REVEAL YOUR BEST

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BATCH FUNDAMENTALS – 1
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Batch Fundamentals: Key Concepts and Configuration Part 1

• Topics
  – Introduction to Experion Batch
  – Instance vs. Class Based recipes
    ▪ Experion Batch for Instance Based Recipes
  – Experion Batch components
  – Activity functionality in Experion
  – Create an Instance Based Recipe
  – Operator Interface
  – Common Device functionality
  – Alias table usage
Batch Fundamentals: Key Concepts and Configuration Part 2

• Topics
  – Experion Batch Session 1 recap
  – Experion Batch for Class Based recipes
  – Unit Timeline display
  – Batch messaging interface – Notification Center
    ▪ Usage in SafeView
  – Procedure Explorer
  – Batch Application Service
Introduction to Experion Batch

• Experion Batch is a set of features and capabilities in Experion PKS which can be applied to batch processes

• These features and capabilities are integrated into the Experion environment
  – They run on supported controllers along with the rest of process control on the control system
  – Experion Batch provides
    ▪ Sequential and device control
    ▪ Recipe and procedure control
    ▪ Support for ISA-S88 batch standards

• These features can also be applied to certain continuous processes and to procedural automation

• Experion Batch is supported on ACE, C300, C200E, UOC, VUOC and their respective simulation environments
  – On C200 controllers, Experion Batch supports SCM/CM execution when another controller provides recipe control
Batch Architecture & Execution

Distributed Batch Engine

Recipe & Configuration Database

Recipe Database
Batch Server

Operator Station

Operator Station

UOC

UOC

UOC

vUOC

C300
Batch Applications

Scenario #1
- Single Recipe
- Single Equipment
- Fixed set of Formula

Scenario #2
- Multiple Recipes
- Single Equipment
- Frequent change of Formula
Batch Applications

Scenario #3

- Single Recipe
- Multiple Equipments
- Fixed set of Formula

Scenario #4

- Multiple Recipes
- Multiple Equipments
- Frequent change of Formula
Batch Terms

What is a Recipe?

S88 Definition:
– The necessary set of information that uniquely identifies the production requirements for a specific product

What is a Unit?

Unit is physical equipment where the recipe is executed
Instance vs. Class Based Recipes

• Instance based recipes
  – Recipe is linked to a specific unit at the time of coding
  – It will be run only on the linked unit
  – Multiple recipes can be linked to the same unit
  – Typically used in single-unit batch applications

• Class based recipes
  – Recipe is not linked to a specific unit
  – Corresponds to a Master Recipe in the S88 model
  – A control recipe instance is created for each batch on a given unit
  – Typically used in multi-unit and multi-product batch applications

• Experion Batch supports both type of recipes
Experion Batch Components

For Instance Based Recipes

• Unit Control Module (UCM)
  – UCM represents a physical unit in the plant against which a RCM can be run

• Recipe Control Module (RCM)
  – RCM is a container built to run recipes
  – It is similar in structure to SCM, but includes support for Phase Blocks
  – Can be run at different S88 levels like Procedure, Unit Procedure, Unit Operation or a Phase

• Phase Block
  – Phase block is used to interface with child SCM or an RCM and control them
  – It is built from Phase Block Type defined in the library
  – Phase Block Type is used to specify parameters and reports for a Phase or a Data Block
Experion Batch Components

For Instance Based Recipes

• Data Block
  – Created when a Phase Block Type is associated with a SCM or a RCM
  – Aligns parameter definition in layered recipes

• Sequential Control Module (SCM)
  – Executes sequential control using devices on the system
  – Includes support for normal and abnormal handlers

• Control Module (CM)
  – It is the container used to provide discrete and continuous control for PID loops, discrete valves, etc.
  – It is typically controlled by a SCM
Activity and Activity Entity

• What is an Activity?
  – Activity is an instance of an activity entity and represents a sequential task or procedure with a beginning and end
  – Activity types include Batch for batch recipe execution and Procedure for procedural operations execution
  – Activity execution can be created and managed in Batch, Procedure or Activity summary pages on the station
  – Activities participate in resource acquisition/release and allow for better arbitration during batch execution
  – Activities can be only created during runtime and are not configured
  – Activities have a lifecycle

• Activity Entity
  – In Experion activity entities include SCM’s, RCM’s and Master Recipes
  – Activity Entity is a template from which an Activity can be instantiated
Activity Lifecycle

- **Init**: Create activity
- **Pre-Executing**: Enter/Modify Formula/Report parameter<br>Activity is independent of SCM
- **Execution**: Activity has acquired the SCM
- **Post-Execution**: Activity is independent of SCM

- **Start**: Act Ent Start
- **RESET Command**: Act Ent RESET

- **Operator/API**
- **EPKS**

- **Activity Created**: Data block initialized
- **Remove activity**: Activity removed
Create an Instance Based Recipe

Equipment database

- Identify the equipment modules in the example
- Build the Control Modules
  - Discrete and Continuous device configuration
  - PID loops, discrete valves, pumps, motors etc.
Create an Instance Based Recipe

**Equipment Database**

- Identify the equipment modules in the example
- Build the Control Modules
  - Discrete and Continuous device configuration
  - PID loops, discrete valves, pumps, motors etc.
- Build Phase Block Types
  - Identify Parameters and Reports
Create an Instance Based Recipe

Equipment Database

- Identify the equipment modules in the example
- Build the Control Modules
  - Discrete and Continuous device configuration
  - PID loops, discrete valves, pumps, motors etc.
- Build Phase Block Types
  - Identify Parameters and Reports
- Build SCM’s for the equipment Modules
  - P_ADDDA, P_INERT, P_XFER, P_AGIT, P_HEAT
  - Phase Block Type linked as a Data Block on the SCM
- Build
Create an Instance Based Recipe

Recipe Building

• Build an RCM in the Control Builder or Recipe Builder
  – Associate with the Unit UCM
    ▪ Configure to acquire unit
  – Add Phase Blocks by dragging in SCM’s
    ▪ System adds Phase Blocks and links with the SCM
  – Add Sync, Transition and Step blocks as needed
  – Configure parameters, reports
  – Configure event reporting
  – Configure abnormal state propagation and projection
  – Configure Procedure Level and Icon
Operator Interface

- Chart View and Table View are available from Station Detail Display for SCM and RCM.
- These interfaces have been available since SCM’s were available.
- These displays allow for interfacing with the RCM or the SCM.
Operator Interface

- UI Toolkit is available to embed SCM/RCM control and visualization into custom graphics
- It is accessed as a set of objects from the HMIWeb Display Builder
Operator Interface

- **Summary Displays**
  - Batch, Procedure and Activity summary displays are available
  - Batch and Procedure Summary displays show the respective type of activities
  - Activity Summary shows all Activities

- **When Activity is in Activity Summary Display User can:**
  - Command the RCM
  - Navigate to Detail and Associated display
  - View and Modify values of Header, Formula and Report parameters

- **From the Summary Display new activity can be created**
Operator Interface

• Unit Timeline and Procedure Explorer are new system displays available for batch visualization

• Notification Center to be introduced with R511.1 will provide a window for batch messages as a popup screen

• These features are explored in the second batch session
Alias Tables

- Alias Table available in SCM and RCM
- It is used to create alias names to refer to tag parameters which can be resolved at runtime

In RCM’s aliases can be used to represent Units, Recipes or Equipment
- This allows RCM’s to execute against different Units
  - Note: Only one instance of an RCM can be active at a time though multiple activities can be created and queued up for execution.
Common Device Function

- This functionality allows multiple SCM’s to control a commonly shared device
- This feature is built into Experion and can be accessed through simple configuration
- Simplifies configuration effort
- This feature
  - Allows a CM to be shared by multiple SCM’s
  - Supports action qualifiers to acquire and release the CM
  - Only supports Boolean values
  - Lets the user have control over acquiring and releasing resources

Select SCM Option as COMMON on CM