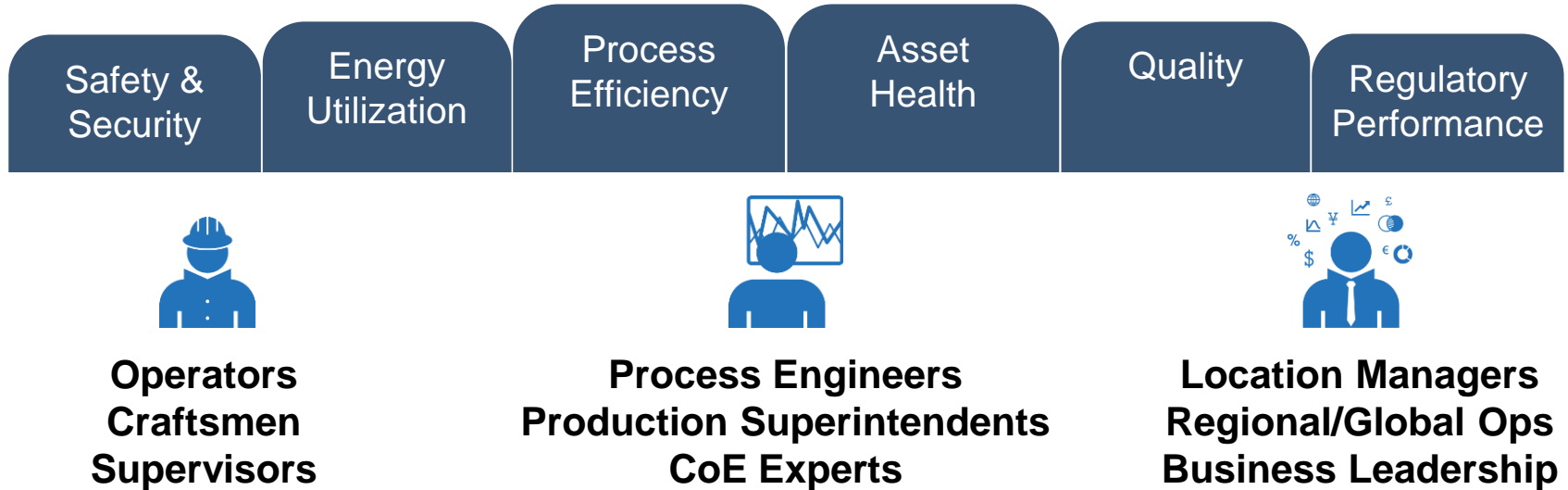


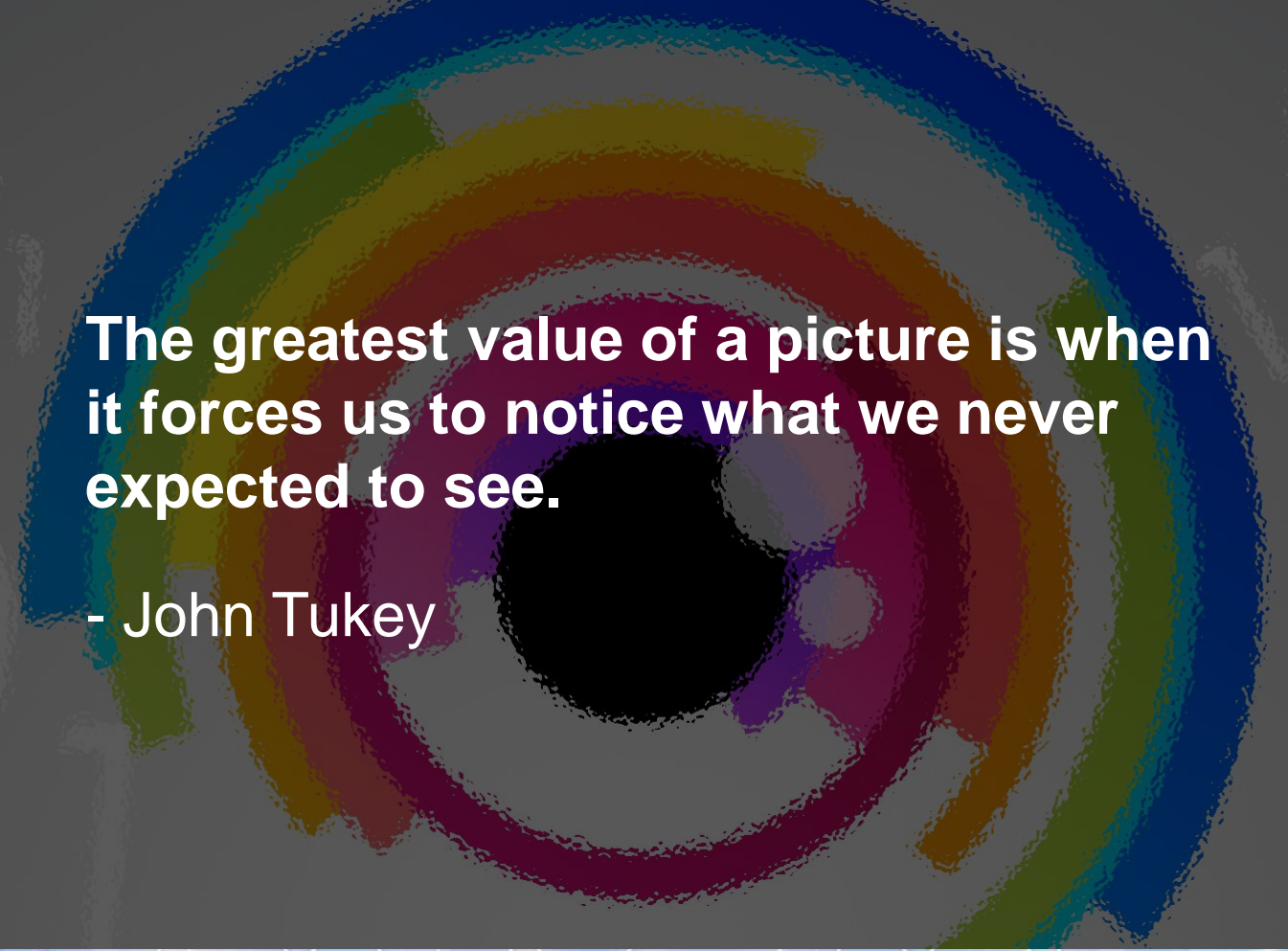
# IloT Data Access with the PI System

John Maytum  
October 5<sup>th</sup> 2017



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



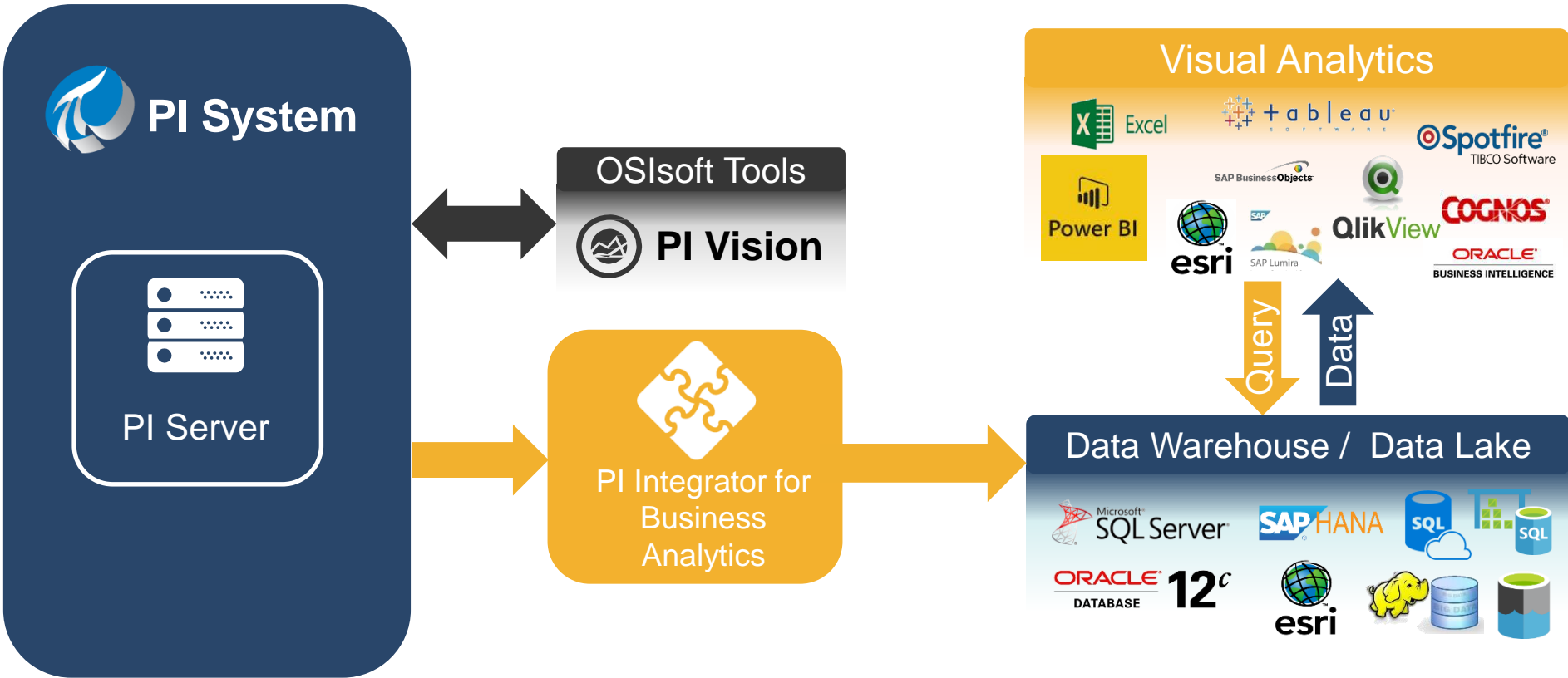


**The greatest value of a picture is when  
it forces us to notice what we never  
expected to see.**

**- John Tukey**



# Streaming Data to the Right Places



# 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



# PI Vision

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



**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



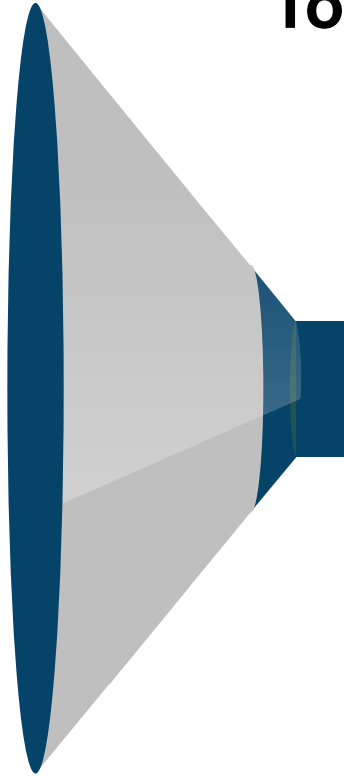
### PI WebParts

Dashboards



### PI Manual Logger

Manual Data Entry



## Tomorrow



# A Truly Extensible Visualization Infrastructure

Who benefits from extensions?



**OSIsoft Teams**



**Partners**



**Customers**

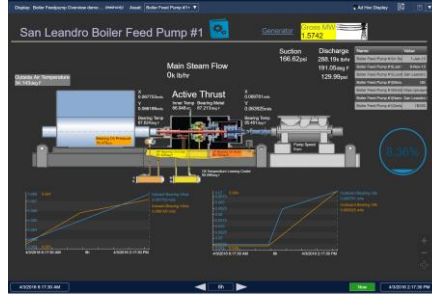




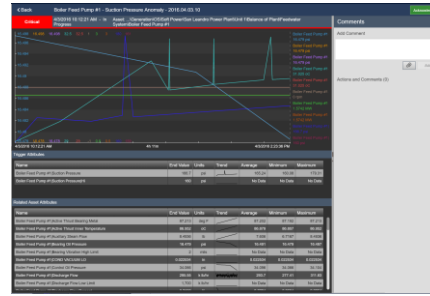
# Modern Visualization for the Modern PI System



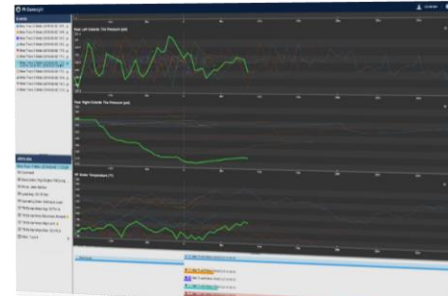
**Authoring**



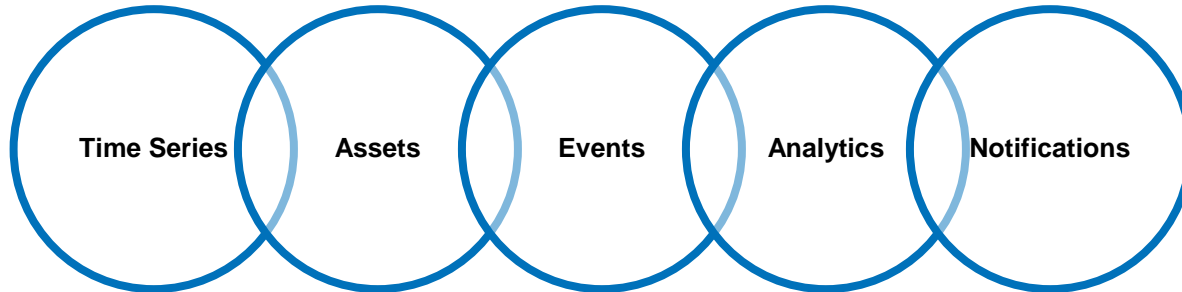
**Monitoring**



**Manual Entry**



**Ad Hoc Analysis**



Time Series

Assets

Events

Analytics

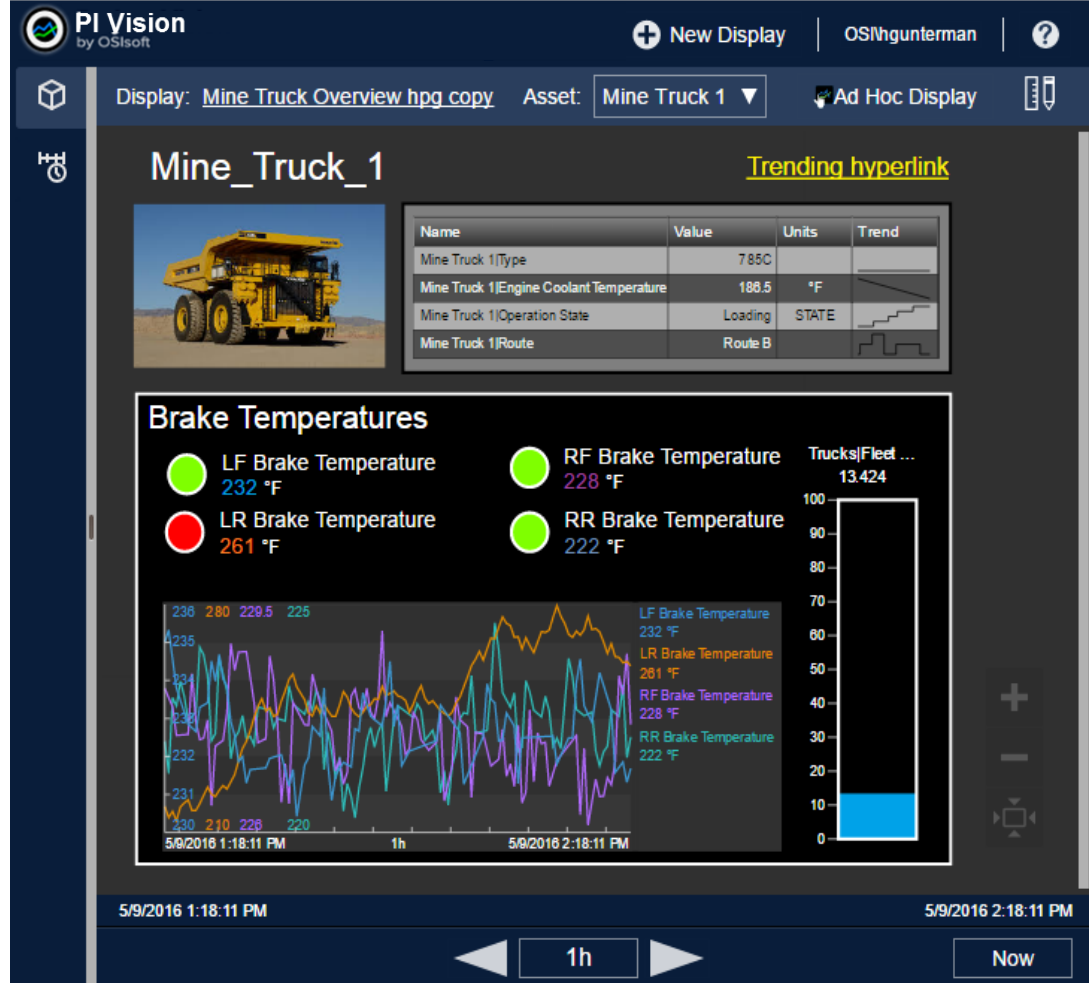
Notifications



# 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

Disparate assets or one-by-one interactions

Interacting with common assets as a fleet

System Optimization

Benchmarking

Monitoring

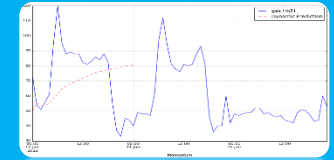
Process Optimization

Fleet-wide performance comparisons

Large scale multi-variate analysis

Real-time visibility

Real-time & historical views across any plant asset



- HMI

- PI Vision
- PI Datalink

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

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

Complexity



# 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?

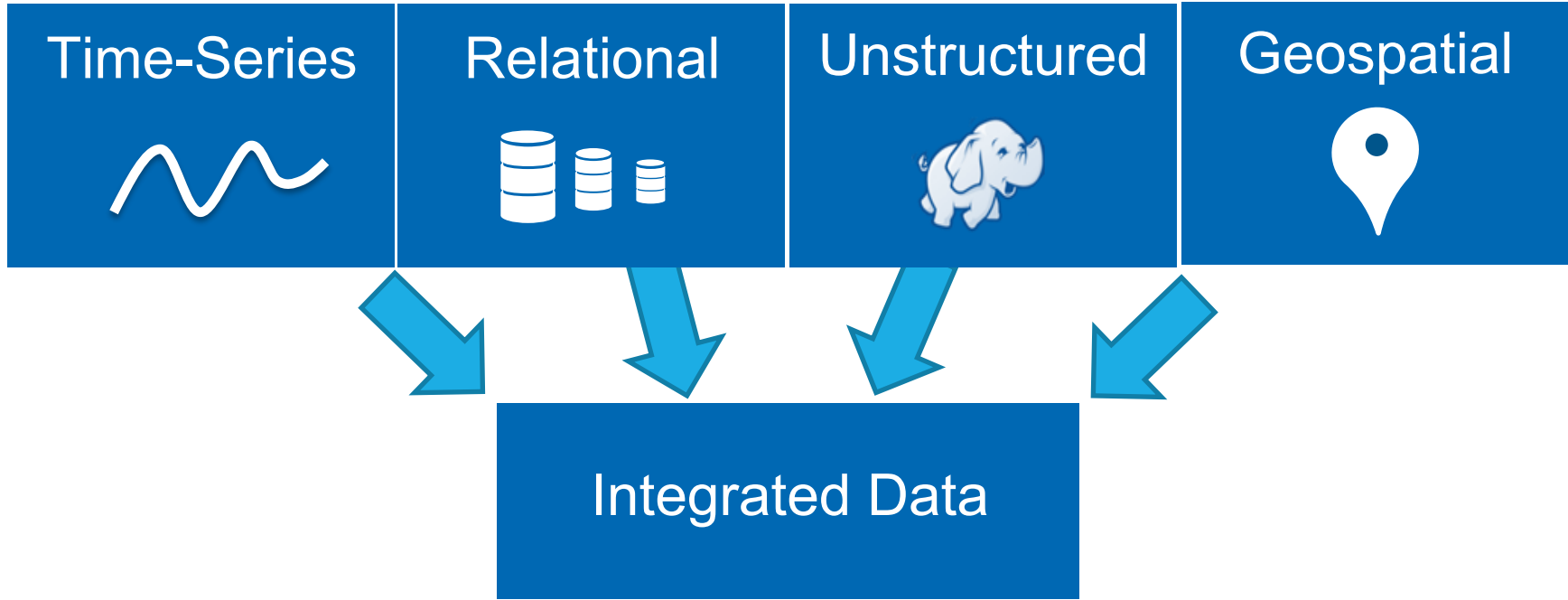


Transmission & Dist.

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



# Data Integration Brings Together Different Data



**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



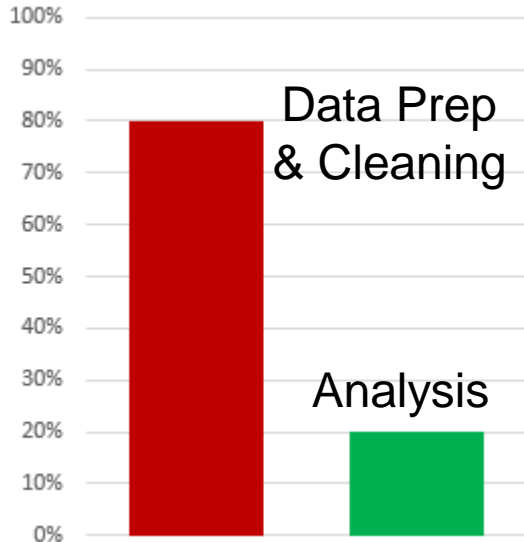
Turbine 2

Speed  
Bearing Temp  
Oil Temp  
Wear Factor



# Data Integration Projects are Challenging

## Time



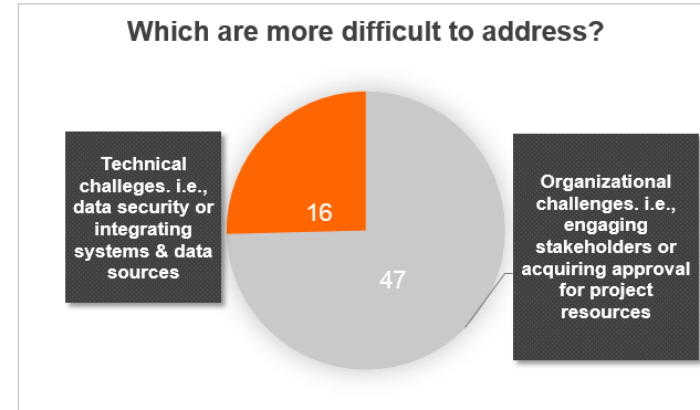
**Warning:** Currently, data analysts spend 50-80% of their time merely collecting and preparing data<sup>1</sup>

## 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

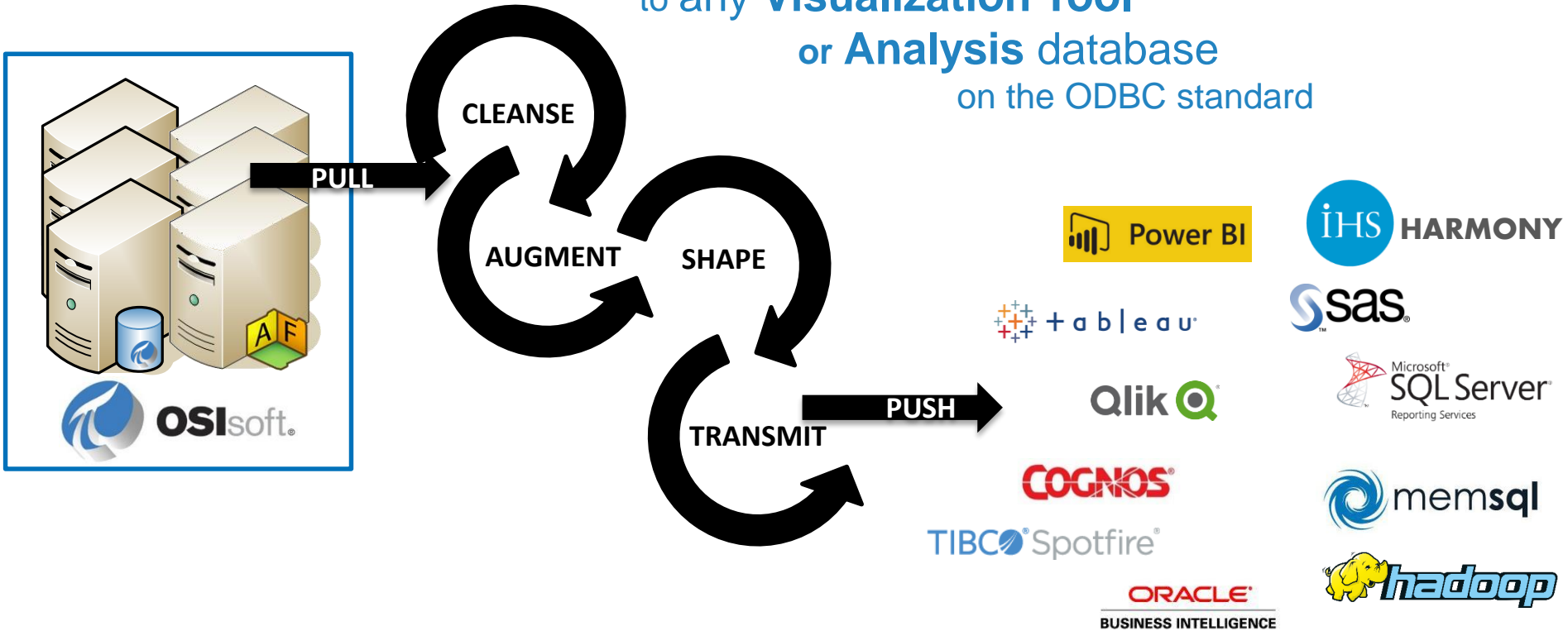
<sup>1</sup><https://hbr.org/2014/04/the-sexiest-job-of-the-21st-century-is-tedious-and-that-needs-to-change/>





# Prepare and Deliver Process Data

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



# Advanced Integrations: Supported Systems

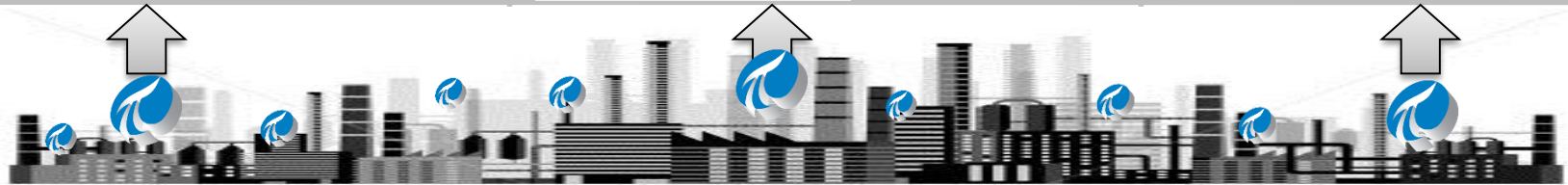
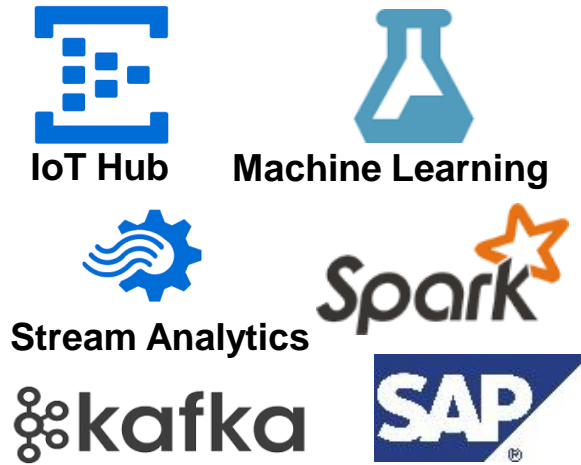
## Visual Analytics



## Data Warehouse / Data Lake



## Streaming Analytics – 2017

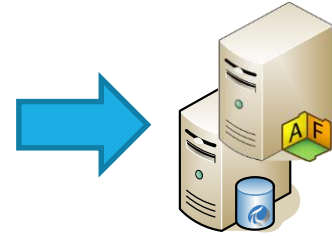


# What Can This Look Like?

**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!**



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 / z:AAA	1/1/1970 12:00:00 AM

- Elements
- Event Frames
- Library
- Unit of Measure
- Contacts

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 3<sup>rd</sup> 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 2<sup>nd</sup> 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

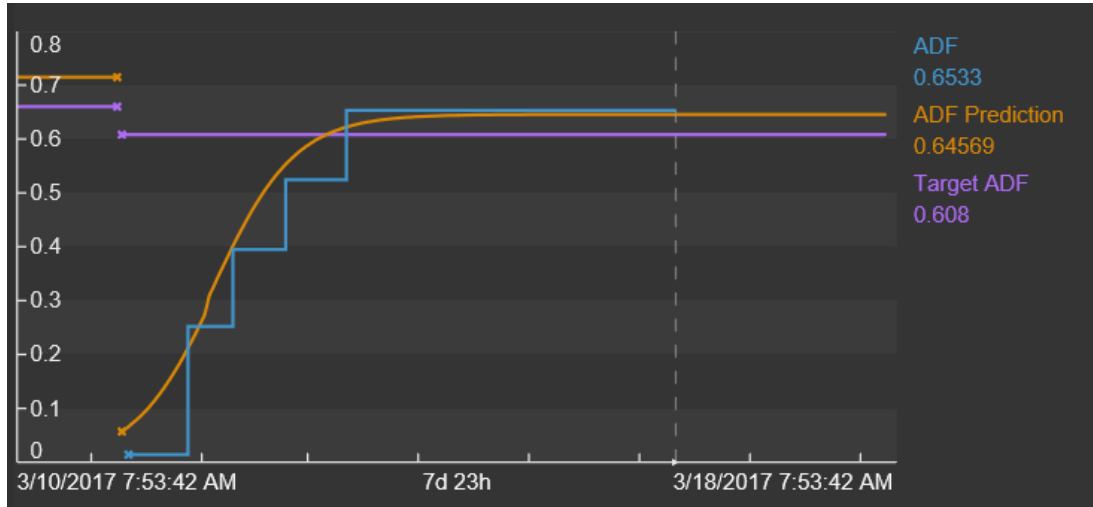
Ability to eliminate production time losses and increase production capacity

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



# Detecting Early Deviations and Taking Corrective Action

## Black Butte Porter – Vessel 45



### Indications:

- Uncharacteristic fermentation

### Actions taken:

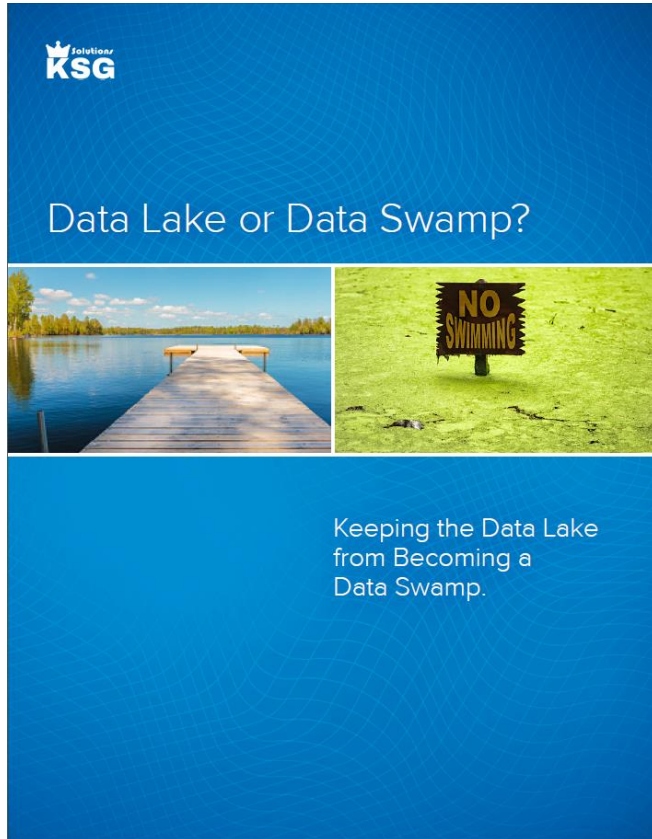
- Transition to free rise early

### Results:

- Production time reduced
- Batch saved
- Quality maintained



# Data Lake or Data Swamp White Paper



**KSG** solutions

## Data Lake or Data Swamp?

Keeping the Data Lake from Becoming a Data Swamp.



## ABOUT THE AUTHOR

**J**ohn de Koning, success advisor in industrial data processing, created his roots in the oil and gas industry. As a technology and innovation manager for Shell, John was focused on generating \$500+ million value annually by introducing innovative ways of processing manufacturing and production data. He became an industry leader by introducing architectures to contextualize, integrate and aggregate manufacturing and production data at a corporate level. The experience and understanding gained has been used as the foundation for this white paper.

*The paper is focused on helping industry leaders understand the characteristics of the various data processing techniques, and how they link together to form an optimum solution architecture for processing time-series data in combination with enterprise data lake initiatives.*





# Contact Information

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Solution Architect

OSIsoft



## Questions

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



State your **name & company**

## Please remember to...

Complete the  
Post-Event Survey



감사합니다

谢谢

Danke

Merci

Gracias

**Thank You**

ありがとう

Спасибо

Obrigado

