

The PI System as an Infrastructure: Overview of PI System 2010

Presented by
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Infrastructure: Characteristics and Expectations

Real-time Infrastructure Delivers Opportunities

Electrical Power



Communications



Transportation



- **Valuable** – delivers a recognized benefit
- **Reliable and Secure** – always available, safe and trusted
- **Accessible** – adaptable to innovation, easy to use
- **Contextual** - organized to be effective, efficient, and extendable
- **Sustainable** – must be able to last and adapt to change



What is The PI System ?

The industry standard in enterprise infrastructure for management of real-time data and events

Aggregation – PI System Data Infrastructure

ISA S95

Level 4: ERP

Data Access

Level 3: MES

Referenced
Data

Electronic Work
Instructions

Real-Time Data Infrastructure

Common Data Presentation Layer

Level 2

Batch
Control

Continuous
Control

Discrete
Control

SCADA /
PLC / DCS

Level 1

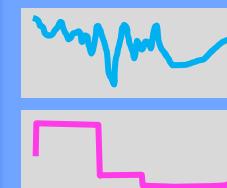
Level 0: Equipment



osisoft® PI System

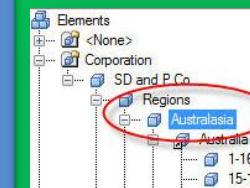
PI Data Access

PI Server



Tag Data

PI AAF



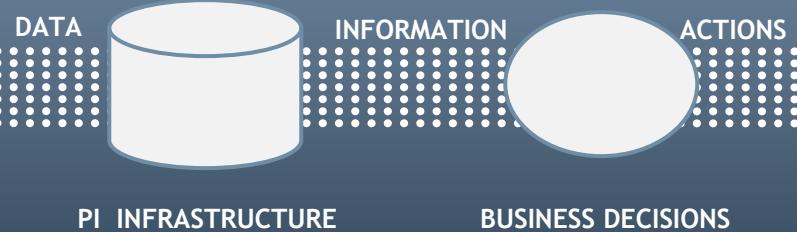
Assets
& Attributes

PI EF

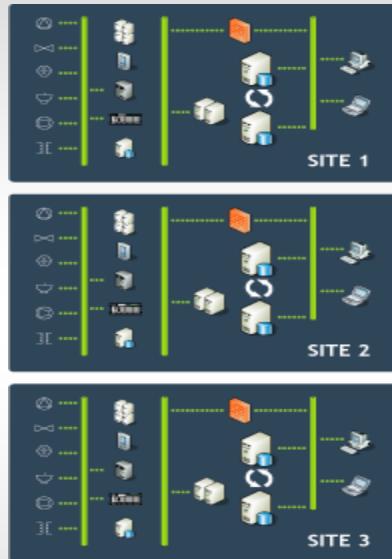
- Downtime
- Batch
- Startup
- Event Frames
& Attributes

Turn Real-time Data Into Actionable Information

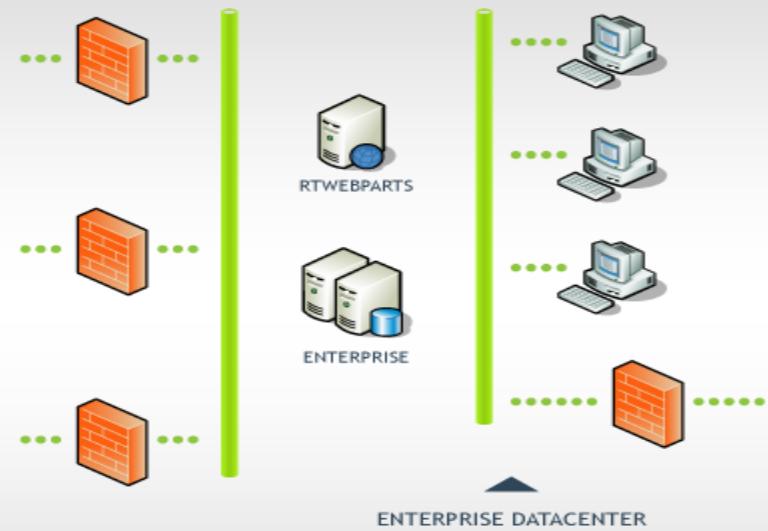
THE PI TECHNOLOGY GIVES THE POSSIBILITY TO PUT IN PLACE BUSINESS SOLUTIONS

PROBLEMS	TURN REAL-TIME DATA INTO ACTIONABLE INFORMATION	RESULTS
 ENERGY RESOURCES AND UTILISATION  EQUIPMENT STATUS  KNOWLEDGE PERENNIALITY  PROCESS CONDITIONS AND QUALITY  ENVIRONMENTAL REQUIREMENTS AND REGULATIONS	 <p>The diagram illustrates the PI technology's workflow. It starts with a central cylinder labeled "PI INFRASTRUCTURE". To its left is a vertical column of dots labeled "DATA", and to its right is another vertical column of dots labeled "INFORMATION". A large circle labeled "BUSINESS DECISIONS" is positioned to the right of the "INFORMATION" dots. Above the "INFORMATION" dots, there is a smaller circle labeled "ACTIONS". The entire process is labeled "TURN REAL-TIME DATA INTO ACTIONABLE INFORMATION".</p>	 ENERGY AND RESOURCES MANAGEMENT  CONDITION-BASED MAINTENANCE  KNOWLEDGE TRANSFER AND RETENTION  PRODUCTION OPTIMIZATION  COMPLIANCE

Typical Architecture: *Enterprise level*



Various Facilities



Enterprise IT



Business Connectivity

PI System Overview



COLLECT



HISTORIZIZE



FIND



ANALYZE



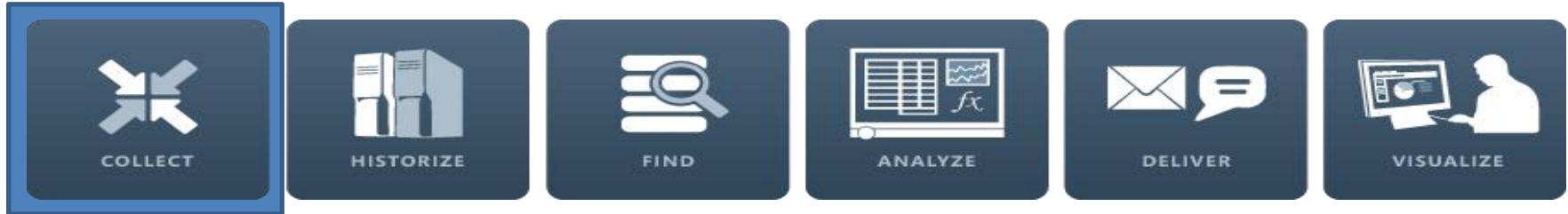
DELIVER



VISUALIZE

The OSIsoft PI System is the highly scalable and secure real-time and event infrastructure that connects people with the right operational and manufacturing information at the right time in order to *analyze, collaborate, and make smart decisions*

The PI System: Collect

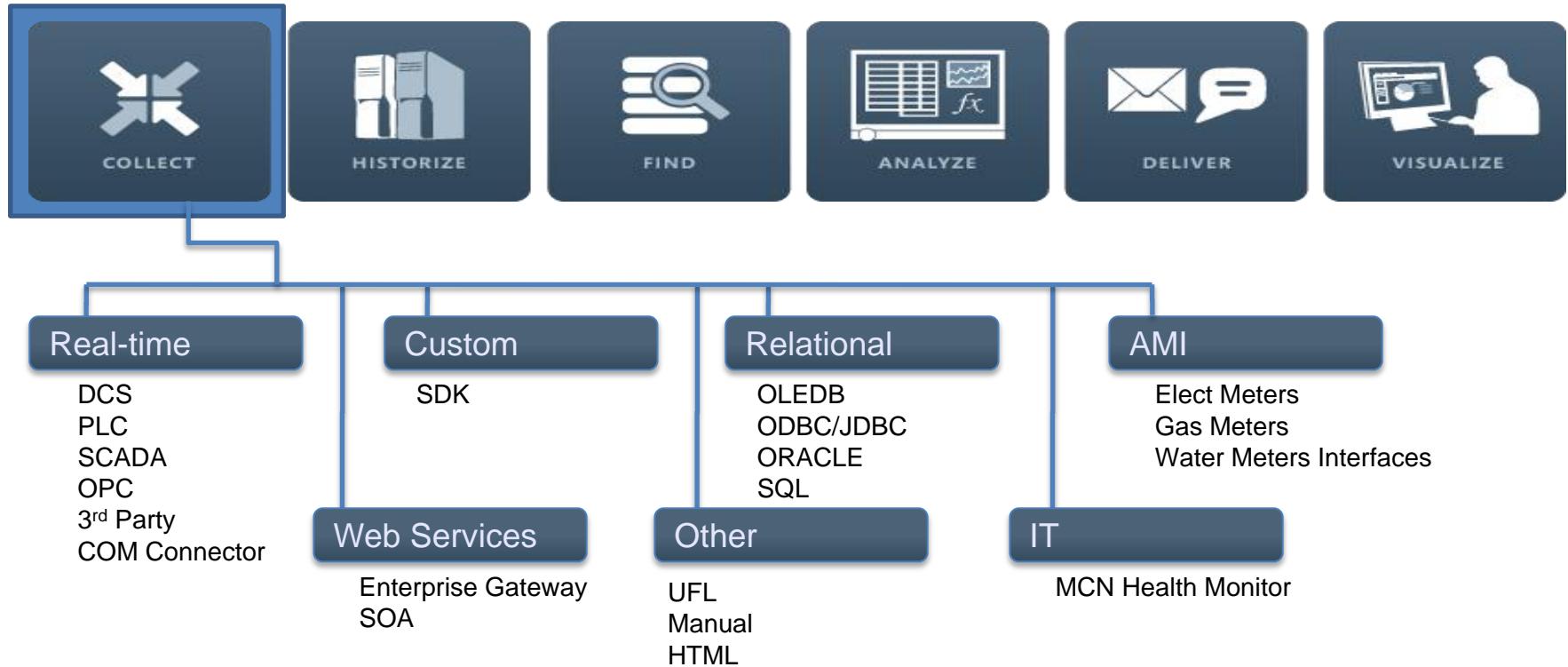


The PI System collects real-time data from multiple sources every second, minute or day and stores the values forever.

- Measures and aggregates a broad range of data types
- Handles both time-series data and events
- Secures the access and transmission of the data
- Data collection redundancy and high availability

The PI System can connect to more than 450 different systems

The PI System: Collect



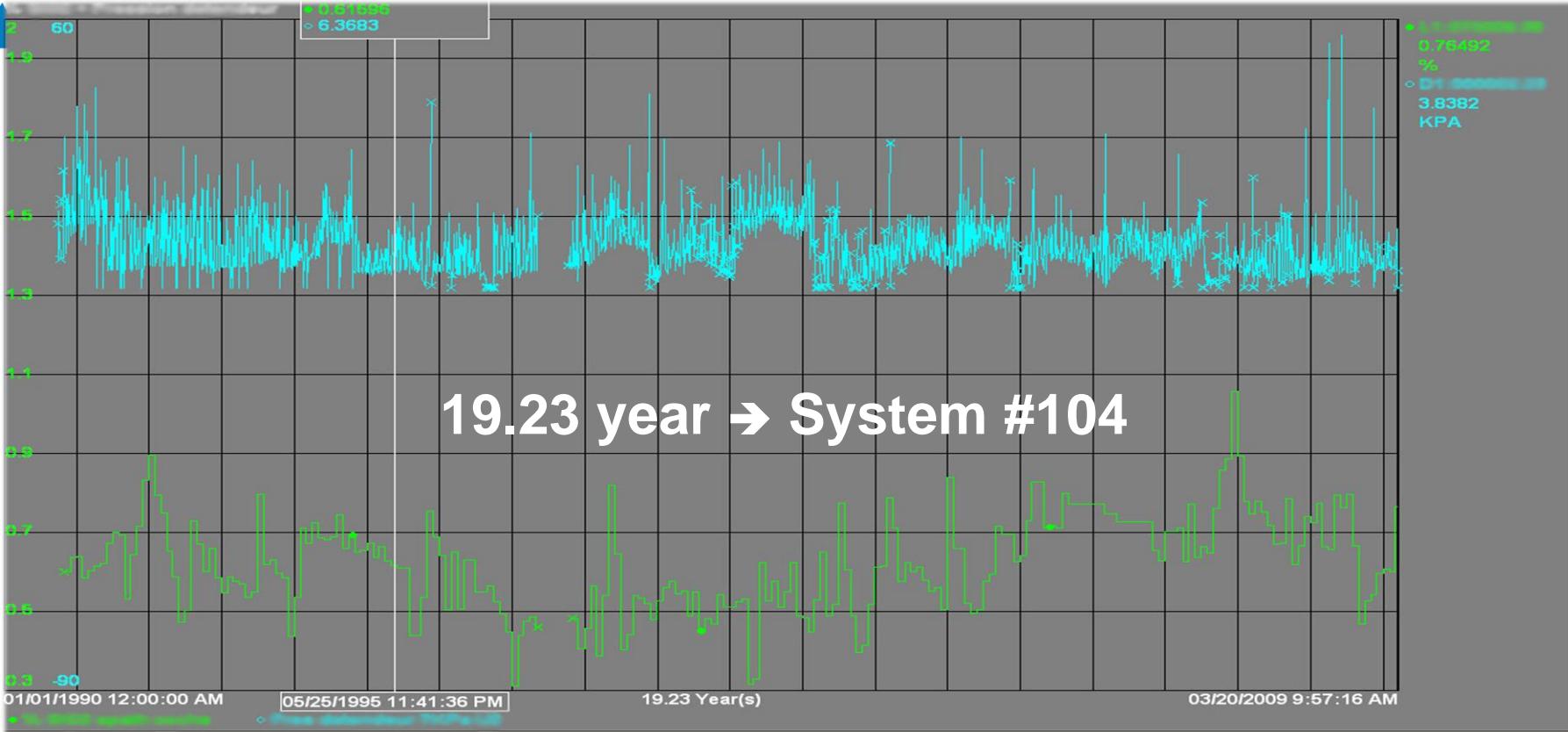
The PI System: Historize



The PI Server can

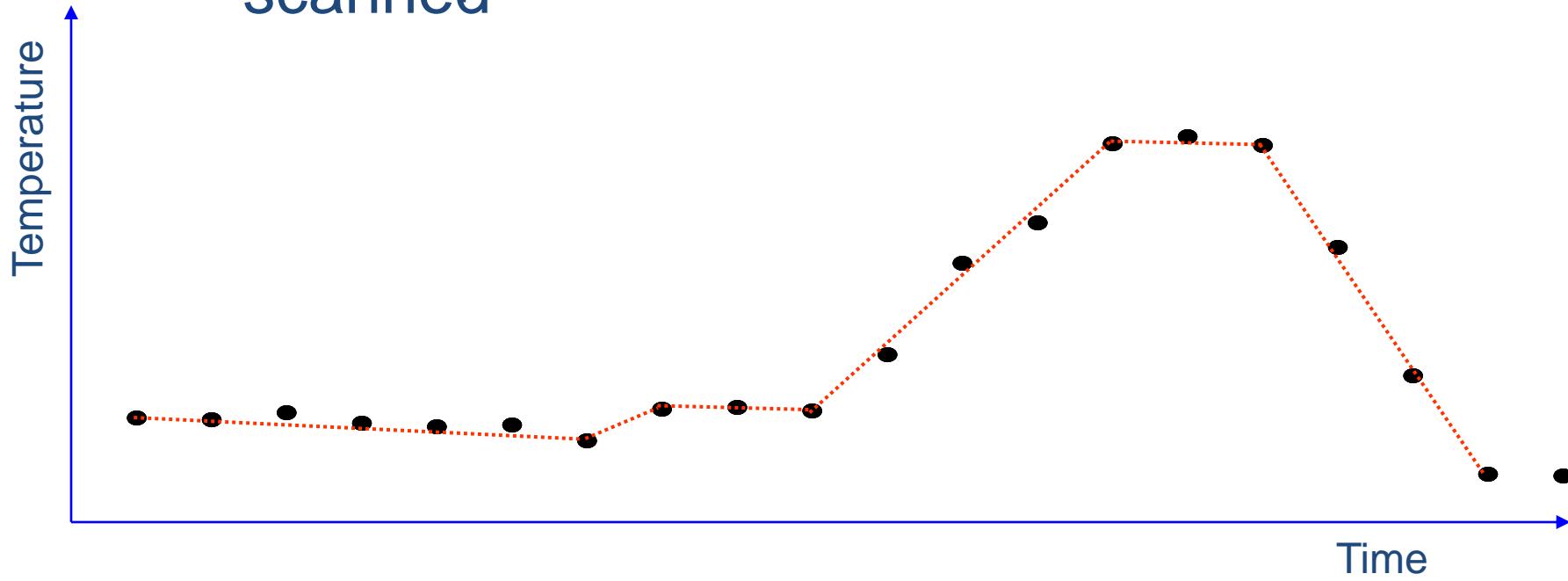
- Archive the data and keep it online for decades
- Store and retrieve the data efficiently
- Securely control access to the data
- Distribute the data to client applications
- Expose the data supporting standard communication protocols

The PI Server: Historize!

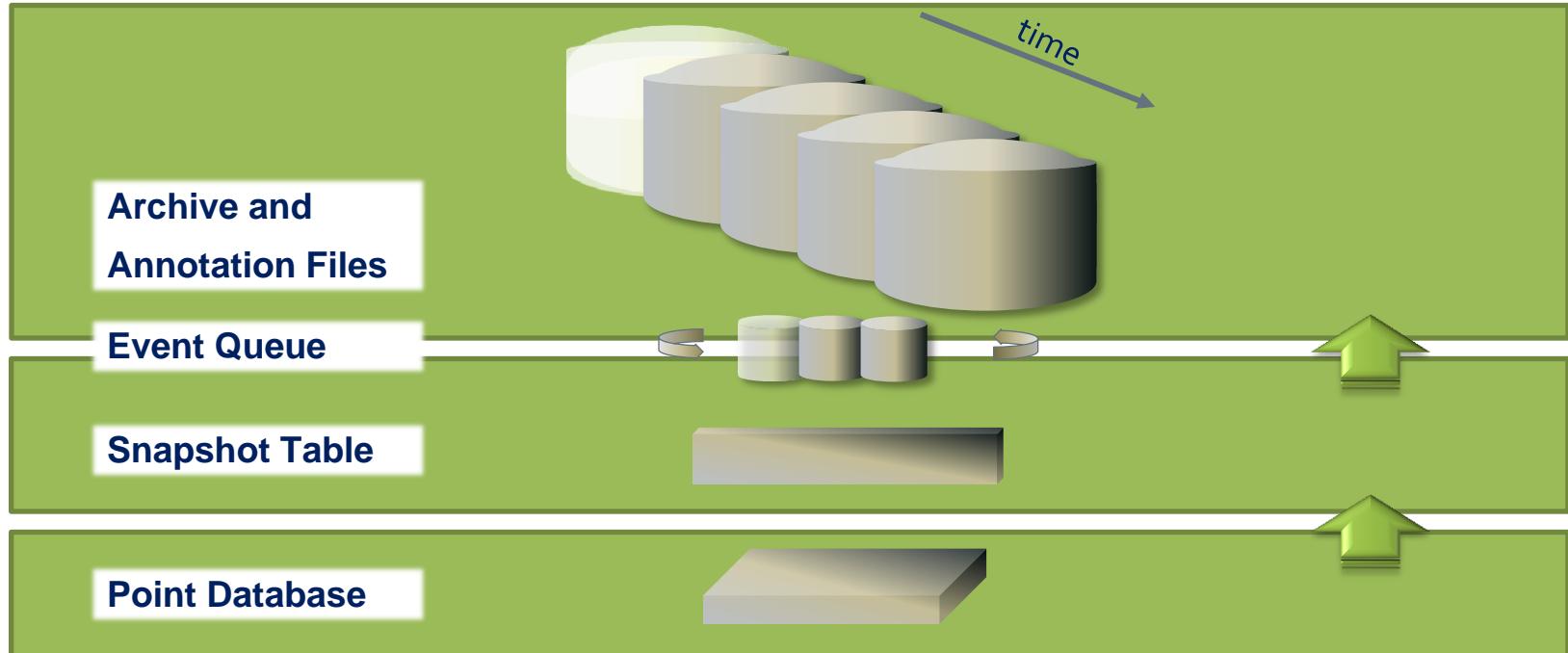


Compression

Raw values
After Excention
scanned



Event Storage



Event :=

Tag
Where ?

Timestamp
When ?

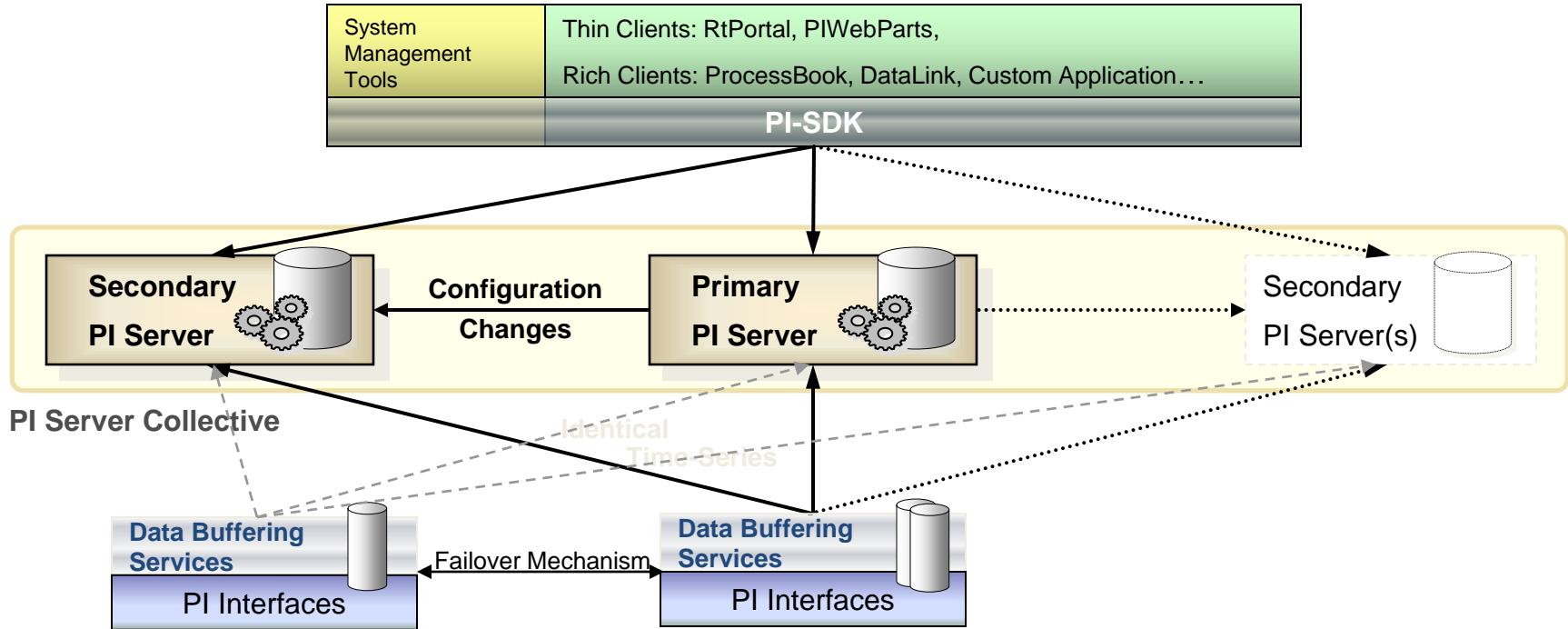
Value
What ?

Questionable
Quality ?

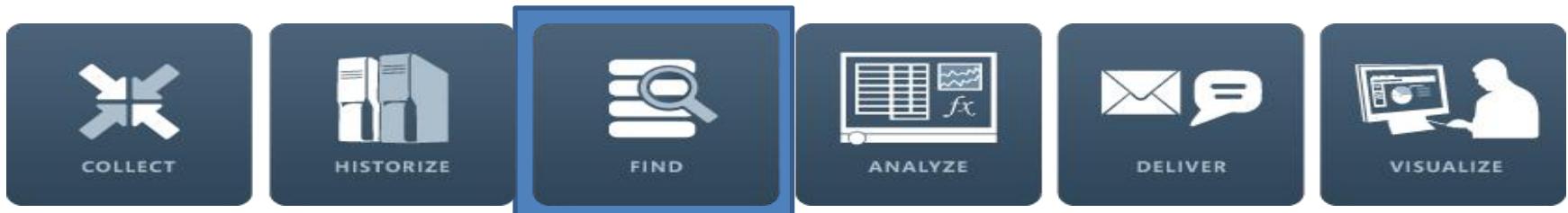
Substituted
Changed ?

Annotation
Add. Bit stream

OSIsoft HA Technology

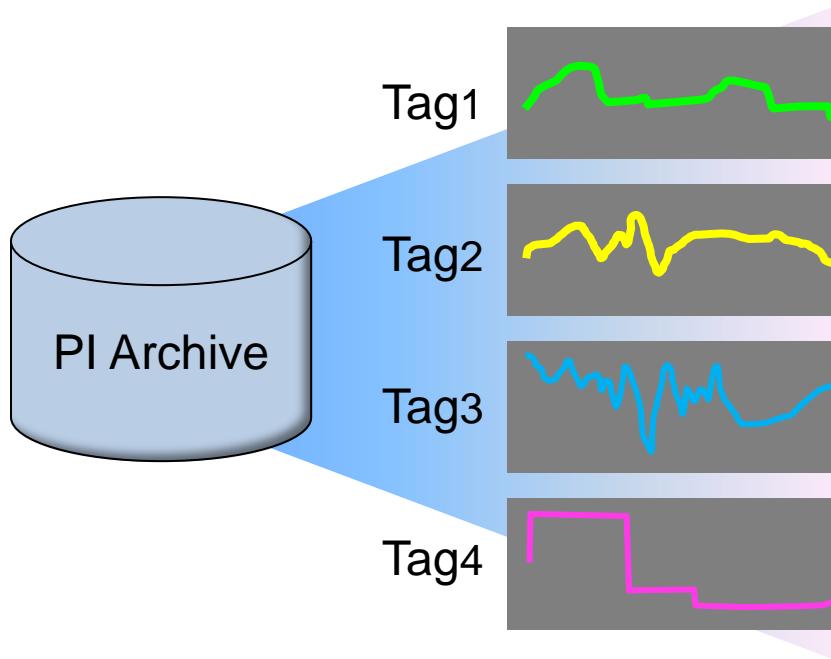


The PI System: Find

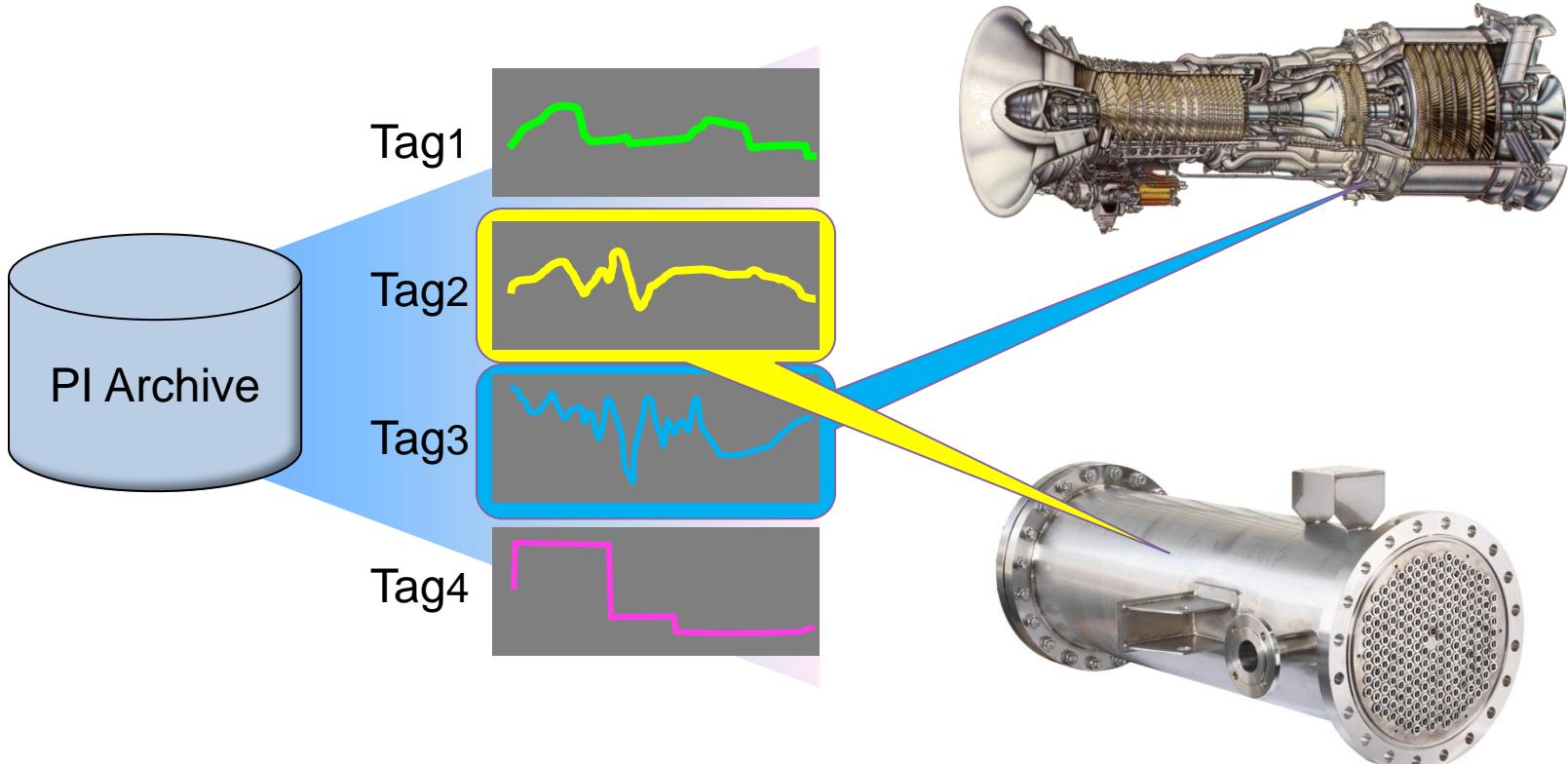


- Create and store your asset hierarchy
- Provide easily understood asset and attribute names for ease of use
- Link to multiple data sources
- Provide a platform for analysis or applications
- Securely control access to the data
- Distribute the data to client applications
- Expose the data supporting standard communication protocols

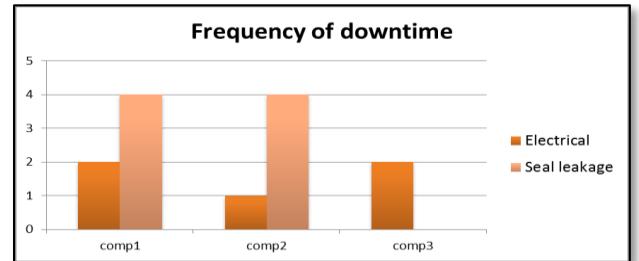
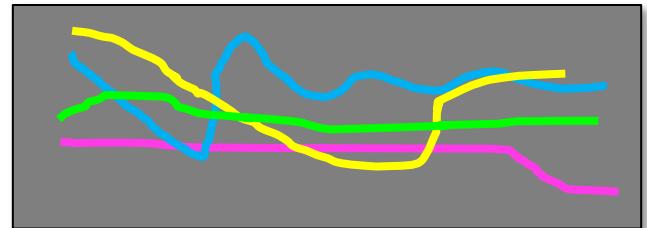
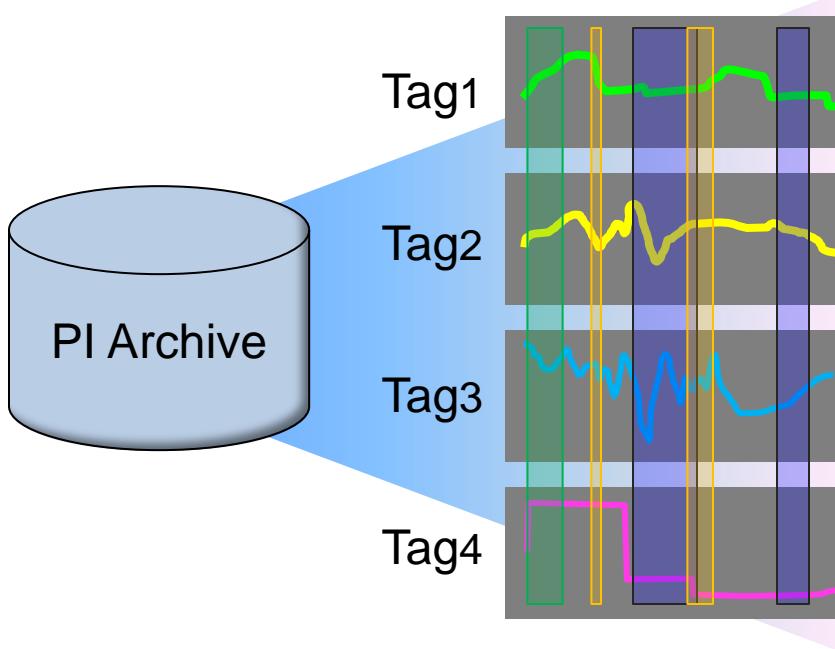
PI Server – Time series data and Tags



Assets help you find the right Tags



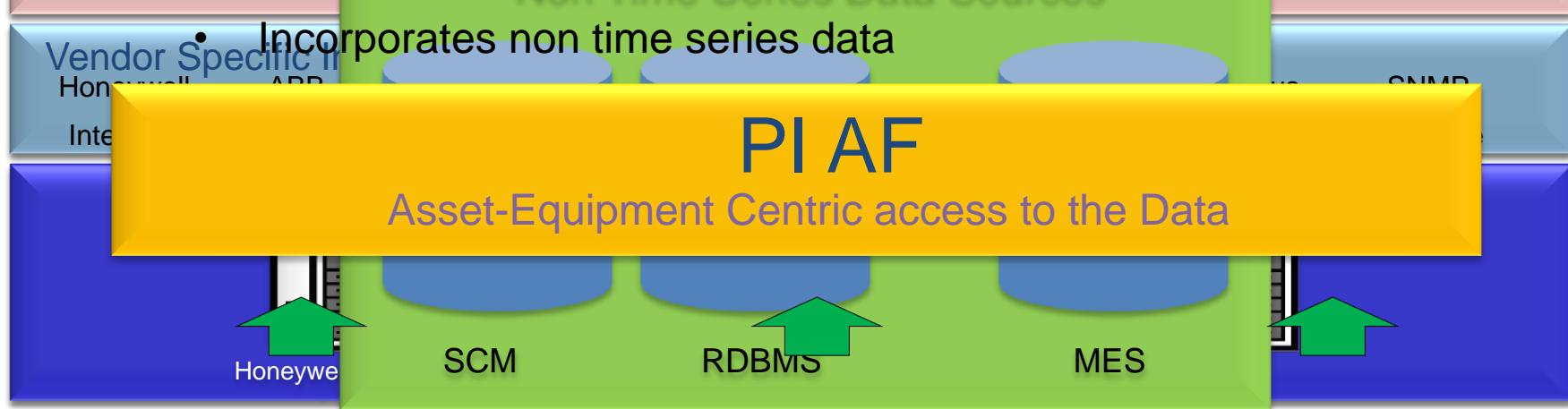
Event Frames help you find the right time periods



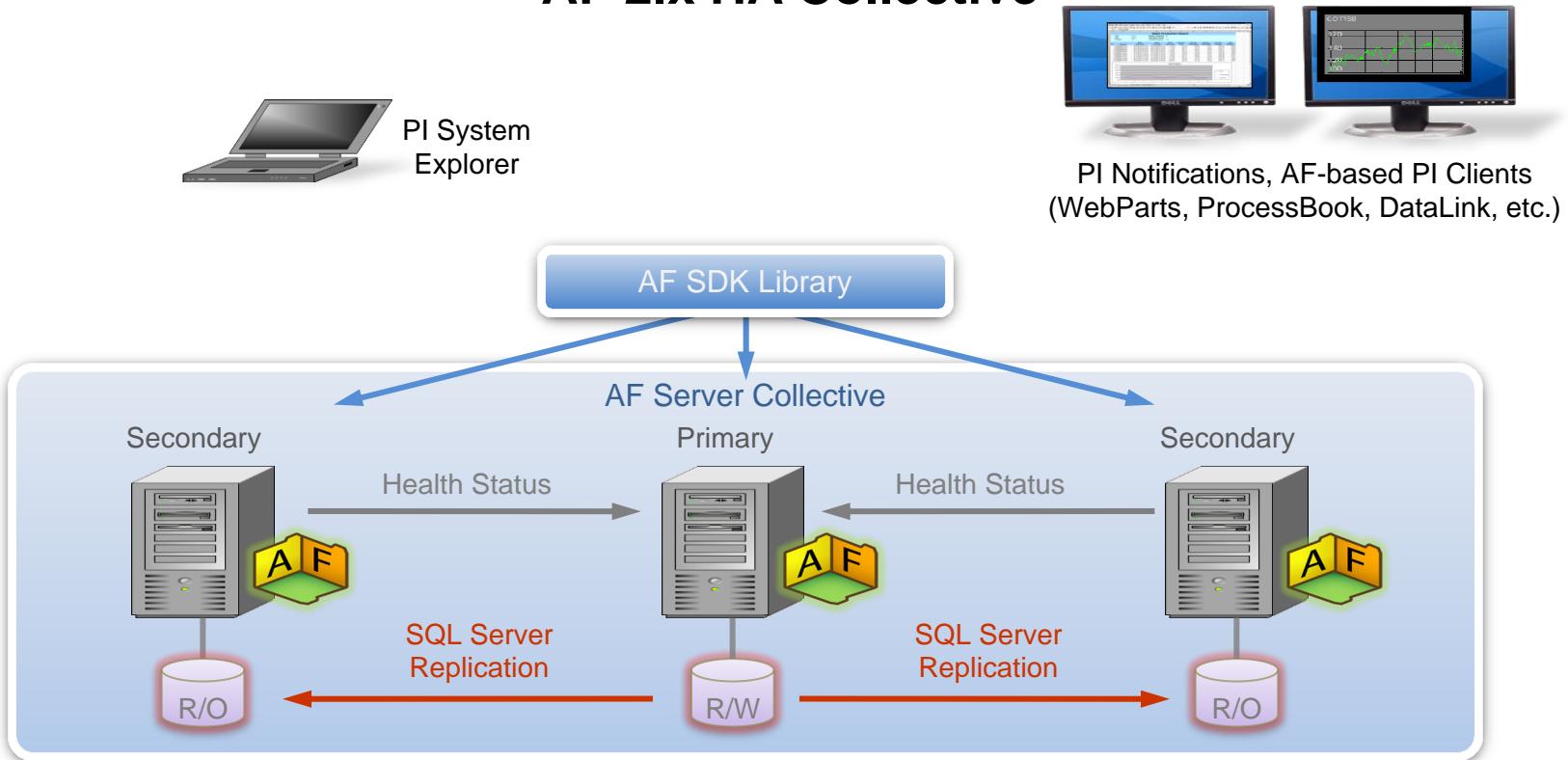
Asset centric

- Data structured and organized by asset
- Spans multiple PI Systems
- Incorporates non time series data

Non Time Series Data Sources



AF 2.x HA Collective



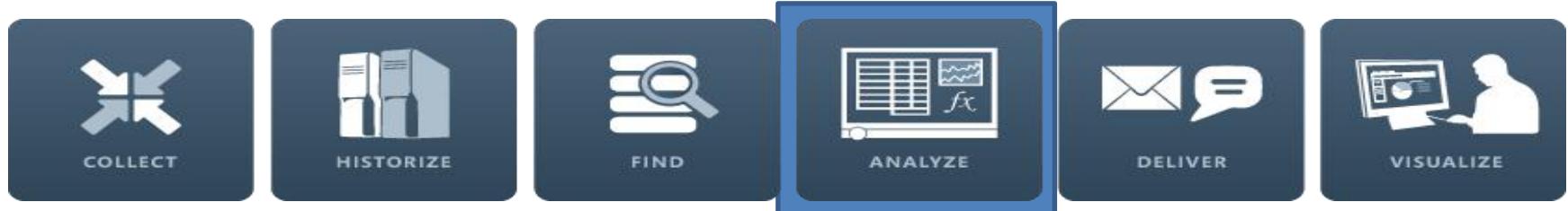


AZ SONRA.....

More details will be in the talk

Do“More with Less“ using PI AF & PI Notifications

The PI System: Analyze



Convert real-time data into actionable information

- CEP (Complex Event Processing) & Post processing
- Equations, calculations, aggregations, filters, business rules

Monitor business & operational performance in real time

Analyze

ANALYZE

ANALYZE

Convert real-time data and events into actionable information. Measure and improve business performance.

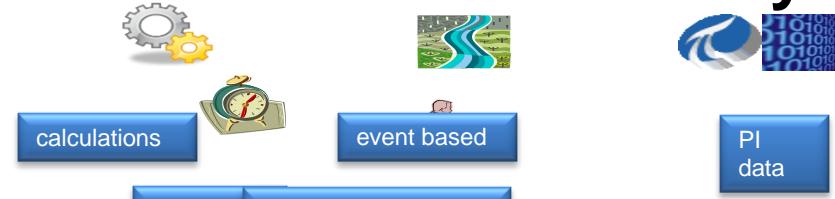
- Combine data elements together
- Aggregate totals and averages
- Filter out irrelevant data.
- Includes both configured and programmed analytics
- Enables organizations to continually improve by analyzing data and obtaining insight into their operations.

BATCH ID	PI MIN	PI AVG	PI MAX	PI RANGE	PI STDEV
MP_20090911_115632	147.1	172.6	205.6	58.5	13.6
MP_20090910_204531	266.7	316.9	366.9	100.2	26.5
MP_20090910_170536	32.8	102.5	230.0	197.2	36.4
MP_20090910_160842	141.8	188.3	220.1	78.4	21.6
MP_20090909_220449	230.0	328.4	426.3	196.3	56.2
MP_20090909_153813	201.5	256.4	289.0	87.5	18.2
MP_20090909_142545	264.1	291.1	327.9	63.8	14.7
MP_20090909_132727	295.4	338.1	377.1	81.7	25.4
MP_20090902_171845	32.3	129.7	292.8	260.5	88.1
MP_20090902_153523	108.6	184.5	251.6	143.0	35.2
MP_20090901_204325	311.9	363.5	409.4	97.4	23.4
MP_20090831_194329	340.6	361.8	396.0	55.4	13.2

MIN	AVG	MAX	MAX	MAX
32.3	252.8	426.3	260.5	88.1

PI Analytics – Components and Functionality

- Performance Equations



- Totalizers



- Alarms/Statistical Quality Control



- Advanced Computing Engine



- PI for StreamInsight

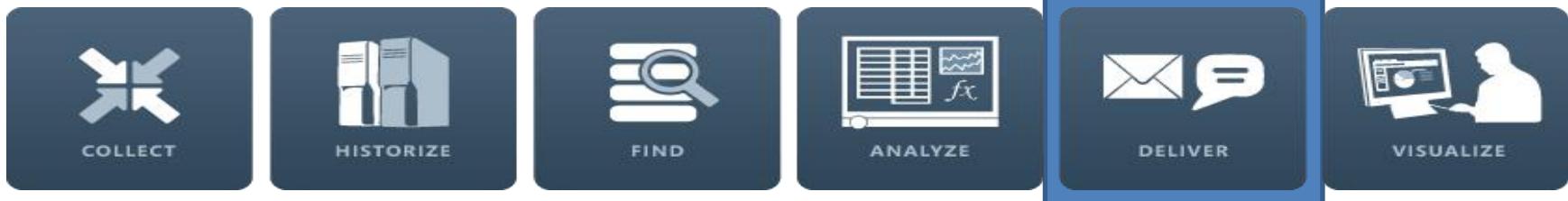


- Asset Framework supported Analytics*



* Future products

The PI System: Deliver



- PI Notifications – deliver exceptions to humans or push to other systems
- PI Data Access – allow applications to pull data from the PI System
 - SQL Data Access
 - Web Services
 - OPC Servers
 - Software Development Kits



PI Data Access: The 2010 Wave



Microsoft®
BizTalk® Server

Microsoft®
SQL Server®
Analysis/Reporting Service



Microsoft®
SharePoint®

PI JDBC
2010

PI Web
Services 2010

PI OLEDB
Enterprise 2010

PI OPC DA/HDA
Server 2010

OSIsoft SDKs



Asset Information /
Metadata

Notifications
Analytics

Relational / Non Time Series



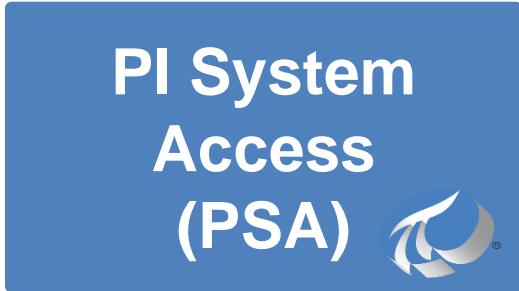
PI Server



PI Server Collective

Time Series Data

Development → Runtime



```
AFTimeRange tr = new AFTimeRange(new AFTime(tex  
AFValues vals = _afDB.Elements["Pump123"].Attri  
  
lstValues.Items.Clear();  
foreach(AFValue val in vals)  
{  
  
    lstValues.Items.Add(val.Value.ToString() +  
}
```



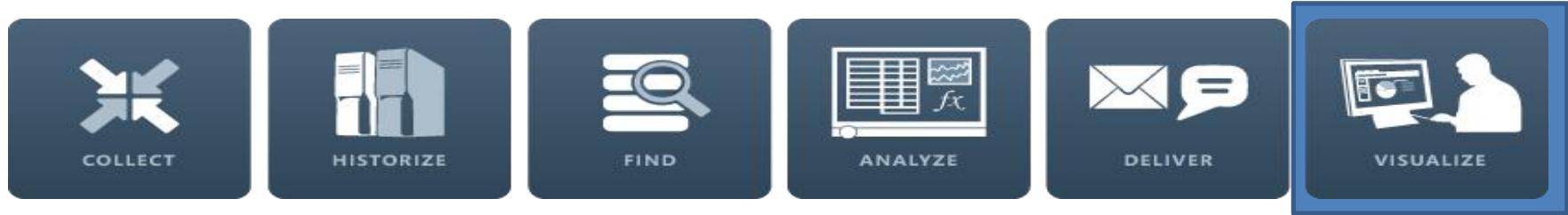


Products Covered by PSA

- OSIsoft SDKs
 - PI SDK
 - AF SDK (includes AN/EF SDK)
- SQL Family
 - PI OLEDB Enterprise
 - PI OLEDB
 - PI JDBC
 - PI ODBC
- PI OPC DA/HDA Server
- PI Web Services
- PI API



The PI System: Visualize



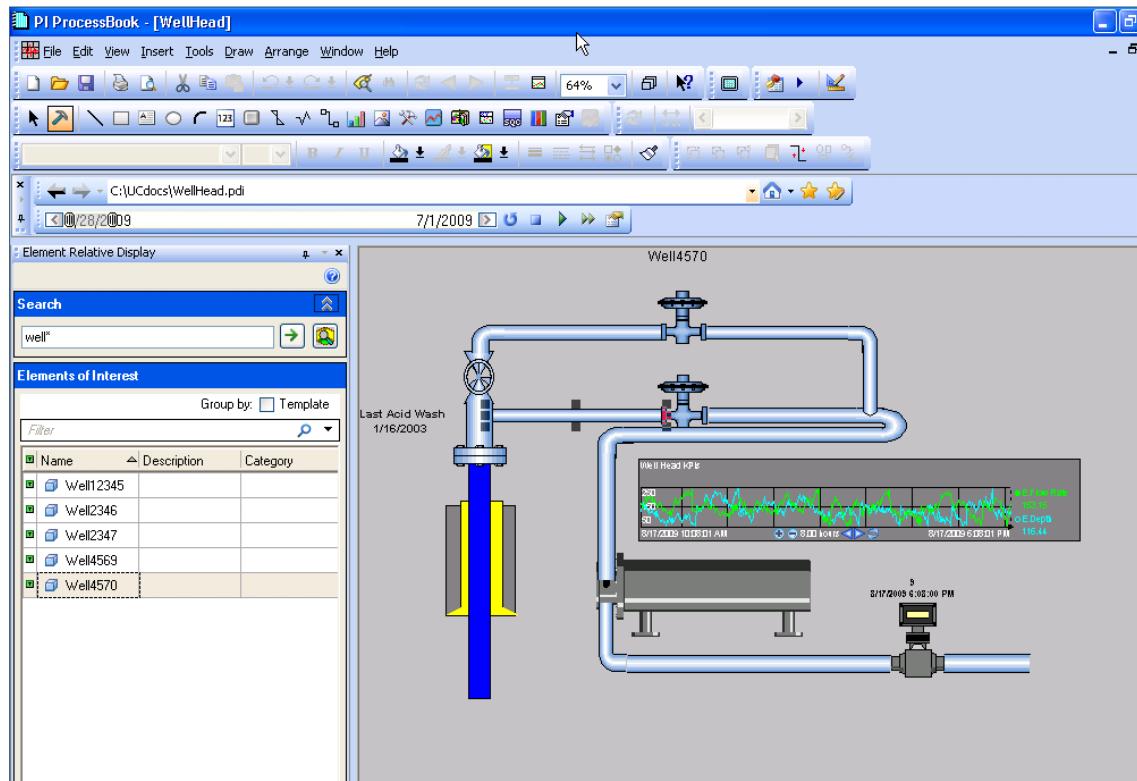
The decision makers can use the well-known tools like:

- Just Internet Browser with Silverlight
- OSIsoft PI ProcessBook
- Just Microsoft Office environment Microsoft Office Excel or Microsoft Office SharePoint
- SAP Enterprise Portal

The Visuals stimulates the creativity and gives solutions to end-users for solving business problems.

PI ProcessBook

- Draw intuitive graphical diagrams and, include live data
- Make one diagram refer to many similar units or assets
- Easily trend data
- View annotations to data points
- Intuitive “status” indicator displays health of data on the display
- Large symbol library included to make drawings quickly
- Import graphics for customized displays.



PI DataLink + Excel 2010 + PowerPivot

- PI System Add-In for Microsoft Excel
- Create interactive reports and analyses in a spreadsheet
- Worksheets update
- Worksheets can be published
- SharePoint workflow integration

The screenshot displays two Microsoft Excel windows side-by-side, illustrating the integration of the PI DataLink add-in.

Left Window (Microsoft Excel - Unit Report.xls):

- Sheet1:** A data grid showing historical data for "SL.GEN.UNIT1.MW" and "SL.GEN.UNIT1.Freq". It includes columns for Current Value, Minimum, Maximum, and Time.
- Sheet2:** A line chart titled "Something vs. Something Else" comparing "SL.GEN.UNIT1.MW" and "SL.GEN.UNIT1.Freq" over time.

Right Window (First 96 meters - Microsoft Excel):

- PowerPivot Tab:** Shows a "Daily Statistics Report" for SilverSpring_1ND 73421000E on July 21, 2009.
- Data:** Includes tables for Registers, Snapshot Value, Cumulative Demand TOURateA (kVARH), Cumulative Total Demand TOURateA (kW), Totalizing Energy TOURateA (kVARTH), and Totalizing Total Energy TOURateA (kWh).
- Chart:** A scatter plot showing Energy (kVArh) and Energy (kWh) over time.
- Table:** An Interval Data table showing Energy (kVArh), Total Energy (kWh), and Energy (Vavg(A-N)) for various intervals from 20-Jul-09 00:00:00 to 20-Jul-09 17:00:00.

Providing tools to create visual summaries of the data to alert decision makers and call attention to the most important information of the moment.

Visualization – PI WebParts & Microsoft SharePoint



Refinery Processes

- RefiningCo
 - Billings Refinery
 - Casper Refinery
- Coking
- Crude Vac Units**
- FCCU
- Isomerization
- Reforming
- Sat Gas Plant
- Denver Refinery

Pump Run-Time Hours

Descriptor	Current State
Kerosene Draw A	0
Kerosene Draw B	0
Hvy. Naphtha Draw A	0
Hvy. Naphtha Draw B	0

Ad hoc Trend -- Web Page Dialog

OSIsoft Start -2h

Plot0

81 79 77 75

100% 77.48 Deg C

Process Performance to Plan

Measurement	Target	Units	% Below	% On	% Above
Heavy Naphtha Endpoint	395	Deg F	16%	80%	4%
Vacuum Heater Duty	86.9	MMBTU/Hr	0%	80%	20%
Kerosene Draw Rate	4.5	MPBD	5%	96%	1%
Crude Charge Rate	205	MPBD	29%	97%	0%

Process Overview

RtTimes

More Eyes on PI > PowerPivot Gallery > Fuel Gas Utilization and Benchmarking Report.xlsx

Microsoft Excel Web App

Corporate Fuel Gas Consumption

Row Labels	Fuel Gas Volume KFT3 Column Labels				Grand Total
	Cracking	Distilling	Extruding	Milling	
Houston	121,818	54,812	98,063	274,694	
Boiler	108,161	10,049	26,473	144,684	
Heater	13,657	44,763	71,590	130,010	
Little Rock		44,952	63,409		108,361
Boiler	9,464	18,646		28,110	
Heater	35,488	44,763		80,251	
Tucson	125,455	36,175		92,188	253,819
Boiler	107,410	17,321		38,036	162,767
Heater	18,045	18,854		54,152	91,052
Wichita	91,865	45,170	44,546		181,581
Boiler	57,075	18,199	8,468		83,741
Heater	34,790	26,971	36,078		97,840
Grand Total	339,138	126,297	162,767	190,252	818,454

RtTable

DrawingN

01-E456-78
01-E378-56
01-E345-57
01-E569-23
01E346-346

Stacked Bar Chart

Legend: Milling (Blue), Extruding (Green), Distilling (Red), Cracking (Purple)

Boiler Houston Little Rock Tucson Wichita

Executives Engineers Operators Analysts

PI WebParts 2010 for Microsoft SharePoint 2010 or 2007

32

PI Coresight User Interface

PI Coresight homepage

New Undo Redo Messages Sinusoid (Read Only) Help

sinusoid

SineTest01 SineTest01 45.675

SineTest02 -23.394

SineTest03 -49.013

Name Description Value Units Trend Minimum Maximum

B-045 Asset Name	Asset Process Name	No Data	n/a	n/a	
B-045 Burner	Burner Model	XG-65	n/a	n/a	
B-045 Fuel	Relative Fuel Gas Use per ton of Fee	739		n/a	n/a
B-045 Fuel Gas Flow	Fuel Gas Flow Rate	31.69 k sft3/h		24.02	36.00

8/16/2011 9:09:38 AM 1h 8h 1d 1w 1m 8.00 hours Now 8/16/2011 5:09:38 PM 16 Aug 10 11 12 13 14 Aug 15 16 17 18 19 10 AM 11 AM 12 PM 1 PM 2 PM 3 PM 4 PM 5 PM

Last Build: 08/16/2011 16:04:23

Legend: SineTest04 (Blue), SineTest05 (Red), SineTest06 (Yellow)

The screenshot displays the PI Coresight User Interface with the following key elements:

- Top Bar:** Includes links to "PI Coresight homepage", "New", "Undo", "Redo", "Messages", "Sinusoid (Read Only)", "Help", and a search icon.
- Left Sidebar:** A tree view showing the hierarchy of data items, starting with "sinusoid". Other nodes include "PM21", "PM21|Parent|Child|", "Identity Mine Chan:", "Sinusoid", "SINUSOID", and "SINUSOID.". Below this is a "Cart" section containing items like "Fuel Table", "Fuel Analysis", "sym3", "B-045 Trend", and "sym11".
- Main Area:** Contains several data visualization components:
 - A digital gauge for "SineTest01" showing a value of 41.351.
 - A horizontal slider for "SineTest01" showing a value of 45.675.
 - A vertical bar chart for "SineTest02" showing a value of -23.394.
 - A circular gauge for "SineTest03" showing a value of -49.013.
 - A table showing asset process names and their values, trends, and ranges.
 - A trend chart at the bottom showing three data series (SineTest04, SineTest05, SineTest06) over time from August 10 to 16, 2011.
- Bottom Bar:** Shows the current date and time (8/16/2011 9:09:38 AM), a timestamp (8.00 hours ago), and a build date (Last Build: 08/16/2011 16:04:23).



AZ SONRA.....

More details will be in the talk

The Fastest, Easiest Way to Visualize
Your PI System Data with PI Coresight



Summary

PI System 2010



PI System 2010

PI Notifications



PI Analytics

PE

Totalizer

PI ACE

PI Asset Framework



PI Archives



Real-time Interfaces



Real-Time Data

DCS / PLC / SCADA / OPC
HISTORIANS /
INTERFACES



Custom Data

APIs / SDKs



IT Data

IT MONITOR



Relational Data

OLEDB / ODBC
SQL SERVER /
ORACLE



Web Services

SOA / EXTERNAL DATA
LEGACY APPS

Windows integrated security



High availability



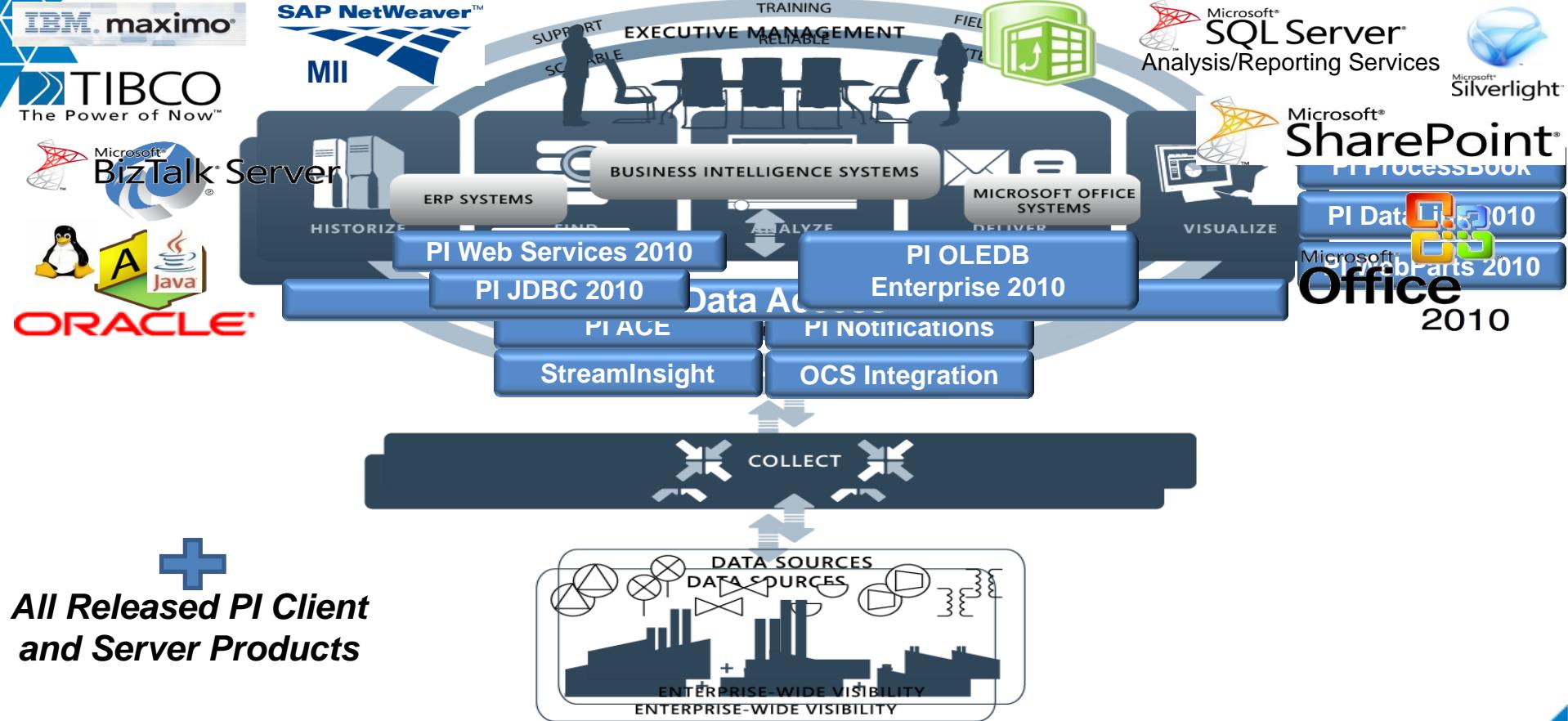
64-bit product

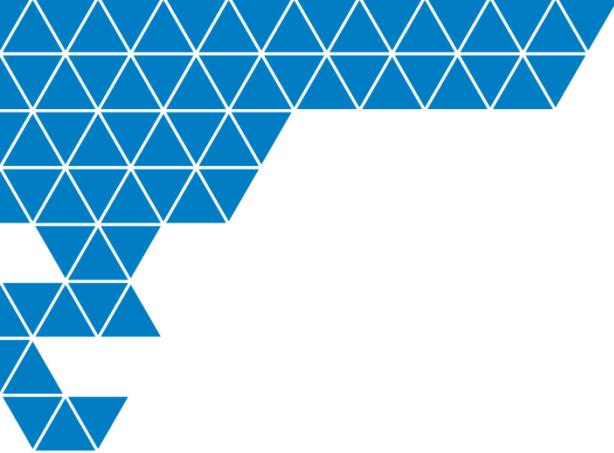


Virtualization



PI System 2010





Thank you