Autonomous RTUs
IoT for Water Telemetry

Water resources management

- River level & flow gauging
- Groundwater monitoring
- Lake and reservoir level monitoring
- Leak detection in distribution pipelines
- Water quality monitoring

Design Principles

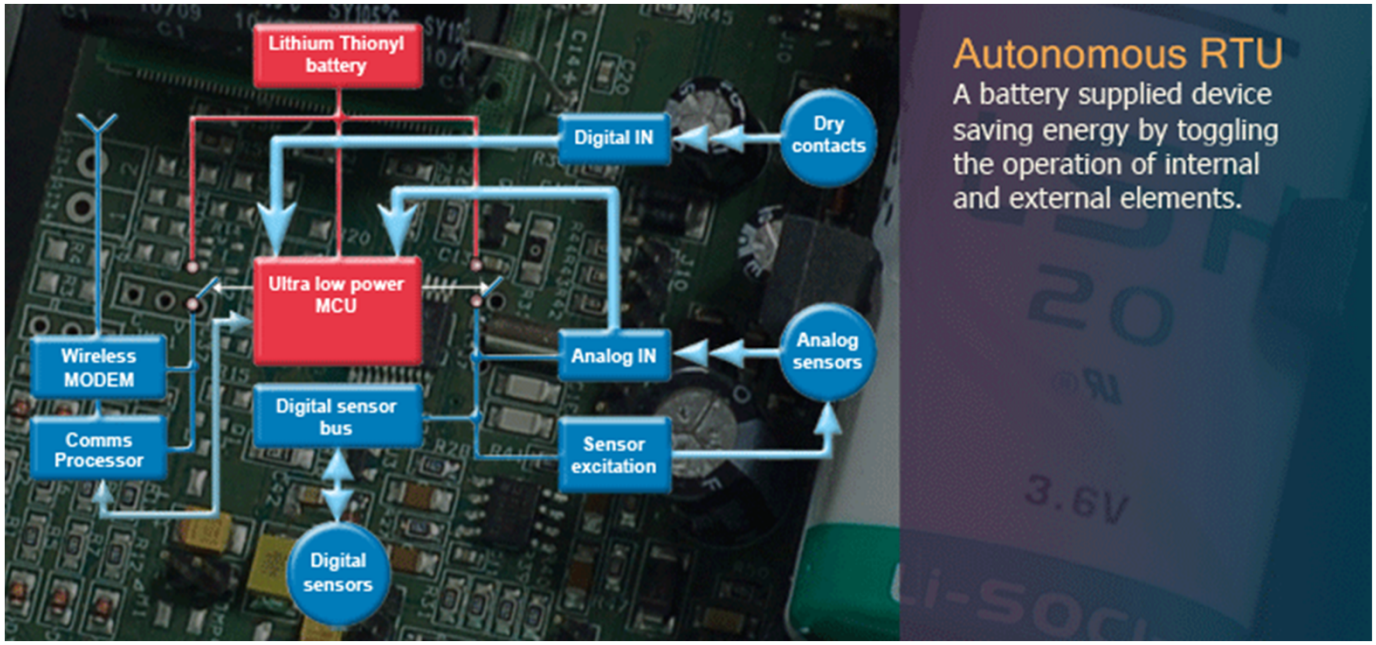
Autonomous RTUs are flexible devices allowing any modern power source scheme.

They are designed to operate autonomously using single lithium battery cells achieving maximum reliability, and long term solution robustness with operational lifetime >20 years.

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

They can be used in hybrid power solutions combining lithium battery for telecommunications with rechargable power sources for sensor excitation allowing mixed power media applications seamlessly.

Operating principle



An ultra low power MCU is in continuous operation with two main tasks:

- Performing measurement, data recording and detecting an alarm condition.
- Controlling power of internal and external functional elements in order to extend battery lifetime. The principle is to power functional sections, according to user defined time schedules.

Autonomous RTUs utilize an ultra low power dual processor architecture in order to combine low power consumption with advanced processing and communication characteristics.

Functions:

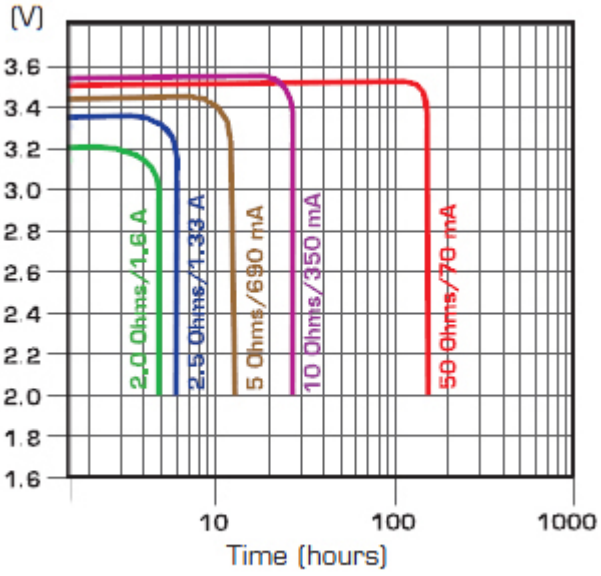
- Measurement
- Transducer excitation
- Data recording
- Data & alarm transmission

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

System comparison

Subject	Solar powered	Autonomous
Daily energy consumption	2 mAh (An average 2 mA current draw is assumed).	0.03 mAh (2 mA during sampling, 40 µA in idle state, sampling period at 1 minute).
Maintenance free operation	2-3 years. The rechargeable cell's capacity diminishes over time. Current delivery is reduced due to increase in internal resistance over time.	Up to 15 years. The Lithium Thionyl battery features undiminished voltage level and current delivery during almost 98% of its lifetime.
System power supply	Complex, costly.	Simple, low cost.
Ambient temperature	Frost protection for the solar cell is required at lower temperatures. Solar cell efficiency is lowered and rechargeable battery life is shortened at temperatures over 40°C.	Infinite's autonomous devices operate at temperatures between −20°C and +65°C.
Weather conditions	Smooth operation depends on sufficient sunlight.	Weather independent.
Overall system size	Massive, provoking vandalism.	Minimum sized, compact, unnoticeable.
Minimum sampling period	Down to a few seconds, according to the availability of the renewable energy source.	1 minute (5...15 minutes, typ) for preserving a reasonable battery lifetime.

Lithium Thionyl Battery



Typical discharge profiles at + 20°C

Internet of Things Networks & Technologies

2G/3G/4G

NB-IoT

LTE-M

sigfox

LoRa™

Itron

Silver Spring NETWORKS

ADU-500 Autonomous RTU

The ADU-500 is an ultra low power, wireless RTU with data logging and alarming capabilities.

The battery powered RTU supports acquisition from multiple sensors and it incorporates three digital inputs, two analog inputs, two pulse counter inputs, SDI-12 bus, RS485 Modbus and multiple excitation options for powering measuring transducers.

The ADU-500 uses an internal cellular modem to automatically send data and alarms.

A D-size Lithium Thionyl battery can provide autonomous operation for over 10 years.

IoT Autonomous devices

ADU-500, RTU/Data Logger

2G/3G/4G

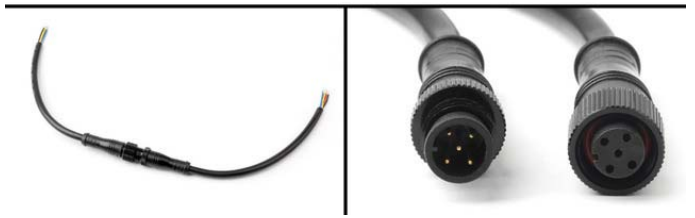
NB-IoT

LTE-M

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

ADU/BSC IP68

5Pin 0.3mm²



IP68

IoT Autonomous devices

NB-IoT
LTE-M

2G/3G/4G

BSC-50D, GSM Alarming RTU

Power supply:	3.6V, 13 Ah Lithium Thionyl battery, D-size
	5VDC mains or photovoltaic power
Consumption :	Continuous 18µA
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: M1	Sierra Wireless 2G, 3G, 4G, NBIoT, LTE-Cat
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-260 SIGFOX

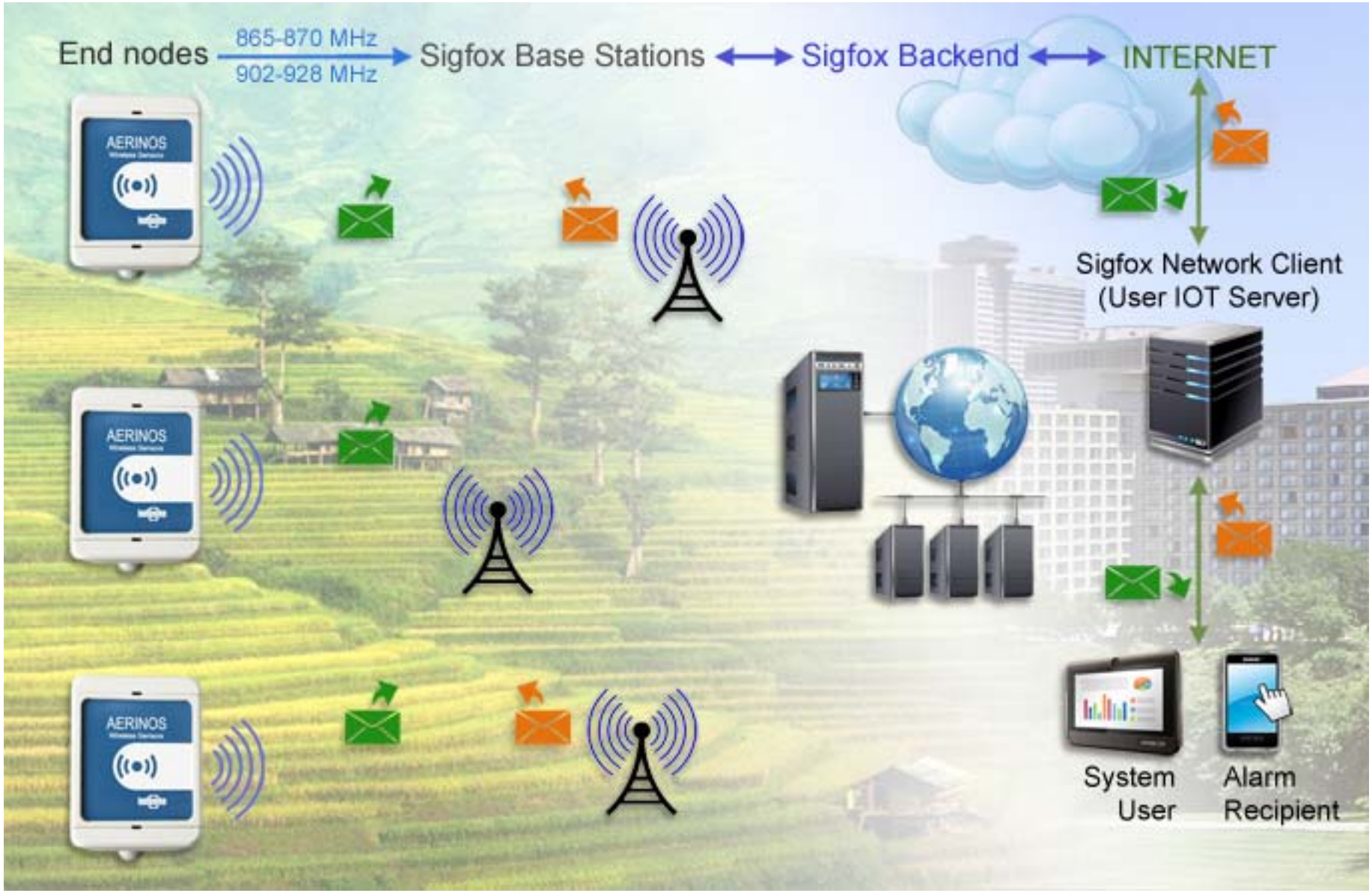
The ADS-260 is an ultra low power, wireless smart end node for the Sigfox network.

It is available for the SIGFOX network for Europe, USA, Latin America, Australia and New Zealand, RC1, RC2, RC4.

The battery powered RTU supports acquisition from multiple sensors and it incorporates one digital/analogue/pulse input, SDI-12 bus with up to 3 sensors supported, an RS485 Modbus bus with up to 3 sensors supported and multiple excitation options for powering measuring transducers.

A D-size Lithium Thionyl battery can provide autonomous operation for over 10 years.

ADS-260 SIGFOX



IoT Autonomous devices

ADS-260, Sigfox IoT wireless end nodes

sigfox

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size
	5VDC mains or photovoltaic power
Consumption :	Continuous 18µA
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:	Sigfox RCZ1, RCZ2, RCZ4
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-270 LoRaWan

The ADS-270 is an ultra low power, wireless smart end node for the LoRaWan network.

It is available for Europe, USA, Latin America, Asia, Australia and New Zealand, with frequencies 433, 868 and 915 MHz.

The battery powered RTU supports acquisition from multiple sensors and it incorporates one digital/analogue/pulse input, SDI-12 bus with up to 3 sensors supported, an RS485 Modbus bus with up to 3 sensors supported and multiple excitation options for powering measuring transducers.

A D-size Lithium Thionyl battery can provide autonomous operation for over 10 years.

IoT Autonomous devices

ADS-270, LoraWan IoT wireless end nodes

LoRa™ WAN

Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size
	5VDC mains or photovoltaic power
Consumption :	Continuous 18µA
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

ADS-410 Itron

The ADS-410 is an ultra low power, wireless smart end node for the Itron network.

It is available for Europe and USA, with frequencies 868 and 915 MHz. The Itron network is an very secure network which is usually owned by utilities and municipal authorities.

The battery powered RTU supports acquisition from multiple sensors and it incorporates one digital/analogue/pulse input, SDI-12 bus with up to 3 sensors supported, an RS485 Modbus bus with up to 3 sensors supported and multiple excitation options for powering measuring transducers.

A D-size Lithium Thionyl battery can provide autonomous operation for over 10 years.

LoRa™ WAN

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 18µA
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°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

Sensors

Water Level Ultrasonic

PH

Water Quality

Sensors

Surcharge Velocity sensor

Correlation Sensor

Water Quality

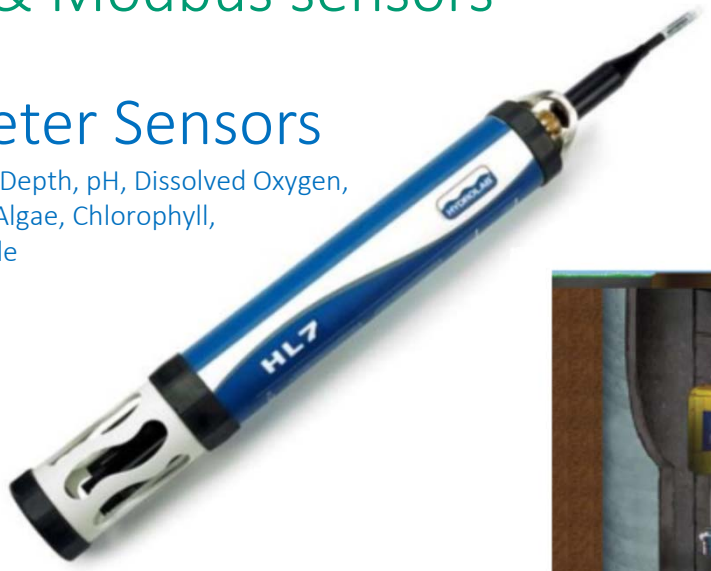
Sensors

Water application SDI12 & Modbus sensors

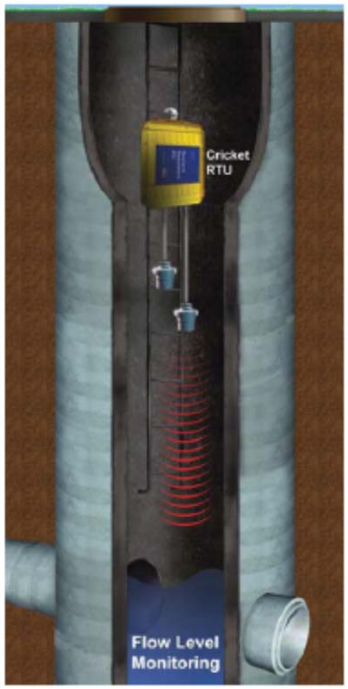
Submersible water level sensors

Multiparameter Sensors

Temperature, Conductivity, Depth, pH, Dissolved Oxygen, Turbidity, ORP, Blue-Green Algae, Chlorophyll, Ammonium, Nitrate, Chloride



Water velocity



Sewer level

Sensors

All in one weather

Ambient
Humidity & Temperature

Valve

Sensors

Wind Speed

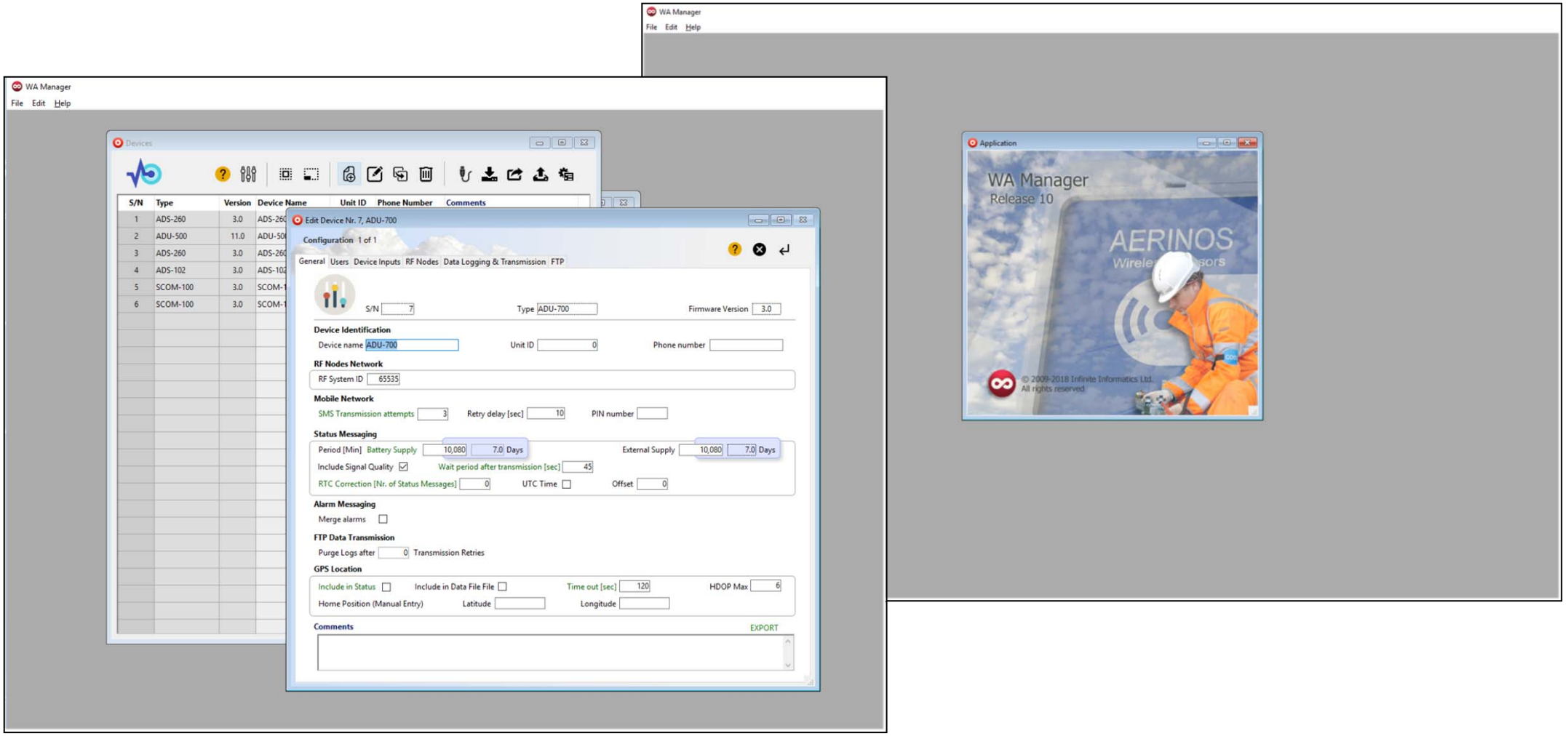
Sun Radiation

Wind Direction

Gas Sensors

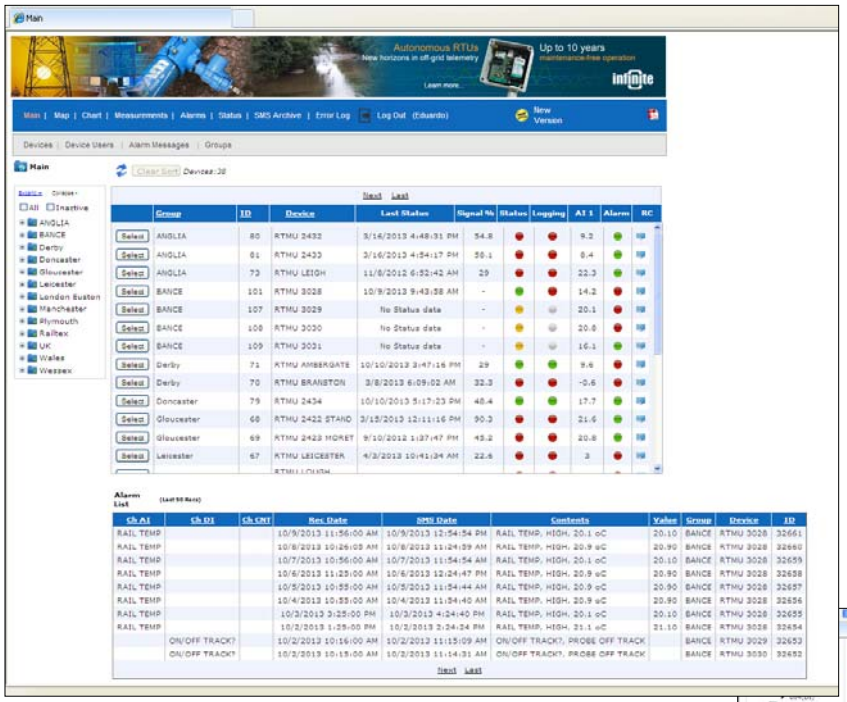
Configuration Software

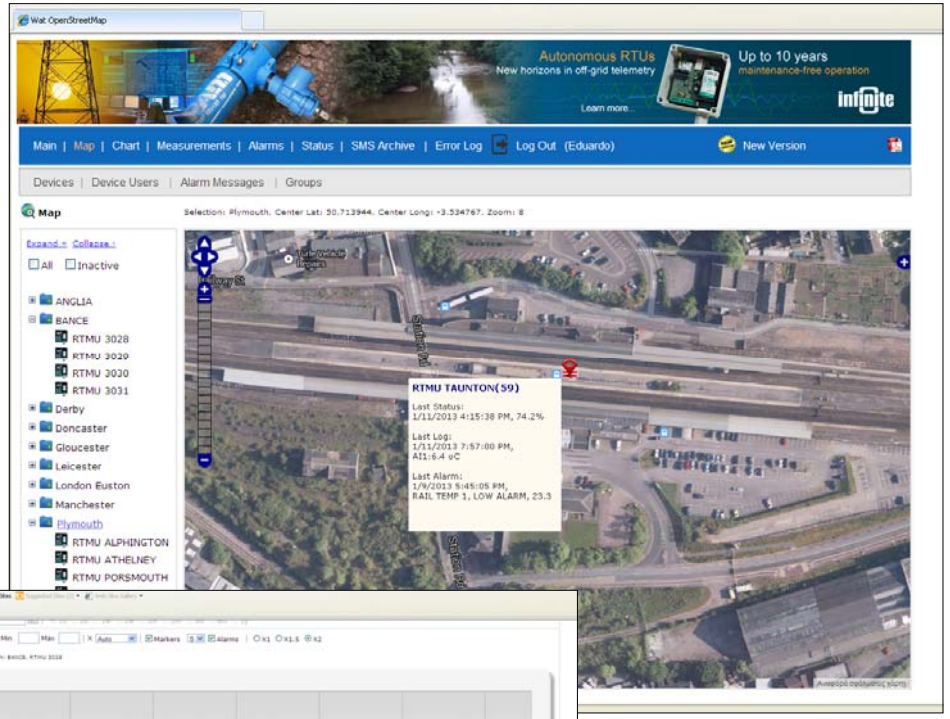
New WAManager configuration tool

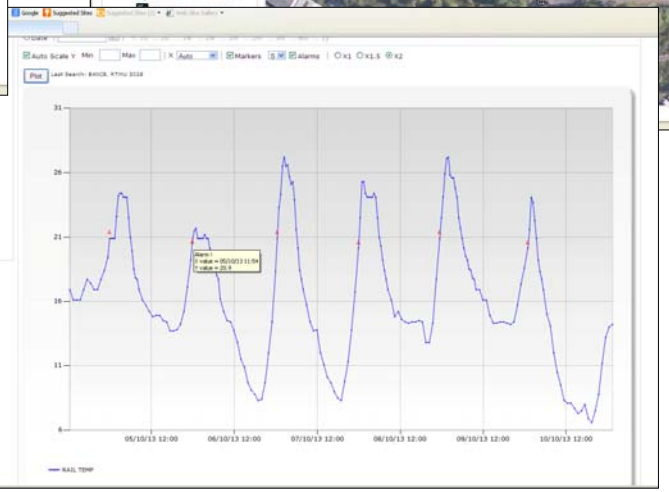


WaT - Web aided Telemetry

Cloud telemetry platform with GIS information







ANDROID APP ON Google play

Download on the App Store

infinite

WaTeye - Dashboard

Main Settings Group : Keolis Amey Docklands, Devices : 21, Map Centering : Lat 51.507627 | Long -0.027937 | Zoom Level 12

16:07:59

Devices

	Station	Status
Select	CAT-RAIN GAUGE	Log Data on time (28/11/2018 12:44)
Select	CAT-SIGFOX-01	Log Data delayed (28/11/2018 15:50)
Select	CAT-SIGFOX-02	Log Data delayed (28/11/2018 15:37)
Select	DELTA-RAIN	Log Data delayed (28/11/2018 00:56)
Select	DELTA-SIGFOX-01	Log Data delayed (28/11/2018 15:49)
Select	DELTA-SIGFOX-02	Log Data delayed (28/11/2018 14:05)

Hourly Forecast

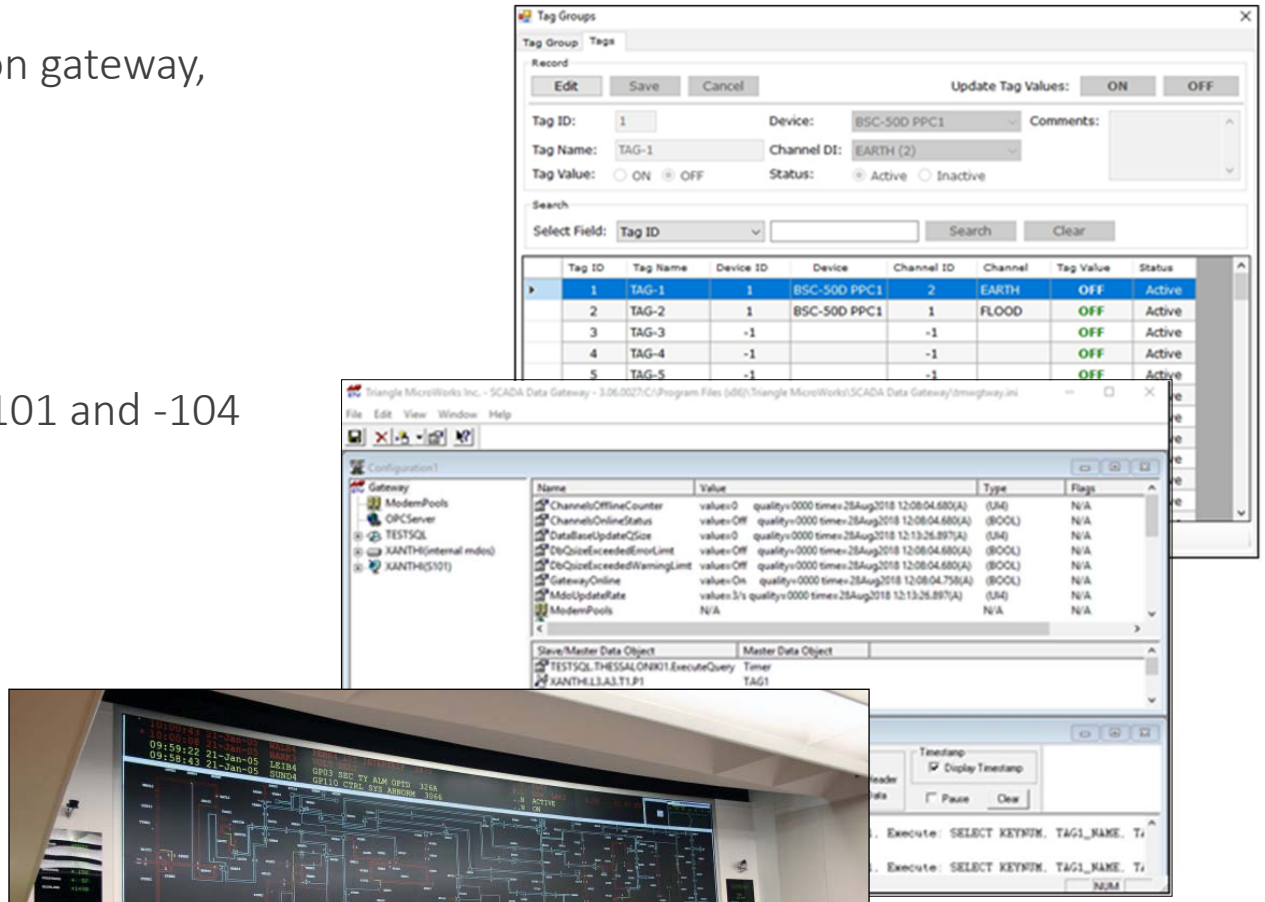
18:00	21:00	00:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00	00:00
13.01°C	13.26°C	12.19°C	12.3°C	11.76°C	10.91°C	11.02°C	10.95°C	10.59°C	10.15°C	10.01°C
10.12 m/s	6.86 m/s	4.86 m/s	5.55 m/s	8.06 m/s	9.87 m/s	10.61 m/s	7.14 m/s	5.91 m/s	7.05 m/s	7.12 m/s
1011.29	1012.16	1013.13	1012.23	1009.97	1007.32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

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.



Battery lifetime

BSC-50D RTU/Data logger powered using one 3.6V, 13Ah lithium-thionyl battery

Excitation @3.3V [mA]	Sampling rate [S/hour]	Sampling delay [sec]	Sending rate [hours]	Battery life [Years]
1	4	1	2	4.3
1	60	1	2	4.2
25	4	1	2	4.0
25	60	1	2	2
25	60	1	4	2.3
25	60	1	8	2.5
5	4	1	24	10.4
25	4	1	24	9.0
25	4	5	24	5.4
50	4	5	24	3.6
100	4	5	24	2.1

Clients & OEM


amey


AMERICAN WATER


VINCI


sixense
Systems


US3
UTILITY SYSTEMS SCIENCE & SOFTWARE


CIMPRO


TESLA
MEASUREMENT CONTROL SYSTEMS
ENVIRONMENTAL TECHNOLOGIES


CAS DATALOGGERS
Data Loggers For All Applications


ORBICON
wsp


WATSONC


Itron


ISOIL
INDUSTRIA


infinite