



### **Project Overview**

**Objective:** Development of an IoT-based framework for energy optimization in industrial assembly lines.

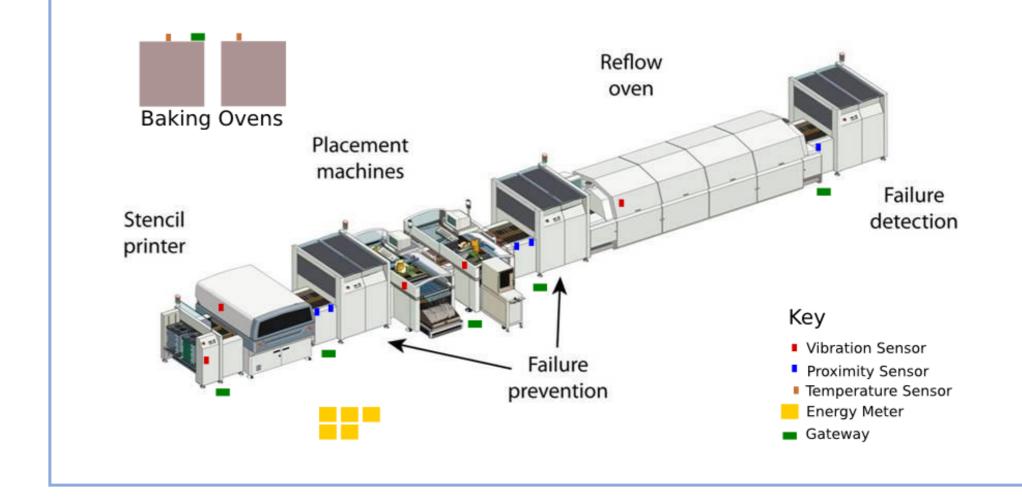
Case study: An SMT PCB Assembly Line

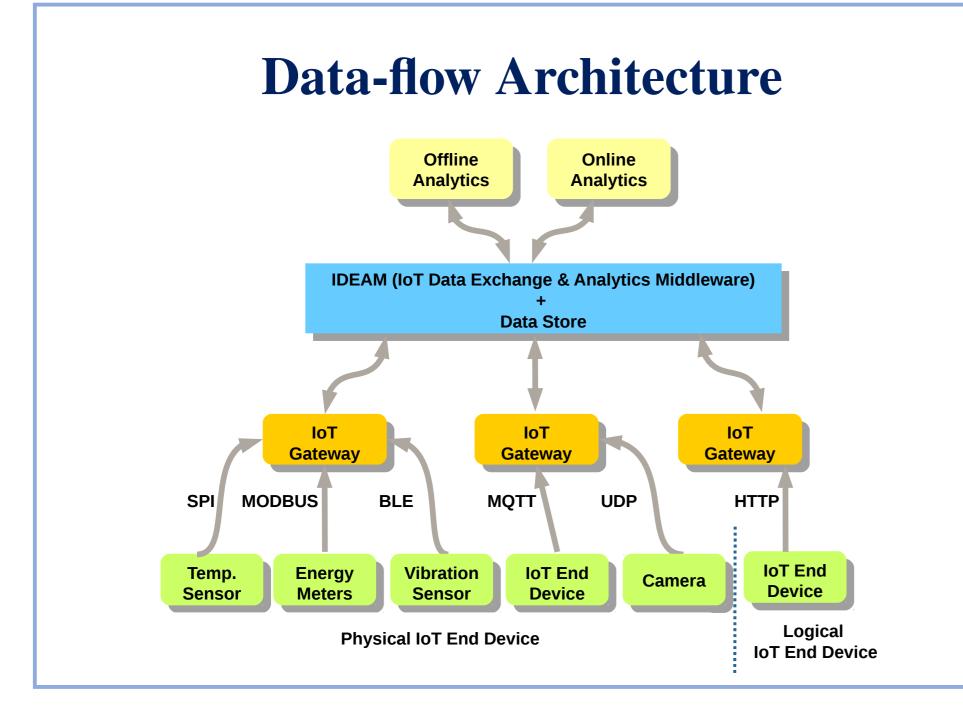
#### **Components:**

- Data Aggregation Platform
- Data Analysis Engine and KPI displays
- Simulation Model for Prediction and Process Optimization

### **Sensor Deployment**

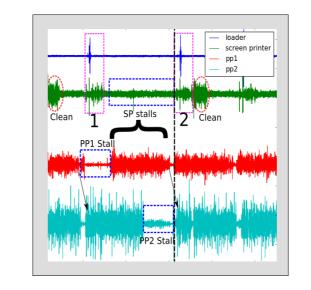
#### **An SMT-PCB Assembly Line**





# **Key Performance Indicators and Insights from Data**

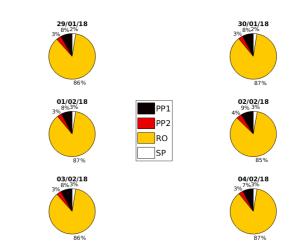
A Snapshot of Vibration Sensor Data



**Performance Metrics Tracked:** 

- Machine-wise idle-times, latencies and energy consumption
- System Throughput
- Machine Breakdowns, Shifts.

Machine-wise break-up of energy over a week



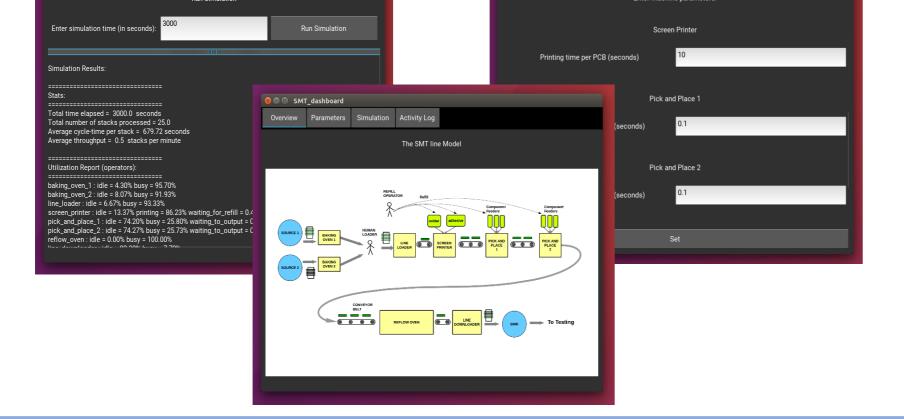
**Insights:** The Re-flow oven accounts for more than 85% of the total energy consumption on average, whereas the Pick and Place machines are often the throughput bottlenecks.

# **Parameterized Simulation Model** with GUI support

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## **Energy Optimization** and Ongoing Study Items

• Impact of buffering between the Pick and Place and Re-flow



operations (preliminary results based on simulation indicate that up-to 2X reduction in energy is possible via buffer insertion.)

- Design space exploration of line configuration
- Optimal inspection and re-calibration policies
- Human-in-the-loop modelling
- Dashboard for real-time operational support

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