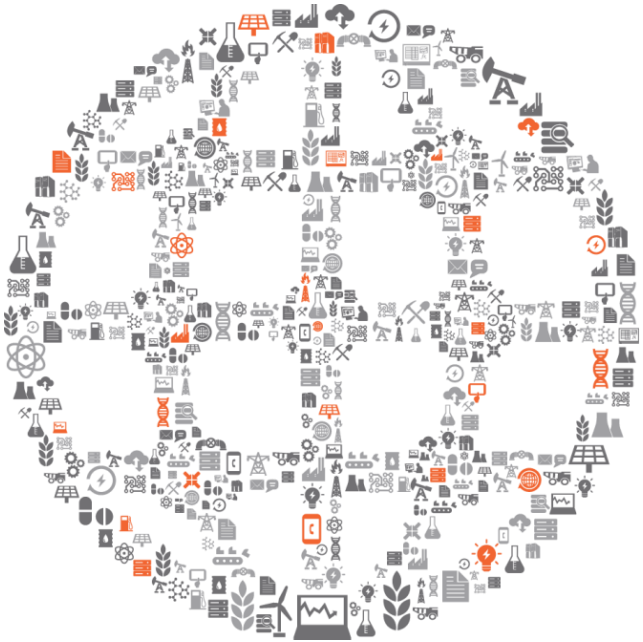


OSIsoft.

REGIONAL SEMINAR

The Power of Data

THRIVING IN A WORLD OF CHANGE

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

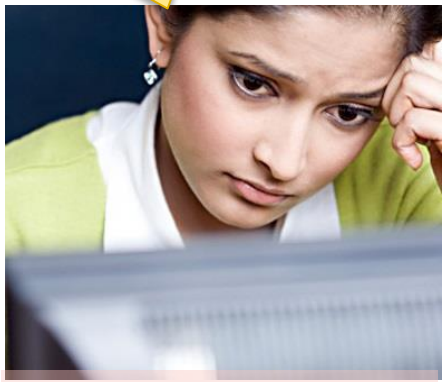
Presented by **Louis-Philippe Page-Morin, Systems Engineer**

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 Asset Framework

PI Data Archive

PI Interfaces for Health Monitoring

PI Notifications

Asset Based Analytics

Cloud Computing

SaaS

Windows Integrated Security

Windows Server Active Directory

High Availability (HA)

64-bits Architecture

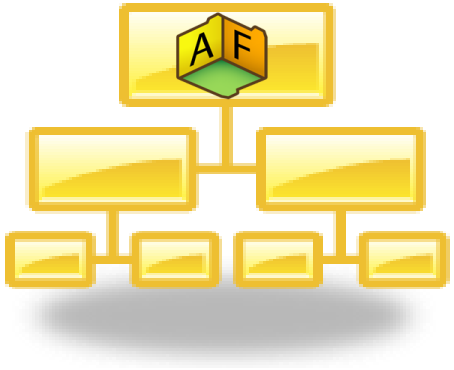
Virtualization

Microsoft Hyper-V

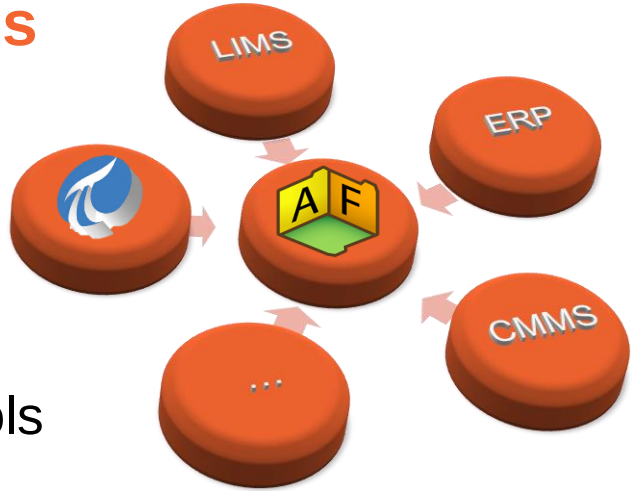
CITRIX vmware

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

Rotor Speed

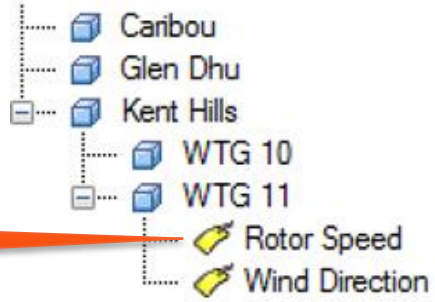
Efficiency

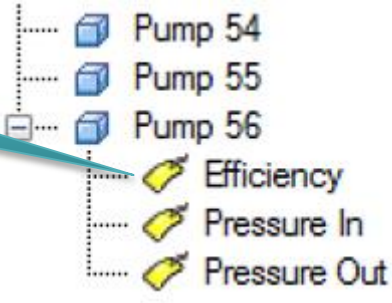
GT56.TIC.PV

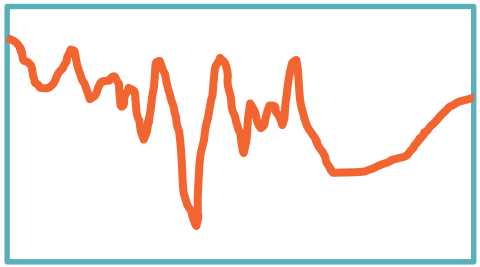
WT11.SI.PV

P56.PEF.CALC

GP23.ATHK8.PV



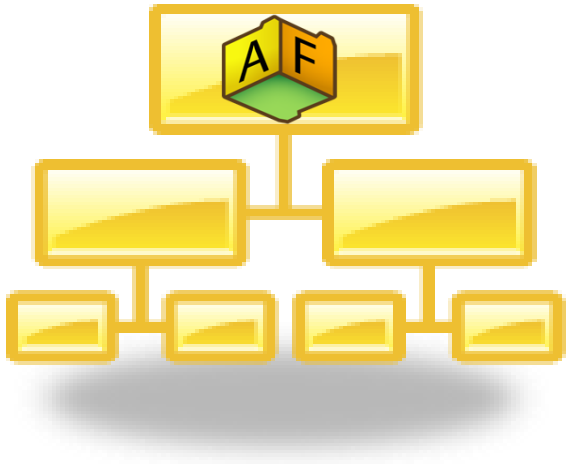




	A	B
1	Efficiency	74.54%
2		
3		

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

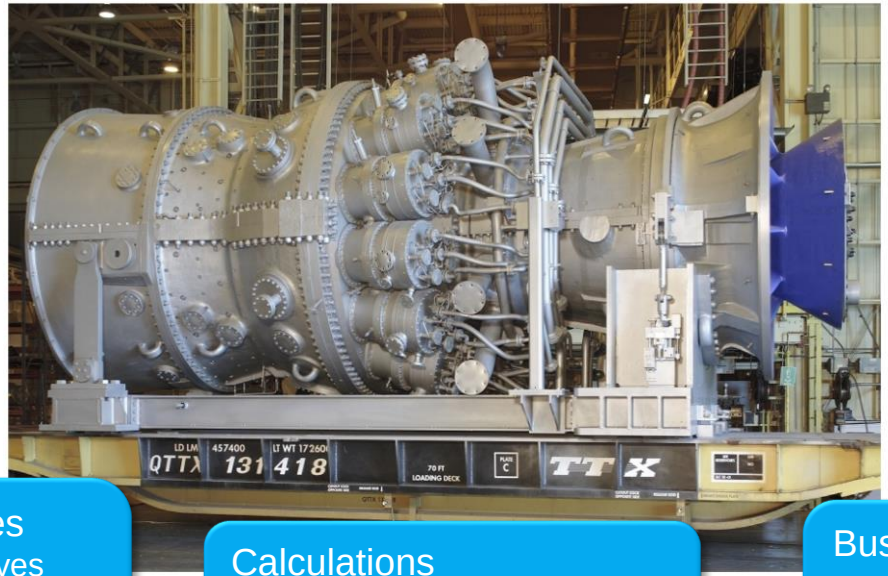


A Complete Picture of your Asset

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



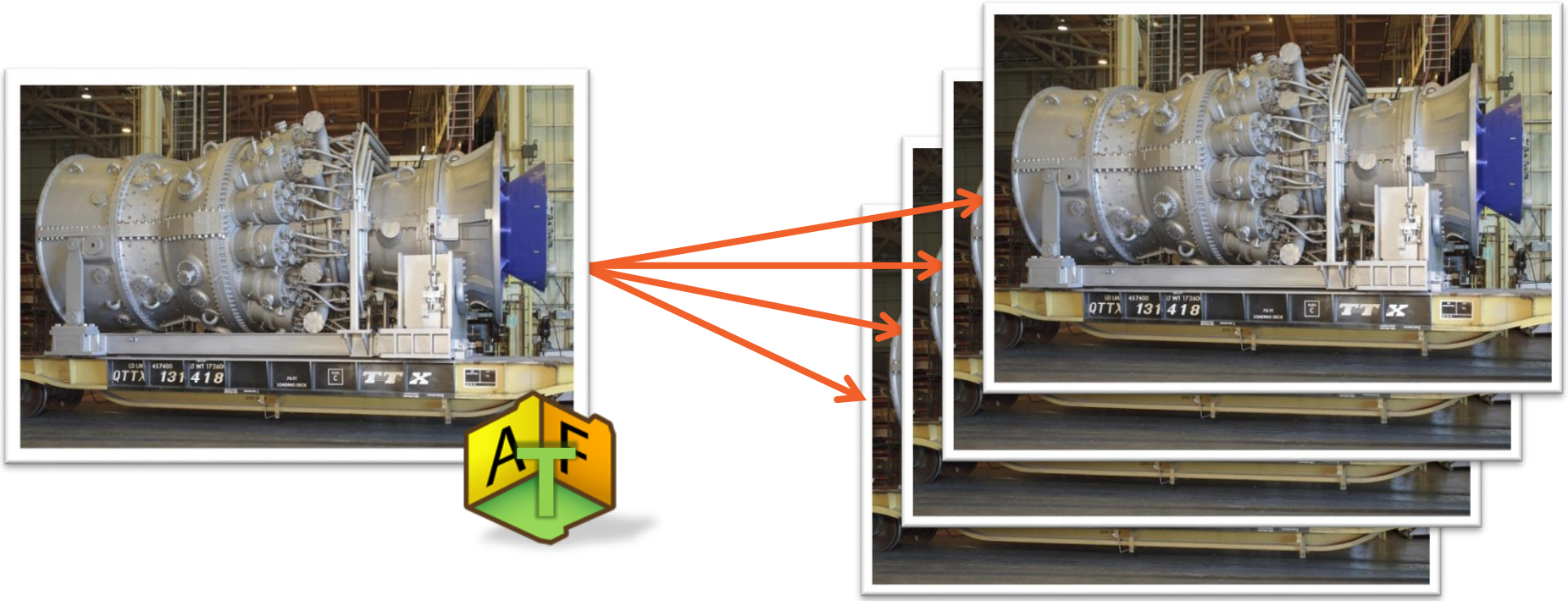
Calculations
- Performance calculations
- KPI's

Real-time Values
- Exhaust temperature
- Exhaust flow
- Measured MW output

Notifications
- Performance excursions
- Temperature difference
- High temperature

Business Events
- Downtime
- Startup
- Excursions

A Common View for Similar Assets



PI Interfaces Will Help you Get Started

PI Interface

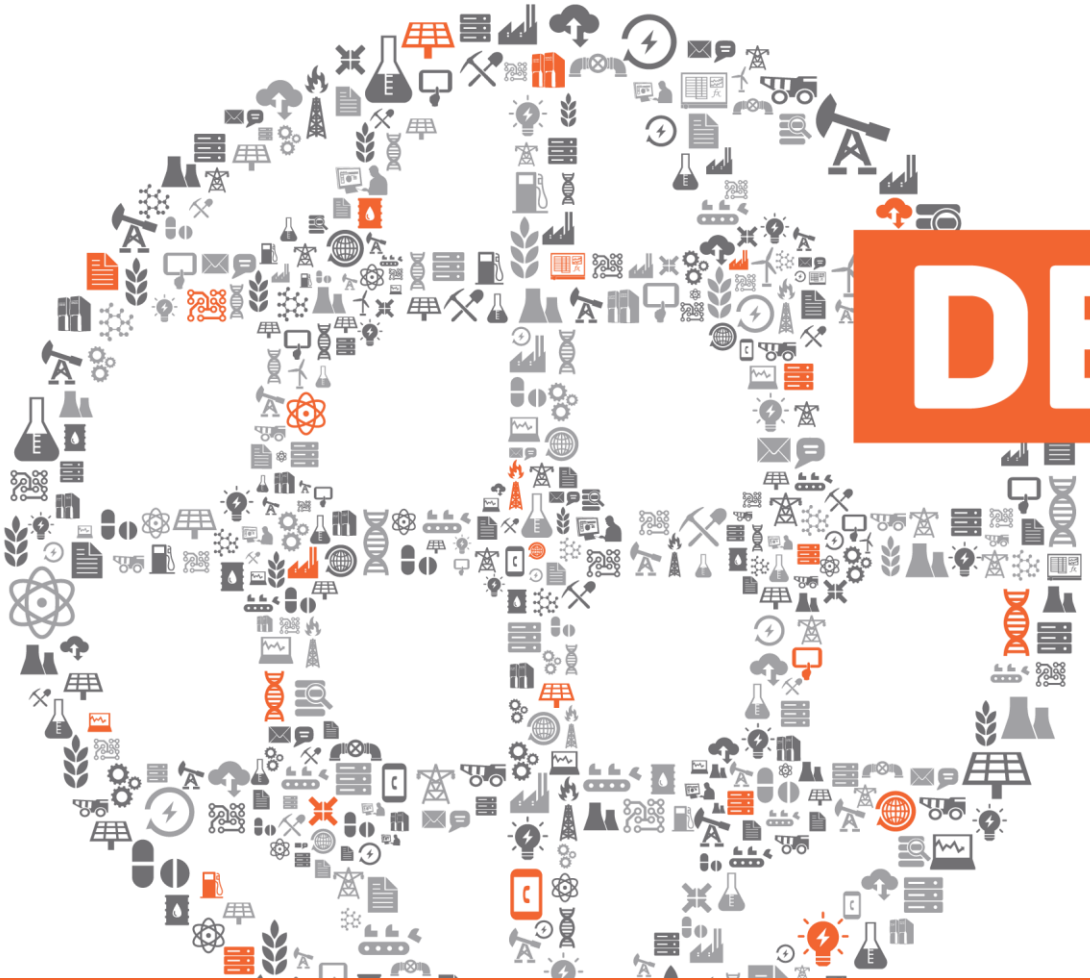
Classic PI Interfaces

- Real-time Values
  - Inlet pressure
  - Inlet flow
  - Ambient temperature
  - Exhaust temperature
  - Exhaust flow
  - Measured MW output

Asset based PI Interfaces

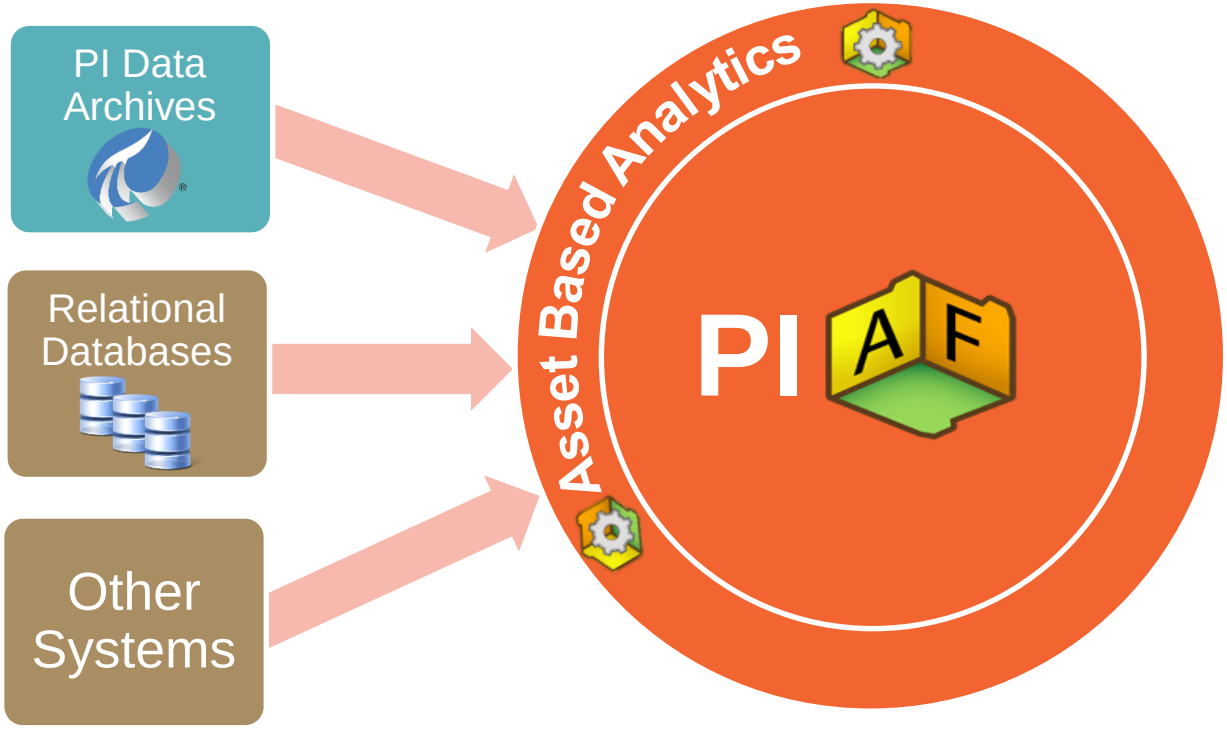
- Asset details
  - Name
  - Make
  - Model
- Business Events
  - Downtime
  - Startup
  - Excursions

Asset based PI Interfaces starting roll out late 2013



DEMO

Basic Concepts of PI AF

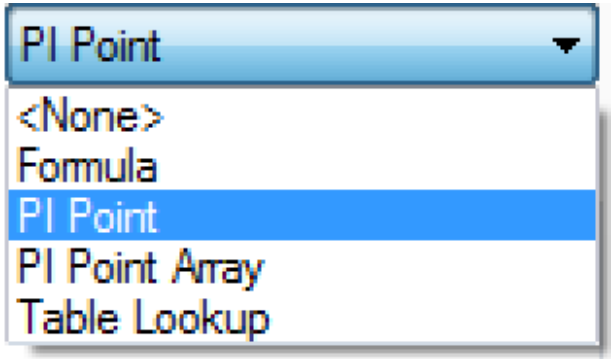


The Asset Based Analytics transform your data into actionable information

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**

- Expected release: Q1 2014

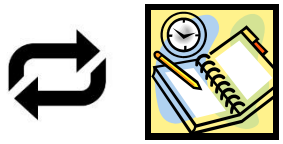
Asset Based Analytics – Expression and Rollup

Extruding Process

Boiler Efficiency = AVG(B1..Bn)

Boiler1

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



Boiler Template

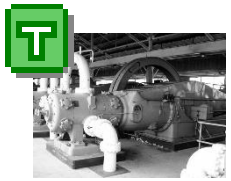
Boiler2

- Flow Out
- Fuel Flow Rate
- Efficiency

Boiler3

- Flow Out
- Fuel Flow Rate
- Efficiency

Asset Based Analytics – Event Frame Generation



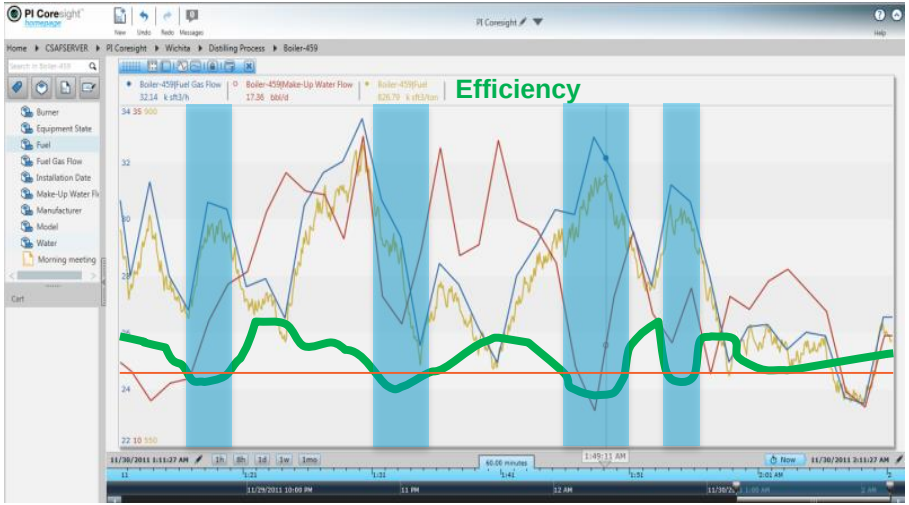
|Efficiency

|Fuel Flow Rate

|Flow Out

myEF

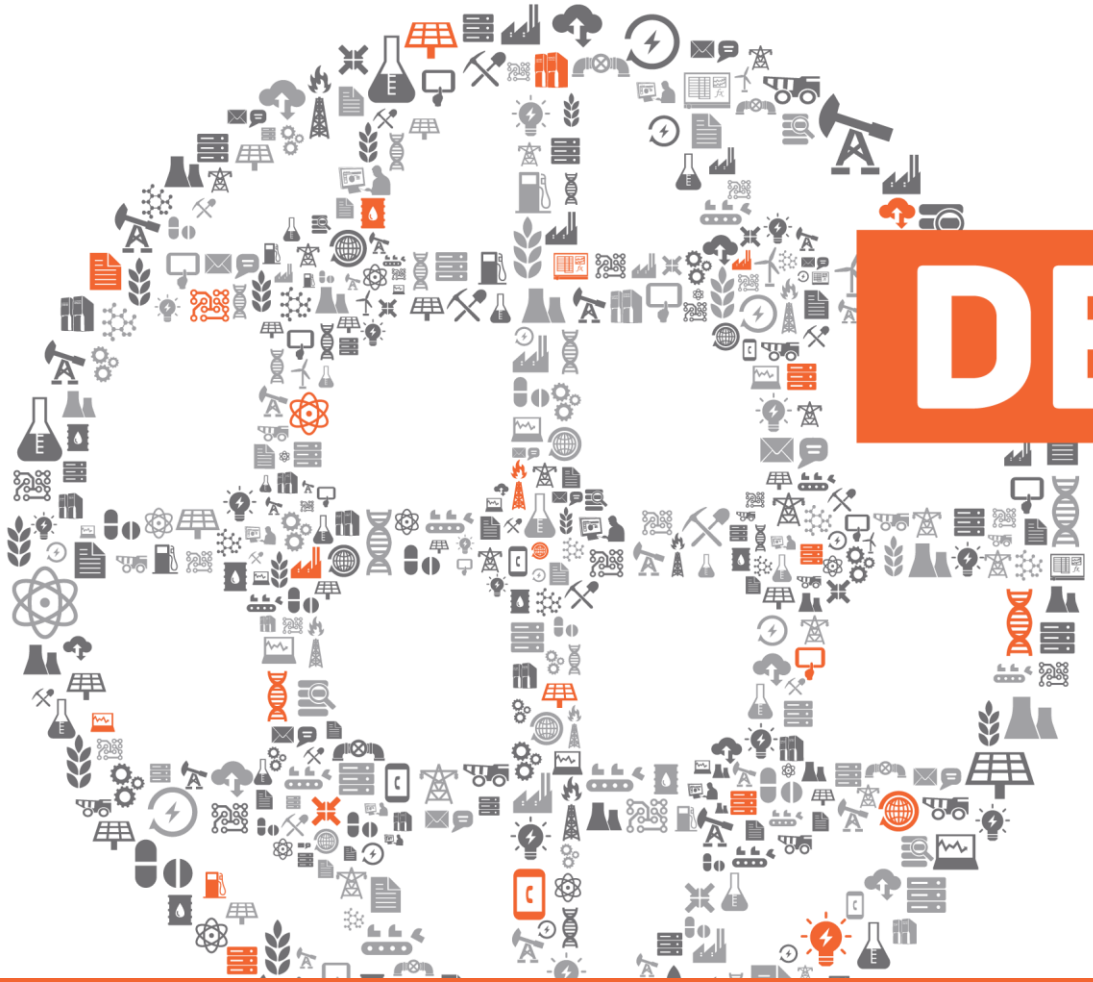
|Efficiency



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

myEF.Start = (Efficiency < LIMIT)

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

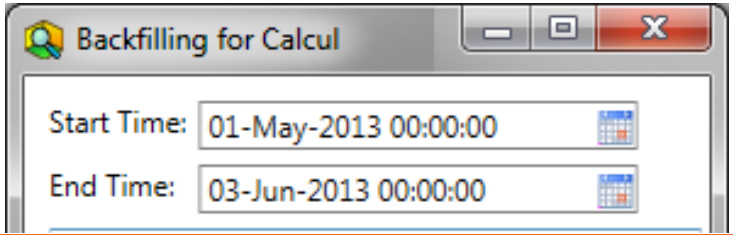


DEMO

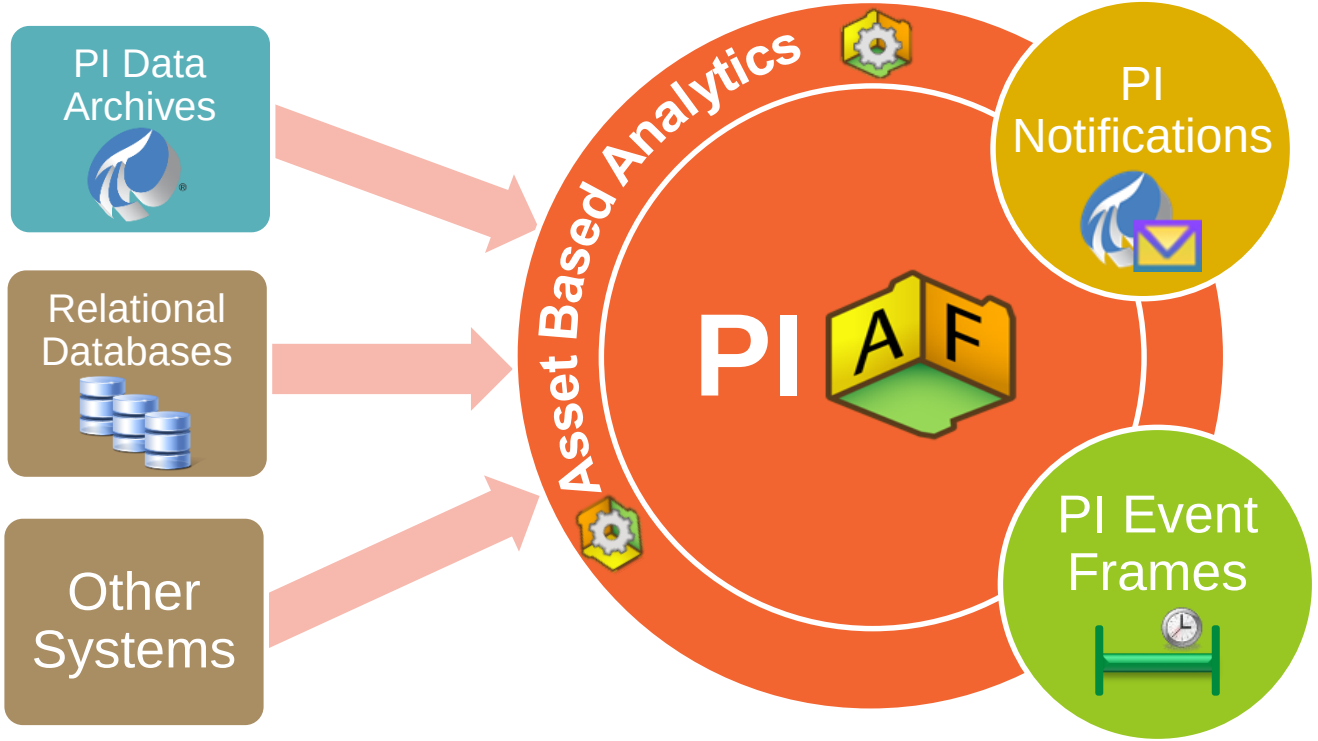
Asset Based Analytics – Planned Version

- 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**

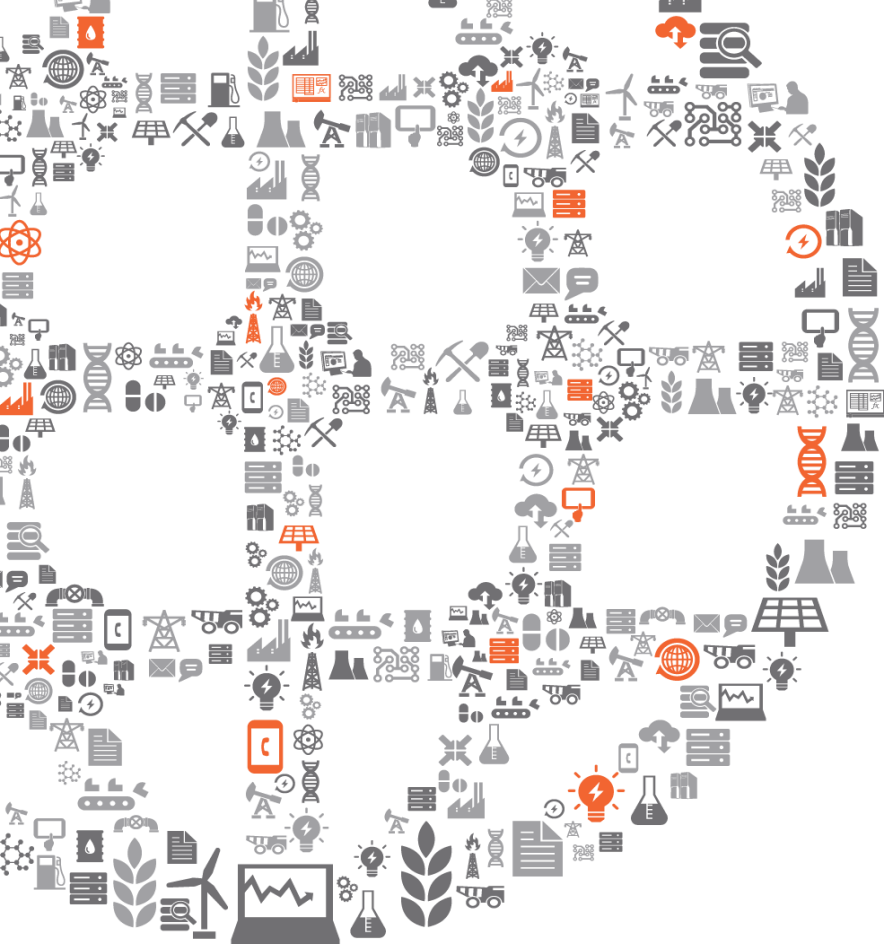
Name	Expression
A	'Attribute1'*10
B	A+'Attribute2'
C	B-'Attribute3'



Basic Concepts of PI AF



The other PI Server components enhance your assets structure information



PI Event Frames

Bookmarks for your Real-Time Data

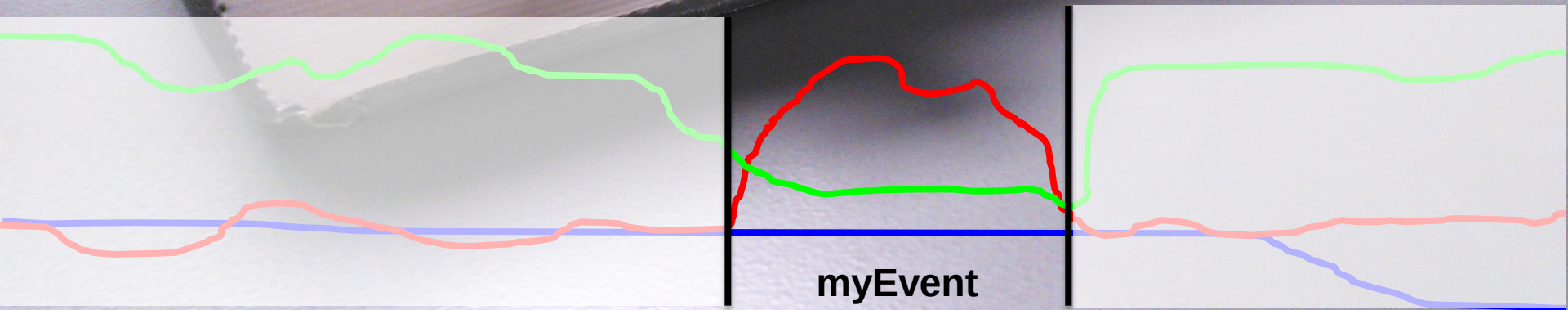
PI Event Frames

Info

Start

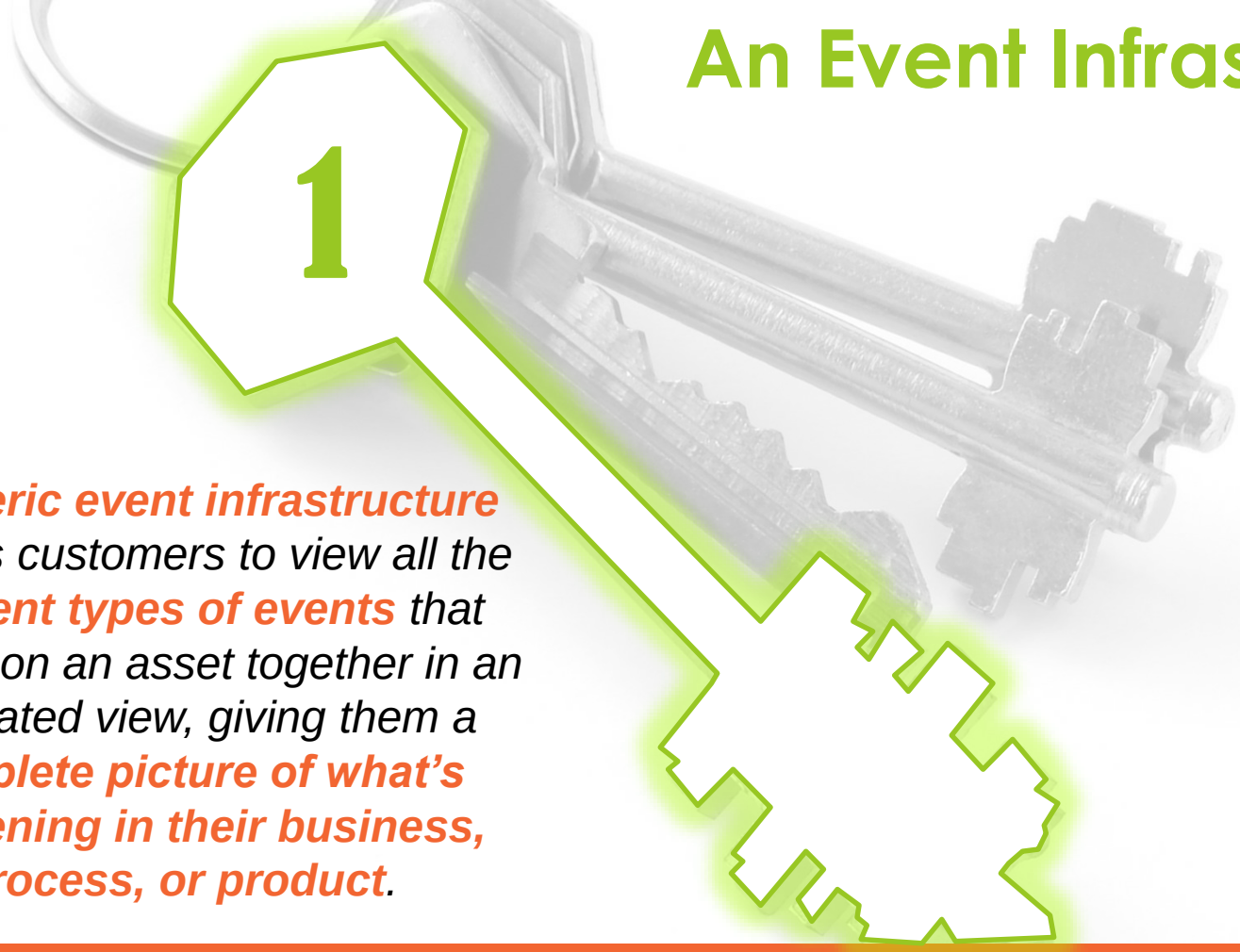
End

Your Data



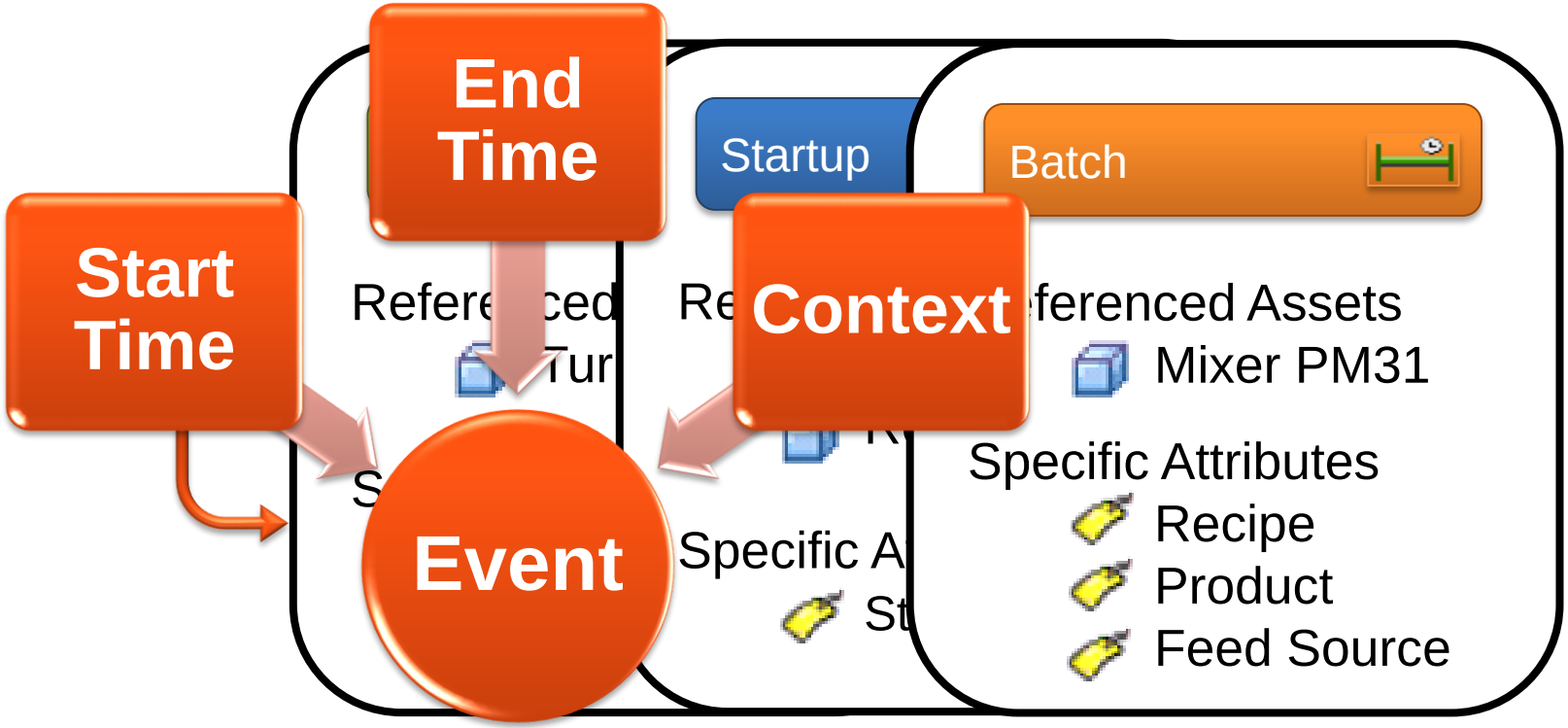
Unlocking the Value of Real-Time Data and Events

An Event Infrastructure

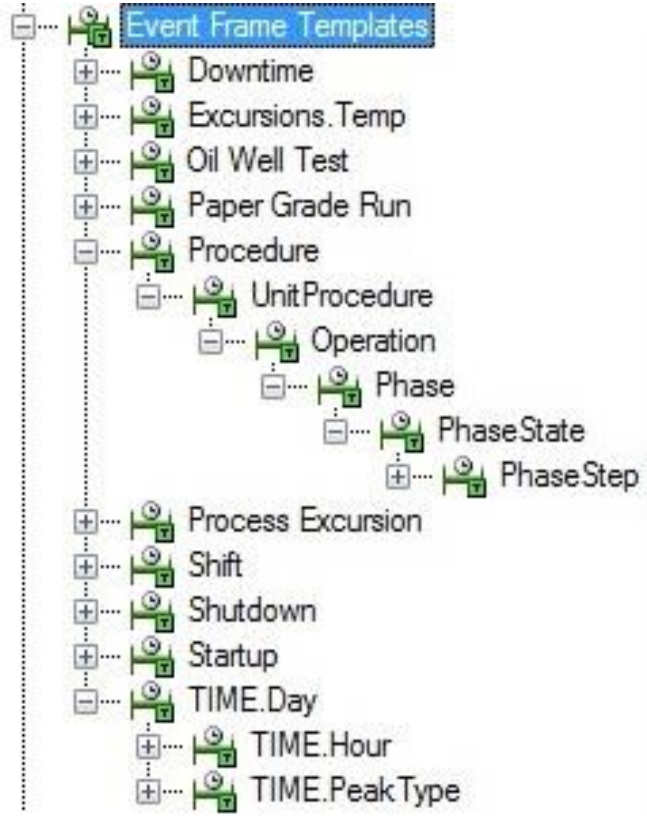


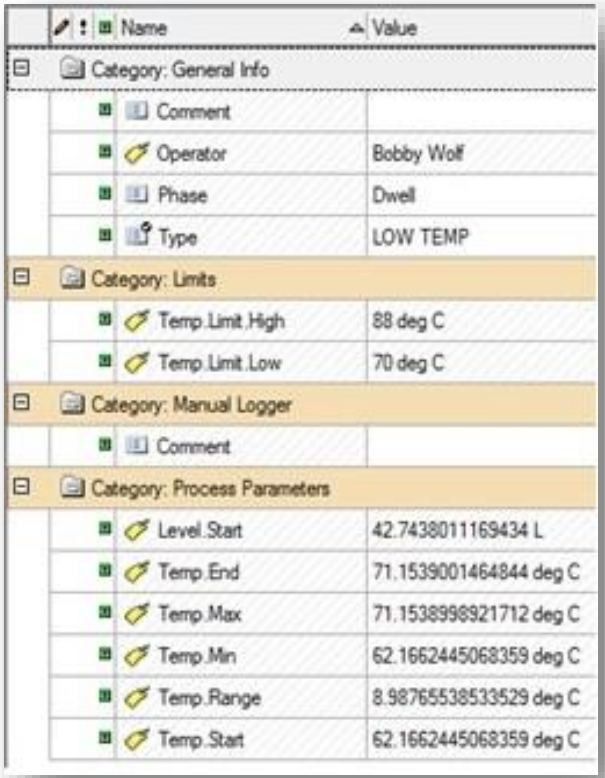
*A **generic event infrastructure** enables customers to view all the **different types of events** that happen on an asset together in an integrated view, giving them a **complete picture of what's happening in their business, process, or product**.*

Define your Events



Event Frame Templates and Customizable Context



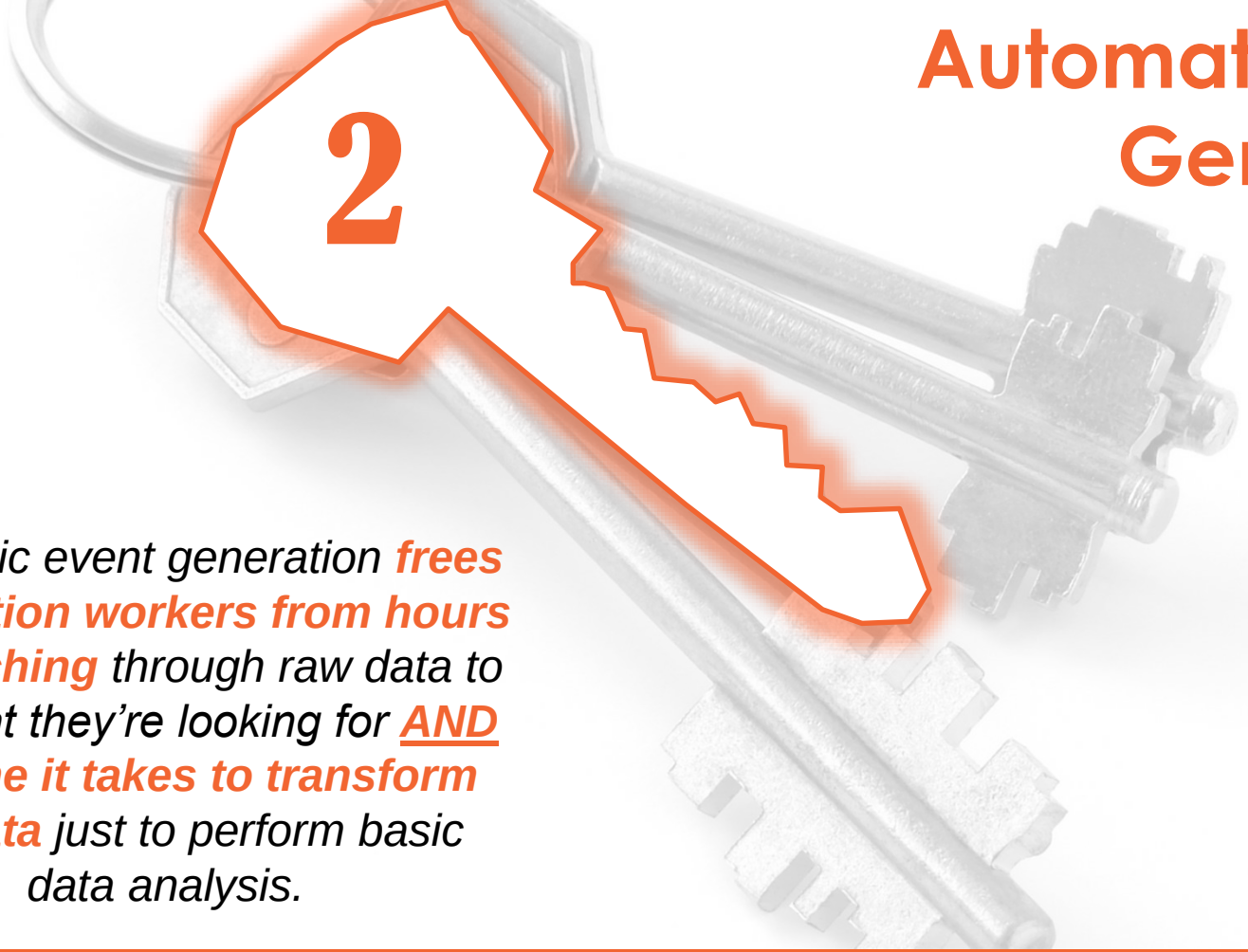


Text entries useful for filtering/group-by analysis

Placeholders for **manual data entry**

Calculated data using event start & end time context

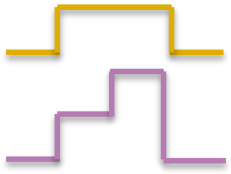
Automatic Event Generation



*Automatic event generation **frees 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

DeltaV, Syncade, Rockwell Automation, GE Fanuc, ABB, Foxboro, werum, Siemens, Wonderware, Honeywell

PI Event Frames Generator

Auto-create Events

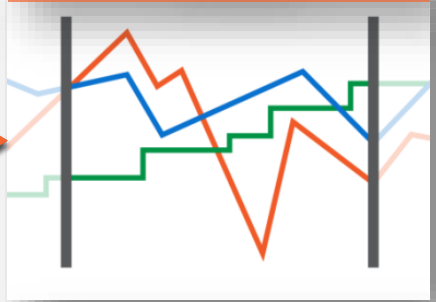
Asset Based Calc.

[Temperature > 180]

PI Interfaces for BES / MES

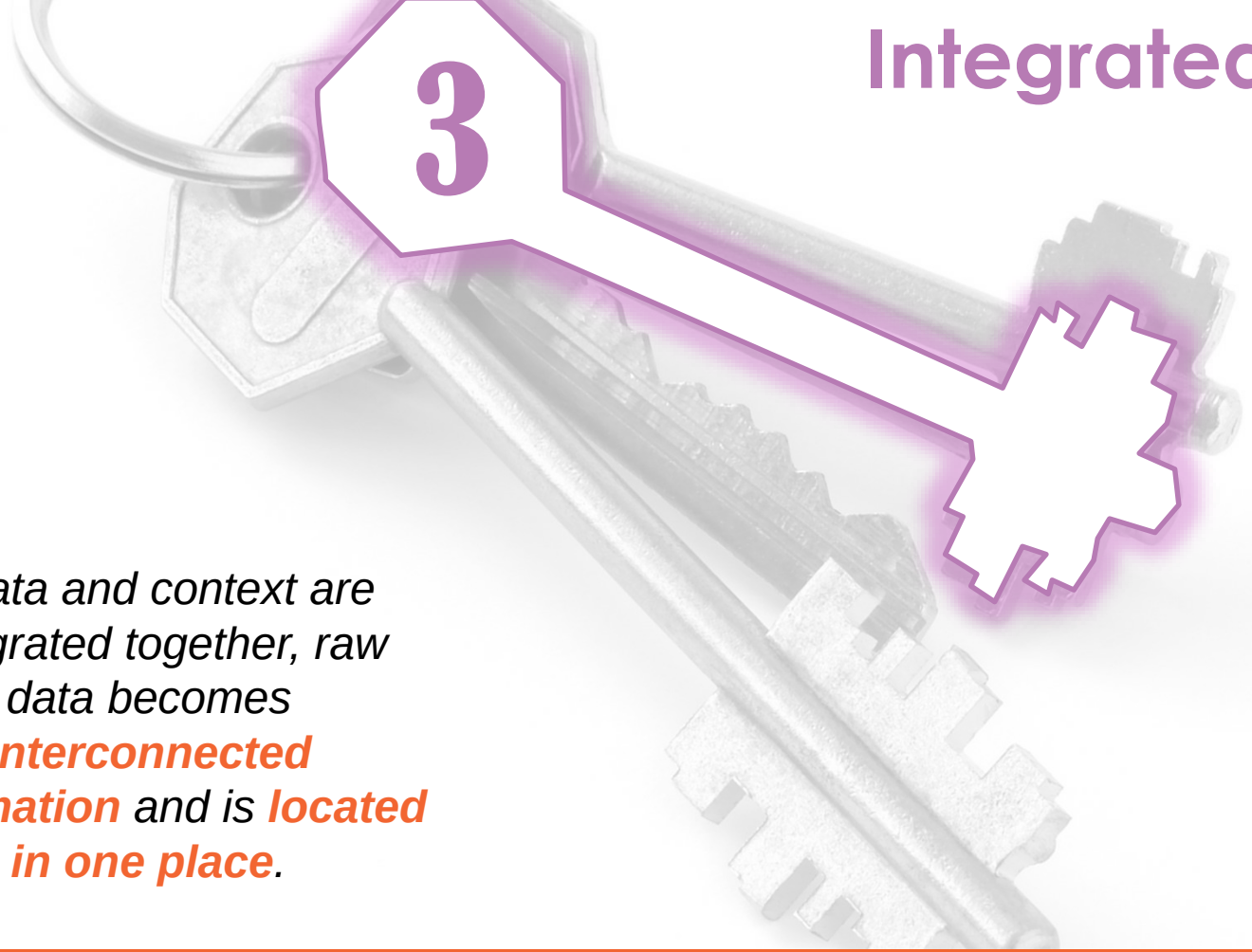
Auto-create Assets & Attributes

Events



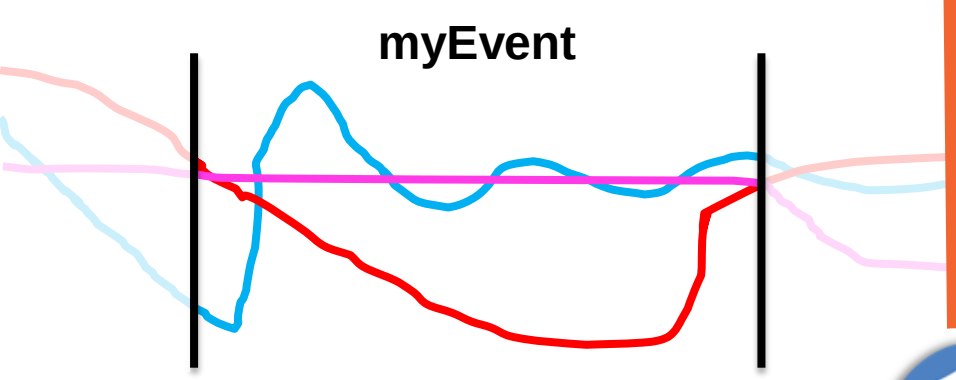
Assets

Integrated Data & Context

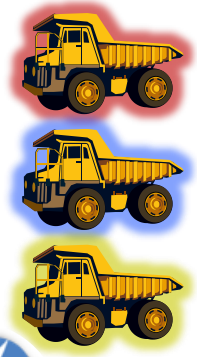


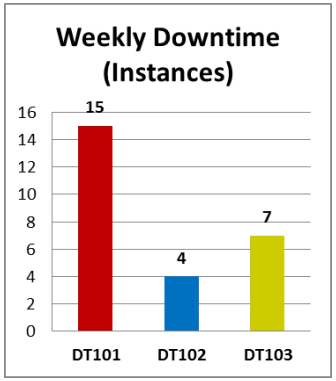
If data and context are integrated together, raw data becomes ***interconnected information*** *and is* ***located in one place****.*

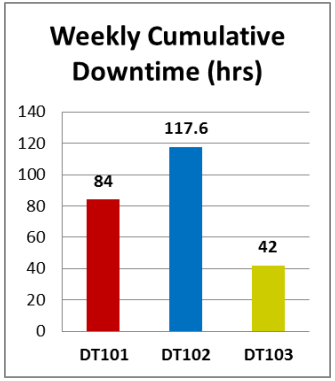
Simplify Data Analysis



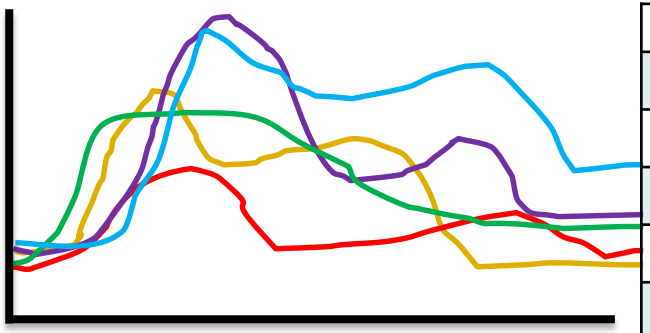
Perform Asset Comparisons







Event Overlay Trend (Temp.)

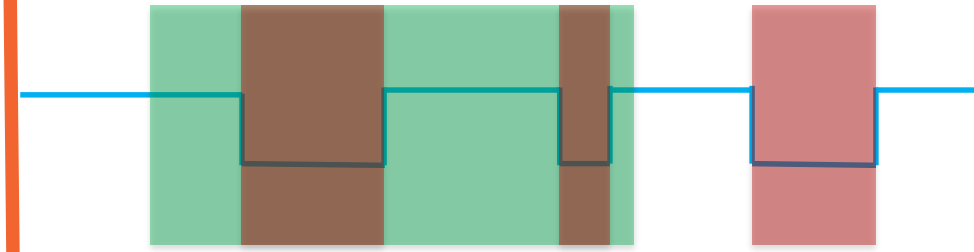


Name	Temp.Max
EF1	122.47
EF2	109.34
EF3	112.73
EF4	98.61
EF5	125.24

Downtime Events for Product XYZ

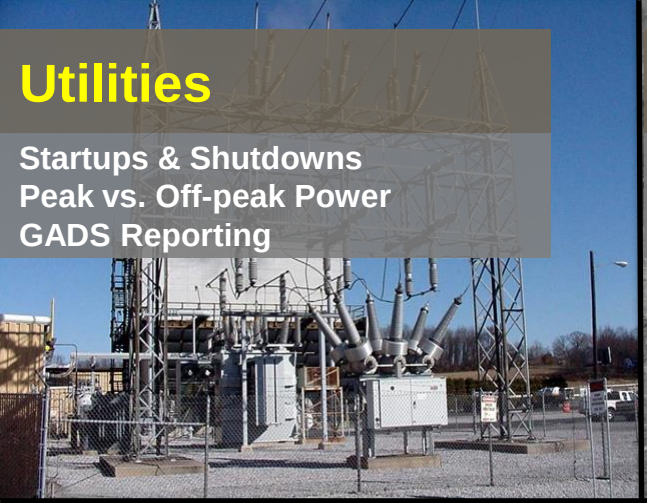
Product XYZ (1)

Downtime (2)



Perform Event Comparisons

Discover Event Interrelationships

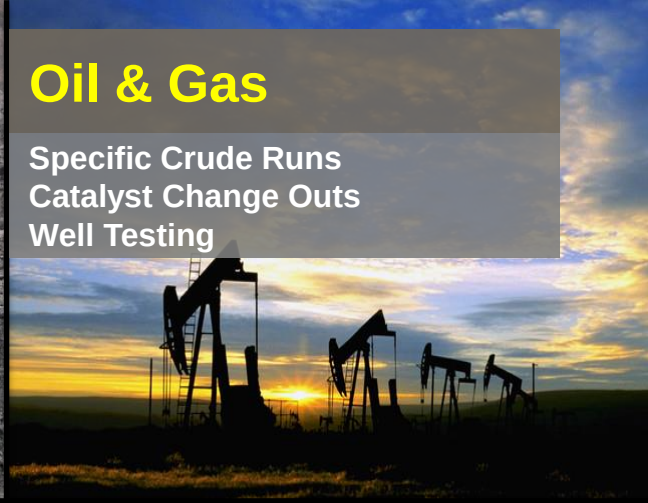


Utilities

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

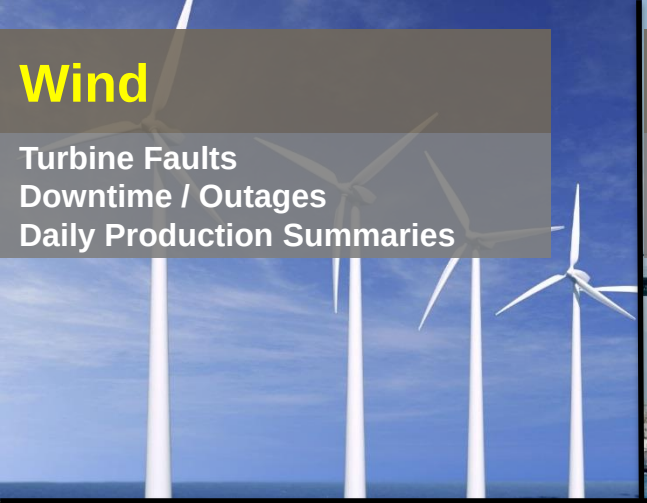
Downtime / OEE / TEEP
Safety Events
Process Excursions

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

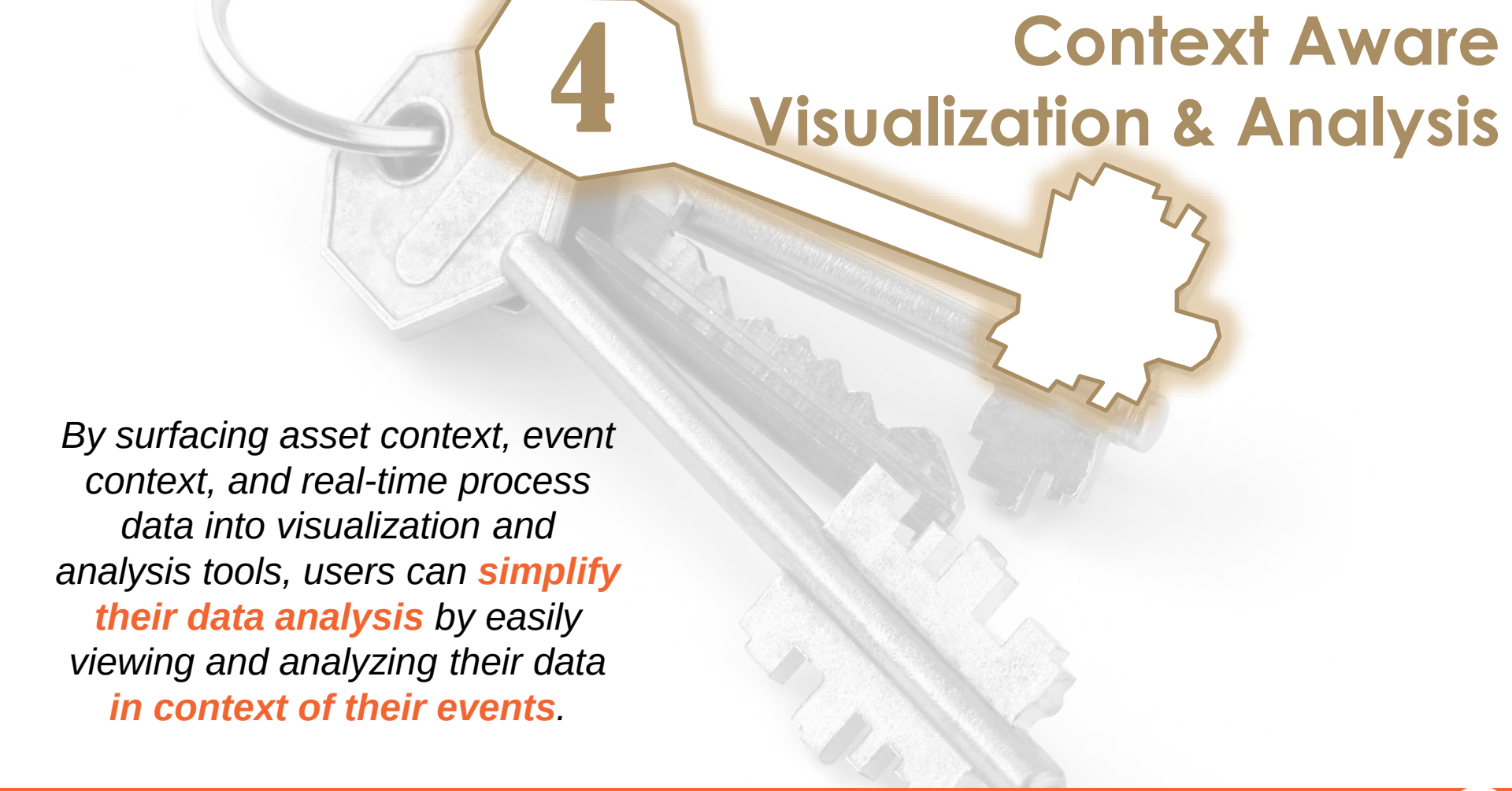
Daily / Monthly Consumption
Air Emissions Monitoring
Waste Water Discharge

Water Utilities

Water Quality Excursions
Water Level Excursions
Leaks / Large Consumptions

Solar

Sun vs. Shade Days
Production Summaries
Downtime



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

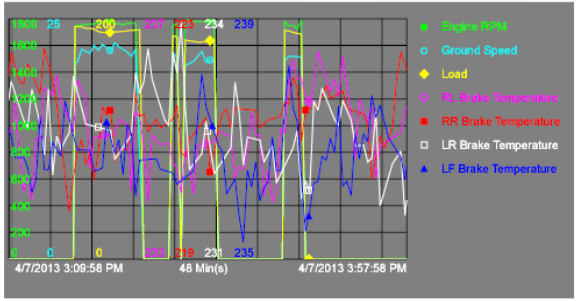
Trip Operational State Events

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

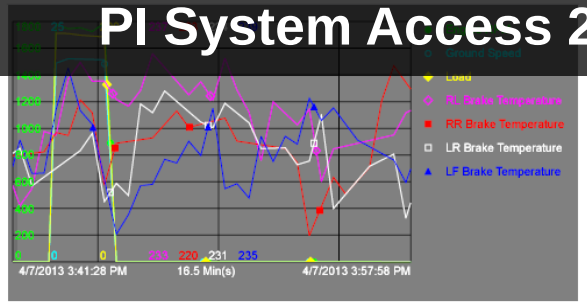
Trip Event Trend



Trip Attributes

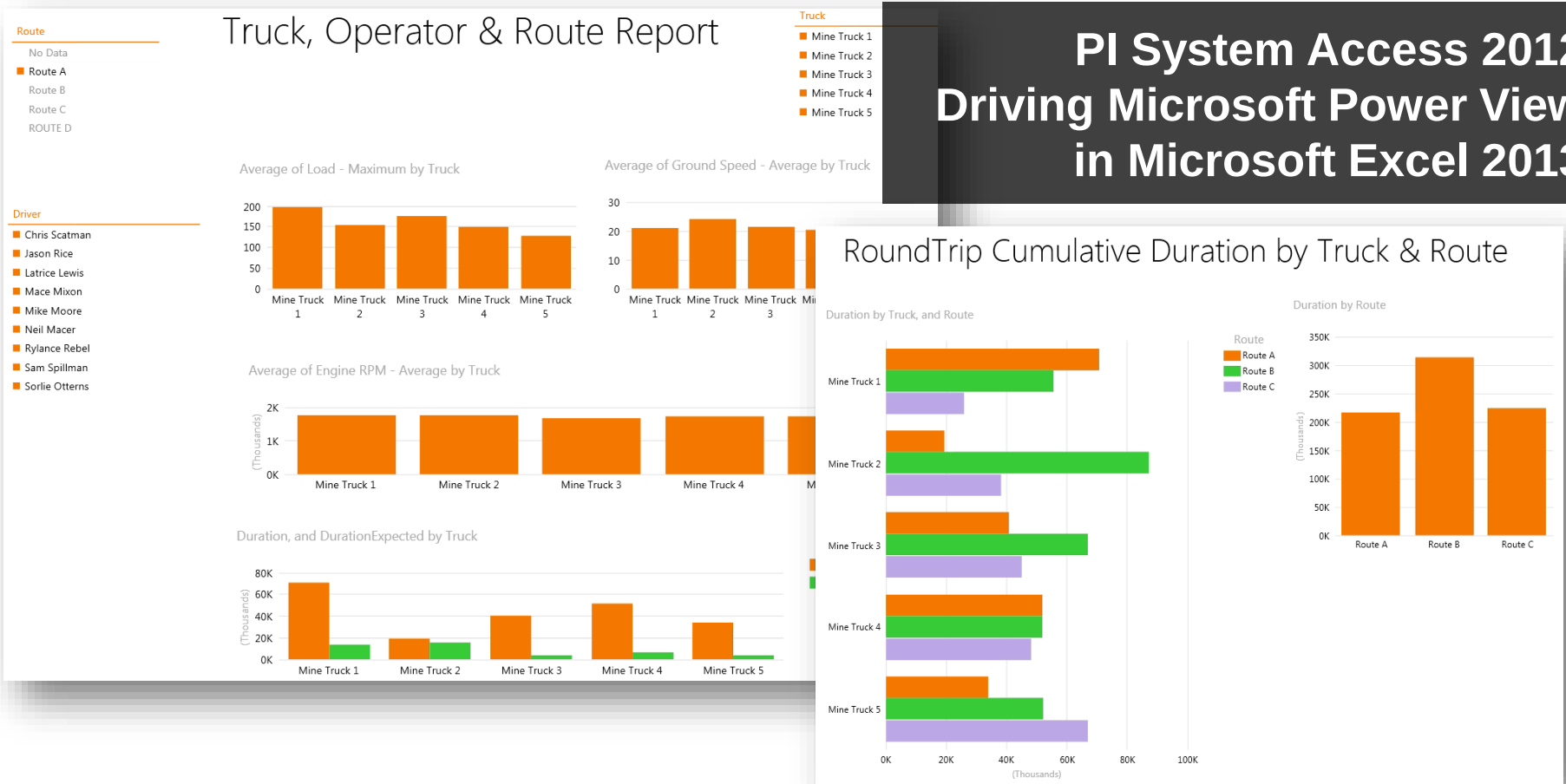
Attribute	Value	UOM
Comment		
Description	RoundTrip	
Driver	Revill Swivel	
Duration	2880	s
Duration.Expected	360	s
Engine RPM - Average	1723.4249567159	rpm
Engine RPM - Maximum	1784.61865234375	rpm
Ground Speed - Average	20.6147543030977	mi/h
Ground Speed - Maximum	22.7460880279541	mi/h
Load - Maximum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

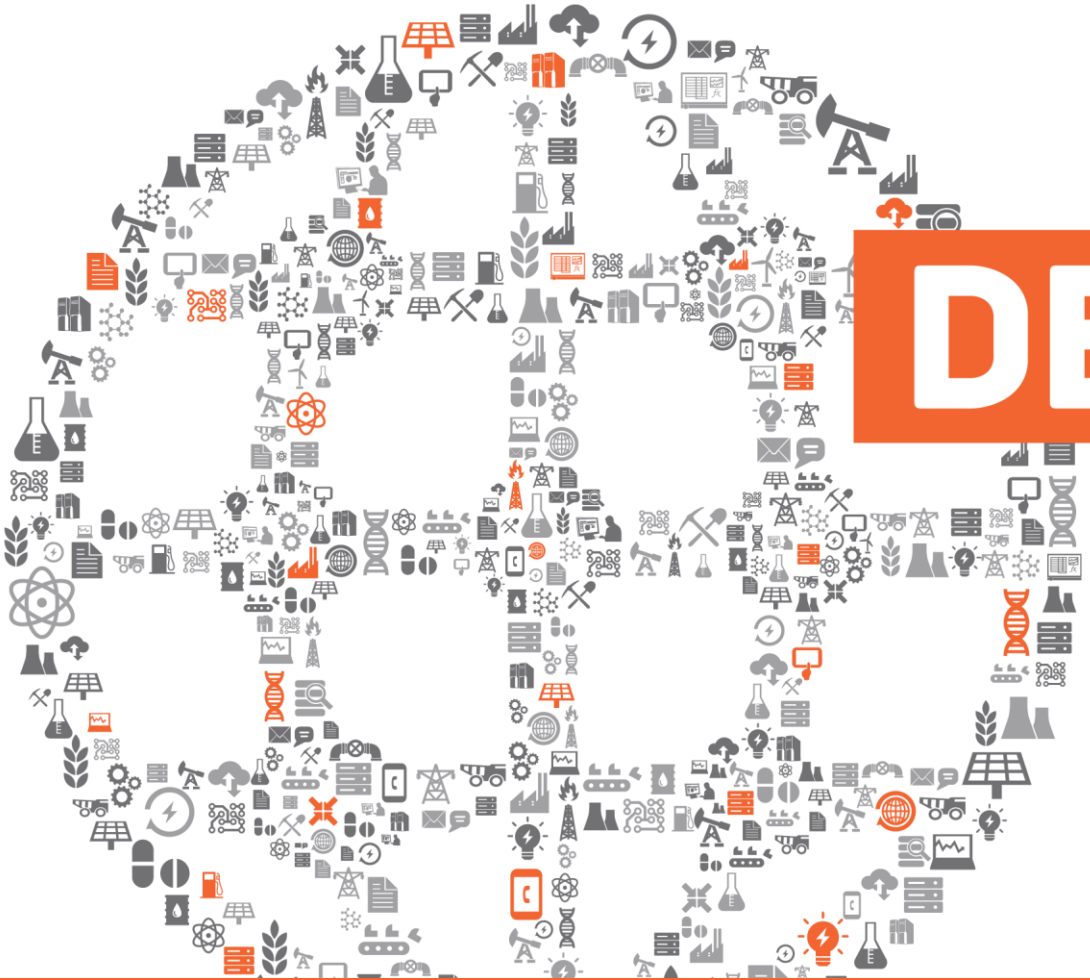
Trip Operational State Event Trend



PI WebParts Leveraging PI System Access 2012

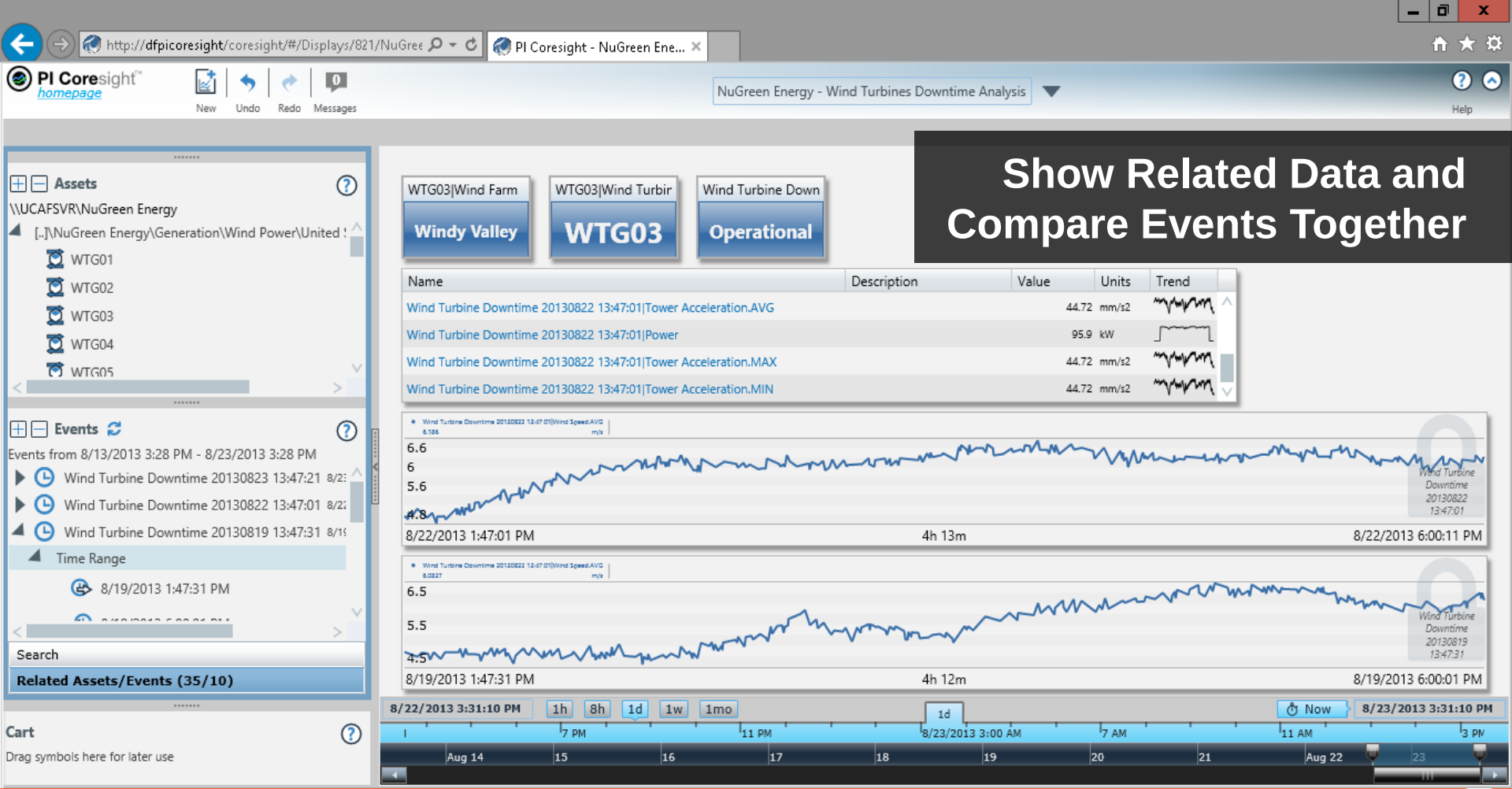
PI System Access 2012
Driving Microsoft Power View in Microsoft Excel 2013





DEMO

Show Related Data and Compare Events Together



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 DataLink – Event Frame Data

Select a RoundTrip: RT: MT5 RoundTrip 20130410 21:10:08

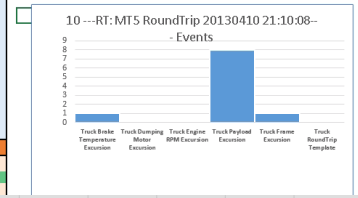
Search Start: *-4d (07-Apr-13 08:09:58)

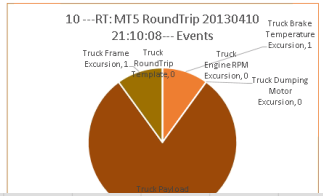
Search End: * (11-Apr-13 08:10:00)

Truck: Mine Truck 5

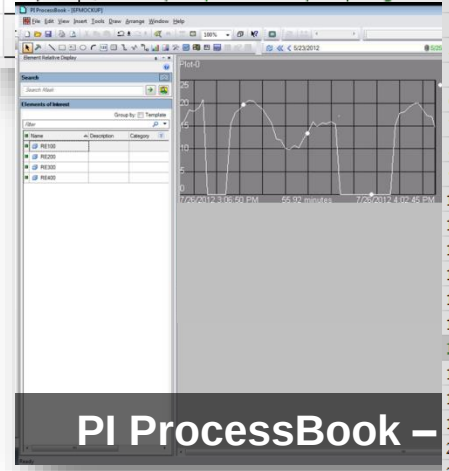
ROUNDTRIP INFORMATION	
Truck RoundTrip Name	RT: MT5 RoundTrip 20130410 21:10:08
Truck	Mine Truck 5
Start Time	10-Apr-13 21:10:08
End Time	10-Apr-13 22:07:08
Duration	0 0:57:00
Duration (min)	57.0
Route	Route C
Driver	Teddy Bigs
Comment	
Element Path	\\UCARSVR\OSI Mining\Corporation\Trucks\Mine Truck 5
ENGINE ECM	
Engine RPM.Avg	1706.78
Engine RPM.Max	1770.54
Ground Speed.Avg	20.56

(10) Truck Excursions Events during RoundTrip ---RT: MT5 RoundTrip 20130410 21:10:08--- on <<Mine Truck 5>>

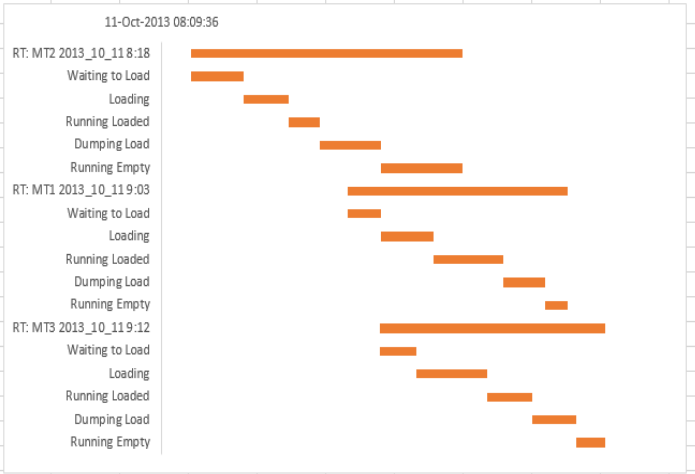




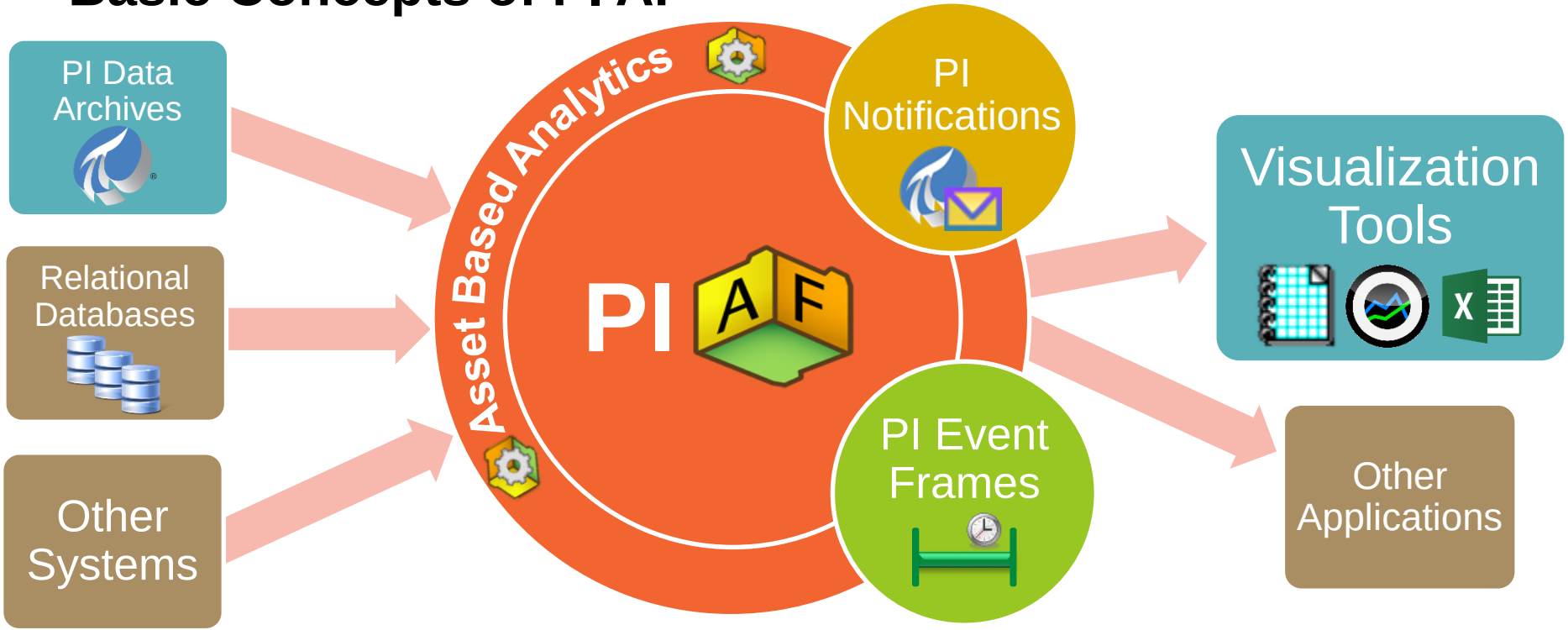
PI ProcessBook –



	Event name	Start time	End time	Duration	Primary element
3	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
4	Waiting to Load	11-Oct-2013 08:18:08	11-Oct-2013 08:33:08	0 00:15:00	Mine Truck 2
5	Loading	11-Oct-2013 08:33:08	11-Oct-2013 08:46:08	0 00:13:00	Mine Truck 2
6	Running Loaded	11-Oct-2013 08:46:08	11-Oct-2013 08:55:08	0 00:09:00	Mine Truck 2
7	Dumping Load	11-Oct-2013 08:55:08	11-Oct-2013 09:12:38	0 00:17:30	Mine Truck 2
8	Running Empty	11-Oct-2013 09:12:38	11-Oct-2013 09:36:08	0 00:23:30	Mine Truck 2
9	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
10	Waiting to Load	11-Oct-2013 09:03:08	11-Oct-2013 09:12:38	0 00:09:30	Mine Truck 1
11	Loading	11-Oct-2013 09:12:38	11-Oct-2013 09:27:38	0 00:15:00	Mine Truck 1
12	Running Loaded	11-Oct-2013 09:27:38	11-Oct-2013 09:47:38	0 00:20:00	Mine Truck 1
13	Dumping Load	11-Oct-2013 09:47:38	11-Oct-2013 09:59:38	0 00:12:00	Mine Truck 1
14	Running Empty	11-Oct-2013 09:59:38	11-Oct-2013 10:06:08	0 00:06:30	Mine Truck 1
15	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
16	Waiting to Load	11-Oct-2013 09:12:08	11-Oct-2013 09:22:38	0 00:10:30	Mine Truck 3
17	Loading	11-Oct-2013 09:22:38	11-Oct-2013 09:43:08	0 00:20:30	Mine Truck 3
18	Running Loaded	11-Oct-2013 09:43:08	11-Oct-2013 09:56:08	0 00:13:00	Mine Truck 3
19	Dumping Load	11-Oct-2013 09:56:08	11-Oct-2013 10:08:38	0 00:12:30	Mine Truck 3
20	Running Empty	11-Oct-2013 10:08:38	11-Oct-2013 10:17:08	0 00:08:30	Mine Truck 3



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?

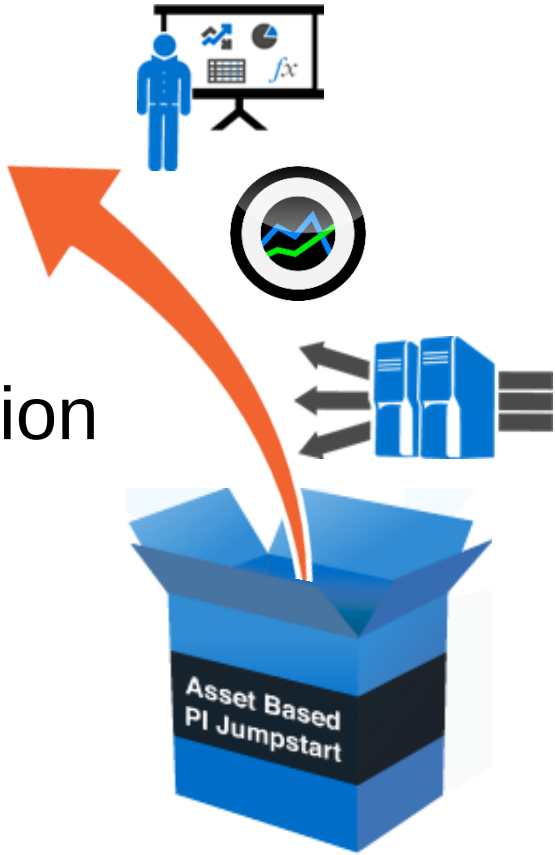
1. Upgrade to **PI Server 2012**
2. Configure **PI AF**
3. Configure **PI Event Frames**

PI Server 2012

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**

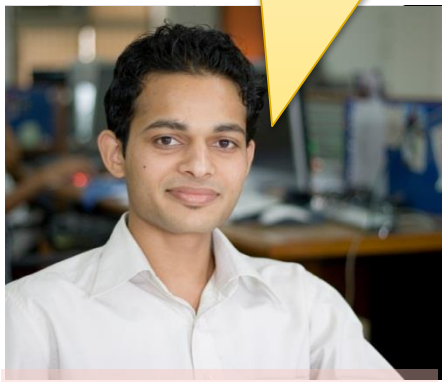
Assets, Analytics, and Events

Shorten the Time to Insight

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

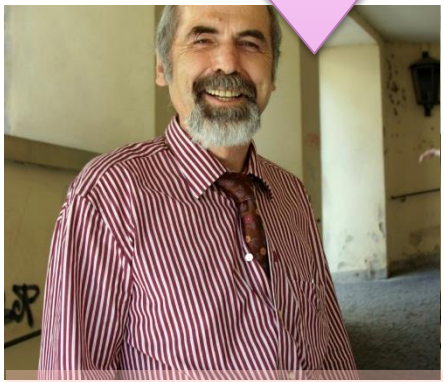
Information Tech

*"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**

Questions

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

State your **name & company**

THANK YOU

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Systems Engineer

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