



Digital Transformation

*Railway asset operational performance
visualization in ArcGIS*

Presented by Matthew Miller

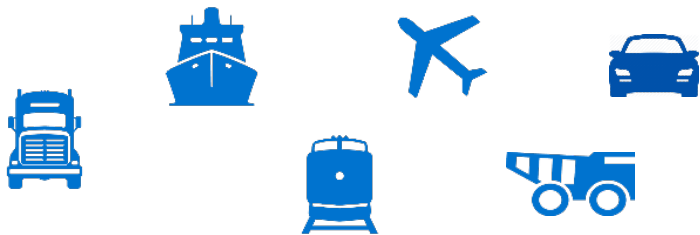
Transportation Industry Principal

Introduction

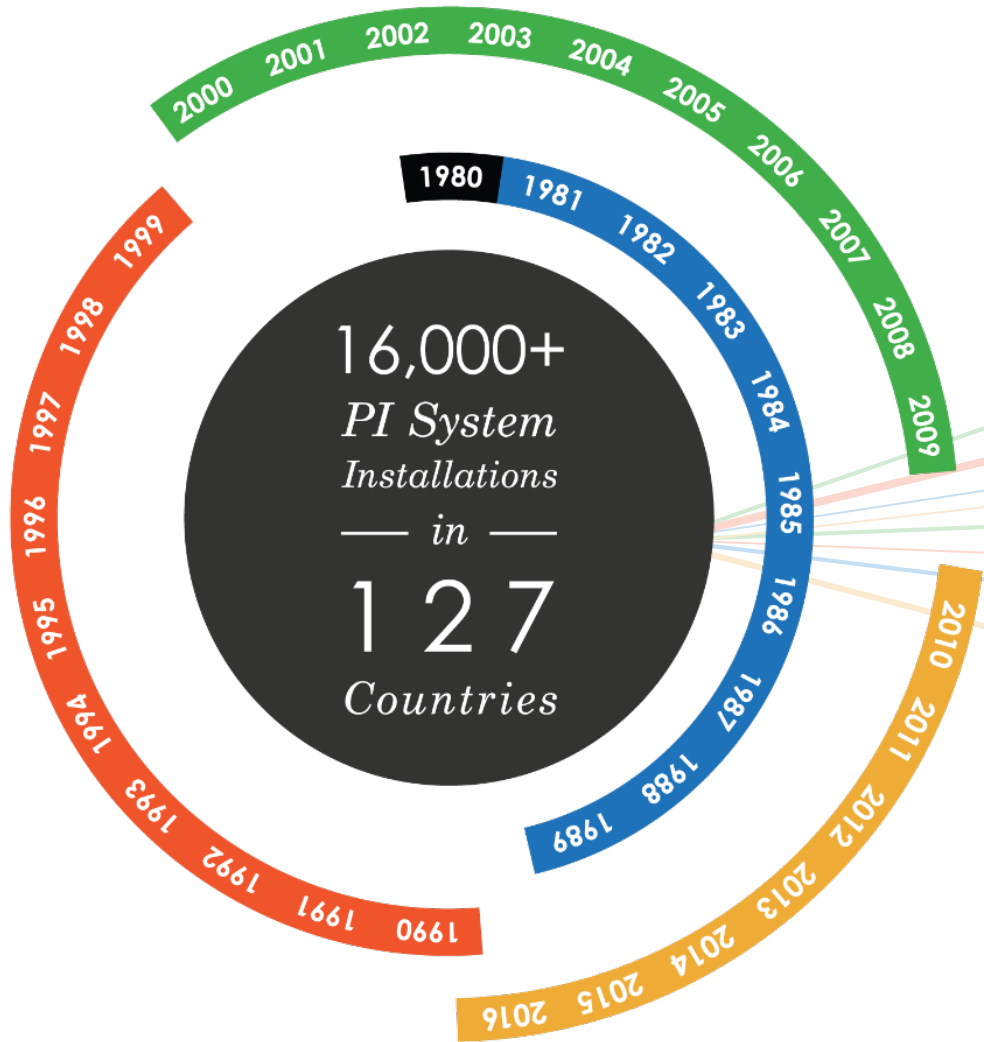
Matt Miller

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Transportation Industry Principal



A Unique and Proven Vision

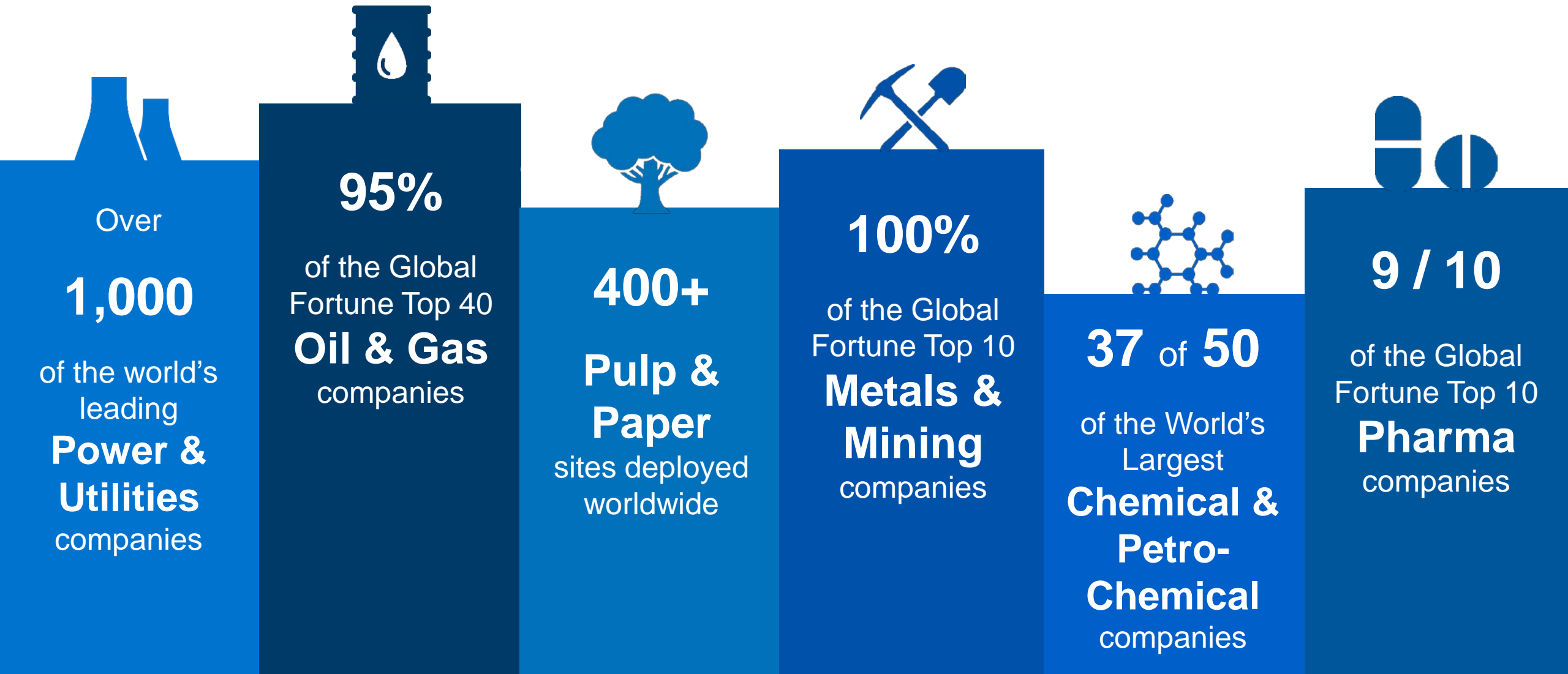


For over 36 years OSIssoft has delivered:

- Software that consolidates and centralizes sensor based data
- Open infrastructure to support best of breed ecosystems
- Scalability from small deployments to enterprise deployments
- Information that empowers people & drives for change

Supporting 65% of the Fortune 500 Operating Companies

OSIsoft is trusted by the world's leading companies



Presentation Topics

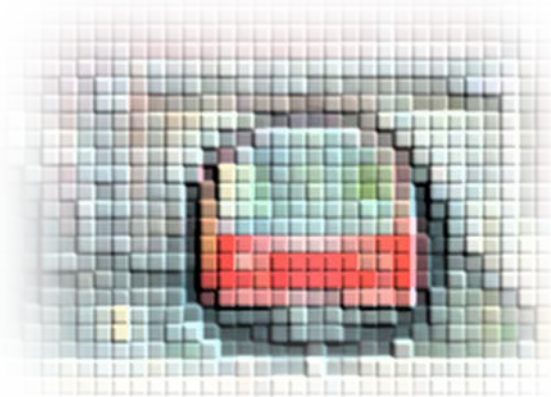
- Digitalization of the railway business
- Digital supply chains, ecosystems and communities
- OT and IT Convergence
- Why GIS is integral to OT/IT convergence
- Example of community systems
- What YOU can do!

Digitalization of Asset & Energy-Intensive Businesses

- “I DON’T KNOW” is no longer a good answer...
- Volatile business climate demands faster responses
- Data-driven culture is elusive at scale



Digitalization over Time



Verbal
Strip charts
Clipboards
Tribal knowledge

Controls
SCADA
DCS
Data Logger
Historian

IIoT
Sensors
Infrastructure
Mobility

IoE
Big Data
Cloud
Communities

Digitalization goes beyond capturing data

- Not something you buy, it's something you do!
- Often a strategy with executive buy-in
- Will lead to something **NEW**



Most enterprises have digital pockets... digital businesses will undergo a transformation

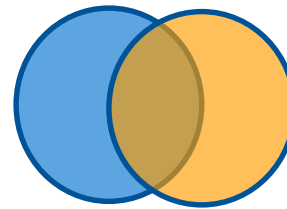
digital competence → digital usage → digital transformation

How?

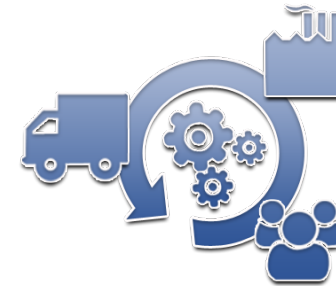
Connect, Converge & Collaborate

- IIoT – capture digital records of ALL key physical behaviors

- Bring OT and IT worlds together

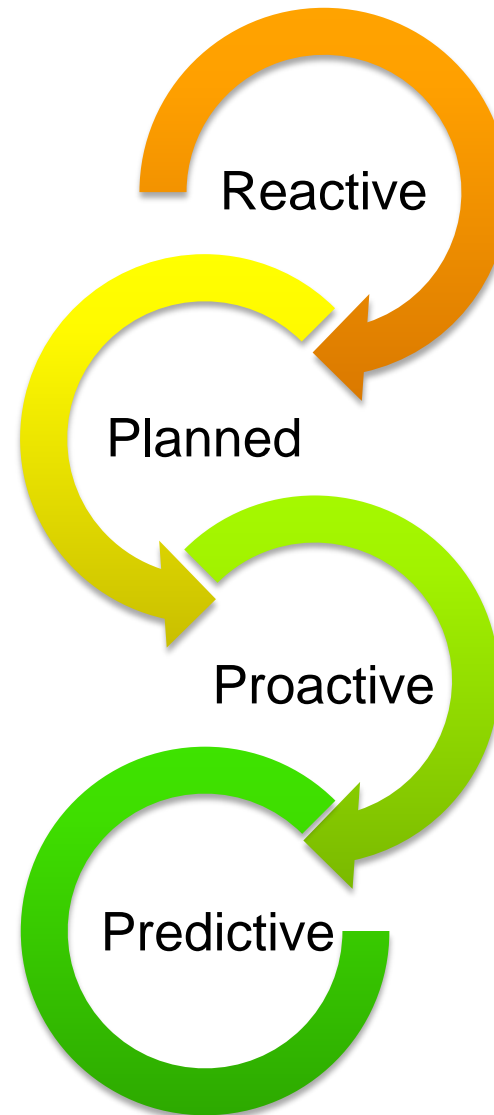


- Collaborating across the value chain



Data Driven Real-time Operations

- ✓ On-time performance
- ✓ Asset Management
- ✓ Asset Maintenance
- ✓ Network Capacity
- ✓ Energy Management
- ✓ Safety
- ✓ Regulatory Compliance



Capturing all the data....

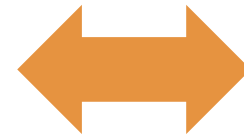
... bringing and end to “I don’t know....”

CONNECT: the Industrial Internet of Things

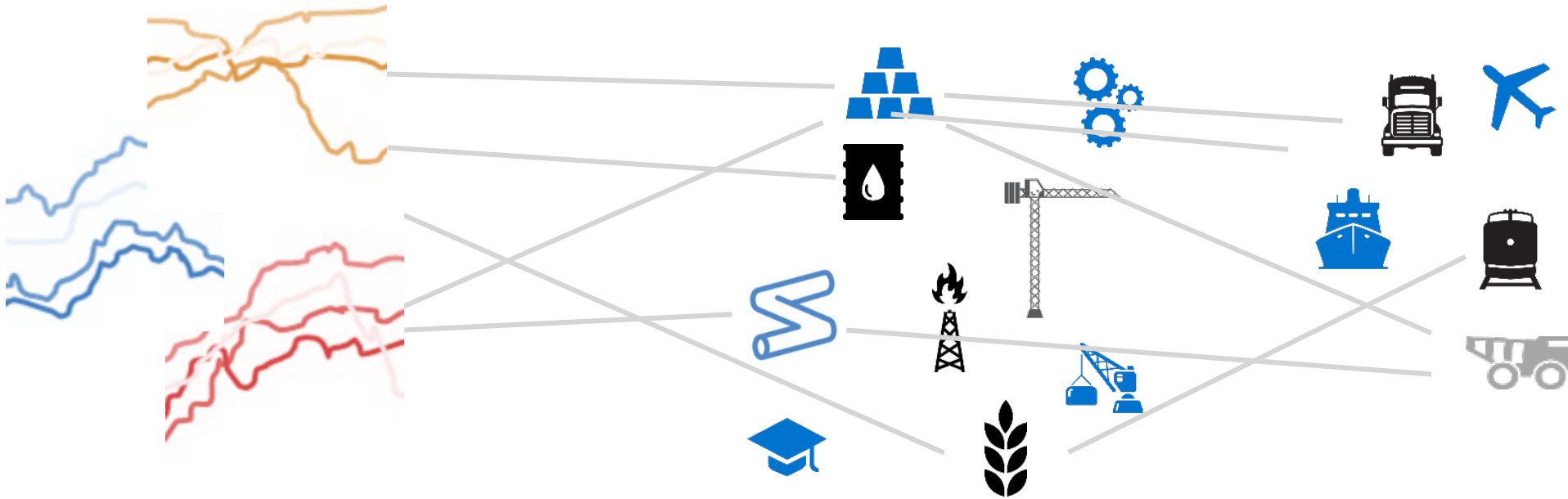
New Data Streams



New Locations



New Applications



Multiple Sites, Multiple Systems, Multiple Users, Multiple Businesses, Simplified Governance

Hybrid Industrial Data Ecosystem

Data Sources → Data Integration → Data Analysis



Impacts

Safety &
Security

Asset
Health

Energy
Utilization

Quality

Process
Efficiency

Regulatory
Compliance

Asset Condition Monitoring

Major EU Railway

Facing **increasing capacity demands** with **ageing assets** and political/public pressure to **improve its service level** while keeping costs in check.



CHALLENGES

Its operations & maintenance departments need to tackle safety, security and efficiencies on high-CAPEX assets. Better tools to face the deluge of data (eg. smart alarms) and rapidly take action on the information.

- Quickly prove the value of the system and evaluate extensibility
- Prioritize corrective and preventative maintenance actions (fault identification and diagnosis)

SOLUTION

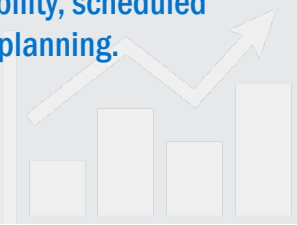
Consolidating data from various asset types and vendors (track circuits, track equipment, weighting stations, catenaries) making it available to stakeholders

- Agile development in “sandbox mode” smart alarms sorting, assess asset health index, various displays and reports to prove business value.
- Better informed (all information in one place, in real-time) about the actual health of assets

RESULTS

Bringing stakeholders together for collaboration and take more timely actions.

- Identify distressed assets and use data to assess which ones need immediate attention
- Improve network availability, scheduled work and maintenance planning.



Fleet Condition-Monitoring

Large Latin American Freight Railway

Goal to **reduce operations and maintenance costs** on their mixed manufacture (GE, Siemens, EMD) **fleet of 700 locomotives**.



CHALLENGES

Lacked the network and systems to continually collect data from fleet in the field.

- Ability to provide consistent service across all locomotives
- Short Implementation timeline
- No additional infrastructure costs
- Support system expansions in the future.

SOLUTION

Collected VR Data using Wi-Fi transfers into a real-time infrastructure supporting CMMS

- Used WAN connections at Signal Stations as hotspots
- Leveraged existing on-board VR data
- Unified data sets from all makes and models

RESULTS

Completed transition to CBM within a year expanding network to support streaming data

- Minimize Maintenance Costs
- Increase availability
- Provide consistent support across 700 locomotives



Environmental Site Monitoring

US Class 1 Railway

Ensure its **commitment to environmental health** is met by monitoring and reporting on station fuel delivery and operational waste remediation sites.



CHALLENGES

Old sites in agricultural areas posed runoff risks, with no way to verify environmental compliance

- Better manage fuel utilization and purchases
- Identify equipment problems before they lead to non-compliance
- Reduce manual oversight and reporting

SOLUTION

Reporting from 17 sites are centralized and automated to deliver compliance and real-time awareness.

- Monitoring of all fueling sites
- Consistent environmental compliance reporting
- Real-time notice of non-compliance
- Leverage investment in fuel site automation

RESULTS

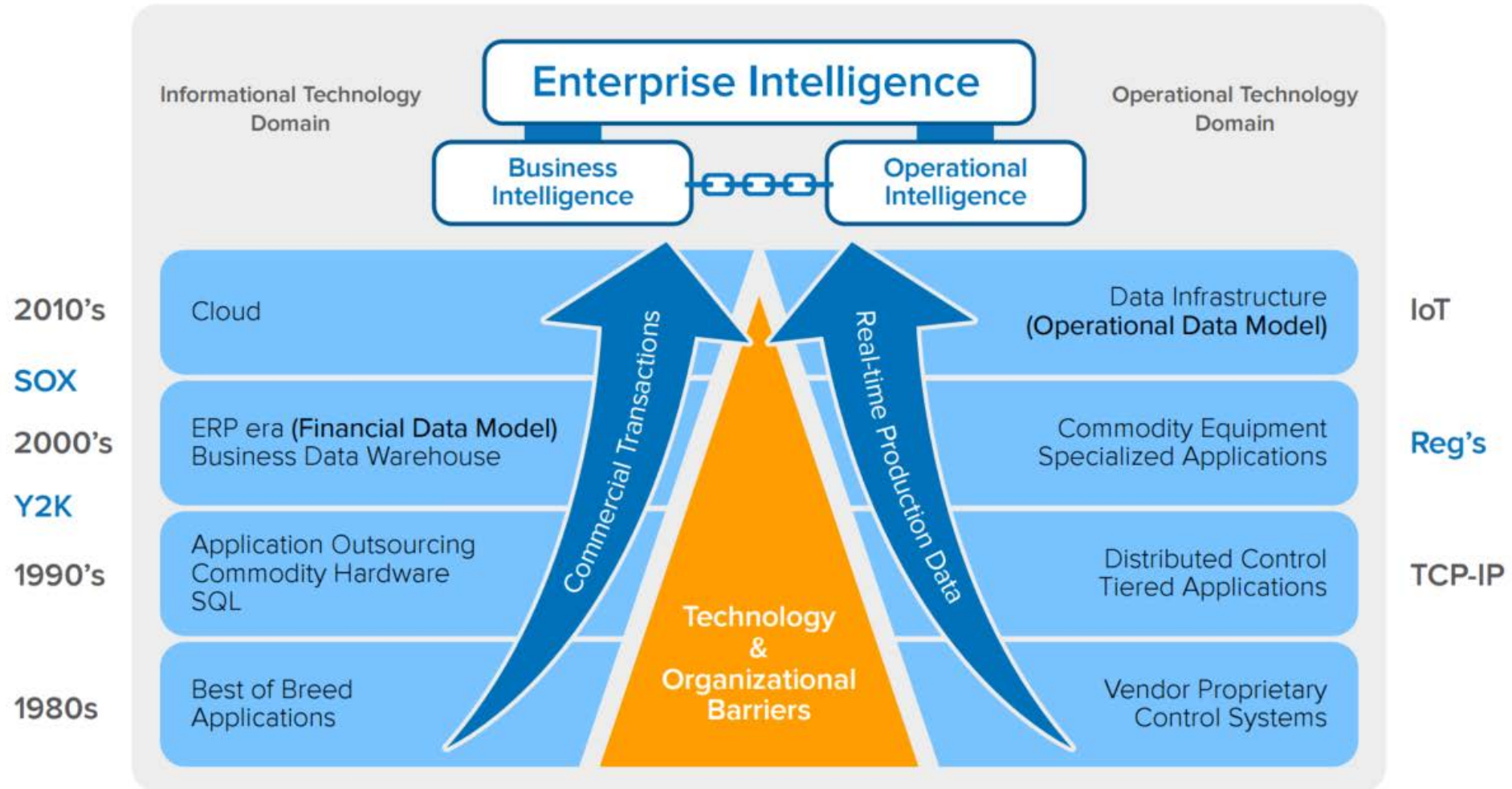
Remain in compliance with environmental agencies regulations.

- Real-time connection to 17 remote sites with no data loss
- Auditable data storage and reporting for EPA & FRA compliance.
- Provided view into equipment and fuel usage
- Monitor effectiveness of fuel-water separators

Data, process and people working together...

... to improve the business

Evolution of OT and IT Integration



[White paper wp-strategies-for-integrating-ot-and-it-lt-en20.pdf](#)

CONVERGE: Data flow across normally siloed applications

- Integrate OT systems to remove silos
- Create bi-directional communication between OT&IT systems
- Seamless connection between enterprise data sources



PI Integrator for Esri ArcGIS

Two primary usage patterns

1. Faster response for emergency or urgent response scenarios
2. Identifying geographic correlations in operational performance or efficiencies

Both leading to improved **Situational Awareness** and improved **Operational Excellence** by using a **Common Operational Picture**.

The integration of the PI and ArcGIS systems can result in better daily and operation planning, and better responses to emergency, urgent situations:



Proactive Network and Asset Management



Improving Process and Operational Workflows



Tracking, Reporting and Compliance



Situational Awareness for Emergency Response



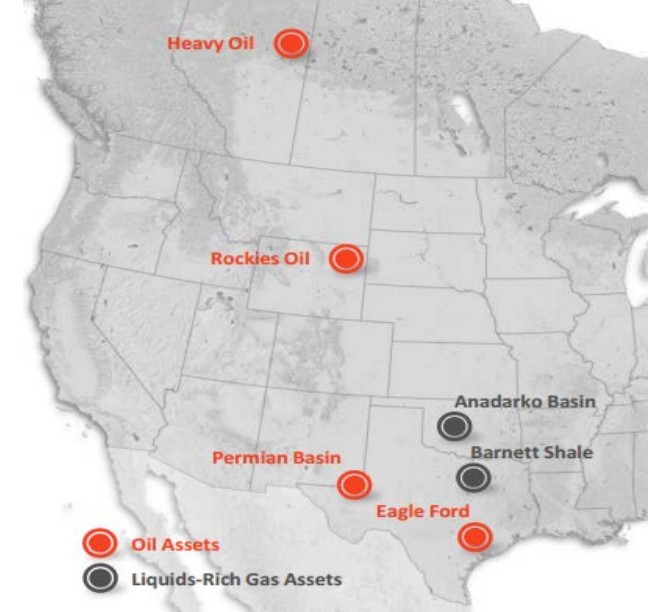
Health, Safety, and Environment

Distributed Oil Field Operations

Devon Energy

“We have a field that produces a **lot** of water, and **to keep the oil flowing** you’ve **got to keep the water flowing**”

Rick Howell, Real-Time Data Supervisor



CHALLENGES

- Operators and engineers must manage water flows through a geographically disperse network of pipes, valves, transfer points, and reservoirs.
- One field covers 400,000 acres, or 625 square miles
- Capacity problems around transfer points affect productivity
- Operators had to drive back to the office to get real-time data

SOLUTION

The PI Integrator for Esri ArcGIS provides operators real-time visibility into equipment and water flow conditions in the ArcGIS platform.

- Field operators and engineers in headquarters have a single, real-time version of the truth
- Project rolled out in 6 weeks without any custom code

RESULTS

Operators can quickly identify conditions that need attention and can triage based on location

- Employee’s are empowered to build their own dashboards and displays
- Same data available on mobile devices as in the office

Lowering Cost and Improving Reliability of Wind Farm Operations & Maintenance

Dong Energy

“**Asset integrity improvements** through remote monitoring will safeguard high **health and safety** standards and **reduce OPEX costs.**”

Anders Ropke, Lead Data Architect



CHALLENGES

- Must optimize wind power generation while managing OPEX and keeping workers safe.
- Will operate 1,800+ offshore wind turbines by 2020
- OPEX working offshore is 15x's higher than onshore

SOLUTION

The PI Integrator for Esri ArcGIS provides a common way to access information for multiple teams

- View real-time status of maintenance activities, power production, and profitability
- Improve efficiency of O&M activities

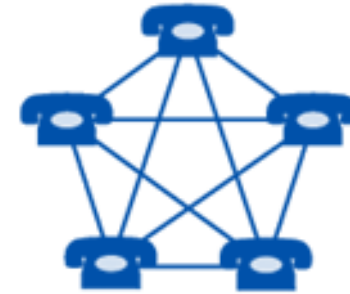
RESULTS

Working toward a goal of reducing maintenance trips offshore by half.

- This goal would reduce OPEX by 20M Euro/year.

Benefits of convergence are about speed, adaptability and collaboration

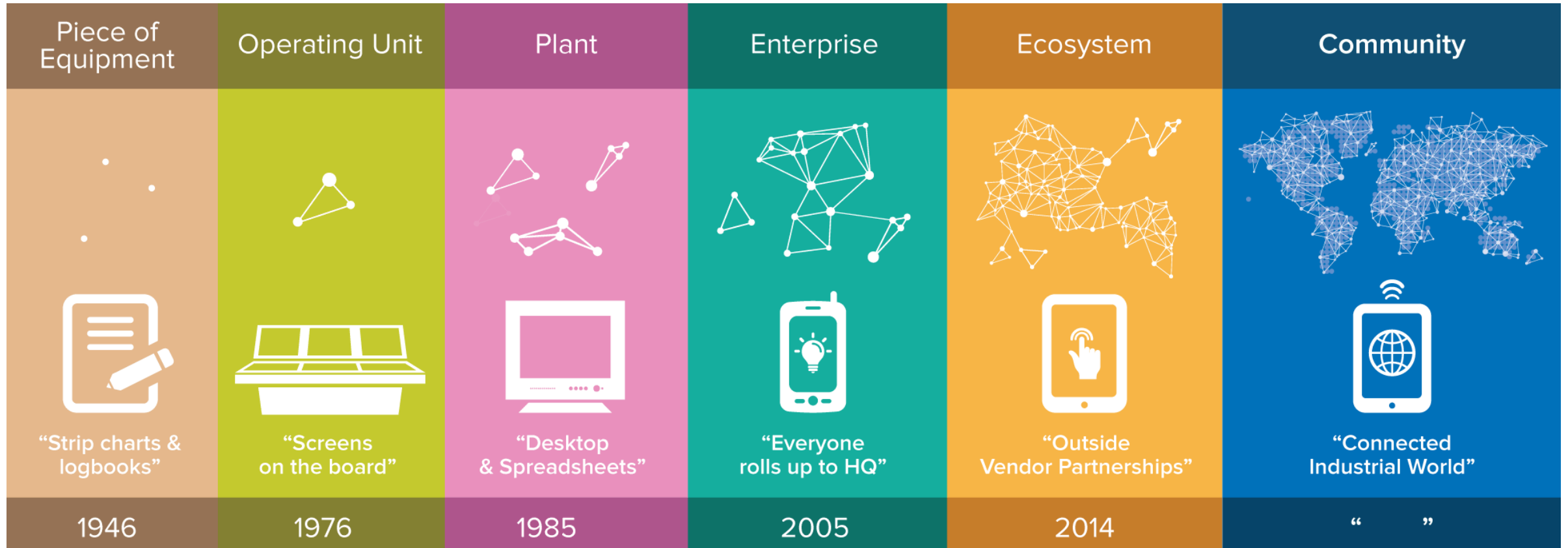
- Reduce overall variability
 - By understanding how systems interact
- Make processes adaptive to real-time conditions
 - Align operational decisions to dynamic business conditions
- Closed-loop decision-making
 - Understand effects of decisions soon enough to adapt and act



Sharing beyond traditional four walls....

... and beyond the organization

The Journey to a Connected World



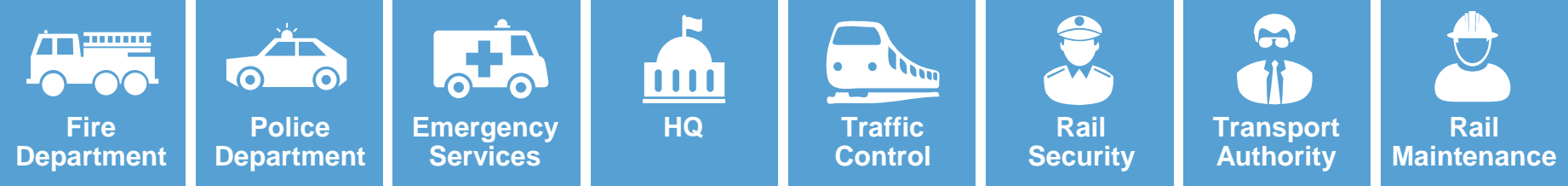
A Complex “Community” Environment

Difficult coordination of real-time response

Slow decision making

Inefficient staff deployment

Costly business interruptions



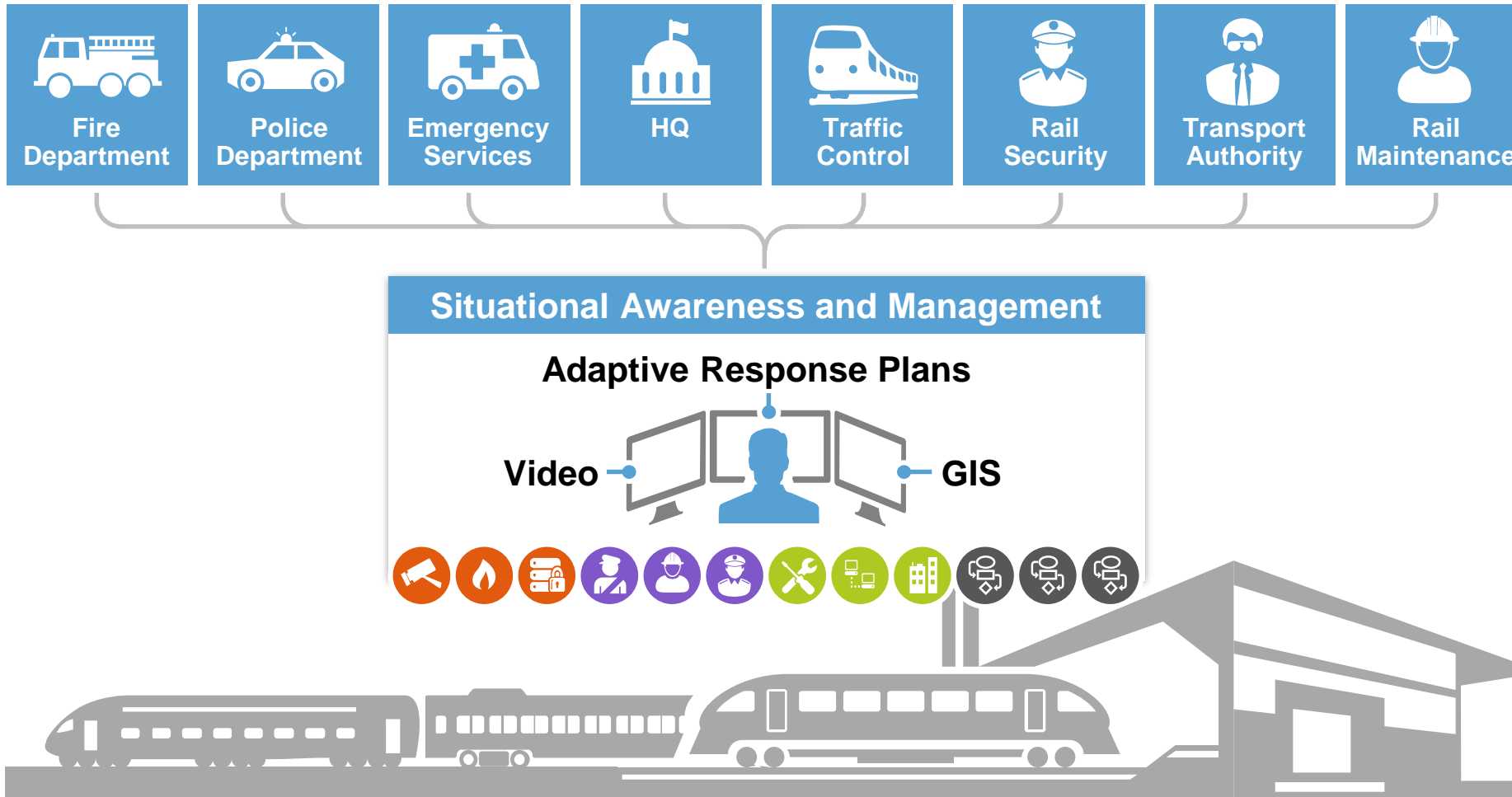
■ Sensors
 ● People
 ● Systems
 ● Processes

Advanced Situation Management

Faster identification, response, recovery & debriefing

⋮

Increased efficiency without increasing headcount



■ Sensors ■ People ■ Systems ■ Processes

DATA INSIGHTS

Asset Performance

Statistical
Analytics



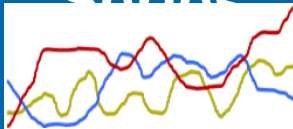
Analytical
Insight



Visual
Analytics

Work flow
Performance

Time
Series



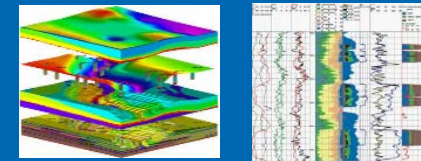
Relational



Unstructure



GIS

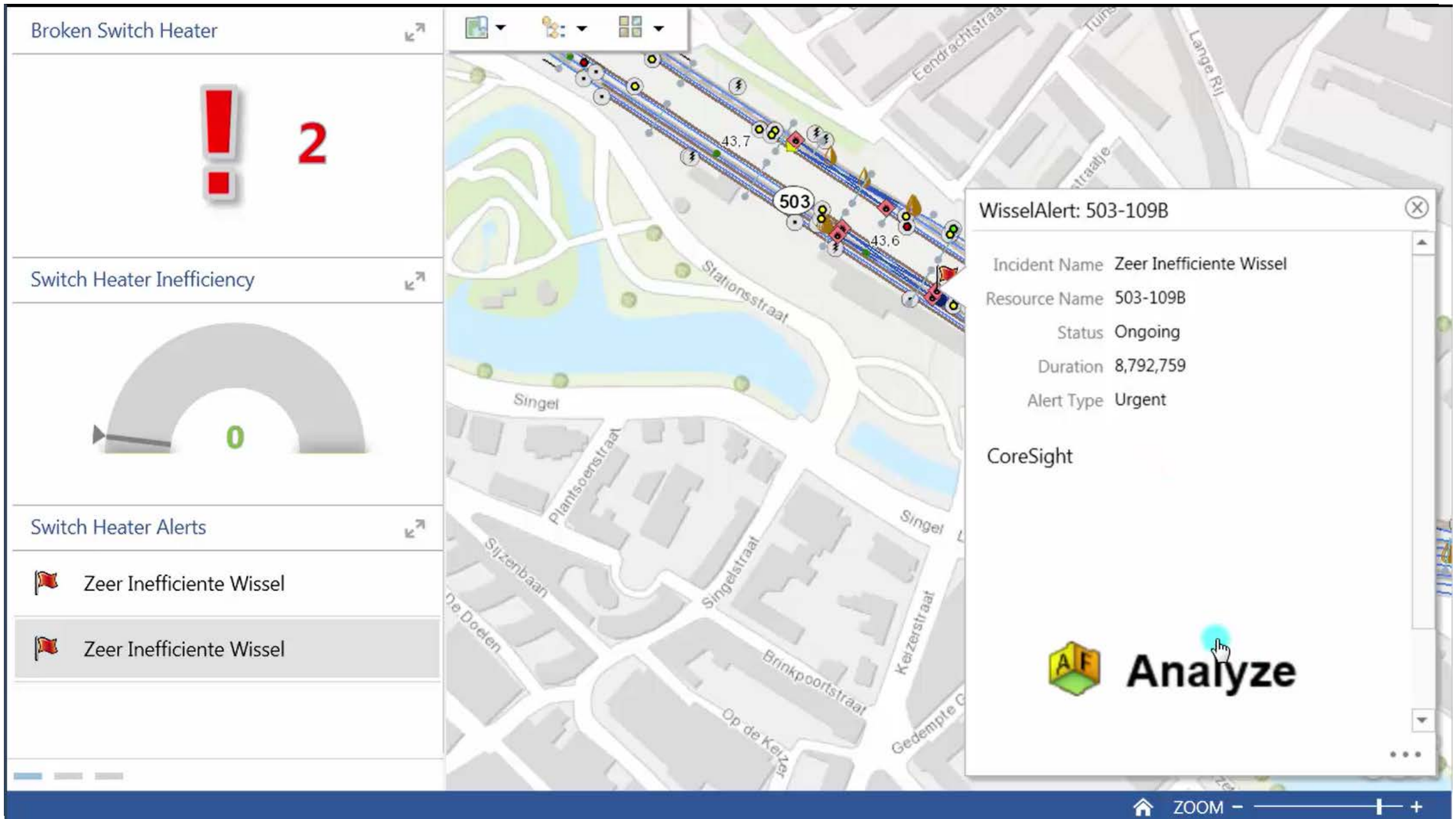


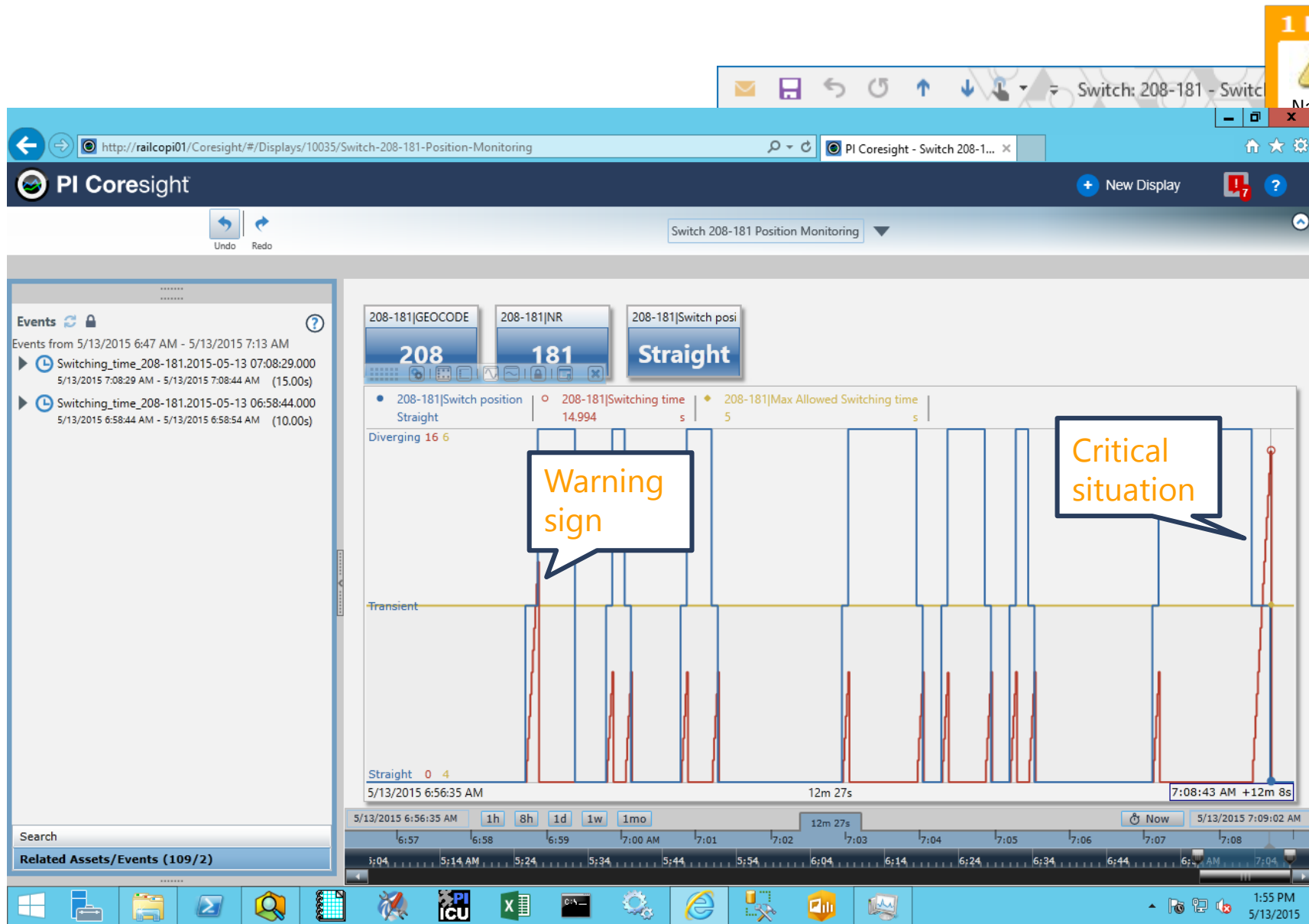
NICE®



Qognify







1 Notification

Warning

Name: [Abnormal Switching](#)

Switch ID: 208-181

Location: Deventer

Description: Switching on 5-May-2015 08:43 AM took 15s to get to complete diverging position.

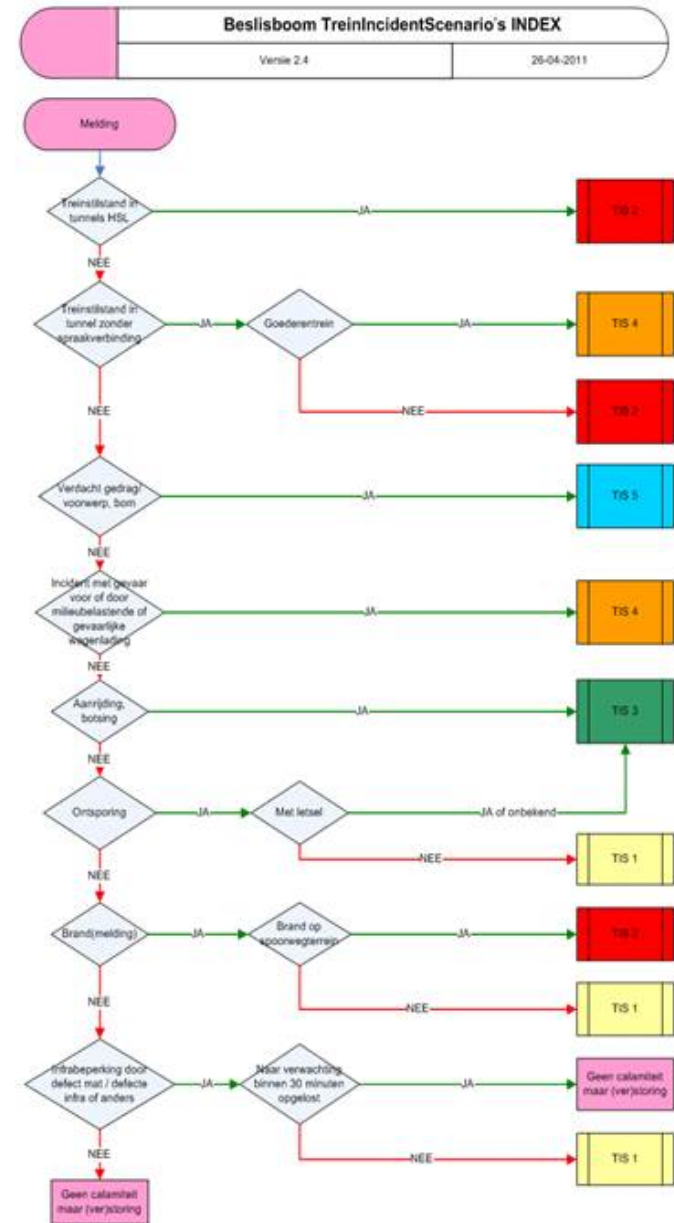
Asset:

Switching position.

PI Coresight logo and user profile icons are visible at the bottom of this section.

Knowledge Management

- Workflows drive faster action
- Promote more thorough responses
- Drive repeatable and predictable outcomes
- Platform for collaboration and continuous improvement



recom gr Hatchback

Progress: 300 (Veibeg to rodetes)

Detector: Tfd Ut Times - Uvrecht Central Time

Detector name: Sander Vlietman

Search Area: OUT

Time of occurrence: 19/05/2015 10:22

Time occur by Detector: OFF

Further information

Name Giving incident	Location Type	Location	Section	K	Spoorw	Objec
recom gr Hatchback	bill	3	C	3	Nijmegen - Trald	

Involved trains

Trainnr	Orgo	Location Type	Location	Section	K	Spoorw	Train Type	ACC	Dist
4	Out	bill	3	C	3		Freight	No	1

Stranded trains

Trainnr	Orgo	Location Type	Location	Section	K	Spoorw	Train Type	ACC	Dist

Other incidents

what happened?

Remarks

Ignore search area (X) for all locater find in the table above event

Logical replantes

Limitations

Infrastructure Restriction

Incident Intake Forms

NICE Situatio

Incidents Log

- Panic Button Activated 1 Alarm Urgent Today 13:56:14 AM
- Train & Vehicle Collision Today 21:23:42 PM High
- Medical Emergency 1 Medical Yesterday 05:21:43 PM
- Line Maintenance 1 Maintenance Today 12:08:17 PM
- Weather Alert 1 Weather Today 03:13:52 AM Medium
- Switch Malfunction 1 Maintenance Yesterday 11:23:33 PM

Train & Car Collision 15:23:42

Warning

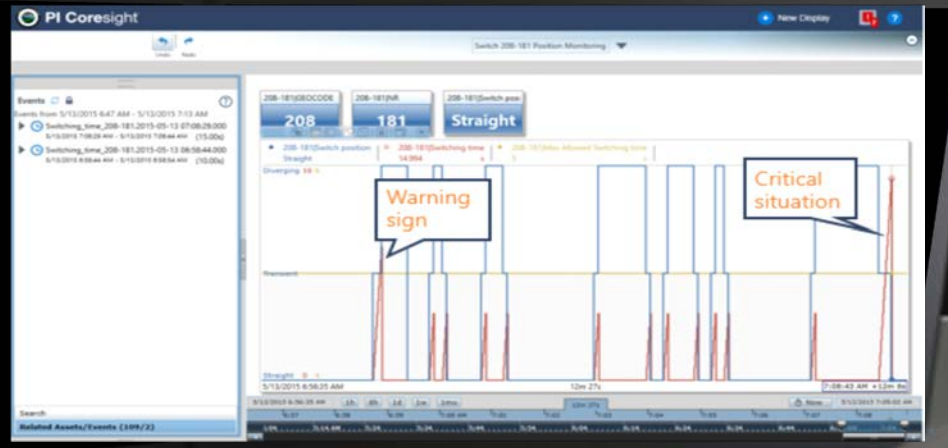
Name: Abnormal Switching

Switch ID: 208-181

Location: Deventer

Description: Switching on 5-May-2015 07:28:43 AM took 15s to get to complete Deventer position.

Adaptive response workflows



Real-Time Data Visualization and GIS

503-107A

Switch Operation

Position Transient
 Switching Time 310031 s
 Temperature 29.87 °C



Switch Heater

Model LP Heater
 Brand Fastrax

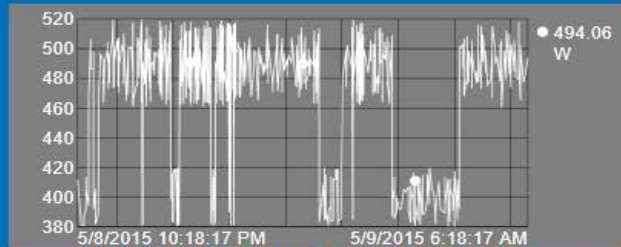
Switch Motor

Status ON
 Voltage 43.88 V

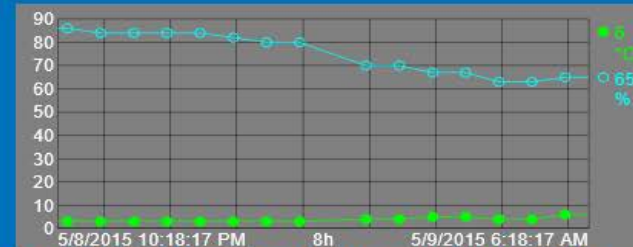
Heater Efficiency



Status ON
 Wasted Power 1.00 W



Motor Power Consumption (last 1 hour)



Ambient Temperature and Humidity (last 1 hour)

5/8/2015 10:18:17 PM

8h

Now

5/9/2015 6:18:17 AM

Director of Operations



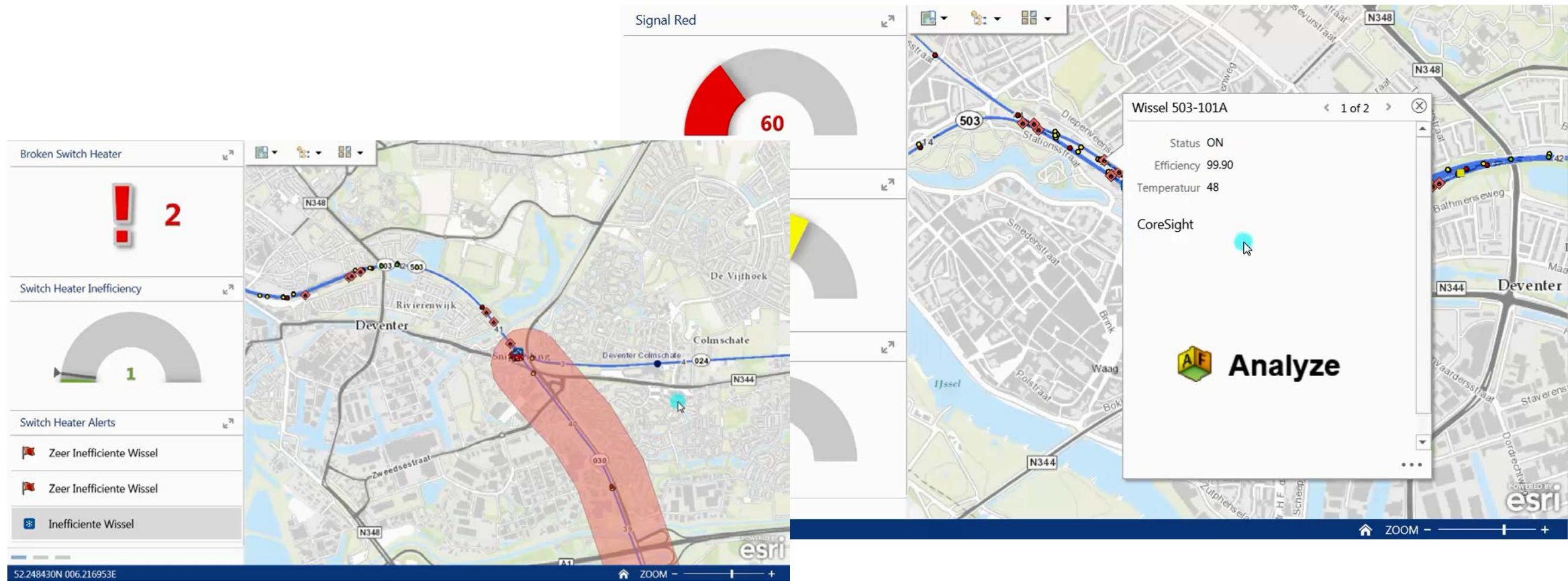
**Understanding business status
(organization's scorecard)**
Monitor Business and Service KPIs

Supervisor

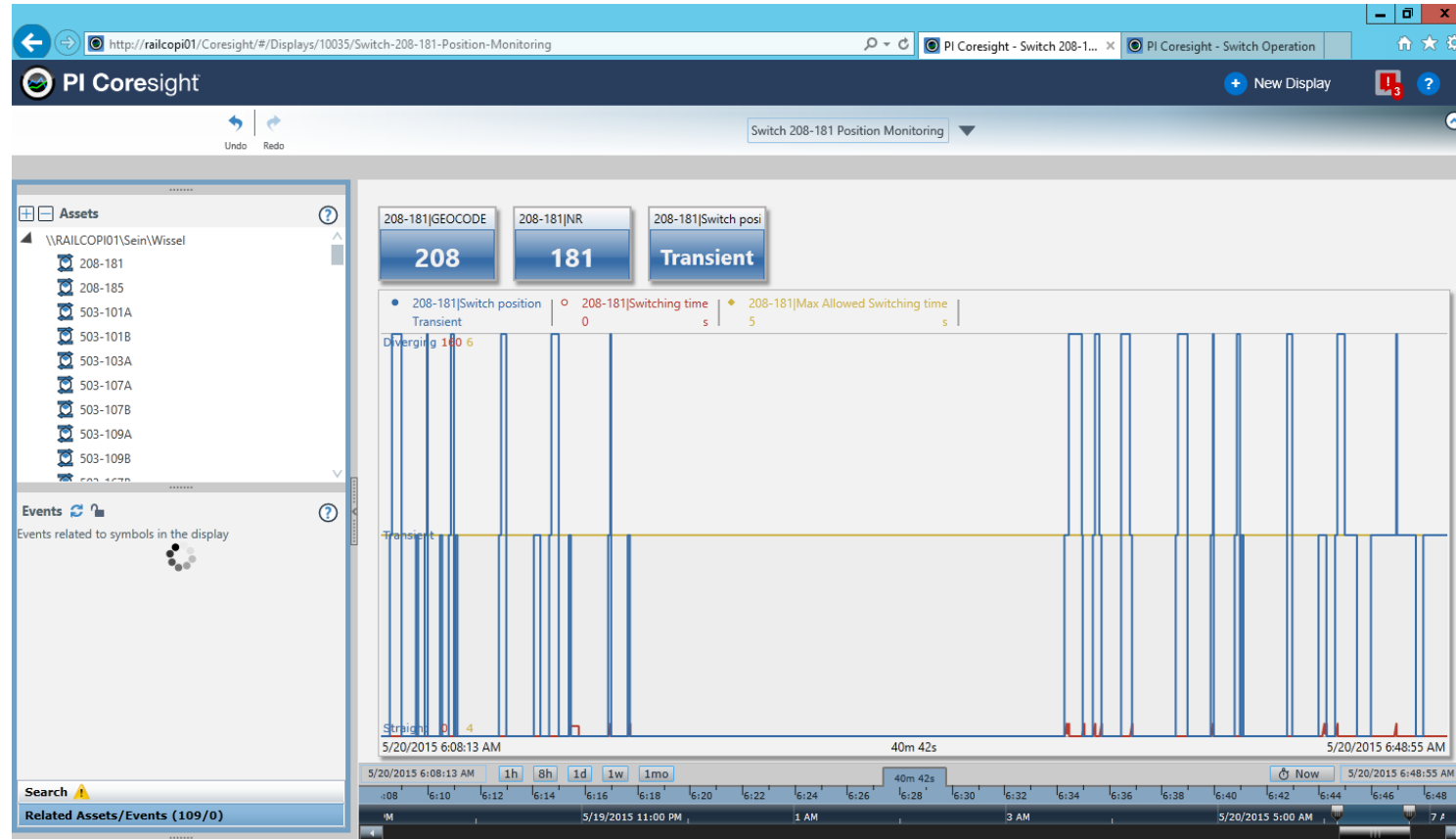


**Decision support tools: variety of relevant
data available in (near) real time**
Providing snapshot of current status
across the organization's facilities and
departments

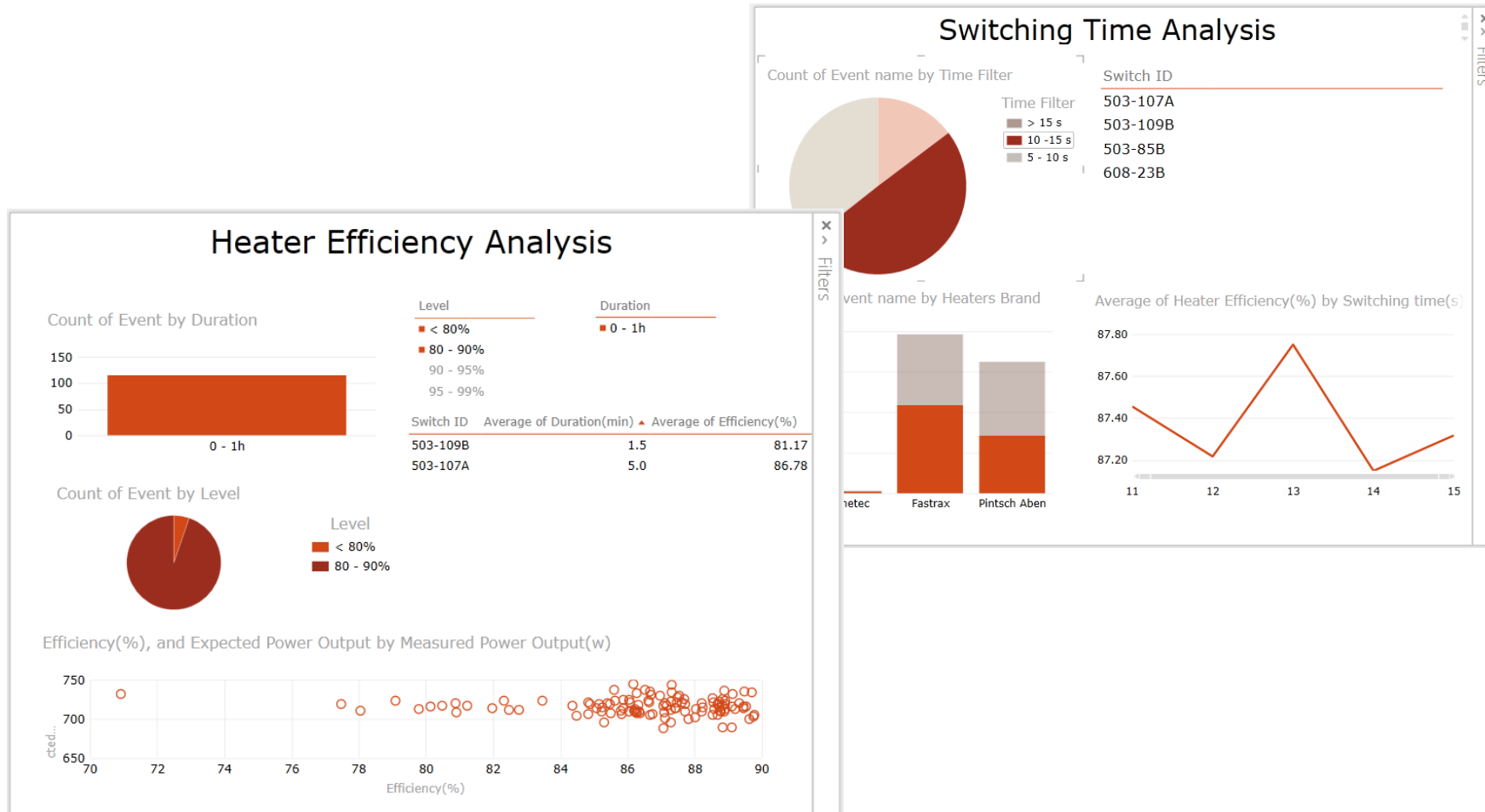
Collaborative & Informed Response



Problem Verification

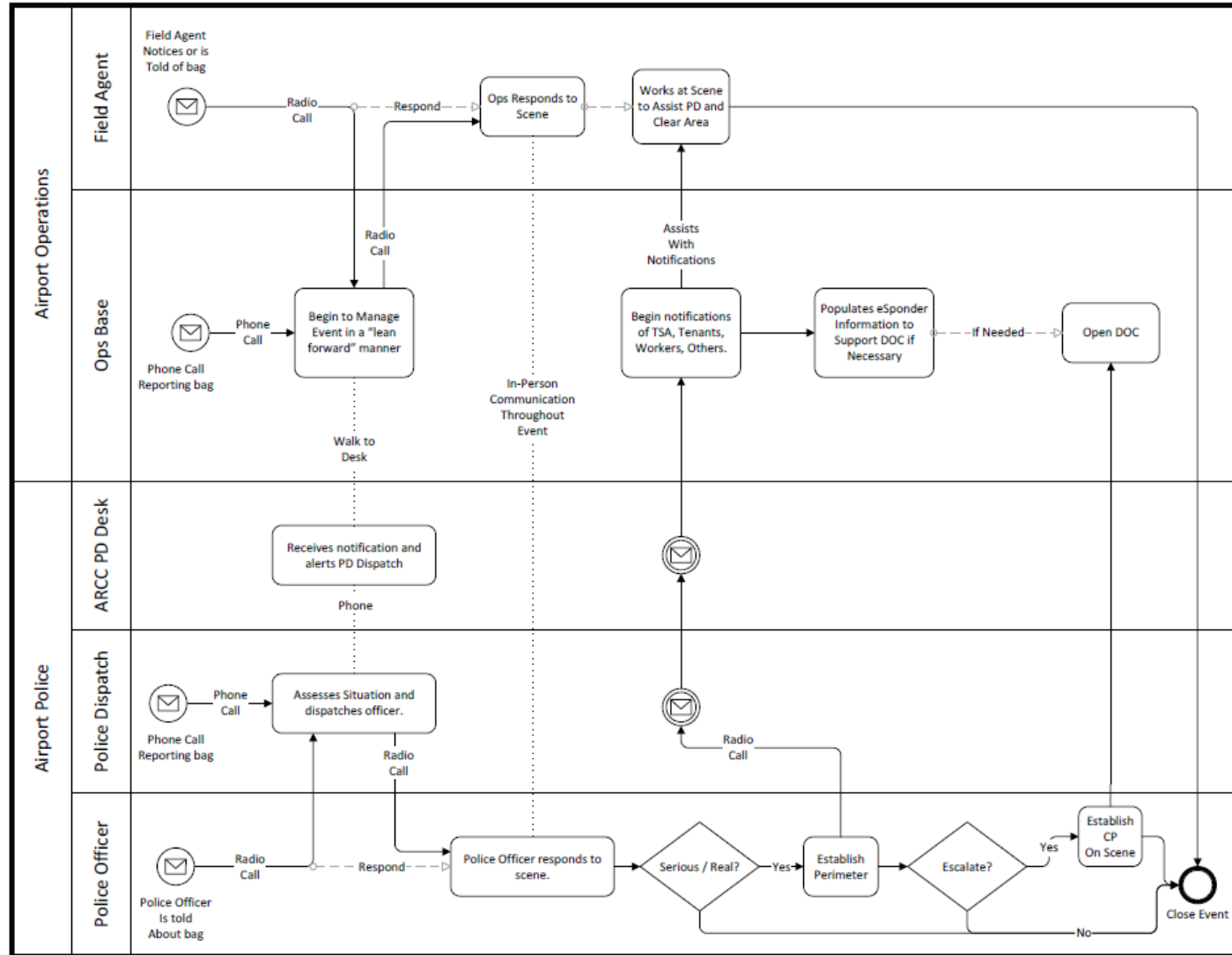


Driving Continuous Improvement



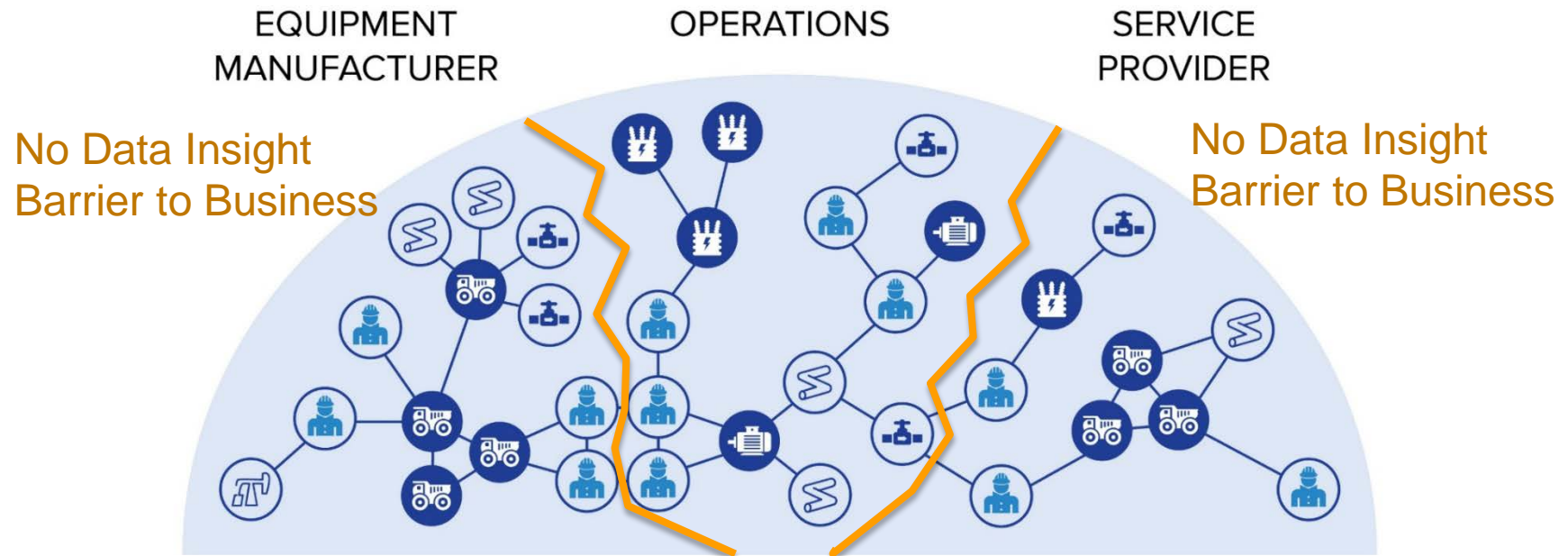
Suspicious baggage

16



COLLABORATE: Uncovering latent ROI, novel efficiencies through collaborations

- Colleagues
- Stakeholders
- Value Chain – business partners
- Service Partners
- Communities



Overall Digitalization Benefits

- Driving more predictable business outcomes
 - Reduce variability
 - Embrace and manage uncertainty and risk
- Operationalize new insights and information
 - Closed loop processing...
- Collaborative data-driven culture focused on business success
- Identify transformational opportunities

What can YOU do?

- Help operationalize GIS by making it relevant to other groups/silos
- Bring real-time and asset data into the GIS platform
- Engage with the OT & IT organizations to drive operational performance across the value chain

Contact Information

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

Dank u wel

ありがとう

Спасибо

Obrigado