IIoT Data Access with the PI System

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10 October 2017

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

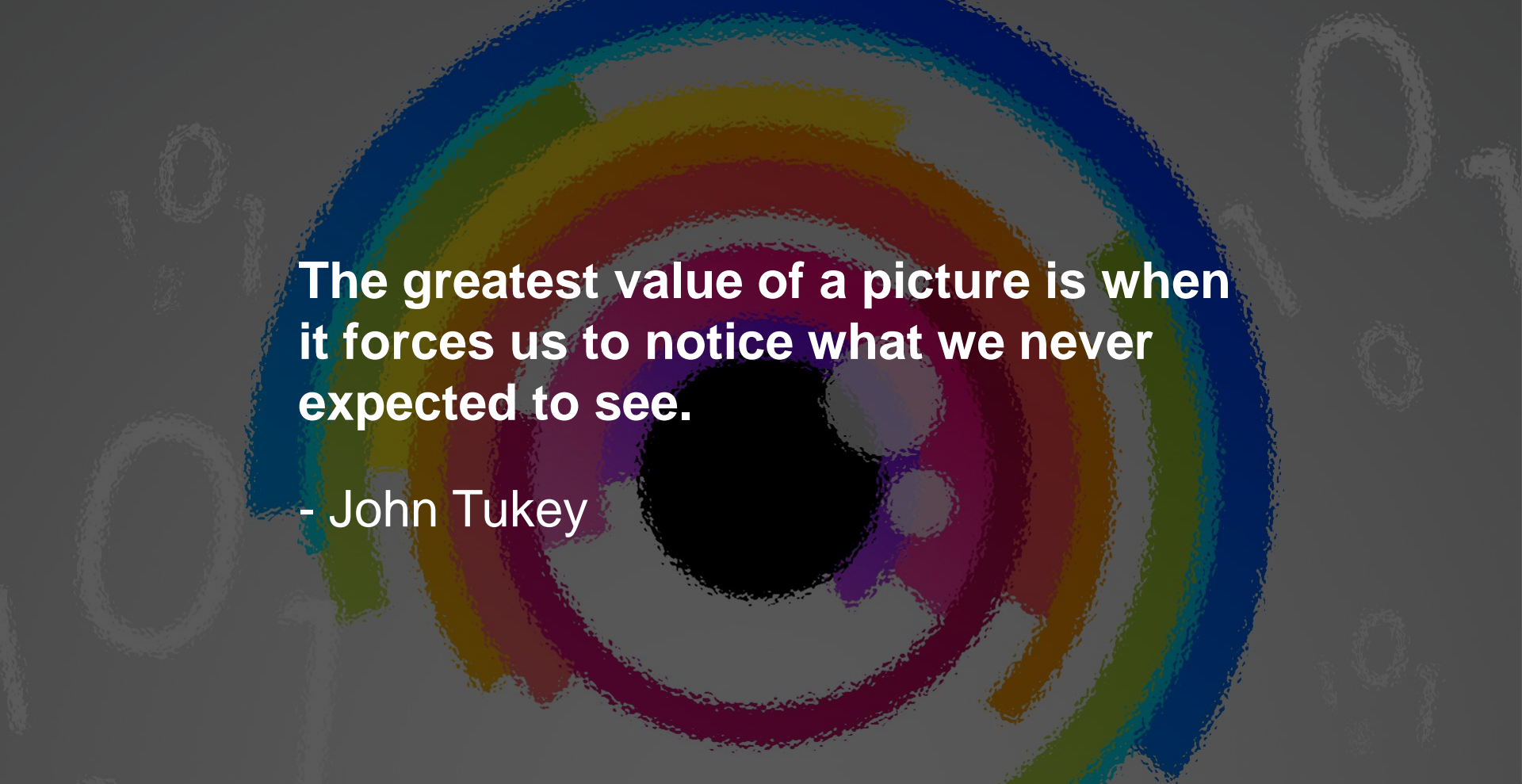| Safety & Security	Energy Utilization	Process Efficiency	Asset Health	Quality	Regulatory Performance

Operators
Craftsmen
Supervisors

Process Engineers
Production Superintendents
CoE Experts

Location Managers
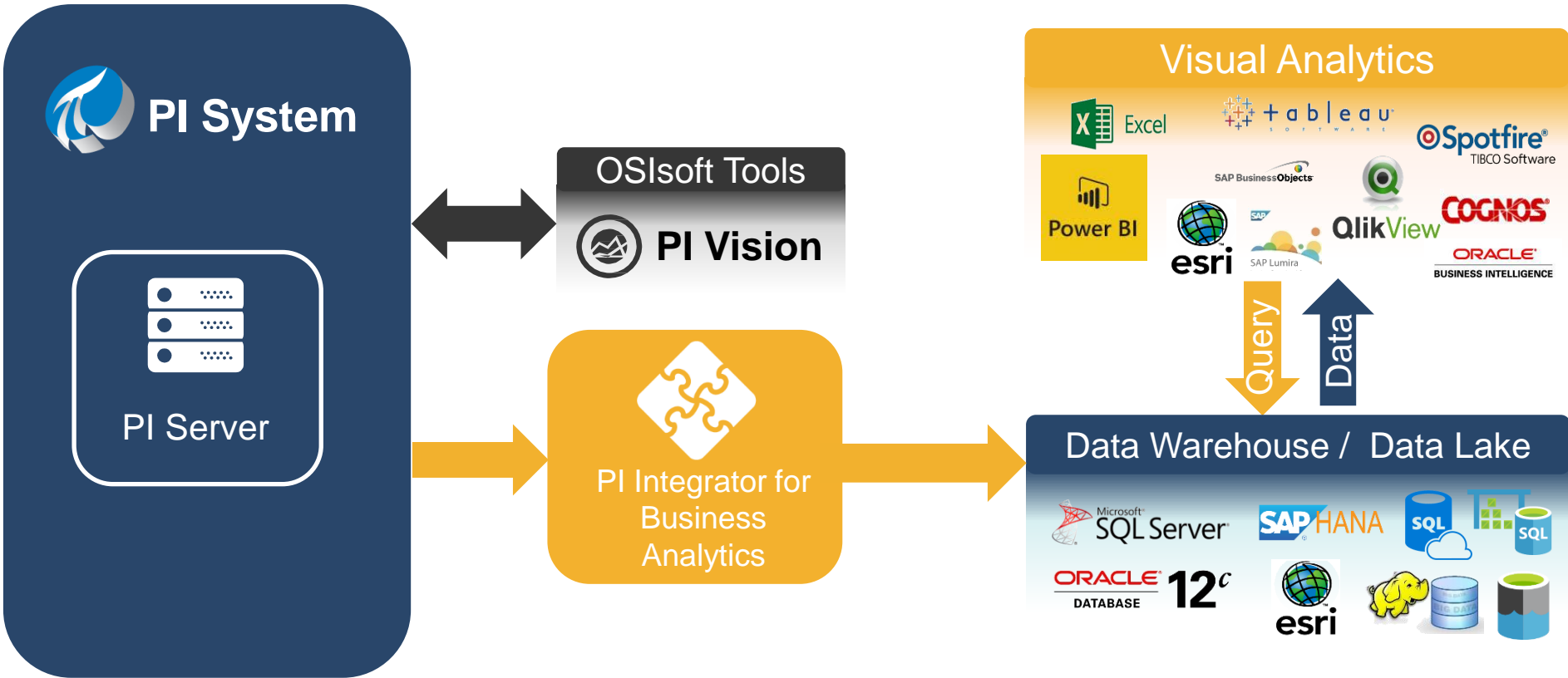**Regional/Global Ops**
Business Leadership

The greatest value of a picture is when it forces us to notice what we never expected to see.

- John Tukey

Streaming Data to the Right Places

PI System

PI Server

OSIsoft Tools

PI Vision

PI Integrator for Business Analytics

Visual Analytics

Excel — tableau SOFTWARE — Spotfire TIBCO Software

Power BI — esri — SAP Lumira — QlikView — COGNOS — ORACLE BUSINESS INTELLIGENCE

SAP BusinessObjects

Query — Data

Data Warehouse / Data Lake

Microsoft SQL Server — SAP HANA — SQL — SQL

ORACLE DATABASE 12c — esri

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

OSIsoft.

PI Vision

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

Create Beautiful Information Displays & Dashboards	Monitor and Optimize Complex Processes	Analyze and Compare Important Events	Input Critical Data in Context

Your window into operational intelligence

A Single Platform for Your Visualization Needs

Today

PI ProcessBook
Display Editor
Process Monitoring
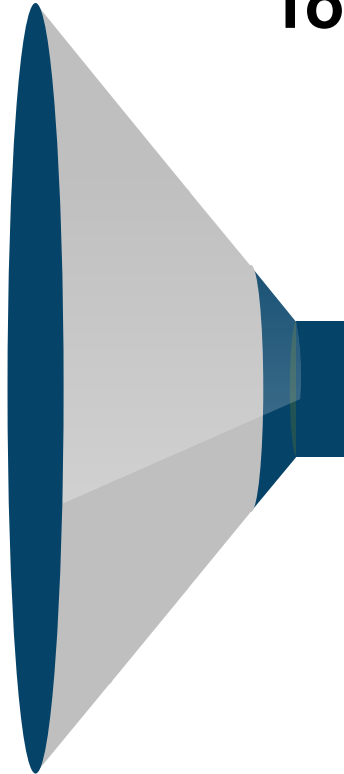
PI Vision
Ad Hoc Analysis
PB Display Viewer

PI WebParts
Dashboards

PI Manual Logger
Manual Data Entry

Tomorrow

- Display Editor
- Process Monitoring
- Ad-hoc Analysis
- Notifications
- Reporting
- Data Input
- Advanced Charting
- Dashboards

A Truly Extensible Visualization Infrastructure

Who benefits from extensions?

Display Editor

Process Monitoring

Dashboards

Ad-hoc Analysis

Advanced Charting

Notifications

Data Input

Reporting

OSIsoft Teams

Partner EcoSphere

Partners

Customers

Modern Visualization for the Modern PI System

Authoring   **Monitoring**   **Manual Entry**   **Ad Hoc Analysis**
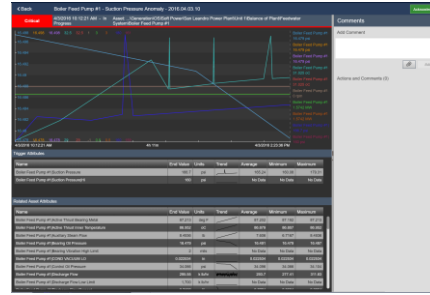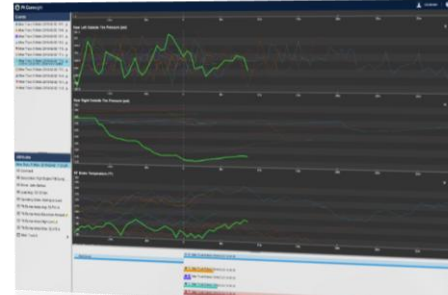
Time Series · Assets · Events · Analytics · Notifications
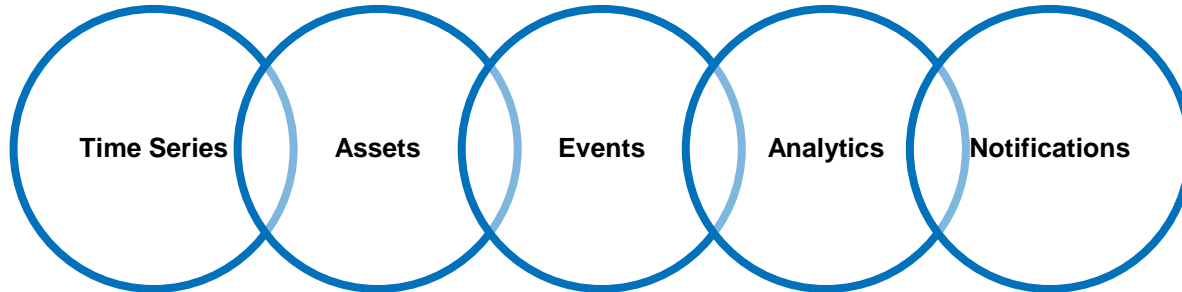
What is PI Vision?

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

PI Integrators:
Blending data to ask complex questions

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

System Optimization

Benchmarking

Process Optimization

Monitoring

Real-time visibility

• HMI

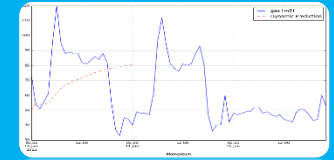## Real-time & historical views across any plant asset

• PI Vision
• PI Datalink

Fleet-wide performance comparisons

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

Large scale multi-variate analysis

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

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?
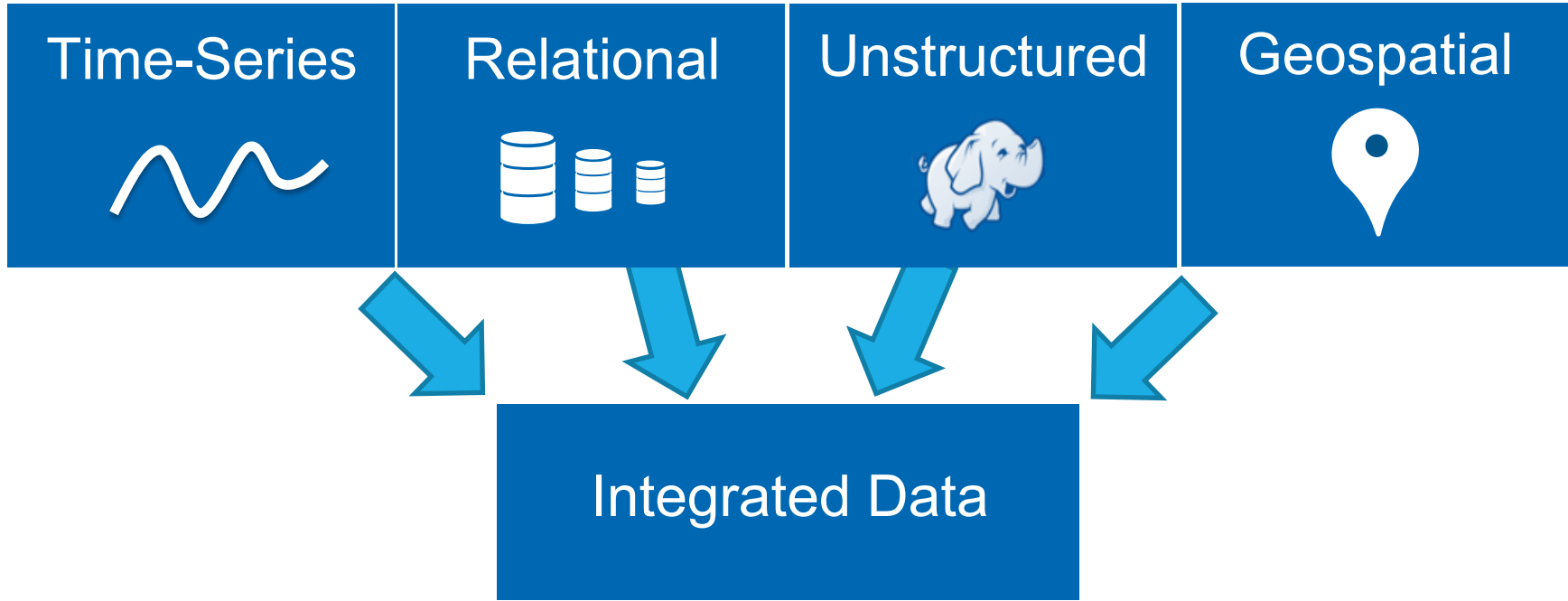- Where was the instrument when I took that measurement?

Transmission & Dist.

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

Data Integration Brings Together Different Data

Time-Series

Relational

Unstructured

Geospatial

Integrated Data

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

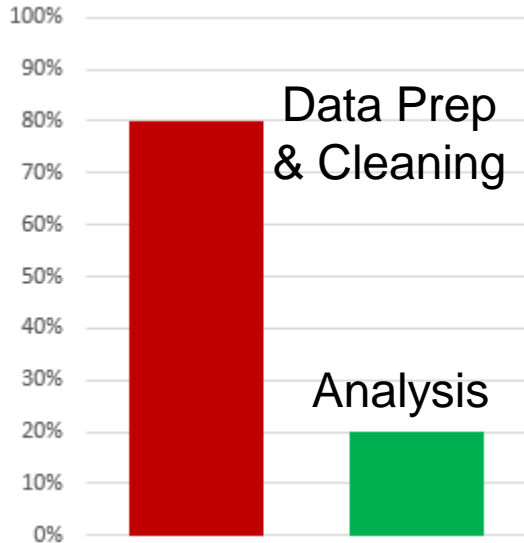# Time-Series Data is Complex!

Turbine 1

Speed
Bearing Temp
Oil Temp

Turbine 2

Speed
Bearing Temp
Oil Temp
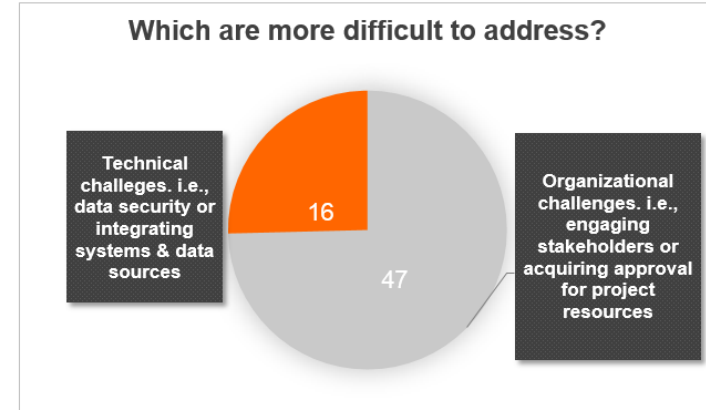Wear Factor

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

Which are more difficult to address?

Technical challenges. i.e., data security or integrating systems & data sources

16

47

Organizational challenges. i.e., engaging stakeholders or acquiring approval for project resources
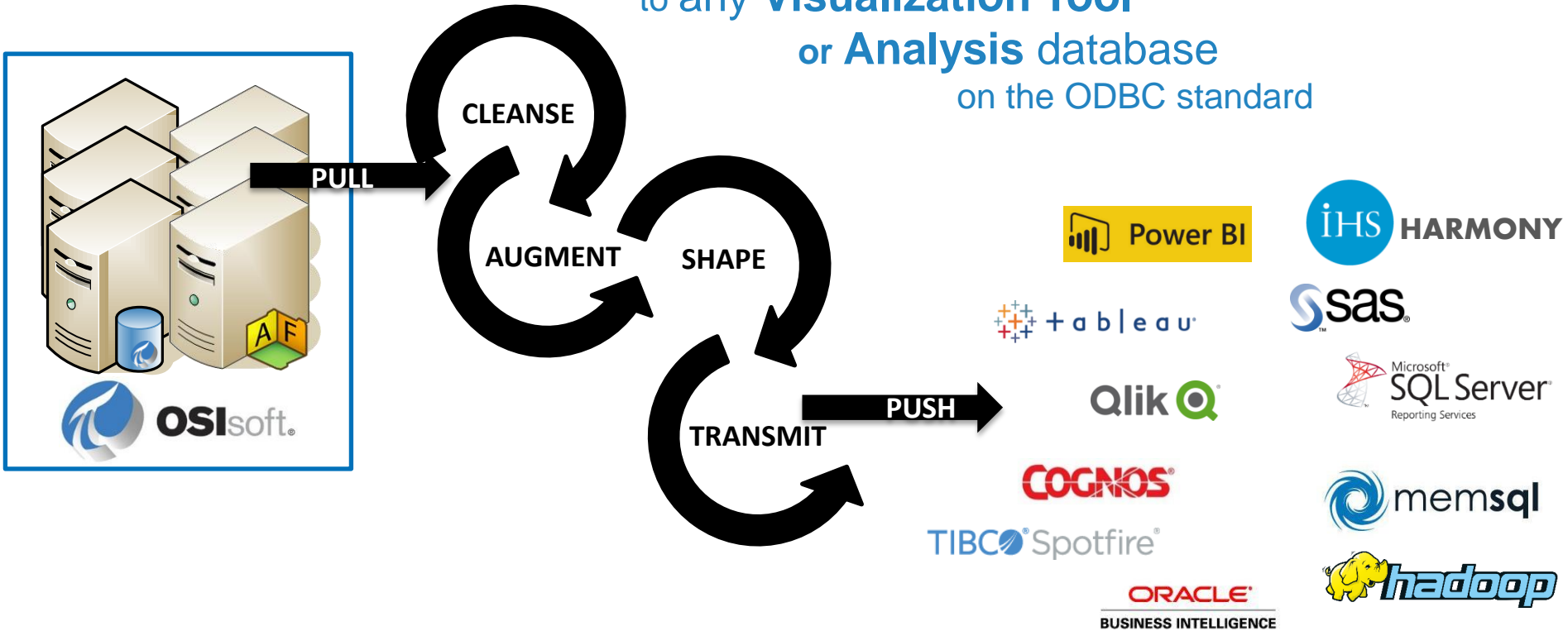
Warning: If "why?" for the project is not clearly communicated, business barriers will delay and risk the project

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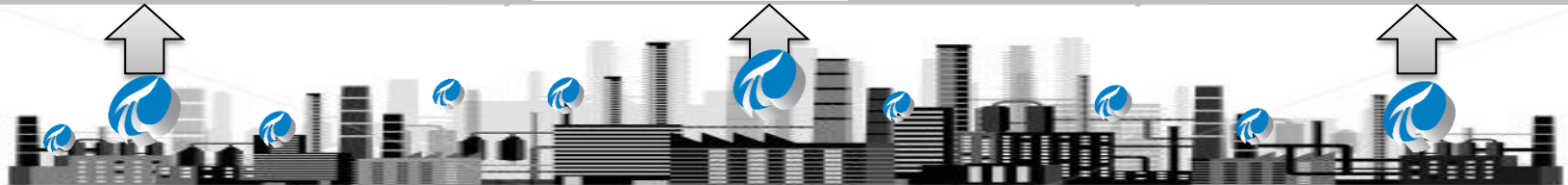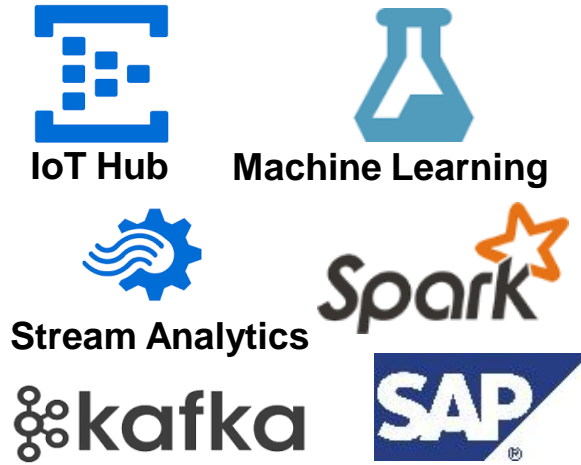
What Can This Look Like?

Example application:
Comparing data from smart badge sensors

Badges worn by individuals track environmental conditions in different areas
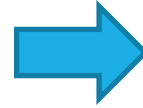
Badge data is streamed in real-time to an OSIsoft PI System

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!

File   Search   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

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

Elements

Event Frames

Library

Unit of Measure

Contacts

Smart Badge G Modified:5/13/2017 8:03:00 PM. Version: 1/1/1970 12:00:00 AM, Revision 2

	2015-2016	**2017**	**Future**

Business Intelligence & Data Warehouses

Available Today
PI Integrator for Business Analytics
- Microsoft SQL Server, Oracle
- Hadoop (HDFS/HIVE)
PI Integrator for SAP HANA

Available
Cloud Platforms
- Microsoft Azure
- HANA Cloud Platform (5/2017)

Considered (2018)
More Platforms
- ESRI ArcGIS GeoAnalytics
- AWS Redshift
- Teradata

Streaming Systems

Real-Time GIS
PI Integrator for Esri ArcGIS
- Situational Awareness
- Real-Time Geoprocessing
- Import ESRI features (assets)

Planned (2H 2017)
Stream Systems
- Azure Event Hubs, IoT Hub
- Apache Kafka
- SAP SDS (Available)

Considered (2018)
Stream Systems
- AWS Kinesis

PI Integrator Framework

Planned (Q4 2017)
- Process Scale out
- SSL / HTTPS

Planned (2018)
- All Integrators on common Framework (ESRI)
- Node Scale Out and HA

New Integration Patterns

Research
Enable business process orchestration with PI System data – workflow, asset sync, transaction-like data, MES

Research
IoT Platform Integration with 3rd parties

Research
Enable partners and customers to build applications and interact programmatically using PI Integrator Framework.

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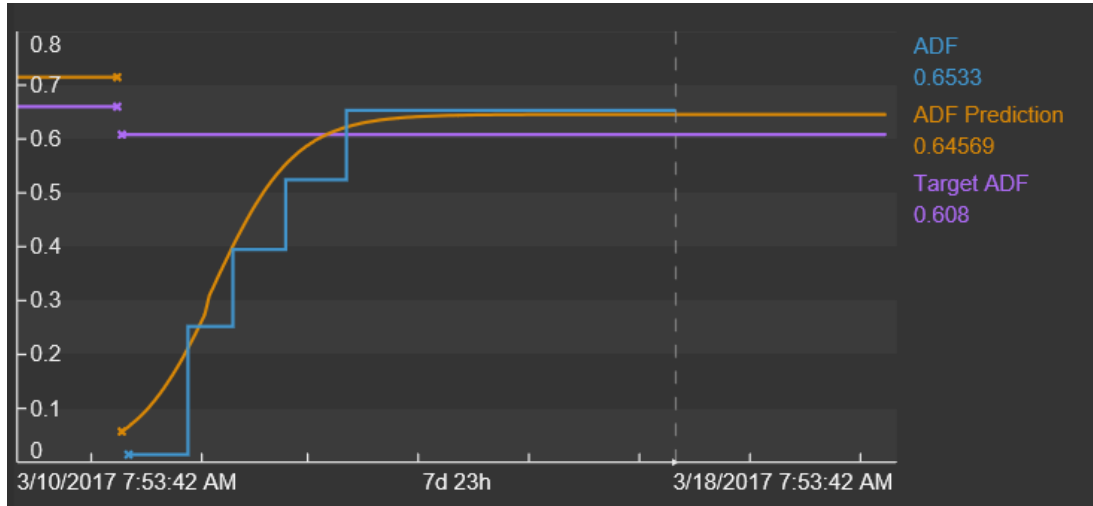
• PI System
• PI Integrator for Microsoft Azure
• SQL Data Warehouse
• Azure Machine Learning
• Azure Data Factory

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

Detecting <u>Early Deviations</u> and Taking <u>Corrective Action</u>

Black Butte Porter – Vessel 45

Indications:
- Uncharacteristic fermentation

Actions taken:
- Transition to free rise early

Results:
- Production time reduced
- Batch saved
- Quality maintained

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