Designing for Sustainable TCO in Connected Manufacturing Implementations

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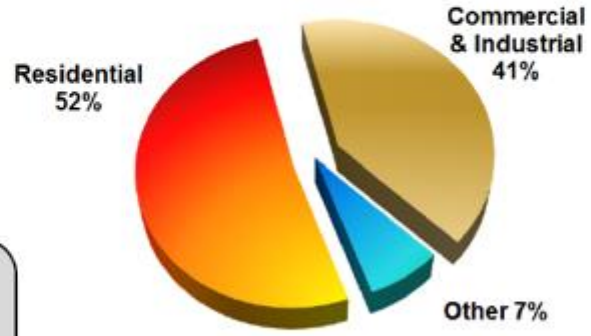
At a Glance

Variety of end markets include residential, light commercial and industrial

Leading designer and manufacturer of a wide range of power generation equipment and other engine powered products

Global distribution network of independent dealers, distributors, retailers, wholesalers and equipment rental companies, and also sold direct to certain end users

2017 LTM Sales: $1.518 billion



Global manufacturing, distribution, fulfillment and commercial footprint with facilities located in the U.S., Latin America, Europe and Asia.

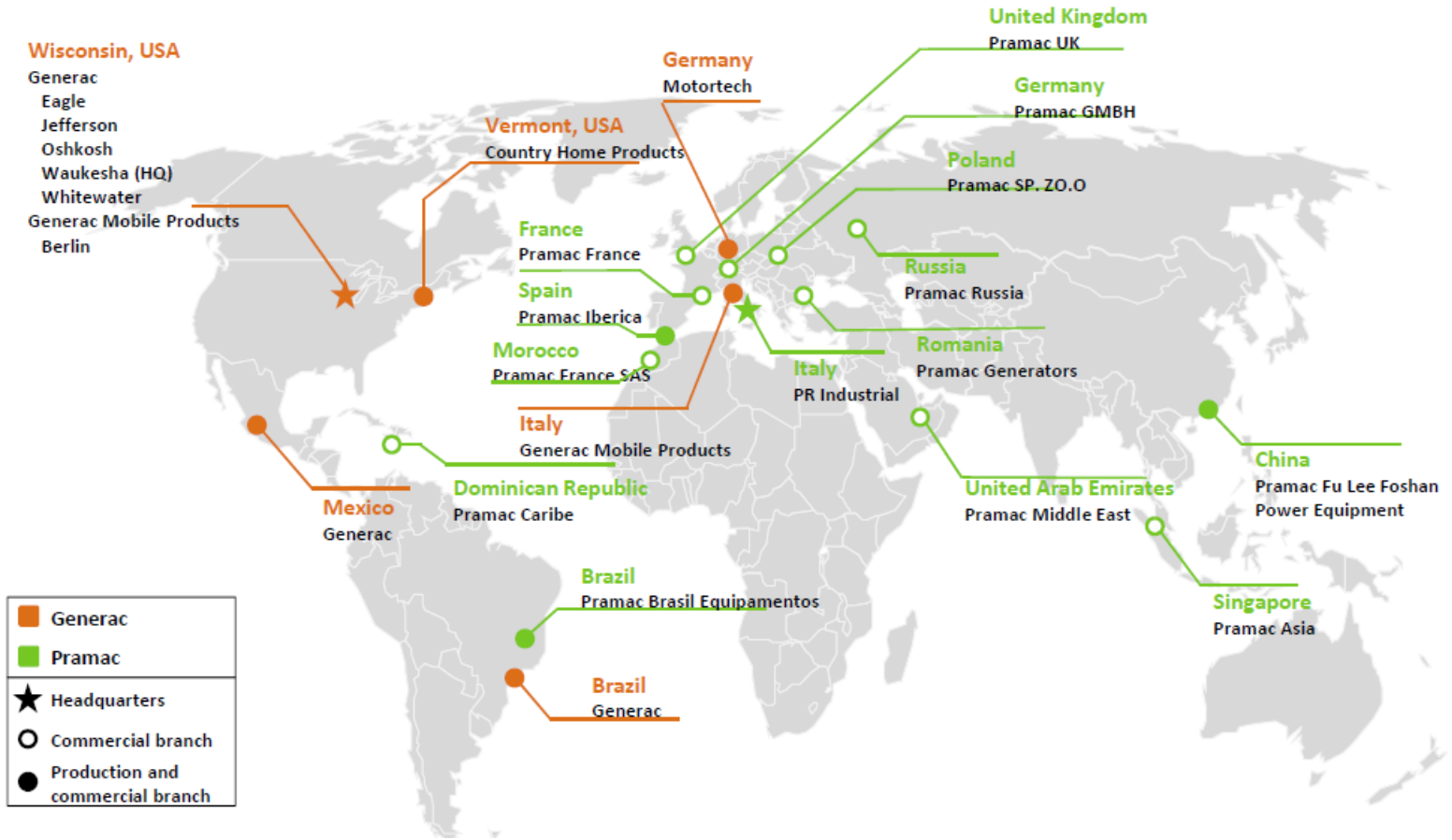
Ten acquisitions completed since 2011, including recent strategic acquisitions of Pramac and Motortech

Approx. 4,500 employees (as of 1/1/2017)

THE #1 NAME IN HOME BACKUP GENERATORS

Founded in 1959, Generac was the first to engineer affordable home standby generators, along with the first engine developed specifically for the rigors of generator use, and is now the #1 manufacturer of home backup generators. Generac manufactures the widest range of power products in the marketplace including portable, residential, commercial and industrial generators. We are also the leading designer and manufacturer of manual and fully automatic transfer switches and accessories for backup power applications up to 2 MW.

Global Footprint



OVER 2.7M FT² OF VERTICALLY INTEGRATED MANUFACTURING CAPACITY SERVING A GLOBALLY DIVERSE COMMERCIAL FOOTPRINT

Product Portfolio

Consumer Power

Air-cooled Home Standby Generators

Liquid-cooled Home Standby Generators

Portable & Inverter Generators

Engine Powered Tools

Chore-Related Outdoor Power Equipment

- Pressure washers
- Water pumps
- Field & brush mowers
- Trimmer mowers
- Chippers & shredders
- Log splitters
- Lawn & leaf vacuums
- Stump grinders

C&I Stationary

Larger kW & Container Gensets

Industrial Stationary Generators

Commercial Stationary Generators

C&I Mobile

Light Towers

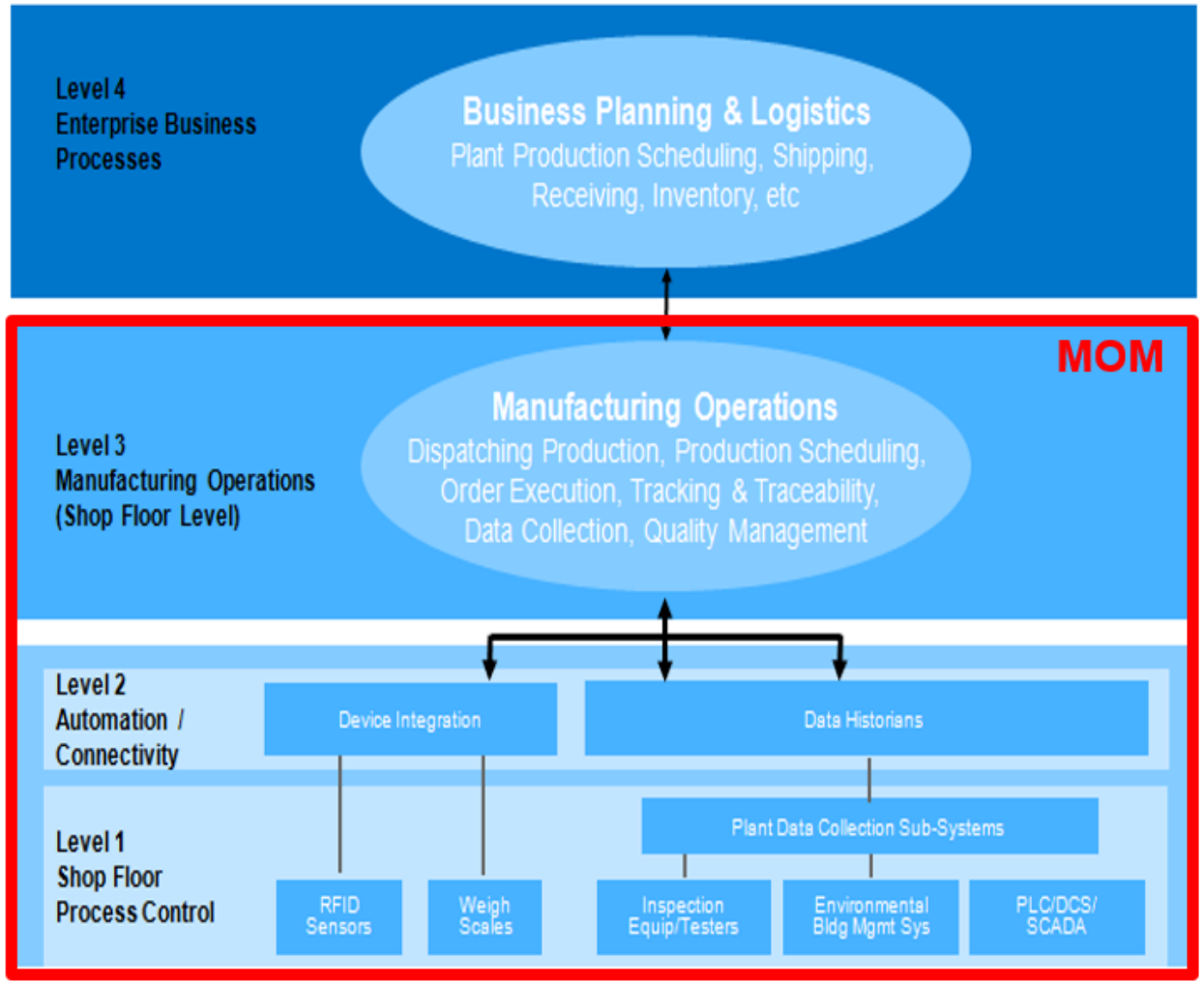
Mobile Generators

Heaters & Pumps

Foundations in Connected Manufacturing
The Generac MOM Journey

- ✓ Established Enterprise and In-Plant Process Historians - 2015
- ✓ Integrated Automated Test Cells w/Process Historians and ECC - 2015
- ✓ Conducted As-Is / To-Be Requirements Gathering and Documentation - 2016
- ✓ Evaluated In-House Application Vendors (Automation & ERP) - 2016
- ✓ Selected SAP Manufacturing Suite (ME, MII, and PCo) - 2016
- ✓ Conducted Analysis w/SAP and Partner for Pilot Project Functionality - 2016
- ✓ Implemented Pilot Project in Specific Areas of Selected Plant - 2017

The Generac MOM Landscape
Leveraging the SAP Investment



Enterprise/ Management Level

SAP ERP GRID PTC

Region/Plant Level

SAP ME **SAP MII**

Line/Cell Level

SAP Pco

Proficy HMI/SCADA - CIMPLICITY

Proficy Historian Analysis

Dream Report

Proficy Historian

Implementation Partners

- Seeit Solutions (SAP ME, MII, PCo, Blueprinting, etc.)

724 E. Kensington Road
Arlington Heights, IL 60004

Phone: (847) 483-8703
Fax: (847) 298-4788
info@seeitmii.com

SERVICES SAP PARTNER

- Stone Technologies (Device Integration PLC Interfaces)

Stone Technologies, Inc.

1 866 STONETEK
636 530 7240
Fax: 734 448 2014
550 Spirit of St. Louis Blvd
Chesterfield, MO 63005

Control Engineering System Integrator Hall of Fame

csia CERTIFIED

TCO – Total Cost of Ownership
Managing Throughout the Project Lifecycle

- Project Preparation (Requirements Gathering)
- Blueprinting (Design)
- Realization (Build)
- Test (UT, SIT, UAT)
- Final Preparation (Cutover)
- Go Live Support (Hypercare)

Unforeseen Cost Challenges to be Wary Of

- Connecting the “Things” of the IIoT
  - Wired vs. WiFi, Non-ENET Capable PLCs, Undersized PLC CPUs
- Change Orders Due to Miscommunications Between Developers
  - Naming Conventions, Points-of-Interface, Etc.
- Inability to Test End-to-End (No DEV / QA Machines Available)
  - Machine Interfaces Must be Thoroughly Simulated
- Limited Resources – Implementation Team Needs to Roll-Off Post Hypercare
  - Pressure to Wean Off External Consultants

Leveraging Industry Standards / Best Practices
Speaking with a Common Language

- ISA-95
  - Production Modeling, ERP to MOM Interfaces
- ISA-88
  - Data Point Naming Conventions (Tagnaming)
- PackML
  - Device Integration Modularity (PLC / SCADA Interfaces)
- MESA (Manufacturing Enterprise Solutions Association)
  - Education and Training

Benefits of Adapting Standards

- Flexibility to Choose SI Partners
  - Standards-based Documentation is Easily Exchanged and Understood
- Ability for Development Teams to Work Remotely and Independently
  - Confidence that Everything will Work when Brought Together
- Easier Integrations with External Application Platforms
  - Plug and Play with Solutions from the Best Vendors
- Reduced Risk from Personnel / Team Changes
  - Tribal Knowledge becomes a Thing of the Past

Applying ISA-95 Requirements Definition

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ANSI/ISA-95

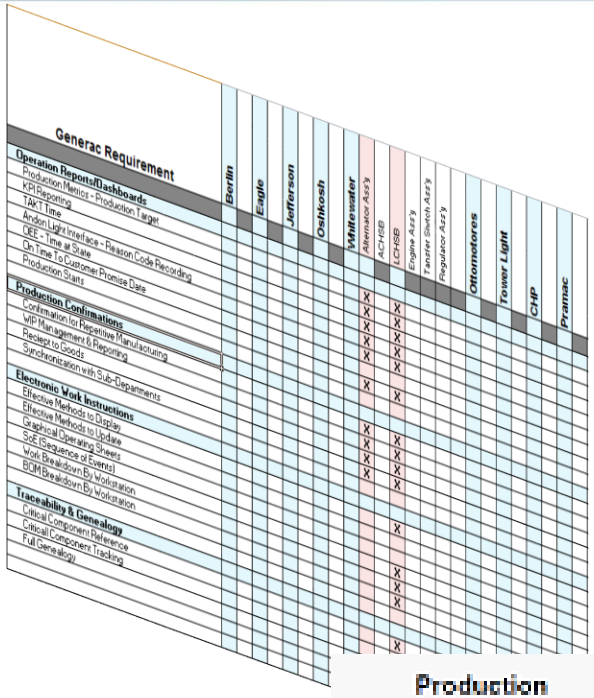
From Wikipedia, the free encyclopedia
(Redirected from ISA-95)

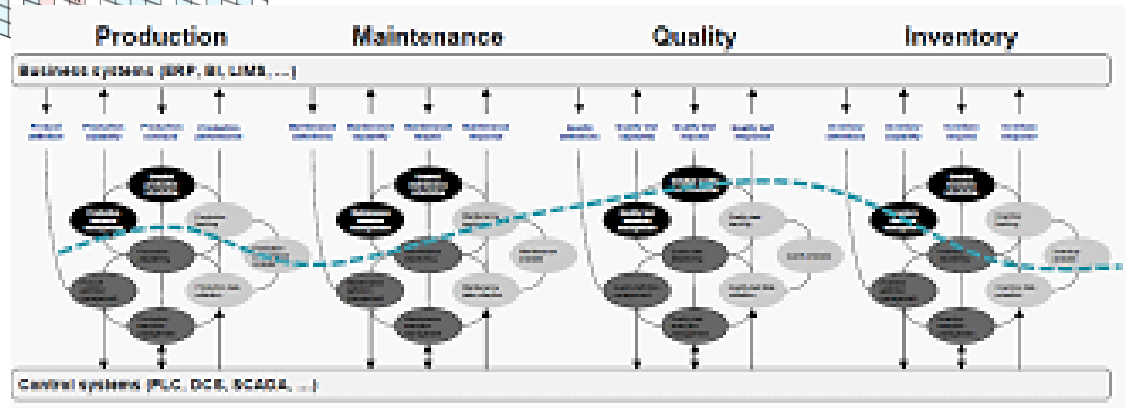
ANSI/ISA-95, or **ISA-95** as it is more commonly referred, is an international standard from the International Society of Automation for developing an automated interface between enterprise and control systems. This standard has been developed for global manufacturers. It was developed to be applied in all industries, and in all sorts of processes, like batch processes, continuous and repetitive processes.

The objectives of ISA-95 are to provide consistent terminology that is a foundation for supplier and manufacturer communications, provide consistent information models, and to provide consistent operations models which is a foundation for clarifying application functionality and how information is to be used.

MESA INTERNATIONAL MESA.ORG

Applying ISA-95 Requirements Definition





ISA-95 Standards Provide Structure for Connectivity

Applying ISA-88
Production Modeling + Tagnaming

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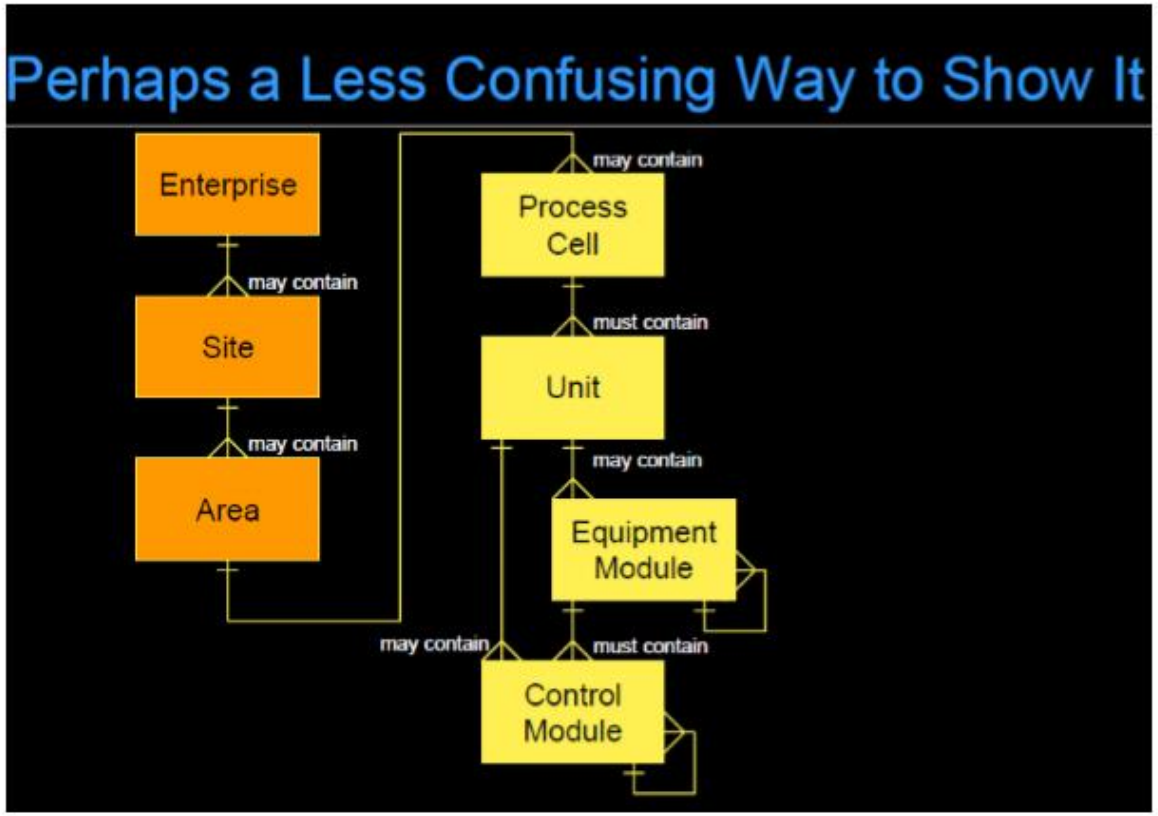
ISA-88

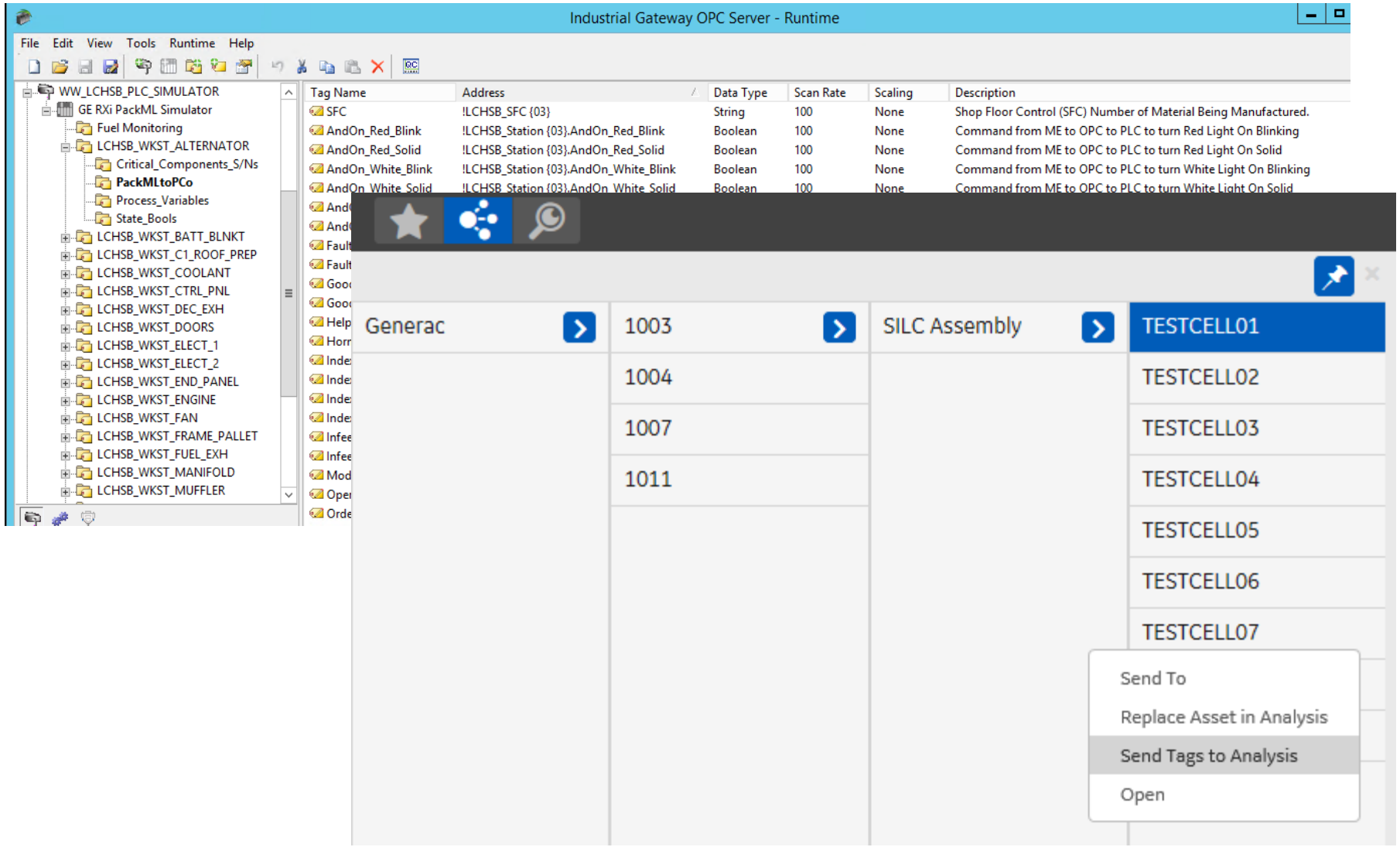
From Wikipedia, the free encyclopedia

S88, shorthand for **ANSI/ISA-88**, is a standard addressing batch process control. It is a design philosophy for describing equipment, and procedures.



(L. Craig, WBF 2005 Tutorial: *An S88 Overview*)

Applying ISA-88
Production Modeling + Tagnaming



Applying PackML
Commonality in Device Integration

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PackML

From Wikipedia, the free encyclopedia
(Redirected from Packml)

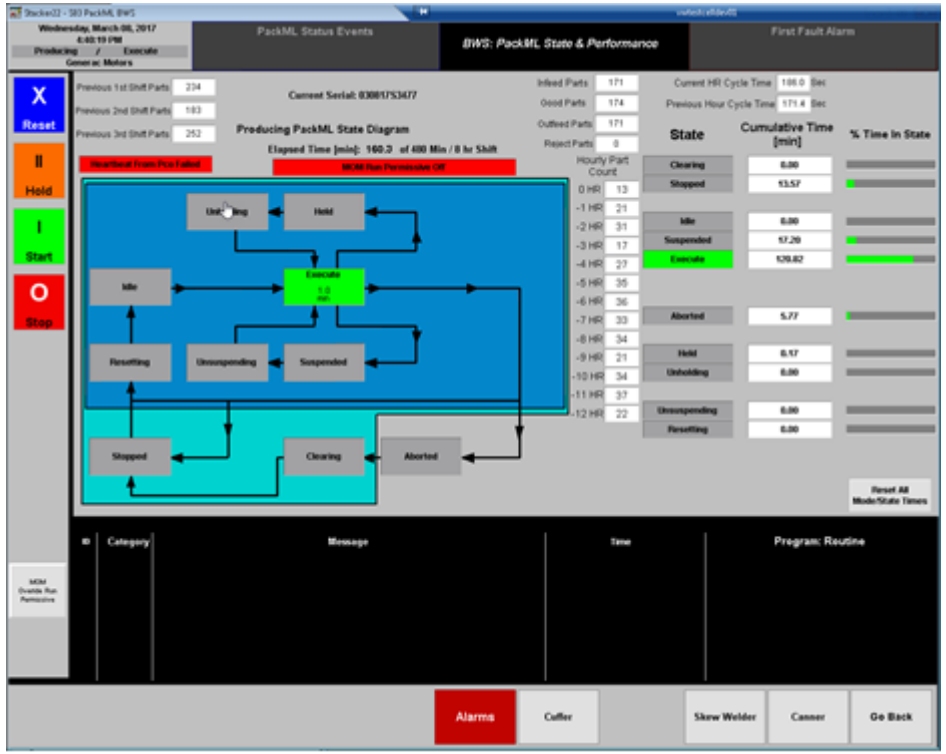
PackML (Packaging Machine Language) is an industry technical standard for the control of packaging machines, as an aspect of industrial automation.

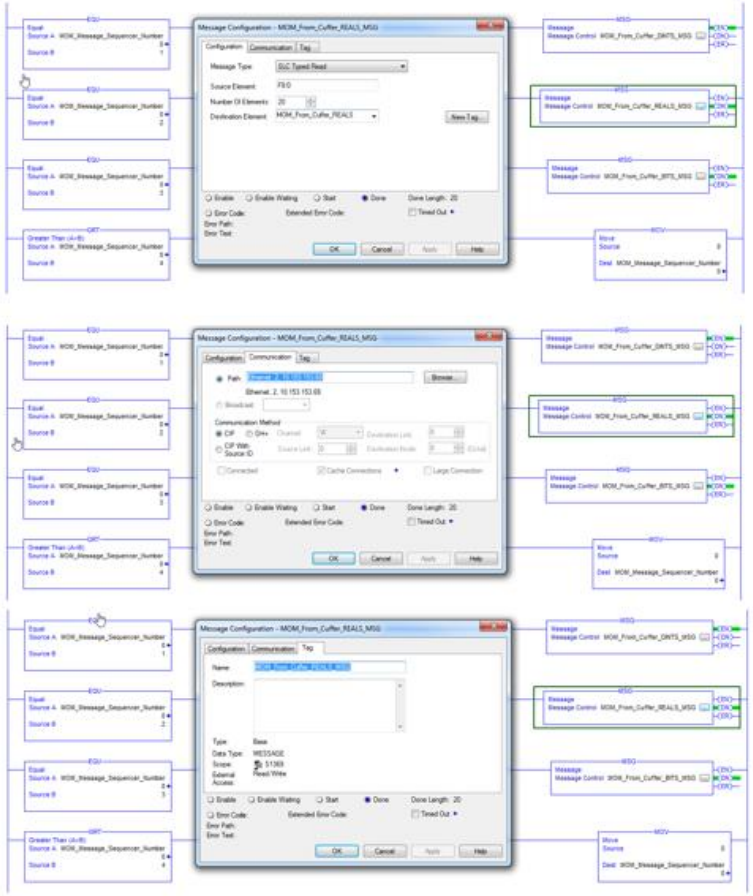
The Manufacturing Automation Industry is broken down into three main categories; Continuous control, Batch control and Discrete control.[1] The batch control industry and the packaging industry (discrete control of packaging machines) are the focus of a set of standards and guidelines that are similar but have differences driven by equipment functionality.[2]

The primary objective of PackML is to bring a common “look and feel” and operational consistency to all machines that make up a Packing Line (note: can be used for other types of discrete process)[3] PackML provides:

- Standard defined machine states and operational flow[4]
- Overall Equipment Effectiveness (OEE) data [4]
- Root Cause Analysis (RCA) data[4]
- Flexible recipe schemes and common SCADA or MES inputs[4]

Applying PackML Commonality in Device Integration





OMAC
The Organization for Machine Automation and Control

Adopting Non-Traditional UI Platforms
Lower Cost Hardware for Every Function

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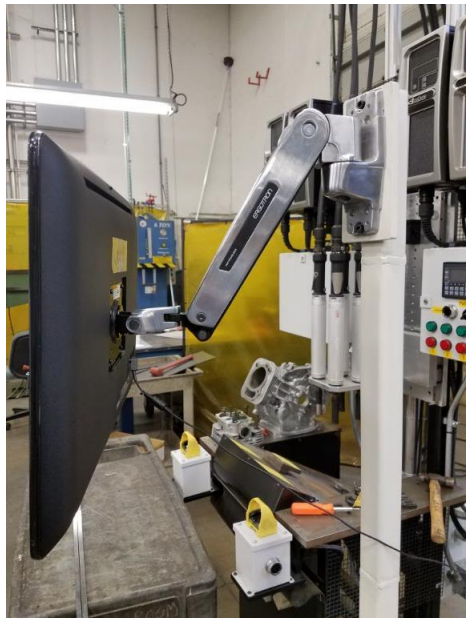
chrome

Chrome Sign Builder

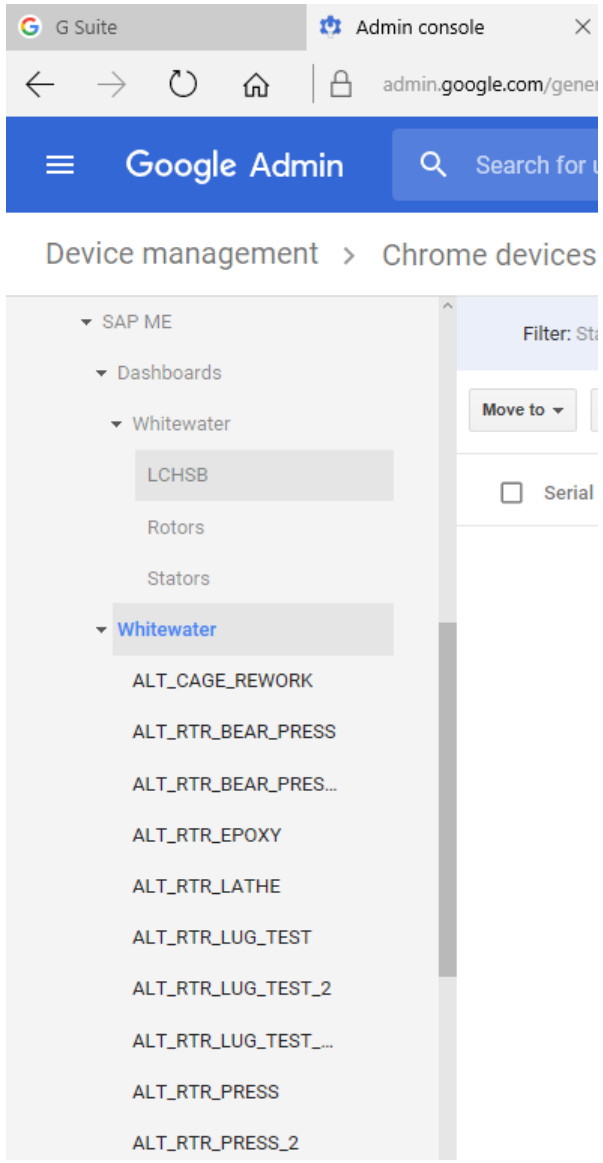
Big Screen Dashboards

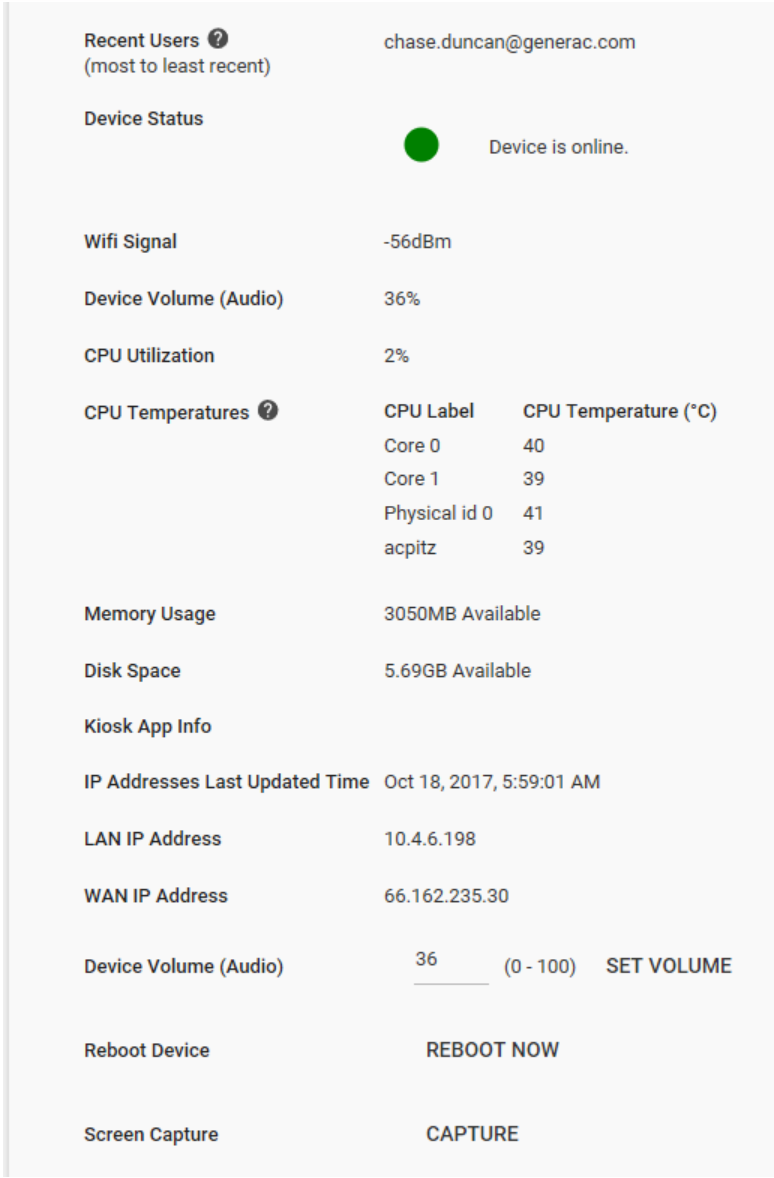
Assembly Line UIs



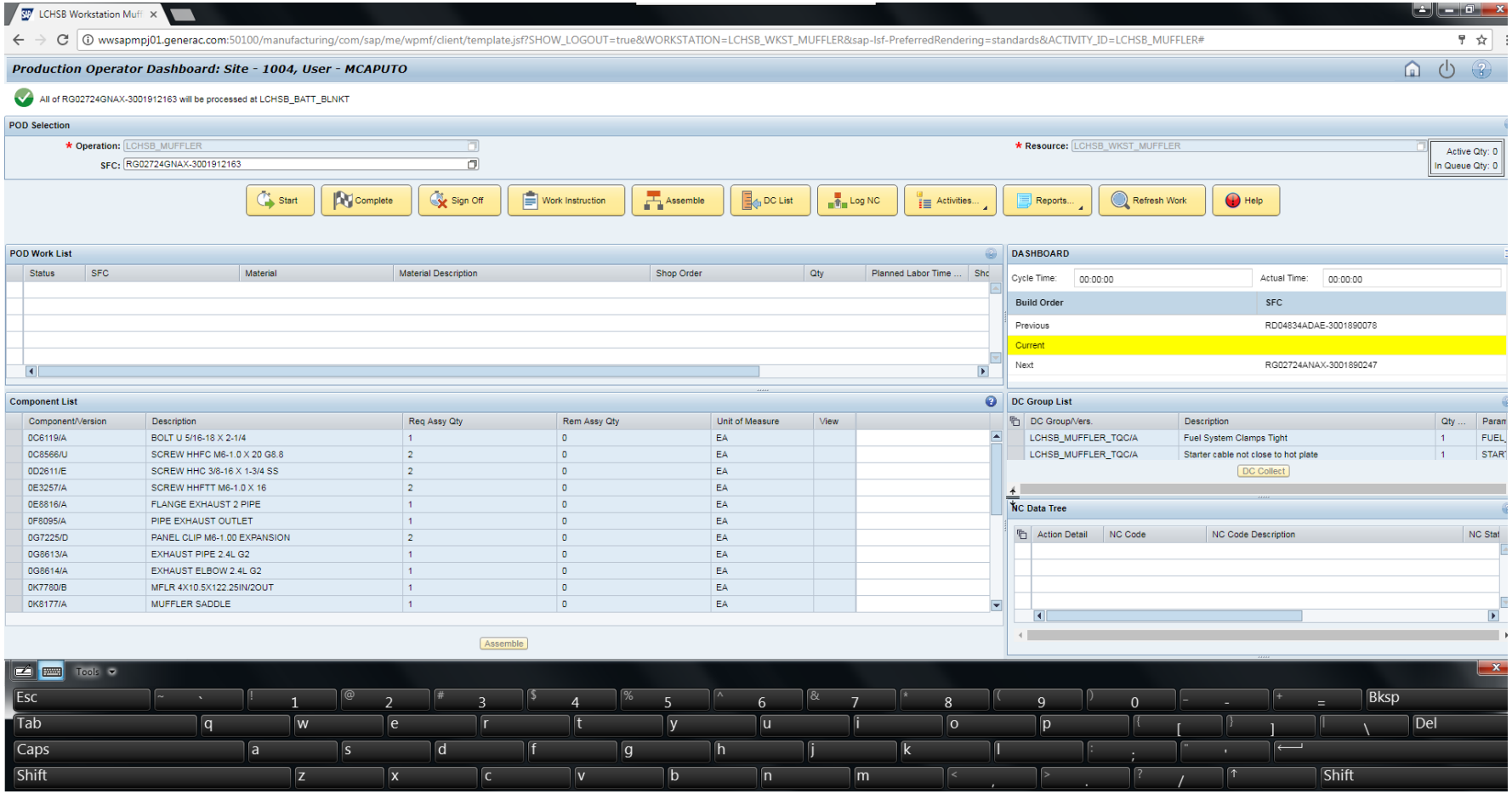
Machine Shop UIs

Adopting Non-Traditional UI Platforms
Google G Suite Admin Console

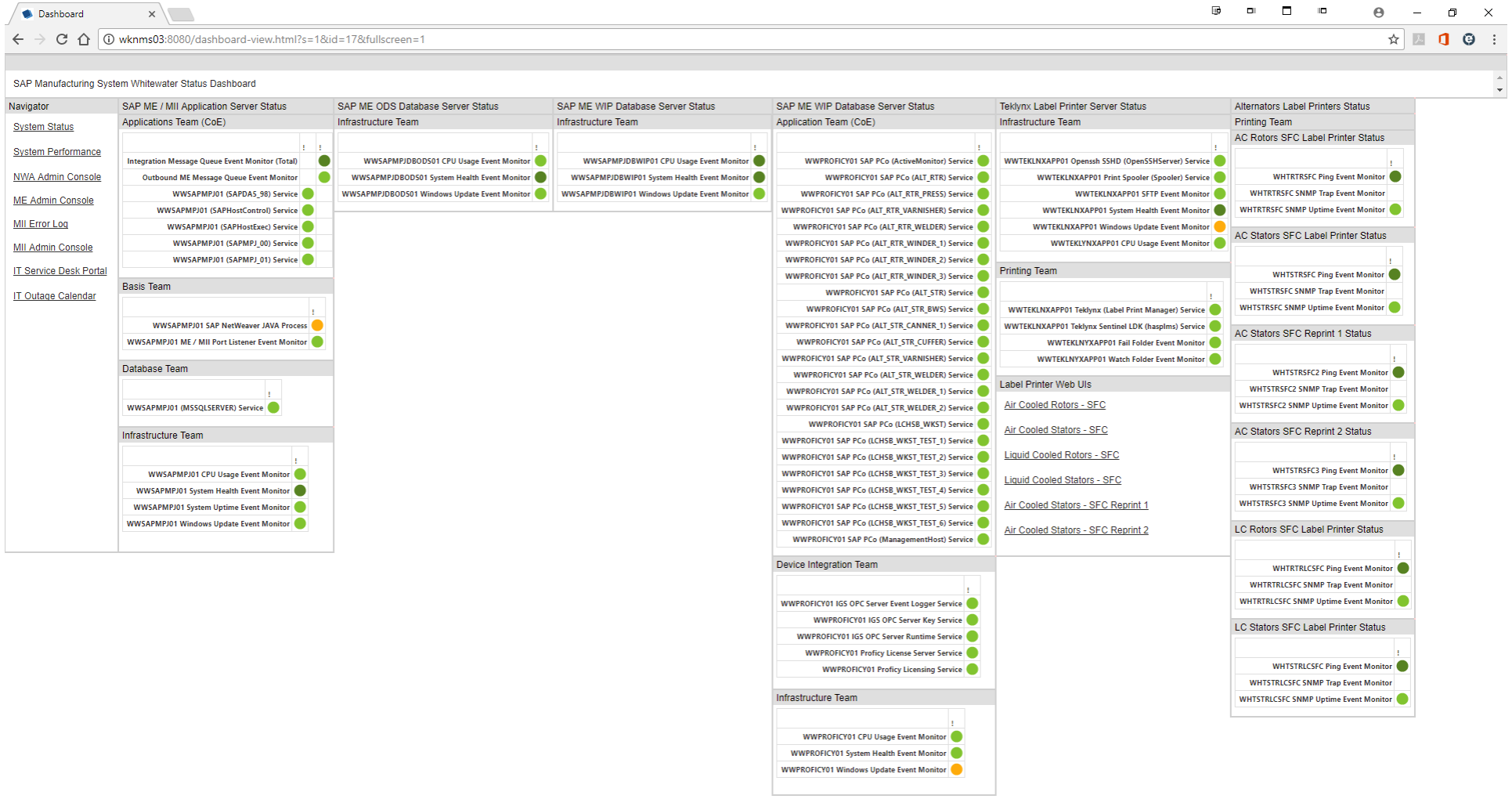




Google Chrome
SAP Manufacturing Execution POD



Predictive Monitoring w/Analytics
Ensuring a Robust and Stable Platform



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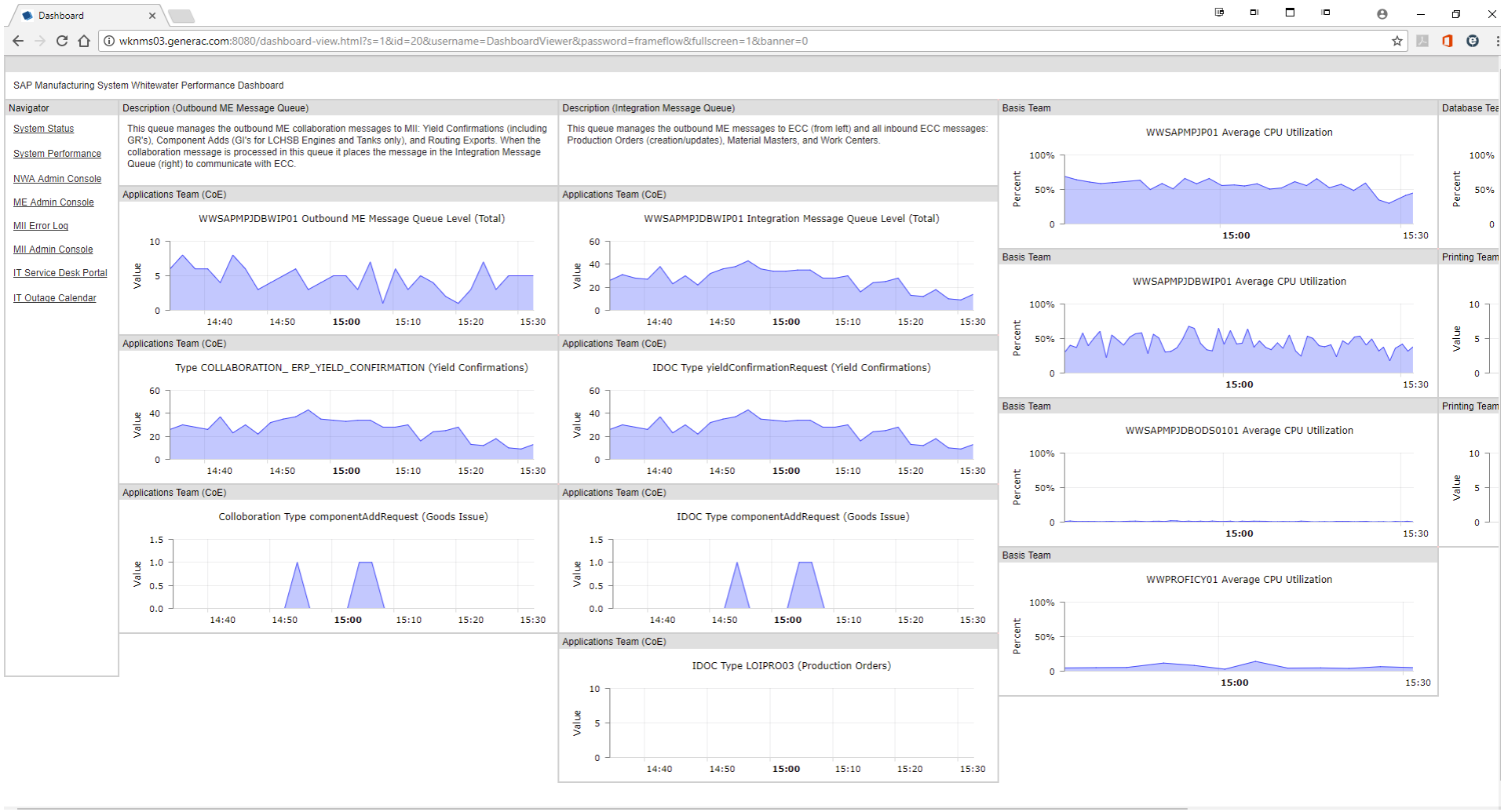

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