TrakSYS™ Training

Day 1

Training Overview

Training Agenda

Day 1	Day 2	Day 3	Day 4	Day 5
TrakSYS Overview	Content Pages	Performance Management	API Introduction	Production Scheduling
Setup and Installation	Values Dictionary	Content Page Functionality	Logic Service	Alerts and Notifications
Configuration Basics	Visual Pages	Batching and Storage Systems	Data Management Service	Inventory Management
Navigation Introduction	Content Parts and Features	Template Systems	TrakSYS Extensibility	Statistical Process Control
Functionality and Data	Users and Permissions	Task Configuration	Sites, Translations, and Audit	Support and Resources

Introduction Training

Advanced Training

Comprehensive Training

Target Audience

Owners & Users

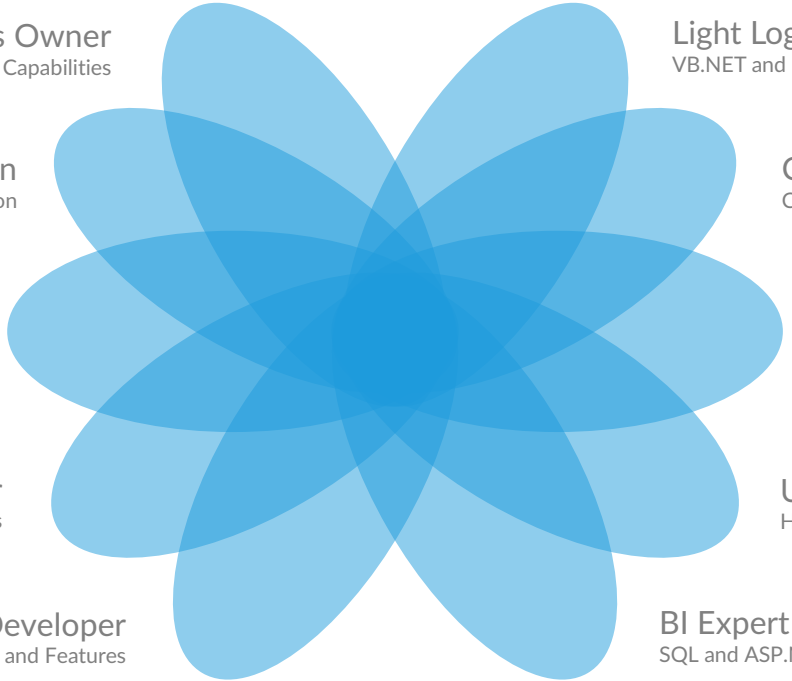
Business Owner
General Capabilities

Infrastructure Admin
IT / Automation

Configuration Admin
Business Rules

Data Consumer
Standard Reports and Pages

Business Developer
Value Proposition and Features



Developers

Light Logic
VB.NET and basic C#

Complex Rules
C# and TrakSYS API

Light User Interface
Web Paradigm and Configurable Pages

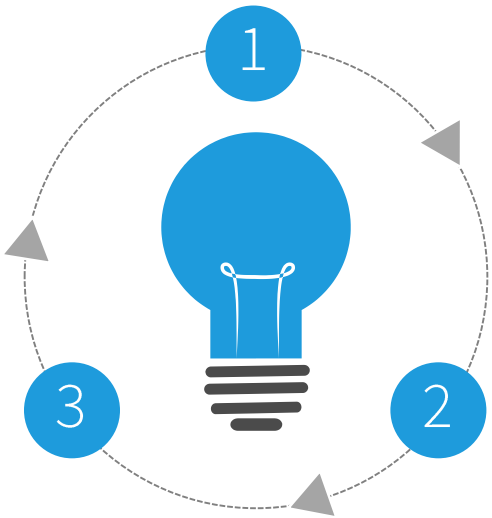
UI Expert
HTML/CSS/JS/ASP.NET C#

BI Expert
SQL and ASP.NET C#

Training Format

Presentation and Discussion

Training topics focusing on concepts, features and capabilities of TrakSYS™.



Questions ?

Ask them! We will...

Answer Now
Answer Later
Find the Answer
Arrange a Session

Lab Assignment

Hands-on activity using training PCs and TrakSYS™ software.

Instructor Demonstration

Live demonstration of key concepts from the presentation topic.

Daily Schedule

- 75 — Presentation and Discussion — 08:30 – 09:45
- 30 — Lab — 09:45 – 10:15
- 15 — Break — 10:15 – 10:30
- 60 — Presentation and Discussion — 10:30 – 11:30
- 30 — Lab — 11:30 – 12:00
- 60 — Lunch — 12:00 – 13:00
- 75 — Presentation and Discussion — 13:00 – 14:15
- 30 — Lab — 14:15 – 14:45
- 15 — Break — 14:45 – 15:00
- 60 — Presentation and Discussion — 15:00 – 16:00
- 30 — Lab — 16:00 – 16:30

- Labs may crossover into Breaks
- Feel free to Come and Go
- Strive to stick to Schedule

Orange County Companies

Demonstration and Training Environment

Throughout the training course, a fictitious plants called Orange County Vitamin and Orange County Foods will be used for demonstration and as a target for hands-on lab exercises.

Plant Operations

The Orange County Vitamin plant includes vitamin raw material processing (Batch), Warehousing (Storage), and Packaging/Finishing (Discrete).

The Orange County Foods plant includes similar capabilities, but has been designed to display additional features that are new to TrakSYS 11.

TrakSYS Overview

Training Objectives

Provide a general introduction to the TrakSYS concept, business goals and technical overview.

Describe the high level component architecture and introduce some of the key services, applications and user interfaces that make up the TrakSYS platform.

Business Overview

The Business Overview video provides a high level review of TrakSYS™ from a functional and goal perspective.

Technical Overview

The Technical Overview video provides a high level review of TrakSYS™ from an component and application perspective.

Component Overview

Business and Operations Users
Line Managers, Quality, CI, Lean, Plant Managers, Corporate, etc.

Web Browser

TrakSYS™ Platform
Real-Time Data Collection, Execution, Alerts, Reports, Analytics

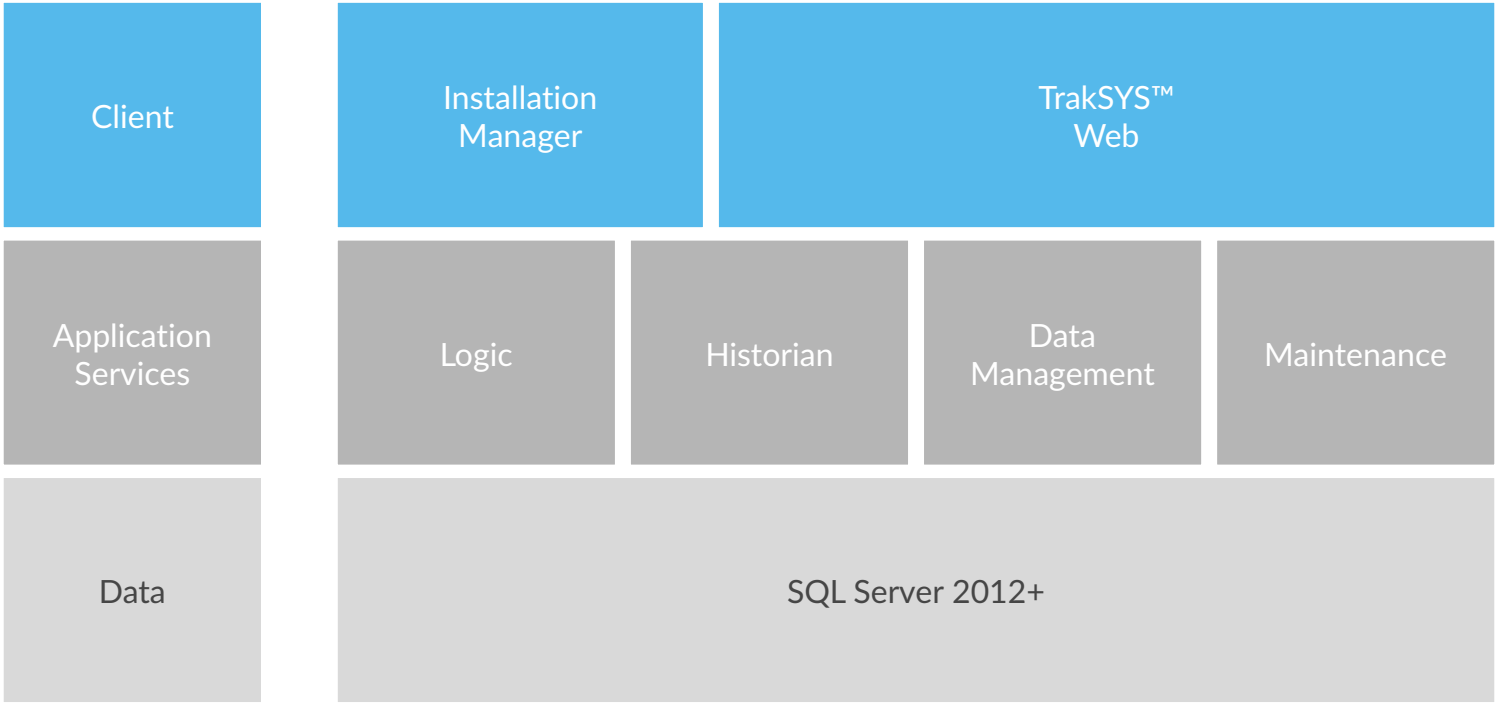
Standard APIs

Business Applications
ERP, Quality, Maintenance, Batch, Planning & Scheduling, etc.

IIoT • PLC • OPC • API • CSV • Structured Data Files

Receiving • Testing • Preparation • Production • Packaging • Warehouse • Shipping

Component Overview



Logic Service

- Real-time Data Collection Engine
- Receives inputs from OPC Sources
- Executes Business Rules to calculate Events, Tasks, Steps, Transfers and Sample Processing
- Calculates KPIs
- Broadcasts Notifications
- Collects data from I/O, LIMS, PLCs, Historians, SCADA, ERP, and other Business Applications

Supports Multiple and/or Distributed Instances

Historian Service

- Monitors and records changing TrakSYS™ Tag values for historical Trending and Analysis
- Supports Store and Forward when the TrakSYS™ Database is Unavailable
- Supports algorithmic Data Compression (SLIM 3)
- Licensable TrakSYS™ component Tag History Definitions Required

Supports Multiple and/or Distributed Instances

Data Management Service

- Independent multi-threaded service used for executing Non-Real Time Operations
- Facilitates processing large Data Aggregation
- Connects to external Business Systems for Import and Export of Configuration and Data
- Schedules periodic execution of scripted Modules

Supports Multiple and/or Distributed Instances

Maintenance Service

- Continually executing in the Background of every TrakSYS™ Installation
- Executes core built-in TrakSYS™ application Functions
- Monitors and Trims Database Log Tables
- Distributes programmatic Notifications
- Executes built-in KPI and Event data modifications after Updates and Edits

Setup and Installation

Training Objectives

Provide an overview of the setup and installation process for the TrakSYS software and its components.

Demonstrate some of the typical setup and installation activities involved in deploying the software to a new server/environment.

Installation Overview

1

Platform Pre-Requisites

Windows Server 2012 R2/2014/2016/2019, .NET Framework and Internet Information Services. Installation guides available on the TrakSYS™ Support Site.

2

SQL Server

Version 2012 / 2014 / 2016. Standard or Enterprise. Scripted install from the TrakSYS™ setup DVD/ISO or manual installation instructions available on the Support Site.

3

TrakSYS Setup

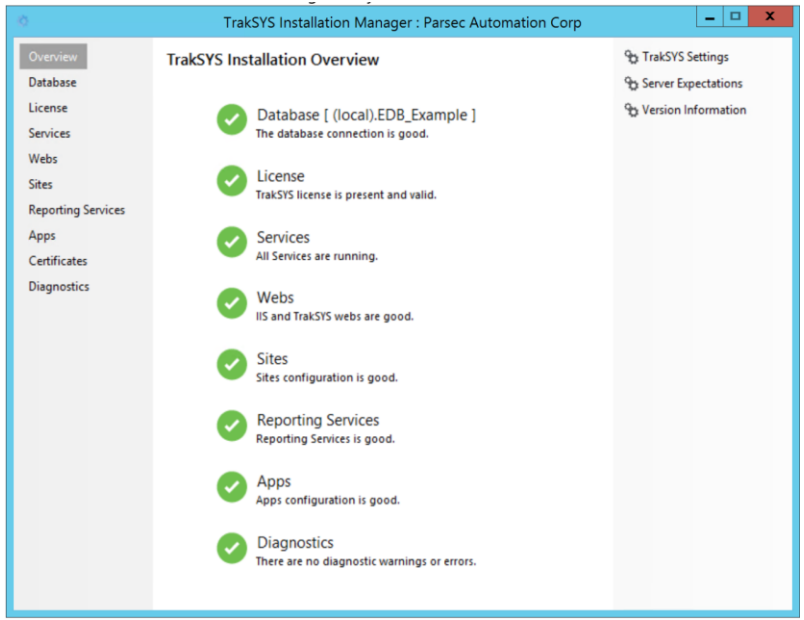
The TrakSYS™ setup executable deploys all of the executable files to the target machine. Additional setup options and configuration is continued from the Installation Manager.

4

TrakSYS Installation Manager

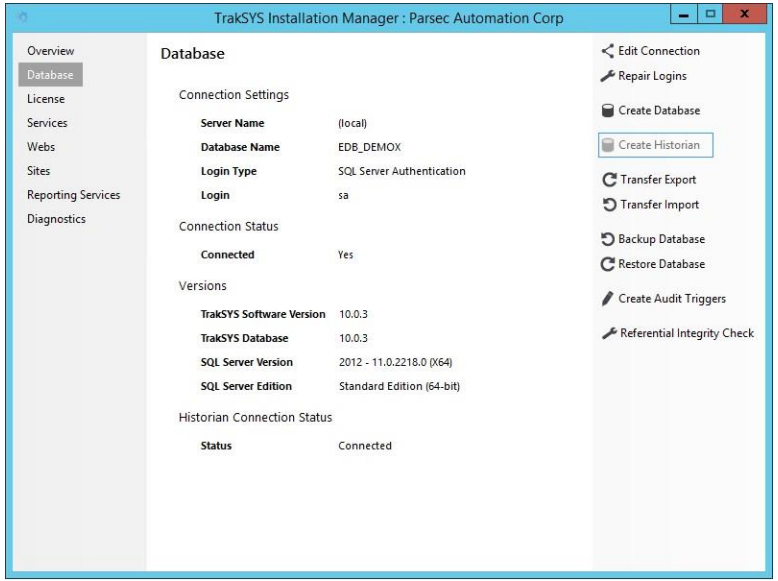
After the TrakSYS™ files are deployed, the Installation Manager is used to configure the database, connection, services, web and other platform settings.

Installation Manager



- Primary tool used to manage the installation of TrakSYS™ services and components.
- Manage, troubleshoot and maintain an implementation after the initial deployment.
- Replaces and consolidates several components from previous TrakSYS™ versions.
- Main screen acts as a status overview of the various elements of the installation, as well as a menu to interact with details and options in each section.

Database Management



Database Connection Overview

Displays the current status of the application connection to the TrakSYS™ database. Including login information, SQL version, and TrakSYS™ version.

Database Operations

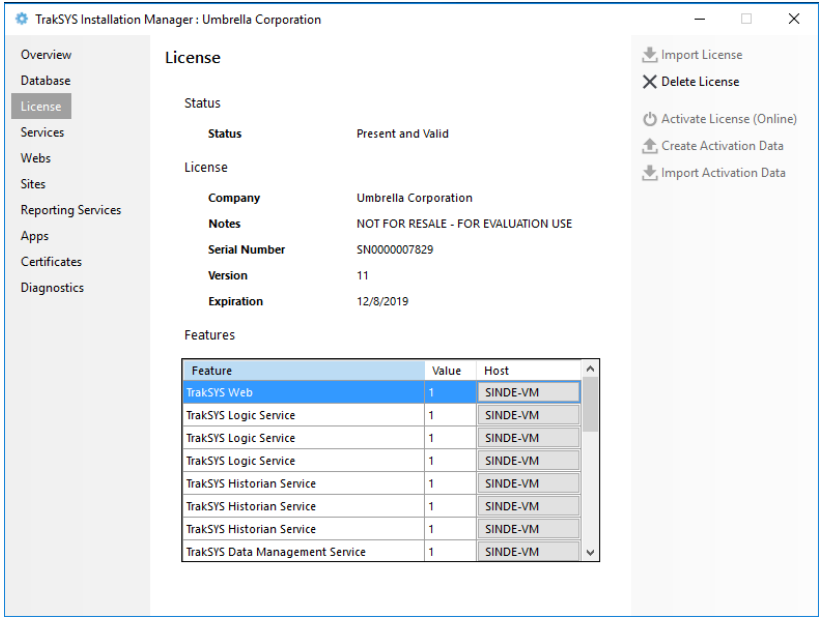
- Edit Connection
- Repair Logins
- Create / Upgrade Database
- Backup / Restore Database
- Transfer Export/Import

Audit Trigger Operations

(available when TrakSYS Audit features are licensed)

- Create Audit Triggers
- Delete Audit Triggers

License Management



License Overview

Displays the current TrakSYS™ license and status. The TrakSYS™ license file must be imported into the database and activated in order for the software and components to be utilized.

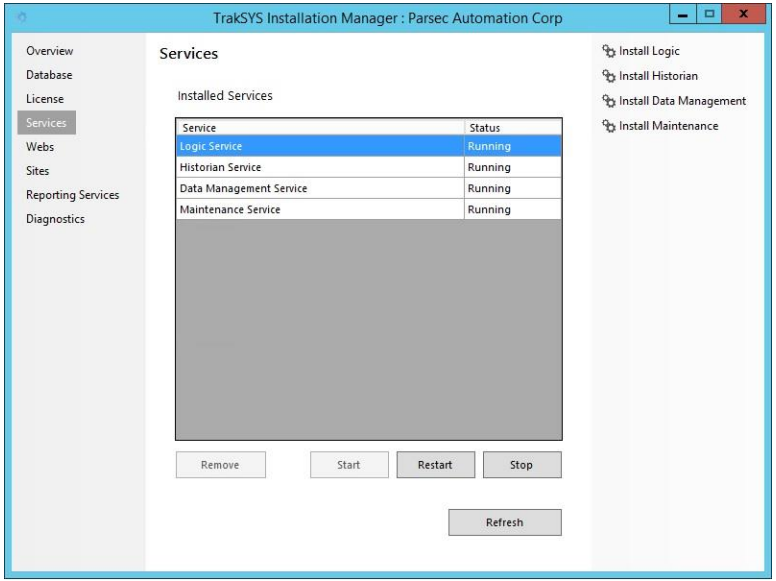
License Operations

- Import License
- Delete License
- Activate License Online
- Activate License Manually

License Features

Lists the TrakSYS™ features from the current license. Allows the assignment of server name (Host) to license features which are required to be locked to a specific host machine.

Service Management



Services Overview

Lists the TrakSYS™ services that are currently installed on the local server. Includes the current server running status.

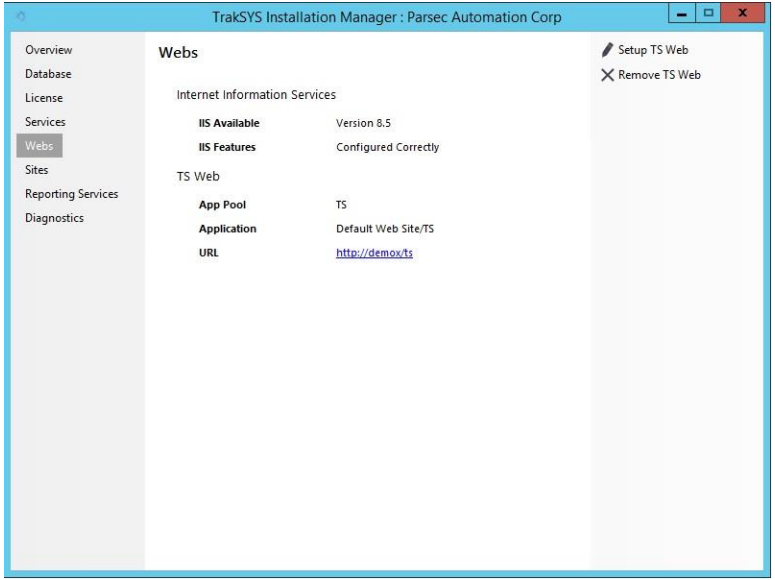
Service Operations

- Install Logic
- Install Historian
- Install Data Management
- Install Maintenance

Service Control

TrakSYS™ services can be started, stopped and restarted from the user interface. They can also be controlled from the standard Windows Services management interface.

Web Application Management



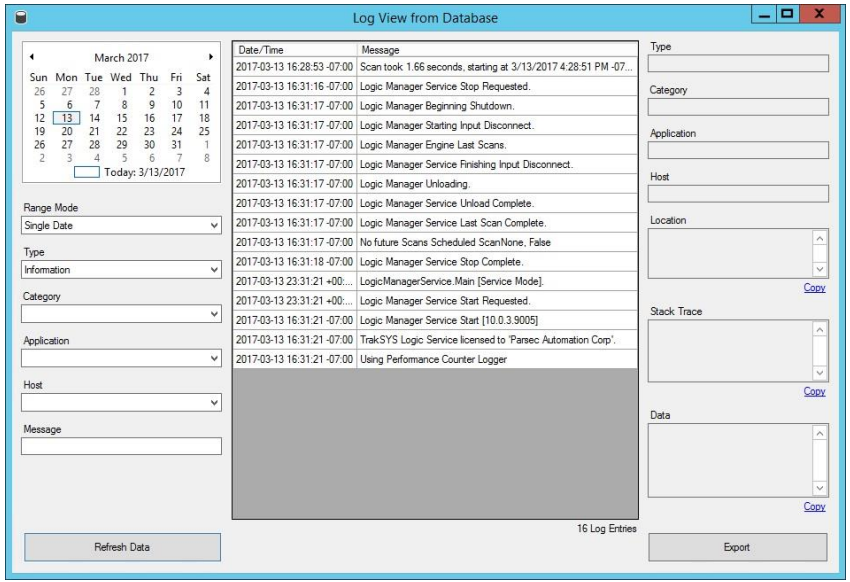
Web Application Overview

Displays the status of the TrakSYS™ web user interface application that is installed on Windows Internet Information Services (IIS). TrakSYS™ requires specific IIS features to be installed on the server in order to support its deployment and use.

Web Operations

- Setup TS Web
- Remove TS Web
- Setup / Remove WEBTrak (legacy)

Other Features



Reporting Services

Allows management of TrakSYS™ reports hosted in SQL Reporting Services. Includes Reporting Services status and operations for installing and removing standard reports to/from the Reporting Services platform.

Sites

Allows for the creation and management of TrakSYS™ Sites. This feature is only available when the appropriate multi-site license is present.

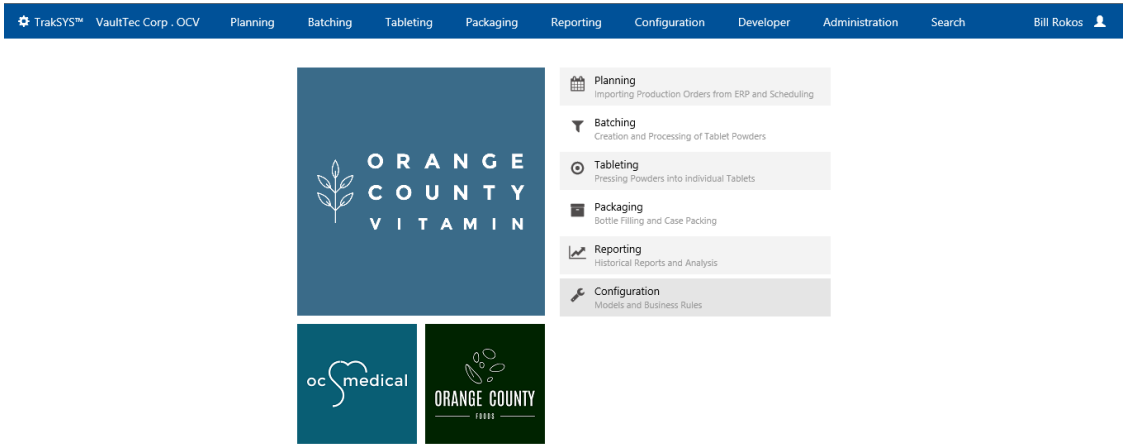
Diagnostics and Troubleshooting

Access to OPC and Mail connection statuses, and TrakSYS™ log/trace entries. Includes operations to export application messages for convenient transport to support staff.

Installation Success

Upon successful setup and installation configuration, the TrakSYS™ application user interface should be accessible by navigating a browser to…

http: // servername / ts



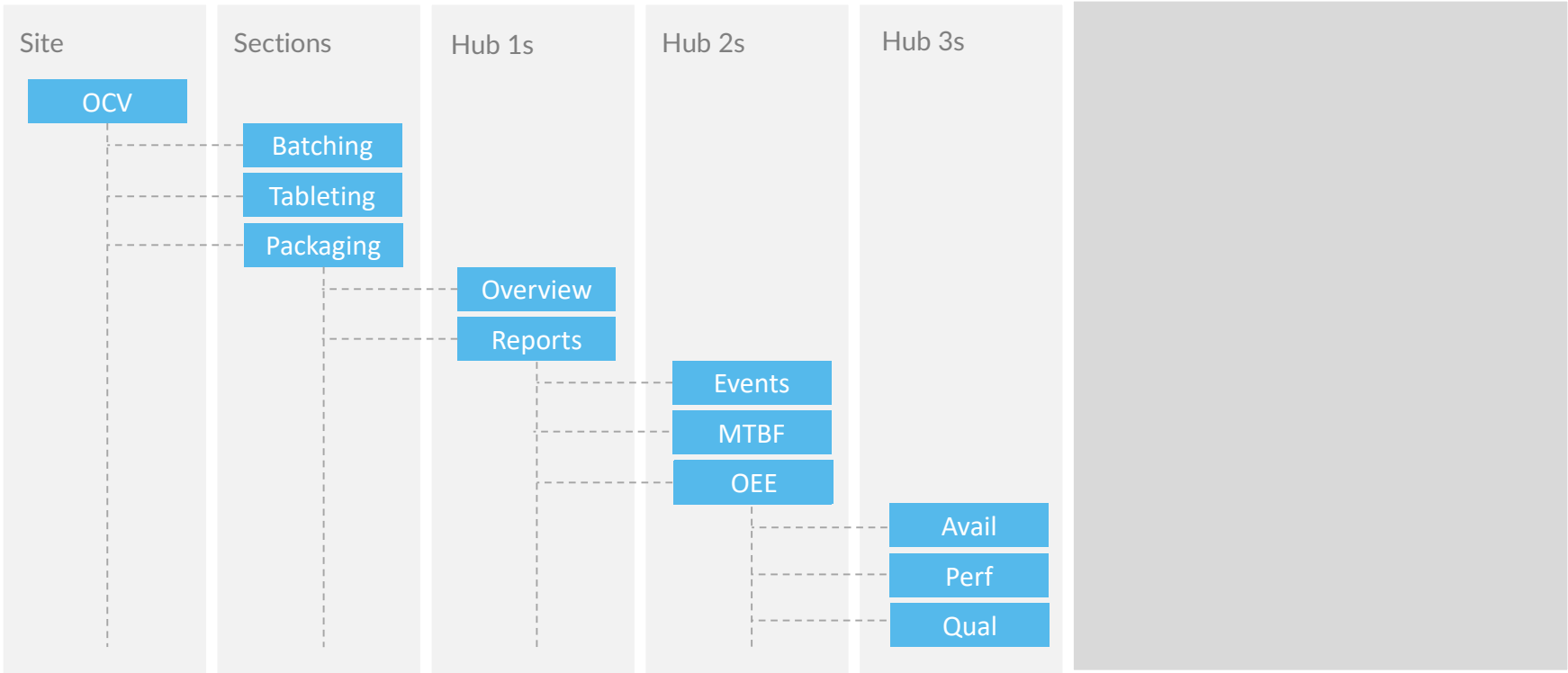
Navigation Basics

Training Objectives

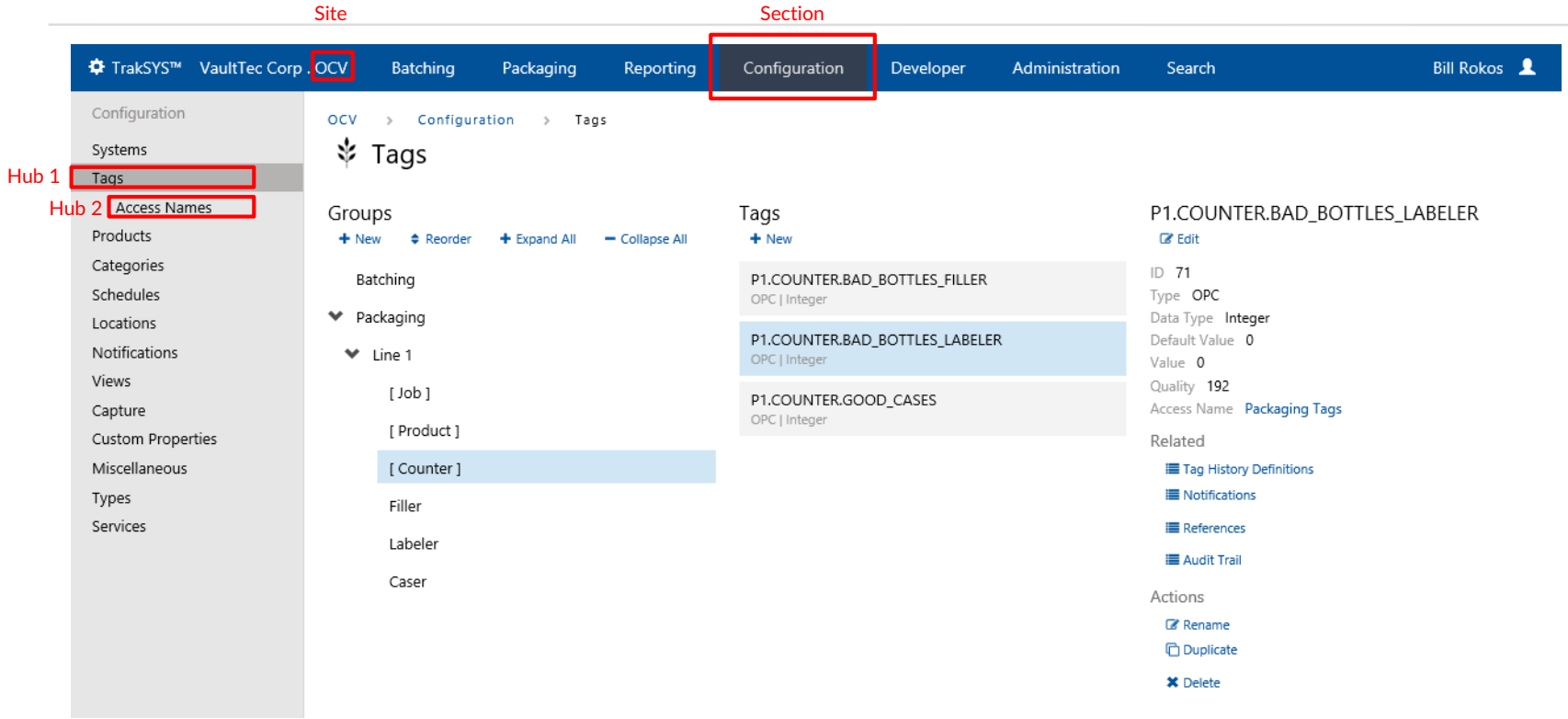
Introduce the fundamentals of the TrakSYS web user interface.

Become familiar with the types of Pages, user interface patterns and navigational elements.

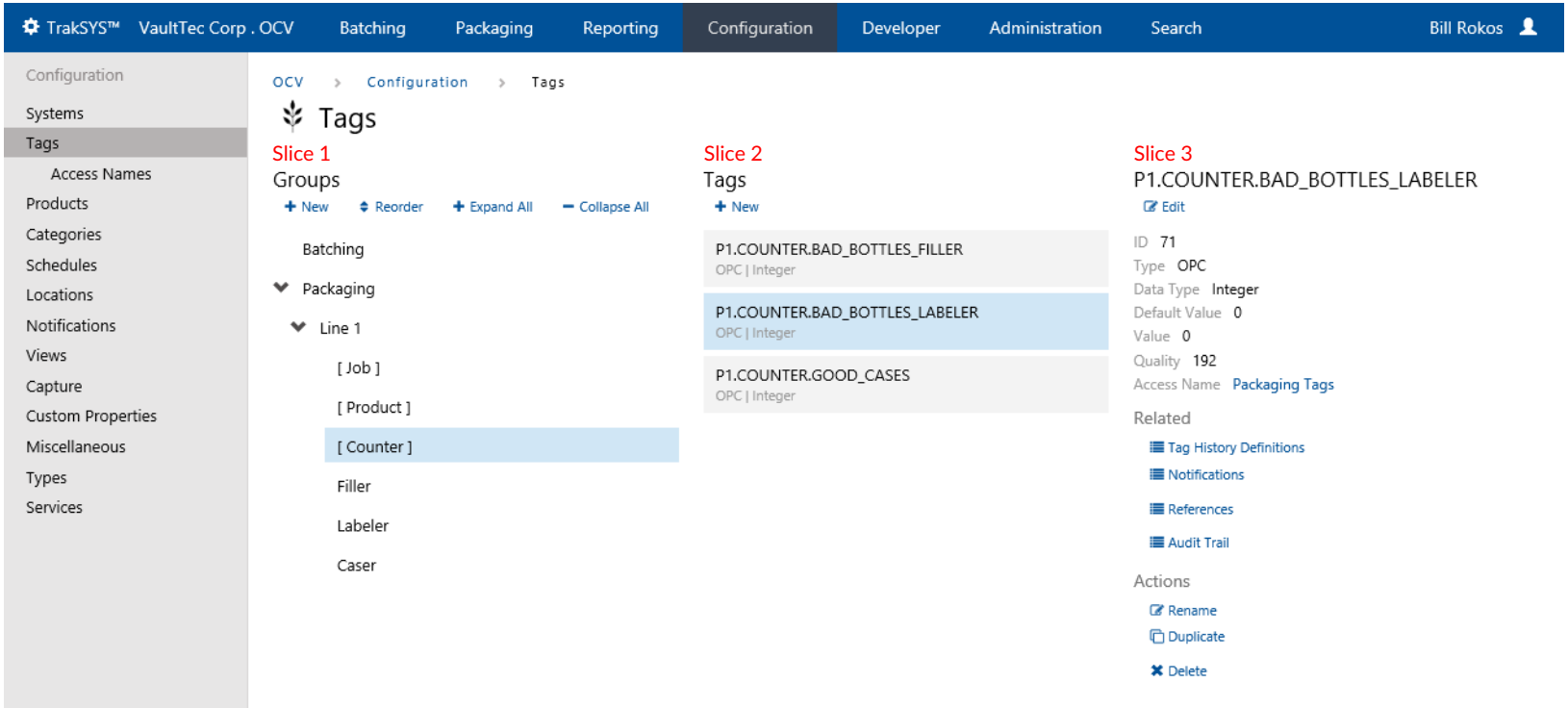
Page Hierarchy



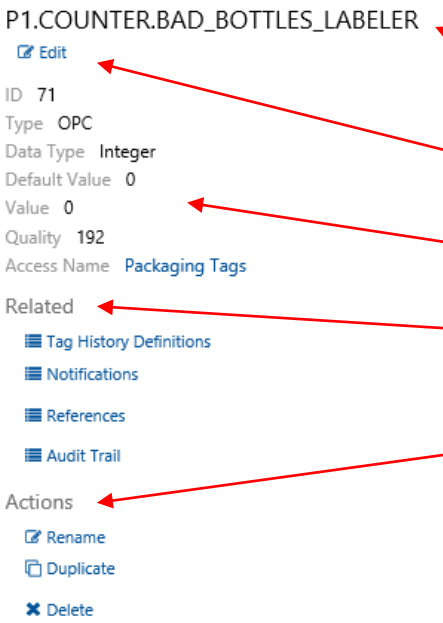
Page Hierarchy



Slices

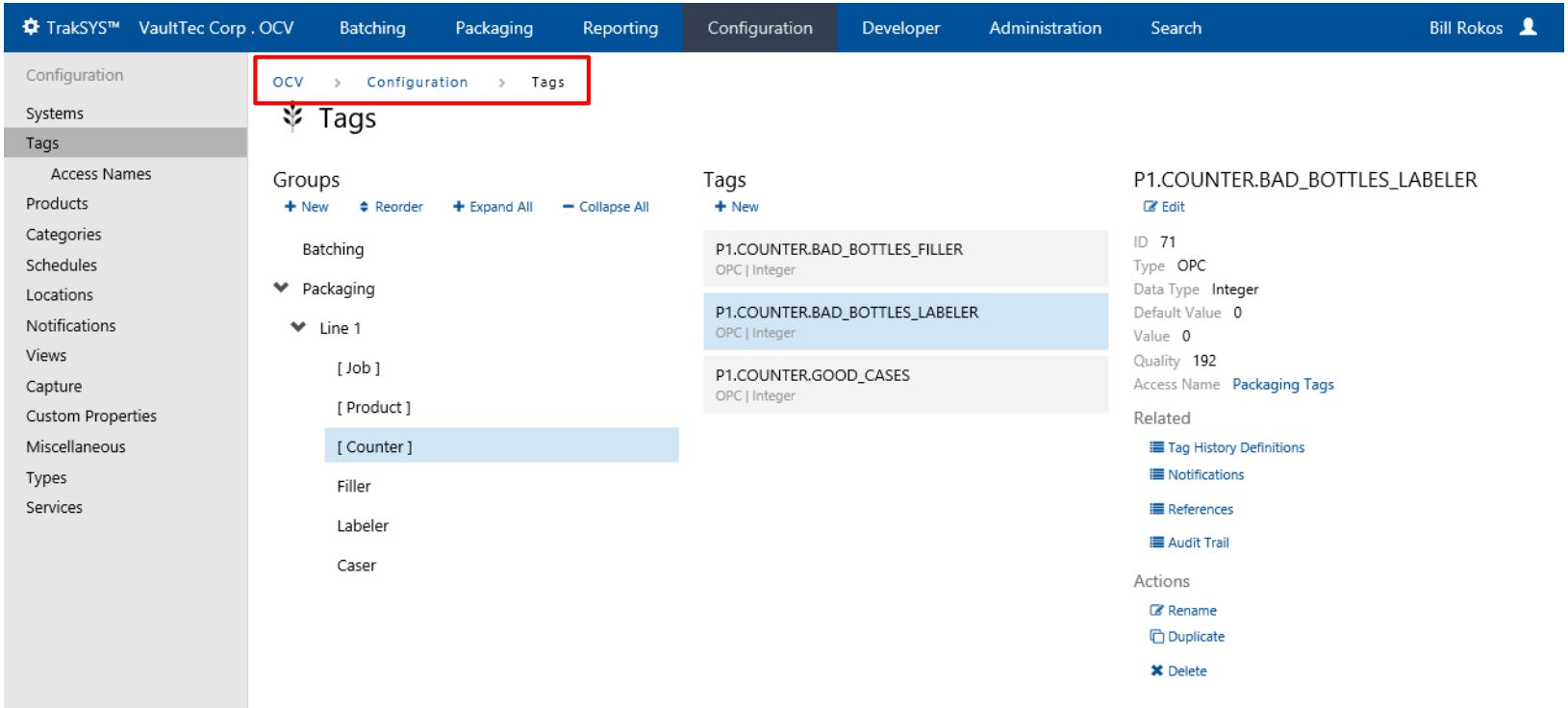

TrakSYS™ VaultTec Corp . OCV
Batching
Packaging
Reporting
Configuration
Developer
Administration
Search
Bill Rokos
Configuration
Systems
Tags
Access Names
Products
Categories
Schedules
Locations
Notifications
Views
Capture
Custom Properties
Miscellaneous
Types
Services
OCV › Configuration › Tags
Tags
Slice 1
Groups
New
Reorder
Expand All
Collapse All
Batching
Packaging
Line 1
[Job]
[Product]
[Counter]
Filler
Labeler
Caser
Slice 2
Tags
New
P1.COUNTER.BAD_BOTTLES_FILLER
OPC | Integer
P1.COUNTER.BAD_BOTTLES_LABELER
OPC | Integer
P1.COUNTER.GOOD_CASES
OPC | Integer
Slice 3
P1.COUNTER.BAD_BOTTLES_LABELER
Edit
ID 71
Type OPC
Data Type Integer
Default Value 0
Value 0
Quality 192
Access Name Packaging Tags
Related
Tag History Definitions
Notifications
References
Audit Trail
Actions
Rename
Duplicate
Delete

Item Slice



- Entity Name
- Common Actions
- Key Properties
- Related (typically Child) Entities
- Actions

Breadcrumbs



Modeling and Configuration
Areas and Systems

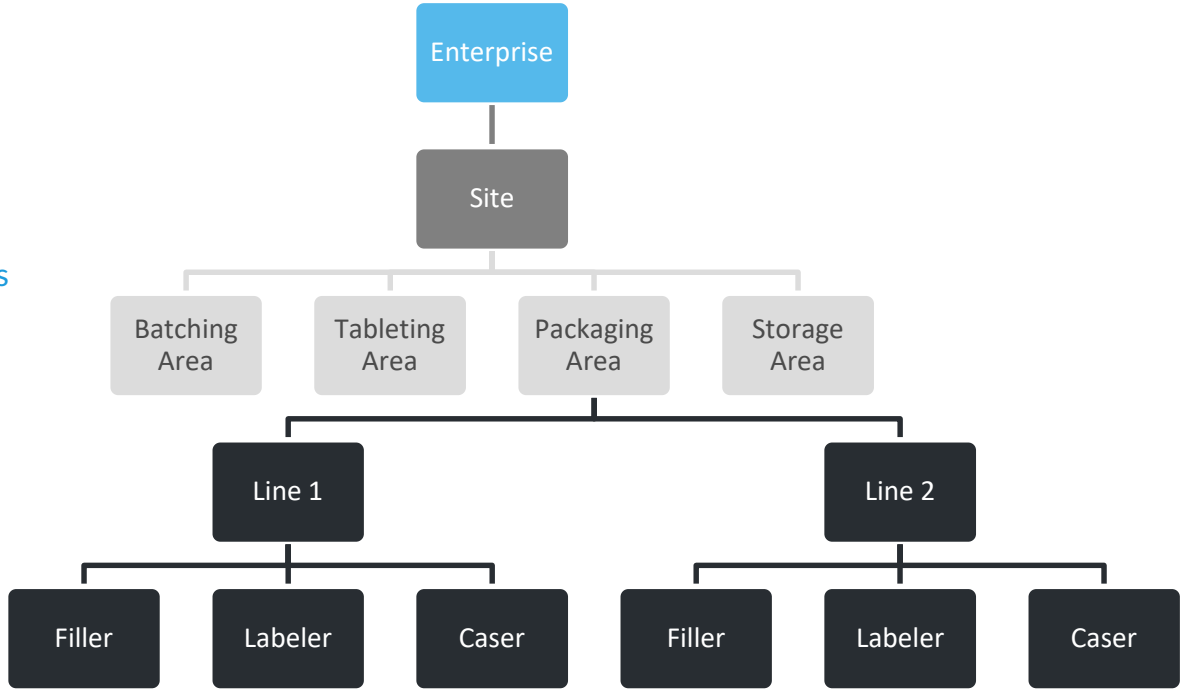
Training Objectives

Discover how TrakSYS can be used to model a physical production environment and equipment using Areas and Systems.

Define and explain the types of Systems that can be modeled in TrakSYS to handle different types of production processes.

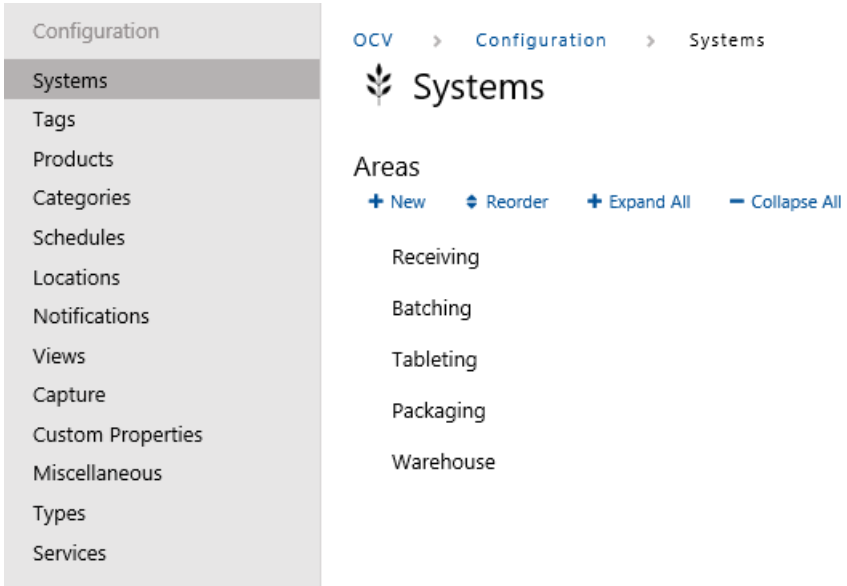
Asset Hierarchy

- Name in configuration: Sites, Areas, and Systems
- Represent / Model the physical Production Environment
- Specific equipment modeled by TrakSYS™ Systems and Sub-Systems
  - Discrete
  - Batch
  - Storage



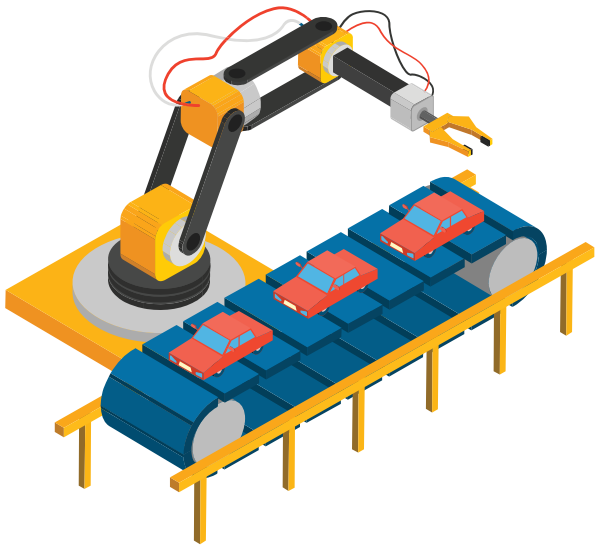
Areas

- An Area represents a subset of the production environment or logical grouping of plant assets.
- Areas exist to Group and Organize manufacturing Systems
- Hierarchal structure supported: Areas may contain other Areas
- Can be modeled using the ISA S95 Naming Conventions (Enterprise, Site, Area)



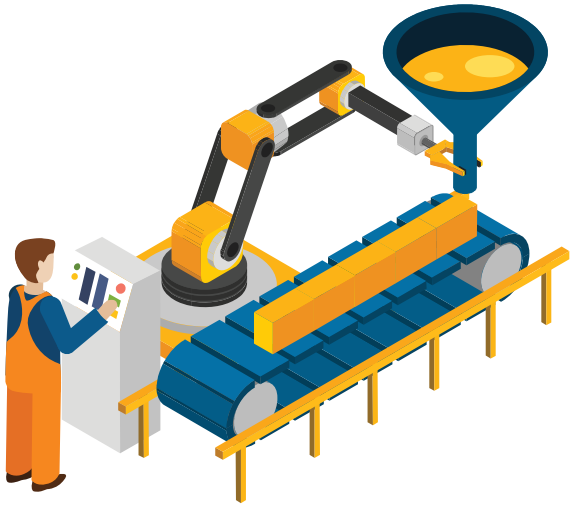
Discrete Systems

- Used to model Manufacturing Equipment which produce / process Discrete Items (Cans, Cases, Widgets, etc…)
- May represent a Production Line (S95), or Work Cell (S95) / Individual Equipment (e.g. Packaging Line, Labeler, Caser, Sealer, etc…)
- May include Sub-Systems (Work Cells) to represent smaller components within the main System
- Contain child configuration elements to model Stoppages, Tasks, SPC Sampling and KPI Calculations



Batch Systems

- Used to model Manufacturing Equipment which produce / process Batch or Volumes of Material (Process Cells (S95) / Batching Lines)
- Contain one or more Sub-Systems or Units (e.g. Blender, Mixer, Granulator, and Dryer)
- Contain child configuration elements to model Batch Steps, Events, Tasks, and SPC Sampling

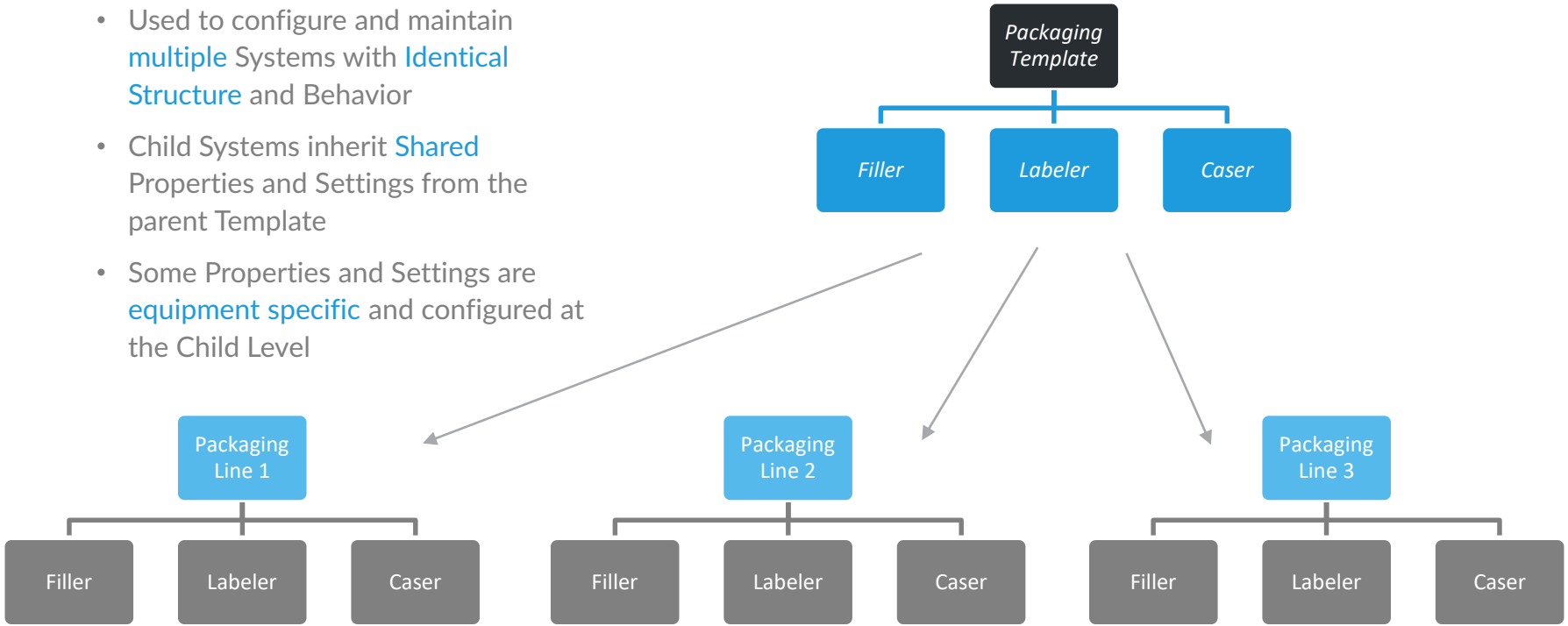


Storage Systems

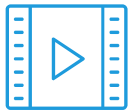
- Used to model Manufacturing Equipment which store a Quantity of Material (Storage Zones (S95))
- Facilitate Inventory and Material Management Solutions
- Contain child configuration elements to model Material Transfers , Events, Tasks, and SPC Sampling

Template Systems

- Used to configure and maintain multiple Systems with Identical Structure and Behavior
- Child Systems inherit Shared Properties and Settings from the parent Template
- Some Properties and Settings are equipment specific and configured at the Child Level



Demonstration



- Install TrakSYS™ from Setup
- Installation Manager
  - Create Database
  - Import / Activate License
  - Install Services
  - Setup TS Web
- TS Web Navigation
  - Sections
  - Hubs
  - Slices (Configuration)
- Configure
  - Area
  - Discrete System
  - Sub-System
- Show Options
  - Batch Systems
  - Storage Systems
  - Template Systems

Lab 1

Modeling and Configuration

Tags

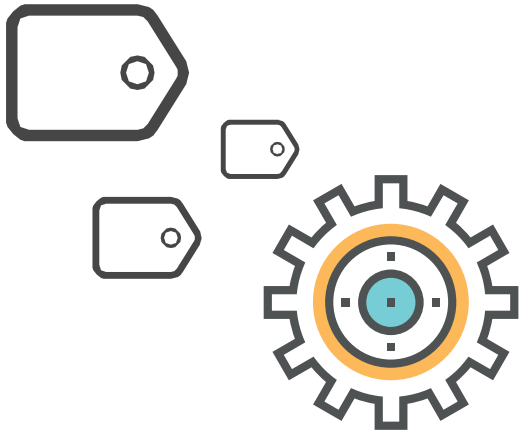
Training Objectives

Learn how TrakSYS monitors Tags from external sources such as plant equipment, PLCs, and other production systems.

Understand how business rules and conditions can be created using different TrakSYS Tag types to combine and calculate new Tag values.

What is a Tag?

- Represents a single, real-time Value from the Manufacturing Process
- A Tag Value is defined / typed as …
  - Discrete (0 or 1)
  - Integer
  - Float
  - String
- Tag Sources include…
  - Inputs from the Physical Process (PLCs)
  - Logical Expressions and Scripts
  - Internal TrakSYS™ Statuses
  - Solution Manipulated Virtual Addresses



Tag Examples

LINE_1_FILLER_JAM

A Discrete value monitored from the Filler PLC indicating if the machine is stopped due to a Jammed condition.

LINE_3_GOOD_CASES

A Float counter value monitored from the end of the Line indicating the number of good cases packaged.

LINE_2_RUNNING

A Discrete value calculated in expression / script which is true (1) when the Total Counter is incrementing.

LINE_5_PRODUCT_SKU

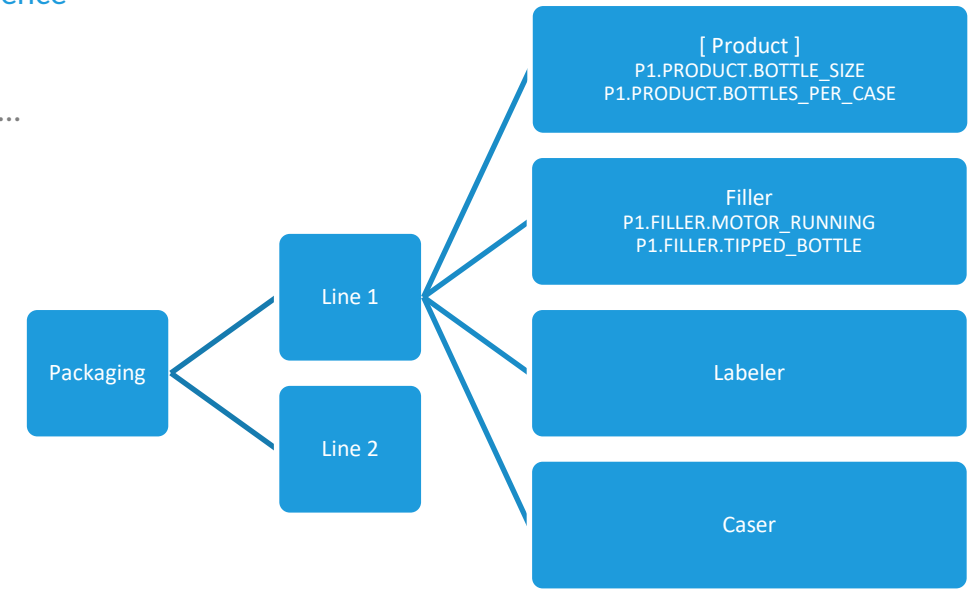
A String value stored in the TrakSYS™ database, populated via user interface by users when a new Production Run is started.

LINE_4_CURRENT_EVENT

A String value calculated and exposed from TrakSYS™ indicating the name of the currently active System Event.

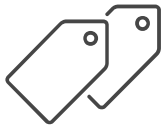
Tag Groups

- Used to organize Tags for Human Convenience
- Open / Hierarchical Structure
- Suggested Tag Group Naming Convention…
  - Spaces
  - Normal Case
- Suggested Tag Naming Convention…
  - No Spaces, Underscore for Spaces
  - ALL CAPS
  - Mimic Tag Group Hierarchy
  - Dots Separate Tag Groups



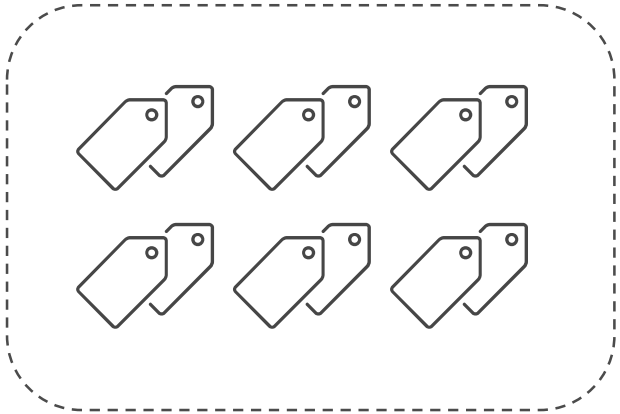
OPC Tags

- Represent real-time data points from OPC Compliant Servers
- The Item Name Property specifies a unique, fully qualified Tag address from the target OPC Server
- Each Tag is related to an OPC Access Name which defines the connection to the OPC Server



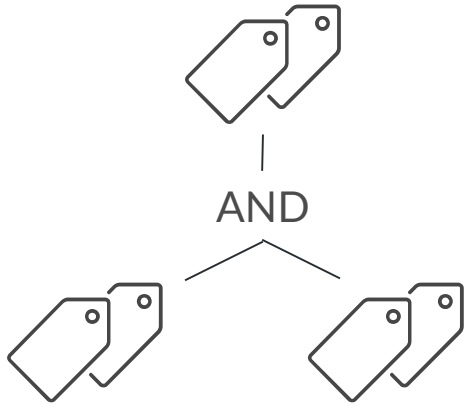
OPC Access Names

- Defines an OPC data source and how TrakSYS™ connects to OPC Servers
- Key Properties
  - Node
    IP Address or PC Name
  - OPC Server Name
    Programmatic Name of OPC Server
  - Access Path
    Optional Item Name Prefix
- Parent entity referenced by each OPC Tag



Logic Tags

- Logic Tags allow the combination and operation on existing Tags within TrakSYS
- Create Business Rules and Logic without:
  - Reprogramming PLCs
  - Updating / Changing existing Automation
  - Customization using Scripting
- Expose the result of the Logic Tag operation as a new Tag Value



Logic Tags

Compare

Takes 2 input values (Tags or Constants) and compares them producing a Discrete result value.

Latch

Takes 2 Discrete Tag inputs, the first latches the result value, the second clears it. Produces a Discrete result value.

Boolean

Takes N input Tags and applies a Boolean condition (AND, OR, NAND, etc..) producing a Discrete result value.

Switch

Takes in a single Tag value and returns a result based on a comparison table of input -> output values.

Calculation

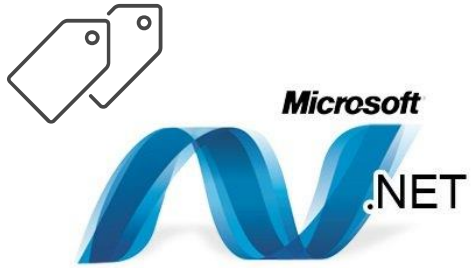
Takes 2 input Tags and applies an arithmetic operation (+, -, *, /, %, etc...) producing a new result value.

Aggregate

Takes N input Tags and applies an aggregate operation (SUM, AVG, etc...) producing a new result value.

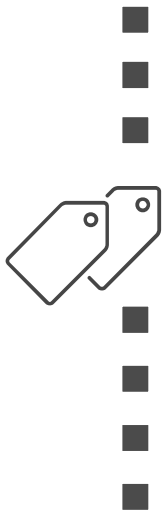
Script Tags

- Define a complex logical Expression or Calculation within a single Tag
- Simplify the implementation of complex Business Rules
- After executing, returns a single result Value
- Script Types
  - Simple (VB.NET)
  - Advanced (C#.NET)
- Executed synchronously within the Logic Service memory and Scans
- Recommended to Avoid heavy Data Aggregation and communication with External Systems



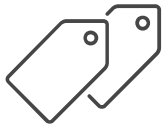
Counter Tags

- Used to monitor and accumulate an incrementing Automation Input (Tag)
- Accumulates input Tag changes since the previous Logic Service Scan
- Produces the aggregated input increase as the resulting Tag Value
- Contains settings for Max Increment per Scan and Input Multiplier



State Tags

- Returns internal Logic Service state Values
- Data Type chosen based on the State Tag Attribute
- Entity Types
  - Access Name
  - Event Definition
  - Function Definition
  - Logic Service
  - KPI Calculation
  - KPI Counter
  - Sample Definition
  - Schedule
  - System
  - Tag



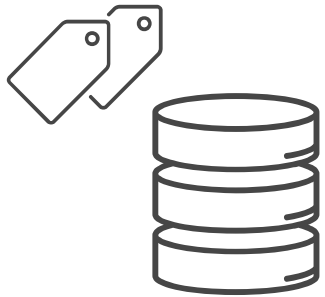
Active

Scheduled

Running Seconds

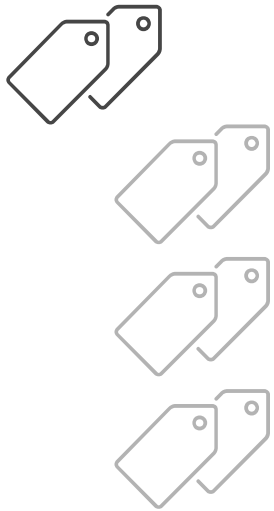
Virtual Tags

- Used to store real-time data Values that are not available from External Sources
- Values are maintained in the TrakSYS Database
- Values are modified using TrakSYS User Interfaces Functions, APIs or directly in the Database
- Examples include…
  - Current Job Name
  - Current Product
  - Production Theoretical Rate
  - Counter Multipliers



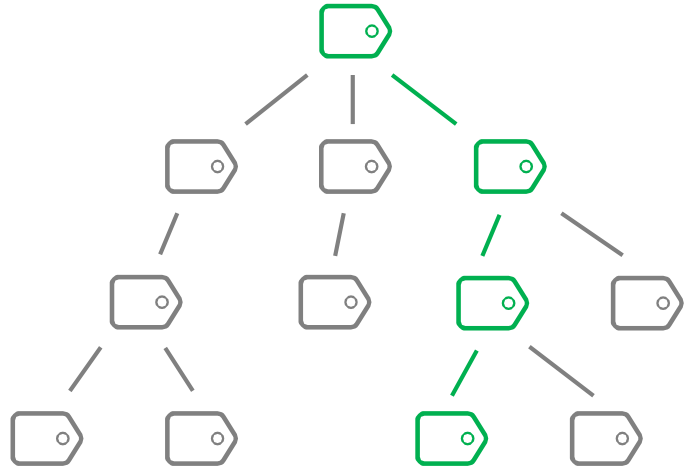
Template Tags

- Placeholder Tags assigned to properties in and beneath a Template System
- Aid in Tag Duplication when a new Template System is Created
- When Template Tag Duplication occurs, all Template Tags from the Template Systems are copied to the target Child System Structure



Additional Tag Settings

- **Persist Value Changes to Database**
  When checked, the Logic Service will update the value of this Tag in the database whenever it changes (default True).
- **Force Evaluation**
  When checked, the Logic Service will evaluate this Tag every scan, regardless of change (default False).
- **Prerequisite Tags**
  When specified, the Logic Service will ensure the referenced Tags are evaluated before the parent Tag. These are generated automatically by default or a manual list of Prerequisite Tags can be specified.



Tag evaluation occurs intelligently from the bottom up, based on when referenced Prerequisite Tags change value.

Smart Tags and Smart Devices

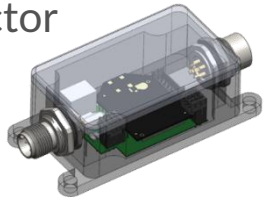
Training Objectives

Become familiar with the Smart Device hardware available for use with the TrakSYS software.

Understand how to configure Smart Tags to communicate with Smart Devices.

Smart Devices

TrakSYS Smart Data Collector



Communication Module
Lightweight RF
Wireless Mesh Network

Power
Quick Disconnect
12-30VDC (3W)

Sealed
IP65 Rated Enclosure

Sensor Connection
M12 5-Pin Connector
Nearly any 3rd Party Sensor

Logic Module
Local Logic Processing
Data Push and Heartbeat

Mounting
Flexible Attachment and Mounting Options

TrakSYS Smart Coordinator

Web Interface
Simple Configuration
Settings and Diagnostics

Processing Module
Data Push
Collector Heartbeat

Power
Standard AC Adapter

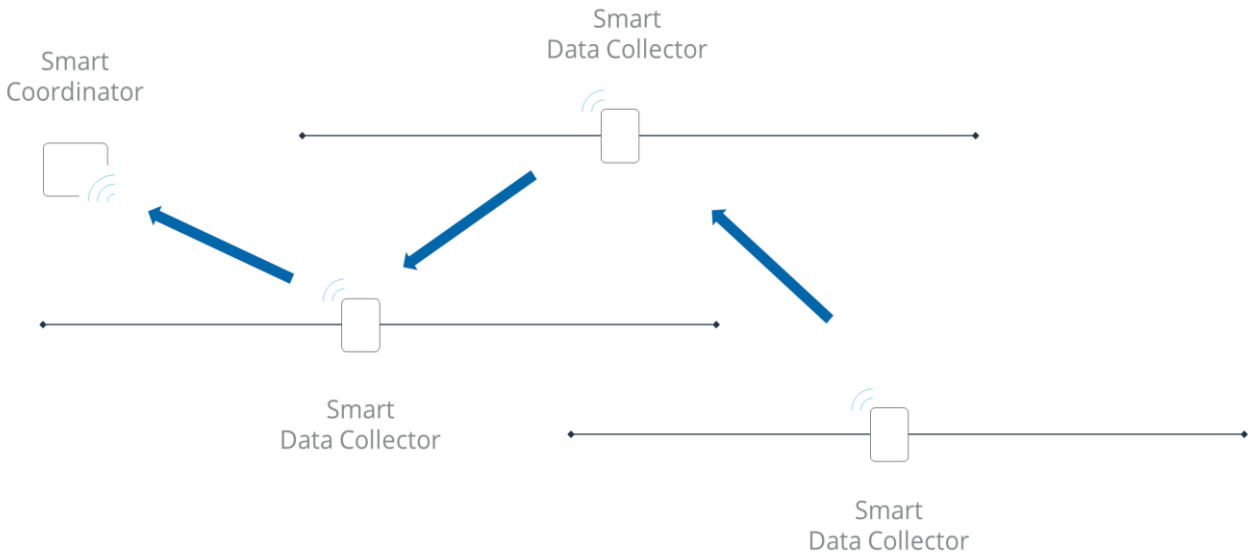
Wireless Hotspot
Local wireless hotspot for easy, standalone configuration

Ethernet
Wired connection to TrakSYS™ Network

Antenna
Lightweight RF Wireless with Smart Data Collectors

CE/FCC Certified

Smart Architecture

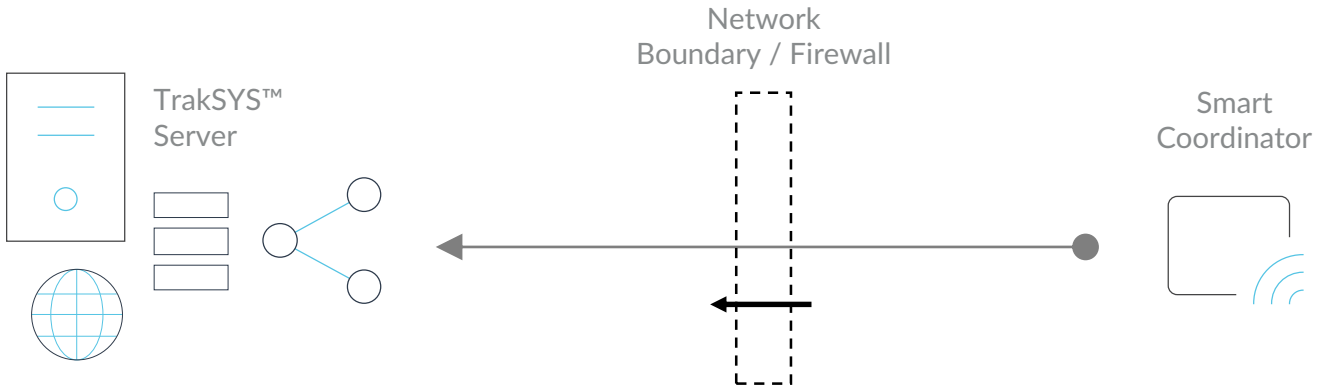


Add and Expand
Add new Data Collectors to the Edge of the Network as Needed

Data Relay
Data is relayed to the Coordinator through the closest Device

Zero Configuration
New Data Collectors connect and begin Communicating Automatically

TrakSYS Connectivity



Integrated

Web Service endpoints are included with TrakSYS™. No need for additional communication drivers.

Firewall Friendly

Port 80 is the only required firewall configuration. This is typically already allowed.

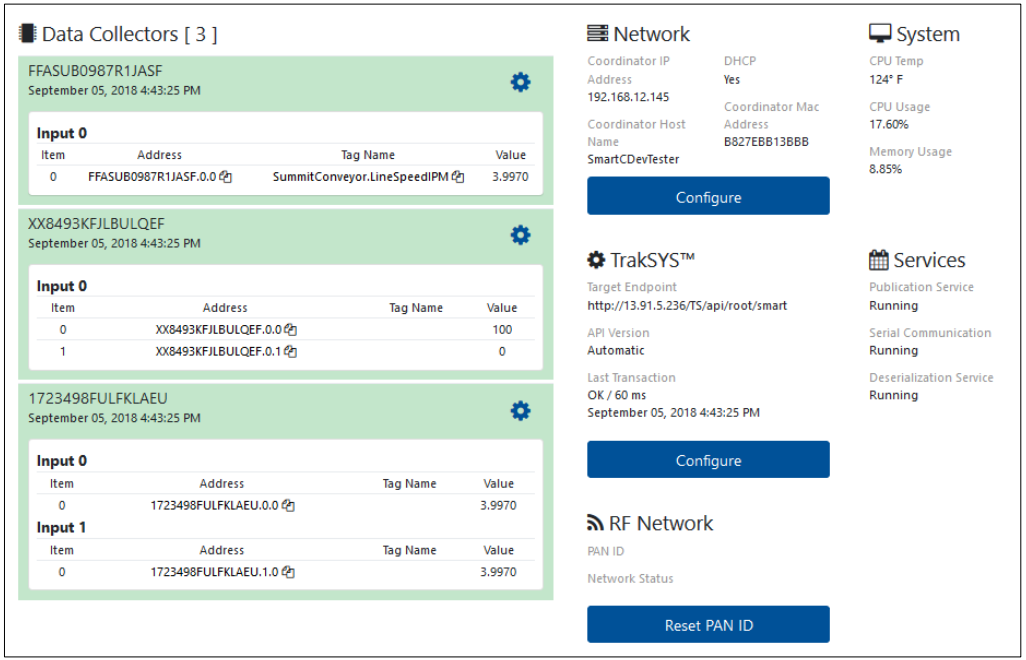
One-Way

Communication flows only from the Coordinator to the TrakSYS™ server, making internetwork configuration requirements more secure.

Compact

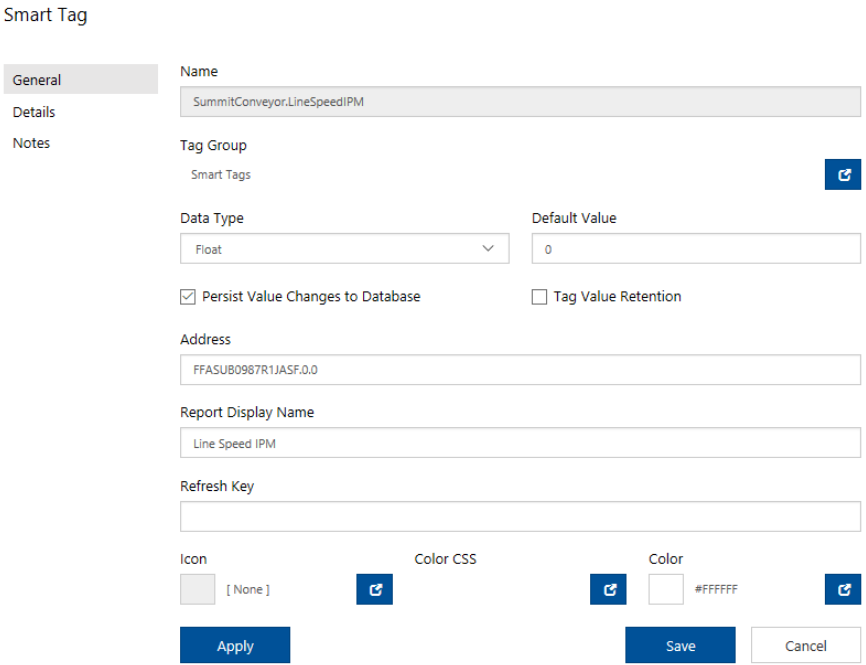
Lightweight messages are sent to the TrakSYS™ server on data change and heartbeat.

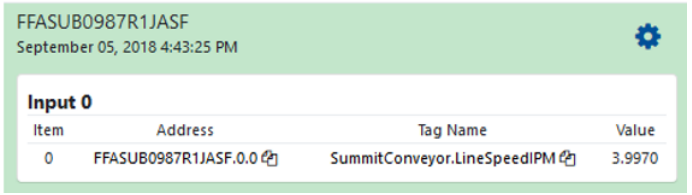
Smart Device Web Service



- **Data Collectors**
  Identifies the Smart Collectors that are connected to the Coordinator, including their unique address and current value.
- **Network Information**
  Shows the information related to connecting the Smart Devices together, as well as pointing the coordinator to the appropriate TrakSYS installation.
- **System Status**
  Displays key indicators of the Coordinator's current state for troubleshooting purposes.

Smart Tags





- **Address**
  Provide the matching Address from the Smart Coordinator screen. If configured correctly, the Coordinator will automatically connect the two and will show the connection in the Coordinator interface.

- **Standard Properties**
  All other properties match those of a Virtual Tag.

Modeling and Configuration
Tag Historian

Training Objectives

Become familiar with the Historian Service and related configuration entities.

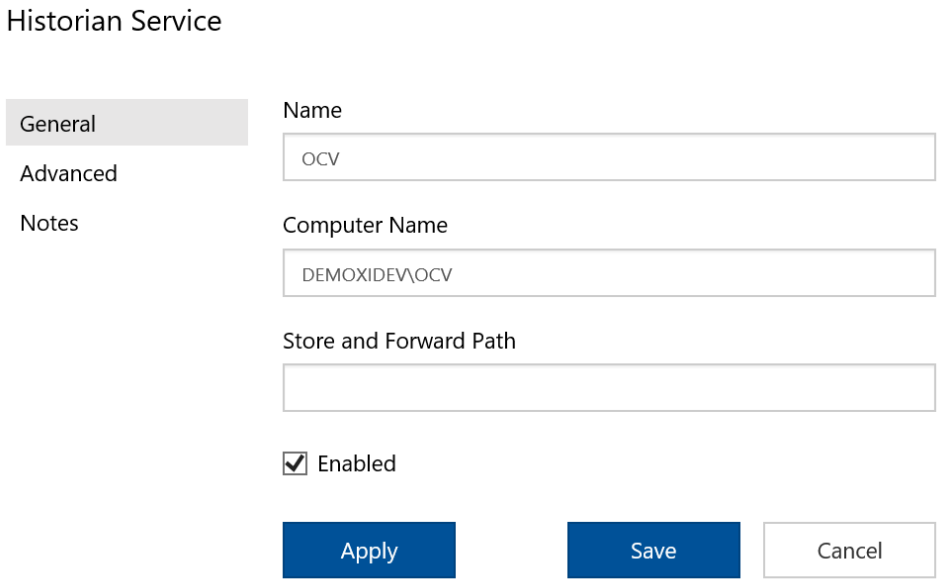
View the related Content Pages for Historian Solutions. Additional information about Content Pages will be covered in later sections.)

Historian Service Review

- Monitors and records changing TrakSYS™ Tag values for historical Trending and Analysis
- Supports Store and Forward when the TrakSYS™ Database is Unavailable
- Supports algorithmic Data Compression (SLIM 3)
- Licensable TrakSYS™ component Tag History Definitions Required

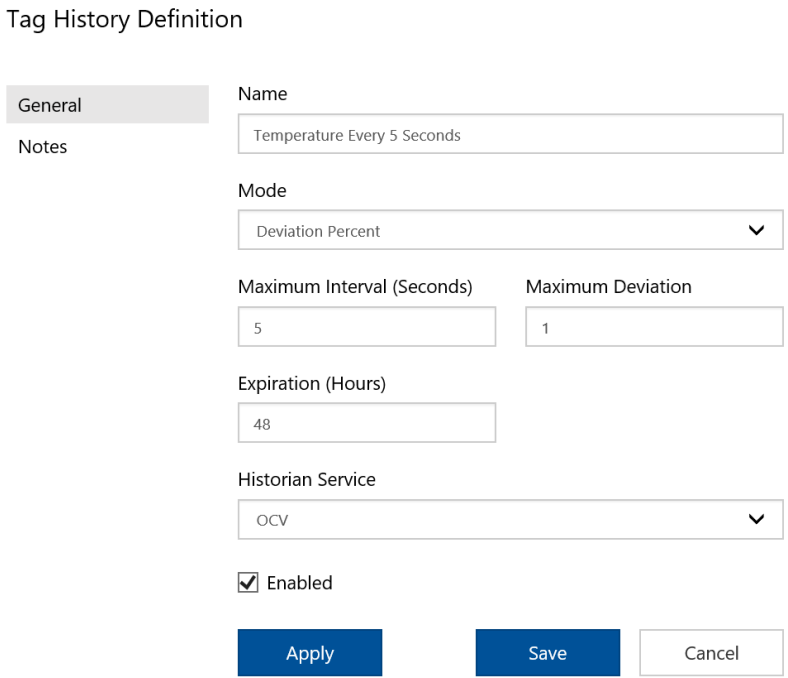
Supports Multiple and/or Distributed Instances

Historian Service Configuration



- **Name**
  Display name for the service
- **Computer Name**
  Name of the service instance for this entity
- **Store and Forward Path**
  Server location for where to store records locally if connection is lost

Tag History Definition



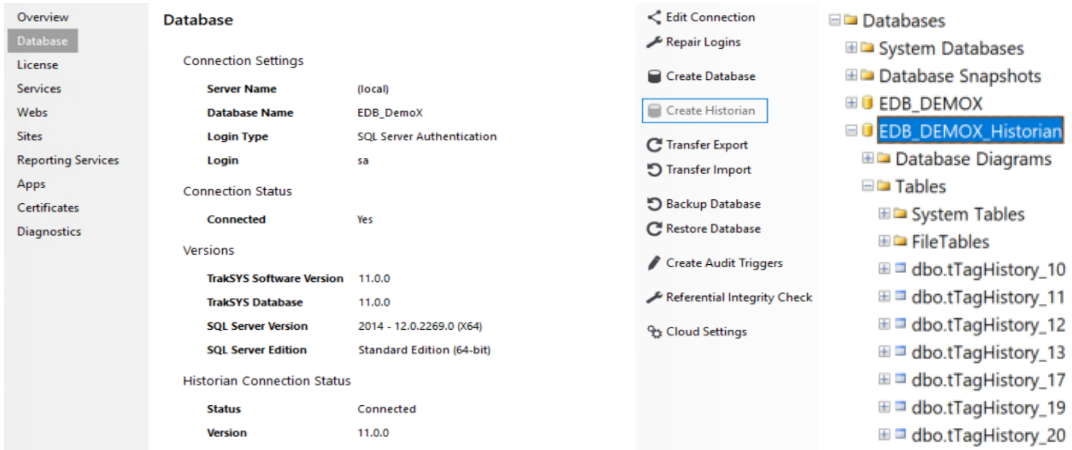
- **Name**
  The field that is used for display in reports
- **Mode**
  The method for determining when a value will be recorded
- **Maximum Interval**
  The maximum time that can pass before automatically recording a value automatically.
- **Maximum Deviation**
  The maximum (flat value or percentage) change that can occur before recording a value automatically.
- **Expiration**
  How many hours before the Historian Data is automatically deleted. Set to 0 to disable.

Historian Database

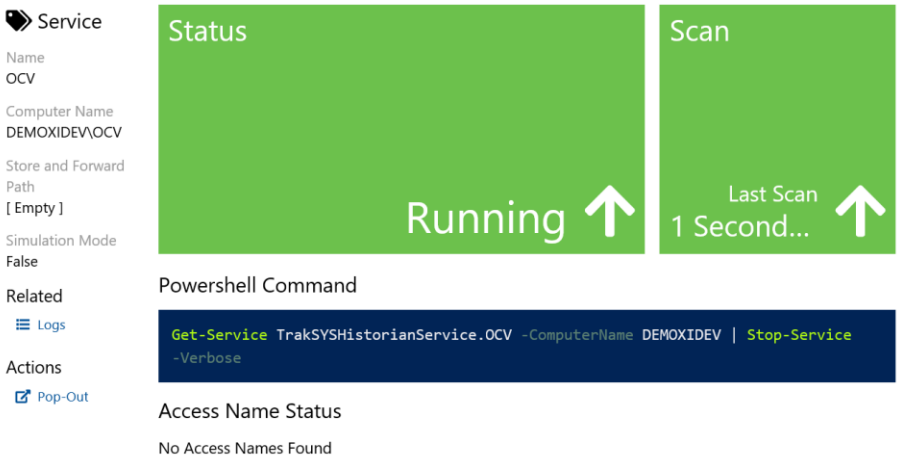
Database can be created through the TrakSYS Installation Manager

One table will be created for each Tag Historian Definition that is configured

All Historian **data** will be stored in the Historian Database



Historian Service



Once configured, the Historian Service can be tracked through the Administration Section

Additional information for managing the service can be found here, including Logs

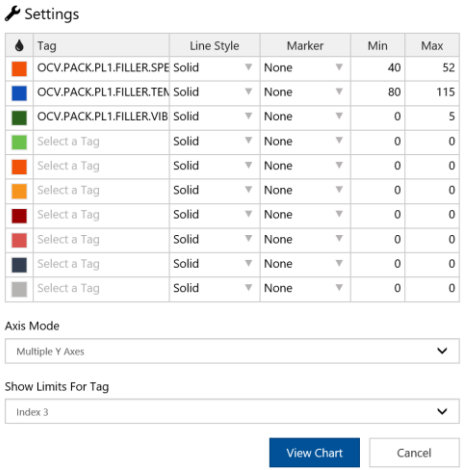
The Historian Service will automatically stop running if no Tag Historian Definitions are assigned to it

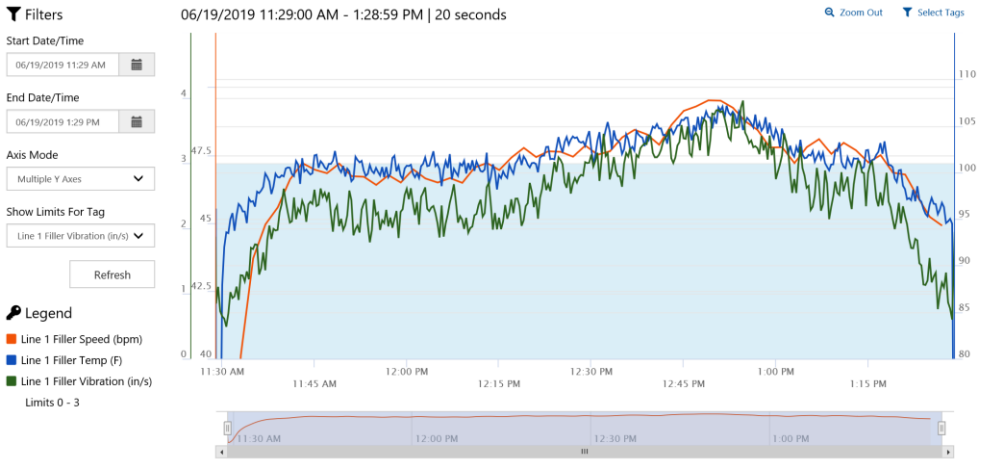
Historian Content Page

Easy picker system to display desired Historian information

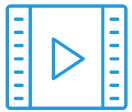
Specialized charting for historical trending capabilities

Additional parts available for customization needs





Demonstration



- Configure a Tag Group
- Configure a Virtual Tag
- Configure an OPC Access Name
    - Configure an OPC Tag
- Configure a Compare Tag
    - Highlight Tag Picker
- Configure a Script Tag
- Configure the Historian Service
- Create the Historian Database
- Create a Tag History Definition

Lab 2

Logic Service
and Tag Interaction

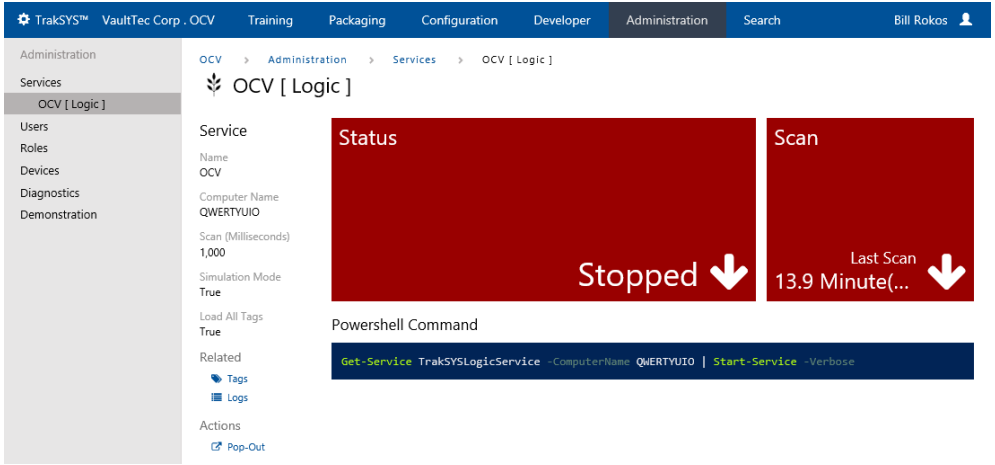
Training Objectives

Understand the TrakSYS administrative user interface for monitoring the status of the Logic Service (and other TrakSYS services).

Learn how to monitor Tag value changes in real-time, as well as modify Tag values for simulation and testing.

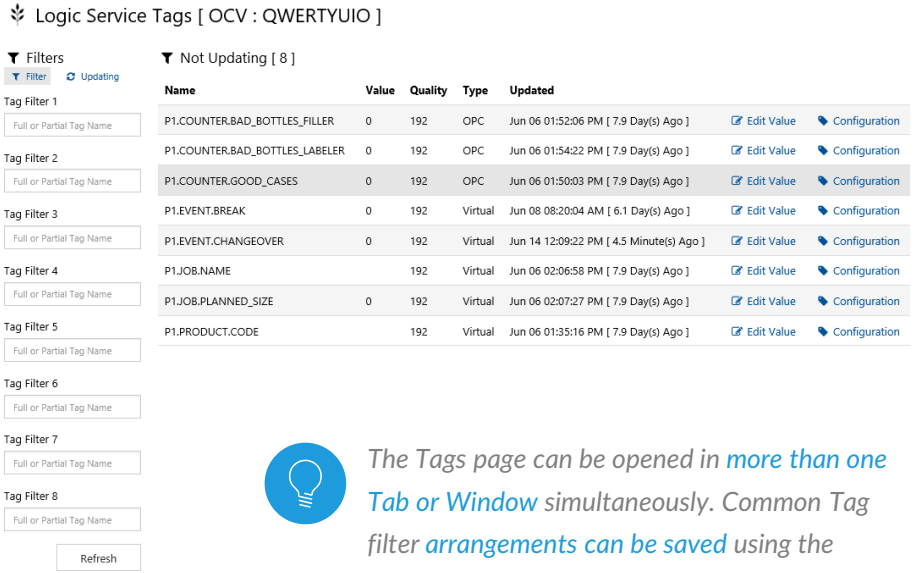
Logic Service Hub

- Located in the Administration Section under the Services Hub
- Hub is automatically created for each Service Instance
- Service specific Status, Related Items and Actions
- Service Control is handled from outside the Web Application



The Service Pages can be popped-out to a more compact form factor for constant display while working.

Logic Service Tags

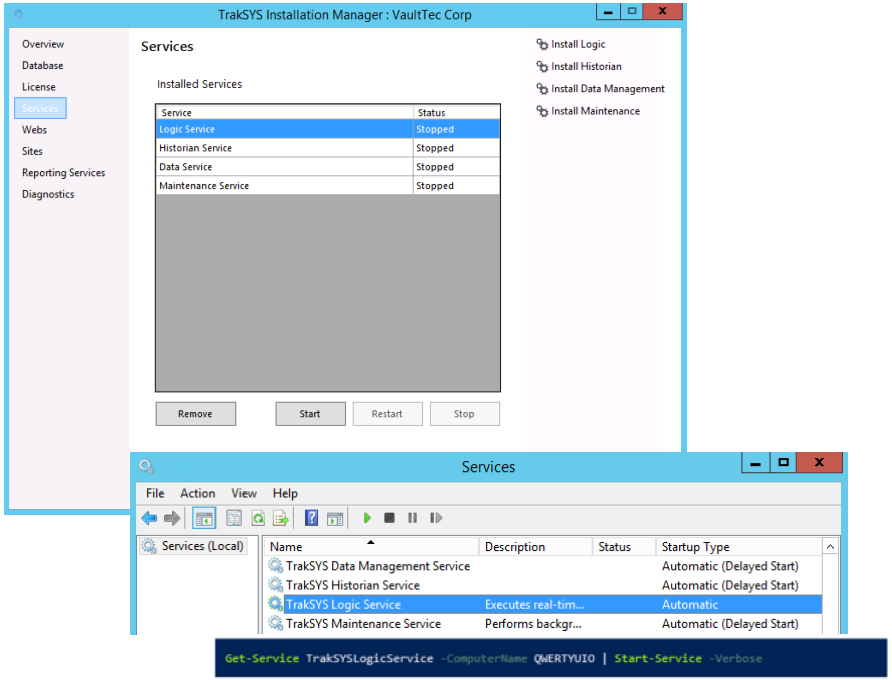


The Tags page can be opened in more than one Tab or Window simultaneously. Common Tag filter arrangements can be saved using the browser Favorites.

- Monitor real-time Tag Values being managed by the Logic Service
- Only functional when the Logic Service is Running
- **Filter Mode**
  Set up to 8 Tag Name Filters
- **Updating Mode**
  Live Tag Values are Displayed
  - Red = Bad Quality
  - Green = Recently Changed
- Values may be edited for Simulation and Testing (Virtual and OPC only)

Service Control

- **TrakSYS**
  Services can be started, stopped, and re-started using the Services page in the TrakSYS Installation Manager application.
- **Windows**
  Services can be started, stopped, and re-started using the Windows Services applet.
- **PowerShell**
  Services can be started, stopped, and re-started using a PowerShell command with the appropriate credentials



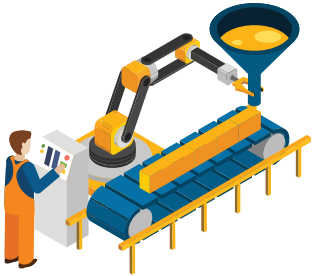
Modeling and Configuration
System Functionality

Training Objectives

Become familiarized with the various System Definitions, their basic structures and intended uses.

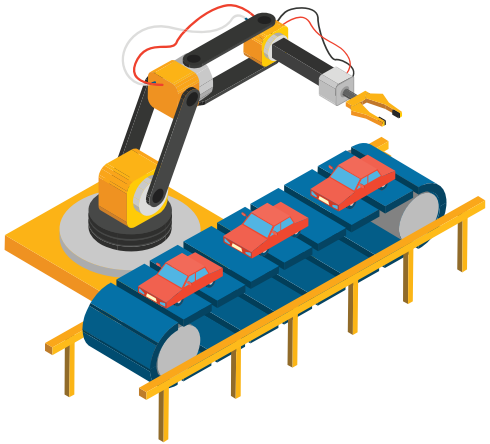
Later sections of the training course will cover each of these functions in more detail.

System Functionality



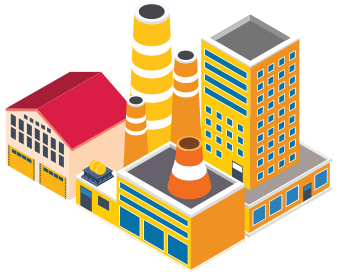
Batch Systems

- Function Definitions (Steps)
- Task Definitions (Quality)
- Event Definitions (Downtime)
- Sample Definitions (SPC)



Discrete Systems

- Event Definitions (Downtime)
- KPI Calculations (OEE)
- Sample Definitions (SPC)
- Task Definitions (Quality)

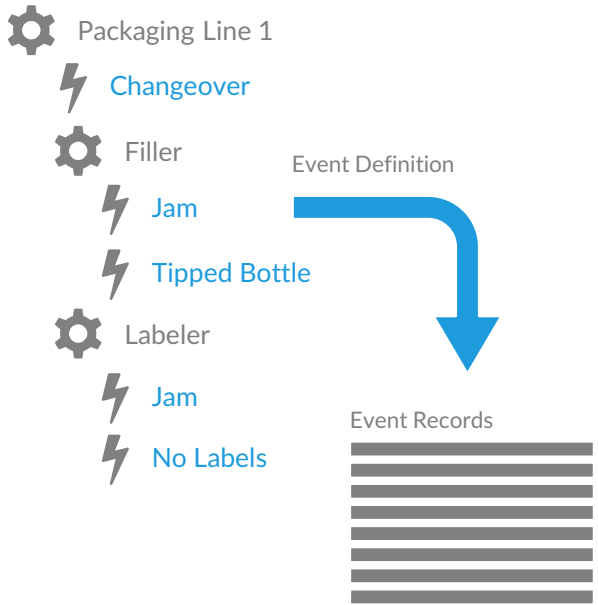


Storage Systems

- Transfer Definitions (Material)
- Event Definitions (Downtime)
- Task Definitions (Quality)
- Sample Definitions (SPC)

Event Definitions

Discrete, Batch or Storage Systems



Configuration

- Represent configurable data entry fields to be collected during execution of a specific Event
- An Event represents a span of time (typically downtime) associated with a specific asset (System)
- Configurable at the System OR Sub-System Level
- A Discrete Trigger Tag property indicates when an Event Starts and Ends

Execution

- Loaded and executed by the Logic Service
- Events contain reference to related information such as Job, Batch, Product, Shift, OEE Type, Category, etc…
- Only one Event at a time can be active for a given System *

Event Definitions: Examples

Discrete, Batch or Storage Systems

General Fault

- Trigger Source:
  - Automation
- OEE Type:
  - Availability Loss
- MTBF Type:
  - Failure
- Requires User Input:
  - Yes

Maintenance

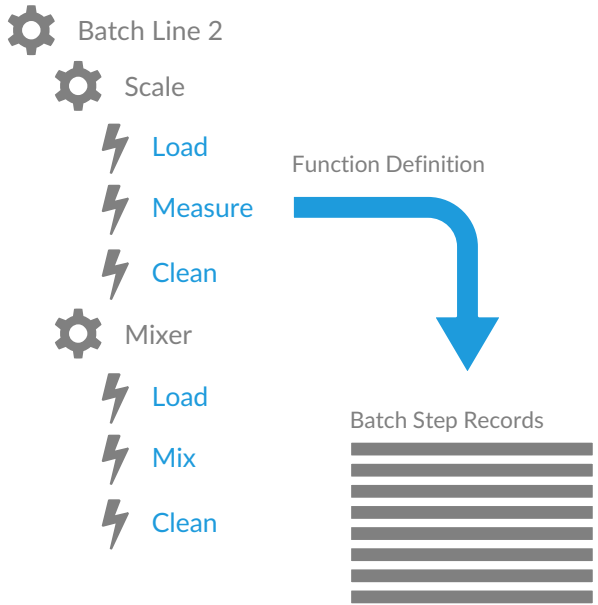
- Trigger Source:
  - Manual
- OEE Type:
  - Availability Loss
- MTBF Type:
  - Non-Failure
- Requires User Input:
  - No

Lunch

- Trigger Source:
  - Logic Tag (Daily at Noon)
- OEE Type:
  - Not Scheduled
- MTBF Type:
  - Excluded
- Requires User Input:
  - No

Function Definitions

Batch Systems Only



Configuration

- Allows the real-time examination of an input condition to record instances of Batch Step records in the TrakSYS Database
- A Batch Step represents a span of time that a Batch System is engaged in a specific activity (Step)
- Configurable at the Sub-System Level Only
- A Discrete Trigger Tag property indicates when a Batch Step Starts and Ends

Execution

- Loaded and executed by the Logic Service
- Batch Steps contain reference to related information such as Job, Batch, Product, Shift, etc…
- It is possible for multiple Batch Steps in a single Sub-System to be simultaneously active, with each Batch Step having a corresponding Batch Step Record

Function Definitions: Examples

Batch Systems Only

[Scale] Measure/Weigh

- Trigger Source:
  - Manual
- Parameters:
  - None
- Used in Recipes:
  - ADRA (Step 2)
  - DRIS (Step 3)
  - SAFS (Step 3)

[Dryer] Heat Up

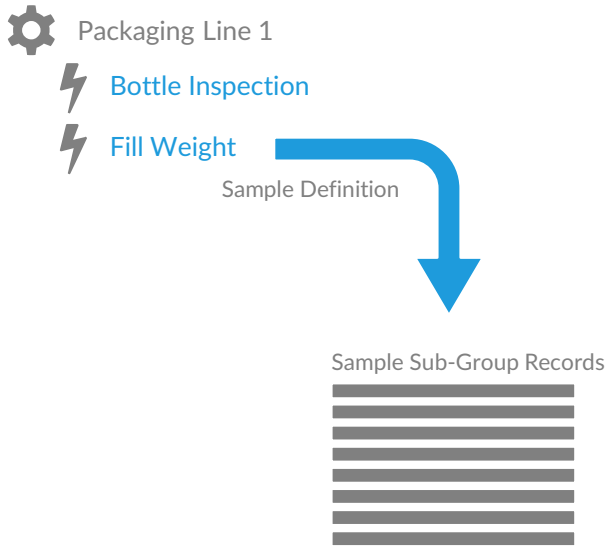
- Trigger Source:
  - Automatic
- Parameter:
  - Temperature
- Used in Recipes:
  - ADRA (Step 6/10)
  - DRIS (Step 8)
  - SAFS (Step 9)

[Granulator] Unload

- Trigger Source:
  - Manual
- Parameters:
  - RPM
- Used in Recipes:
  - DRIS (Step 16)
  - SAFS (Step 17)

Sample Definitions

Discrete, Batch or Storage Systems



Configuration

- Defines the parameters for taking quality SPC samples of a specific type to record instances of Sample Sub-Group records in the TrakSYS Database
- An Sample Sub-Group represents a set of 1-N samples measured together and associated with a specific asset (System)
- Configurable at the System Level Only
- Constants or Tags can be defined to specify SPC Limits

Execution

- SPC data typically logged against a Sample Definition via user interface data entry Forms
- Sample Sub-Groups contain reference to related information such as Job, Batch, Product, Shift, etc…
- Automated SPC sampling can be achieved using the API and Scripting to capture values and create Sample Sub-Groups

Sample Definitions: Examples

Discrete, Batch or Storage Systems

Fill Weight

- Type:
  Variable
- Control Limits:
  61-63g
- Specification Limits:
  >60g
- Rules:
  Western Electric

Temperature

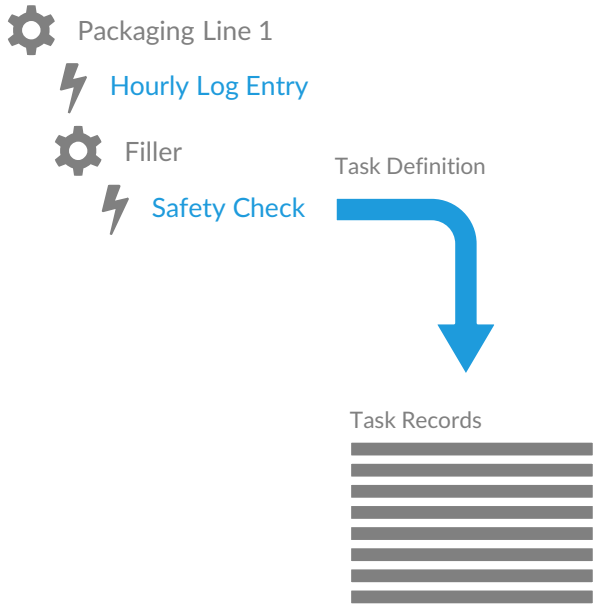
- Type:
  Variable
- Control Limits:
  Auto-Calculate
- Specification Limits:
  68-72 °F
- Rules:
  6 Trending
  Above/Below CLs

Bottle Inspection

- Type:
  Attribute
- Control Limits:
  Auto-Calculate
- Specification Limits:
  None
- Rules:
  Western Electric

Task Definitions

Discrete, Batch or Storage Systems



Configuration

- Allows the real-time examination of an input condition to record instances of Task records in the TrakSYS Database
- A Task represents a request with pre-defined user inputs required (a form) associated with a specific asset (System)
- Task Definitions are configured to require 1 or more user input fields (Task Form Items)
- Configurable at the System OR Sub-System Level
- A Discrete Trigger Tag property indicates when a Task is Generated

Execution

- Loaded and executed by the Logic Service
- Tasks contain reference to related information such as Job, Batch, Product, Shift, etc…
- Task Forms are implemented and completed in the TS Web User Interface

Task Definitions: Examples

Discrete, Batch or Storage Systems

Prepare Forms

- Trigger:
  - Job Start
- Time to Complete:
  - 15 Minutes
- Evaluation Logic:
  - None can Fail
- Inputs:
  - BOM Verified
  - Safety Sign-off
  - Quality Standards
  - Reference

Maintenance Request

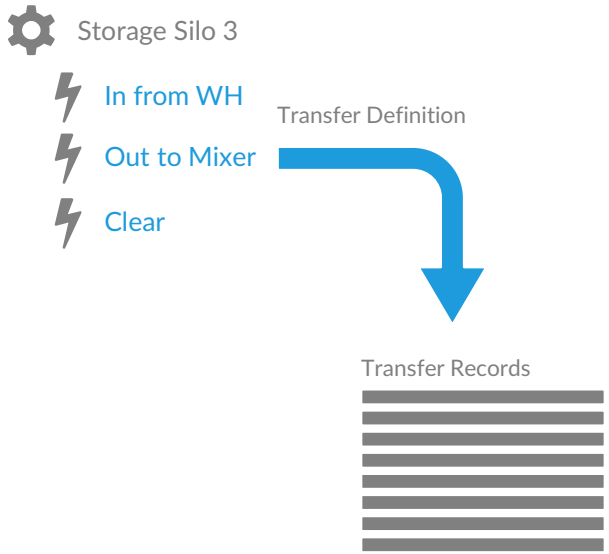
- Trigger:
  - Manual
- Time to Complete:
  - 60 Minutes
- Evaluation Logic:
  - Always Pass
- Inputs:
  - Affected Machine
  - Cause of Issue
  - Resolution

Filler PM

- Trigger:
  - Machine Bottle Count
- Time to Complete:
  - 30 Minutes
- Evaluation Logic:
  - Manual Pass/Fail
- Inputs:
  - Inspect Fill Heads
  - Inspect Valve
  - Clean Machine

Transfer Definitions

Storage Systems Only



Configuration

- Allows the real-time examination of an input condition to record instances of Transfer records in the TrakSYS Database
- A Transfer represents a movement of a specific Material to or from a Storage System
- Configurable at the System Level Only
- A Discrete Trigger Tag property indicates when a Transfer Starts and Ends

Execution

- Loaded and executed by the Logic Service
- Transfers contain reference to related information such as Job, Batch, Product, Shift, etc…
- Data records include captured information such as the Material Code and Quantity that is Transferred

Transfer Definitions: Examples

Storage Systems Only

Transfer In

- Trigger:
  - Manual
- Context Input:
  - Manual Form Input
- Target System:
  - Loading Bay A

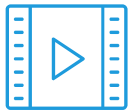
Transfer Out

- Trigger:
  - Automatic
- Context Input:
  - Barcode Scan
- Target System:
  - Shipping Bay B

Set/Adjust

- Trigger:
  - Manual
- Context Input:
  - Machine Reading
- Target System:
  - (Self)

Demonstration



- Configure an Event Definition
- Configure a Function Definition
- Configure a Sample Definition
- Configure a Transfer Definition
- Configure a Task Definition
    - Assign Task Form Items
- Show the Logic Service Hub
- Filter Tag List
- Change a Tag Value

Lab 3

Entity Introduction

Training Objectives

Understand the basic pattern of structures in the TrakSYS Database and their matching TrakSYS Models.

Later sections will cover Entity Relationship Diagrams (ERDs) of entities in more details.

Entity Example

- **Entity**
  Everything that is stored in TrakSYS database is linked to a specific entity, whether it is data or configuration or something else.
- **DbEntity Model**
  In script, every entity has a matching DbEntity model that can be used to interact with that type of information.
- **tEntity Table**
  In the database, every entity has a matching tEntity table that will contain all the data for that type of information.

Entity: Event

DbEvent

```
var ev = new DbEvent();
ev.
```

- LinkedEventID
- ModifiedDateTime
- Notes
- OeeEventType
- ProductID
- ShiftHistoryID
- SplitEventID
- StartDateTime
- State
- StateDateTime

tEvent

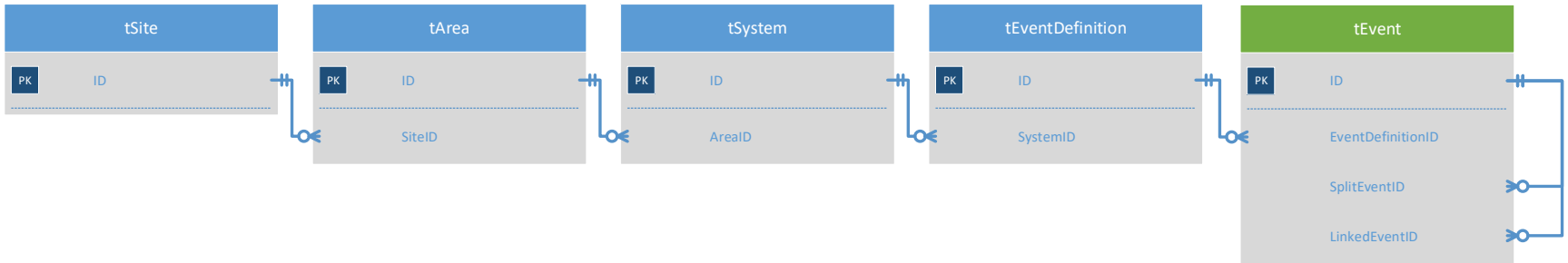
- EndDateTime (datetimeoffset(3), null)
- Date (date, not null)
- Impact (float, not null)
- Count (int, not null)
- EventDefinitionID (int, not null)
- EventCategoryID (Computed, int, null)
- ShiftHistoryID (int, null)
- ProductID (int, null)
- JobID (int, null)
- BatchID (int, null)
- OeeEventType (int, not null)
- EventIsolationType (int, not null)
- State (int, not null)
- StateDateTime (datetimeoffset(3), not null)
- SplitEventID (int, null)
- LinkedEventID (int, null)
- DisplayDelaySeconds (int, not null)
- AcknowledgeDurationMinutes (int, not null)
- IsEdited (bit, not null)

Event Data

Linking to Sites

Each Entity can be linked to a specific Site through foreign Keys.

This allows data to be reported on by a number of specific, asset-based groupings.

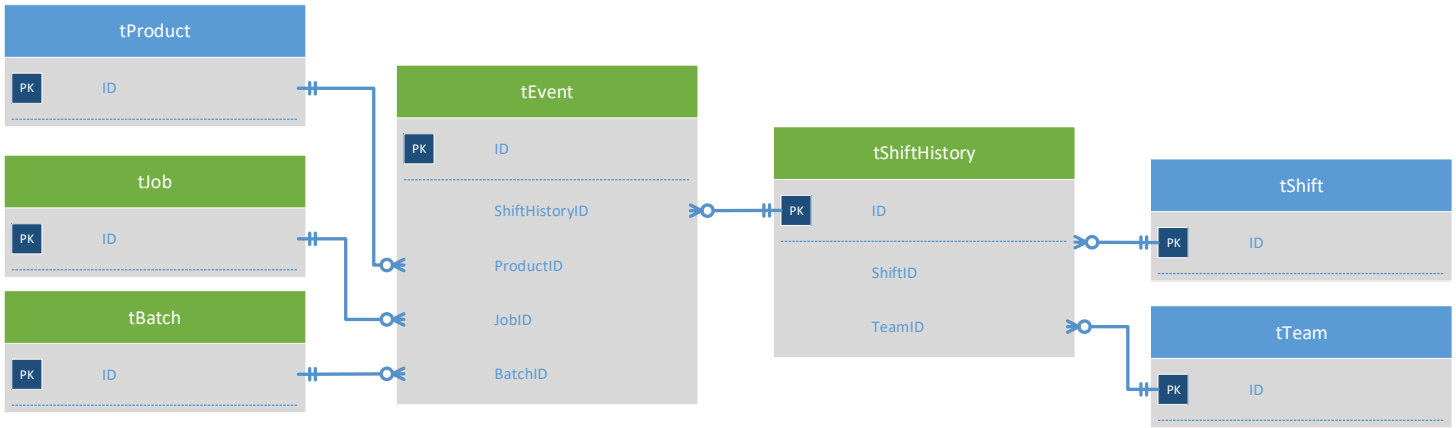


Event Data

Linking to Context

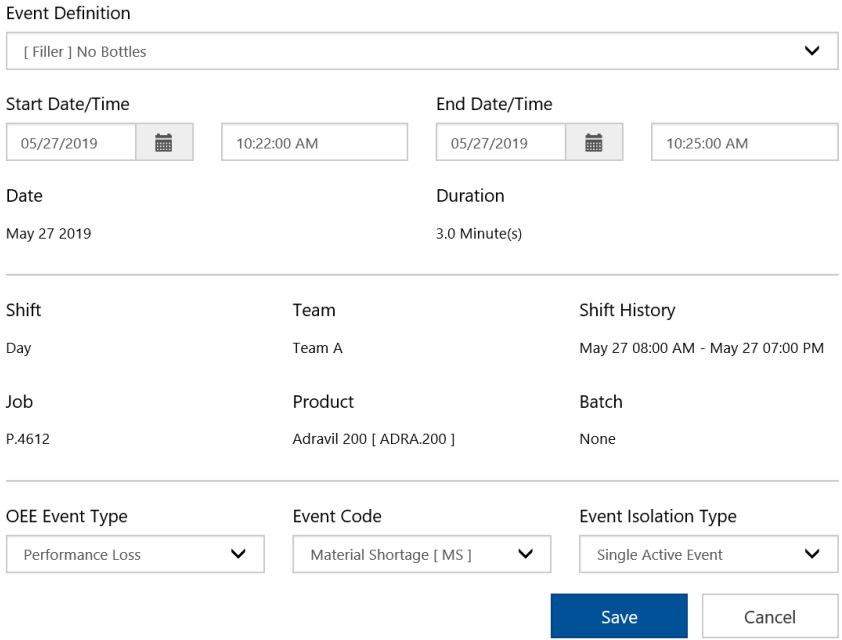
Data records also have contextual identifiers, both standard and implementation specific ones.

This allows data to be reported on by a number of specific, contextual and implementation-specific groupings.



Event Data

Example Use



- The DbEvent object can be used in page development to display information to users. Modifications can then be made to the object.
- Using the API, the DbEvent object can also be used to update their matching tEvent table record.
- The tEvent table can be reported against using standard web parts and pages.
- This pattern allows for manual editing and interactions with the TrakSYS data. This will be covered in more detail in later sections.

Modeling and Configuration
Schedules, Products, Jobs and Capture

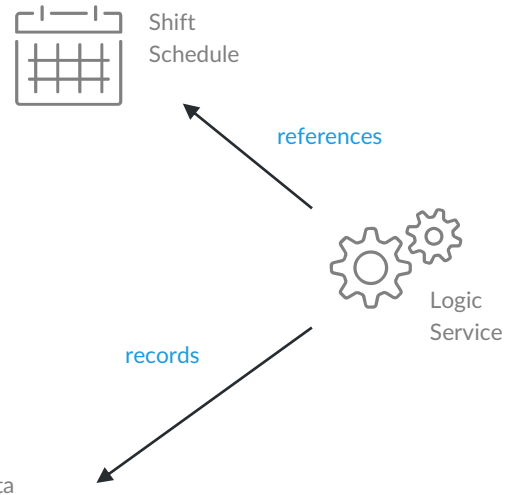
Training Objectives

Introduce additional configuration entities and functionality designed to monitor and store information related to the manufacturing process.

Entities such as Schedules, Product Information, Job and Batch as well as extensible data Capture scheme allow for additional context to be added to the core System data captured by TrakSYS.

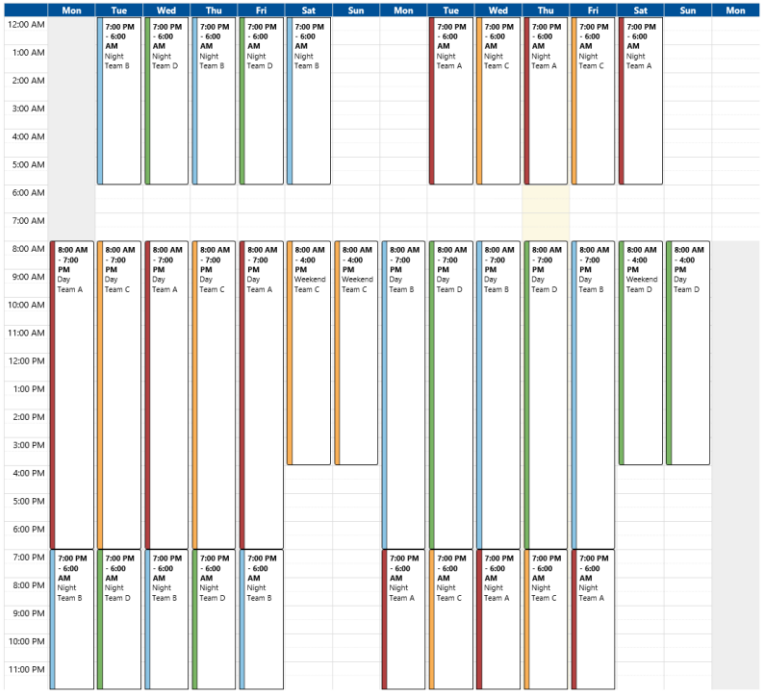
Scheduling

- **Schedules**
  An arrangement of Shift and Team assignments over a repeating calendar pattern. Used by the Logic Service to associate personnel to collected data such as Events and Tasks.
- **Shifts**
  Represent named time periods for operators or Teams (Day Shift, Night Shift, etc…)
- **Teams**
  Represent a specific group of operators that may be assigned to work during a particular Shift (Team A, Team B)



Schedule Pattern

- Schedules may include one or more Schedule Patterns
  - Logic Service uses the Schedule Pattern with the most recent Effective Date/Time
- Represents a repeating arrangement of Shifts and Teams (Schedule Pattern Items)
  - Start Date/Time and Duration
  - Shift and Team
  - Gaps are Allowed (no Shift/Team is associated)

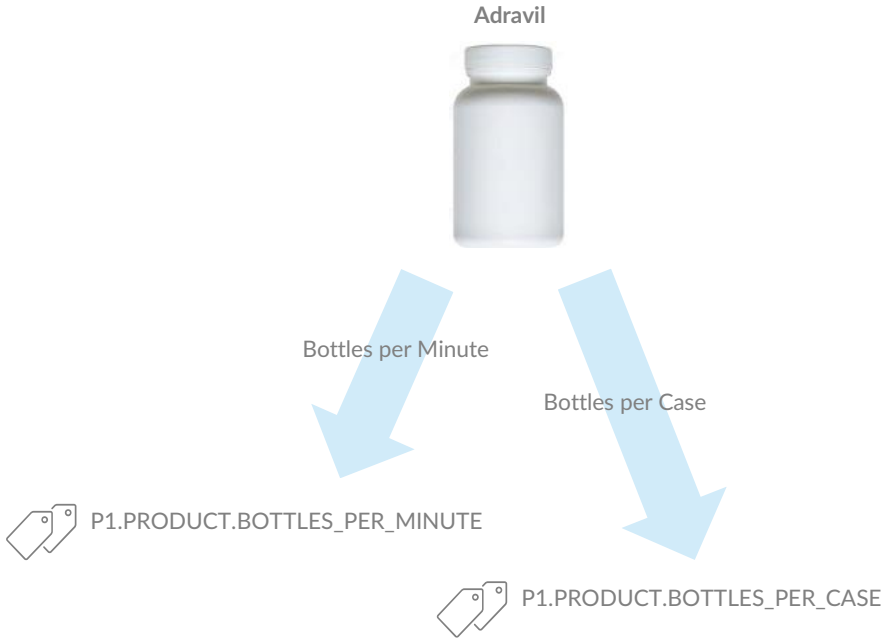


Products

- Products represent the finished good that are produced from a manufacturing process (System)
- A unique Product Code (SKU, Item Number, etc…) identifies each Product
- May contain user defined attributes such as Theoretical Rate or Multipliers.
- May contain a list of Materials and quantities that are required to produce the Product (BOM)
- When assigned to a Batch System, Recipes may be defined to represent the formula or set of production steps for creating the Product

Product Configuration

- **Product Scheme (Packaging Lines)**
  A set of user defined Product Attributes for which values can be provided for each Product.
- **Product Set (Packaging Line 1)**
  A list of Products that can be produced from a System or group of Systems.
- **Product Map**
  A mapping that defines specific Tags to be populated with Product Attributes from a designated Product Set.

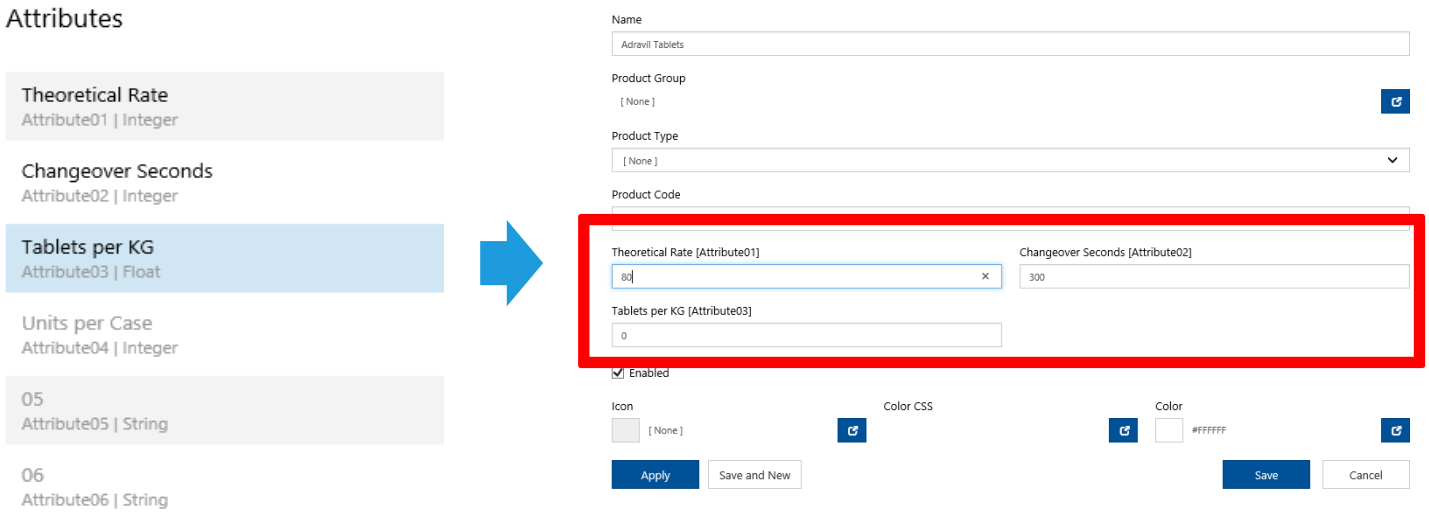


Product Scheme Example

Product Scheme

Attribute names and data type can be changed.

Disabled attributes will be hidden.



Product Map Example

System : Packaging Line 1

Tags

- P1.PRODUCT.CODE (current product running)
- P1.PRODUCT.BOTTLES_PER_MINUTE
- P1.PRODUCT.BOTTLES_PER_CASE

Product Scheme : Packaging Attributes

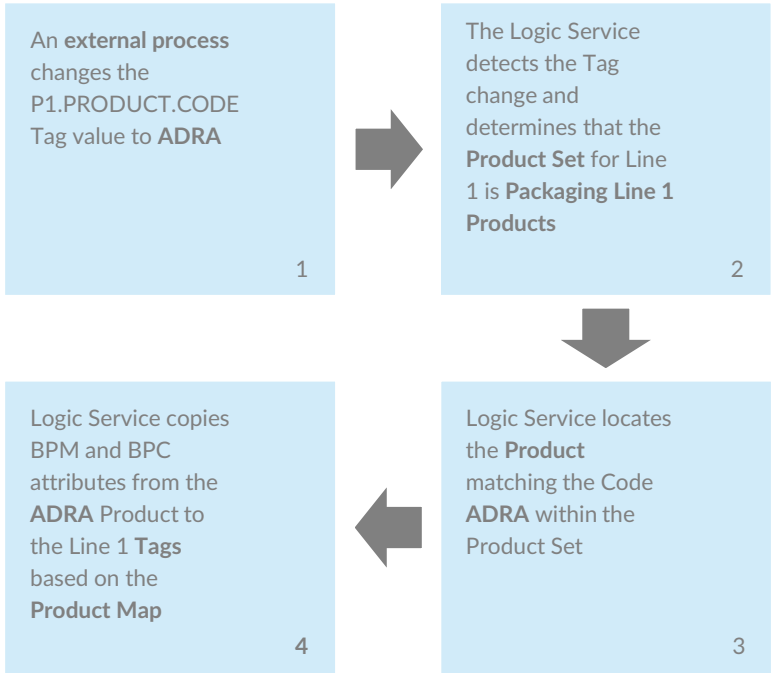
- Bottles per Minute (BPM)
- Bottles per Case (BPC)

Product Set : Packaging Line 1 Products

- Adravil | ADRA | 200 BPM | 24 BPC
- Prospirim | PROS | 150 BPM | 36 BPC

Product Map : Packaging Line 1 Map

- Monitors Tag P1.PRODUCT.CODE for changing Value
- Maps attributes from Product Set Packaging Line 1 to specific Tags for the Packaging Line 1 System
  - Bottles per Minute (BPM) -> P1.PRODUCT.BOTTLES_PER_MINUTE
  - Bottles per Case (BPC) -> P1.PRODUCT.BOTTLES_PER_CASE



Product Map Example

Product Configuration

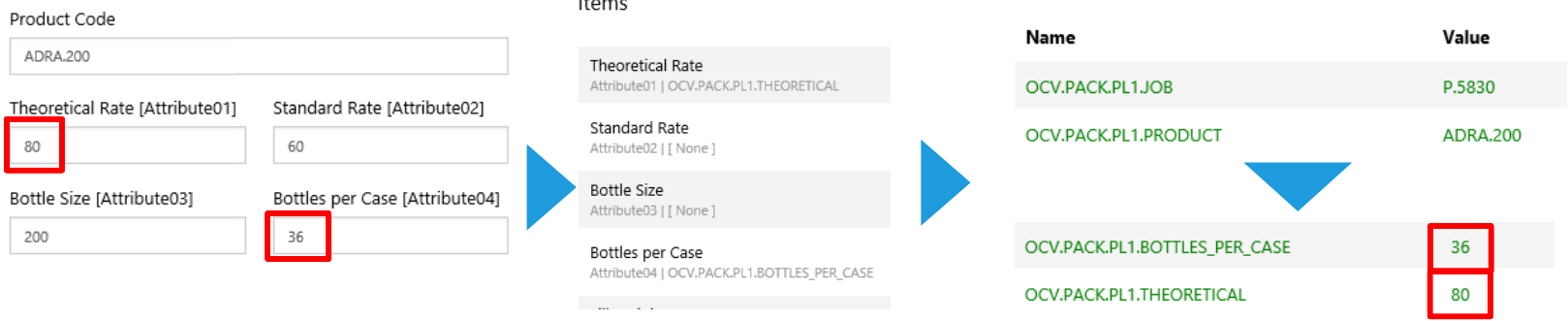
Product is part of a Product Set and has Attributes exposed based upon the Product Scheme

Product Mapping

Attributes are mapped to specific Tags.

Logic Evaluation

When the Product Map Tag changes, Logic Service finds the matching product and updates the other tags

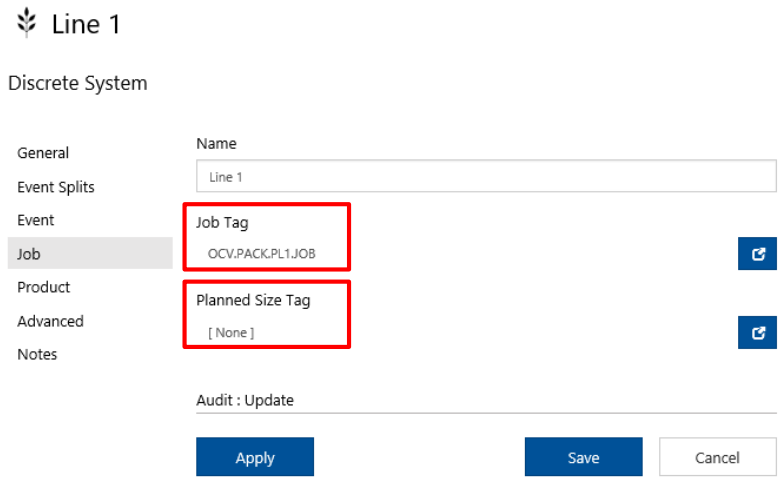


Jobs

- Jobs represent a production run of a specific Product on a specific System or Systems
- Other common terms for Jobs are Process Order, Order, (Production) Run, etc…
- All production data collected by TrakSYS (Events, KPIs, Steps, Tasks, Samples, Transfers, etc..) can be related to a Job

Job Configuration

- The Job Tag should contain a unique identifier for the current Job running on the System
- The Job Planned Size Tag should contain the target size (units to be produced) for the current Job
- TrakSYS creates a new Job record for a System when the Job Tag changes Value

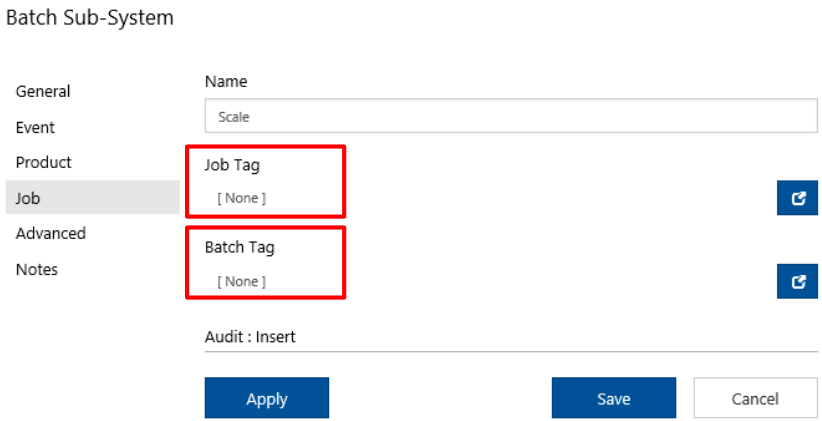


Batches

- Batches are smaller sub-sets of production within a Job
- Batches apply only to Batch type Systems
- A single Batch Job may contain one or more Batches
- A single Batch System (containing many Batch Sub-Systems) may be processing more than one Batch Simultaneously
- Each Batch Sub-System may only be operating on one Batch Simultaneously

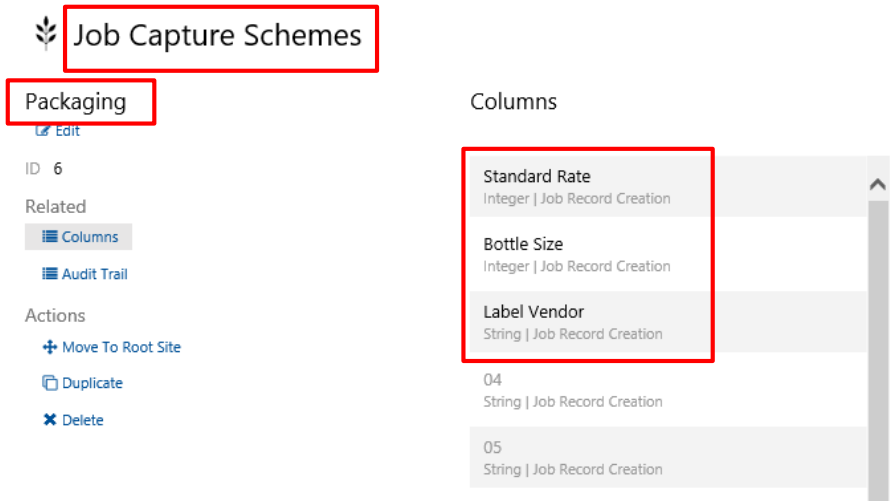
Batch Configuration

- Job and Batch Tags are configured at the Sub-System level in Batch Systems
- A Batch System must have at least one Sub-System
- The Job Tag should contain a unique identifier for the current Job running on the Sub-System
- The Batch Tag should contain a unique identifier for the current Batch running on the Sub-System
- TrakSYS creates new Job and Batch records for a System when the Job and Batch Tags change Values



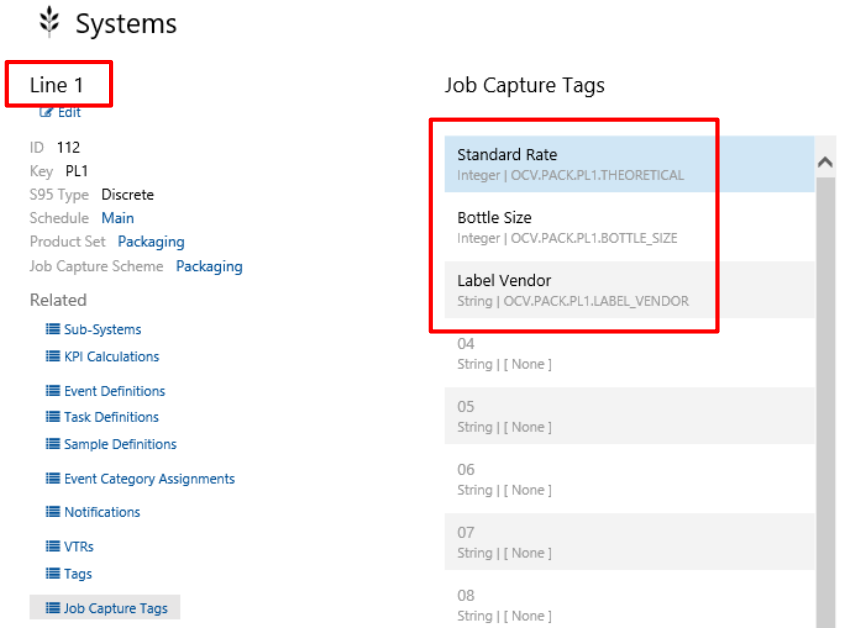
Capture Schemes

- A Capture Scheme is a set of user-defined data points to be recorded and related to Production Data
- **Job Capture Schemes**
  Up to 20 additional values can be recorded with Job Records
- **System Capture Schemes**
  Up to 10 additional values can be recorded with Event Records
- **KPI Capture Schemes**
  Up to 10 additional columns can be recorded with KPI Interval Records



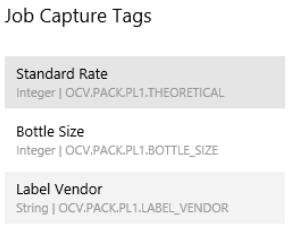
Capture Tags

- Capture Tag associations map a specific Tag value to a Capture Column for a given System or KPI Calculation
- The Logic Service automatically populates the Capture Column with the Tag value as Events, Intervals and Jobs are Created

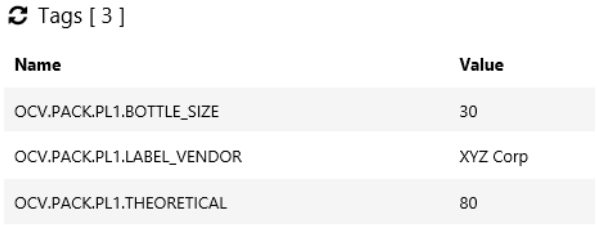


Capture Scheme Example

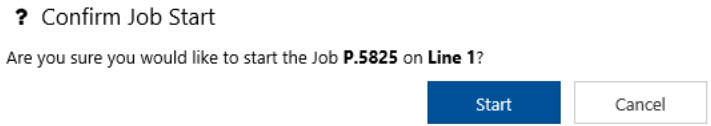
Configured Capture Scheme with tags.



External Source sets these tag values.



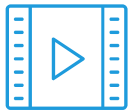
Job with scheme is processed by logic service.



Job Data Record created contains capture information from tags.

Name: P.5825
Product: Adravil200
Capture01: 80
Capture02: 30
Capture03: XYZ Corp

Demonstration



- Configure Shifts and Teams
- Configure a Schedule
  - 14 Day Pattern
- Configure Products
  - Scheme
  - Set
  - Products
- Configure a Job Tag Assignment
- Configure Batch Tag Assignment
- Configure a Job Capture Scheme
  - Job Capture Tag Assignment

Lab 4