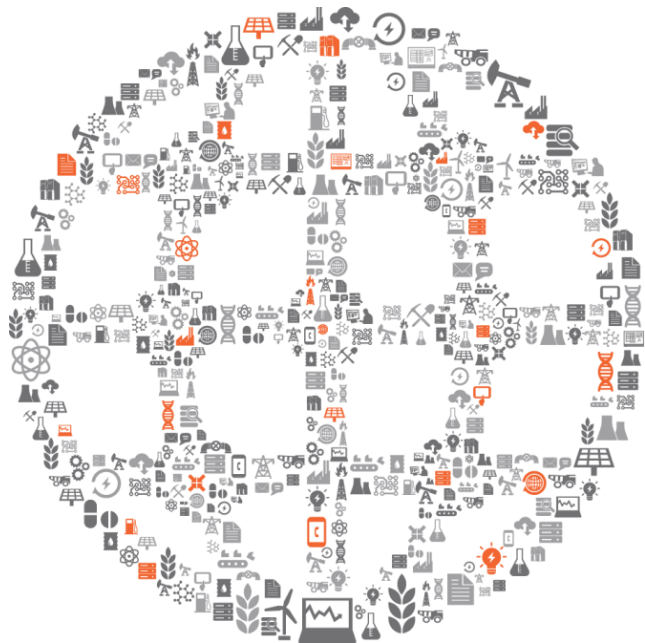
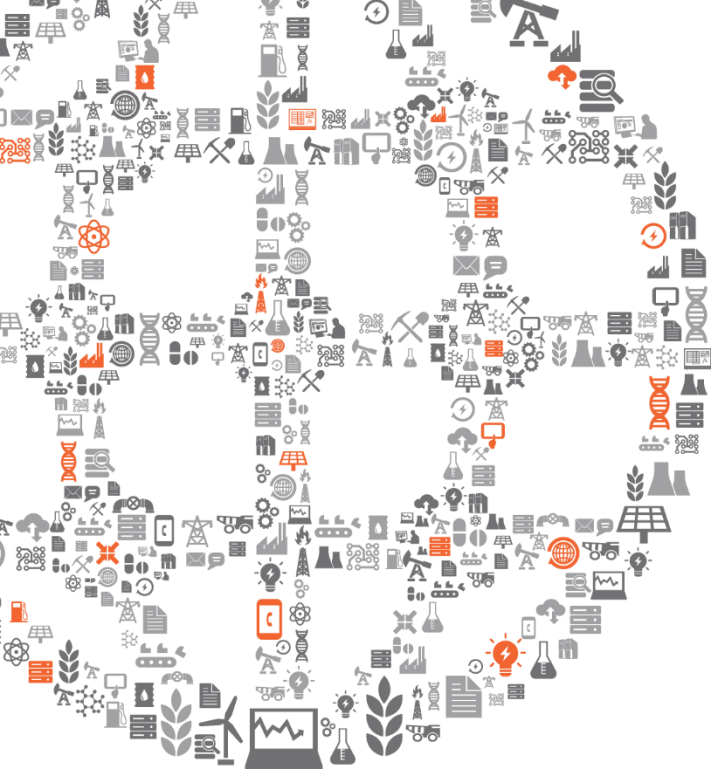




OSIsoft®
**REGIONAL
SEMINAR**
The **Power** of **Data**

**THRIVING
IN A
WORLD OF
CHANGE**

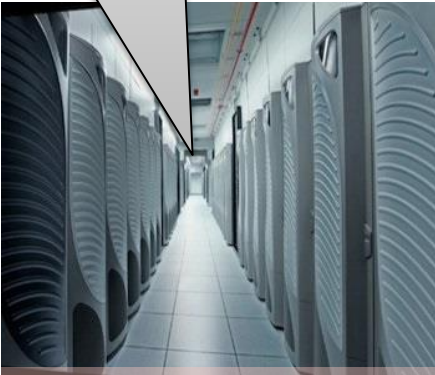


Using Structured Data to Improve Decision Making with Assets, Analytics and Events

Presented by Louis-Philippe Page-Morin, lpagemorin@osisoft.com

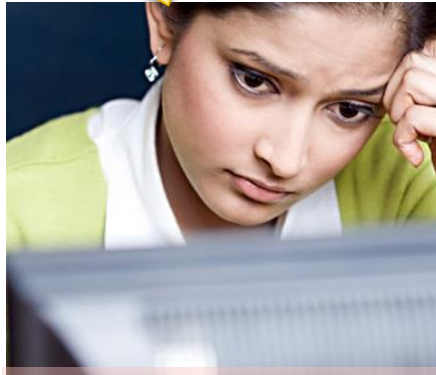
Information Challenges

"I'm **maintaining** a lot of **different data** and event databases. **Integration** is always a **big project**."



Information Tech

"This issue is **recursive**, but there is **so much data**, it will take another week to find all related data to **compare occurrences**."



Engineer

"Every site has the **same process**, but the **instrumentation is different**. Collaboration is nearly impossible."



Manager

"We're **losing money**. We need to make an informed decision quickly, but only raw data is available. We **need information and KPIs**."



Executive

The PI Server Package

PI Event
Frames



PI Interfaces
for Health Monitoring

PI Asset
Framework



PI Notifications



PI Data
Archive



Asset
Based
Analytics



Cloud Computing



Windows Integrated
Security



High Availability (HA)



64-bits Architecture



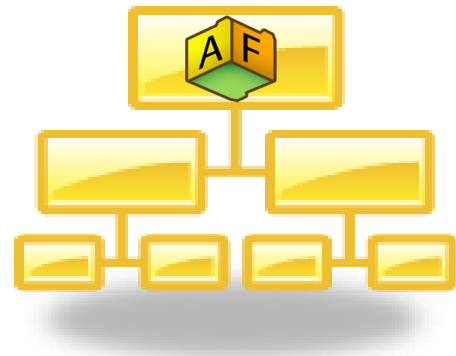
Virtualization
Microsoft®
Hyper-V™



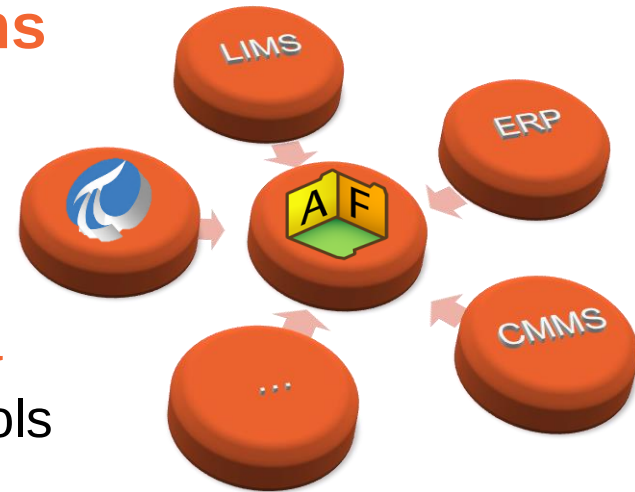


PI Asset Framework

PI Asset Framework (PI AF)



- **Hierarchical** database
- Allows for **consistent** integration and organization of data coming from **different systems**
- Enables the PI System to:
 - Define your assets in a **scalable**, secure and **extensible** database
 - Aggregate **time-series and relational data**
 - Integrate with **analysis** and **notification** tools



Using Assets and a Common Vocabulary



PI Data
Archive

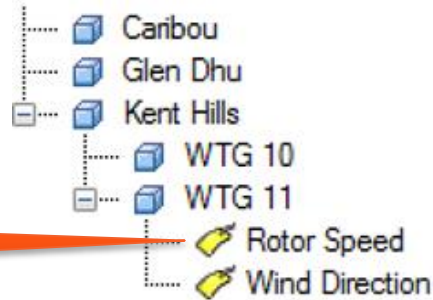


PI AF



GT56.TIC.PV

WT11.SI.PV



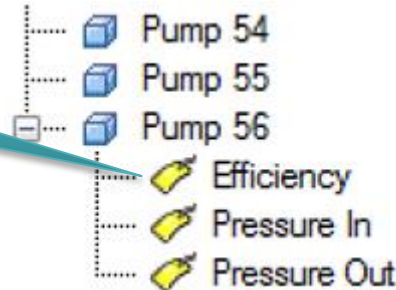
Rotor Speed



Efficiency

P56.PEF.CALC

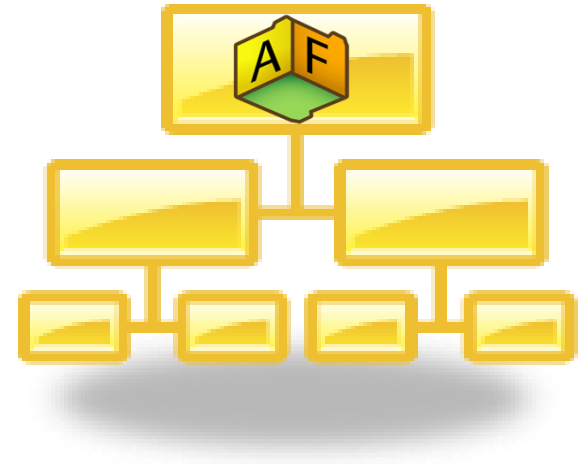
GP23.ATHK8.PV



	A	B
1	Efficiency	74.54%
2		
3		

Structure: Knowledge Applied to Data

- Structure ties **your knowledge** to **your process data**
- Structure helps you
 - Store your domain expertise
 - Develop applications
 - Build displays
 - Answer new questions



A Complete Picture of your Asset

Real-time values

- Inlet pressure
- Inlet flow
- Ambient temperature

Asset details

- Name
- Make
- Model

External Databases

- Performance curves
- Last service date
- Design documents
- Inspection best practice

Calculations

- Performance calculations
- KPI's

Business Events

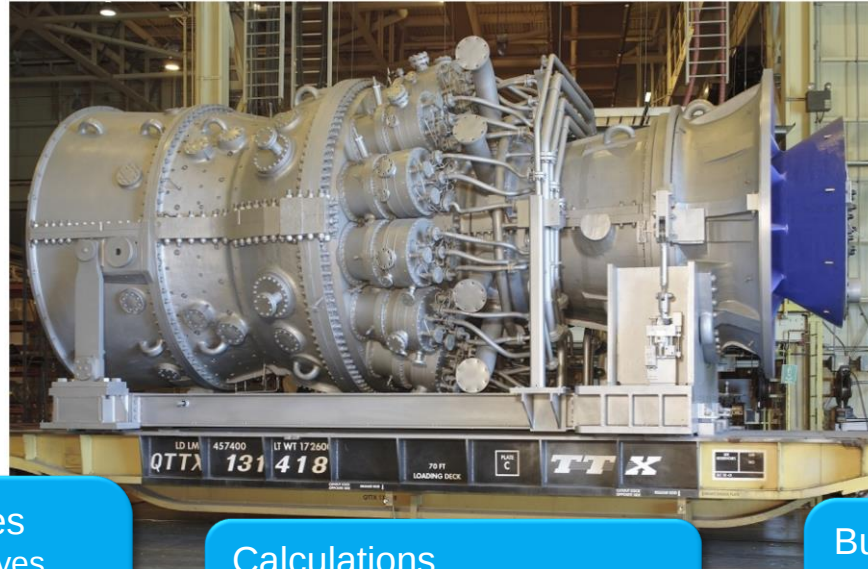
- Downtime
- Startup
- Excursions

Real-time Values

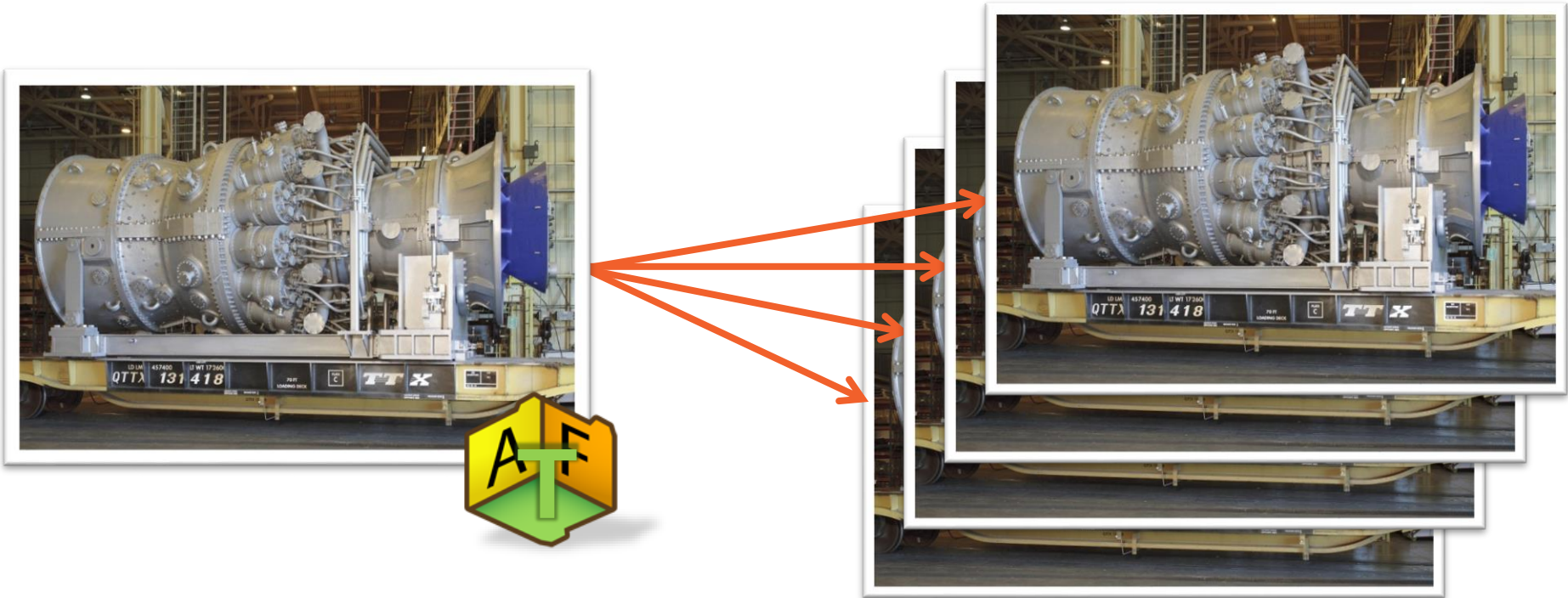
- Exhaust temperature
- Exhaust flow
- Measured MW output

Notifications

- Performance excursions
- Temperature difference
- High temperature



A Common View for Similar Assets



PI Interfaces Will Help you Get Started



Classic PI Interfaces

PI Interface

Asset based PI Interfaces

Real-time Values

- Inlet pressure
- Inlet flow
- Ambient temperature
- Exhaust temperature
- Exhaust flow
- Measured MW output

Asset details

- Name
- Make
- Model

Business Events

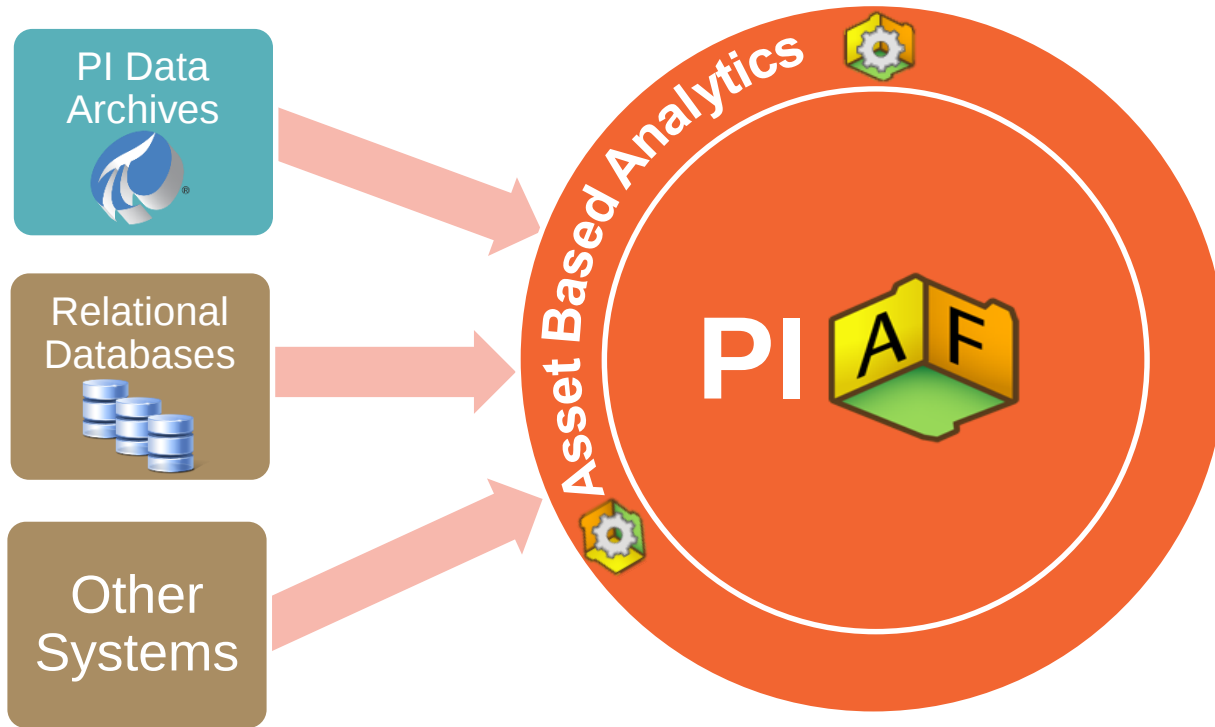
- Downtime
- Startup
- Excursions

Asset based PI Interfaces starting roll out late 2013



DEMO

Basic Concepts of PI AF



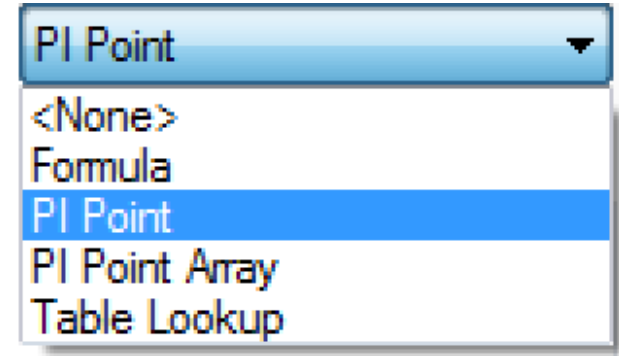
The Asset Based Analytics transform your data into actionable information



Asset Based Analytics

Asset Based Analytics Today

- **Formula** Data Reference
 - Basic **mathematical operators** and functions
- **PI Point** Data Reference
 - Summary calculations (total, average, etc.)
 - Pointer to **tag based analytics** (Performance Equations, Totalizer and PI ACE tags)



Asset Based Analytics Tomorrow

- Will evolve to enable **new calculation types**
 - **Expression** calculations “Performance Equations”
 - **Rollup** calculations
 - Automatic **Event Frame Generation**



Analysis Type: ☐ Expression ☒ Rollup ☐ Event Frame Generation

- Expected release: Q1 2014

Asset Based Analytics – Expression and Rollup

Extruding Process

Boiler Efficiency = $\text{AVG}(\text{B1}..\text{Bn})$

Boiler1

Flow Out

Fuel Flow Rate

Efficiency = $(\text{Flow Out} / \text{Fuel Flow Rate} * 3.14)$

Boiler2

Flow Out

Fuel Flow Rate

Efficiency

Boiler3

Flow Out

Fuel Flow Rate

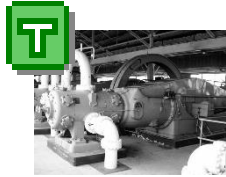
Efficiency



Boiler
Template



Asset Based Analytics – Event Frame Generation



|Efficiency

|Fuel Flow Rate

|Flow Out



myEF

|Efficiency



 **Efficiency** = (**Flow Out** / **Fuel Flow Rate** * 3.14)

 **myEF.Start** = (**Efficiency** < LIMIT)

myEF.End = (**Efficiency** > LIMIT) AND (**Fuel Flow Rate** > 25)

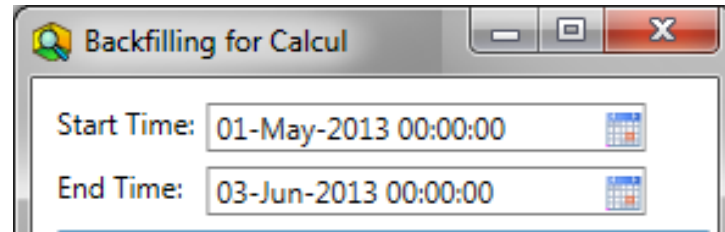


DEMO

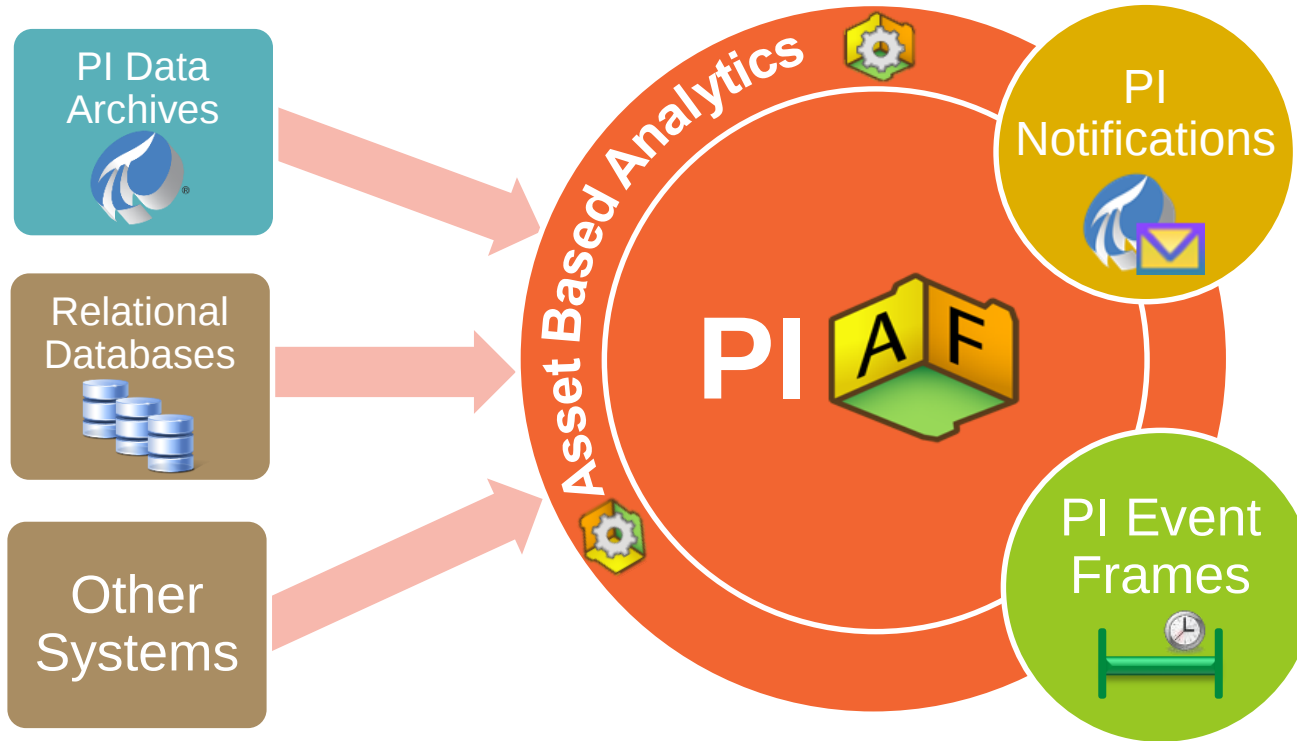
Asset Based Analytics – Planned Version

- PE, Rollup, Event Frame Generation
- **Attributes** as **inputs** and **outputs**
- Support for **calculation dependencies**
- **Preview** and test using historical data
- **On-demand or scheduled** calculations
- **Archiving** of the results
- Manual **backfill**

Name	Expression
A	'Attribute1'*10
B	A+'Attribute2'
C	B-'Attribute3'



Basic Concepts of PI AF



**The Asset Based
PI Server
components
enhance your
assets structure
information**



PI Event Frames

Bookmarks for your Real-Time Data

PI Event Frames

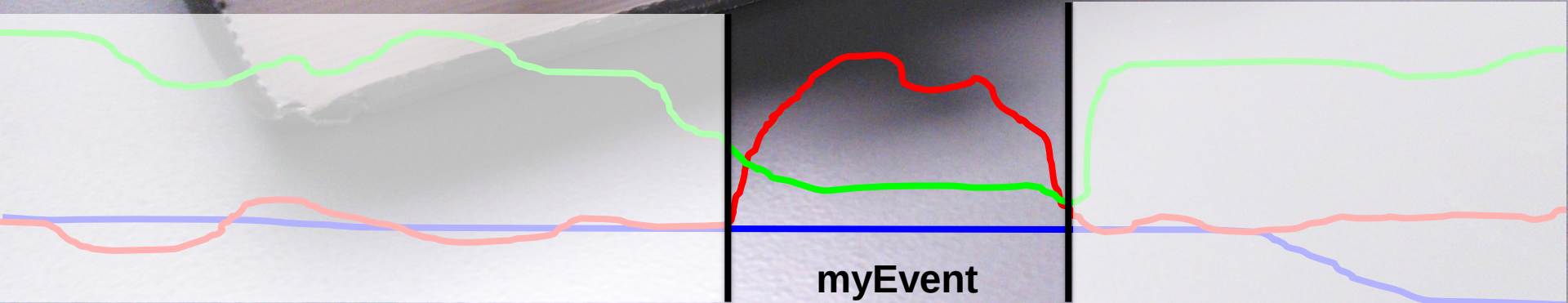


Info

End

Start

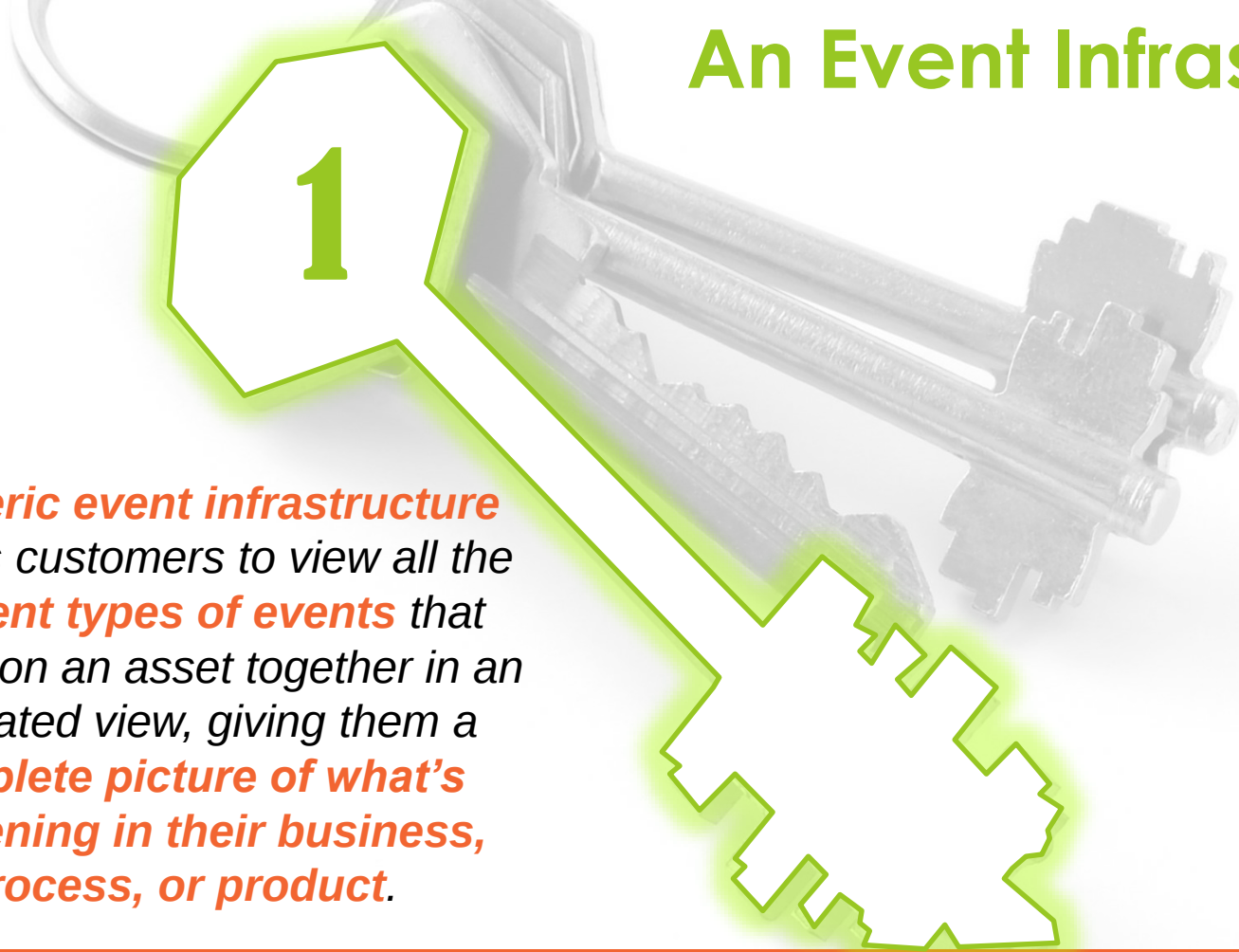
Your
Data





Unlocking the Value of Real-Time Data and Events

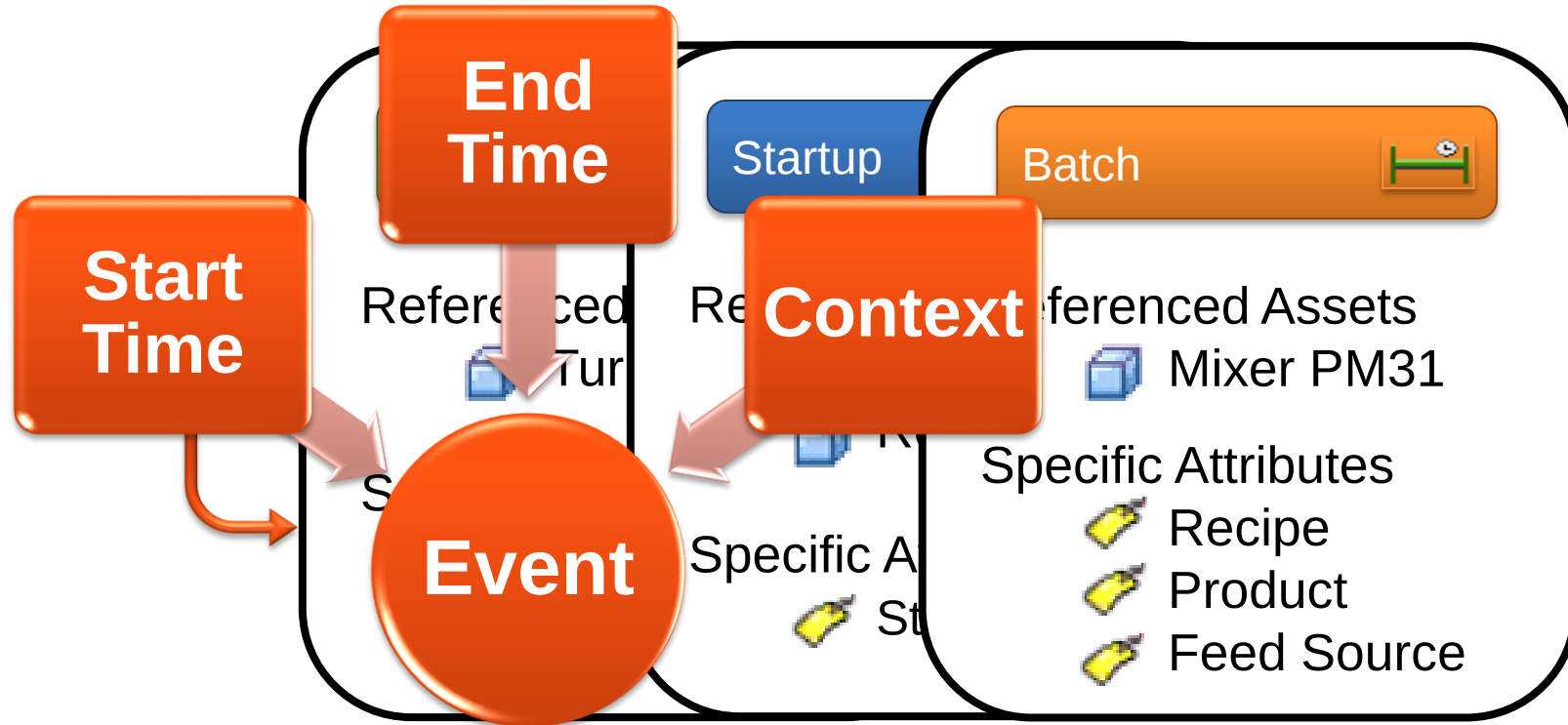
An Event Infrastructure



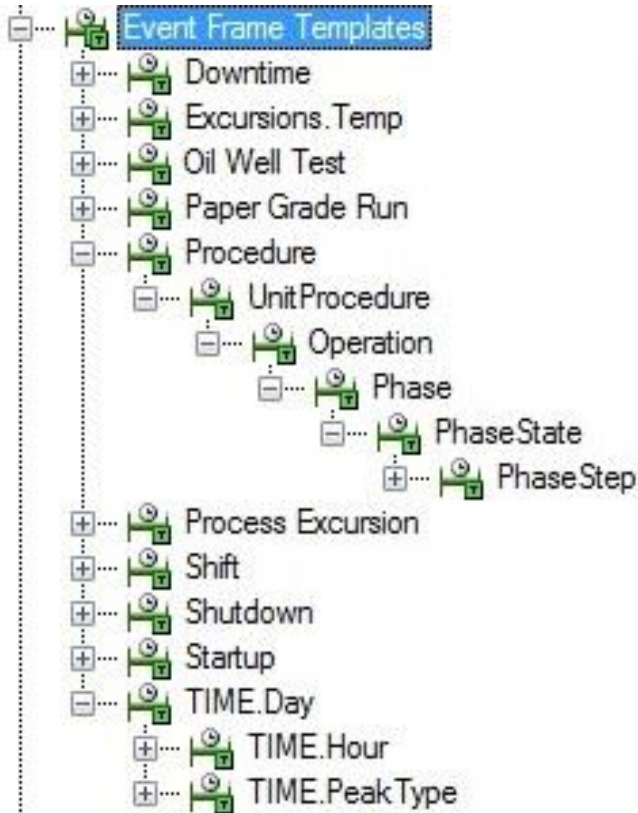
1

A **generic event infrastructure** enables customers to view all the **different types of events** that happen on an asset together in an integrated view, giving them a **complete picture of what's happening in their business, process, or product.**

Define your Events



Event Frame Templates and Customizable Context



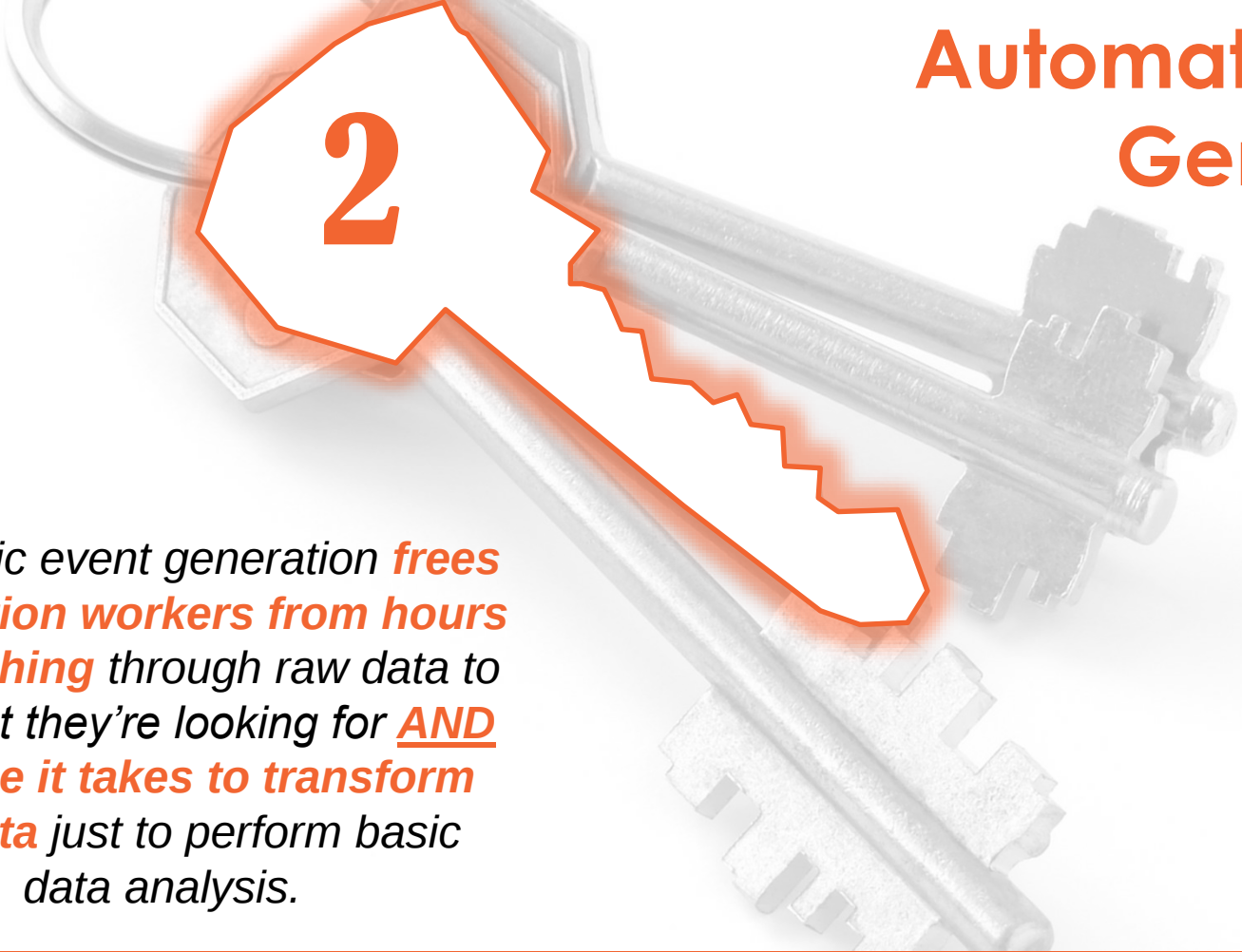
Name	Value
Category: General Info	
Comment	
Operator	Bobby Wolf
Phase	Dwell
Type	LOW TEMP
Category: Limits	
Temp.Limit.High	88 deg C
Temp.Limit.Low	70 deg C
Category: Manual Logger	
Comment	
Category: Process Parameters	
Level.Start	42.7438011169434 L
Temp.End	71.1539001464844 deg C
Temp.Max	71.1538998921712 deg C
Temp.Min	62.1662445068359 deg C
Temp.Range	8.98765538533529 deg C
Temp.Start	62.1662445068359 deg C

Text entries
useful for
filtering/group-
by analysis

Placeholders
for **manual**
data entry

Calculated
data using
event start &
end time
context

Automatic Event Generation



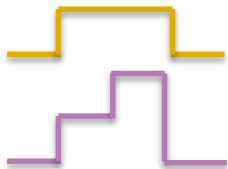
2

Automatic event generation **fre**
information workers from hours
of searching through raw data to
find what they're looking for **AND**
the time it takes to transform
the data just to perform basic
data analysis.

Automatic Event Generation



Trigger PI Tags



Trigger PI AF Attributes

Category: Process Parameters	
Agitation	41.379638671875 rpm
Concentration	44.1733856201172 kg/L
Level	39.4587707519531 L
Temperature	52.3757171630859 deg C
Weight	1743.02749652183 kg

External Systems



PI Event Frames Generator



Auto-create Events

Asset Based Calc.
[Temperature > 180]

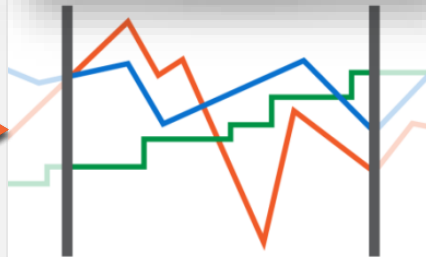


PI Interfaces for
BES / MES



Auto-create
Assets & Attributes

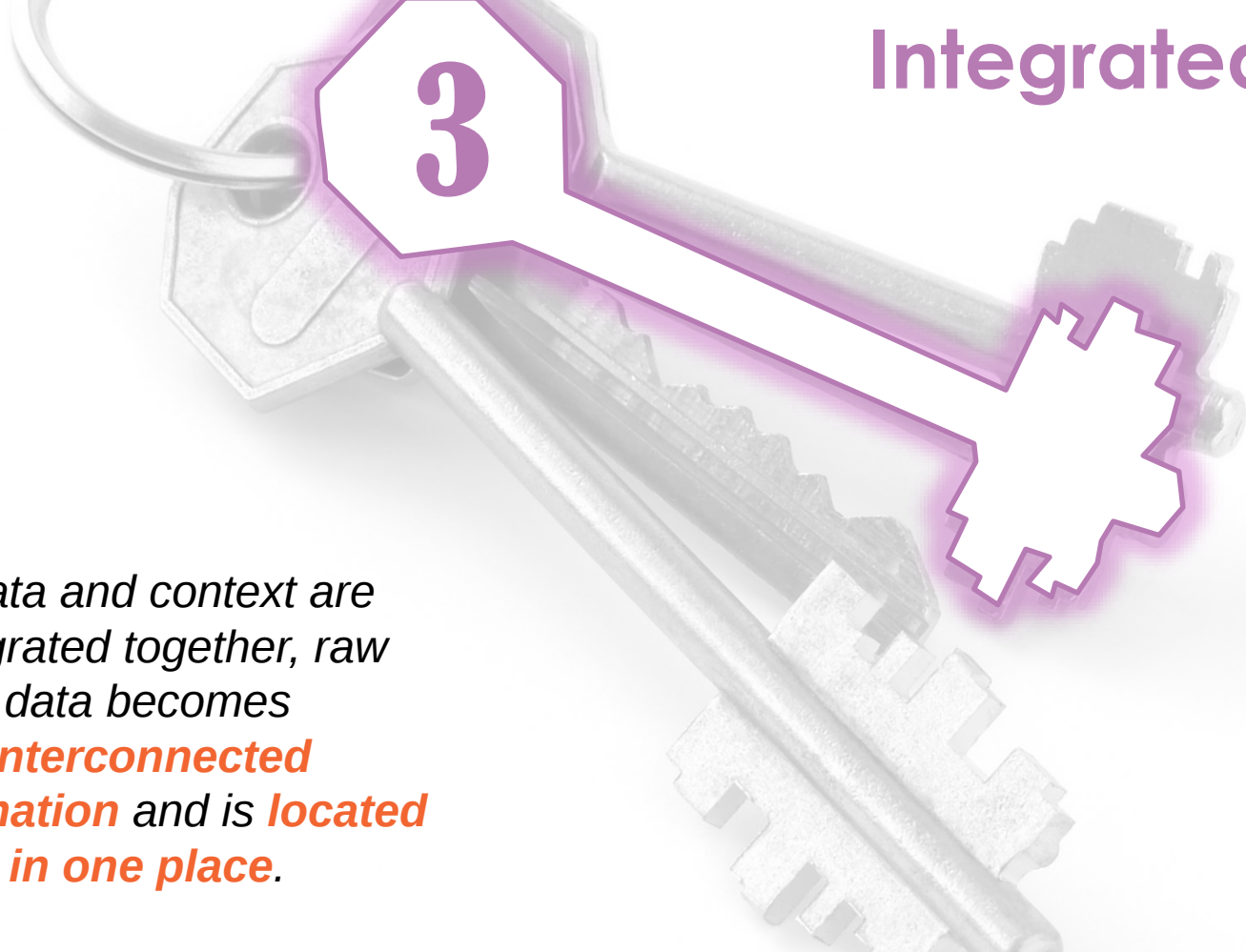
Events



Assets



Integrated Data & Context

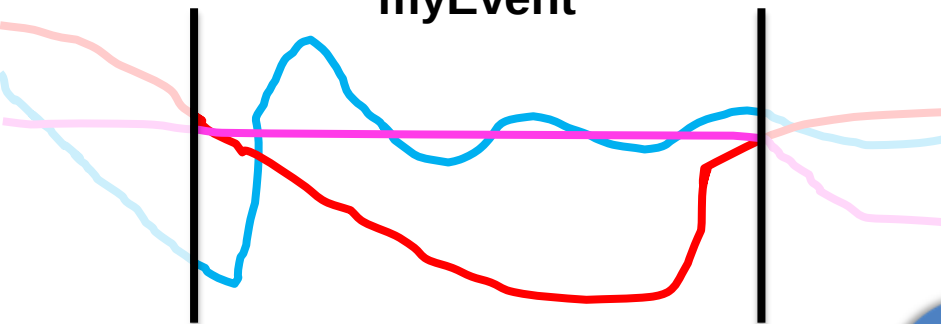


3

*If data and context are integrated together, raw data becomes **interconnected information** and is **located in one place.***

Simplify Data Analysis

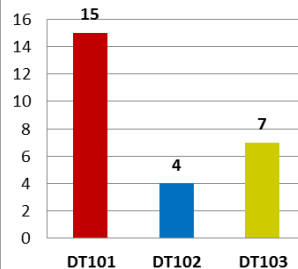
myEvent



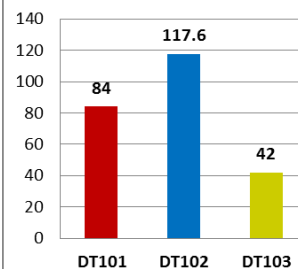
Perform Asset Comparisons



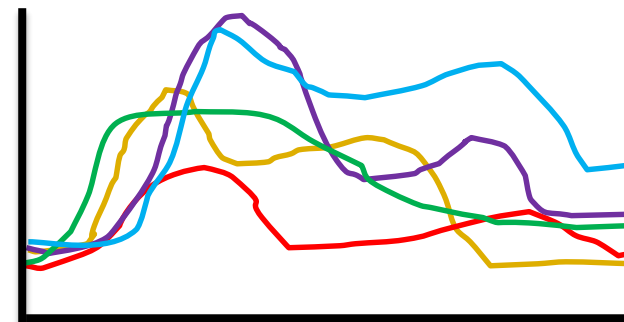
Weekly Downtime
(Instances)



Weekly Cumulative
Downtime (hrs)



Event Overlay Trend (Temp.)

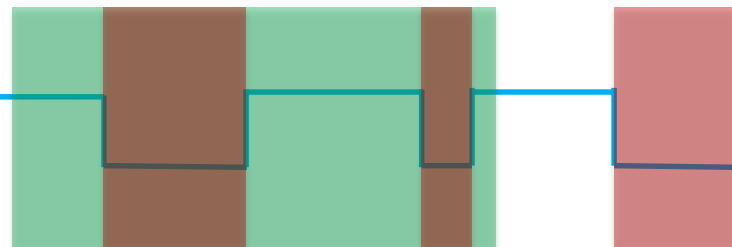


Name	Temp.Max
EF1	122.47
EF2	109.34
EF3	112.73
EF4	98.61
EF5	125.24

Downtime Events for Product XYZ

Product XYZ (1)

Downtime (2)



Perform Event Comparisons

Discover Event Interrelationships

Utilities

Startups & Shutdowns
Peak vs. Off-peak Power
GADS Reporting



Metals & Mining

Downtime / Reason Codes
Anode Tracking
Material Transfers



Oil & Gas

Specific Crude Runs
Catalyst Change Outs
Well Testing



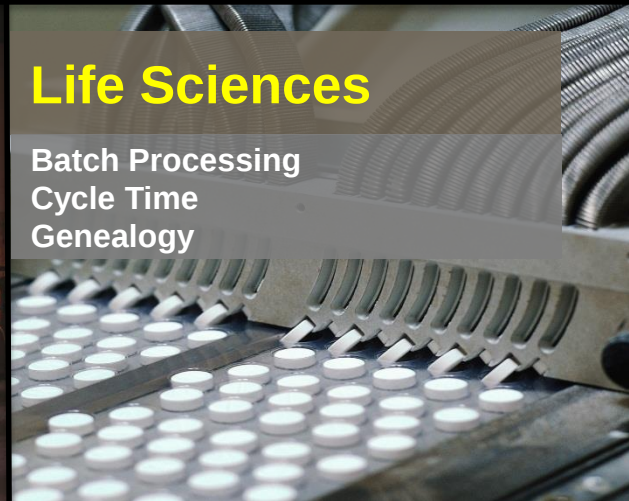
Chemicals

Downtime / OEE / TEEP
Safety Events
Process Excursions



Life Sciences

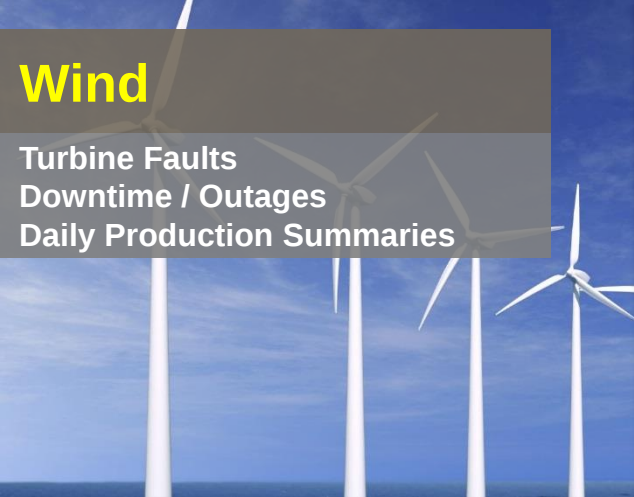
Batch Processing
Cycle Time
Genealogy



Pulp & Paper

Grade Runs / Grade Changes
Pulp Cooking
Startups of Major Equipment





Wind

Turbine Faults
Downtime / Outages
Daily Production Summaries



Transportation

Trips (Point A to Point B)
Fueling
Asset Excursions / Faults



O&G – Downstream

Specific Crude Runs
Catalyst Change Outs
Environmental Excursions



Sustainability

Daily / Monthly Consumption
Air Emissions Monitoring
Waste Water Discharge



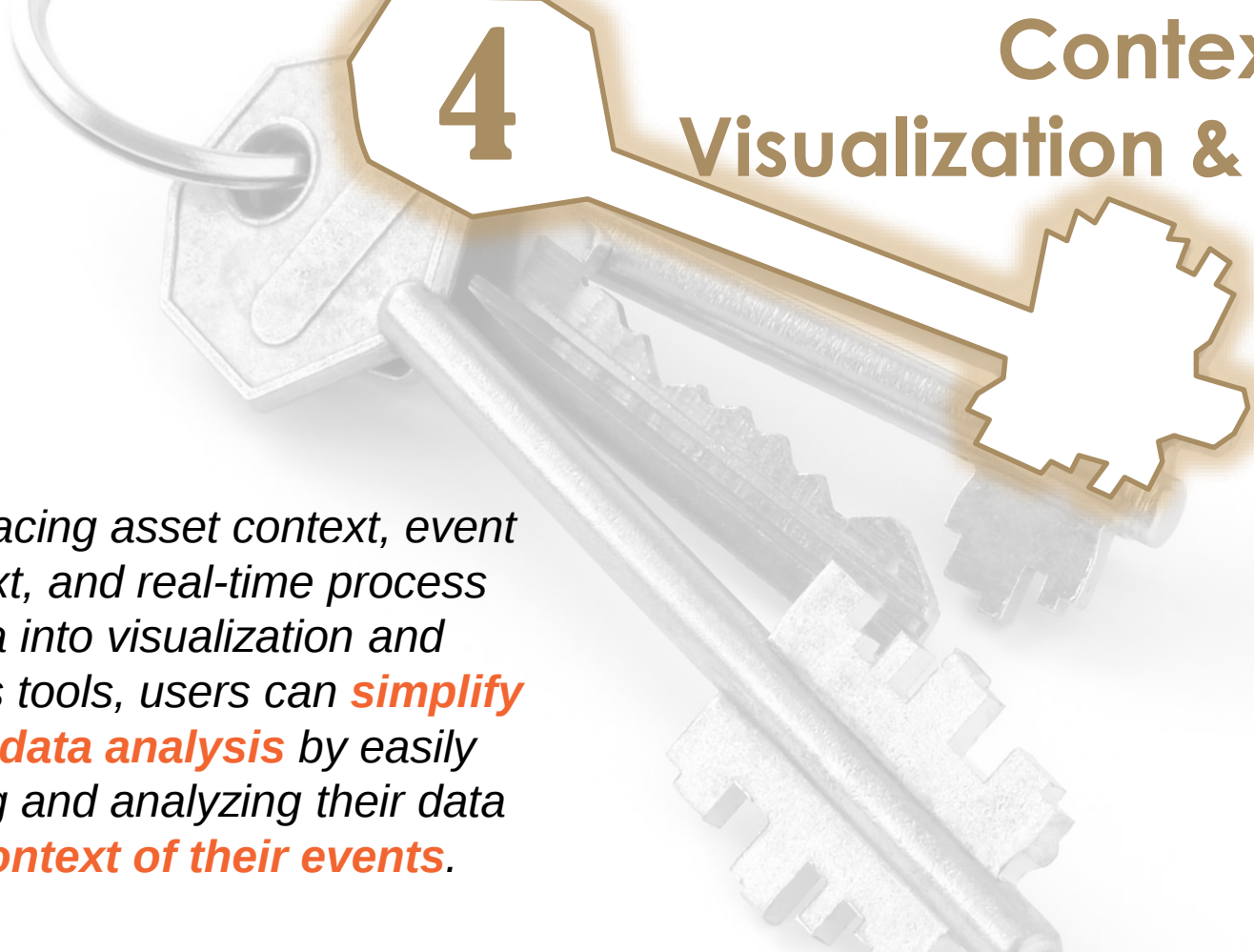
Water Utilities

Water Quality Excursions
Water Level Excursions
Leaks / Large Consumptions



Solar

Sun vs. Shade Days
Production Summaries
Downtime



4

Context Aware Visualization & Analysis

*By surfacing asset context, event context, and real-time process data into visualization and analysis tools, users can **simplify their data analysis** by easily viewing and analyzing their data **in context of their events.***

Event Search Time Range

Start Time
*-1d

End Time
*

Apply

⏪ ⏩ ⏴ ⏵

Select a Truck

- Trucks
 - Mine Truck 1
 - Mine Truck 2
 - Mine Truck 3
 - Mine Truck 4**
 - Mine Truck 5

Trip Operational State



OSI Mining Links

- URL
- OSI Mining HOME
- Truck Fleet Monitoring
- Truck Trip Events
- OSI Mining Reports
- PI Coresight - HOME
- PI Coresight - Mine Trucks
- PI Coresight - Truck Tire Detail

+ Add new link

Truck Trip Events Summary

Count	Cum. Duration	Avg Duration (Sec)	Expected Avg Duration (Sec)
29	22:24:00	2880	360

Truck Trip Events

Name	Start Time	End Time	Duration
RT: MT4 2013_04_07 12:44	4/7/2013 12:44:28 PM	4/7/2013 1:32:28 PM	00:48:00
RT: MT4 2013_04_07 13:32	4/7/2013 1:32:58 PM	4/7/2013 2:20:58 PM	00:48:00
RT: MT4 2013_04_07 14:21	4/7/2013 2:21:28 PM	4/7/2013 3:09:28 PM	00:48:00
RT: MT4 2013_04_07 15:09	4/7/2013 3:09:58 PM	4/7/2013 3:57:58 PM	00:48:00
RT: MT4 2013_04_07 15:58	4/7/2013 3:58:28 PM	4/7/2013 4:46:28 PM	00:48:00
RT: MT4 2013_04_07 16:46	4/7/2013 4:46:58 PM	4/7/2013 5:34:58 PM	00:48:00
RT: MT4 2013_04_07 17:35	4/7/2013 5:35:28 PM	4/7/2013 6:23:28 PM	00:48:00
RT: MT4 2013_04_07 18:23	4/7/2013 6:23:58 PM	4/7/2013 7:11:58 PM	00:48:00
RT: MT4 2013_04_07 19:12	4/7/2013 7:12:28 PM	4/7/2013 8:00:28 PM	00:48:00
RT: MT4 2013_04_07 20:00	4/7/2013 8:00:58 PM	4/7/2013 8:48:58 PM	00:48:00

Showing 1 to 10 of 29

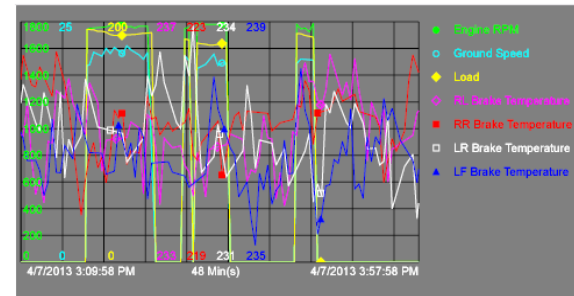
Trip Operational State Events

Name	Start Time	End Time	Duration
Waiting to Load	4/7/2013 3:09:58 PM	4/7/2013 3:19:28 PM	00:09:30
Loading	4/7/2013 3:19:28 PM	4/7/2013 3:25:28 PM	00:06:00
Running Loaded	4/7/2013 3:25:28 PM	4/7/2013 3:36:28 PM	00:11:00
Dumping Load	4/7/2013 3:36:28 PM	4/7/2013 3:41:28 PM	00:05:00
Running Empty	4/7/2013 3:41:28 PM	4/7/2013 3:57:58 PM	00:16:30

Trip Operational State Event Attributes

Attribute	Value	UOM
Comment		
Description	Running Empty	
Driver	Lebron James	
Duration	990	s
Duration.Expected	360	s
Engine RPM - Average	1730.04305844085	rpm
Engine RPM - Maximum	1784.16015625	rpm
LF Brake Temperature	236.584747314453	deg F
LF Brake Temperature - Maximum	238.224411010742	deg F
LF Brake Temperature - Minimum	235.461395263672	deg F
LF Brake Temperature - Std	0.541336338240054	deg F
LR Brake Temperature	236.323379516602	deg F
LR Brake Temperature - Maximum	237.286865234375	deg F
LR Brake Temperature - Minimum	235.466247558594	deg F
LR Brake Temperature - Std	0.316483902347557	deg F

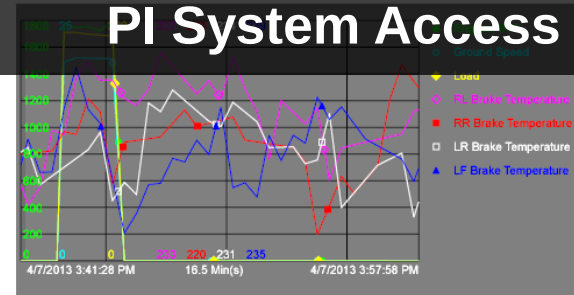
Trip Event Trend



Trip Attributes

Attribute	Value	UOM
Comment		
Description	RoundTrip	
Driver	Revill Swivel	
Duration	2880	s
Duration.Expected	360	s
Engine RPM - Average	1723.4249567159	rpm
Engine RPM - Maximum	1784.61865234375	rpm
Ground Speed - Average	20.6147543030977	mi/h
Ground Speed - Maximum	22.7460880279541	mi/h
Load - Maximum	177.920925348455	ton
Load - Range	10.0697290593928	ton
Route	Round Trip	

Trip Operational State Event Trend



Route

- No Data
- Route A
- Route B
- Route C
- ROUTE D

Driver

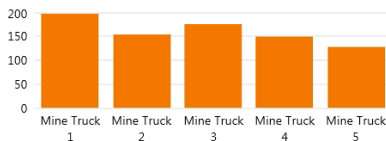
- Chris Scatman
- Jason Rice
- Latrice Lewis
- Mace Mixon
- Mike Moore
- Neil Macer
- Rylance Rebel
- Sam Spillman
- Sorlie Otters

Truck, Operator & Route Report

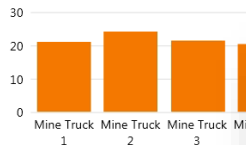
Truck

- Mine Truck 1
- Mine Truck 2
- Mine Truck 3
- Mine Truck 4
- Mine Truck 5

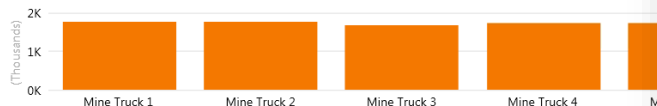
Average of Load - Maximum by Truck



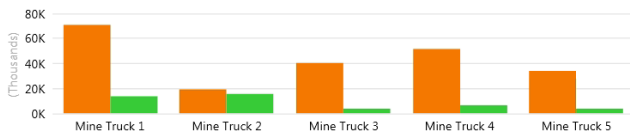
Average of Ground Speed - Average by Truck



Average of Engine RPM - Average by Truck



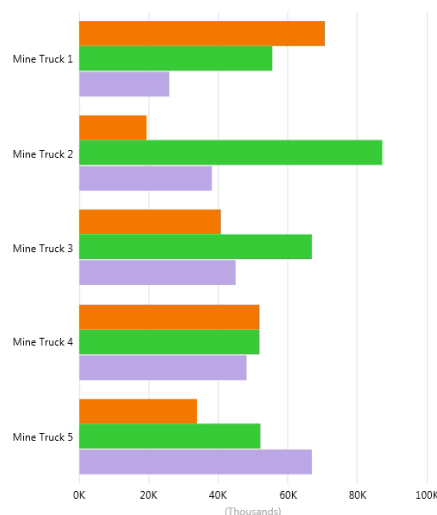
Duration, and DurationExpected by Truck



PI System Access 2012 Driving Microsoft Power View in Microsoft Excel 2013

RoundTrip Cumulative Duration by Truck & Route

Duration by Truck, and Route



Duration by Route



Gas Turbine 2

Assets

\\SYMBOLAF25\EventFrame\Big Creek

[.]

- Gas Turbine 1
- Gas Turbine 2

[.] 2x2x1 Flow Model

- Gas Turbine 1
- Gas Turbine 2

Events

- PowerPlantShutDown - 20120
- Gas Turbine 2 - GT Exhaust Gas
- Gas Turbine 2 - GT Exhaust Gas

Data Items

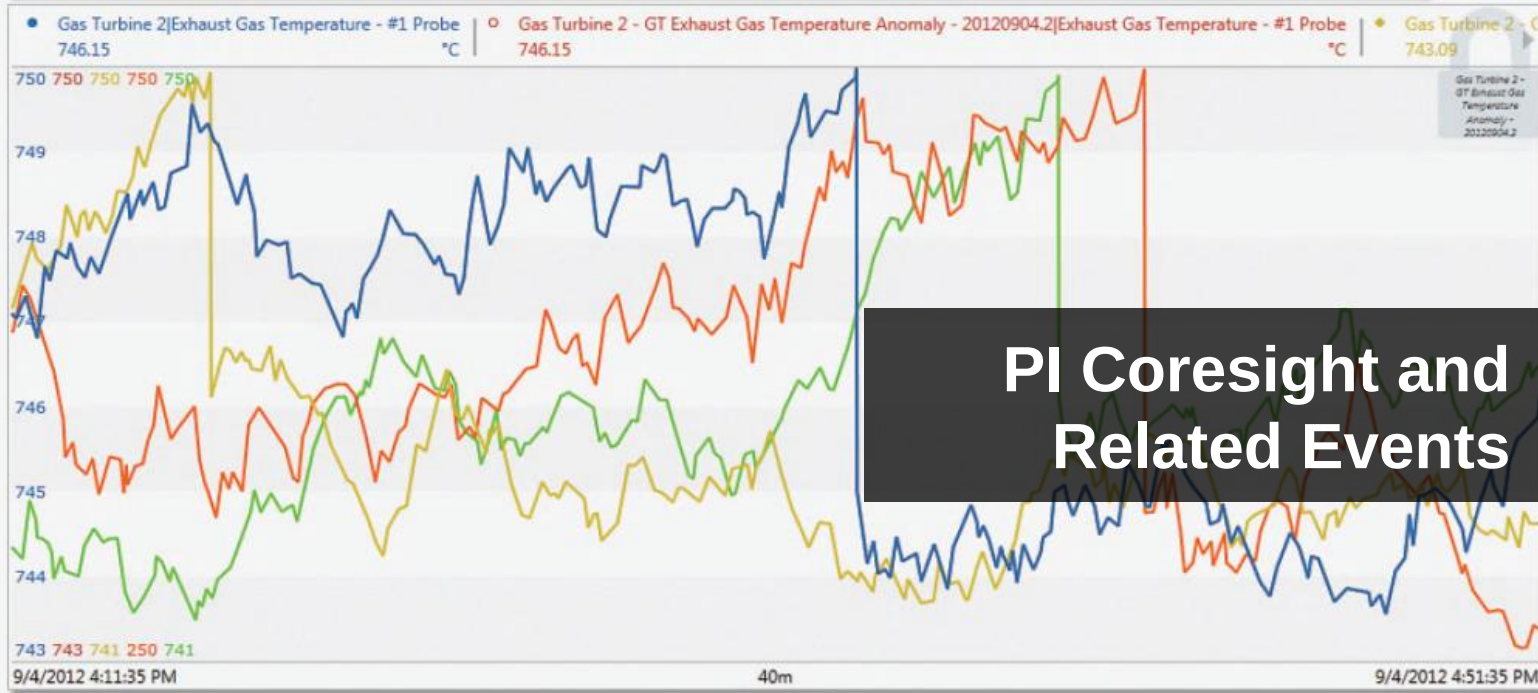
Time Range

- 9/4/2012 4:11:35 PM
- 9/4/2012 4:51:35 PM

Assets

- Gas Turbine 2 - GT Exhaust Gas
- Gas Turbine 2 - GT Exhaust Gas
- Gas Turbine 2 - GT Exhaust Gas

Name	Value	Trend	Units	Average	Minimum	Maximum
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[Comment]	0			n/a	n/a	n/a
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[Exhaust Gas Temperature - #1 Probe]	746.15		°C	n/a	n/a	n/a
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[Exhaust Gas Temperature - #2 Probe]	743.09		°C	n/a	n/a	n/a
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[Exhaust Gas Temperature - #3 Probe]	276.35		°C	n/a	n/a	n/a
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[Exhaust Gas Temperature - #4 Probe]	745.49		°C	n/a	n/a	n/a
Gas Turbine 2 - GT Exhaust Gas Temperature Anomaly - 20120904.2[ExpectedDuration]	0			n/a	n/a	n/a

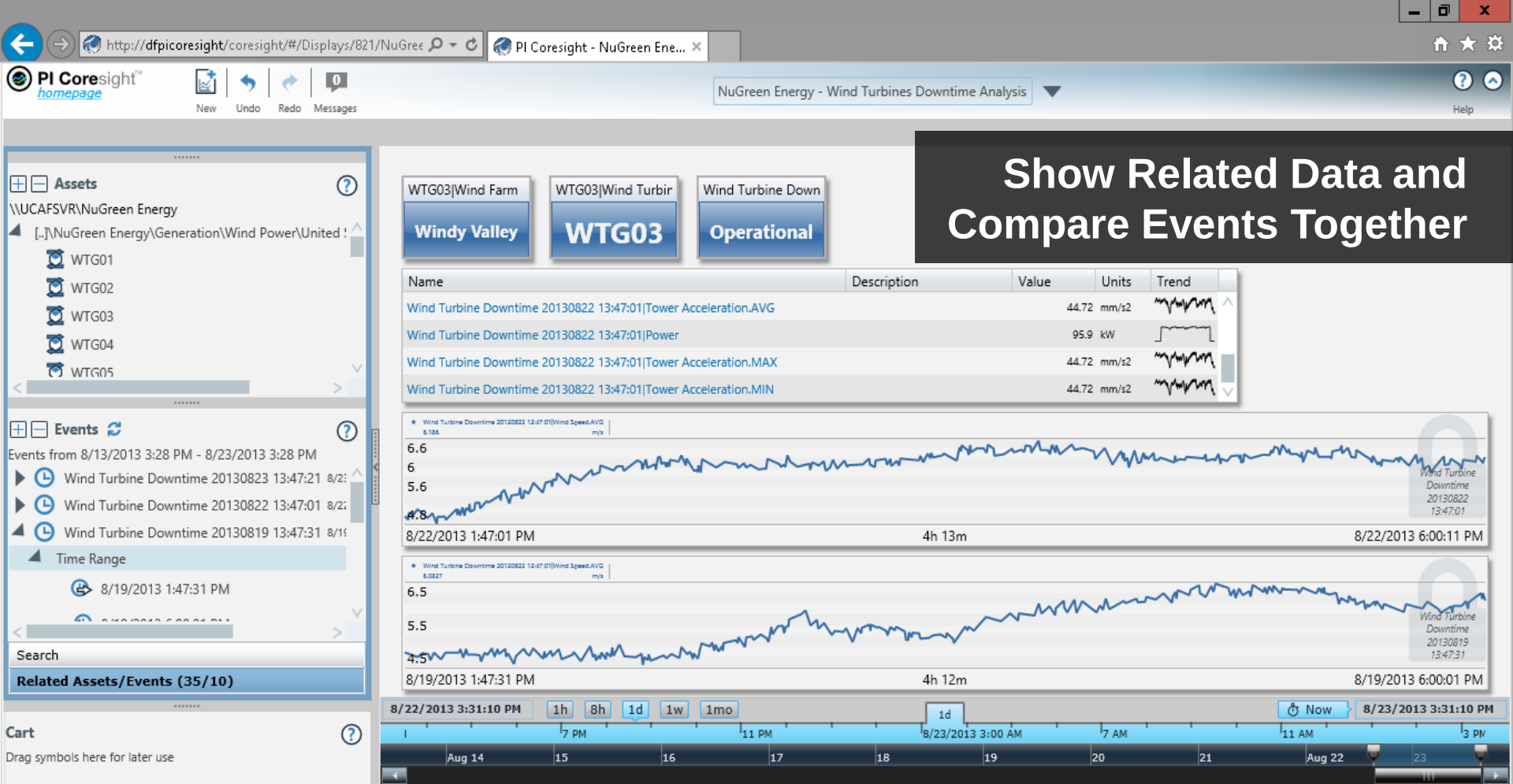


PI Coresight and Related Events





DEMO



Upcoming Products with Event Frames Support

Event Frame Generation

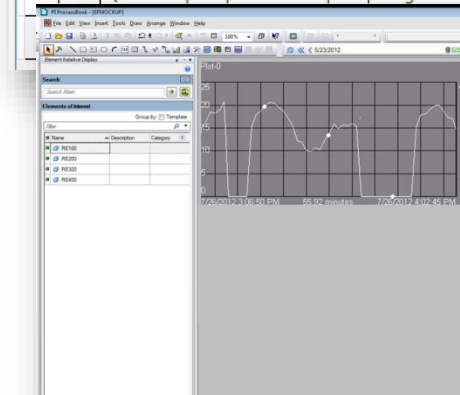
Start Trigger

Variable	Expression
Output	('Operating State'="Unloading") AND ('Tilt Dump Amps'>'Tilt Dump Amps High Limit')
	Add a new expression

End Trigger

☐ Same as start trigger

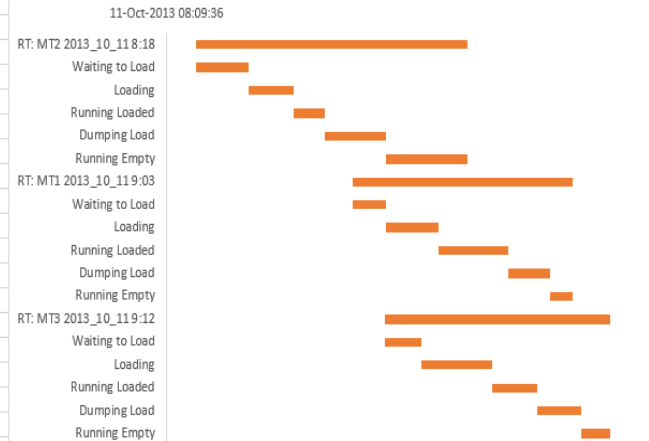
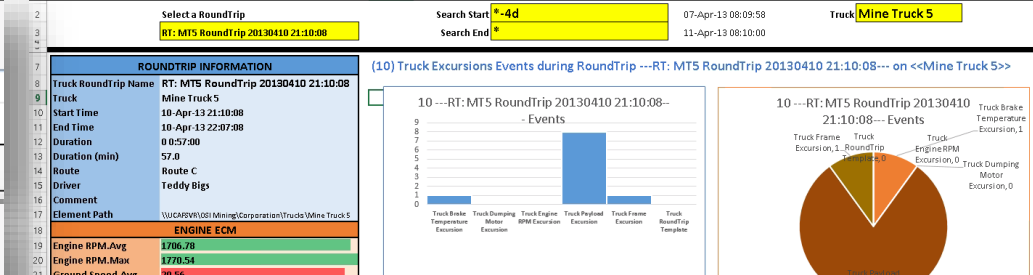
Variable	Expression
Output	('Tilt Dump Amps'<'Tilt Dump Amps High Limit')



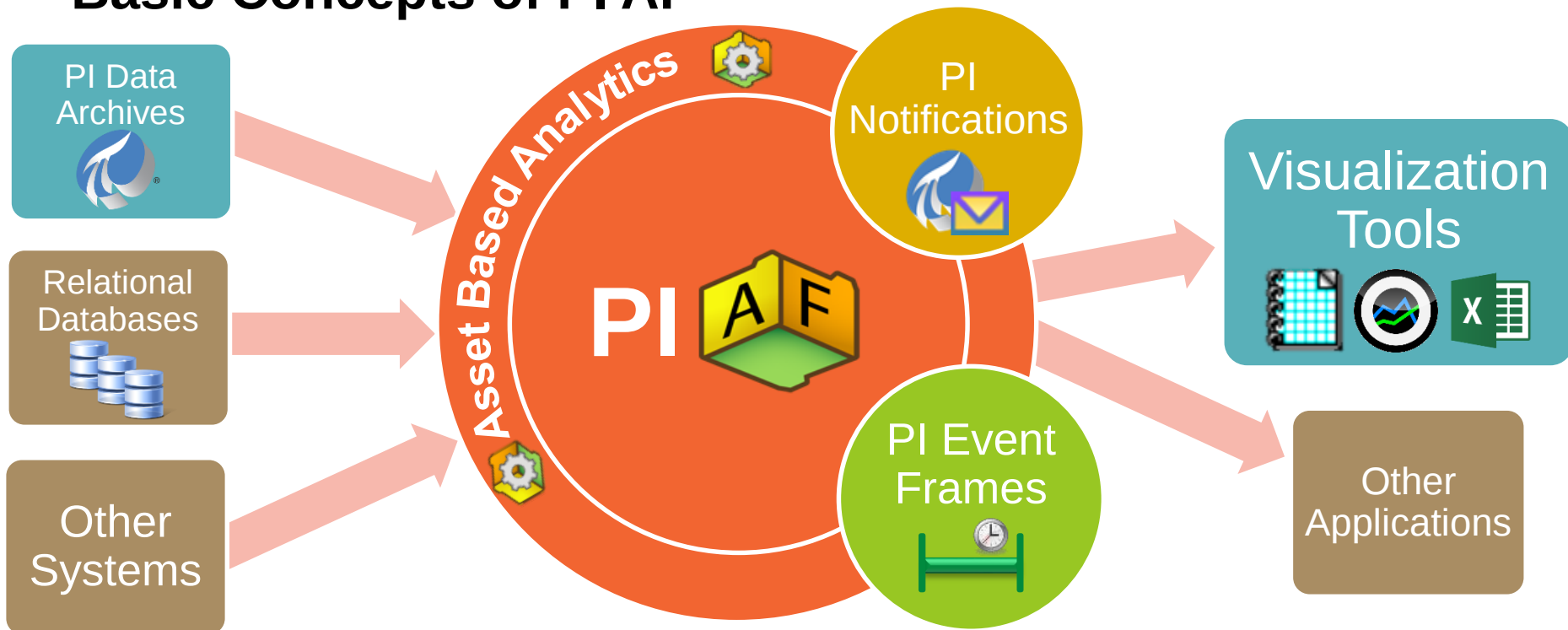
PI ProcessBook –

	A	B	C	D	E
Event name	Start time	End time	Duration	Primary element	
RT: MT2 2013_10_11 8:18	11-Oct-2013 08:18:08	11-Oct-2013 09:36:08	0 01:18:00	Mine Truck 2	
Waiting to Load	11-Oct-2013 08:18:08	11-Oct-2013 08:33:08	0 00:15:00	Mine Truck 2	
Loading	11-Oct-2013 08:33:08	11-Oct-2013 08:46:08	0 00:13:00	Mine Truck 2	
Running Loaded	11-Oct-2013 08:46:08	11-Oct-2013 08:55:08	0 00:09:00	Mine Truck 2	
Dumping Load	11-Oct-2013 08:55:08	11-Oct-2013 09:12:38	0 00:17:30	Mine Truck 2	
Running Empty	11-Oct-2013 09:12:38	11-Oct-2013 09:36:08	0 00:23:30	Mine Truck 2	
RT: MT1 2013_10_11 9:03	11-Oct-2013 09:03:08	11-Oct-2013 10:06:08	0 01:03:00	Mine Truck 1	
Waiting to Load	11-Oct-2013 09:03:08	11-Oct-2013 09:12:38	0 00:09:30	Mine Truck 1	
Loading	11-Oct-2013 09:12:38	11-Oct-2013 09:27:38	0 00:15:00	Mine Truck 1	
Running Loaded	11-Oct-2013 09:27:38	11-Oct-2013 09:47:38	0 00:20:00	Mine Truck 1	
Dumping Load	11-Oct-2013 09:47:38	11-Oct-2013 09:59:38	0 00:12:00	Mine Truck 1	
Running Empty	11-Oct-2013 09:59:38	11-Oct-2013 10:06:08	0 00:06:30	Mine Truck 1	
RT: MT3 2013_10_11 9:12	11-Oct-2013 09:12:08	11-Oct-2013 10:17:08	0 01:05:00	Mine Truck 3	
Waiting to Load	11-Oct-2013 09:12:08	11-Oct-2013 09:22:38	0 00:10:30	Mine Truck 3	
Loading	11-Oct-2013 09:22:38	11-Oct-2013 09:43:08	0 00:20:30	Mine Truck 3	
Running Loaded	11-Oct-2013 09:43:08	11-Oct-2013 09:56:08	0 00:13:00	Mine Truck 3	
Dumping Load	11-Oct-2013 09:56:08	11-Oct-2013 10:08:38	0 00:12:30	Mine Truck 3	
Running Empty	11-Oct-2013 10:08:38	11-Oct-2013 10:17:08	0 00:08:30	Mine Truck 3	

PI DataLink – Event Frame Data



Basic Concepts of PI AF



**PI AF becomes the main access point
for visualization tools and applications**



Asset Based PI Jumpstart

How Can I Get Started?

1. Upgrade to **PI Server 2012**
2. Configure **PI AF**
3. Configure **PI Event Frames**



Looking for time?

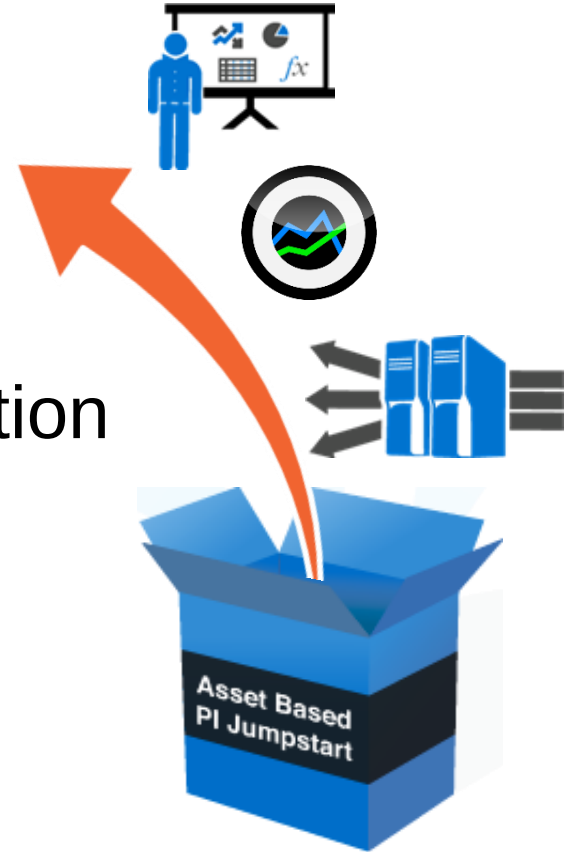
Looking for resources?

Looking for knowledge?



Asset Based PI Jumpstart Service Offering

- Upgrade to **PI Server 2012**
 - Includes PI AF and PI Coresight
- **3 licenses** for **PI Coresight**
- **3-day workshop** to start the definition process of your assets in PI AF
 - Where **your data and processes** become **your assets and analytics**



3-day Workshop = Collaborative Coaching

- **Your experts:**
 - **Process** knowledge
 - Knowledge of existing **databases and systems**
 - Knowledge of your PI System and **process data**
- **Our experts:**
 - Knowledge of the **PI System** latest and greatest releases
 - PI System **best practices**



Assets, Analytics, and Events

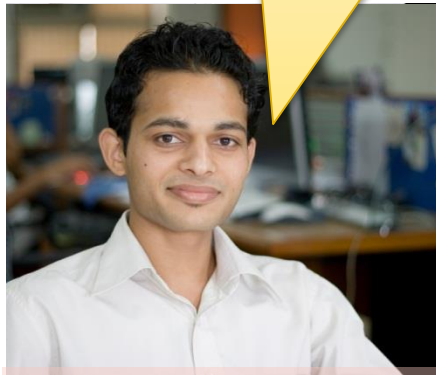
Shorten the Time to Insight

"We've turned our site's process data into **valuable information** and powered our corporate reporting and BI initiatives."



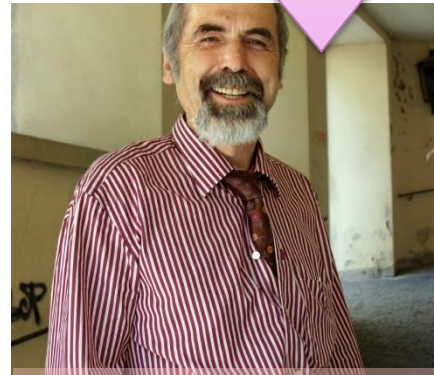
Information Tech

"The PI System enables us to **spend our time analyzing the data** instead of retrieving and manipulating the data."



Engineer

"My employees now have **the right information** to make decisions. We are **sharing best practices** across sites now that we're **talking the same language.**"



Manager

"We are more efficient, our assets are more reliable, and we are producing more with less. **The PI System impacts my bottom line.**"



Executive

Key Points to Take Home



OSIsoft.
**REGIONAL
SEMINAR**
The Power of Data

**THRIVING
IN A
WORLD OF
CHANGE**

- **PI AF** creates a common language and enables data integration
- **PI Analytics** transform data into information and add your expertise into the PI System
- **PI Event Frames** bookmark important events along with their related information
- **Asset Based PI Jumpstart** will get you started
- The **PI System** continues to evolve so you can take advantage of **the full power of your data**



State your
**name &
company**



THANK YOU

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Systems Engineer

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