

SMART FACTORY, D-E63

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STUDENT ENGINEER INTERN III



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Overview

- **Introduction**
 - About Me
- **Smart Factory Overview**
 - Purpose
 - Industry
- **Data**
 - Data Feeds
 - Work Orders
- **The POLCA Method**
 - What is POLCA
 - How it is useful
- **Outcome**
 - Future Work
 - Results

About Me

- **The University of Texas at El Paso, Senior Fall 2024**
 - B.S. in Computer Science, December 2024
- **Hobbies:**
 - Running, Skiing, Climbing, Chess, Cooking, Football, Soccer, Reading, Movies, Art etc.
- **Favorite Class in College:**
 - Machine Learning: Empowering computers to learn from data
- **Post-Grad Plans:**
 - Masters in AI, continue with Research
- **What did I enjoy most this summer at KCNSC?**
 - Data Science integrations in the Smart Factory.
 - Expand my network, learn about career opportunities



POLCA Project

Problem:

- **Current manufacturing processes exhibited in the plant are not very efficient**
- **Frequent Bottlenecks and Overproduction**
- **Poor Workflow and Inflexibility**
- **Excessive Work-in-Progress (WIP) and Long Lead Times**
- **Misalignment with Lean Manufacturing Principles**

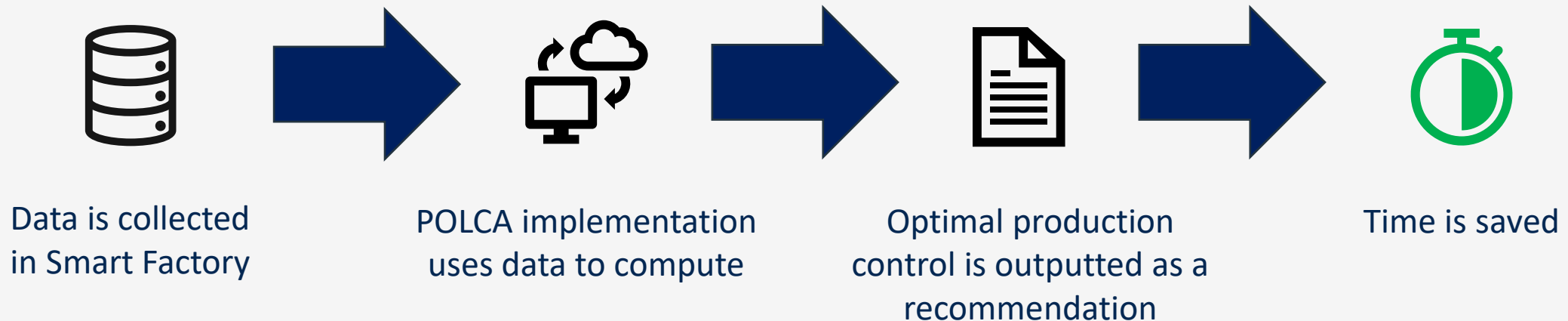
Solution:

- **Use Smart Factory data feeds to prototype the POLCA production control system for generating automated plans of the day for manufacturing leaders to validate and adjust as needed to prioritize floor actions.**

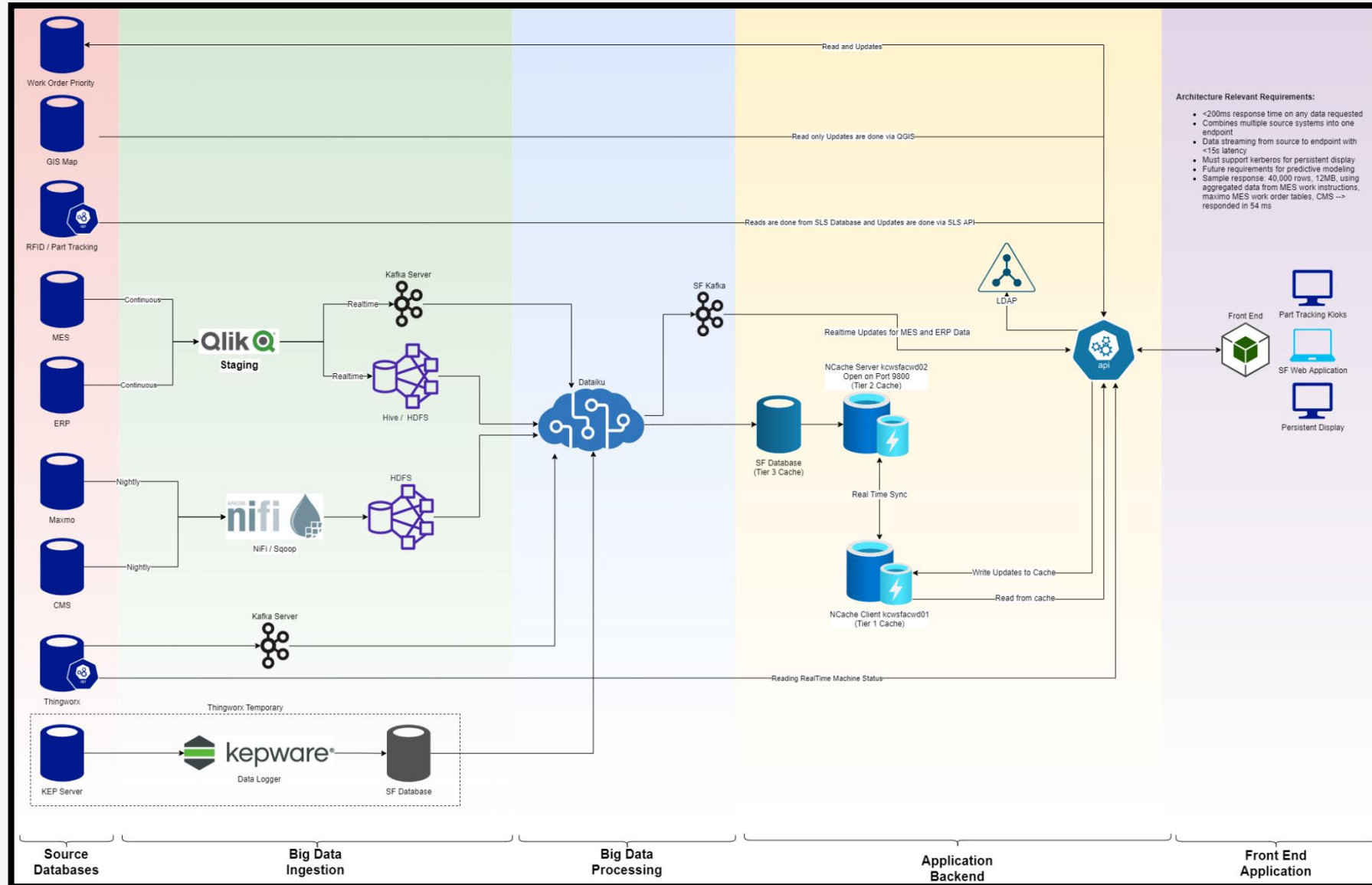


Purpose

- The purpose of the solution is to leverage smart factory data and POLCA to create an adaptive and efficient production control system that addresses the key inefficiencies and aligns the manufacturing processes with lean principles.



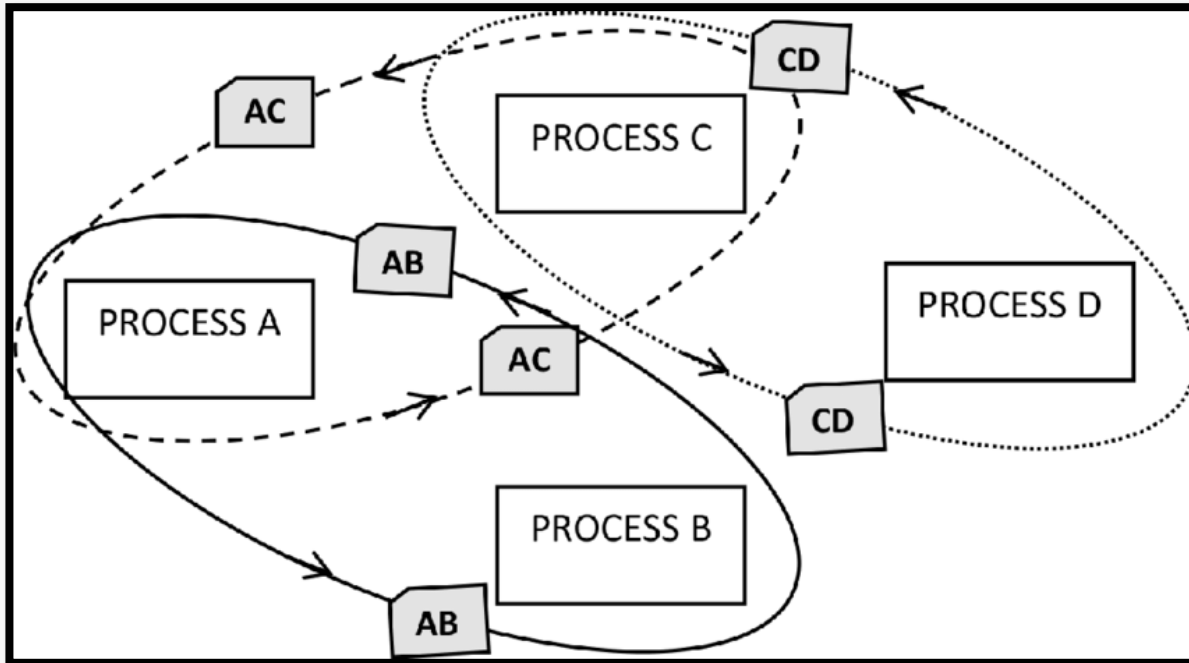
Smart Factory



- Backend view to Smart Factory operation
- Work processes
- Efficient architecture
- Real time data
- POLCA data from MES, ERP, etc.
- Dataiku is central hub

The POLCA Method

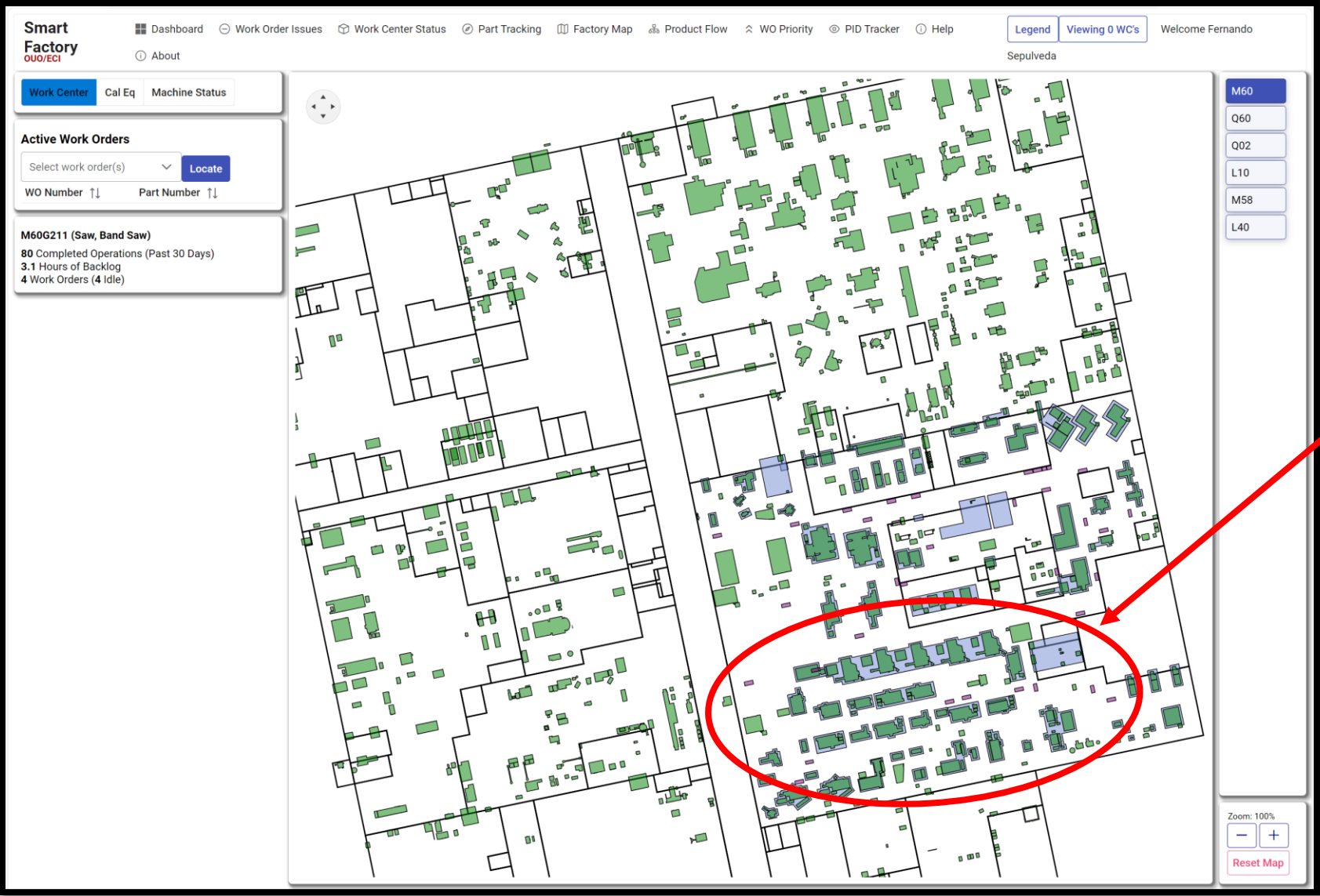
Paired-cell Overlapping Loops of Cards with Authorization



- Less wasted time in planning
- Efficient job authorization
- Higher priority to certain cells
- Prevents build-up of unnecessary materials
- Prevents bottlenecks

- It is a hybrid push-pull system that combines the best features of card-based pull (Kanban) systems and push (MRP) systems.

POLCA in Smart Factory



Implement
POLCA
processes

Generate
automated
plans

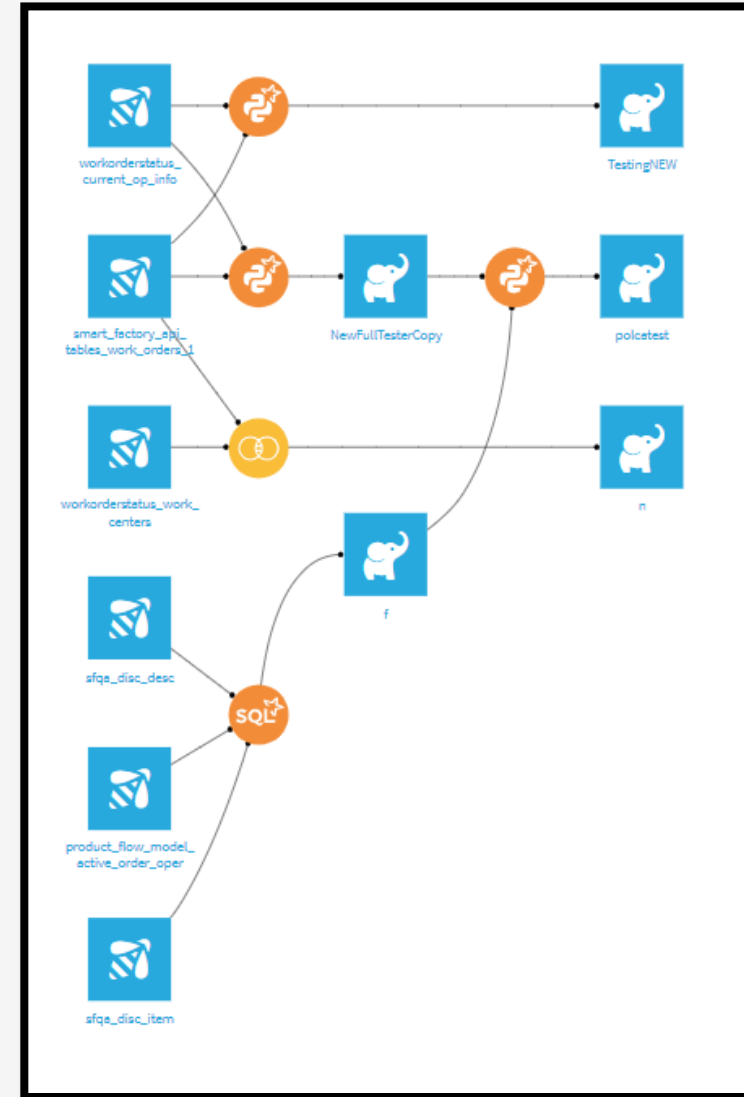
Data Used

- MES Data
- ERP Data
- workorderstatus_current_op_info
- smart_factory_api_tables_work_orders_1



- Work Center
- Work Orders
- Order ID
- Cards

Dataset Schema



Accomplishments and Future

Progress

- **Extraction Methods()**
 - Calculated Key Metrics necessary to compute using formulas described through POLCA Book documentation
- **Translated the POLCA process and applied for Smart Factory use**
- **Skimmed and parsed the data into a single dataset which can be used for Smart Factory operation**
- **Created a Card Counter as provided in POLCA book documentation along with reusable code**

Next Steps

- **Apply the POLCA dataset with code written into a Virtual Interface**
- **Ensure POLCA operations take data correctly**
 - Data integrity
- **Improvements**
 - Take data from the floor manager
 - 24/7 refresh rate

Lessons Learned

- **Experience with Dataiku**
- **Experience with POLCA**
- **General manufacturing processes were new to me**
- **It is important to troubleshoot**
- **Don't reinvent the wheel – if a simple process works well there is no need to make it complicated**
- **KCNSC operations**

Thank you!

- Justin Talley - M
- Joseph Lipoff - TM
- Wyatt Pickett - TM
- Sam Thomas - PM
- E-63 Team



Key Takeaway: Improvement is always applicable