

Analytics Energy Management Security  
Regulatory Compliance Time Series Real-time Event Frames  
**Digital Transformation**  
Open System Asset Health Sensor-based Data IoT  
Operational Intelligence Quality Integrators Connectivity  
High Speed Community Process Scalability Partner  
Infrastructure Reliability Enterprise Agreement  
Business Impact Operational Efficiency Safety  
Enterprise Connected Services Ecosystem  
PI System Visualization Asset Framework  
Millions of Streams Big Data Future Data



# PI Integrator for Esri ArcGIS: A Journey Through Time and Space

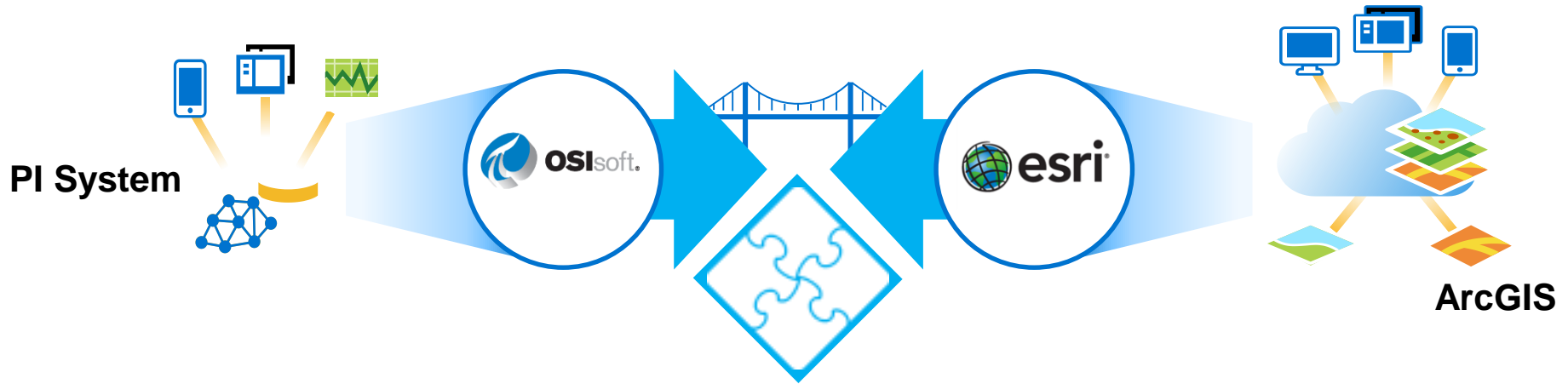
Presented by **Elizabeth Ammarell**, Product Manager



# The Past: Where We Started

# Two companies, one vision

Use data to reveal insights, process improvements and business value.



Transform your data.  
Transform your world.

The Science of Where

# Why need PI Integrator for Esri ArcGIS?



# To leverage space and time data together

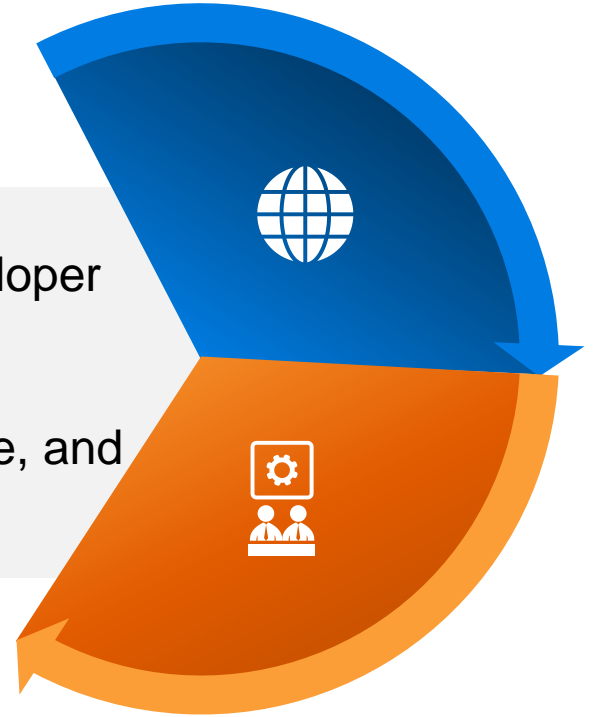


# To provide a self-service solution without custom code



Requires **no custom code** or developer technologies

**Minimal** configuration, maintenance, and administration



# To bring together ArcGIS and PI System experts



**PI users** with minimal GIS knowledge and  
**GIS users** with minimal PI knowledge

More **opportunities** due to broader  
access to data and shared applications







# The Present: Where Users Find Value

Browser address bar: <https://portaltest01.osisoft.int/pigeoportal/configuration#/service>

Page Title: PI Integrator for Esri ArcGIS

Navigation: home / services / CatCanyonWells

### Service CatCanyonWells

*O&G wells in the Cat Canyon field*  
 Created on 03/22/2016 02:15:39 (13 minutes ago)

Layers (2)  
*Layers allow you to select data from the PI System to connect to the ArcGIS Platform. Layer data can be exposed in different ways. You can configure these capabilities after you have created a layer.*

[+ Create Layer](#) [Tile view](#)

Name ↓	Description	Created	Modified	Active connections
Blockman	Wells operated by Blockman	03/22/2016 02:17:15	03/22/2016 02:17:15	1
Dominion	Wells operated by Dominion	03/22/2016 02:20:20	03/22/2016 02:20:20	1

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**Goal:** Improve the efficiency of business workflows and **situational awareness** for Noble's upstream operations



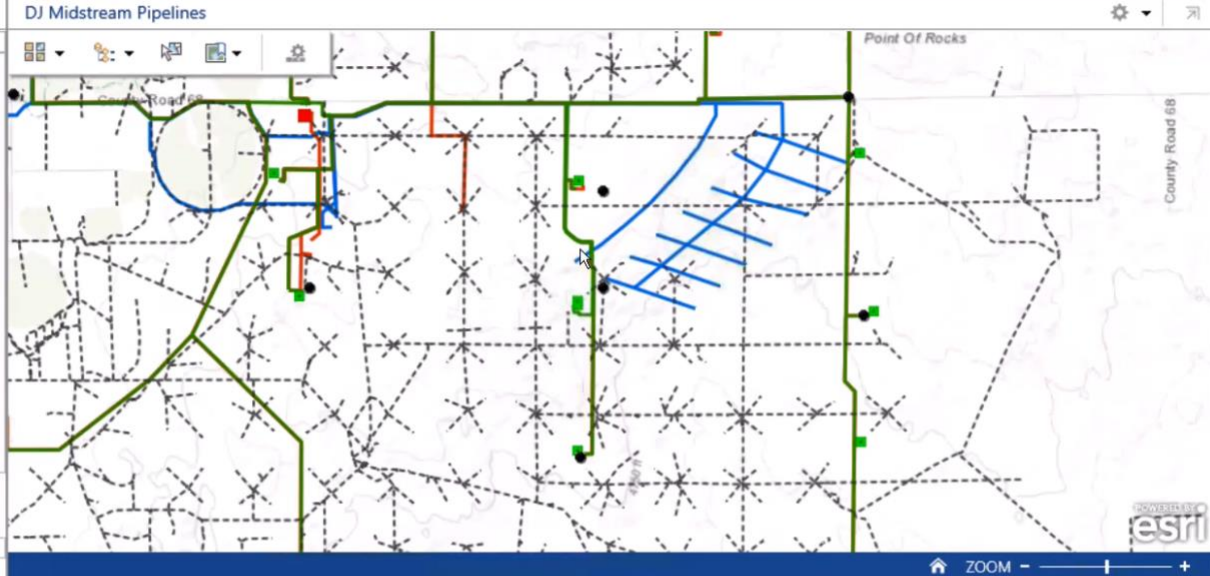
**Result:** A **standard visualization tool**

- Remote asset status
- Production rates
- Weather data
- One map includes details for every location



Legend

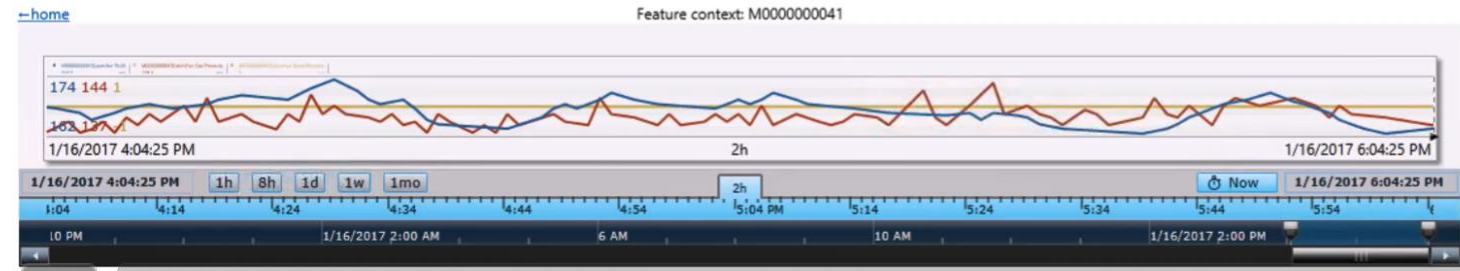
- ▲ D15\_OPERATIONS - Launchers & Receiver
  -
- ▲ D15\_OPERATIONS - Econodes
  - Wells Ranch Econodes to CGF
- ▲ D15\_OPERATIONS - Facilities
  - CPF
  - OPF
  - ▲ Processing Plant
- ▲ D15\_OPERATIONS - NBL Lease Roads
  - Lease Roads
- ▲ D15\_OPERATIONS - Oil Pipelines
  - Oil Pipelines
- ▲ D15\_OPERATIONS - Gas Pipelines
  - Gas Pipelines
- ▲ D15\_OPERATIONS - NGL Pipelines
  - NGL Pipelines



Launchers...

- M0000000017
  - Gas Pressure: 152.10
  - Trunk Pressure: 0.30
- M0000000018
  - Gas Pressure: 0.00
  - Trunk Pressure: 0.00
- M0000000019
  - Gas Pressure: 158.90
  - Trunk Pressure: 0.00
- M0000000020
  - Gas Pressure: 154.80
  - Trunk Pressure: 0.00
- M0000000021
  - Gas Pressure: 157.10
  - Trunk Pressure: 0.00
- M0000000022
  - Gas Pressure: 154.80
  - Trunk Pressure: 0.30
- M0000000023
  - Gas Pressure: 156.20

Coresight



Average Gas Pressure

No Data

**Goal: Reduce water loss** and **optimize manual process** for monitoring leaks



**WHITE HOUSE  
UTILITY DISTRICT**

**Result: GIS-centric water loss management**

- Automated KPI calculation and data update to ArcGIS
- Access to historical zone and meter details
- Daily review process shortened to 15 minutes
- 2016 water loss savings of \$500,000

“...spending more time finding leaks and managing staff, **rather than managing the data.**”

-Carl Alexander,  
GIS Manager

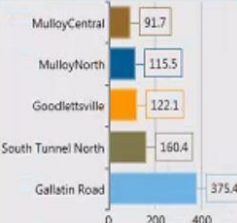
South Tunnel North Zone  
 Cost per Day 462.01  
 GPM at Stake 160.42  
 Min Night Flow 183.10  
 Survey Date 9/21/2016 12:45 AM  
 Target PI 0.03  
 GPM per Conn 0.24  
 Miles of Pipe 36.13  
 Num of Conn 756  
 Comments target mnf 39

Total Cost per Day

**\$ 4117.76024183827**

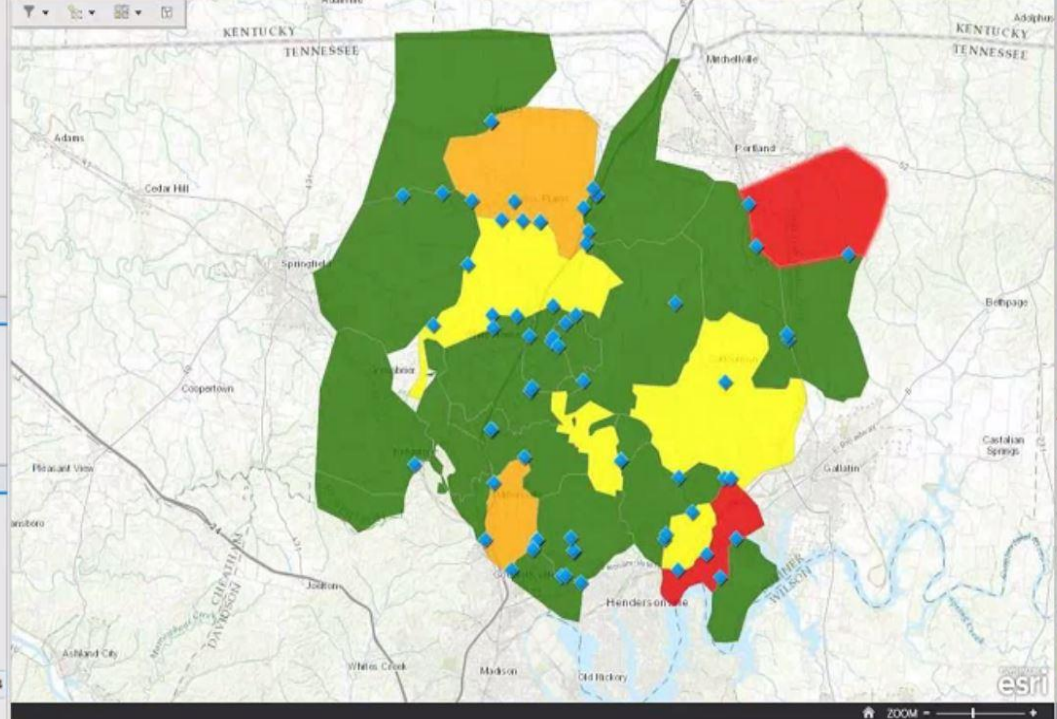
Cost is \$2.00 per 1000 gallons

Top 5 GPM at Stake



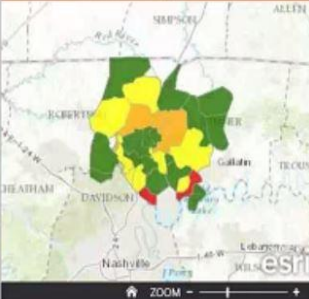
Legend

- 4 DMA Meters
- 4 DMA Zones (GPM at Stake)
  - 60 to 50
  - > 50 to 100
  - > 100 to 150
  - > 150 to 500

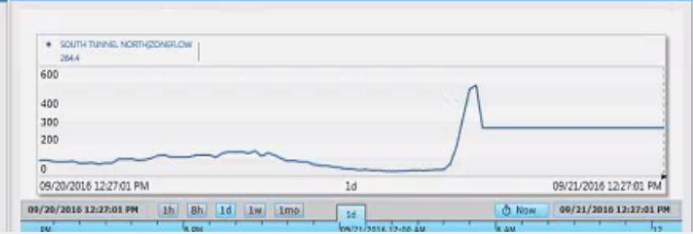


- South Tunnel South  
MNF 56.8399963378906 @ 09/21/2016 2:30:00 AM
- Lower Tyree Discharge  
MNF 4.12087917327881 @ 09/21/2016 2:08:59 AM
- South Tunnel West  
MNF 62.1999893188477 @ 09/21/2016 2:00:00 AM
- Bend Area  
MNF 79.9700012207031 @ 09/21/2016 2:00:00 AM
- BethelWest  
MNF 80.2083587646484 @ 09/21/2016 1:54:19 AM

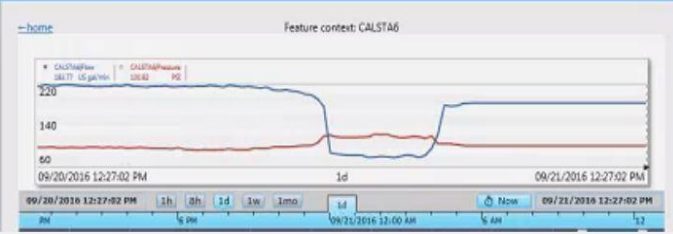
DMA Zone MNF History Web Map



DMA Zone Flow



DMA Meter data



90,000 people served

2016 Water Loss Savings \$500,000



# The Future: Where We Can Go

# Looking forward to 2017 release...in testing now!

## Architecture

Simplified to ease administration.

## Time-enabled Maps

Access historical PI System data.

## Tiered Product Offering

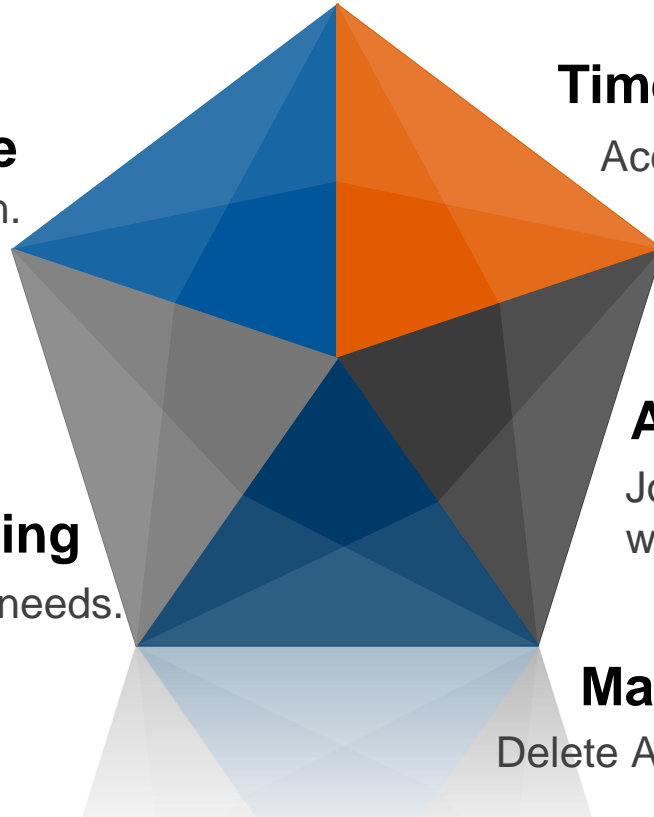
Deployment options to suit your needs.

## Augmented Feature Layer

Join operational data with existing ArcGIS layers.

## Manageability

Delete ArcGIS items from the Integrator.





# Looking forward to 2017 release

## Architecture

Simplified to ease administration.

## Time-enabled Maps

Access historical PI System data.

## Augmented Feature Layer

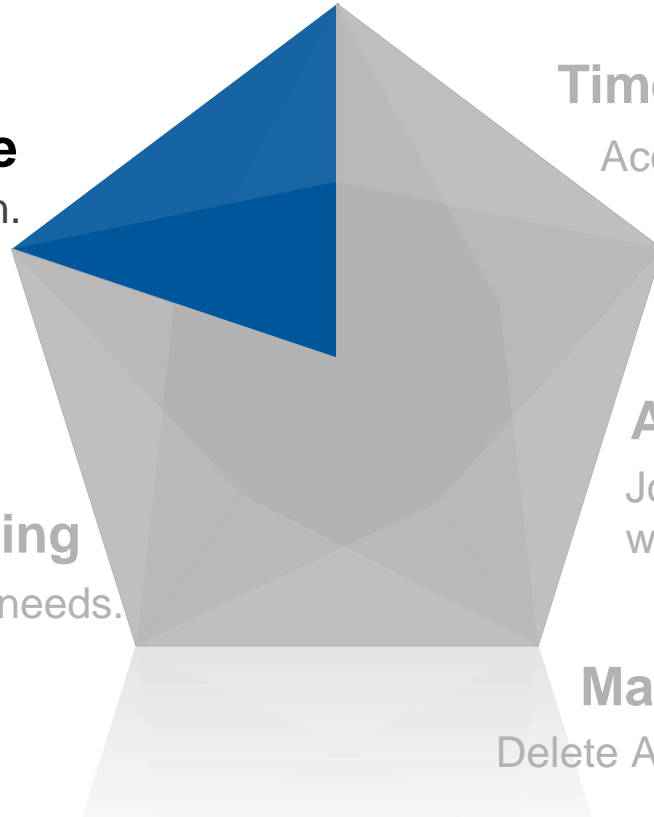
Join operational data with existing ArcGIS layers.

## Tiered Product Offering

Deployment options to suit your needs.

## Manageability

Delete ArcGIS items from the Integrator.



# Simplified Integrator architecture

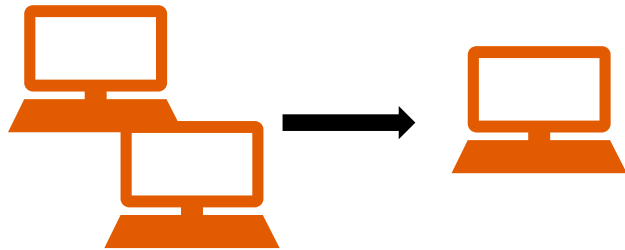
---

PI Integrator for  
Esri ArcGIS  
**Application Server**

+

PI Integrator for  
Esri ArcGIS  
**Data Relay**

**PI Integrator for  
Esri ArcGIS**



---

Merged Data Relay and Application Server

---

Requires single executable and installation

---

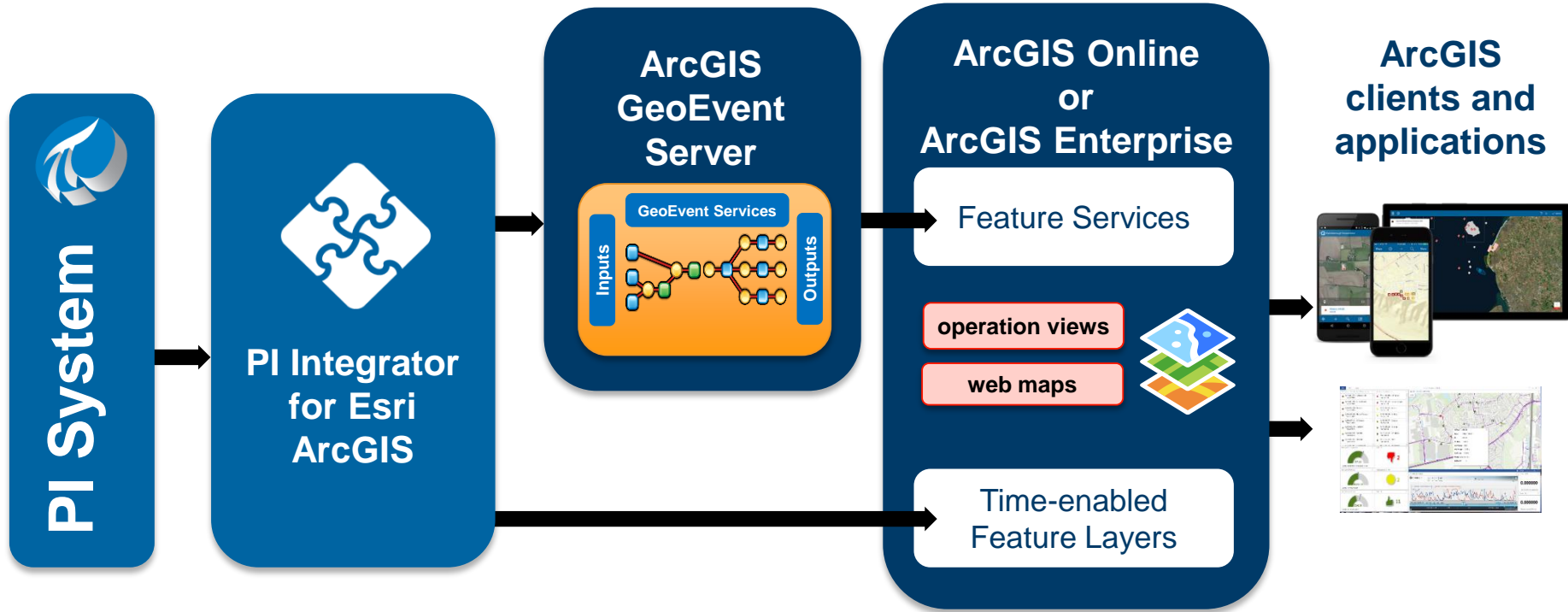
Removed dependency on Microsoft IIS

---

Application runs as a self-hosted web service

---

# Two data flows from PI System to ArcGIS enable more integration patterns



# Looking forward to 2017 release

## Architecture

Simplified to ease administration.

## Time-enabled Maps

Access historical PI System data.

## Augmented Feature Layer

Join operational data with existing ArcGIS layers.

## Tiered Product Offering

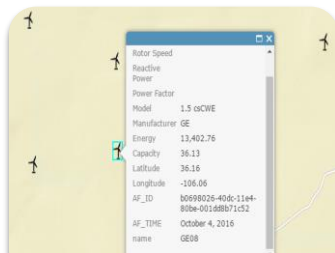
Deployment options to suit your needs.

## Manageability

Delete ArcGIS items from the Integrator.



# Time-enabled maps reveal insights hidden in the data



Review historical data when alarms are triggered



Validate and compare asset routes



Investigate incident cause and effect



Evaluate conditions across various regions



Combine data sources and tools

**Elements**

- World
  - Alabama
  - Alaska
  - Arizona
  - Arkansas
  - California
    - Amador
    - Butte
      - 18614
      - 44255
      - 49879
      - 92337
      - 98656
    - Calaveras
    - Colusa
      - 14109
      - 26697
      - 28074
      - 3055
      - 3279
      - 36705
      - 37399
      - 44287
      - 45568
      - 47961
      - 57521
      - 60575
      - 61088

- Elements
- Event Frames
- Library
- Unit of Measure
- Analyses

8 Attributes

14109

General Child Elements Attributes Ports Analyses Version

Excluded attributes are hidden.

Filter

Name	Value	Data Reference
Category: <None>		
FID	14030	<None>
GUID	{C799335A-4E02-40B9-BA14-99E3C5F0A922}	<None>
LATITUDE	39.04084332	<None>
LONGITUDE	-121.9768316	<None>
Pressure	189.61265563964844	PI Point
Production	166.26390075683594	PI Point
Temperature	52.391155242919922	PI Point
WELL_ID	14109	<None>

Group by:  Category  Template

Name:

Description:

Properties:

Categories:

Default UOM:

Value Type: <Anything>

Value:

Data Reference:

Settings...

Limits Forecasts

# Looking forward to 2017 release

## Architecture

Simplified to ease administration.

## Time-enabled Maps

Access historical PI System data.

## Tiered Product Offering

Deployment options to suit your needs.

## Augmented Feature Layer

Join operational data with existing ArcGIS layers.

## Manageability

Delete ArcGIS items from the Integrator.

# Augmented feature layers combine PI data with geometry from ArcGIS into a single time-enabled layer

Pipeline0011

General Child Elements Attributes Ports Analyses Noti

Filter

	Name	Value
	Downstream Pressure	53.7464828
	MAOP	100
	Name	Pipeline0011
	Upstream Pressure	96.03381
	Volume Flow	124.95192

ArcGIS REST Services Directory

[Home](#) > [services](#) > [Hosted](#) > [pipelines \(FeatureServer\)](#) > [pipeli](#)

[JSON](#)

**Layer: pipelines\_static (ID: 0)**

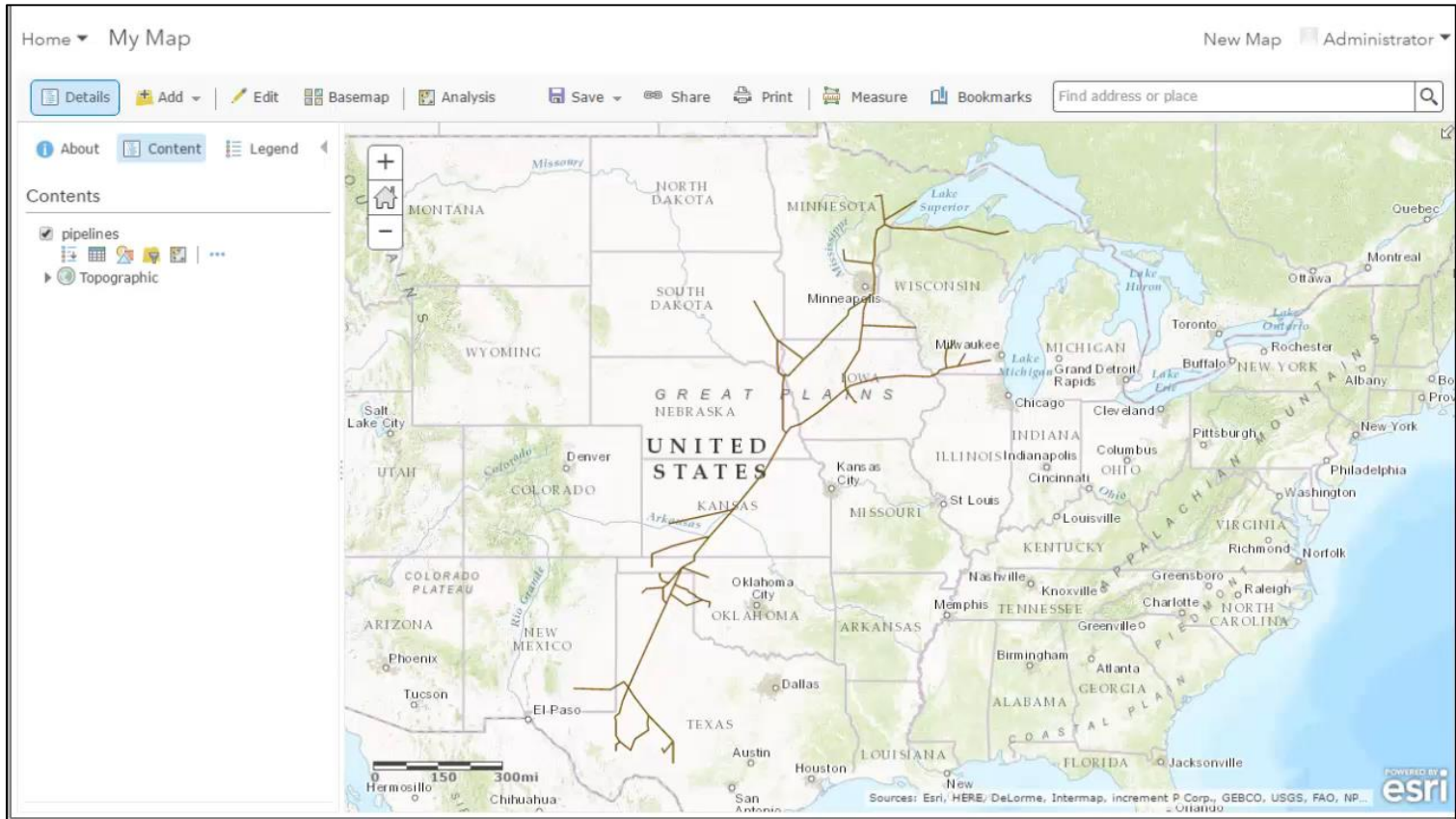
**Geometry Type:** esriGeometryPolyline

**Fields:**

- objectid ( type: esriFieldTypeOID ,
- upstream\_compressor\_station ( ty
- pipe\_diameter ( type: esriFieldTyp
- mileage ( type: esriFieldTypeDoub
- length\_classification ( type: esriFi
- friction\_coefficient ( type: esriFiel
- downstream\_compressor\_station
- arcgis\_feature\_shape ( type: esriI
- name ( type: esriFieldTypeString ,



# Create an augmented feature layer



# Looking forward to 2017 release

## Architecture

Simplified to ease administration.

## Time-enabled Maps

Access historical PI System data.

## Augmented Feature Layer

Join operational data with existing ArcGIS layers.

## Tiered Product Offering

Deployment options to suit your needs.

## Manageability

Delete ArcGIS items from the Integrator.

# Improved system manageability

---

Delete Integrator-created ArcGIS objects from the Integrator

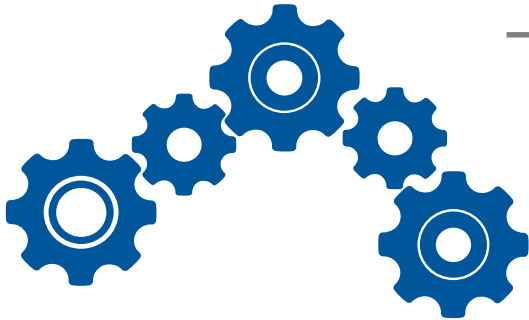
---

No need to log into ArcGIS Online or Portal for ArcGIS

---

No need to log into GeoEvent Server Manager

---



## Service Power Generation Service ✖

Power Generation Service

Created on 02/20/2017 09:51:14 (17 hours ago)

Layers (1)

Layers are used to select PI System data to connect to the ArcGIS platform. You can configure multiple layers within a single service.

+ Create Layer

Tile view

Name ↓	Description	Created	Modified	Time-enabled	GeoEvent
Wind Turbines Layer	Wind Turbines Layer	02/20/2017 09:54:03	02/20/2017 09:54:03		✓ ✖



Click to delete  
Integrator  
layer



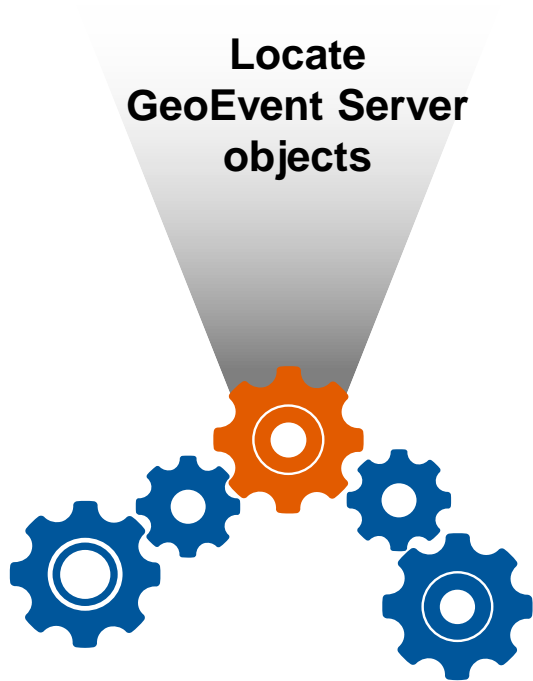
## Locate ArcGIS feature service



[home](#) / [services](#) / [Power Generation Service](#) / [Wind Turbines Layer](#) / [delete-wizard](#)

**1. Feature Service Environment** 2. GeoEvent Server Environment 3. Confirmation 4. Summary

- ✓ Portal for ArcGIS credentials verified.
- ✓ **Feature service** 'power\_generation\_service' was found



1. Feature Service Environment
- 2. GeoEvent Server Environment**
3. Confirmation
4. Summary

✓ You are connected to GeoEvent Server **dpnagis105m1 GeoEvent**.

✓ GeoEvent Server objects can be deleted from 'https://dpnagis105m1.osisoft.int:6143'

**The following GeoEvent Server objects can be deleted from this layer:**

**Service:** pigeo-power-generation-service-wind-turbines-layer-service

**Input:** pigeo-power-generation-service-wind-turbines-layer-ws-in

**Output:** pigeo-power-generation-service-wind-turbines-layer-fs-update-out

**GeoEvent Defintion:** pigeo-power-generation-service-wind-turbines-layer-ws-in



**Delete all  
discovered  
items**

[home](#) / [services](#) / [Power Generation Service](#) / [Wind Turbines Layer](#) / [delete-wizard](#)

1. Feature Service Environment 2. GeoEvent Server Environment **3. Confirmation** 4. Summary

Status of the Layer Delete Wizard:

**Feature Service Environment:** 'power\_generation\_service' can be deleted from 'https://dpnagis105m1.osisoft.int/portal'

**GeoEvent Server Environment:** GeoEvent Server objects can be deleted from 'https://dpnagis105m1.osisoft.int:6143'

**Integrator Environment:** Layer ready to delete

After you click Delete, the process might take several minutes to complete. Do not close the browser or navigate away from this page until the process is complete.

Delete

1. Feature Service Environment 2. GeoEvent Server Environment 3. Confirmation 4. **Summary**

Delete Summary:

- ✓ **Feature Service:** 'power\_generation\_service' was deleted successfully for 'https://dpnagis105m1.osisoft.int/portal'
  - ✓ **GeoEvent Server:** All GeoEvent Server objects for this layer were deleted successfully on 'https://dpnagis105m1.osisoft.int:6143'.
  - ✓ **Layer:** 'Wind Turbines Layer' was deleted successfully for 'PI Integrator for Esri ArcGIS'
- ✳️ All objects associated with this layer have been deleted.



Deleted layer  
cleaned up



# Looking forward to 2017 release

## Architecture

Simplified to ease administration.

## Time-enabled Maps

View historical PI System data.

## Augmented Feature Layer

Join operational data with existing ArcGIS layers.

## Tiered Product Offering

Deployment options to suit your needs.

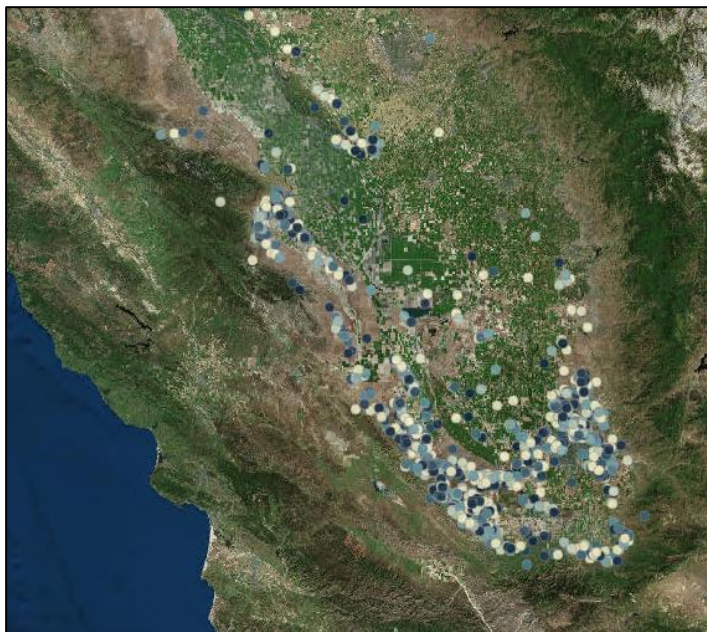
## Manageability

Delete ArcGIS items from the Integrator.

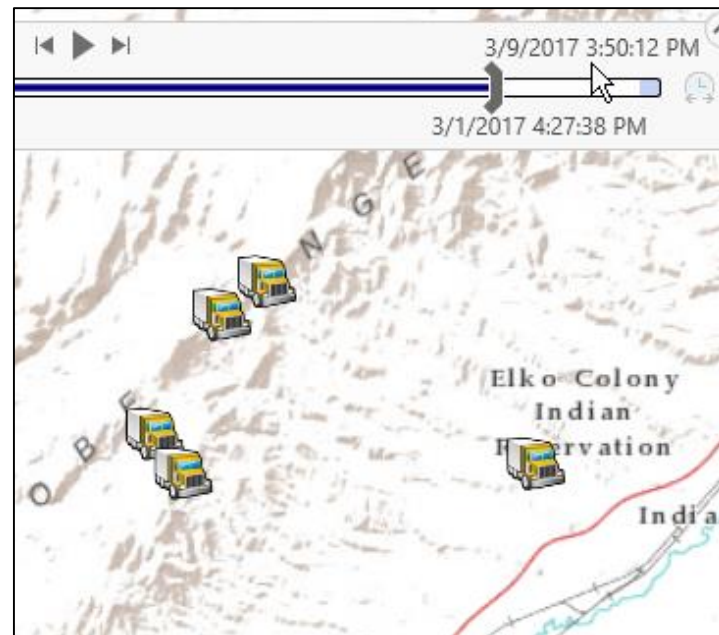


# PI Integrator for Esri ArcGIS Basic

*For visualization and simple use cases*



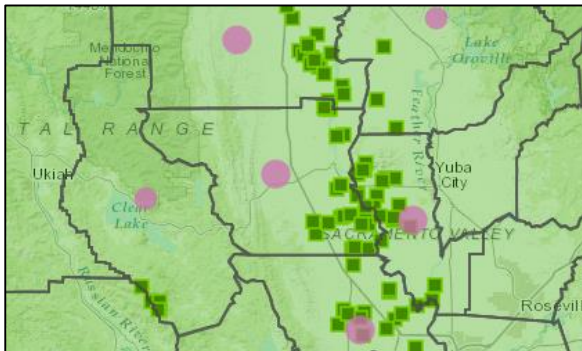
Geospatial Situational Awareness



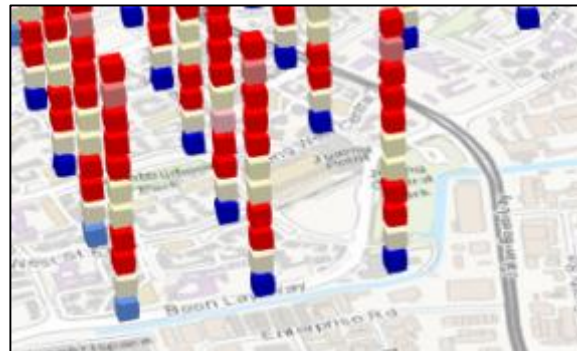
Time-enabled Maps

# PI Integrator for Esri ArcGIS Advanced

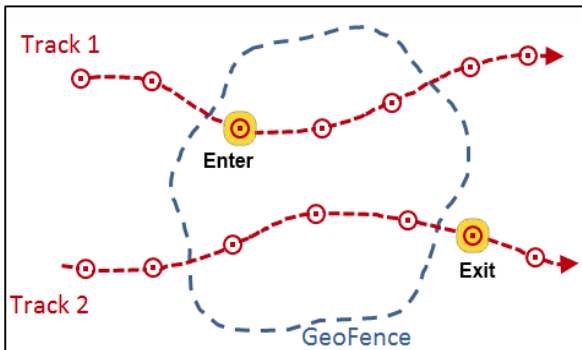
*For enabling higher levels of integration and analysis*



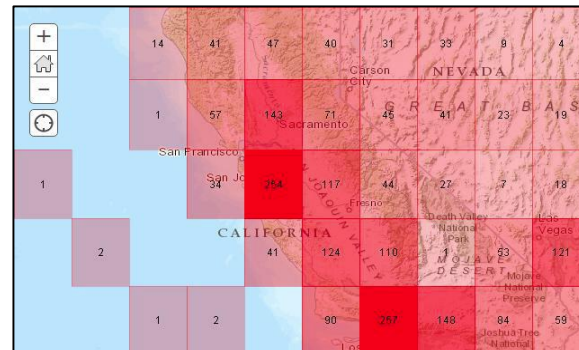
Spatial Aggregation



Spatiotemporal Aggregation



Real-time Geoprocesing



Spatial Analytics at Scale

## Time-enabled Maps



## Analytics at Scale

- ArcGIS spatiotemporal big data store
- Distributed analytics with GeoAnalytics Server

## H2 2017

### Move to Integrator Framework

- Create layers from shapes instead of element templates
- Consistent user experience for PI Integrators

## Visualization

- Maps in PI Visualization
- Operations Dashboard
- Web AppBuilder
- Notifications

## 2018 Research

### Asset Synch

- Scheduled synch between PI and ArcGIS
- Select which assets and attributes to include

# What does this mean for you?

## Options

Choose the  
right solution  
for your  
organization

## Simplicity

Easier to  
deploy, to  
manage, and  
to use

## Function

Time-enabled  
applications  
expand  
integration  
potential

**Does this interest you? Please contact us!**

**BetaIntegratorForEsri@osisoft.com**

Looking for:

- potential early adopters
- feedback on CTP/Beta code
- input on roadmap initiatives



**Have an idea how  
to improve our  
products?**

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hear from you!**

<https://feedback.osisoft.com/>



# OSIsoft + Esri Integration – Additional presentations

<b>White House Utility District</b>	<i>Maximizing Operations Utilizing Real Time Spatial Information</i>
<b>Peak Reliability</b>	<i>Managing the Power Grid Using Maps, Real-time Data and Rosetta Stones</i>
<b>ERCOT</b>	<i>ERCOT's Use of the OSIsoft Ecosystem for the New Reliability Risk Operator Desk</i>
<b>Noble Energy + CSE-Icon</b>	<i>Building a Corporate AF Model and Realizing Value from Integrating Real-time Data with GIS</i>
<b>PowerStream</b>	<i>On the path to Intelligent Maintenance with the PI System</i>
<b>IntegralGIS + PJM</b>	<i>PJM Data Integration</i>
<b>Adani Ports + ECGIT + VCS</b>	<i>Adani Port's Integrated Information Management for Operational Excellence, Performance and Profit</i>



# Solve more problems, more efficiently

“...spending more time finding leaks and  
managing staff,  
**rather than managing the data.**”  
-Carl Alexander,  
GIS Manager

# Contact Information

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Product Manager

OSIssoft



## 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