DATA FULFILLS THE PROMISE OF THE INDUSTRIAL IOT
Vancouver, BC
November 20, 2019
OSIsoft Creates a Digital Infrastructure for Critical Operations

APPLICATIONS & ANALYTIC TOOLS

Real-time Monitoring
Analytics, GIS, BIG Data
Specialized Applications
3rd Party Services

DATA SOURCES
- Automation Systems
- IoT Gateways
- Control Systems
- Remote Sensors & Assets

PEOPLE
- Process Engineer
- Production Manager
- Reporting Analyst
- Control Room Tech
- Data Scientist
- Maintenance Engineer

www.bcwwa.org
Across Multiple Industries

- **80%** of the top companies globally
- **1000+** utilities worldwide
- **8** of the global Fortune top 10 companies
- **24** of the top 25 pharmaceutical companies
- **9** of the top 10 chemical companies rely on the PI System
- **138.5M** metric tons per year of production monitored
Across the Globe

39+ Years
140+ Countries
21,000 Sites
2B Data Streams
24/25 of our first customers are still with us

Bahrain*
Beijing*
Calgary
Cleveland
Dubai

Frykdek-Mistek*
Frankfurt*
Houston
Johnson City*
London*

Madrid*
Mexico City*
Montreal*
Moscow*
Paris*

Perth*
Philadelphia*
Phoenix
SAN LEANDRO*
Sao Paulo*

Seoul*
Shanghai*
Singapore*
Sydney*
Tokyo*

*Technical support available

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IoT  IloT

Deep Learning

Data Lake

Trends and KPIs

Big Data

Data Science

IT/OT Convergence

Open source

Digital Transformation

Analytics

Artificial Intelligence

Time-series Data

Machine Learning
If you can’t measure it, you can’t manage it

- Peter Drucker
Digital Transformation is Changing Industry

Greater Operational Efficiency & Cost Savings

Customer saved $46 million and improved renewable integration with real-time data visualizations and weather forecasting.

“Smart” Products & Data-Driven Services

Partner helps transportation giants save up to $1.5 million per ship per year through after-market services for fuel reduction & predictive maintenance.
Strong Drivers for IIoT and Digital Transformation

OBSERVATION
Combined annual revenue from devices, software, and service bundles projected to grow to $144.6 billion in 2027, a compound annual growth rate of 11.4%

DRIVERS
» More efficient energy use
» Predictive, preventive maintenance
» Competitive differentiation
» Transforming businesses, customer experiences
» Increased worker safety
» Falling component costs
» Falling data management costs

Source: Navigant Research, “Finding the ROI in Digital Transformation”, January 15, 2019
The Solution? The Data / The Problem? The Data

IoT and Analytics
Challenges exist making use of IoT data

Q. What challenges has your organization encountered with respect to IoT analytics?

- Difficulty in capturing enough data for analytics: 38.8%
- Difficulty with data integration: 38.5%
- Lack of flexible visualization tools: 36.3%
- Difficulty in capturing data reliably: 36.0%
- Difficulty in finding meaningful patterns in the data: 36.0%

The Data Deluge

**Volume**

Oil & Gas
- 7.5 million instruments
- 100k calculations/minute

**Variety**

Power Generation
- 310,000 tags, 250 formats,
- 140+ locations

**Velocity**

Manufacturing
- 200,000 events/sec
Data Graveyards
Finding Meaningful Data Patterns

YOUR DATA LOOKS LIKE THIS...

BUT YOU NEED THIS...
Two Trends on a Collision Course

IT Budgets Growing
2.8% to 6.8% Annually

But Data is Doubling Every Two Years
Skills gap holding back potential
Despite its rapid adoption, IoT is not without challenges. Even when IoT is adopted, the same adversities can hinder success.

Companies with enough skilled workers
The opportunity is vast for businesses to get ahead, but the skills gap must be prioritized for IoT to realize its true potential.

New Skills Required

Total hours worked in Europe and United States, 2016 vs 2030 estimate, billion

- Physical and manual skills
  - 2016: 174
  - 2030: 203
  - Change: -14%

- Basic cognitive skills
  - 2016: 97
  - 2030: 115
  - Change: +15%

- Higher cognitive skills
  - 2016: 151
  - 2030: 140
  - Change: -8%

- Social and emotional skills
  - 2016: 148
  - 2030: 119
  - Change: -24%

- Technological skills
  - 2016: 113
  - 2030: 73
  - Change: -35%

Source: McKinsey Global Institute Workforce Skills Model; McKinsey Global Institute analysis
Roles are Changing

Digital Innovation Manager

Innovation and Digital Team - IoT

Vice President, IoT Platforms

Director of Digital Experience Design

VP Digital

Senior Data Engineer

Senior Director - Digital Services

Director, Digital Partnerships

Director of Data and Innovation

Digital and Data Science Officer

Global Director of Data Innovation
Traditional Data Architecture

### Enterprise Zone
- **Enterprise Network**
- **Site Business Planning & Logistics Network**

### Demilitarized Zone

### Manufacturing Zone
- **Cell/Area Zone**
  - **Level 3**: Site Manufacturing Operations & Control
  - **Level 2**: Area Supervisory Control
  - **Level 1**: Basic Process
  - **Level 0**: Process

### Safety Zone
- **Safety-Critical**

Source: Owl Cyber Defense blog: "How IIoT and the Cloud are Upending the Purdue Model in Manufacturing"; September 11, 2019, by Charlie Schick
Data Patterns are Changing

Source: Owl Cyber Defense blog: “How IIoT and the Cloud are Upending the Purdue Model in Manufacturing;”, September 11, 2019, by Charlie Schick
Industrial IoT Architecture

Source: Owl Cyber Defense blog: “How IIoT and the Cloud are Upending the Purdue Model in Manufacturing”, September 11, 2019, by Charlie Schick
Edge to Cloud

**CLOUD**
- Big Data processing
- Business Logic
- Data Warehousing

**EDGE**
- Realtime data processing
- At source/on premises
- Data visualization
- Basic analytics
- Data caching, buffering
- Data filtering, optimization
- M2M communications

**INTERNET**

**LAN/WAN**

**SENSORS AND CONTROLLERS**

Industrial IoT Platforms

Leading Industry 4.0 Vendors 2019

Connected Industry Building Blocks

Industrial IoT Platforms

Analytics

Other Industry 4.0 Supporting Technologies

Additive Manufacturing

Augmented and Virtual Reality

Collaborative Robots

Connected Machine Vision

Drone / UAVs

Self-Driving (Material Transport) Vehicles

Source: IoT Analytics, January 2019. Vendor map does not include software of vertical or use case specific solutions (e.g., end-to-end vibration monitoring solutions, etc.). Leading companies were selected based on a number of factors including sophistication of relevant product offerings, number of compelling case studies, and size of Industry 4.0 business. It is possible that some vendors have been missed. To submit a company for consideration in the 2020 vendor map, please contact research@iot-analytics.com with the company information.

Source: IoT Analytics
Traditional SCADA Architecture

Traditional SCADA High-Level Architecture

HMI/SCADA Client
- Graphical Displays
- Trend Displays
- Alarm Displays
- Operator Logs
- Reporting

SCADA Server
- Real-Time DB and Event Manager
  - Device and Asset Tags, Alarm Setpoints, Calculations, Logic
- Device Drivers
  - OPC, OPC UA, Custom Devices, Modbus, Profibus, etc.
- Comms/Gateways
  - Radio, Cell, WLAN, LAN, Serial, Analog

Device and Control
- PLC, DCS, Loop Controllers, Vision System, RTU, Motion Controller

Developer's Station
- Graphics, Alarms, RT DB Tags, Reports, Drivers

Historian and Archiving
- Data Historian, Alarm Logs, Operator Logs, Report Archive
- Export Data for Analysis

External Apps
- Recipe Management, Asset Management, Quality Control, Batch Management, etc.

Source: IDC Manufacturing and Energy Insights, 2019
Transformed SCADA High-Level Architecture

Source: IDC Manufacturing and Energy Insights, 2019
## Opportunities

<table>
<thead>
<tr>
<th>USE CASES</th>
<th>% ADOPTION</th>
<th>% OF PROJECTS IN &quot;USE&quot; STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy management</td>
<td>23%</td>
<td>41%</td>
</tr>
<tr>
<td>Industrial automation</td>
<td>48%</td>
<td>38%</td>
</tr>
<tr>
<td>Supply chain and logistics</td>
<td>43%</td>
<td>36%</td>
</tr>
<tr>
<td>Condition-based predictive maintenance</td>
<td>30%</td>
<td>34%</td>
</tr>
<tr>
<td>Plant safety and security</td>
<td>33%</td>
<td>34%</td>
</tr>
<tr>
<td>Production planning and scheduling</td>
<td>43%</td>
<td>33%</td>
</tr>
<tr>
<td>Quality and compliance</td>
<td>45%</td>
<td>31%</td>
</tr>
<tr>
<td>Condition-based monitoring and service</td>
<td>29%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Source: Microsoft IoT Signals “Summary of Research Learnings 2019
Data-Based Maintenance: the Killer App for IIoT?

Unplanned Downtime and Poor Maintenance Cost
Process Industries:

- **5%** of their annual production
- **$20 Billion** in losses
- And **80%** could have been avoided
A large municipal Public Utilities Commission predicts it will save about 9,600 hours of labor and reduce the risk of accidental discharge by monitoring 100 critical pumps.
Maintenance can cost 15x more at offshore wind farms. By reducing boat trips with remote monitoring, a European power producer estimates it can save 20 million Euros a year by 2020.
Staying Out of the Cold

An Oil & Gas customer estimates that data-based maintenance saves $16.75 per hour per truck, or $20 million per year. The risk of certain types of injuries was reduced by 85%.
A large pump supplier provides their customers with real-time performance insights. One customer avoided $630,000 in losses when a welder’s blanket almost clogged a pump.
Industry Predictions

1. Hasten to Innovation
   - By 2024, over 50% of all IT spending will be directly for digital transformation and innovation (up from 31% in 2018), growing at 17% CAGR (vs. 2% for the rest of IT)

2. Connected Clouds
   - By 2022, 70% of enterprises will integrate cloud management across their public and private clouds by deploying unified hybrid/multicloud management technologies, tools and processes.

3. Edge Build-Out
   - By 2023, over 50% of new enterprise IT infrastructure deployed will be at the edge rather than corporate datacenters, up from less than 10% today; by 2024, the number of apps at the edge will increase 800%

4. Industry Apps Explosion
   - By 2023, over 500 million digital apps and services will be developed and deployed using cloud native approaches, most of those targeted at industry specific digital transformation use cases.

We Believe People With **Data** Can Transform Their World