IIoT Data Access with the PI System

Daniel McGovern

November 8th, 2017

OSIsoft

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PI System Data is Used Across the Enterprise to Achieve Business Impacting Change

Safety & Security | Energy Utilization | Process Efficiency | Asset Health | Quality | Regulatory Performance

Operators
Craftsmen
Supervisors

Process Engineers
Production Superintendents
CoE Experts

Location Managers
Regional/Global Ops
Business Leadership

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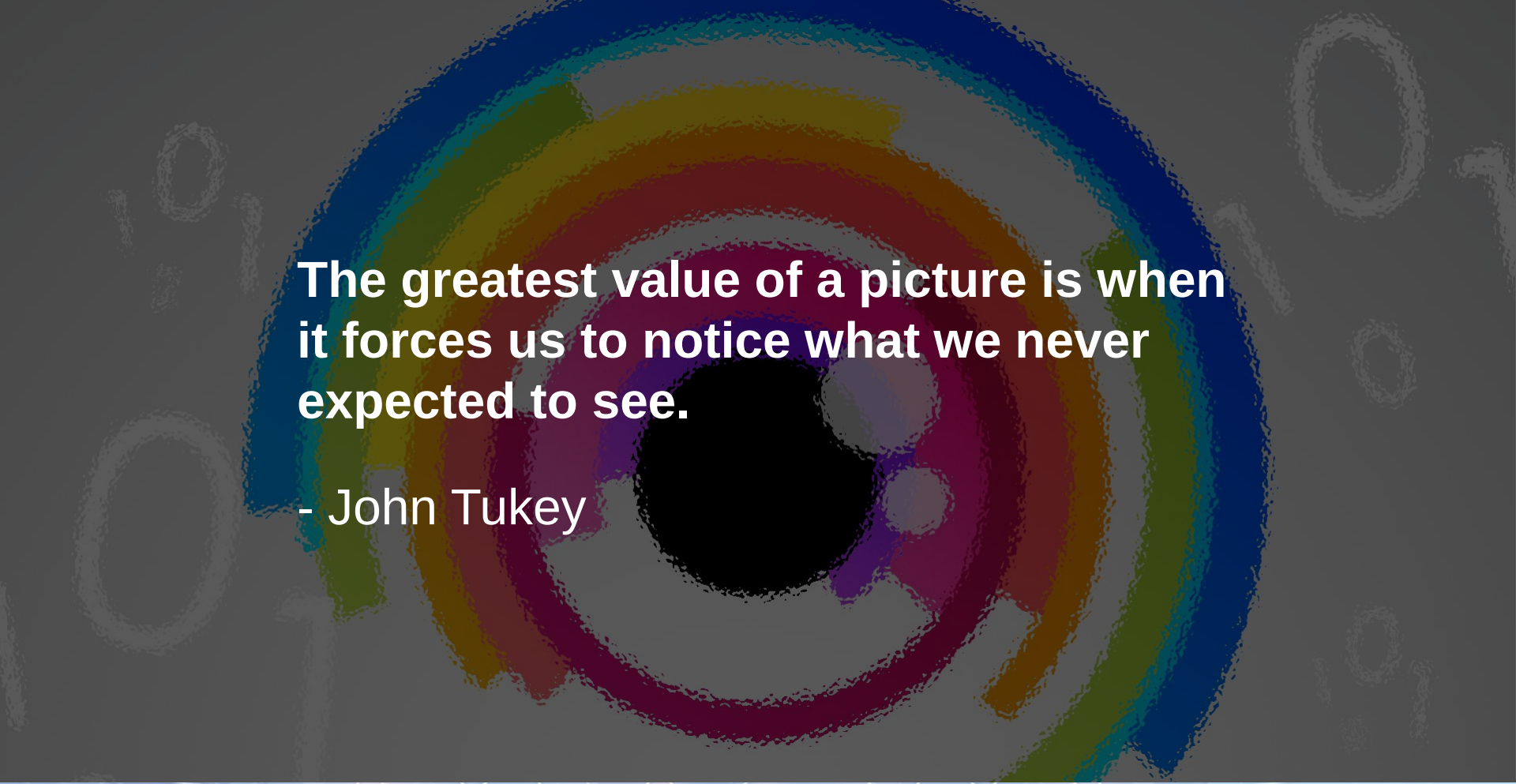

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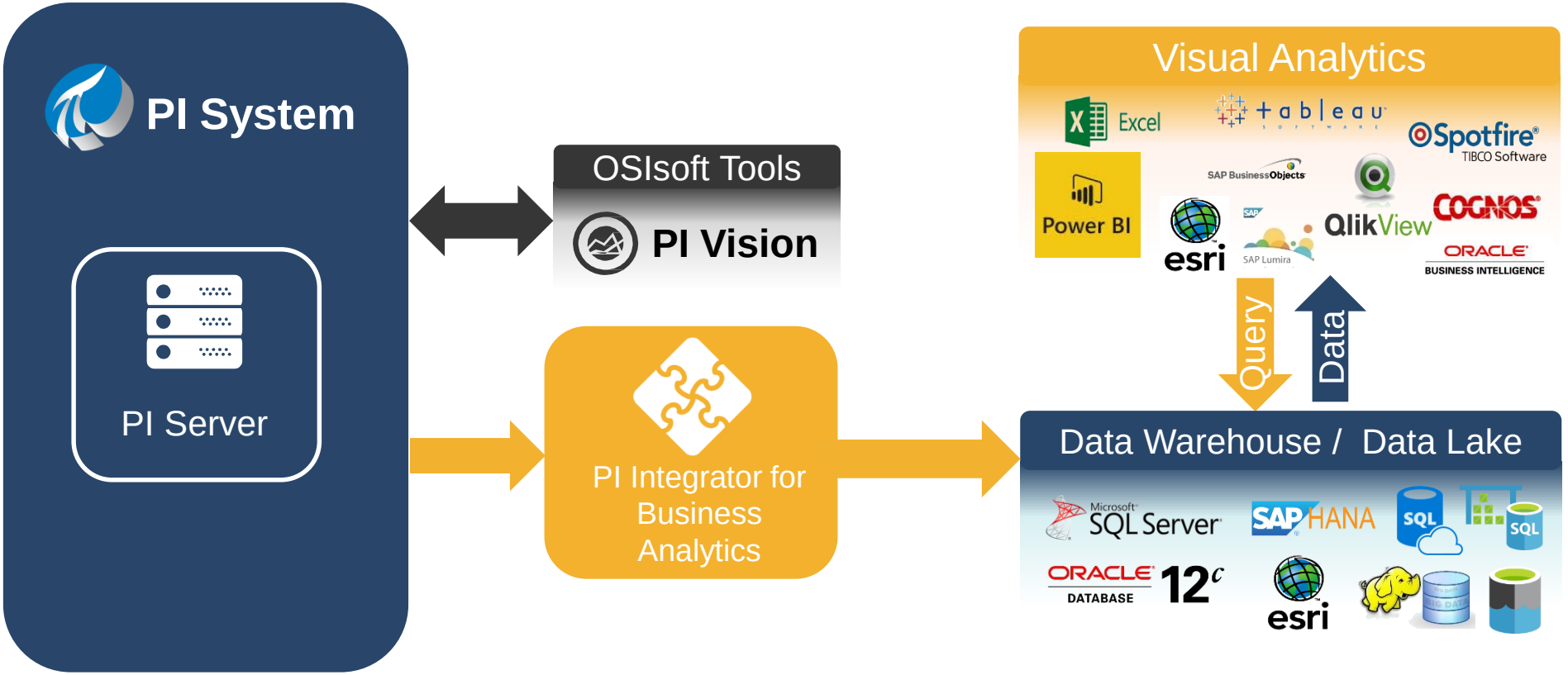
Streaming Data to the Right Places



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Utilizing PI System Data

PI Vision

Unified visualization infrastructure, your window into operational intelligence

PI Integrators

Blend operational data with business data for complex analyses

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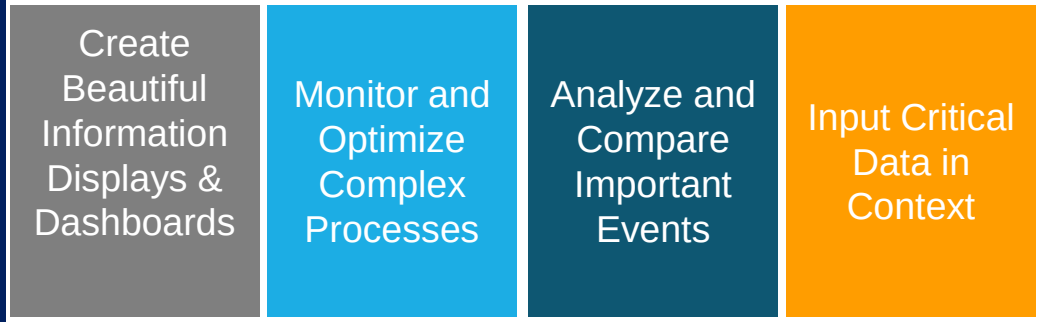
PI Vision

We are embarking on a **unified visualization infrastructure** to deliver a seamless, powerful, extensible experience



Your window into operational intelligence

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A Single Platform for Your Visualization Needs

Today

PI ProcessBook
Display Editor
Process Monitoring

PI Vision
Ad Hoc Analysis
PB Display Viewer

PI WebParts
Dashboards

PI Manual Logger
Manual Data Entry

Tomorrow

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A Truly Extensible Visualization Infrastructure

Who benefits from extensions?

OSIsoft Teams

Partner EcoSphere

Partners

Customers

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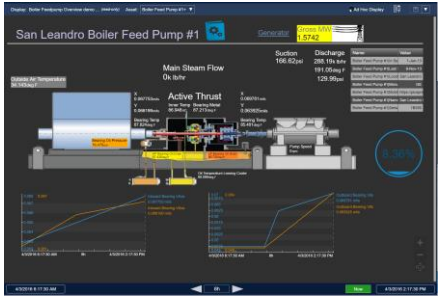
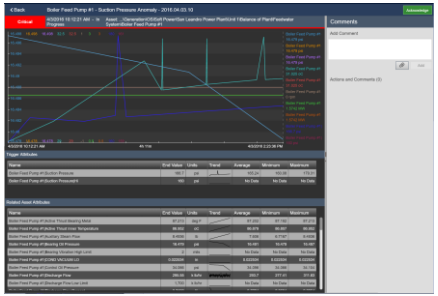
Modern Visualization for the Modern PI System

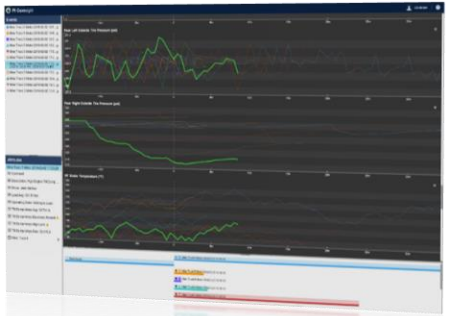
Authoring



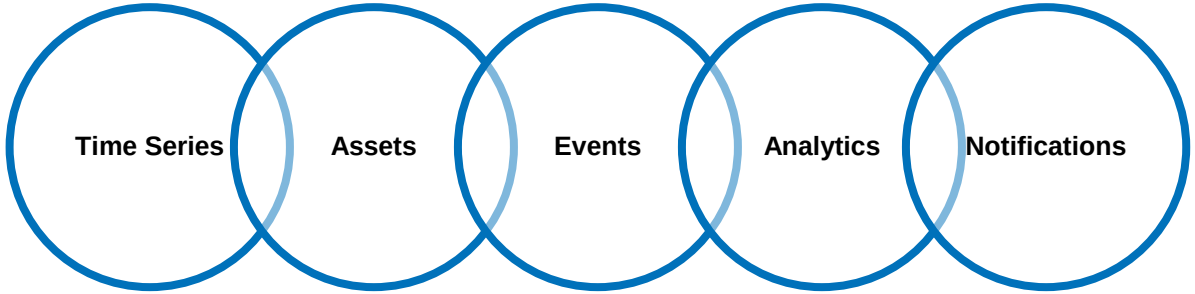
Monitoring



Manual Entry



Ad Hoc Analysis



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What is PI Vision?

The fastest, easiest way to visualize PI System data

- Access data from any web browser, including mobile device browsers
- Collaborate and share comments across the company
- Deploy and roll-out rapidly

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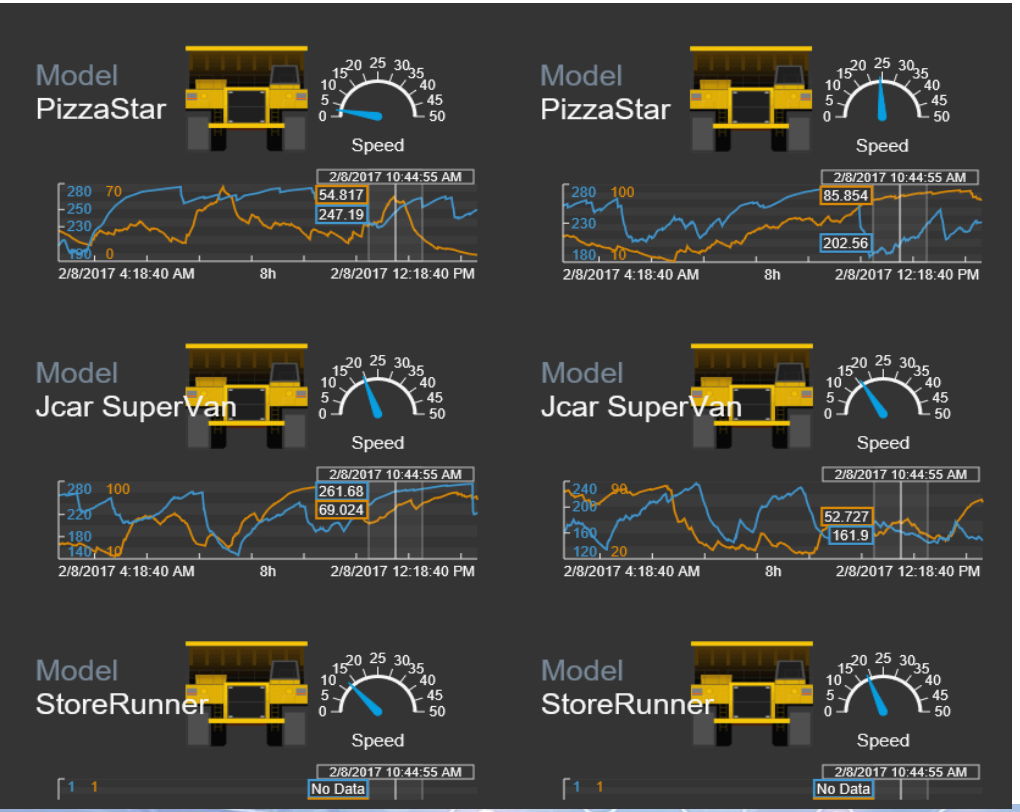
Auto-populate Monitoring Displays with Collections



Group one or more symbols as a “collection”

Screen auto-populates that same grouping for all assets

- New assets are added automatically
- Add filter criteria to quickly see troubled assets

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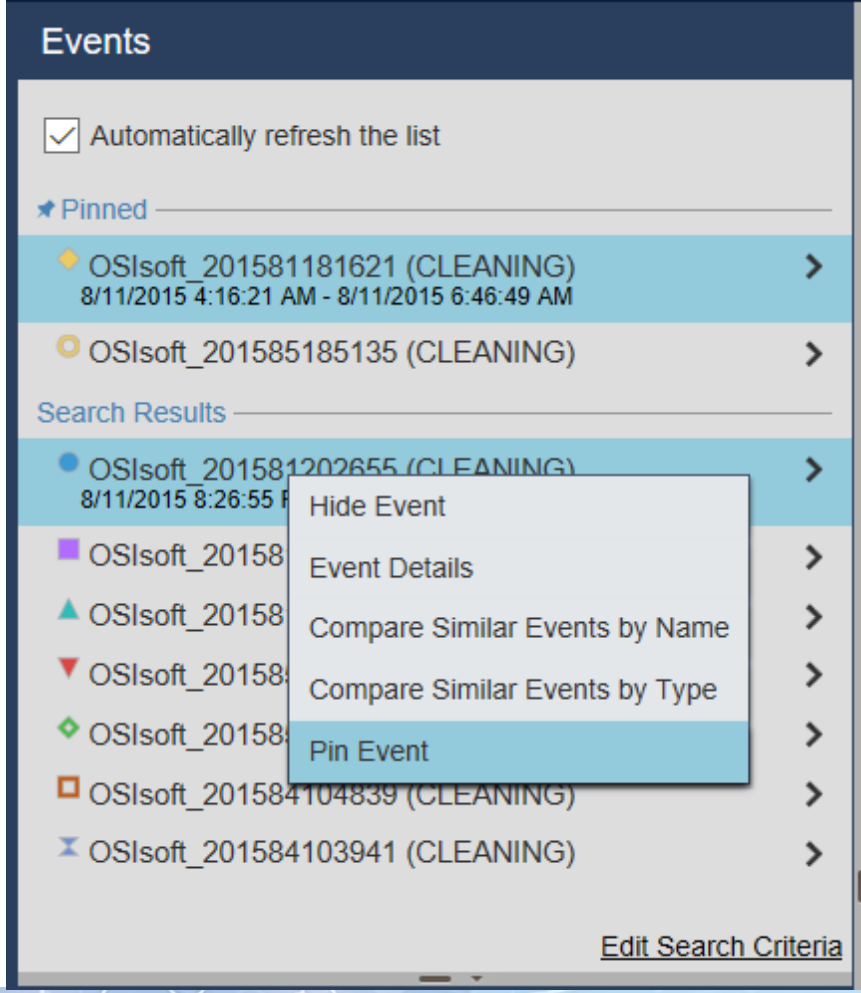
Pinned Events

- Identify batch process deviation by comparing to a reference
  - “Pin” one or more events, to be used as a reference
  - Pinned events are saved with the display



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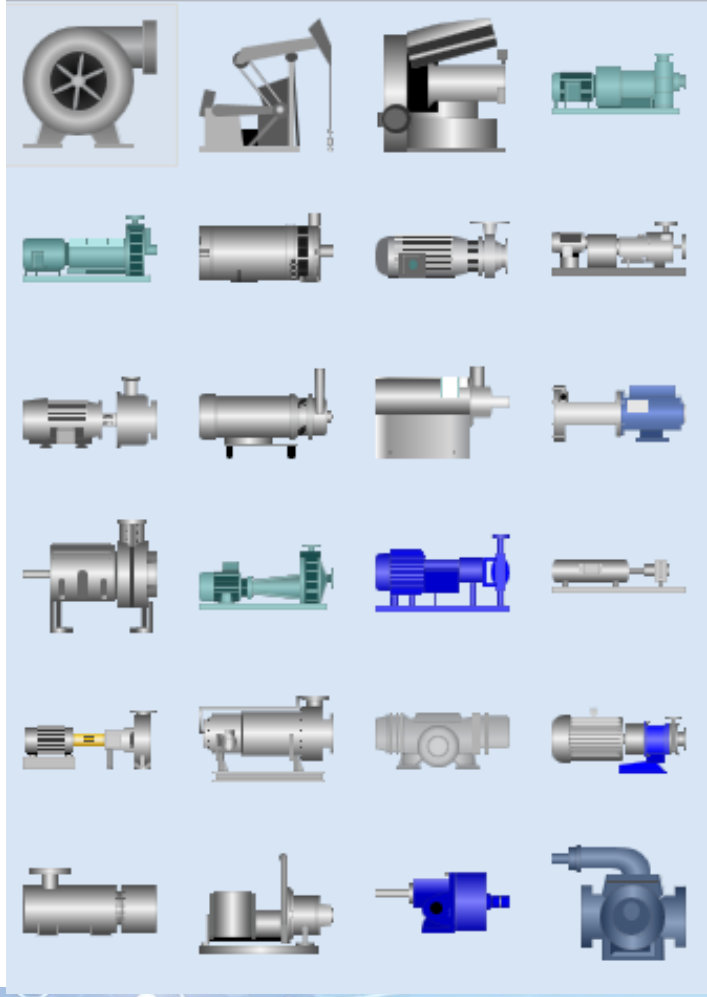
Graphics Library

- Easily create standard views by using an extensive library of graphics symbols
- Use the same symbols as are available from PI ProcessBook



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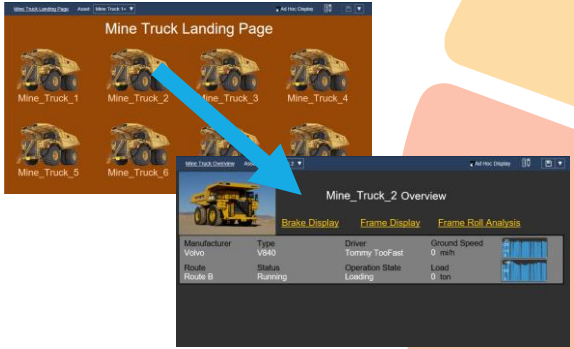
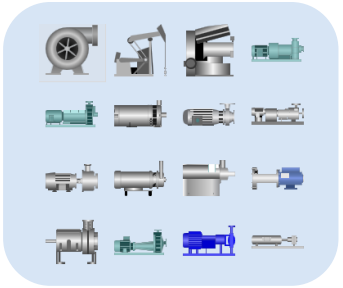
PI Vision 2017

Collections

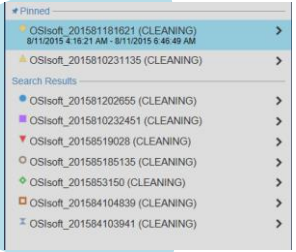
Drill-in Navigation



Graphic Library

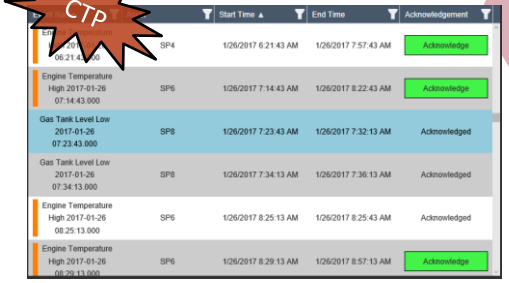


Pinned Events



Events Table

CTP

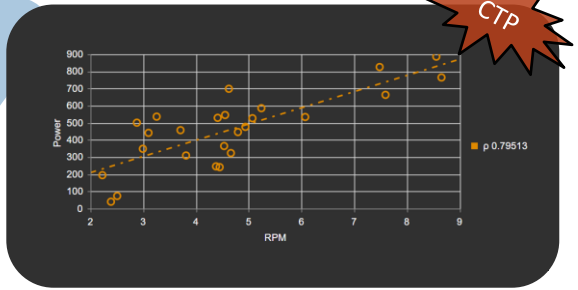


Asset Comparison Table

Asset	Manufacturer	Driver	Engine RPM	Load	Status
Mine Truck 1	Caterpillar	Jason Rice	0	0	Running
Mine Truck 2	Volvo	Tommy TooFast	0	0	Running
Mine Truck 3	Komatsu	Edna Thompson	1,682.6	159.87	Running
Mine Truck 4	Caterpillar	Revill Swivel	0	0	Running
Mine Truck 5	Volvo	John Sintilas	0	0	Running
Mine Truck 6	Komatsu	Steve Kwan	1,744.9	194.14	Running
Mine Truck 7	Volvo	Brian Bostwick	0	0	Running
Mine Truck 8	Caterpillar	Steve Kia	0	0	Running
Mine Truck 9	Caterpillar	Justin Brown	0	0	Running
Mine Truck 10	Volvo	Bob Bonkers	1,719.7	157.74	Running

XY Plot

CTP



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PI Integrators:
Blending data to ask complex questions

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PI System Users Need to Solve a Variety of Complex Questions

Complexity

Disparate assets or one-by-one interactions

Interacting with common assets as a fleet

Monitoring

Real-time visibility

- HMI

Process Optimization

Real-time & historical views across any plant asset

- PI Vision
- PI Datalink

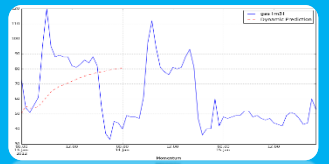
Benchmarking

Fleet-wide performance comparisons

- BI Apps (i.e. Tableau, Spotfire, Lumira)
- PI Integrator for Business Analytics
- SAP HANA IoT Integrator by OSIsoft

System Optimization

Large scale multi-variate analysis



- Machine Learning (Azure ML, R)
- PI Integrator for Business Analytics
- SAP HANA IoT Integrator by OSIsoft

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Data Integration can Address Big Questions

Mining

- What material is being hauled?
- Was it raining?
- Were there holes in the road?
- What is the grade of the hill?
- Was there scheduled downtime?
- Are there different driving behaviors?

Oil & Gas

- When did the geology change?
- Which well was being drilled?
- What angle was the drill bit?
- Is production related to drill conditions?

Wind Power

- Was wind gusty or steady?
- Was the maintenance planned?
- How long does this issue usually take to fix?

Pharmaceuticals

- What product is being made?
- When is the equipment empty?
- Where was the instrument when I took that measurement?

Transmission & Dist.

- How are renewables impacting equipment?
- Was there a voltage violation?
- What are the changes in weather?

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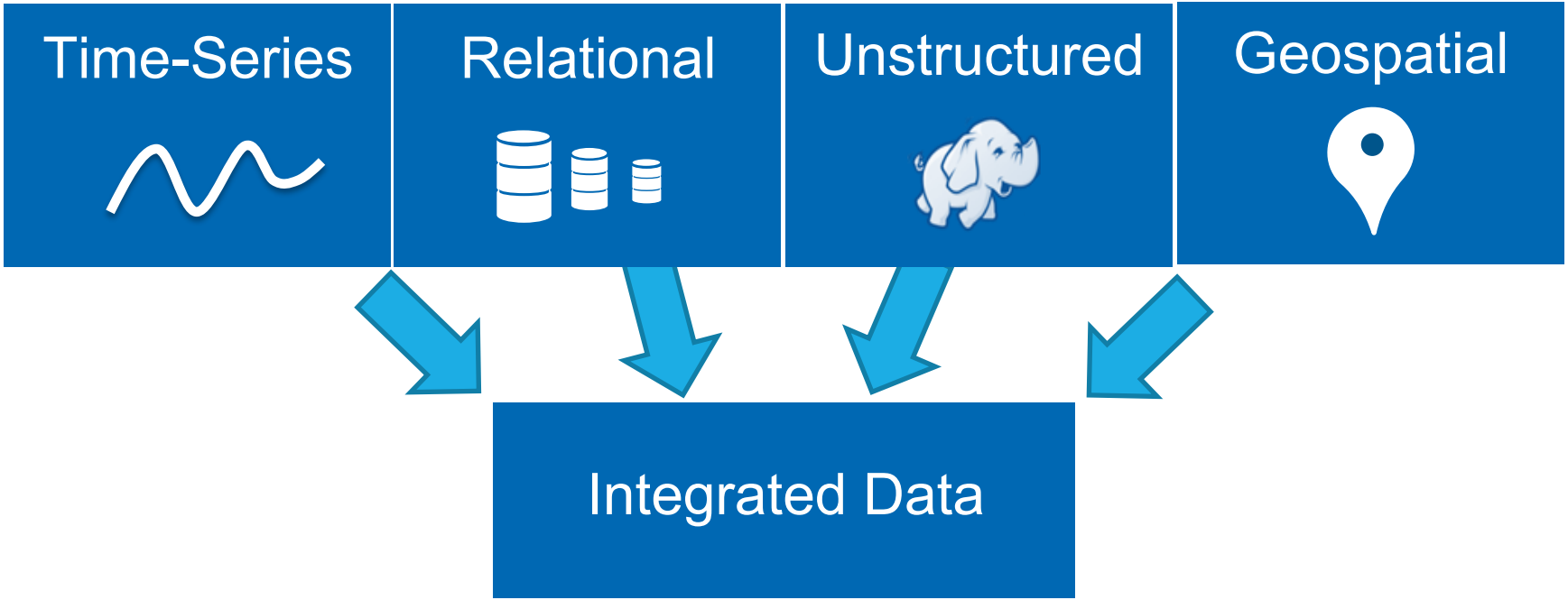
Data Integration Brings Together Different Data



Integrate, verb: combine (one thing) with another so that they become a whole

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Time-Series Data is Complex!

Turbine 1

Speed

Bearing Temp

Oil Temp

Turbine 2

Speed

Bearing Temp

Oil Temp

Wear Factor

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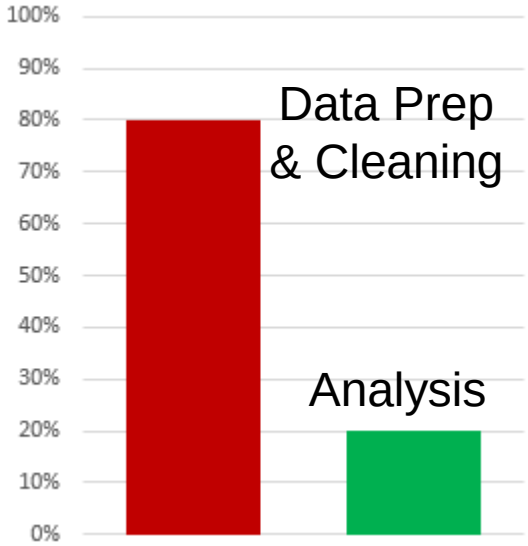
Data Integration Projects are Challenging

Time

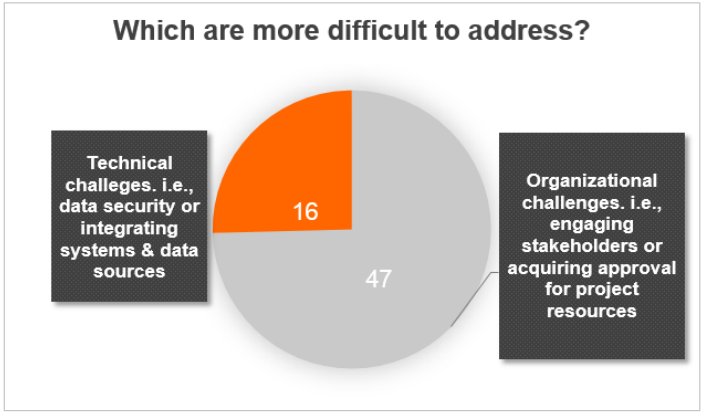


Warning: Currently, data analysts spend 50-80% of their time merely collecting and preparing data[1]

Expense

Warning: data integration often requires ongoing upkeep

Risk



Warning: If "why?" for the project is not clearly communicated, business barriers will delay and risk the project

[1]*https://hbr.org/2014/04/the-sexiest-job-of-the-21st-century-is-tedious-and-that-needs-to-change/*

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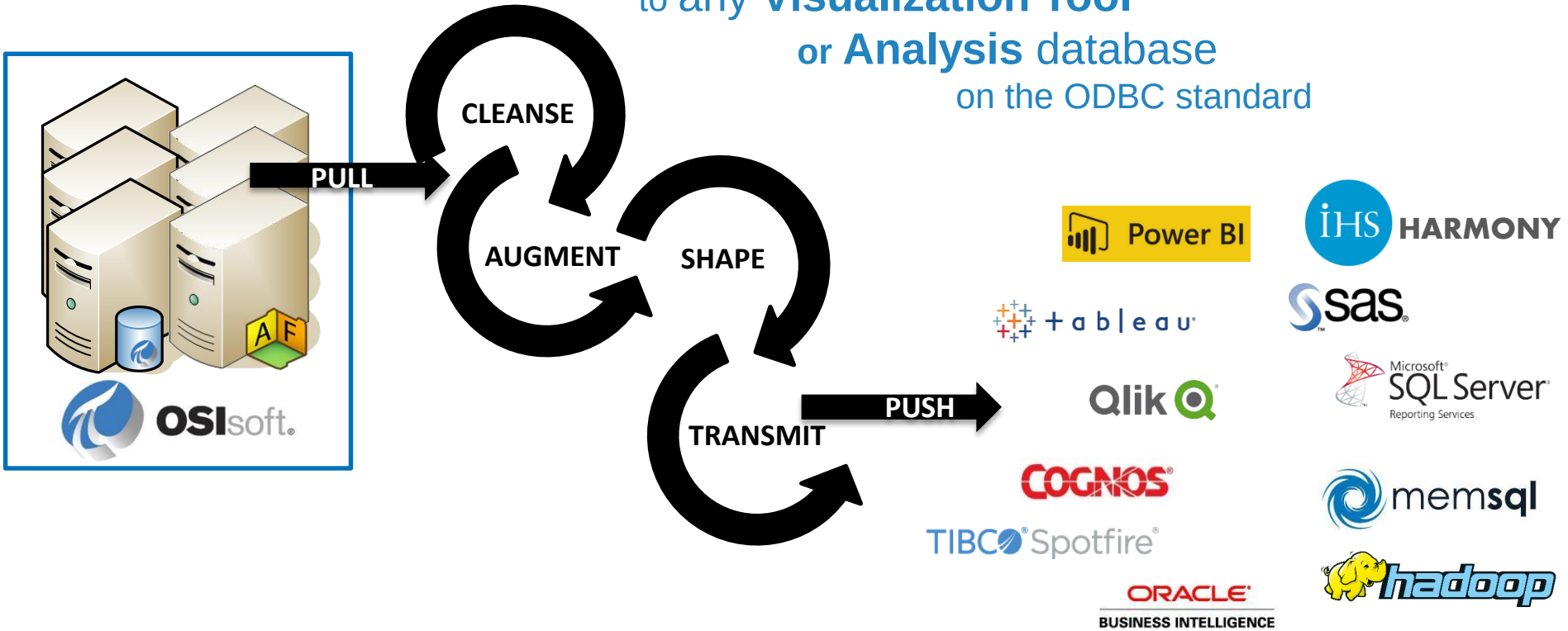
Prepare and Deliver Process Data

to any **Visualization Tool**
or Analysis database
on the ODBC standard



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Advanced Integrations: Supported Systems

Visual Analytics

Excel

Spotfire® TIBCO Software

SAP BusinessObjects

COGNOS

esri

ORACLE BUSINESS INTELLIGENCE

+ableau SOFTWARE

Power BI

SAP Lumira

QlikView

Data Warehouse / Data Lake

SQL

Microsoft® SQL Server®

SQL

ORACLE® DATABASE 12c

SAP® HANA

Streaming Analytics – 2017

IoT Hub

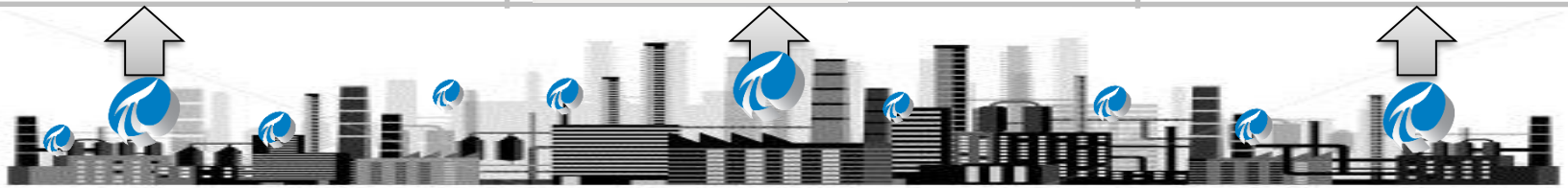
Machine Learning

Stream Analytics

Spark

kafka

SAP®



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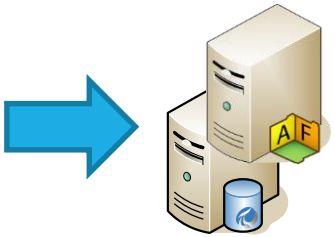
What Can This Look Like?

Example application:
Comparing data from smart badge sensors

Badges worn by individuals track environmental conditions in different areas



Badge data is streamed in real-time to an OSIsoft PI System

1. Smart badge sensors generate data
2. The PI System collects, manages, and enhances that data
3. **Our goal:** use SAP HANA to detect patterns in the data stored in the PI System

Solution: a PI Integrator can publish data from the PI System into SAP HANA!

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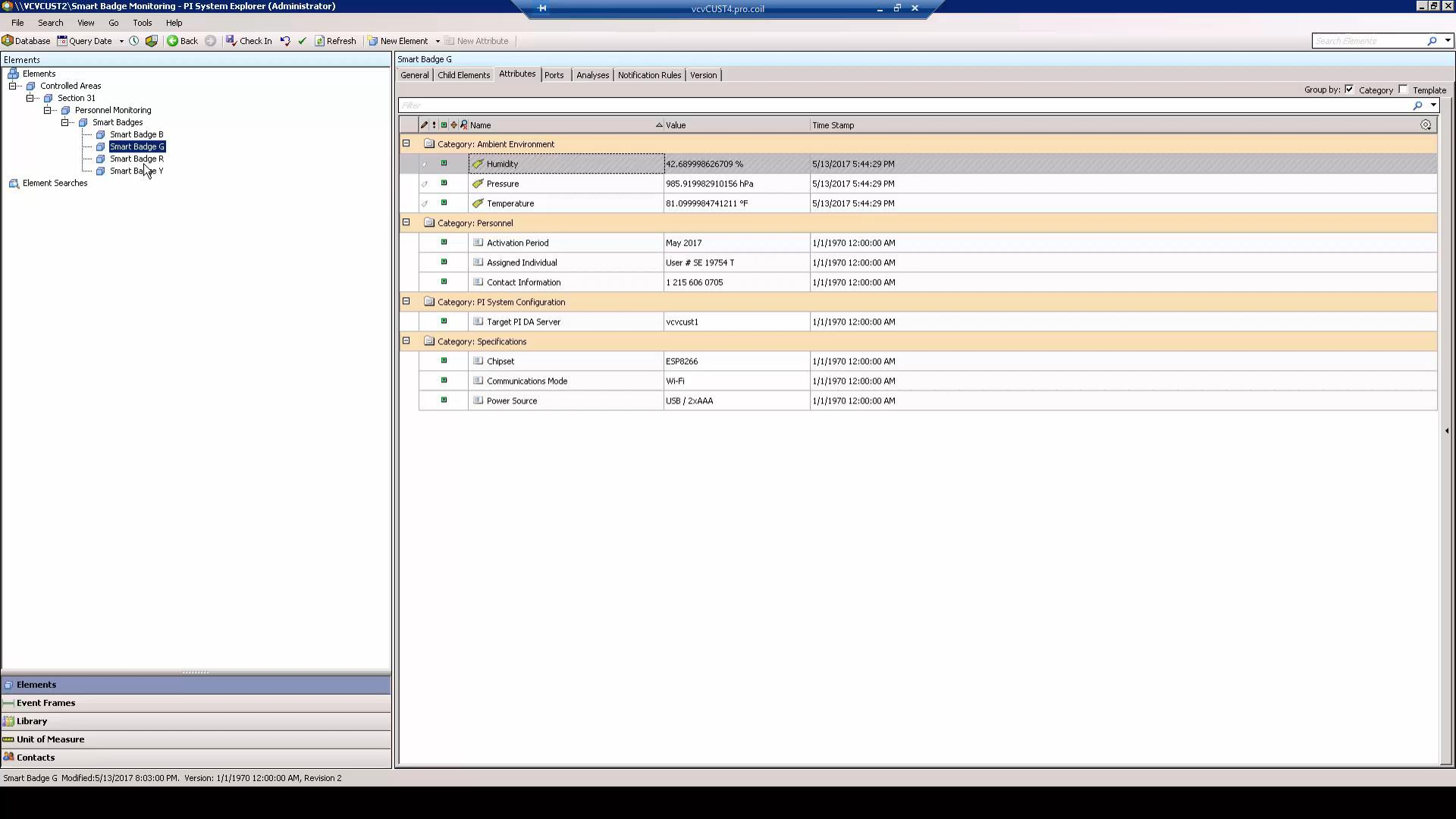
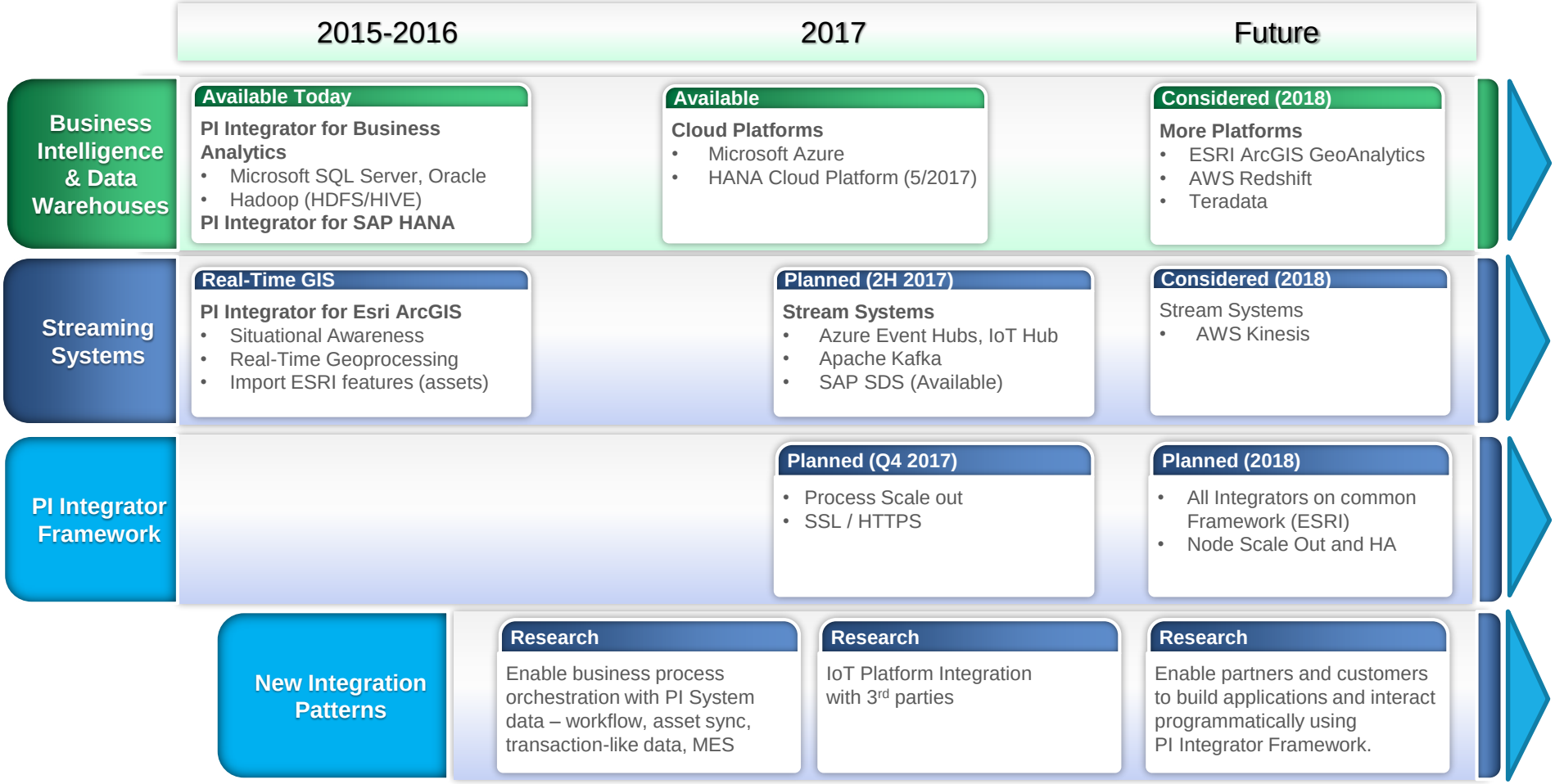

\\VCVCUST2\Smart Badge Monitoring - PI System Explorer (Administrator)
vcvCUST4.pro.coil
File
Search
View
Go
Tools
Help
Database
Query Date
Back
Check In
Refresh
New Element
New Attribute
Search Elements
Elements
Elements
Controlled Areas
Section 31
Personnel Monitoring
Smart Badges
Smart Badge B
Smart Badge G
Smart Badge R
Smart Badge Y
Element Searches
Elements
Event Frames
Library
Unit of Measure
Contacts
Smart Badge G
General
Child Elements
Attributes
Ports
Analyses
Notification Rules
Version
Group by: Category Template
Filter
Name
Value
Time Stamp
Category: Ambient Environment
Humidity
42.689998626709 %
5/13/2017 5:44:29 PM
Pressure
985.919982910156 hPa
5/13/2017 5:44:29 PM
Temperature
81.0999984741211 °F
5/13/2017 5:44:29 PM
Category: Personnel
Activation Period
May 2017
1/1/1970 12:00:00 AM
Assigned Individual
User # SE 19754 T
1/1/1970 12:00:00 AM
Contact Information
1 215 606 0705
1/1/1970 12:00:00 AM
Category: PI System Configuration
Target PI DA Server
vcvcust1
1/1/1970 12:00:00 AM
Category: Specifications
Chipset
ESP8266
1/1/1970 12:00:00 AM
Communications Mode
Wi-Fi
1/1/1970 12:00:00 AM
Power Source
USB / 2xAAA
1/1/1970 12:00:00 AM
Smart Badge G Modified:5/13/2017 8:03:00 PM. Version: 1/1/1970 12:00:00 AM, Revision 2



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Customer Example: Deschutes Brewery

Leveraging the PI System and Cortana Intelligence to Increase Process Efficiency

COMPANY and GOAL

Deschutes Brewery is the 7th largest craft brewery in US, and wanted to maximize production with its existing infrastructure to fund construction of a 2nd brewery in Roanoke, VA

CHALLENGE

Batch's phase transition happens between manual density measurements occurring every 8-10 hours

- Impact: Losing up to 72 hours in production time

SOLUTION

Use data science to achieve accurate predictive analytics for determining a batch's density measurements

- PI System
- PI Integrator for Microsoft Azure
- SQL Data Warehouse
- Azure Machine Learning
- Azure Data Factory

RESULTS

Ability to eliminate production time losses and increase production capacity

- Accurate predictions of when a batch's phase transitions from fermentation to free rise

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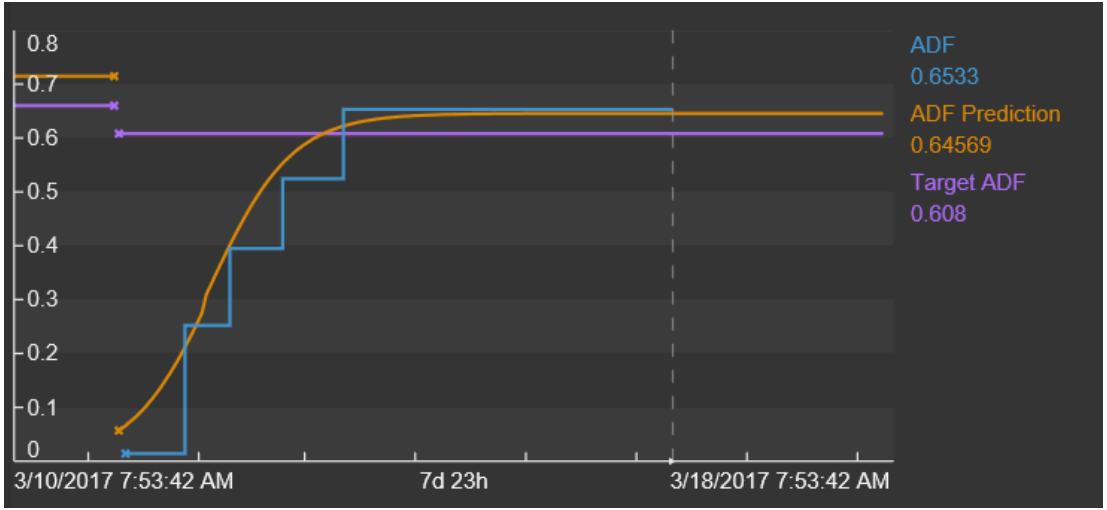
Detecting Early Deviations and Taking Corrective Action

Black Butte Porter – Vessel 45



Indications:

- Uncharacteristic fermentation

Actions taken:

- Transition to free rise early

Results:

- Production time reduced
- Batch saved
- Quality maintained

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Contact Information

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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Post-Event Survey

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

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