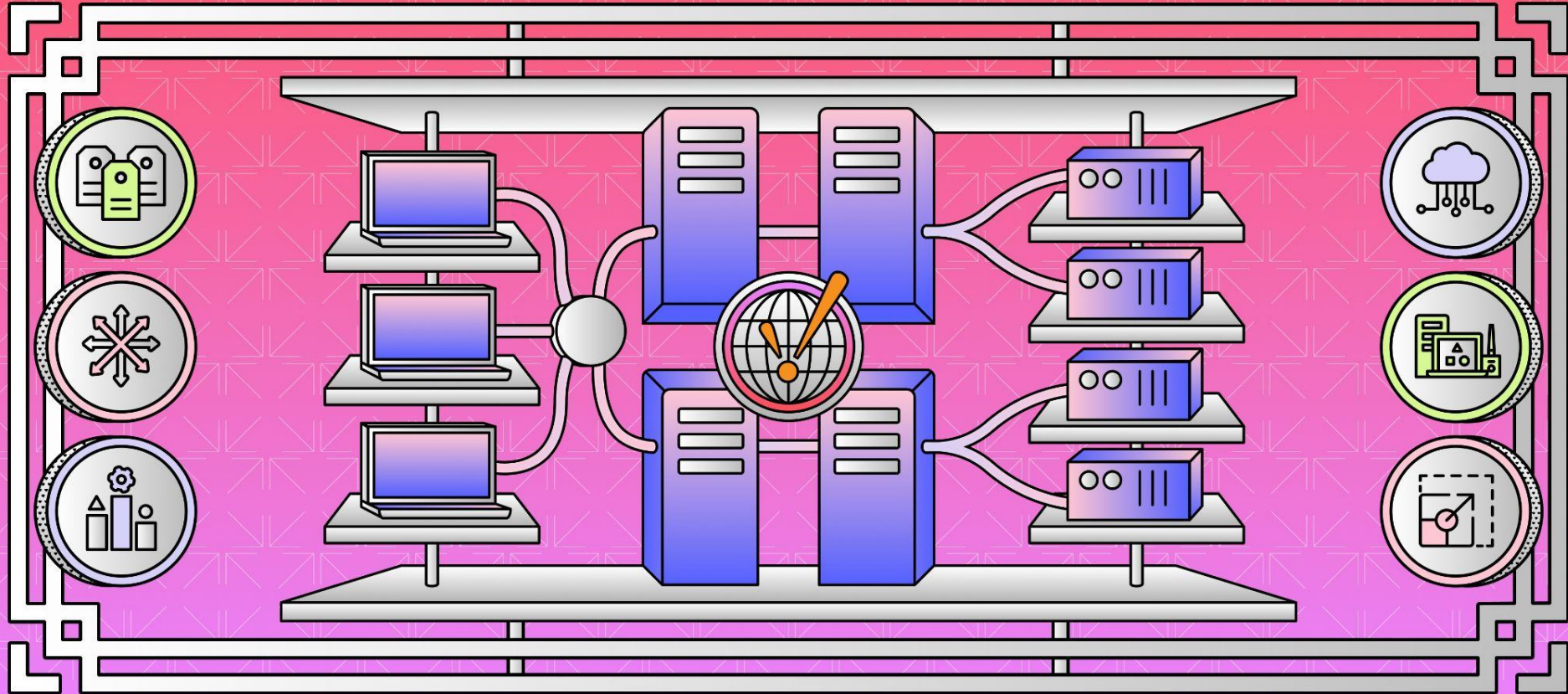


Stop Struggling, Start Scaling Your System With Ignition



Moderator



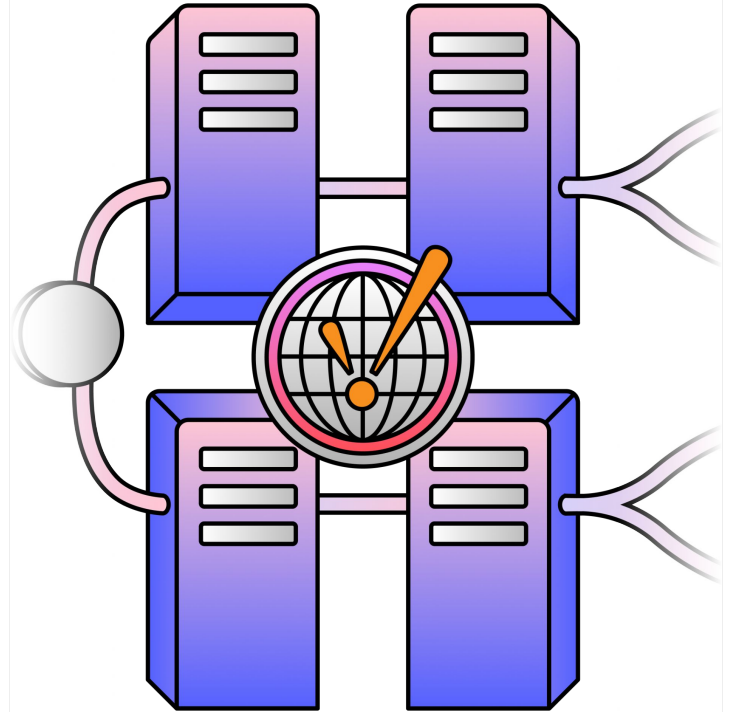
Reese Tyson

Senior Sales Engineer I

Inductive Automation

Agenda

- Introductions
- Project by Vertech
- Project by Enuda
- Project by DMC
- Project by Multi-Dimensional Integration
- Q&A



Guest Speakers



Alex Klein

Digital Plant Manager
Vertech



**Dragana Nikolova
Cvetanoska**

Head of Project
Management
Enuda



Ross Mowry

System Integration
Engineer
*Multi-Dimensional
Integration*



Addison Waege

Scrum Master
Vertech



John Williams

Regional Manager
DMC

About Inductive Automation



Johnson & Johnson



Chobani

69%

of Fortune 100

5k+

Registered
Integrators

140+

Countries

23+

Years In The
Industry

DFW

FUJIFILM



Crate&Barrel



NOV



BASF

Introducing Ignition

Connect, Design, and Deploy Without Limits:

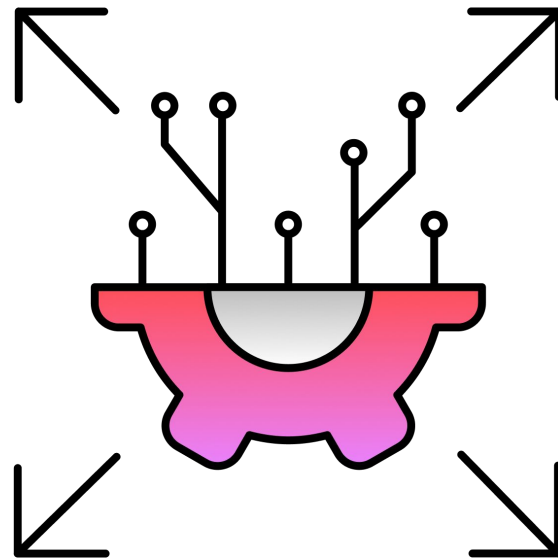
- One central hub for the plant floor and beyond
- Build any kind of industrial application
- Web-deploy to desktops, industrial displays & mobile devices
- Unlimited licensing
- Cross-platform compatibility
- Industrial-strength security & stability



**The Unlimited Platform for
Enterprise Integration, Industrial
Applications, and More**

Unlock Real Scalability With Ignition

- Ignition solves scalability pain points with unlimited licensing and flexible architectures.
- Let's explore some real-world projects to see how Ignition's unique features made scalability easy.





Scalability in Datacenters

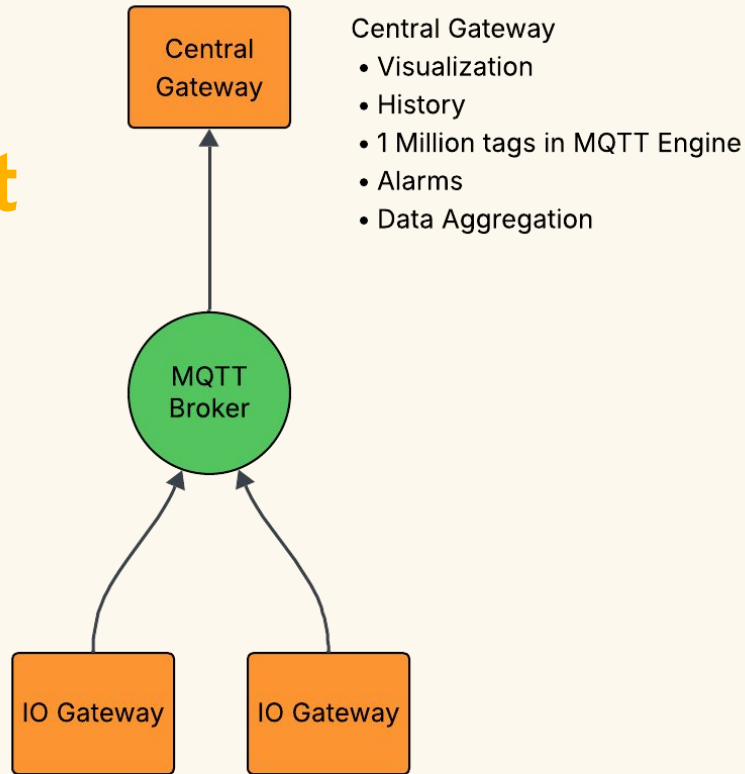
For Inductive Automation

Scalability

Lots of connections and Data

- Hundreds of devices to connect to
- Millions of tags to account for
- Multiple simultaneous users per site
- Our original intent needed to undergo a revolution.....

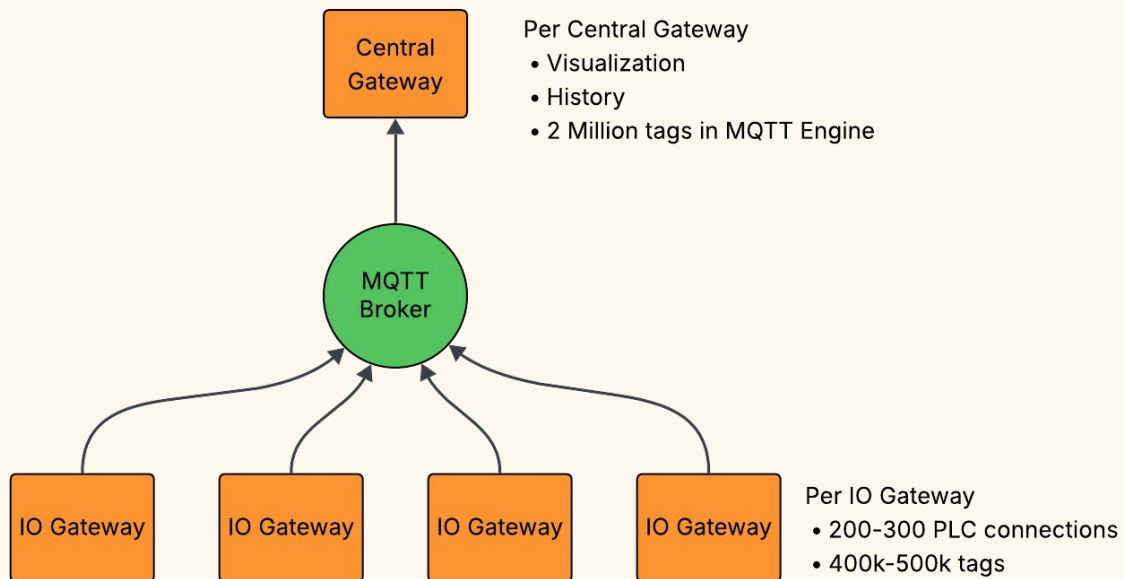
Starting Point



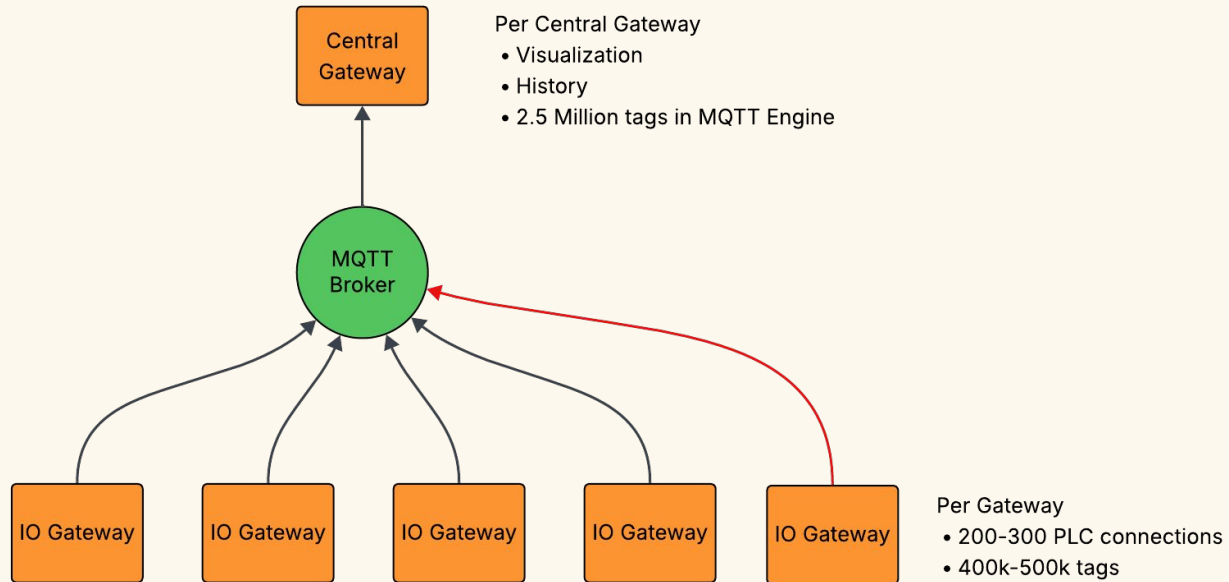
- Central Gateway
- Visualization
 - History
 - 1 Million tags in MQTT Engine
 - Alarms
 - Data Aggregation

- Per Gateway
- 200-300 PLC connections
 - 400k-500k tags

Max Stable Size



It Broke.....

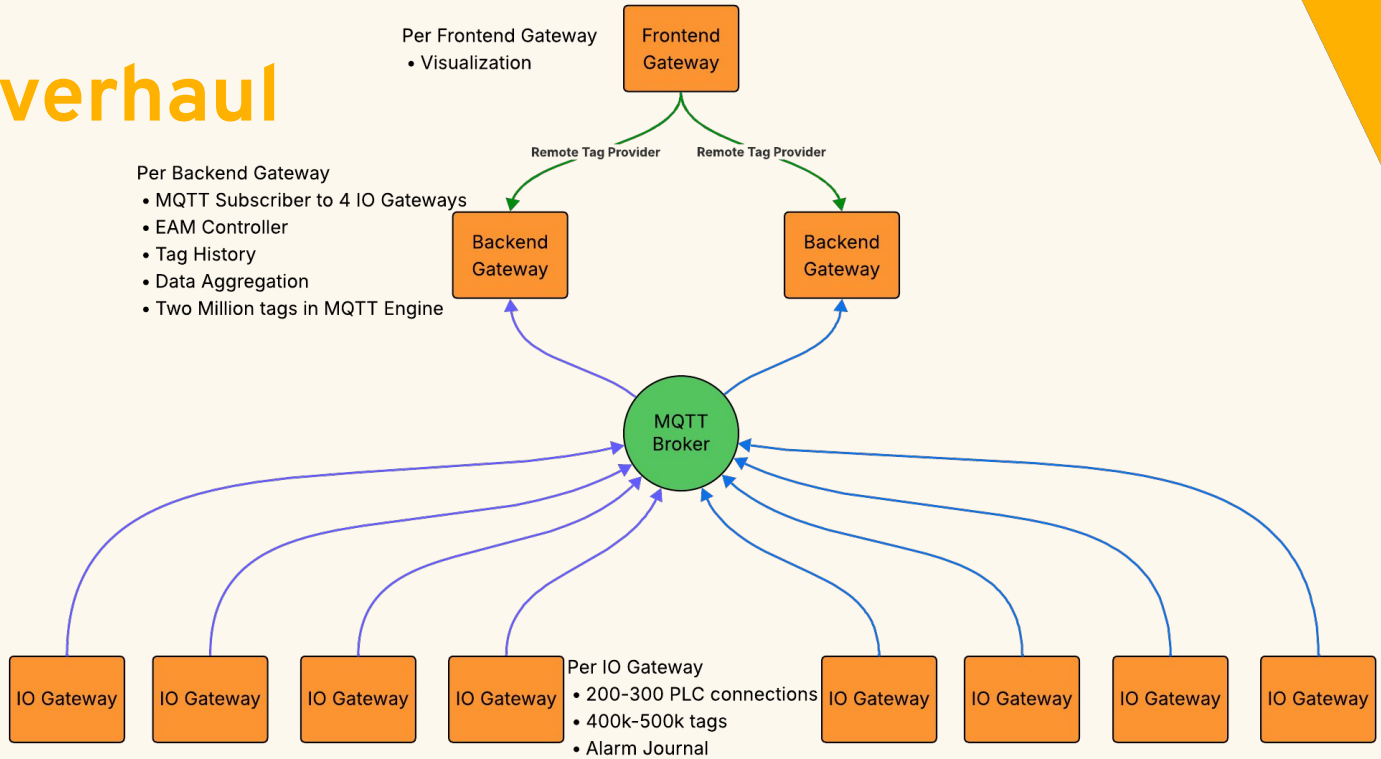


Reached out to our friends at IA

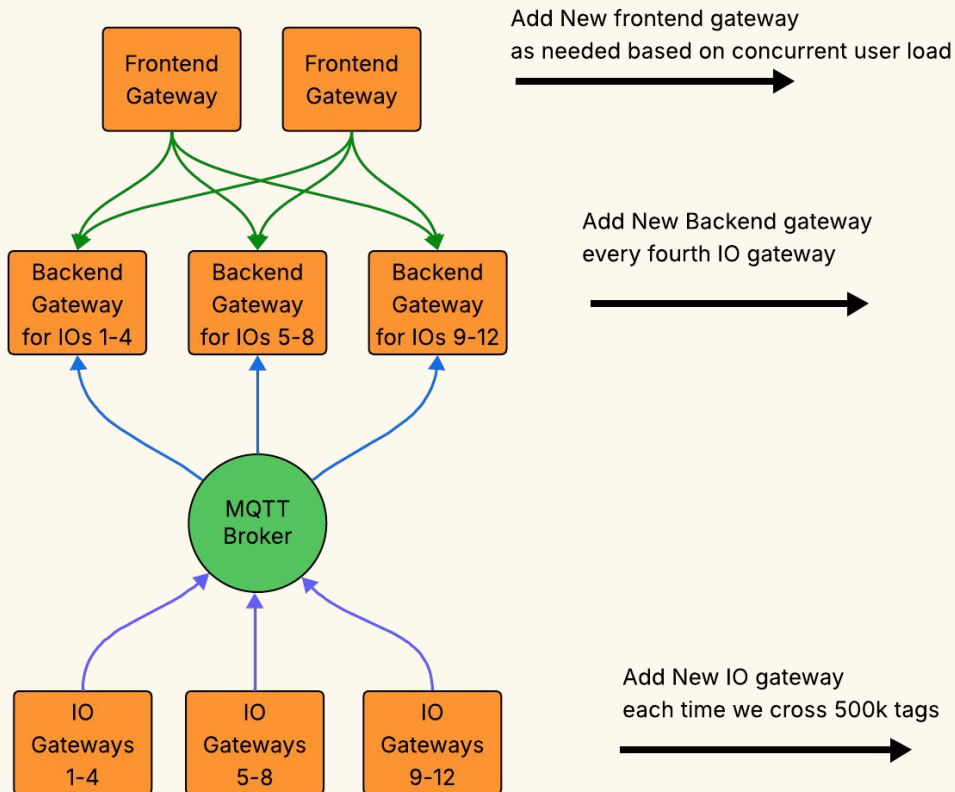
We brought this problem to IA and through many brainstorming sessions and baseline testing we landed on a prescribed scale out architecture.



The Overhaul



Horizontal Scale



Ignition as a Platform Allowed us to Scale

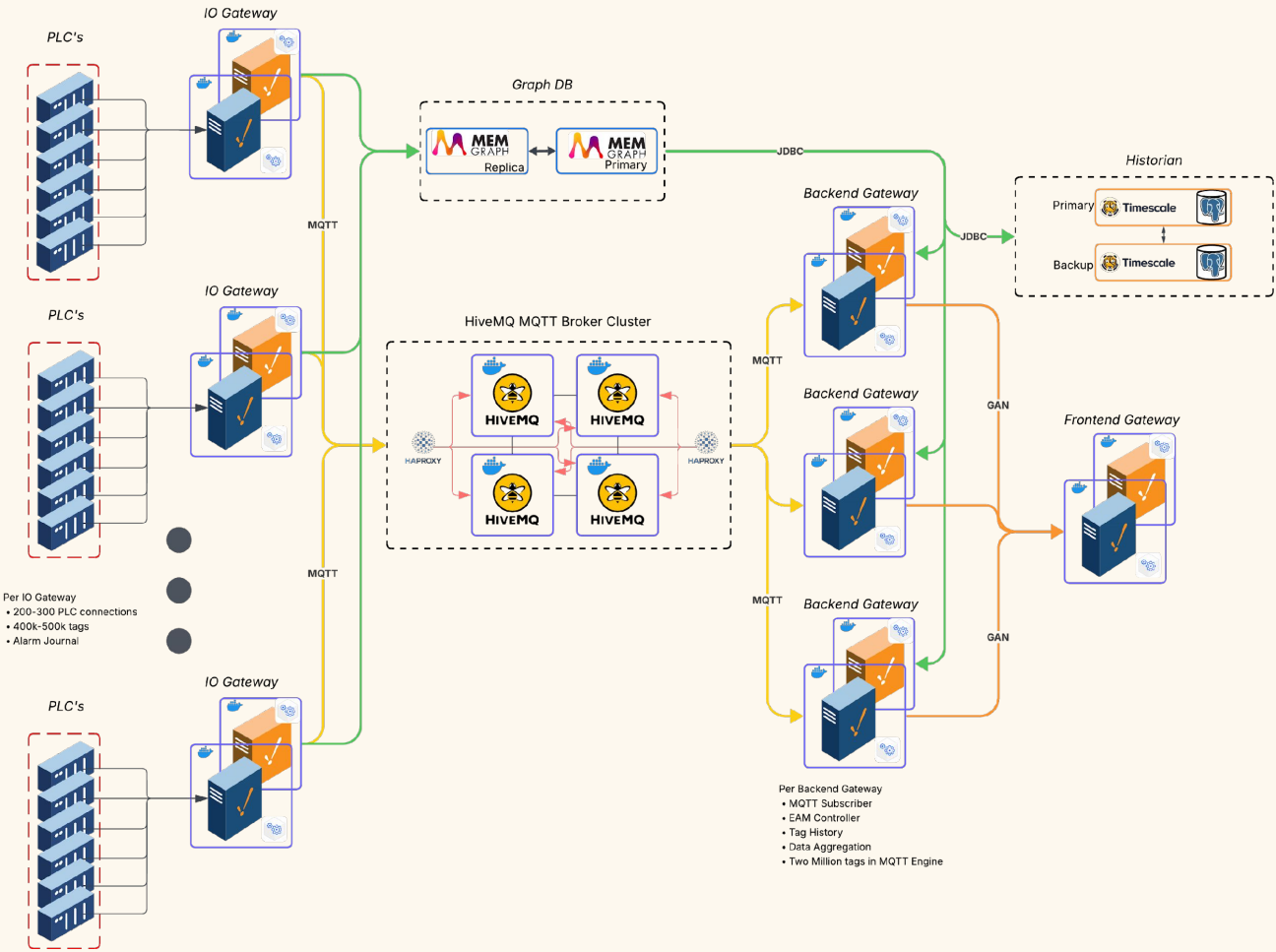
- Minimal rework of the application
- Clear scaling plan
- Deepened our understanding of the platform
- Happy customer

But scaling is not just about how big you can grow, you must be able to maintain it.....

Ignition 8.3

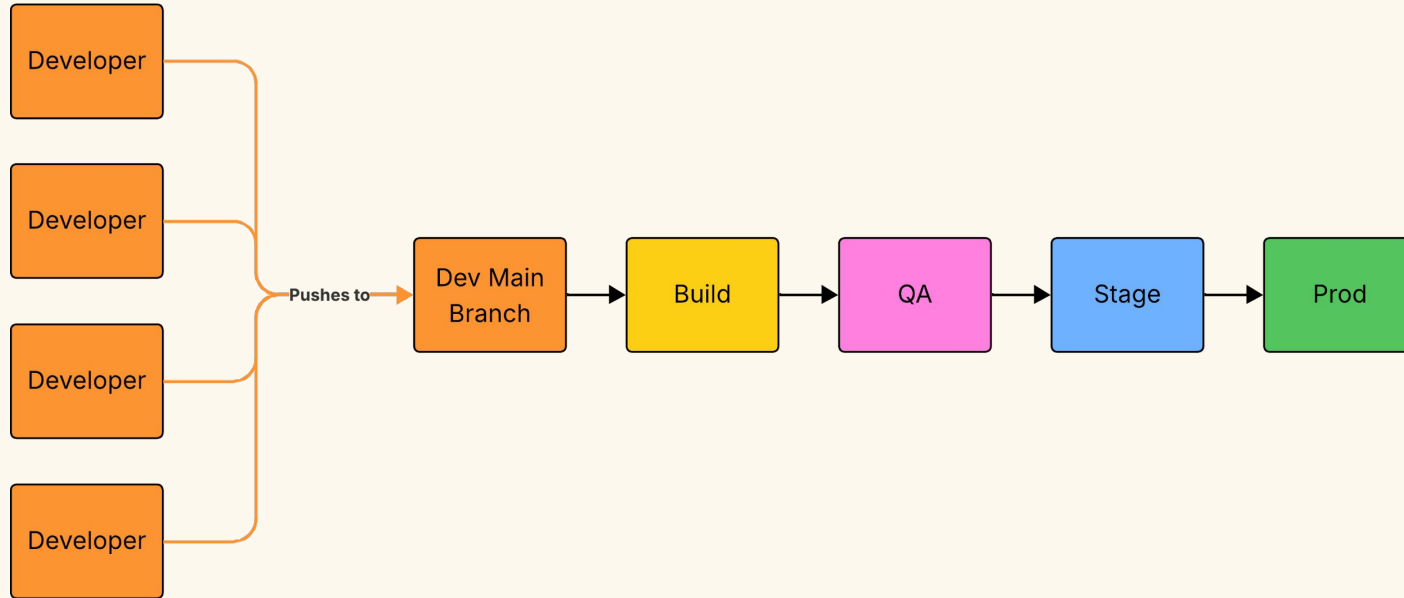
- Containerization and CI/CD became much easier
- Architecture as code





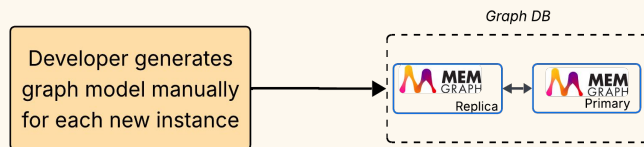
Throw Everything in a Container

Source Control & GitOps

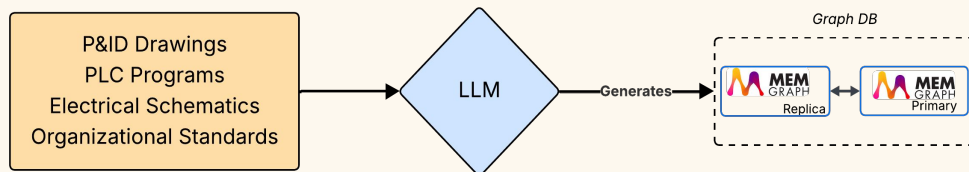


What Does the Future Look Like?

Today

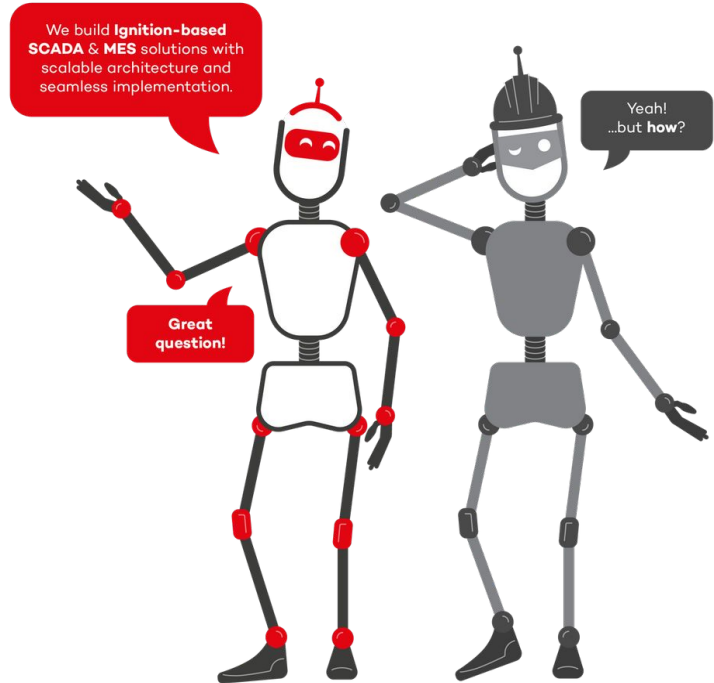


Future



FROM UNUSABLE TO **SCALABLE**:

Redesigning Industrial Historical
Reporting with Ignition



When Historical Reporting Breaks Down

Industry: Electrical Measurement



CRITICAL PERFORMANCE DEGRADATION

Queries for one hour of single-tag data were taking nearly 24 hours to complete.



ROOT CAUSES IDENTIFIED

- No defined polling strategy or tag organisation
- Legacy SCADA platform with limited data access
- Architecture unable to scale with system growth
- Inefficient database queries overwhelming the system

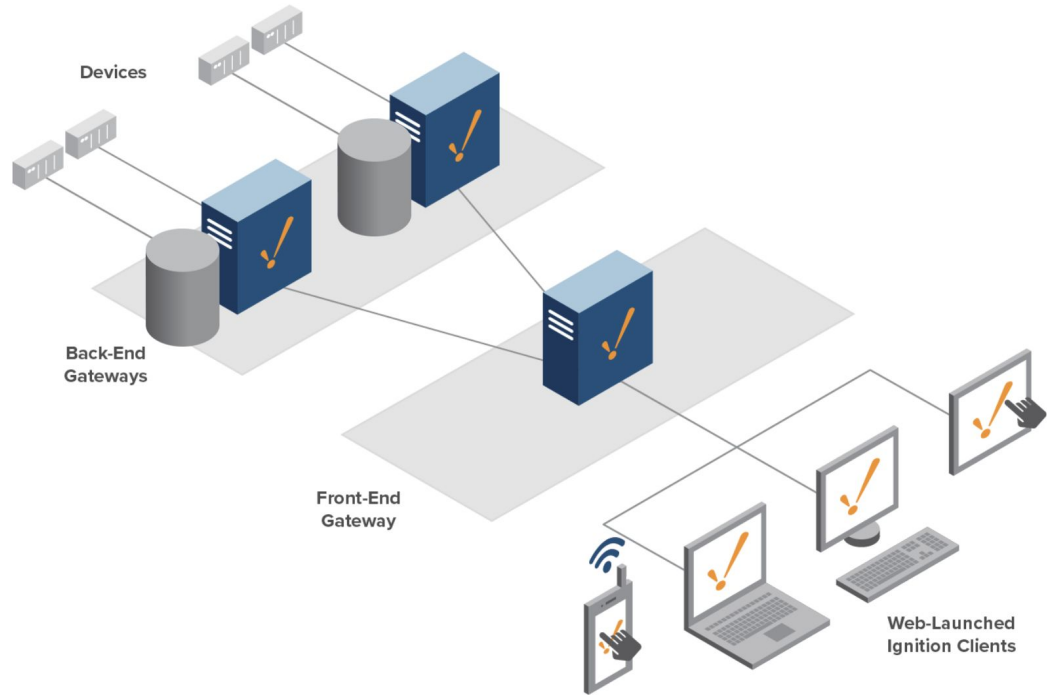
This wasn't a simple query optimisation problem—
the entire architectural foundation required a complete rethink
to support modern industrial operations.



Redesigning The Architecture with Ignition

We implemented a **scalable solution using Ignition**, separating backend data collection from frontend visualisation.

This layered approach enabled **independent scaling** of each component while **maintaining system performance and reliability across the entire site**.



Backend Layer: Data Acquisition

01

Data Acquisition

Direct connection to PLCs and field devices with optimised polling rates.

02

Tag Structuring

Organised hierarchical naming conventions for efficient querying.

03

Local Buffering

Store-and-forward capability ensures zero data loss during network disruptions.

04

Time-Series Storage

PostgreSQL with TimescaleDB extension for optimised historical data management. Optimised data storage performance at the gateway level.



Frontend Layer & Scalability Benefits



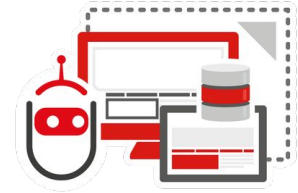
Site-Level Supervision

Centralised Ignition Standard Gateway provides unified visualisation, dashboards, and KPI reporting across all shop floor areas without impacting data collection performance.



Gateway Network Architecture

All communication between Level 1 and Level 2 flows through Gateway Network, enabling secure, efficient data transfer and centralised system management.



Horizontal Scalability

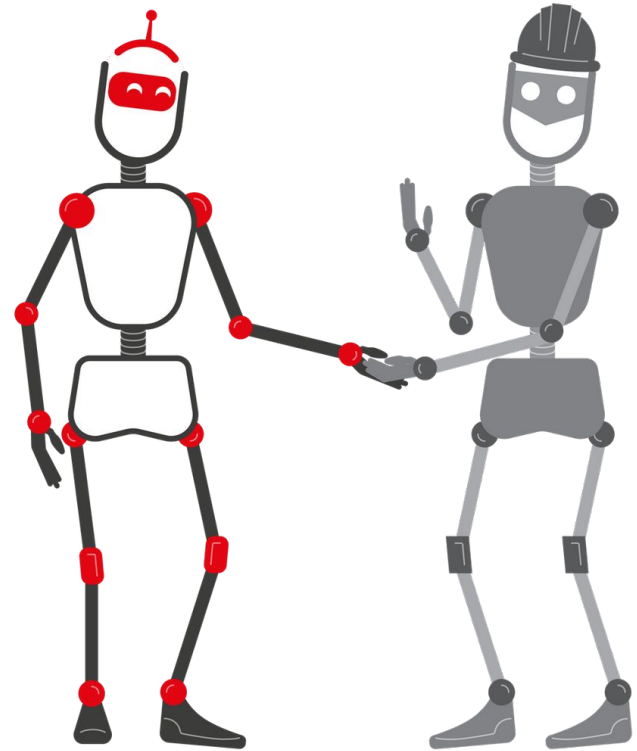
Add new Standard Gateways for additional shop floor areas without redesigning the architecture. Each gateway operates independently while contributing to the unified system.



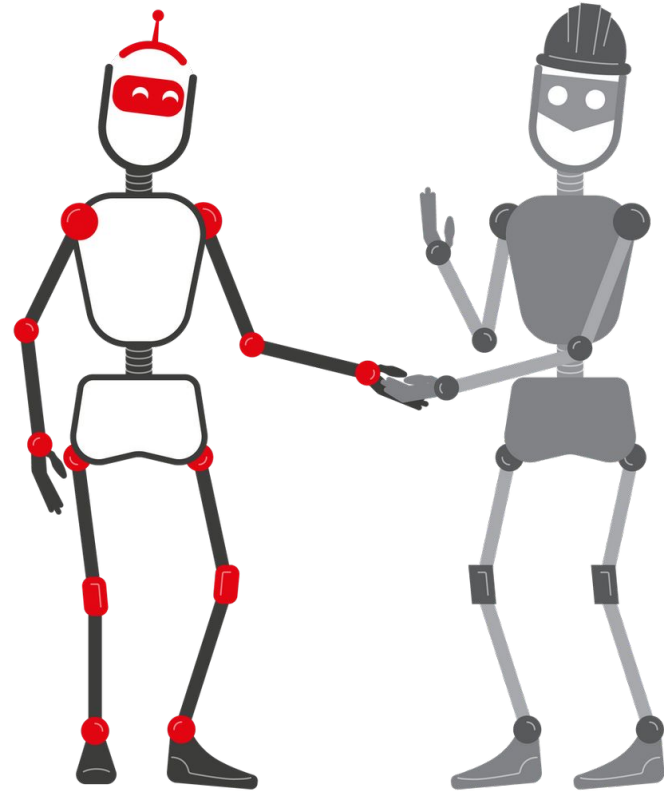
The Result

Historical queries now return in seconds, not days.

The system **scales seamlessly** as operations expand, and engineers have **reliable access to the data they need for informed decision-making.**

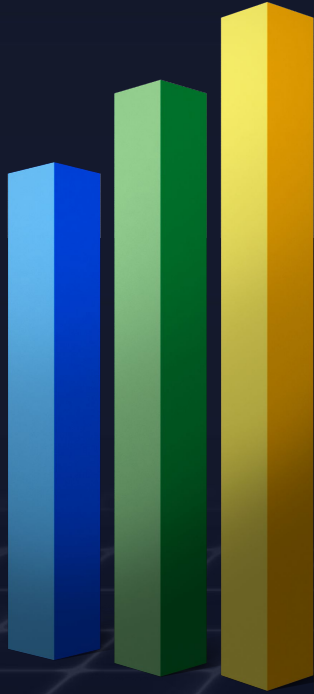


Thank You!



- **Ignition & Sepasoft Premier Integrator**
- 100+ Ignition Developers
- Awards
 - 2021 Firebrand Award Winner
 - 2024 Ignition Build-a-Thon Winner
 - 2024 CSIA (Control System Integrators Association) Integrator Member of the Year





How do we scale
from a pilot facility to
a production facility?

Sila Problem Statement

Alameda, CA – Sila Headquarters

- Research lab, battery cell lab, and manufacturing facility
- 50 MWh capacity
- **8 PLCs and 50K tags, single redundant gateway.**

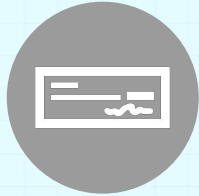


Moses Lake, WA – Production Facility

- 5 GWh capacity (25 - 100 GWh expansion)
- **25+ PLCs and 260K tags, 10+ edge instances.**



Common Scaling Problems



Lack of Investment



Lack of Int. Resources



Larger Scope + More Voices



Dedicated Internal Teams



No Visibility to Vendors



Geographic Differences



Up-front Expectation Setting



Supplemental External Resources

Key Technical Problems



Control Standardization



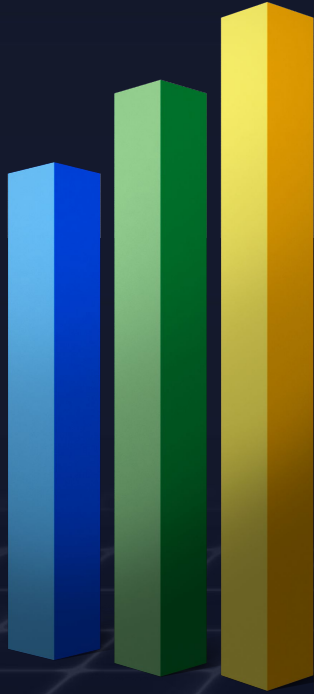
Flexibility & Uptime



Key Data Access



Consistent User Experience



Control Standardization

How do we standardize control schemes between different tools, systems, and developers?

Control Standardization



Previous State

- Variety of OEMs with different code bases
- Bespoke UDTs and devices based on developer/team

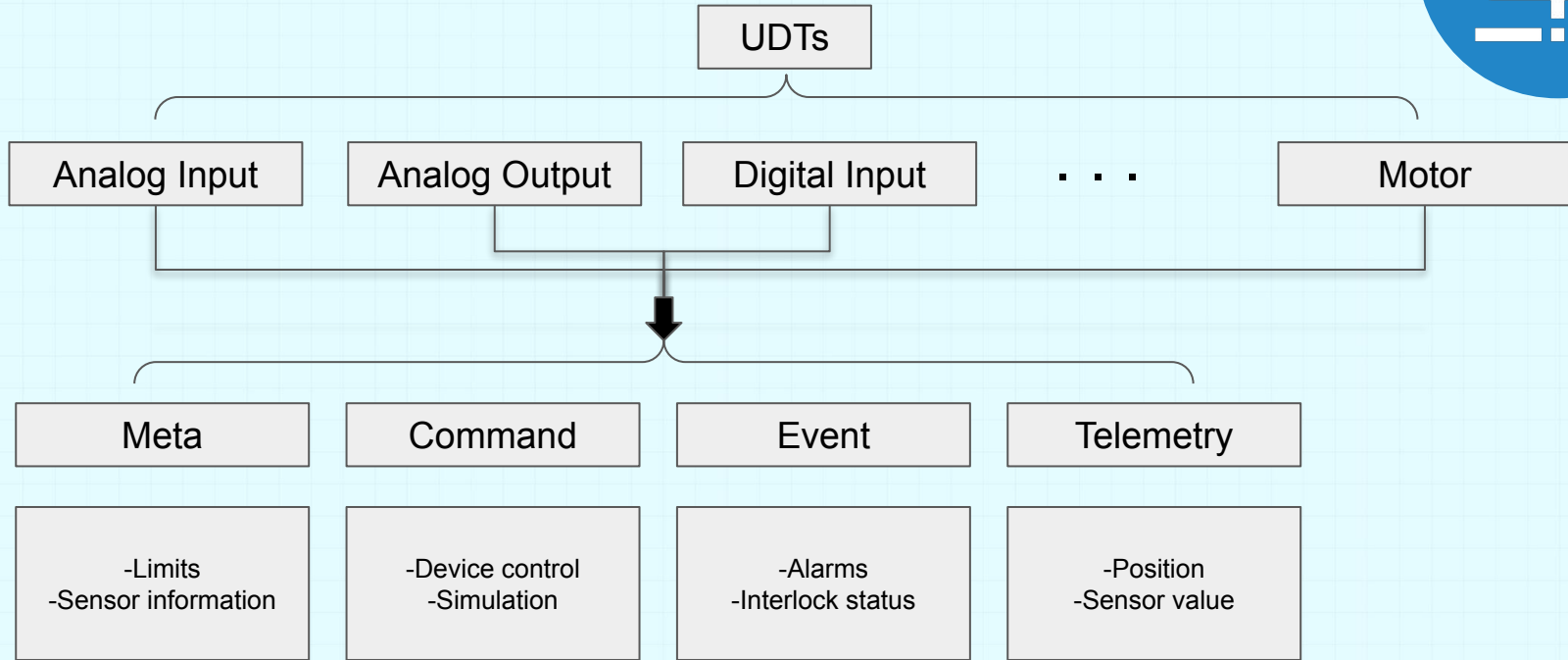
Solution

- Smart UDTs
- Re-develop OEM code as needed
- Import/export spreadsheet

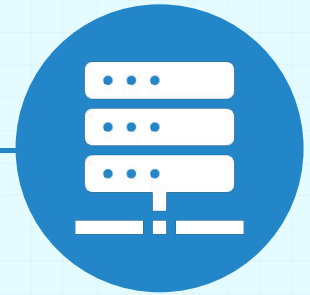
Current State

- Standard UDTs across all equipment
- Faster tag addition and modification with import/export tool

Control Standardization

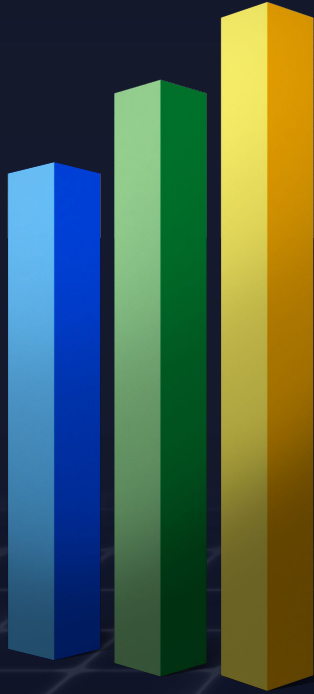


Control Standardization



	A	B	C	F	G	H	I	J	K	L
1	PnID	OPC UDT Struc	RootTag	description	engLo	engHi	alarmHiLimit	alarmLoLimit	rawValue	processValue
2	TI_006	Sila UDT	"DB_H_001_Inputs"							
3	TI_007	Sila UDT	"DB_H_001_Inputs"							
4	TI_008	Undefined	"DB_H_001_Inputs"	\$temp sensor 1	.LLM	.HLM	.SP_H	.SP_L	.ACT_Raw	.ACT
5	TI_009	Undefined	"DB_H_001_Inputs"	\$temp sensor 2	.SplInputMin	.SplInputMax	AlarmH	AlarmL	.InputValue	.OutputValue





Flexibility & Uptime

How do we bring tools online quickly and provide flexibility for future downtime?

Flexibility & Uptime



Previous State

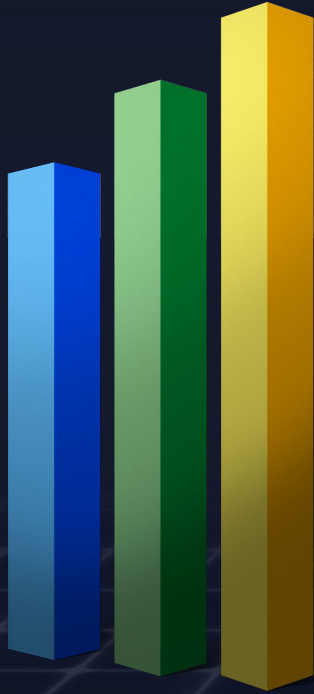
- Gateway network for data collection and OPC connections
- Point-to-point connections, heavier load on edge devices
- Manual setup for new tools

Solution

- MQTT pub/sub model
- Decoupled, lighter data flow
- Automatic tag discovery speeds up onboarding

Current State

- Decoupled architecture
- Edge devices simplified
- Foundation for UNS
- Robust and flexible



Key Data Access

How do we generate and provide key system data to key personnel?

Key Data Access



Previous State

- Tools logged data separately
- Connections were one-off and brittle
- Users had to request data

Solution

- UNS
- Structuring tags by location/unit/device instead of by PLC for user familiarity

Current State

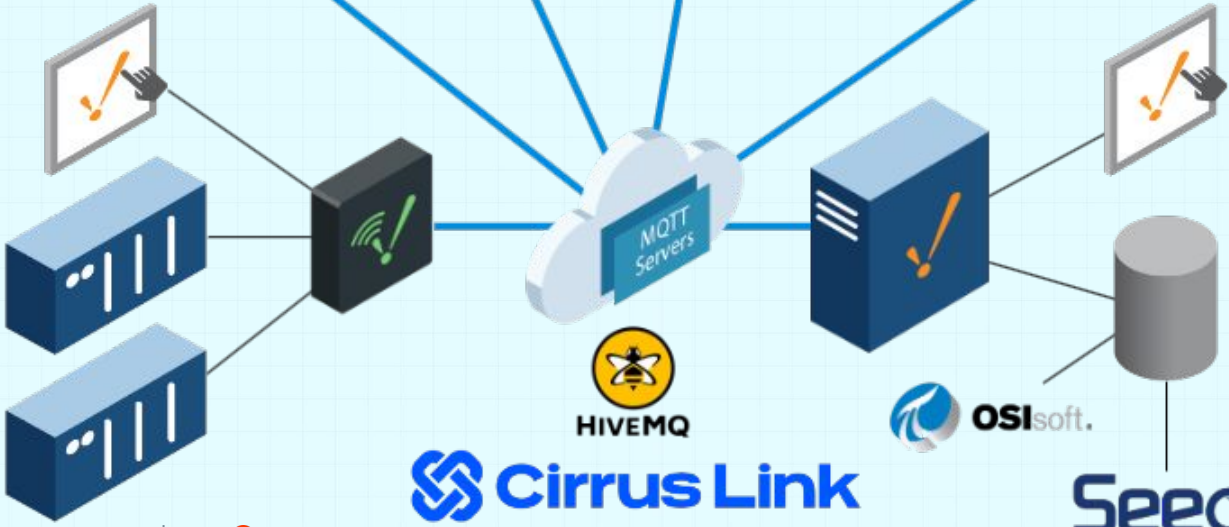
- One namespace, many consumers
- Democratized access
- Consistent context
- Real-time availability

Key Data Access



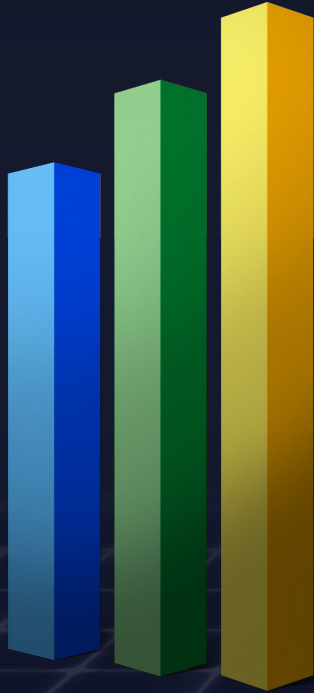
Enterprise

Manufacturing



HIVEMQ





Consistent User Experience

How do we ensure a single look and feel from the edge through to the central control room?

Consistent User Experience



Previous State

- Disparate OEM HMIs
- Inconsistent standards between teams / developers

Solution

- Ignition Edge + Central Gateway Interfaces
- Deployment pipelines via Gateway Network
- Session properties

Current State

- Library of shared screens and components
- Common user interface for OEM and Sila developed tools
- Easy to use screens

Consistent User Experience

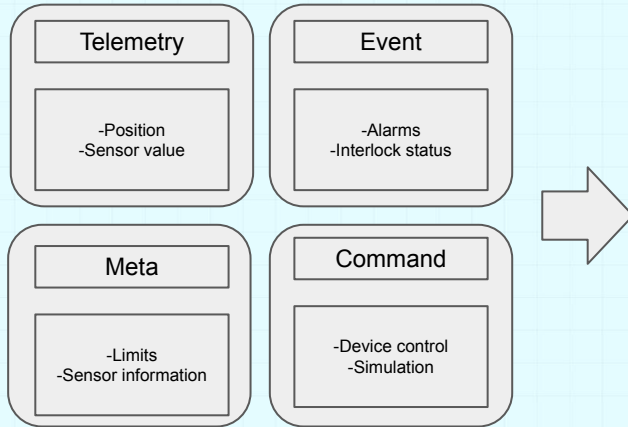


AI 0 bar PDI_001 500 TL_006 C 0 C TI_007	AO OP: 0 % JC_001 OP: 0 % JC_002
DI ZI_003 ZI_004	DO open HS_123 HS_123 HS_123 SL_001
Motor M_100 Current: 1.0 Speed RPM: 1.0 Torque: 1.0 M_100 Current: 1.0 Speed: 1.0 Speed RPM: 1.0 Torque: 1.0 M_100 Current: 1.0 Speed: 1.0 Speed RPM: 1.0 Torque: 1.0 M_101 Current: 1.0 Speed: 1.0 Speed RPM: 1.0 Torque: 1.0	Alarm 1. TI_006 - L - Low Temperature 2. TI_006 - H - High Temperature 3. PT_001 High Pressure 4. TT_001 High Temperature
PID 23 FIC_002 FIC_002 PV: 3.21 SP: 1 1.0 %	Selector Select... HS_001

Button START	FNVR M_328 M_328
F-AI 0 C SI_445 0 C TI_201B 0 null TI_203B	F-DI XA_201
F_DO closed EY_203 EY_406 EY_406	SIF SIF Tripped S_306 SIF Tripped S_307



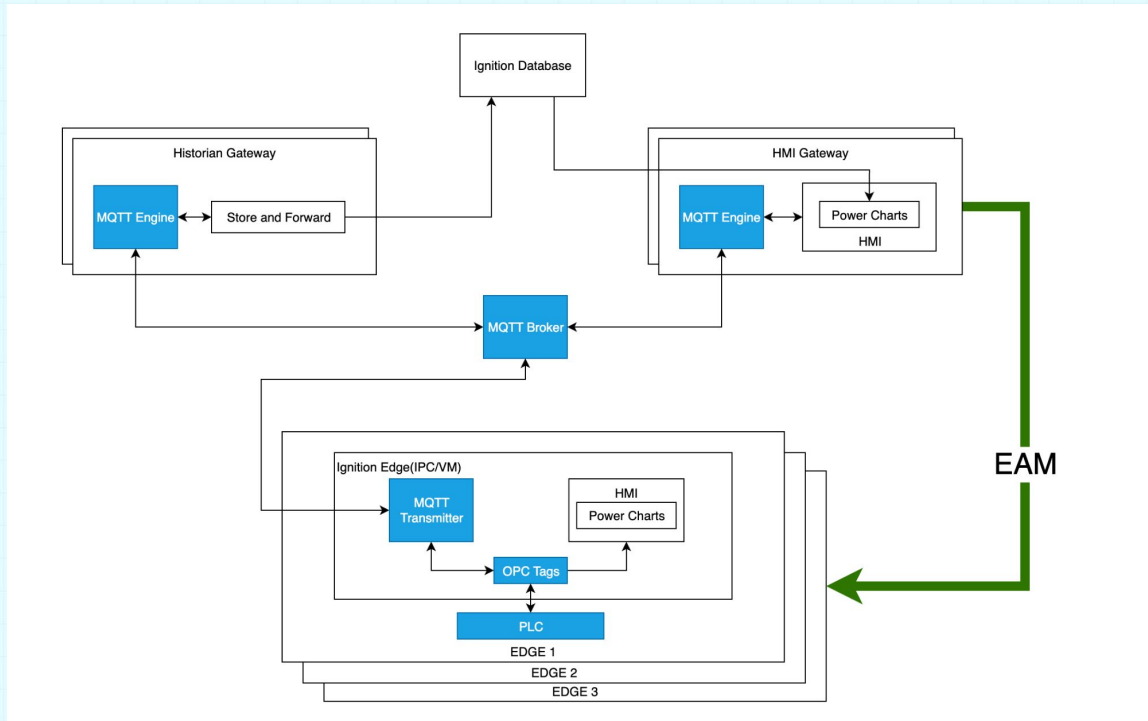
Consistent User Experience



The screenshot shows a user interface for a sensor named "Sensor TI_005". The interface is divided into several sections:

- Telemetry:** Process Value: 21.69 °C, Raw Value: 13213.0
- Event:** Fault: IO Fault: Module Fault: HH: LL: H: L:
- Meta:** Device Type: Temp. Transmitter, Smart; Eq. Module: Unit 095; Description: 095-TK-001; Sig. Type: Current; Eng Lo: -50.00; Eng Hi: 100.00; Hi Hi Limit: 100.00; Timer: 0.00 s; Hi Limit: 90.00; Timer: 5.00 s; Lo Limit: -22.34; Timer: 60.00 s; Lo Lo Limit: -50.00; Timer: 0.00 s
- Command/Simulation:** Overwrite: ; Disable Device: ; Use Alternate Value: ; Alternate Value: 0.00; **SET VALUES** button
- Graph:** A line graph with a y-axis from 0 to 100 and an x-axis with a value of .000. The graph area is currently black.
- Command:** Disable Device: ; **SET VALUES** button

Consistent User Experience





MULTI-DIMENSIONAL
I N T E G R A T I O N



MES Workflow Integration At An Enterprise Scale



Project Summary

- **Scope**

- Create an operator workflow engine that provided a standardized operator experience to orchestrate machine and component work orders across fabrication, paint, and assembly areas.
- Integration of AMR/AGV fleet controllers, PLC controlled subsystems, torque tools, and other automated equipment.

- **Considerations**

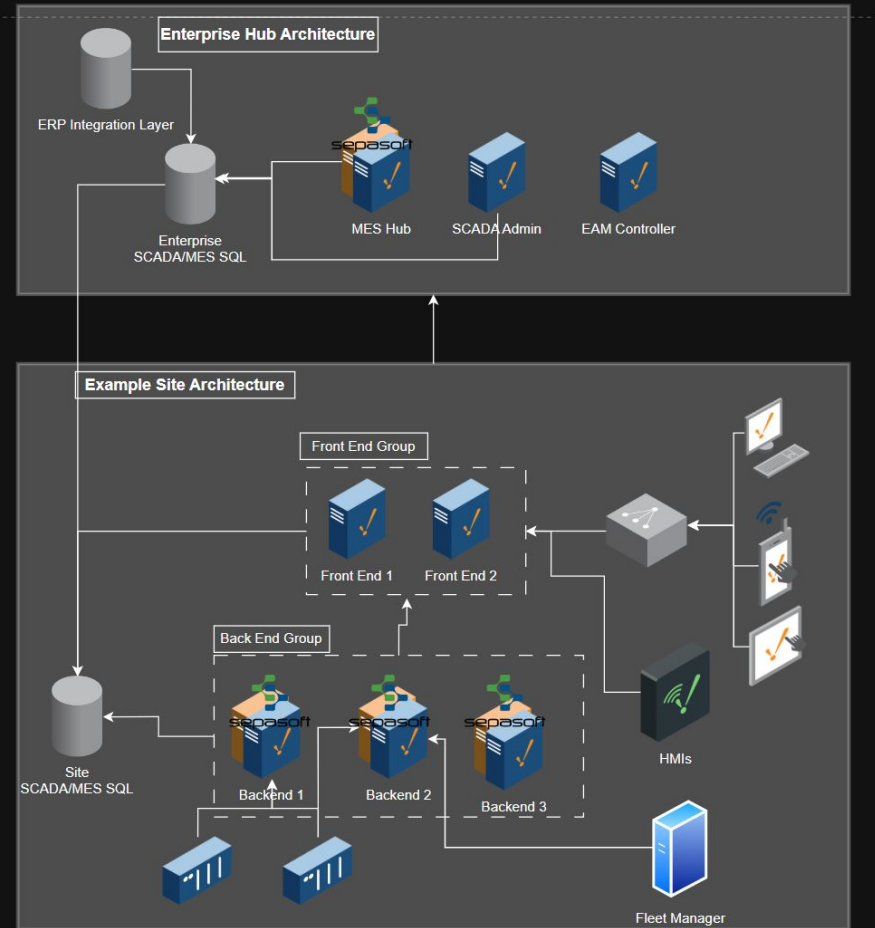
- Variable workflow requirements applied at the area, line, and cell level.
- Modular design for ease of integration of future features.

- **Key Concepts**

- Identify common use cases.
- Identify where each required feature's configuration belonged.

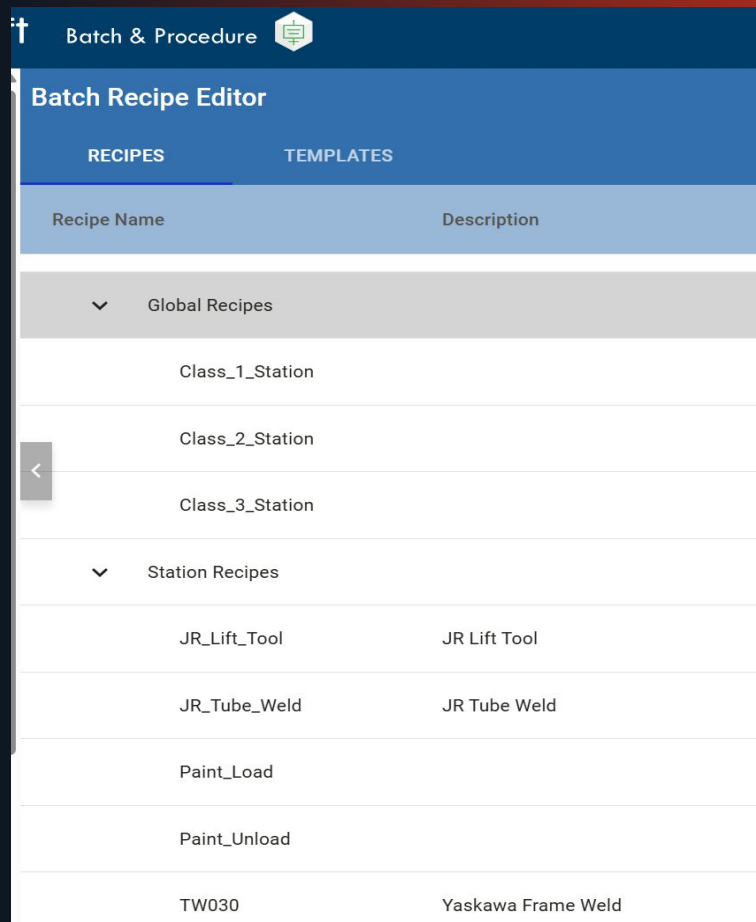
Architecture

- Sepsosoft MES Enterprise used to sync data and application resources.
- Back End Gateway Group
 - Load balancing of station cycle execution by area.
 - Strategic division of high load bearing features. Plant run schedule generation, AMR fleet manager integration...etc).
- Front End Gateway Group
 - Pairing with a load balancer to fit number of front end servers to match site size.



Station Class Definition

- Station class grouping to manage definition of the work content in a station and standardize the core process of work order execution.
- Class 1 - Operator work order interaction, no automated tooling.
- Class 2 - Cycle execution with an AGV/AMR.
- Class 3 - Cycle execution with recipe controlled automated tool.
 - Special consideration for equipment and station specific workflows.
- Resources managed globally at the MES Hub for synchronous consistent deployments to all sites and servers.



The screenshot shows the 'Batch & Procedure' interface with a 'Batch Recipe Editor' window. The window has two tabs: 'RECIPES' (selected) and 'TEMPLATES'. Below the tabs is a table with columns 'Recipe Name' and 'Description'. The table is organized into two sections: 'Global Recipes' and 'Station Recipes', each with a dropdown arrow. The 'Global Recipes' section lists 'Class_1_Station', 'Class_2_Station', and 'Class_3_Station'. The 'Station Recipes' section lists 'JR_Lift_Tool' (JR Lift Tool), 'JR_Tube_Weld' (JR Tube Weld), 'Paint_Load', 'Paint_Unload', and 'TW030' (Yaskawa Frame Weld).

Recipe Name	Description
Global Recipes	
Class_1_Station	
Class_2_Station	
Class_3_Station	
Station Recipes	
JR_Lift_Tool	JR Lift Tool
JR_Tube_Weld	JR Tube Weld
Paint_Load	
Paint_Unload	
TW030	Yaskawa Frame Weld

Resources Built For Scale

- Development of self configuring resources to manage large scale deployments and increase standardization were developed.
- Project standard script libraries to decrease developer spin up time and increase global variable references.
- Station Control View Mapping
 - Definition of all operator interfaces managed in site central SQL DB.
 - Tags within the station definition UDT pull the view layout data for use on a view canvas.
 - Provides the ability to update a station control screen site wide.
- Flexibility Where it Matters
 - UDTs and script libraries that leveraged the ISA-95 model.
 - Flexibility in the SCADA layer allowed workflows to be optimized at the station level.
 - Allowed for maintaining commonality in the MES layer as new use cases and stations are added to each facility.

Class 1 Fabrication Station

Current index time remaining: Today's Takt Time: 112 minutes


1:51:48

Machines Completed: 0

Station: 111:48
Ahead
Line 2
Behind

Previous Shift Total: 1 /0

Station TT090A - Status


Waiting for Cycle Start

Barcode Verification

Component ID Unverified

Component ID

Scan barcode to verify...

Verify Component ID

Requested Item Number: 1001290006
Click to Refresh

Work Status Control

Supervisor Override

Work Complete

Request Supervisor Help

Non-Conformance

Run Schedule: Select any Component ID with Matching Item Numbers

M04618020240619
PNT, BLACKS JLG3360023 JLG BLACK GLOSS | BOOM,MID WELD |
StartDate: Jun 19 2024 12:00AM |
M046180 | 1001290006

M16171020240702
PNT, BLACKS JLG3360023 JLG BLACK GLOSS | BOOM,MID WELD |
StartDate: Jul 2 2024 12:00AM |
M161710 | 1001290006

Class 2 Assembly Station Control Variant

Current index time remaining: Today's Takt Time: 25 minutes

25:00

Machines Completed

0

Previous Shift Total: 0


Station

25:00
Ahead

Line
10
Behind

/0

Station TF010C - Status



 Waiting for Cycle Start

Barcode Verification

Component ID Unverified


Component ID

Scan barcode to verify...


 Verify Component ID

Work Status Control

Supervisor Override


 Work Complete

Request Supervisor Help
 Non-Conformance

Run Schedule: Scan First Order from the Schedule

0160136114


E75 | ENCLOSED CAB,W/HEAT,A/C | ENG,HRC 74HP | 8042 |
 BASE BOOM PAINT: ORANGE,JLG
 M558520 | ID: UNDEFINED(ERROR)

0160134483

E75 | ENCLOSED CAB,W/HEAT | ENG,HRC 74HP | 8042 |
 BASE BOOM PAINT: ORANGE,JLG
 M558530 | ID: UNDEFINED(ERROR)

Main Schedule
Alarm

Station Enable Control

 Disable Station TF010C

Station In Manual Material Delivery

Station In Manual Material Delivery

Material Handler Ready to Move

> Material Handler Entrance Permission

Material Delivery Selection

Change to AMR Delivery

Permission to Exit to Station PT_Unload_Q1 NOT Granted
 Active Work Order: None

Material Exit Confirmation

Material Handler Ready to Move

> Material Handler Ready to Move

Station Control
JaMES
Part Requesting
Interlocks

Class 3 Paint Line Loading Station

Current index time remaining: Today's Takt Time: 8 minutes

07:58

Machines Completed: **0**

Previous Shift Total: 0

Station: **7:58**
Ahead
Line
33
Behind

/0

Station PT010A - Status

Alarm Active

Paint Load Sequence

Barcode Verification

Component ID Verified

Component ID: M01684020250227

Verify Component ID

Work Status Control

Supervisor Override

Work Complete

Request Supervisor Help

Non-Conformance

Material Delivery Selection

Change to AMR Delivery

Waiting for Manual Delivery

Material Arrival Confirmation

Run Schedule: Select 2 Components to load into Paint

M01684020250227
BLACK, JLG GLOSS | Carrier GroupId: 12 | Carrier Order: 1 |
Kit Number: 1 |
0160136632 | 1001281972

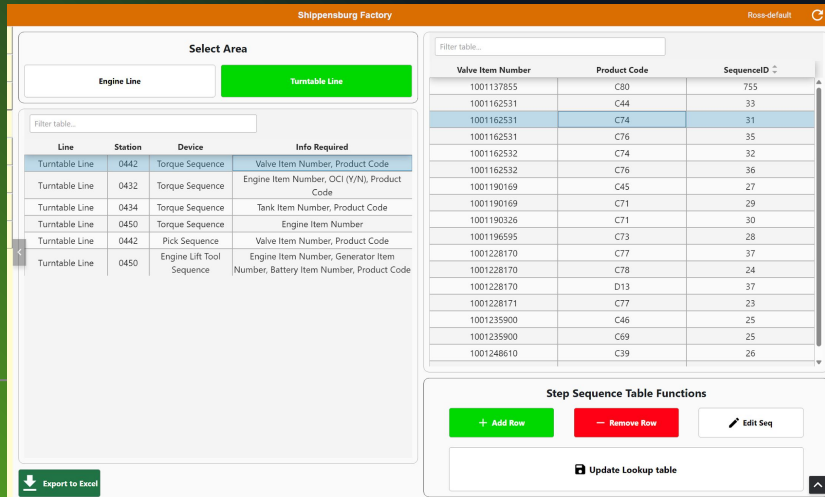
M01685020250227
BLACK, JLG GLOSS | Carrier GroupId: 12 | Carrier Order: 4 |
Kit Number: 1 |
0160136583 | 1001281972

Station Control | JaMES | Interlocks

Main Schedule | Recipe | **Alarm Active**

Automation Sequence Management

- Feature integrated into class 3 stations that allows for the sequence of automated tooling steps to be completed in a station for a given work order.
- Allows for a dynamic number of tools to be defined as part of a station. Users can edit what the mix of tooling steps and the recipe/job commanded to the system.
- Each tool definition is maintained in a UDT and relational database table as a new tool type is integrated.
- Enables a variable number of arguments in determining the recipe by automation sequence and station. Integrated into work order scheduling functionality to ensure standard order retrieval and catch issues caused by being unable to load a recipe in a station that needs it ahead of time.



Shippensburg Factory - Ross-default

Select Area

Engine Line: Turntable Line:

Filter table...

Line	Station	Device	Info Required
Turntable Line	0442	Torque Sequence	Valve Item Number, Product Code
Turntable Line	0432	Torque Sequence	Engine Item Number, OCI (Y/N), Product Code
Turntable Line	0434	Torque Sequence	Tank Item Number, Product Code
Turntable Line	0450	Torque Sequence	Engine Item Number
Turntable Line	0442	Pick Sequence	Valve Item Number, Product Code
Turntable Line	0450	Engine Lift Tool Sequence	Engine Item Number, Generator Item Number, Battery Item Number, Product Code

Filter table...

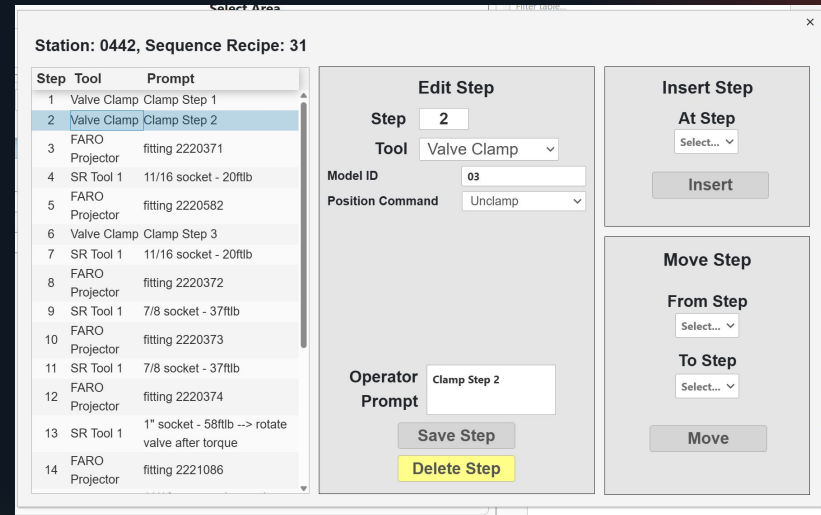
Valve Item Number	Product Code	SequenceID
1001137855	C80	755
1001162531	C44	33
1001162531	C74	31
1001162531	C76	35
1001162532	C74	32
1001162532	C76	36
1001190169	C45	27
1001190169	C71	29
1001190326	C71	30
1001196595	C73	28
1001228170	C77	37
1001228170	C78	24
1001228170	D13	37
1001228171	C77	23
1001235900	C46	25
1001235900	C69	25
1001248610	C39	26

Step Sequence Table Functions

+ Add Row - Remove Row Edit Seq

Update Lookup table

Export to Excel



Station: 0442, Sequence Recipe: 31

Step	Tool	Prompt
1	Valve Clamp	Clamp Step 1
2	Valve Clamp	Clamp Step 2
3	FARO Projector	fitting 2220371
4	SR Tool 1	11/16 socket - 20ftlb
5	FARO Projector	fitting 2220582
6	Valve Clamp	Clamp Step 3
7	SR Tool 1	11/16 socket - 20ftlb
8	FARO Projector	fitting 2220372
9	SR Tool 1	7/8 socket - 37ftlb
10	FARO Projector	fitting 2220373
11	SR Tool 1	7/8 socket - 37ftlb
12	FARO Projector	fitting 2220374
13	SR Tool 1	1" socket - 58ftlb --> rotate valve after torque
14	FARO Projector	fitting 2221086

Edit Step

Step:

Tool:

Model ID:

Position Command:

Operator:

Prompt:

Buttons: Save Step, Delete Step

Insert Step

At Step:

Insert

Move Step

From Step:

To Step:

Move

Global User Management

Integration of User Management at the enterprise level.

- Integration of AD/Hybrid user source to all Ignition devices in an effort towards SSO.
- Allows for a user to be added to all site and Ignition Edge gateways at once.
- Site specific role and roster management. Admin page to associate gateway network connections with a site as new gateways come online.

The screenshot displays the 'Edit User' interface for user 'u123456' in the 'Enterprise (Menasha)' system. The interface is divided into several sections:

- Navigation:** Home, Admin, and Dashboards.
- User Properties:** Fields for User Number (u123456), First Name (Ross), and Last Name (Mowry).
- Roles:** A list of roles with checkboxes and site selection dropdowns:
 - Administrator (checked), Shippensburg
 - Developer (checked), McConnellsburg, Shippensburg
 - Engineering (checked), Select Site(s)
 - Maintenance (checked), Select Site(s)
 - Quality (checked), Select Site(s)
 - Scheduler (checked), Select Site(s)
- Rosters:** An empty table for managing rosters.
- Contact Information:** A table with columns for Type, Value, and Remove? containing an email address: rmowry@jlg.com.

Future Integrations

▪Enterprise and Site Level UNS Integration

- Connectivity to monitor production and KPIs at all levels of the enterprise.
- Historical data collection.
- Enhanced velocity to future deployments.

▪Integration of Legacy Integrations

- Tying together smaller one-off projects into the enterprise architecture for better visibility and application synergy.



Ignition! 8.3

Ready To Try Ignition For Yourself?

Download the full version for free at:

inductiveautomation.com



[inductiveuniversity.com](https://www.inductiveuniversity.com)

*Ignition User Manual also available at:
docs.inductiveautomation.com*

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Questions & Answers



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