



Operational Intelligence in the Water Industry

Presented by **Dan Lopez**

Challenges for the Water Industry



Energy Efficiency

High Pumping and Treatment Energy Costs

Complex Meter Data Management



Process Productivity

Lost Non-Revenue Water (e.g. Leaks)

Burst Pipes

Infiltration

Difficulty optimizing costs



Asset Health

Unexpected Downtime

Aging Infrastructure

Lack of Condition-Based Maintenance



Quality / Safety

Contamination

High Standards for Water Quality

Supply security



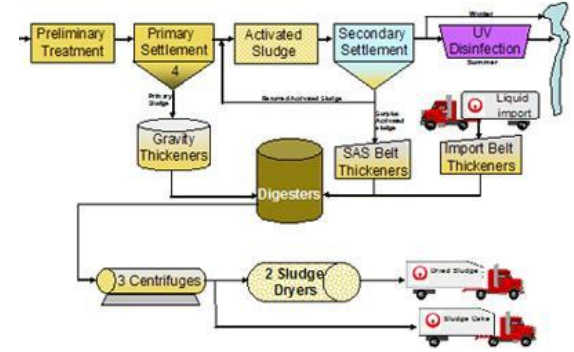
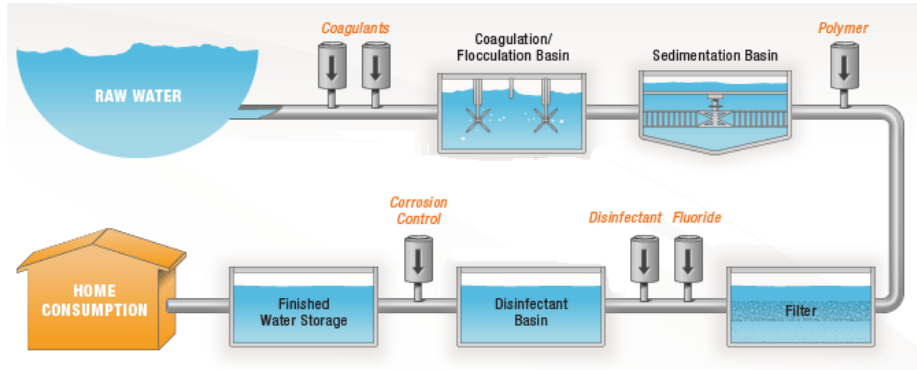
Regulatory Reporting

Stringent Water Quality Testing

Strict Environmental Regulations



Challenges for the Water Industry



Source & Watersheds

- Flood Management ⁶
- River and Dam Monitoring ⁶
- Safety and Security ^{3,6}
- Source Water Management ^{1,6}

Distribution/Collection

- Water Loss / Leakage Control ^{3,5,8}
- Water Quality ^{2,3,5}
- Time-of-Use Pumping ^{3,4}
- Asset Management ^{1,4}
- GIS Integration ^{3,8}
- Metering ^{7,8}
- Energy Reduction ^{3,4,5}

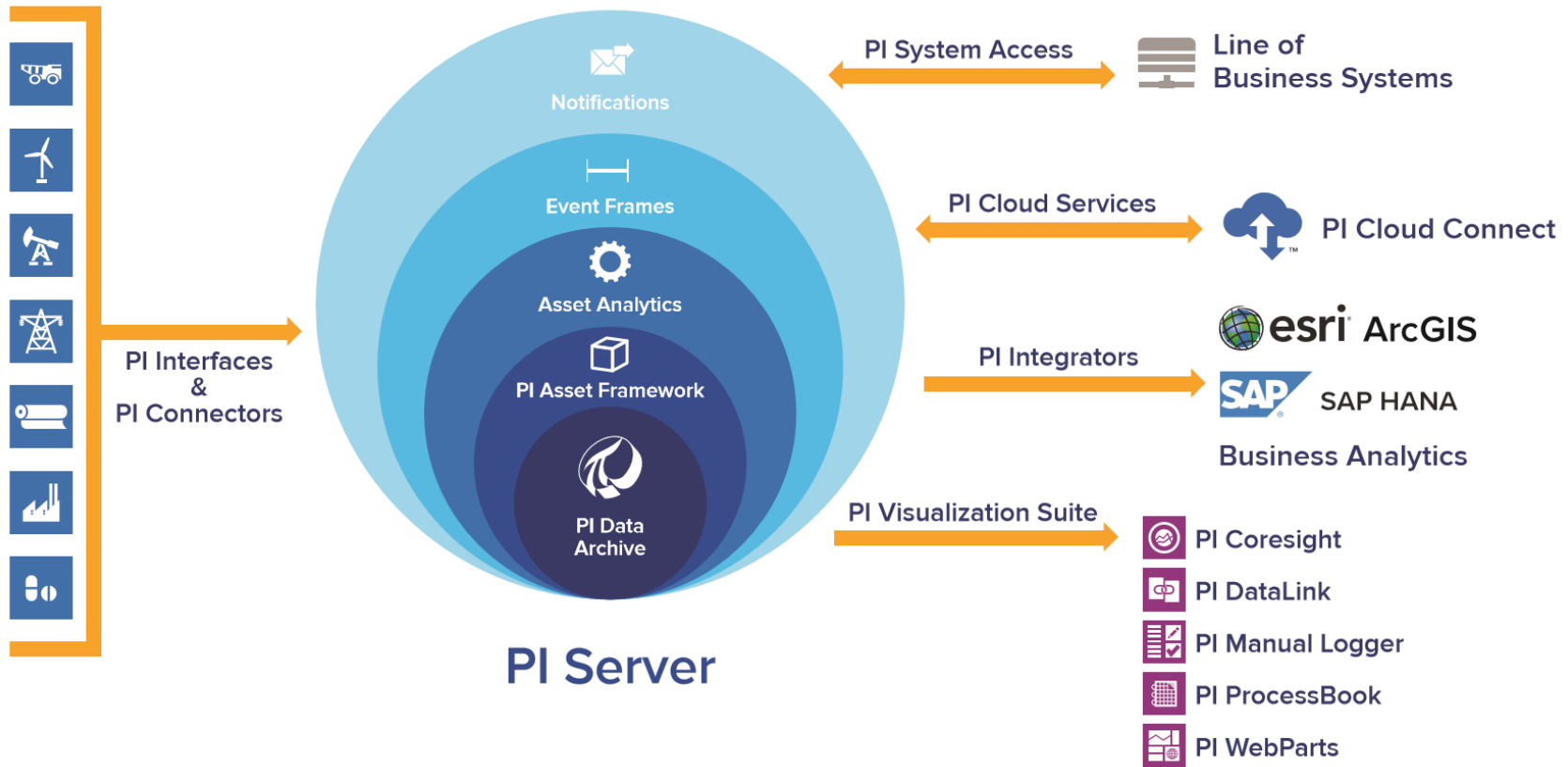
Water Treatment

- Turbidity / Water Quality ^{3,5}
- Compliance Reporting ^{1,3,5}
- Chemical Consumption ²
- Capacity Planning ¹

Wastewater Treatment

- Condition-Based Maintenance ^{1,2,3,4,5}
- Energy Reduction / Digester Gas ^{2,3}
- IT / Communications Health ¹
- Capacity Smoothing ¹
- Sewer Overflow Reductions

The PI System Infrastructure



Visualization Landscape



PI Coresight
Ad hoc analysis and collaboration



PI Manual Logger
Manual entries, fast and secure from anywhere



PI WebParts
Composite apps for Microsoft SharePoint



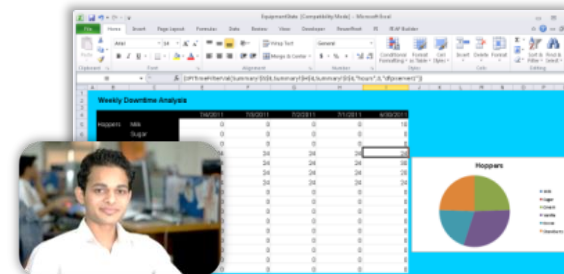
PI ProcessBook
Display authoring and process monitoring

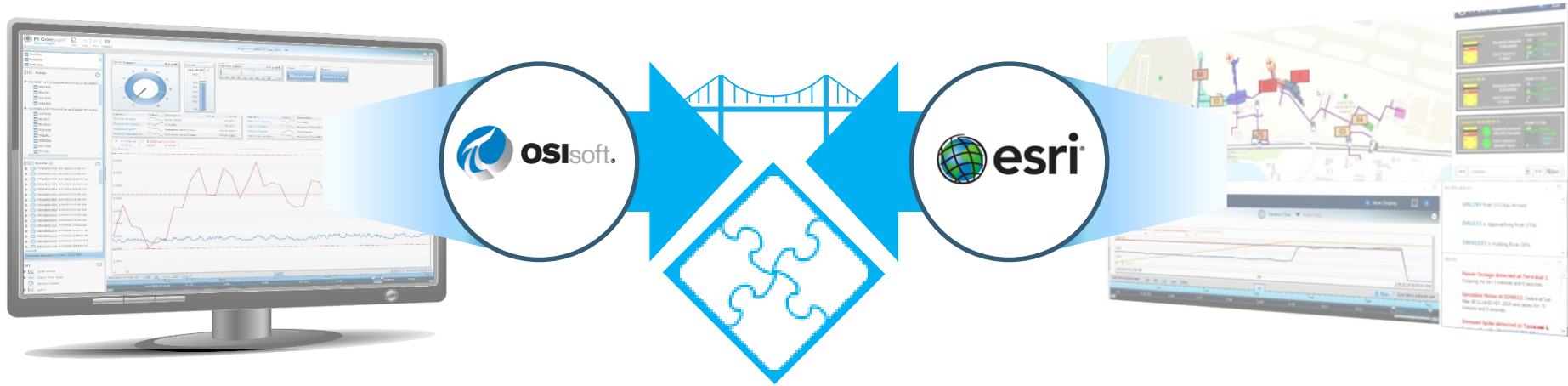


PI System Access
Business analytics for all the corporation



PI DataLink
Reporting and Analytics in Microsoft Excel





PI Integrator for Esri ArcGIS

What Existed Prior to the Integrator

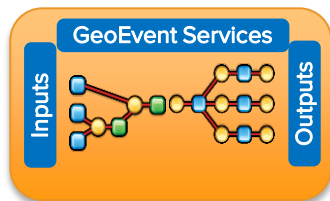
PI System



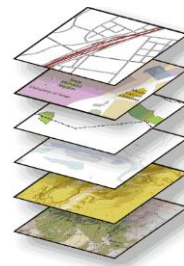
PI Data Archive 2014
PI Asset Framework 2014
PI Coresight

(Real-time data infrastructure)

Esri GeoEvent Extension 10.2.1



Esri Feature Services



Esri Client Tools



Key Similarity: Esri *Feature Layers* and *Features* are Comparable...

The screenshot displays the ArcGIS web interface for 'Cat Canyon Assets'. The top navigation bar includes 'HOME', 'Cat Canyon Assets', and 'NE'. Below this is a toolbar with 'Details', 'Add', 'Basemap', 'Save', 'Share', 'Print', 'Directions', 'Measure', and 'Bookmarks', along with a search box 'Find address or place'. The left sidebar contains 'About', 'Content', and 'Legend' tabs, and a 'Contents' panel with a tree view: 'Cat Canyon Assets' (expanded), 'Wells', 'Pipelines', 'Fields', and 'Topographic'. A blue circle highlights the 'Contents' panel, with a blue arrow pointing to a larger blue box labeled 'Feature Layers'. Another blue circle highlights a large area on the map filled with black star-shaped symbols, with a blue arrow pointing to a larger blue box labeled 'Features'. The map shows a topographic view of a canyon area with labels for 'Compton Rd', 'Cat Canyon', and 'Pump station Crude Oil'. A scale bar at the bottom left indicates 0, 0.2, and 0.4 miles. The footer contains 'Esri.com', 'ArcGIS Marketplace', 'Help', 'Terms of Use', 'Privacy', 'Contact Esri', and 'Report Abuse'.

...To PI Asset Framework (AF) *Element* Templates and *Elements*

File View Go Tools Help
Database Query Date Back Check In Refresh New Template New Attribute Template

Library
PUG Well Data
Categories
Analysis Categories
Attribute Categories
Element Categories
Reference Type Categories
Table Categories
Templates
Element Templates
Cat Canyon template
MaintenanceVehicle
Event Frame Templates
Model Templates
Transfer Templates
Enumeration Sets
Reference Types
Tables
Table Connections

Cat Canyon template
General Attribute Templates Ports Analysis Templates

Filter
Name Description
ActiveWell
APINumber
AssetName
Bottom Hole Pressure
FieldName
Flow Rate
Flow Tubing Pressure
GeometryLatitude
GeometryLongitude
Hydrostatic Head
LeaseName
OBJECTID
OperatorNa
TypeText
Well_Type

Group by: Category Template

Name: ActiveWell
Description:
Configuration Item: Indexed:
Categories: configuration
Default LIQM: <None>

PI AF Templates

PI AF Elements

File Edit View Go Tools Help
Database Query Date Back Check In Refresh New Element New Attribute

Elements
Bell
CE-08300101
CE-08300109
CE-08300303
CE-08300324
CE-08300683
CE-08300778
CE-08300804
CE-08301509
CE-08301516
CE-08301517
CE-08301523
CE-08301524
CE-08301525
CE-08301526
CE-08301531
CE-08301532
CE-08301533
CE-08301540
CE-08301542
CE-08301544
CE-08301546
CE-08301547
CE-08301551
CE-08301552
CF-08301556

CE-08300101
General Child Elements Attributes Ports Analyses Version

Filter
Name Value
ActiveWell Y
APINumber 08300101
AssetName CE-08300101
Bottom H... 304.04745483398437
Bottom H... 263.12661743164062
CountyNa... Santa Barbara
FieldName Ca... Canyon
Flow Rate 414.95938110351562
Flow Tubi... 287.76724243164062
Geometry... 414.376.09317385
Geometry... -13.94080.3099847
Hydrostat... 330.31280517578125
LeaseName Bell
OBJECTID 4
OperatorNa Clancy Energy
TypeText Oil & Gas
Well_Type OG

Group by: Category Template

PI System Data Animates the Map

HOME ▾ Cat Canyon Operations NEW MAP Michelle ▾

Details Add ▾ Basemap Save ▾ Share Print Directions Measure Bookmarks Find address or place

About Content Legend

Legend

Trucks

Wells

- < 250 k sft 3/h
- 250 - 300 k sft 3/h
- > 300 k sft 3/h

Cat Canyon Assets

Pipelines

Facilities

Interconnects

Pipelines

- Crude Oil
- LPG/NGL
- Miscellaneous
- Natural Gas
- Petrochemical
- Refined Products

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Well Flow Rate: 57-ShX-14-H

Well	57-ShX-14-H
TheTimestamp	2012/10/03 3:46 PM
FlowRate	264.26
FlowTubingPressure	363.34
Longitude	-106.18
Latitude	43.26

Zoom to Get Directions Edit

Wells

Q Search

	CE-08300011 Flow Rate: 250.92 k sft3/h Flow Tubing Pressure: 181.21 psi 1/6/2014 12:19 PM
	CE-08300073 Flow Rate: 362.30 k sft3/h Flow Tubing Pressure: 99.26 psi 1/6/2014 12:19 PM
	CE-08300083 Flow Rate: 302.46 k sft3/h Flow Tubing Pressure: 167.81 psi 1/6/2014 12:19 PM
	CE-08300101 Flow Rate: 247.43 k sft3/h Flow Tubing Pressure: 247.27 psi 1/6/2014 12:19 PM

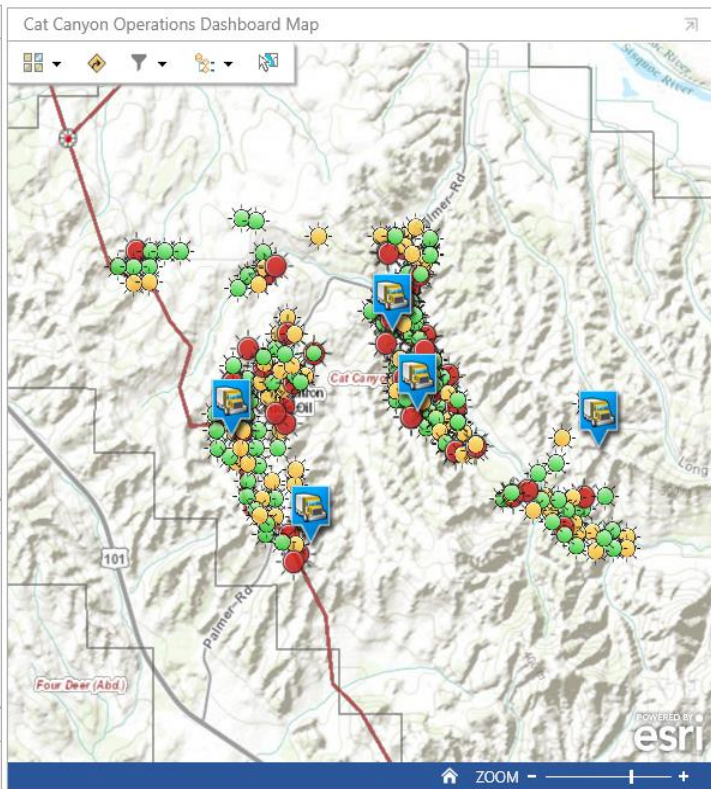
Flow Rate



Flow Tubing Pressure



Production KPI



GeoFences

(2)

GeoFenceld	Category	Name
^ Danger Zone 1 Items		
DangerousArea/Danger Zone	DangerousArea	Danger Zone
^ Drilling Activity 1 Items		
DangerousArea/Drilling Activity	DangerousArea	Drilling Activity

Alerts

Alerts (8)

Incident Name	Resource	Resource Name	Description	As
^ Cumulative 8 Items				
DangerousArea		Roustabout Miguel	Ongoing for last 54 seconds.	
DangerousArea		Roustabout Miguel	Ended at Mon Jan 06 17:18:05 UTC 2014 and lasted for 36 seconds.	
DangerousArea		Roustabout Carol	Ongoing for last 3 minutes and 40 seconds.	



Trucks

	Roustabout Miguel Fuel: 0.00 gal Speed: 2.92 mph
	Electrician Bob Fuel: 0.00 gal Speed: 2.69 mph
	Welder Joe Fuel: 68.22 gal Speed: 10.84 mph
	Supervisor Lauren Fuel: 16.52 gal Speed: 26.13 mph

Truck Detail

Roustabout Miguel

This truck has consumed 0.00 gallons and has driven 316,019.69 miles

Roustabout Miguel

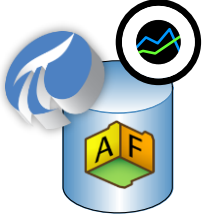


Fleet Average Speed



How Does It Work? Recap: What Existed Prior to the Integrator

PI System

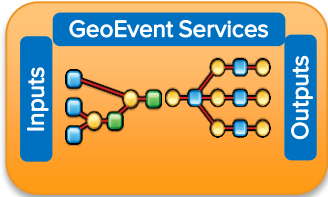


PI Data Archive 2014
PI Asset Framework 2014
PI Coresight

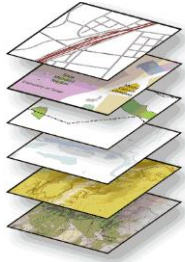
(Real-time data infrastructure)



Esri GeoEvent
Extension 10.2.1



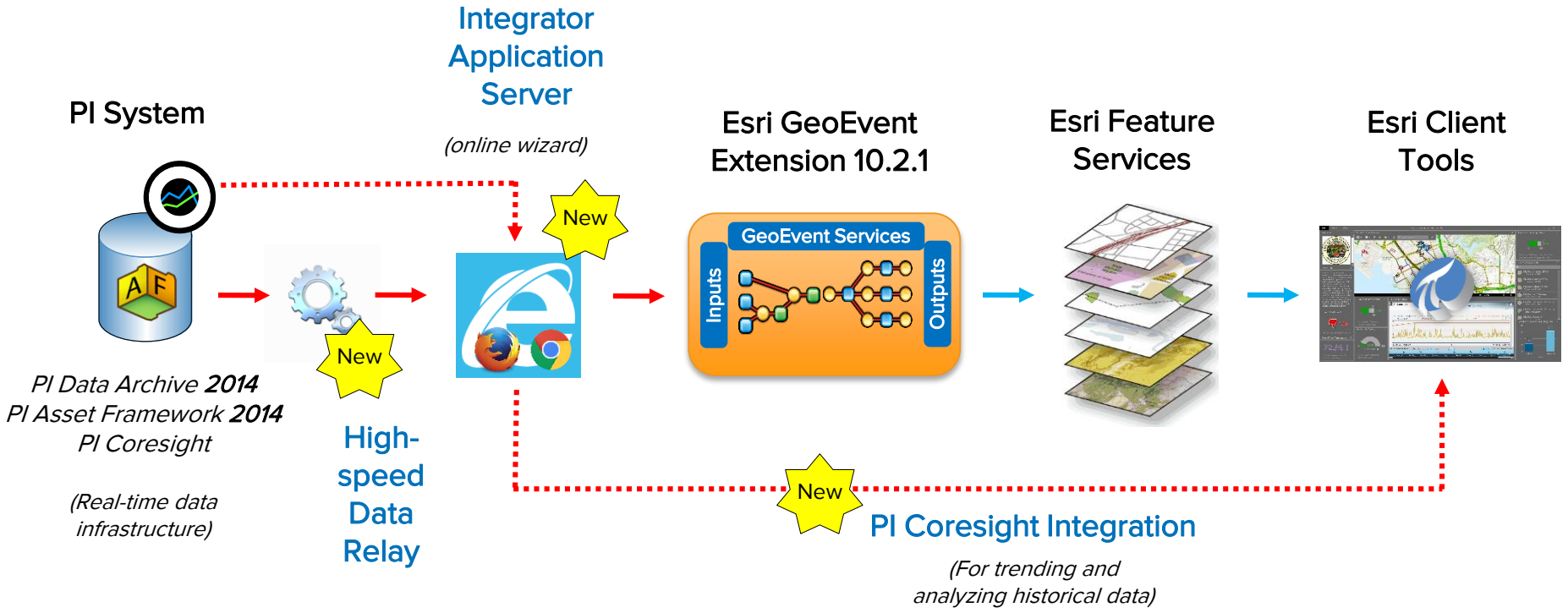
Esri Feature
Services



Esri Client
Tools

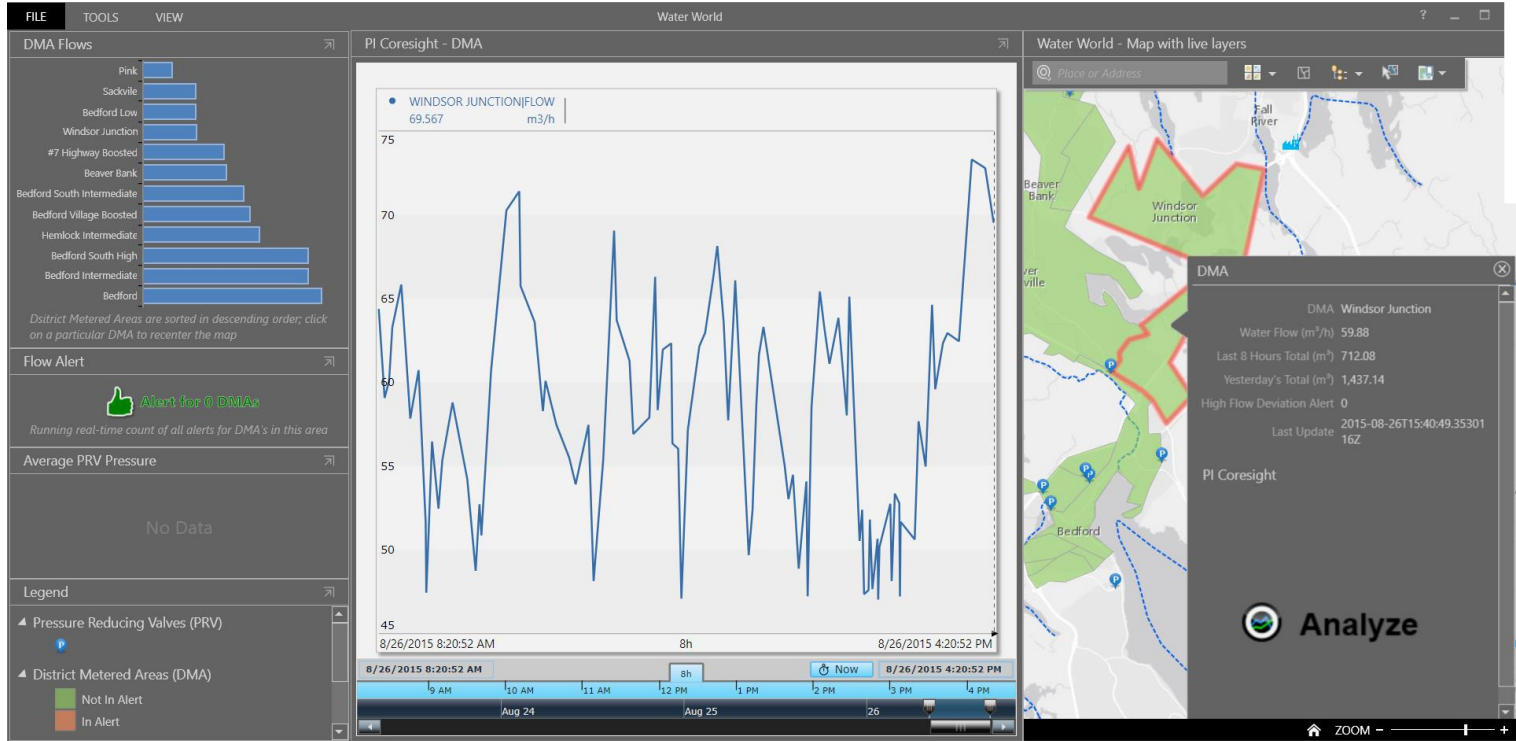


Our Solution: the PI Integrator for Esri ArcGIS



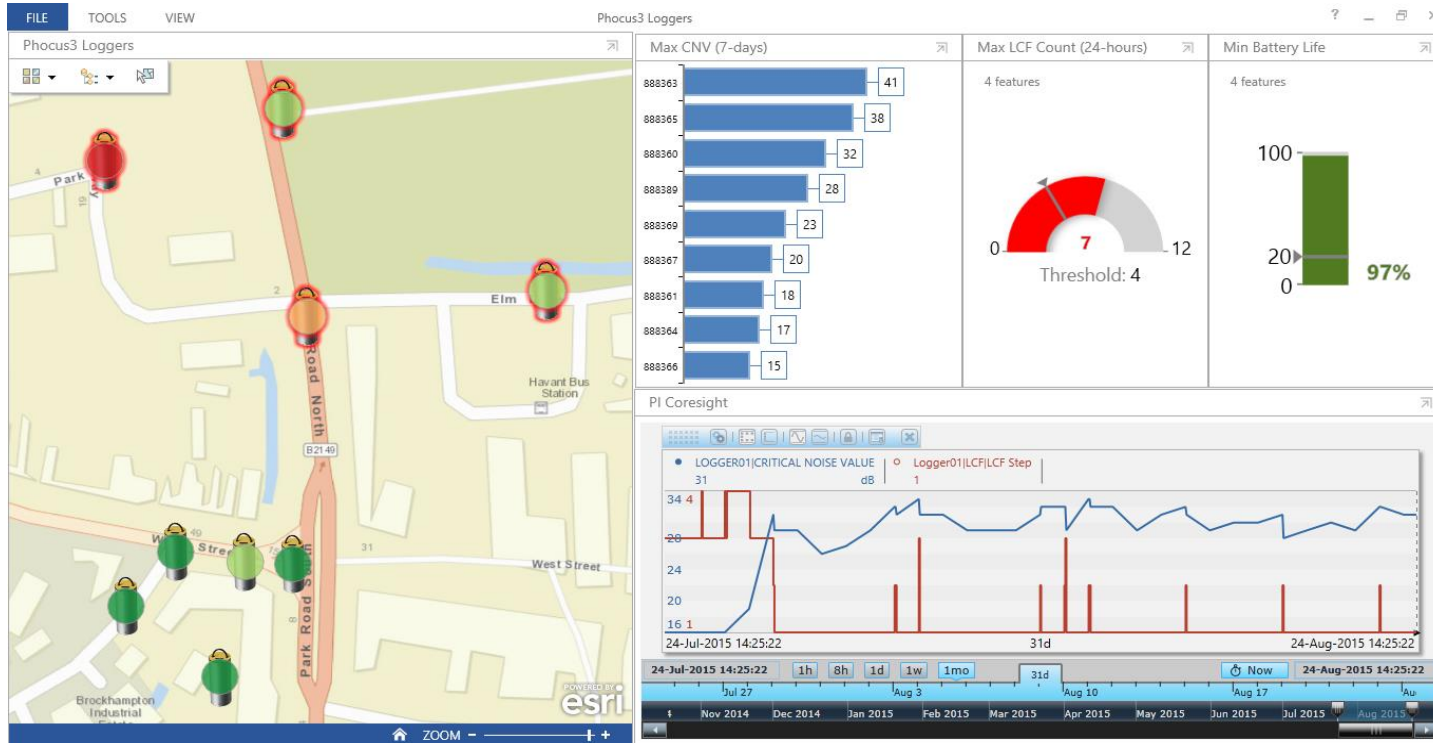
Water Leakage Detection on DMAs

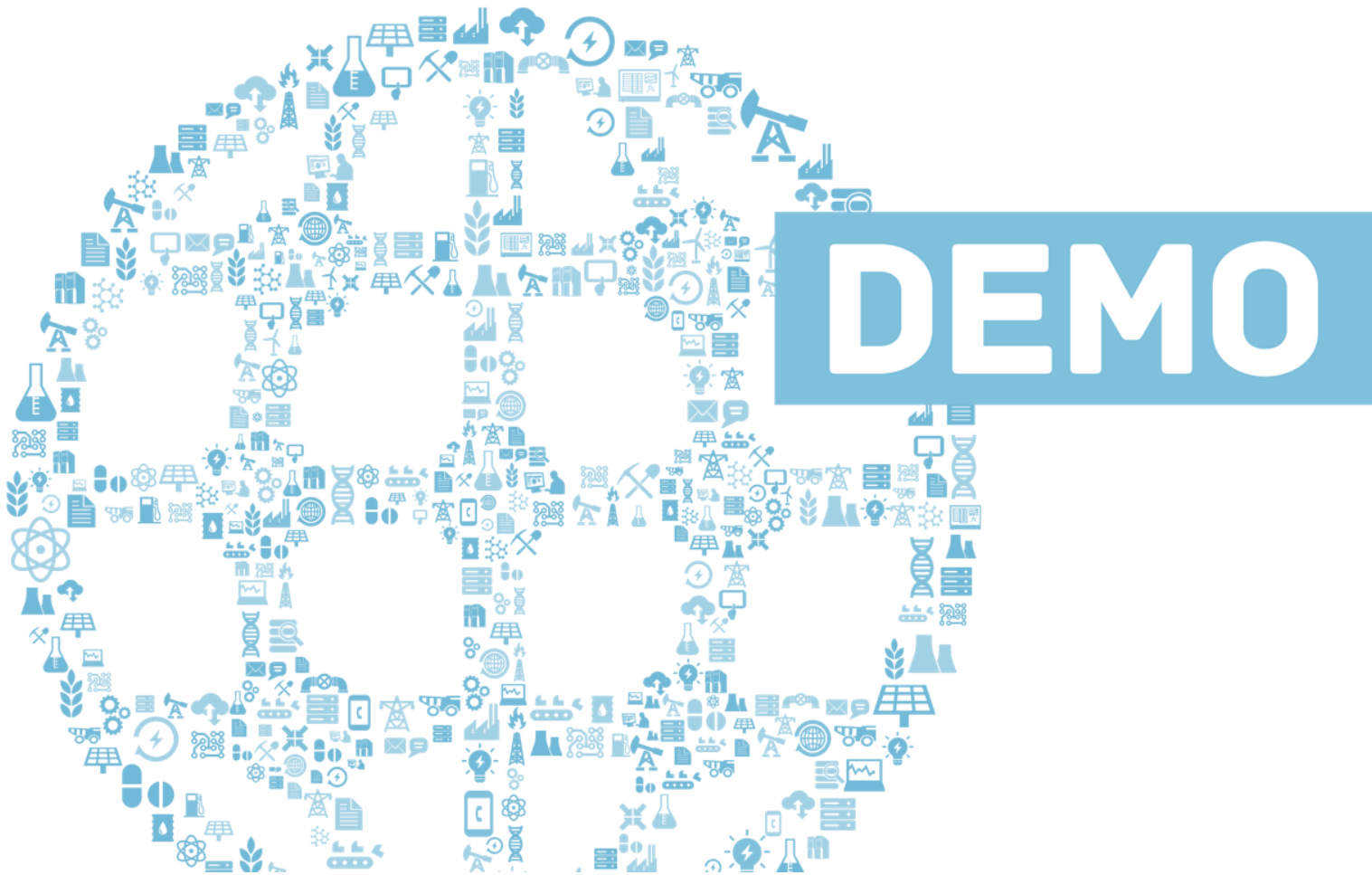
Real-time operations data can be integrated alongside Esri maps



Water Leak Detection Using Acoustic Noise Loggers

Leverage the ability to stream *any* PI System data into ArcGIS





The background features a repeating pattern of binary code (0s and 1s) in a light gray color. Overlaid on this are various industrial and technical icons, including cranes, gears, a person with a tool, a factory building, a power tower, a crane, and a truck. The text 'Use Cases' is prominently displayed in the lower right quadrant in a bold, blue, sans-serif font.

Use Cases

Leveraging the PI System in Water Loss Control

HALIFAX

Halifax Water (Canada)

Halifax manages water and wastewater for 325,000 people. Their goal was to use the PI System to find and reduce leaks in real-time and to decrease the frequency of water main breaks



CHALLENGES

The information needed for analytics was fractured, stuck and inaccessible in non-interoperable systems

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

SOLUTION

A PI System now monitors the District Metered Areas and water distribution system in real-time, notifying operations of potential leaks and breaks

Halifax was able to detect & address an expensive leak (700 gallons per minute running for 9 hours)

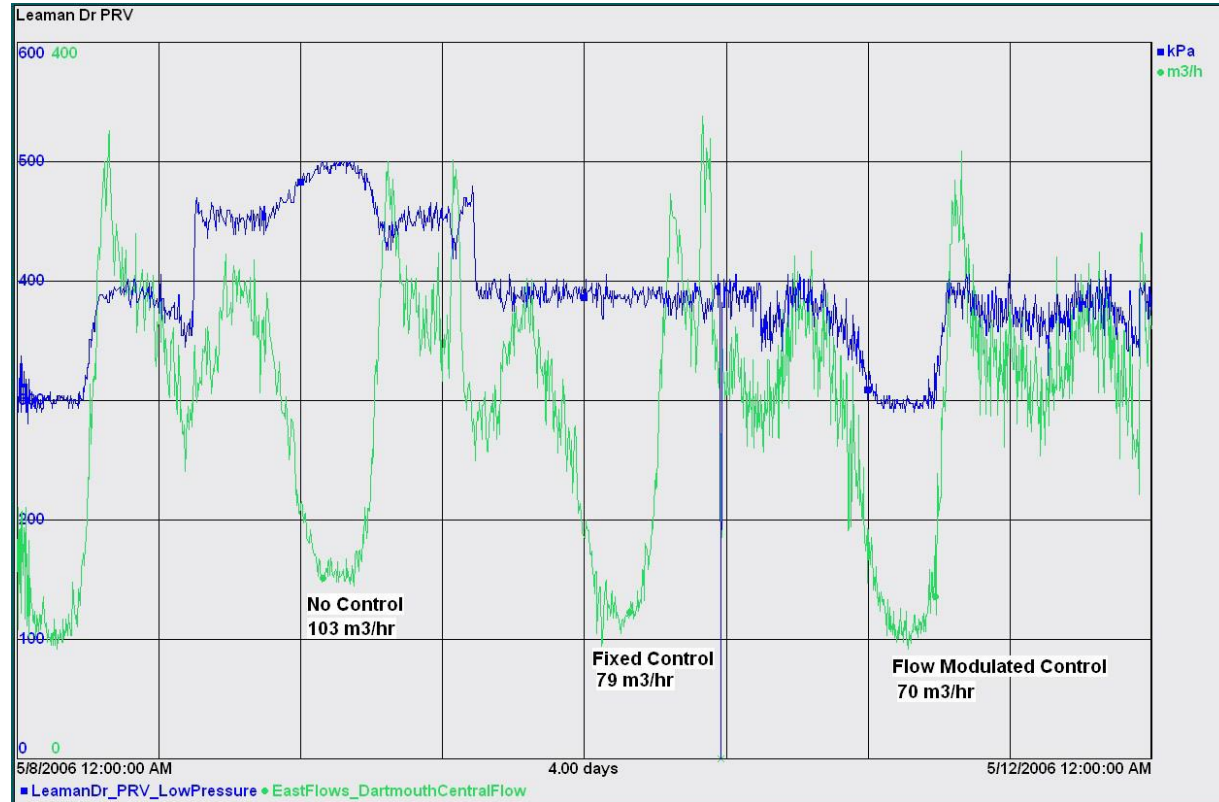
RESULTS

Halifax is saving \$600,000 per year from reducing leaks, and in some areas they've reduced the frequency of average main breaks by 50%

The company's Infrastructure Leakage Index (ILI) has significantly improved from 9 to 2.5



- Halifax used the PI System to reduce their average rate of water main breaks from 23 breaks per year to 12 breaks per year



Reduce Leaks & Non Revenue Water

- “We can see the turbidity and chlorine levels at the plant – and also out in the distribution system. That is a beautiful thing!”
- “The PI System has changed the way we do business here.”

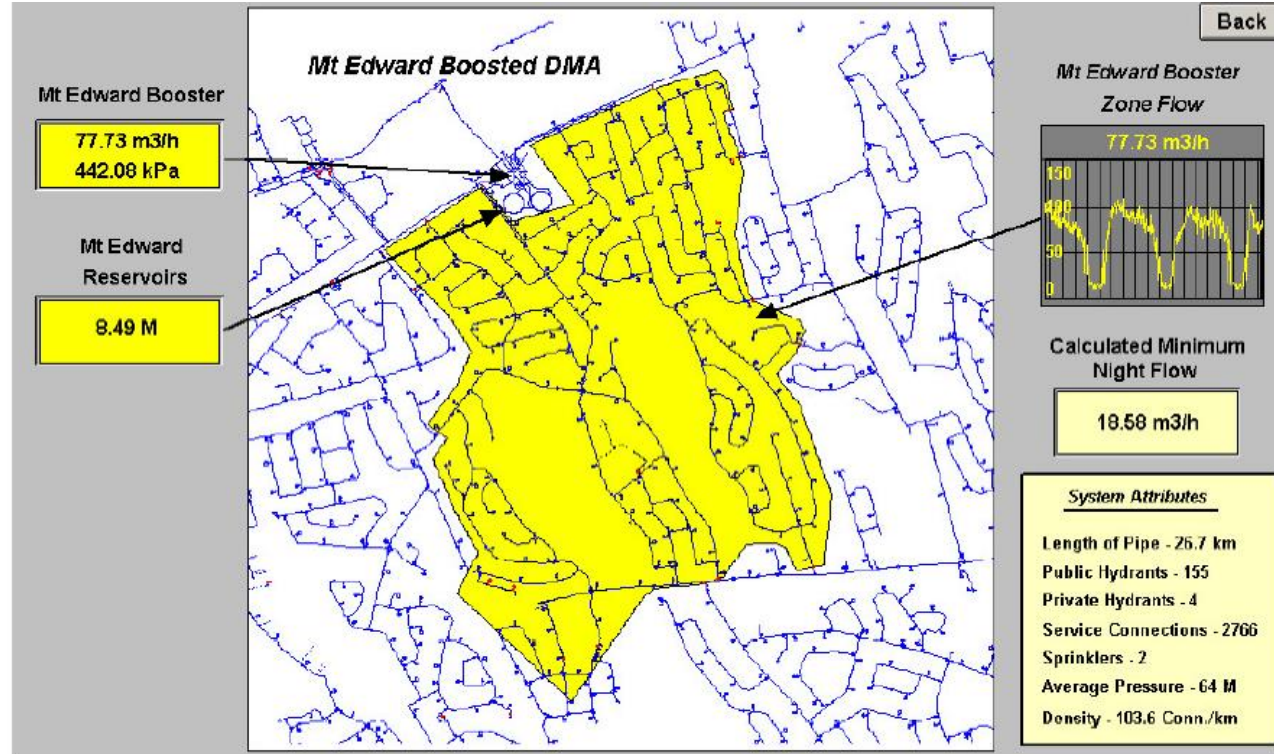


Figure 2.3 Mount Edward DMA, Dartmouth, Nova Scotia

GIS Integration

Veolia Water (France)

Veolia provides water to over 149 towns and 4 million people in the Paris region. They strive to have **real-time, full traceability** of all their water operations.



CHALLENGES

The three target geographic regions each had independent water and wastewater SCADA systems that didn't talk to each other

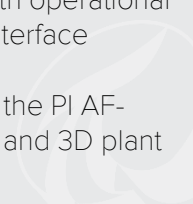


SOLUTION

SCADA system data is now integrated with GIS data in the PI System, enabling real-time operational and spatial situational awareness

Operators now work with operational data using a live map interface

Sites can fully leverage the PI AF-SDK, Esri ArcGIS maps, and 3D plant modelling software



RESULTS

Veolia now has the ability to fully trace water from source to tap

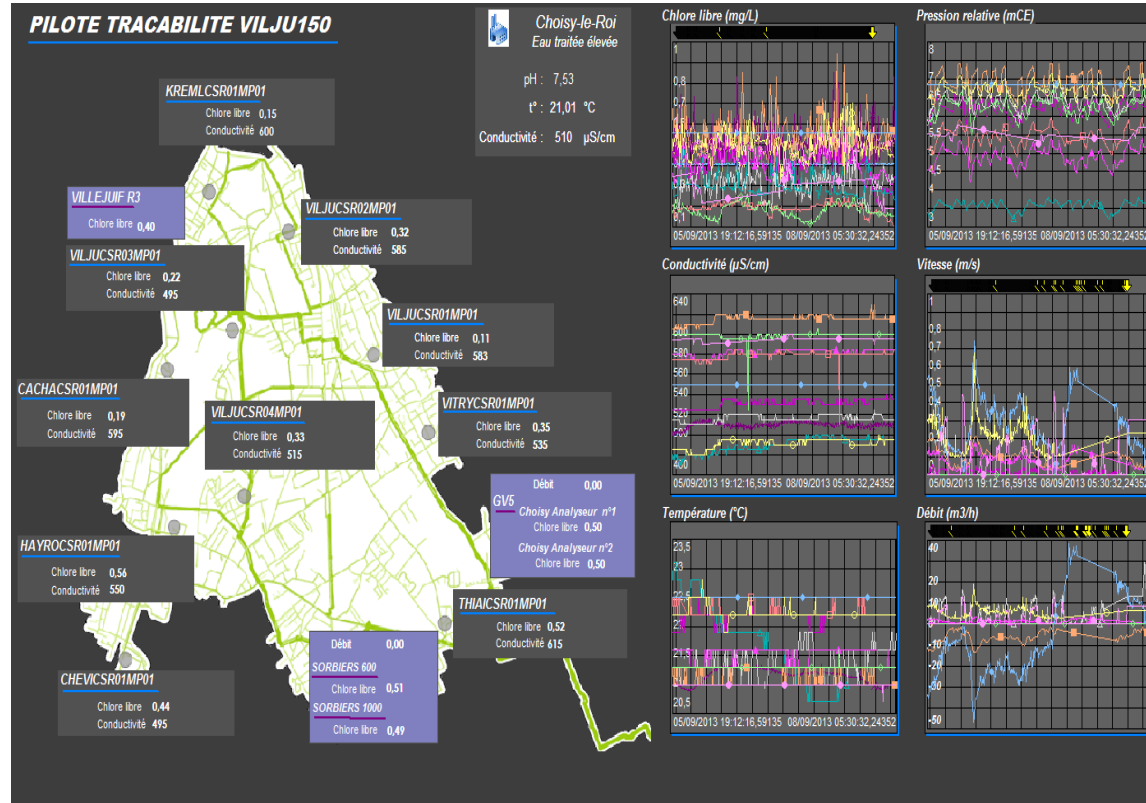
Veolia has found 7% more water leaks and has reduced their run-time of leaks

Energy costs have also been reduced by 6%



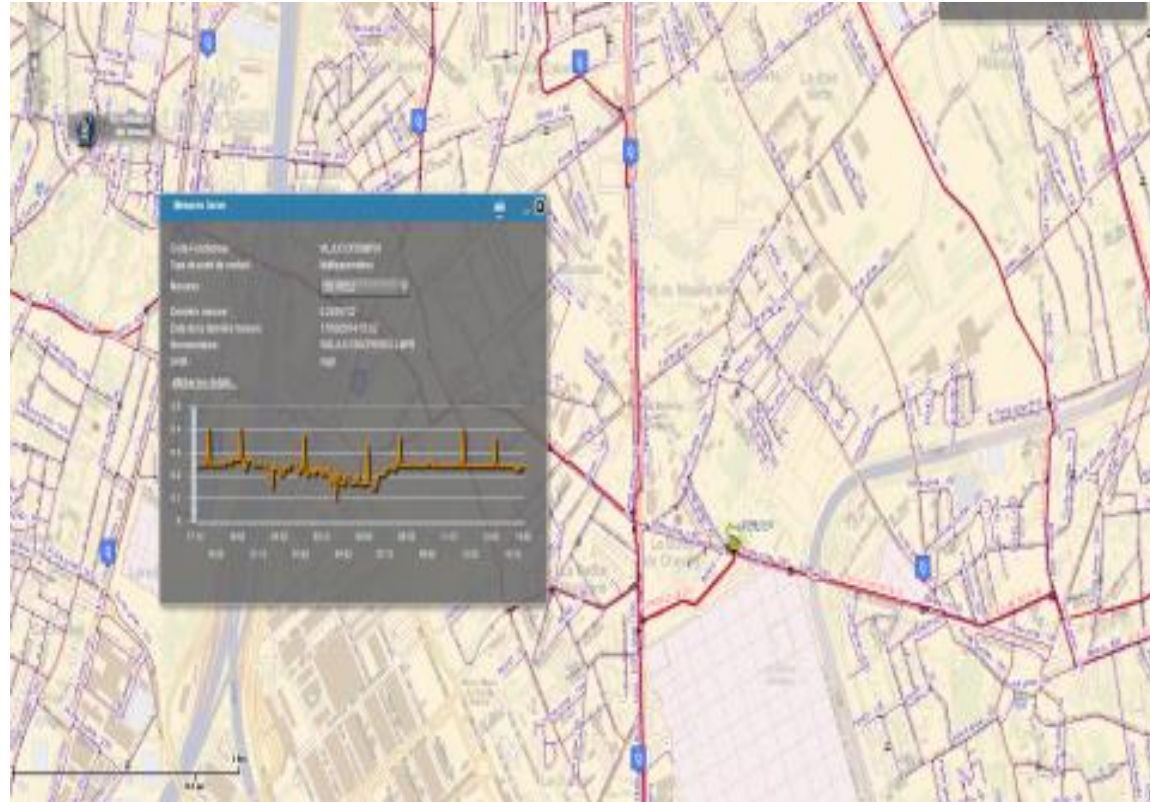
Unified Control & Visibility

- A single control center for three territories
- A unique vision for an efficient control, where water supplies, network, customer service and data are associated with context
- Improved ability to guarantee real-time water supply safety



Real-time GIS Integration

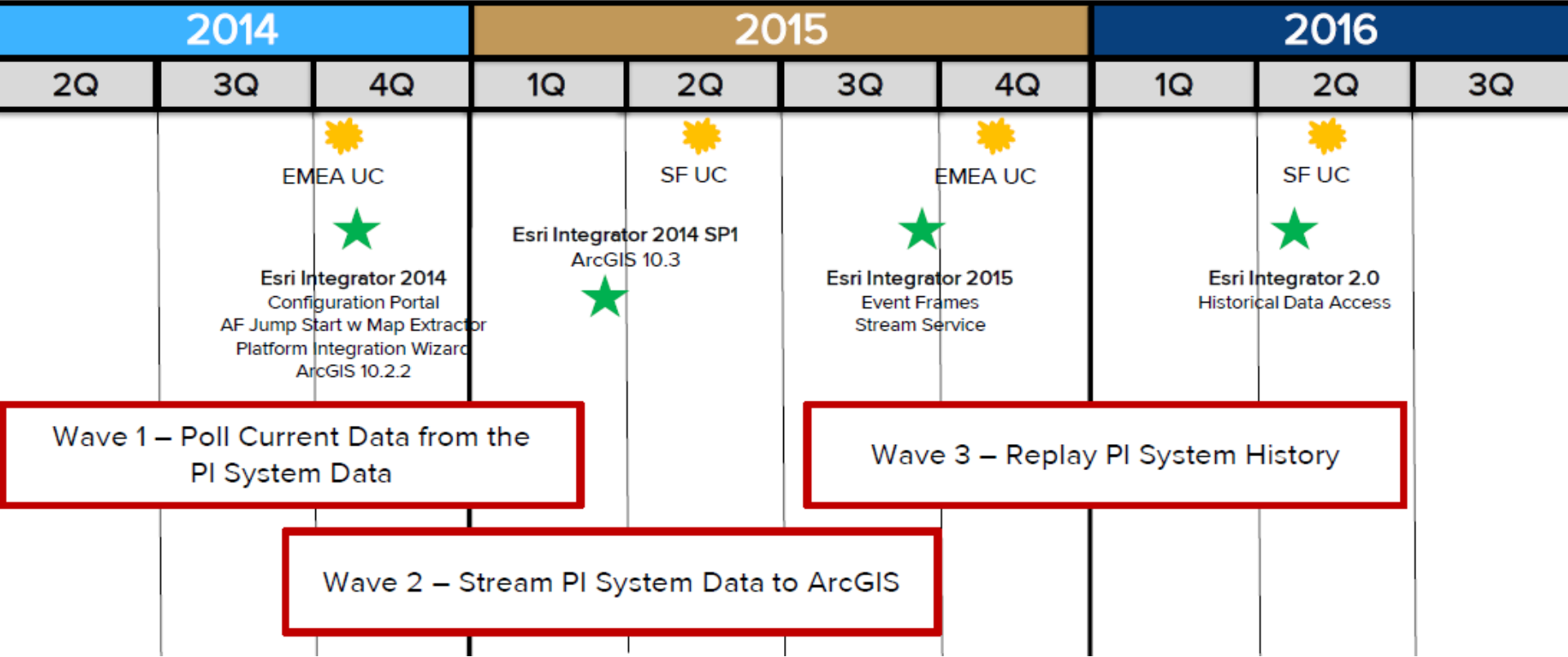
- Includes data from multiple data sources, with better consolidation and readability
- Allows better situational awareness and a synoptic overview across the whole territory
- Resulted in uncovering 7% more leaks





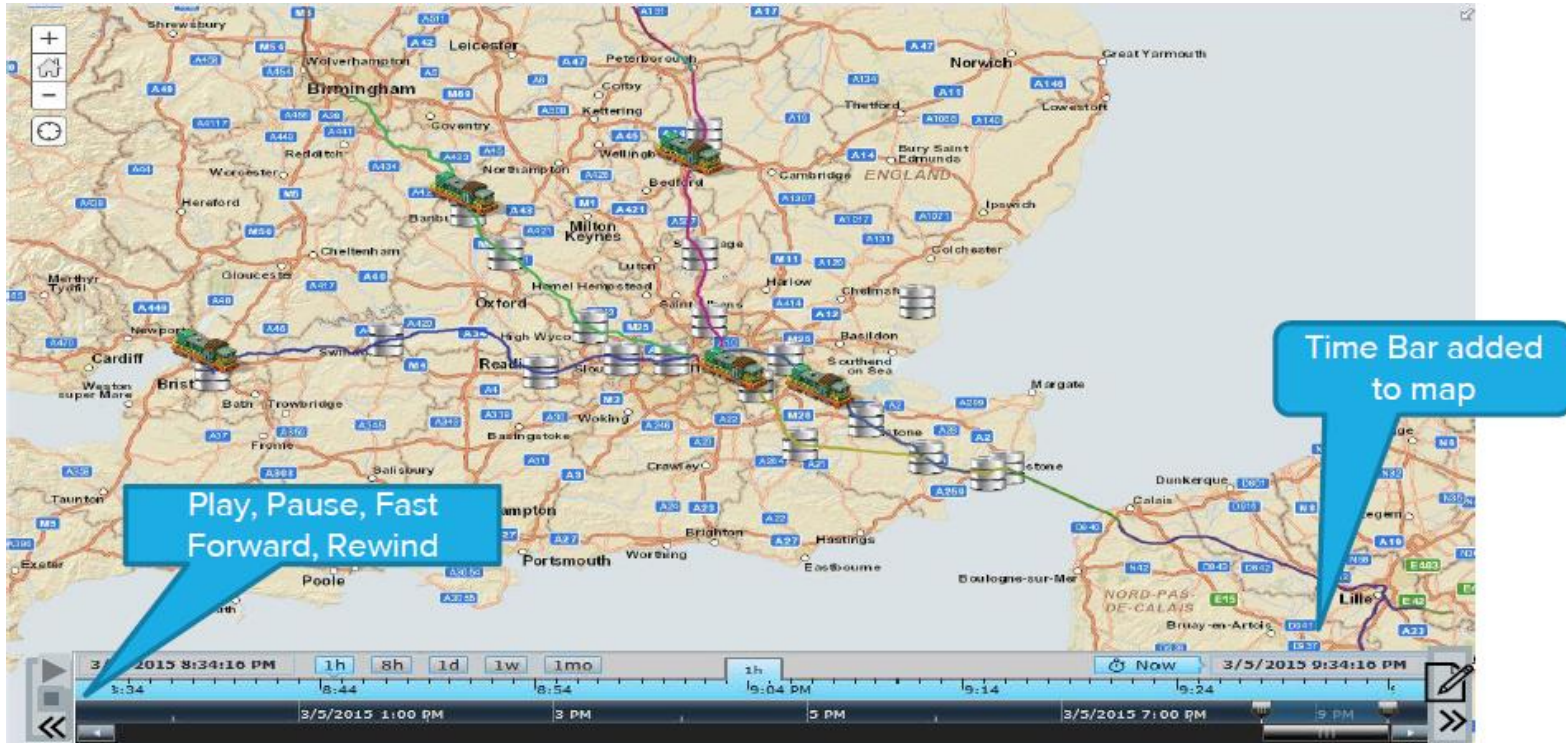
PI Integrator for Esri ArcGIS Roadmap

PI Integrator for Esri ArcGIS Roadmap



Future Capabilities: Replaying History

Maps could be “rewinded” to show the recent events and history



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado



Questions?

Please wait for the
microphone before
asking your question

Please state your name
and your company



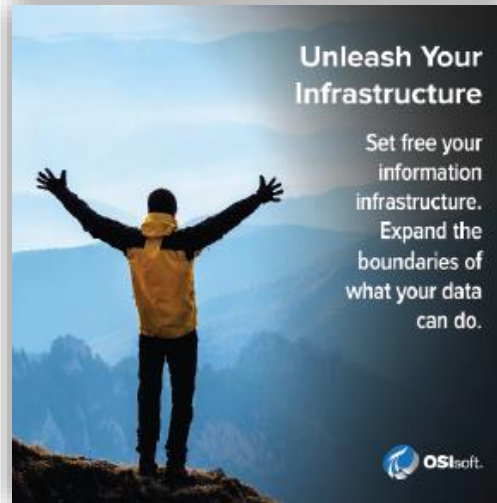
Come See Us At The Pods!

Bring your questions, comments, and suggestions!



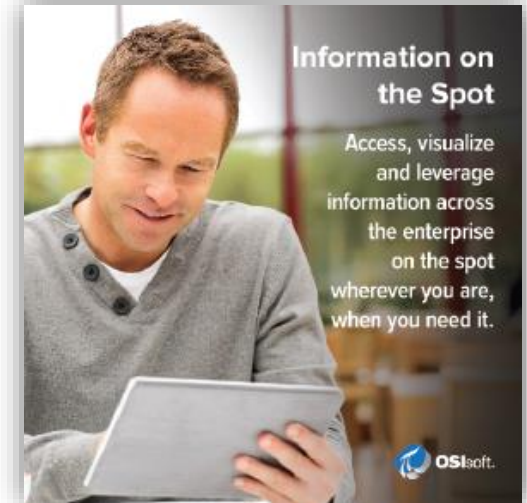

The Power of Connection

Bridging the data divide. Connecting people, systems, and information across the entire value chain.



Unleash Your Infrastructure

Set free your information infrastructure. Expand the boundaries of what your data can do.



Information on the Spot

Access, visualize and leverage information across the enterprise on the spot wherever you are, when you need it.

