

PI Asset Framework (AF) Speeds Up Time To Solution

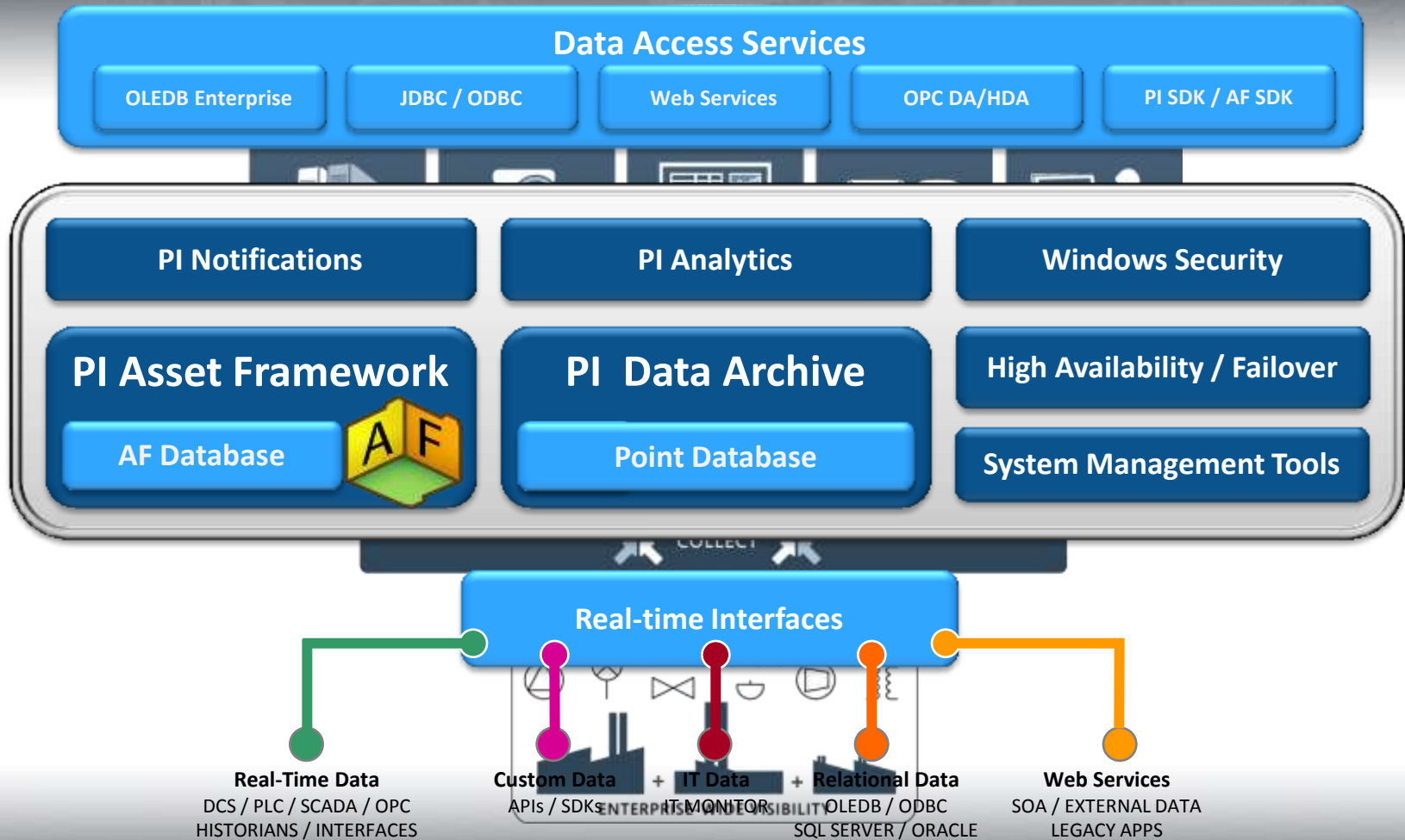
Presented By:

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Stephen Kwan, OSIsoft



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PI Server 2010



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PI AF Elements and Attributes

- Elements represent physical or logical entities
 - Attributes and attribute templates define properties
 - Object Types to help define relationships
 - Categories for classifications
 - References to define relationship between Elements/Attributes
- Element Templates can be created and reused for consistency – changes are propagated to each instance
- Can be created without an Element Template
- Can be organized in hierarchical structure or connectivity models



PI AF Elements

AMI Demo - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Element Search

Elements

- Elements
 - Arizona
 - By household categories
 - By industries
 - California
 - Distribution grid
 - LV-01_A1-001
 - LV-01_A1-002
 - LV-01_A1-003
 - LV-01_A1-004
 - LV-01_A1-005
 - LV-01_A1-006
 - LV-01_A1-007
 - LV-01_A1-008
 - LV-01_A1-009
 - LV-01_A1-010
 - LV-01_A1-011
 - LV-01_A1-012
 - LV-01_A1-013
 - LV-01_A1-014
 - LV-01_A1-015
 - LV-01_A1-016
 - LV-01_A1-017
 - LV-01_A1-018
 - LV-01_A1-019
 - LV-01_A1-020
 - LV-01_A1-021
- Event Frames
- Library
- Unit of Measure

Elements

Group by: ☐ Category ☐ Template

Search

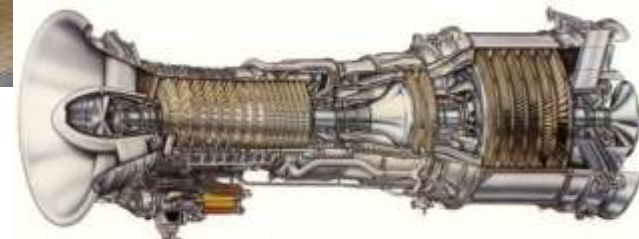
Name	Description	Category	Type	Template
AMI Demo Elements				
Arizona	Non physical entity d...		Other	Area
By household categories	Model use to define ...		Other	Hierarchical...
By industries	Model use to define ...		Other	Hierarchical...
California	Non physical entity d...		Other	Area
San Diego	Geographical location		Node	Location
District 01	Non physical entity d...		Other	Area
District 02	Non physical entity d...		Other	Area
District 03	Non physical entity d...		Other	Area
Neighborhood A1	Non physical entity d...		Other	Area
Neighborhood A2	Non physical entity d...		Other	Area
SD-03_A2-001	ABB power meter	Extended family; Gas heating/cooling; Household; Zone 3	Measurement	PowerMete...
SD-03_A2-002	GE power meter	Extended family; Gas heating/cooling; Household; Zone 4	Measurement	PowerMete...
SD-03_A2-003	Siemens power meter	Household; Single family - no children; Solar heating/cooling; Z...	Measurement	PowerMete...
SD-03_A2-004	Siemens power meter	Business; Geothermic heating/cooling; Industrial Super Heavy; ...	Measurement	PowerMete...
SD-03_A2-005	Siemens power meter	Business; Gas heating/cooling; Industrial Heavy; Zone 5	Measurement	PowerMete...
SD-03_A2-006	Siemens power meter	Electrical heating/cooling; Household; Single family - no childre...	Measurement	PowerMete...
SD-03_A2-007	ABB power meter	Business; Industrial Heavy; Solar heating/cooling; Zone 5	Measurement	PowerMete...
SD-03_A2-008	GE power meter	Electrical heating/cooling; Household; Small community; Zone 2	Measurement	PowerMete...

SD-03_A2-002 Modified:8/3/2010 10:10:26 AM. Version: 1/1/1970 12:00:00 AM, Revision 1

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Element Template/Attributes

- PI AF Element Attributes:
 - Static Values
 - Name plate information
 - Operating limits
 - Data References
 - Time series data – PI Tags and PI Tag
 - Relational data
 - Tables
 - Formulas/Calculations
 - Units of Measure (UOM)



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PI AF Benefits

- Exposes an intuitive, asset centric view of your data for everyone to consume
 - No need to memorize point/tag names
 - Single version of the Truth
 - Common asset models and relationships
 - Search and find information
 - Data references to time series, relational and other data
 - Communication & Collaboration
 - Knowledge Management



About AF

Who: Asle Frantzen
What: Software Engineer
Where: Norway

Amitec is a Value Added Reseller (VAR) for OSIsoft, and has been a partner since 1996



Experiences from Project

- Customer in the Oil & Gas sector
 - Offshore operation – North Sea
 - Company's first operatorship
- Building everything from scratch
 - New organization / people
 - New Oil/Gas rig
 - Cooperation with experienced oil field developer

Asset Management

- Customer uses a system called COMOS
 - Life Cycle Asset Information Management system
 - Instruments, gauges, valves, etc. (production)
 - » *AND*
 - Heaters, fire extinguishers, etc. (living quarters)



COMOS

Comos - [1|H|T|PFB.1 P&ID A1 DIN 2481]

File Edit View Administrator Extra Windows Help A C4 Power plant label according KKS default

Installations Locations

1HTK10AM001-M01 Mi

Installation according to KKS

- B Power lines and own requirement
- H Conventional heat generation
- T Chemical flue gas treatment in
 - A Flue gas channel system
 - D Flue gas scrubbing ~» 7
 - E Flue gas scrubbing and fill
 - F Absorption circuit ~» 99
 - K Absorption medium treatment
 - 10 Continuous number
 - A Aggregates
 - A Armatures with
 - M Mixing-, agitator
 - 001 Agitator
 - M01 Motor
 - P Pumps
 - B Apparatus
 - C Direct measuring
 - 15 Continuous number
 - PFB.1 P&ID A1 DIN 2481 »
 - PFB.2 P&ID A1 DIN 2481 »
 - Q Processwater ~» 01GHI
 - T Draining system
 - W Blocking medium supply
 - K Nuclear-technical auxiliary installation
 - U Buildings

3-phase, single speed, with ground

1HTK10AM001-M01 Motor 07.06.2004 x=294 y=251 Total objects: 21734 To save: 0

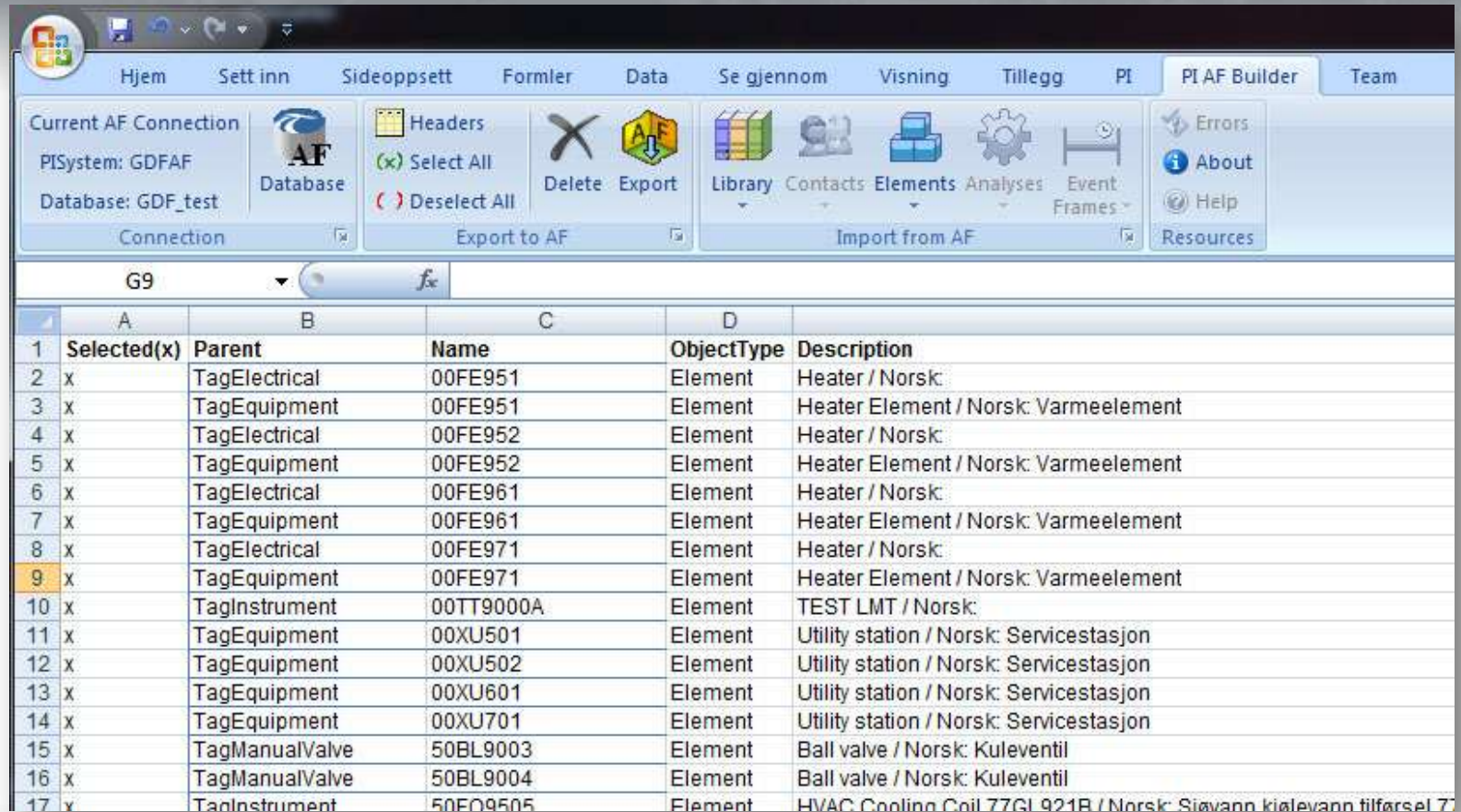
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Ways of Importing Data into PI AF

- Using the AFBUILDER plugin for Excel
 - *Requires configuration (GUI)*
- Using the AFImport command line tool
 - *Requires data preparation*
- Using the PI AF SDK
 - *Requires coding*



AFBuilder Plugin for Excel



	A	B	C	D	Description
1	Selected(x)	Parent	Name	ObjectType	
2	x	TagElectrical	00FE951	Element	Heater / Norsk:
3	x	TagEquipment	00FE951	Element	Heater Element / Norsk: Varmeelement
4	x	TagElectrical	00FE952	Element	Heater / Norsk:
5	x	TagEquipment	00FE952	Element	Heater Element / Norsk: Varmeelement
6	x	TagElectrical	00FE961	Element	Heater / Norsk:
7	x	TagEquipment	00FE961	Element	Heater Element / Norsk: Varmeelement
8	x	TagElectrical	00FE971	Element	Heater / Norsk:
9	x	TagEquipment	00FE971	Element	Heater Element / Norsk: Varmeelement
10	x	TagInstrument	00TT9000A	Element	TEST LMT / Norsk:
11	x	TagEquipment	00XU501	Element	Utility station / Norsk: Servicestasjon
12	x	TagEquipment	00XU502	Element	Utility station / Norsk: Servicestasjon
13	x	TagEquipment	00XU601	Element	Utility station / Norsk: Servicestasjon
14	x	TagEquipment	00XU701	Element	Utility station / Norsk: Servicestasjon
15	x	TagManualValve	50BL9003	Element	Ball valve / Norsk: Kuleventil
16	x	TagManualValve	50BL9004	Element	Ball valve / Norsk: Kuleventil
17	x	TagInstrument	50EQ9505	Element	HVAC Cooling Coil 77GL 921B / Norsk: Sivann kjølevann tilførsel 77

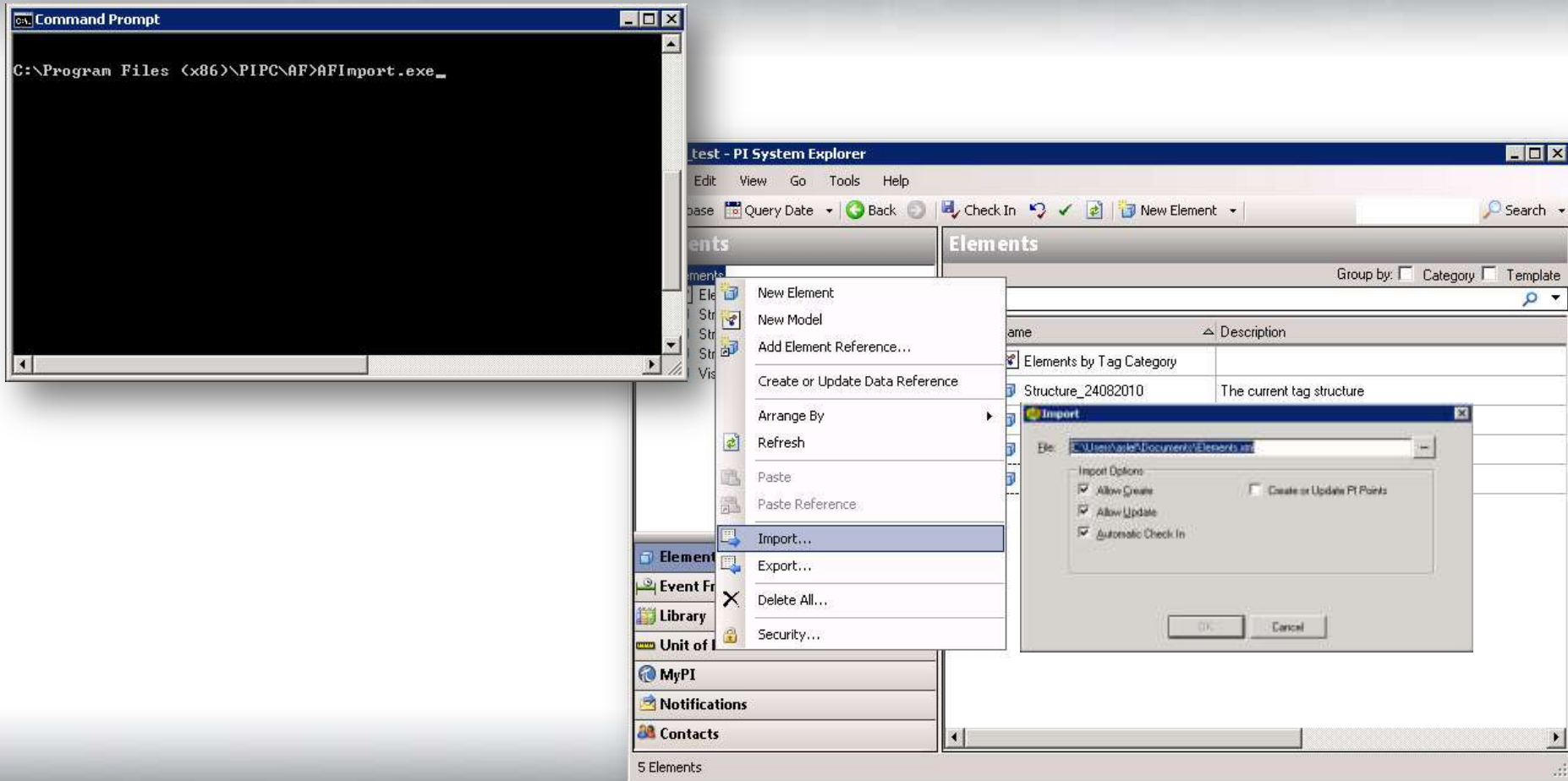
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AFBuilder Plugin for Excel

- Testing the performance:
 - Amount of records: 13.500
 - Time spent: 314 minutes (5 hrs 14 mins)
 - Avg: 43 elements / minute

AFImport Command Line Tool

(Same as importing in PI System Explorer)



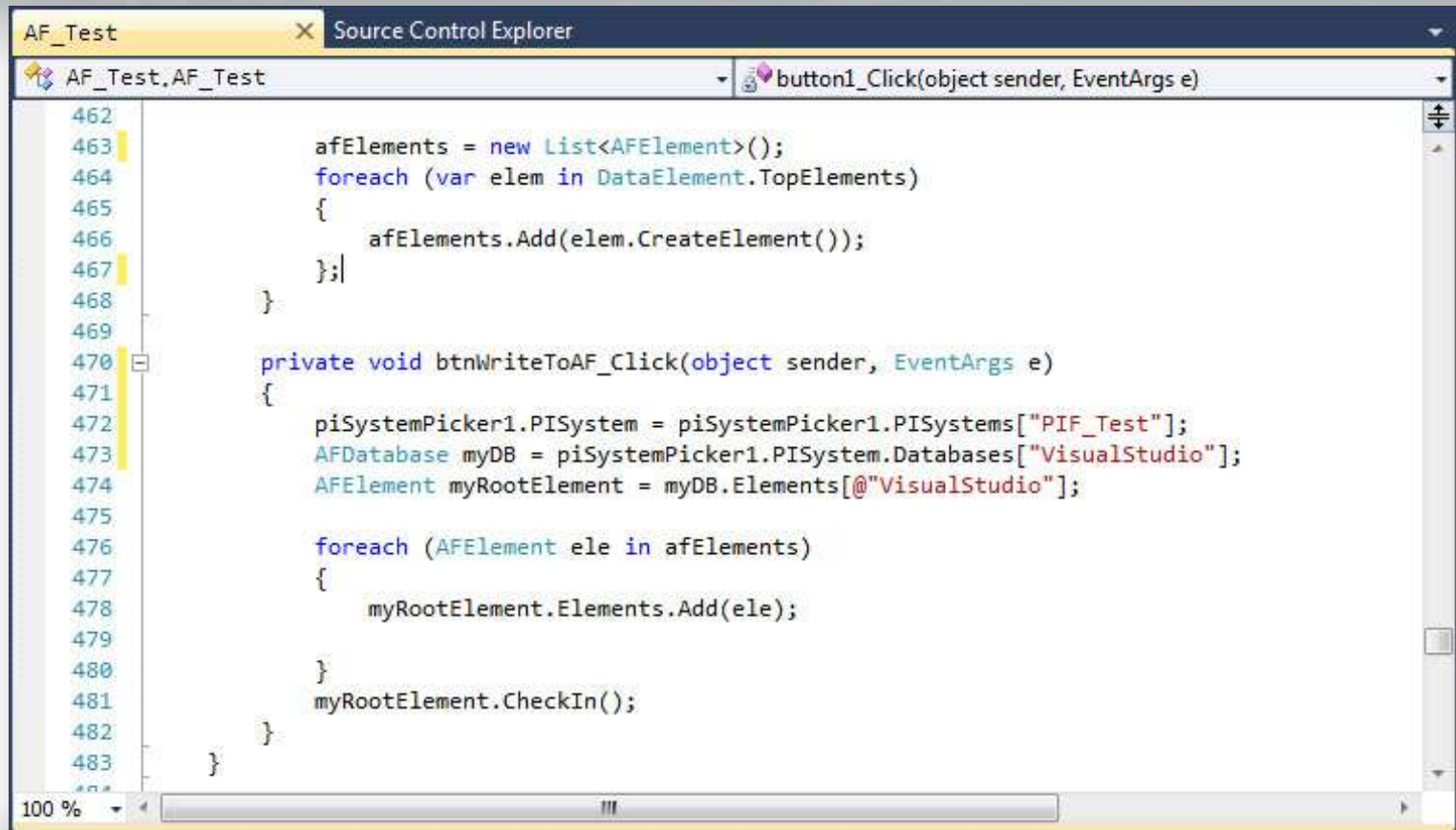
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AImport Command Line Tool

(Same as importing in PI System Explorer)

- Testing the performance:
 - Amount of records: 13.500
 - Time spent: 20 minutes 52 seconds
 - Avg: 647 elements / minute

PI AF SDK in Visual Studio



```
462
463     afElements = new List<AFEElement>();
464     foreach (var elem in DataElement.TopElements)
465     {
466         afElements.Add(elem.CreateElement());
467     };
468 }
469
470 private void btnWriteToAF_Click(object sender, EventArgs e)
471 {
472     piSystemPicker1.PISystem = piSystemPicker1.PISystems["PIF_Test"];
473     AFDatabase myDB = piSystemPicker1.PISystem.Databases["VisualStudio"];
474     AFElement myRootElement = myDB.Elements["@VisualStudio"];
475
476     foreach (AFEElement ele in afElements)
477     {
478         myRootElement.Elements.Add(ele);
479     }
480     myRootElement.CheckIn();
481 }
482
483 }
```

PI AF SDK in Visual Studio

- Testing the performance:
 - Avg: 42 elements / minute *

** Quick test done without any form of code optimization*

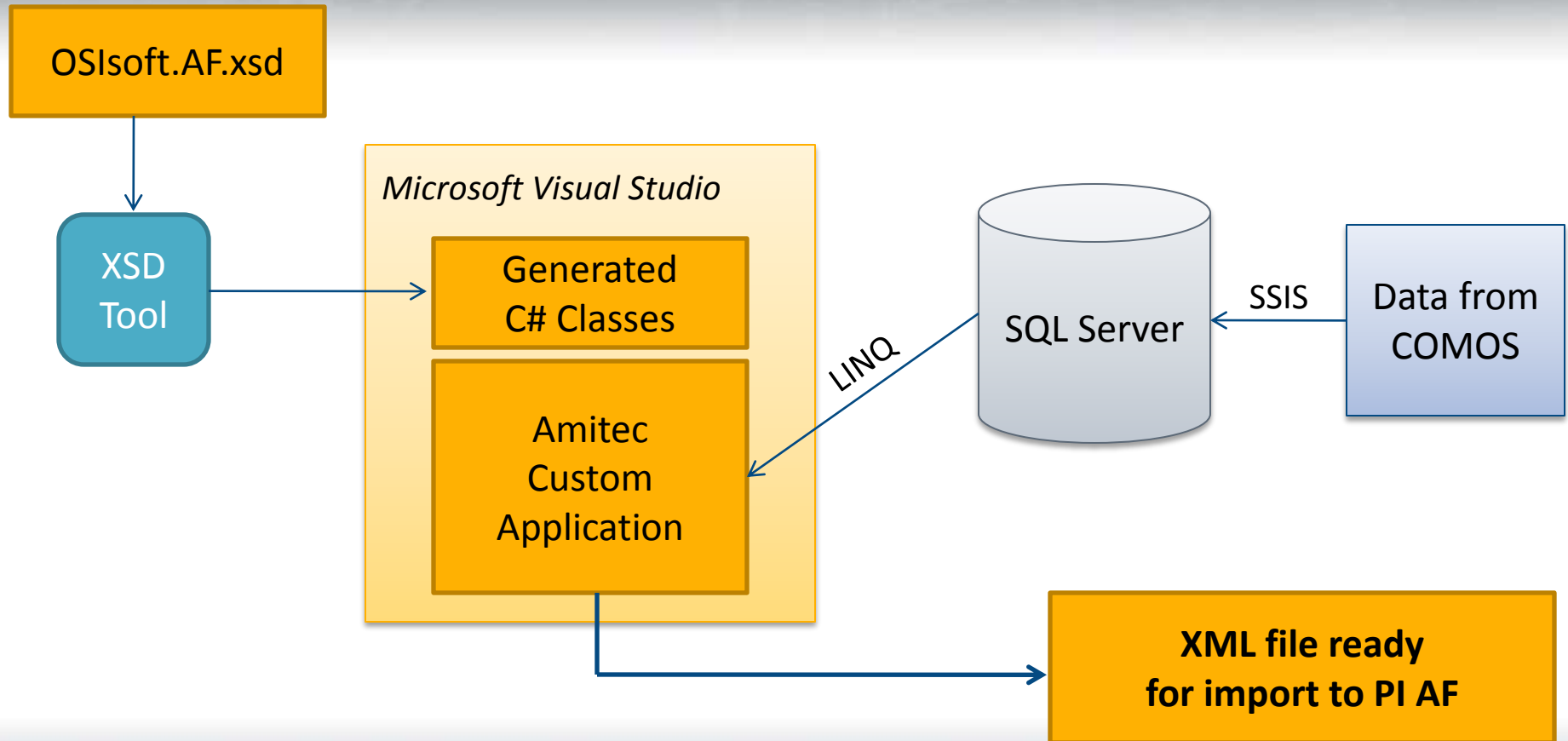


Our Preferred Way

AFImport command line tool



Preparing the Data



Generating the Data

- First attempt:
 - Generated XML file in appr. 30 seconds
 - 7.2 Million lines / 256 MB
 - 133.430 elements, with 5-10 attributes each
- Imported to AF:
 - Total time of 245 minutes (4 hrs 5 mins)
 - Avg: 544 elements / minute

Optimizing Speed with Templates

Element with attributes

General | Attribute Templates | Ports

Filter

Name	Description	Default Value	Data Reference
Discipline			<None>
Function Code			<None>
Function Code Descripti...			Table Lookup
Is Electrical Consumer		False	<None>
Is Field Equipment		False	<None>
Location code			<None>
Norsok component descri...			<None>
Object State			<None>
Overall Category			<None>
PI Tag value		0	PI Point
Sequence No.			<None>
System Code		00	<None>
System Code Description			Table Lookup
Tag Category			<None>

Group by: ☐ Category

Name: PI Tag value

Description:

Configuration Item: ☐ Indexed: ☐

Categories:

UDM: <None>

Value Type: Double

Default Value: 0

Data Reference: PI Point

Settings...

\\%Server%\%Element%

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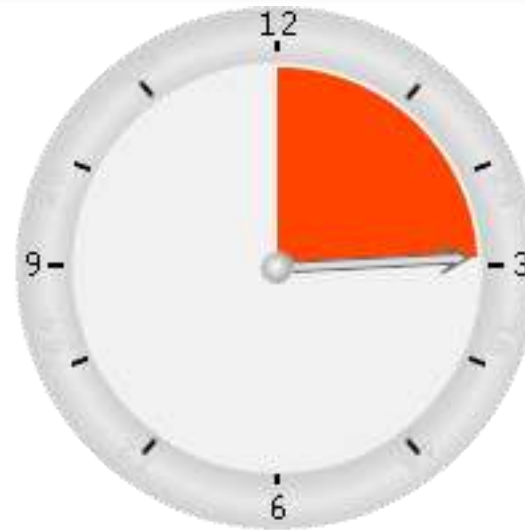
Generating the Data

- Second attempt – using Element Template:
 - Generated XML file in appr. 25 seconds
 - 5.5 Million lines / 190 MB
 - 133.430 elements based on an Element Template
- Imported to PI AF:
 - Total time of 175 minutes (2 hrs 55 mins)
 - Avg: 762 elements / minute

Generating the Data

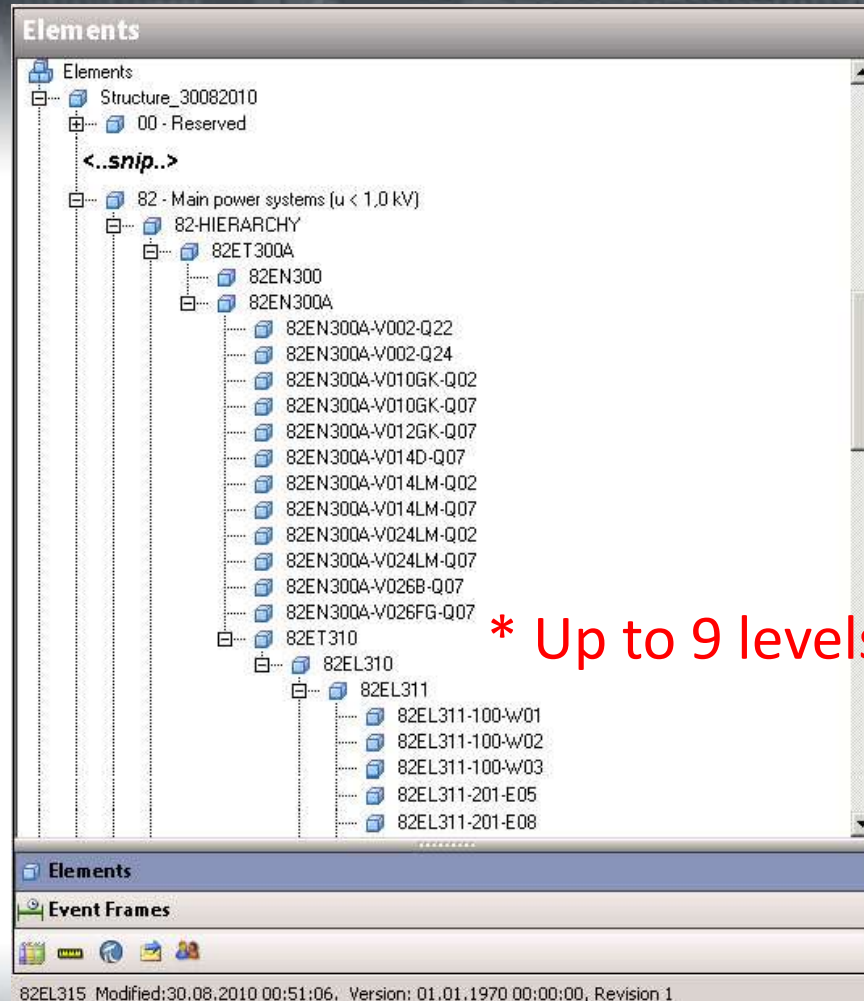


Without Template



With Template

The Imported Tag Structure



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PI AF = Value for the Users

PIF_test - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Element New Attribute Search

Elements

- Structure_30082010
 - 00 - Reserved
 - 13 - Riser and well systems topside
 - 18 - Riser and well systems subsea
 - 19 - Sub sea installation, maintenance and work-o
 - 20 - Separation and stabilization system
 - 20-CABEL
 - 20-HIERARCHY
 - 20JX061
 - 20JX062
 - 20PG051A
 - 20AP2268
 - 20CS001
 - 20CS051A
 - 20FO4313
 - 20HA003A
 - 20PI4310
 - 20TI4311
 - 20VX001A
 - 20PI4312
 - 20VX002
 - 20ER051A
 - 20FO2253
 - 20FT2252
 - 20HV1004

20PI4312

General Child Elements Attributes Ports Version

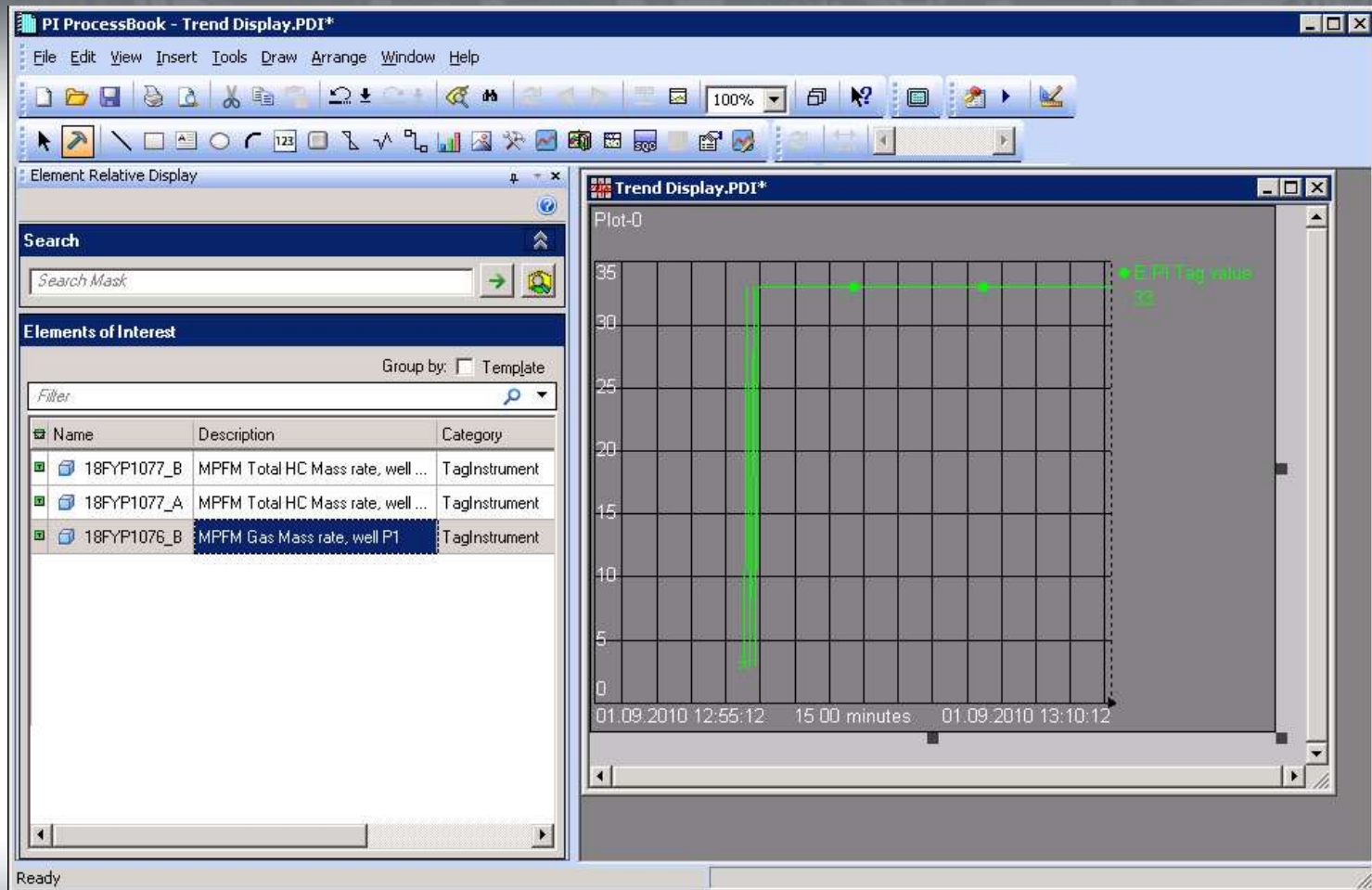
Filter

Name	Value	Description	Data Reference	Settings
Discipline	J - Automation		<None>	
Function Code	PI		<None>	
Function Code Description	Fire water pumps.		Table Lookup	SELECT [Function Code] F...
Is Electrical Consumer	False		<None>	
Is Field Equipment	True		<None>	
Location code	P30S		<None>	
Norsok component description	Nitrogen forladetrykk		<None>	
Object State	Planned		<None>	
Overall Category	HSE		<None>	
PI Tag value	Cannot retrieve PI Point '20PI4312' for attribut...		PI Point	\\amitecpi\20PI4312
Sequence No.	4312		<None>	
System Code	00		<None>	
System Code Description	Reserved		Table Lookup	SELECT Description FRO...
Tag Category	TagInstrument		<None>	

12 Attributes

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PI AF = Value for the Users

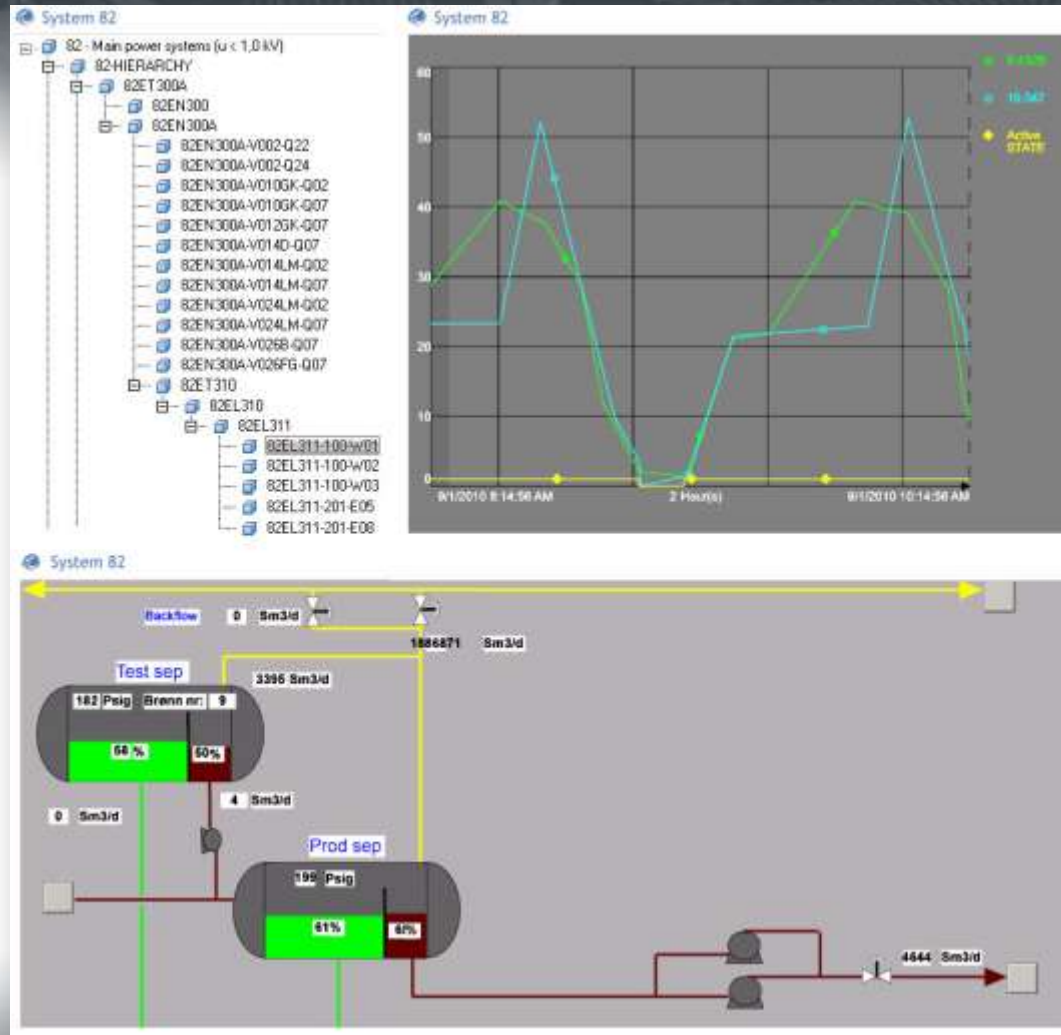


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PI AF = Value for the Users

The screenshot displays the PI ProcessBook - Trend Display* application interface. On the left, a tree view under 'Elements' lists various system components, including 'Structure_30082010' and its sub-items like '00 - Reserved', '13 - Riser and well systems topside', and '13-CABEL'. The main window shows a 'Trend Display*' plot for 'Plot-0' with a green line graph. The plot has a y-axis from 0 to 70 and an x-axis showing time from 30.08.2010 01:50:00 to 30.08.2010 02:00:00. The plot shows a sharp increase in the value around 01:55:00. Overlaid on the main window are two dialog boxes. The 'Define Trend' dialog box is open, showing the 'General' tab with 'Plot Name: Plot-0' and 'Tags in Plot: DS AF2: \\GDFAF\GDF_test\Structure_30082010\13 -'. The 'Select AF Attribute' dialog box is also open, showing the 'Database: GDF_test' and 'Element: Structure_30082010' tree. The 'Attribute:' field is set to 'PI Tag value' and the 'UOM:' is '<None>'. The 'Use PIPoint directly' checkbox is unchecked. The OSIsoft logo is visible in the bottom right corner.

PI AF = Value for the Users



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PI AF Technologies Used

Elements	Yes
Attributes	Yes
Models	Not yet
Categories	Yes, Element Categories
Templates	Yes, Element Templates
Enumeration Sets	Yes (no)
Tables and Table Lookup	Yes
PI Point Data Reference	Yes
Unit of Measure (UOM)	Not yet

Questions?





Thank You!

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