Autonomous RTUs

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 >10+ 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.

Internet of Things Networks & Technologies

2G/3G/4G

NB-IoT

LTE-M

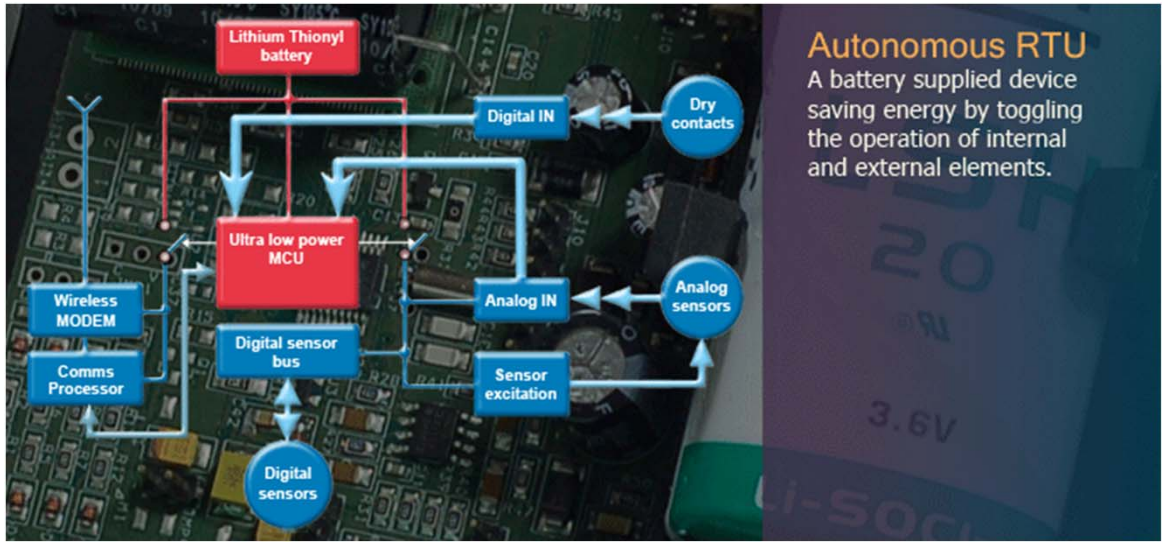
sigfox

LoRa™

Itron

Silver Spring NETWORKS

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:

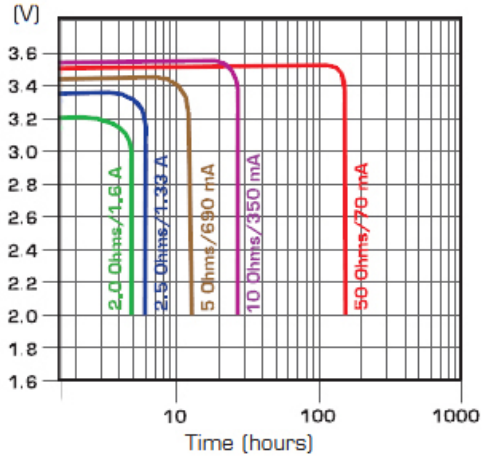
- Measurement
- Transducer excitation
- Data recording
- Data & alarm transmission

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

Battery lifetime

BSC-50E RTU/Data logger powered by 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

Water resources management

- Level & flow
- Groundwater monitoring
- Lake and reservoir level monitoring
- Leak detection in distribution pipelines
- Sewer water monitoring
- Water quality monitoring

Power grid

Earth fault detection and localization in urban power distribution systems.

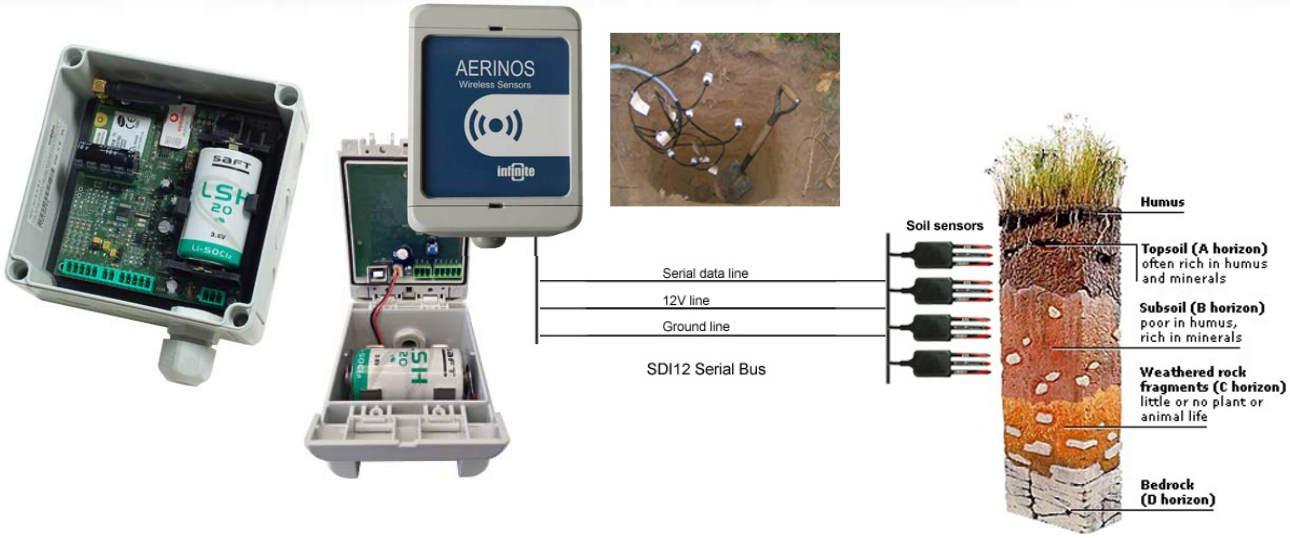
In combination with earth ground fault detection relays,

- Seamless connection to SCADA via OPC server
- Earth faults can be located in the first minute after occurrence.
- Significant reduction of the CAIDI and SAIDI reliability indicators

Precision Agriculture

Agriculture related weather measurements:

- Solar radiation
- Air temperature and relative humidity
- Wind speed and direction
- Rainfall
- Soil temperature and moisture
- All in one weather stations



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

Gas Distribution

- Flow and pressure
- Moisture and leak detection
- LPG level measurement on Gas Storage Tanks

Cathodic Protection

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

Off-grid general purpose monitoring

- Generator voltage, current
- Diesel fuel tank level
- Backup battery readiness
- Fire, Smoke & water
- Intruder alarming
- Door open and motion detection

IoT Autonomous devices

NB-IoT

LTE-M

2G/3G/4G

ADU-500, RTU/Data Logger

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

IoT Autonomous devices

2G/3G/4G

BSC-50 E, 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

IoT Autonomous devices

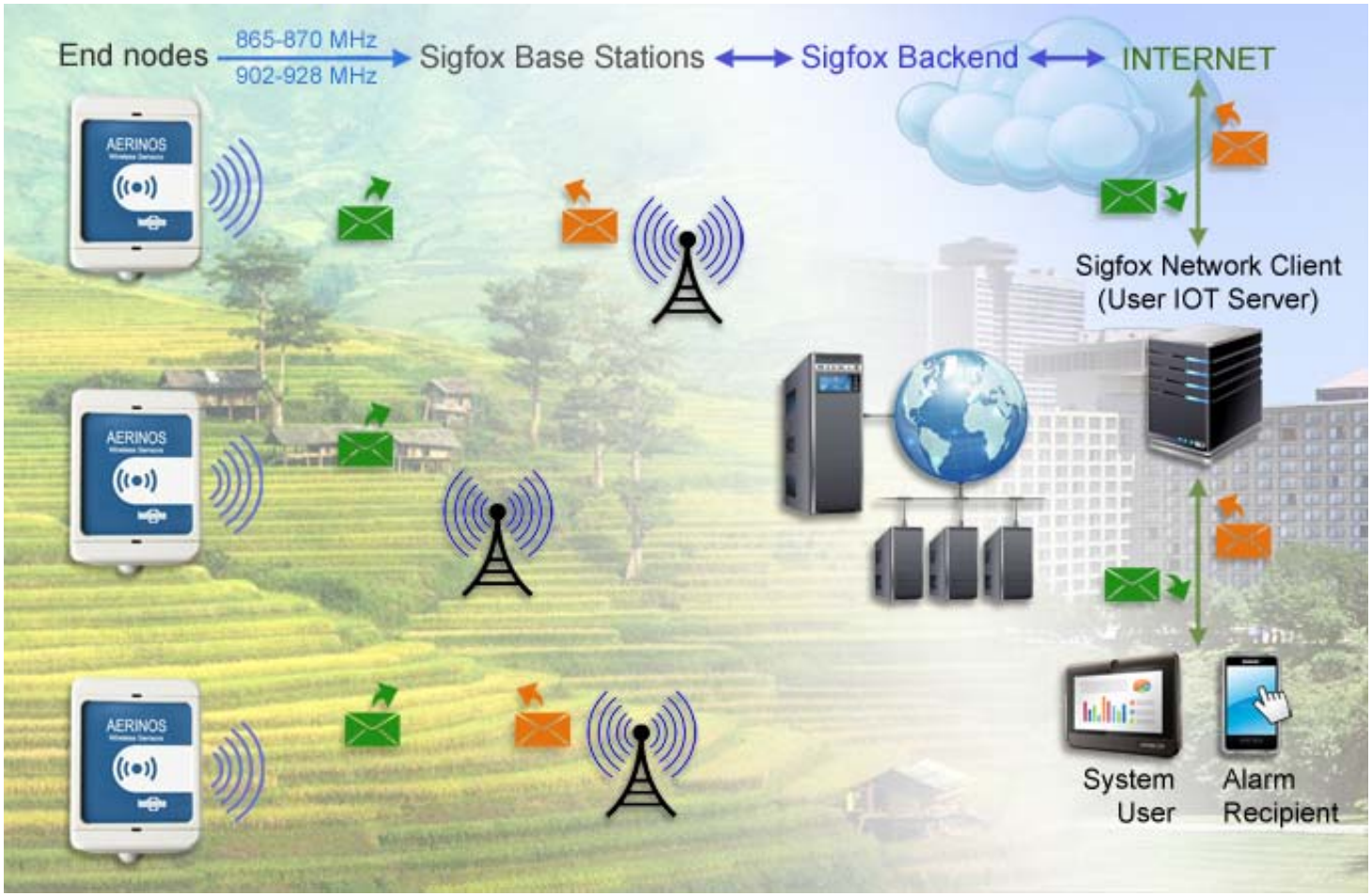
NB-IoT
LTE-M

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:	Sierra Wireless 2G, 3G, 4G, NBIoT, 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


End nodes
865-870 MHz
902-928 MHz
Sigfox Base Stations
Sigfox Backend
INTERNET
Sigfox Network Client
(User IOT Server)
AERINOS
AERINOS
AERINOS
System
User
Alarm
Recipient

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 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:	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 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

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

DISTRIBUTECH®
CONFERENCE & EXHIBITION

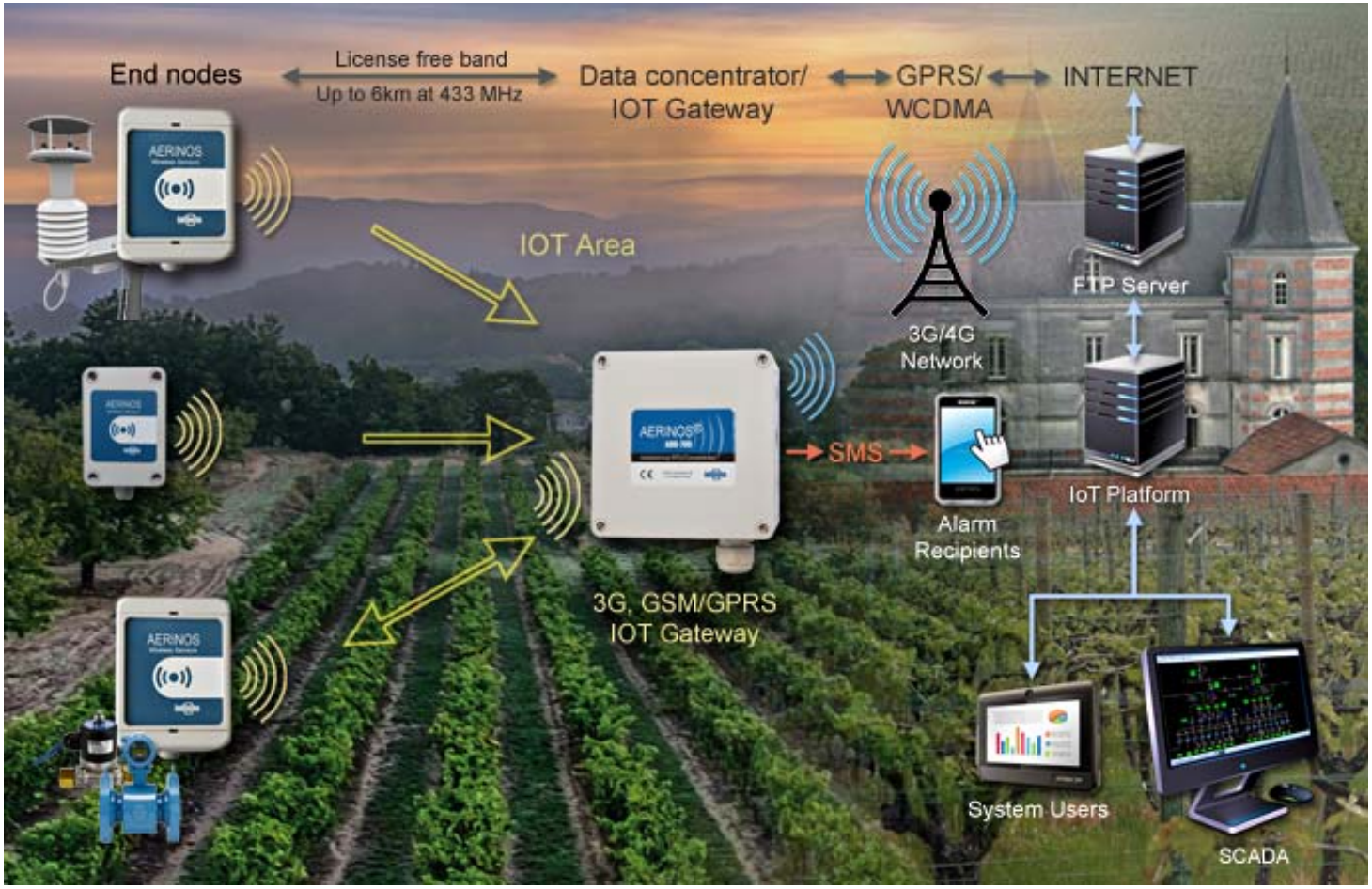
USA/New Orleans 2019

#DTECH\Gen 5 SN

Itron
Silver Spring®
NETWORKS

Gen 5
Sensor Node

ADU-700 Profisens



IoT Autonomous devices

ADU-700, Wireless Gateway RTU/Data Logger

NB-IoT
LTE-M
2G/3G/4G

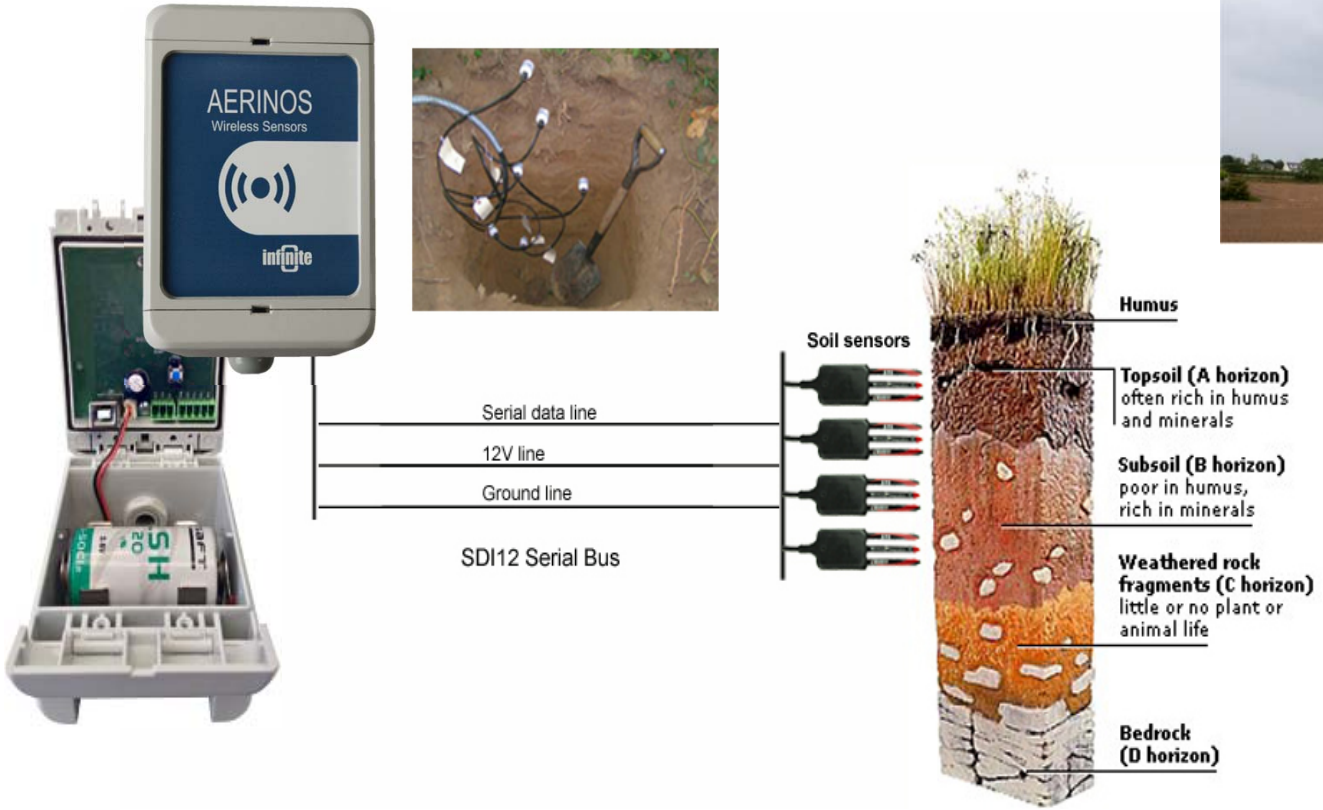
Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size
	12VDC mains or photovoltaic power
Consumption :	Continuous 18µA
RS485:	For future use
Digital inputs:	3, 0-30VDC
Wireless RF:	Radiocrafts 433.05-433.79 4+Km line of sight
Wireless modem:	Sierra Wireless HL series 3G or 4G
Messages:	Alarm, Status, Data
Temperature:	-40°...+65°C, operating
Dimensions:	130 x 130 x 75 mm
Housing:	IP66, IP68 Nema 4x

IoT Autonomous devices

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 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 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


AERINOS
Wireless Sensors
infinite
Serial data line
12V line
Ground line
SDI12 Serial Bus
Soil sensors
Humus
Topsoil (A horizon)
often rich in humus
and minerals
Subsoil (B horizon)
poor in humus,
rich in minerals
Weathered rock
fragments (C horizon)
little or no plant or
animal life
Bedrock
(D horizon)

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 18µA
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 18µA
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

Power Grid & Industrial

Underground Earth Ground fault detector

Multifunctional RTUs

4-20mA, 0-20mA, 0-10V, 0-1V sensors

Current Transformers

Fault passage indicators

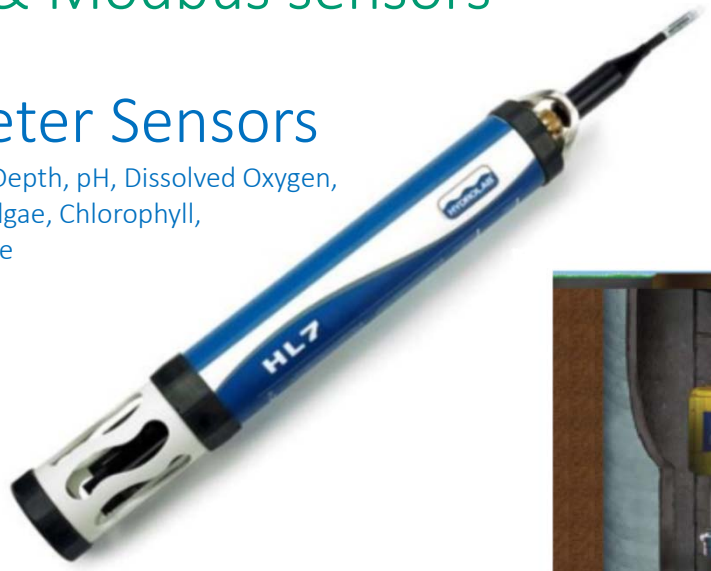
Sensors

Water application SDI12 & Modbus sensors

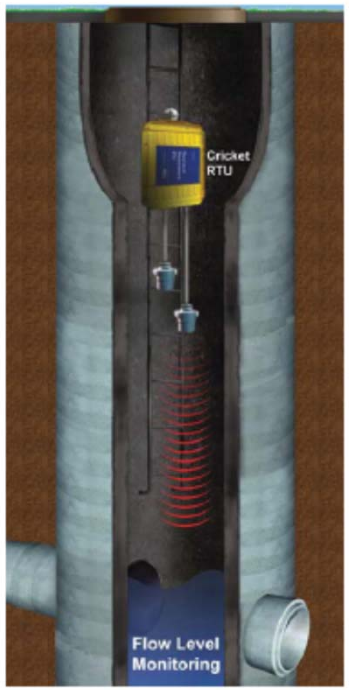
Submersible water level sensors

Multiparameter Sensors

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



Water velocity



Sewer level

Sensors

Water application SDI12 & Modbus sensors

Ultrasonic water level

PH

Sensors

Environmental SDI12 & Modbus sensors

All in one weather stations

Ambient
Humidity & Temperature

Gas Sensors

Sensors

Wind Speed

Sun Radiation

Wind Direction

Sensors

Agriculture sensors

Leaf Wetness

Soil Moisture, Conductivity, Temperature

Soil Moisture

Soil Temperature

Sensors

Structural Engineering SDI12 sensors

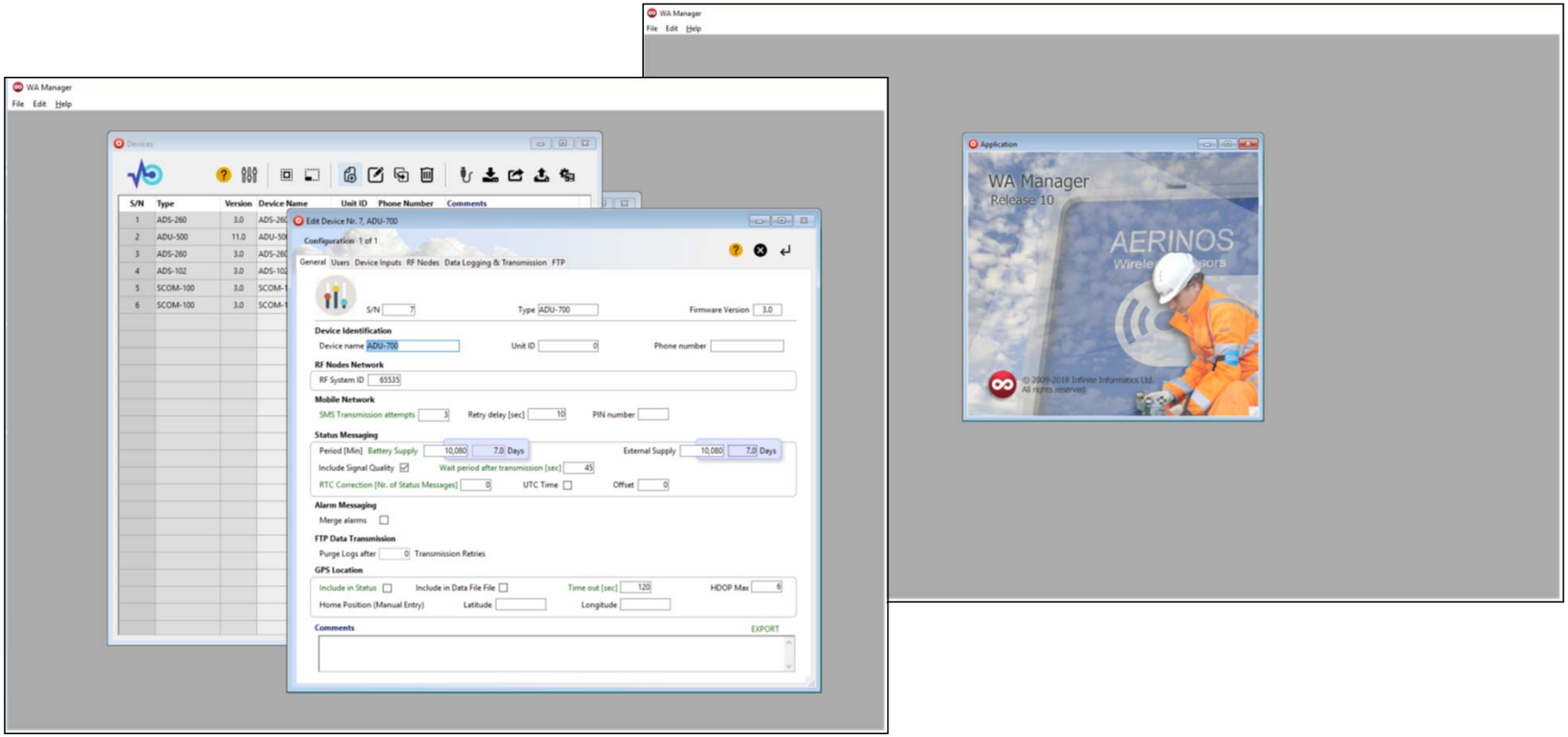
Crack Propagation

Inclination

Critical Structure Monitoring

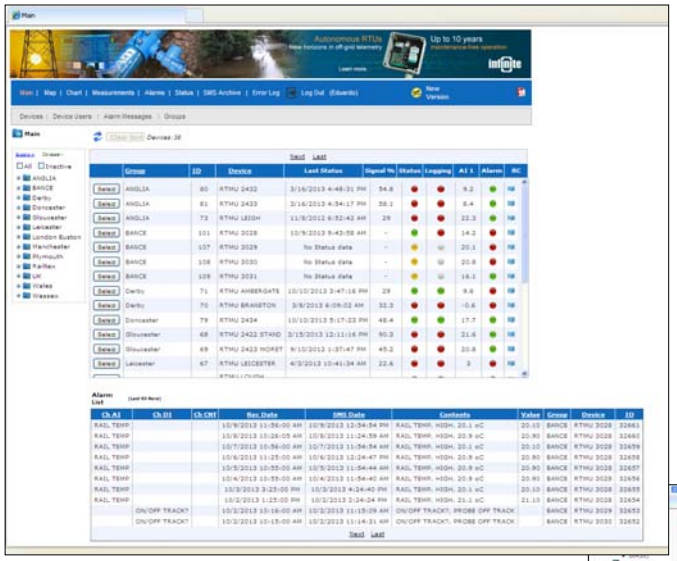
Bridge suspension

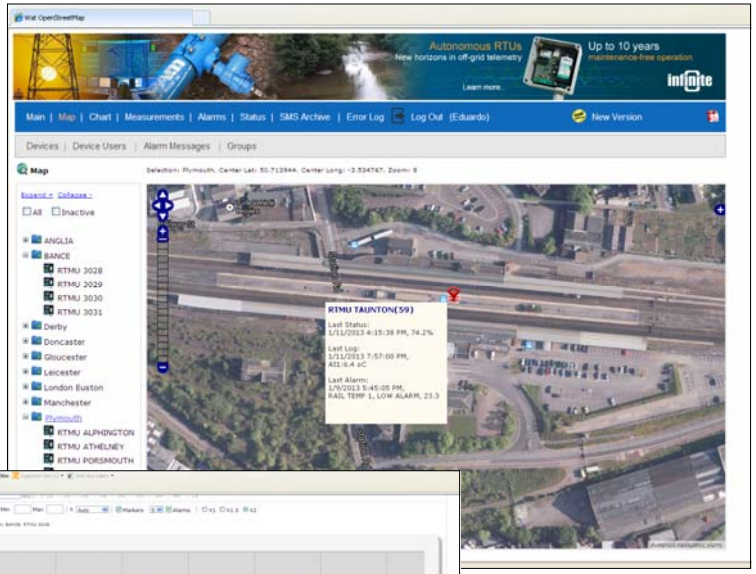
WA Manager – Windows software to configure devices

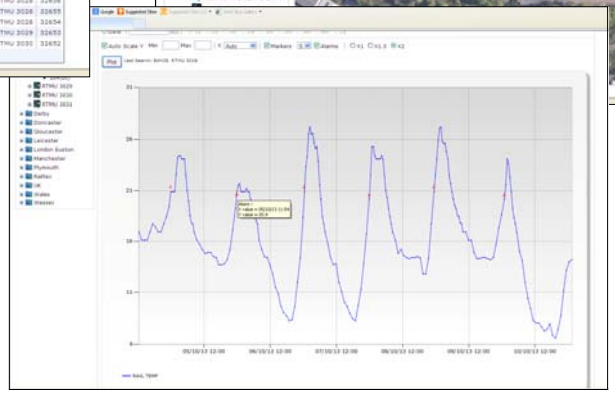


WaT - Web aided Telemetry

Cloud telemetry platform with GIS information







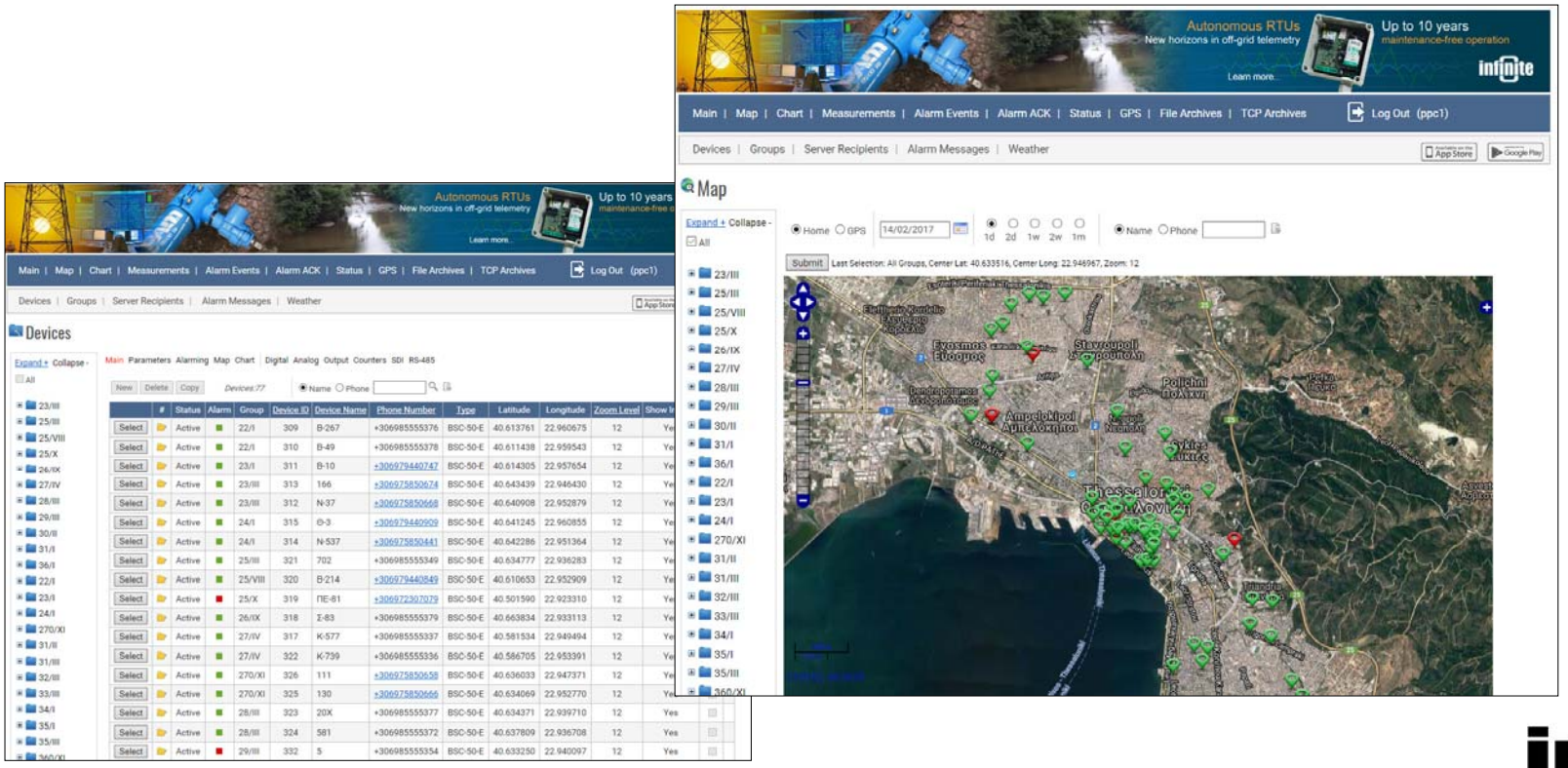
ANDROID APP ON Google play

Download on the App Store

infinite

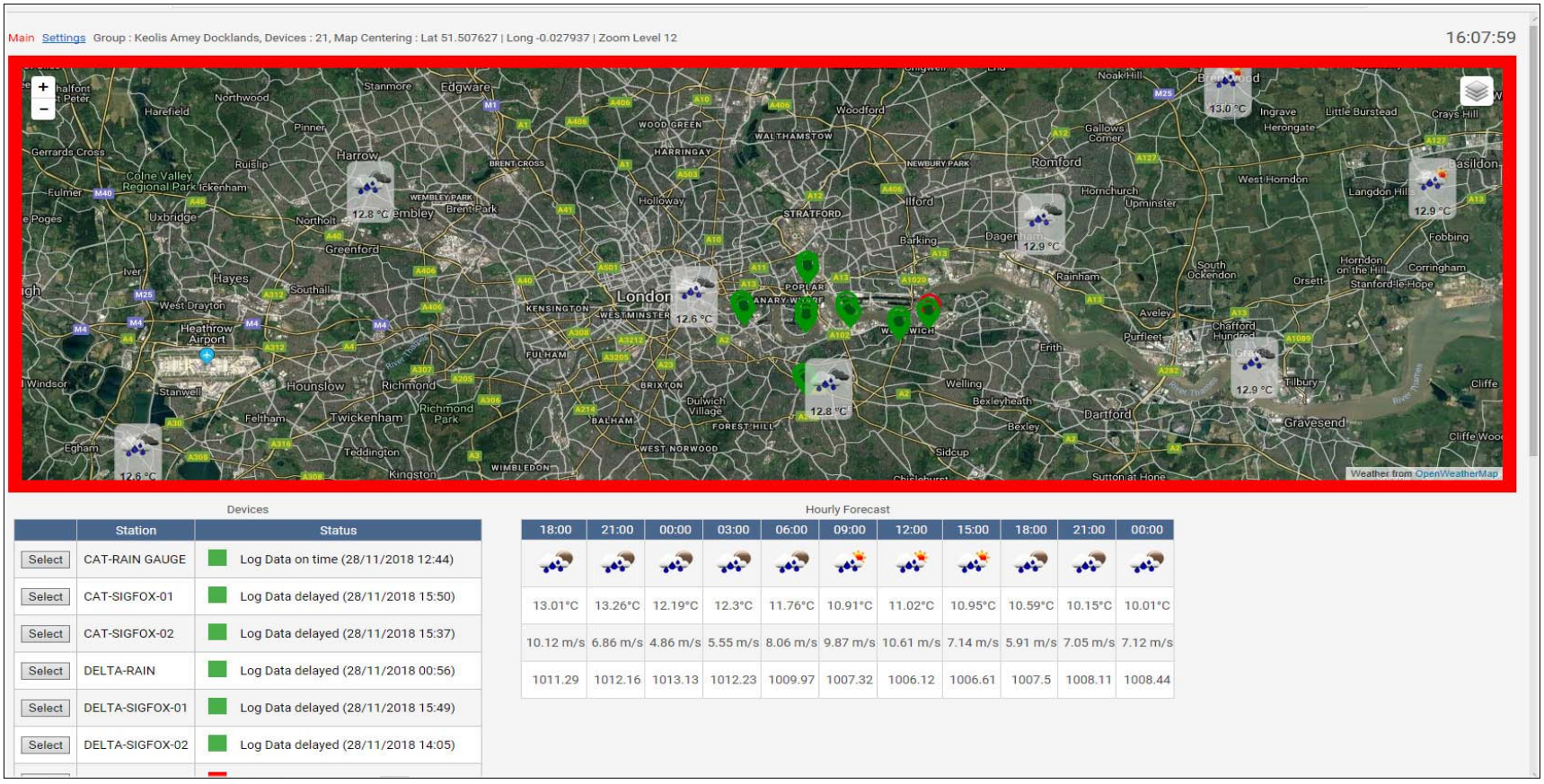
WaT - Web aided Telemetry

Cloud telemetry platform with GIS information



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.