EXECUTIVE PROGRAM
SAS® GLOBAL FORUM 2016
IMAGINE. CREATE. INNOVATE.

Intelligence for the Industrial Internet of Things

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INTELLIGENCE FOR THE INDUSTRIAL INTERNET OF THINGS
IoT & Connected Factory

SAS Global Forum
The introduction of IoT into the manufacturing environment is ushering in a fourth Industrial Revolution.

Industry 4.0 Characteristics

- Dynamic business and engineering processes enabling last-minute changes to production
- Personalized, local production and mass customization
- Creating value opportunities through services
Market Disruptors

- Rise in global Middle Class
- 3D Printing at end of supply chain
- Demands and requirements of Mass customization
- Rising costs of labor in developing countries
- Increasing environmental regulation
- Digital and physical convergence

Business Challenge

- Industry 4.0  Build new Smart Factories or outsource (Fabless goes mainstream: Capital expense vs operating expense)
- New IoT driven business models
- Access to skilled workers
- Supply chain compliance and integrity
The Challenges

- Preserve Infrastructure
  - Retrofit

- Many Devices to Connect
  - Tailored

- Customized Solution
  - Flexibility

- Increasing Complexity
  - Information & Operation Convergence
Inteł’s Industry 4.0 journey started decades ago

80’s Factory
- No robotic material transport
- Run cards on wafer boxes
- Basic equipment standards
- Initial equipment control
- Initial manufacturing execution solution

90’s Factory
- Beginning robotic material transport
- Automated statistical process control
- Improved equipment control
- Improved inventory control and tracking
- Improved equipment automation standards
- Initial manufacturing execution solutions
- Initial planning and supply chain integration
- Improved decision making systems

Today’s Factory
- Pervasive robotic material transport
- Pervasive equipment standardization
- Advanced manufacturing execution solutions
- Real-time excursion control
- Advanced process control & adjustment
- Predictive and Adaptive maintenance
- Advanced inventory control and tracking
- Advanced rapid decision making
- World class supply chain capabilities
- Big data repositories
- Quark integration with industrial equipment
Intel’s Industry 4.0 reference architecture is an open platform that enables IT cost structure and capabilities reuse across the enterprise.
Intel Manufacturing Experience

Use Case #1 – Automated Tester
- 50% Reduction in Maintenance Time
- 20% Reduction in Spare Costs
- 25% Reduction in Non-Genuine Yield Loss

Use Case #2 – Assembly
- 50% Reduction in Yield Loss

Use Case #3 – Vision System
- 10X Faster Results
- 10% Headcount Efficiency
INTELLIGENCE FOR THE INDUSTRIAL INTERNET OF THINGS
Industrial Performance Monitoring and Control

Rise of an Information Centric Architecture
Monitoring complexities we deal with

- Annulus Pressures
- Production Chemicals
- Corrosion Monitoring
- Critical Equipment Health Monitoring
- Gas Monitoring
- OEM Equipment Monitoring
- Emissions
- Energy
- Quality
- Safety
- Inferred Measurements

Output Quality Parameters
- Composition Parameter 1 - Heavies
- Composition Parameter 2 - Tepa

Inputs
- Bottom Flow
- Drum Temperature
- Steam Flow
- Bottom Temperature
- Differential Pressure
- Feed Flow
- Feed Temperature
- Column Temperature 2
- Column Temperature 3
- Column Temperature 4
- Column Temperature 5
- Overhead Temperature
- Pressure
- Top Temperature
- Reflux Flow

Distillation Column XYZ

Inputs
Bottom Flow
Drum Temperature
Steam Flow
Bottom Temperature
Differential Pressure
Feed Flow
Feed Temperature
Column Temperature 2
Column Temperature 3
Column Temperature 4
Column Temperature 5
Overhead Temperature
Pressure
Top Temperature
Reflux Flow
Process Industry Datasets

- Data sets are large and complex – traditional data processing applications are inadequate.
- Challenges include capture, curation, quality, search, analysis, sharing, storage, transfer, visualization, and information privacy.
- Often used for predictive analytics or other certain advanced methods to extract value from data, and seldom to a particular size of data set.
Performance Monitoring (IIoT) vs. Control Architecture

- Corporate Network
- Shared Zone (DMZ)
- Corporate Users
- 3rd Party Sites
- Mobile User
- Web User
- Subscription rules, Big Data, Visualization And Analytics
- Enterprise Data Center
- Corporate
- 3rd Party
- Sites
The Effect On Plant Architecture

Process Safety

Process Control

Site Safety

Reliability

Energy Efficiency

Process Automation Network

- Safety System
- DCS System

“Run Plant Safely”

Plant Operations Network

- Wireless
- Wired
- WiFi
- Remote
- I/O
- Mobile

“Achieve Operational Excellence”

3rd Party Applications
Performance Monitoring Challenges

- **Data**
  - What data do we collect?
  - What do we do with this data?
  - How do we get the best data in the right hands?
  - How do we then act on that data?
  - How do we prevent shutdowns with predictive data?
  - How do we improve output/production without a complete technology overhaul?
  - How do we do this quick and seamless with as little investment as possible?
  - How do we capture expertise?

- **Platforms and Tools**
  - What infrastructure should I use?
  - What tools do I use?
  - Should I store on-premise or in the cloud?
  - Should I use open source?
  - How do I scale?
Can analytics provide an answer?

- Are my cuts on target?
- Is my equipment performing correctly?
- Can I increase throughput?
- How do I find sources of oscillations?
- Will I detect future events before they happen?
- Am I looking at the correct leading indicators?
- Will my equipment make it to the next turnaround?
Observations

- Analytics for Process Industries is distinctive in that it sets specific requirements for Data Infrastructure, Time-Series framework, training algorithms including data analytics, and presenting the results.
- Performance monitoring and analytics needs to deal with the two separate but related domains.
- The infrastructure needs to be extendable from on-site to cloud.
- Visual analytics is a key component.
Panel Questions