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PI System 101: Basics for Beginners

Presented by

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Wessam Manoun

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We’re all Here to Share Ideas!

Meet the people next to you!

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*How **do you** use the PI System to do your job?*

*How **do your colleagues** use the PI System to do their jobs?*

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PI 101: What is the PI System used for?

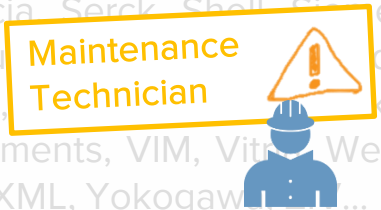
Users apply the PI System to Many Challenges!

What is the forecast of productivity?

I need to know the moment an asset goes out of tune.

I need to combine data from 3 sources in 1 report.

The equipment is not working! What's the problem?



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The PI System is a multi-tool for “operational” data

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PI 101: Class Outline

"Infrastructure" what is it good for?

See how the PI System actually works

and how the PI system fits together

What the most successful users use their PI System for

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Leveraging the PI System in Wate

CHALLENGE

Non-interoperable systems and fractured information sharing prevented running analytics

- Operators and planners often relied on estimates rather than real data to do their job

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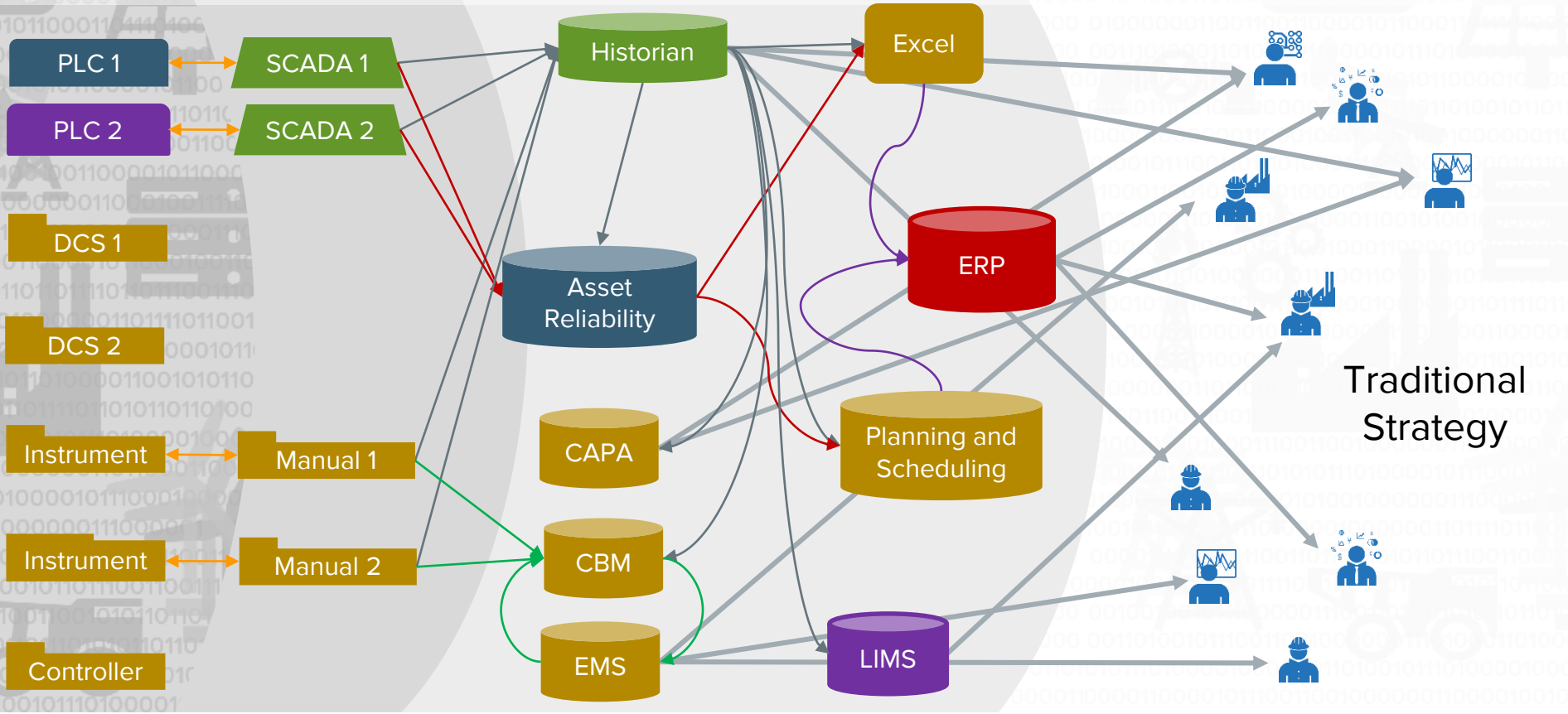
We've All Been Here...



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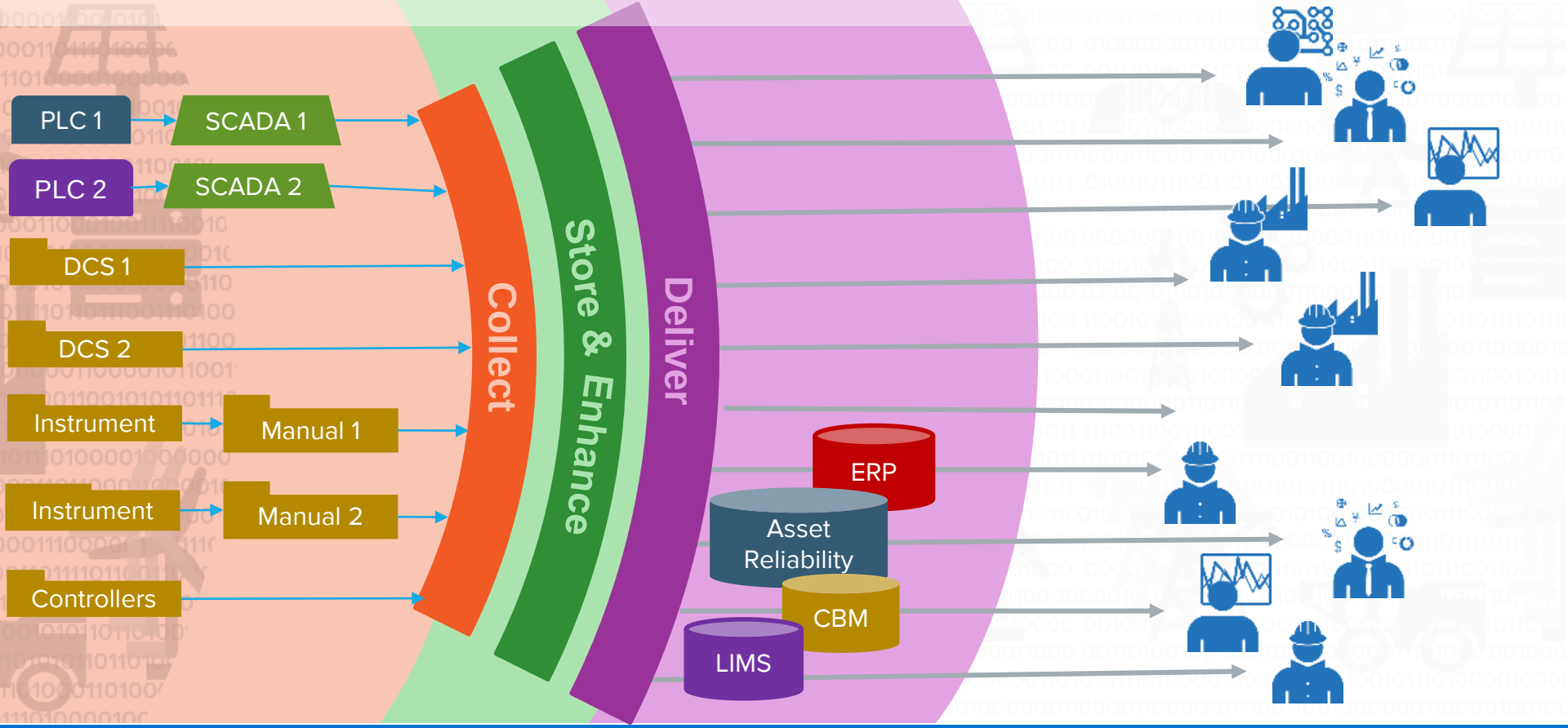
… And You've Made It This Far…



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The PI System handles operational data from sensor to destination

Collect

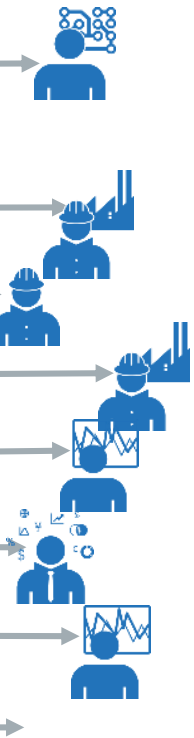
data using
PI Interfaces

Manage & Enhance

data within the
PI Server

Deliver

data via
PI Client Tools



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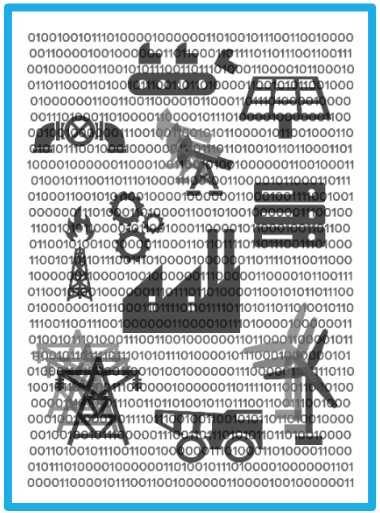
PI 101: What does the PI System "DO"?



Wherever your data starts

to wherever your data needs to go

The **PI System Infrastructure**

is **everything in between**

After today, we hope you're equipped to think up new goals!

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Before our demonstration…

*What **sensors, devices, or assets** matter to you or your industry?*

We'll show one example; see how your case might be similar

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What the most successful users use their PI System for

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Our Scenario: an Industrial Campus

- An industrial campus with large annual utilities usage
  - Utility costs are very important for our budget!
- We are concerned about the campus electrical grid
  - We maintain and manage our own internal generation, grid, and distribution networks!

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Data Delivery: to the Right People at the Right Time

PI Interface

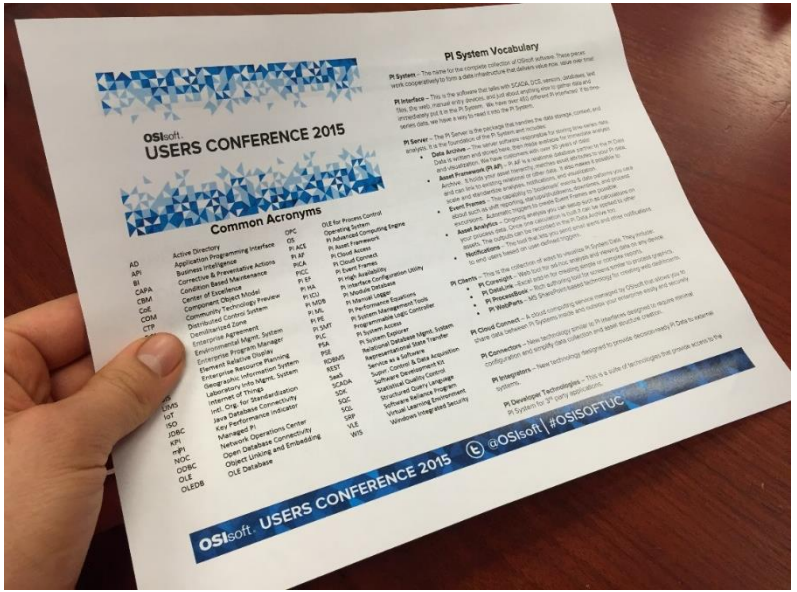
Talks with SCADA, DCS, sensors, databases, text files, the web, manual entry devices, and just about anything else to gather data and immediately put it in the PI System.

PI ProcessBook

Rich authoring tool for screens similar to process graphics.

PI Coresight

Web tool for charts, numbers, graphics, quick analysis, and viewing data on any device.



Your handy info sheet!

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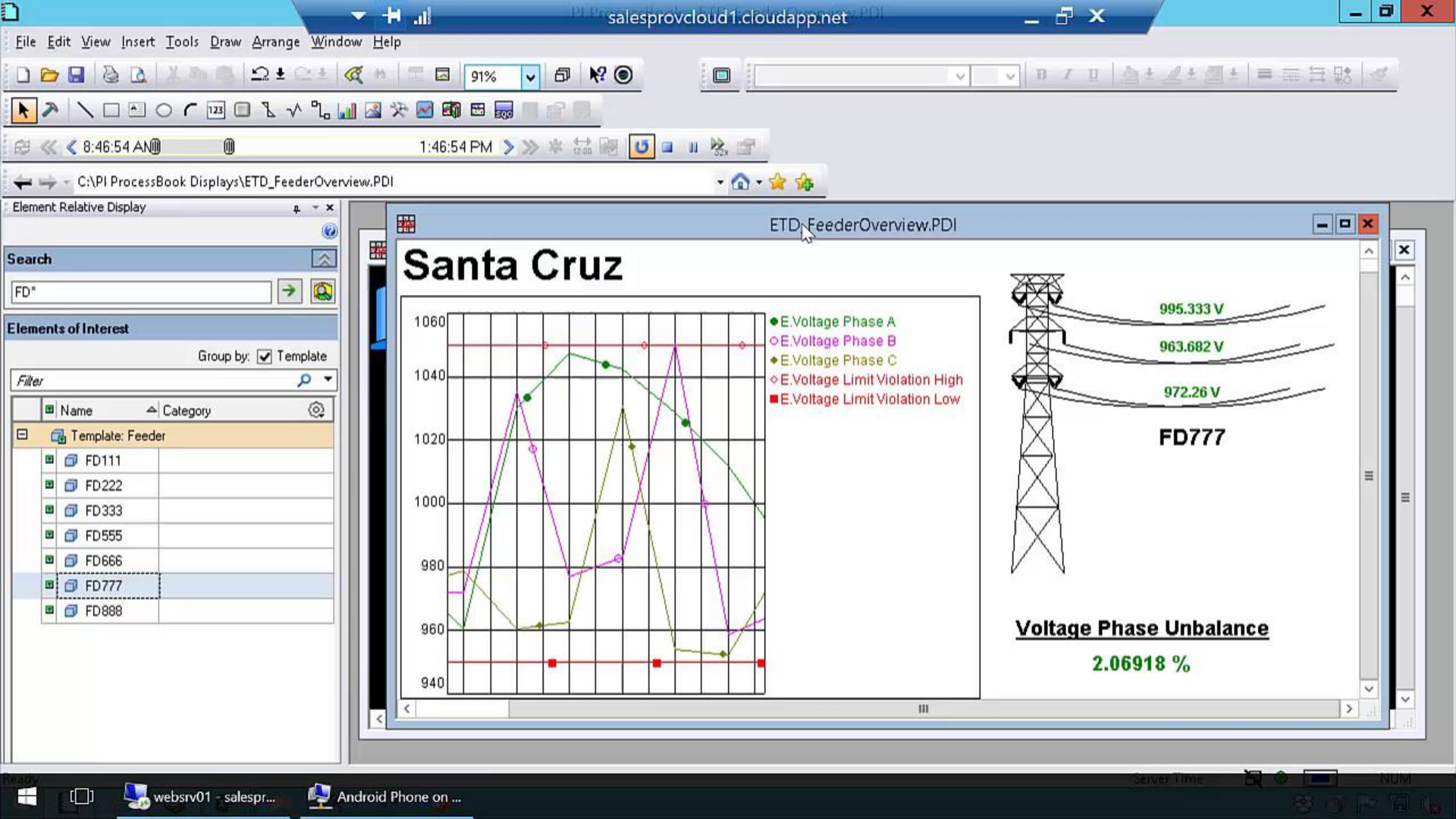
salesprovcloud1.cloudapp.net
File Edit View Insert Tools Draw Arrange Window Help
91%
8:46:54 AM
1:46:54 PM
C:\PI ProcessBook Displays\ETD_FeederOverview.PDI
Element Relative Display
Search
FD*
Elements of Interest
Group by: Template
Filter
Name
Category
Template: Feeder
FD111
FD222
FD333
FD555
FD666
FD777
FD888
ETD_FeederOverview.PDI
Santa Cruz
1060
1040
1020
1000
980
960
940
E.Voltage Phase A
E.Voltage Phase B
E.Voltage Phase C
E.Voltage Limit Violation High
E.Voltage Limit Violation Low
995.333 V
963.682 V
972.26 V
FD777
Voltage Phase Unbalance
2.06918 %
websrv01 - salespr...
Android Phone on ...

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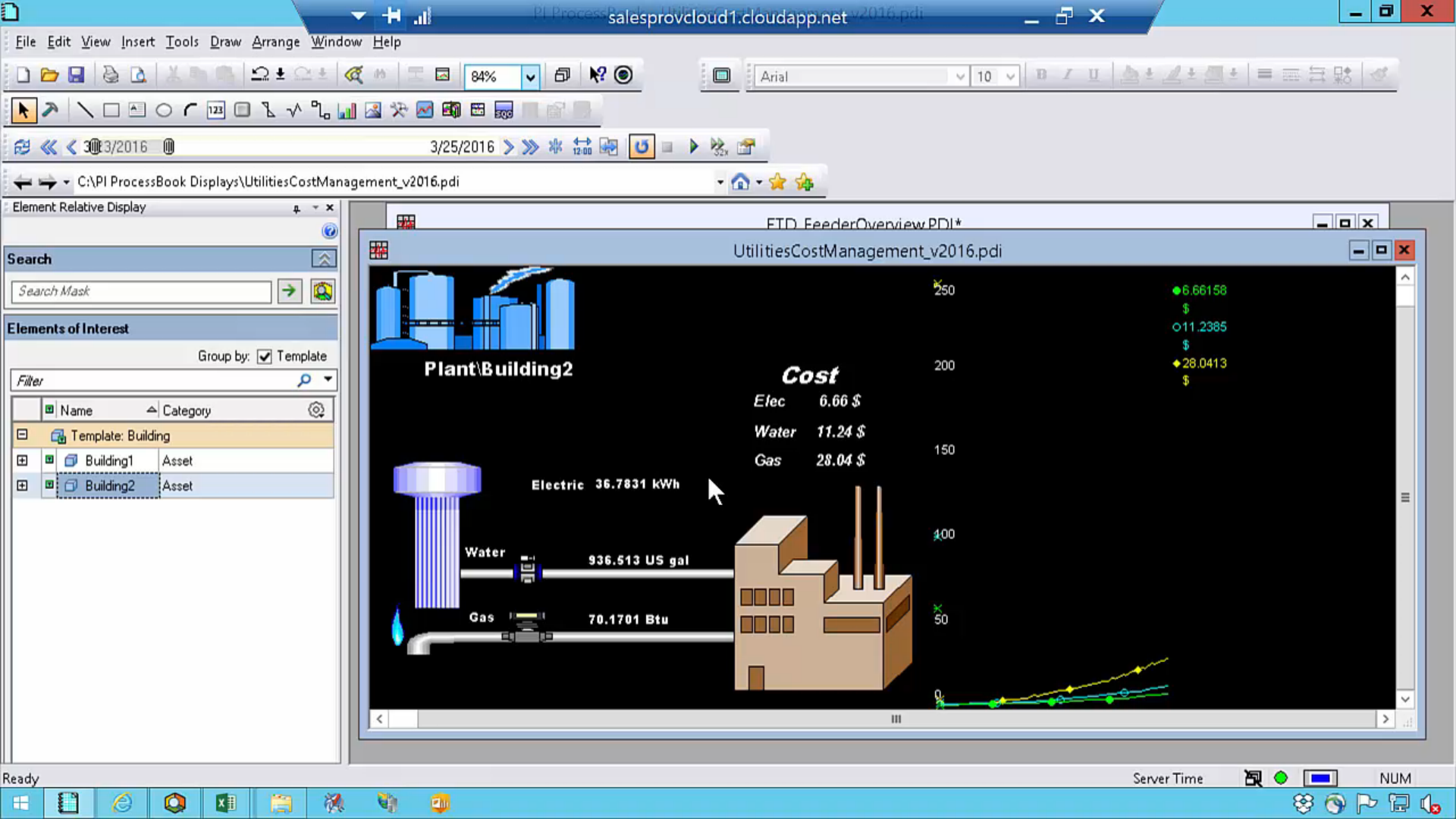
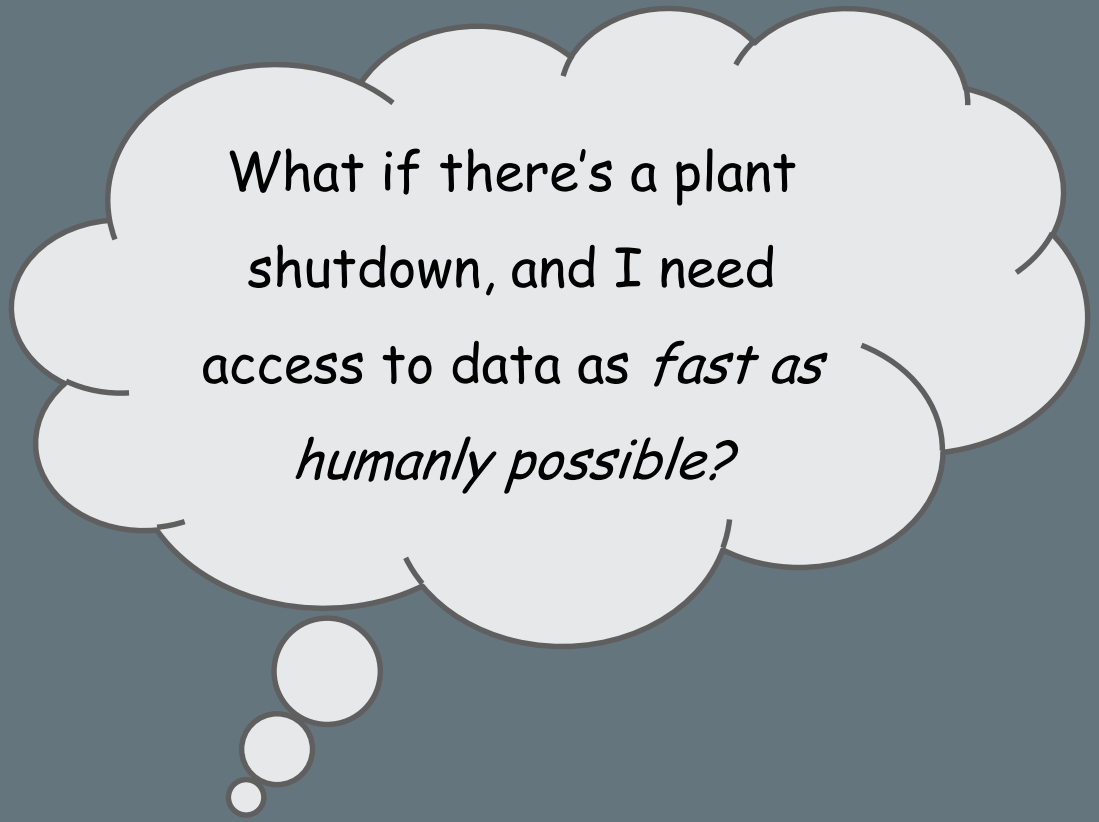

salesprovcloud1.cloudapp.net
File Edit View Insert Tools Draw Arrange Window Help
C:\PI ProcessBook Displays\UtilitiesCostManagement_v2016.pdi
Element Relative Display
Search
Search Mask
Elements of Interest
Group by: Template
Filter
Name
Category
Template: Building
Building1
Asset
Building2
Asset
UtilitiesCostManagement_v2016.pdi
Plant\Building2
Cost
Elec 6.66 $
Water 11.24 $
Gas 28.04 $
Electric 36.7831 kWh
Water
936.513 US gal
Gas
70.1701 Btu
250
200
150
100
50
0
6.66158
$
11.2385
$
28.0413
$
Ready
Server Time
NUM



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http://localhost/Coresight/#/

PI Coresight

PI Coresight

Evaluation Version - expires in 257 days

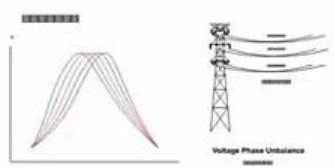
New Display | Dlopez

Search All Displays

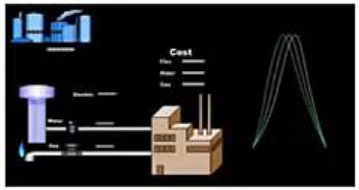
Filter by Keywords

- All Displays
- Favorites
- My Displays
- Recent
- PI ProcessBook Displays

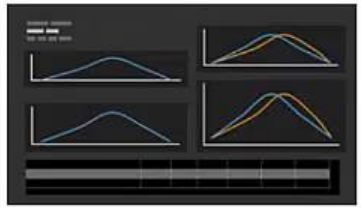
All Displays (20)



ETD_FeederOverview
HOMEPROVISIONG\dlopez

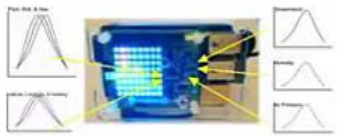


UtilitiesCostManagement_v2016
HOMEPROVISIONG\dlopez



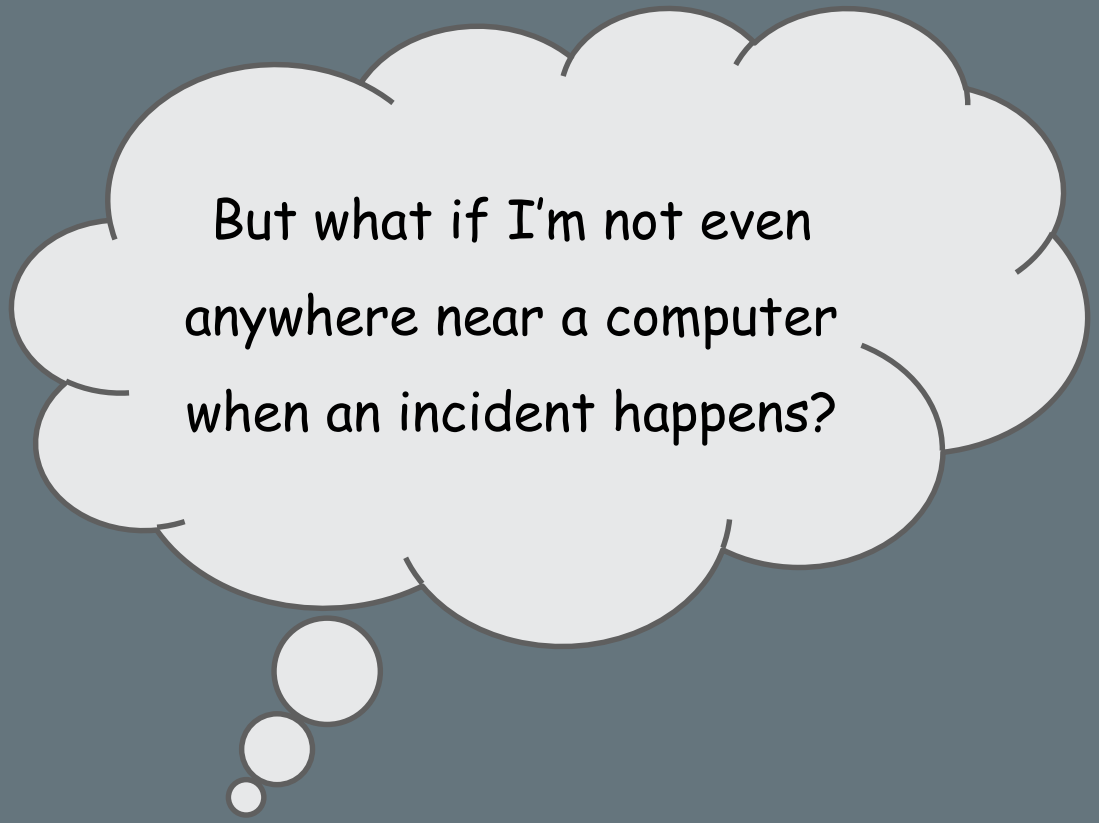
DragonBoard Monitoring
HOMEPROVISIONG\dlopez

Doghouse Dashboard
HOMEPROVISIONG\dlopez



IoT Sensor Module Data
HOMEPROVISIONG\dlopez

Stacked Trends
HOMEPROVISIONG\dlopez



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http://localhost/Coresight/#/Displays/30049/Building-Dashboard

PI Coresight - Building Dashb...

PI Coresight

Evaluation Version - expires in 257 days

New Display | Dlopez

Search

Search in Plant

Home

Asset Based Analysis

Plant

Building1

Building2

Attributes

Plant

Cost

Electrical Cost

Gas Cost

Water Cost

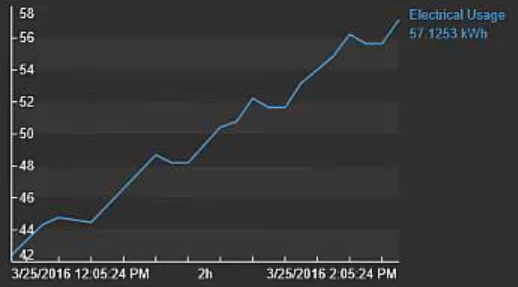
Downtime

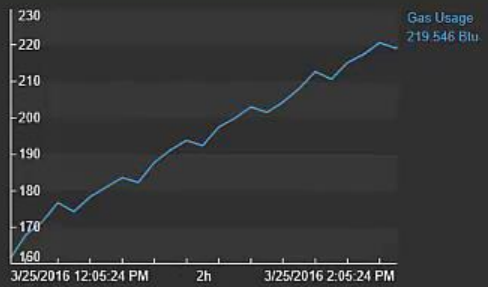
Electrical Downtime

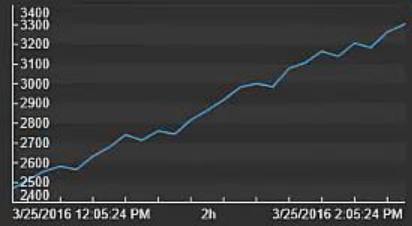
Location

Display: Building Dashboard Asset: Building1

Ad Hoc Display | Save







Building1|Electrical Usage
57.1253 kWh
3/25/2016 2:05:24 PM

Building1|Gas Usage
219.546 Btu
3/25/2016 2:05:24 PM

Building1|Water Usage
3307.01 US gal
3/25/2016 2:05:24 PM

Name	Units	Average	Minimum	Maximum	StdDev
Building1|Electrical Usage	kWh	49.7025	42.4313	57.1253	4.19184
Building1|Gas Usage	Btu	194.429	161.759	220.533	16.0072
Building1|Water Usage	US gal	2881.59	2469.25	3307.01	241.539

3/25/2016 12:05:24 PM | 2h | Now | 3/25/2016 2:05:24 PM

Data Enhancement: adding Structure and Analyses

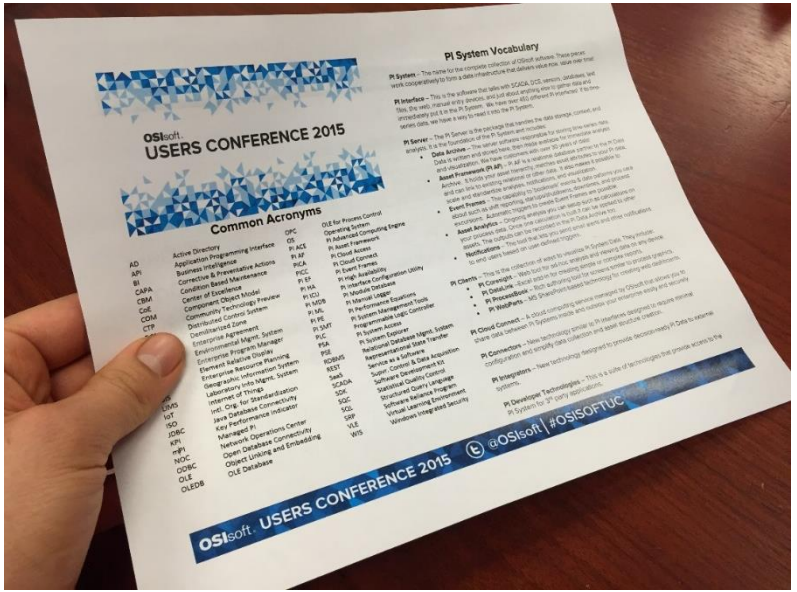
Asset Framework (PI AF)

- Relational database partner to the PI Data Archive.
- It holds your asset hierarchy, matches asset attributes to your PI data, and can link to existing relational or other data. It also makes it possible to scale and standardize analyses, notifications, and visualization.

PI DataLink

- Excel add-in for creating simple or complex reports.

And more…



Your handy info sheet!

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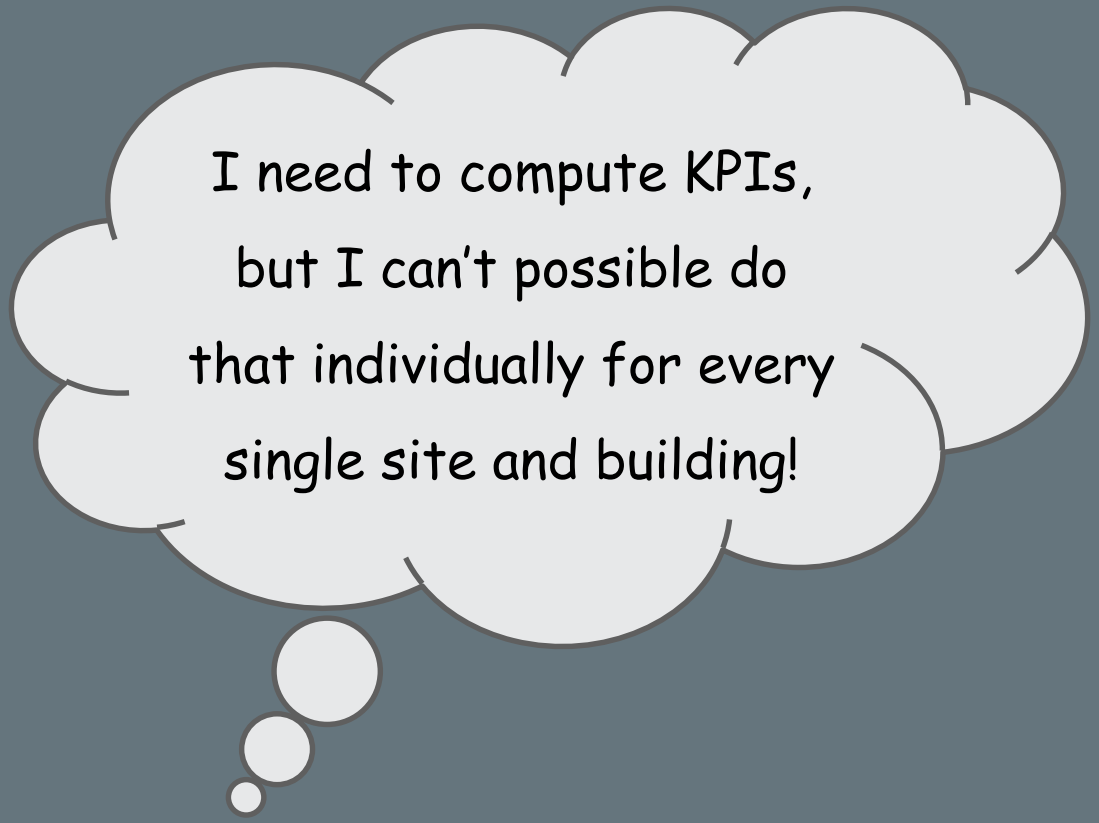

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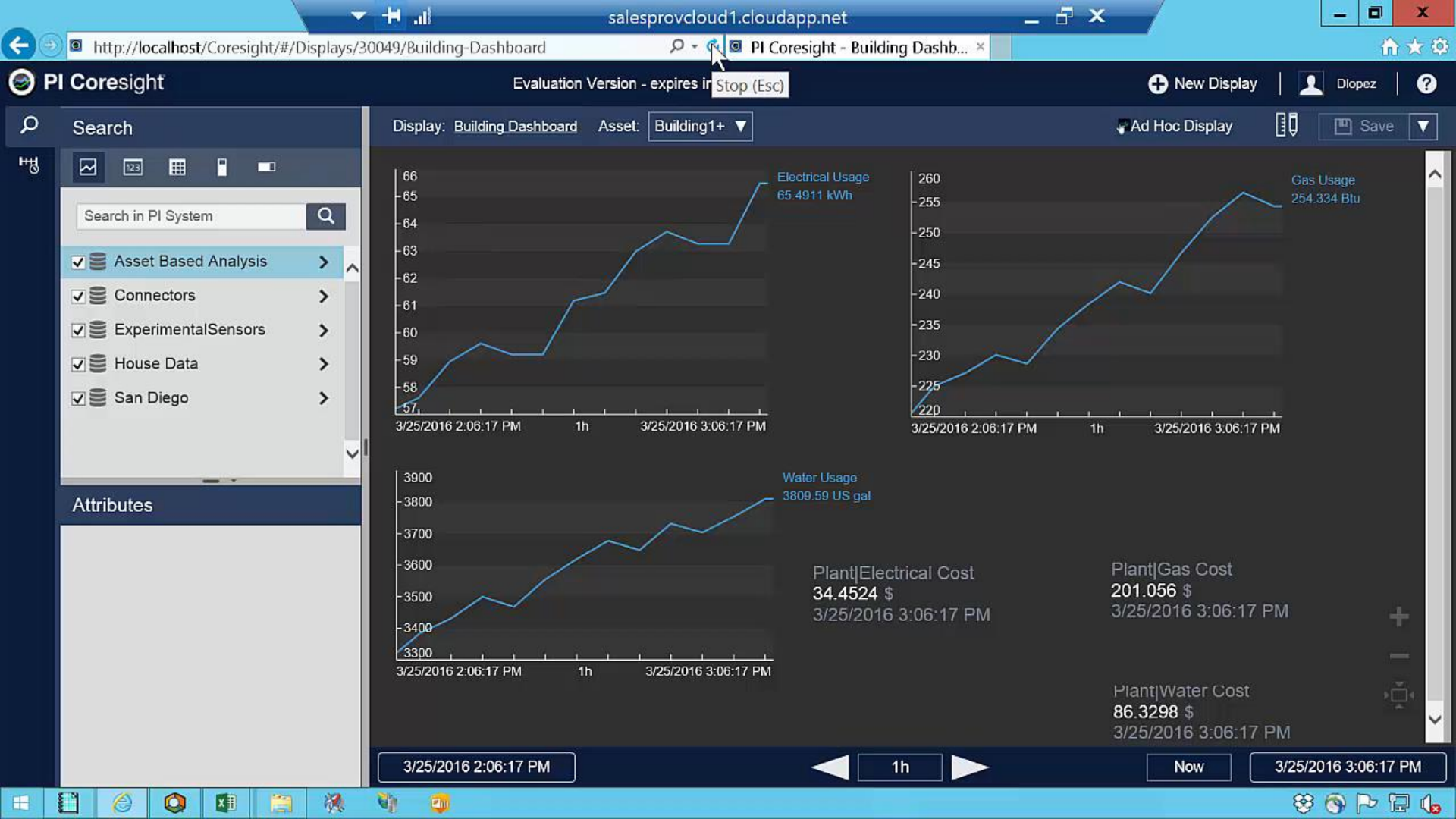
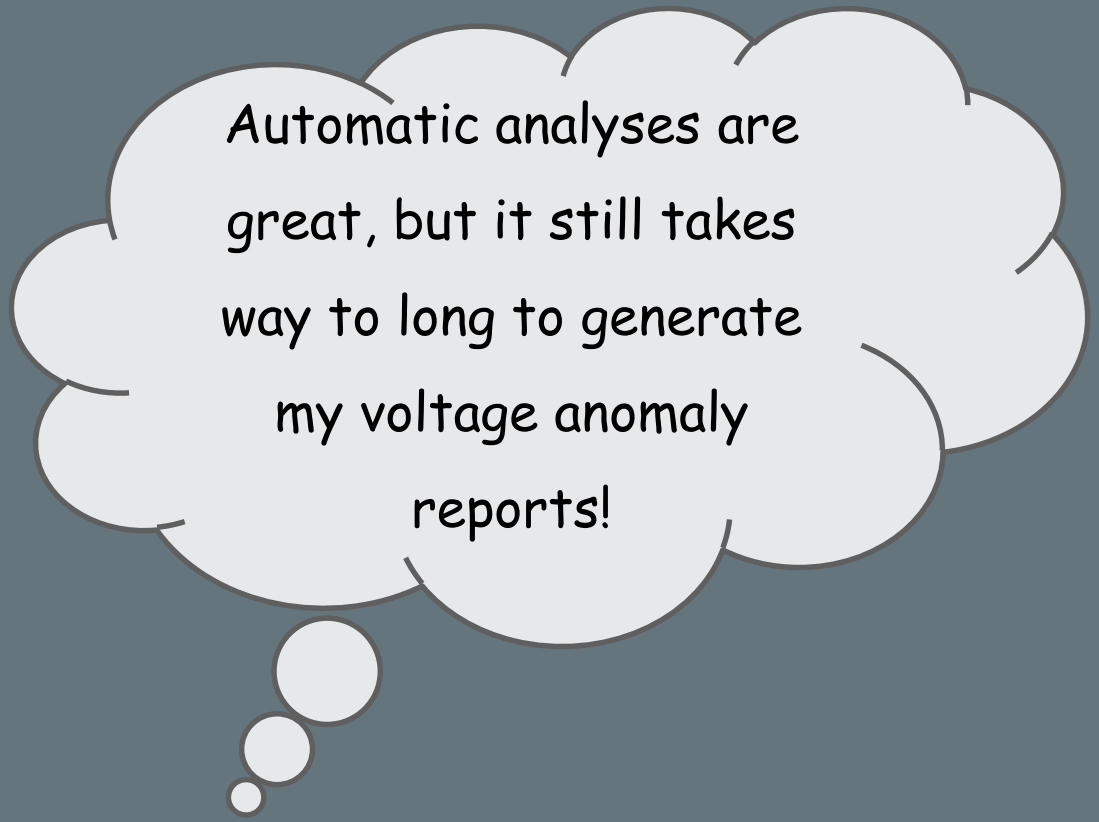

salesprovcloud1.cloudapp.net
http://localhost/Coresight/#/Displays/30049/Building-Dashboard
PI Coresight - Building Dashb...
Stop (Esc)
PI Coresight
Evaluation Version - expires in
New Display
Dlopez
Search
Search in PI System
Asset Based Analysis
Connectors
ExperimentalSensors
House Data
San Diego
Attributes
Display: Building Dashboard
Asset: Building1+
Ad Hoc Display
Save
Electrical Usage
65.4911 kWh
Gas Usage
254.334 Btu
Water Usage
3809.59 US gal
3/25/2016 2:06:17 PM
1h
3/25/2016 3:06:17 PM
Plant|Electrical Cost
34.4524 $
3/25/2016 3:06:17 PM
Plant|Gas Cost
201.056 $
3/25/2016 3:06:17 PM
Plant|Water Cost
86.3298 $
3/25/2016 3:06:17 PM
Now



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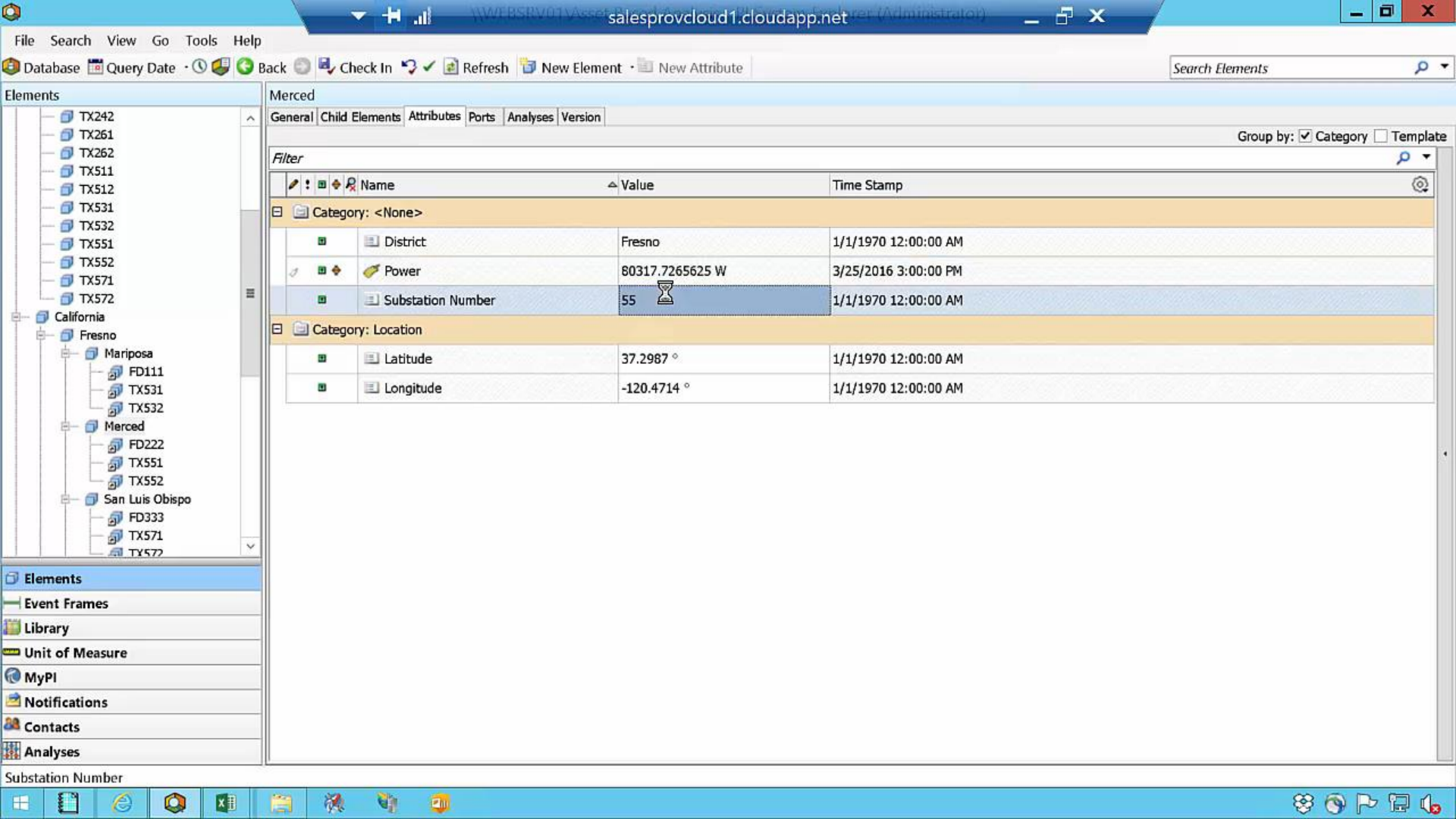
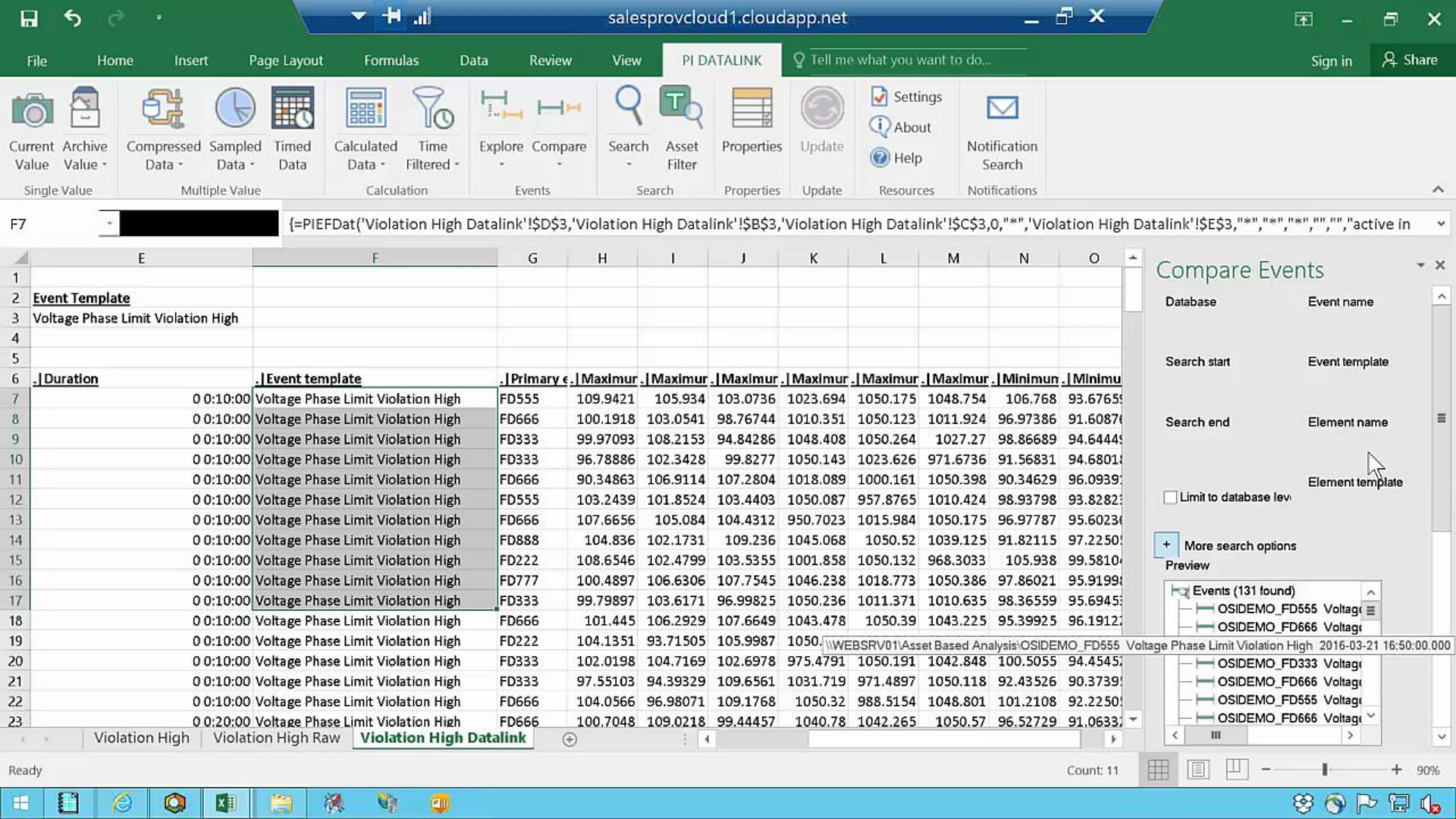

salesprovcloud1.cloudapp.net
File Search View Go Tools Help
Database Query Date Back Check In Refresh New Element New Attribute
Search Elements
Elements
TX242
TX261
TX262
TX511
TX512
TX531
TX532
TX551
TX552
TX571
TX572
California
Fresno
Mariposa
FD111
TX531
TX532
Merced
FD222
TX551
TX552
San Luis Obispo
FD333
TX571
TX572
Elements
Event Frames
Library
Unit of Measure
MyPI
Notifications
Contacts
Analyses
Merced
General Child Elements Attributes Ports Analyses Version
Group by: Category Template
Filter
Name Value Time Stamp
Category: <None>
District Fresno 1/1/1970 12:00:00 AM
Power 80317.7265625 W 3/25/2016 3:00:00 PM
Substation Number 55 1/1/1970 12:00:00 AM
Category: Location
Latitude 37.2987 ° 1/1/1970 12:00:00 AM
Longitude -120.4714 ° 1/1/1970 12:00:00 AM
Substation Number


salesprovcloud1.cloudapp.net
File
Home
Insert
Page Layout
Formulas
Data
Review
View
PI DATALINK
Tell me what you want to do...
Sign in
Share
Current Value
Archive Value
Compressed Data
Sampled Data
Timed Data
Calculated Data
Time Filtered
Explore
Compare
Search
Asset Filter
Properties
Update
Settings
About
Help
Notification Search
Single Value
Multiple Value
Calculation
Events
Search
Properties
Update
Resources
Notifications
F7
{=PIEFDat('Violation High Datalink'!$D$3,'Violation High Datalink'!$B$3,'Violation High Datalink'!$C$3,0,"*",'Violation High Datalink'!$E$3,"*","*","*","","","active in
Event Template
Voltage Phase Limit Violation High
.|Duration
.|Event template
.|Primary €
.|Maximur
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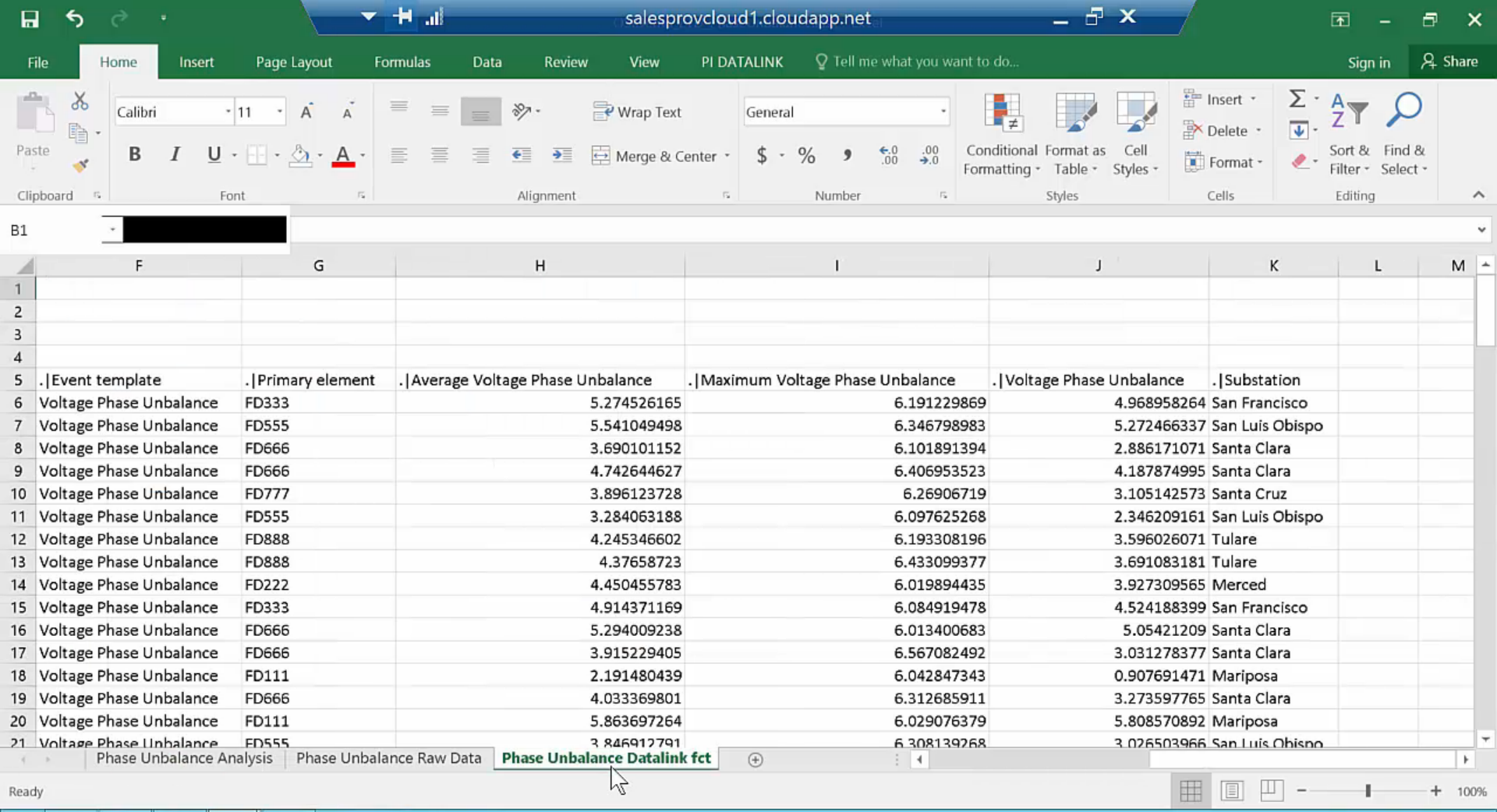
.|Minimu
0 0:10:00 Voltage Phase Limit Violation High FD555 109.9421 105.934 103.0736 1023.694 1050.175 1048.754 106.768 93.6765
0 0:10:00 Voltage Phase Limit Violation High FD666 100.1918 103.0541 98.76744 1010.351 1050.123 1011.924 96.97386 91.6087
0 0:10:00 Voltage Phase Limit Violation High FD333 99.97093 108.2153 94.84286 1048.408 1050.264 1027.27 98.86689 94.6444
0 0:10:00 Voltage Phase Limit Violation High FD333 96.78886 102.3428 99.8277 1050.143 1023.626 971.6736 91.56831 94.6801
0 0:10:00 Voltage Phase Limit Violation High FD666 90.34863 106.9114 107.2804 1018.089 1000.161 1050.398 90.34629 96.0939
0 0:10:00 Voltage Phase Limit Violation High FD555 103.2439 101.8524 103.4403 1050.087 957.8765 1010.424 98.93798 93.8282
0 0:10:00 Voltage Phase Limit Violation High FD666 107.6656 105.084 104.4312 950.7023 1015.984 1050.175 96.97787 95.6023
0 0:10:00 Voltage Phase Limit Violation High FD888 104.836 102.1731 109.236 1045.068 1050.52 1039.125 91.82115 97.2250
0 0:10:00 Voltage Phase Limit Violation High FD222 108.6546 102.4799 103.5355 1001.858 1050.132 968.3033 105.938 99.5810
0 0:10:00 Voltage Phase Limit Violation High FD777 100.4897 106.6306 107.7545 1046.238 1018.773 1050.386 97.86021 95.9199
0 0:10:00 Voltage Phase Limit Violation High FD333 99.79897 103.6171 96.99825 1050.236 1011.371 1010.635 98.36559 95.6945
0 0:10:00 Voltage Phase Limit Violation High FD666 101.445 106.2929 107.6649 1043.478 1050.39 1043.225 95.39925 96.1912
0 0:10:00 Voltage Phase Limit Violation High FD222 104.1351 93.71505 105.9987 1050.
0 0:10:00 Voltage Phase Limit Violation High FD333 102.0198 104.7169 102.6978 975.4791 1050.191 1042.848 100.5055 94.4545
0 0:10:00 Voltage Phase Limit Violation High FD333 97.55103 94.39329 109.6561 1031.719 971.4897 1050.118 92.43526 90.3739
0 0:10:00 Voltage Phase Limit Violation High FD666 104.0566 96.98071 109.1768 1050.32 988.5154 1048.801 101.2108 92.2250
0 0:20:00 Voltage Phase Limit Violation High FD666 100.7048 109.0218 99.44457 1040.78 1042.265 1050.57 96.52729 91.0633
\\WEBSRV01\Asset Based Analysis\OSIDEMO_FD555 Voltage Phase Limit Violation High 2016-03-21 16:50:00.000
Violation High
Violation High Raw
Violation High Datalink
Compare Events
Database
Event name
Search start
Event template
Search end
Element name
Element template
Limit to database lev
More search options
Preview
Events (131 found)
OSIDEMO_FD555 Voltage
OSIDEMO_FD666 Voltage
OSIDEMO_FD333 Voltage
OSIDEMO_FD666 Voltage
OSIDEMO_FD555 Voltage
OSIDEMO_FD666 Voltage
Ready
Count: 11
90%



.|Event template	.|Primary element	.|Average Voltage Phase Unbalance	.|Maximum Voltage Phase Unbalance	.|Voltage Phase Unbalance	.|Substation
Voltage Phase Unbalance	FD333	5.274526165	6.191229869	4.968958264	San Francisco
Voltage Phase Unbalance	FD555	5.541049498	6.346798983	5.272466337	San Luis Obispo
Voltage Phase Unbalance	FD666	3.690101152	6.101891394	2.886171071	Santa Clara
Voltage Phase Unbalance	FD666	4.742644627	6.406953523	4.187874995	Santa Clara
Voltage Phase Unbalance	FD777	3.896123728	6.26906719	3.105142573	Santa Cruz
Voltage Phase Unbalance	FD555	3.284063188	6.097625268	2.346209161	San Luis Obispo
Voltage Phase Unbalance	FD888	4.245346602	6.193308196	3.596026071	Tulare
Voltage Phase Unbalance	FD888	4.37658723	6.433099377	3.691083181	Tulare
Voltage Phase Unbalance	FD222	4.450455783	6.019894435	3.927309565	Merced
Voltage Phase Unbalance	FD333	4.914371169	6.084919478	4.524188399	San Francisco
Voltage Phase Unbalance	FD666	5.294009238	6.013400683	5.05421209	Santa Clara
Voltage Phase Unbalance	FD666	3.915229405	6.567082492	3.031278377	Santa Clara
Voltage Phase Unbalance	FD111	2.191480439	6.042847343	0.907691471	Mariposa
Voltage Phase Unbalance	FD666	4.033369801	6.312685911	3.273597765	Santa Clara
Voltage Phase Unbalance	FD111	5.863697264	6.029076379	5.808570892	Mariposa
Voltage Phase Unbalance	FD555	3.846912791	6.308139268	3.026503966	San Luis Obispo

What Are the Pieces of the PI System?

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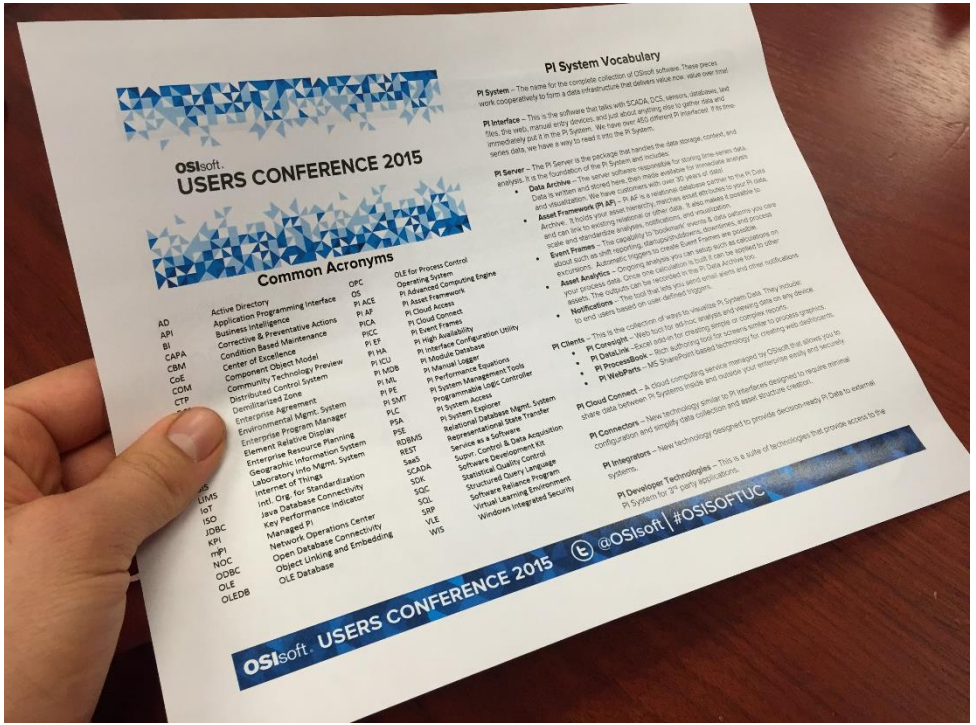
Remember to Take a Look at…

Your handy info sheet!



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The PI System has 3 Layers

PI Interfaces
& PI Connectors

SCADA
PLC
Manual
DCS
Databases
Sensors

- OPC
- Modbus
- Wonderware
- DNP3
- RDBMS

And hundreds more!

PI Server
Store & Enhance

Data Archive

- Historical data
- Real-time data
- Future Data

Asset Framework

- Asset Structure
- Asset Analytics
- Event Frames
- Notifications

PI Clients
Deliver

- PI Coresight
- PI ProcessBook
- PI DataLink

- IT Data Warehouses
- BI tools
- Esri ArcGIS
- Foreign PI Systems
- Custom Applications

Real Time Troubleshooting

Keep the Process Healthy

Report on data quickly

Avoid breakdowns

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PI 101: Class Outline

"Infrastructure" what is it good for?

See how the PI System actually works

and how the PI system fits together

What the most successful users use their PI System for

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What companies use the PI System for

6 Common Uses

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Leveraging the PI System in Water Loss Control

COMPANY and GOAL

Halifax manages water and wastewater for 325,000

HALIFAX

COMPANY and GOAL

Halifax manages water and wastewater for 325,000 people. Halifax wanted to both **find and reduce leaks** in real-time and reduce water main breaks

- Operators and planners often relied on estimates rather than real data to do their job

- "We can see the turbidities and chlorine levels at the plant – and also out in the distribution system. That is a beautiful thing!"

- Halifax detected and addressed a big leak of 700 gallons per minute that had been running for 9 hours.
- The company's Infrastructure Leakage Index (ILI) improved from 9 to 2.5.

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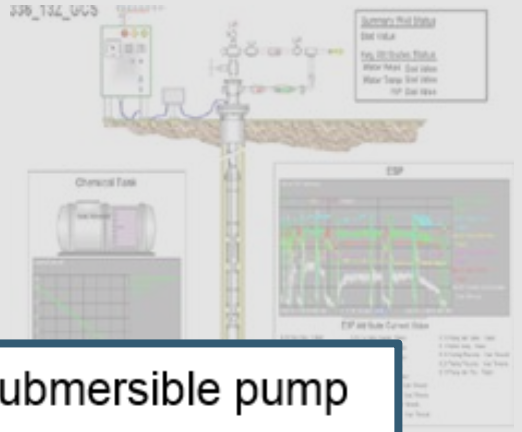
ESP Reliability Improvement Saves $40M/y

Global O&G Company

Company faced highly expensive repair costs from electrical submersible pump (ESP) failures so they wanted to **reduce costs through the detection of failure** before these pumps breakdown.



Company faced highly expensive repair costs from electrical submersible pump (ESP) failures so they wanted to **reduce costs through the detection of failure** before these pumps breakdown.

submersible pumps leading to high repair costs.

- **$100M+/yr in repair** of **Electrical Submersible Pump (ESP)**
- 3,800 ESPs with **20% failure rate per year**

Notifications to alert engineers of potential failures.

- Develop a PI System based **application to predict ESP failure**
- Setup PI Notifications to generate **exception-based reporting**

production by 65% and mean time between failure by 35%.

- Greater than **$40M/year** saving in reduced maintenance alone

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Enhancing SAGD Operational Safety and Reservoir Monitoring & Optimization

SUNCOR

Goal was to enhance SAGD Operational Safety and streamline abnormal reservoir response reporting.

In Situ Application Support Group, Firebag

Goal was to **enhance SAGD Operational Safety** and streamline abnormal reservoir response reporting.

In Situ Application Support Group, Firebag

- Need to collect real-time information for a large number of wells and conditions

- Full deployment of Asset Framework and Notifications
- PI Interfaces collect data from a large number of wells with similar instrumentation.

- Improved operations visibility
- Better energy and environmental regulatory reporting

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Environmental Regulatory and Corporate Sustainability Reporting

Dolphin Energy

"We did the project to ensure the AECS can **produce reliable data for all air emission reporting** including corporate KPI."

Dr. Rola Atiyeh

"We did the project to ensure the AECS can **produce reliable data for all air emission reporting** including corporate KPI."

DOLPHIN ENERGY دولفين للطاقة

C

Multiple s
and data
time consuming to QA/QC and generate reports

- Calculations and reliability issues due to instrument failures and process shutdown, creatied data gaps

to reconcile/validate values for accurate data reporting

- Well documented equation methods
- Real-time data quality and emission limits monitoring

reconciled PI System data, meeting EHS compliance and reporting requirements

- Reduction of the risk of being fined for non-compliance
- Calculation methodologies can be verified by 3rd-party auditors
- Saves substantial time for QA/QC

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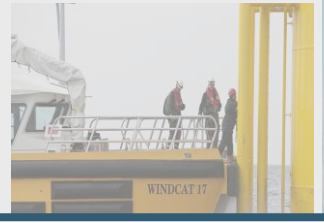
Combining Real-time and Spatial Decision Making with the PI Integrator for Esri ArcGIS

DONG Energy

We wanted to be able to view data across our entire portfolio of off-shore wind turbines in a way that would allow us to ***reduce health, safety and environmental risk*** as well as ***reduce operating costs***.



DONG

We wanted to be able to view data across our entire portfolio of off-shore wind turbines in a way that would allow us to ***reduce health, safety and environmental risk*** as well as ***reduce operating costs***.

DONG energy

expensive compared to onshore

- Working on an offshore wind turbine is 15x more expensive than onshore
- Increase operational efficiency while expanding fleet

and spatial data on a map

Integration of PI System data with spatial data from Esri ArcGIS

SAP Integration to support work dispatching

turbines and reduce cost up to ~20M EUR/year.

- Unscheduled visits/turbine/year will be reduced from 4 times to 2 times
- Fast decision making in Technical Support

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*What **tasks or goals** are you **already** using the PI System for?*

*What **new tasks or goals** are you interested in using the PI System for?*

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*What **tasks or goals** are you **already** using the PI System for?*

*What **new tasks or goals** are you interested in using the PI System for?*

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Quick Review: What is the PI System

Collect

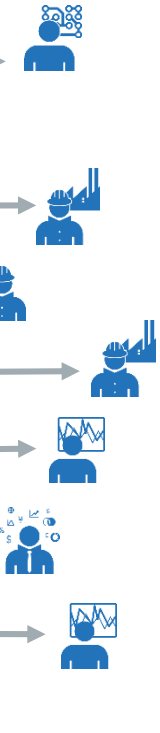
data using
PI Interfaces

Manage & Enhance

data within the
PI Server

Deliver

data via
PI Client Tools



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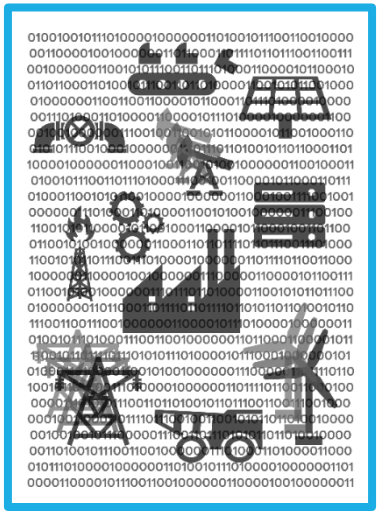
Quick Review: What the PI System Does.



Wherever your data starts

to wherever your data needs to go

The **PI System Infrastructure**

is **everything in between**

After today, we hope you're equipped to think up new goals!

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What companies use the PI System for

6 Common Uses

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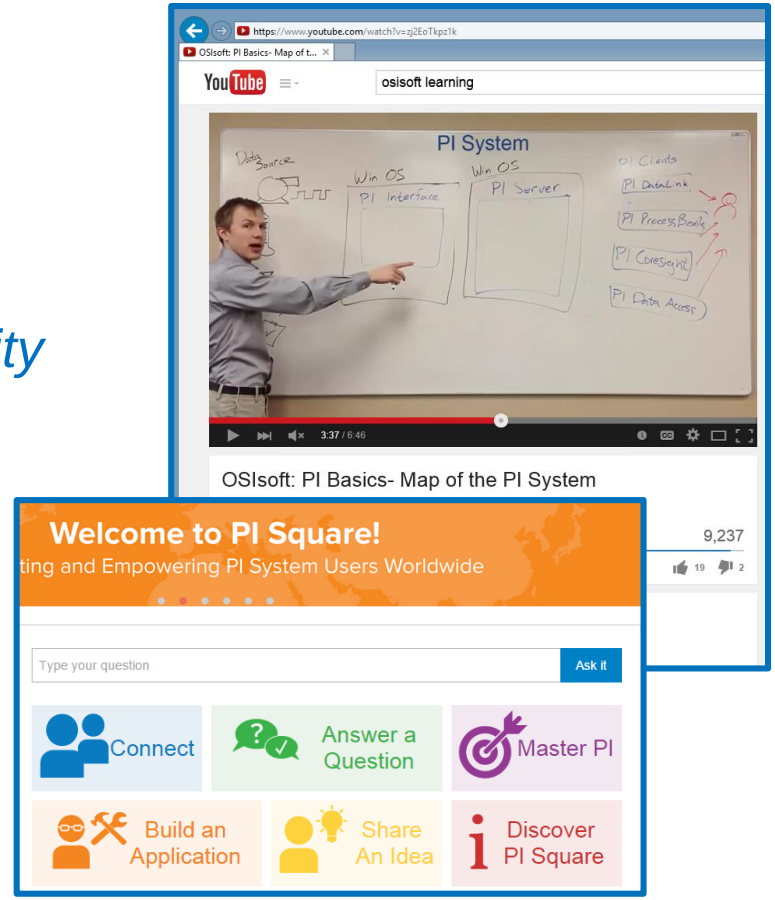
How Can You Learn More?

OSIsoft YouTube Channel

PI Square Users Community

Live Classes &
Virtual Learning
Environment (VLE)

Tech Support &
Field Service



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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

http://ddut.ch/osisoft

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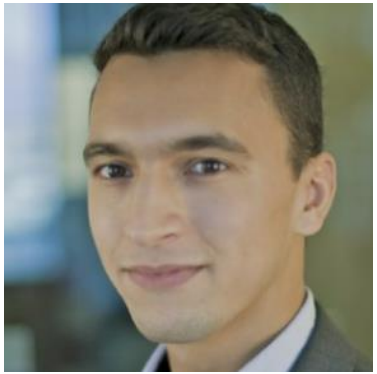

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After You Leave, What's Next at the UC?

TechCon Talks

Hands On Labs

Product Expo

Come meet us and ask us questions! ☺

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감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado

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