

```
point.Snapshot;  
2. Dim srv As PISDK.Server  
3. Fore*%^(%) (point in server.PIPoints)?!!??  
4. Dim srv A PISDK.Server  
5. if (time_to_market > expected)  
{  
    solution = vCampus;}  
6. if (time_to_market > expected)  
{  
    solution = vCampus;}  
}
```

"where PI geeks meet"

OSIsoft®

V CAMPUS

2009

LIVE!

Palace Hotel, San Francisco, CA ▪ Dec. 1-2, 2009

```
1. foreach (point in server.PIPoints)  
{  
    point.Snapshot;  
}  
2. Dim srv As PISDK.Server  
3. Fore*%^(%) (point in server.PIPoints)?!!??  
4. Dim srv A PISDK.Server  
5. if (time_to_market > expected)  
{  
    solution = vCampus;}  
6. if (time_to_market > expected)  
{  
    solution = vCampus;}  
}
```

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2009

Metadata Replication in AF

Rich Marcell

Chief Architect

SmartSignal Corporation

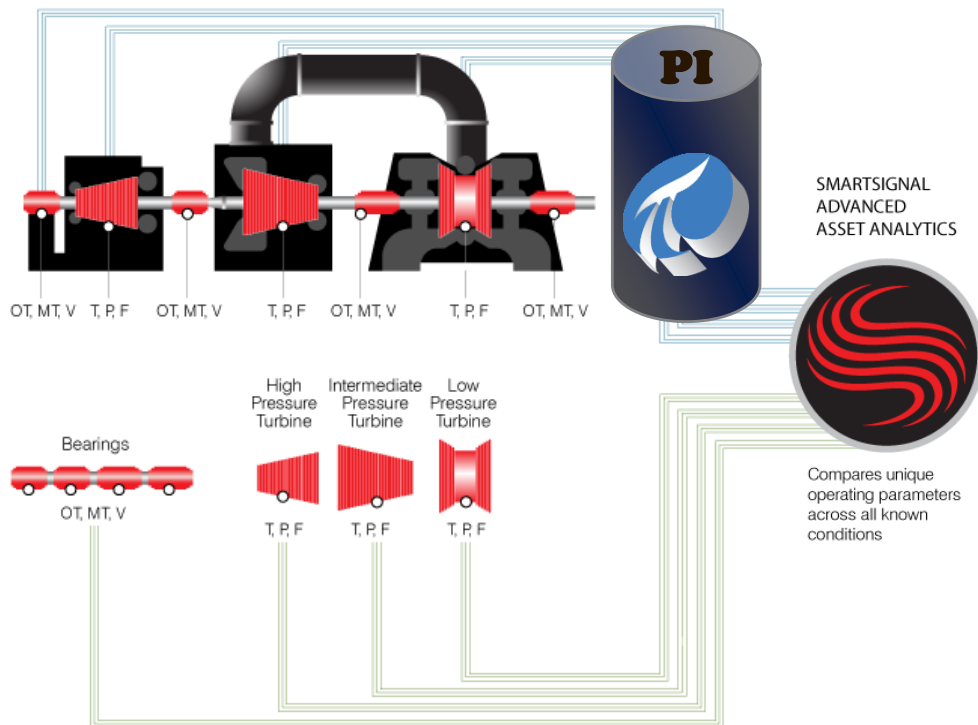
```
1. foreach (point in server.PIPoints)
{
    point.Snapshot;
}
2. Dim srv As PISDK.Server
3. Fore*%*% (point in server.PIPoints)?!!??
4. Dim srv A PISDK.Server
```

```
1. foreach (point in server.PIPoints)
{
    point.Snapshot;
}
2. Dim srv As PISDK.Server
3. Fore*%*% (point in server.PIPoints)?!!??
4. Dim srv A PISDK.Server
5. if (time to market > expected)
```

Agenda

- Brief overview of EPI*Center
- Demo 1 – xConnector metadata & data replication
 - Implementation focus – Formulas, Tag naming
- Demo 2 – SmartSignal incidents – PowerPoint
 - Implementation focus – Digital tags and AF
- Demo 3 – SmartSignal summary info – PowerPoint
 - Implementation focus – Navigating AF metadata from ProcessBook

REAL-TIME SENSOR DATA

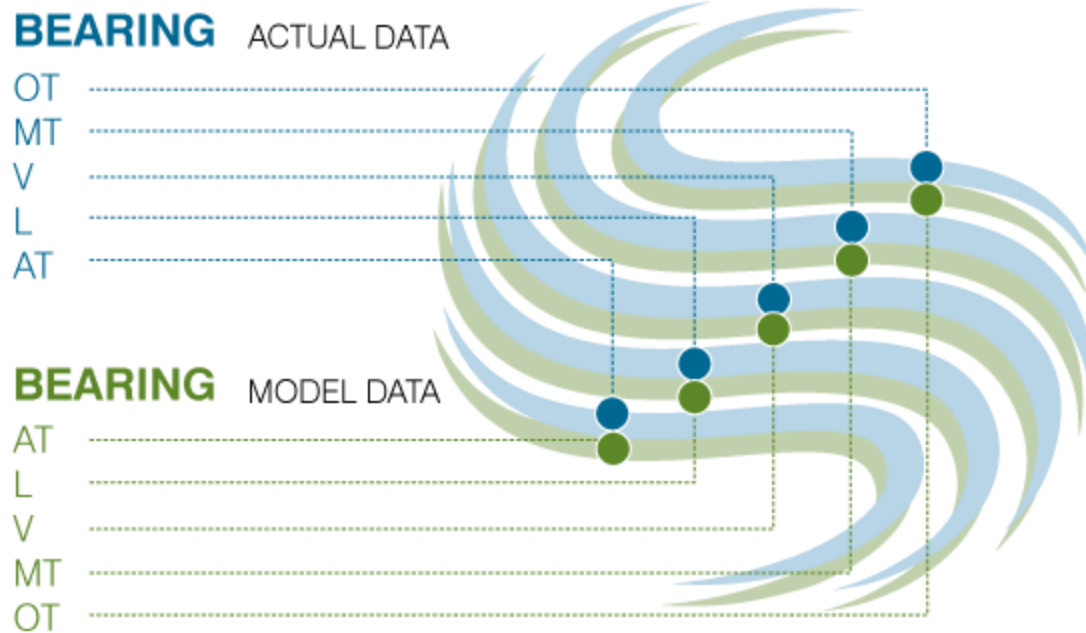


PERSONALIZED EMPIRICAL MODELS

OT= oil temp | MT= metal temp | V= vibration | T= temperature | P= pressure | F= flow

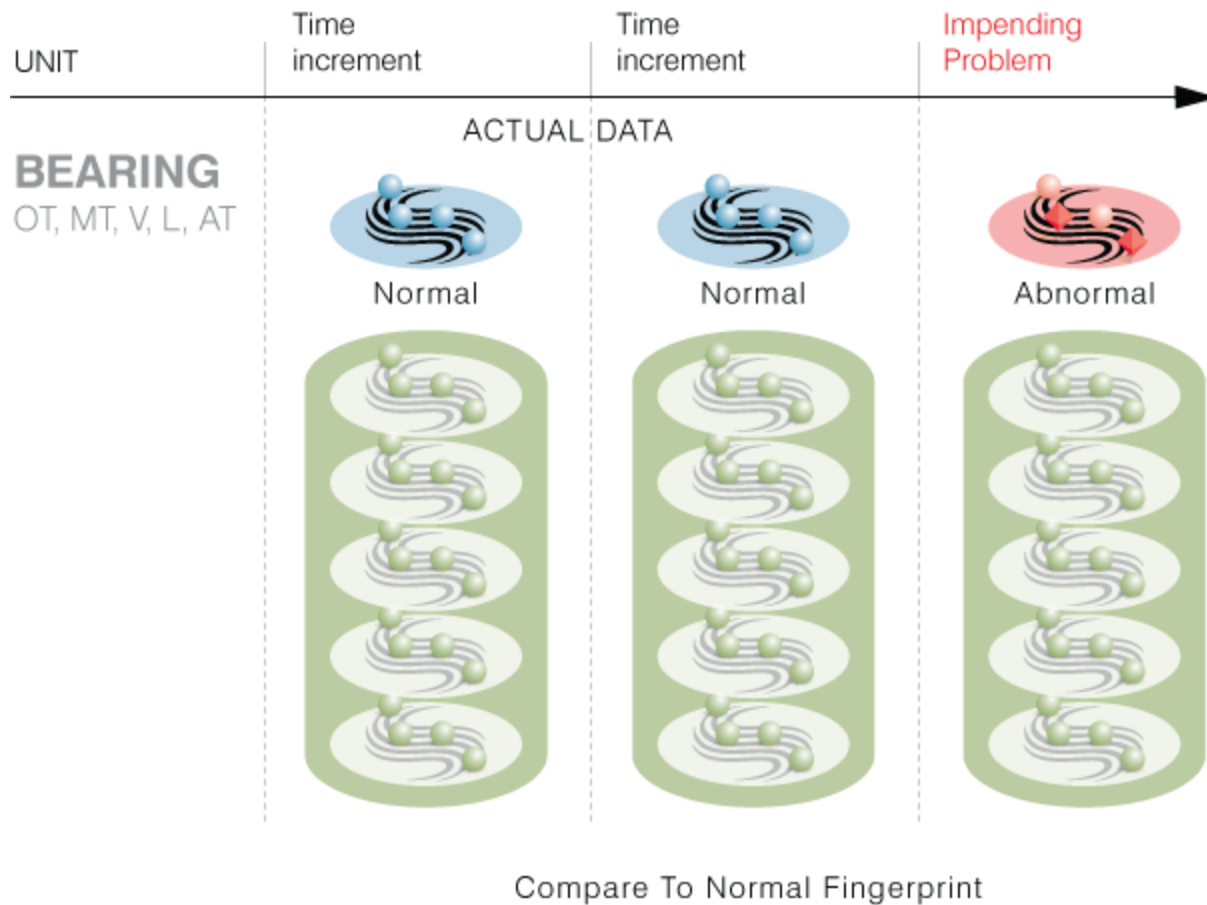
COMPARING ACTUAL DATA TO MODEL DATA

Actual Data (fingerprint) is compared to Model Data (fingerprint)
For load and ambient conditions using patented technologies

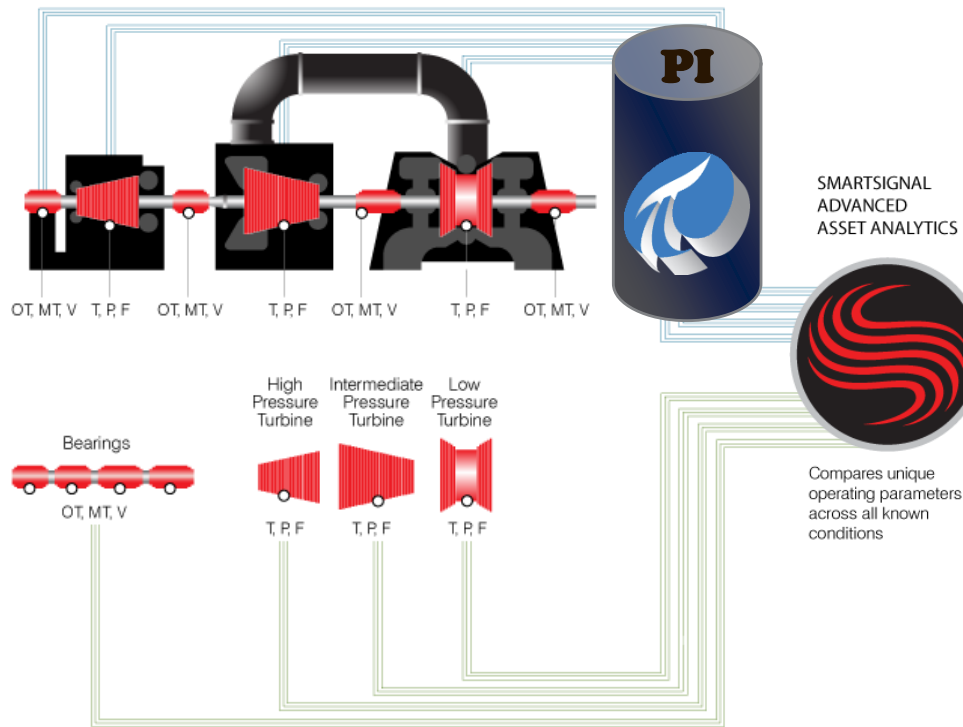


OT= oil temp | MT= metal temp | V= vibration | L= load | AT= ambient temperature

DATA IS GATHERED EVERY X UNITS...



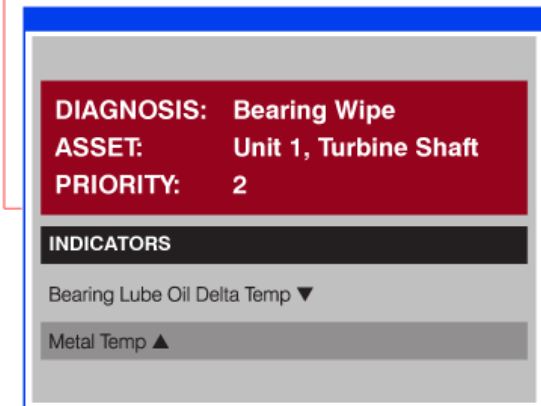
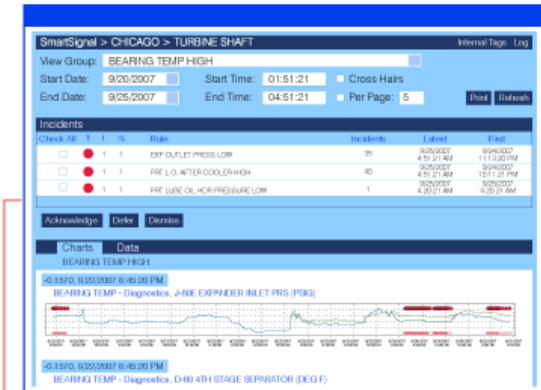
REAL-TIME SENSOR DATA



PERSONALIZED EMPIRICAL MODELS

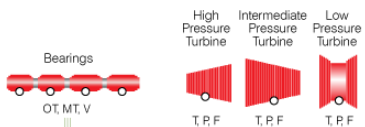
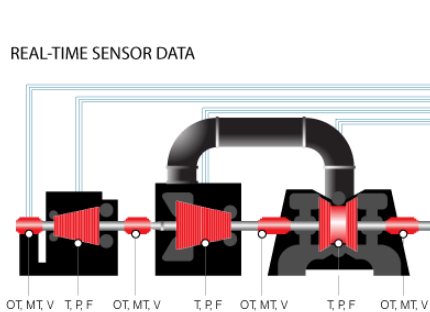
OT= oil temp | MT= metal temp | V= vibration | T= temperature | P= pressure | F= flow

PRECURSOR to FAILURE



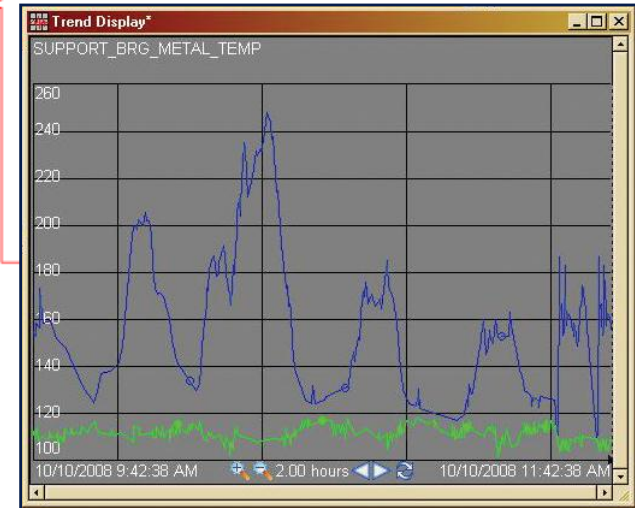
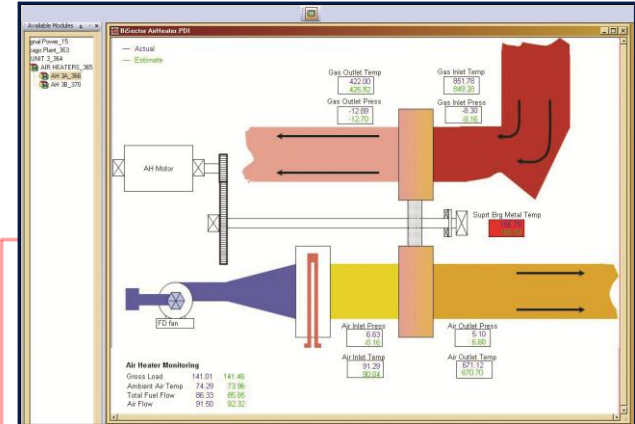
Diagnostic Intelligence to narrow the problem set

REAL-TIME SENSOR DATA



PERSONALIZED EMPIRICAL MODELS

OT= oil temp | MT= metal temp | V= vibration | T= temperature | P= pressure | F= flow

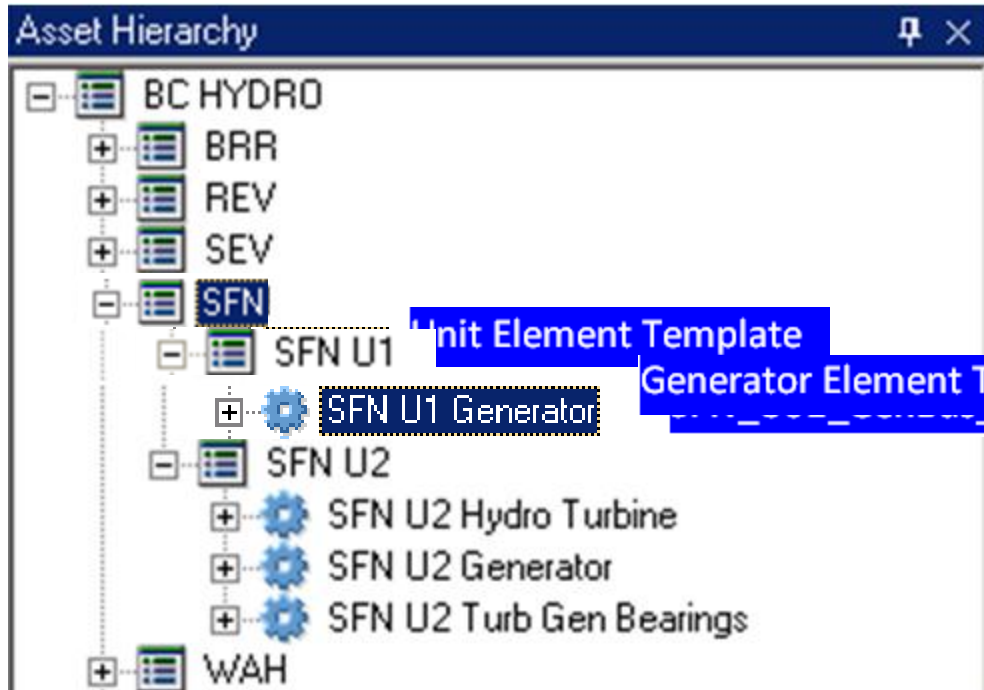


The Power of Partnership



Demo #1

Bottom Up Replication



Unit Element Template

Generator Element Template

estimate_167

r model 167: 119.34

xConnector Tag Naming

SmartSignal xConnector

smartsignal xconnector

Status: Paused...

Home Settings Tag Naming Server Configuration

Observation Data Output Tags

Output Type	Begin tag name with	Label	Example
Estimate	☒ PI Tag Name ☐ EPI Tag Name	Estimate	ts.sp1.Estimate_mName_15
Incident Value	☒ PI Tag Name ☐ EPI Tag Name	IncidentValue	ts.sp1_SSC_RuleSet_RSName.IncidentValue_15
Incident State	☒ PI Tag Name ☐ EPI Tag Name	IncidentState	ts.sp1_SSC_RuleSet_RSName.IncidentState_15
Residual	☒ PI Tag Name ☐ EPI Tag Name	Residual	ts.sp1.Residual_mName_15
Smoothed Actual	☒ PI Tag Name ☐ EPI Tag Name	SmoothedActual	ts.sp1.SmoothedActual_15
Smoothed Residual	☒ PI Tag Name ☐ EPI Tag Name	SmoothedResidual	ts.sp1.SmoothedResidual_mName_15
Actual (calculated) *	☐ PI Tag Name ☒ EPI Tag Name	Actual	Speed.Actual_15
Action Code	☒ PI Tag Name ☐ EPI Tag Name	ActionCode	ts.sp1_SSC_RuleSet_RSName.ActionCode_15
RuleSet Prefix (used in Incident Value and Incident State)		_SSC_RuleSet_	

* PI tag names for calculated variables may be set in the [Settings](#) Section

Label prefix: Label suffix:

Include in Model output Tagname

☐ Model ID ☒ Model Name ☒ Asset ID

Asset Group and Asset Summary Tags

Output Type	Begin tag name with	Label
Incident Count	☒ Asset Name ☐ Asset Label ☐ Blank	CountOf%TYPE%Incidents
Child Assets Count	☒ Group Name ☐ Group Label ☐ Blank	ChildAssetsWith%TYPE%Incidents
Node ID	☒ Node Name ☐ Node Label ☐ Blank	NodeID

* Labels for Asset Groups and Assets may be set in the [Settings](#) Section

Label prefix: Label suffix:

Apply Cancel

Created PI Tags

- All tags created by xConnector have
 - point owner = SmartSignal
 - Extended Descriptor containing
 - Tag Guid from EPI*Center
 - Output type (e.g., estimate, residual, etc.)
 - Model ID (if modeled output)
 - Ruleset Name (if incident information)
- In memory cache created at startup time

PI Tag Missing - Details

Name: PI Server:

Descriptor:

Point class: Point source:

Point type: Digital set:

Eng Units: Display digits:

Exdesc:

- SFN U1
 - SFN U1 Generator **SFN_U01_GenBus_kV_00.Estimate_167** r model 167: 119.34
 - SFN U2
 - SFN U2 Hydro Turbine
 - SFN U2 Generator **SFN_U01_GenBus_kV_00.Estimate_Electrical_165**
 - SFN U2 Turb Gen Bearings
 - WAH

Demo #2

PI Digital Tags map to Integer (multi-state) or string



Digital tag multi-state color



Digital Tag Label

Search

Name

Brg 6 Vib 2_SSC_RuleSet_HIGHORLC

Brg 7 Oil Drain Temp_SSC_RuleSet_H

Brg 7 Temp 1_SSC_RuleSet_HIGHOR

Brg 7 Temp 2_SSC_RuleSet_HIGHOR

Brg 7 Temp 3_SSC_RuleSet_HIGHOR

Brg 7 Temp 4_SSC_RuleSet_HIGHOR

Brg 7 Vib 1_SSC_RuleSet_HIGHORLC

Brg 7 Vib 2_SSC_RuleSet_HIGHORLC

Brg 8 Oil Drain Temp_SSC_RuleSet_H

Brg 8 Temp 1_SSC_RuleSet_HIGHOR

Brg 8 Temp 2_SSC_RuleSet_HIGHOR

Brg 8 Temp 3_SSC_RuleSet_HIGHOR

Brg 8 Temp 4_SSC_RuleSet_HIGHOR

Brg 8 Vib 1_SSC_RuleSet_HIGHORLC

Brg 8 Vib 2_SSC_RuleSet_HIGHORLC

Name:

Brg 8 Vib 2_SSC_RuleSet_HIGHORLOW.IncidentValue

Description:

Configuration Item:

☐

Categories

IncidentValue

UOM:

<None>

Value Type:

SSC_RuleSet_HIGHORLOW

Default Value:

Data Reference:

Basic Types

Boolean

Array Types

Byte

Enumeration Sets

DateTime

Objects

Double

Guid

Int16

Int32

Int64

Single

String

AF Enumeration Sets

Library

- EPICenter
 - Categories
 - Templates
 - Enumeration Sets
 - SSC_INCIDENT_STATES**
 - SSC_RuleSet_HIGHORLOW
 - Reference Types
 - Tables

SSC_INCIDENT_STATES

General

Name: SSC_INCIDENT_STATES

Description:

☐ Hexadecimal

	Value	Name
▶	0	None
	1	New
	2	Acknowledged
	3	Deferred
*		

Library

- EPICenter
 - Categories
 - Templates
 - Enumeration Sets
 - SSC_INCIDENT_STATES
 - SSC_RuleSet_HIGHORLOW**
 - Reference Types
 - Tables

SSC_RuleSet_HIGHORLOW

General

Name: SSC_RuleSet_HIGHORLOW

Description:

☐ Hexadecimal

	Value	Name
▶	0	None
	1	SLOW
	2	MED
	3	FAST
*		

Attribute Template Value Type

IncidentValue	
	Brg 8 Temp 3_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 8 Temp 4_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 8 Vib 1_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 8 Vib 2_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 9 Oil Drain Temp_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 9 Temp 1_SSC_RuleSet_HIGHORLOW.IncidentValue
	Brg 9 Temp 2_SSC_RuleSet_HIGHORLOW.IncidentValue

Name: Brg 8 Vib 2_SSC_RuleSet_HIGHORLOW.IncidentValue

Description:

Configuration Item: ☐ Indexed: ☐

Categories: IncidentValue

UOM: <None>

Value Type: SSC_RuleSet_HIGHORLOW

Default Value:

Data Reference:

Enumeration Sets:

Objects:

SSC_ACTION_CODES

SSC_INCIDENT_STATES

SSC_RuleSet_HIGHORLOW

Data Reference – Digital tag

Elements

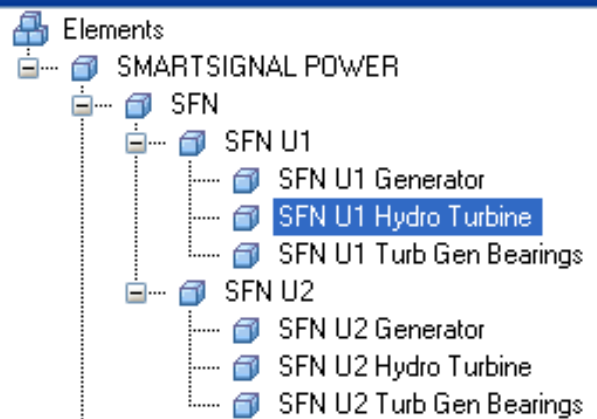
- SMARTSIGNAL POWER
 - SFN
 - WATERFORD 1
 - WATERFORD 2
 - WF2 STEAM TURBINE
 - Brg 8 Temp 3_SSC_RuleSet_HIGHORLOW.IncidentValue
 - Brg 8 Temp 4_SSC_RuleSet_HIGHORLOW.IncidentValue
 - Brg 8 Vib 1_SSC_RuleSet_HIGHORLOW.IncidentValue
 - Brg 8 Vib 2_SSC_RuleSet_HIGHORLOW.IncidentValue** FAST
 - Brg 9 Oil Drain Temp_SSC_RuleSet_HIGHORLOW.IncidentValue
 - Brg 9 Temp 1_SSC_RuleSet_HIGHORLOW.IncidentValue
 - Brg 9 Temp 2_SSC_RuleSet_HIGHORLOW.IncidentValue

Name:	Brg 8 Vib 2_SSC_RuleSet_HIGHORLOW.IncidentValue
Description:	
Configuration Item:	☐
Categories	IncidentValue 
UOM:	<None>
Value Type:	SSC_RuleSet_HIGHORLOW
Value:	FAST 
Data Reference:	PI Point 
Settings...	
\\LRMARCELL1\WF2:TB4024.AG_SSC_RuleSet_HIGHORLOW.IncidentValue_237	

Demo #3

Navigate the Metadata

Elements



A tree view showing the hierarchy of elements. The root is 'Elements', which contains 'SMARTSIGNAL POWER'. Under 'SMARTSIGNAL POWER' is 'SFN'. Under 'SFN' are 'SFN U1' and 'SFN U2'. Under 'SFN U1' are 'SFN U1 Generator', 'SFN U1 Hydro Turbine' (highlighted), and 'SFN U1 Turb Gen Bearings'. Under 'SFN U2' are 'SFN U2 Generator', 'SFN U2 Hydro Turbine', and 'SFN U2 Turb Gen Bearings'.

SFN U1 Hydro Turbine

General

Child Elements

Attributes

Ports

Version

Name: SFN U1 Hydro Turbine

Description:

Template: HYDRO_TURBINE_ASSET

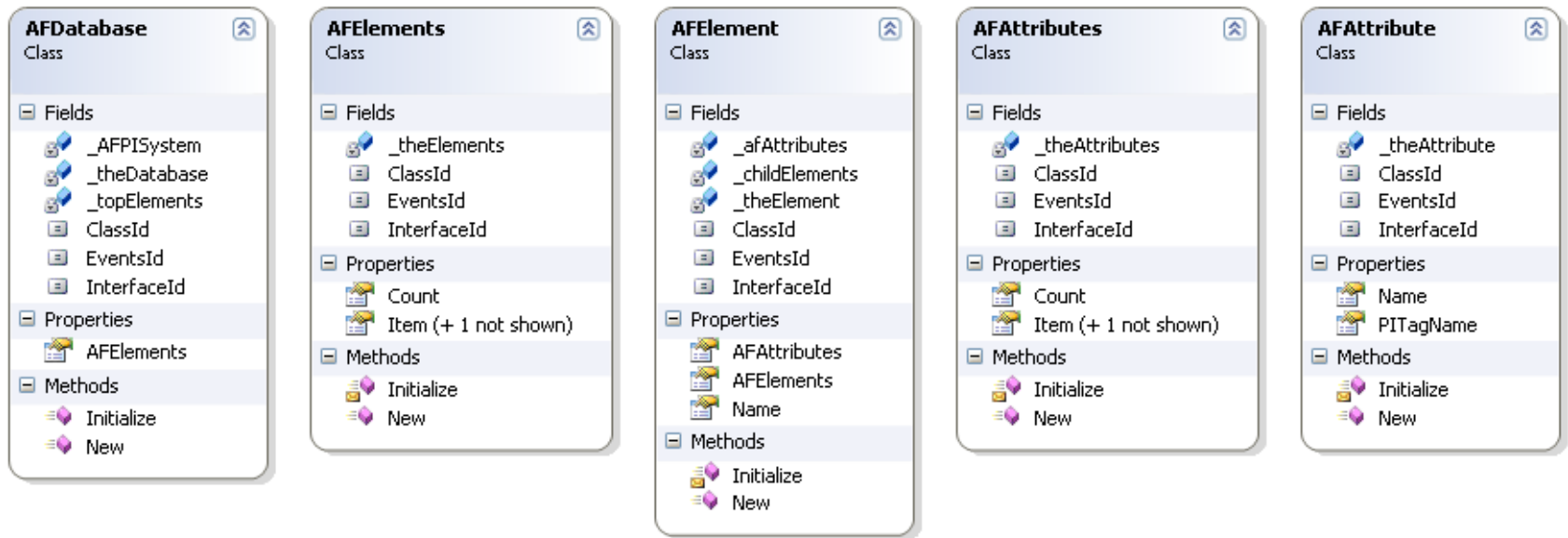
Categories:

Default Attribute: <None>

[Extended Properties](#)

Find: [Details](#) [Model](#) [Layers](#) [Connections](#) [Analysis](#) [Notes](#)

COM Wrapper around AF collections



```
1. point.Snapshot;  
2. Dim srv As PISDK.Server  
3. Fore*%*) (point in server.PIPoints)?!!??  
4. Dim srv A PISDK.Server  
5. if (time_to_market > expected)  
2. Dim srv As PISDK.Server  
3. Fore*%*) (point in server.PIPoints)?!!??  
4. Dim srv A PISDK.Server  
5. if (time_to_market > expected)
```

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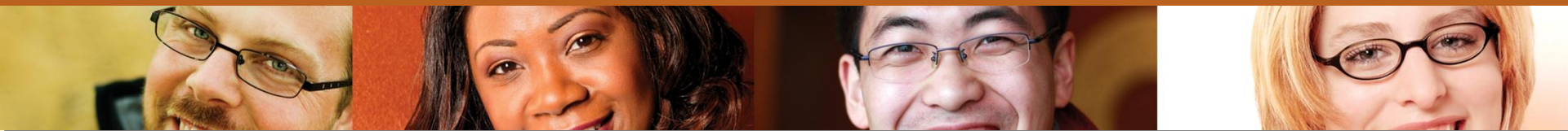
V

CAMPUS | LIVE!

2009

"where
PI geeks
meet"

THANK YOU.



```
1. foreach (point in server.PIPoints)  
{  
    point.Snapshot;  
}  
2. Dim srv As PISDK.Server  
3. Fore*%*) (point in server.PIPoints)?!!??  
4. Dim  
point.Snapshot;  
2. Dim srv As PISDK.Server  
3. Fore*%*) (point in server.PIPoints)?!!??  
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