



1

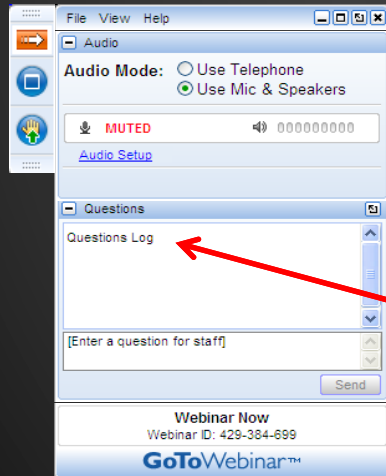
**How IoT is Changing the Game and
New Tech is Redefining Asset Management**

Thursday May 23, 2019
11:00 AM - 12:15 PM ET

The Water Environment Federation logo is located in the bottom right corner of the slide. It features the same white stylized 'W' icon and text as seen in the first image.

2

How to Participate Today



- Audio Modes
 - Listen using Mic & Speakers
 - Or, select "Use Telephone" and dial the conference (please remember long distance phone charges apply).
- Submit your questions using the Questions pane.
- A recording will be available for replay shortly after this webcast.



3

Today's Moderator



Reese Johnson
Principal Engineer
Metropolitan Sewer District
of Greater Cincinnati



4

Today's Speakers



Nicole Kaiser
Senior Client Manager, Western US



Umair Alam
Technology Consultant, UK



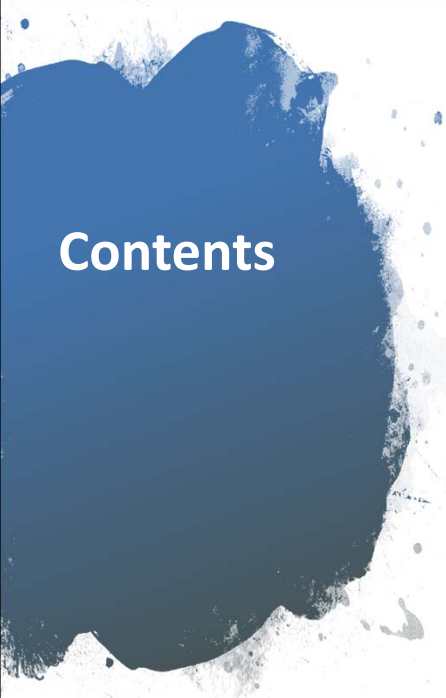
5

Building Smarter Systems with Internet of Things (IoT) Technologies

By Umair Alam



6





Contents

- 1. Overview of IoT**
 - Introduction to IoT
 - IoT Architecture
 - IoT and Data Analytics
 - Benefits and Opportunities
- 2. IoT Developments**
 - Uses Cases in Water
 - Data Transmission Methods
 - IoT Networks
 - Risks and Blockers
- 3. IoT in Practice**
 - Coliban Water
 - Sydney Water
 - Northumbrian Water

7

Overview of IoT



Water Environment Federation
the water quality people

8

Introduction to IoT



'A new dimension has been added to the world of information and communication technologies (ICTs): from anytime, any place connectivity for anyone, we will now have connectivity for anything.... Connections will multiply and create an entirely new dynamic network of networks – an Internet of Things' ITU 2005



9

IoT Architecture



Key Components of IoT Architecture

Gateway



Internet Connection



Microcontroller

Sensor



IoT Cloud Platform



10

IoT and Data Analytics



IoT sensors can be utilised for several outputs:

- **Data storage.** The information sent by sensors are stored in the cloud and used later
- **Data visualization:** It provides several ways to represent data using charts
- **Data analytics:** Set of services ranging from simple outputs to more intelligent features such as machine learning and so on.



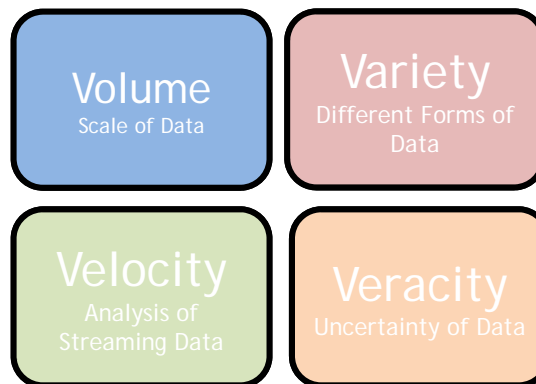
11

IoT and Big Data



Big Data is defined as the collection of data sets so large and complex that it becomes difficult to process.

- During 2008, the number of things connected to the internet exceed the number of people on earth.
- Total spend on IoT devices reach \$3.7 trillion in 2018
- By 2020, there will be 50 billion connected things.



12

Benefits and opportunities

- Data communication
- Interoperability and Integrated water resource approach
- Data rich. Information rich.
- Significant Cost Savings
- Improved Customer Service



39 Billion USD savings

Only 0.5% Of Data is proactively used

13

IoT Developments



Water Environment Federation
the water quality people

14

IoT Use Cases



IoT can be used for several applications relevant to the water industry.

- Leak Detection
- Asset Optimisation
- Water Quality
- Smart Metering
- Digital Twinning
- Customer Experience

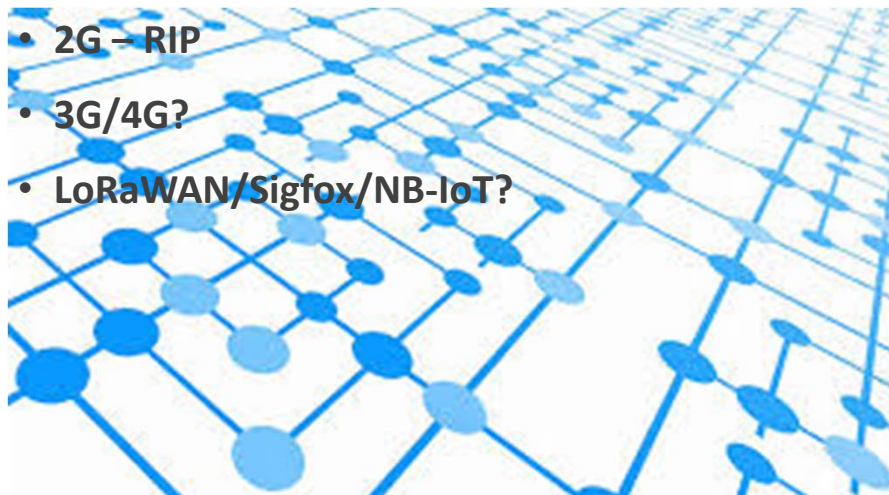


15

Data Transmission Methods



- 2G – RIP
- 3G/4G?
- LoRaWAN/Sigfox/NB-IoT?




16

IoT Data Networks


Technology	Data Transfer	Range	Energy Consumption	Battery Life	Cost	Impact on Water Productivity	Application
LoRaWAN	Medium	High	Low	Very High	Medium	High	Data intensive and expensive equipment
SigFox	Medium	Very High	Low	Very High	Medium	High	Smart Meters and Sensors
NB-IoT	High	High	Medium	High	High/ Very High	High	Smart Meters and Sensors
LTE-M	High	High	Medium	High	High/ Very High	High	Roaming Application


Source: Frost and Sullivan, 2019



 Water Environment Federation
 the water quality people


17


Risks and blockers



Privacy 

Security 




 Water Environment Federation
 the water quality people



18



19

Case Study 2


Unnamed Utility

Drivers

- Minimise downtime
- Correction Costs

Cost Category	Current Annual Cost
Preventive Maintenance	\$1.5m
Corrective & Breakdown Maintenance	\$4.6m
Renewals	\$3m




Technology

- IoT Pump 'Magnet'





Application

- Sewer pump station
- Booster station



20

Case Study 1



Drivers


- Connecting 500,000 sensors to a secure cloud
- Understanding irregular water usage patterns

Technology

- Smart Metering





Application

- Water Distribution Network



21

Case Study 3



Drivers


- Trial IoT Networks

Technology

- Several including leak detection, water quality and smart metering

Application

- Three District Metered Areas



22

Summary



- IoT really does have huge potential but we still **need people**
- IoT Networks, **who to choose?**
- **True** innovative IoT solutions **addresses pain points.**
- Security concerns should be **taken seriously**

23



Let's talk

24

Embracing Innovation to Improve Asset Management Strategies: What's on the Leading Edge?

Presented by Nicole Kaiser



25



Presentation Topics

- Asset Management 101
- Challenges and opportunities
- Current and future trends
- Areas of asset management where emerging tech is most apparent
- Examples of innovative technologies



26

Asset Management 101

1. Building an inventory of assets
2. Scheduling and tracking maintenance or replacement
3. Managing budgeted and actual annual expenses and revenue

Goal of Asset Management: Minimize asset lifecycle costs, with an acceptable level of risk, while continuously delivering desired levels of service.

Source: EPA Asset Management 101 Presentation, <https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities>



27



Challenges

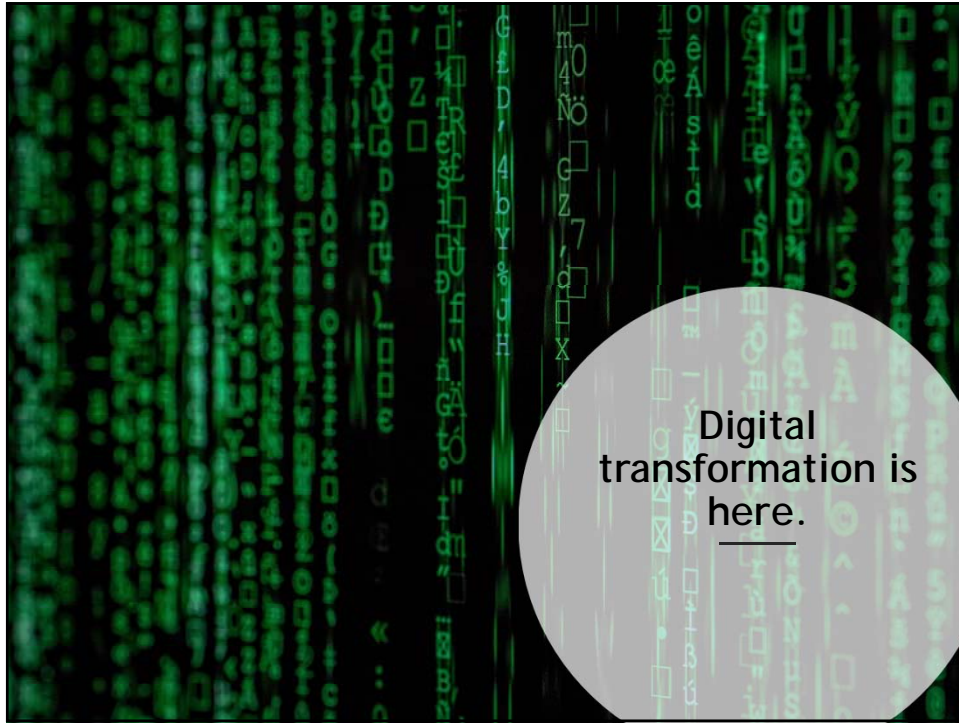
- Costs
- Data feast or famine
- Realistic planning + expenditure
- Legacy Systems
- Retirement

Opportunities

- Managing costs
- Leveraging data
- Realistic planning + expenditure
- Integration + front end improvements
- Training, record management, succession planning



28



29



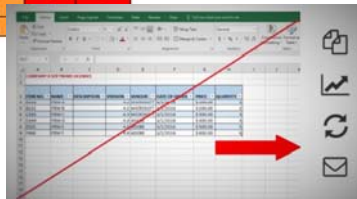
30

Asset Management Applications for New Tech

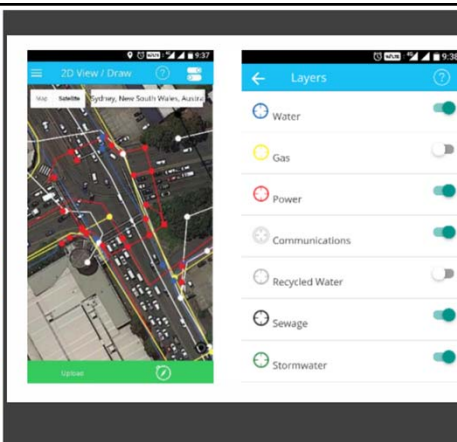
- Asset identification, condition assessment and monitoring
- Repair and replacement
- Data and record management
- Training, planning and succession preparedness
- Cyber and physical security

Likelihood	Consequences				
	1 Very low	2 Low	3 Moderate	4 High	5 Very high
Very low (1)	VL	VL	L	M	M
Low (2)	VL	VL	M	M	H
Moderate (3)	L	L	H	H	E
High (4)	L	M	H	H	E
Very high (5)	L	M	H	H	E

Key
 E = extreme
 H = high
 M = medium
 L = low
 VL = very low



31



Asset identification, inspection and monitoring tools are getting exponentially more sophisticated.




32




670m (2,200ft) CABLE-LESS MULTI-SENSOR INSPECTION SUCCESSFULLY COMPLETED

- Tether free acoustic and video inspection (video requires low turbidity)
- Water and sewer applications
- Gravity fed and pressurized applications, 4-in to 120-in diameter pipes
- Pipe material agnostic (although material matters for acoustic data)

Pipe Condition Inspection




33



Monitoring identifies sources of losses, including over-sizing, wear, cavitation and operation away from best efficiency point.

At one pump station, efficiency monitoring is saving a Nevada utility \$100k/year by optimizing schedules and combinations.

Asset Condition Monitoring



34

High Res 3D Imaging of Hard-to-Reach Assets & Machine Learning for Processing Inspection Data

Before

After

2.65m

Robotics, AI and Machine Learning are Changing the Asset Inspection Game

Distance (m)

- Cracks
- Junction
- Roots

Asset Inspection and Data Analysis

35

A

B

C

D

Legend

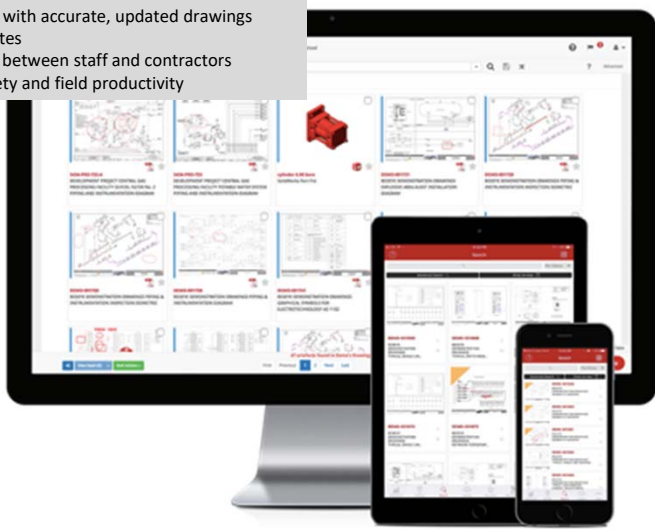
- Leakage Risk Areas
- Low Priority
- Medium Priority
- High Priority
- Historic Incident

Rehab, Replacement and Resiliency Improvements


36

Advantages


- Provides staff with accurate, updated drawings
- Omits duplicates
- Collaboration between staff and contractors
- Enhances safety and field productivity




Record Management (& Field Mobility!)



37



Training, Planning and Succession Preparedness



38

A

B

C

D

CHEMICAL
Hydrochloric acid pump
 LAT: -34.438576 LONG: 150.877136 ALT: 44.67156982421875
What you need to know
 Chemical
Site Specific Information
 Type hazard information here
 Add websites too!

Physical and Cyber Security

Water Environment Federation
 the water quality people

39

isle

WHY ISLE?
 ALL OUR SERVICES REVOLVE AROUND THE STRATEGIC IDENTIFICATION AND IMPLEMENTATION OF TECHNOLOGIES AND PRACTICES

Office locations
 TAG Locations, Workshops and Events

Technology Forums
 Digital Platform
 Identification of Solutions

Water Environment Federation
 the water quality people

40



Thank you!

For more information, please contact us.

Nicole Kaiser, Senior Client Manager, Western US
Nicole.Kaiser@isleutilities.com / 301.412.8464

Umair Alam, Technology Consultant, UK Office
Umair.Alam@isleutilities.com

www.isleutilities.com

Think outside the drop. Innovate.

