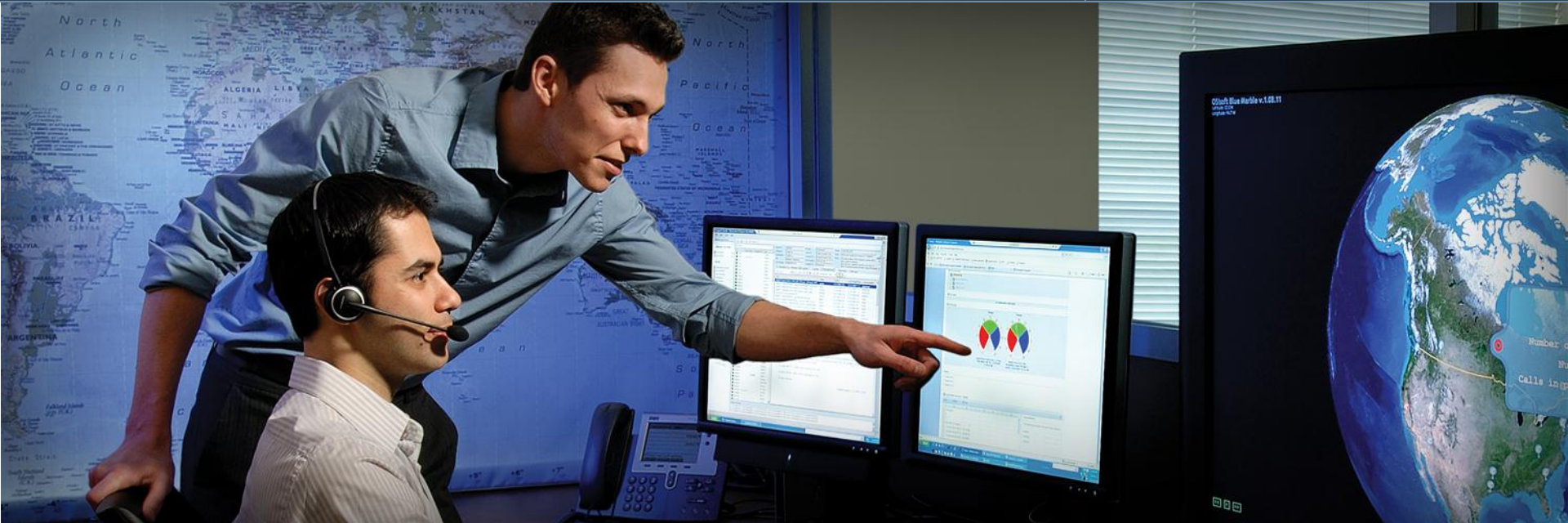




Regional Seminars  
Bucharest - Romania



## PI System Products Overview

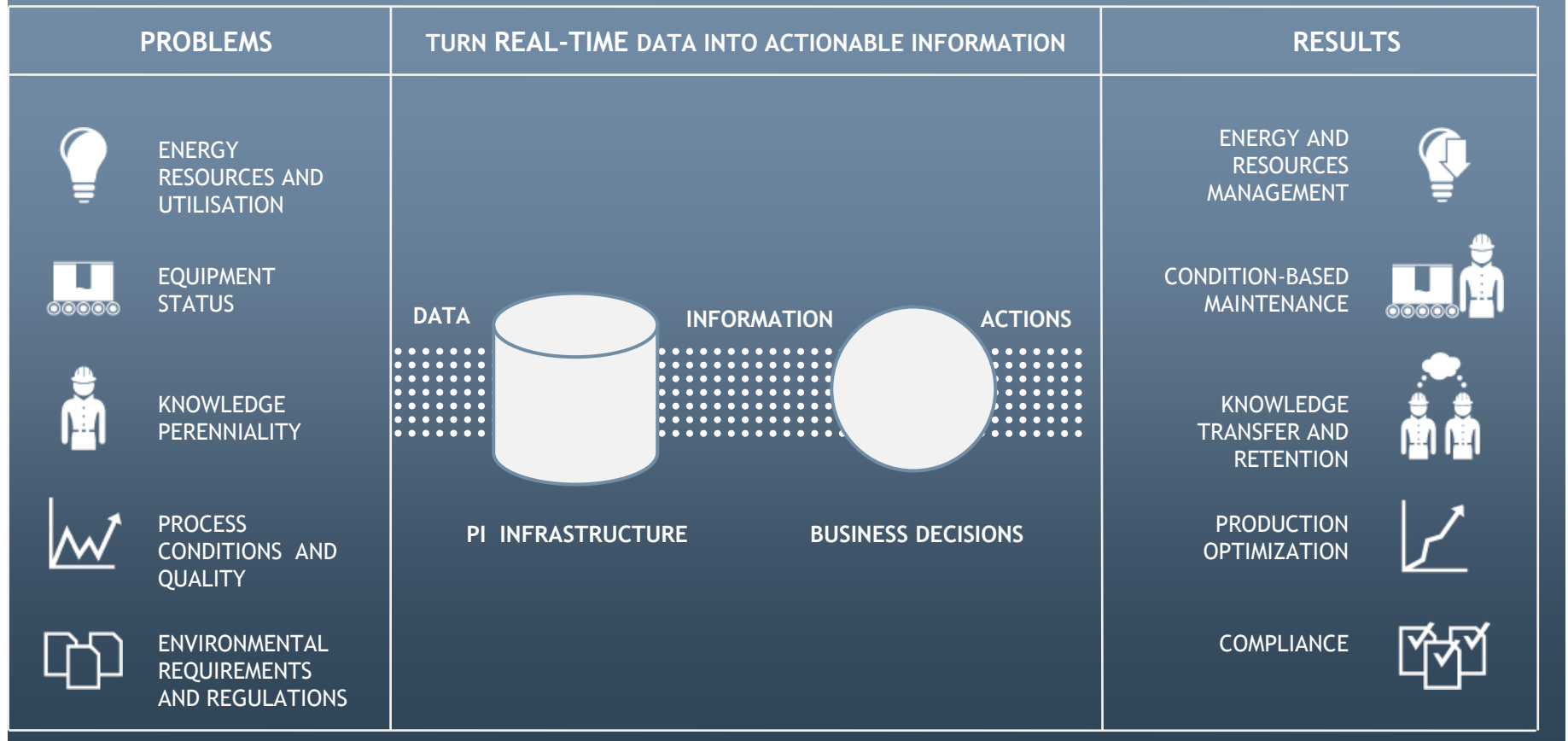
Hans Otto Weinhold , Sr. Customer Support Engineer

[Hans-Otto@osisoft.com](mailto:Hans-Otto@osisoft.com)

# Turn Real-time Data Into Actionable Information



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



# Strategic Alliances - Overview



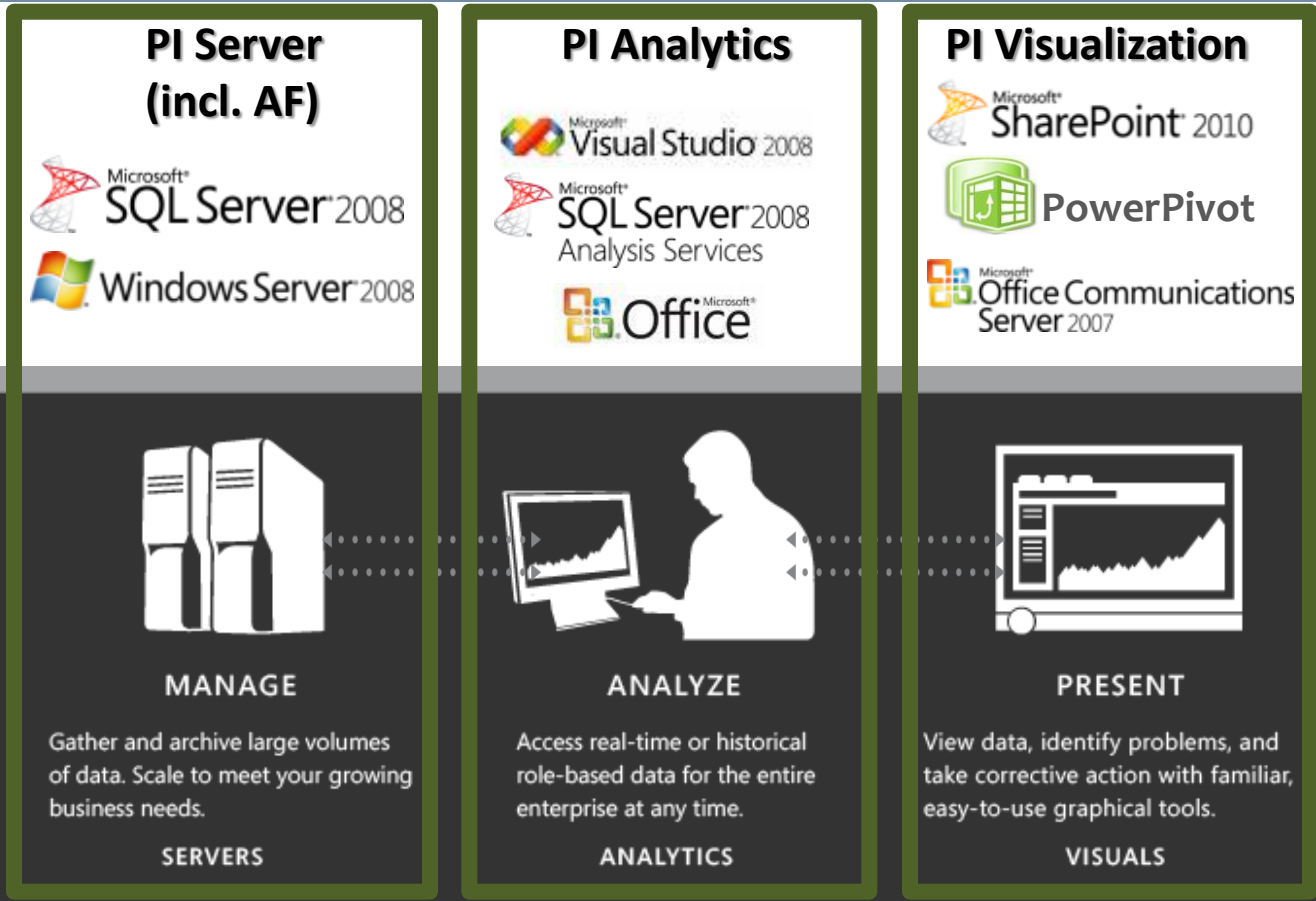
**Microsoft**



Real-time Data  
Infrastructure

Productivity &  
Infrastructure

Line of Business  
Connectivity



**CONNECT**

Collect data from hundreds of sources.

**INTERFACES**



**MANAGE**

Gather and archive large volumes of data. Scale to meet your growing business needs.

**SERVERS**



**ANALYZE**

Access real-time or historical role-based data for the entire enterprise at any time.

**ANALYTICS**



**PRESENT**

View data, identify problems, and take corrective action with familiar, easy-to-use graphical tools.

**VISUALS**

**Managed PI**

**ENTERPRISE AGREEMENTS**

**Software + Services**

**SERVICES**

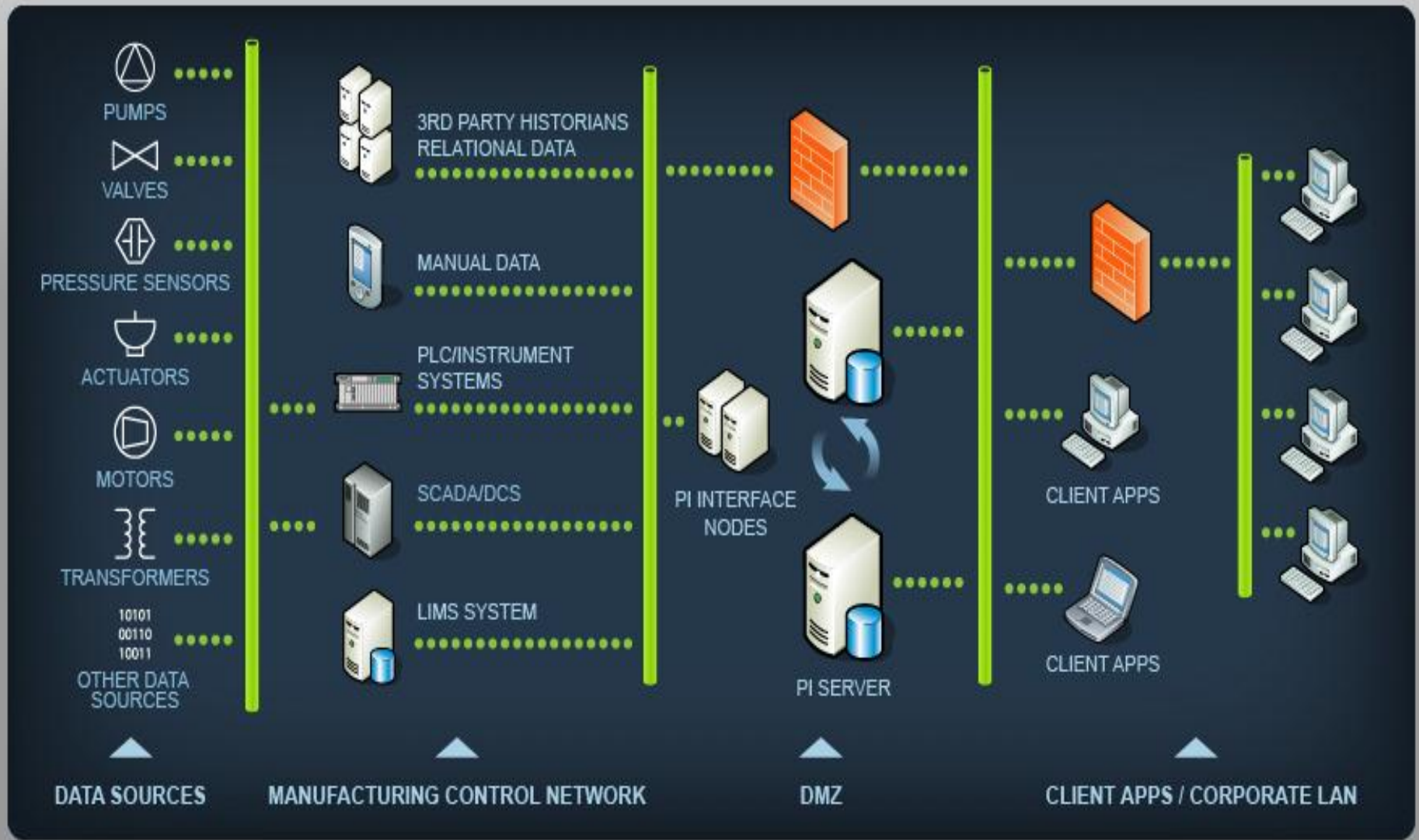


## • **SAP** Certified

Powered by SAP NetWeaver

- OSIsoft Partner Since 1996
- SAP Production Planning-Process Industries (SAP PP-PI) module
- SAP Plant Maintenance (SAP-PM) module
- SAP Quality Management (SAP-QM) module
- The OSIsoft Business Package for SAP Portal
- Member of ES Community
- Member of Value Network for Chemicals, Mining, and Utilities
- Enterprise Services for SAP Enterprise Service Repository
- AMI MDUS as SAP Endorsed Business Solution (EBS) and participant in SAP Lighthouse Council

# The PI System: Generic Architecture





## Connect

Collect data from hundreds of sources.

**Interfaces**



## Manage

Gather and archive large volumes of data. Scale to meet your growing business needs.

**Servers**



## Analyze

Access real-time or historical role-based data for the entire enterprise at any time.

**Analytics**



## Present

View data, identify problems, and take corrective action with familiar, easy-to-use graphical tools.

**Visuals**

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 to analyze, collaborate, and act.

## Connect to over 400 data systems and sources

*Measures and aggregates a broad range of data types*

[MY SUPPORT](#) | [PRODUCTS](#) | [DOWNLOAD CENTER](#) | [KNOWLEDGE CENTER](#) | [CONTACT US](#)

### PI Interfaces

#### PRODUCTS

- PI Servers
- Client Products
- Layered Products
- OPC
- Interfaces
- COM Connectors
- System Management
- RLINK
- ECHO
- PI Protocol Converter
- OSIsoft MDUS
- Prerequisite Kits

#### RELATED PRODUCTS

- COM Connectors

#### PI Interfaces Search

[Search](#)[List All](#)

- Standard
- Maintenance
- 3rd Party
- Non-Standard

Name	Platform	Current Version	Shipping Version	Part#	APS Status
Siemens RXS4 Meter	NTI	1.0.0.1	1.0.0.1	PI-IN-SI-RXS4-NT	
Siemens S5 PLC				See Comments	
Siemens S7 PLC				See Comments	
Siemens S7-200 PLC's				See Comments	
Siemens SIMATIC Batch Interface	NTI	1.0.1.0		PI-IN-SI-SBAT-NTI	
Siemens Simatic Net (TI-505, S5)	NTI	1.4.2.1	1.4.2.1	PI-IN-SI-SIMAT-NTI	
Siemens Simatic Net S7	NTI	1.0.0	1.0.0	PI-IN-SI-S7-NTI	
Siemens SINAUT				See Comments	



Connect

Collect data from hundreds of sources

Real-time

Relational

Transactional

Custom

Web Services

AMI

IT



## Software Fault-Tolerant System

- Interface Failover
- Buffering
- PI Server Replication
- *SDK Services (discovery, failover, and load distribution)*
- *N-way Buffering of Non-Interface Data (e.g. PI-SDK)*
- *Replication of Archive Edits among Server Nodes*
- *Promotion of Secondary Nodes on Primary Failure (configurable)*

## Near-Independent, Physically Separated Servers

- No hardware/network restrictions, no limit on Server nodes

## General Benefits

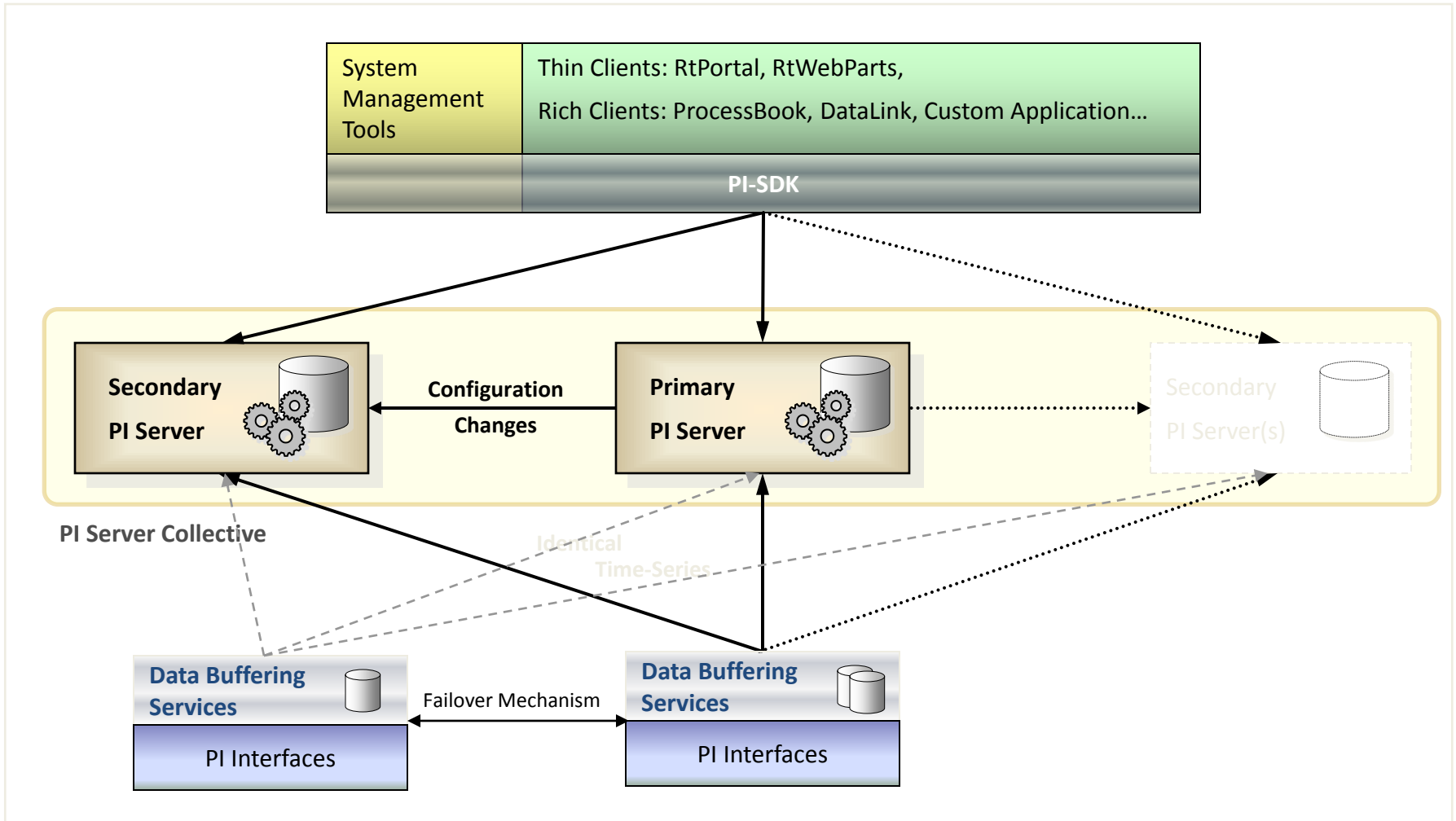
- Availability, end-USER sees one logical system
- Scalability, system load can be distributed
- Flexibility, accommodates your environment

## For IT and Management

- Reduced Total Cost of Ownership (TCO)
- Allows Disaster Recovery Plans

## Extra benefit: Hardware and Software just out of the box

# PI HA Architecture



## Designed for time series and non time series data:

- **High Performance (storage AND retrieval)**  
e.g. Timestamp Resolution - 15 µs; Sustained Read from Archive -300.000 values/sec  
and write 100.000 values/sec depends on hardware + multiple users
- **Scalability (no practical limits in growth)**  
System Size 1.000 to 2.000.000 Data Streams (32 bit) # 1.000 to 10.000.000 Data Streams (64 bit);  
Number of Users limited only by hardware
- **High Availability (backbone for business critical applications)**  
High Availability for Server collectives and Client failover, actual Part of Platform Release 1  
in development load balancing, peer-to-peer replication
- **Security (access to all data with no risk for operations)**  
Configuration & Data Security by Tag, Element and User
- **Extensibility (be prepared for unplanned integration)**  
Supported Standards like OPC DA, OPC HDA, OPC A&E, OPC XML-DA, ODBC, OLE DB, COM, .NET, SNMP, Perf.Counter
- **Crossing boundaries (technical, organizational, regional,... )**
- **Protection of investment: Integration of legacy systems**  
e.g. Data from 20 year old DCS shown in Excel Services
- **Unified data access to all operations**



Gather and archive large volumes of data. Scale to meet your business needs.

PI Server

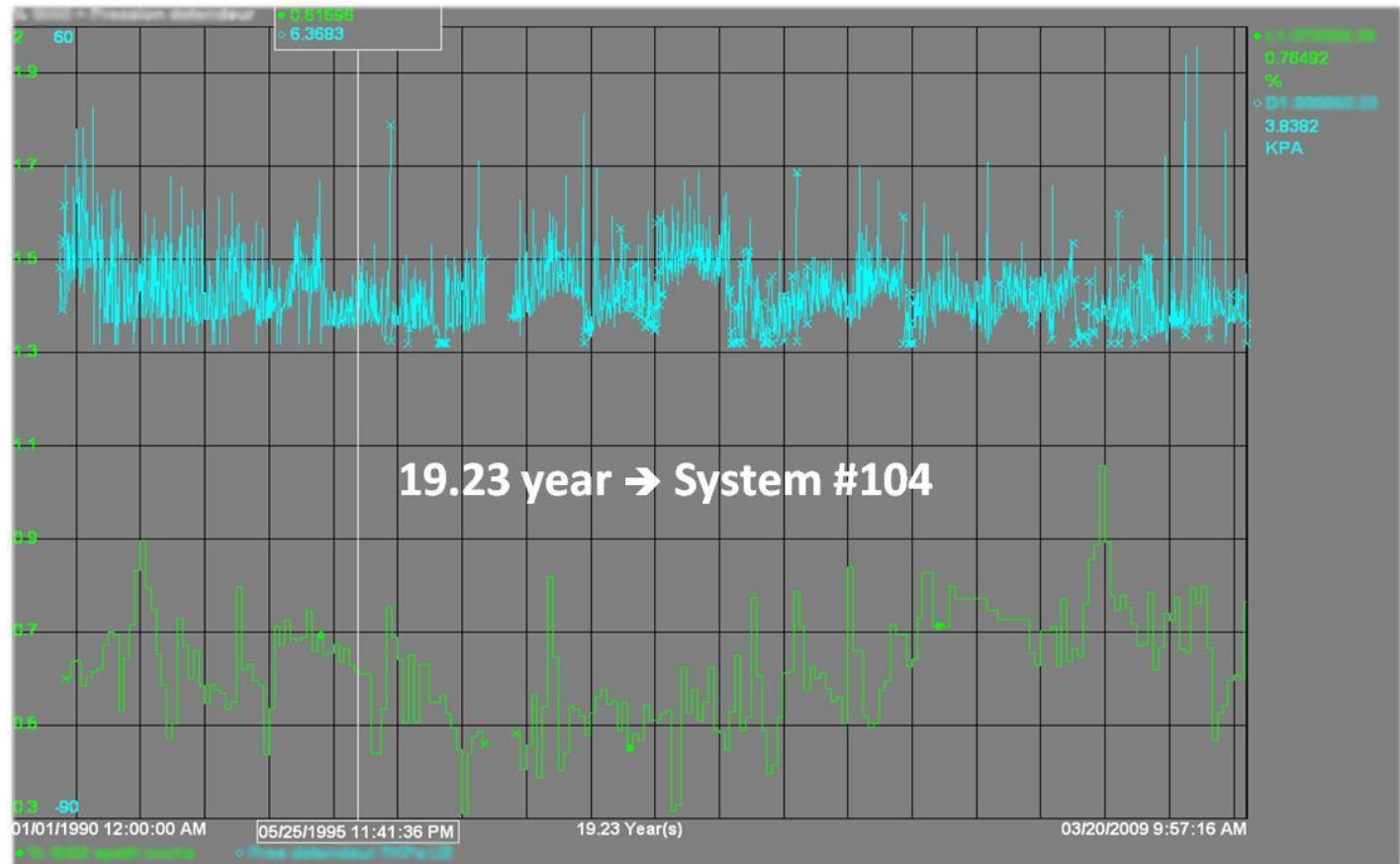
System Management

System Access

PI Asset Framework

## Reliably gather, archive and serve large volumes of data

*Designed for time series and non time series data*

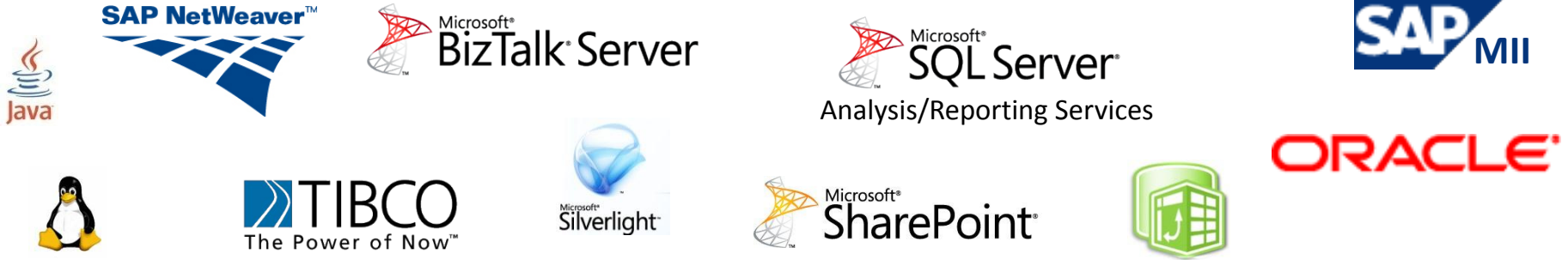


# The PI Data Access layer



- PI ODBC Client
- PI OLEDB Provider
- PI JDBC Driver
- OPC
  - OPC DA/HDA Server
  - OPC UA Server
- Web Services
  - PI Web Services
- SDKs
  - PI SDK
  - AF SDK

# Data Access: The 2010 Wave



PI JDBC Driver

PI Web Services 2010

PI OLEDB Enterprise 2010

OSIsoft SDKs


 Asset Information / Metadata

Notifications  
Analytics

Relational / Non Time Series Data



 PI Server

 PI Server Collective

Time Series Data

# What is PI AF 2.x ?



## PI AF 2.x is ...

A set of tools for organizing data around your processes, operations, facilities and organization to support an information model.

## Helping You to ...

structure your data in a meaningful way to search and view it in the right context so problems can be solved faster.





Gather and archive large volumes of data. Scale to meet your business needs.

- PI Server
- System Management
- System Access
- PI Asset Framework

## Contextualize, structurize and enrich data

*Represents the entire Asset Structure of the Plant*

### Shaping your data by:

#### 1. Defining types of assets

Schema how to attribute Elements



#### 2. Association to a "real" asset

Created from Template



#### 3. Describing the "real" asset

having Units Of Measurements (UOM)  
can come via data references from everywhere



#### 4. Physical/logical asset structure

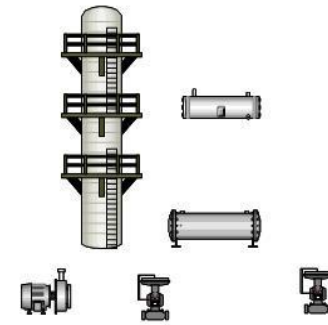


#### 5. Assets connectivity

Model : Collections of connected elements

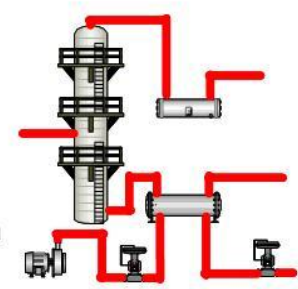
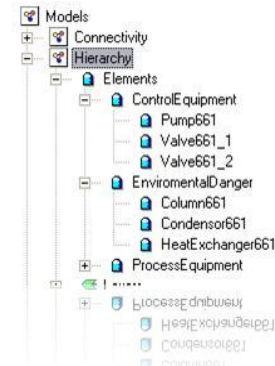


- Condensor
- Heatexchanger
- Column
- Valve
- Pipe
- Pump
  
- Column661
- Condensor661
- P661\_1
- P661\_2
- HeatExchanger661
- Valve661\_1
- Valve661\_2



OpeningGrade  
InspectionResult  
LastInspection  
SerialNumber  
XYZY

PIPoint: \\MOBILEVBC\Valve661\_1.OpeningGrade  
Table Lookup: SELECT InspectionResult FROM ...  
Table Lookup: SELECT LastInspection FROM ...  
Table Lookup: SELECT SerialNumber FROM ...  
Formula: A=OpeningGrade/[A\*0.98]

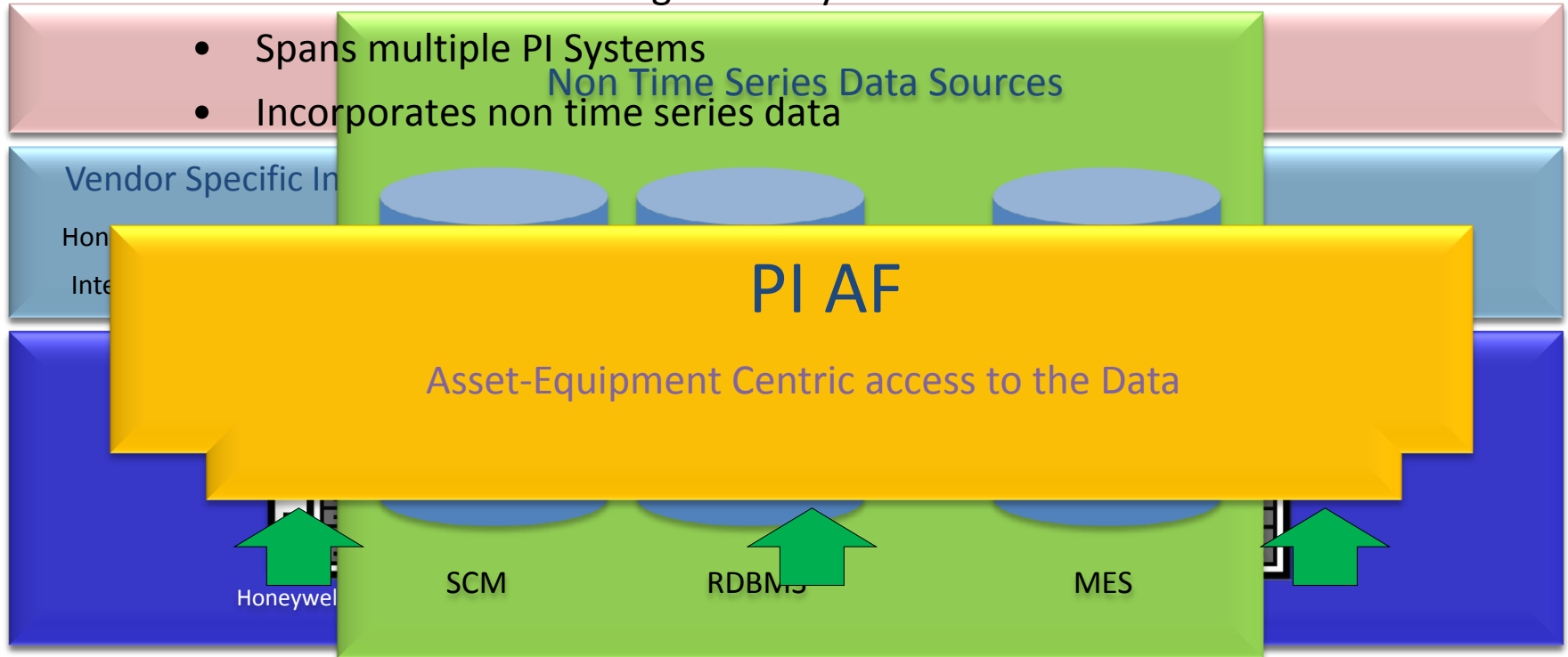


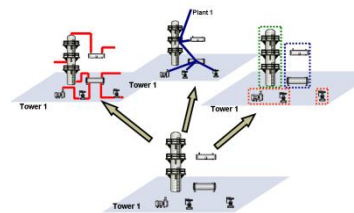
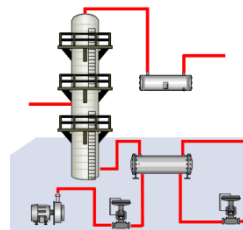
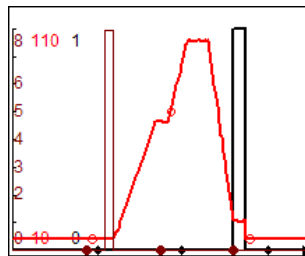
AF stands for either

- *Application Framework*
  - Users can build applications on top of AF
- *Analysis Framework*
  - AF is great to host calculations
- *Asset Framework*
  - AF is equipment centric

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

Non Time Series Data Sources





**History**

Connectivity

PI – Archive

**Context**

Aliasing

Versions

Hierarchies

**Connections**

Templating

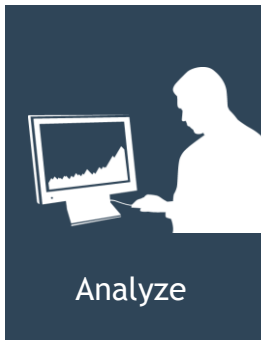
Flow sheeting

“foreign” data

Model analyses

**Unification**

“foreign” structures



Access real-time or historical role-based data for the entire enterprise at any time.

- Advanced Computing Agent
- Performance Equations
- PI Notifications
- PI Reports™
- Batch
- Statistical Quality Control (SQC)

## Convert real-time data into actionable information

*Measure and improve business performance*

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

**PI Notifications**

Tag Name	Test Value Type	Current Value	Clamping	Bad Value
Test1	Current Value	76.15478	No Clamping	No Substitution

**PI Notifications IM Service - \\SL3ITPIAF01\IT\Sites Depository (OAK)\Servers\Daredevil\Notifications[Dis...**

**PI Notifications**  
San Jose temperature is Out of Range

```
ent-max'  
nt-min') then  
  
ent-max'  
nt-min') then
```

Office Communications Server 2007 R2

- Pump daily uptime

```
TimeEQ('04:123PUMP_STAT.DC', 't', '*', "ON")/3600
```

- High/Low alarm on tank level with alarm reset every shift

```
If ( Hour('*') = 6 or Hour('*') = 18 ) and Minute('*') = 1 Then
  If (TagMIN('DC1-LI-005.PV', '*', '*-5m') >= 'UO-Niveau-Reservoir-Floculent-max'
  or TagMax('DC1-LI-005.PV', '*', '*-5m') <= 'UO-Niveau-Reservoir-Floculent-min') then
    1
  else 0
else Max(PrevVal('DC1-LI-005.PV.Alarme.RQ', '*-5s'),
  if (TagMIN('DC1-LI-005.PV', '*', '*-5m') >= 'UO-Niveau-Reservoir-Floculent-max'
  or TagMax('DC1-LI-005.PV', '*', '*-5m') <= 'UO-Niveau-Reservoir-Floculent-min') then
    1
  else 0)
```

# The PI Analytics :PI Totalizer



**Name & Type** | Sampling | Results | Archive | Security | System | Options | Summary

Name: Pump\_Starts  
Description: Number of start  
SourceTag: Statut\_Pompe  
Eng Units: Starts  
Point Type: Int32

**Totalizer Type**  
 Summary Calculation  Count Events  
 All Events  Events where value changes

**Name & Type** | Sampling | Results | Archive | Security | System | Options | Summary

**Write final results**  
 after a time period elapses  after a number of source events  
 based on a trigger event  continue forever (interim results ONLY)

**Details**  
Start schedule at: 0 Minute(s) after midnight  
Results every: 2 Minute(s)  Vary w/ DST

**Name & Type** | Sampling | Results | Archive | Security | System | Options | Summary

Whenever a new source tag event occurs  
 Periodically  Interpolate  Extrapolate  
Start schedule at: 0  
Sample every: 2

Whenever the event expression changes

Filter the source data with the following expression

**Name & Type** | Sampling | Results | Archive | Security | System | Options | Summary

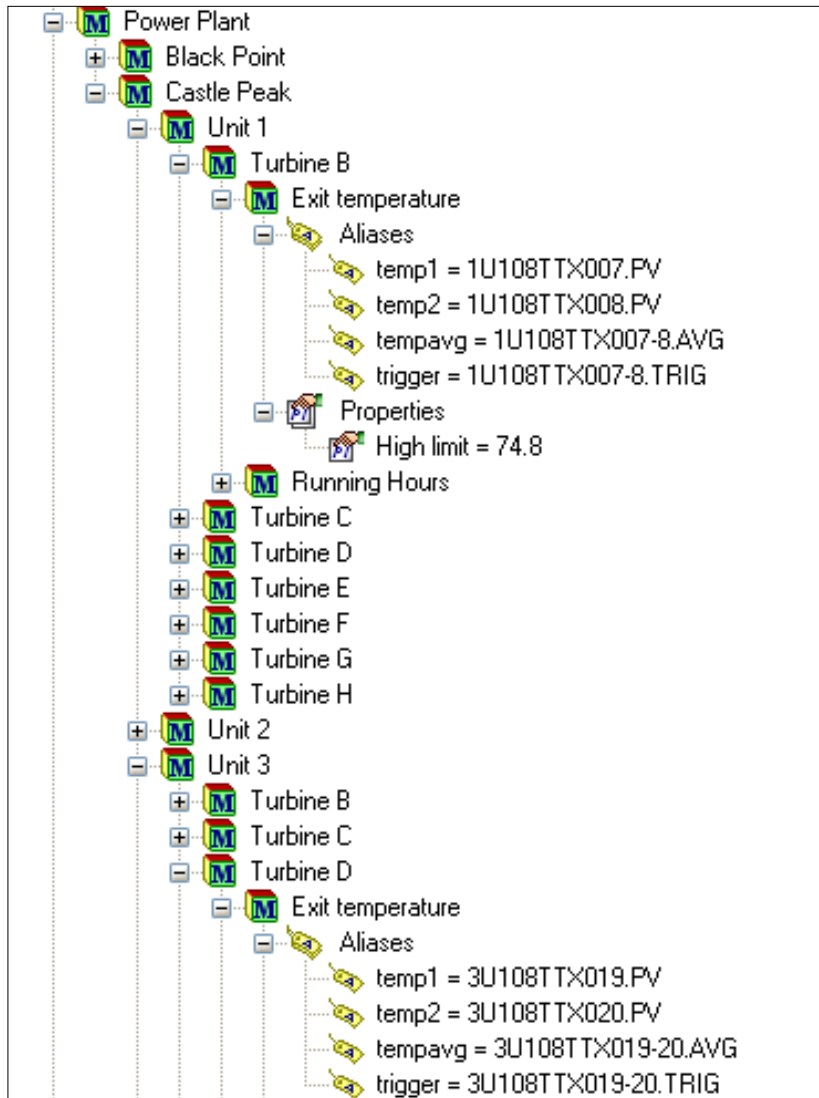
**Write final results**  
 start  at  period

Allow external reset  
 Use negative source values  
 Source tag is a DCS integrator  
 Close at end of the Sampling Period  
 Source OverRange is ZERO + SPAN  
 Use Source Tag BAD in place of "Bad Total"

Source UnderRange is:  zero  bad

Final result at:  start  end  both

Conversion Factor: 1  
Source = Zero below: 0  
Pct good values needed: 85



**Test**

Context: Wocalhost\Power Plant\Castle Peak\Unit 1\Turb Reference Time: \*

**Input Aliases**

Tag Name	Test Value Type	Current Value	Clamping	Bad Value
temp1	Current Value	76.15458	No Clamping	No Substitution
temp2	Current Value	74.56452	No Clamping	No Substitution

exit\_temp (Declarations)

```

Public dblLimit As Double

' Tag Name/VB Variable Name Correspondence Table
' Tag Name VB Variable Name
'-----
' temp1 temp1
' temp2 temp2
' tempavg tempavg
' trigger trigger

Public Overrides Sub ACECalculations()
    tempavg.Value = (temp1.Value + temp2.Value) / 2
    If tempavg.PrevVal() < dblLimit And tempavg.Value > dblLimit Then
        trigger.Value = 1
    Else
        trigger.Value = 0
    End If
End Sub

Protected Overrides Sub InitializePIACEPoints()...

' User-written module dependent initialization code

Protected Overrides Sub ModuleDependentInitialization()...

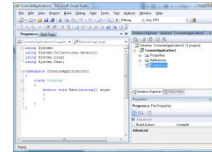
'...
Protected Overrides Sub ModuleDependentTermination()
End Sub
End Class
  
```



# PI & StreamInsight Platform



StreamInsight Application Development

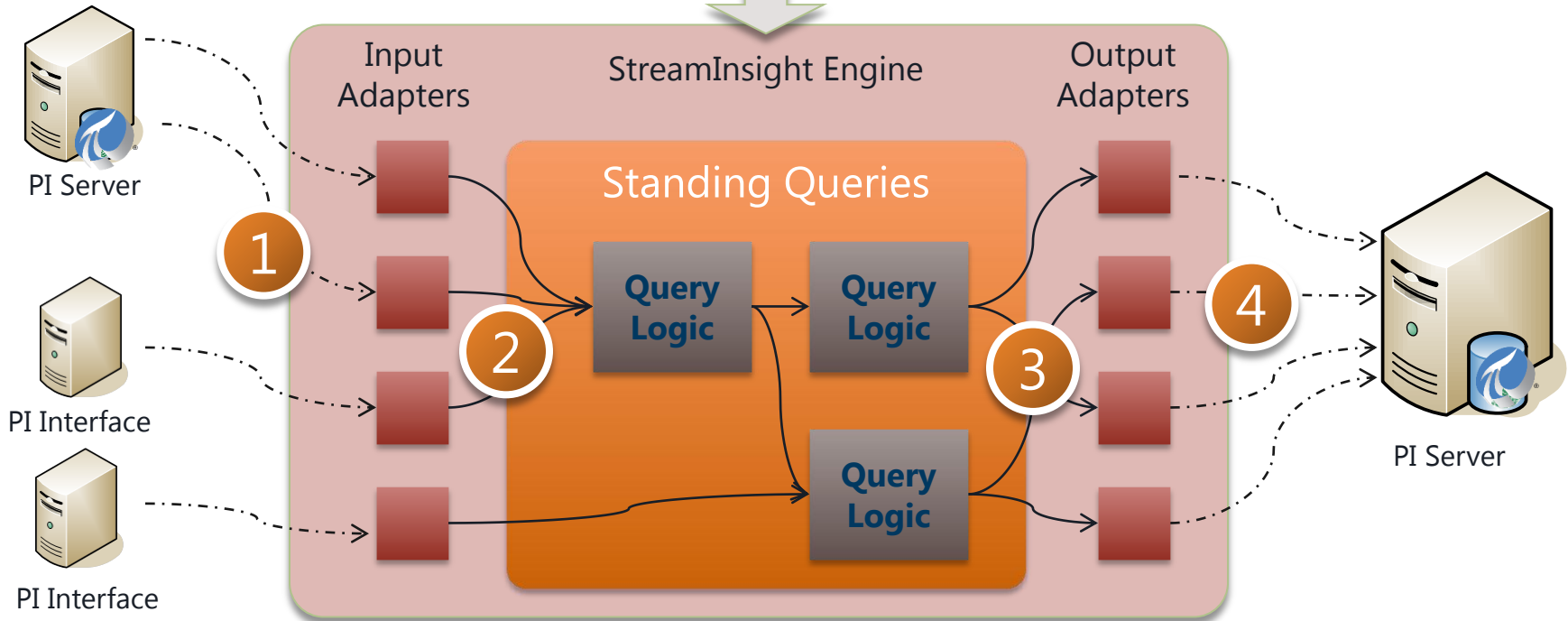


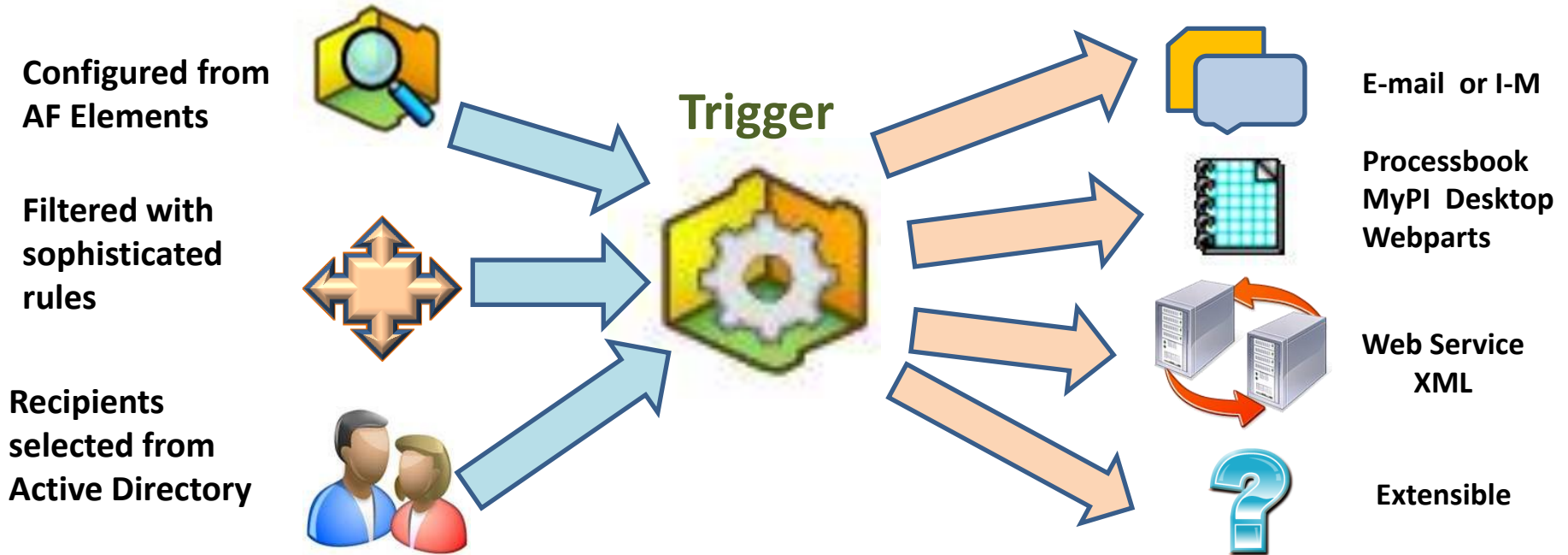
.NET  
C#  
LINQ

StreamInsight Application at Runtime

Event sources

Event targets





## Define information once

- Fewer errors
- Automatically in sync
- Maintenance can scale

## Override where necessary

- Change time rule
- Define specific content
- Add/modify subscribers

[Go See: Using Templates to Speed Up Configuration of Your PI System](#)

# PI for Office 2010

## PI Notifications and OCS



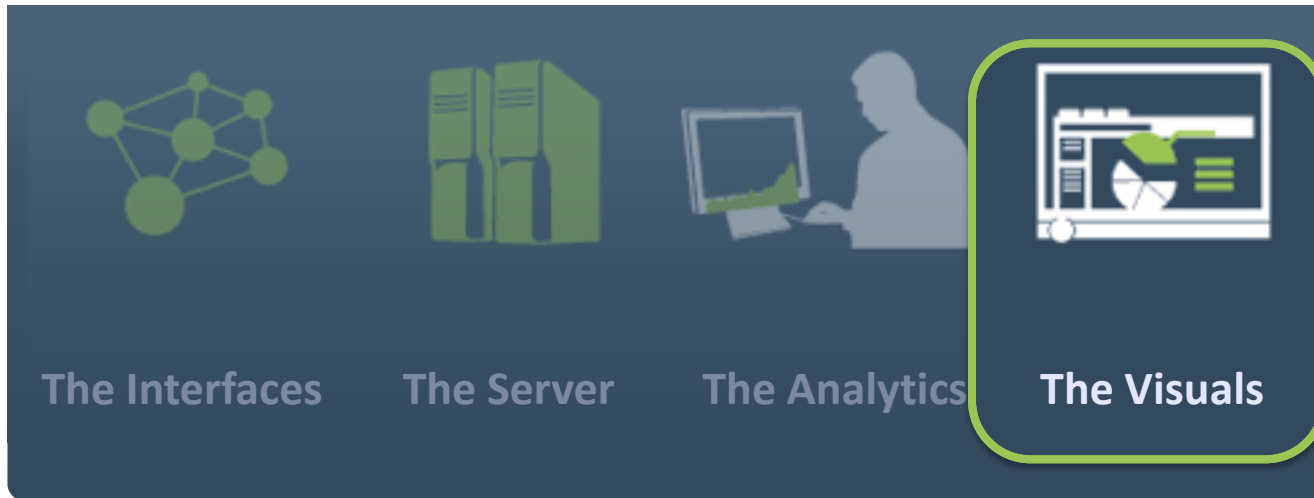
Office Communicator window showing a conversation with Alex Robinson. The contact is available. The conversation history shows a message from PI Notifications with the subject "San Jose performance is ...". The message content includes a link to "SouthRidge Video North America" and actions "Acknowledge" and "Acknowledge with Comment". A system message states: "Could not display a form related to this conversation, which may prevent access to some options. If this problem persists, contact your system administrator. Last message received on 2/18/2010 at 11:32 AM."

PI Notifications IM Service window showing a notification event. The event details are:

- Name:** Disk Space Low on Daredevil
- Server:** SL3ITPIAF01
- Database:** IT
- Start Time:** 10/19/2009 1:20:34 PM
- Trigger Time:** 10/19/2009 1:20:34 PM
- Target:** \\SL3ITPIAF01\IT\Sites Depository\OAK\Servers\Daredevil

The notification text reads: "Disk Space Low on Daredevil [Disk Space Low on Daredevil] generated a new notification event." Below the text is a graph titled "Plot0" showing "% Free Space is the ratio of the free sp...". The graph has a y-axis from 45 to 95 and a green line representing the data. The x-axis is labeled "Target: \\starlight\OAK\Daredevil LogicalDisk/".

At the bottom, a notification bubble from "PI Notifications" says "San Jose temperature is Out of Range".

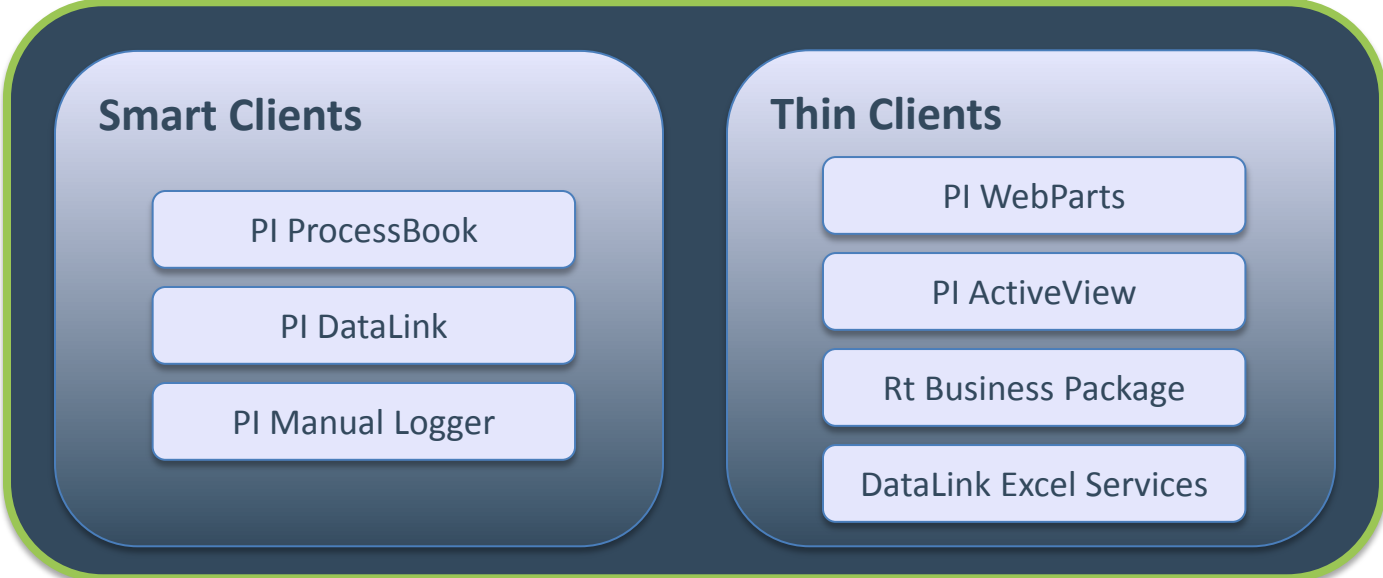


The decision makers can use the well-known tools like:

- OSIsoft PI ProcessBook
- 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.

# The PI System: Visualize



# Microsoft Business Intelligence

## Get more out of products you already own



### Business User Experience



### Business Collaboration Platform



### Data Infrastructure and BI Platform



#### Familiar User Experience

- Self-service Access and Insight
- Data Exploration and Analysis
- Predictive Analysis
- Data Visualization
- Contextual Visualization

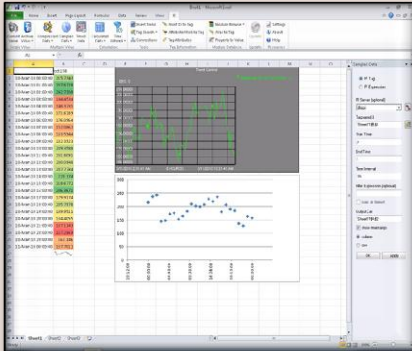
#### Integrated Content and Collaboration

- Thin Clients
- Dashboards
- BI Search
- Content Management
- Compositions

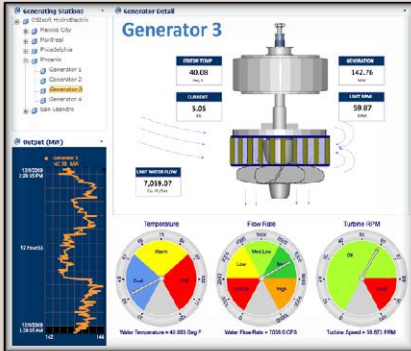
#### Data Infrastructure and BI Platform

- Analysis Services
- Reporting Services
- Integration Services
- Master Data
- Data Mining Services
- Data Warehousing

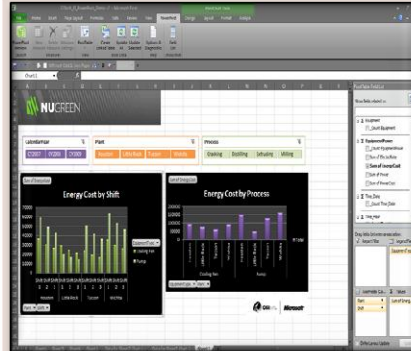
# PI for Office 2010



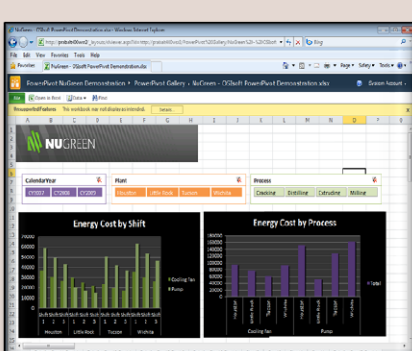
**PI DataLink for Excel 2010**



**PI WebParts for SharePoint 2010**



**PI and PowerPivot for Excel 2010**

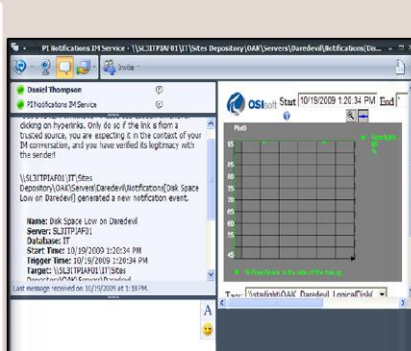


**PI and PowerPivot for SharePoint 2010**

**PI OLEDB Enterprise 2010**

**PI Web Services 2010**

**PI Data Access Technologies**



**PI Notifications 1.1 OCS R2 Delivery Channel**

## Gain a comprehensive view of operational information



Present

View data, identify problems, and take corrective action with familiar, easy-to-use graphical tools.

- ProcessBook®
- PI DataLink™
- DataLink for Excel Services
- PI BatchView
- PI WebParts™

**PI WebParts™**

**Crude Unit Overview**

**Web Part Page - Microsoft Internet Explorer**

Address: <http://shareberry.osisoft.com/sites/Curt/Billings/Billings%20Refinery.aspx>

**Billings Refinery**

**Process Performance**

Measurement	Target	Units	% Below	% On	% Above
Heavy Naptha 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**

**Pump Run-Time Hours**

Descriptor	Current State
Crude Charge A	0 / 2000
Crude Charge B	0 / 2000
Crude Charge C	0 / 2000
Crude Charge D	0 / 2000
Hvy. Naptha Draw B	0 / 3000
Hvy. Naptha Draw A	0 / 3000
Kerosene Draw A	0 / 1500
Kerosene Draw B	0 / 1500

**Lab Results**

Time	Value
2/28/2008 8:00:00 PM	178
3/1/2008	20.81
3/1/2008	20.81
3/2/2008	20.81

**Process Graphics**

**Workbook Provides System Organization**

**Provide Access to real time and historical process information for analysis and reporting**



# PI for Office 2010

## PI and PowerPivot for Excel 2010

OSIsoft\_Pi\_PowerPivot\_Demo - 2 - Microsoft Excel

**PowerPivot** | Design | Layout | Format | Analyze

File | Home | Insert | Page Layout | Formulas | Data | Review | View | **PowerPivot** | PivotTable | Create Linked Table | Update All | Update Selected | Options & Diagnostics | Field List

Chart 1

**NUGREEN**

**CalendarYear**: CY2007, CY2008, CY2009

**Plant**: Houston, Little Rock, Tucson, Wichita

**Process**: Cracking, Distilling, Extruding, Milling

**Energy Cost by Shift**

EquipmentType: Cooling Fan, Pump

Plant: Houston, Little Rock, Tucson, Wichita

Shift: 1, 2, 3

**Energy Cost by Process**

EquipmentType: Total

Plant: Houston, Little Rock, Tucson, Wichita

Process: Cooling Fan, Pump

**PivotTable Field List**

Show fields related to:

- Σ Equipment
  - \_Count Equipment
- Σ EquipmentPower
  - \_Count EquipmentPower
  - Sum of ElectricRate
  - Sum of EnergyCost**
  - Sum of Power
  - Sum of PowerCost
- Σ Time\_Date
  - \_Count Time\_Date
- Σ Time\_Hour

Drag fields between areas below:

Report Filter:  EquipmentType

Legend Fields...:  EquipmentType

Axis Fields (Ca...): Plant, Shift

Σ Values: Sum of Energ...

Defer Layout Update

Sheet6 | Sheet5 | Sheet4 | Sheet1 | Data for Sheet7 Chart 1 | Data for Sheet7 Chart 2 | Sheet7

EC14 - San Jose

My SharePoint Alex Robinson

**SAN JOSE KPIS**

Metric	Value	Timestamp
Real Time Total Power (kW)	4002.9	3/8/2010 2:02:38 PM
Real Time PUE	1.5701	3/8/2010 1:59:38 PM
30 Day Power Cost (\$M)	1.2503	3/8/2010 2:03:09 PM
30 Day Emission (MTCDE)	593.54	3/8/2010 2:03:09 PM

**SAN JOSE SIX MONTH POWER VIEW**

Power Monitoring — San Jose Total Power Six Month View (mW)

San Jose Total Real Time Power - Six Month View (mW)

9/8/2009 2:03:21 PM 181.04 Day(s) 3/8/2010 2:03:21 PM

%Capacity

PUE

1 2 3 4

Power - SAP Enterprise Portal 6.0 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://earth:50000/inj/portal

Welcome gretchen schwenzer

Search Advanced Search

Java Development Home Plant Management Content Administration User Administration System Administration PeoplesPages RTReports Collaboration Content Management Delegated User Administration Java Developer

RLINK-PM | Johns Page | Multi | RLINK-PPPI | Table | Release\_1\_1 | TableTemplate | Power | FirstEnergy

Power History Back Forward

### Gauge for Real Time Data

NOX - Number of Emission Excursions

SOX - Number of Emission Excursions

### KPI for Real Time Data

RTKPI

Display Group: All KPI Groups

Status	Description	Current Value	EngUnits	Target Value	% Diff	Date/Time	Action
■	Total Price	606.3	MMBtu	800	-24.213%	1/31/2006 9:33:00 AM	
●	Fuel Price	15.201	\$/MMBtu	15	1.34%	1/31/2006 9:38:00 AM	
■	Power Price	88.329	\$/MWh	300	-70.557%	1/31/2006 9:33:00 AM	
■	Heat Rate	15731	MMBtu	9500	65.589%	1/31/2006 9:28:30 AM	
●	Production	1353.1	MWh	900	50.344%	1/31/2006 9:37:00 AM	
■	Contracts	2199.2	MWh	0	2199.2%	1/31/2006 9:32:30 AM	

### Trend for Real Time Data

1/31/2006 5:38:14 AM 4 Hours 1/31/2006 9:38:14 AM

### Graphic for Real Time Data

#### Ponderosa Overview

190.3 MW, 223.9 KV, 150 MVAR, 11385, FGC-1, 382, 377, 84.6 Temp, DegF, 15.6 NOX, ppm, 11.1 NH3, ppm, 6.2 CO, ppm, 6.3 O2, %

25737, 251 gpm, 5451, 115, 51 kpph, 23.9, 47 kpph, 89.9 MVAR, 88.0 MW, 108.4 Feedwater, 39.1 Eff, 426.4 Fuel, 5256.6 Heat Rate

190.3 MW, 151.4 MVAR, 11385, FGC-2, 382, 377, 84.6 Temp, DegF, 15.6 NOX, ppm, 11.1 NH3, ppm, 6.2 CO, ppm, 6.3 O2, %

25737, 251 gpm, 5451, 115, 51 kpph, 23.9, 47 kpph, 89.9 MVAR, 88.0 MW, 108.4 Feedwater, 39.1 Eff, 426.4 Fuel, 5256.6 Heat Rate

### TreeView for Real Time Data

- PowerGeneration
  - RtGraphic
  - FossilFuel
    - Ponderosa
      - Active power
      - Ambient Air Pressure
      - Ambient Air Relative Humidity
      - Ambient Air Temperature
      - Heat rate
      - RtGraphic
        - HRSG-1
        - HRSG-2
        - Turbine 1



Thank you

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