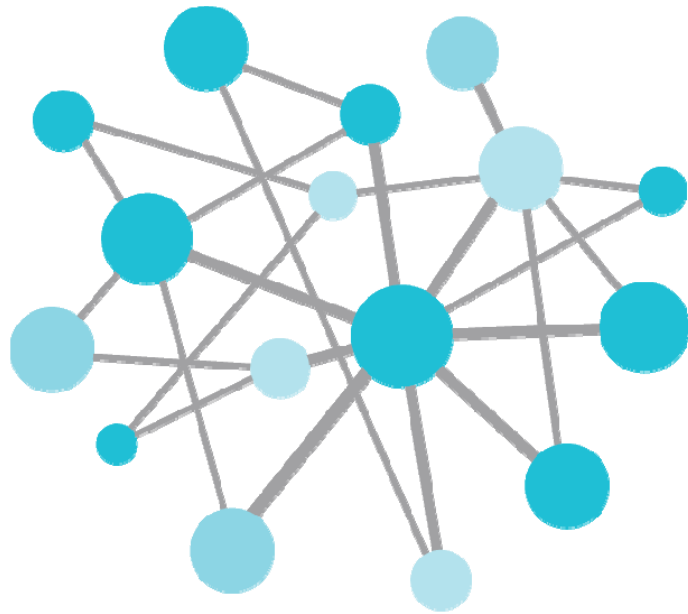




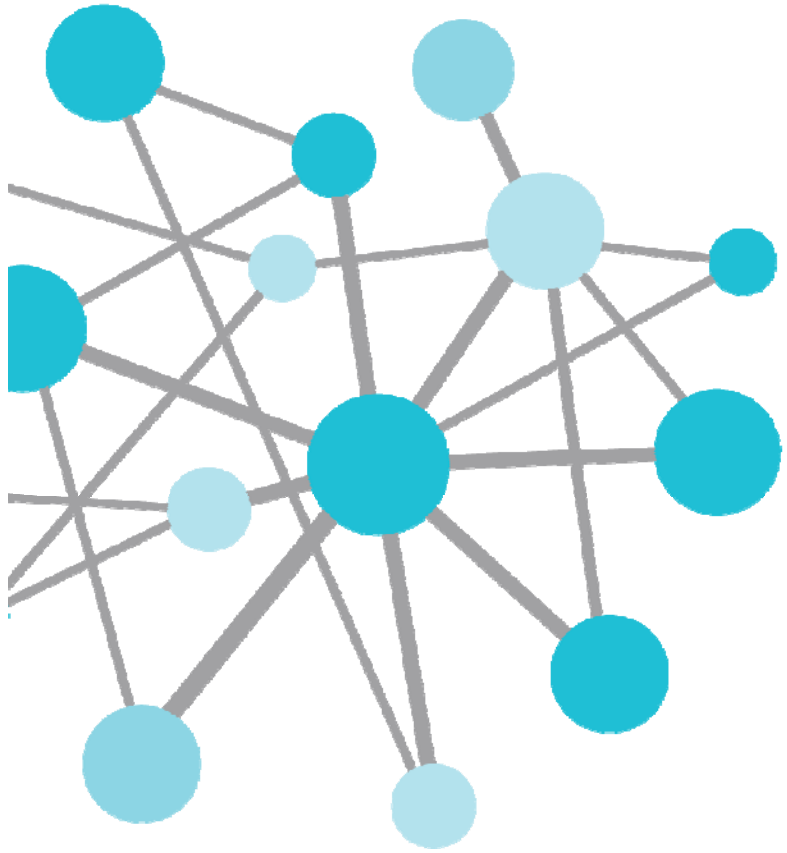
OSIsoft.

PI SYSTEM ROADSHOW 2014

The **Power** of **Data**

DECISION READY IN REAL-TIME

O C E A N I A

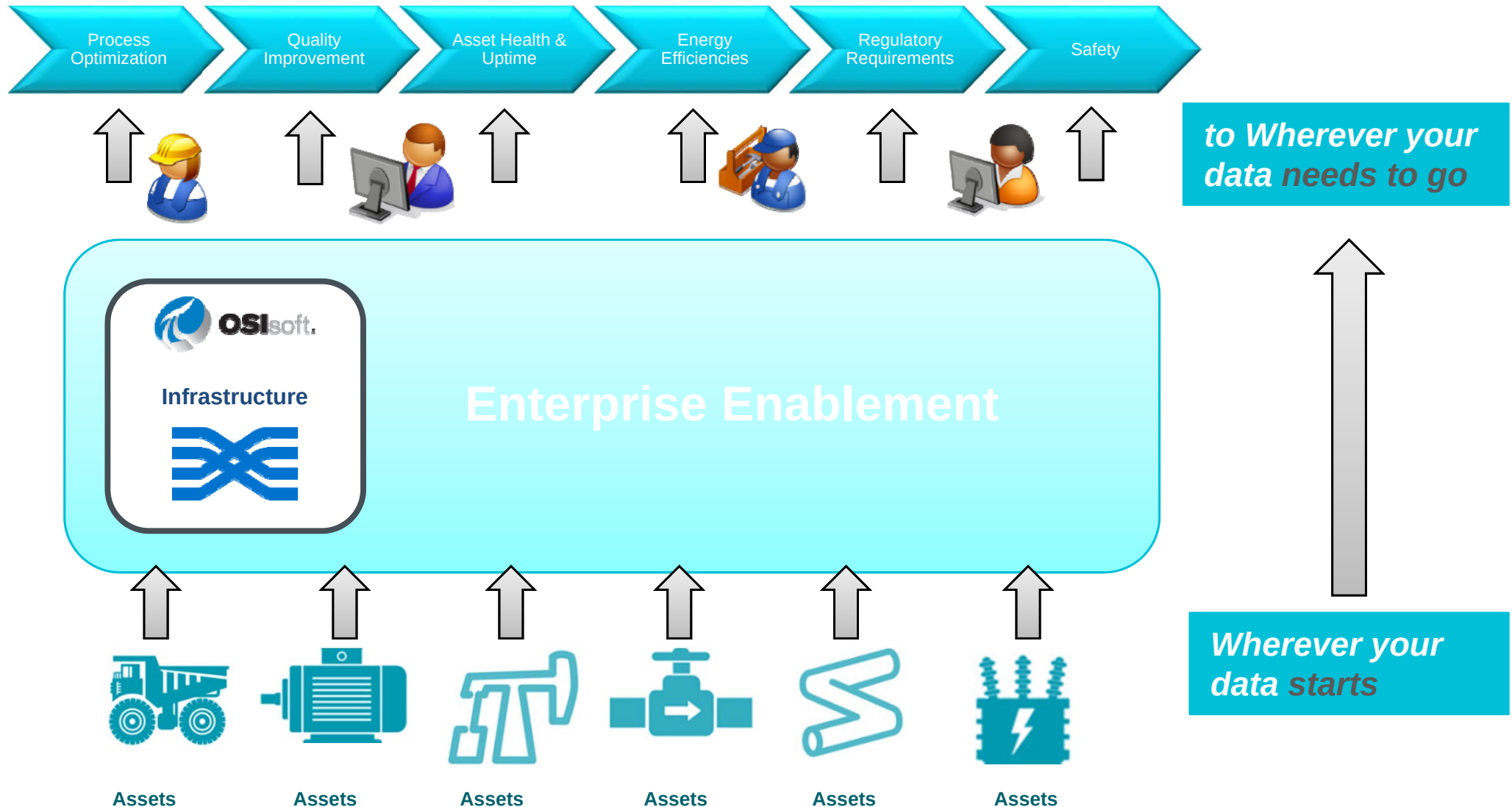


What is new with the PI System?

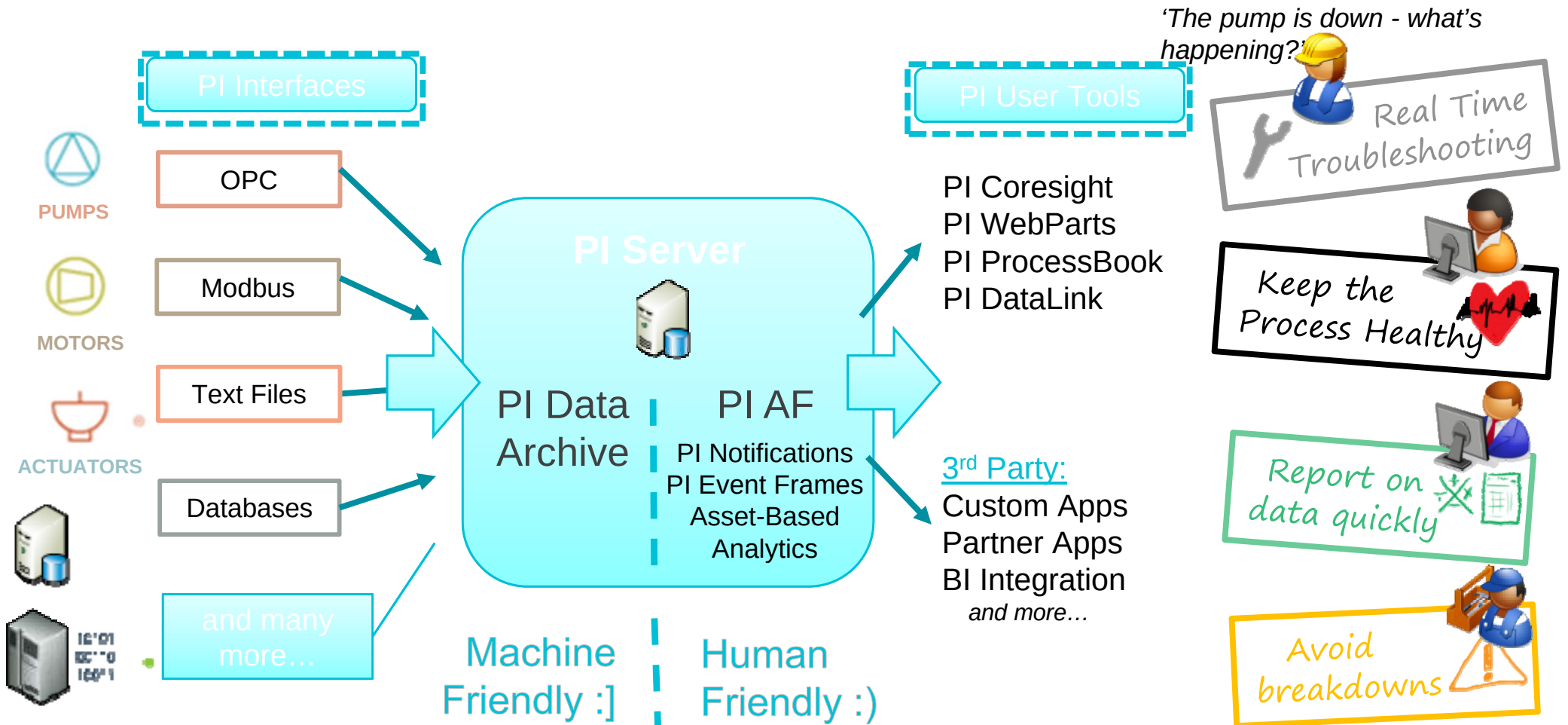
Presented by **Michael Luo**, Technical Consultant, OSIsoft

An Enterprise Infrastructure

Data Driven Insights



What is part of our Infrastructure...



What is included in PI Server 2014

- | | |
|---|---|
| <ul style="list-style-type: none">• Time Series Data Storage<ul style="list-style-type: none">• PI Data Archive• Contextual, Organize and Find<ul style="list-style-type: none">• PI Asset Framework (PI AF) | <ul style="list-style-type: none">• Mark Important Events<ul style="list-style-type: none">• PI Event Frames• Notify Based on Conditions<ul style="list-style-type: none">• PI Notifications |
| <ul style="list-style-type: none">• Analytics and Event Generation<ul style="list-style-type: none">• Asset-Based Analytics• PI ACE (Advanced Computing Engine)• PI Performance Equations• PI Totalizers | <ul style="list-style-type: none">• System Management<ul style="list-style-type: none">• PI System Management Tool• PI Interfaces for System Management |

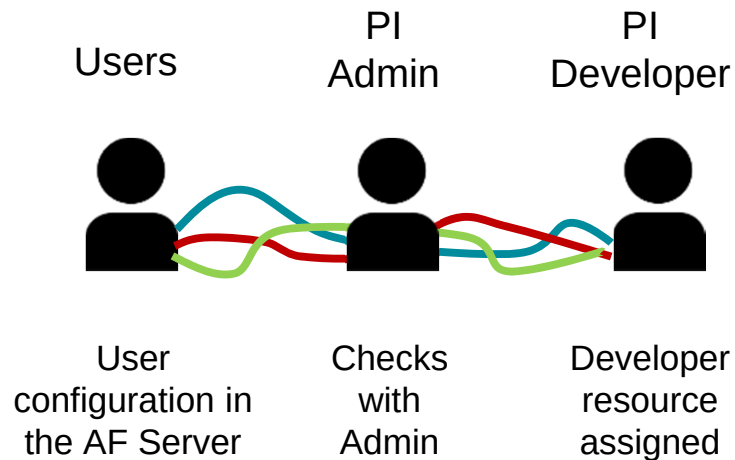
Asset-Based Analytics

- Easy – empower users to build their own calculations
- Reuse and standardize
 - Clarity and correctness
- KPIs and Rollups
- Automatic Event marking
- And of course, *Performance and scalability*



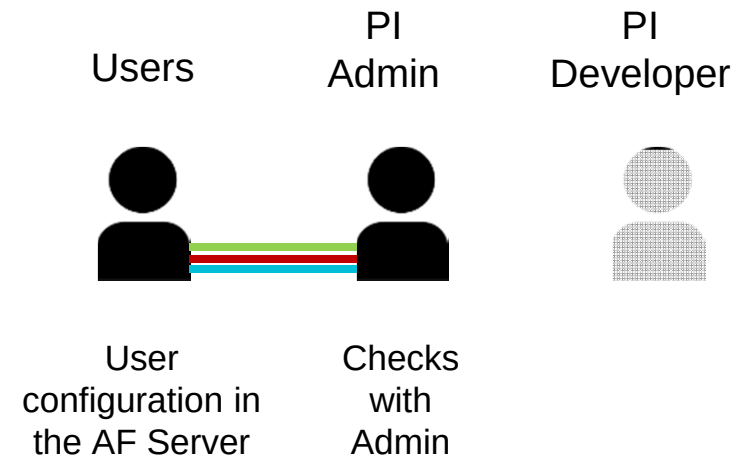
Asset-Based Analytics: Self-Service Analytics

Before



- Slows down time to value
- Creates complexities (interactions are numerous)

After



- Immediate feedback, validate what your looking for
- Build new elements from templates, added analysis inherited by derived elements

\\Kaboom\NuGreen - PI System Explorer (Administrator)

File View Go Tools Help

Database Query Date Back Check In Refresh New Template Search Element Templates

Library

- NuGreen
 - Categories
 - Analysis Categories
 - Attribute Categories
 - Element Categories
 - Reference Type Categories
 - Table Categories
 - Templates
 - Element Templates
 - Boiler
 - Combined Cycle Power Plan
 - Compressor
 - Condenser
 - Cooling Fan
 - Enterprise
 - Gas Turbine
 - Heater
 - HRS
 - Monitored Site
 - Plant
 - Process
 - Pump
 - Steam Turbine
 - Unit
 - Event Frame Templates
 - Model Templates
 - Transfer Templates

Gas Turbine

General Attribute Templates Ports Analysis Templates

Name: G

Description:

Categories:

Analysis Type: ☒ Expression ☐ Rollup ☐ Event Frame Generation

Example Element: [NuGreen\Houston\Power and Steam Generation\Gas Turbine 1](#)

Name	Expression	Value	Output Attribute
Variable1	Type an expression		Click to map
Add a new expression			

Functions

Insert functions into the expression

All

- Abs
- Acoss
- And
- Ascii
- Asin
- Atn

Abs(number x)
Return the absolute value of an integer or real number.
Example: Abs(1)

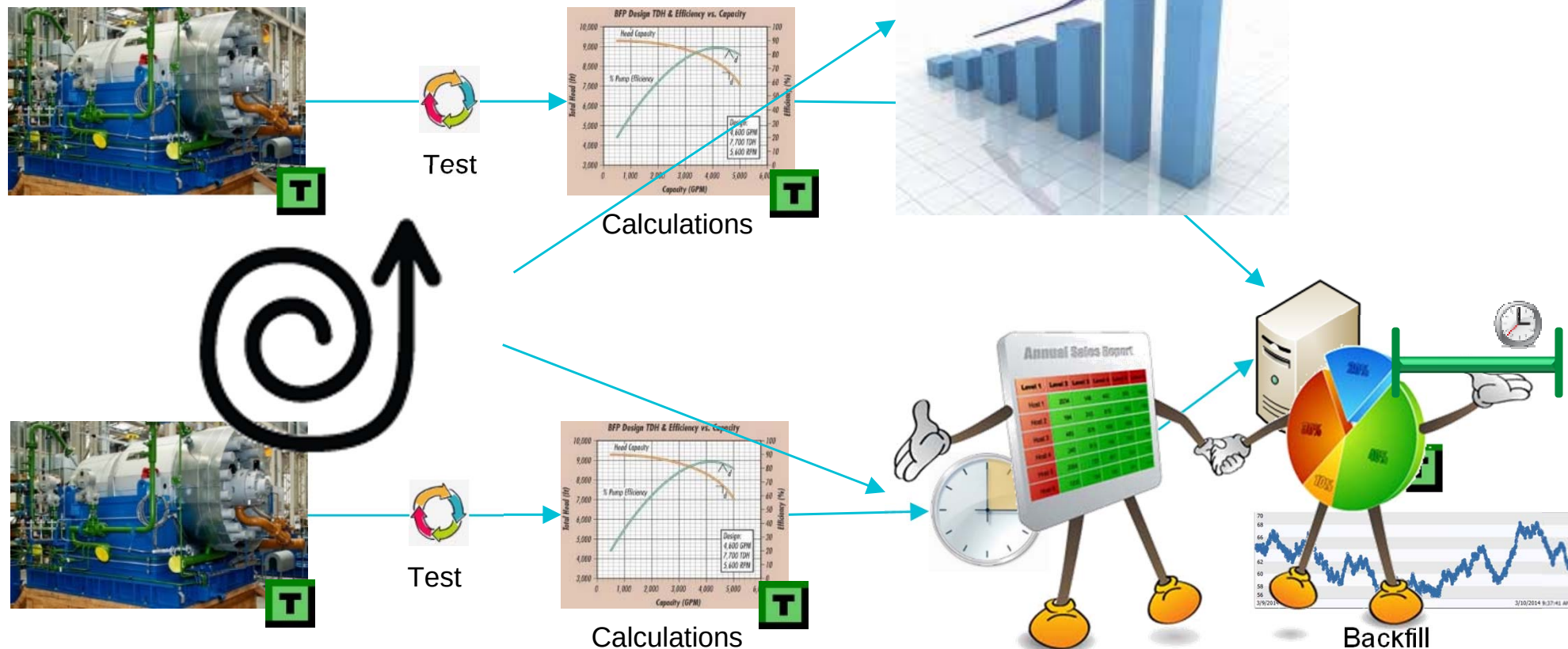
Attributes

Scheduling: ☐ Event-Triggered ☒ Periodic

Period: 00h 05m 00s [Configure](#)

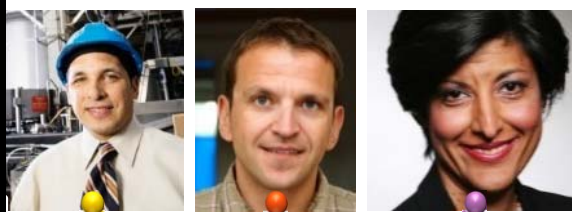
Gas Turbine Modified: 3/13/2014 12:52:45 PM.

Usage Scenarios



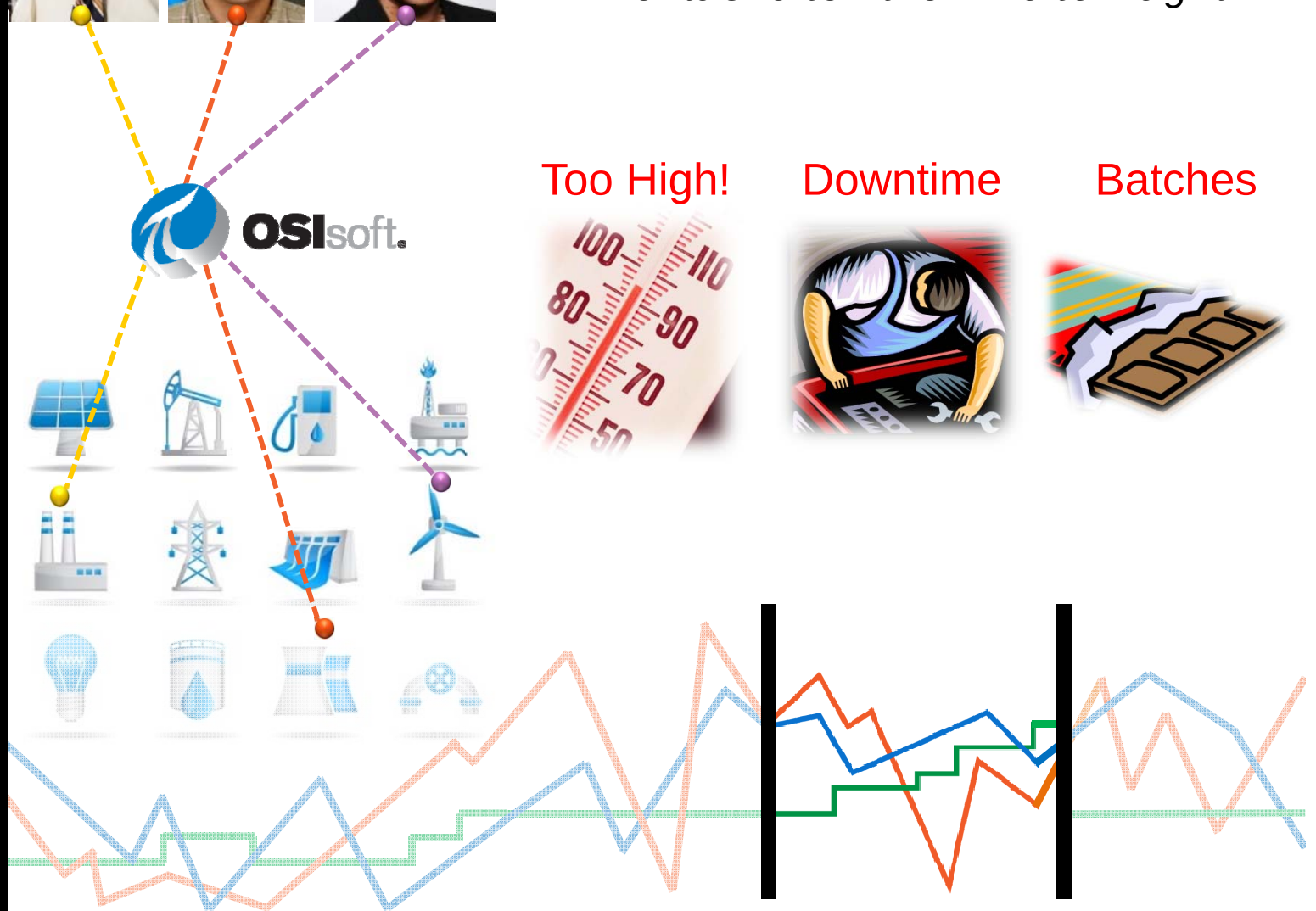


Information Challenges



PI Event Frames

Events Shorten the Time to Insight



EF Customer Survey: Most Important EF Visualization

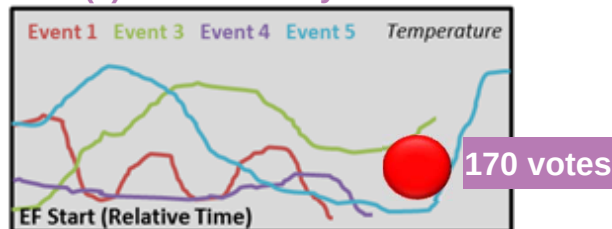
(1) Trend: Time Leading up to EF Start



(2) Trend: EF Start to EF End



(3) Event Overlay Trend

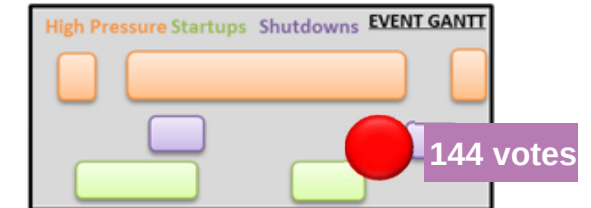


(4) View Event Attributes in Table

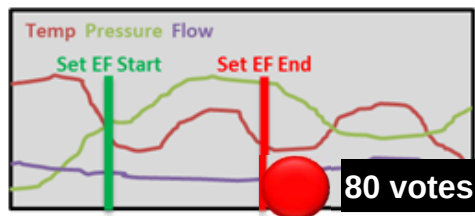
W Name	Duration	Start Time	End Time	Template
EF Event 1	1 min	5/9/2013 3:00:00 PM	5/9/2013 4:00:00 PM	DownTime
EF Event 2	1 min	5/9/2013 3:00:00 PM	5/9/2013 4:00:00 PM	DownTime
EF Event 3	1 min	5/9/2013 3:00:00 PM	5/9/2013 4:00:00 PM	DownTime
EF Event 4	1 min	5/9/2013 3:00:00 PM	5/9/2013 4:00:00 PM	DownTime
EF Event 5	1 min	5/9/2013 3:00:00 PM	5/9/2013 4:00:00 PM	DownTime

154 votes

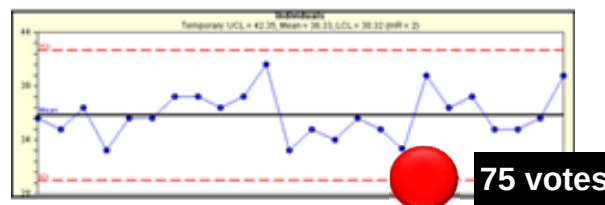
(5) Gantt Chart (aligned w/trend)



(6) Manual Creation of Events



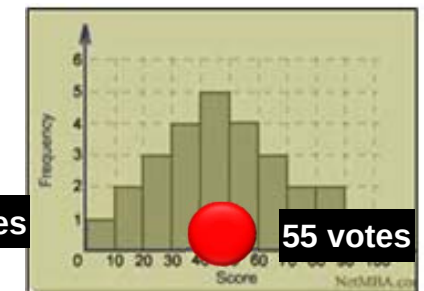
(7) SQC Chart



(8) Line / Column Chart (Event x-axis)



(9) Histogram





PI AF Asset Based Analytics – Event Detection



The screenshot displays the PI System Explorer application window. The left pane shows a hierarchical tree of templates, with 'Event Frame Templates' selected. The main pane shows the configuration for the 'Boiler Feed Pump Vibration Anomaly' template. The 'Analysis Type' is set to 'Event Frame Generation'. The 'StartTrigger' expression is defined as: `if ('Inboard Bearing Vibration X' > 'Bearing Vibration High Limit') Then true else if ('Inboard Bearing Vibration Y' > 'Bearing Vibration High Limit') Then true else if ('Outboard Bearing Vibration X' > 'Bearing Vibration High Limit') Then true else if ('Outboard Bearing Vibration Y' > 'Bearing Vibration High Limit') then true else false`. The 'EndTrigger' is set to 'Type an expression (optional)'. The 'Duration' is set to 30 seconds. The 'Scheduling' is set to 'Event-Triggered'. The 'Trigger on' is set to 'Any Input'. The 'Functions' pane on the right lists various mathematical and logical functions.

Element Template

EF Start Trigger

Time True

Root Cause Child Events

Type = EF Generation

PE Functions



PI AF Asset Based Analytics – Event Preview



\\UCAFSVR\Power Generation - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element Search Elements

Elements

- Generation
 - OSIsoft Power
 - Big Creek Power Plant
 - Cleveland Power Plant
 - Houston Power Plant
 - Philadelphia Power Plant
 - San Leandro Power Plant
 - Unit 1
 - Air Heater
 - Balance of Plant
 - Boiler Feed Pump #1
 - Boiler Feed Pump #2
 - Generator
 - Mills
 - Turbine
 - Wind Power Generation Fleet
 - Transmission and Distribution
- Element Searches

Boiler Feed Pump #1

General Child Elements Attributes Ports Analyses Version

Name: Boiler Feed Pump Vibration Anomaly

Description:

Categories:

Analysis Type: ☐ Expression ☐ Rollup ☒ Event Frame Generation

Event Frame Template

Name Expression

StartTrigger if

EndTrigger

Preview results for Boiler Feed Pump Vibration Anomaly

Start Time: *-1w

End Time: *

Generate Results

Name	Duration	Start time	End time
- Boiler Feed Pump Vibration Anomaly - 2014.03.28.15	01:57:30	3/28/2014 3:57:11 PM	3/28/2014 5:54:41 PM
- Boiler Feed Pump Vibration Anomaly - 2014.03.29.15	01:57:30	3/29/2014 3:57:11 PM	3/29/2014 5:54:41 PM
- Boiler Feed Pump Vibration Anomaly - 2014.04.01.00	06:58:18.0144869	4/1/2014 12:43:11 AM	

Close

StartTrigger true for: 30 Seconds

☒ Generate child root cause event frame before parent event frame starts

Duration: 1 Days

Name: Root Cause

Category:

Scheduling: ☒ Event-Triggered ☐ Periodic

Trigger on: Any Input

Boiler Feed Pump #1 Modified: 3/27/2014 12:29:21 AM. Version: 1/1/1970 12:00:00 AM, Revision 13

Connected to the PI Analysis Service.

Results Preview



PI AF Asset Based Analytics – Backfilling Events



\\UCAFSVR\Power Generation - PI System Explorer

File View Go Tools Help

Database Query Date Back Check In Refresh

Analyses

Choose a filter

Analysis Template

All (117)

No Template (1)

Boiler Feed Pump Turbine\Boiler Feed Pump Cavitation Anomaly (8)

Boiler Feed Pump Turbine\Boiler Feed Pump Control Oil Pressure Anom

Boiler Feed Pump Turbine\Boiler Feed Pump High Bearing Temperature

Boiler Feed Pump Turbine\Boiler Feed Pump Low Discharge Flow Anom

Boiler Feed Pump Turbine\Boiler Feed Pump Low Pump Speed (8)

Boiler Feed Pump Turbine\Boiler Feed Pump Suction Pressure Anomaly

Boiler Feed Pump Turbine\Boiler Feed Pump Vibration Anomaly (8)

Gas Turbine Template\GTExhaustGasTempDiffP1vP2 (2)

Gas Turbine Template\GTExhaustGasTempDiffP1vP3 (2)

Gas Turbine Template\GTExhaustGasTempDiffP1vP4 (2)

Gas Turbine Template\GTExhaustGasTempDiffP2vP1 (2)

Gas Turbine Template\GTExhaustGasTempDiffP2vP3 (2)

Gas Turbine Template\GTExhaustGasTempDiffP2vP4 (2)

Gas Turbine Template\GTExhaustGasTempDiffP3vP1 (2)

Gas Turbine Template\GTExhaustGasTempDiffP3vP2 (2)

Gas Turbine Template\GTExhaustGasTempDiffP3vP4 (2)

Gas Turbine Template\GTExhaustGasTempDiffP4vP1 (2)

Gas Turbine Template\GTExhaustGasTempDiffP4vP2 (2)

Gas Turbine Template\GTExhaustGasTempDiffP4vP3 (2)

Gas Turbine Template\GTExhaustGasTemperatureAnomaly (2)

Mill\Mill Low Feeder Speed (16)

Coal Plant\Plant Generating (4)

Coal Plant\Plant Not Generating (4)

Combined Cycle Power Plant Template\PowerPlantShutDown (1)

Combined Cycle Power Plant Template\PowerPlantStartUp (1)

Unit\Unit Shutdown (4)

Unit\Unit Trip (4)

Analyses

8 checked analyses

✓	Status	Element	Name	Template	Backfilling
✓	✓	Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\Philadelphia Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\Philadelphia Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\San Leandro Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\San Leandro Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\Houston Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	✓	Generation\OSISoft Power\Houston Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓

Operations

[Start checked analyses](#)

[Stop checked analyses](#)

[Backfill checked analyses](#)

Backfill Events into History

Pending Operations

No pending operations

Analysis details

Overview Errors And Warnings

Boiler Feed Pump Vibration Anomaly configuration

Analysis type: Event Frame Generation

Description: Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Feedwater System\Boiler Feed Pump #1

Element path: Boiler Feed Pump Vibration Anomaly

Template: Natural

Schedule: Natural

Status

In AF: Enabled

In PI Analysis Service: Running

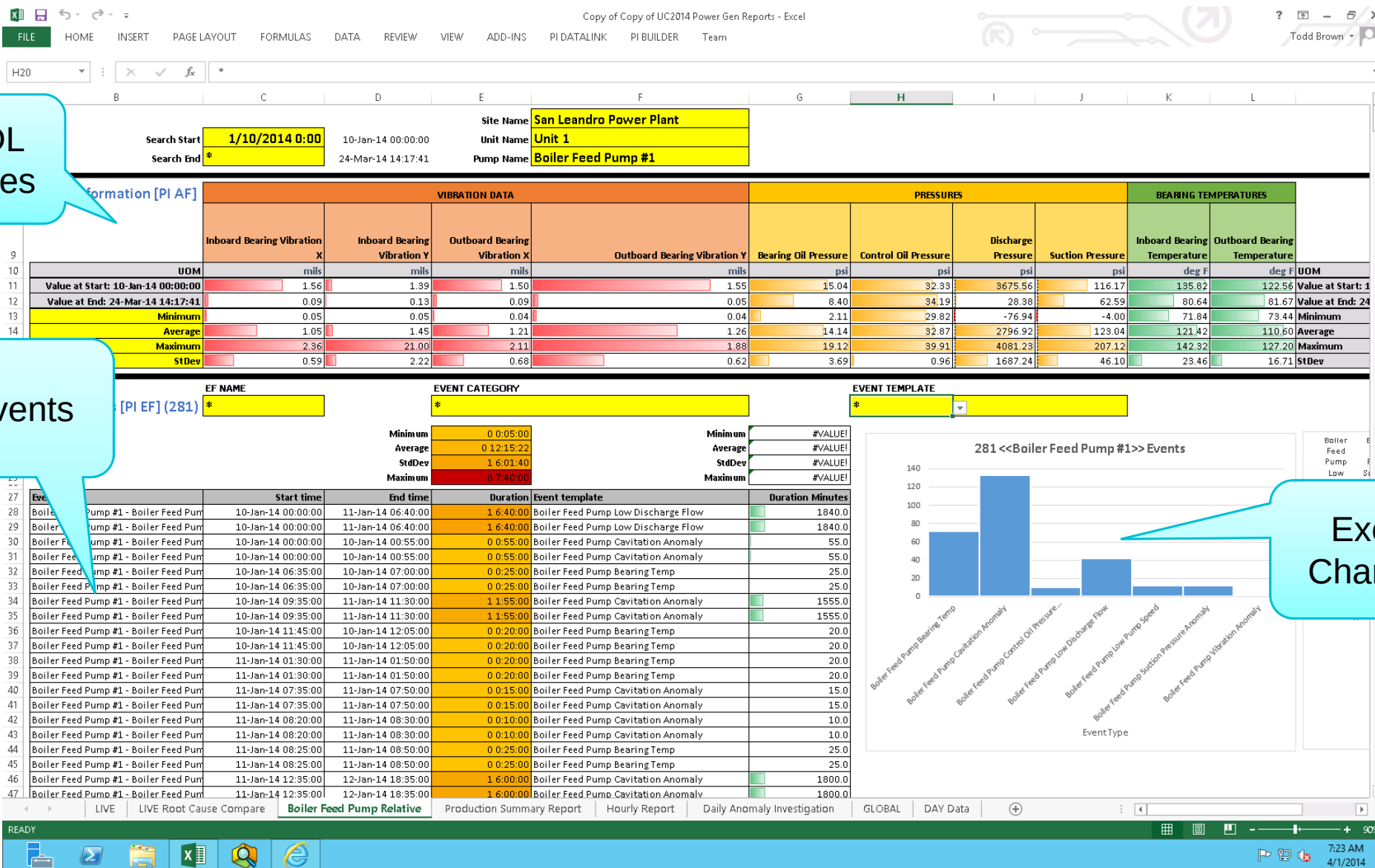
[Analysis configuration](#)

Analyses

7:39 AM 4/1/2014



PI DataLink 2014 – Pump Relative Report

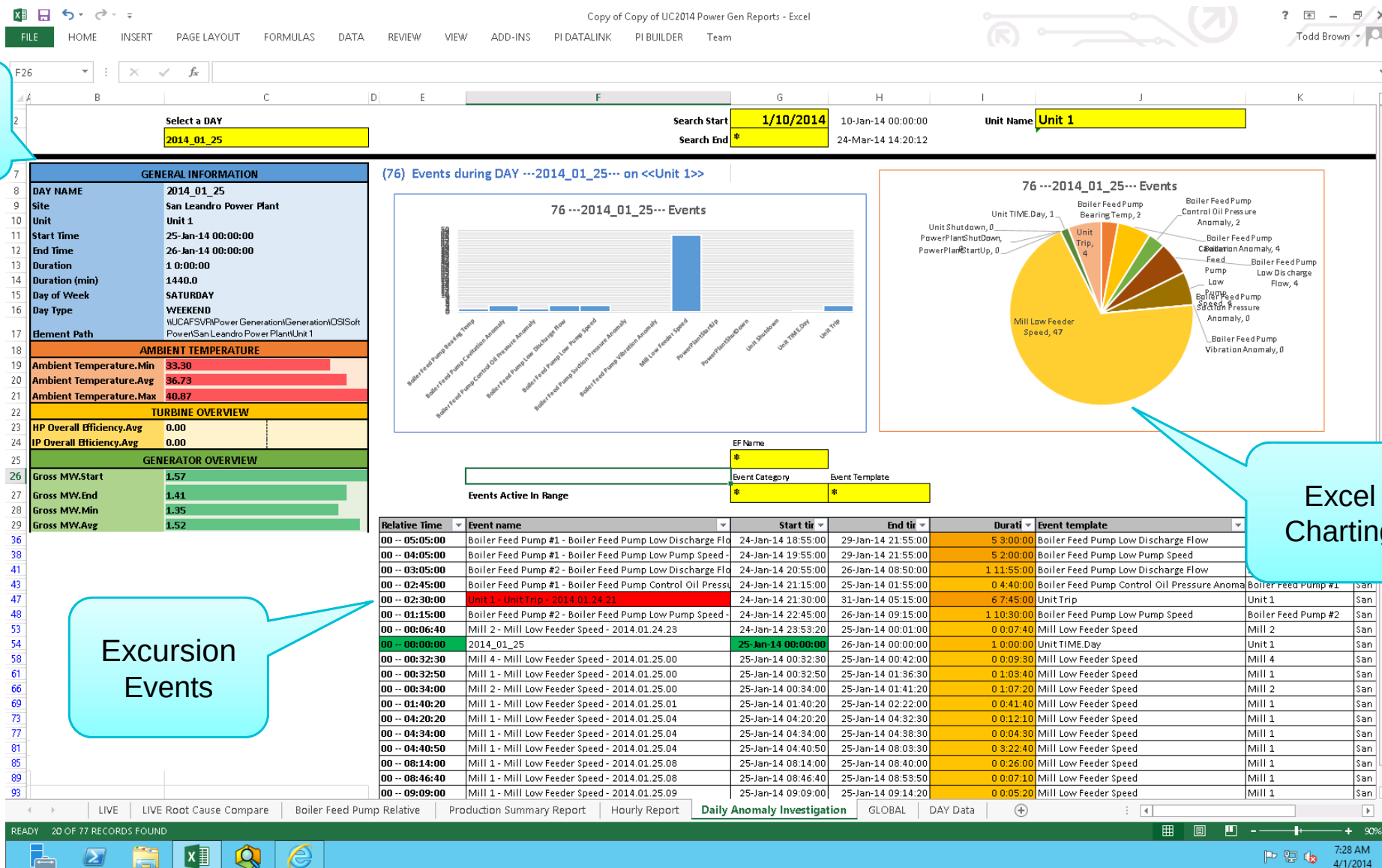




PI DataLink 2014 – Daily Anomaly Report

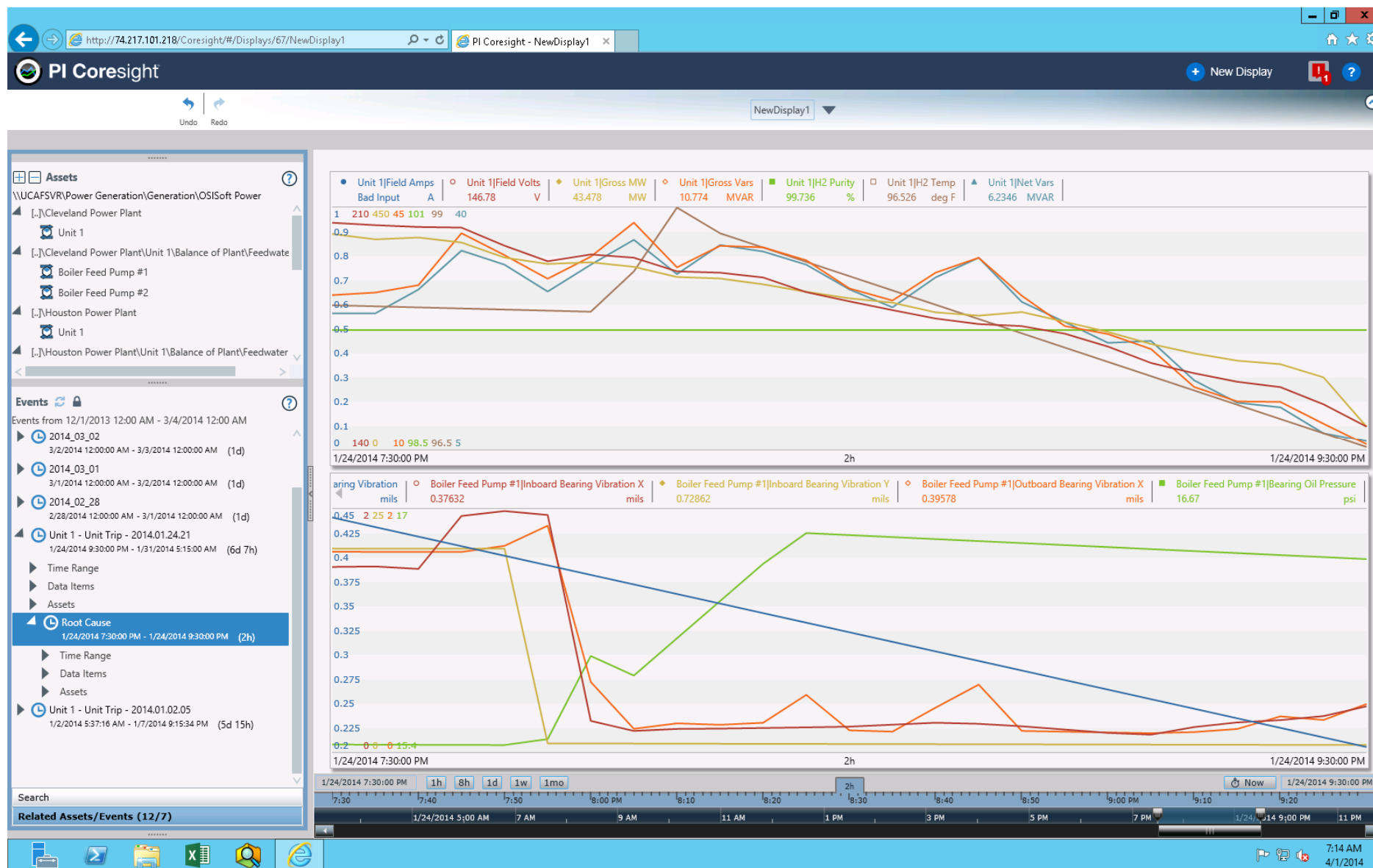


Daily Data

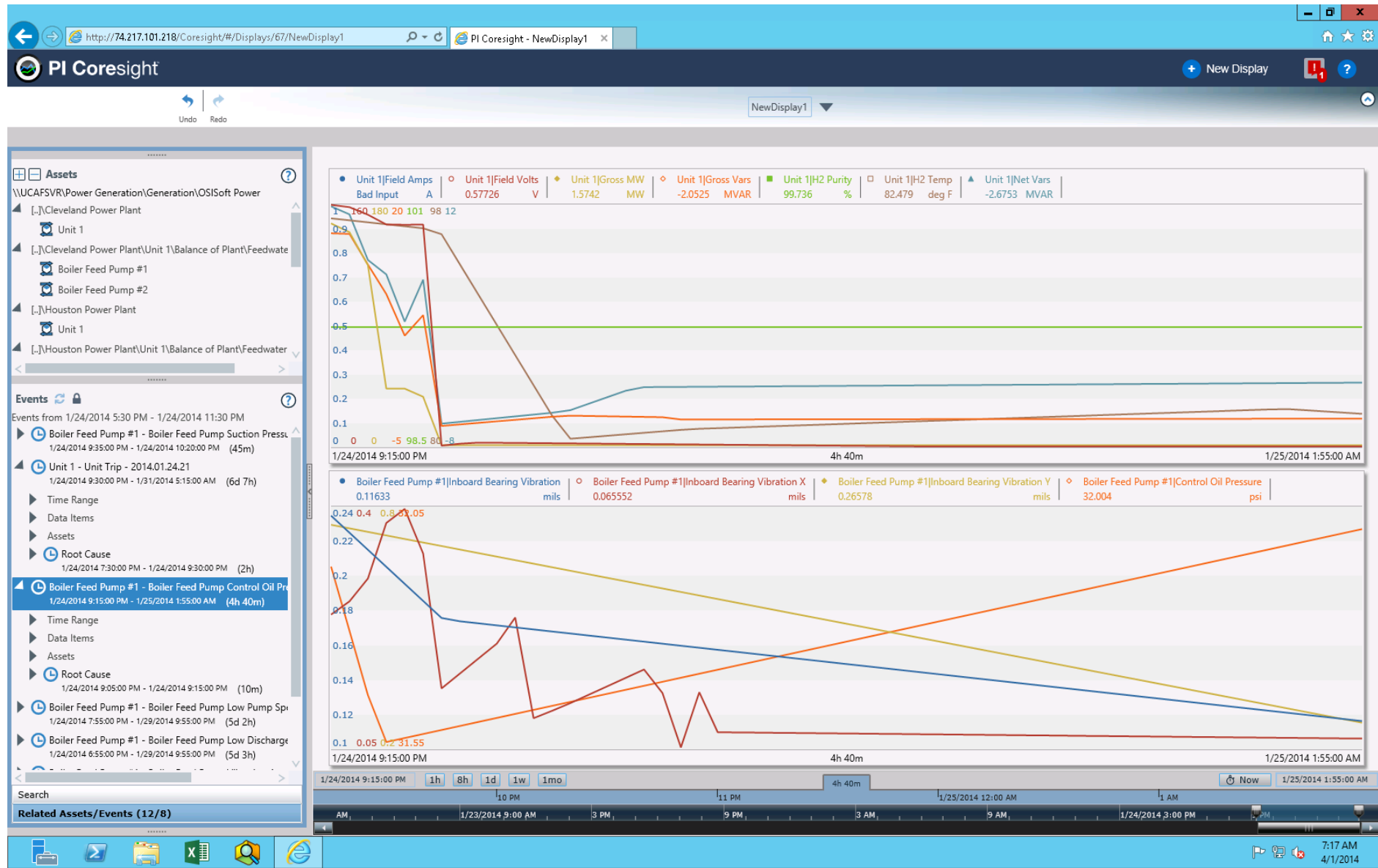


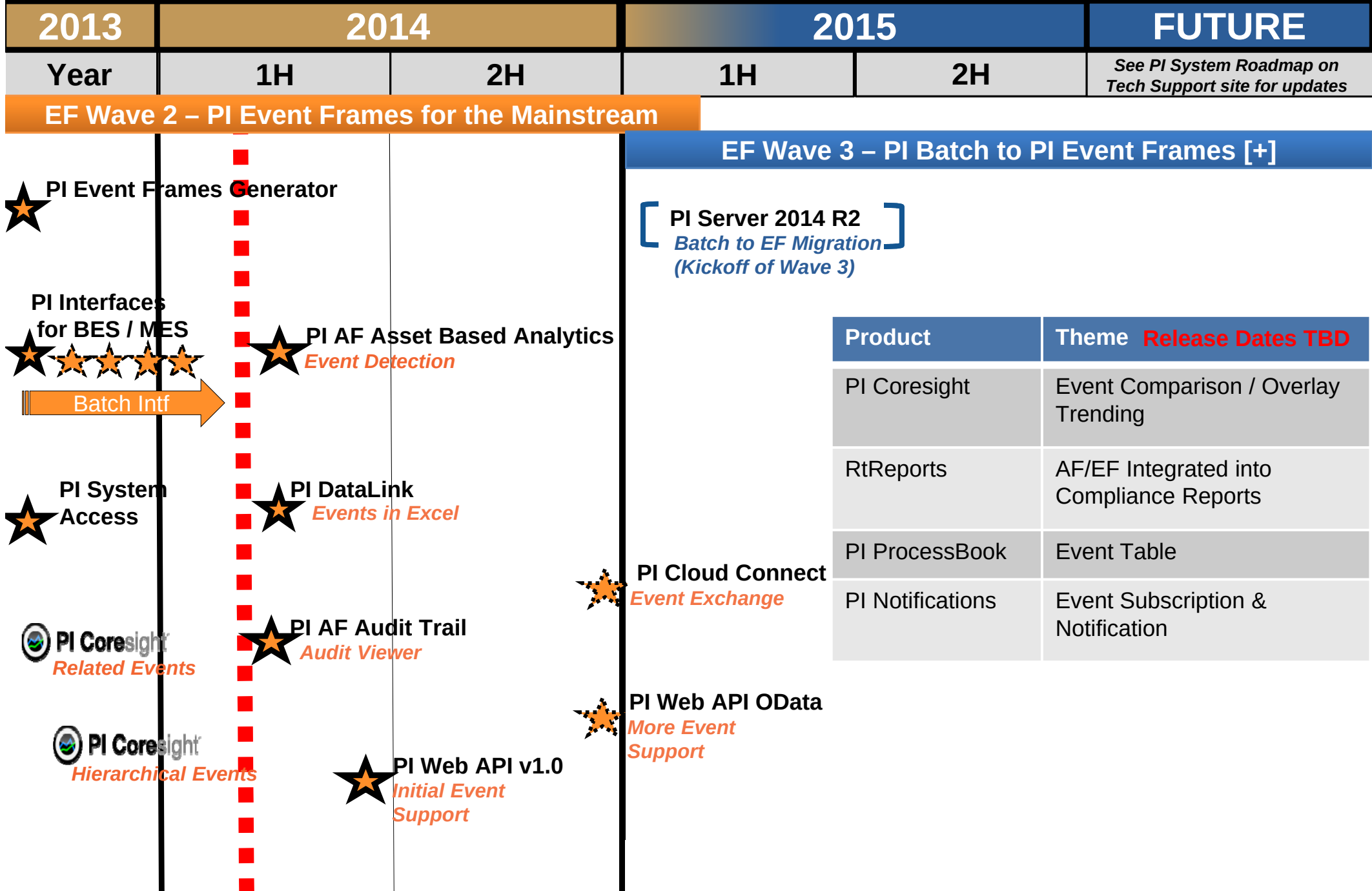


PI Coresight – Root Cause Event Trending



PI Coresight – Anomaly Events





NOTE: Future dates & plans are subject to change. Last Updated: 03-25-2014

PI Coresight 2014

Transitional release with Big New Features

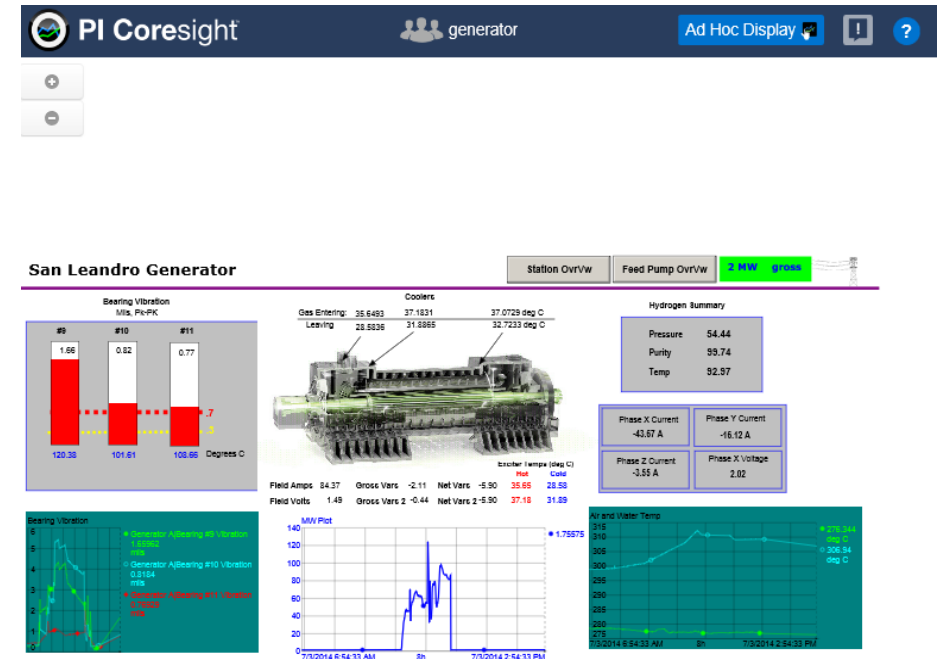
- Moving from desktop browser only to phone, tablet, and desktop
- Making PB displays available on new devices and combine them with new visualization tools
- Improving performance and scalability
- On the path to fully integrated visualization toolset
 - High fidelity display editor
 - Ad-hoc investigation
 - Analytics and Notifications
 - Any device anywhere

PI Coresight 2014

I need to access my graphic displays and real-time data using any modern browser so that I can trouble shoot problems without special software installed.

PI ProcessBook Display Viewing

- Viewable on any modern browser
- Displays organized by import folder
- No special software needed on the client machine

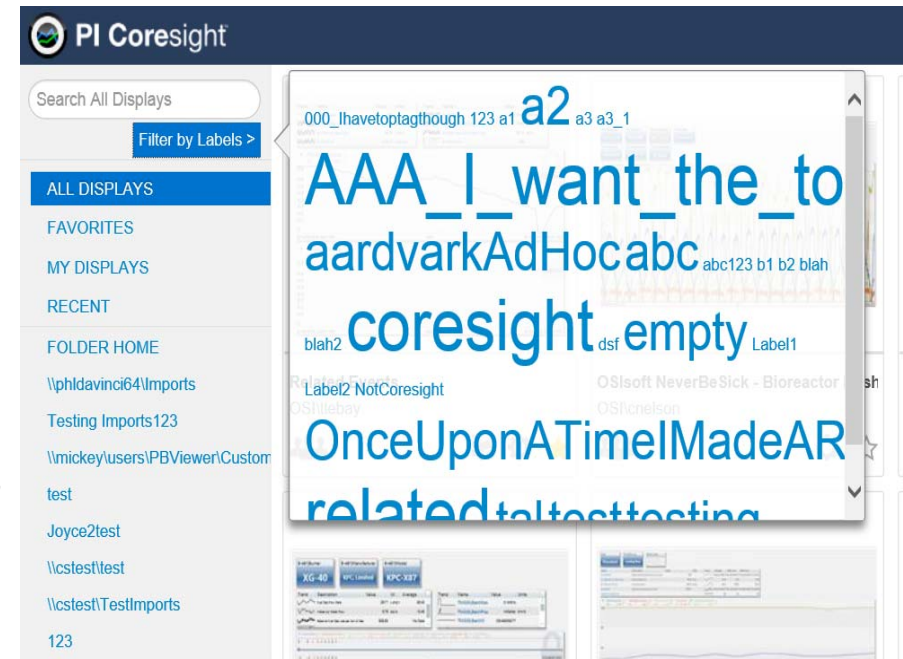


PI Coresight 2014

I need to quickly filter the list of displays to see only the ones I am interested in so I don't waste time hunting for what I want.

New Home Page

- Available using any modern browser
- Find and open native Coresight or PB displays
- Organize displays with folders or labels
- Administrator can manage any display



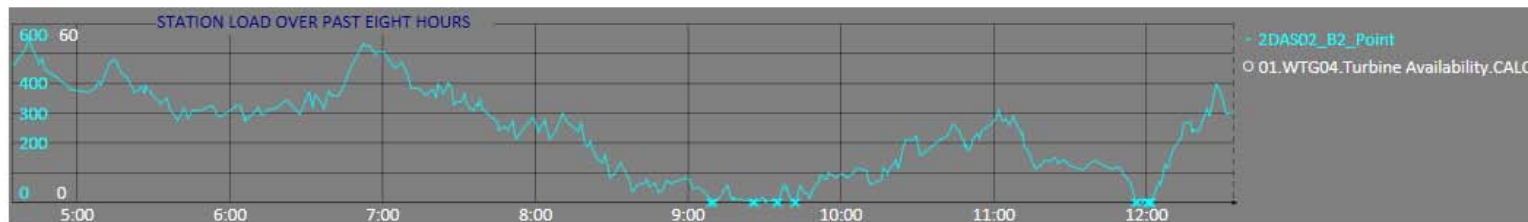
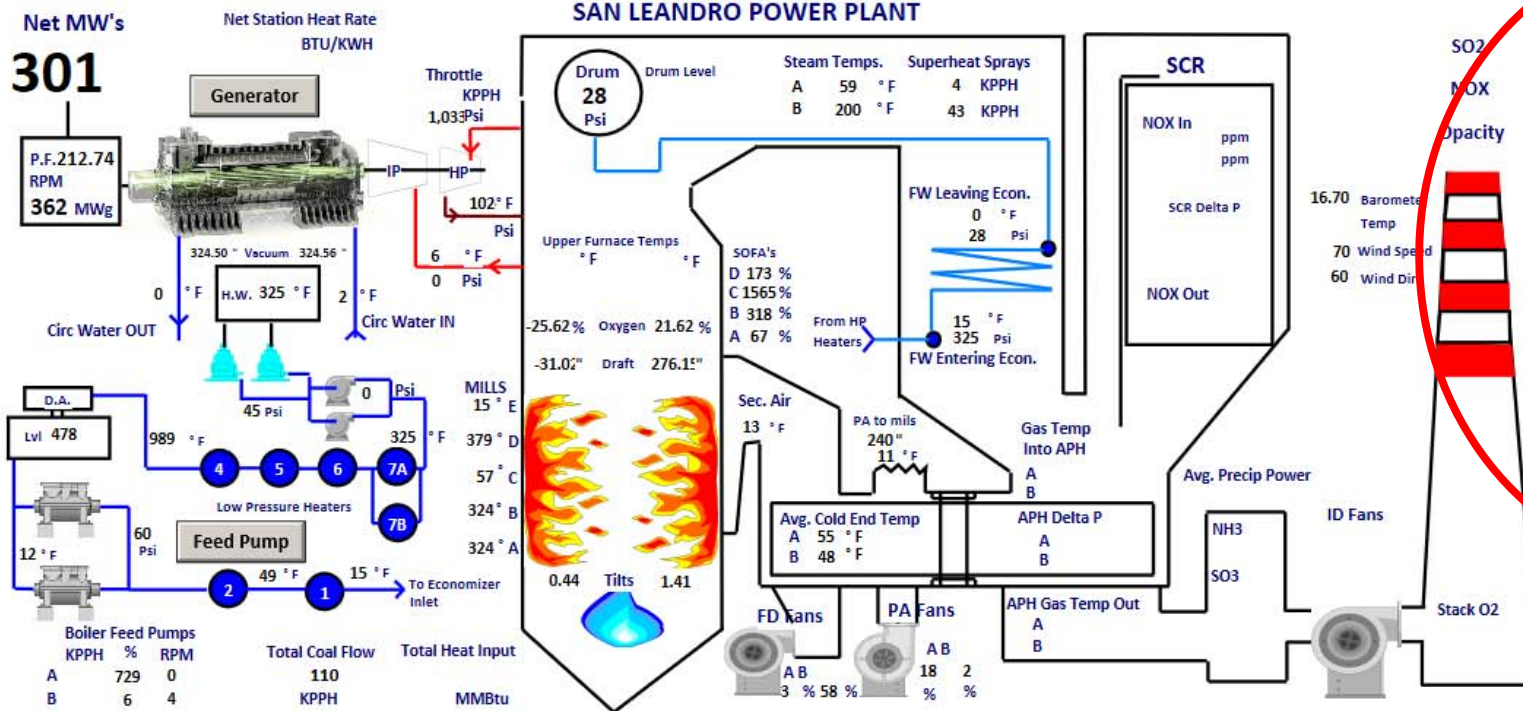
PI Coresight 2014

I need access to my data and displays from anywhere and with any device, so I can solve problems even before I get there.

Mobile site

- Automatically displayed on small screen devices
- Find and display native Coresight and PB displays
- Full display, data item, and asset search



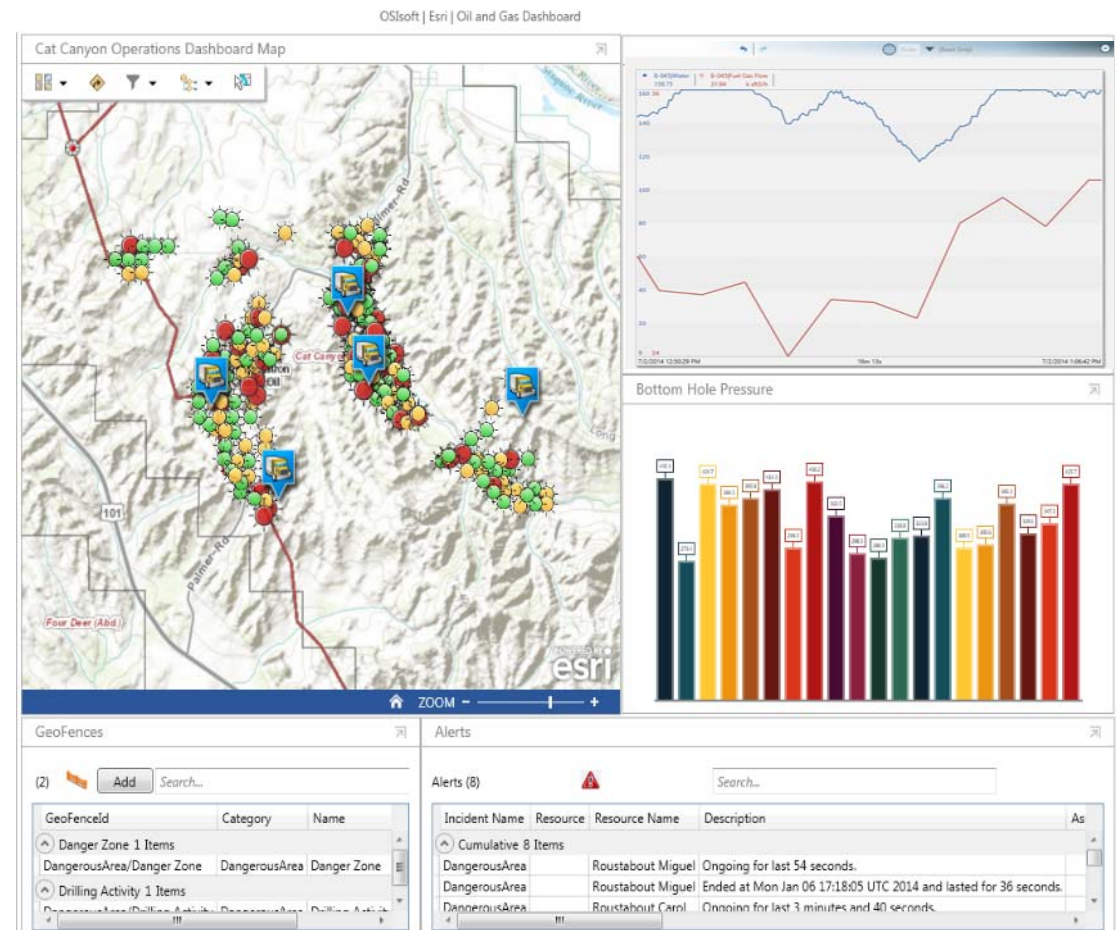


PI Coresight 2014

I need to integrating PI Coresight with business applications and portal sites to get a complete view of operations.

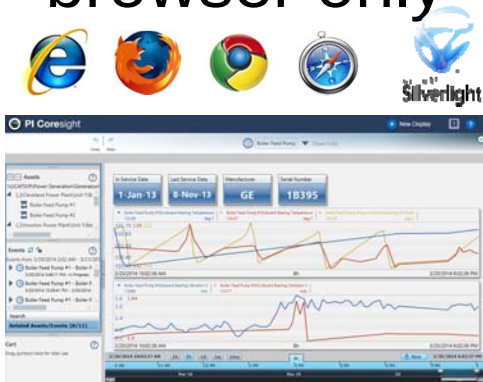
New URI parameters

- Hide Toolbar, Timebar
- Set element of interest for PB displays
- Set time zone for the current display



What works where?

Desktop
browser only



Displays built
in PI
Coresight

Any modern browser



Homepage



Mobile site



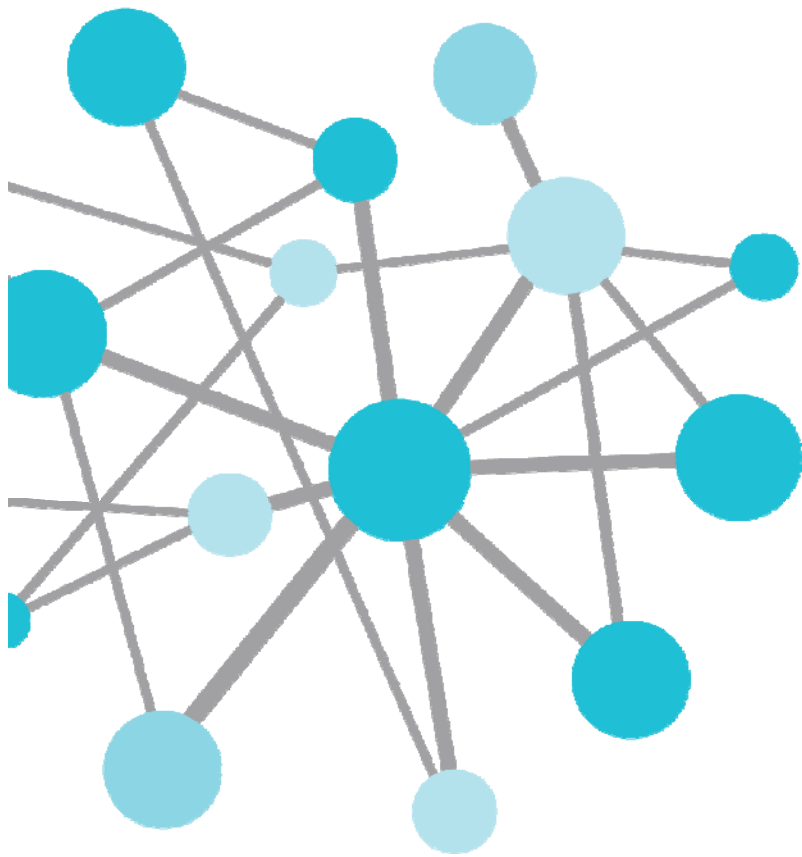
PB Displays



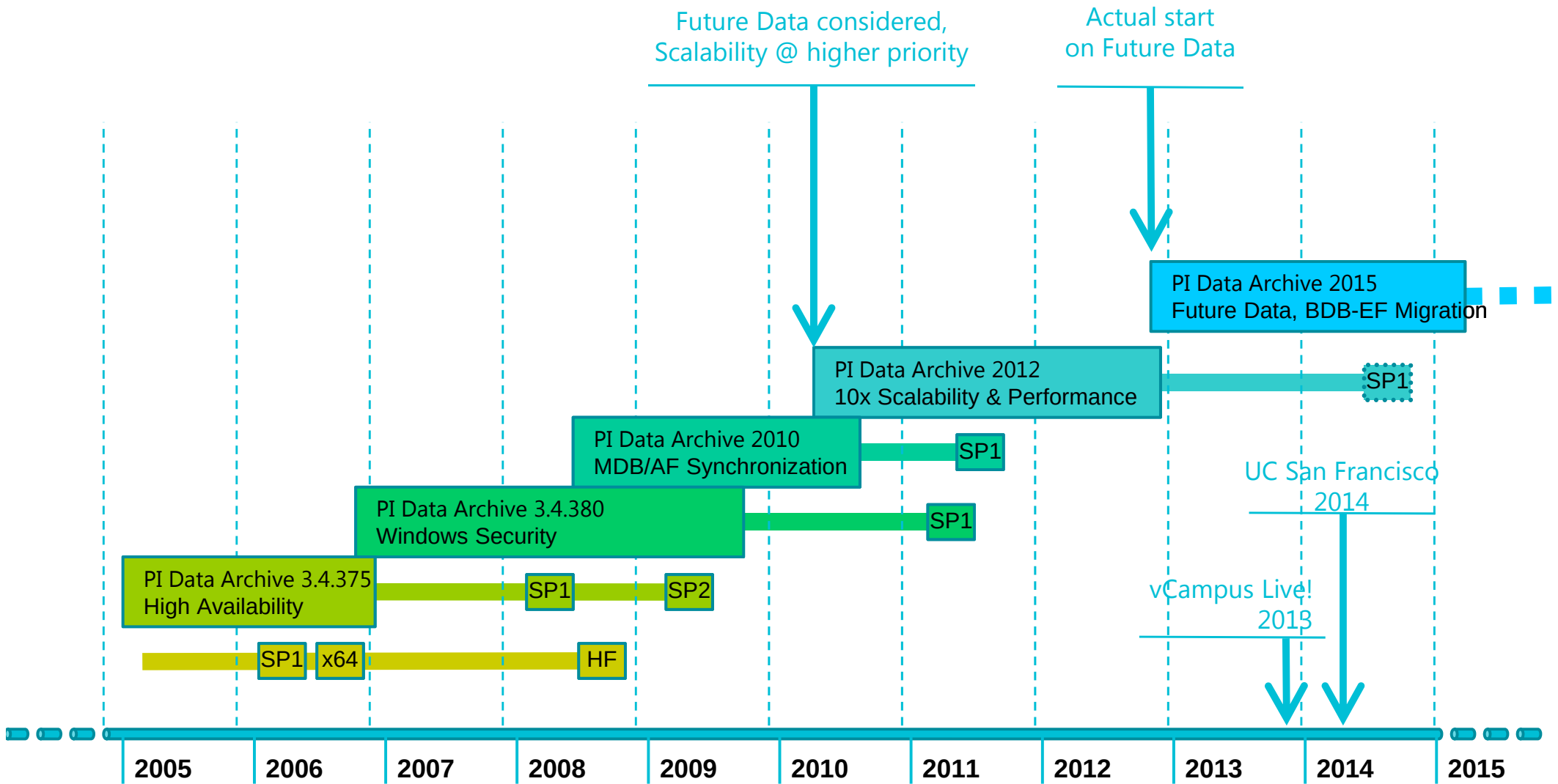
Native Apps



iPad
iPhone

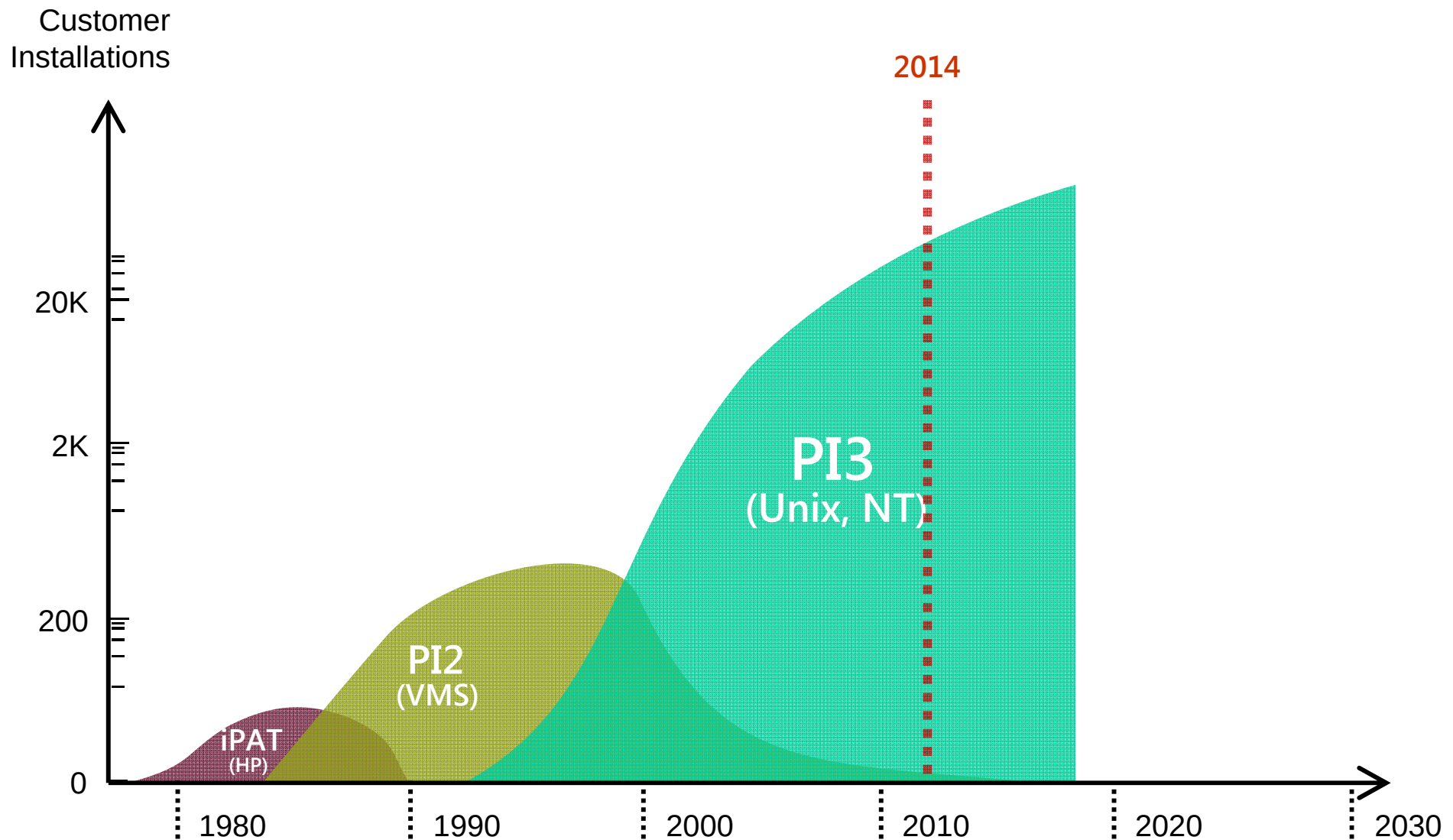


Future Data





Does it still matter?



FUTURE DATA “PERFECT STORMS”

PI Event Frames

Analysis, Reporting, Visualization

Use Case: capture and search forecast metadata

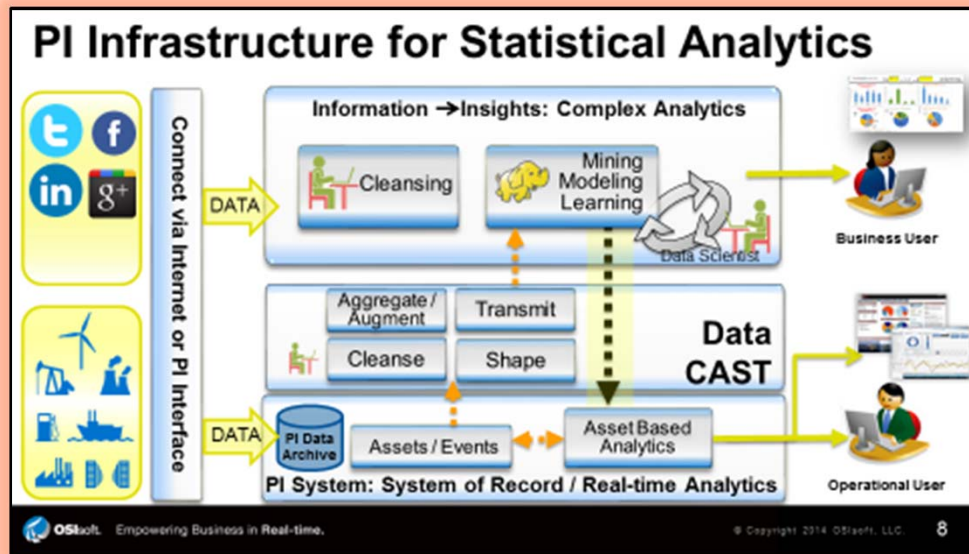
The screenshot shows the PI Datalink Excel interface. The main window displays a table with columns for Search Filter, Value, Event name, Child 1, Child 2, Child 3, Product, Start time, End time, and Duration. The table contains data for various paint batches, including 'PAINT_323' and 'PAINT_330'. A sidebar on the right titled 'Explore Events' provides search options like Database, Search start, Search end, Limit to database level, and Event category.

	A	B	C	D	E	F	G	H	I	J	K	L
	Search Filter	Value	Event name	Child 1	Child 2	Child 3	Product	Start time	End time	Duration		
1	AF DB	\\WILDEBEEST\MDB-EF Migration	PAINT_323	UP_COLOR: 1-1			BLUE PAINT	14-Mar-14 01:26:00	14-Mar-14 02:35:00	0 1		
2	Search Start	3/14/2014	PAINT_323	UP_COLOR: 1-1	OP_COLOR: 1-1		BLUE PAINT	14-Mar-14 01:26:01	14-Mar-14 02:18:01	0 0		
3	Search End	*	PAINT_323	UP_COLOR: 1-1	OP_COLOR: 1-1	FILL: 1-1		14-Mar-14 01:26:01	14-Mar-14 02:16:01	0 0		
4	EF Name	*	PAINT_323	UP_COLOR: 1-1	OP_COLOR: 1-1	DUMP: 1-1		14-Mar-14 01:27:01	14-Mar-14 01:41:01	0 0		
5	EF Template	Batch	PAINT_323	UP_COLOR: 1-1	OP_COLOR: 1-1			14-Mar-14 01:42:01	14-Mar-14 02:14:01	0 0		
6	Unit Name	*	PAINT_323	UP_BLEND: 1-1			BLUE PAINT	14-Mar-14 01:26:01	14-Mar-14 02:28:01	0 1		
7			PAINT_323	UP_BLEND: 1-1	OP_CHARGE: 1-1			14-Mar-14 01:28:01	14-Mar-14 02:01:01	0 0		
8	Product	BLUE PAINT	PAINT_323	UP_BLEND: 1-1	OP_CHARGE: 1-1	CHG_BASE: 1-1		14-Mar-14 01:28:01	14-Mar-14 01:39:01	0 0		
9			PAINT_323	UP_BLEND: 1-1	OP_CHARGE: 1-1	CI IG_COLOR: 1-1		14-Mar-14 01:40:01	14-Mar-14 02:00:01	0 0		
10			PAINT_323	UP_BLEND: 1-1	OP_FINISH: 1-1			14-Mar-14 02:03:01	14-Mar-14 02:27:01	0 0		
11			PAINT_323	UP_BLEND: 1-1	OP_FINISH: 1-1	AGITATE: 1-1		14-Mar-14 02:03:01	14-Mar-14 02:12:01	0 0		
12			PAINT_323	UP_BLEND: 1-1	OP_FINISH: 1-1	DRAIN: 1-1		14-Mar-14 02:14:01	14-Mar-14 02:25:01	0 0		
13	Instructions for a smooth live batch		PAINT_323	UP_BLEND: 1-1	OP_FINISH: 1-1			14-Mar-14 02:14:01	14-Mar-14 02:25:01	0 0		
14	EF Attribute Filter on Product		PAINT_330	UP_COLOR: 1-1			BLUE PAINT	14-Mar-14 12:36:00	14-Mar-14 13:20:00	0 0		
15	Select some additional Procedure		PAINT_330	UP_COLOR: 1-1			BLUE PAINT	14-Mar-14 12:36:01	14-Mar-14 13:11:01	0 0		
16	3 Sublevels		PAINT_330	UP_COLOR: 1-1	OP_COLOR: 1-1			14-Mar-14 12:37:01	14-Mar-14 13:08:01	0 0		
17	Filter on Product		PAINT_330	UP_COLOR: 1-1	OP_COLOR: 1-1	FILL: 1-1		14-Mar-14 12:37:01	14-Mar-14 12:44:01	0 0		
18			PAINT_330	UP_COLOR: 1-1	OP_COLOR: 1-1	DUMP: 1-1		14-Mar-14 12:46:01	14-Mar-14 13:06:01	0 0		
19			PAINT_330	UP_BLEND: 1-1			BLUE PAINT	14-Mar-14 12:36:01	14-Mar-14 13:11:01	0 0		

FUTURE DATA “PERFECT STORMS”

PI Integrator “CAST” for Hadoop *Big Data Analytics*

Use Case: feed predictive data back to the PI Server

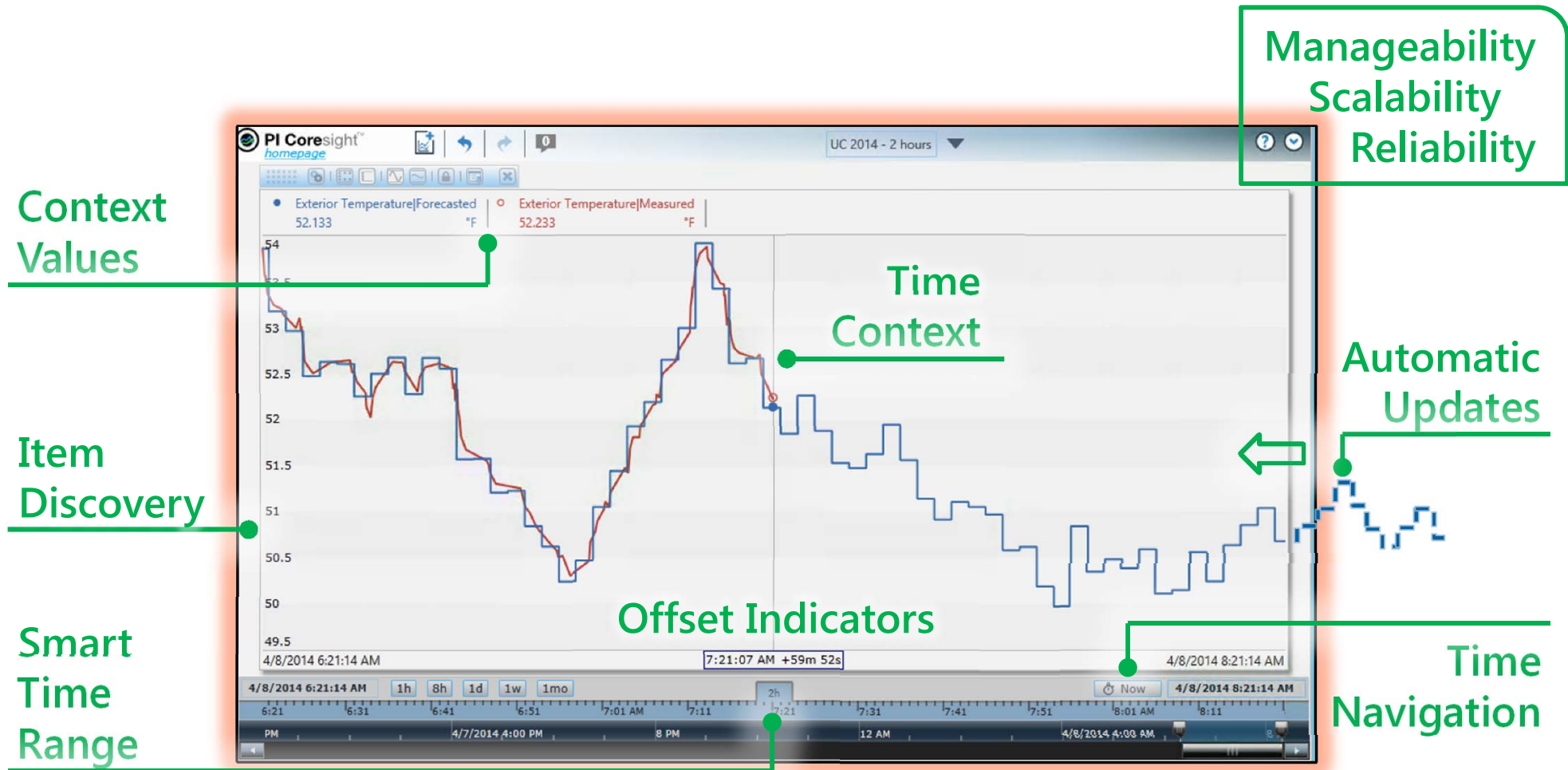


PI Integrator for Esri ArcGIS *Geospatial Forecasts (e.g., Weather)*

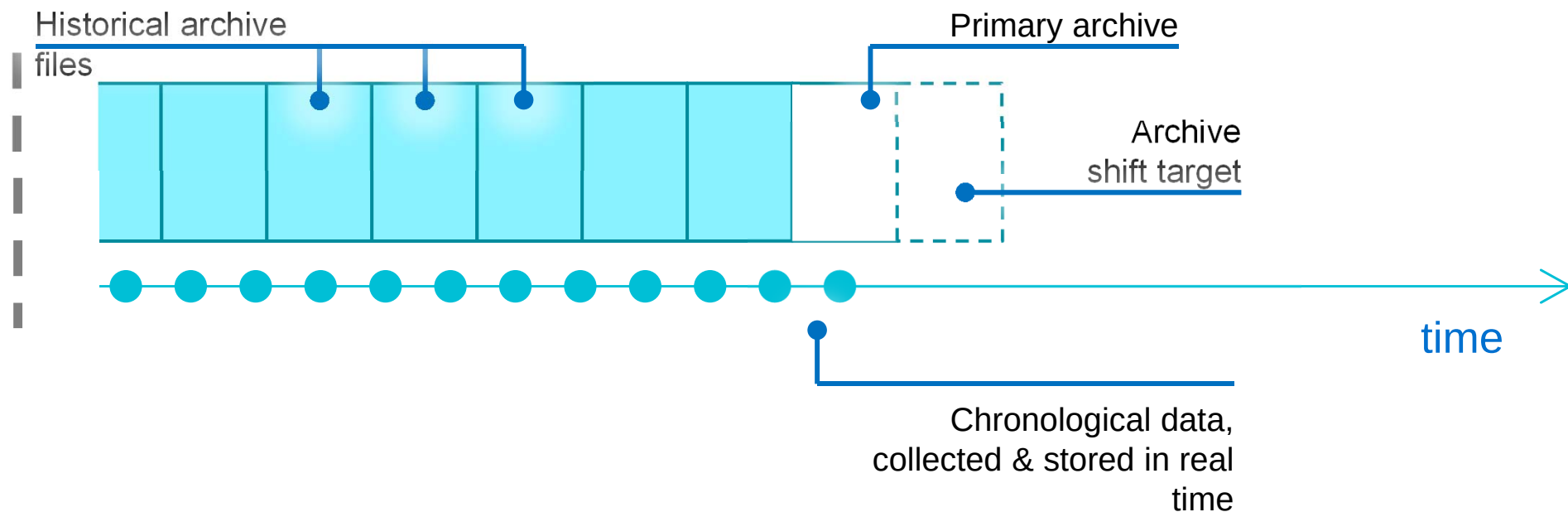
Use Case: overlay future data on live maps



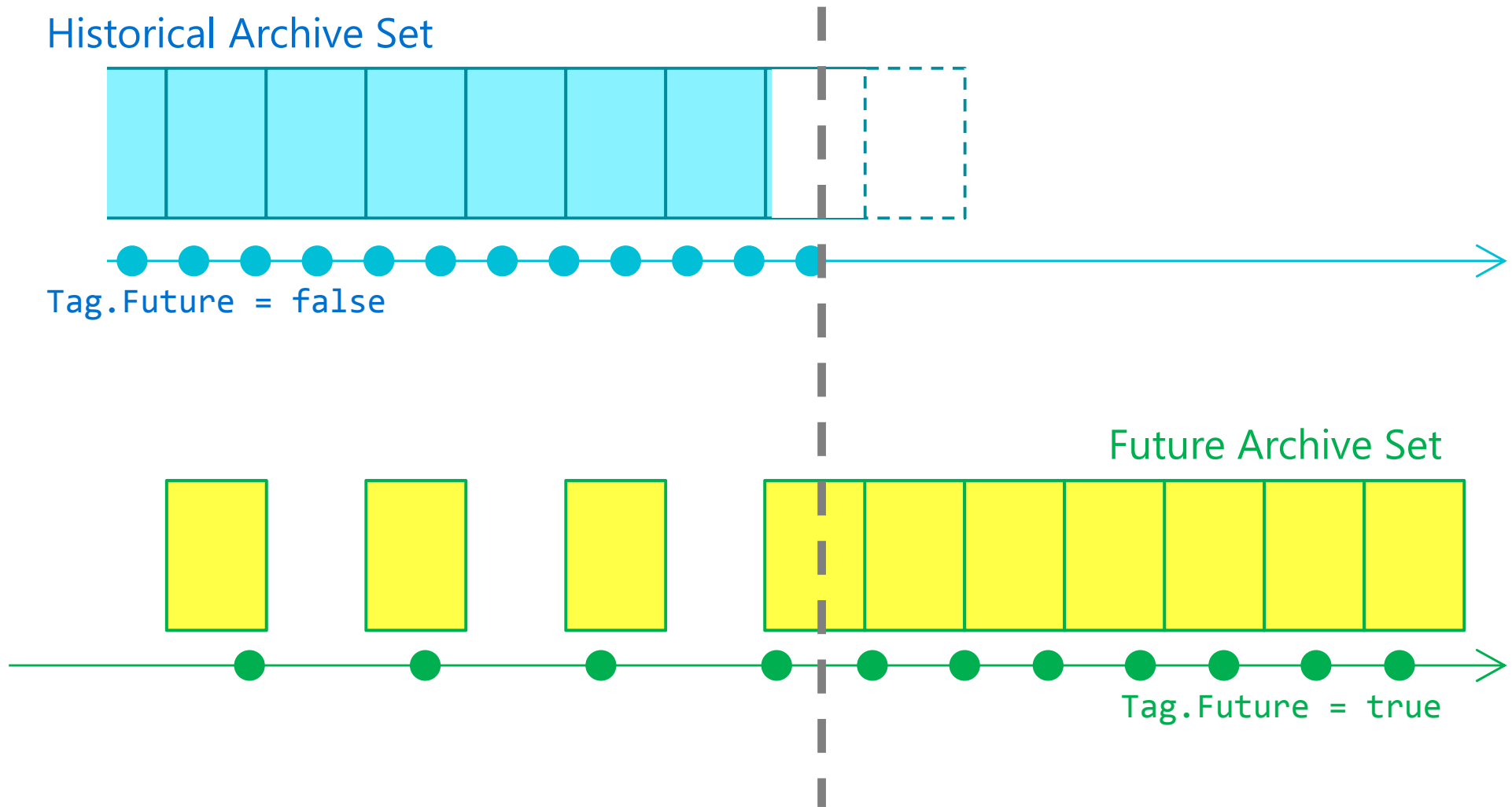
More Than Meets the Eye



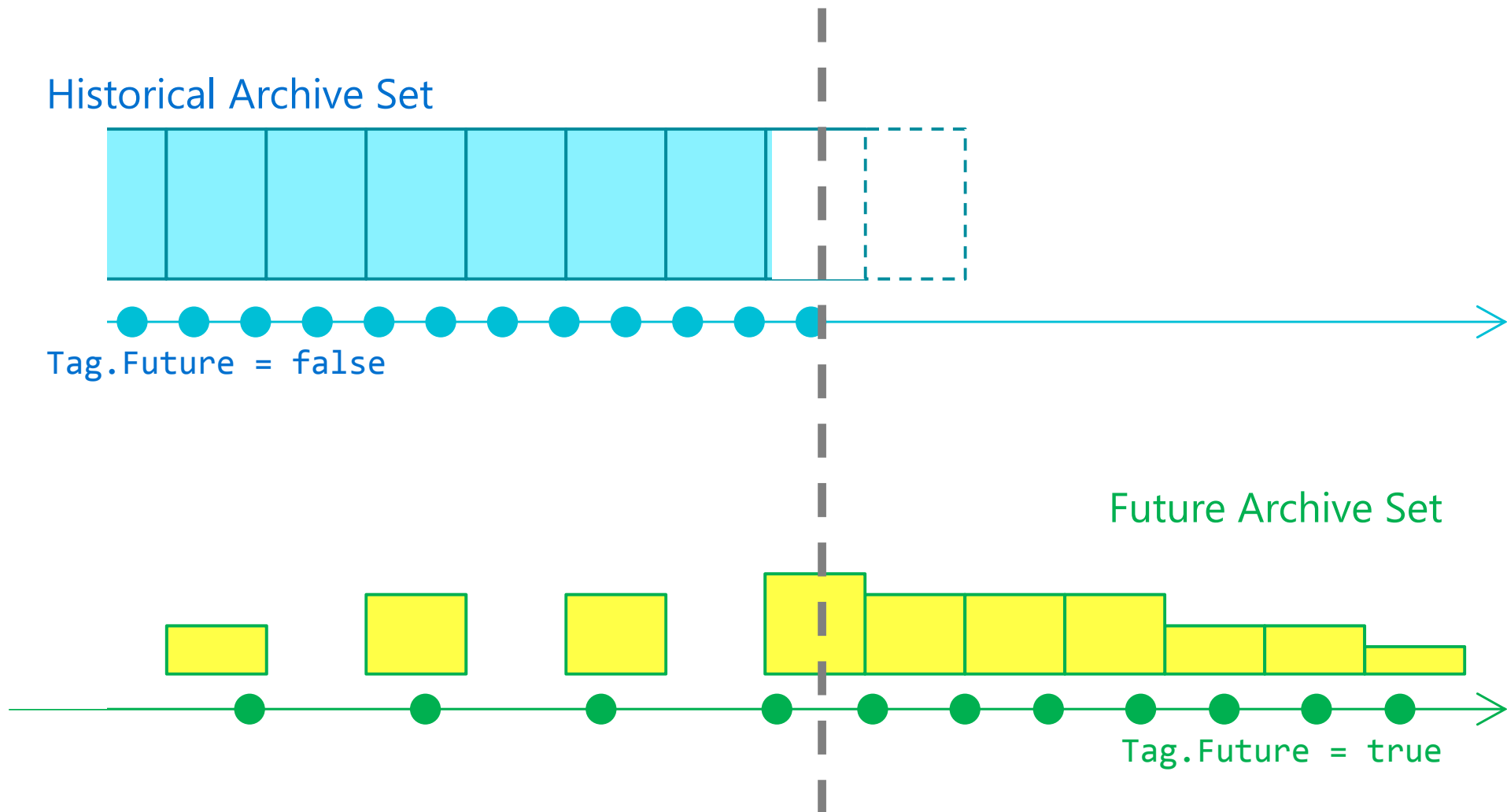
Storing “Historical” Data...

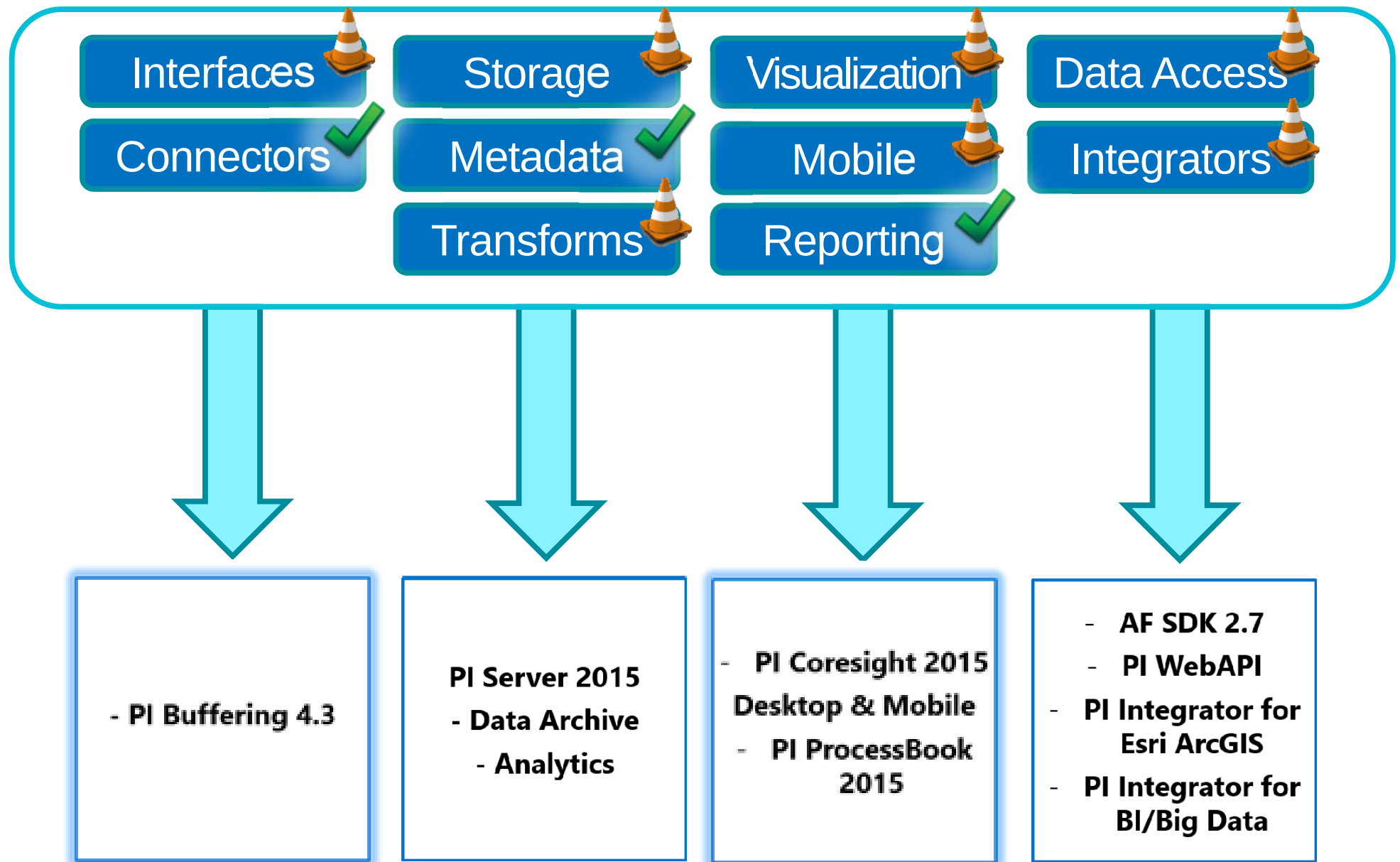


...And Storing “Future” Data



...And Storing “Future” Data





Michael Luo

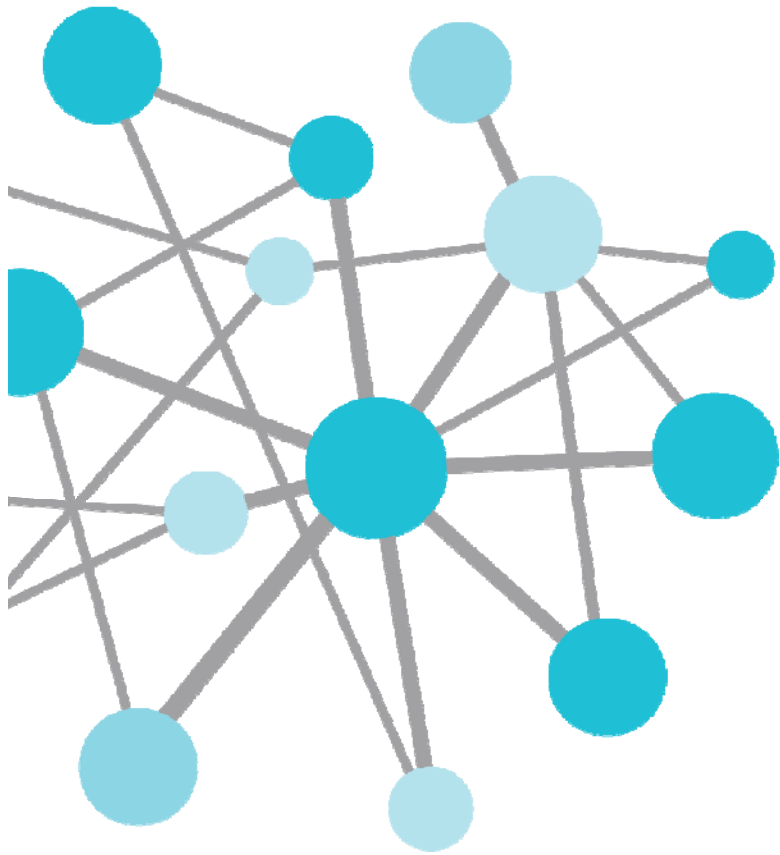
mluo@osisoft.com

Technical Consultant

OSIsoft Australia Pty Ltd

PI System Roadmap

<https://techsupport.osisoft.com/Products/Product-Roadmap>



THANK YOU

Brought to you by  **OSIsoft.**