TrakSYS™ Training

Day 5

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

Production Scheduling
Configuration

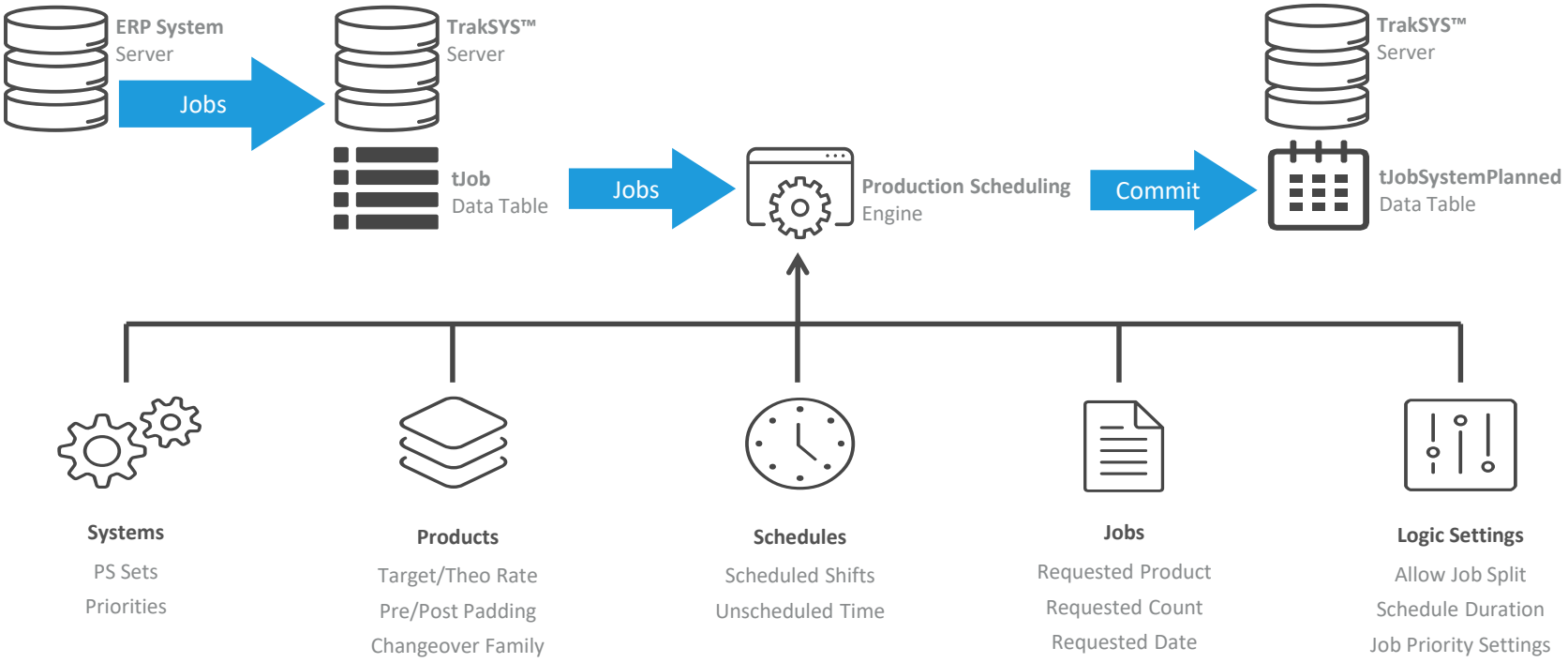
Training Objectives

Become exposed to the configuration properties and other patterns of the Production Scheduling engine.

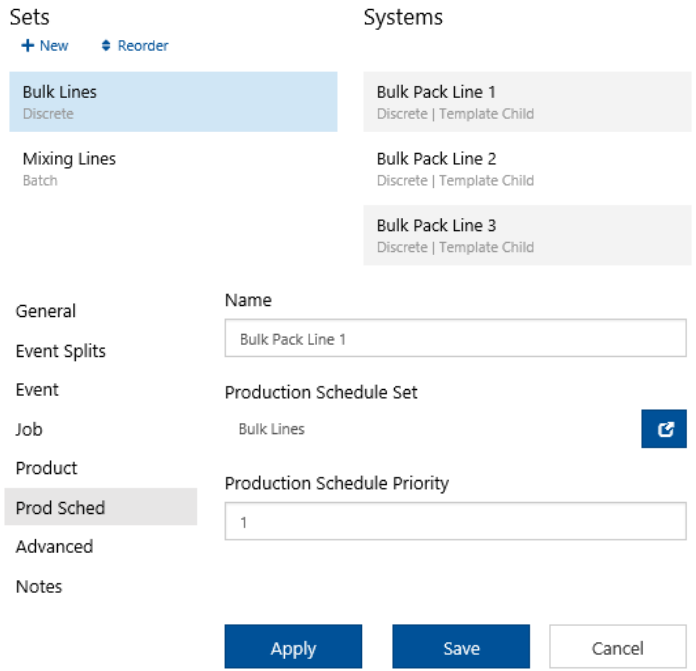
Understand the relations between the various configuration entities.

TrakSYS Production Scheduling

Configuration

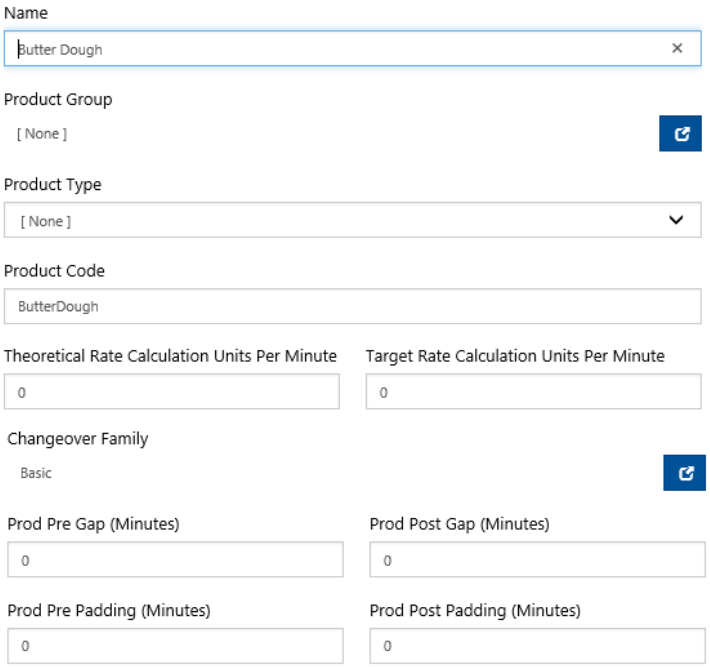


ProdSched Entities: PsSets and Systems



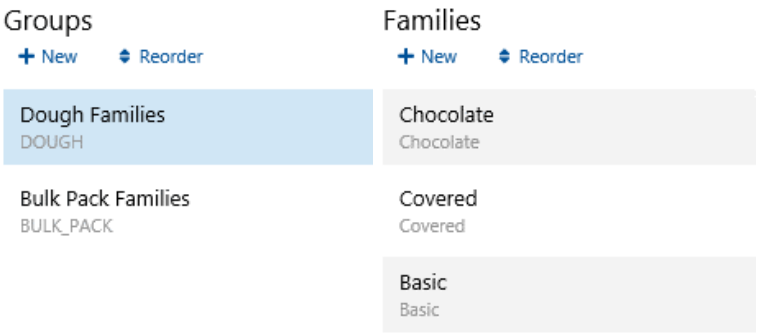
- Ps Sets group together Systems that should be scheduled together.
- Each System can be assigned to a single PsSet
- Scheduling occurs against a single PsSet at a time
- Systems can be given a Production Schedule Priority, which is used as a criteria for scheduling priority

ProdSched Entities: Products



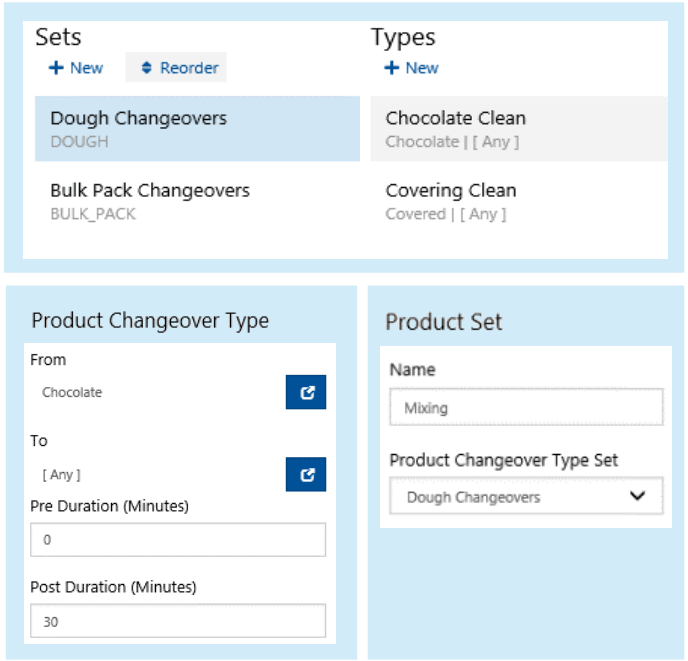
- Products can have a single Changeover Family assigned to it (covered in the next slides)
- Product Theoretical Rate is used as a criteria for scheduling priority
- Pre and Post Gap will add unassociated time before or after a Job record. These values are used as a criteria for scheduling priority
- Pre and Post Padding will add associated time before or after a Job record. These values are used as criteria for scheduling priority.

ProdSched Entities: Product Changeover Families



- Changeover Families group together products that share similar changeover requirements.
- The Changeover Family Groups exist for human readability
- Relations between Changeover Families are Changeover Types (covered in the next slide)

ProdSched Entities: Product Changeover Types



- Changeover Types are grouped into Sets which can contain a collection of Changeover Family relationships
- Each Product Changeover Type identified the Changeover FROM a specified family TO a specified family
- For each transition, a Pre and Post duration can be assigned, which is used as a criteria for scheduling priority
- Each Product Set can be assigned to a Product Changeover Type Set

Production Scheduling
Data and Interfaces

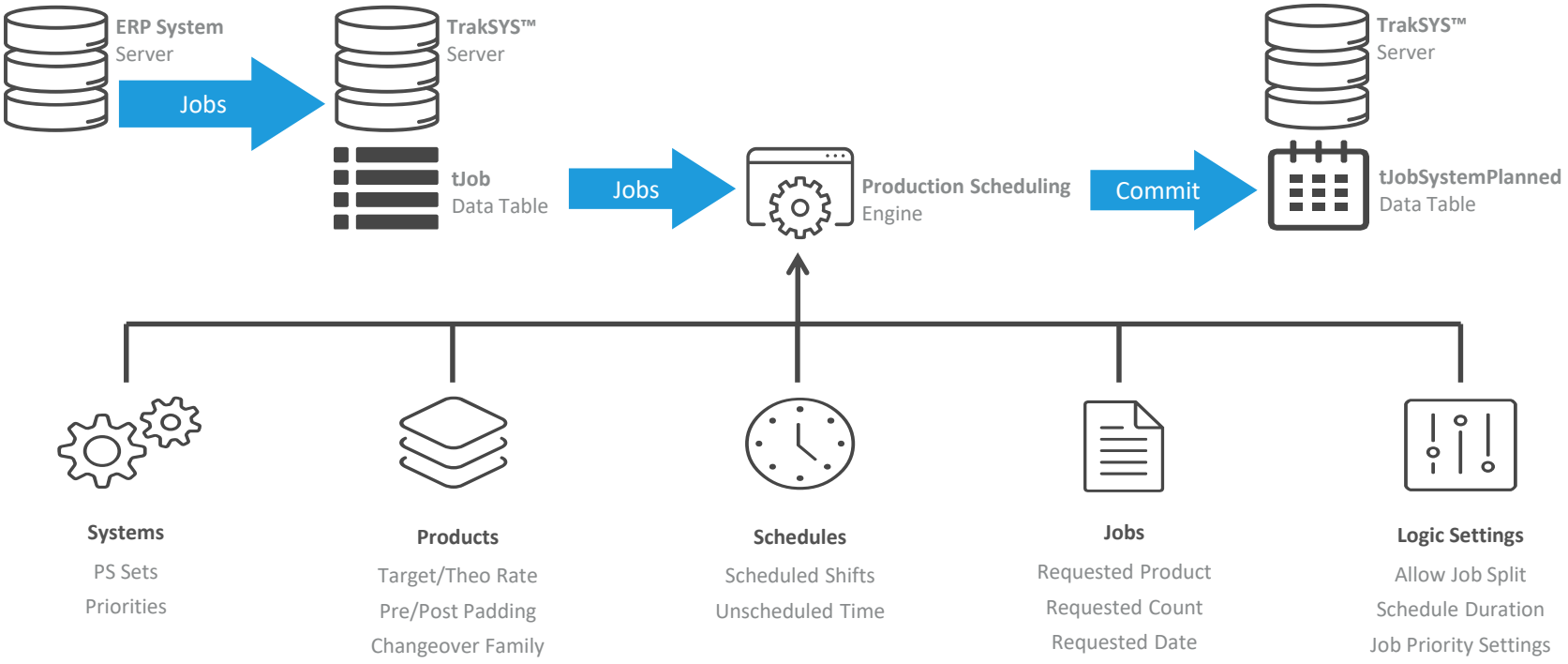
Training Objectives

Become familiar with the Content Pages available for Production Scheduling.

Explore the resulting data from the Production Scheduling engine and understand the troubleshooting and extensibility options available for advanced scheduling needs.

TrakSYS Production Scheduling

Data Flow



ProdSched Content Pages

- Standard Content Pages exist to facilitate a standard scheduling workflow
- Ps.PsSchedule
  - When provided with a PsSetID, it will retrieve all job records for that PsSet and display their current information as a timeline.
- Ps.PsGenerate
  - When provided with a PsSetID, it will retrieve all job records for that PsSet. A set of weighted criteria will be presented, which can then be used to run the schedule engine logic against the retrieved jobs. This will create a PsStage record.
- Ps.PsStaged
  - When provided with a PsSetID, it will retrieve all PsStage records for that PsSet. The user can toggle between the different PsStage records to determine which is preferred, and then commit the schedule.

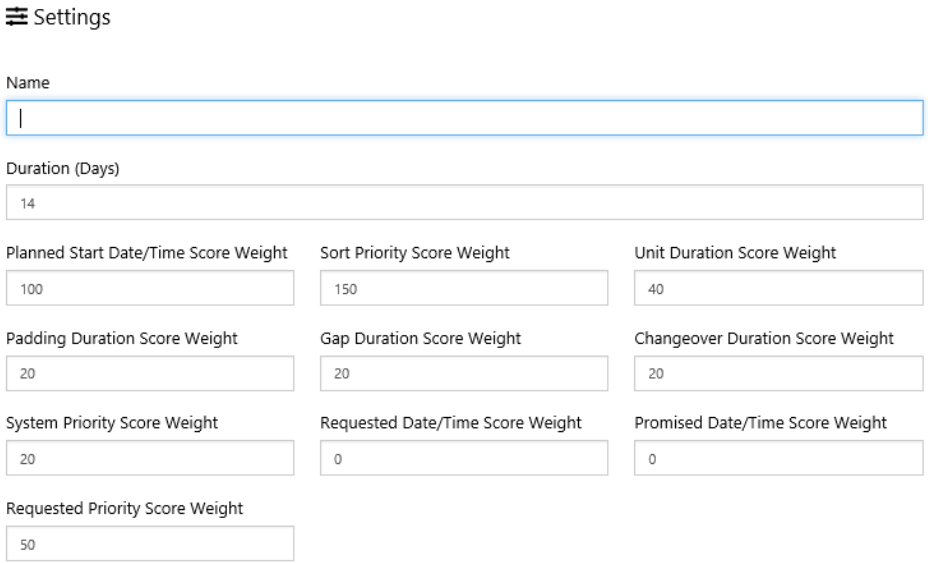
ProdSched Jobs

- ID (PK, int, not null)
- ExternalID (nvarchar(100), not null)
- Name (nvarchar(100), not null)
- AltName (nvarchar(100), not null)
- Description (nvarchar(500), not null)
- Notes (nvarchar(1000), not null)
- Type (int, not null)
- Lot (nvarchar(450), not null)
- SubLot (nvarchar(450), not null)
- ParentJobID (int, null)
- ProductID (int, null)
- PlannedStartDateTime (datetimeoffset(3), null)
- PlannedDurationSeconds (int, null)
- ModifiedDateTime (datetimeoffset(3), null)
- UploadedDateTime (datetimeoffset(3), null)
- PsSetID (int, null)
- PsRequestedProductCode (nvarchar(100), not null)
- PsRequestedDateTime (datetimeoffset(3), null)
- PsRequestedPriority (int, null)
- PsPromisedDateTime (datetimeoffset(3), null)
- PsPaddingPreSeconds (int, not null)
- PsPaddingPostSeconds (int, not null)
- PsGapPreSeconds (int, not null)
- PsGapPostSeconds (int, not null)
- PsChangeoverPreSeconds (int, not null)
- PsChangeoverPostSeconds (int, not null)

Jobs Properties relating to Production Scheduling

- PsSetID: Identifies which PsSet this job will be scheduled against
- PsRequestedProductCode: Identifies what Product Code to use when looking for viable Systems and Product information
- PsRequestedDateTime: Identifies the earliest start time for the job and is used as criteria for scheduling priority
- PsRequestedPriority: Is used as criteria for scheduling priority
- PsPromisedDateTime: Is used as criteria for scheduling priority
- Ps<Type>Seconds: Populated after scheduling for display purposes

ProdSched PsSettings



- PsSettings is a Model in the API that is used to determine how scheduling logic is processed
- Score Weights are all determined relative to one another
- Standard priorities are shown on the left, but additional logic and priorities can be added (Later slides)
- When run, the Scheduling logic will create a PsStage, but will not immediately affect the Job records

ProdSched PsSettings

ScheduleDurationDays (14):
How many days the scheduler should try to schedule jobs

WillExtendJobOverNotScheduledTime (True):
Determines whether jobs can be extended over unscheduled time or must be completed whole during scheduled time

MinRequestedDateTimeField ("PsRequestedDateTime"):
This field will set the earliest a job could be scheduled.

PlannedStartDateTimeScoreWeight (100):
Gives priority to earlier jobs. It makes sure that jobs will be scheduled starting at the earliest possible time.

SortPriorityScoreWeight (150):
Gives priority to jobs that are first in the sorted job list. Jobs are sorted using the *SortPriorityField*s.

- SortPriorityField01 ("PsPromisedDateTime")
- SortPriorityField02 ("PsRequestedPriority")
- SortPriorityField03 ("PsRequestedDateTime")

PsRequestedDateTimeScoreWeight (0):
Gives priority to jobs with a eariler Requested Date/Time (PsRequestedDateTime)

PsPromisedDateTimeScoreWeight (0):
Gives priority to jobs with a eariler Promised Date/Time (PsPromisedDateTime)

PsRequestedPriorityScoreWeight (50):
Gives priority to jobs with a higher Requested Priority (PsRequestedPriority)

UnitDurationScoreWeight (40):
Gives priority to longer jobs. The unit duration is calculated from job PlannedCalculationCount and product TargetRateCalculationUnitsPerMinute

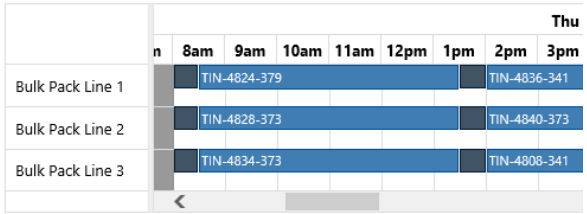
PaddingDurationScoreWeight (20):
GapDurationScoreWeight (20):
ChangeoverDurationScoreWeight (20):
This gives jobs with less Padding/Gap/Changeover higher priority.
(Based upon the Product settings and their Changeover Families/Types)

SystemPriorityScoreWeight (20):
This gives jobs priority based on the system priority (tSystem.PsPriority)

ProdSched PsStage

Production Schedule

Commit



Jobs

System	Job	Product
Bulk Pack Line 1	TIN-4804-373	Sugar - 40 Case [SUGAR.40]
Bulk Pack Line 1	TIN-4814-341	Butter - 40 Case [BUTTER.40]
Bulk Pack Line 1	TIN-4824-379	Chocolate Chip - 50 Case [CHOCHIP.50]
Bulk Pack Line 1	TIN-4836-341	Sugar - 100 Case [SUGAR.100]
Bulk Pack Line 1	TIN-4848-341	Chocolate Chip - 50 Case [CHOCHIP.50]
Bulk Pack Line 1	TIN-4806-379	Sugar - 40 Case [SUGAR.40]

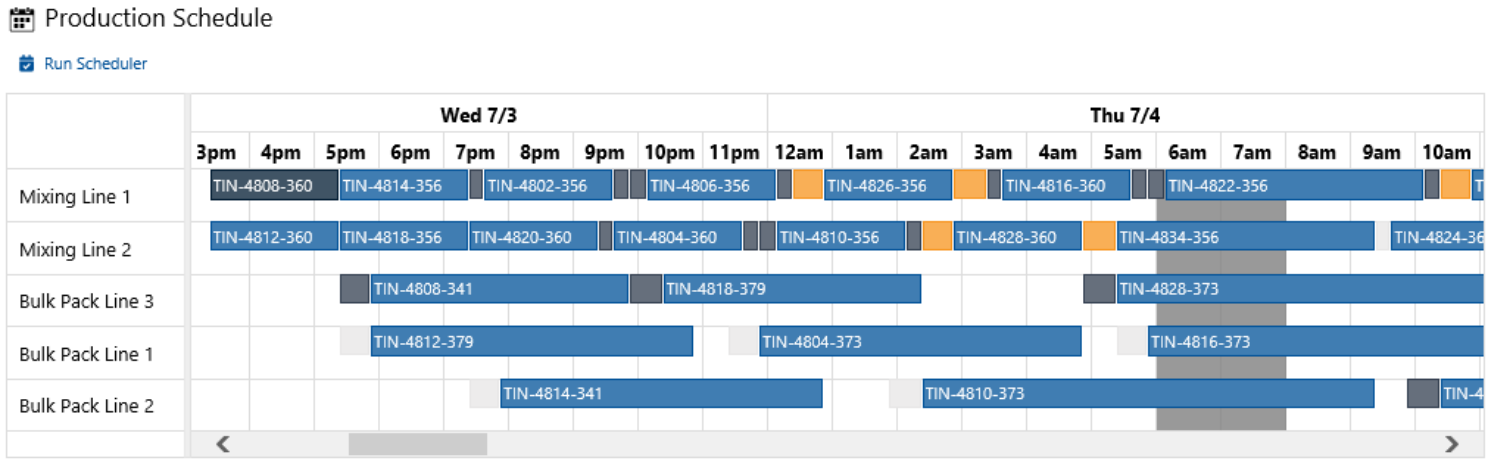
- PsStage is a data record that is generated by the Scheduling logic
- PsStage contains Notes with the settings used to generate the Stage
- The resulting Jobs from the Scheduling logic are saved as PsStageJob records, which contain all of the Job's potential information
- Logs relating to the PsStage are stored as PsStageMessage records. Additional records can be created for troubleshooting by enabling "Verbose Logging" when running the Scheduling logic
- Multiple PsStages can be created for a single PsSetID

ProdSched Commit

Once a PsStage has been selected, it can be committed

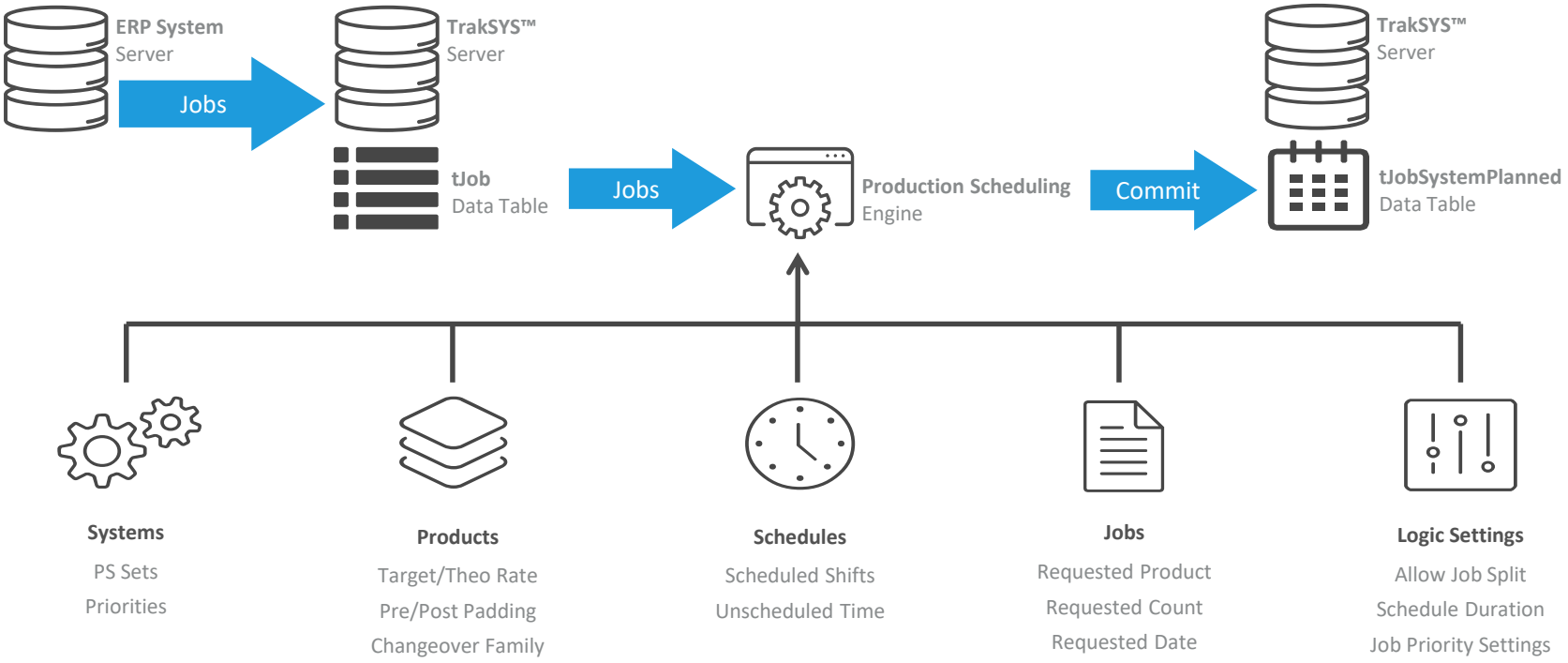
Committing a PsStage will update the job information of all PsStageJobs

All remaining PsStage records for the matching PsSet will be removed



TrakSYS Production Scheduling

Recap



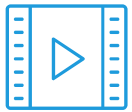
ProdSched Extensibility

```
var settings = new ETS.Core.Api.Models.ProductionScheduling.PsScheduleSettings();
settings.GapDurationScoreWeight = 10;
settings.ChangeoverDurationScoreWeight = 100;
settings.IsVerboseLoggingEnabled = true;
this.Ets.Api.ProdSched.Schedule(settings);
```

```
-- Next Available Time after Job is Jun 22 04:04
-- Calculating Scores
Assigning B40-379-1820 for Bulk Pack Line 2 at Jun 22 04:04 with 24,000 units. Total Duration = 6.2 hours
-- Total Duration = 6.2 hours
-- Changeover Duration = 10 minutes
-- Padding Duration = 0 minutes
-- Gap Duration = 0 minutes
-- Unsched Duration = 2.0 hours
-- Next Available Time after Job is Jun 22 10:14
-- Calculating Scores
Assigning S100-341-1911 for Bulk Pack Line 1 at Jun 22 04:04 with 9,600 units. Total Duration = 6.2 hours
-- Total Duration = 6.2 hours
-- Changeover Duration = 10 minutes
```

- The scheduling logic has built in troubleshooting and extensibility
- When run, the scheduler will output information to the tPsStageMessage table. When Verbose Logging is enabled, additional messages will be recorded for each job that gets assigned.
- Scheduling settings can be assigned, and scheduling can be completed through API calls. Additional script classes exist for extensible logic hooks as well.

Demonstration



- Configure a PsSet
- Assign a System to a PsSet
- Configure Ps related settings on a Product
- Configure a Product Changeover Family
- Configure a Product Changeover Type
- Configure a PsSchedule Content Page
- Demonstrate the standard Ps flow

Lab 17

Messaging and Notification

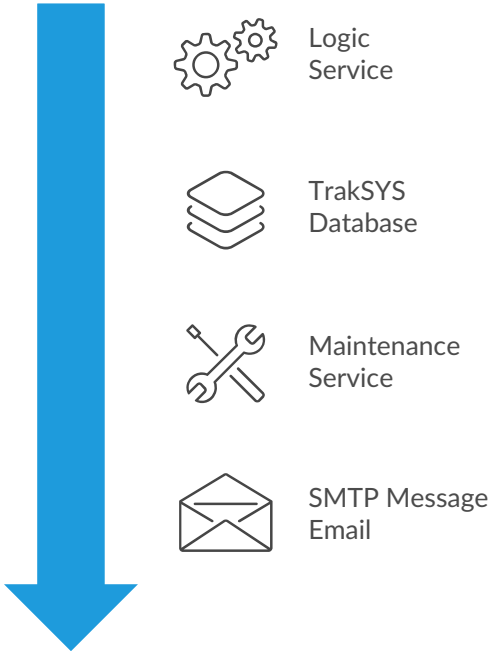
Training Objectives

Review the various techniques for sending messages and notifications in TrakSYS.

Understand the configuration entities for defining notification message contents, target groups, and the conditions for triggering.

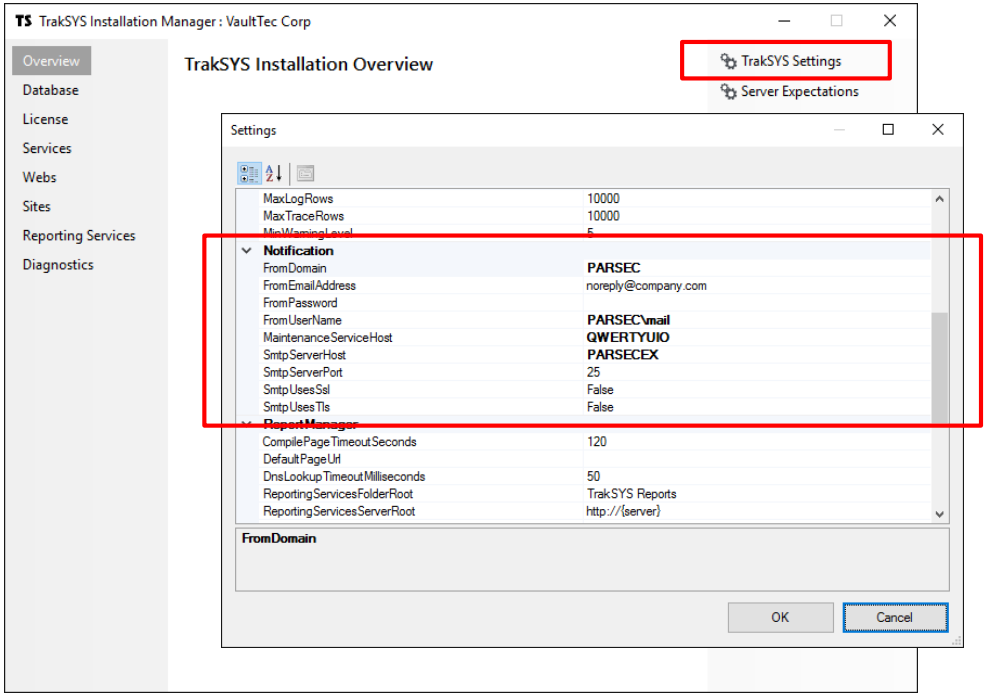
Messaging and Notifications

- **Notification Definitions**
  Message content Templates
- **Notification Targets**
  Groups of Users
- Configure Trigger Conditions
- Notifications are sent via email using SMTP
- The Logic Service processes Business Rules and trigger conditions to generate Messages
- The Maintenance Service connects to the configured Mail Service and dispatches Messages



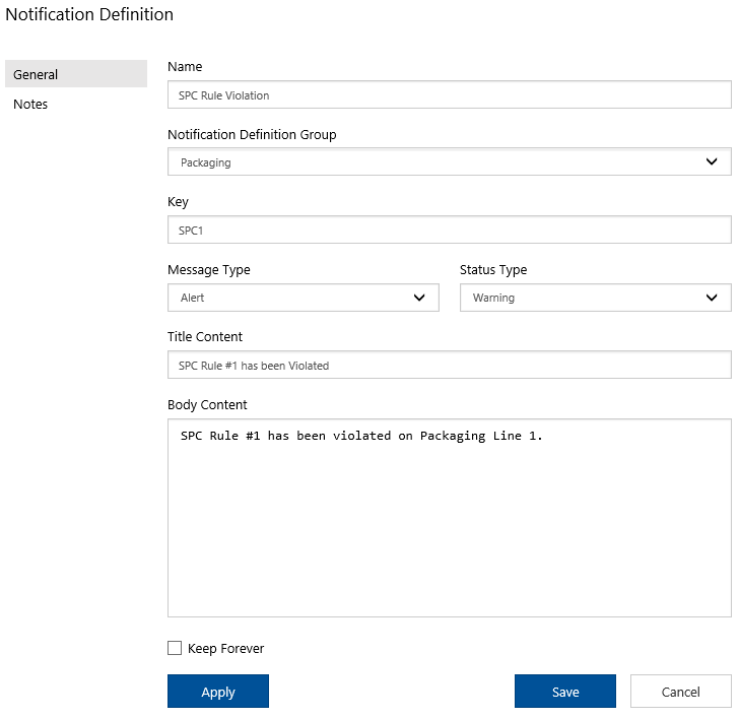
Notification Server Settings

- **Installation Manager | TrakSYS Settings**
  SMTP mail server connection and other global Notification Settings
  - Maintenance Service Host
  - Mail Server Address / Port
  - Authentication
  - From Email Address

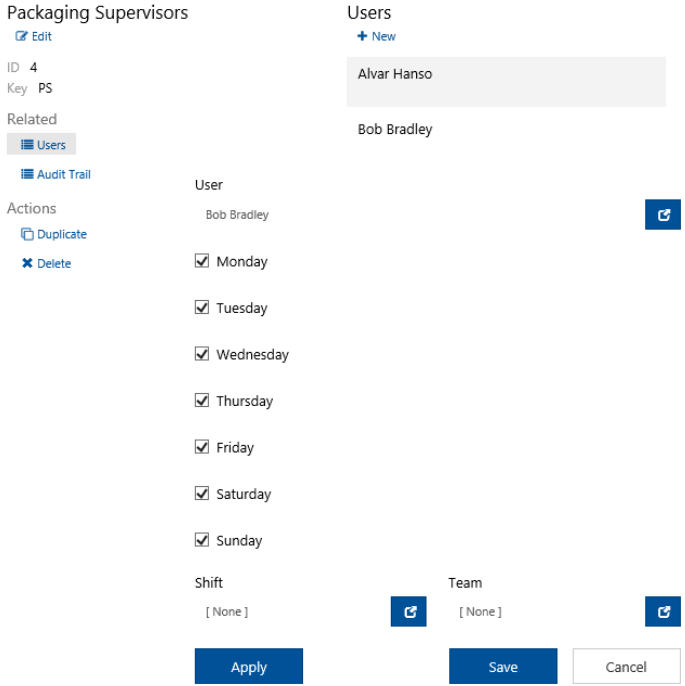


Notification Definitions

- Message templates that can be re-used for different Notification Triggers
- TrakSYS Content Expressions may be used to add dynamic content to a Notification's Title (Subject) and Body
- Notifications can be send as Alerts or Emails from a web address (URL)
- Emails support file attachments based on existing URLs or web-accessible Documents



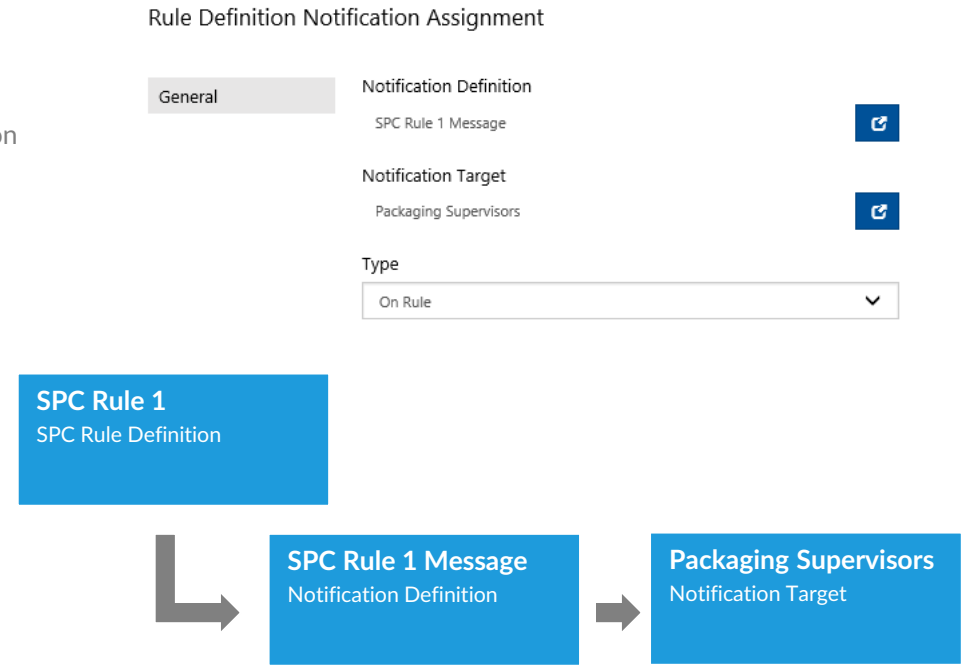
Notification Targets



- Distribution list of Users who are eligible to receive a Notification
- May be re-used for multiple Notification Definitions
- Message delivery to a Target User may be filtered by day of week and by the active Shift or Team
- Notifications are sent to the email addresses configured for Target Users

Triggering Notifications

- Notifications are triggered based on conditions related to Configuration Entities or via API
- Notification arguments are parameters passed from an Entity to a related Notification Definition
- Notification Triggering Entities
  - Systems
  - Event Definitions
  - Function Definitions
  - SPC Rule Definitions
  - Task Definitions
  - Tags
  - Modules
  - Module Steps
  - Logic Services



Notification Arguments

Legacy Expression Syntax
{arg:ArgName}

Arguments can be used to make the notification dynamic

Additional Arguments can be added through configuration and scripting for added customization

- **Common**
  - NotificationID
  - NotificationName
- **System and Event Definition**
  - SystemID
  - EventDefinitionID
  - EventDefinitionName
  - EventID
- **Function Definition**
  - SystemID
  - SystemName
  - SubSystemName
  - FunctionDefinitionID
  - FunctionDefinitionName
  - BatchStepID
- **SPC Rule Definition**
  - SystemID
  - SystemName
  - SampleSubGroupRuleID
  - SampleDefinitionRuleDefinitionID
- **Task Definition**
  - SystemID
  - SystemName
  - TaskDefinitionID
  - TaskDefinitionName
  - TaskID
  - UserState
- **Tag**
  - TagID
  - TagName
  - TagValue

Notification Examples

Notification Definition

Fill Weight Out of Specification [{entity[args.SystemID]|System.Name}]

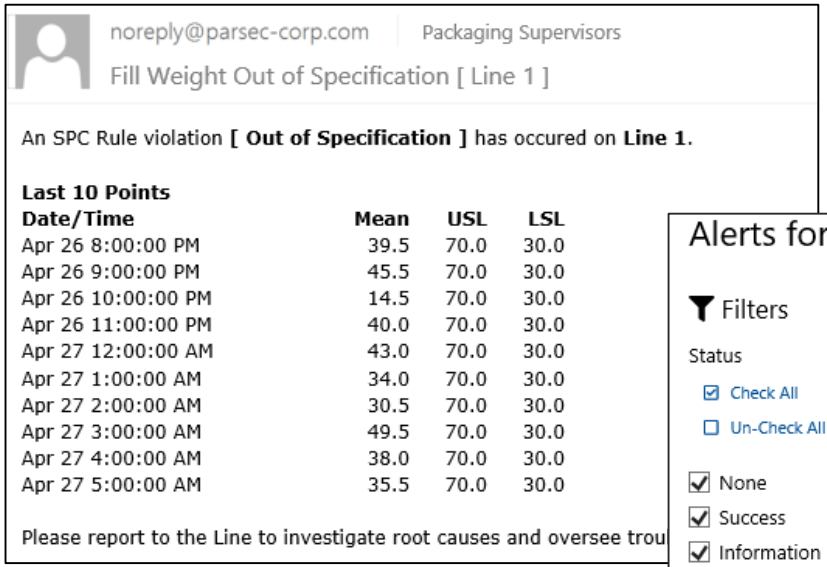
```
<div style="font-family:Verdana;font-size:9pt">
 An SPC Rule violation <b>[ {entity[args.SampleDefinitionRuleDefinitionID]|SampleDefinitionRuleDefinition.Name} ]</b>
 has occured on <b>{entity[args.SystemID]|System.Name}</b>.<br/>
 <br/>
 <table border="0" cellspacing="2" cellpadding="2" width="350px">
  <tr>
   <td colspan="4" style="font-weight:bold;">Last 10 Points</td>
  </tr>
  <tr>
   <td width="200px" style="font-weight:bold;text-align:left;">Date/Time</td>
   <td width="50px" style="font-weight:bold;text-align:right;">Mean</td>
   <td width="50px" style="font-weight:bold;text-align:right;">USL</td>
   <td width="50px" style="font-weight:bold;text-align:right;">LSL</td>
  </tr>
  <ets_repeat over="points">
  <tr>
   <td style="text-align:left;">{dataset[points.@row]|PointDateTime:MMM dd h:mm:ss tt}</td>
   <td style="text-align:right;">{dataset[points.@row]|PointMean:N1}</td>
   <td style="text-align:right;">{dataset[points.@row]|USL:N1}</td>
   <td style="text-align:right;">{dataset[points.@row]|LSL:N1}</td>
  </tr>
  </ets_repeat>
 </table>
 <br/>
 Please report to the Line to investigate root causes and oversee troubleshooting.<br/>
</div>

<ets_dataset name="points">
 SELECT * FROM
 (
  SELECT TOP 10
   sg.SampleDateTime AS [PointDateTime],
   sg.SampleCalculation AS [PointMean],
   sg.ProcessUsl AS [USL],
   sg.ProcessLsl AS [LSL]
  FROM tSampleSubGroup sg
  WHERE sg.SampleDefinitionID = {entity[args.SampleDefinitionRuleDefinitionID]|SampleDefinitionRuleDefinition.SampleDefinitionID|[null]:-1;}
  ORDER BY sg.ID DESC
 ) p ORDER BY p.PointDateTime
</ets_dataset>
```

Time to Record {args|Utility} Meters in {args|Area}

Navigate to the meter entry form.

Notification Examples

Processed Notification



noreply@parsec-corp.com | Packaging Supervisors

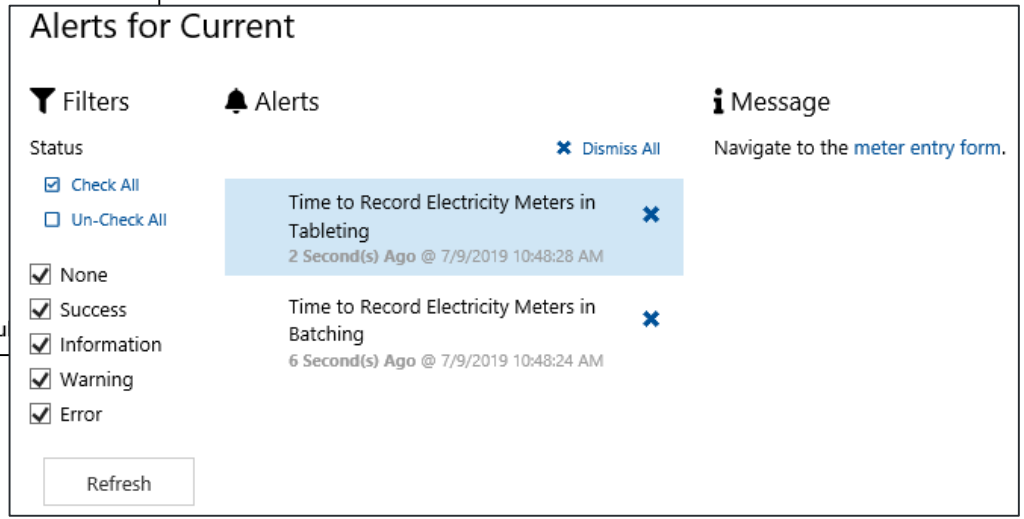
Fill Weight Out of Specification [Line 1]

An SPC Rule violation **[Out of Specification]** has occured on **Line 1**.

Last 10 Points

Date/Time	Mean	USL	LSL
Apr 26 8:00:00 PM	39.5	70.0	30.0
Apr 26 9:00:00 PM	45.5	70.0	30.0
Apr 26 10:00:00 PM	14.5	70.0	30.0
Apr 26 11:00:00 PM	40.0	70.0	30.0
Apr 27 12:00:00 AM	43.0	70.0	30.0
Apr 27 1:00:00 AM	34.0	70.0	30.0
Apr 27 2:00:00 AM	30.5	70.0	30.0
Apr 27 3:00:00 AM	49.5	70.0	30.0
Apr 27 4:00:00 AM	38.0	70.0	30.0
Apr 27 5:00:00 AM	35.5	70.0	30.0

Please report to the Line to investigate root causes and oversee trou



Alerts for Current

Filters

Status

Check All

Un-Check All

None

Success

Information

Warning

Error

Refresh

Alerts

Dismiss All

Time to Record Electricity Meters in Tableting

2 Second(s) Ago @ 7/9/2019 10:48:28 AM

Time to Record Electricity Meters in Batching

6 Second(s) Ago @ 7/9/2019 10:48:24 AM

Message

Navigate to the meter entry form.

Items and Locations

Training Objectives

Explore the configuration entities and data structures within TrakSYS to support Inventory and Track/Trace type solutions.

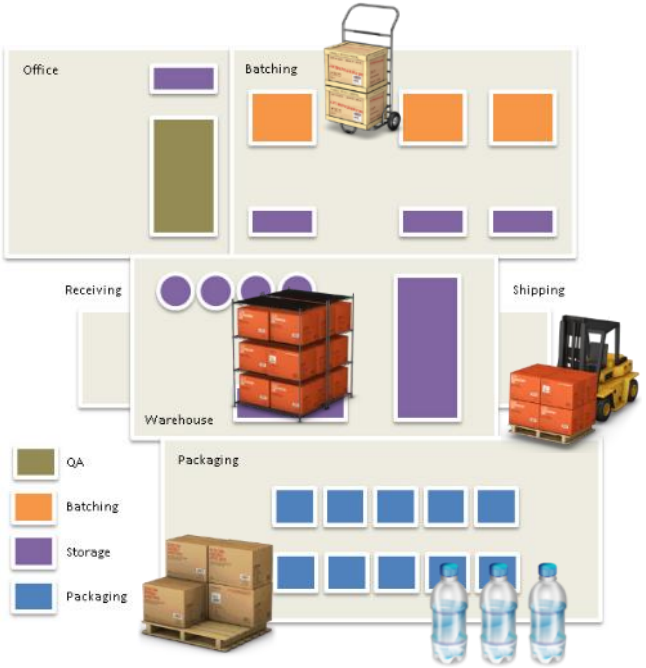
Learn how to configure Locations to represent physical places in the manufacturing environment.

Understand the concept of Items and the various techniques for describing movements and historical actions.

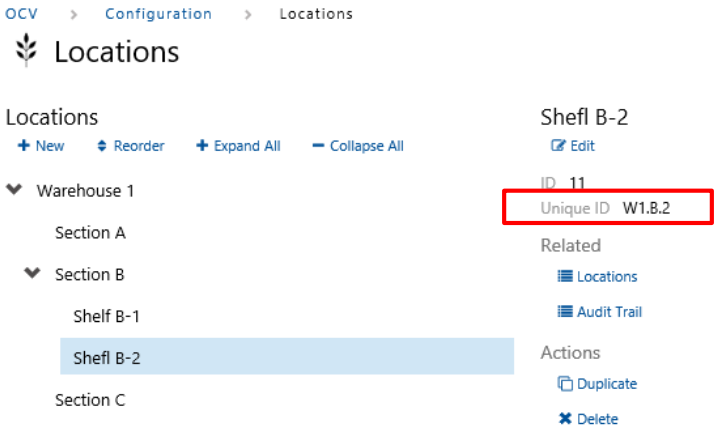
Items and Locations

Items and Locations are abstract structures that can be used to track the actions, statuses, and movements of various physical items throughout the manufacturing environment.

- Tanks, pallets, and containers used to transport and hold raw materials or work in process.
- Components and their respective lot numbers used in the assembly of a semi-finished or final good.
- Individual production units (bottles, cans, cartons) serialized for Track and Trace.

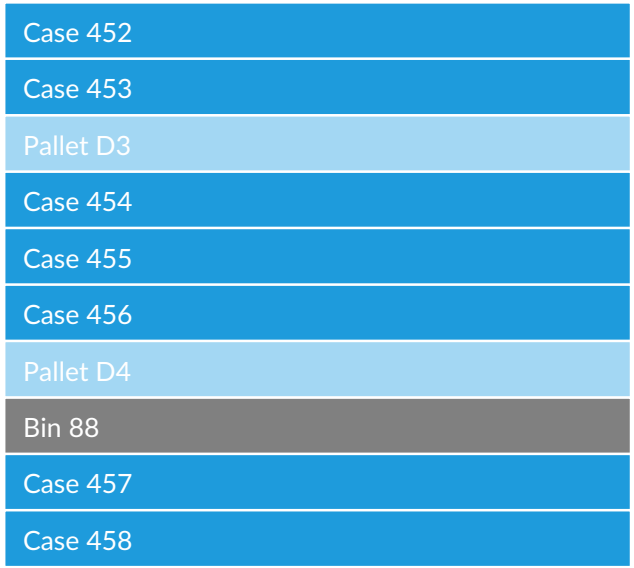


Locations



- Represent a physical place in the Manufacturing Environment
  - Room, Isle, Shelf Number, etc…
- Each Location can be assigned a Unique ID
  - Typically an external Identifier
- Hierarchical Structure (Locations can contain other Locations)
  - Independent of the Area and System Hierarchy
- Systems may be assigned to a specific Location (for tracking the location of material as it is transferred around)

Item Definitions

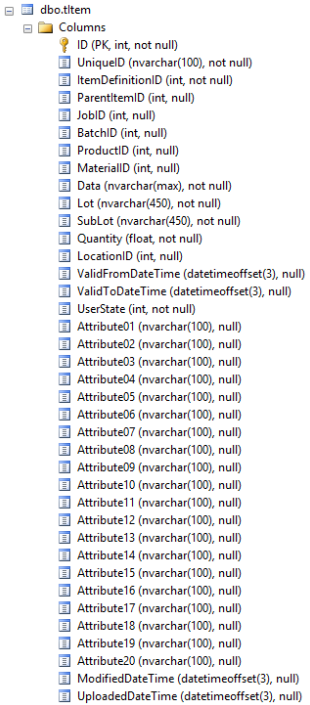


- Types of physical items used, produced, or consumed within the Manufacturing Process
  - Bottle
  - Case
  - Pallet
  - Bin
  - Etc…
- Allows multiple types of Items to be stored/tracked in the same Data Structures

Items

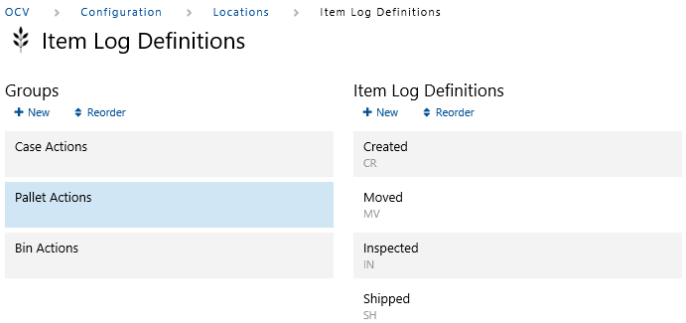
- An abstract entity representing a single, physical Thing
  - Bottle 1234, Case A9388, Pallet D529, etc…
- Could represent a (moveable) Container
  - Bin 82, Tote 21, Cart 45, etc…
- Typically something that is physically Mobile (meaning it can be moved to different Locations)
- Items can contain other Items (Parent –Child)
  - Pallet (Item) contains many Cases (Items)

Item Data Fields



- Represents the Item and its Present State (most fields are optional)
- **UniqueID**
  A unique string identifier for the Item within the business process.
- **ItemDefinitionID**
  Specifies the type of Item.
- **LocationID**
  The current Location of the Item.
- **JobID, BatchID, ProductID, MaterialID, Lot, SubLot**
  Identifies the Item in terms of manufacturing entities.
- **Quantity**
  If the item is a container, specifies the quantity stored within.
- **ValidFrom/ToDateTime**
  Timestamps that can be used for expiration business rules.
- **UserState and Attribute<01-20>**
  Developer-use-only fields for assigning custom states and related data.

Item Log Definitions and Item Log



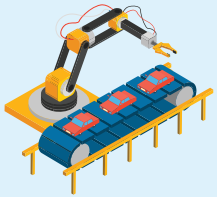
- Defines types of actions and status transitions that can be recorded for an Item
- Created in Groups of related Actions (typically for a specific type of Item)
- An Item Log entry is essentially a snapshot of an Item's state, at the time that a specific type of action occurred.
- Item Log entries for an Item represent its History
- An Item Log record has the same structure as the Item + User and Notes for Traceability
- Item Log records are typically created using API script in Logic Service, Data Management Service, or via web User Interfaces (as Items transition states)

Item and Location Scenario

Preface

Locations

- Line 1 (L1)
- Rack 1 (R1)
- Rack 2 (R2)
- Rack 3 (R3)



Item Definitions

- Case
- Pallet

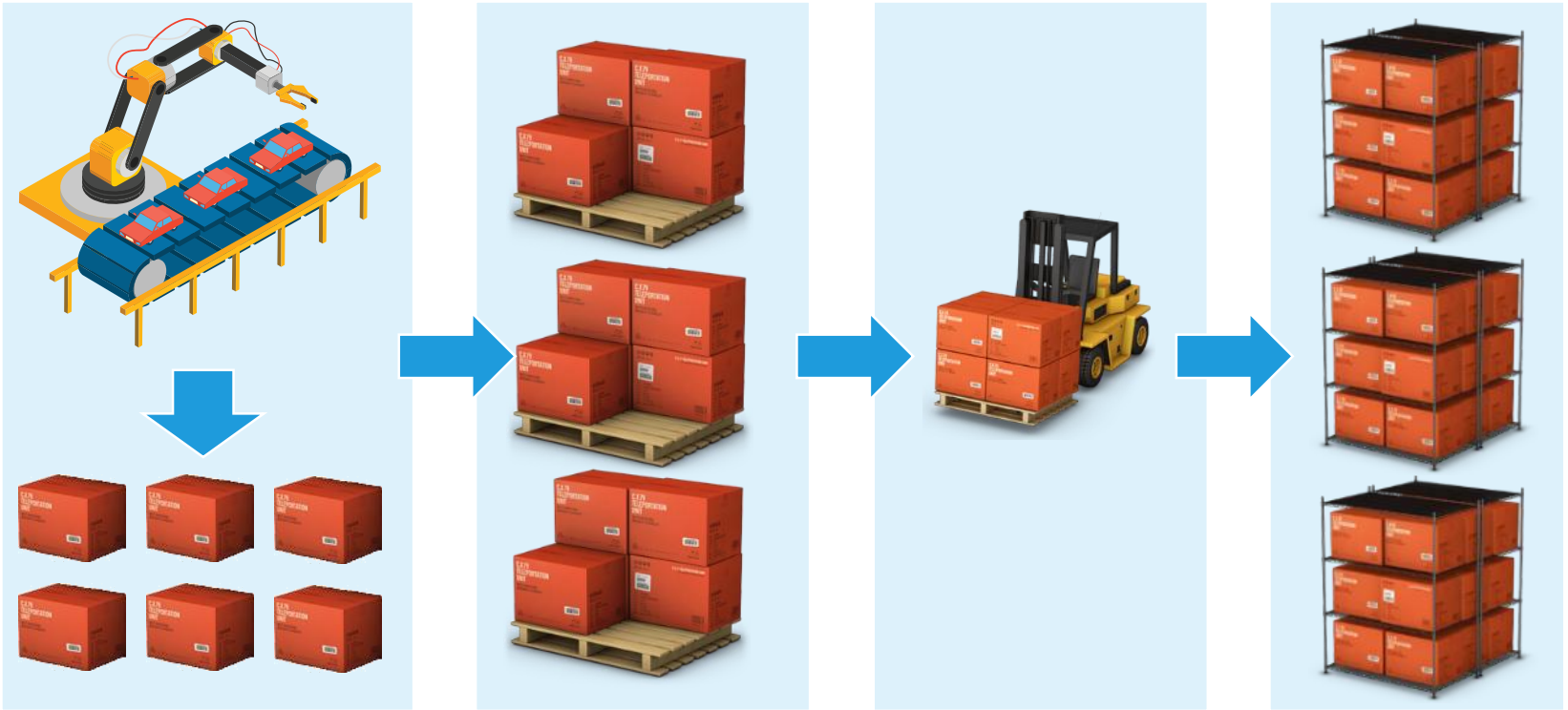
Item Log Definitions

- Case Actions
  - Created
  - Added to Pallet

- Pallet Actions
  - Created
  - Moved

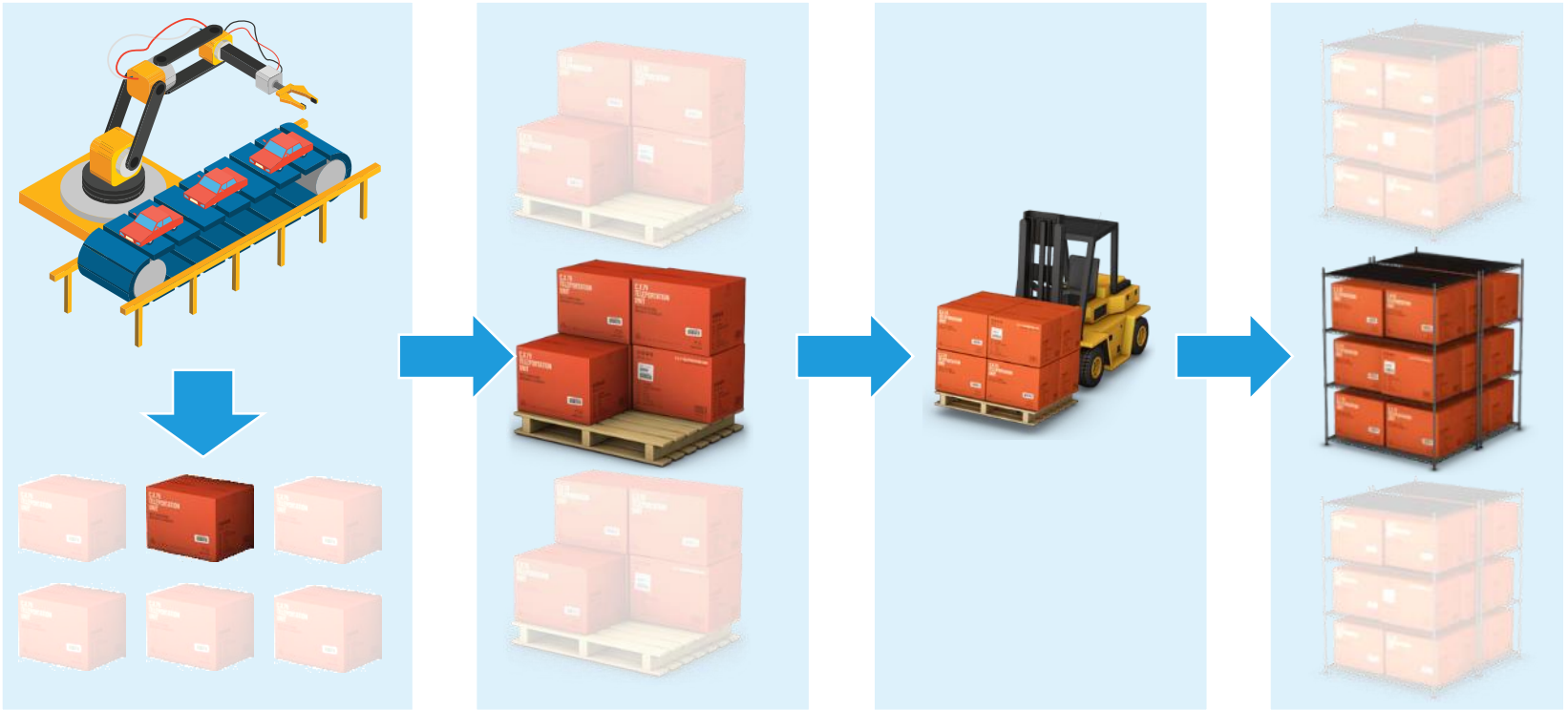
Item and Location Scenario

Full View



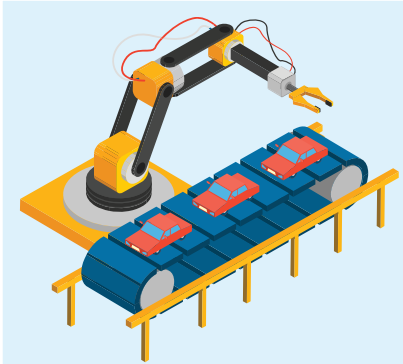
Item and Location Scenario

Single Item



Item and Location Scenario

Records

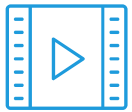


ItemLog: Case Created
Name: Case 452
Location: Line 1

ItemLog: Added to Pallet
Parent Item: Pallet 113

ItemLog: Moved
Location: Rack 2

Demonstration



- Configure a Location
- Relate a Location to a System
- Configure an Item Definition
- Configure and Item Log Definition
- Configure a Notification Definition
- Configure a Notification Target
- Associate a Notification with an Event Definition

Lab 18

Statistical Process Control (SPC)
Configuration

Training Objectives

Explain basic Statistical Process Control (SPC) concepts and the different TrakSYS configuration entities that support sample data collection and analysis.

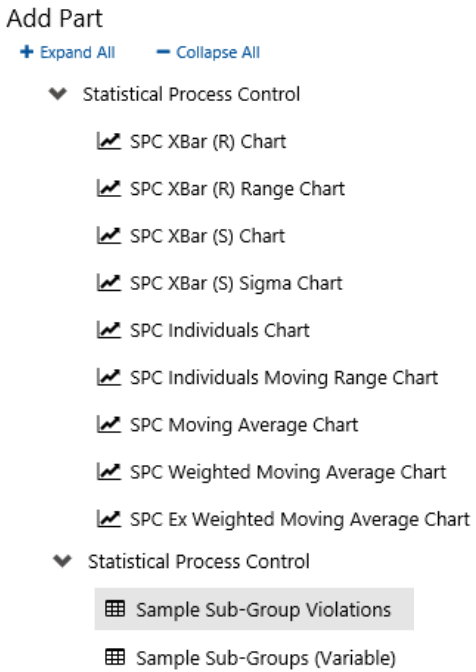
Understand how TrakSYS can be used for real-time monitoring and reaction to sample variations based on configurable and scripted business rules.

Statistical Process Control (SPC)

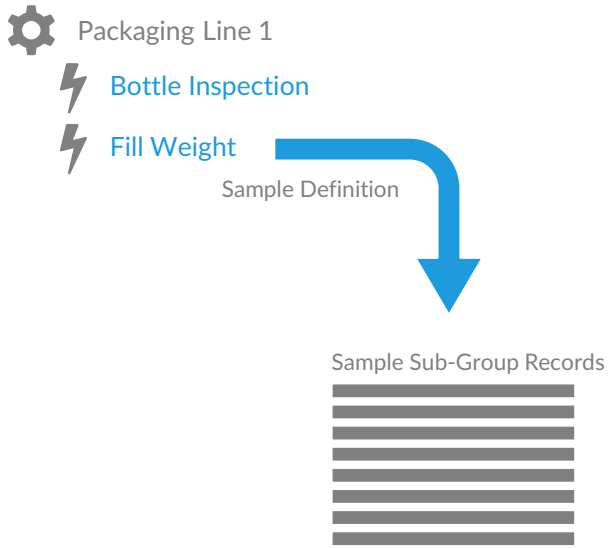
- Method of quality control based on statistical methods and algorithms.
- Perform random sampling of various product attributes and process parameters.
- Monitor process variability in real-time using a catalog of different control charts and graphs.
- Define business rules to be applied to sample values as they are collected and trigger Notifications based on rule violations.
- Enabled manufacturing adjustments to improve the overall quality of final goods produced (quality by design).

SPC in TrakSYS

- Provides SPC functionality for data collected from a manufacturing process.
- Allows definition of the different types of values to be sampled and recorded, along with one or more statistical rules to be applied to the data.
- Data may be collected automatically in real-time or manually through web-based user interfaces.
- Standard set of SPC Content Parts available for data capture, reporting, and analysis



Sample Definitions



Configuration

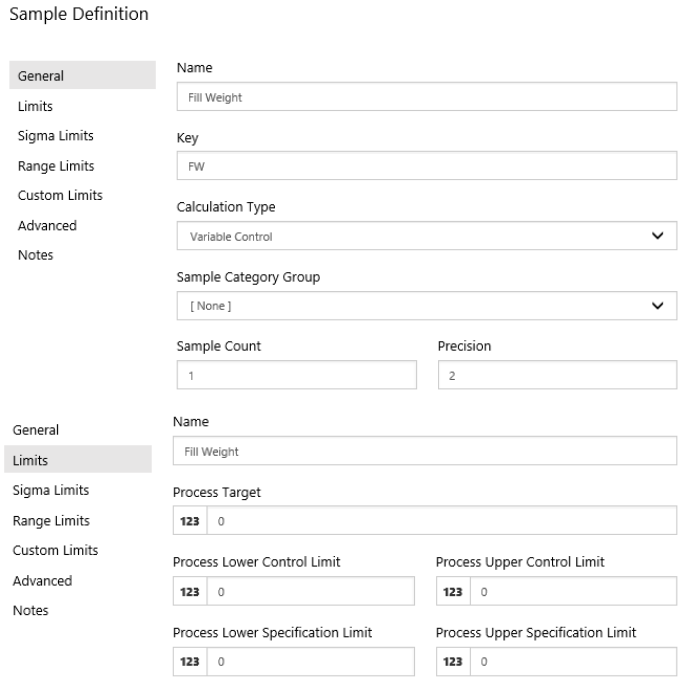
- Defines the parameters for taking quality SPC samples of a specific type to record instances of Sample Sub-Group records in the TrakSYS Database
- An Sample Sub-Group represents a set of 1-N samples measured together and associated with a specific asset (System)
- Configurable at the System Level Only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

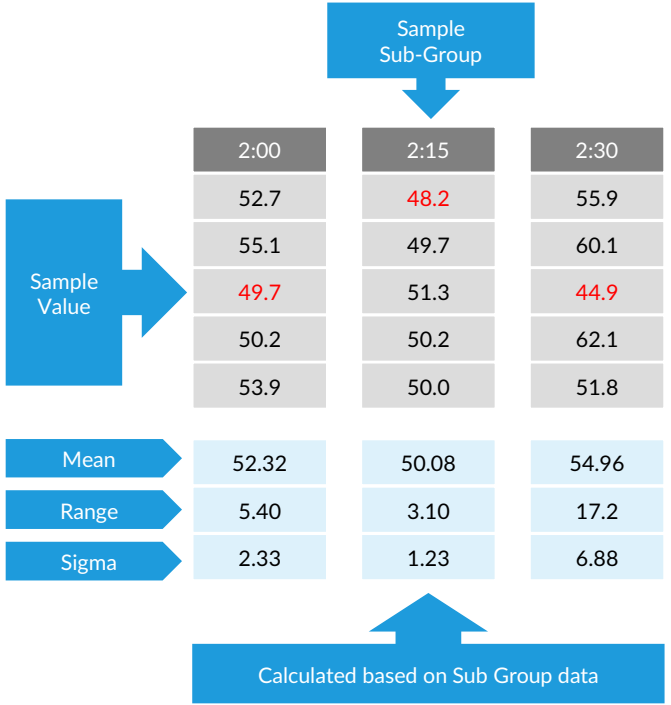
Sample Definition Properties

- **Calculation Type**
  Determines if the measurement is of Variable or Attribute type.
- **Sample Count**
  Specifies the number of Samples to be taken during one Sample Sub-Group.
- **Limits**
  Specifies constant or Tag-based values for the Target, Control, and Specification limits.
- **Control Limits**
  Charts and user interfaces can be configured to use these presets, or auto-calculate them based on a data range.



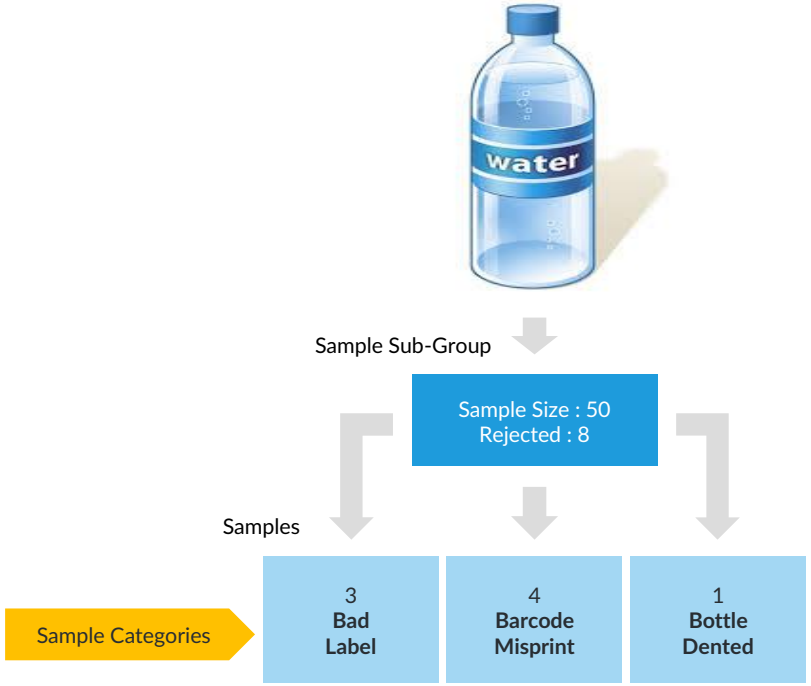
Sample Sub-Groups and Sample Data

- **Sample Definition**
  A type of measurement performed on a specific System.
  - Fill Weight, Bottle Inspection
- **Sample Sub-Group**
  A set of one or more measurements taken for a given Sample Definition, at a specific time. This set of is typically combined to form aggregated values which represent the entire group.
  - Mean, Range, Sigma
- **Sample**
  An individual sample values taken within a Sample Sub-Group.



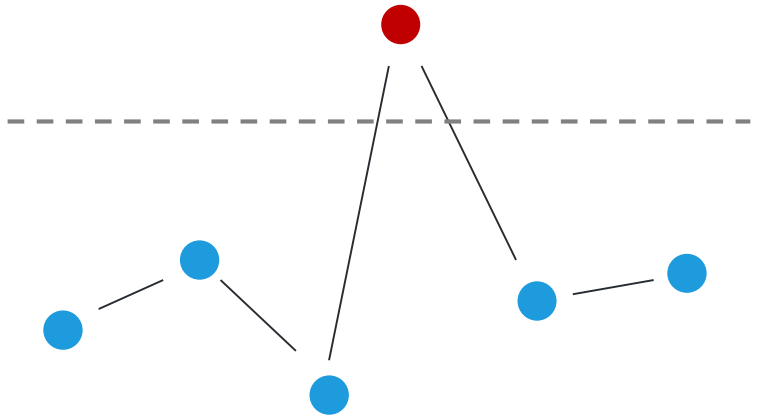
Sample Categories

- Used for Attribute Control type Sample Definitions
- Classifies quantities/counts within the Sample Sub-Group
- Defined in related Groups
- A Sample Category Group is assigned to an Attribute Sample Definition
- Users relate available Sample Categories to individual Sample Values



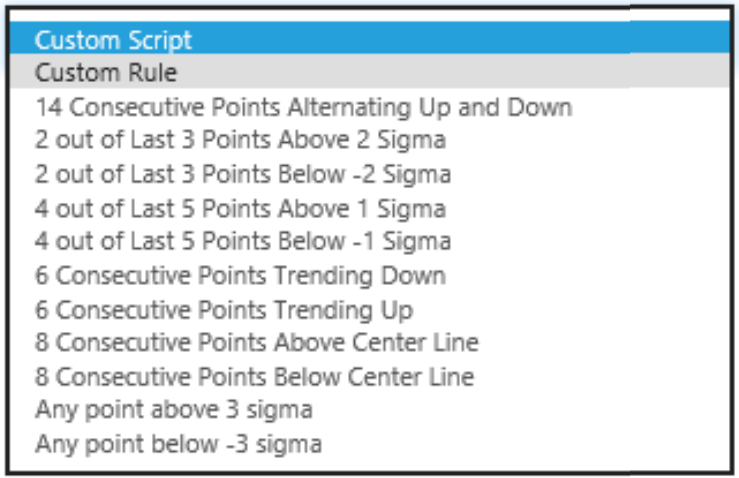
SPC Rule Definitions

- Business Rules applied to new Sample Sub-Groups as they are Recorded
- For detecting “out-of-control” Processes and other actionable Conditions
- Based on a variety of data inputs…
  - Single Sample Value
  - Aggregation of all Samples in a Sub-Group
  - Data trends for up to the last 100 Sample Sub-Groups
- Rule violations are related with the Sample Sub-Group data from which they were Triggered
- May be used to trigger Notifications, or other scripted Business Rules



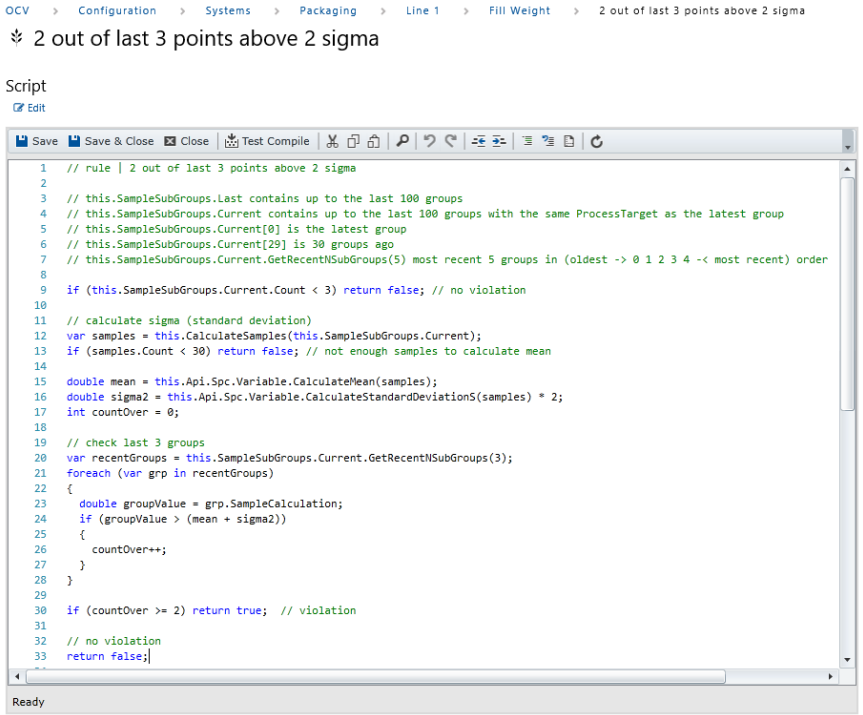
Standard Rule Definitions

Rule Type



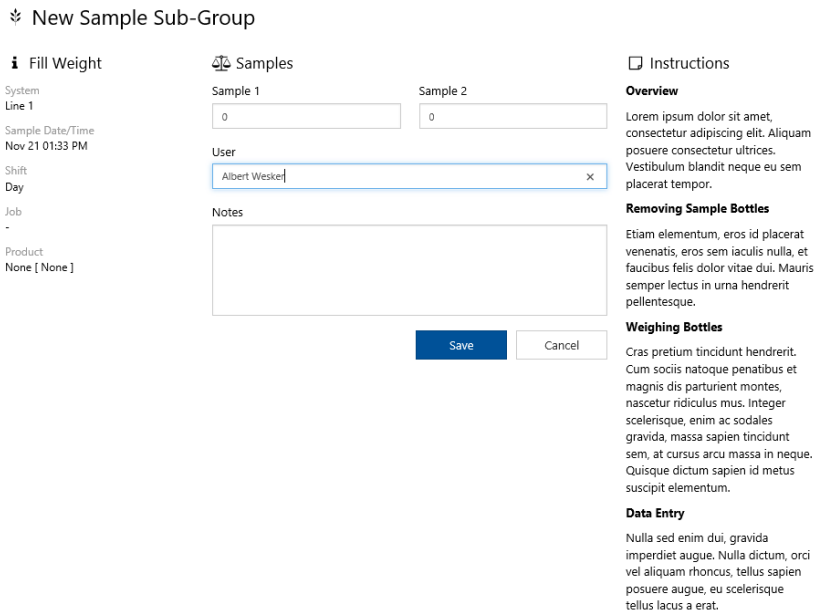
- Standard Rules are based on Western Electric Rules
- Logic is set and cannot be altered
- Control Limits are calculated against the last 100 samples with the same Target value
- Can be applied without Scripting

Scripted Rule Definition



- Business Rules added to an SPC Rule Definition are scripted using C#.NET
- Several supporting classes and methods available for creating a Rule
  - this.SampleSubGroups.Current[]
    Last 50 Sample Sub Groups recorded for current Process Target value.
  - this.SampleSubGroups.Last[]
    Last 50 Sample Sub Groups recorded.
  - this.Api.Spc.Variable and this.Api.Spc.Attribute
    API functions for calculating SPC aggregations.
- Can be built as a Custom Rule for re-use

SPC Data Collection Techniques



- SPC data may be collected in multiple ways…
  - Manually using standard Content Pages
  - Manually using custom Page Definitions
  - Automatic via Logic Service Script / API
  - Automatic via Data Management Service Modules / API
- A combination of these may be used for a single Sample Definition

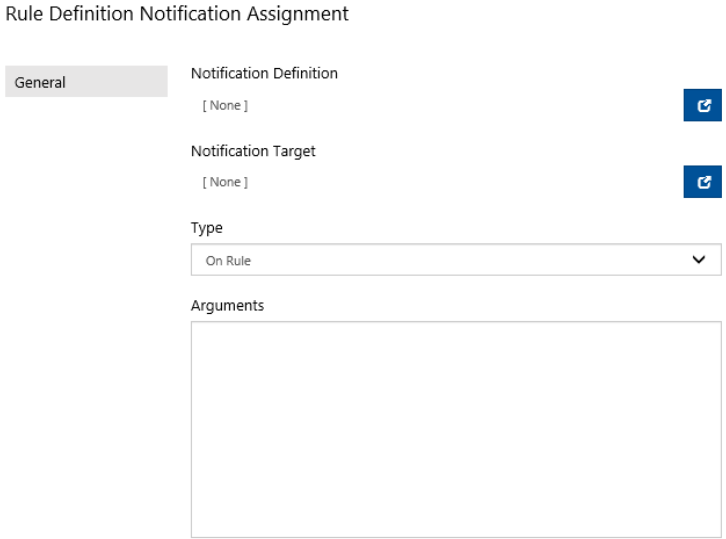
SPC Scripting Support

- ETS.Core.Scripting.SampleSubGroupItem
  - Individual Sample Value to be Recorded
- ETS.Core.Scripting.SampleSubGroupData
  - Sample Sub Group Object
  - Contains list of SampleSubGroupItems and attributes for related Production Values (Product, Job, Shift, etc.)
- Global.Context.CalculateSampleSubGroupVariable()
  - Creates a SampleSubGroupData object for Variable Control
- Global.Context.CalculateSampleSubGroupAttribute()
  - Creates a SampleSubGroupData object for Attribute Control
- Global.Context.InsertSampleSubGroup()
  - Inserts a SampleSubGroupData object for a specific SampleDefinitionID

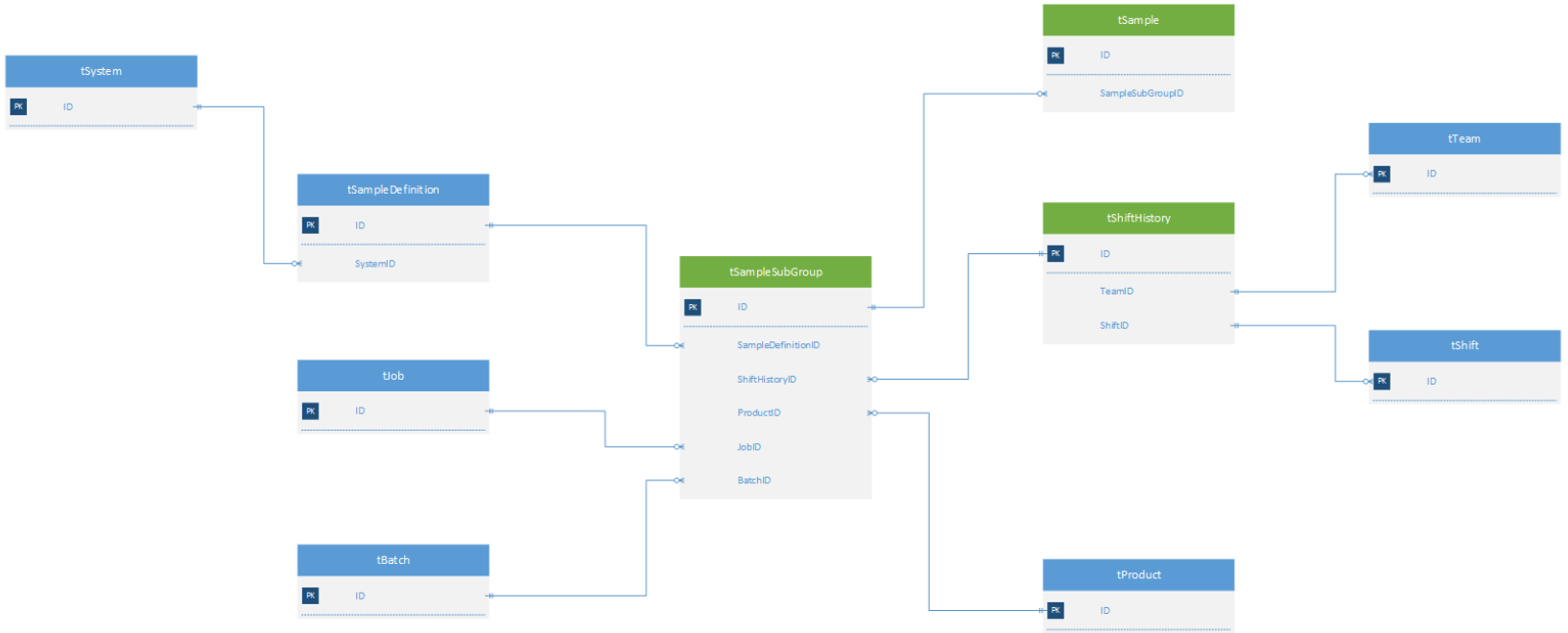
```
// create a list of SampleSubGroupItems (sample values)
List<SampleSubGroupItem> items =
  new List<SampleSubGroupItem>();
items.Add(new SampleSubGroupItem(42.5));
items.Add(new SampleSubGroupItem(38.7));
items.Add(new SampleSubGroupItem(56.2));

// create a SampleSubGroupData object and load with values
int sampleDefinitionID = 23;
SampleSubGroupData subGroup =
  Global.Context.CalculateSampleSubGroupVariable(
    sampleDefinitionID,
    items.ToArray()
);

// insert SampleSubGroup for a Sample Definition
bool result =
  Global.Context.InsertSampleSubGroup(
    subGroup,
    sampleDefinitionID
  )
if (!result) return false;

// return success
return true;
```

SPC Script Events

- The following transitions are monitored by the Logic Service for SPC Sample Sub-Group records…
  - On Created
- The following transitions are monitored by the Logic Service for SPC Rule records…
  - On Rule (Fail)
- TrakSYS allows for these transitions to be used to trigger real-time functionality such as…
  - Email Notifications
  - Entity Script Class Events



SPC Data Structures



Statistical Process Control (SPC)

User Interfaces

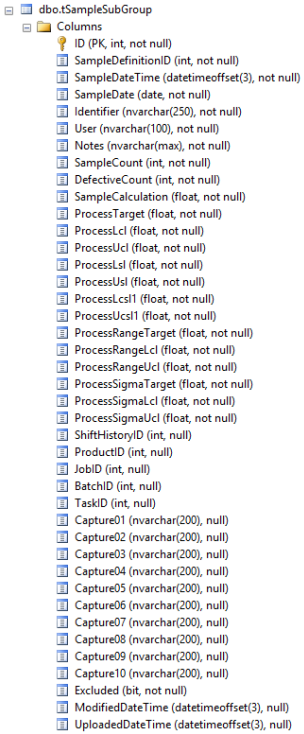
Training Objectives

Explore the standard TrakSYS Content Pages and Parts available to configure and build SPC user interfaces.

Describe the data entry form capabilities provided by the SPC data entry form Page.

Showcase the various SPC Data Table and specialty Chart Parts.

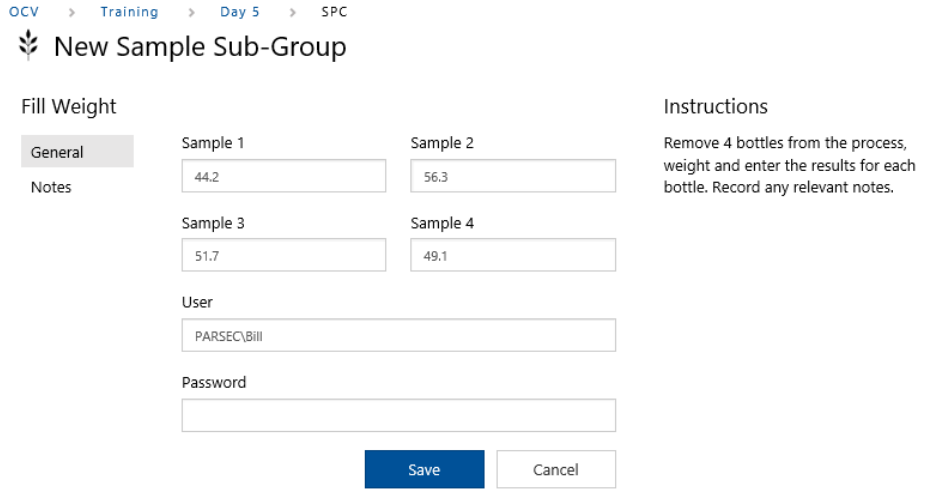
Sample Sub-Group Data Fields



- **SampleDateTime**
  Timestamp for the SPC record creation.
- **Identifier**
  A solution-specific identifier that can be assigned to the group of Samples.
- **SampleCount**
  Total number of Samples taken.
- **Defective Count**
  Number of failed Samples (Attribute Control).
- **SampleCalculation**
  Contains the Mean of all child Samples (Variable Control).
- **Process<FieldName>**
  Target, and limits as of the time the Samples were taken.
- **Capture<01-10>**
  Developer-use fields allowing the storage of solution-specific Sample related values.

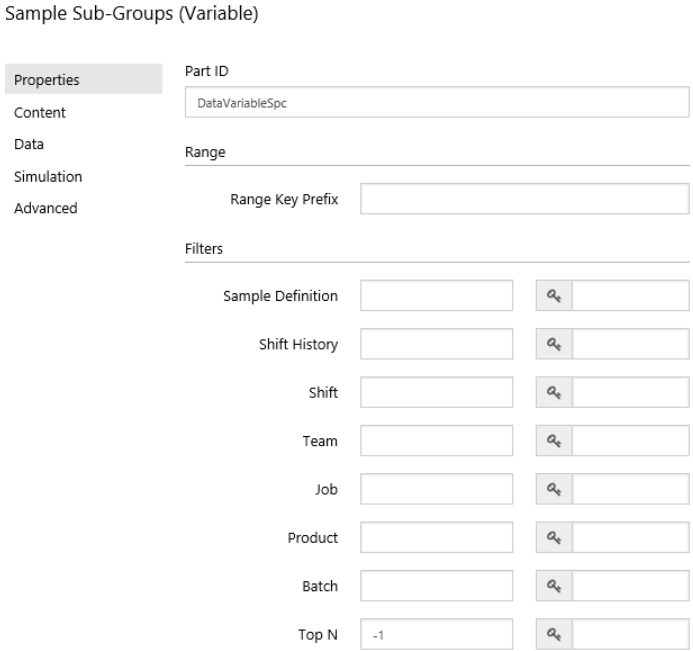
Variable Sub-Group New/Edit Content Page

- Automatic SPC Data Entry Form render based on Sample Definition Configuration
- Basic field Validation and SPC Business Rules
- Integrated SPC Instruction Display
- Edit Mode driven by SampleSubGroupID
- New Mode driven by SampleDefinitionID
- Zero Script for Database/API Interaction

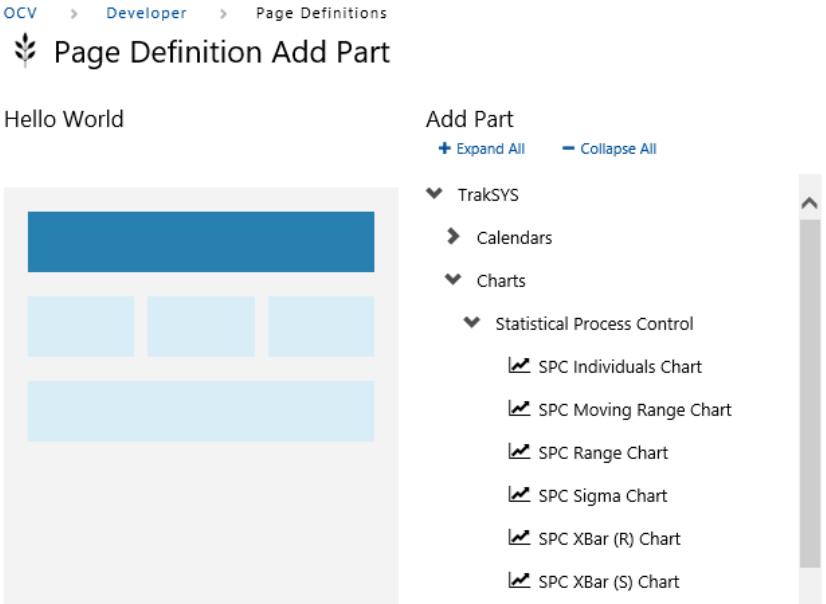


Variable Sub-Group Data Table Content Part

- Retrieves Sample Sub-Group data records from the TrakSYS database over a selected Range and Filter Criteria
- Feeds resultant Data Table into the Values Dictionary
- Provider for SPC visualizations…
  - Tabular Display
  - SPC Variable Charts
  - General Charts
  - More…



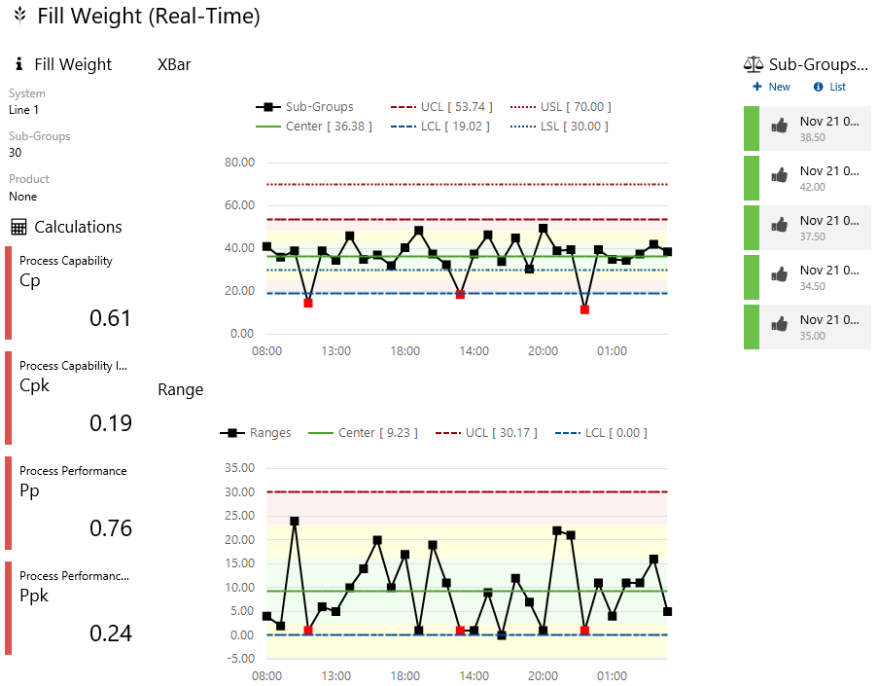
SPC Variable Chart Content Parts



- Standard Charts in the Content Part Catalog
- Specific to Variable or Attribute Visualization
- Supports different visualizations of a shared SPC dataset (Data Table)

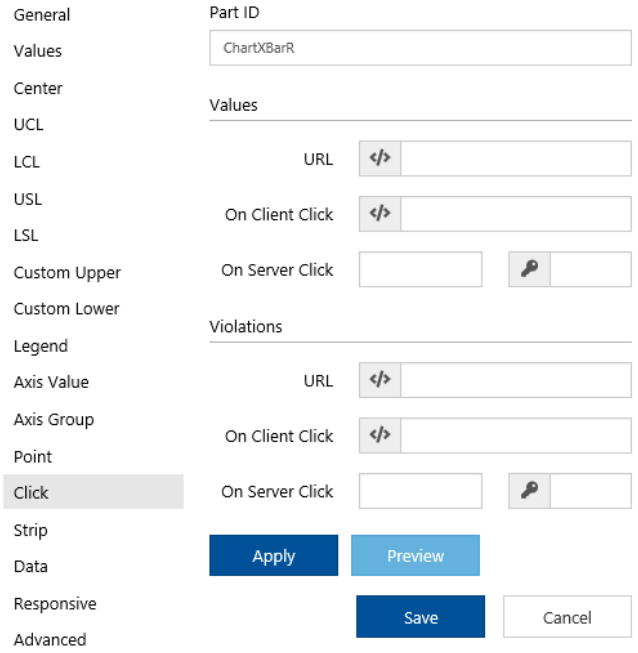
X-Bar and Range Chart Content Parts

- One of the most common visualizations of periodic quality Measurements over a Range (current Job, last 30, etc…)
- **X-Bar Chart**
  - Plots the Mean of Sample Sub-Groups
  - Compares trend to Control and Specification Limits
- **Range Chart**
  - Plots the Range of Sample Sub-Groups (difference between smallest and largest Sample in the Group)



SPC Chart Properties

- SPC charts have many additional SPC specific properties
- Limits can be shown and hidden
- Strips can be added to display changes in Contextual references
- On-Click options can be set differently for points with violations and for points without violations

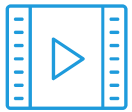


Rollup Chart Properties

- Some data providers, including the SPC parts, also include Rollup capabilities
- Rollup values are included in the Values Dictionary with the same prefix
- This typically includes common aggregation metrics, such as OEE, CPK, or Averages
- The SPC Data Provider can also be configured to return an additional DataTable of Histogram data


```
Setting Ets.Values['Data.SampleSubGroupsVariable.Pp'] to 0.701068318919836
Setting Ets.Values['Data.SampleSubGroupsVariable.Ppk'] to 0.25413726560844
Setting Ets.Values['Data.SampleSubGroupsVariable.Cp'] to 0.559382411666137
Setting Ets.Values['Data.SampleSubGroupsVariable.Cpk'] to 0.202776124228975

Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.Mean'] to 37.25
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.StandardDeviation'] to 9.3494652
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram'] to (Rows=5) DataTable
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.HasData'] to True
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.HasNoData'] to False
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.RowCount'] to 5
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.RowIsSelected'] to False
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.RowIsNotSelected'] to True
Setting Ets.Values['Data.SampleSubGroupsVariable.Histogram.SelectedIndex'] to -1
```

Demonstration



- Configure a Variable type SPC Sample Definition
- Configure an SPC Rule Violation
- Configure the SPC Content Page
- Create a new SampleSubGroup
- Violate an SPC Rule
- View the SPC Part properties

Lab 19

Support and Resources

Training Objectives

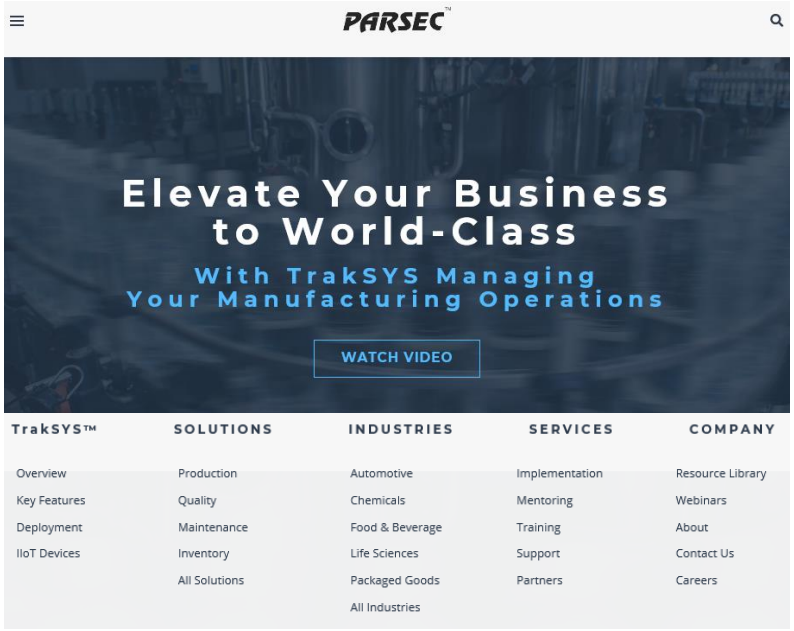
Learn about resources available online.

Learn about the different avenues you have to contact us for support and resources.

Parsec Site

https://parsec-corp.com/

- TrakSYS: Provides general overview of the software capabilities and deployment options
- Solutions: Looks at the main pillars of MES and explains some common capabilities within each
- Industries: Examines the common needs for different solutions and the role of TrakSYS in those industries
- Services: Describes the different levels of involvement and support that Parsec provides
- Company: Information about Parsec as well as access to the public library of resources, including case studies, collateral, and infographics for general consumption

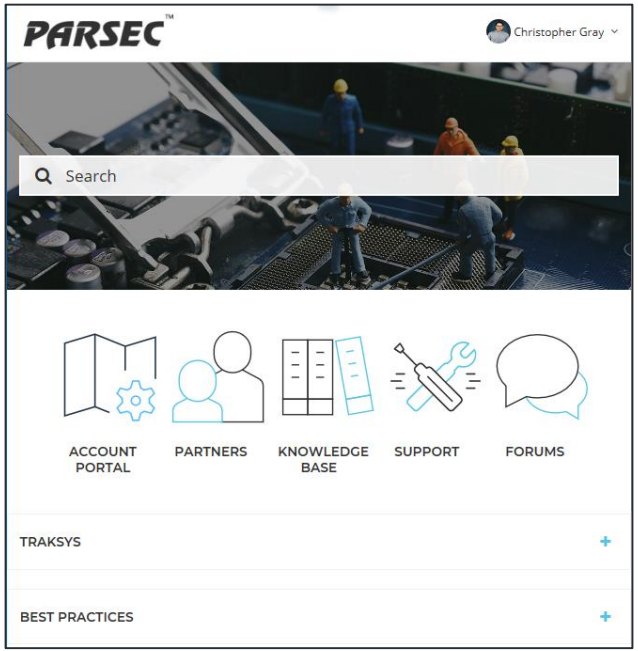


Support Site

https://portal.parsec-corp.com/hc/en-us

Requires a license to be able to access. Certain sections will be shown or hidden based upon the user.

- Account Portal: Provides an overview of your account, including access to your Licenses and your Parsec Contact's information
- Partners: Additional collateral and tools for Partners, including Partner Updates, Parsec Presentations, and various Request Forms relating to the sales process
- Knowledge Base: Expands the topics below to show common articles and questions. Direct searches can be completed through the search bar above
- Support: Contains general Support Site information, download files for recent TrakSYS versions, and the Reference Documentation
- Forum: Grants access to the TrakSYS Technical Forum and TrakSYS Feature Requests



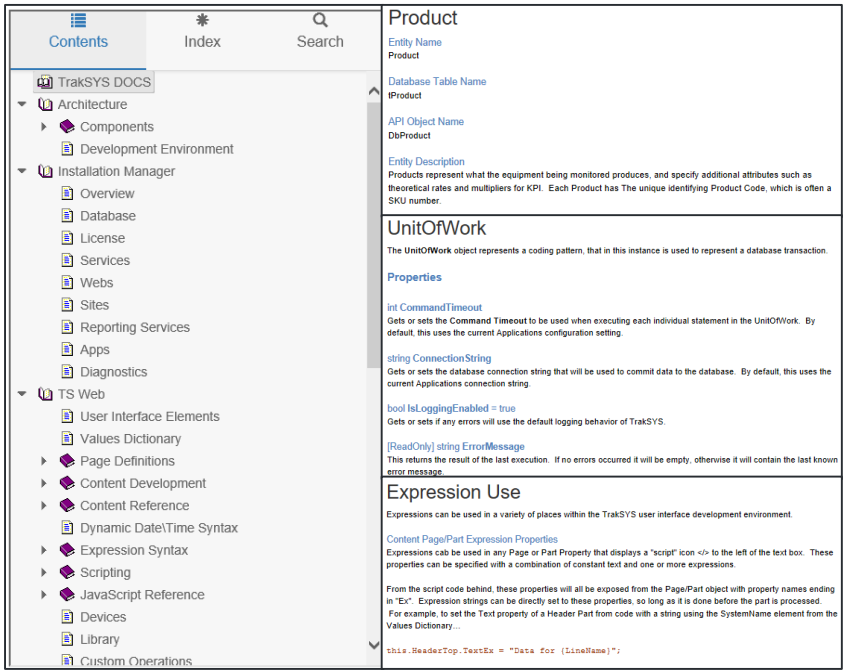
Reference Documentation

https://portal.parsec-corp.com/hc/en-us

The reference documentation includes details on the majority of TrakSYS content. This includes details on the properties of entities, data, definitions, and more. It provides standard definitions for many of the topics covered in this training, including a large variety of other content.

The following are examples of content:

- Expression Syntax (standard and TrakSYS specific)
- API Calls and parameters
- TrakSYS Enums
- Standard JavaScript calls
- Entity Properties and corresponding Table/Object names



Parsec Resources

When to use which one

Applications Team

Contact:

applications@parsec-corp.com

Scope:

Training, demonstration, and sales support. Also assists with implementation when the exchange is mutually beneficial.

Cost:

None. Training assistance provided when training is purchased. Other assistance provided when available.

Support Team

Contact:

support@parsec-corp.com

Scope:

Troubleshooting, documentation, standard how-to's, licensing, as well as general configuration and functionality.

Cost:

Support access is linked to SMA. As long as SMA is active, support resources can be utilized.

Mentoring Service

Contact:

Depends upon assigned mentor

Scope:

Implementation-specific assistance. Mentoring is completed by the same resource each time.

Cost:

Hourly rate depending on the type of mentoring required. Hours are banked and used hours are logged when used.

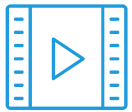
Final Notes

Files: Take a copy of the Training Materials and your Database with you! If you forget your files, contact your trainer.

Your Database: Databases will be deleted and only the starting database will be available training ends.

Training Help: Have additional questions? Training content does NOT fall under the support domain. Contact the Applications team, or your trainer, for help.

Demonstration



- Navigate through the Parsec Website
- Navigate to the Parsec Support Portal
- View the Reference Documentation
- Show Training Documents

Lab 20

Thank You!