Practical IIoT Solutions

JMP Engineering







AAI-JMP Profile

- 14 Branches across North America with focus on Automation and Process Control and Information Systems
- 120+ employees
- Independent Full Service Turnkey Solutions Provider in Discrete Control, Process Control, Energy Management & Information Systems
- Boiler Combustion Controls, Liquor Cycle Process Optimization and Industrial Energy Management represent Core Application Expertise
- Industrial Energy Solutions Team Comprised of Individuals with Hands-On Background in Boiler & Utility Controls Design, Implementation Start-Up and Operation





Demystifying the Industrial Internet of Things

Examining real, practical examples, where IIoT transformed businesses







Process Automation | Controls | Information | Robotics

Industrial IoT





5 Drivers Fuel IIoT Value in Manufacturing

How Can Manufacturers Capitalize on This Opportunity?







The Convergence







IT/OT Convergence

The Integration of Information Technology (IT) Systems Used for Data Centric Computing With Operational Technology (OT) Systems Used to Monitor Events, Processes and Devices and Make Adjustments to Enterprise and Industrial Operations Objective:

Improve Enterprise and Industrial (MFG) Operations





IT/OT Architecture

Enterprise Zone

	Level 5 – Enterprise		
	Level 4 – Site Planning and Logistics		
De	militarized Zone	(Firewall)	
	DMZ		
Manufacturing Zone (Firewall)			
	Level 3 – Site MFG Oper	ations and Control	
Area. Zone		(Firewall)	
	Level 2 – Area Supervisory Control		
	Level 1 – Basic Control		
	Level 0 – Process/Field I	Devices	

Purdue Model for Control Hierarchy Logical Framework

See: Modified Purdue Model - Control Hierarchy architecture (NIST special publication 800-82.)





Problems IIoT Solve







Cost (WIP Inventory, IT Systems, Labor, Materials, Energy, Maintenance) Time to Value







Practical IIoT Solutions

IIoT Solutions:

- Network Architecture and Infrastructure Assessment
- Productivity & Quality
- KPIs and Dashboards
- Mobility and Work Process Management
- Asset Management Utilization
- Energy (Sustainability) Monitoring and Targeting





JMP Customer Applications

- Aircraft Parts Mfg.
 - Equipment Effectiveness (OEE) data collection, improve downtime messaging and response times.
- Automobile Manufacturer
 - Energy (Sustainability) Monitoring & Targeting
 - Operations/Maintenance Mobility
 - Remote and mobile monitoring (data collection/product tracking)
- Food Manufacturer
 - Networking support and upgrades
- Rogers Centre, Toronto, ON
 - Roof Management Controls, Secure Network Infrastructure and Mobility
- Regional Water System
 - Large SCADA and Infrastructure Security Improvements
- Food Manufacturer
 - Energy Monitoring & Targeting







Case Study Auto Manufacturer

• Overview:

- Long standing customer of JMP (12 years) —
- First plant to make specific vehicles outside _ of home country

Plant statistics:

- 8,000 employees
- 3 million sq. ft. —
- Many disparate facility systems, for example: Air, Water, Heat, Cooling, Power







- Overview:
- The Client Major Automobile Manufacturer
- The Project Energy and Utilities Information System

• The Challenge:

Reduce the cost of energy and utilities across their production system

- Need for a comprehensive energy and utilities information management system to allow plant operations management to visualize, analyze and optimize the performance of the energy and utilities infrastructure:
 - Designed to collect data energy and utilities data from across the plant
 - Provide reports, dashboards and other information analysis tools based upon location and need
- System functionality driven by the requirements defined by government entities in order to be eligible for energy incentive programs and grants





- Initial Conditions:
- Limited monthly utility report after the fact
- Shop managers have no visibility to real time utility usage
- Environmental effect on production variability obscured
- Non-production utilities usage unknown

You can't control what you can't measure.







- Functional Requirements and Drivers:
- Leverage the customer's preferred platform technology
- Complete engineering requirements definition and network study
- Metering Real Time data collection; load historian with real-time data
- Monitoring Define web dashboards, reports, and query tools
- Modeling Model utilities usage for each shop/area/asset
- Deploy Commercial Off-The-Shelf software (COTS) as platform technology





• The Implementation:

- System control and detailed system visualization provided via a distributed implementation of Rockwell PLC Hardware and HMI, Desktop Visualization and Energy Analytical Software. Rockwell is the plant standard control Platform.
- Ethernet based metering, subsystems and multiple third party gateways were used to connect the sensor and meter infrastructure to the information system
- System includes hundreds of water, air, gas, electric and steam meters and drives, with additional meters, sensors, systems and data sources to be added as the system evolves





• The Results:

- The base system was accepted in October 2014.
- Individual energy and utility infrastructure projects will be added to the systems in the coming months
- Multiple examples of energy savings recognized and acted upon even before final system was accepted:
 - Capturing and acting on a "peak shaving" opportunity
- The client projects a double digit ROI annually to combat an energy and utility bill of nearly \$45 million
- Increased energy awareness and visibility
- Funding for >\$10 million, many capital projects initiated







• What's next?

Project	Project Description	Savings
Compressed Air – Blow off reduction	Install new control system and 2 VSD screw compressors	2,000 MWh
HVAC refurbishment	Install new HVAC controls, VSD's on fans, overall BAS control system	2,300 MWh
Chiller system efficiency improvement	Optimize chiller plant efficiency – install new control system, VSD's on pumps	4,000 MWh
Fuel cell	Install 1.4 MW molten carbonate fuel cell, reclaim available heat	8,000 MWh
Utility monitoring and targeting	Support update of utility monitoring system, develop targeting system	TBD
Combined heat and power	Install 3 to 6 MW of gas turbine and 1600 ton absorption chiller	TBD
Solar wall (solar heating)	Determine best location(s), HVAC integration for conserval solar wall	175 Km3
South paint steam elimination	Reclaim heat from RTO to heat pre-treatment dip tanks and ASH reheat coils	710 Km3
North paint steam reduction	Install local HWB to heat pre-treatment dip tanks and shop HVACs	100 Km3



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Questions

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