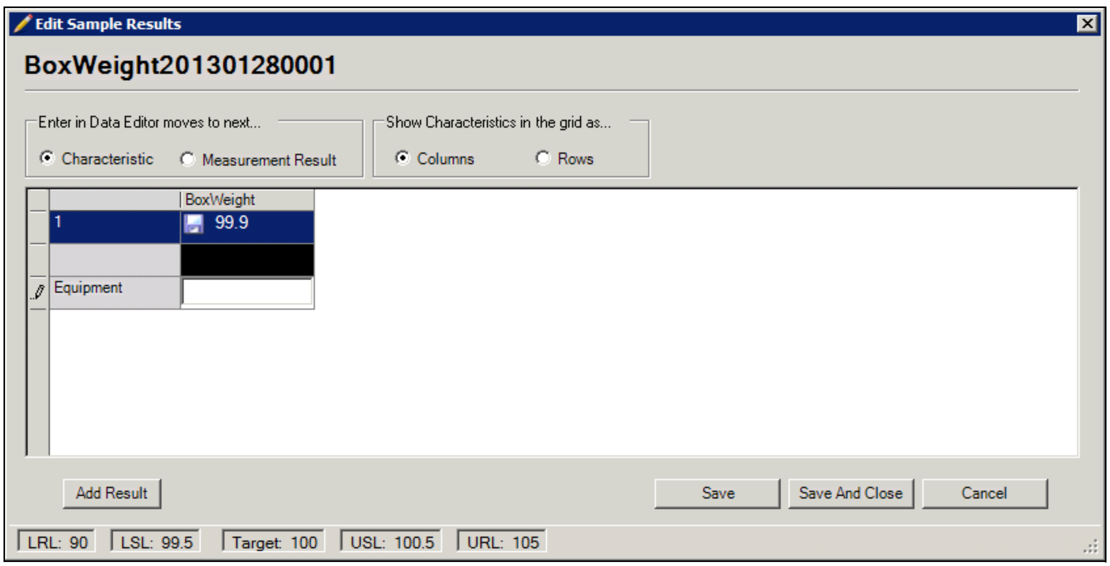
    In the **Entity/Entity Class** field, **Boxer_001** appears.



54. Click **Apply**.

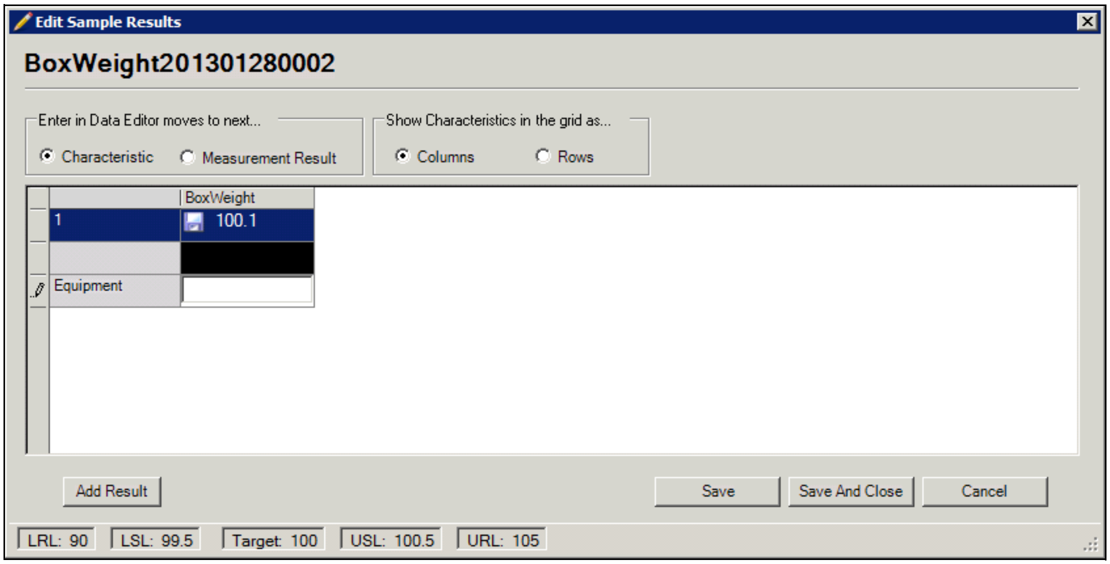
    If you had to open **Sample Viewer**, log on as **Boxer_001**.

55. In the **Sample Viewer** window, edit the first sample.
56. In the **Edit Sample Results** dialog box, **BoxWeight** field, enter **99.9**, and then press **Enter**.



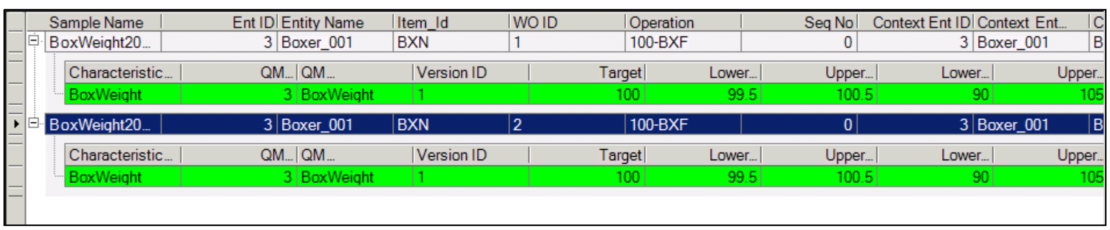
57. Click **Save And Close**.

58. Edit the second sample entering a box weight of **100.1**.



59. Click **Save And Close**.

Both **BoxWeight** Characteristics appear highlighted in green.

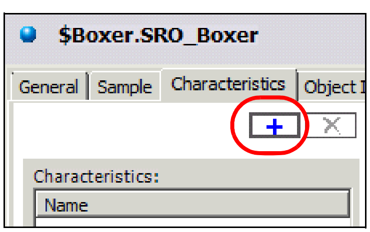


Configure the SRO for Automatic Data Collection

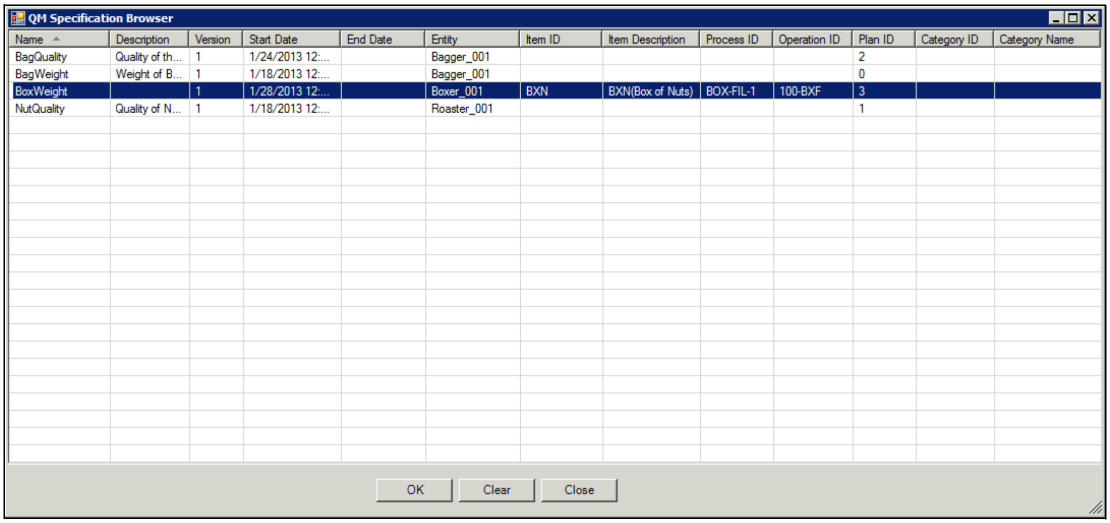
Now, you will return to the ArchestrA IDE to configure **SRO_Boxer** for automatic data collection.

60. In the ArchestrA IDE, **Template Toolbox**, double-click **SRO_Boxer**.

61. On the **Characteristics** tab, click **Add**.

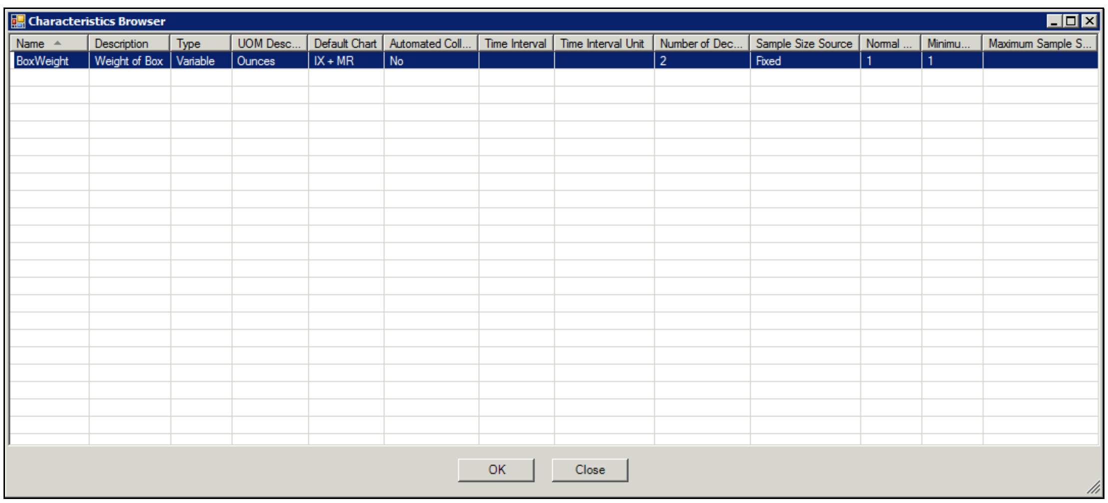


62. In the **QM Specification Browser**, click **BoxWeight**.



63. Click **OK**.

64. In the **Characteristics Browser**, click **BoxWeight**.

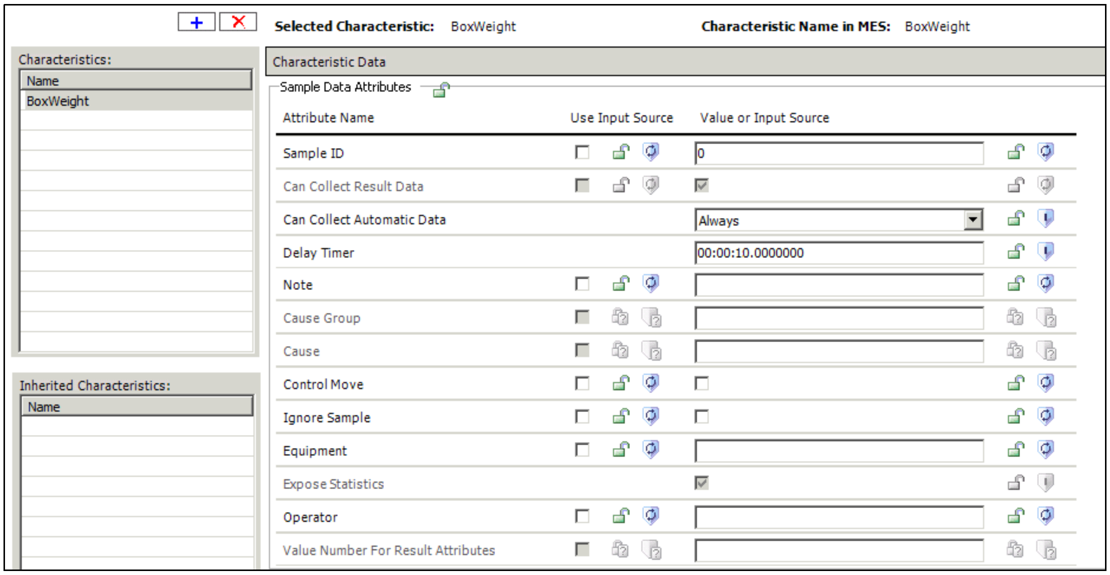


65. Click **OK**.

66. Configure the **Sample Data Attributes** area as follows:

Can Collect Automatic Data: Always

Delay Timer: 00:00:10.0000000

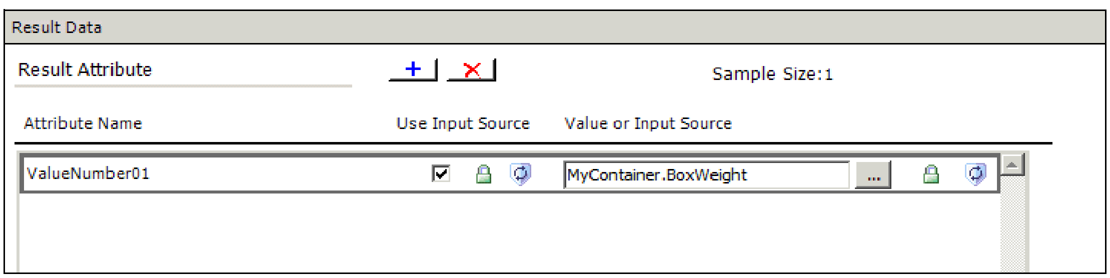


67. In the **Result Attribute** area, click **Add**.

68. Configure the **ValueNumber01** attribute as follows:

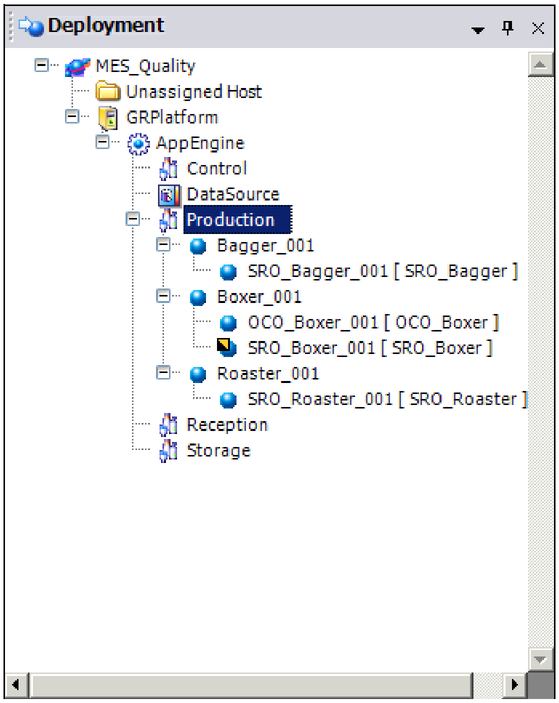
Use Input Source: *checked* and *locked*

Value or Input Source: MyContainer.BoxWeight and *locked*



69. Save and close the configuration editor.

The **Deployment** view displays that **SRO_Boxer_001** needs to be redeployed.



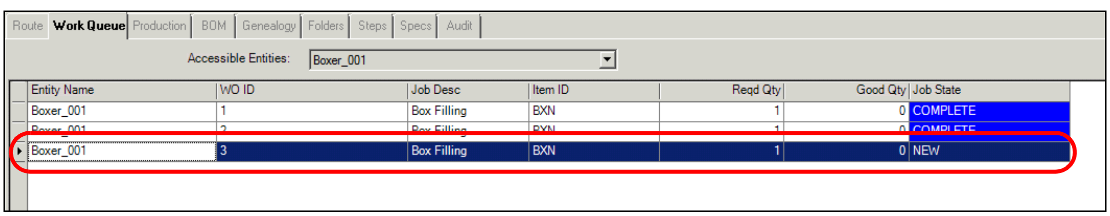
70. Redeploy **SRO_Boxer_001**.

Create and Run Another Work Order

You will now return to MES Client to create a third work order. Then, you will return to MES Operator to run the work order. Finally, you will return to **Sample Viewer** to verify and chart the data.

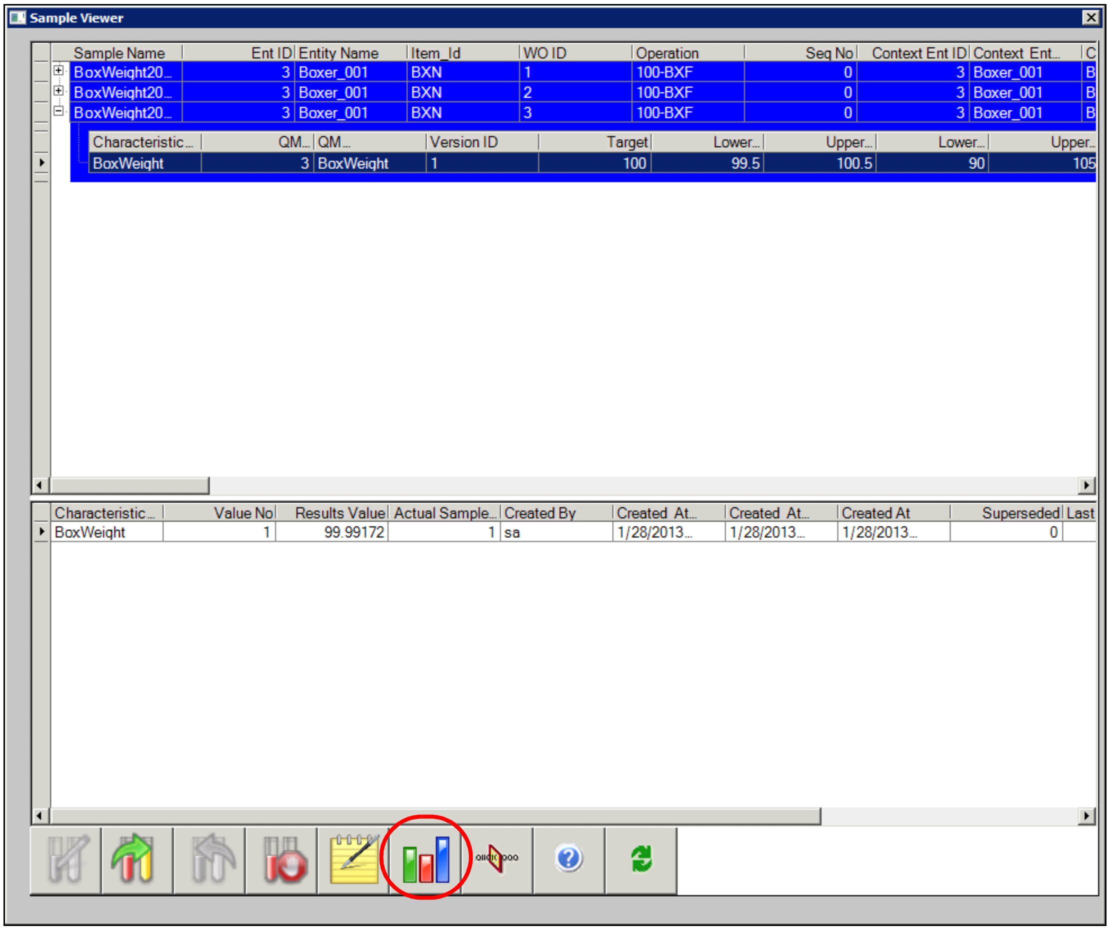
71. In MES Client, on the **Processes** tab, create a new work order from **BOX-FIL-1**.

72. In MES Operator, click **Refresh**, and then on the **Work Queue** tab, click the third work order.

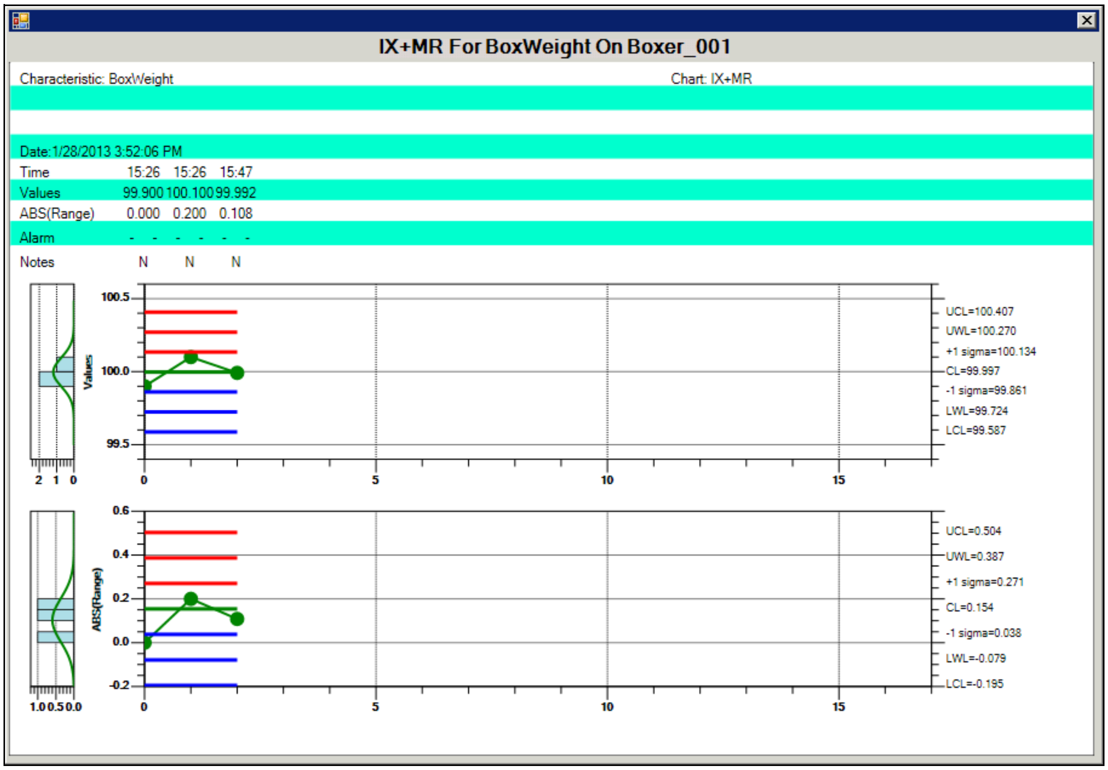


73. Start and stop the selected job.

74. In WindowViewer, **Sample Viewer** window, click **Refresh**.
75. Expand the third sample and click the **BoxWeight** Characteristic.
76. Click the **Chart** button.



The chart appears and displays the three data points.



Optional

77. Repeat work order creation and the running of jobs as desired.

Module 5 – MES Reporting Features

Module Objectives

- Implant a Control Chart interface using ArchestrA graphics
- Explain the Wonderware Information Server Reporting Elements associated with MES Software/Quality

Section 1 – Control Charts

This section describes how to implement an SPC Control Chart using MES .NET controls. This includes how to interface with the control chart.

SPC Chart

The MES Software/Quality ArchestrA graphics package provided with this course, also found on the WDN, includes an SPC Chart Graphic. The SPC Chart Graphic is provided for interacting with the MES Software/Quality SPC Chart control. The SPC Chart Graphic consists of two main components. The left side has numerous chart properties available for interacting with the chart while the right side has the embedded SPC Chart .NET control.

SPC Chart Control Configuration

The SPC Chart .NET control has been configured with some of the properties already set. These can be found by selecting the chart and going to the end of the properties list in the group titled Quality Management.

The Characteristic Name Filter property is a required property at runtime and has been pre-configured with “pH”. This can be changed at runtime or in development.

The Chart Title property has also been entered in development.

The Plot Primary Measurements is turned off initially.

The Chart Type, Points Per Page, and Refresh Rate settings are left at the default values.

All the chart properties for showing the charts and histograms are turned on.

If you double-click on the chart you will get a list of data bindings done on the SPC Chart. Many of the chart properties are best accessed through the data bindings of the chart so that changes are directly sent to the chart without having to write extra code to handle data types not well understood by ArchestrA. The chart properties that have data bindings are:

- **Chart Title**: To specify the title of the chart
- **Chart Type**: To specify the type of chart for plotting the data points or set the chart type to **Default** to use the chart configured in the Characteristic
- **Number Of Points**: To specify the maximum number of data points that can be plotted on the chart
- **Points Per Page**: To specify the number of point that can be displayed on the graph at a given time
- **Refresh Rate**: To specify the plotting rate, in minutes, to check the MESDB for new data

Design

Many user input fields are available on the graphic for interacting with the chart. As mentioned previously some like the Chart Title input field is tied to the chart through the data bindings. Others like all the chart filter options are tied to the SPC Chart property directly in the user input animation link. All the chart filter options are available except the Spare field filters.

The chart control options section has toggle check boxes to turn on and off charts, histograms, and individual measurements which are all directly linked to the SPC Chart through the animation links. The Refresh Rate, Number of Points, Points Per Page, and Chart type options are linked to the chart through the data bindings option to more readily handle data types.

Beneath the chart type user input is a List Box with the preconfigured charts that are supported by the control and the corresponding ChartType enumeration value expected by the control.

The graphic also has buttons which contain scripting to work with the settings.

The **Clear Filters** button calls the ClearFilters() method on the SPC Chart and then reads all the filter settings from the chart. This will clear out all the filters except the Characteristic.

The **Reset Filters** button calls the ResetFilters() method on the SPC Chart and then reads all the filter settings from the chart. This will read the most resent sample for the provided Characteristic and set the filters to the values in the database for the sample. Generally, this will set the Entity ID and if available the Item ID, Work Order, Process, and Operation. There is also a disable link if the chart is not in a state where this command can be called.

The **Display Chart** button calls the DisplayChart() method to refresh the SPC Chart with the updated filters and chart type applied. There is also a disable link if the chart is not in a state where this command can be called.

Runtime

The graphic element can be directly embedded within an InTouch window. There is no need to associate the graphic to an object.

When the window containing the graphic is first opened, the chart will be blank. To generate an SPC Chart, enter a valid Characteristic and click the **Display Chart** button. This will generate a chart using all the available data for the provided Characteristic which may be across multiple machines and/or products.

To generate a chart based on the filters defined within the MES database, click the **Reset Filters** button and then the **Display Chart** button.

Click any of the chart control options to show or hide chart components, which will immediately be reflected within the chart. The Chart Title will also be immediately reflected within the chart.

Changing the Characteristic will immediately clear out the chart and require the **Display Chart** button to be clicked again.

Changing any of the filters or the Chart Type will not clear out the chart and will not be applied until the **Display Chart** button is clicked again.

The **Clear Filters** button removes all the filters except the Characteristic and to clear out the SPC Chart. Enter any new filters if desired and click the **Display Chart** button to read the data for the supplied Characteristic and generate the SPC Chart.

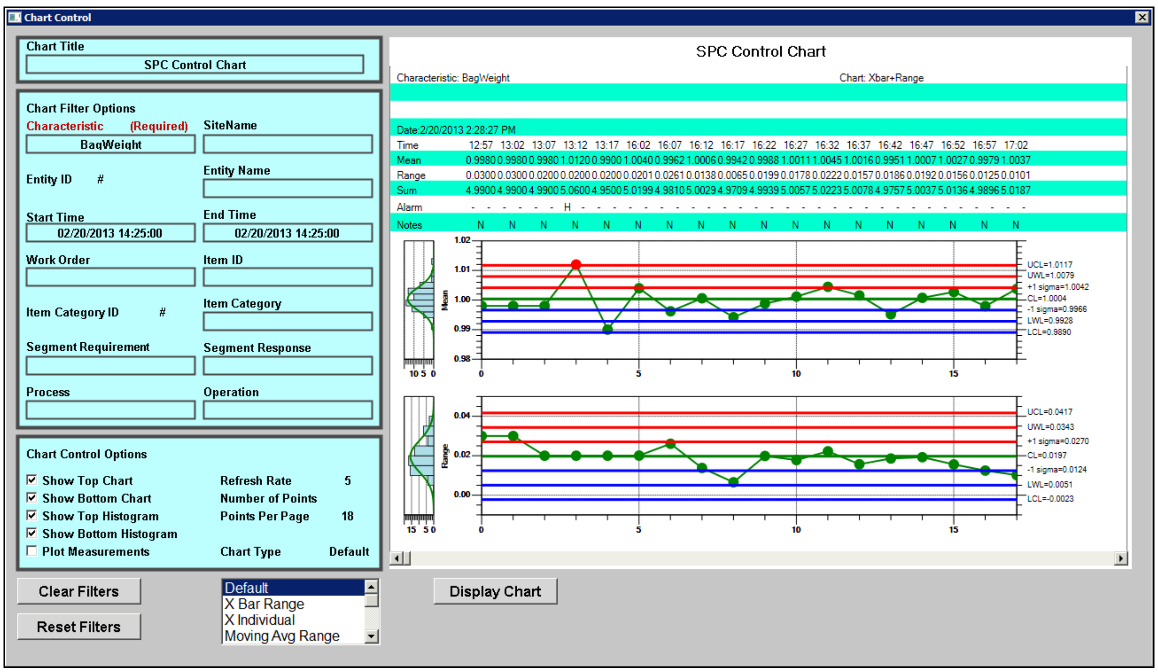
Lab 12 – Creating the InTouch Control Chart

Introduction

In previous labs, you created four Sample Plans and used the Sample Viewer Control to edit and view the data. While the Sample Viewer Control does allow for the editing and viewing of the data via a control chart, this may not be appropriate for all users.

In this lab, you will implement the **SPC Control Chart** symbol and work with the user input fields at runtime to view the data from the Sample Plans.

This symbol is not part of the default installation and has been provided as part of this course. This and the other MES Software/Quality graphics used in this course can be downloaded from the Wonderware Developer Network. This course refers to the graphics that were available at the time of printing. When downloaded, the graphics may be a different version and not match this manual.



Objectives

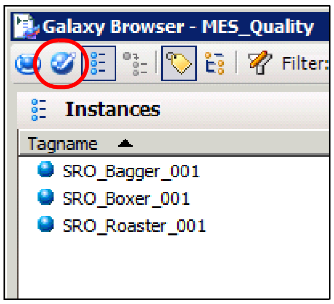
Upon completion of this lab, you will be able to:

- Implement the SPC Control Chart Graphic
- Access all defined Characteristics
- Work with chart filters

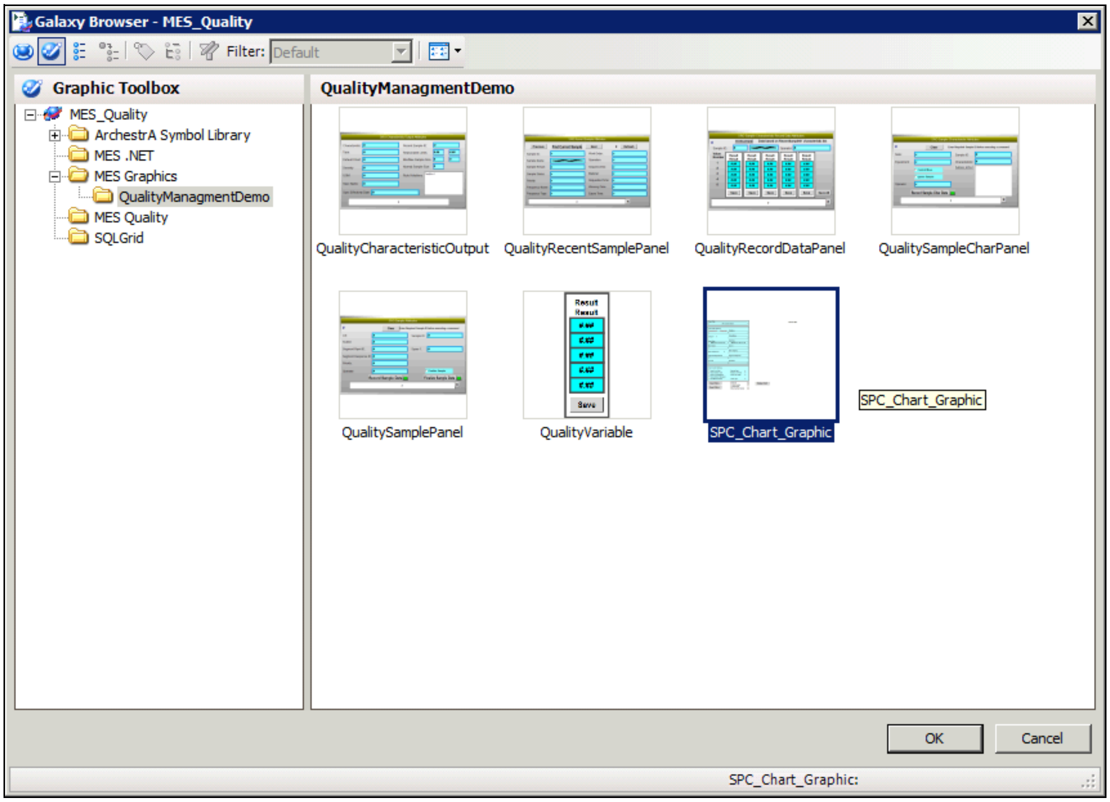
Embed the SPC Chart Graphic

First, you will return to the ArchestrA IDE and create the control chart symbol. You will then embed the SPC Chart graphic into the symbol.

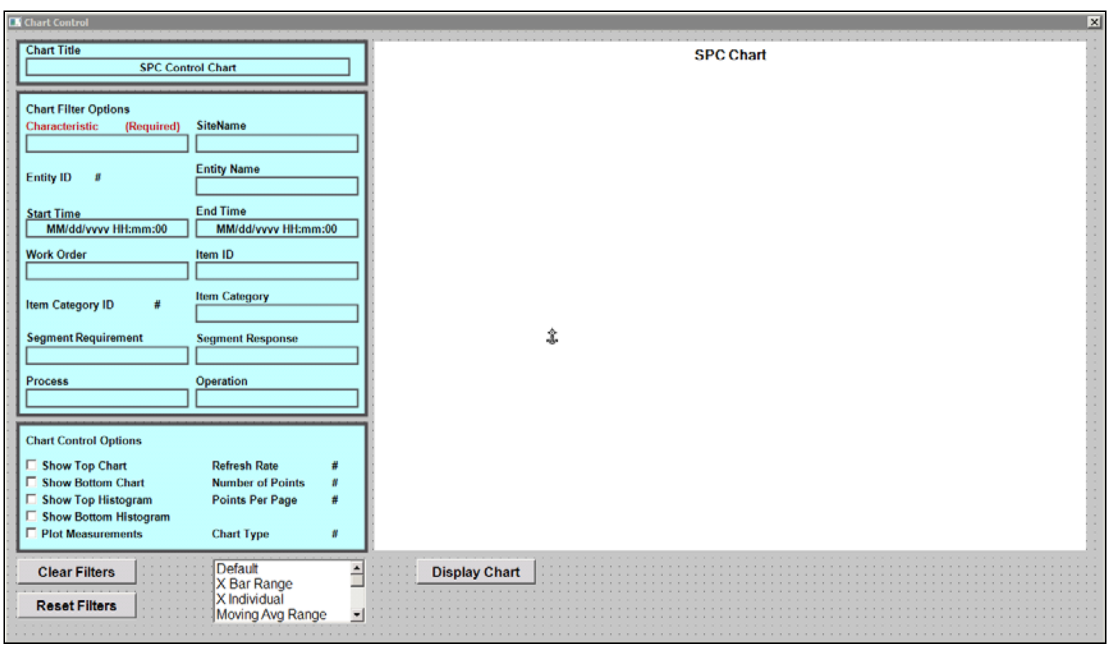
1. In WindowViewer, close the chart, if necessary.
2. In the top-right corner, click **Development**.
3. In WindowMaker, close **Sample Viewer**.
4. Create a full sized window named **Chart Control**.
5. Click **Embed ArchestrA Graphic**.
6. In the **Galaxy Browser**, click the **Graphic Toolbox** button.



7. In the **Graphic Toolbox** pane, expand **MES Graphics**, and then click **QualityManagmentDemo**.
8. In the **QualityManagmentDemo** pane, click **SPC_Chart_Graphic**.



9. Click **OK**.
10. Click the canvas to place the graphic.



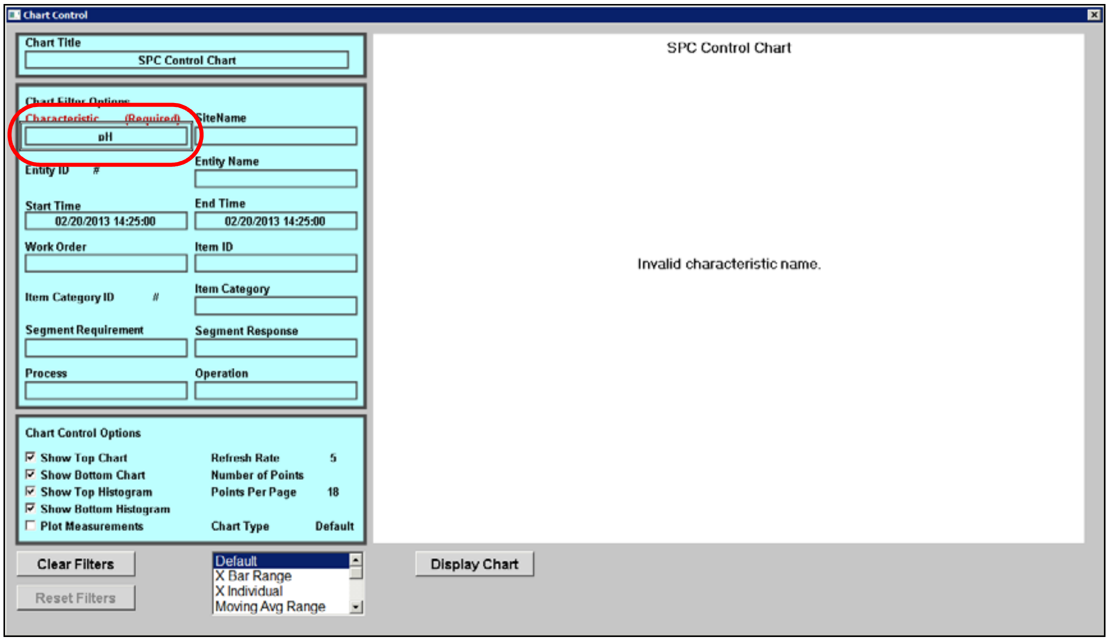
View the Data in Runtime

Now, you will switch to runtime, and configure the user input fields to display the data from the Sample Plans.

11. Click **Runtime**.

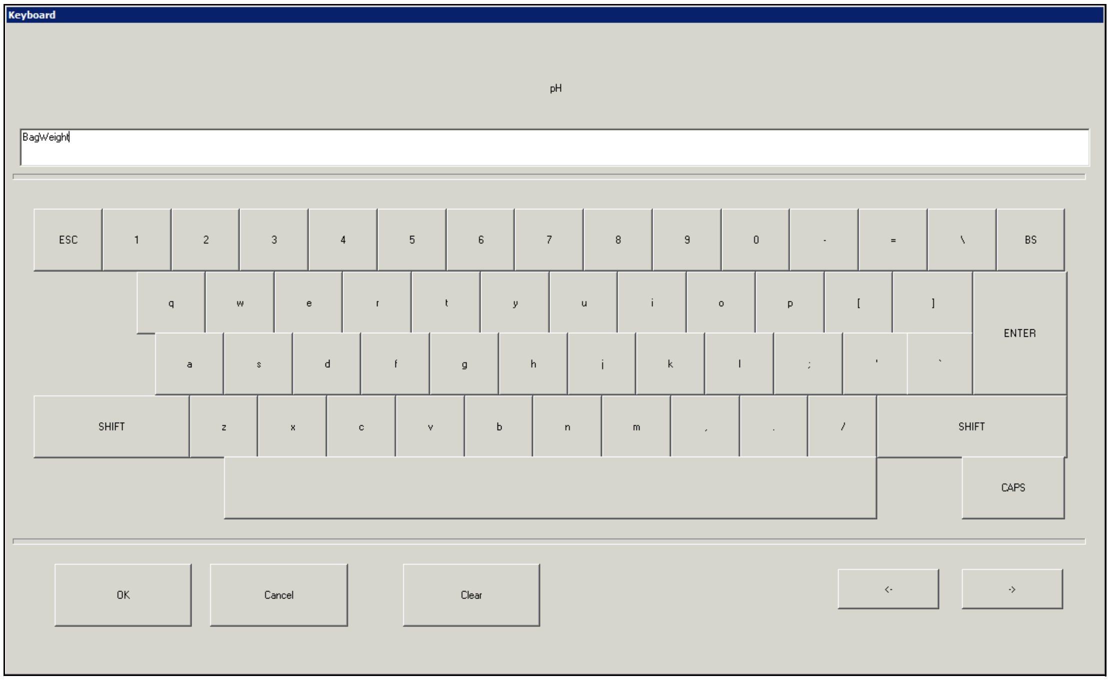
    In WindowViewer, **Chart Control** window, the graphic appears.

12. Click the **Characteristic** field.



The **Keyboard** dialog box appears.

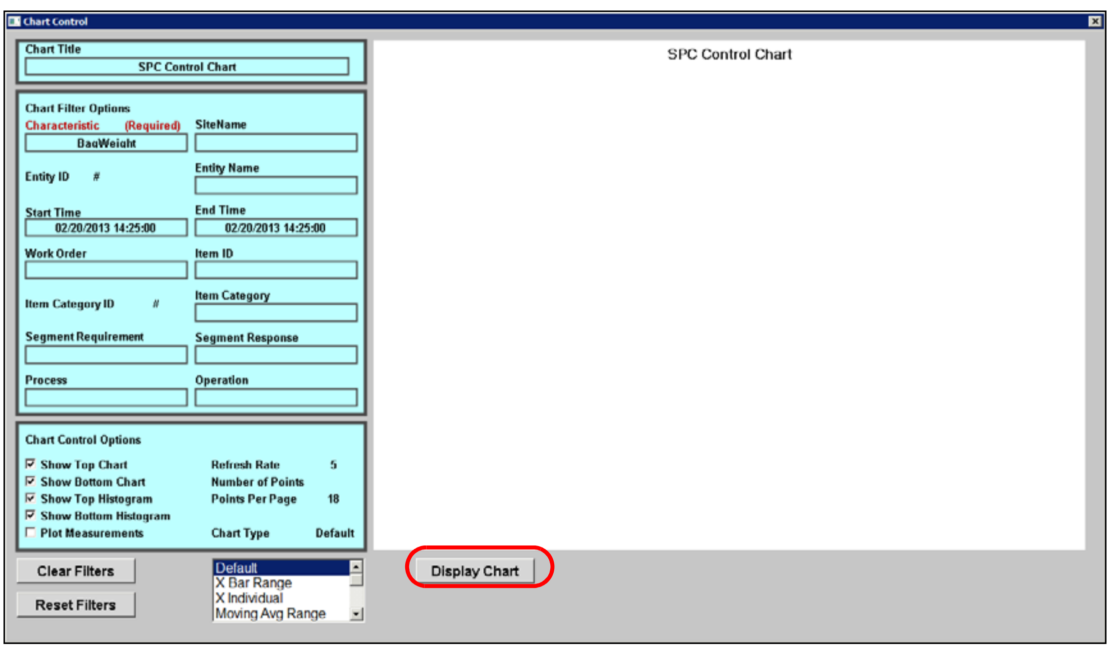
13. Enter **BagWeight**.



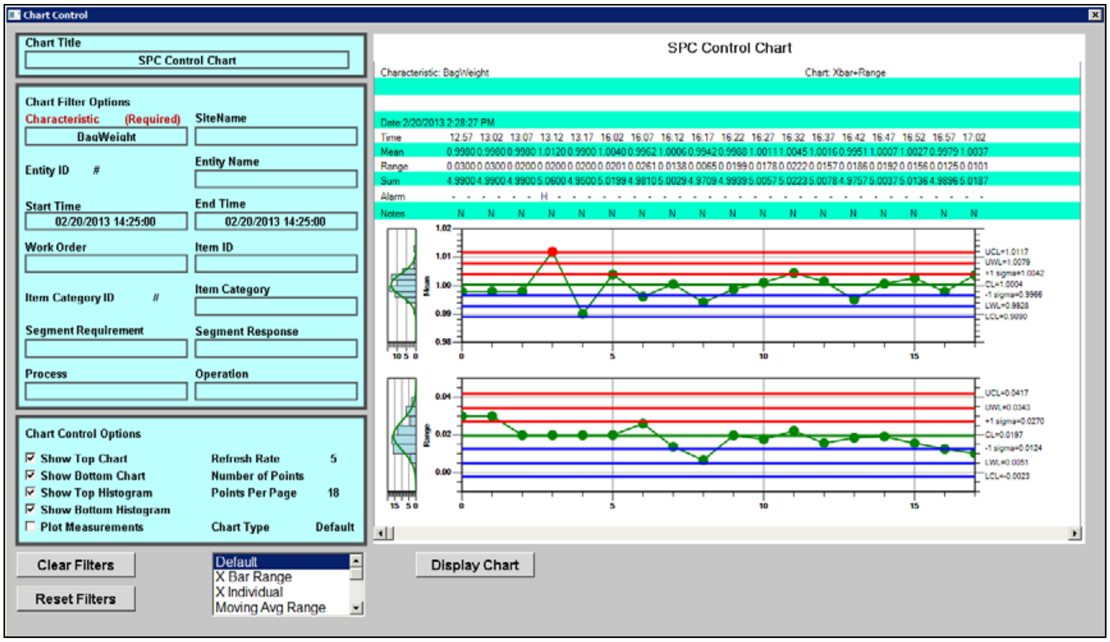
14. Click **OK**.

In the **Characteristic** field, **BagWeight** appears.

15. Click the **Display Chart** button.

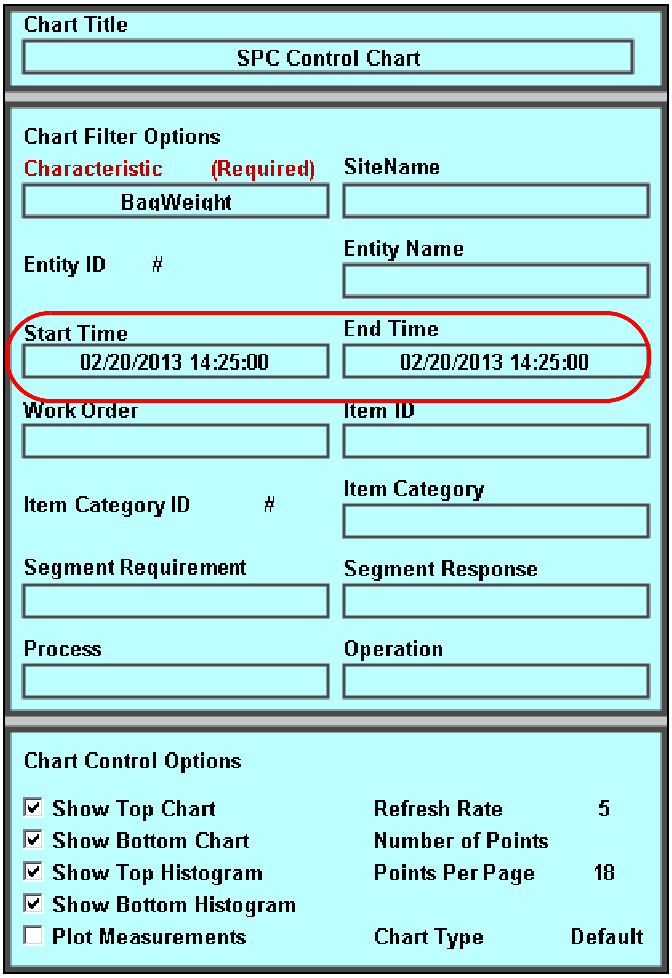


The control chart appears.



Optional

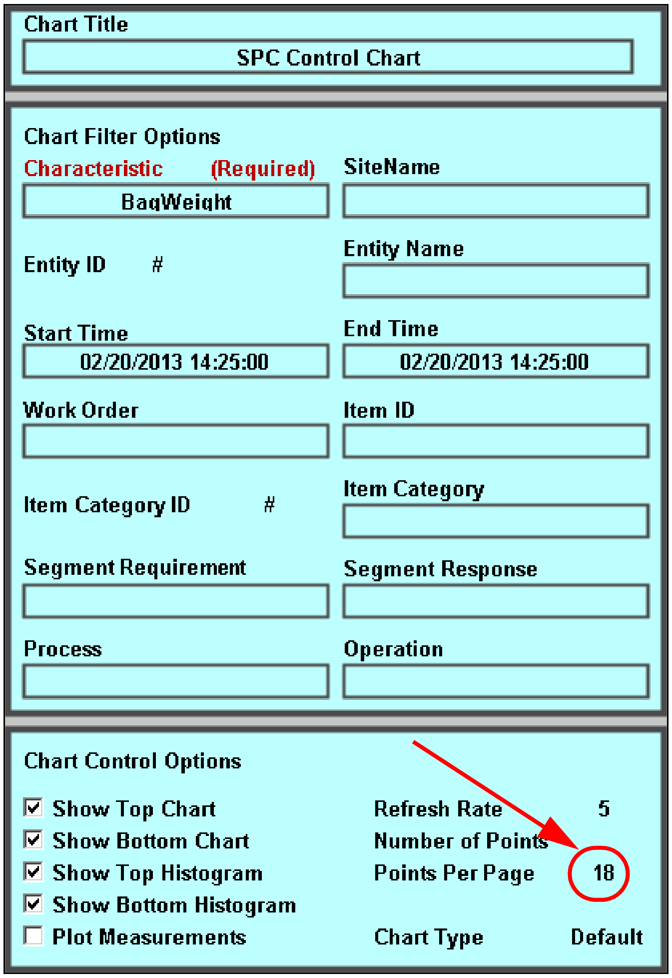
16. Edit the **Start Time** and **End Time**.



17. Click **Display Chart**.

    The control chart displays the data for the given time frame.

18. Edit **Points Per Page**.



19. Click **Display Chart**.

    The control chart displays the number of data points given.

Section 2 – ArchestrA Reports

This section demonstrates how to access the Wonderware MES Software/Quality reporting elements using the ArchestrA Reports feature of Wonderware Information Server.

Overview

You can view reports with the Reporting Services feature of Wonderware Information Server. Wonderware MES Reports can show:

- Production data for all shifts for specified Entities and Items
- Genealogy to track specified Items
- OEE data
- Production event summaries for Utilization
- Summary statistics and SPC charts for quality data

Before running any MES report in Wonderware Information Server, you must follow the instructions given in the **Reporting Services Security Configuration.txt** file. The file is installed at **C:\Program Files\Wonderware\MES\Reporting Services** (this location may be different depending on the operation system that you are using) during the installation.

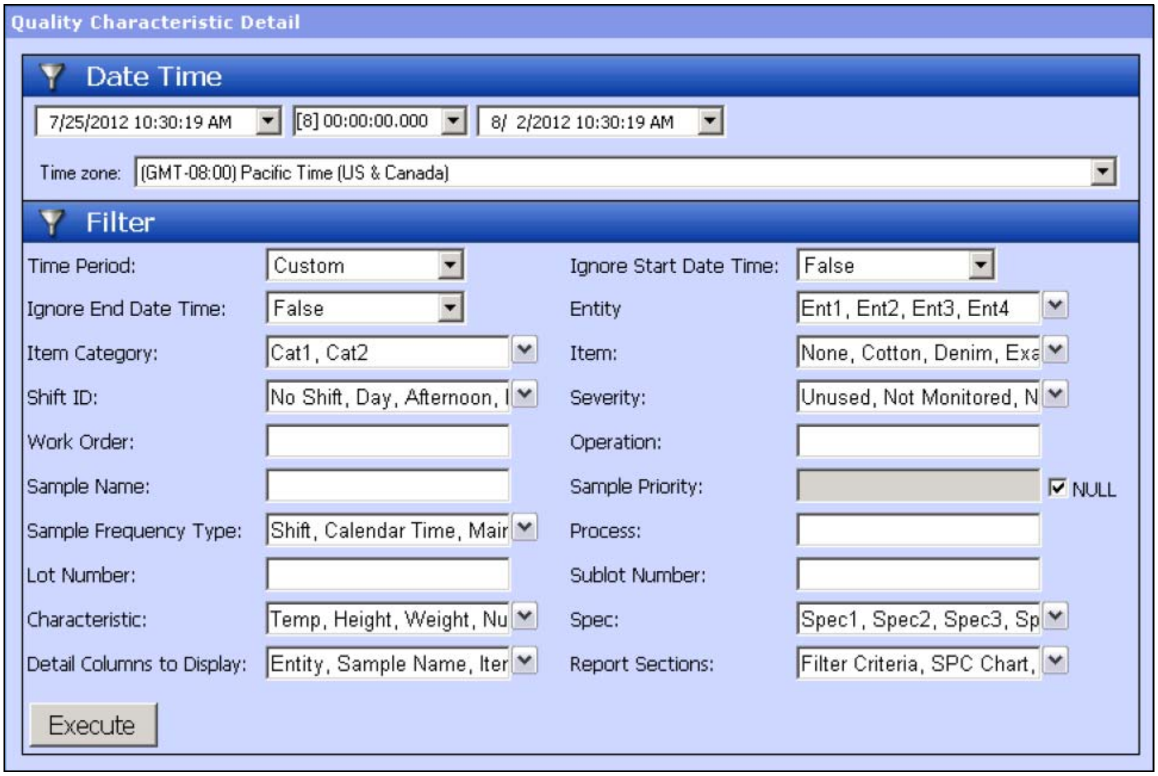
There are two reports related to quality:

- Quality Characteristic Detail
- Quality Summary

The following will detail each of these report related to quality.

Quality Characteristic Detail Report

The **Quality Characteristic Detail** report provides information on sample data based on Characteristics and multiple filters.



The **Date Time** section allows you to enter the Start Time and End Time, or enter the Start Time and select the Relative Time Range.

The times of your **Date Time** and **Filter** query result are converted into the time zone that you select. A globe/exclamation icon indicator appears next to the **Date Time** and **Filter** selection to indicate your change in the default time zone.

In the **Time Period** section, you can select one of the following time periods for the report:

- **Current Shift**: The time period represented by the current shift may be different for different entities.
- **Last Shift**: The time period represented by the last shift may be different for different entities.
- **Current Day**: The local time period from midnight to 11:59:59PM. This includes both the local times encompassing the current time on the report server. This remains unchanged with respect to different time zones.
- **Last Day**: The day before the current day.
- **Current Week**: The local time period from midnight Sunday to 11:59:59PM Saturday. This includes both the local times encompassing the current time on the report server. This is remains unchanged with respect to different time zones.
- **Last Week**: The week before the current week.
- **Custom**: The dates and times are converted to UTC as local times in the selected time zone. The converted UTC values are compared with the requested_time_utc field of the sample records. You must specify the start and end dates and times using the built-in Wonderware Information Server time picker control time zone selector.

The filters that accept a partial string are used to match any part of the corresponding information for the sample, regardless of whether it is uppercase or lowercase. You may specify none, some, or all of the following filters (at the time of printing this manual, you must specify an Item Category associated with a QM Specification):

- **Entity**
- **Item Category**
- **Item**
- **Shift ID**
- **Severity**
- **Work Order**
- **Operation**
- **Sample Name**
- **Sample Priority**
- **Sample Frequency Type**
- **Process**
- **Lot Number**
- **Sublot Number**
- **Characteristic**
- **Spec**

In the **Detail Columns to Display** selection, choose the optional columns you want to display in the Characteristic Detail Data section.

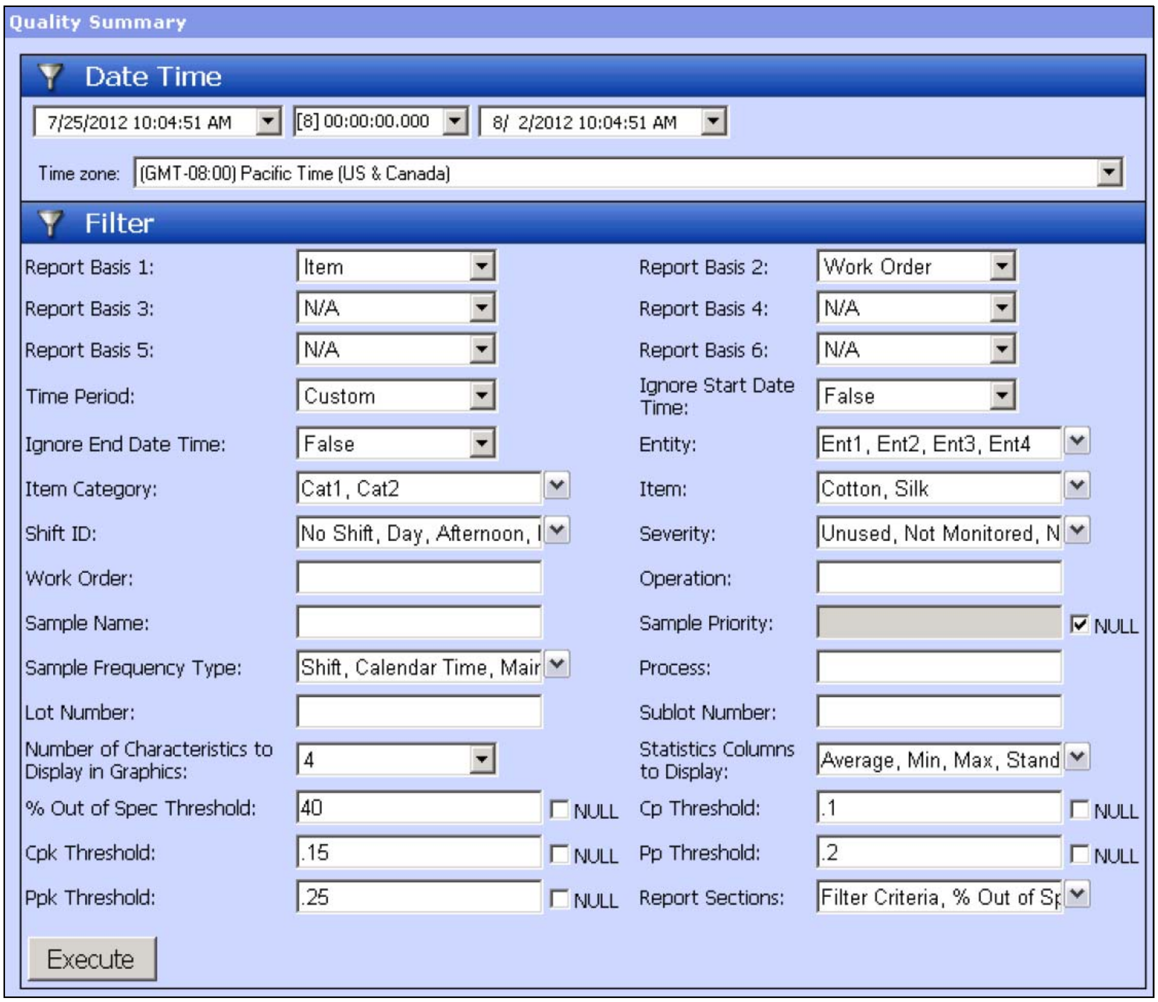
In the **Report Sections** selection, choose the value that you want to display.

Quality Summary Report

The Quality Summary Report provides information and statistics based on equipment, product (item), work order, operation, process, and item category. This report allows you to:

- Select from the multiple report bases
- Specify various filters to apply to the data being reported
- Select which sections of the report are displayed

If you make a selection in one filter, it does not affect the choices in another filter because of the set of existing data.



In the **Filter** section, choose how to group the resulting data based on the following:

- Report Basis 1 to Entity
- Report Basis 2 to Item

By setting the two reports, you can generate a report that groups the summary data by entity and then by item. If you click any of the entity graphs, the resulting report drills down into that entity and is then grouped by the next lower basis option.

The **Number of Characteristics to Display in Graphics** drop-down list allows you to enter an integer from 0 to 9. The results are as follows:

- If you select 0, the results for all Characteristics are grouped into a single bar in each of the charts, one for each basis value.
- If you select 1 through 9, there is a grouped set of bars for each current basis value, and a bar within each set for each Characteristic. There are as many Characteristics as the basis value, till the limit set by the entered value.
- If there are more Characteristics than this limit, an additional bar is added as the last one in each set, labeled Other.

In the Warning Levels area, define the threshold values for % out of specification, Cp, Cpk, Pp, and Ppk, if the corresponding column is selected to be included in the report. If you select the Null check box, there is no threshold set for the corresponding statistic. If a value is above the %Out of Spec or below the performance indicators, the data point is highlighted for quick visual indication.