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Use Cases of the PI Integrator for Esri in Distribution

Presented by **Subbu Sankaran**



San Diego Gas & Electric®

- Subsidiary of Sempra Energy
- Regulated public utility
- Provide safe and reliable energy service to 3.4 million consumers
 - 1.4 million electric meters
 - 800,000 natural gas meters
- 4,100 square mile service territory in San Diego and southern Orange Counties (25 cities)



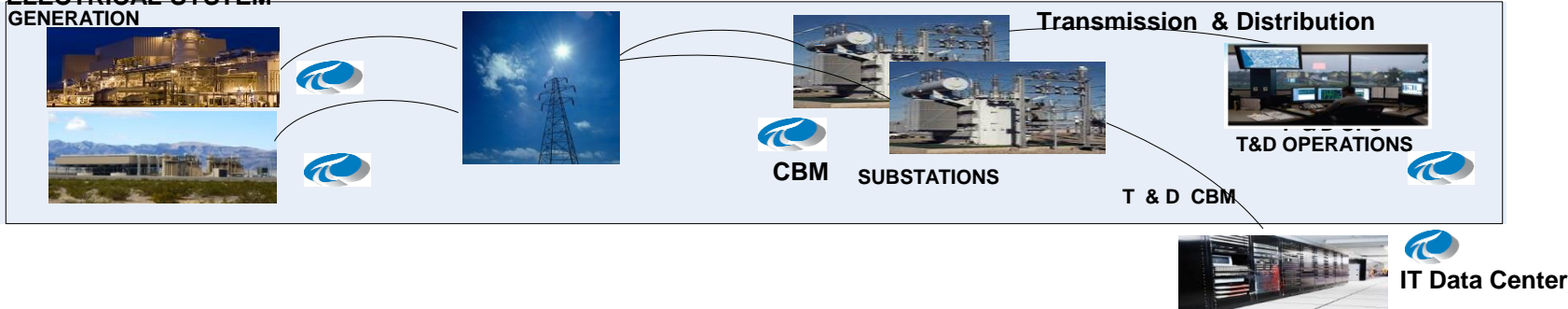
- 1,800 miles of electric transmission lines and 21,600 miles of electric distribution lines
- Two compressor stations, 160 miles of natural gas transmission pipelines, 8,100 miles of distribution pipelines and 6,200 miles of service lines
- 4,500 employees

OSIsoft PI System at SDG&E®

GAS SYSTEM

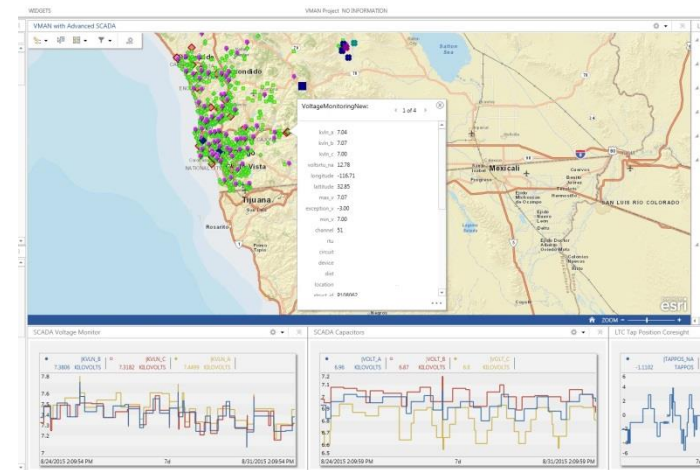


ELECTRICAL SYSTEM



Esri/PI System use cases for Distribution

Actionable and intelligent real-time data for wide area situational awareness.



Business Challenge

Real time situational awareness of distribution assets (highly utilized assets, voltage, weather) for safe and reliable power delivery.

Key operational data dispersed across disconnected enterprise systems.

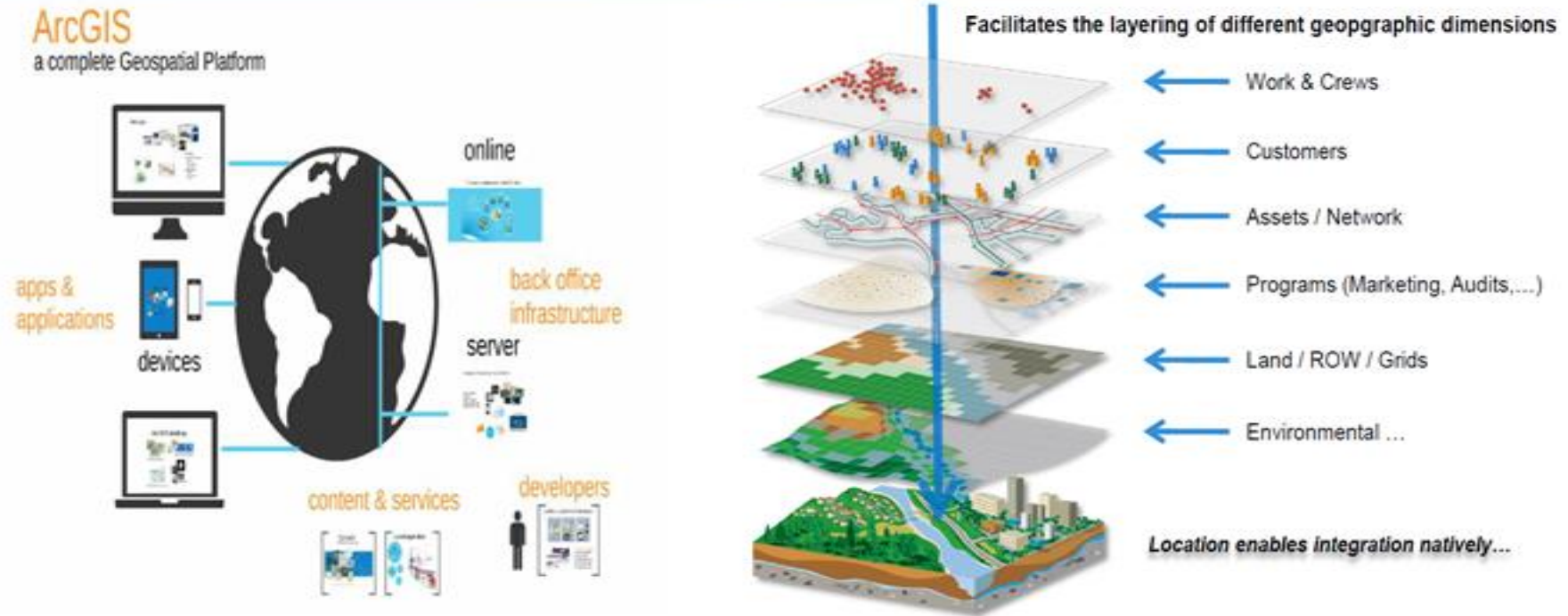
Solution

Implement PI Integrator for ESRI ArcGIS solution to visualize the Geographic Information System and real-time distribution operation data.

Results and Benefits

Rollout GIS operations dashboard to include real-time distribution assets performance, power quality and business metrics to drive decision-making process easier for our distribution operation & engineering department.

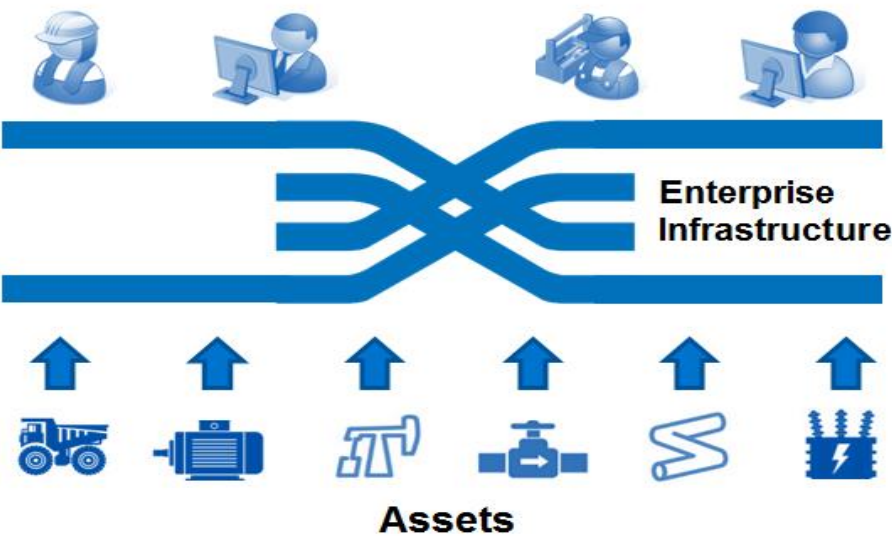
ESRI ArcGIS Platform



OSIsoft + Esri Products



Connect the *right data* to the *right people* in the *right context* for the right decisions in real-time



Usable | Actionable | Accountable

A strategy for making actionable decisions as an organization

Real-time Data in Spatial Context

Real-time GIS Data

- Real-time GIS data is a continuous stream of events flowing from sensors where each event represents the latest state of the sensor.
 - Emergency Response
 - Utility Networks and Warehouses
 - Environmental





PI Integrator for Esri ArcGIS

PI Interfaces



Notifications



Event Frames



Analytics



AF

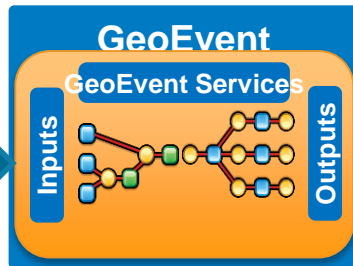


Data Archive



PI Integrator
for Esri ArcGIS

<https://xx-yyyy-zz/geoevent/manager>



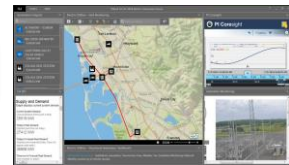
Operations Dashboard
for ArcGIS

ArcGIS Online /
Portal for ArcGIS

operation view

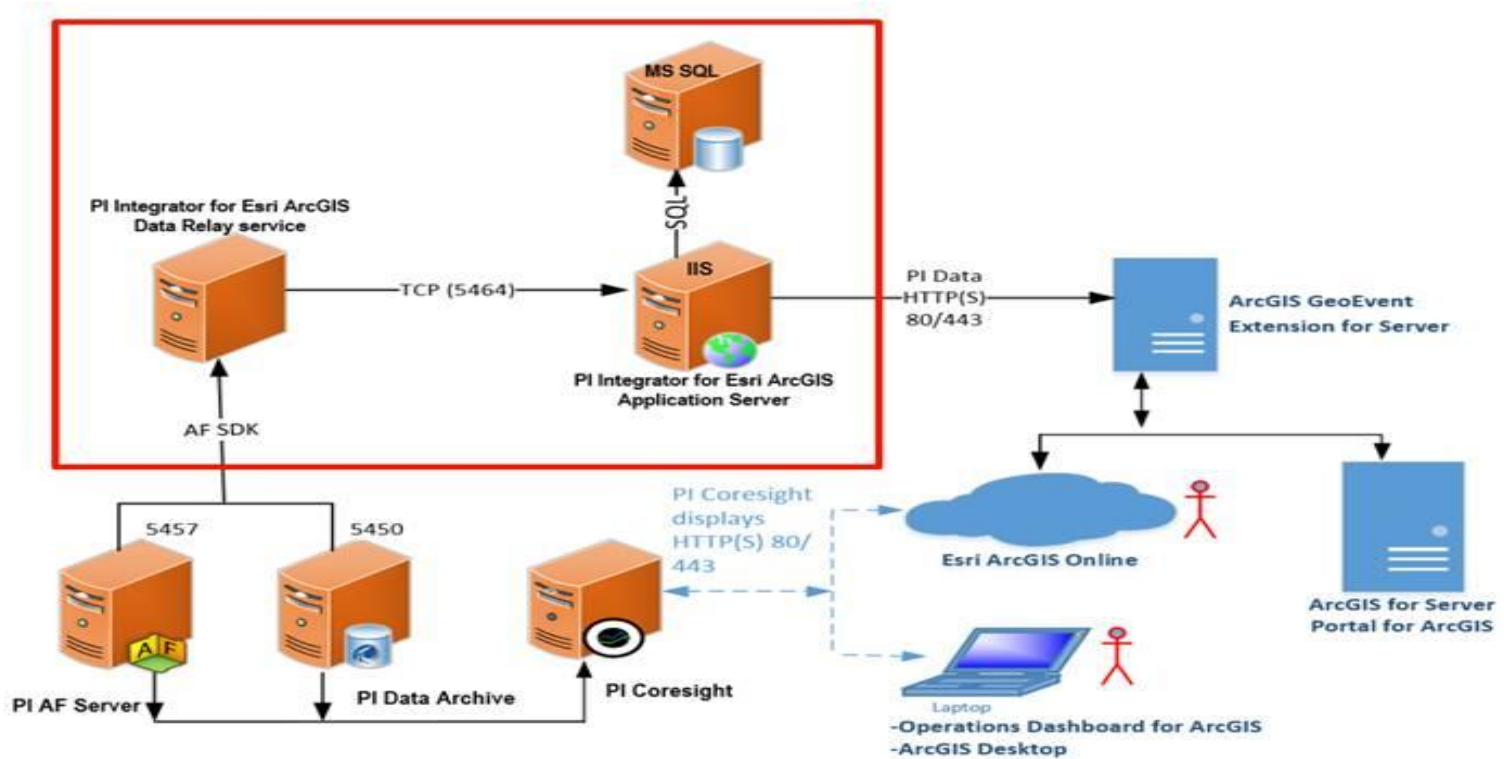
web map

feature layers

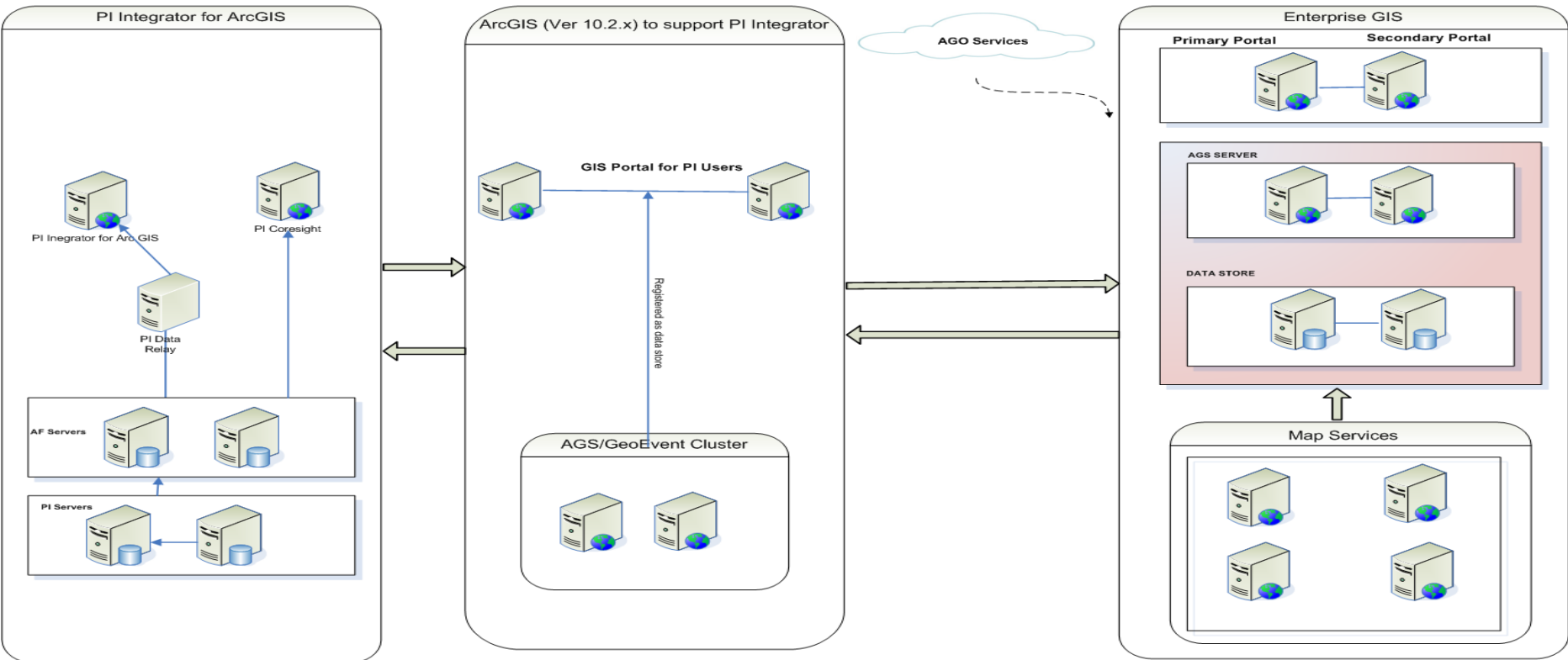



Portal
<https://xx-xxx-xx/>
GIS Server
<https://yy-yyyy-yy/>

PI Integrator for Esri ArcGIS Architecture



PI Integrator for Esri ArcGIS Architecture





Voltage Monitoring (Distribution Engineering)

Voltage Monitoring and Notification (VMAN)

The proliferation of DER changing distribution operations

- Distribution system designed for traditional power flow from central plant to user
- Evolution to multi-directional power flow as DER capacity begins to exceed local energy requirements
- Voltage levels at the customer service are mandated by the CPUC

Need for automated system monitoring

- Currently voltage is set at substation and regulated along the line with no active monitoring
- In order to maintain voltage stability within mandated levels automated monitoring is required

VMAN Requirements

SCADA Monitor Voltage **(AF Analytics/PI Notifications)**

Magnitude

- $\pm 15\%$ for 1 minute or longer
- $\pm 10\%$ for 10 minutes or longer

Phase Balance

- $> 1.5\%$ sustained for 8 hours
- $> 3\%$ sustained for 4 hours

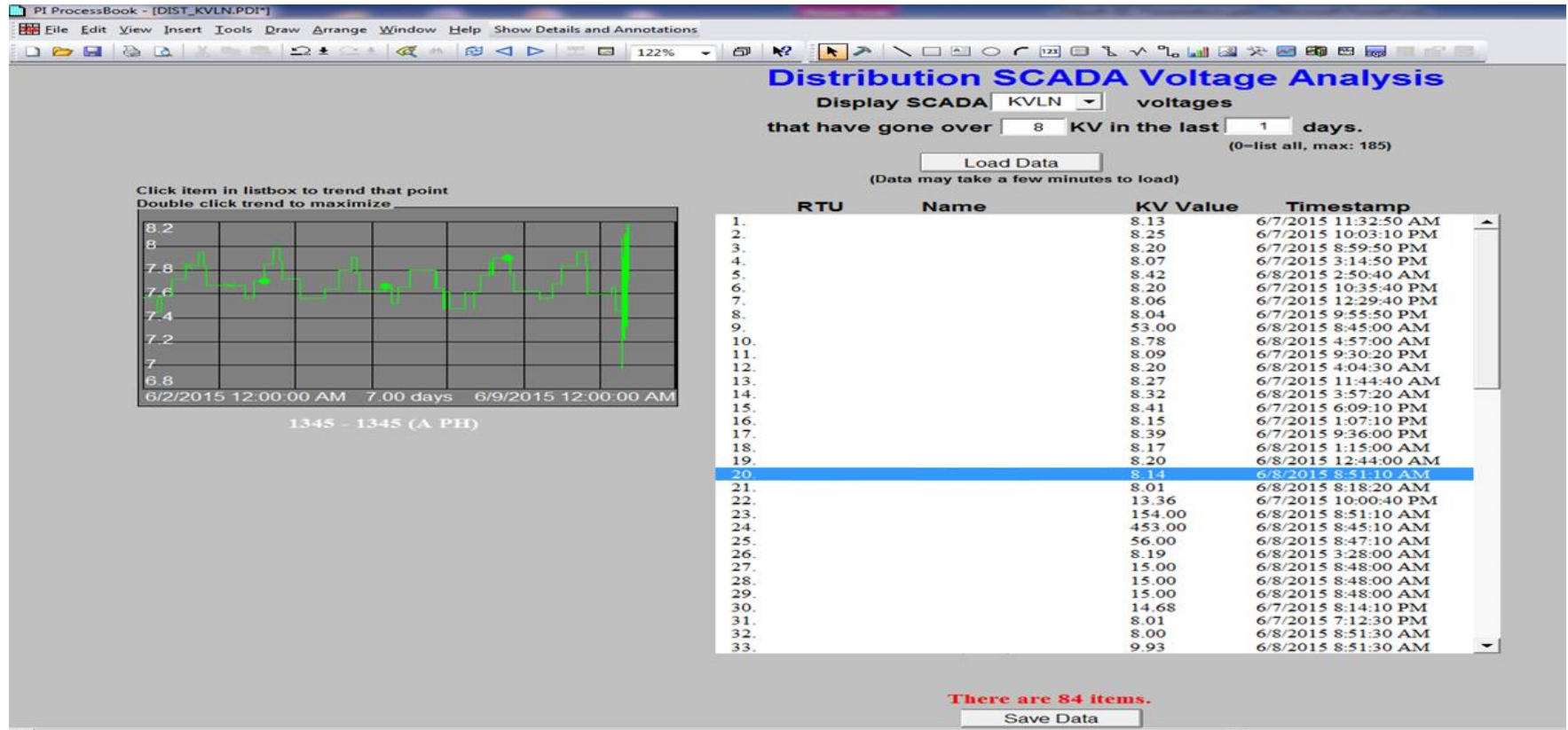
SCADA Capacitor Operations

- Change in operation mode (on, off, auto, manual)
- High switching activity ≥ 6 operations in 24hr
- MVAR change during switching $\leq 85\%$ rating

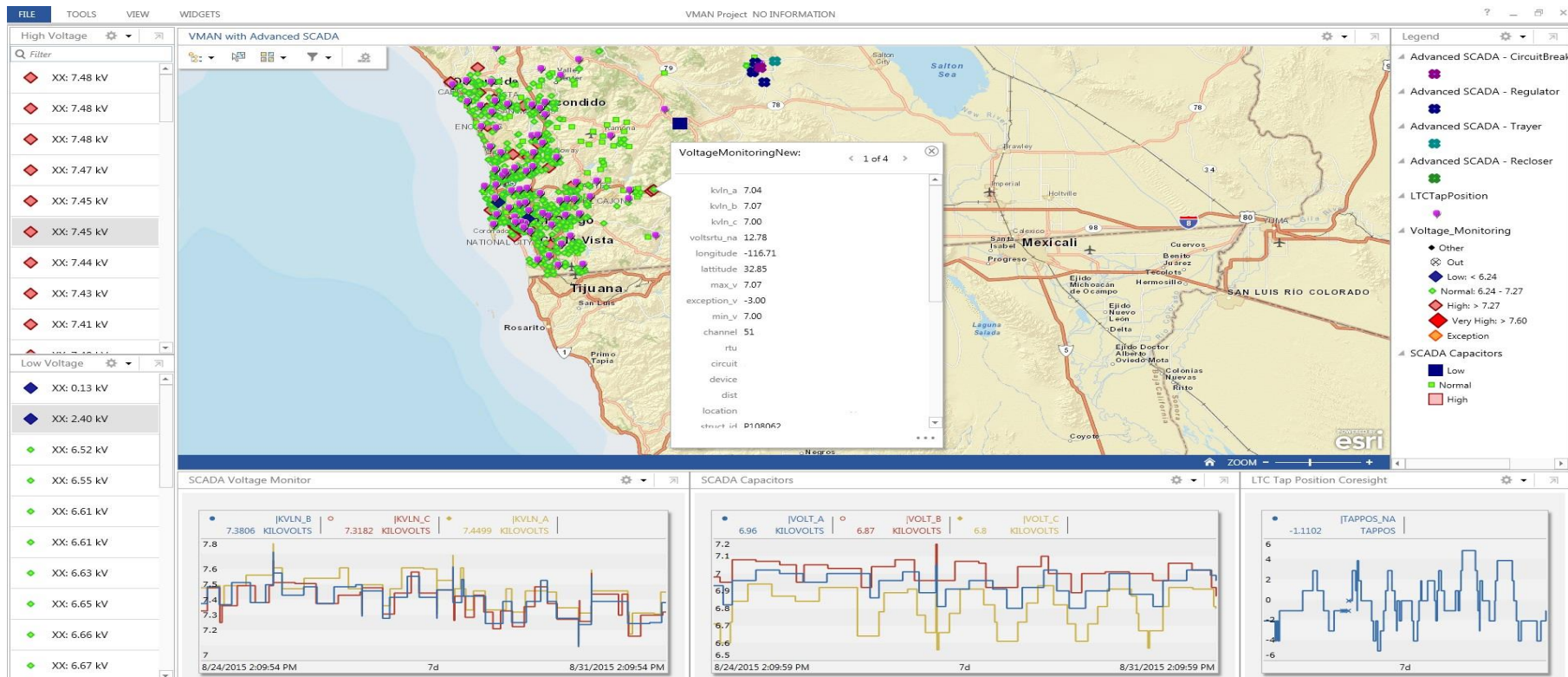
Substation Devices

- Excessive LTC ≥ 50 operations within 24 hours
- LTC not moving through neutral within 7 days

OSIsoft Tools –Voltage Analysis



OSIsoft & ESRI Tools- VMAN





Watch List (Distribution Operations)

OSIsoft Tools – Circuit/XFMR Watch List

PI ProcessBook - [DISTWATCHLIST.PDI*]

File Edit View Insert Tools Draw Arrange Window Help Show Details and Annotations

Select a Substation

- ☒ Circuit
- ☐ Bank
- ☐ All

MW

Circuit

D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH
D.MRM_CIR_	MW_3PH

Bank

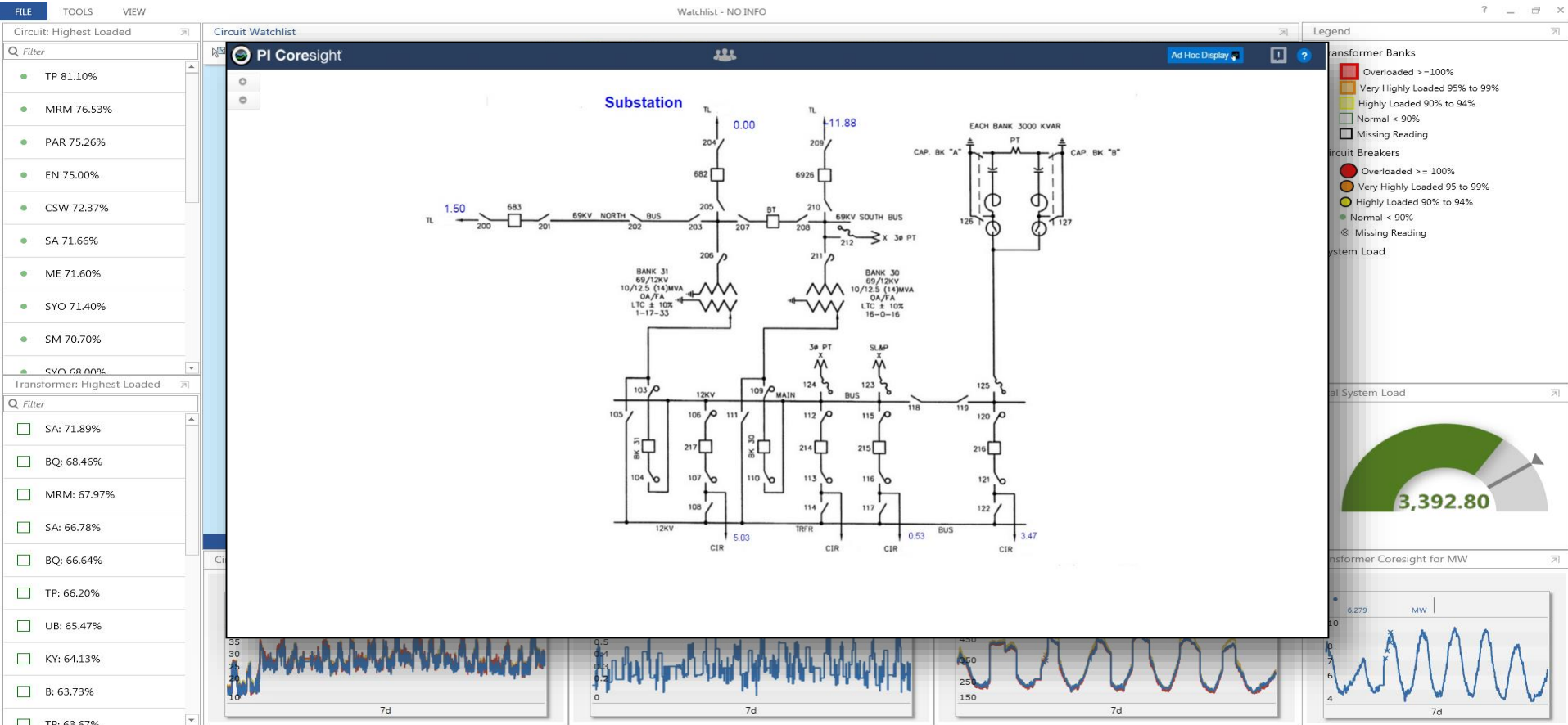
D.MRM_	BK30-MW_3PH
D.MRM_	BK31-MW_3PH
D.MRM_	BK32-MW_3PH
D.MRM_	BK33-MW_3PH

Watch List

3421 8/17/2015 10:55:27.651 AM

	CIR/BK	MW	A Phase (Amps)	B Phase (Amps)	C Phase (Amps)	Rating (Amps/MW)	Forecast (Amps/MW)	% of Rating Max(A,B,C) Or MW
ADD	BD CIR	10.94	514.80	515.40	517.80	600	586	87
CLR								
ADD	TP CIR	10.58	514.20	521.40	516.00	600	512	87
CLR								
ADD	TP_BK32	21.50						
CLR								
ADD	MRM CIR_	9.46	491.20	492.00	491.60	600	471	82
CLR								
ADD								
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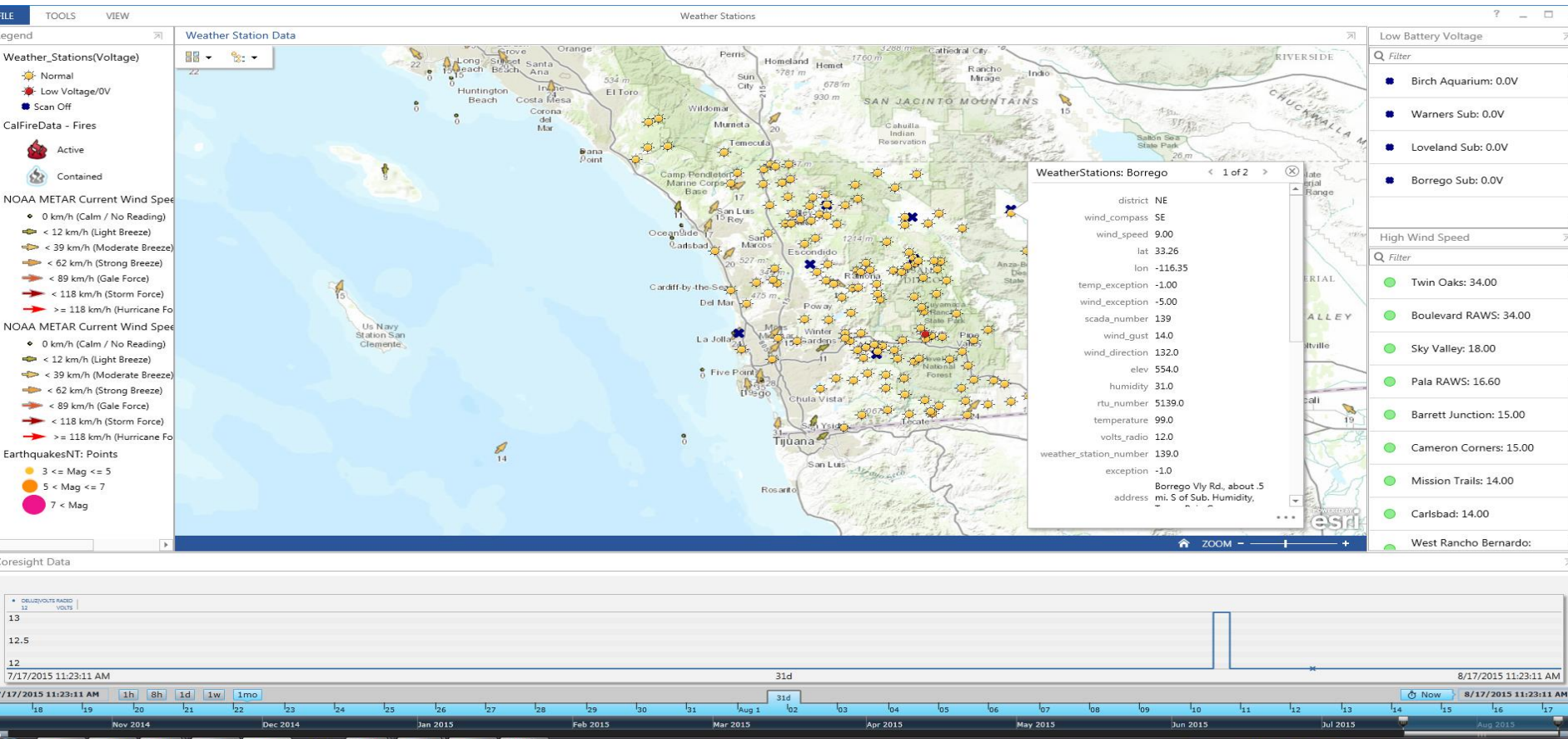
OSIsoft & ESRI Tools - Watch List





Weather & Weather Station Equipment Monitoring (EOC and SDG&E Meteorology)

PI System & ESRI - Weather & Weather Station Moinitoring



Other Initiatives

- WASA (Transmission Synchrophasor)
- Advance SCADA Devices (Distribution Synchrophasor)
- SCADA RTU Health Monitoring (Battery/Communication Status)
- Alternate Dashboard for Transmission Operations
- Advanced Energy Storage

Challenges & Issues

- Operation Dashboard is a new tool to SDG&E
- New Technology product from ESRI (GEE – GeoEvent Extension)
 - Requires ESRI 10.2.x
 - Requires ESRI Portal 10.2.x (above)
 - Current GIS GEE system support 1,000 events per second.
 - Next version will support lot more events per second.
- Known Issues
 - GIS Portal uses a token to authenticate GEE.

Thank you!

<http://www.sdge.com/smartgrid>



Contact Information

Subburaman Sankaran

ssankaran@semprautilities.com

Software Component Architect

SDG&E

Questions

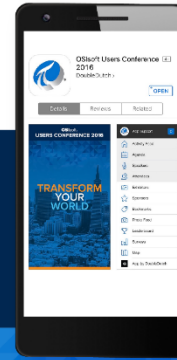
Please wait for the **microphone** before asking your questions



State your **name & company**

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

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