Predicting Water Leakage Across Yorkshire using the PI System

Presented by

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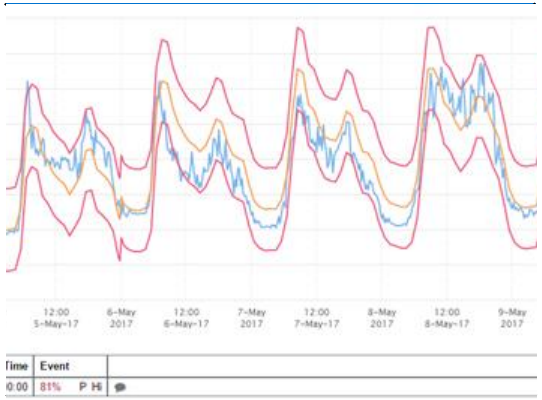
Overview

COMPANY and GOAL

Yorkshire Water & Capula have established 5+5year framework partnership to implement new OT systems & data integration solutions.

Our goal is improved customer service

Yorkshire Water & Capula
System Integration Partnership



CHALLENGE

To predict leakage earlier using a data driven approach before a customer is impacted

- Early event identification
- Reduced operating costs
- Surpass on our targets
- Improve Customer Service

SOLUTION

To increase the analytical capability on existing assets and network data. Improving the insight into network performance

- Utilise new OSIsoft technology
- Replace 6800 F&P Sensors
- New user Interface & analytics
- User configurable, and easy to expand

RESULTS

This project is in deployment, early benefits by improved identification of both flow & pressure from old system. Acid test this winter

- Earlier event & warnings
- Reduced nuisance alerts
- Increase data quality
- Seeing the before unseen
- Ability to fine tune the system

Yorkshire Water

YorkshireWater

Yorkshire Water – Blueprint

The goals of our Blueprint

Sector leading HS&W

Sector leading customer service

TOTEX outperformance

Anticipate regulatory change

Protect non-regulated business

Great service

Our Customer Promise

We are easy to deal with

We get it right first time

We are helpful and friendly

Customer Service

Improving Health, Safety &Wellbeing

Working Together

Everyone Everyday Safe & Well

New ways of working

Working Smarter

Digital Workplace

MAKING TECHNOLOGY WORK FOR YOU

Responding to regulatory change

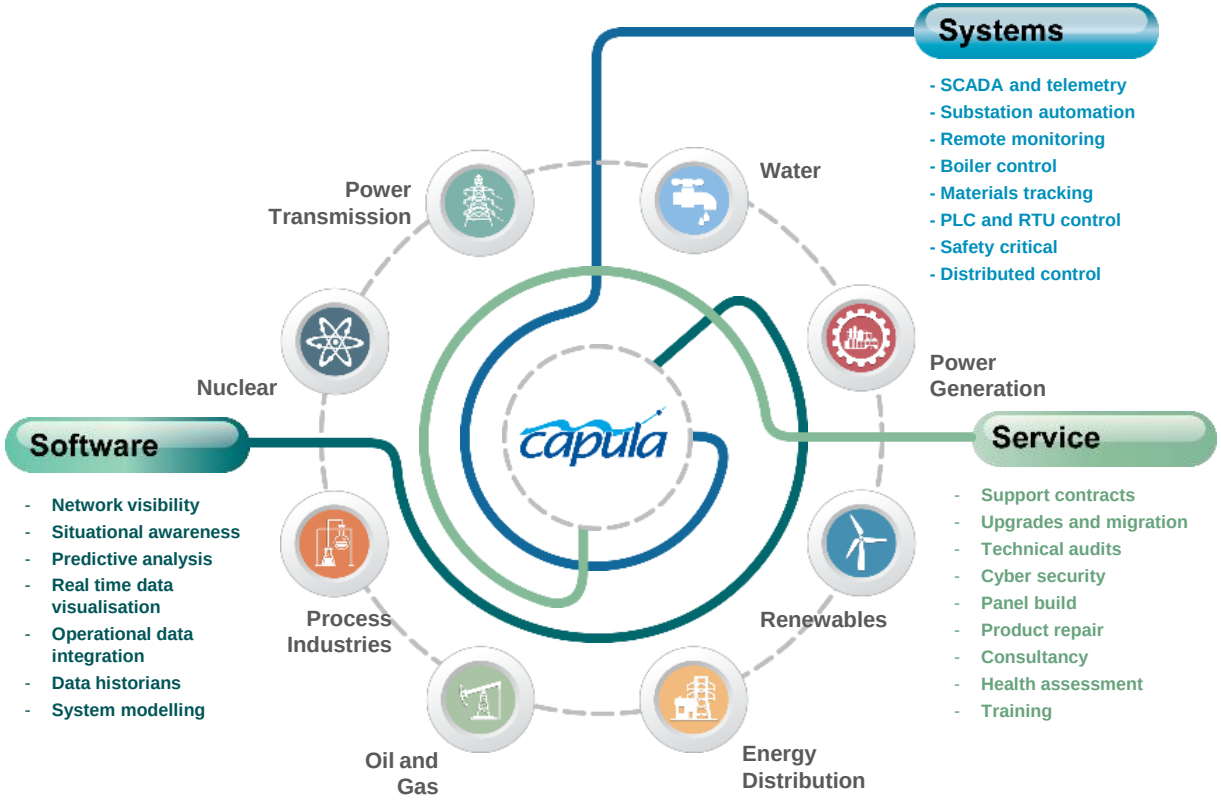
Blueprint 2020

"Taking care of the water environment for good"

Capula - Introduction

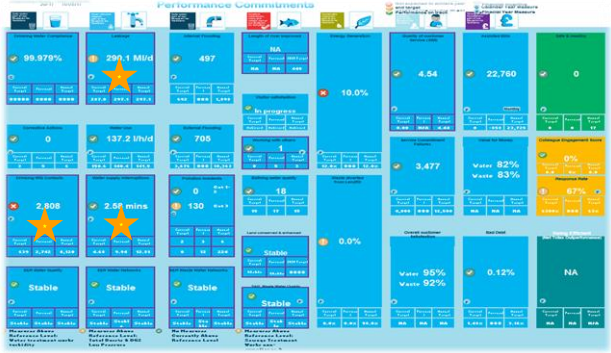
- Capula is a leading systems integrator that delivers transformative systems, software and service solutions to optimise our clients' business operations
  - Leaders in the future of automation and real-time IT
  - Offering independent best of breed solutions
  - Broad industry coverage
  - Established more than 40 years
  - National coverage across UK and Ireland
  - 250+ staff, five office locations

Capula – Advanced Digital Connectivity



Project Drivers

- 2012 - rtNet project deployed
  - 4500 flow & pressure sensors
  - Flat line notifications
- In 2017 New Ofwat targets come into force
  - High risk of not achieving targets
- 2017 Visible Network Project
  - New system & technology
  - 6800 flow & pressure sensors
  - Improved data profiling



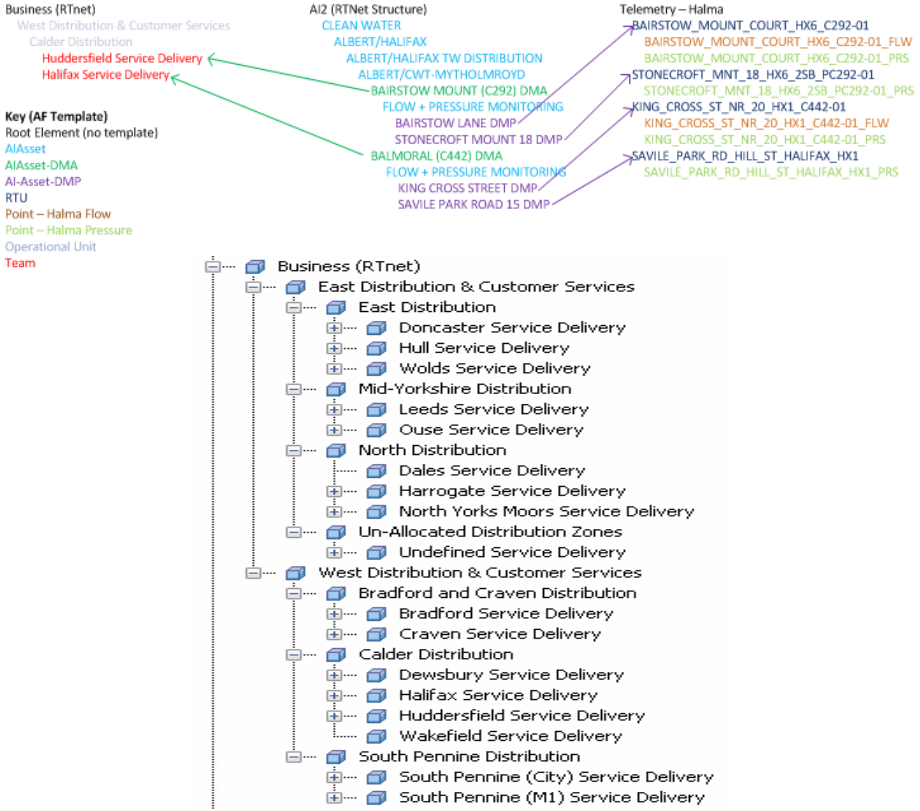
Challenge

- System Enhancement
  - People, Process & Technology
  - Business re-engagement
  - Business Process Management
- Technology
  - System upgrades
  - Automation
  - Speed / Performance

- Deliverables
  - Inform on performance
  - User Experience
  - Scalable
  - Trusted

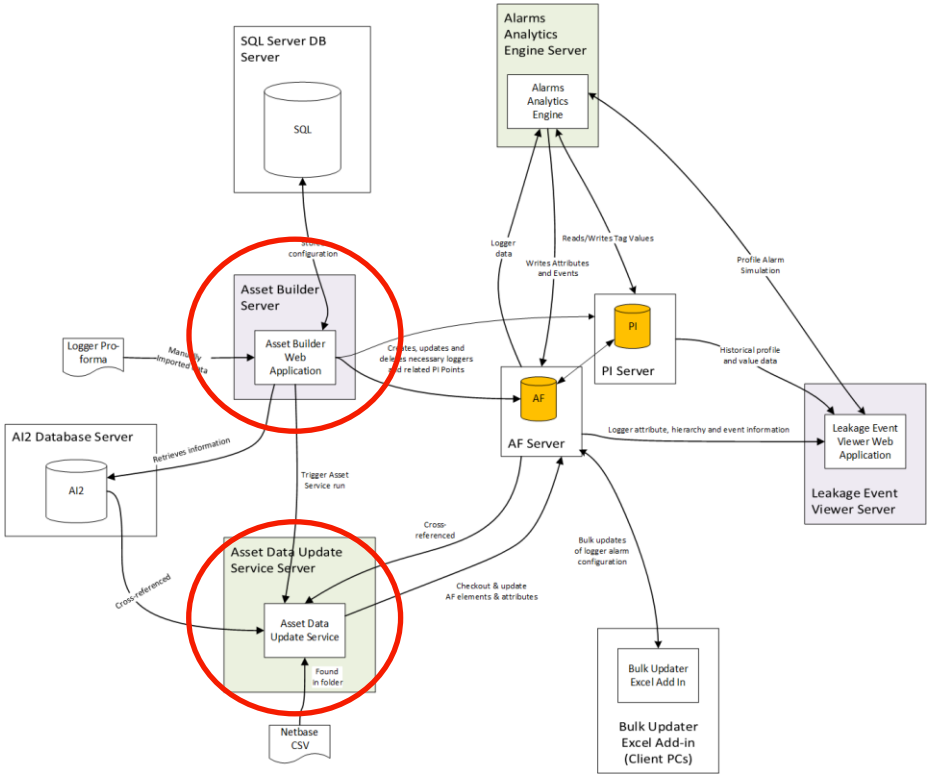
Solution Development

- Design overall framework architecture for asset data
- Carry out a PI AF update
- Replace PI Alarms by limited Profile Alarms
- Find scenarios requiring Profile Alarms
- **Automate the transform of data from Netbase/AI2 to PI AF**
- **Replace ACE calculations with an Alarm Engine to PI AF Event Frames**
  - Signal pre-conditioning to pre-set threshold multipliers
  - Add additional period analysis calculation to detect invalid data
- **Develop user interfaces**



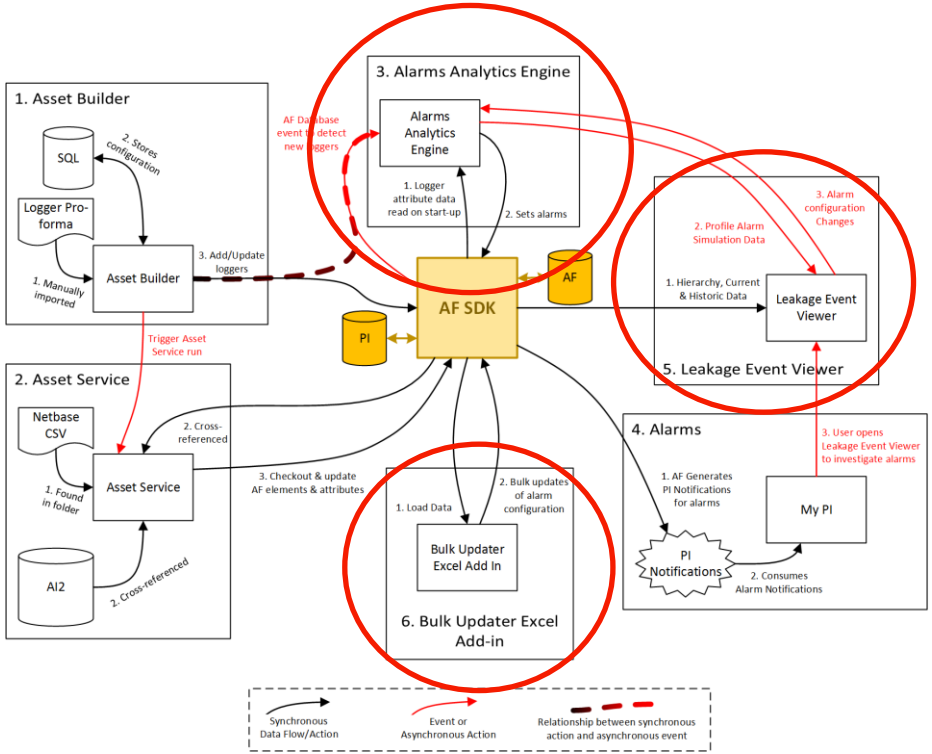
Configuration Management

- Two systems developed
  - Asset Builder/Configurator Web Service
    - Take logger data provided by field service technicians
    - Validate the data and create PI points and Elements in one or more PI System Environments
  - Asset Data Update Service
    - Take DMA hierarchy data from a database, and zone contribution data from CSV files
    - Cross-reference the data and update PI AF accordingly



Leakage Reporting

- Two systems and an Excel add-in developed
  - Alarm Analytics Engine
    - Filters out bad data and generates flow and pressure profiles
    - Allows configuration of calculation settings for each instrument
    - Creates Event Frames in PI AF for suspected leaks
  - Leakage Event Viewer
    - Visualise flow and pressure data across multiple instruments
    - Analyse leakage events and their related data
    - Simulate changes to instrument configuration
  - Bulk Updater
    - Bulk updates to instrument profile configuration



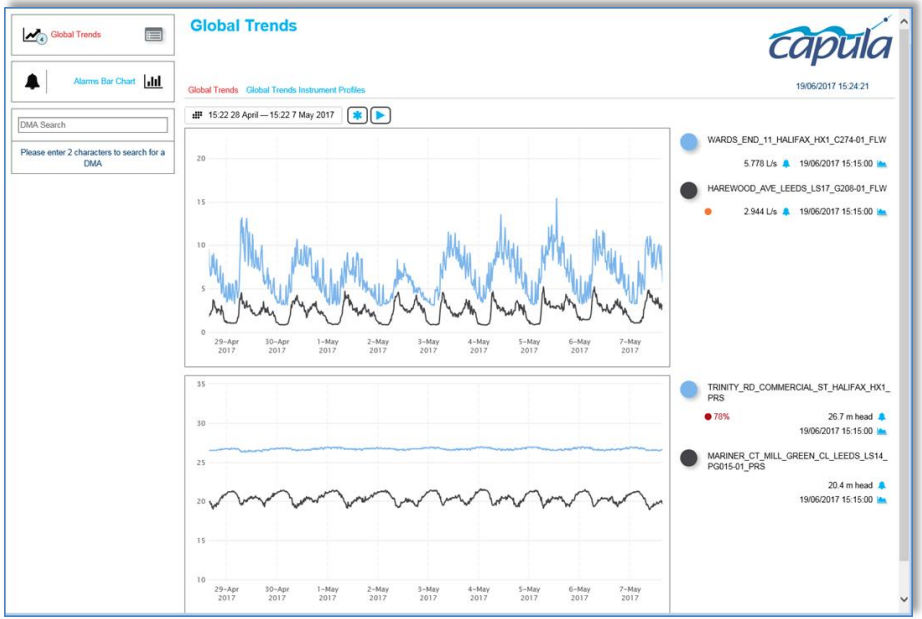
Analytics Engine

- Analyses historic data
  - Filters out flatlines, outliers, past leakage events
  - Creates Hourly and Seasonal profiles based on the remaining good data
- Analyses flow and pressure readings as they come in
  - Compares the readings to the profile upper and lower limits based on the time of day, day of week and accounts for seasonal variations
  - Generates Events together with a confidence level based on amount of bad data, upstream and downstream logger values, related and unrelated logger values.
  - Events with a high confidence level are classed as Alarms

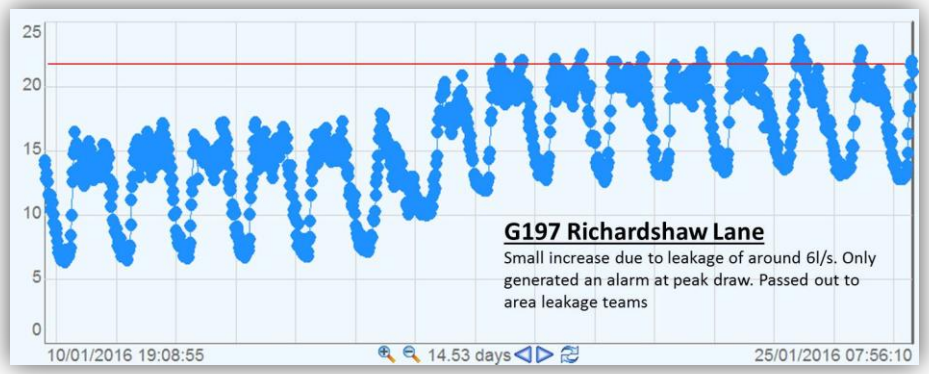
Tag Name	Purpose
<SignalName>.RTNetAlarm.AlarmCounter	Alarm Counter
<SignalName>.RTNetAlarm.HourlyAvg	Hourly Average from Dataset
<SignalName>.RTNetAlarm.HourlyLT	Hourly Lower Threshold
<SignalName>.RTNetAlarm.HourlySD	Hourly Standard Deviation from Dataset
<SignalName>.RTNetAlarm.HourlyUT	Hourly Upper Threshold
<SignalName>.RTNetAlarm.TotalAvg	Total Average from Dataset
<SignalName>.RTNetAlarm.TotalLT	Total Lower Threshold
<SignalName>.RTNetAlarm.TotalSD	Total Standard Deviation from Dataset
<SignalName>.RTNetAlarm.TotalUT	Total Upper Threshold
<SignalName>.RTNetAlarm.AlarmType	Alarm Type
<SignalName>.RTNetAlarm.AlarmTypeCritical	Alarm Type - Only for critical alarms

User Interface – Leakage Event Viewer

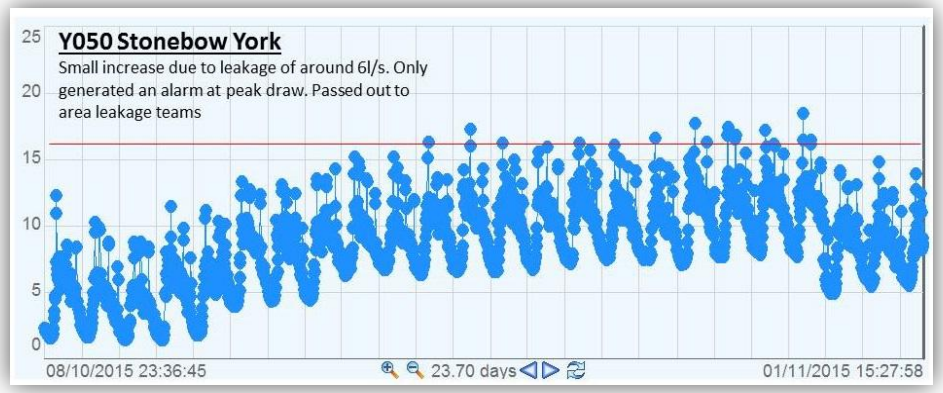
- Global trending allows readings from across the network to be compared
- Profile allows configuration, visualisation and simulation of an instrument



Early Warning Results

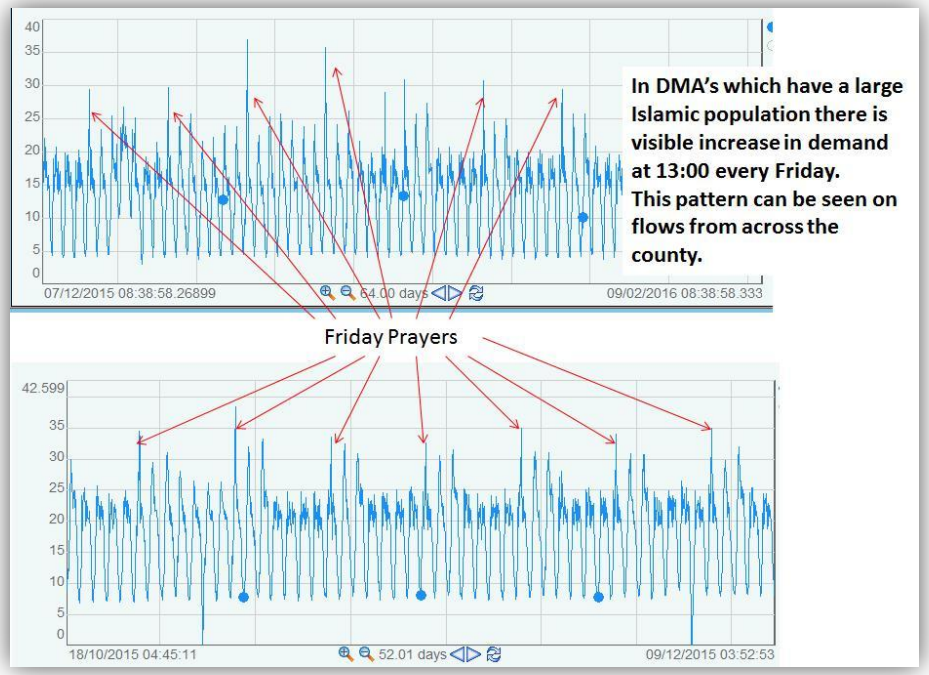


- With Profile Alarms, this event would have been identified almost as soon as it started, a full day and a half before the standard threshold alarm identified it



- This shows a gradually increasing leak that took the threshold alarm over 6 days to detect. A profile alarm would have detected this within the first day

False Positives



- Using the feature of Profile Alarms that compensates for variations occurring at a particular time on the same day every week, these events would be filtered out. A genuine leak occurring at the same time would still be detected however, since the alarm is not inhibited, just the thresholds adjusted temporarily

Business Benefits Summary

- Currently in deployment phase
- Defining new profiles / system configuration
- Increased Network Visibility
- Improved Customer Service
- User configurable system with trusted information

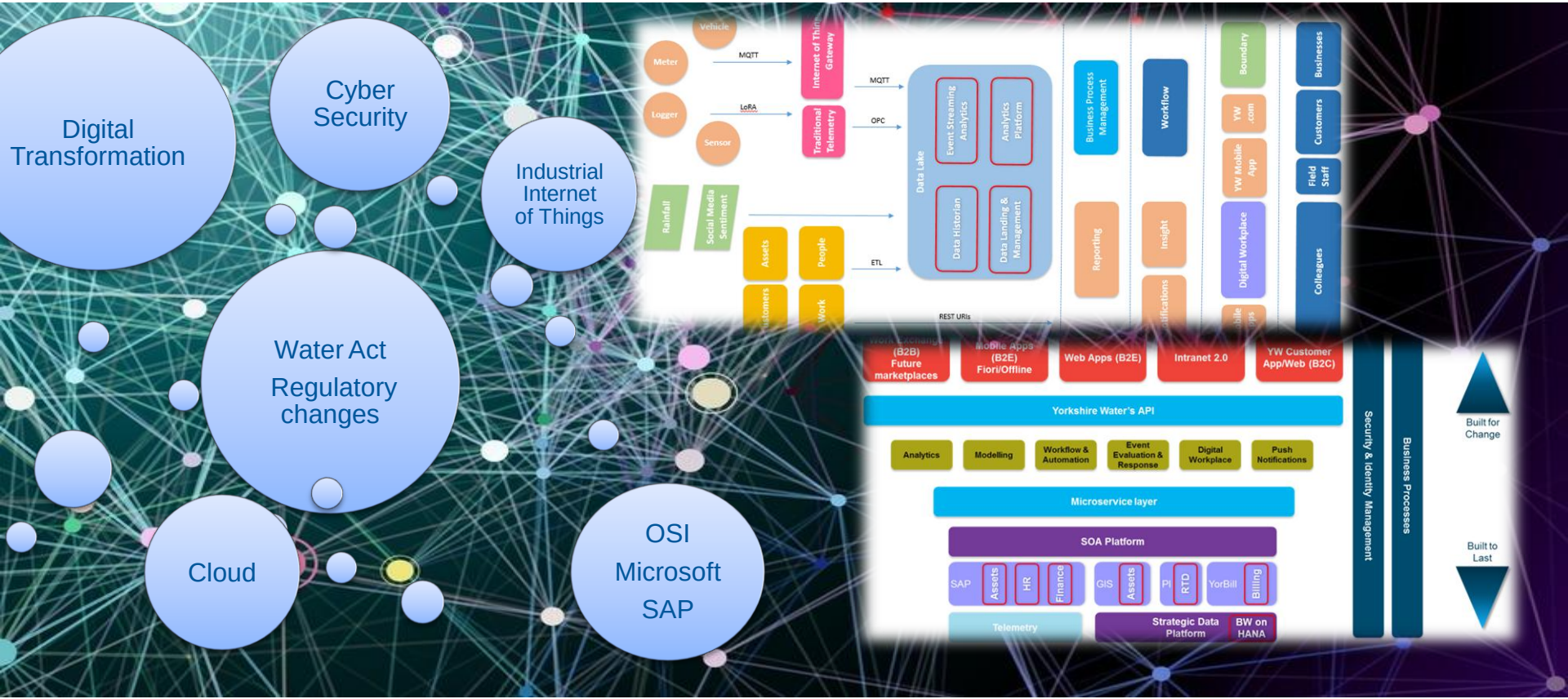
‘Winter is coming’ © HBO

So what’s next ?

Further System Integration

Re-use

Where Next ? Industry 4.0 / Big Data / Digital Age



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Questions

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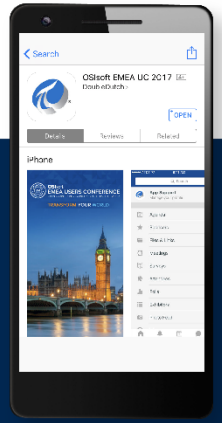
State your **name & company**

Please remember to…

Complete the Online Survey for this session



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Merci

Gracias

Thank You

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Obrigado