Designing a Scalable MTConnect Data Architecture
Will Sobel
Founder and Chief Strategy Officer

VIMANA by System Insights
California | India
About VIMANA by System Insights

The Predictive Analytics Platform for Manufacturing Intelligence

Industrial Internet of Things

Industry 4.0

Smart Factory
Digital Manufacturing
Factory of the Future
Brilliant Factory

Client Initiatives

Industry Initiatives

Meet us at Booth E4149
Today: A Scalable Data Architecture with MTConnect

Predictive Analytics and Smart, Connected products (IoT) #1 and #2 in future importance of manufacturing technologies
Deloitte Global CEO Survey 2016, Global Manufacturing Competitive Index

But 86% of plants **DO NOT** use manufacturing data in analytics
LNS Research, 2016

How do you close that gap with MTConnect?
What is MTConnect?
Without MTConnect
With MTConnect
MTConnect Compatible, and growing

Software and Hardware for Shopfloor Connectivity

CNC
- FANUC
- SIEMENS
- HEIDENHAIN
- Mazak
- FAGOR
- Haas Automation Inc.

EDM
- Sodick
- +GF+ AgieCharmilles
- MITSUBISHI ELECTRIC
- pc-dmis™

PLC
- MITSUBISHI ELECTRIC
- Rockwell Automation
- OMRON
- RFID
- USB

Standards
- OPC
- EtherNet/IP
- Modbus

Identity

Legacy HW
- Digital I/O
- Analog I/O
- Serial

Data Store
What can MTConnect be used for?

Manufacturing process improvement
Operational excellence programs
Better forecasts of production across multiple plants
Better forecasts of production in a plant
Asset performance improvement across plants
Real time alerts based on manufacturing data

LNS Research, 2016
Roadmap to delivering the IIoT Vision

- **Primitive** - No software or control software only
- **Monitored** - Data collection and backward looking reports
- **Real-Time Analytic** - Determines why a process failed or productivity was lost
- **Proactive** - Detect problems before they happen using CEP and learning
- **Predictive** - Problems are solved before they impact process
- **Self Optimizing** - Learning models optimize processes
- **Integrate and Optimize**

Disruptive

Present

95% of shops
Typical manufacturing plant: 5~25 TB of data per year

So what do we do with all of this data?
What are the key considerations in selecting a platform to handle scalability?

Reasoning over multiple time-scales

Reasoning across multiple dimensions

Pattern matching on large data volumes

Power: 3562 Watts
Load[X]: 120%
Alarm: ACTIVE

Temporal Decision Scale

Manufacturing Scale:
- Manufacturing Supply Chain
- Manufacturing Enterprise
- Manufacturing Equipment
  - Sub-Components
  - Process Interface

Process Interface:
- m-Seconds
- Seconds
- Hours
- Days

Process:
- Real-time: process control
- Near-time: process improvement
- Anytime: process management
Scalability: Across the Digital Manufacturing Thread
Disruptive technologies increase the value of digital information along the entire product lifecycle

**The digital thread** is the digital representation of the physical product lifecycle.

4 activities are required to manage the **digital thread**:

- **Information capturing and recording**
  - Relevant set of data to prevent information overflow
  - Automated, real-time capturing via sensors
  - Recording and storing of both historical and new data in a single information system

- **Information transfer**
  - Digitally transfer information across departments, production sites, value chain steps, and company borders

- **Information analysis and synthesis**
  - Identification of relevant data and analysis (ideally, automated)
  - Synthesis of analysis into relevant insights

- **Turning information into outcomes**
  - Translation of analysis results into recommendations that suggest actions for workers or automatically trigger actions of machines
  - Feedback and continuous improvement

*SOURCE: McKinsey*
Support integration across all components of the digital thread
Path to Predictive

Steps to transition from data collection to making predictive decisions

Connect and Secure  Enrich and Analyze  Integrate and Optimize
VIMANA: Implementing the Path to Predictive

VIMANASUITE

Connect
Enrich
Analyze
Solve
Visualize

Data Services

Connect and Secure
Enrich and Analyze
Integrate and Optimize

Connect securely to a wide array of multi-vendor and legacy factory assets, using MTConnect and OPC-UA.

Enrich and analyze volumes of machine data, generating metrics and insight to gain visibility and control.

Integrate and optimize shop floor data with industrial platforms and mission critical systems.

Meet us at Booth E4149
Take Aways

• MTConnect is the first piece in the Analytics stack

• Scalability is required:
  – Vertically: To handle complexity in data from the shop floor
  – Horizontally: Across the digital manufacturing pipeline

• Path to Predictive
  – Secure and Connect
  – Enrich and Analyze
  – Integrate and Optimize

• Lets continue this discussion at our booth, E4149
THANK YOU

Our Offices

United States
1900 Powell Street
Suite 600
Emeryville CA 94608

India
506 Velachery Main Road
East Tambaram
Chennai 600059