

Autonomous RTUs Power Grid





Internet of Things Networks & Technologies



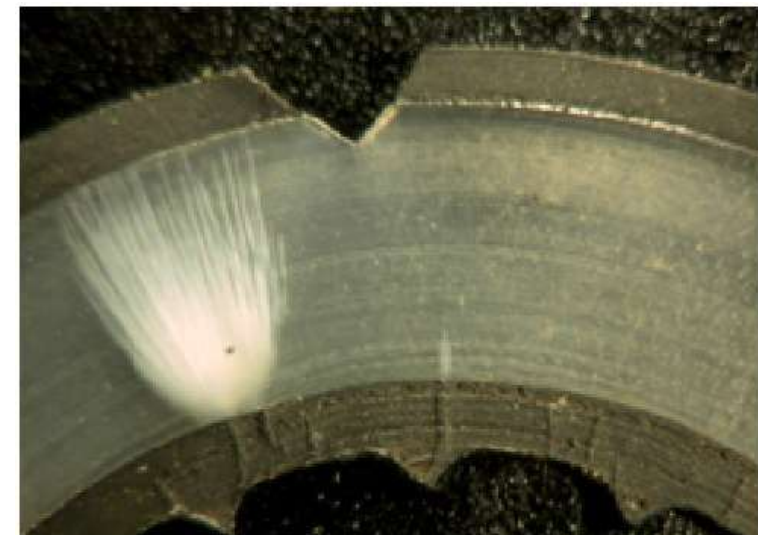
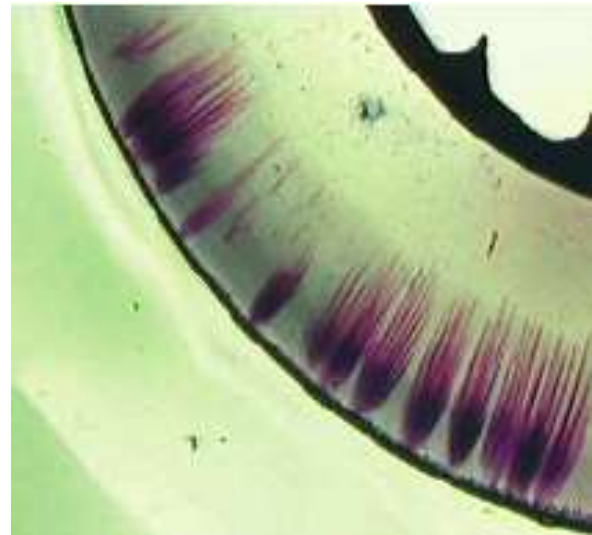
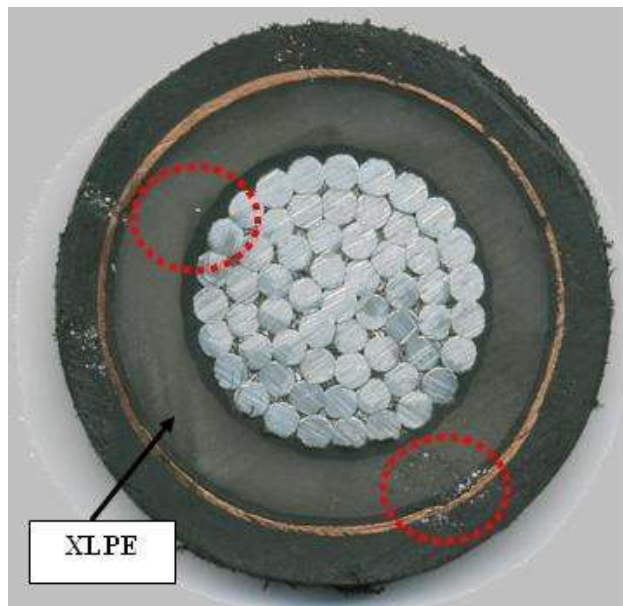
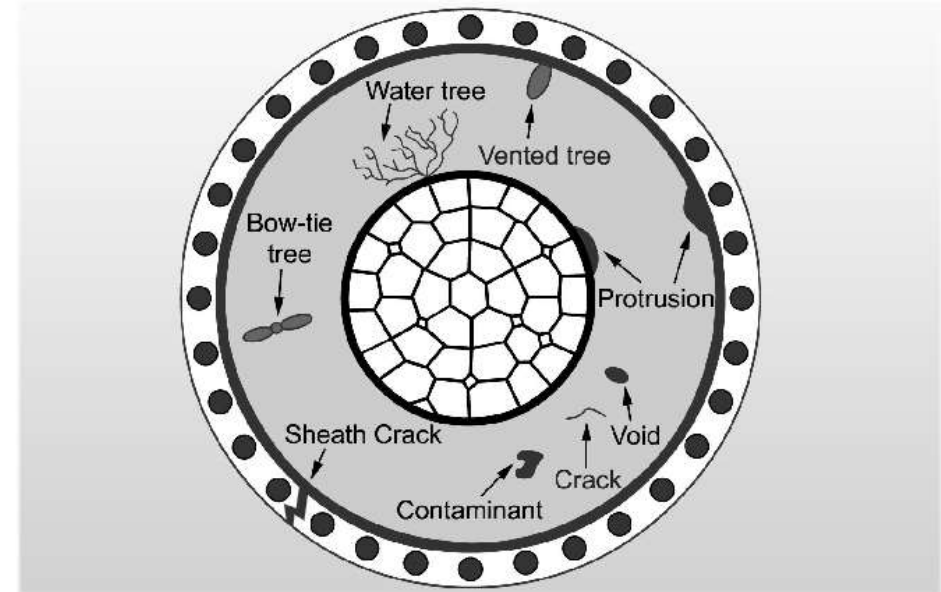
Earth & Current Fault Detection

- Power cables mainly fail because of aging and due to thermal, electrical, mechanical & environmental reasons.
- High temperature, Impulses, bending, vibration, fatigue, water, humidity, chemicals are the factors of failure.
- The most often mechanisms are corrosion, cracking, treeing, etc.

Power Cable Failures

Corrosion
&
Impurities

Treeing





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

Itron



Earth Fault Indicators (EFIs) & Current Fault Indicators (CFIs) detect earth & short circuit faults on underground cables

Each EFI unit has a core-balanced sensor which is fixed around the three phases of the cable. Units that detect a current imbalance due to an earth fault will trip and indicate by either bright LED or a mechanical flag.

CFI units have Phase-Phase short-circuit detection using extra CTs connected around individual phase conductors.

EFIs & CFIs help to quickly identify in which section of the network an earth fault is located, once the network has been tripped by the upstream protection.

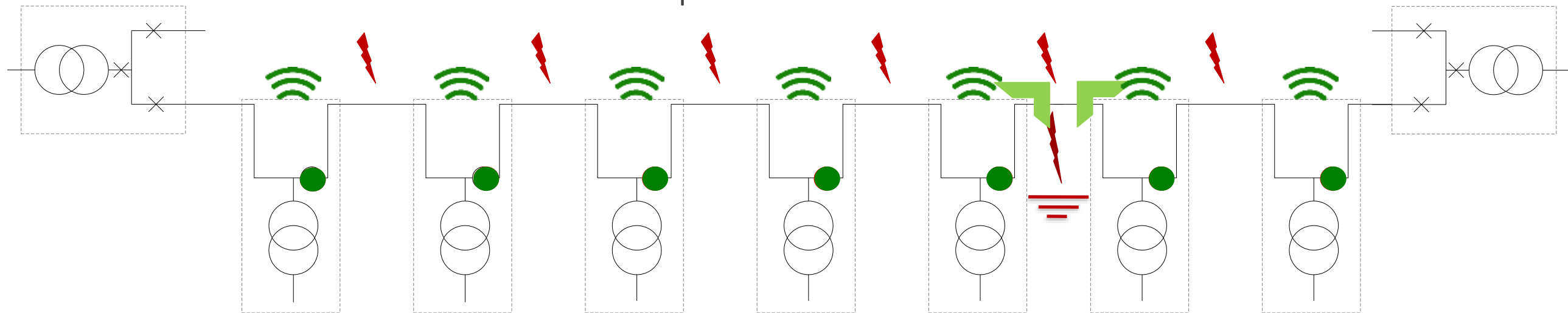
A connected IoT device can transmit the fault indication to a central SCADA system.

IoT connected MV/LV substations Fault Detection



Fault location identified
Restored power to all consumers

HV/MV Substation



HV/MV Substation

SAIFI Improvement

Reduced number of short circuits required to identify the location of the fault.

Reduced stress of network elements (cables & switchgear).

Increased lifetime of switching equipment & cables.

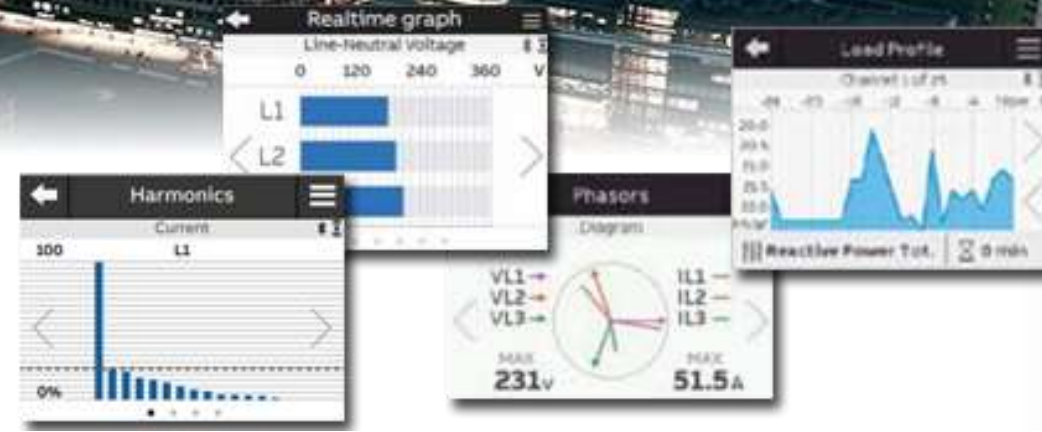
Reduction in infrastructure investments.

SAIDI & CAIDI Improvement

Reduction in the time required to restore power for consumers

Reduction in maintenance crew costs

Energy the Lifeblood of Smart Cities



Network Power Analyzers

- Network analyzers offer real time supervision, improve operations and efficiency.
- Monitor power and detect power anomalies eliminating the need for dedicated expensive instrumentation.
- Significant reduction of the CAIDI and SAIDI reliability indicators
- Seamless connection to SCADA via OPC server



IoT Autonomous devices

ADS-410, Itron IoT wireless end node

Autonomous IOT unit to connect any sensor for telemetry applications. The unit sends data to the cloud using the Itron Network.

It incorporates the Milli 5 embedded wireless communication module for connection to this network. The unit is battery powered for autonomous operation.

The purpose of the device is to connect multiple sensors from any vendor such as analogue (0-20mA, 0-1V), SDI12, RS485 Modbus, measure and transmit the data over the Itron network.

The ADS-410 can also power the sensors with up to 250mA@12VDC using its 3.6V lithium battery.

All telemetry applications can be realized with the ADS-410.

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

Battery lifetime

ADS-410 RTU/Itron powered by one 3.6V, 13Ah lithium-thionyl battery

Excitation @12V [mA]	Sample/Send rate [S/hour]	Sampling delay [sec]	Battery life [Years]
1	4	1	6.9
1	12	1	4.7
1	30	1	2.7
25	6	1	2.6
25	30	1	1
5	4	1	6.2
5	6	1	5.4
5	30	1	2.1
25	4	5	1.8
50	4	5	1
100	4	5	0.5



DISTRIBUTECH[®]
CONFERENCE & EXHIBITION

USA/New Orleans 2019

#DTECH\Gen 5 SN



**Gen 5
Sensor Node**

IoT Autonomous devices

ADS-300, NBIoT/LTE-M RTU

Autonomous IOT unit to connect any sensor for telemetry applications. The unit sends data to the cloud using the NBIoT or LTE-M Network.

It incorporates an embedded wireless communication module made by Sierra Wireless for connection to the LTE network. The unit is battery powered for autonomous operation.

The purpose of the device is to connect multiple sensors from any vendor such as analogue (0-20mA, 0-1V), SDI12, RS485 Modbus, measure and transmit the data over mobile network.

The ADS-300 can also power the sensors with up to 250mA@12VDC using its 3.6V lithium battery.

All telemetry applications can be realized with the ADS-300.

IoT Autonomous devices

ADS-300, NB-IoT/LTE-M RTU



Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 18 μ 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:	Sierra Wireless NBloT, LTE-Cat M1
Antenna	internal or external
Messages:	MQTT Data/Alarm, remote configuration
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



Earth Ground Fault alarming



Substations & Transformers



Multifunctional RTUs, PLCs



Current Transformers



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



Fault passage indicators

IoT Autonomous devices

ADS-460, Streetlight stray voltage monitoring

IOT unit to monitor fault conditions street lights. The unit sends data to the cloud using the Itron Network.

It incorporates the Milli 5 embedded wireless communication module for connection to this network. The unit is battery powered for autonomous operation.

The purpose of the device is to measure current and voltage on the street light service. Current readings would be made on the street light phase and neutral cables and voltage readings between street light neutral to street light metallic base. The information would be communicated back through an existing Itron AMI network.

The unit includes,

2 split core current transformers per device (Up to 50 amperes 5% accuracy)

1 voltage measurement probe (2 measurements with a 500 ohms shunt resistor and without a shunt resistor up to 120 Vrms, 1% accuracy)

The ADS-460 is built with a very powerful analogue front end. It is the single phase multifunction metering IC AD7953 by Analog Devices which can be used for various power grid applications measuring power quality with true rms measurements.

IoT Autonomous devices

ADS-460, Streetlight stray voltage monitoring



Power supply:	3.6V, 13-18 Ah Lithium Thionyl battery, D-size 5VDC mains or photovoltaic power
Consumption :	Continuous 12 μ A
Discrete inputs:	1x Digital input, 0-30VDC also counter, 1 KHz 1x Analog input, 0-1VDC, 12 bit resolution 2 x Current AC RMS 24bit resolution 1 x Voltage AC RMS 24bit resolution 1 x Voltage AC RMS with burden resistor 24 bit resolution
Transducer excitation	3.6V/250mA
Wireless modem:	Milli 5 Itron Silver Spring networks
Antenna	internal or external
Messages:	Data, Alarm
Temperature:	-40°...+65°C, operating
Dimensions:	79.5 x 125 x 61 mm (with cable gland)
Housing:	IP66, IP68 Nema 4x

The Itron logo, featuring the word 'Itron' in a bold, red, italicized sans-serif font. A stylized orange and yellow lightning bolt or spark symbol is positioned above the letter 'o'.

The conEdison logo, featuring a blue stylized 'E' icon followed by the text 'conEdison' in a blue sans-serif font.

Built in single phase multifunction metering IC AD7953 by Analog Devices can be used for various power grid applications

Battery lifetime

ADS-460 RTU Streetlight stray voltage monitoring powered by one 3.6V, 13Ah lithium-thionyl battery

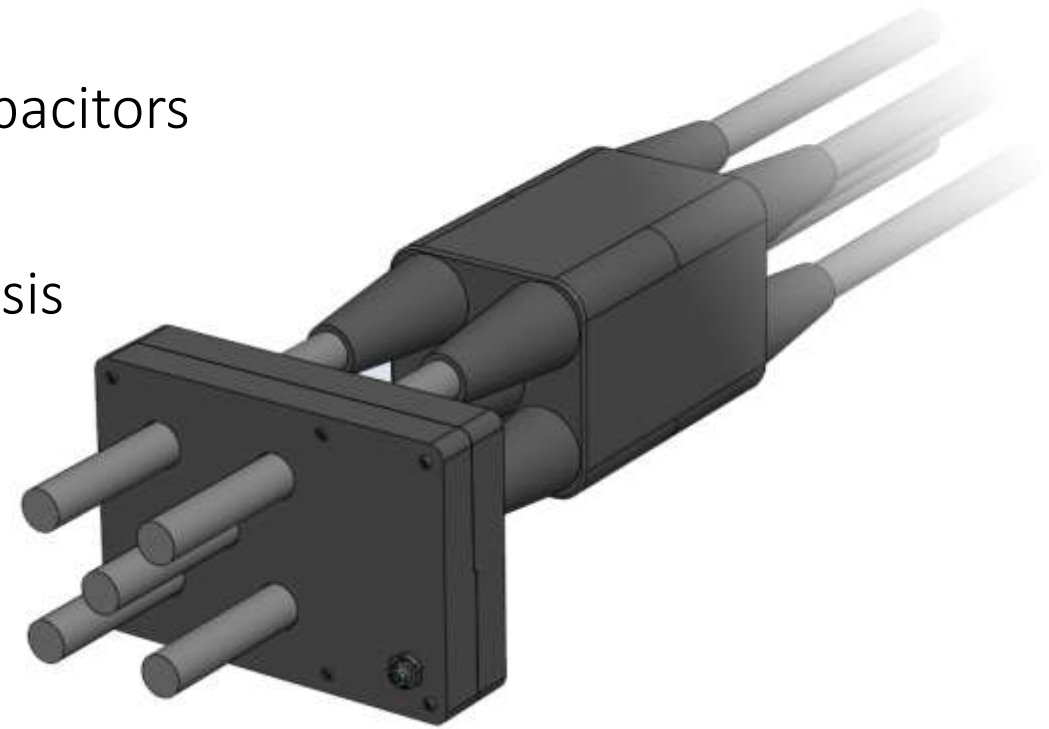
Excitation @12V [mA]	Sample/Send rate [S/hour]	Sampling delay [sec]	Battery life [Years]
1	2	2	>10
1	4	2	8.2
1	6	2	6.5
1	12	2	3.7
1	60	2	0.9
5	2	2	>10
5	4	2	7.8
25	4	2	6.3
50	4	2	5.1



IoT Autonomous devices

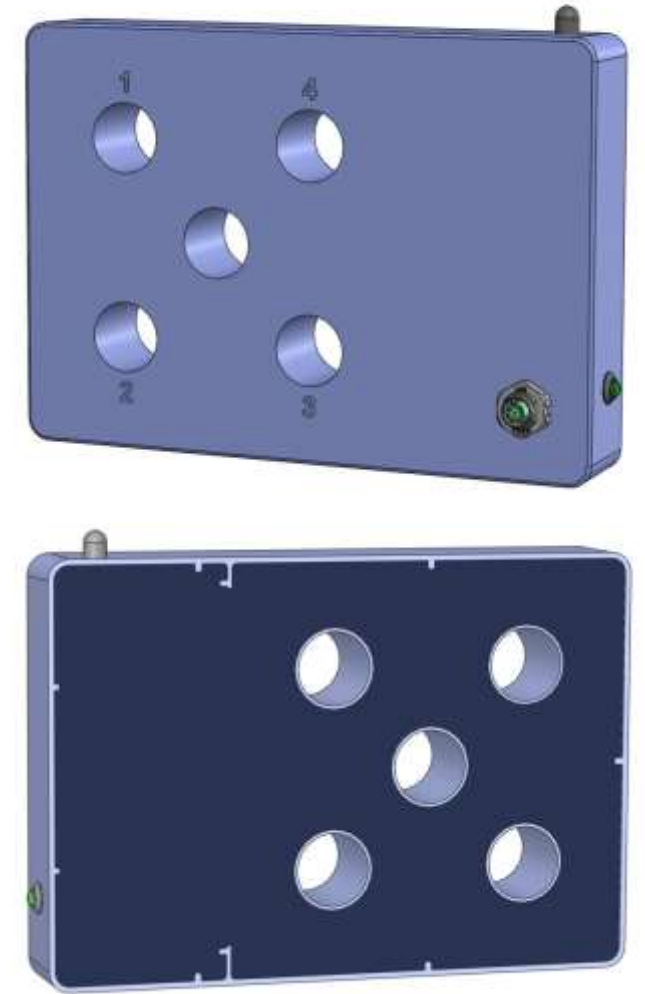
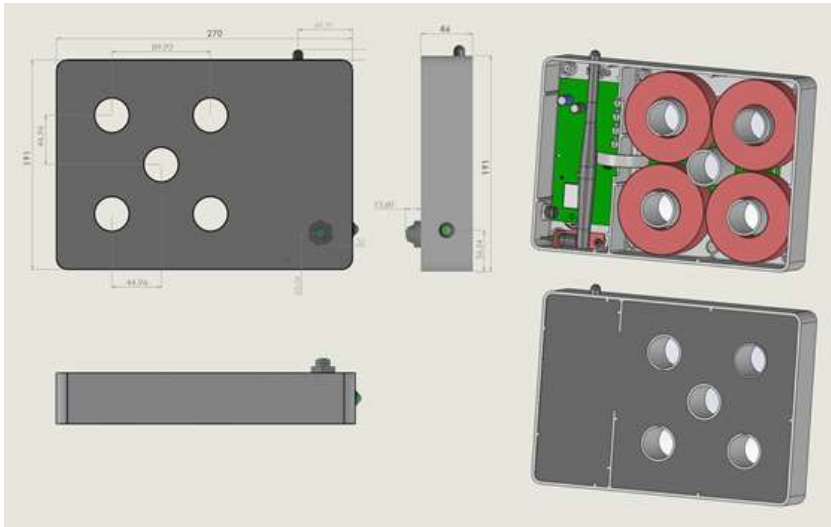
ADS-470, Cable Crab Monitor

- Autonomous RTU measuring underground powerlines (current, direction, temperature)
4x1000A CTs, 4 x Temperature sensors
- Powered using built in power harvesting with Supercapacitors
- Itron Gen5 Network embedded MILLI5 module
- Designed and manufactured exclusively on an OEM basis for a major clients

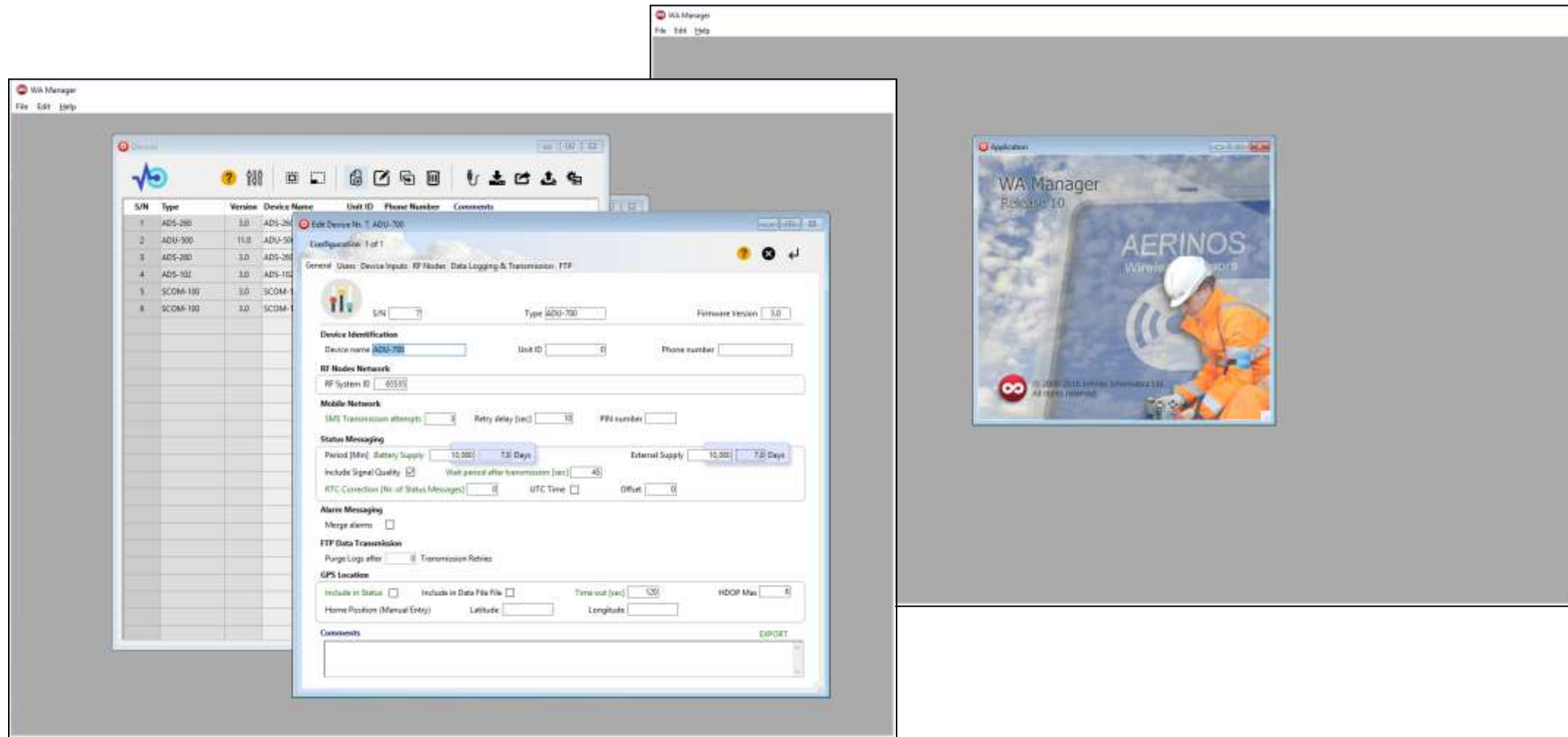


IoT Autonomous devices

ADS-470, Cable Crab Monitor



WA Manager – Windows software to configure devices

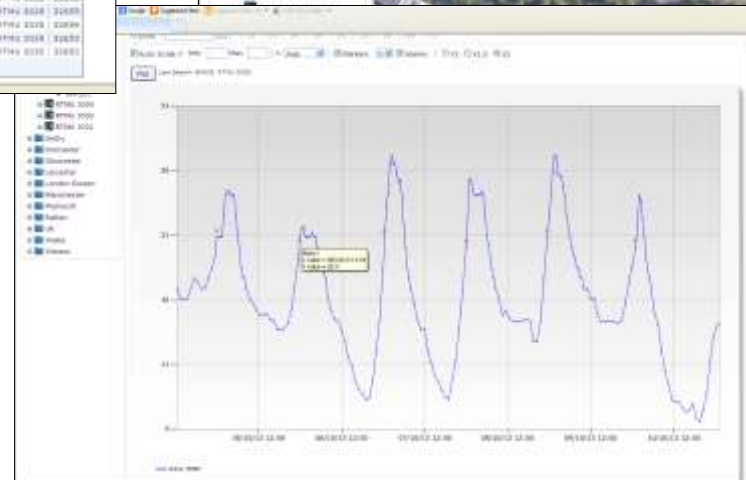


WaT - Web aided Telemetry

Cloud telemetry platform with GIS information

The screenshot displays the main dashboard of the WaT web interface. At the top, there is a navigation bar with options like 'Map', 'Chart', 'Measurements', 'Alarms', 'Status', 'SMS Archive', and 'Error Log'. Below this, a table lists various RTU devices with columns for Group, ID, Name, Last Status, Signal % (Status), Voltage, and Alarm. The table contains several rows of data, including entries for 'HULL', 'DART', 'DORCHESTER', 'LONDON', 'MANCHESTER', 'MILNORTH', 'PARKER', 'PITTS', and 'WISBECH'. Each row has a corresponding status icon (green, yellow, or red) and a small 'Alarm' indicator.

This screenshot shows the 'Map' view of the WaT interface. It features a satellite-style map with a red location pin. A pop-up window provides details for the selected RTU, 'RTU TALTON(59)'. The details include the location name, coordinates (Lat: 52.0131, Lon: -0.1019), and a 'Last Alarm' timestamp: '1/20/2013 4:05:59 PM, AL1-H-4 KC'. A legend on the left side of the map lists various locations such as 'ANGLIA', 'DANCE', 'DART', 'DORCHESTER', 'GLOUCESTER', 'LONDON', 'MANCHESTER', 'MILNORTH', 'PARKER', 'PITTS', and 'WISBECH'. The map also shows a scale bar and navigation controls.



WaT - Web aided Telemetry

Cloud telemetry platform with GIS information

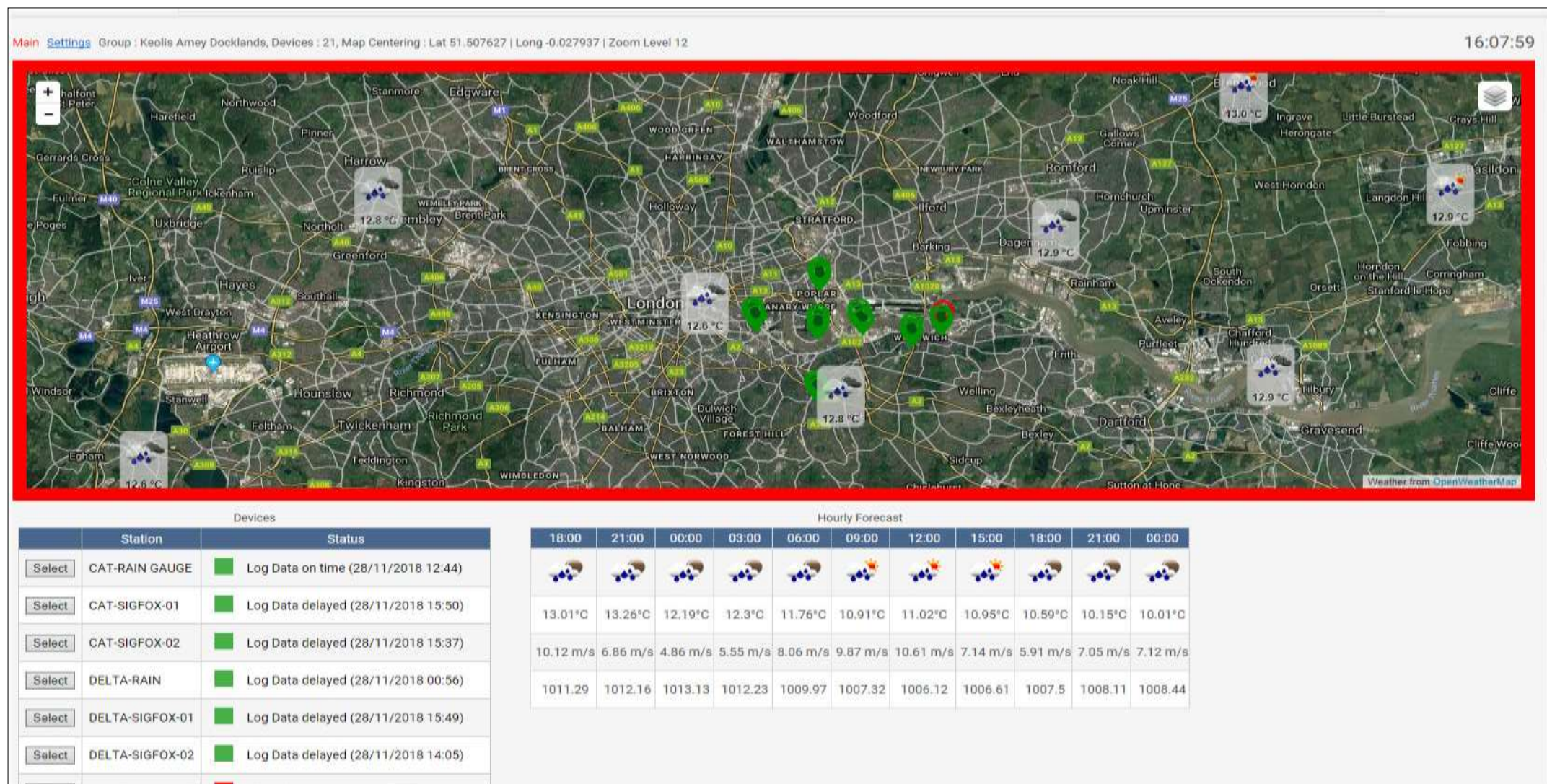
The screenshot displays the WaT web interface. At the top, there is a navigation menu with options: Main, Map, Chart, Measurements, Alarm Events, Alarm ACK, Status, GPS, File Archives, TCP Archives, and Log Out (ppc1). Below the navigation, there are tabs for Devices, Groups, Server Recipients, Alarm Messages, and Weather. The main content area is divided into two sections. On the left, there is a 'Devices' table with columns for Status, Alarm, Group, Device ID, Device Name, Phone Number, Type, Latitude, Longitude, Zoom Level, and Show. The table lists various devices with their respective details. On the right, there is a 'Map' section showing a satellite view of a city area with numerous green location markers. The map includes a search bar, a date selector (14/02/2017), and a zoom level indicator (12).

#	Status	Alarm	Group	Device ID	Device Name	Phone Number	Type	Latitude	Longitude	Zoom Level	Show
23/III	Select	Active	22/I	309	B-267	+306985555376	BSC 50-E	40.613761	22.960975	12	Yes
23/VIII	Select	Active	22/I	310	B-49	+306985555378	BSC 50-E	40.611438	22.959543	12	Yes
25/X	Select	Active	23/I	311	B-10	+306973440747	BSC 50-E	40.614325	22.957654	12	Yes
26/IX	Select	Active	23/II	313	B-6	+306973850974	BSC 50-E	40.643439	22.940430	12	Yes
27/IV	Select	Active	23/III	312	B-37	+306973850966	BSC 50-E	40.640999	22.952979	12	Yes
28/II	Select	Active	24/I	315	B-3	+306973440998	BSC 50-E	40.641245	22.960355	12	Yes
29/III	Select	Active	24/I	314	B-537	+306973850841	BSC 50-E	40.642286	22.951384	12	Yes
30/II	Select	Active	25/II	321	702	+306985555349	BSC 50-E	40.634777	22.956283	12	Yes
31/I	Select	Active	25/VIII	320	B-214	+306973440849	BSC 50-E	40.610853	22.952969	12	Yes
36/I	Select	Active	25-X	319	7E-61	+306973307073	BSC 50-E	40.501980	22.823310	12	Yes
22/I	Select	Active	26/IX	318	F-83	+306985555379	BSC 50-E	40.663834	22.931113	12	Yes
23/I	Select	Active	27/IV	317	K-577	+306985555337	BSC 50-E	40.501334	22.949484	12	Yes
24/I	Select	Active	27/IV	322	K-709	+306985555338	BSC 50-E	40.586728	22.933391	12	Yes
270/XI	Select	Active	270/XI	326	111	+306973850618	BSC 50-E	40.639023	22.947371	12	Yes
31/II	Select	Active	270/XI	325	130	+306973850618	BSC 50-E	40.634864	22.952770	12	Yes
31/III	Select	Active	28/II	323	20X	+306985555377	BSC 50-E	40.634771	22.939710	12	Yes
32/III	Select	Active	28/II	324	381	+306985555372	BSC 50-E	40.637809	22.936738	12	Yes
33/III	Select	Active	28/II	332	5	+306985555354	BSC 50-E	40.632250	22.940037	12	Yes



WaTEye - Web aided Telemetry Eye dashboard

Online dashboard with live weather and telemetry data

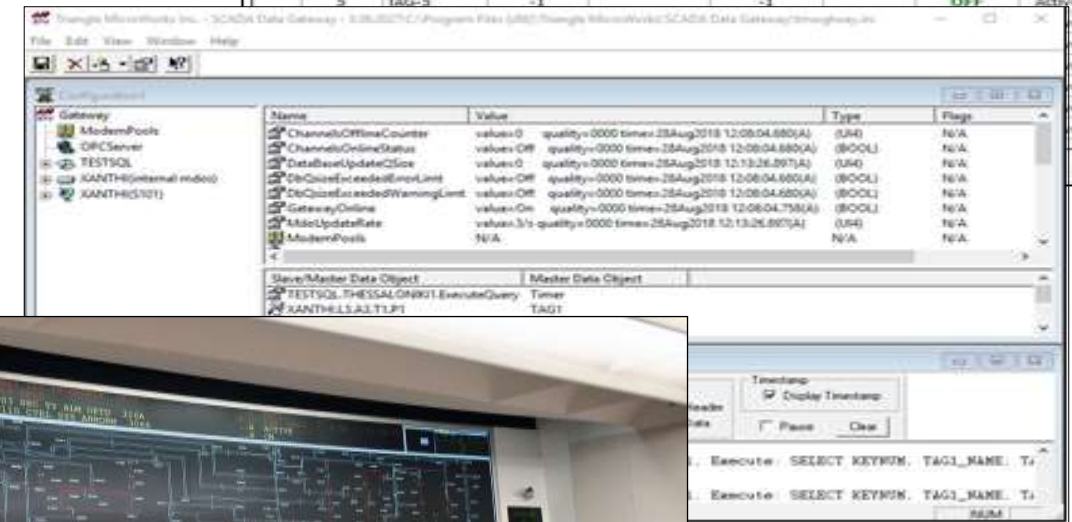
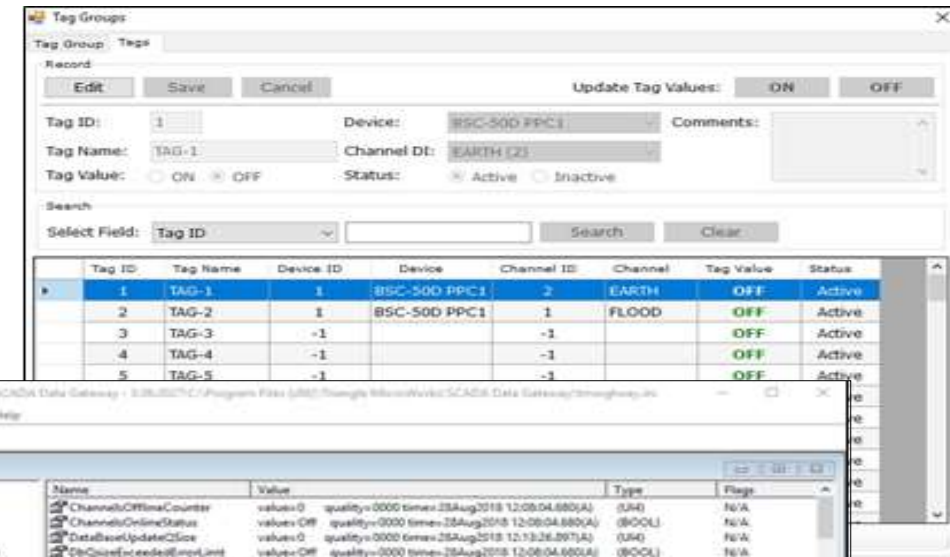


MSG – Multiprotocol Scada Gateway

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

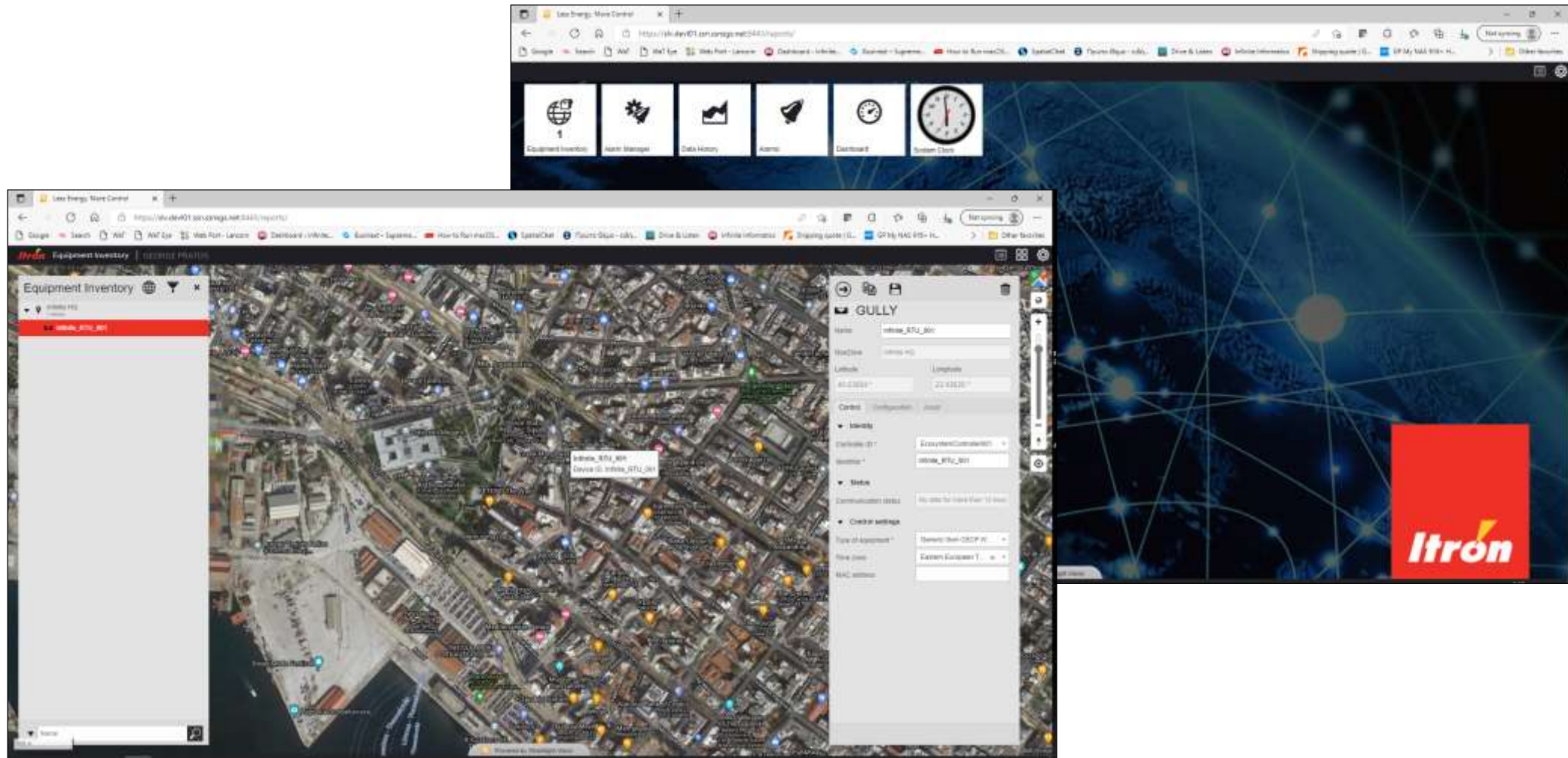
- DNP3 Secure Authentication v5 (SAv5)
- IEC 60870-5-101, 102,103
- IEC 60870-5-104
- IEC 60870-5 Secure Authentication for -101 and -104
- OPC Data Access
- OPC XML Data Access
- OPC Alarms & Events
- IEC 61850
- IEC 60870-6
- Modbus

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



Itron SLV- Streetlight Vision

SLV cloud platform integration

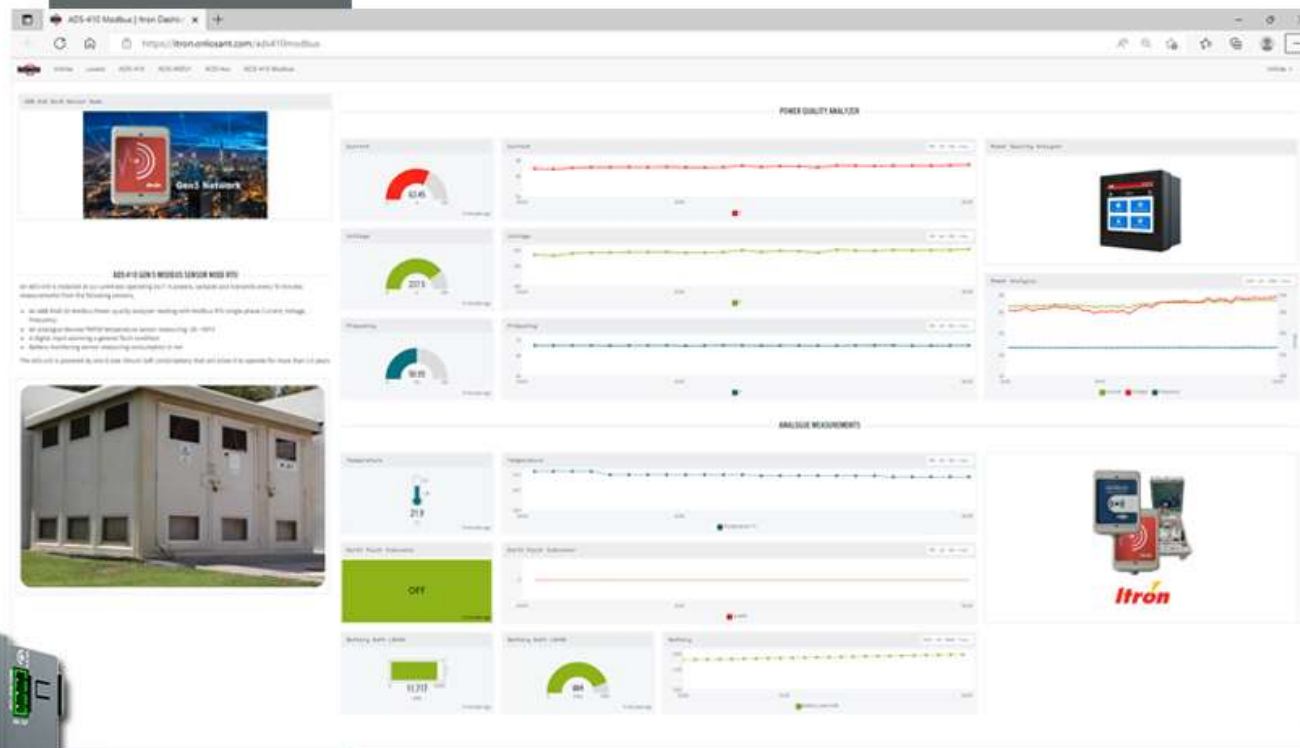


Losant - Cloud Telemetry



Itron

Live @Losant: ADS-410 connected to an ABB M4M Network Analyzer



Login:

<https://itron.onlosant.com>

User: guest@infinite.com.gr

Pass: infiniteitron





Case Study City of New York



Featuring Infinite's **ADS-460** (Gen5) Streetlight stray voltage monitor for stray voltage detection measuring 2 split core CTs 0-100A, 120VAC and ambient temperature. The ADS-460 is designed to be used in a vast range of power quality applications featuring a dedicated power metering processor.



Data are sent directly to the Itron network of Coned using the existing city wide mesh network of power meters as access points.

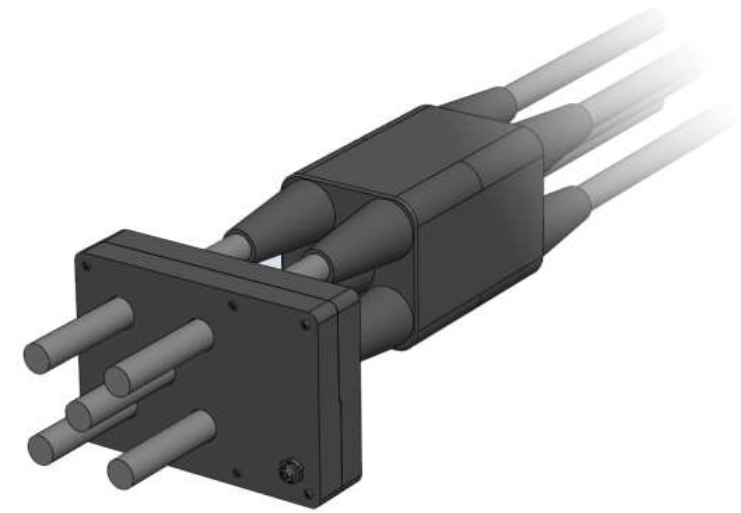


Case Study City of New York

Featuring Infinite's **ADS-470** (Gen5) Cable Crab monitor. A pilot project was deployed for underground powerline monitoring. The ADS-470 is powered using power harvesting and super capacitors. The device is designed with military specifications and it is potted in epoxy allowing to operate fully submerged in to water.

It measures non contact, current, voltage/direction and temperature using 4x1000A CTs, 4 x Temperature sensors.

Data are sent directly to the Itron network of Coned using the existing city wide mesh network of power meters as access points.





Case Study Smart City - Xanthi Greece

<https://www.youtube.com/watch?v=0-muFxbtbnQ>

Featuring Infinite's BSC-50D RTU 4G LTE for earth fault alarming, MSG – Multiprotocol SCADA Gateway offering connectivity to Siemens & EFASEC SCADA systems using the IEC-6870-5-104 protocol.

Following the successful installation at Xanthi, Infinite was awarded a project for 2000 devices as a first stage deployment for the entire country.