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UC2010

Real Time Information — Currency of the New Decade

Hilton San Francisco Union Square | San Francisco, CA

April 26-28, 2010

AF Implementation in Enterprise Asset Management

Orlando Acevedo
SunPower Corp.

Gopal GopalKrishnan, P.E.
OSIsoft, LLC.

Enterprise Asset Management (EAM)

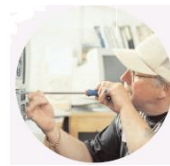
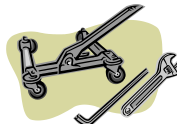
Labor

Parts

Scheduling

PM

Warranty



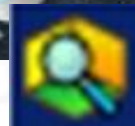
ORACLE

INFORMA



MINCOM

Ventyx



ERP and Asset Management Systems

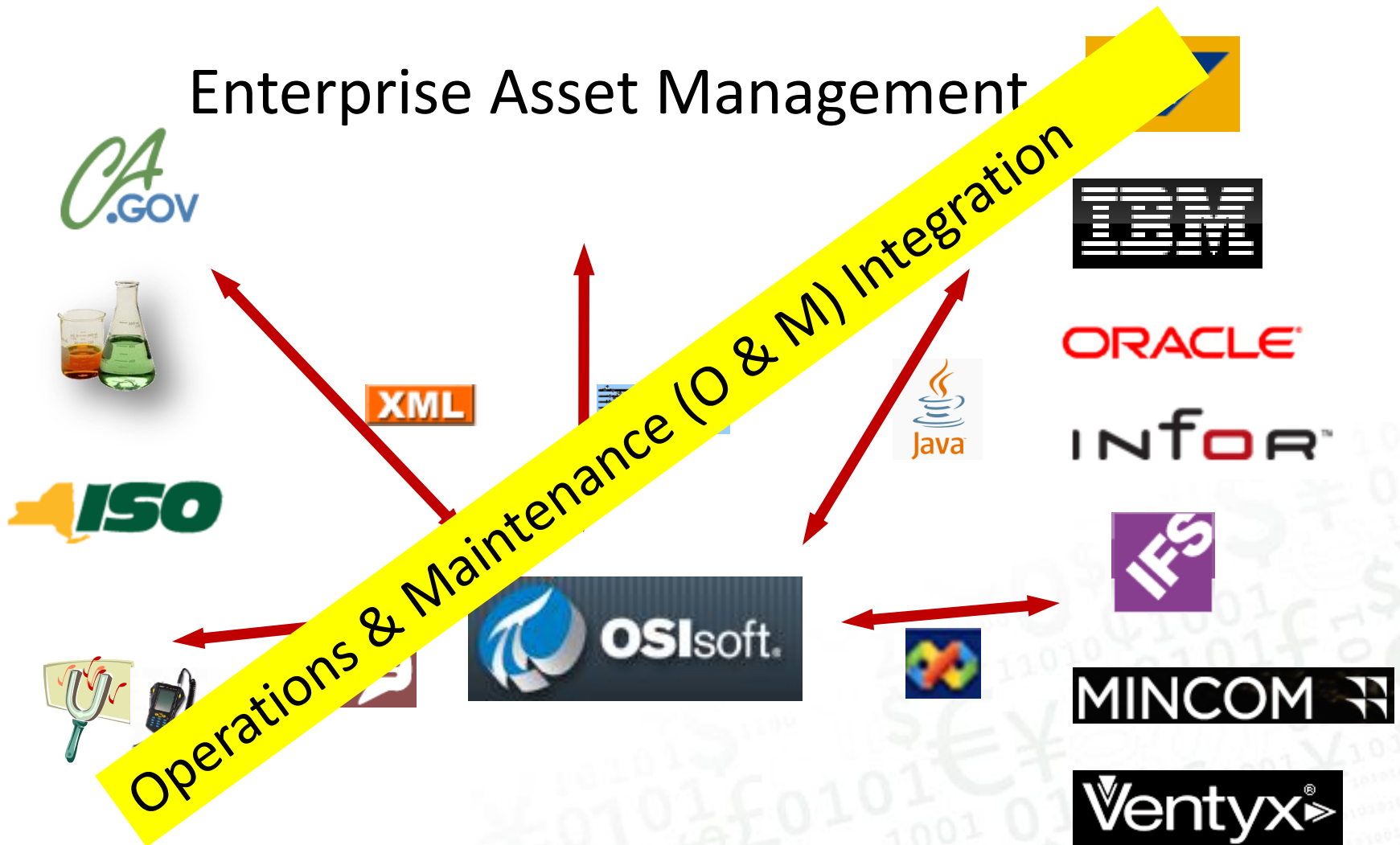
Calibration

Reporting

Compliance



Enterprise Asset Management



Agenda

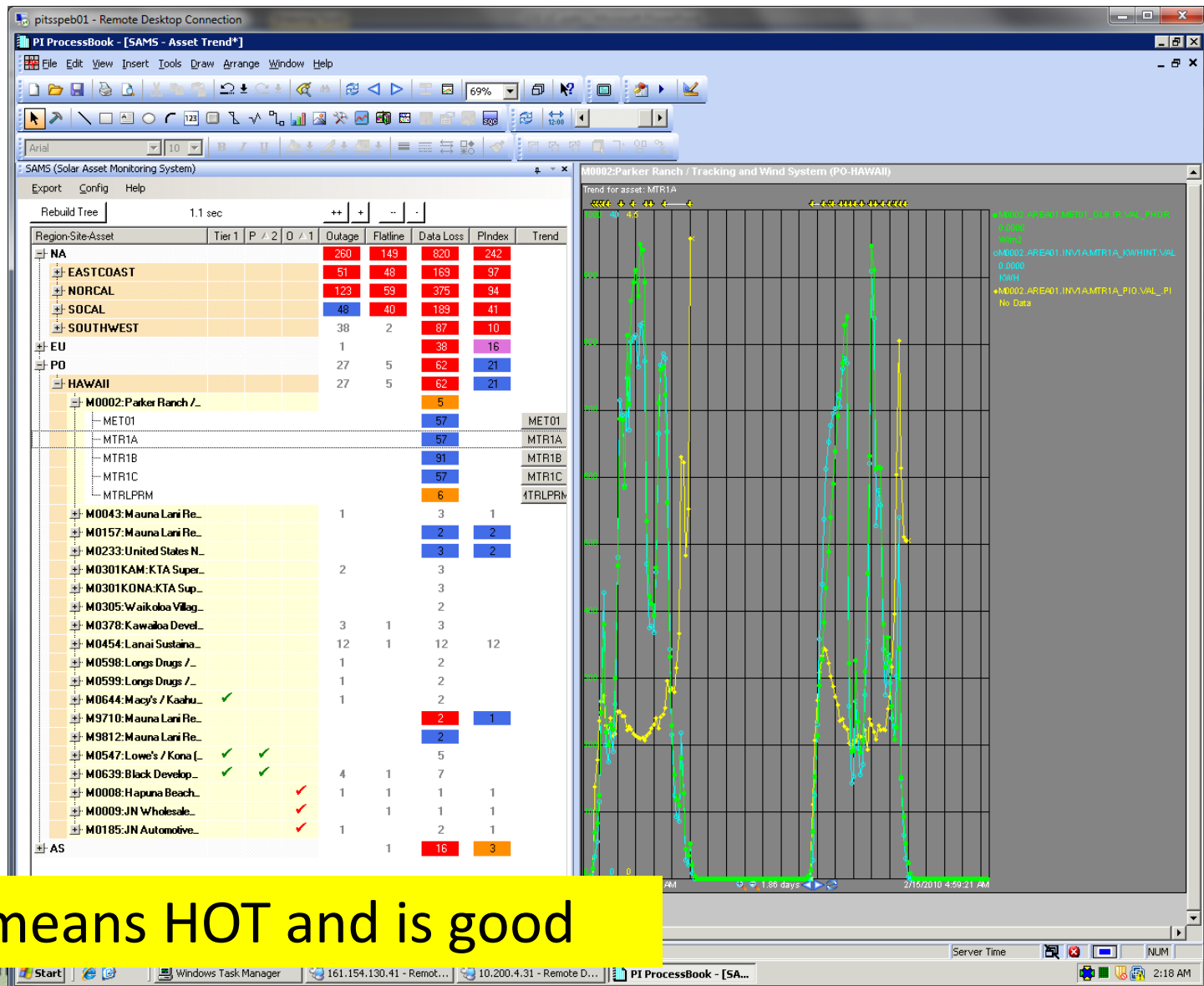


- Use Cases w/ demos
- SunPower Corp. Case Study (by Orlando)
- AF in PI Notifications (Operational Alerts)
 - ISO Reporting DEMO
 - Condition and Usage based maintenance
 - Proxy for condition monitoring DEMO
 - Re-use for generating Work Requests in EAM
- AF as a host for multiple models
 - EAM naming conventions in AF
 - AF Excel add-in
 - CIM model
 - Location hierarchy
 - Component hierarchy
 - Process model
 - Transactions w/External Systems
 - ...

About SunPower

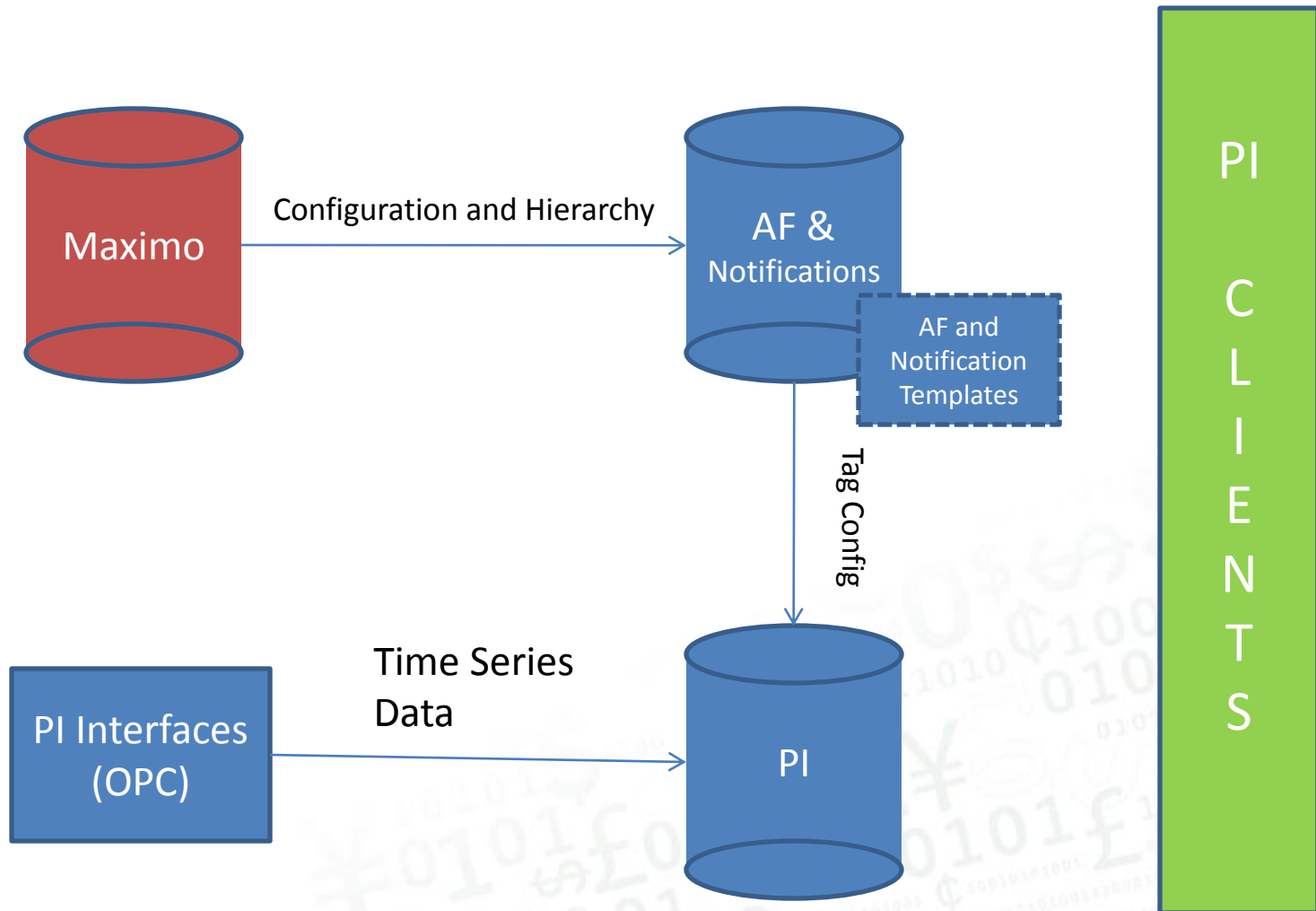
- Vertically integrated:
 - Solar panel manufacturer
 - Systems installer
- Performance Monitoring:
 - Guarantee Performance Contract
 - Research & Development (using the monitored data)

SOC Client Tools



RED means HOT and is good

Architecture



Maximo

MAXIMO - Assets - Microsoft Internet Explorer provided by SunPower Corporation

https://sunpower.mro.com/maximo/ui/maximo.jsp?sc=1271926428447&event=loadapp&tval

Share Browser WebEx

MAXIMO - Assets

Assets

SITES Find: Select Action

List Asset Spare Parts Safety Meters Specifications

Asset 10001081 M0002 ASSET Parker Ranch / Tracking and Wi Region HAWAII

Status OPERATING

Type

Attachments Moved? Maintain Hierarchy?

Details

Drilldown

Select to show children. Select to hide children. Select to return location / asset.

Locations Assets

Location M0002 Parker Ranch / Tracking and Wind System Status OPERATING Region HA

Asset in Location 10001081 M0002 ASSET Parker Ranch / Tracking and Wi

System PRIMARY

Show All Systems

Show Path to Top

View Work Orders & PMs

Cancel

Downtime Modified

Asset Up? ☒

Last Changed Date 5/21/09 5:09 PM

Total Downtime 0:00

Changed By MXINTADM

Changed Date 4/19/10 10:48 AM

Internet | Protected Mode: On

AF System Explorer

SPWR - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Element New Attribute Search

Elements

- Elements
 - Config
 - Sites
 - M0002
 - M0005
 - Layers
 - BLDG01
 - GRP1A
 - LGRFS
 - MET01
 - LOC
 - M0006
 - M0007
 - M0008
 - M0009
 - M0010
 - M0014
 - M0019
 - M0020
 - M0030
 - M0031
 - M0034
 - M0035
 - M0038
 - M0043
 - M0046
 - M0048
 - M0049
 - M0052
 - M0053
 - M0054
 - M0055
 - M0057
 - M0058
 - M0063
 - M0064
 - M0065
 - M0066
 - M0067
 - M0070
 - M0072
 - M007340D
 - M007370M
 - M00737PM

- Event Frames
- Library
- Unit of Measure
- MyPI
- Notifications
- Contacts

zenithAngle

MET01

General Child Elements Attributes Ports Model View Version

Search

Name	Value
ambientTemperature	11.15 °C
CDASMetStationId	33
displayName	FS/First Solar Factory
globalIrradiance	0 W/m2
maxWindSpeed	Cannot retrieve PI Point 'M0005.BLDG01.MET01_WSP.MAX' for attribute 'Sites\M000...
notificationThreshold	*6h
precipitation	0 cm
referenceCellTrackedIrradian...	Cannot retrieve PI Point 'M0005.BLDG01.MET01_TRK_IR_VAL_HPDA' for attribute 'Sit...
windDirection	Cannot retrieve PI Point 'M0005.BLDG01.MET01_WDOR.VAL' for attribute 'Sites\M00...
windSpeed	0.89 m/s
zenithAngle	99

Group by: ☐ Category

Name: zenithAngle

Description:

Configuration Item: ☐

Categories:

UOM: <None>

Value Type: String

Value: 99

Data Reference: SunPowerAttributeLink

Settings...

TemplateName=Location;AttributeName=zenithAng
le

Real Time Info

Start Computer Management SPWR - PI System Ex...

UC2010

Notifications

The screenshot displays the SPWR - PI System Explorer application window. The interface is divided into several sections:

- Notifications List:** A tree view on the left showing a list of notifications. The selected notification is "M0005.BLDG01.GRP1A.INV1A.MTR1A_EnergyMeterDataIssue".
- Notification Details:** The right pane shows the details for the selected notification. It includes fields for Name, Description, Status, Template, and Categories. The Status is "Running" and the Template is "EnergyMeterDataIssue".
- Trigger:** A section below the details showing the trigger conditions. It includes a "Target" field set to "MTR1A" and a "Condition" field with a complex logical expression involving "energyPerScan", "power", and "notificationThreshold".
- Content:** A section showing the content of the notification, which is "0 item(s) of custom content available to subscribers".
- Subscriptions:** A section showing the subscriptions to this notification, which is "1 subscription(s) to this notification".

The bottom of the window shows the Windows taskbar with the Start button and several open applications, including "Computer Management" and "SPWR - PI System Ex...".

Solar Commission Process

- Frequent (1+ week)
- Data Configuration:
 - Maximo
 - SQL server (Monitoring points)
 - PI System
- AF templates
 - Common Model
 - Require custom configuration

Automated Commission Process

- GUI with minimal user input
- Edit Existing sites
- Internal Web Application
- AF/AN SDK

Site Import Utility

- Logon to Web Application
- Create or Edit PI Site Data
- Programmatically composes PI data from Maximo

Site Import Utility

Site Administration Tool

http://pimaximport01/SiteAdministrationPage.aspx

Kiteboarding Lanai Parking Gmail Voice News Maps YouTube Lenovo W500 Wave Picasa OpenSource Scada Other bookmarks

Site Administration Page

Login

Choose Mode

Select Site

Define Inverter Mappings

Define Metstation Mappings

Import PI structures

Complete

Select Site

Associate a CDAS site to the corresponding Maximo Site and then click on the 'Add Site Mapping' button. Only one mapping can be created. After a mapping has been created, click on the Next button to continue.

Maximo Sites

CDAS Sites

Kearny School District / Kearny High School (M0283)

Queens Botanical Gardens (M0288)

SMUD / PV Carport (M0290)

Tom's River Schools / Intermediate North (M0292INTNO)

Cheng Residence (M0306)

Elecnor / Trujillo Phase 1 (M0358)

Elecnor / Jumilla Phase 1 (M0360)

SolarPack / Isla Mayor 2 (M0364)

Applied Materials / Headquarters (M0366)

North Hudson Sewerage (M0364)

Elecnor / Trujillo Phase 1 (M0358)

Elecnor / Trujillo Phase 1 (M0360)

Williams / Residence (M0364)

Elecnor / Jumilla Phase 1 (M0360)

Maximo Systems

Inverter 19 (M0364_AREA01_INV19)

Inverter 20 (M0364_AREA01_INV20)

Inverter 21 (M0364_AREA01_INV21)

Inverter 22 (M0364_AREA01_INV22)

Inverter 23 (M0364_AREA01_INV23)

Inverter 24 (M0364_AREA01_INV24)

Inverter 25 (M0364_AREA01_INV25)

Inverter 26 (M0364_AREA01_INV26)

Inverter 27 (M0364_AREA01_INV27)

Inverter 28 (M0364_AREA01_INV28)

Inverter 29 (M0364_AREA01_INV29)

Inverter 30 (M0364_AREA01_INV30)

Inverter 31 (M0364_AREA01_INV31)

Inverter 32 (M0364_AREA01_INV32)

Inverter 33 (M0364_AREA01_INV33)

Inverter 34 (M0364_AREA01_INV34)

Inverter 35 (M0364_AREA01_INV35)

Inverter 36 (M0364_AREA01_INV36)

Maximo MetStations

Isla Mayor 1

Atlas Test Site

Auburn Hills

Bayonne School District #14

Berkeley Headquarters

Department of Energy Tech Showcase

DOE Assayer

Elverta Hammer Average

Elverta Hammer Maximum

Exelon Generation Company

Florida Power and Light DeSoto County

FPL Space Coast

Horizon Power Marble Bar

Horizon Power Nullagine

Intermediate North School

Add Site Mapping

Cancel

Next

Mapping List

Asset

Maximo

Version 1.1.1

PI Value Now

- EAM (Maximo) changes can be propagated quickly to PI
- Site deployment decreased from week to minutes

Future work

- Site import utility future version:
 - Automatic Service/no user input
 - Automatic AF update on Maximo changes
 - Push PI notification work orders to Maximo

SunPower O&M integration...

- AF templates, Notification templates
 - AF/AN SDK were important tools to automate configuration process
- Semi-automating configuration tasks greatly reduced workload on end users and insured less errors

Agenda

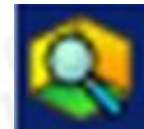


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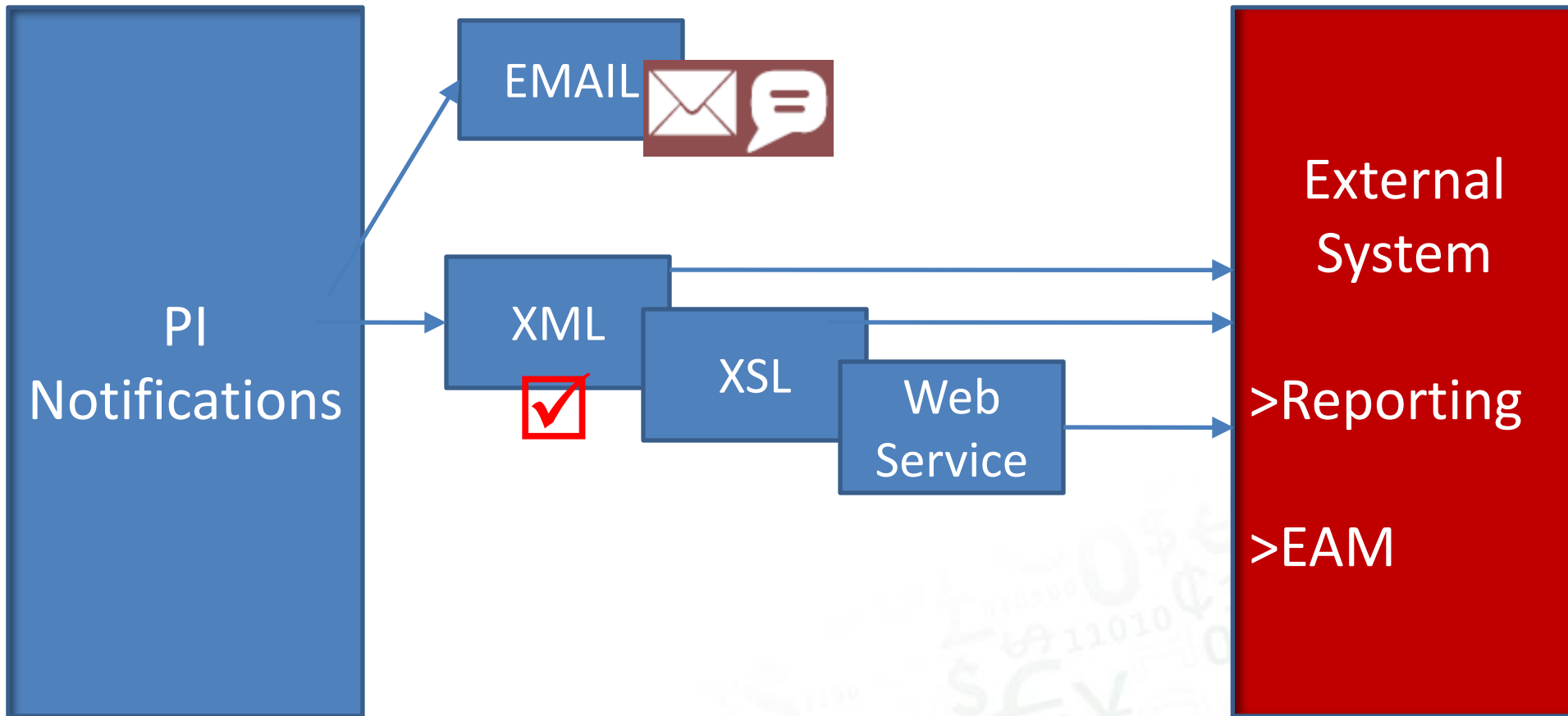
Use Case : ISO Reporting

- NY ISO Wind Turbine Reporting
 - Availability
 - WindSpeed
 - WindDirection
 - Humidity
 - DewPoint
 - ...
 - ...
- Implementation
 - PI Notification
 - XML Delivery Channel

XML



XML Data Flow



XML Delivery Channel (PI Notif. toolkit – vCampus)

Elements

A6083_ODOM-M

A6084_ODOM-M

A6085_ODOM-M

A6086_ODOM-M

A6087_ODOM-M

A6088_ODOM-M

A6089_ODOM-M

A6090_ODOM-M

A6091_ODOM-M

A6092_ODOM-M

A6093_ODOM-M

MAXIMO_WO

MIMOSA

ORACLE Assets

ORACLE Work Request

PIMLTours

PITagPutVal

PUMP2

A_TRIGGERS

WindTurbine01

Elements

Event Frames

WindTurbine01

General

Child Elements

Attributes

Ports

Version

Group by: ☒ Category

Search

Name

Value

Descrip

<None>

AmbientTemperature

80

BarometricPressure

29

BeginTimeStamp

DewPoint

60

EndTimeStamp

GenPTID

1000001

Humidity

85

MetID

1001

TurbineAvailability

Yes

WindDirection

East

WindSpeed

12

Wind Turbine Element instance for NY ISO reporting

Real Time Information — Currency of the New Decade

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OSIsoft UC2010

Notifications

New

- MotorAlert (Motor2)
- New Notification21 (23972 : Motor- 10hp/1)
- New Notification28
- New Notification31
- PIPutVal (PITagPutVal)
- Tivoli4 (TRIGGERS)
- Trigger11PM_Meter1 (11430_RUNHOURS)
- WindingTisHigh (Motor1)
- WindingTisHigh2 (Motor2)
- New Notification33 (11470_RUNHOURS)
- HiVibration (1)
- MaximoMeter (4)
 - MaximoMeter2 (11430_O-PRESSUR)
 - MaximoMeter7 (11430_RUNHOURS)
 - MaximoMeter8 (11430_RUNHOURS)
 - MaximoMeter9 (11450_O-PRESSUR)
- NY_ISO_Wind_30sec (1)
 - NY_ISO_Wind_30sec (WindTurbine01)

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

NY_ISO_Wind_30sec

Overview Trigger Content Subscriptions History

Target: \\GDELL610\AF\WindTurbine01

Select A Target...

Conditions

New Condition

Rule	Configuration	Time True	Result	Priority
PerformanceEqu...	True			

Periodic Time Rule Configuration

Interval

☒ Periodic

☐ Daily

☐ Monthly

Begin at: 00

Frequency:

30

Second(s)

Duration:

30

Second(s)

OK

Cancel

Time Rule: Periodic

Options

☐ Notify only on change in status

Resend Interval:

0

Seconds

Non Repetition Interval:

0

Seconds

Notification – Periodic – every 30 seconds

AF - PI System Explorer

File View Go Tools Help

Database Query Date Back Check In

Notifications

New X [Icons]

- MotorAlert (Motor2)
- New Notification21 (23972 : Motor- 10hp/11)
- New Notification28
- New Notification31
- PIPutVal (PITagPutVal)
- Tivoli4 (TRIGGERS)
- Trigger11PM_Meter1 (11430_RUNHOURS)
- WindingTisHigh (Motor1)
- WindingTisHigh2 (Motor2)
- New Notification33 (11470_RUNHOURS)
- HVibration (1)
- MaximoMeter (4)
 - MaximoMeter2 (11430_O-PRESSUR)
 - MaximoMeter7 (11430_RUNHOURS)
 - MaximoMeter8 (11430_RUNHOURS)
 - MaximoMeter9 (11450_O-PRESSUR)
- NY_ISO_Wind_30sec (1)
 - NY_ISO_Wind_30sec (WindTurbine01)

NY_ISO_Wind_30sec

Overview Trigger Content Subscriptions History

Subscriptions (0 Required acknowledgments)

Gopal Gopalkrishnan - XML_Meter

☐ Include Trigger Input

Attribute	Value
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\GenPTID
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\MetID
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\WindSpeed
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\WindDirection
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\BarometricPressure
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\AmbientTemperature
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\DewPoint
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\Humidity
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\BeginTimeStamp
<input checked="" type="checkbox"/>	\\GDELL610\AF\WindTurbine01\EndTimeStamp

Elements

Event Frames

Library

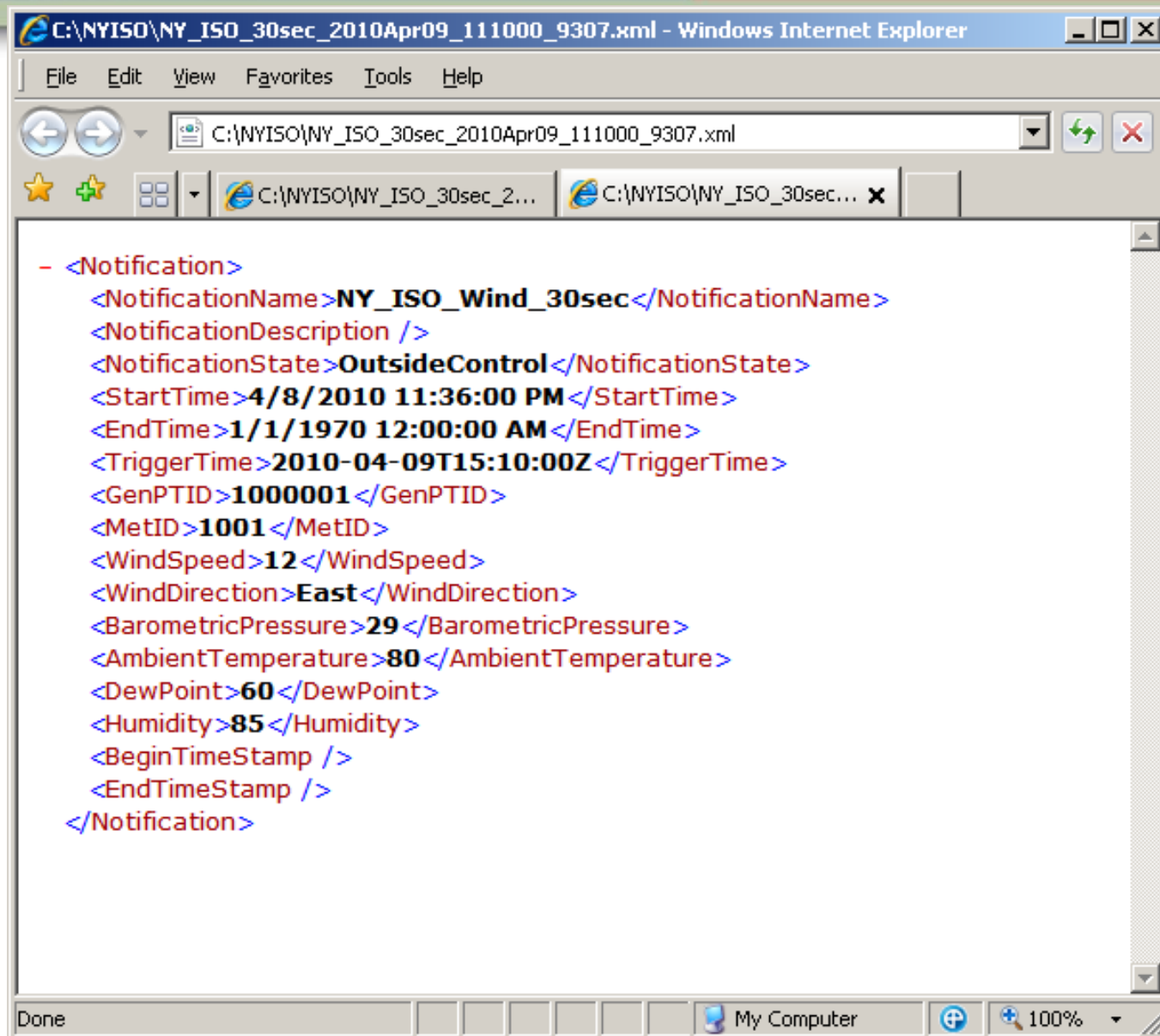
Unit of Measure

MyPI

Notifications

Contacts

Notification – Content includes XML requirements



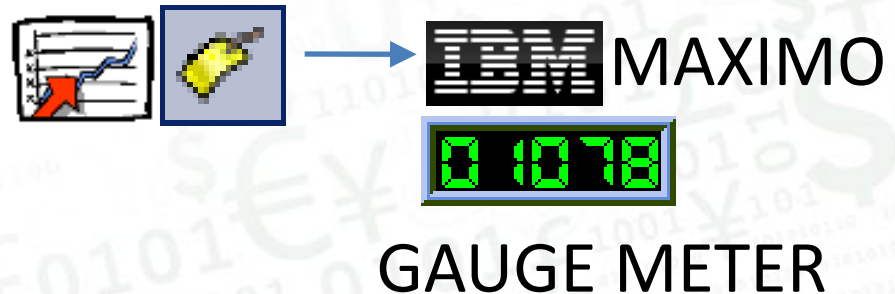
Notification –XML file

Hyperlink launches the demo only during a live session

Enterprise Integration PI Notification NYISO Reporting Demo

Use Case : Maintenance

- Maintenance
 - Equipment condition based instead of calendar
- Implementation
 - Condition assessment in PI
 - Filter DeltaP DailyMax to Maintenance



Filter DeltaP DailyMax to Maximo

- AF for mapping (transaction)



- PI Notifications (XML Delivery)



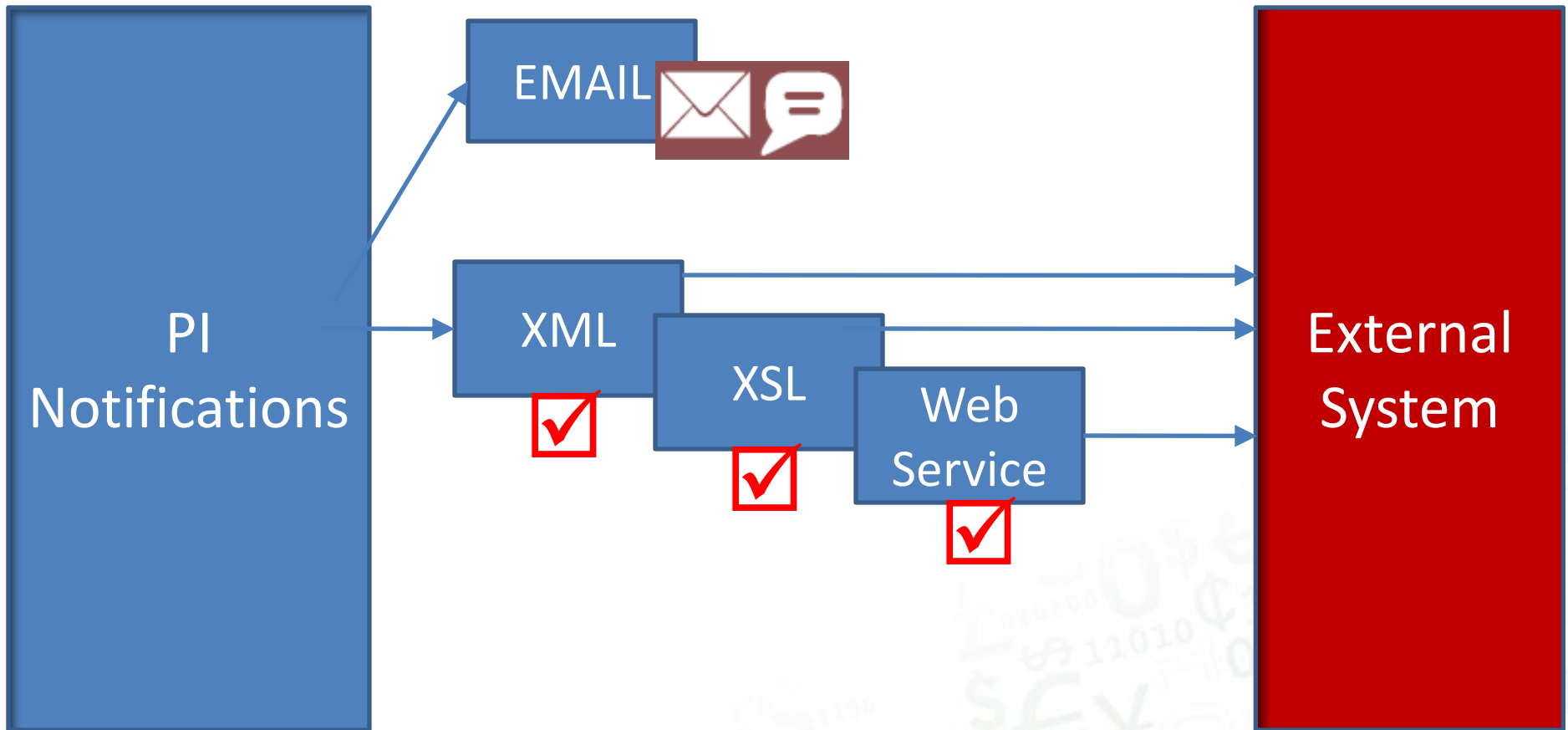
- Push data from PI



- No middleware
(PI tools alone)



XML Data Flow



XML Delivery Channel (PI Notif. toolkit – vCampus)

11450_O-PRESSUR

General | Child Elements | Attributes | Data | Version

Search

PI Point Data Reference

PI Server:

Tag name: Attribute:

Unit of Measure
UOM:

Value retrieval methods

By Time:
Relative Time:

By Time Range:
Calculation basis:
Min percent good:

By Case:

☐ Read only

OK Cancel

Group by: ☒ Category

Name:
Description:
Configuration Item: ☐
Categories:
UOM:
Value Type:
Value:
Data Reference:

Settings...

\\gdell610\BR450_Pressure;TimeMethod=TimeRange;Relative Time=-24h;TimeRangeMethod=Maximum;ReadOnly=False

AF – Point Data Reference - Calculation

Formula Configuration:(Attribute1) [X]

Parameters

A=|NewReading
B=|MAXIMO_METER\11470_O-PRESSUR|NewReadin
C=|MAXIMO_METER\11430_O-PRESSUR|NewReadin

☒ Default Values Allowed

Equations

max(A,B,C)

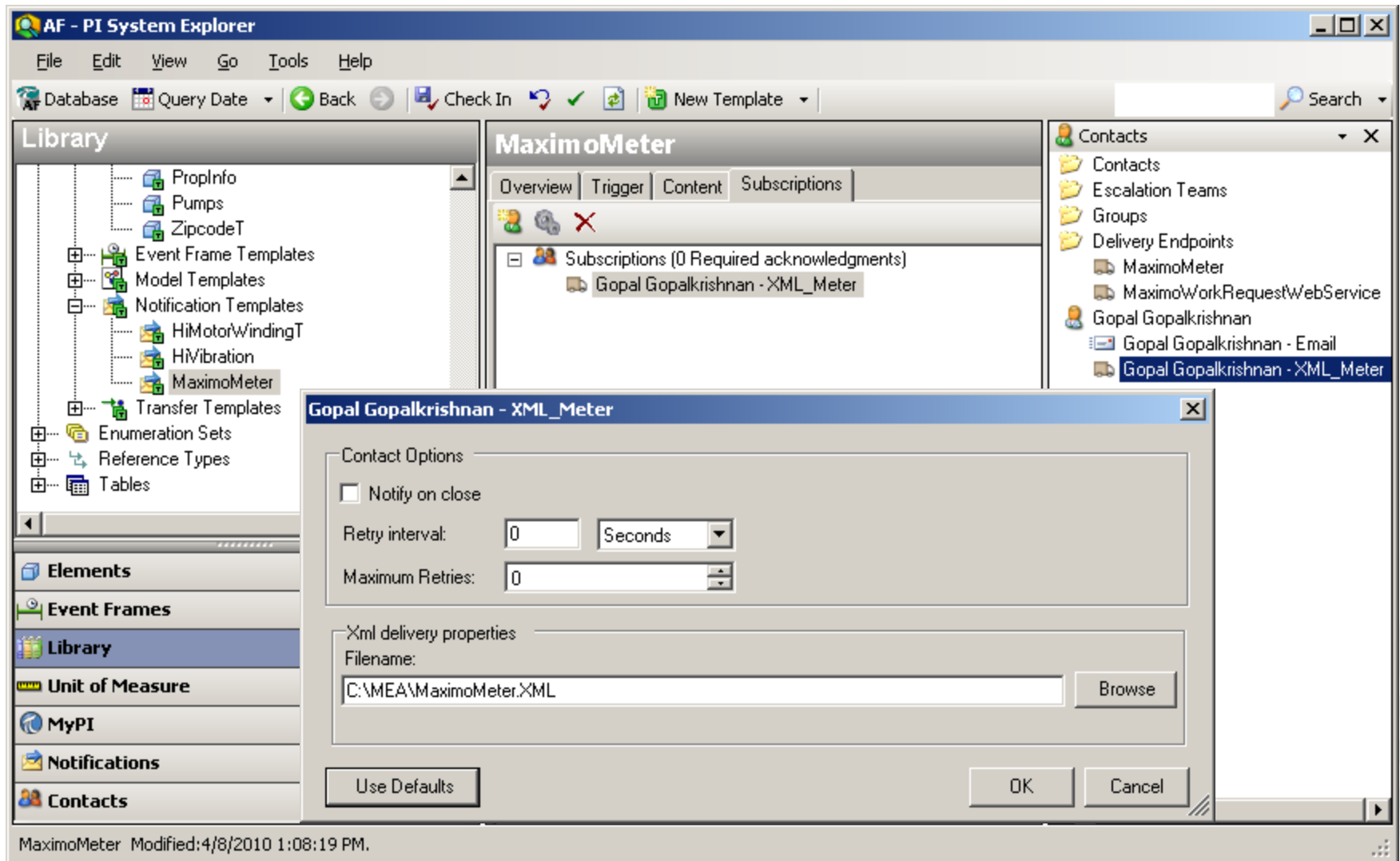
Result

Unit of Measure: <None> Minimum: Maximum:

Evaluate

OK Cancel

AF – Formula Reference - Calculation



Notification Subscription - XML Delivery Channel

AF - PI System Explorer

File View Go Tools Help

Database Query Date Back Check In

Notifications

New X | | | |

- <None> (9)
 - ForTivoli2 (TRIGGERS)
 - MotorAlert (Motor2)
 - New Notification21 (23972 : Motor- 10hp/175)
 - New Notification28
 - PIPutVal (PITagPutVal)
 - Tivoli4 (TRIGGERS)
 - Trigger11PM_Meter1 (11430_RUNHOURS)
 - WindingTisHigh (Motor1)
 - WindingTisHigh2 (Motor2)
- HiVibration (1)
- MaximoMeter (2)
 - MaximoMeter2 (11430_O-PRESSUR)
 - MaximoMeter7 (11430_RUNHOURS)

MaximoMeter7

Overview Trigger Content Subscriptions History

Name: MaximoMeter7

Description: <http://mxesserver:7001/meaweb/services/DEVMEETERInterface>

Status: Running

Template: MaximoMeter

Categories:

Trigger

[Target: 11430_RUNHOURS](#)
[Condition: true](#)

Content

[7 item\(s\) of custom content available to subscribers](#)

Subscriptions

[1 subscription\(s\) to this notification](#)

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

URL specified for delivery to Maximo Meter web services

Hyperlink launches the demo only during a live session

Enterprise Integration PI Notifications XML XSL
WebServices Demo

Agenda



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 - ...

AF - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Element New Attribute Search

Elements

- MAXIMO Asset Hierarchy
- MAXIMO Assets
- Maximo_Eqpt_List
 - 11200 : HVAC System- 50 Ton Cool Cap/
 - 11210 : Circulation Fan- Centrifugal/ 20/00
 - 11211 : Motor Starter- Size 2/440v/3ph/60
 - 11220 : Electrical Control Panel- HVAC Sys
 - 11230 : Emergency Generator
 - 11240 : Circulation Fan- Centrifugal/ 20/00
 - 11250 : Circulation Fan- Centrifugal/ 20/00
 - 11300 : Reciprocating Compressor- Air Coc
 - 11340 : Motor Starter- Size 4/NEMA 12/44
 - 11400 : Boiler- 50,000 Lb/Hr/ Gas Fired/ V
 - 11430 : Centrifugal Pump 100GPM/60FT HD
 - 11450 : Centrifugal Pump 100GPM/60FT HD
 - 11470 : Centrifugal Pump 100 GPM, 60 FT

11430 : Centrifugal Pump 100GPM/60FT HD

General Child Elements Attributes Ports Version

Search

Name	Value
Calculated	
HealthIndex	9
MaximoAsset	
assetnum	11430
changeby	WILSON
changedate	2/9/2005 8:01:37 AM
description	Centrifugal Pump 100GPM/60FT HD
failurecode	PUMPS
manufacturer	IR
serialnum	377-9A
siteid	BEDFORD
PI Measurement	
MotorWindingT	123.3111
VibrationDB	
Vibration	0.07

Group by: ☒ Category

Name: MotorWindingT

Description:

Configuration Item: ☐

Categories: PI Measurement

UOM: <None>

Value Type: String

Value: 123.3111

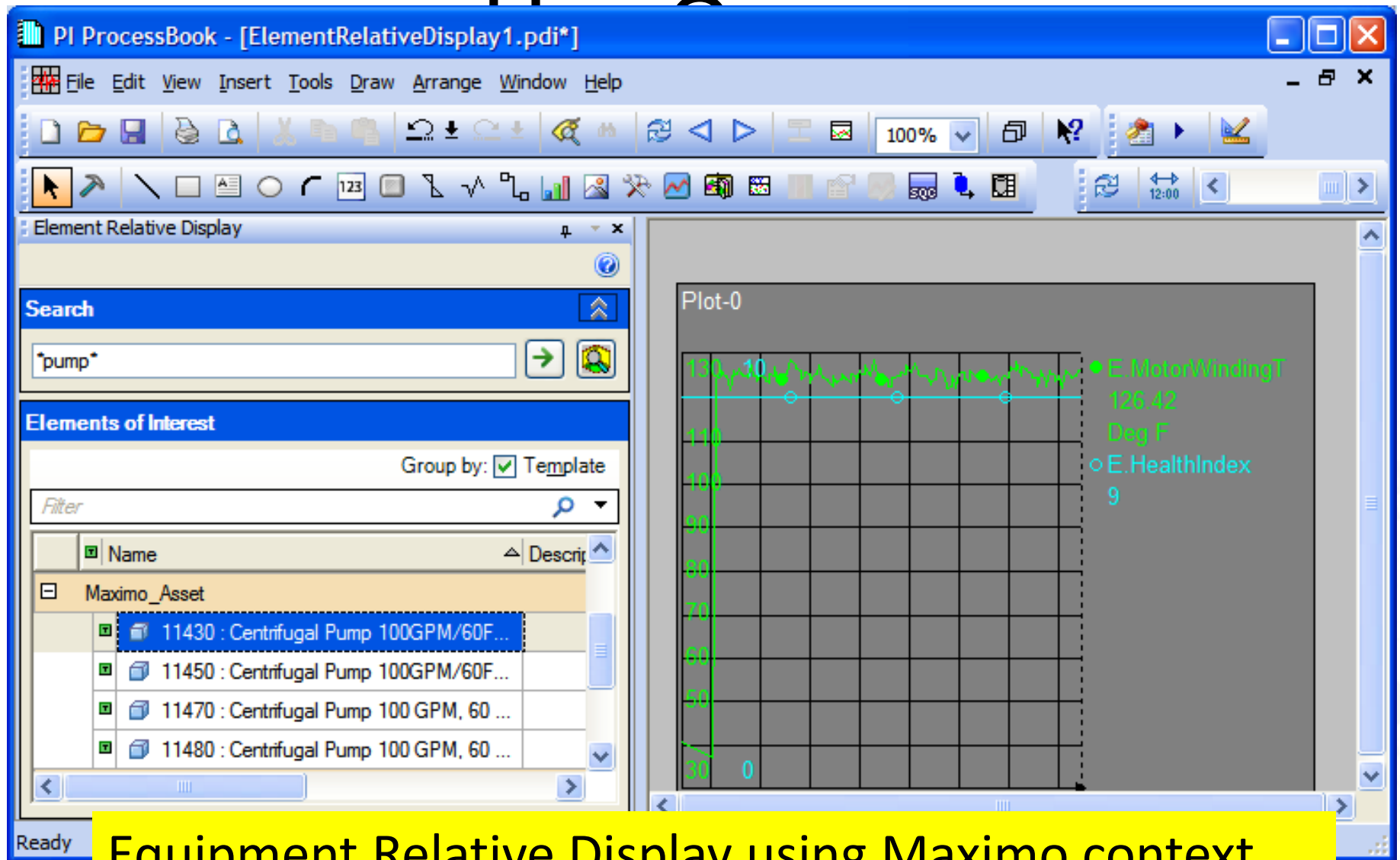
Data Reference: PI Point

Settings...

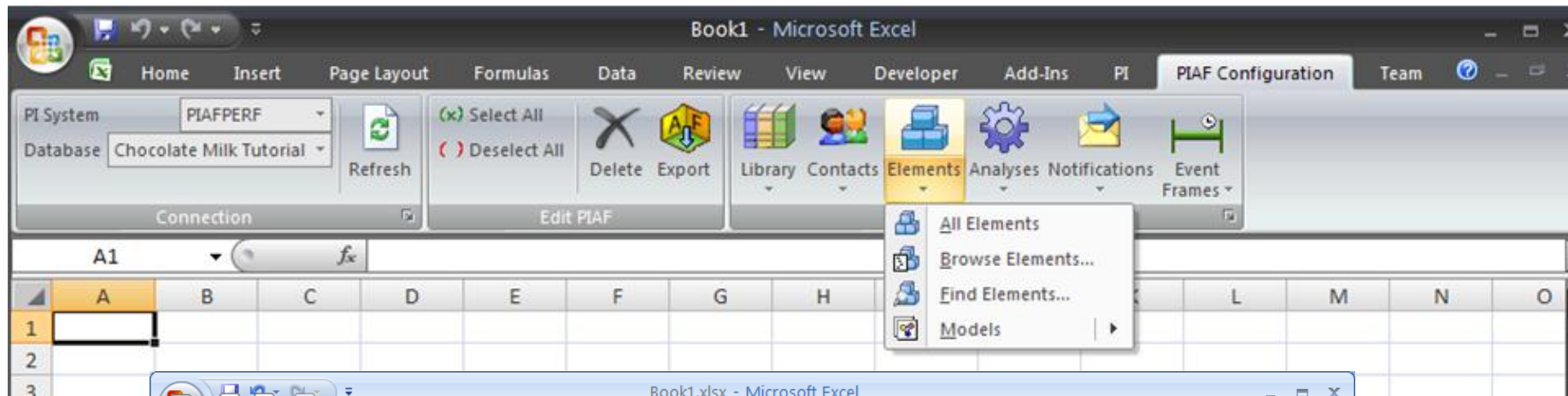
\\gdell610\Motor1.Windings Temperature

MotorWindingT

Maximo Equipment Flat List in AF



Equipment Relative Display using Maximo context



Book1.xlsx - Microsoft Excel

	B	C	D	E	F	G	H
1	assetnum	description	manufacturer	serialnum	failurecode	changedate	changeby
2	11200	HVAC System- 50 Ton Cool Cap/ 450000 Btu Heat Cap	TRN	3481-52		2/7/2005 10:09	WILSON
3	11210	Circulation Fan- Centrifugal/ 20/000 CFM	TRN	3749-9		2/7/2005 10:11	WILSON
4	11211	Motor Starter- Size 2/440v/3ph/60cy	WES	S2DNGB		2/7/2005 10:11	WILSON
5	11220	Electrical Control Panel- HVAC System	WES	24096-2		12/7/1999 21:17	MAXIMO
6	11230	Emergency Generator	WES	32331-4		2/7/2005 10:14	WILSON
7	11240	Circulation Fan- Centrifugal/ 20/000 CFM	TRN	3749-9		2/4/2005 16:38	WILSON
8	11250	Circulation Fan- Centrifugal/ 20/000 CFM	TRN	3749-9	BLDGS	2/7/2005 10:14	WILSON
9	11300	Reciprocating Compressor- Air Cooled/100 CFM	IR	43960		2/7/2005 10:15	WILSON
10	11340	Motor Starter- Size 4/NEMA 12/440v/3ph/60hz	WES	23-4630		2/7/2005 10:15	WILSON
11	11400	Boiler- 50,000 Lb/Hr/ Gas Fired/ Water Tube	BWC	66392	BOILERS	2/7/2005 10:16	WILSON

Equipment List from Maximo bulk load to AF -
 DEMO POD (Tue PM) - AF Excel Configurator

Take Away + Q&A

✓ AF for O & M integration

✓ Data/Event Integration

✓ Visual Integration

✓ PI tools alone, i.e. no middleware

✓ PI tools + middleware to account for workflow/business process

Other Related Talks

Enterprise Integration & PI Data Access Wed AM

What is new in PI Data Access... Wed AM

Building Great Dashboards... Wed AM

Configuring Integrated Visualizations with
PI WebParts Wed AM

Introducing Multi-dimensional Data.... Tue PM

Visualizing Data with PI DataLink 2010.... Tue PM



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Thank you

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