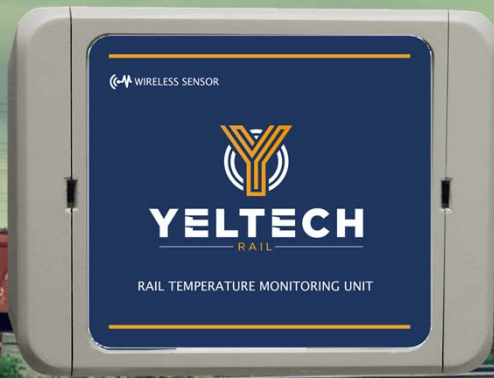




# Rail & Train Wireless IoT Systems





## Internet of Things Networks & Technologies



Infinite's products are being used in rail & train IoT systems. Continuous monitoring of infrastructure minimizes dangerous conditions and eliminates accidents.

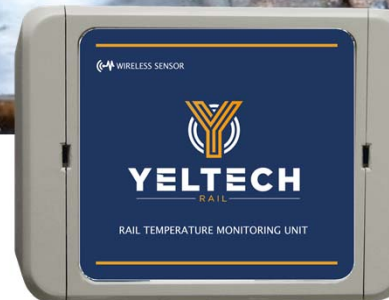
Our solutions include,

## Rail line mount sensors

- Vibration monitoring of rail lines and slippers
- Temperature, ice, rain monitoring of rail lines

## Alarming

- Visual alarming and monitoring systems



## Design Principles

---

Our systems are wireless autonomous RTUs.

They are designed to operate autonomously using single lithium battery cells achieving maximum reliability, and long term solution robustness with long operational lifetime.

They can work on mains, rechargeable battery or photovoltaic power with automatic failover to internal lithium battery on power shortage.

### Functions:

- Measure/Detect train
- Transmit alarm
- Signal visual and sound alarm
- Continuous fault monitoring



### Power Source:

D-size,  
Primary lithium battery  
Nominal voltage: 3.6V,  
Capacity: 13.0Ah



# Rail Temperature Monitoring



## BSC-50D/RTMU MK3, GSM Alarming RTU

Power supply:	3.6V, 13 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	4 x Digital inputs, 0-30VDC 1 x Analog input, 0-1VDC, 12 bit resolution 2 x Digital counter, 1 KHz
Transducer excitation	12V/200mA, 5V/200mA
Wireless modem:	Sierra Wireless 2G, 3G, 4G, NBloT, LTE-Cat M1
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

Application: Rail Line temperature monitoring and alarming. Directly attached to rail lines.

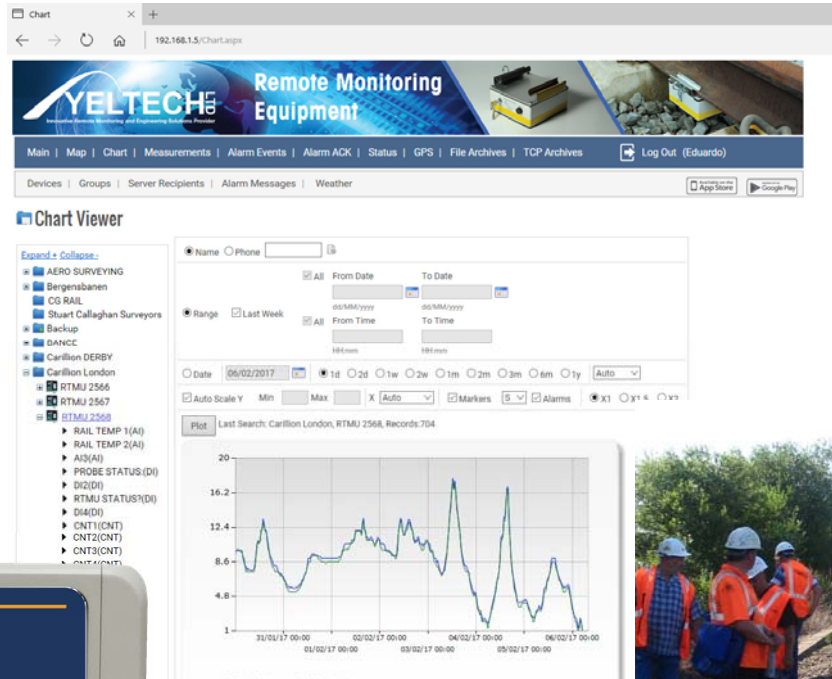
# Emergency Warning Board

## BSC-50 E/EWB, RTU/Data Logger

Supply current:	Continuous: 40µA, Messaging: av. 30mA, 2A peak
Digital inputs:	4, 0-30VDC
Pulse counters:	1, 40Hz, common with DI 4
Analog inputs:	2, 10 bit resolution, 3 gain ranges
Excitation:	7V/140mA or 12VDC/80mA, 5VDC/100mA, 3.5V/200mA
Wireless modem:	Sierra Wireless HL series 2G, 3G or 4G
Messages:	Alarm, Status, Data
Temperature:	-40°...+65°C, operating
Dimensions:	130 x 130 x 75 mm
Housing:	IP66, IP68 Nema 4x

**Application: Emergency warning board IoT connected,  
14 days autonomy.**

# RTMU, Rail line temperature monitoring



# RTMU, Rail line temperature monitoring



**Main**

Expand Collapse -

- All
- AERO SURVEYING
- Bergensbanen
- CO RAIL
- Stuart Callaghan Surveyors
- Backup
- BANCE
- Carillion DERBY
- Carillion London
- Carillion OOCPA
- Carillion Rail
- Crack Pilot
- DEMO
- EnergiVue
- IMTRAM
- JBV-SOR
- JBVTRD
- JERNBANEVERKET
- KELTBRAY
- Murphy
- Murphy1
- Points Heating
- SERCO
- Specialist Rail

London GB

0.3°C

Fog

Long -0.127201

Lat 51.507261

Wind Calm 1 m/s West (270)

Cloudiness fog

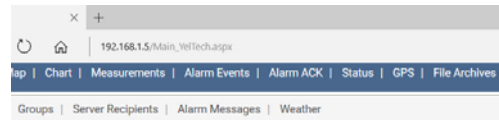
Humidity 100%

Pressure 1019

Min -1°C

**Hourly Forecast**

Time	12:00	15:00	18:00	21:00	00:00	03:00	06:00	09:00	12:00	15:00	18:00
Temp (°C)	6.36	6.73	4.7	4.43	4.69	5.33	6.75	7.49	9.09	9.88	8.15
Wind (m/s)	1.76	2.51	3	3.76	5.21	5.71	3.12	3.21	3.11	3.02	2.45
Cloudiness	1022.53	1023.70	1022.73	1020.9	1018.31	1015.70	1014.48	1015.6	1016.6	1016.56	1017.76



RTMU 2568

Somerfield St 23-42, SE16 2RT, London

RAIL TEMP 1	RAIL TEMP 2	Status	Logging	Alarm
06/02/2017 07:52 1.1 oC	06/02/2017 07:52 0.9 oC	24/01/2017 01:53	06/02/2017 07:52	ON

**Hourly Forecast**

Time	05:02 20:00	05:02 22:00	06:02 00:00	06:02 02:00	06:02 04:00	06:02 06:00
Temp (°C)	5.8	5.8	4.5	2.2	2.2	2.2

GB Tower Hamlets

1.7°C

Haze

- EnergiVue
- IMTRAM
- JBV-SOR
- JBVTRD
- JERNBANEVERKET
- KELTBRAY
- Murphy
- Murphy1
- Points Heating
- SERCO
- Specialist Rail





# RTMU, Rail line temperature monitoring



**Main**

Expand Collapse -

- All
- AERO SURVEYING
- Bergensbanen
- CO RAIL
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- Backup
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- Carillion DERBY
- Carillion London
- Carillion OOCPA
- Carillion Rail
- Crack Pilot
- DEMO
- EnergiVue
- IMTRAM
- JBV-SOR
- JBVTRD
- JERNBANEVERKET
- KELTBRAY
- Murphy
- Murphy1
- Points Heating
- SERCO
- Specialist Rail

London GB

0.3°C

Fog

Long: -0.127201  
Lat: 51.507261

Wind: Calm 1 m/s West (270)

Cloudiness: fog

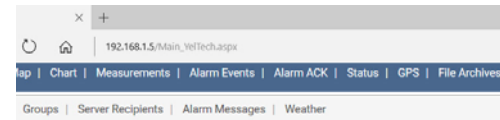
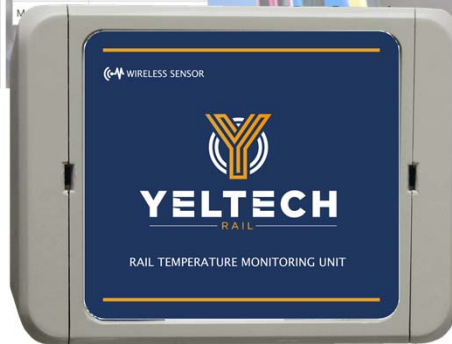
Humidity: 100%

Pressure: 1019

Min: -1°C

**Hourly Forecast**

Time	12:00	15:00	18:00	21:00	00:00	03:00	06:00	09:00	12:00	15:00	18:00
Temp (°C)	6.36	6.73	4.7	4.43	4.69	5.33	6.75	7.49	9.09	9.88	8.15
Wind (m/s)	1.76	2.51	3	3.76	5.21	5.71	3.12	3.21	3.11	3.02	2.45
Cloudiness (%)	1022.53	1023.70	1022.73	1020.9	1018.31	1015.70	1014.48	1015.6	1016.6	1016.56	1017.76



- RTMU 2568
- Somerfield St 23-42, SE16 2RT, London
- RAIL TEMP 1: 06/02/2017 07:52, 1.1 oC
  - RAIL TEMP 2: 06/02/2017 07:52, 0.9 oC
  - Status: 24/01/2017 01:53
  - Logging: 06/02/2017 07:52
  - Alarm: ON
- Hourly Forecast
- Tower Hamlets GB
- 1.7°C
- Haze

RTMU 2568

Somerfield St 23-42, SE16 2RT, London

RAIL TEMP 1	RAIL TEMP 2	Status	Logging	Alarm
06/02/2017 07:52 1.1 oC	06/02/2017 07:52 0.9 oC	24/01/2017 01:53	06/02/2017 07:52	ON

**Hourly Forecast**

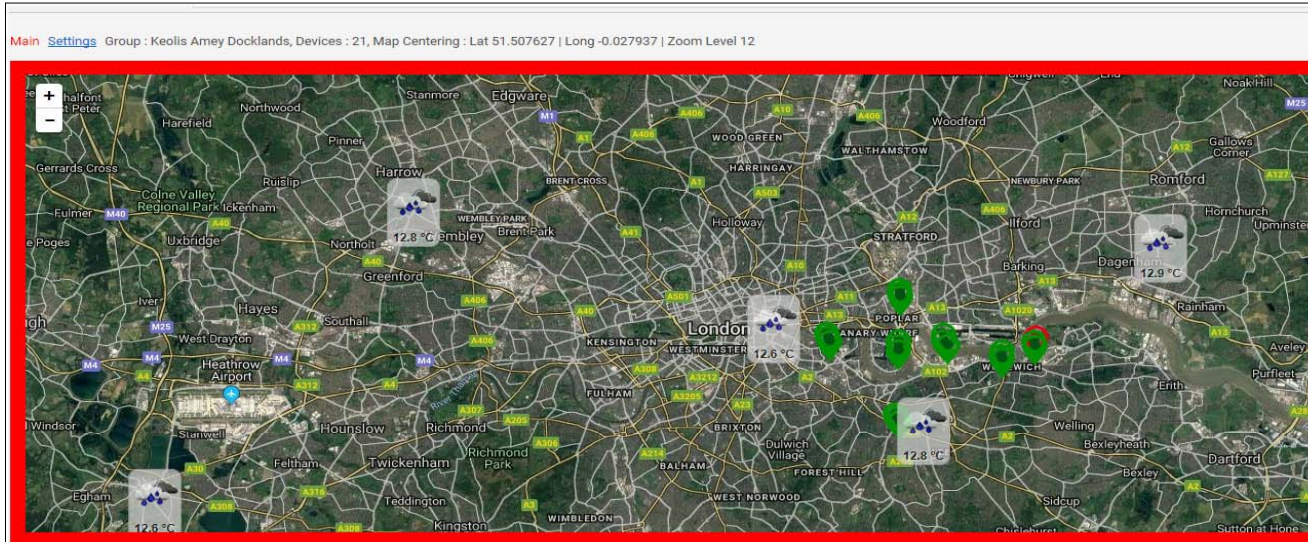
Tower Hamlets GB

1.7°C

Haze



# RTMU, Rail line temperature monitoring

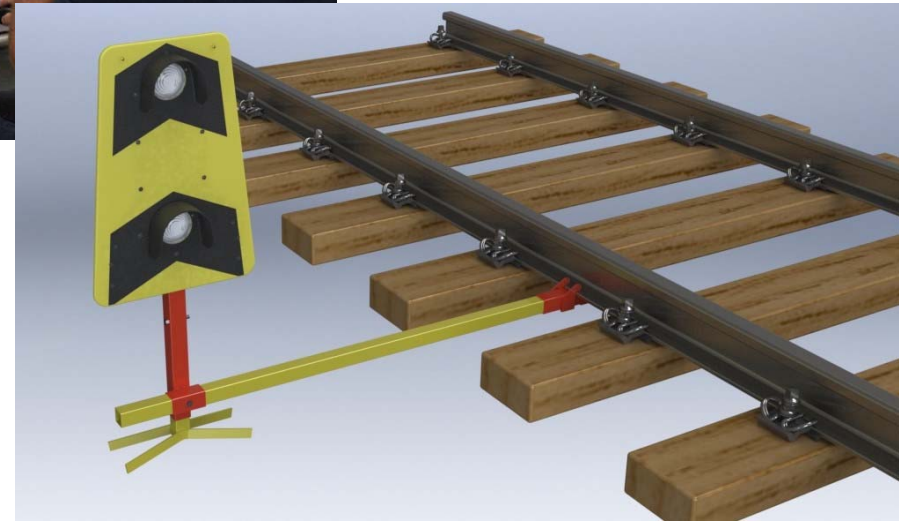


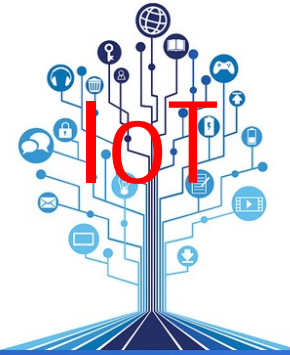
Devices	
Station	Status
<input type="button" value="Select"/> CAT-RAIN GAUGE	<span style="color: green;">■</span> Log Data on time (28/11/2018 12:44)
<input type="button" value="Select"/> CAT-SIGFOX-01	<span style="color: green;">■</span> Log Data delayed (28/11/2018 15:50)
<input type="button" value="Select"/> CAT-SIGFOX-02	<span style="color: green;">■</span> Log Data delayed (28/11/2018 15:37)
<input type="button" value="Select"/> DELTA-RAIN	<span style="color: green;">■</span> Log Data delayed (28/11/2018 00:56)
<input type="button" value="Select"/> DELTA-SIGFOX-01	<span style="color: green;">■</span> Log Data delayed (28/11/2018 15:49)
<input type="button" value="Select"/> DELTA-SIGFOX-02	<span style="color: green;">■</span> Log Data delayed (28/11/2018 14:05)

Hourly Forecast										
18:00	21:00	00:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00	00:00
13.01°C	13.26°C	12.19°C	12.3°C	11.76°C	10.91°C	11.02°C	10.95°C	10.59°C	10.15°C	10.01°C
10.12 m/s	6.86 m/s	4.86 m/s	5.55 m/s	8.06 m/s	9.87 m/s	10.61 m/s	7.14 m/s	5.91 m/s	7.05 m/s	7.12 m/s
1011.29	1012.16	1013.13	1012.23	1009.97	1007.32	1006.12	1006.61	1007.5	1008.11	1008.44



# Rail & Trains





# Construction Engineering IoT Systems





## Internet of Things Networks & Technologies





## Environmental Monitoring

Air quality measurements

- Ozone, nitrogen dioxide, sulphur dioxide, carbon monoxide

Impact measurements in rivers

- pH, dissolved oxygen, conductivity, turbidity, color

Soil quality and sustainability

- Soil moisture, electrical conductivity, temperature



IoT Autonomous RTUs

Application: Environment

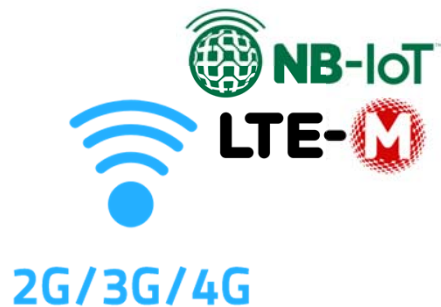


## Cathodic Protection

- Voltage DC
- Voltage AC
- Current
- Transient voltage drop



# IoT Autonomous devices

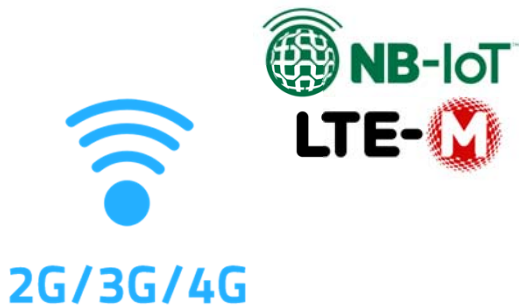


## ADU-500, RTU/Data Logger

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 12VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
SDI12:	up to 16 SDI-12 sensors with up to 48 channels
RS485:	up to 10 Modbus ASCII/RTU up to 10 channels
Digital inputs:	3, 0-30VDC
Pulse counters:	2, 2KHz, common with DI 2&3
Analog inputs:	2, 12 bit resolution, differential, 1-200 programmable gain
Transducer Excitation:	12VDC/400mA, or 9V/500mA or 5VDC/200mA, 3.3V/1A
Battery monitoring:	built in battery gauge continous consumption monitoring
Wireless modem:	Sierra Wireless HL series 2G, 3G or 4G
Messages:	Alarm, Status, Data
Temperature:	-40°...+65°C, operating
Dimensions:	130 x 130 x 75 mm
Housing:	IP66, IP68 Nema 4x



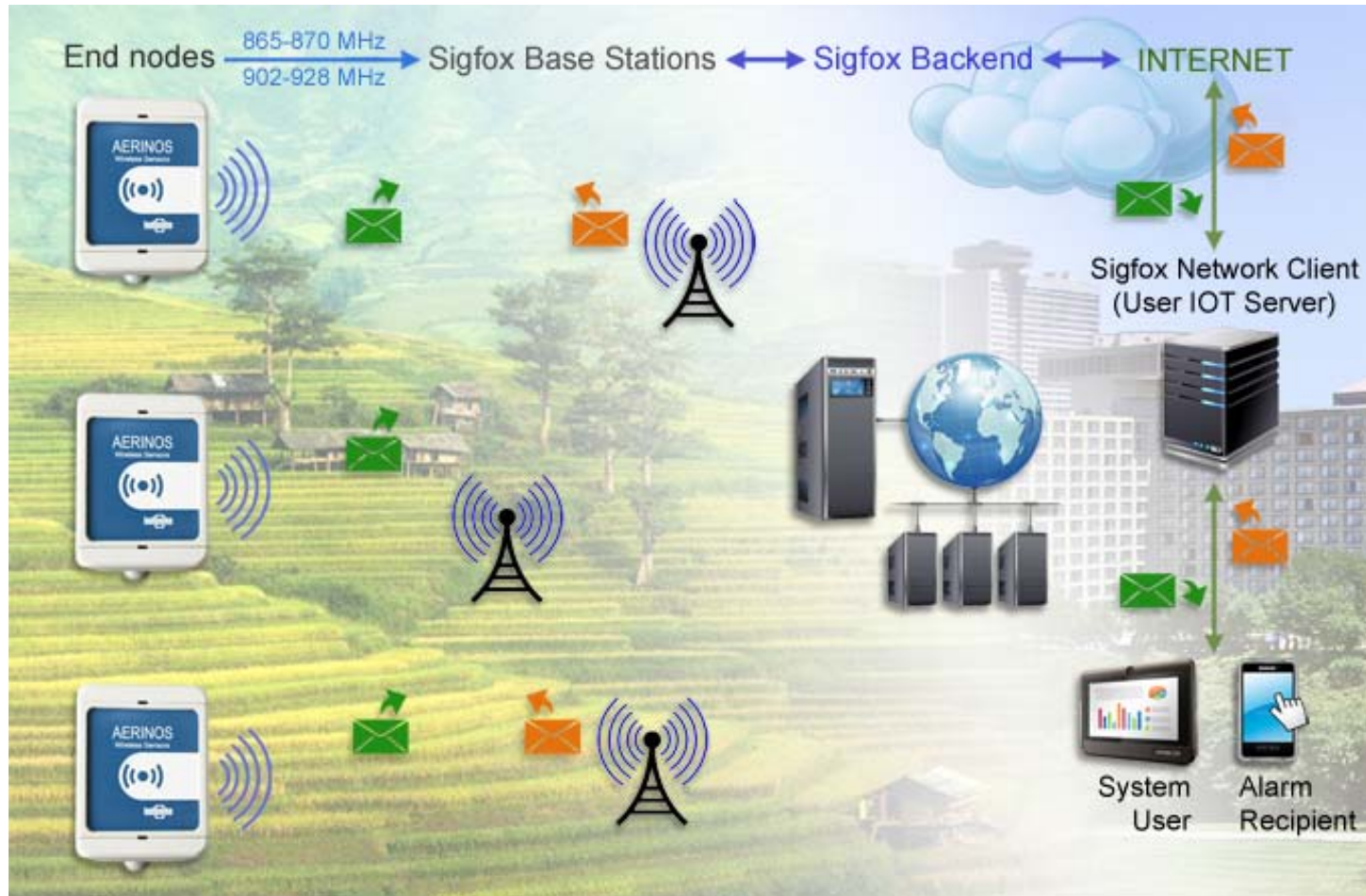
# IoT Autonomous devices



## BSC-50D, GSM Alarming RTU

Power supply:	3.6V, 13 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	4 x Digital inputs, 0-30VDC 1 x Analog input, 0-1VDC, 12 bit resolution 2 x Digital counter, 1 KHz
Transducer excitation	12V/200mA, 5V/200mA
Wireless modem:	Sierra Wireless 2G, 3G, 4G, NBloT, LTE-Cat M1
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# SIGFOX



# IoT Autonomous devices



## ADS-26x, Sigfox IoT wireless end nodes

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	IN1, configurable as: Digital input, 0-30VDC Analog input, 0-1VDC, 12 bit resolution Digital counter, 1 KHz
SDI-12 Bus:	8 Channels, up to 3 sensor support.
RS-485, MODBUS:	8 Channels, up to 3 sensor support, ASCII/RTU.
Transducer excitation	12V/250mA, 5V/200mA
Wireless modem:	Radiocrafts Sigfox RC1,2,4
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# IoT Autonomous devices



## ADS-27x, LoraWan IoT wireless end nodes

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	IN1, configurable as: Digital input, 0-30VDC Analog input, 0-1VDC, 12 bit resolution Digital counter, 1 KHz
SDI-12 Bus:	8 Channels, up to 3 sensor support.
RS-485, MODBUS:	8 Channels, up to 3 sensor support, ASCII/RTU.
Transducer excitation	12V/250mA, 5V/200mA
Wireless modem:	Microchip LoraWan 433/868/915
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# IoT Autonomous devices

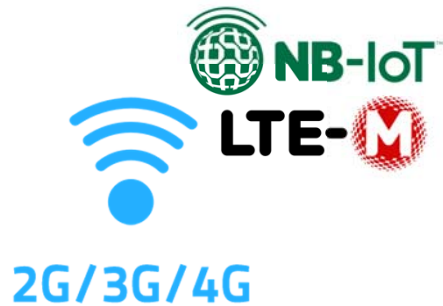


## ADS-410, Itron IoT wireless end nodes

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	IN1, configurable as: Digital input, 0-30VDC Analog input, 0-1VDC, 12 bit resolution Digital counter, 1 KHz
SDI-12 Bus:	8 Channels, up to 3 sensor support.
RS-485, MODBUS:	8 Channels, up to 3 sensor support, ASCII/RTU.
Transducer excitation	12V/250mA, 5V/200mA
Wireless modem:	Milli 5 Itron Silver Spring networks
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20 $^{\circ}$ ...+65 $^{\circ}$ C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# IoT Autonomous devices

## ADU-700, Wireless Gateway RTU/Data Logger



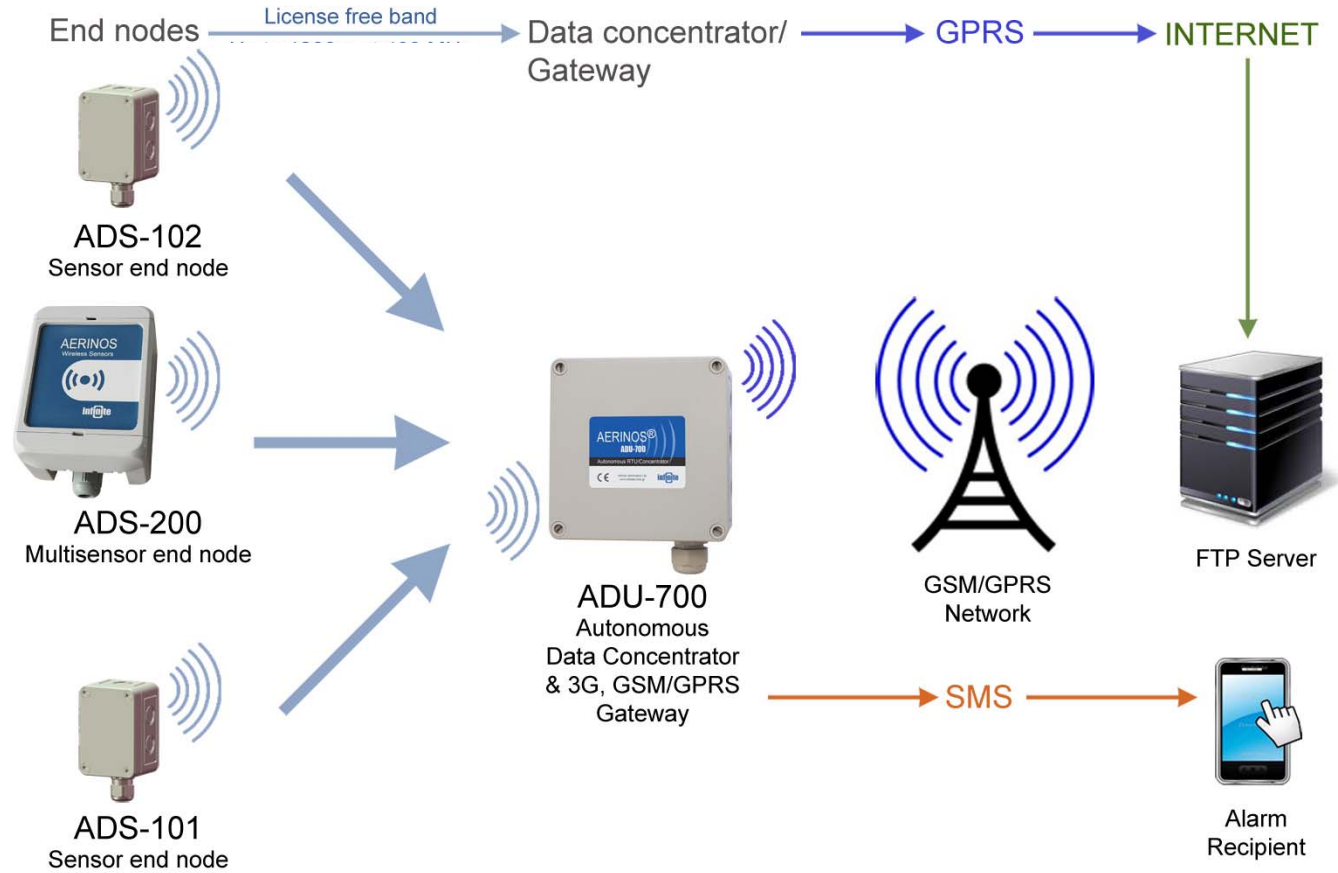
Power supply: 3.6V, 13-18 Ah Lithium Thionyl battery, D-size  
12VDC mains or photovoltaic power

Consumption : Continuous 18 $\mu$ A  
RS485: For future use  
Digital inputs: 3, 0-30VDC

Wireless RF: Radiocrafts 433.05-433.79 4+Km line of sight  
Wireless modem: Sierra Wireless HL series 3G or 4G  
Messages: Alarm, Status, Data

Temperature: -40°...+65°C, operating  
Dimensions: 130 x 130 x 75 mm  
Housing: IP66, IP68 Nema 4x

# IoT Autonomous devices



# IoT Autonomous devices

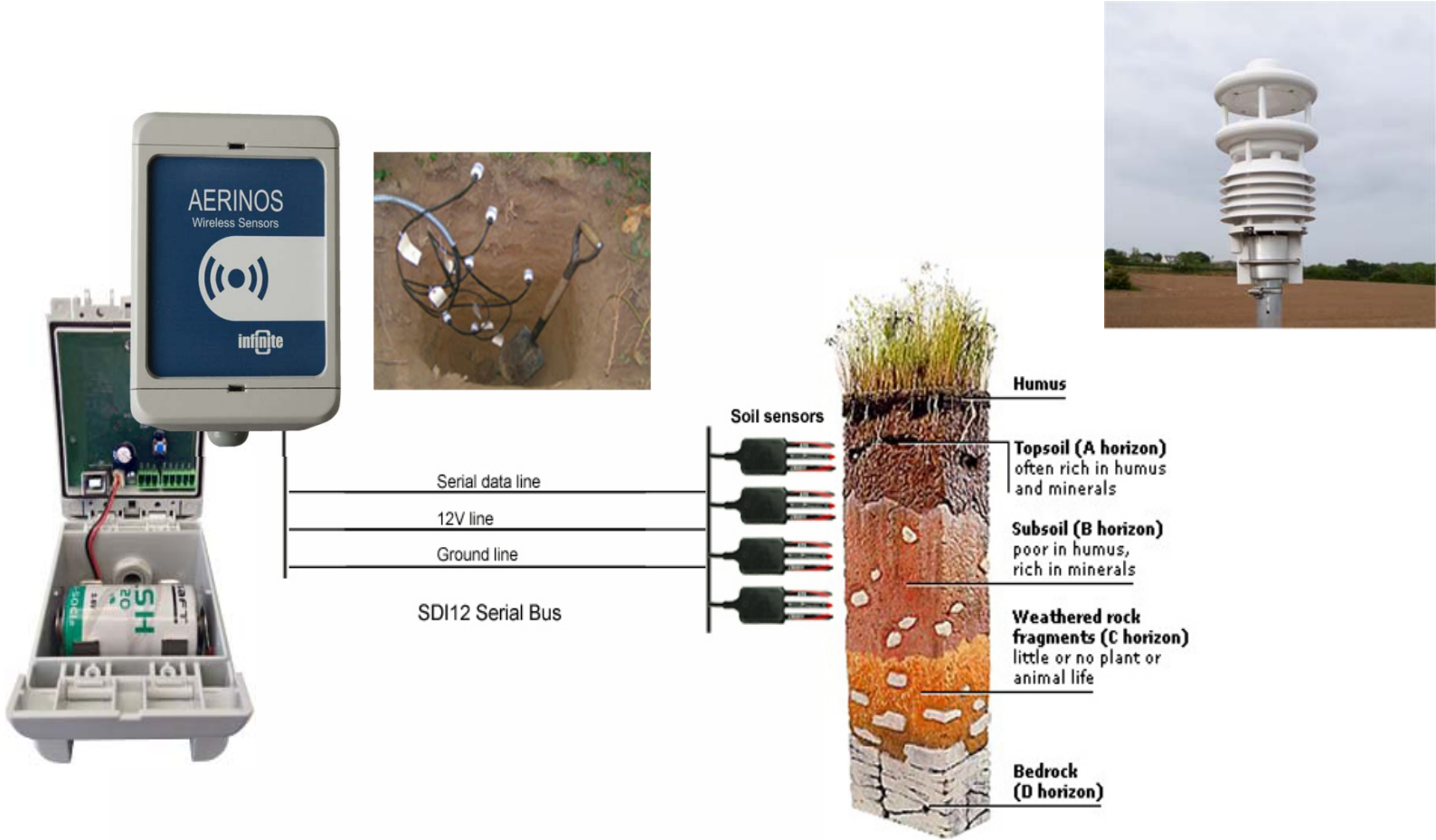
## ADS-200, IoT wireless end nodes



Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	IN1, configurable as: Digital input, 0-30VDC Analog input, 0-1VDC, 12 bit resolution Digital counter, 1 KHz
SDI-12 Bus:	8 Channels, up to 3 sensor support.
RS-485, MODBUS:	8 Channels, up to 3 sensor support, ASCII/RTU.
Transducer excitation	12V/250mA, 5V/200mA
Wireless tranceiver:	Radiocrafts 433.05-433.79 Mhz
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x



# ADS-200



# IoT Autonomous devices



## ADS-210, IoT wireless end nodes

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	1 Digital input, 0-30VDC 1 Digital counter, 1 KHz 1 Analog input, 0-1VDC, 12 bit resolution
Outputs :	1 Valve Channels
Transducer excitation	12V/250mA, 5V/200mA
Wireless tranceiver:	Radiocrafts 433.05-433.79 Mhz
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# IoT Autonomous devices

## ADS-102, IoT wireless end nodes



Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 $\mu$ A
Discrete inputs:	1 Digital input, 0-30VDC 1 Digital counter, 1 KHz 2 Analog input, 0-1VDC, 12 bit resolution
Transducer excitation	3.6V/120mA
Wireless RF :	Radiocrafts 433.05-433.79 Mhz
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-20°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

# Sensors

## Structural Engineering SDI12 sensors



Crack Propagation



Inclination



Bridge suspension

Critical  
Structure  
Monitoring



# Sensors

## Structural Engineering SDI12 sensors



Inclination

Crack Propagation



Critical  
Structure  
Monitoring

# Sensors

---

## Structural Engineering SDI12 sensors



Critical Structure Monitoring



Crack Propagation

# Sensors

---

## Structural Engineering SDI12 sensors



Critical Structure Monitoring



Vibrating wires



Crack Propagation

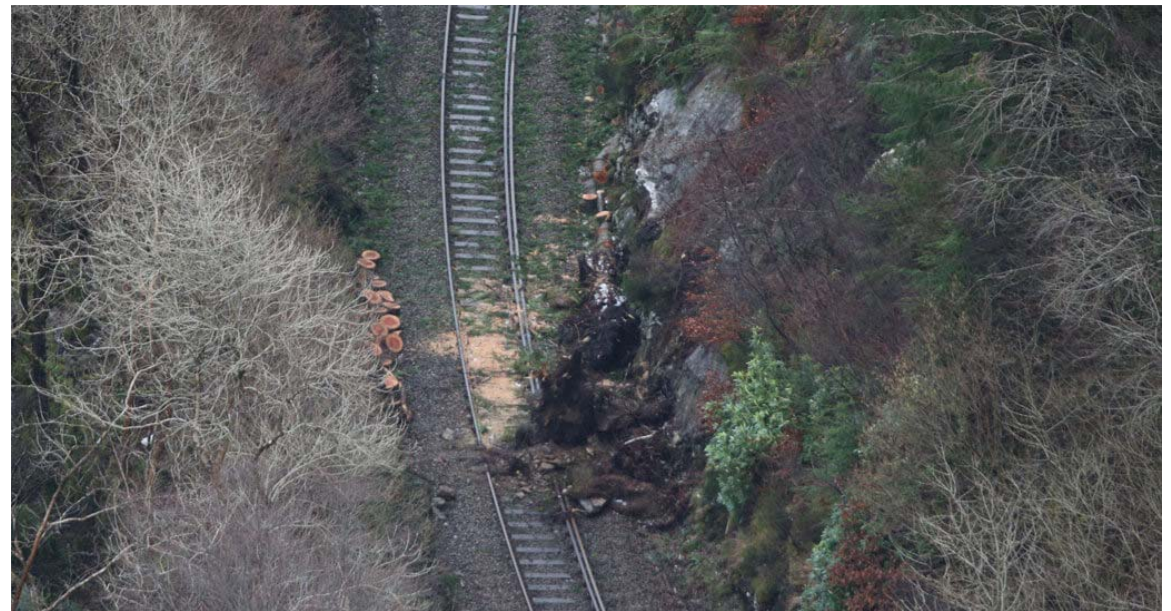
# Sensors

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## Structural Engineering SDI12 sensors



Rock and ground monitoring  
Switzerland



Bank collapse UK



# Sensors

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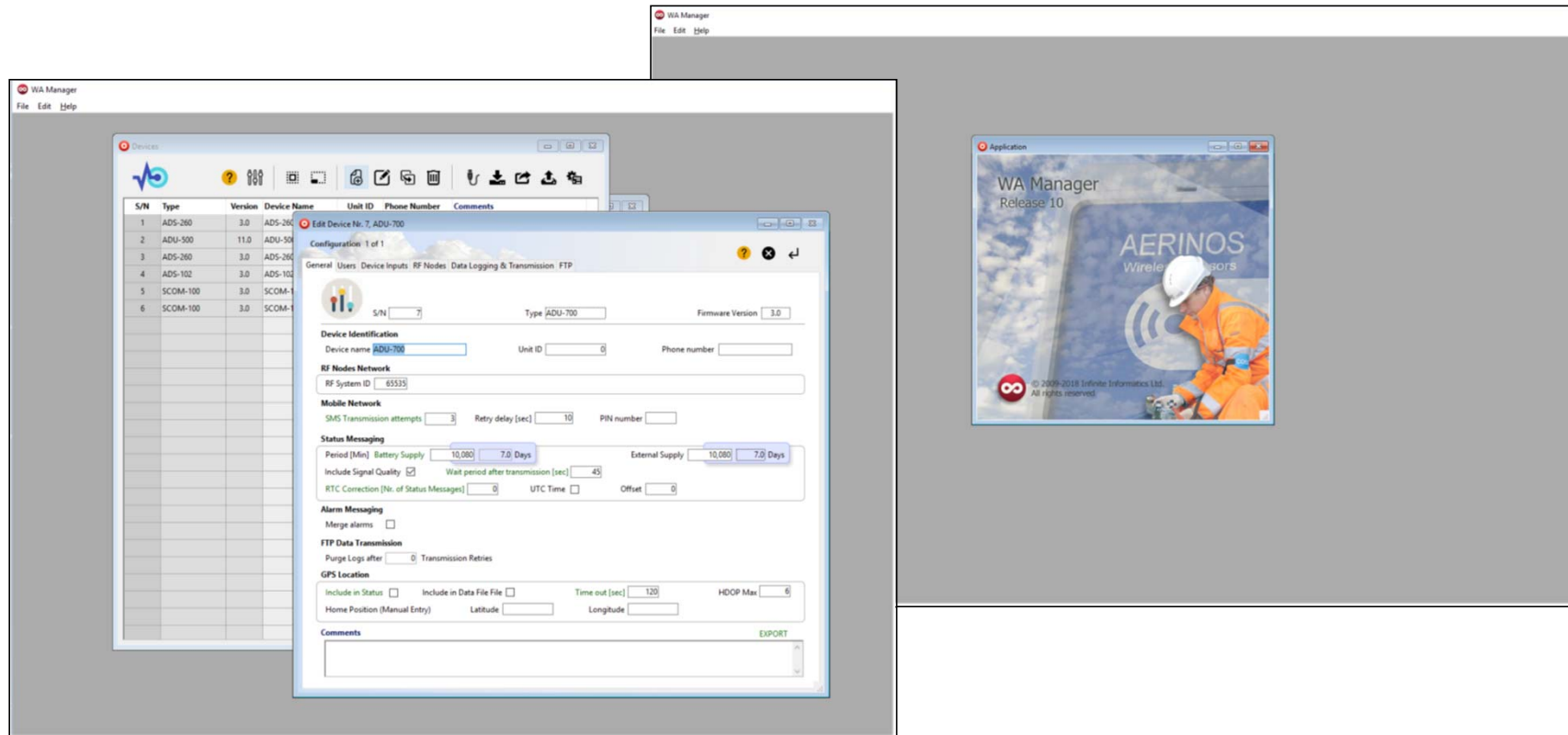


Waves monitoring Istanbul port



Raffles Lighthouse Singapore

# WA Manager – Windows software to configure devices

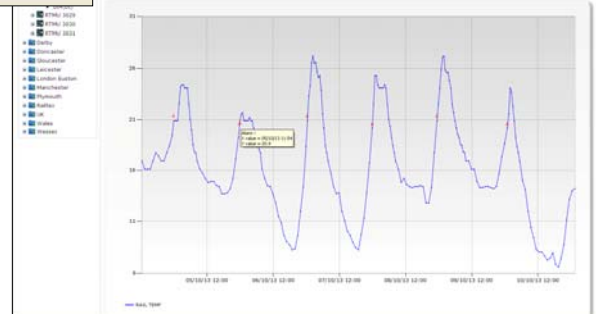


# WaT - Web aided Telemetry

## Cloud telemetry platform with GIS information

The screenshot displays the main dashboard of the WaT web interface. At the top, there's a navigation bar with options like 'Map', 'Chart', 'Measurements', 'Alarms', 'Status', 'SMS Archive', 'Error Log', and 'Log Out'. Below this, a sidebar lists various locations such as ANGLIA, Derby, Doncaster, Gloucester, Leicester, London Euston, Manchester, Plymouth, Stoke, and Wakes. The main area features a table with columns for 'Group', 'ID', 'Status', 'Last Status', 'Signal (%)', 'Status', 'Logging', 'A/I', 'Alarm', and 'IC'. Below the table is an 'Alarm' section with columns for 'Ch. A/I', 'Ch. ID', 'Ch. Desc', 'Msg. Date', 'Msg. Desc', 'Comments', 'Value', 'Group', 'Device', and 'ID'. The table contains several rows of data, including entries for 'RAIL TEMP' and 'ON/OFF TRACK'.

This screenshot shows the map view of the WaT web interface. It features a satellite map of a railway station area. A red pin is placed on the map, and a pop-up window displays details for 'RTMU TAUNTON (59)'. The pop-up includes 'Last Status' (13/10/2013 4:15:38 PM, 74.2%), 'Last Log' (17/10/2013 7:57:00 PM, 82.5-4-IC), and 'Last Alarm' (17/10/2013 8:45:05 PM, RAIL TEMP L1 LOW ALARM, 23.3). The interface also shows a sidebar with a list of devices and a navigation bar at the top.



# WaT - Web aided Telemetry

Cloud telemetry platform with GIS information

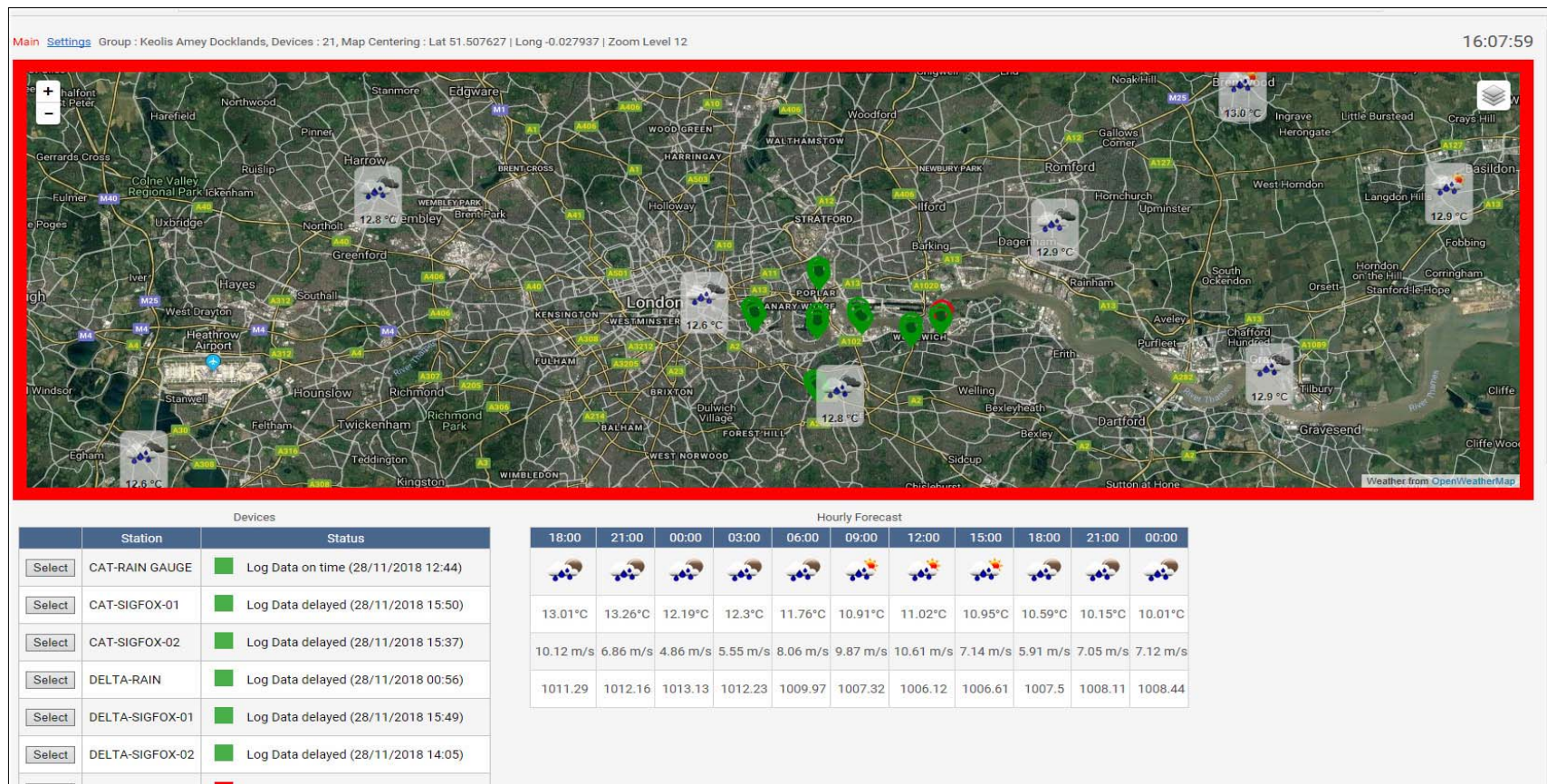
The screenshot displays the WaT web interface. The top navigation bar includes links for Main, Map, Chart, Measurements, Alarm Events, Alarm ACK, Status, GPS, File Archives, and TCP Archives. Below this, there are tabs for Devices, Groups, Server Recipients, Alarm Messages, and Weather. The main content area is split into two panels. The left panel, titled 'Devices', shows a table with columns for #, Status, Alarm, Group, Device ID, Device Name, Phone Number, Type, Latitude, Longitude, Zoom Level, and Show. The right panel, titled 'Map', shows a satellite map of a coastal town with numerous green location markers. The map interface includes a search bar, a date selector (14/02/2017), and zoom controls.

#	Status	Alarm	Group	Device ID	Device Name	Phone Number	Type	Latitude	Longitude	Zoom Level	Show
23/III	Active	22/I	309	B-267	+30698555376	BSC-50-E	40.613761	22.960675	12	Yes	
25/III	Active	22/I	310	B-49	+30698555378	BSC-50-E	40.611438	22.959543	12	Yes	
25/X	Active	23/I	311	B-10	+306979440747	BSC-50-E	40.614305	22.957654	12	Yes	
26/IX	Active	23/III	313	166	+306975850674	BSC-50-E	40.643439	22.946430	12	Yes	
27/IV	Active	23/III	312	N-37	+306975850668	BSC-50-E	40.640908	22.952879	12	Yes	
28/III	Active	24/I	315	0-3	+306979440909	BSC-50-E	40.641245	22.960855	12	Yes	
29/III	Active	24/I	314	N-537	+306975850441	BSC-50-E	40.642286	22.951364	12	Yes	
30/III	Active	25/III	321	702	+30698555349	BSC-50-E	40.634777	22.936283	12	Yes	
31/I	Active	25/VIII	320	B-214	+306979440449	BSC-50-E	40.610653	22.952909	12	Yes	
36/I	Active	25/X	319	PE-81	+306972307079	BSC-50-E	40.501590	22.923310	12	Yes	
22/I	Active	26/IX	318	Z-83	+30698555379	BSC-50-E	40.663834	22.933113	12	Yes	
23/I	Active	27/IV	317	K-577	+30698555337	BSC-50-E	40.581534	22.949494	12	Yes	
24/I	Active	27/IV	322	K-739	+30698555336	BSC-50-E	40.586705	22.953391	12	Yes	
270/XI	Active	270/XI	326	111	+306975850658	BSC-50-E	40.636033	22.947371	12	Yes	
31/III	Active	270/XI	325	130	+306975850666	BSC-50-E	40.634069	22.952770	12	Yes	
31/III	Active	28/III	323	20X	+30698555377	BSC-50-E	40.634371	22.939710	12	Yes	
31/III	Active	28/III	324	581	+30698555372	BSC-50-E	40.637809	22.936708	12	Yes	
32/III	Active	29/III	332	5	+30698555354	BSC-50-E	40.633250	22.940097	12	Yes	



# WaTEye - Web aided Telemetry Eye dashboard

Online dashboard with live weather and telemetry data



# MSG – Multiprotocol Scada Gateway

The MSG is a modern SCADA communication gateway, supporting multiple protocols,

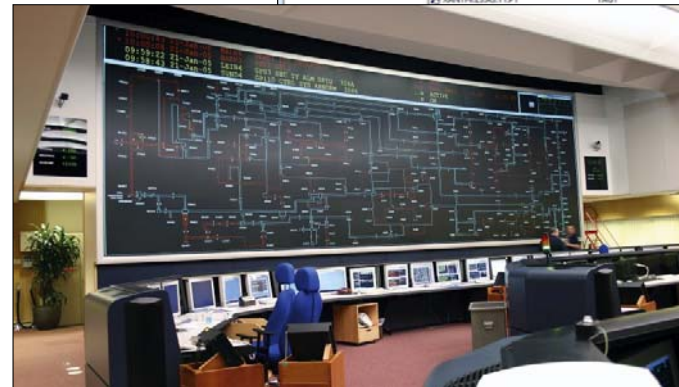
- DNP3 Secure Authentication v5 (SAv5)
- IEC 60870-5-101, 102,103
- IEC 60870-5-104
- IEC 60870-5 Secure Authentication for -101 and -104
- OPC Data Access
- OPC XML Data Access
- OPC Alarms & Events
- IEC 61850
- IEC 60870-6
- Modbus

MS SQL server database backend for Historical data storage and management.

The screenshot displays the 'Tag Groups' configuration window. It includes a 'Record' section with 'Update Tag Values' set to 'ON'. Below this, fields for 'Tag ID', 'Device', 'Tag Name', 'Channel ID', and 'Status' are visible. A search bar is also present. The main area shows a table of tag configurations:

Tag ID	Tag Name	Device ID	Device	Channel ID	Channel	Tag Value	Status
1	TAG-1	1	BSC-500 PPC1	2	EARTH	OFF	Active
2	TAG-2	1	BSC-500 PPC1	1	FLOOD	OFF	Active
3	TAG-3	-1		-1		OFF	Active
4	TAG-4	-1		-1		OFF	Active
5	TAG-5	-1		-1		OFF	Active

Below the table, there is a 'Configuration' window showing a tree view of the gateway settings, including 'Modem Pools', 'OPC Server', and 'XANTH (Internal Modem)'. A 'Slave/Master Data Object' window is also visible, showing a list of data objects and their values.



# Clients & OEM



# Balfour Beatty

