Overview of The PI System

Presented by Frank Batke
Hans Otto Weinhold
Aggregation – PI System Data Infrastructure

ISA S95

Level 4: ERP

Level 3: MES
- Referenced Data
- Electronic Work Instructions

Level 2
- Batch Control
- Continuous Control
- Discrete Control

Level 1

Level 0: Equipment

Real-Time Data Infrastructure
Common Data Presentation Layer

PI System

PI Data Access
- PI Data Archive
- PI AF
- PI EF

Tag Data
- Assets & Attributes
- Event Frames & Attributes

OSIsoft PI System Data Infrastructure
Making available data from many sources, most often databases.
From Tag to Asset

30+ Years of experience
Going Asset centric

PI Processbook
PI Datalink
PI Batch
Performance Equations

PI ACE
RtReports
Module relative Displays

PI Asset Framework

PI Notifications
Element relative displays
PI Coresight
PI Webparts
Asset based Analytics

Infrastructure
“foreign data”
“foreign” structures
time series and non time series
EventFrames
Versions

PI Asset Framework
2.x

History
Connectivity
Time series

PI Data Archive

Context
Alias
Versions
Hierarchies
Module database

Connections
Templates
Flow sheets
“foreign” data

Asset
Element
Module
Tag

1.x

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## See the full picture

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### Asset structure
- **Sensor**
- **Equipment**
- **Process unit/plant**
- **Enterprise**

- Empire Inc.
- Food
- Hanau
- Munich
- Berne
- Brest
- Chemicals
AF = Asset Framework
Find, Analyze, Deliver

PI ACE
Advanced Computing Engine

PI System Access – PSA
- PI SDK
- AF SDK (includes AN/EF SDK)
- PI OLEDB / PI OLEDB Enterprise
- PI JDBC
- PI ODBC
- PI OPC DA/HDA Server
- PI WebServices – SOAP
- PI WebAPI – REST - ODATA
- PI API (Runtime, no Development)

PI Notifications
Trigger

PI SQC
Statistical Quality Control

Asset Based Analytics

Boiler Efficiency = AVG(B1..Bn)
Boiler1
Flow Out
Fuel Flow Rate
Efficiency = (Flow Out / Fuel Flow Rate * 3.14)
Or myProgrammedCalc (Flow Out, Fuel Flow Rate)

Boiler2
Flow Out
Fuel Flow Rate
Efficiency

Boiler3
Flow Out
Fuel Flow Rate
Efficiency

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### Where?

To run the analysis:
- Performance
- Rollout
- Availability

- Client
- Server

### When?

To run the analysis:
- Data retrieval
- Consumer constraints
- Performance

- On event
- On Time Schedule
- On Condition
- Ad hoc
- Recalculate

### What?

Is hosting the algorithm:
- Validation
- Reuse existing investment
- Performance

- Formula (Expression)
- .NET code
- Existing DLL
- 3rd party app

### Context?

What “object” is analysed
- Reusability
- Consistency
- Rollout

- Tag
- Module
- Asset
- Asset Template
- Asset structure

### Result?

Storage place:
- Reusability
- Consistency
- Performance
- Availability
- Validation

- Single Tag
- Multiple Tags
- Event frame
- Action
- Notification
## Analysis Needs Context

<table>
<thead>
<tr>
<th>Time Series Modules</th>
<th>Time Series non Time Series Assets</th>
<th>Asset based Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Equations (PE)</td>
<td>Advanced Computing Engine (ACE)</td>
<td>AF Formula Data Reference</td>
</tr>
</tbody>
</table>

- **sensor**
- **equipment**
- **process unit / plant**
- **enterprise**

Analysis brought into context becomes **reusable** and allows **single point of maintenance**
## Calculations in PI

<table>
<thead>
<tr>
<th>What combination to RUN?</th>
<th>PI Performance Equations</th>
<th>PI Datalink Expression</th>
<th>PIProcessbook Expression</th>
<th>PI ACE</th>
<th>PI AF Formula DR</th>
<th>PI Notifications</th>
<th>PI Asset Based Analytics</th>
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<tr>
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<td>On event</td>
<td>On only</td>
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<tr>
<td>On Time Schedule</td>
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<td>On Condition</td>
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<tr>
<td>Ad hoc</td>
<td>X</td>
<td>X</td>
<td>via Webservice</td>
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<tr>
<td>.NET code</td>
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<td>via SDK</td>
<td>planned</td>
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<td>DLL</td>
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<td>via SDK</td>
<td>planned</td>
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<td>3rd party app</td>
<td>VBA</td>
<td>VBA</td>
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<td>via SDK</td>
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<td>Asset</td>
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<td>via AF Link Subsystem</td>
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<tr>
<td>Eventframe</td>
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<td>via SDK</td>
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<td>via SDK</td>
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<tr>
<td>Action</td>
<td>VBA</td>
<td>VBA</td>
<td>.NET</td>
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<td>X</td>
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</tbody>
</table>
Visualize

**PI Coresight:**
Ad Hoc Analysis & Collaboration
Going mobile

**PI WebParts:**
Composite Apps, Shared broadly
Integration into Portal

**PI ProcessBook:**
Display authoring and Process monitoring

**PI DataLink:**
Reporting using Microsoft Excel as front end
## Demo 1: Assets and Visualisation

<table>
<thead>
<tr>
<th>Context based Visualisation</th>
<th>Element relative Display</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Trend</td>
</tr>
<tr>
<td></td>
<td>• Element name</td>
</tr>
<tr>
<td></td>
<td>• Value</td>
</tr>
<tr>
<td></td>
<td>• X-Y Plot</td>
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</table>

<table>
<thead>
<tr>
<th>Template and Symbol</th>
<th>Model Builder (Processbook 2014 !)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Add a attribute</td>
</tr>
<tr>
<td></td>
<td>• New Composite</td>
</tr>
<tr>
<td></td>
<td>• Resync</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What about good old Excel</th>
<th>PI Datalink</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• From Tag</td>
</tr>
<tr>
<td></td>
<td>• From Attribute</td>
</tr>
</tbody>
</table>
What about the world outside of PI?

Or

How to use my existing investment?
PI System Access

Relational / Non Time Series Data

PI JDBC

PI Web Services (SOAP/REST)

PI OLEDB Enterprise

PI OPC DA/HDA Server

OSIsoft SDKs

Asset Information / Metadata

Notifications

Analytics

PI Data Archive

PI Data Archive Collective

Time Series Data

Microsoft SQL Server

Microsoft BizTalk Server

SAP NetWeaver

IBM Maximo

TIBCO

SharePoint

Silverlight

MathWorks

Certified

Java

SAP MII

Oracle

PI System Access

Empowering Business in Real-time.
## Data access support

<table>
<thead>
<tr>
<th>Product</th>
<th>Real-time</th>
<th>Archive</th>
<th>Metadata (AF)</th>
<th>Event Frames</th>
<th>Write data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLE DB &amp; OLE DB Enterprise</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, Enterprise only</td>
<td>Yes, Enterprise only</td>
<td>No</td>
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<tr>
<td>JDBC</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>ODBC 2014*</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>tbc</td>
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<td>PI Web Services</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>PI System SDK (AF SDK)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>PI SDK</td>
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<td>No</td>
<td>No</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
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</tbody>
</table>

* Release in 2014, support tbc

- Table is for summary purposes only. Consult manuals/OSIsoft to verify functionality
PI Developer Platform

- Open
- Deprecated
- Restricted

AF Extensions:
- Data References
- Time Rules
- Analysis Rules
- Notification channels
<table>
<thead>
<tr>
<th>Use your existing investment:</th>
<th>Use your NEW investment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerPivot (since Office 2010)</td>
<td>PowerBI (since Office 2013/365)</td>
</tr>
<tr>
<td>Create Datasource PI OLEDB Enterprise</td>
<td>Create Datasource PI WebAPI ODATA (beta)</td>
</tr>
<tr>
<td>Create Pivot (t.b.c. by Microsoft)</td>
<td>Create Powerview</td>
</tr>
</tbody>
</table>
THANK YOU