The digitalization is at your fingertips

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WORKFLOW CANVAS

TUTORIAL

SIEMENS Technology (China)

ZHEN HUA, ZHOU

Pain Points of a Traditional Factory

- Mixed-line production is difficult
- The equipments have a low reuse rate
- Rely on system integrators. Difficult to maintain and upgrade
- Inconsistent IT/OT development experience
- Data and processes are isolated

What is Software Defined Factory

- Software driven flexible modular workstations
- Cloud native and on-premise IT/OT integration solution
- Follow IEC/ISO/GBT/... industrial standards
- Intuitive low-code/no-code engineering
- Support offline/online 3D simulation
- Semantic data integration
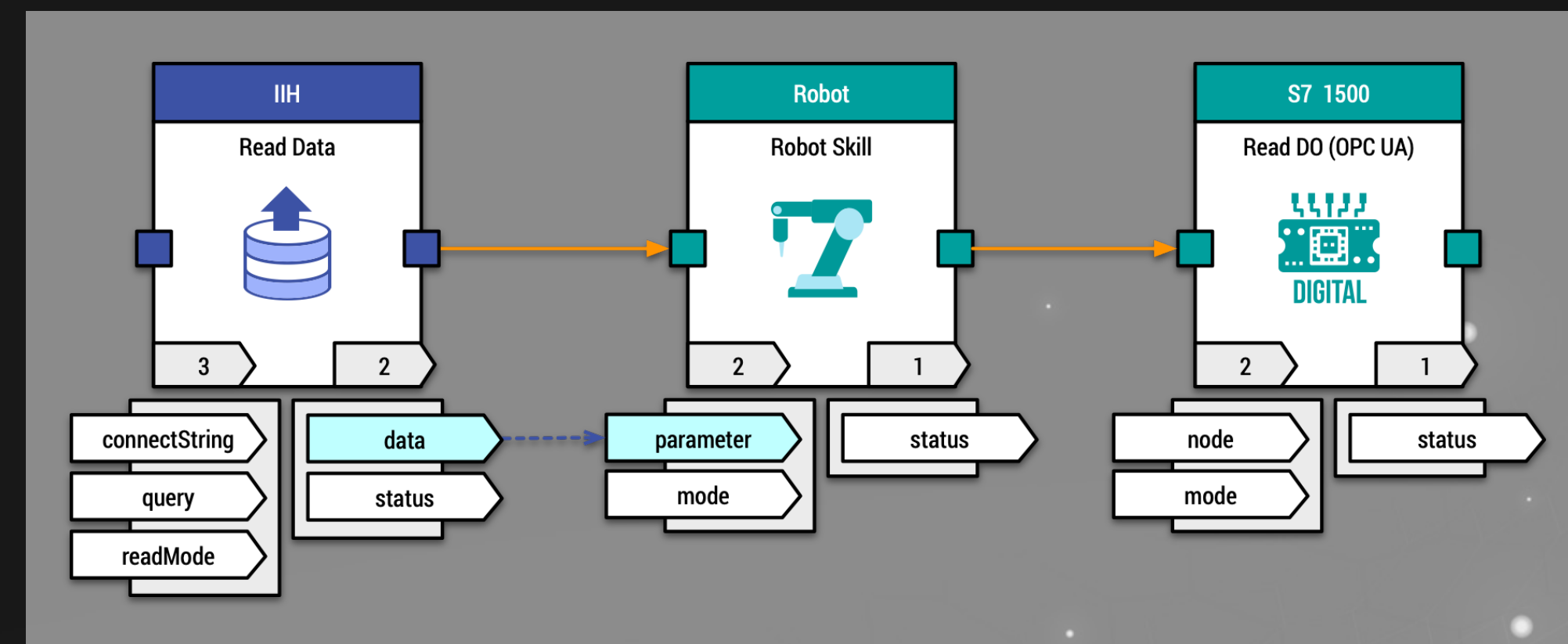- Customization and openness for a ecosystem
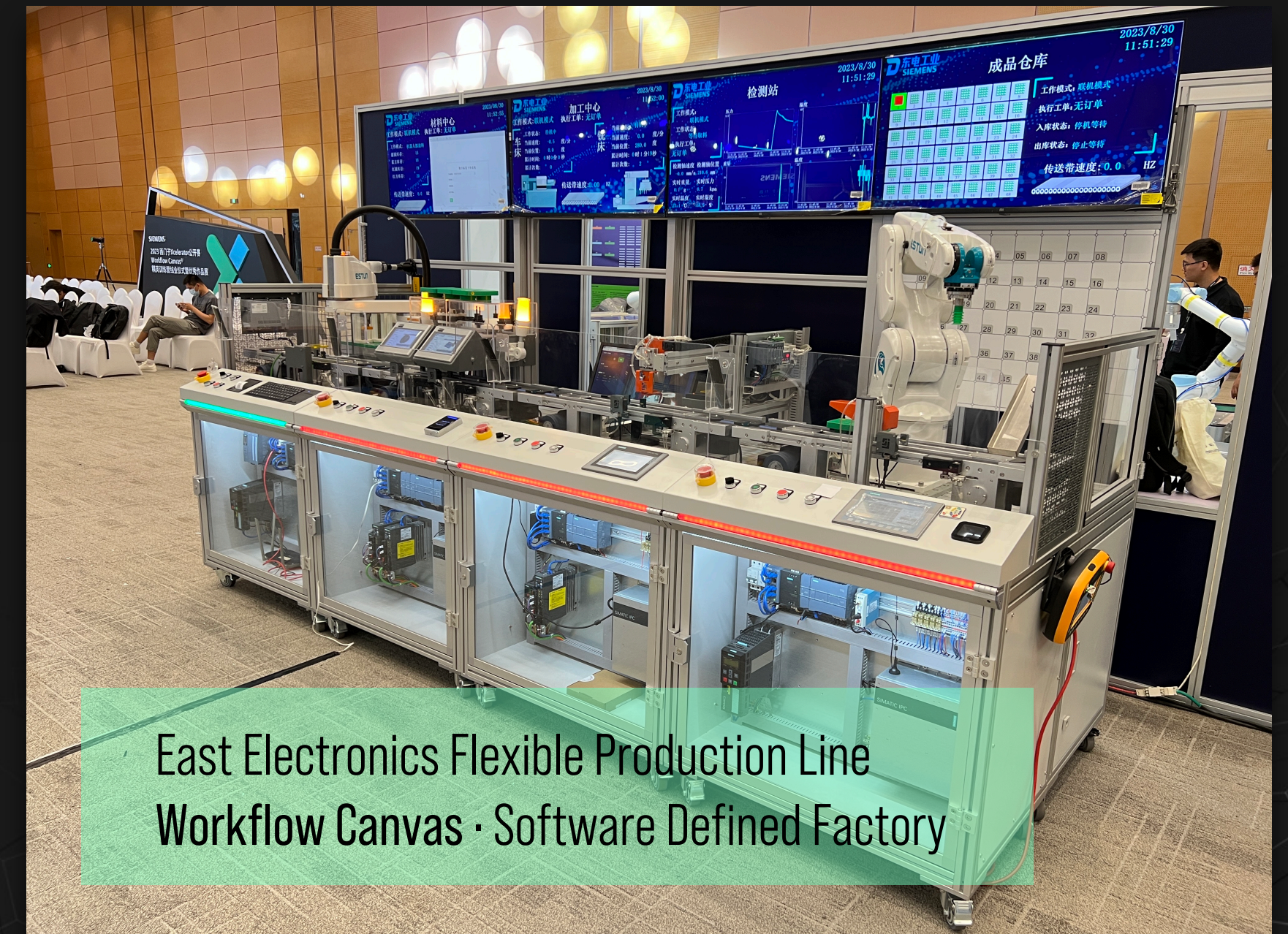
East Electronics Flexible Production Line
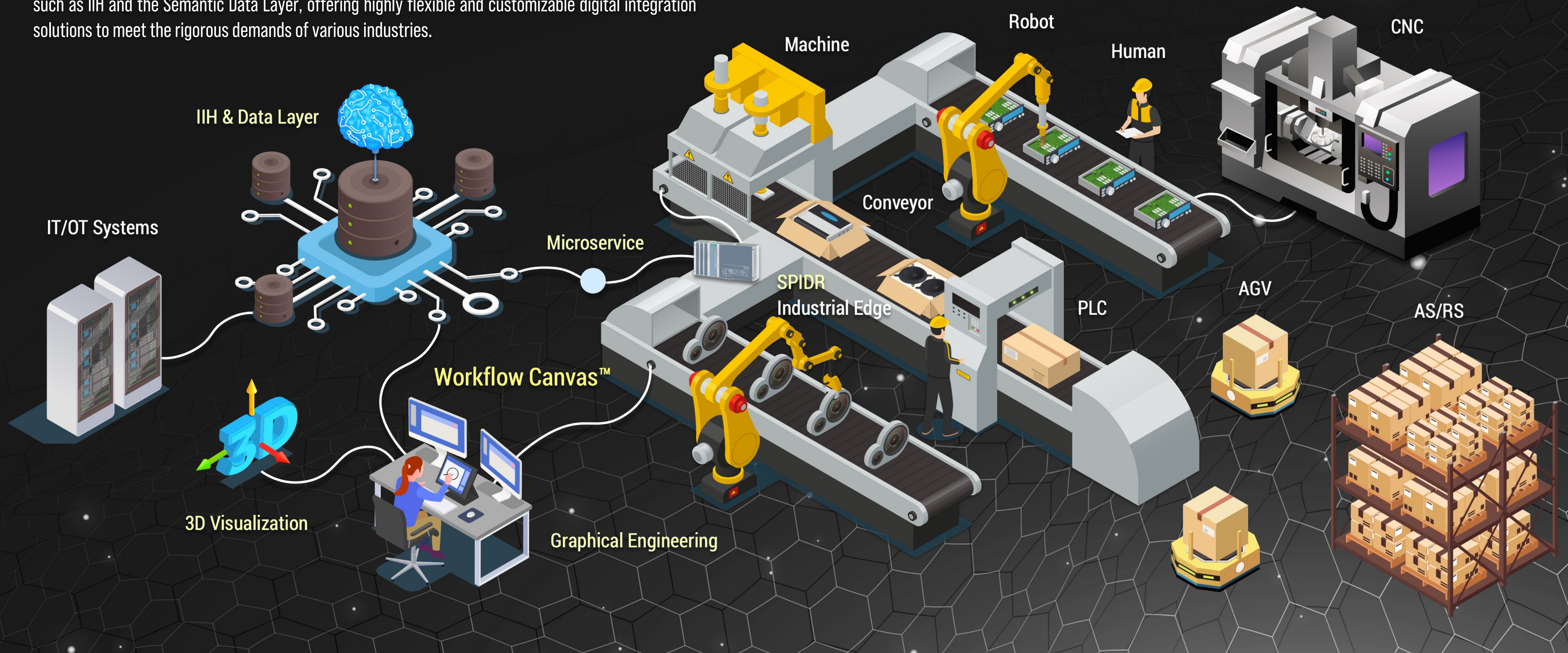Workflow Canvas · Software Defined Factory

AUBO Robotic Factory Flexible Production Line
Workflow Canvas · Software Defined Factory

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IT and OT Integration by Workflow Canvas

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Workflow Canvas is a cloud-native IT/OT integration toolkit that enables Siemens and its eco-partners to develop integrated digital solutions faster, with web-based engineering, built-in 3D visualization, and container-based runtime ready to be deployed either on-premise or in the cloud. Its drag-and-drop interface provides an intuitive developer experience, while both IT and OT engineers can collaborate on the engineering of a plethora of devices, equipment and information systems. The resulting runtime is a cross-platform orchestrator (SPIDR) that comes with data integration options such as IIH and the Semantic Data Layer, offering highly flexible and customizable digital integration solutions to meet the rigorous demands of various industries.

IIH — Read Data
3
2
connectString
query
readMode

data
status

Robot — Robot Skill
2
1
parameter
mode
status

S7 1500 — Read DO (OPC UA)
DIGITAL
2
1
node
mode
status

IIH & Data Layer

IT/OT Systems

Microservice

Machine

Robot

Human

CNC

Conveyor

SPIDR
Industrial Edge

PLC

AGV

AS/RS

Workflow Canvas™

3D Visualization

Graphical Engineering

How to Build a Real Software-Defined Factory Solution from Scratch by Workflow Canvas


SNC S120 Production Line

- Flexible modular workstations
- In-cell robotic & PLC control
- MES & EWMS connection
- In-process quality control
- Data acquisition
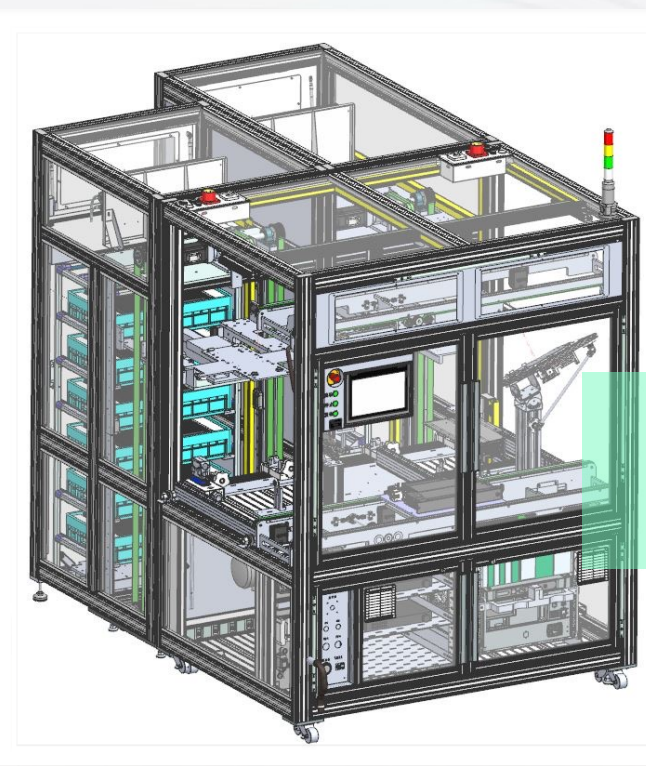- OEE analysis report dashboard
- 3D visualization and debugging

SIEMENS SNC S120 Flexible Production Line
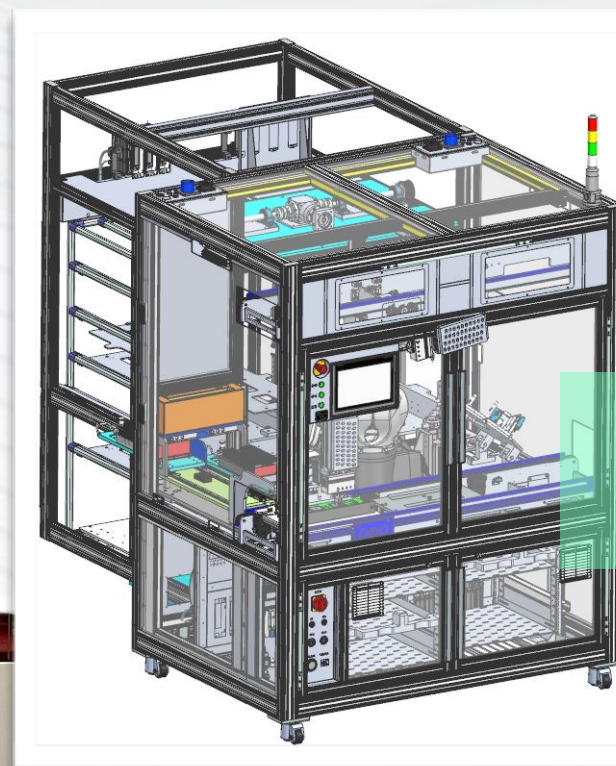Workflow Canvas · Software Defined Factory

Multiple Modular Workstations Configuration: Automatic Workstations
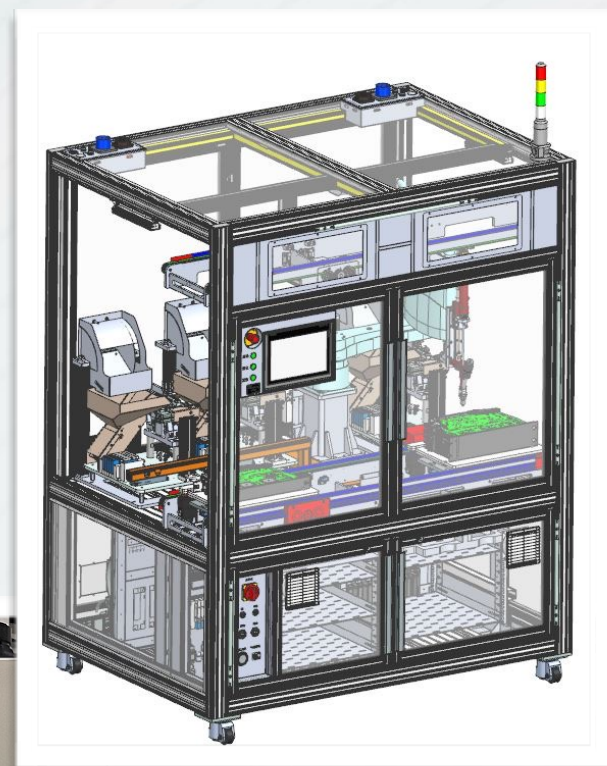
PBO Screwing

Cover Install

PBO&IGBT Install

Multiple Modular Workstations Configuration: Automatic Workstations

Workflow Canvas Graphical Engineering Tool

Toolbar

Resource Group
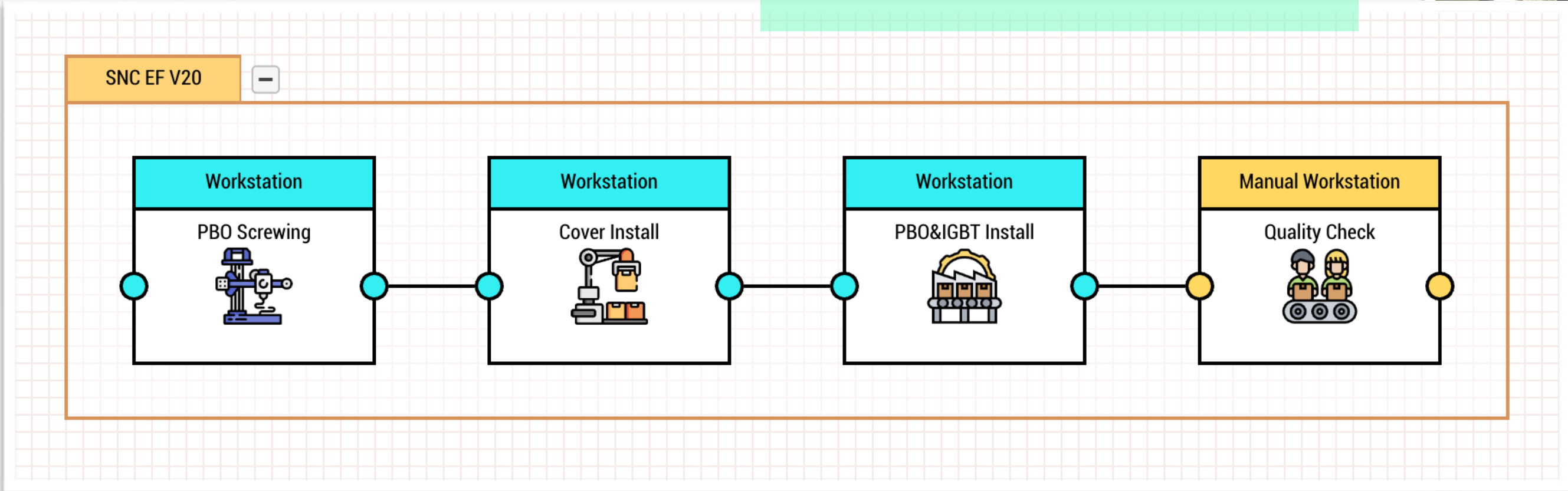
Resource Description

Property Panel

Canvas

Resource Library

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Multiple Modular Workstations Configuration: Add a Manual Workstation
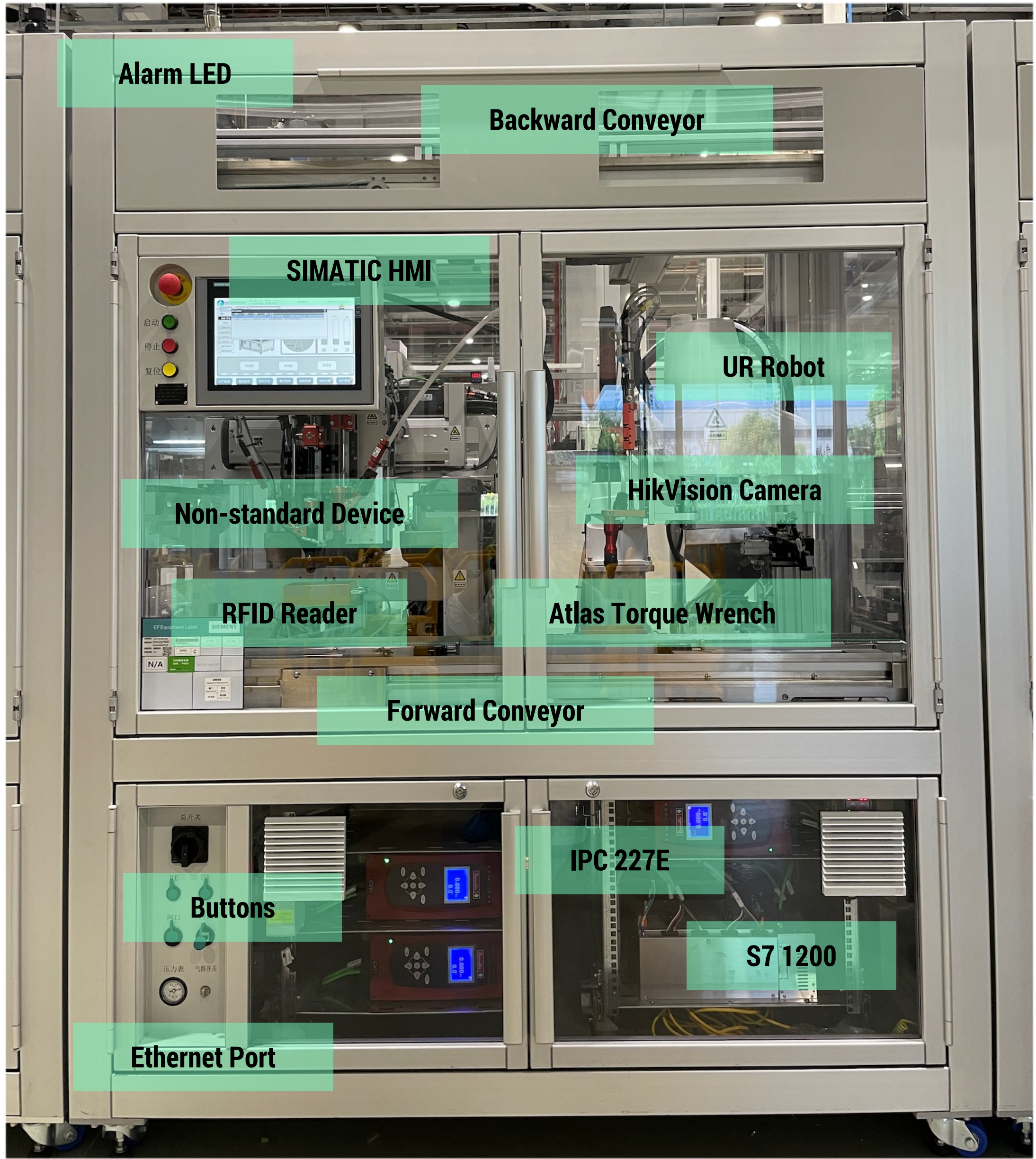

Manual Quality Check

Manual Resource Description

SNC EF V20

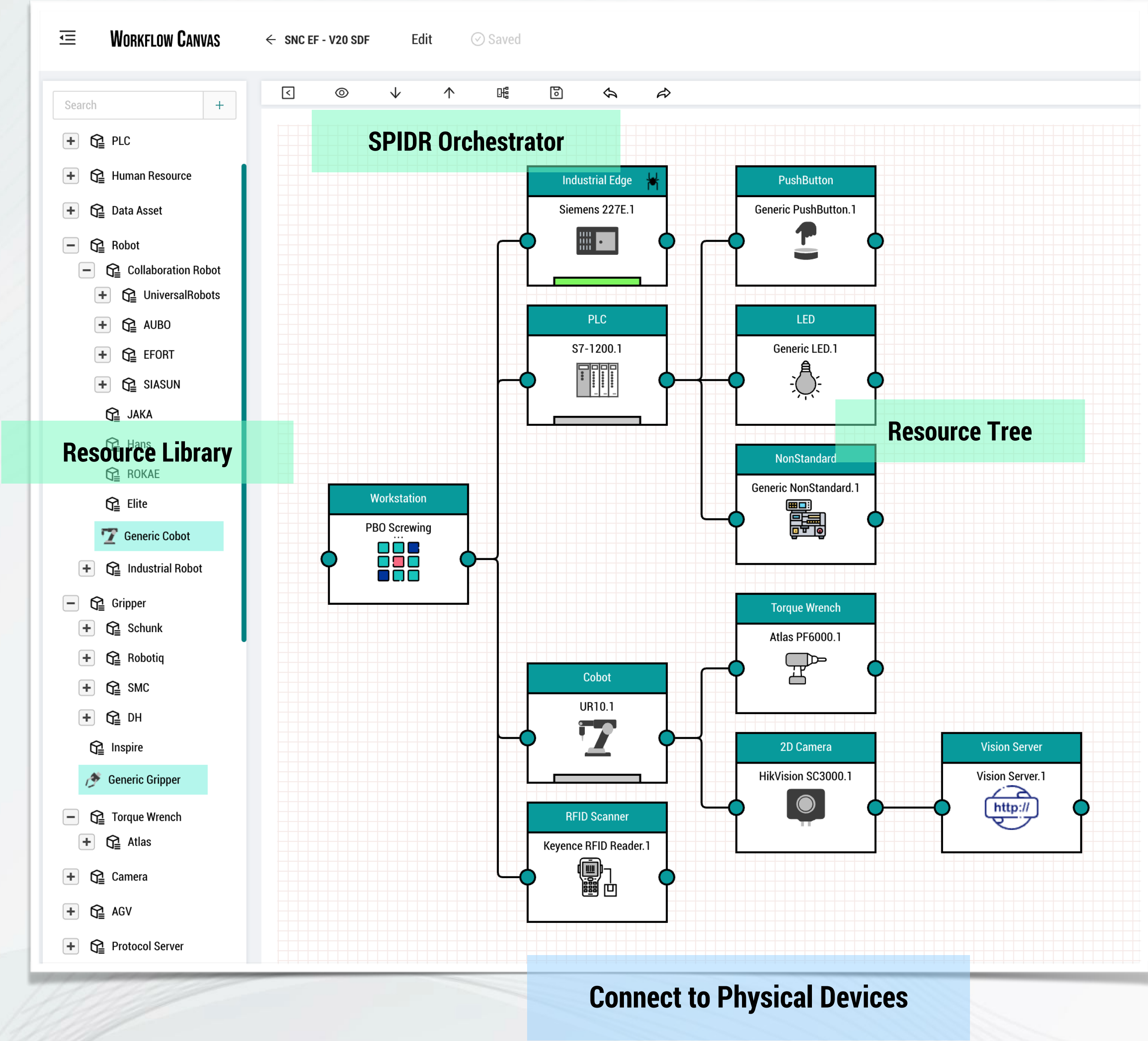| Workstation	Workstation	Workstation	Manual Workstation
PBO Screwing	Cover Install	PBO&IGBT Install	Quality Check

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Software Defined Factory: Easily Adjust the Flexible Workstation
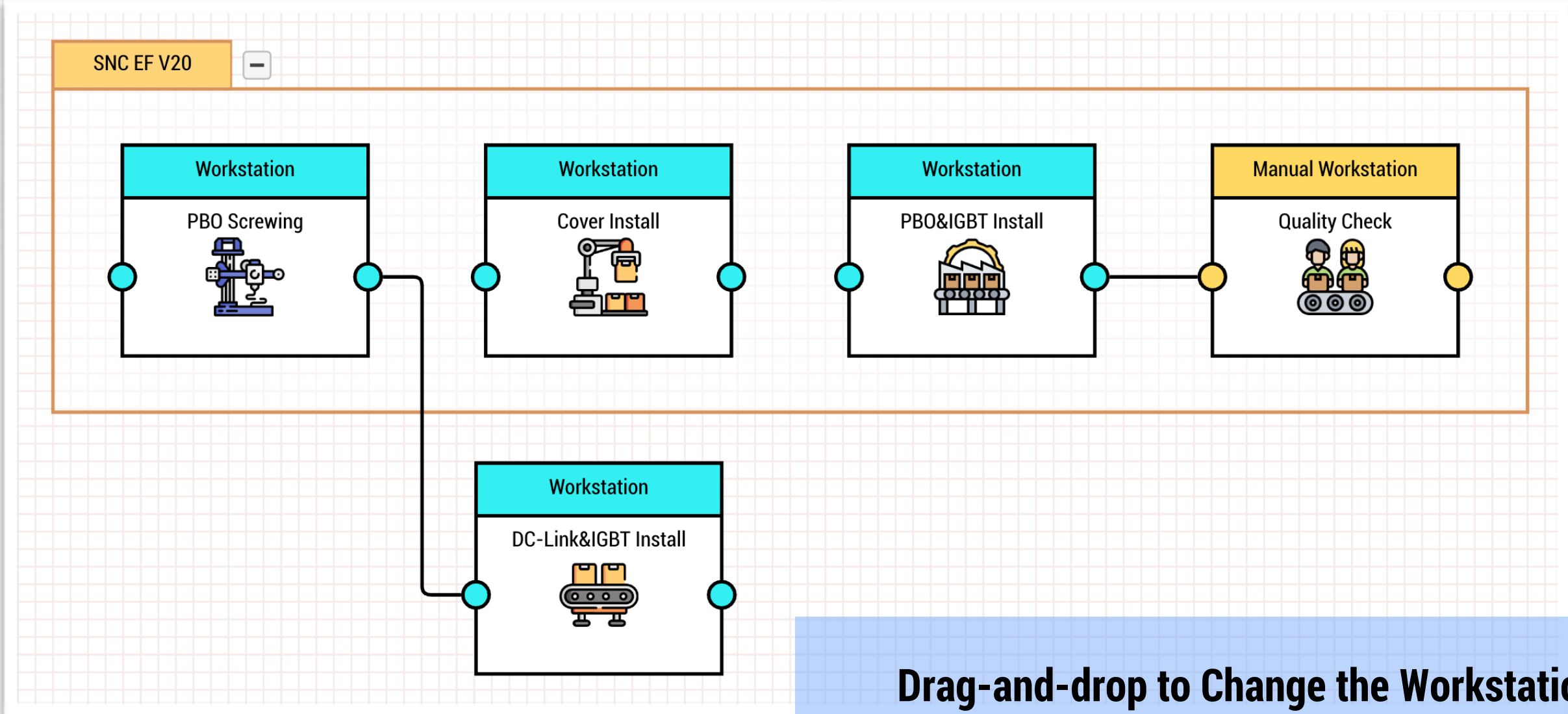
Drag-and-drop to Change the Workstation
No need to update the workflow

Single Workstation In-cell Configuration

SPIDR Orchestrator

Resource Library

Resource Tree

Connect to Physical Devices

Alarm LED
Backward Conveyor
SIMATIC HMI
UR Robot
Non-standard Device
HikVision Camera
RFID Reader
Atlas Torque Wrench
Forward Conveyor
IPC 227E
Buttons
S7 1200
Ethernet Port
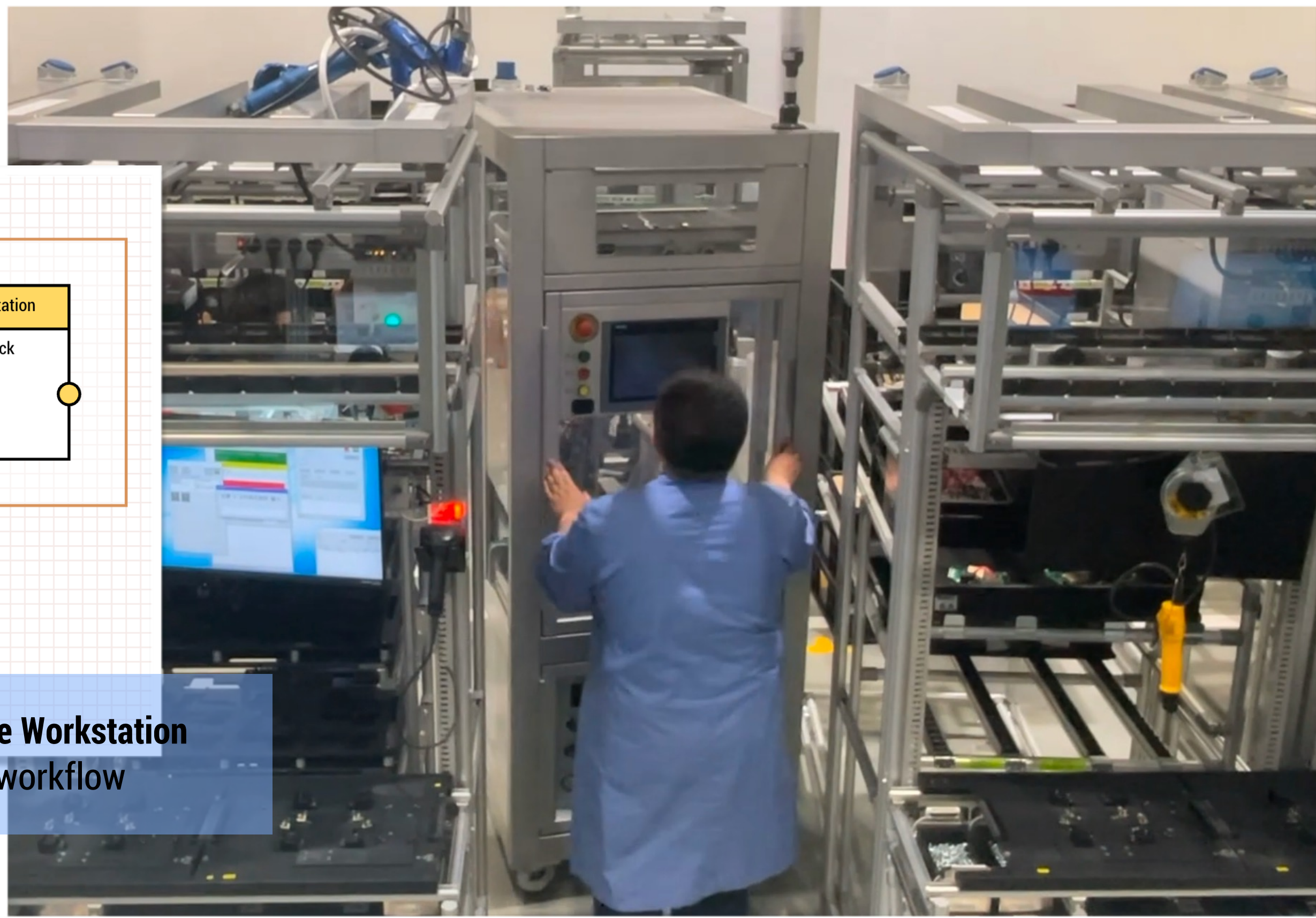
Single Workstation In-cell Configuration: Add IT and human resources
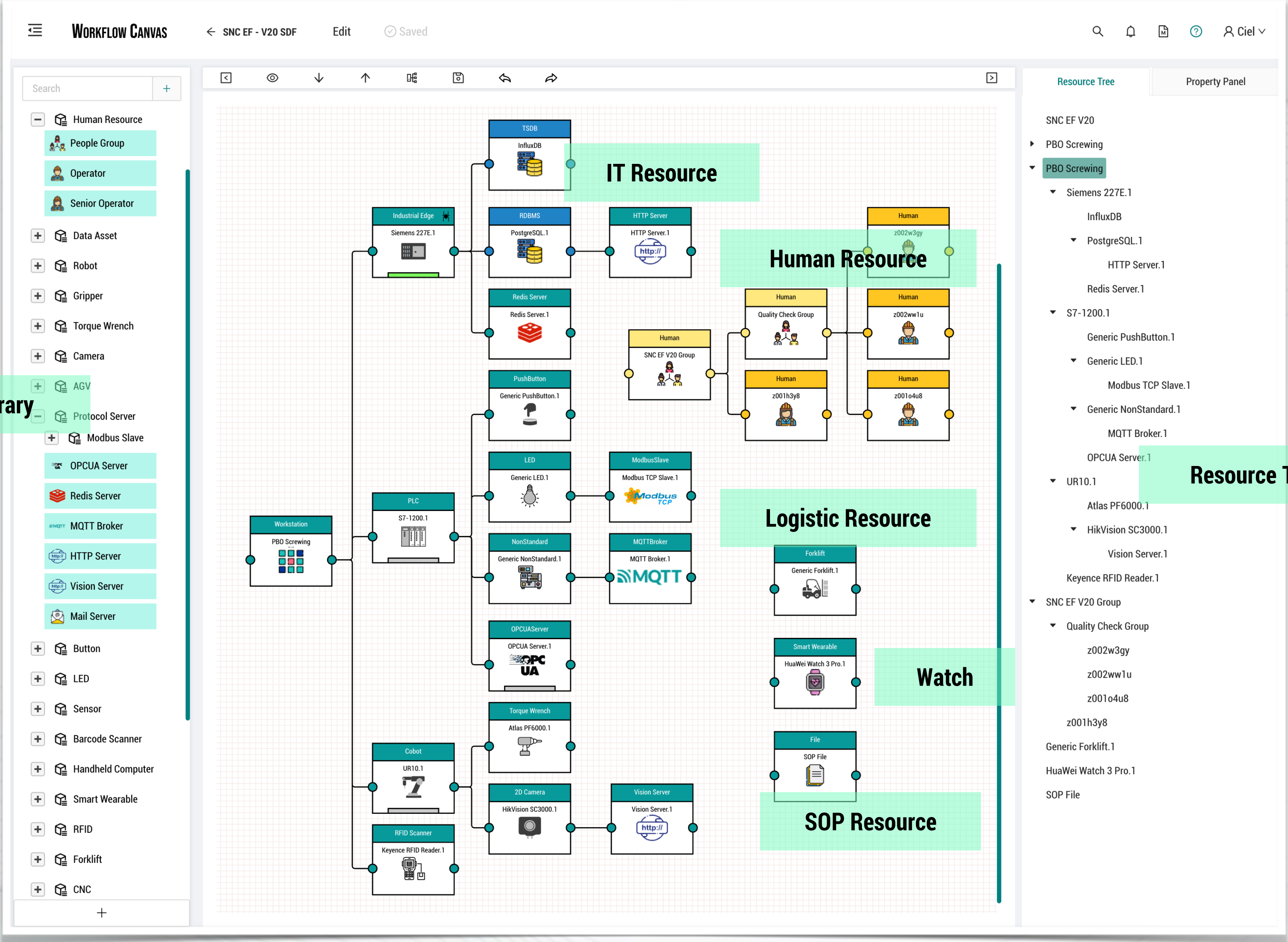
Workflow Canvas™ Engineering: General UI Elements

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Workcell Engineering: Create Basic FBs and Logics

Workcell Engineering: Create Robotic Screw Fastening Workflow
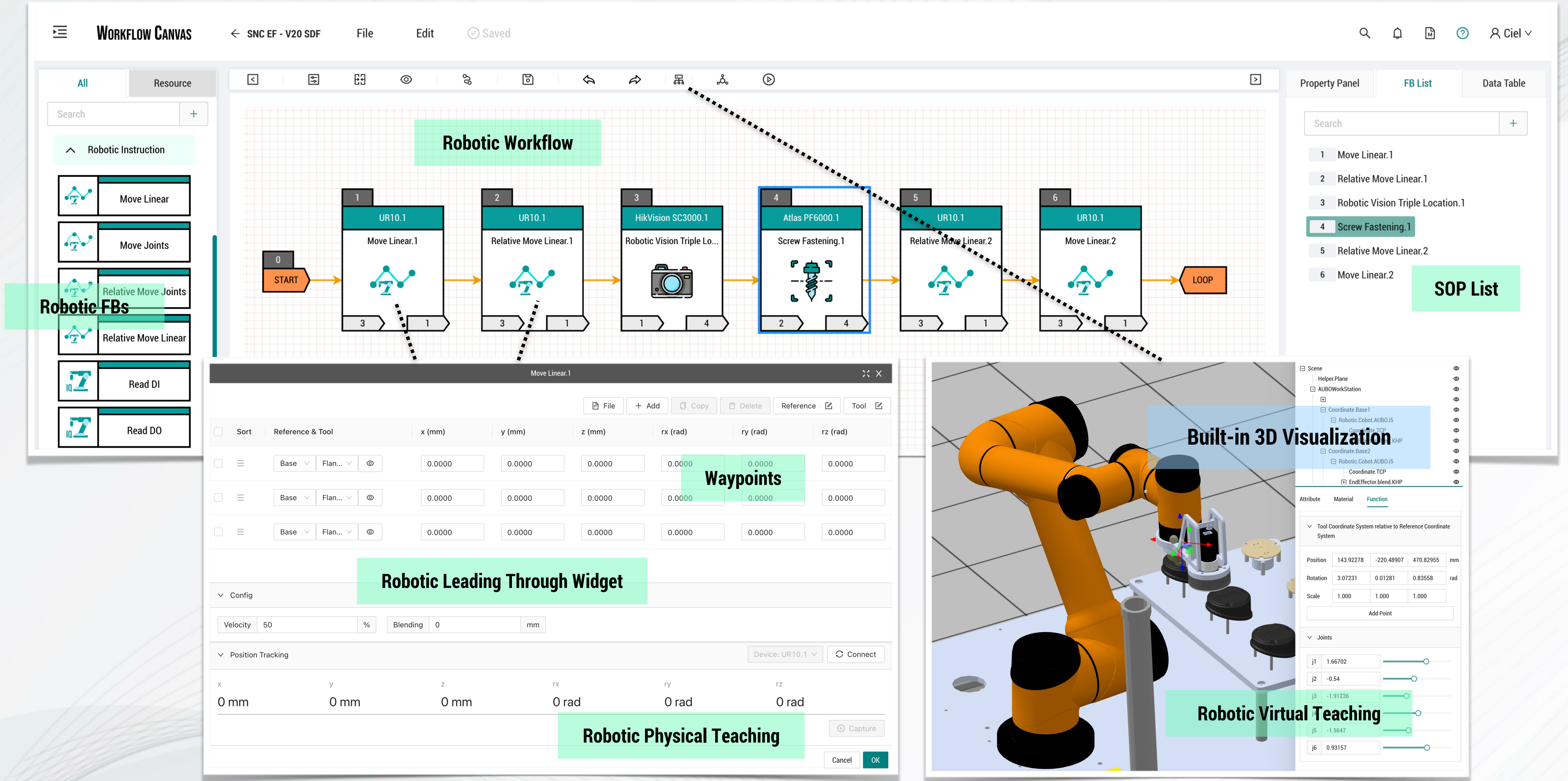
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Workcell Engineering: Create PLC Control Workflow
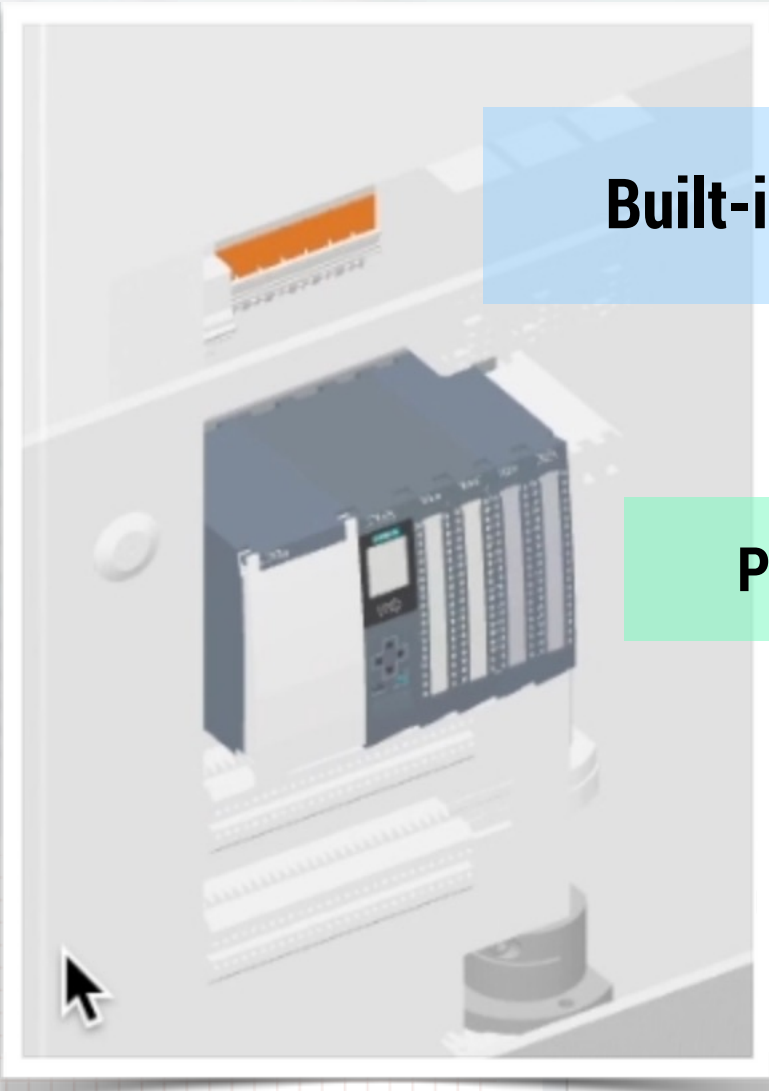
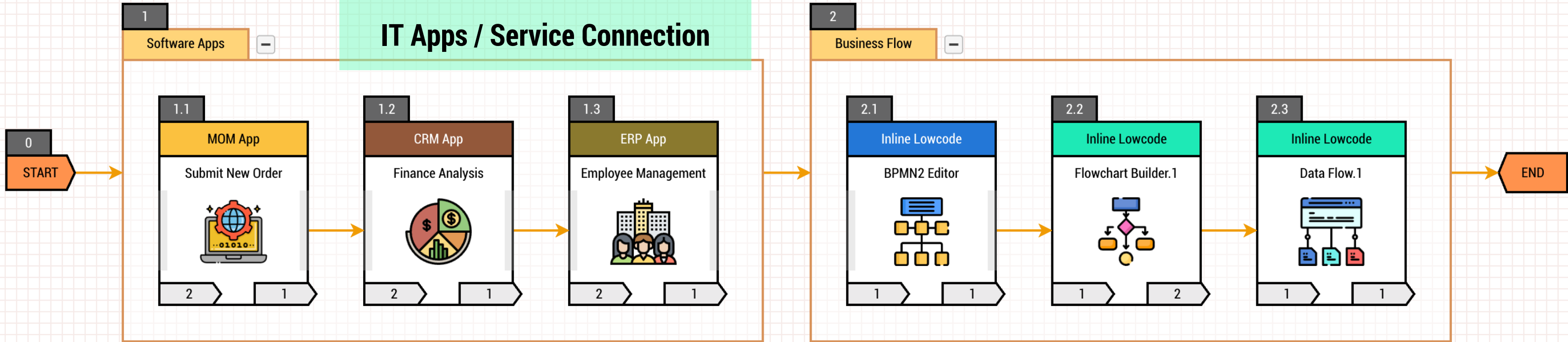**SIEMENS**
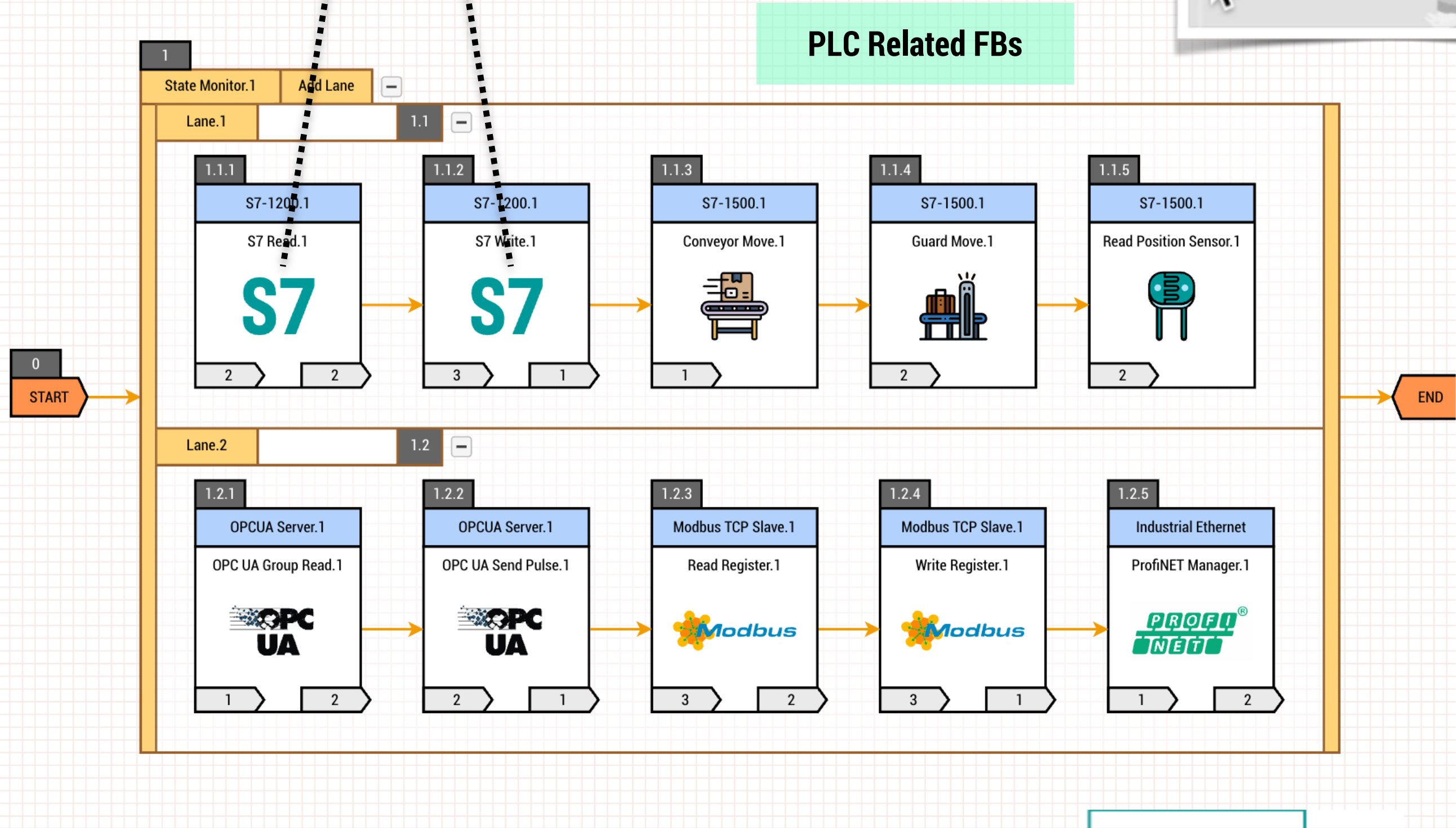
Workcell Engineering: Create IT Workflow

IT Domain FBs and Information Workflow
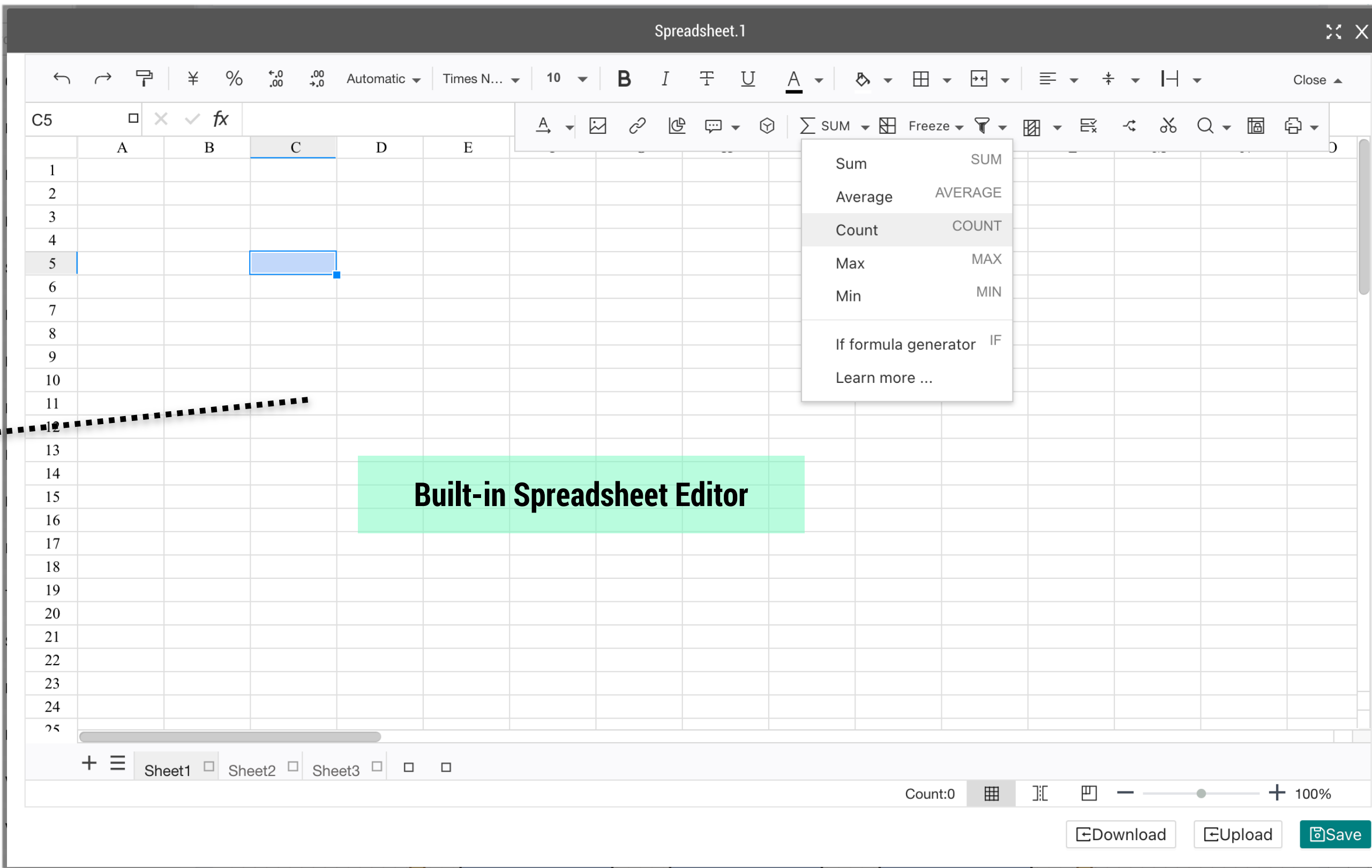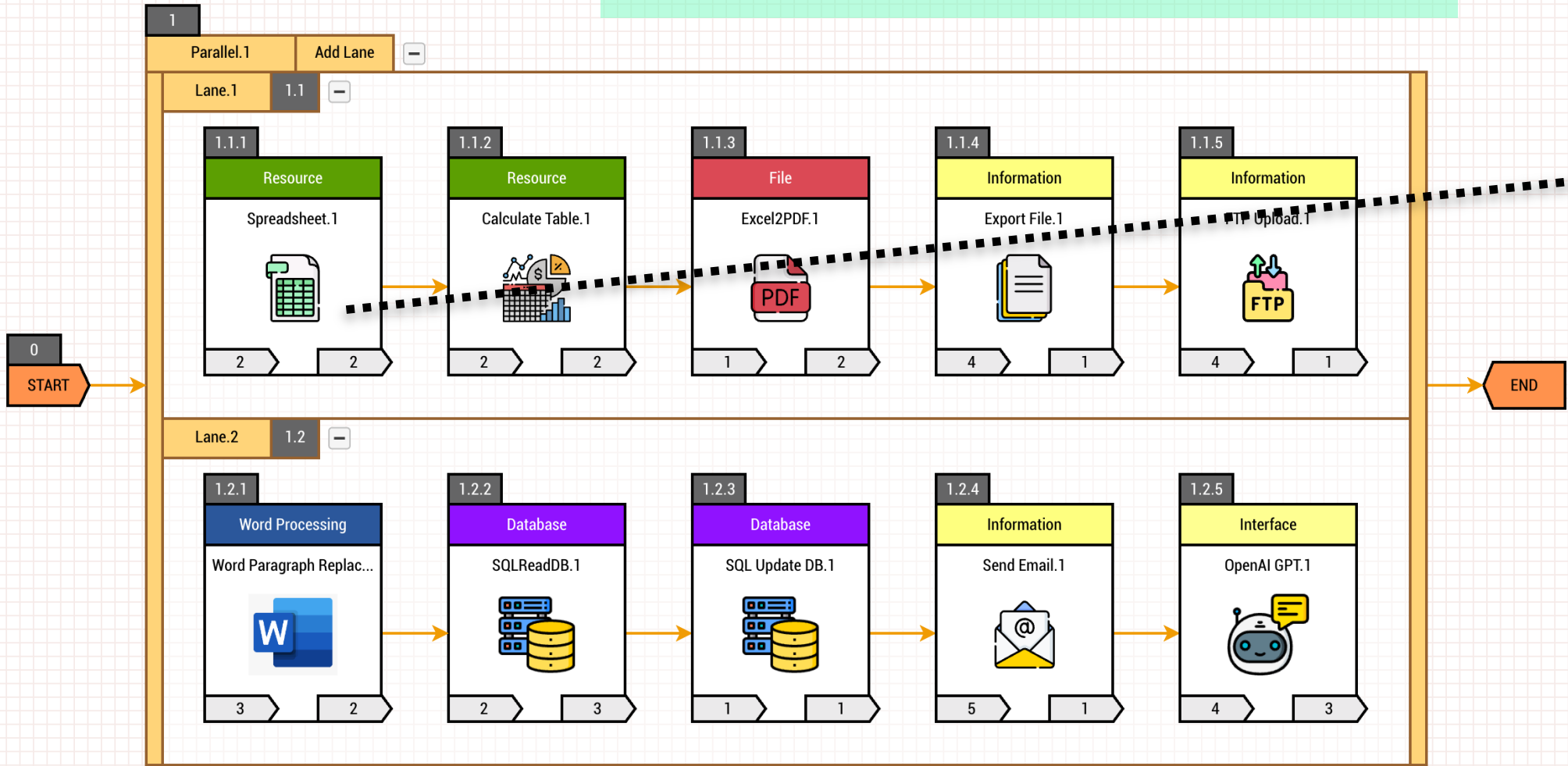
Built-in Spreadsheet Editor

IT Apps / Service Connection

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Workcell Engineering: Customized FBs (Language of Choice)
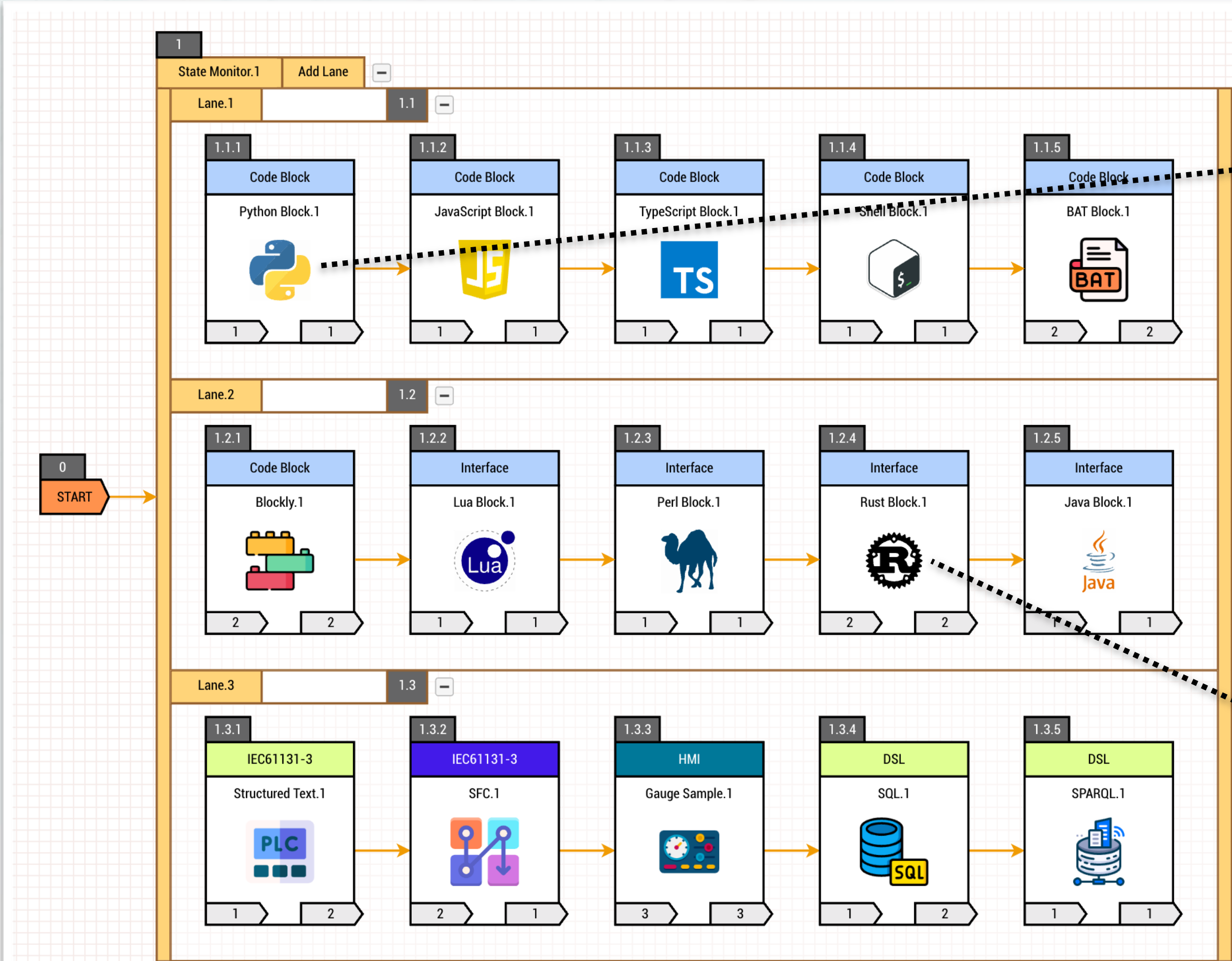
Workflow Canvas Built-in Code Editor

GitHub Importer

Default Interpreted Language Python (Recommended)

Compiled Language : Rust

Workcell Engineering: Error Handling & In-Process Quality Control

In-Process Quality Control

Exception Handling

Error Handling

Warn the Engineer by Smart Wearable Device

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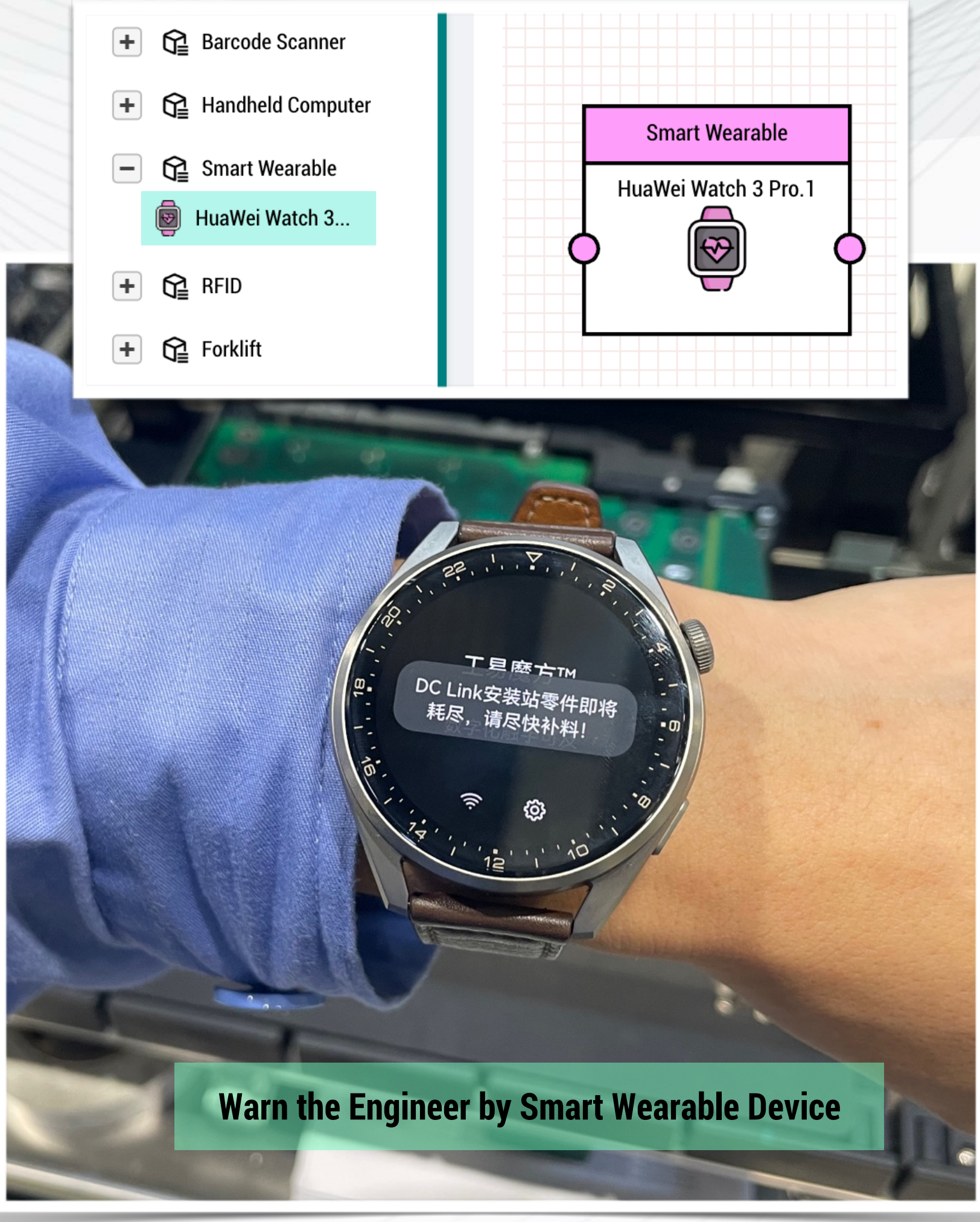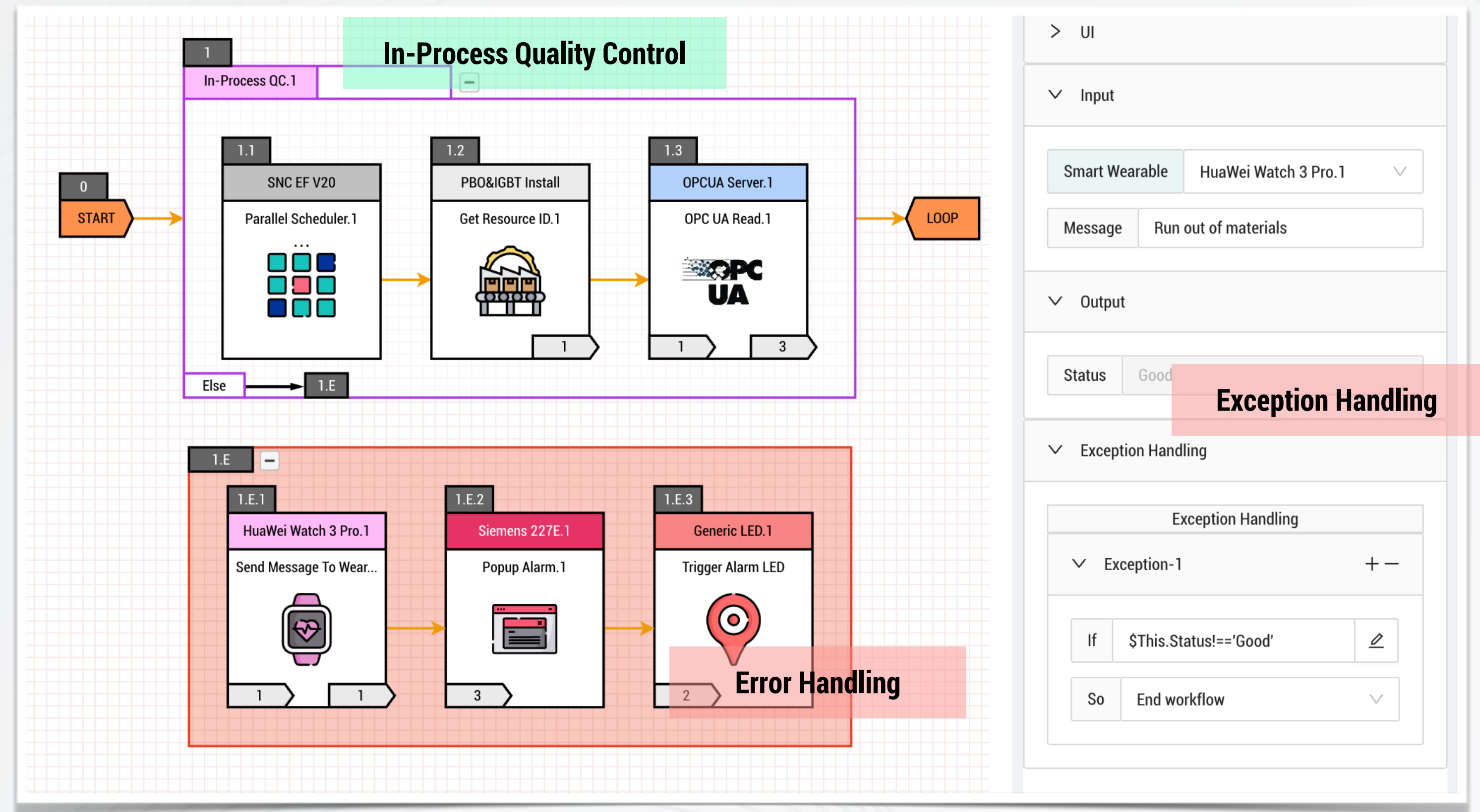
Workflow Execution: Compile and Execution in SPIDR Orchestrator

Configure SPIDR on Industrial Edge

SPIDR Cluster: Hot Standby

On-Premise SPIDR

SIEMENS Industrial Edge

Cloud SPIDR

SPIDR Nest

Industrial Edge
Siemens 227E.2

IPC
Siemens 427E.1

SPIDR Nest: Cluster of SPIDRs

Information

ID   Controller.Siemens.RackPC.427E.1

Display Name   Siemens 427E.1

Description   Generic industrial PC

UI

Category Title   IPC

Category Background

Icon

Parameters

IP Address   127.0.0.1

Port Number   3002

Runtime

Has Runtime   True

Workflow Canvas

← MOM+HMI+PLC   File   Edit   ⊘ Saved

All   Resource

Search   +

SPIDR Control Toolbar

View Log

General

Logic

Programming Language

PLC Instruction

Standard Protocol

Robotic Skill

Robotic End Effector

Robotic Vision

Information Flow

Property Panel   FB List

Information

System.ResetGlobalDataTable.

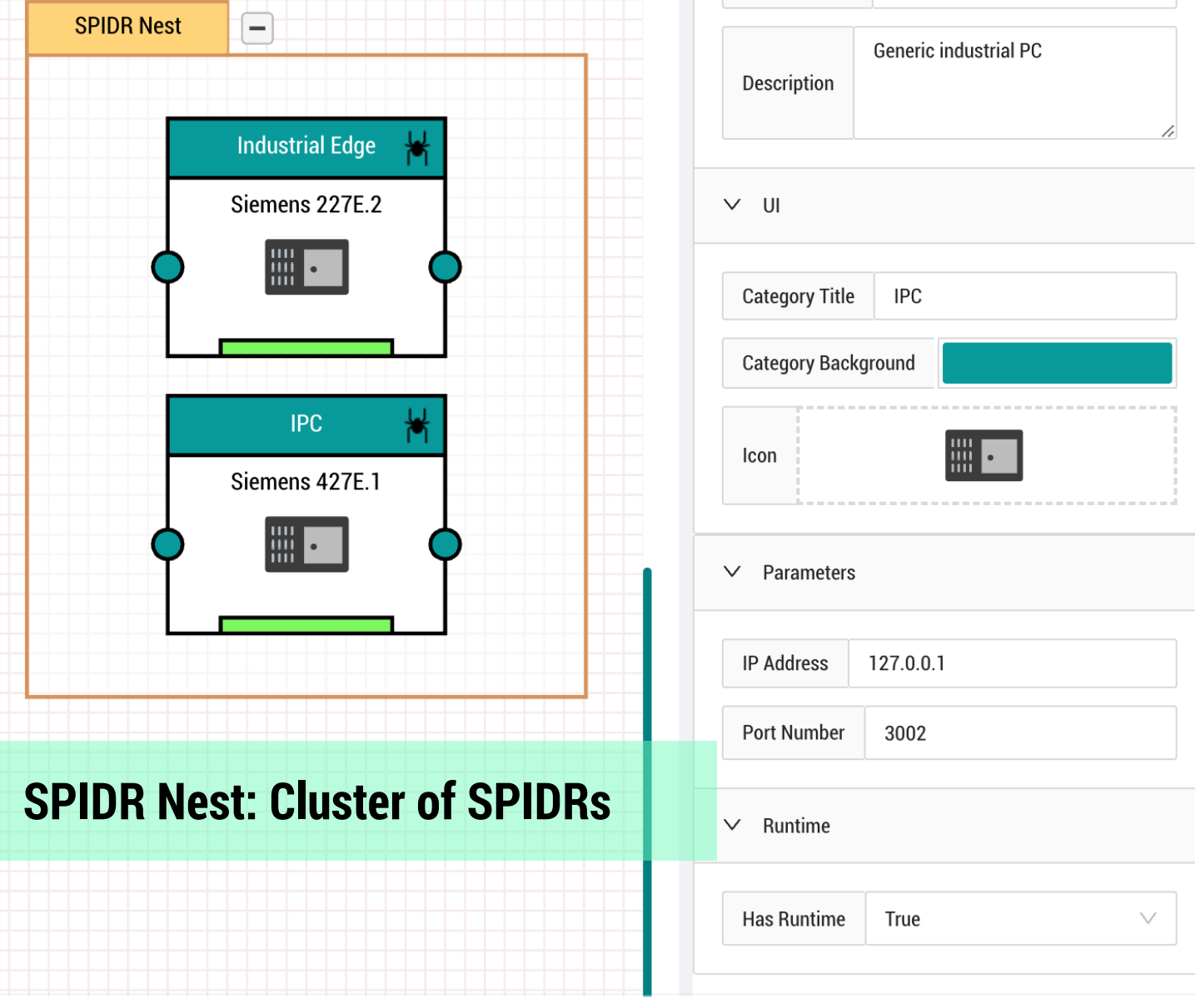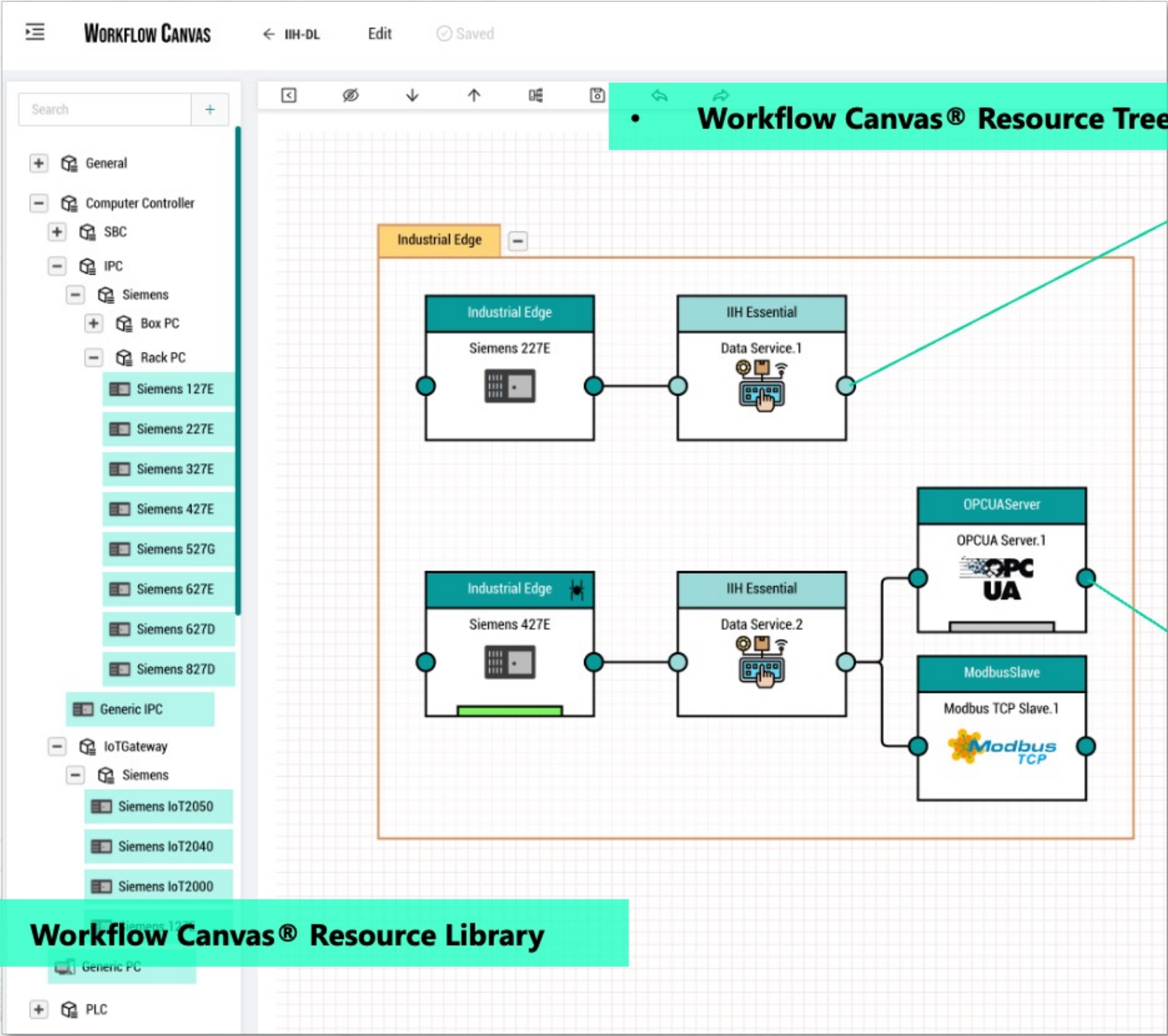### Run logs

```
2023-09-07 00:13:29.092 info: [Main Workflow] workflow is ready.
2023-09-07 00:13:30.499 debug: [Main Workflow] [initResourceSequence]: Start
2023-09-07 00:13:30.499 debug: [Main Workflow] [SmartWearable.HarmonyOS.Init.1]: isBreaked false
2023-09-07 00:13:30.500 info: [Main Workflow] [SmartWearable.HarmonyOS.Init.1]: Start
2023-09-07 00:13:30.500 debug: [Main Workflow] [mainSequence]: Start
2023-09-07 00:13:30.500 debug: [Main Workflow] [OneShot.1]: isBreaked false
2023-09-07 00:13:30.500 info: [Main Workflow] [OneShot.1]: Start
2023-09-07 00:13:30.501 debug: [Main Workflow] [OneShot.1.sequence]: Start
2023-09-07 00:13:30.501 debug: [Main Workflow] [Reset Global Data Table.1]: isBreaked false
2023-09-07 00:13:30.501 info: [Main Workflow] [Reset Global Data Table.1]: Start
2023-09-07 00:13:30.502 info: [Main Workflow] [SmartWearable.HarmonyOS.Init.1]:
```

SPIDR Logging

Name   Rese

tion

Reset C

ion Handling

Exception H

Building Log

⊘ Save Current Workflow

⊘ Acquire Workflow Model

⊘ Transmit Workflow Model

Building Process

⊘ Extract Workflow Files

⊘ Compile Function Blocks

⊘ Parse Workflow CREEM Model

Data Acquisition: Industrial Edge and IIH Configuration

Data Acquisition: FBs to Configure IIH Services API and Built-in SQL & GraphQL Editor

- **Workflow Canvas® Workflow**
- **Workflow Canvas® Parameter Panel**
- **Workflow Canvas® Code Editor**
- **Workflow Canvas® Code Editor**

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Data Visualization: Built-in Dashboard Builder driven by Workflow

Refresh the Data by Workflow and Data Table

HMI Monitor

UI Components

Workflow Canvas Built-in Dashboard Builder

E-Chart

Created User Dashboard
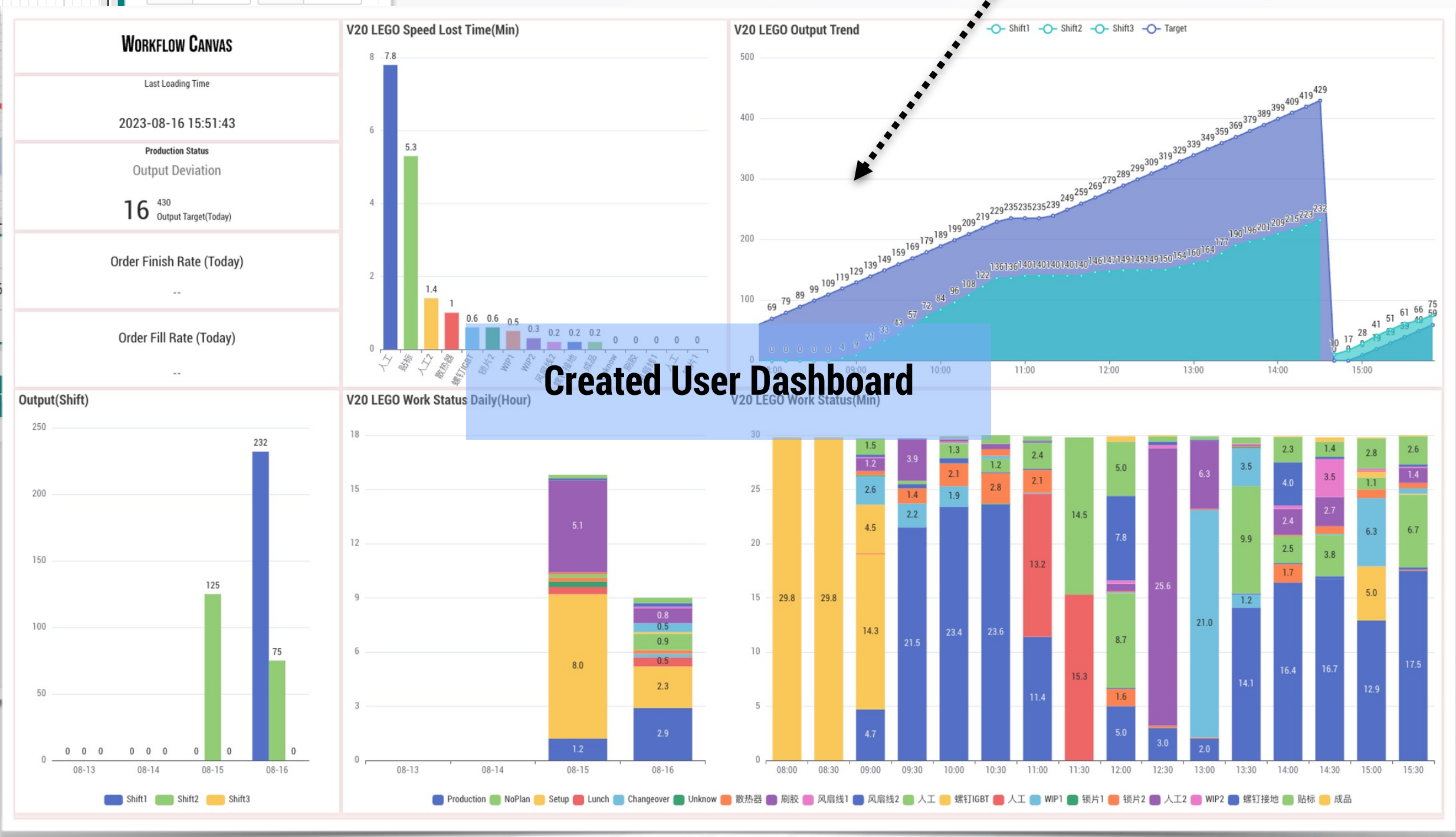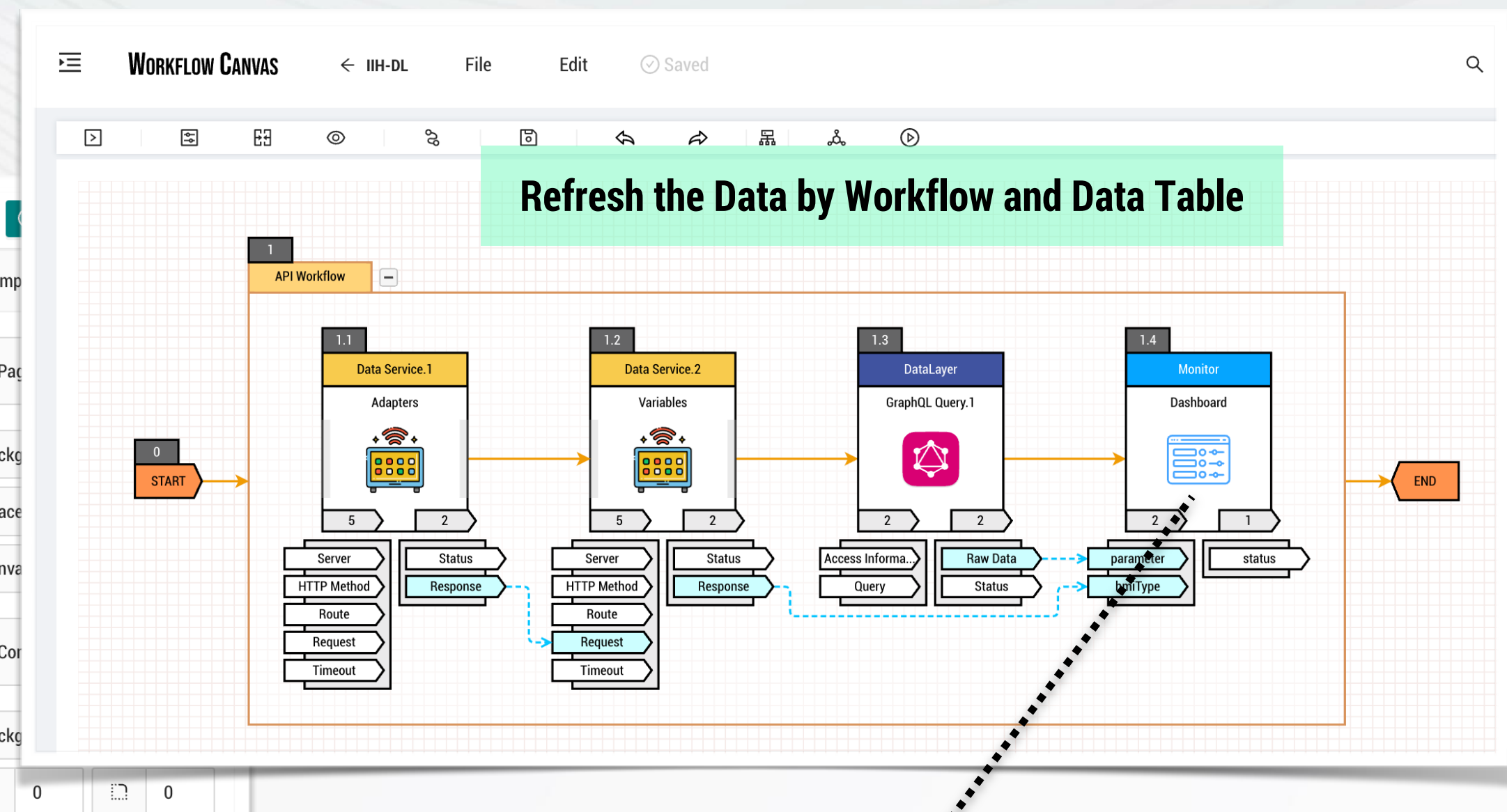
Built-in 3D Visualization: Offline/Online Debugging & Playback

Workflow Canvas 3D Visualization

SNC Packing Workstation

Workflow Canvas Graphical Engineering

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Read More

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