NACE® INTERNATIONAL JUBAIL SAUDI ARABIA SECTION

A Further Step into Digitizing CP Monitoring and Control Process

AMPP™ sogec Specialized Oil & Gas Engineering Co. Ltd.

A Further Step into Digitizing CP Monitoring and Control Process

Introduction

- Cathodic protection (CP) systems are fundamental to Owners integrity management and are widely used on plants, transmission and distribution structures in the gas, petrochemical and water sectors. To comply with regulatory safety standards, routine measurements of CP levels are required. Manual measurements, apart from their high cost, can only indicate problems after they have occurred, which can result in the pipeline being unprotected until the fault is discovered.
- Remote monitoring of CP is a new development that automates the data collection process and provides operators with a proactive surveillance system

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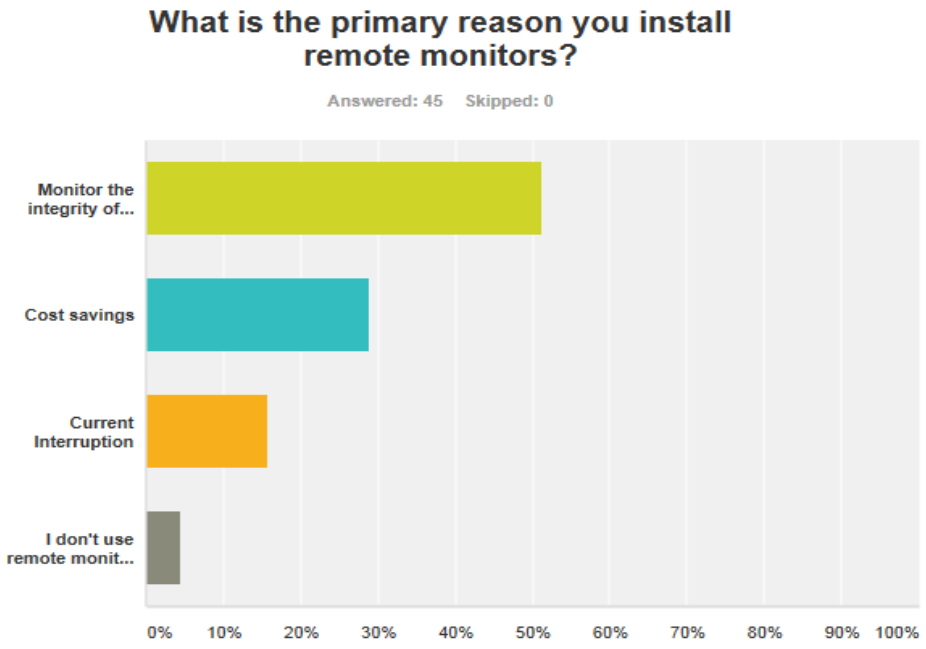
Why We Install Remote Monitoring

- Accurate Data collection and da
- According to a study done by Er of AMPP Technical meetings , A reduced up to 27% if Remote m
- To control the current interrupti
- To spare more time in analyzing
- To reduce hand filled reports

Q1



Answer Choices	Responses	
Monitor the integrity of the CP system	51.11%	23
Cost savings	28.89%	13
Current Interruption	15.56%	7
I don't use remote monitors in my area	4.44%	2
Total		45

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On Site Inspection VS Remote Monitoring Inspection

On site Inspection (Pros)

- On site visual Monitoring
- Routine Cleaning & Maintenance
- Repairs can be done while on site.

Remote Monitoring Inspection(Pros)

- Reduces risk:
  - Driving to remote sites
  - Unsafe areas
  - Weather extremes
- Redirects time:
  - Reduces the process time to collect data
  - Allows more time to analyze data
  - Reduces the need for third party data collection (O&M, Contractor)
- Data accuracy:
  - Redundant storage
  - Manual data entry can be eliminated
- 24/7 Monitoring for the integrity of the CP System
- An alarm is sent when output parameters are not met or exceeded
- The data is readily available to the Technician
- Multiple current sources can be interrupted from the website
- Reduces the inventory of portable interrupters
- Reduces the windshield time to deploy interrupters

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On Site Inspection VS Remote Monitoring Inspection

On site Inspection (Cons)

- The current source can be off between visits
- Time and Travel required for periodic inspections
- Multiple site visits to set portable interrupters

Remote Monitoring Inspection(Cons)

- The initial cost of the equipment
- The maintenance or repair of additional equipment at a remote site
- Site visits to investigate alarms

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Types Of Remote Monitoring

We have Three types OF Remote Monitoring

- Transformer Rectifier Remote monitoring

- Test Station Remote Monitoring

- Test Station Data Handheld Data logger

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Remote Monitoring Device Specification

- A min 5 measurement channels (Programmable)
- Hybrid protection board protects each channel. It is a hybrid protection combination of TVS and GDT.
- The RMU is equipped with an integrated switch to control the connection between the coupon and the pipe.
- Remote communication is achieved through an integrated 2G/3G/4G modem or a satellite Or Ethernet/SCADA.
- No rechargeable battery pack;
  A rechargeable pack with solar box, solar panel or AC mains.

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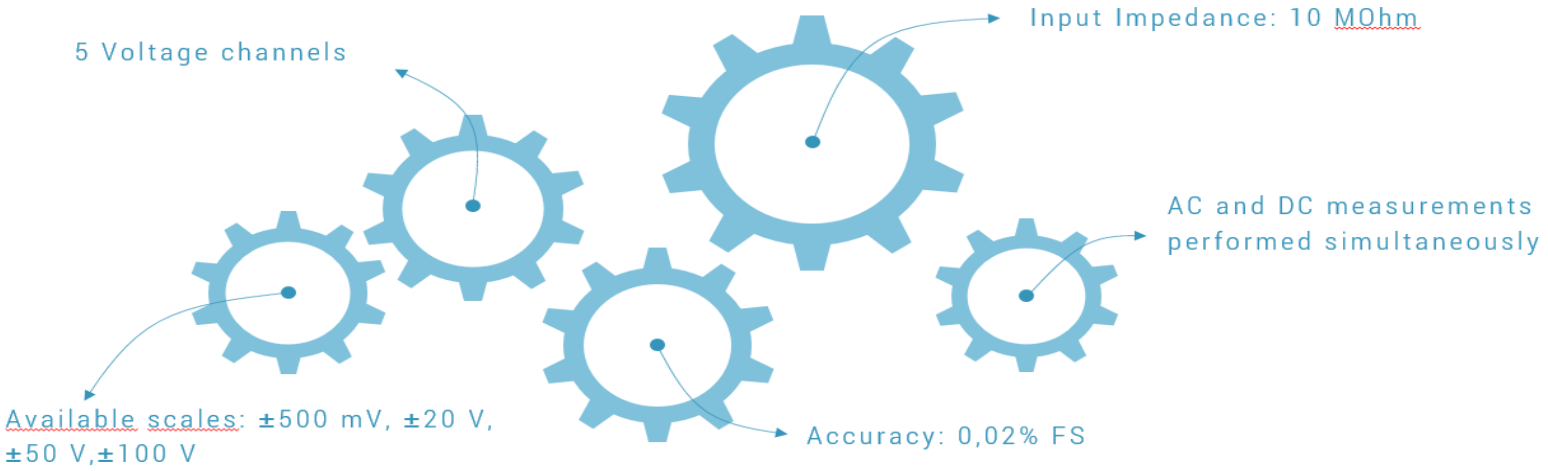
Transformer Rectifier Remote Monitoring Device Specification



CH1	CH2	CH3	CH4	CH5
TR Voltage	TR Current	On Potential	Off Potential	AC Status
Scale (0-100V)	0-500 mV	-/+ 20 V	-/+ 20 V	Digital

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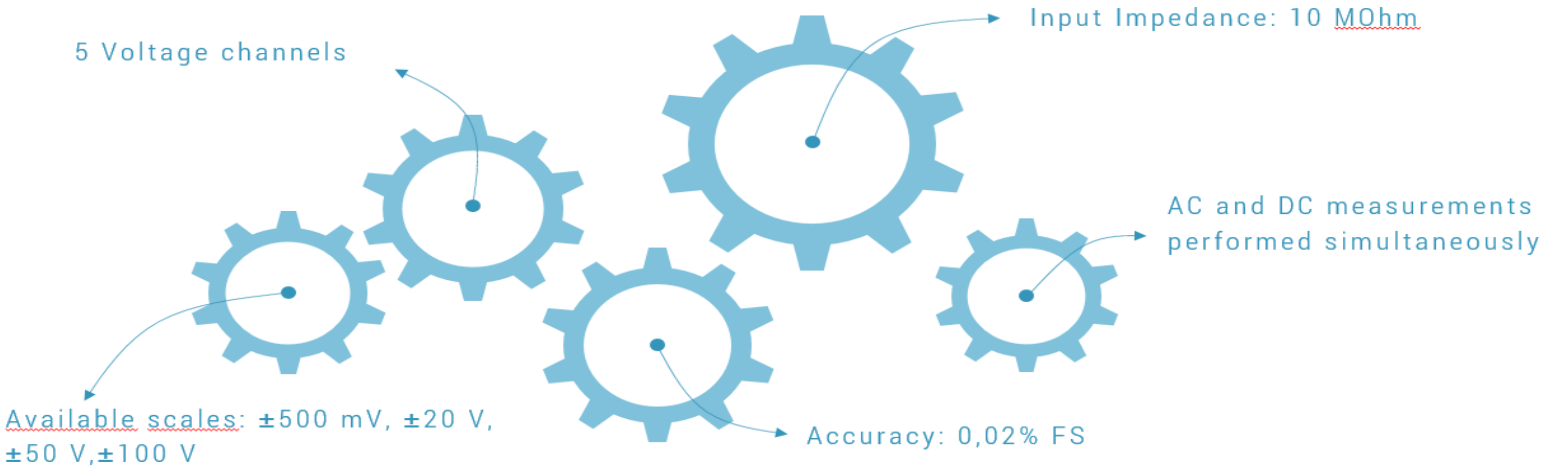
Test Station Remote Monitoring Device Specification



CH1	CH2	CH3	CH4	CH5
On Potential	Off Potential	On Potential	Off Potential	Current
-/+ 20 V	-/+ 20 V	-/+ 20 V	-/+ 20 V	0-500mV

CH1	CH2	CH3	CH4	CH5
On Potential	Off Potential	On Potential	Current	Current
-/+ 20 V	-/+ 20 V	-/+ 20 V	0-500mV	0-500mV

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Handheld Data Logger Monitoring Device Specification

- 2 measurement channels.
- Hybrid protection board protects each channel
- Battery Powered
- Bluetooth Connectivity

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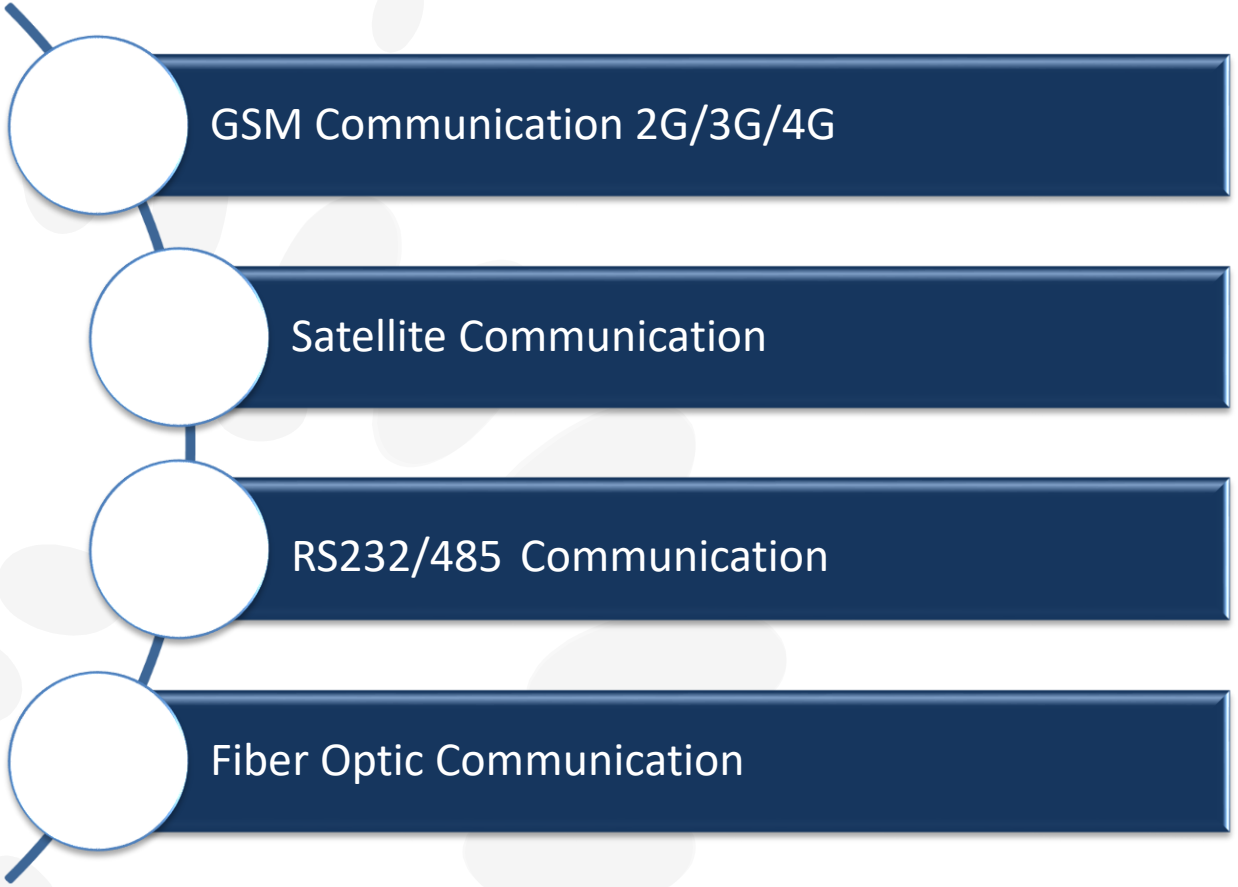
Remote Monitoring Communication



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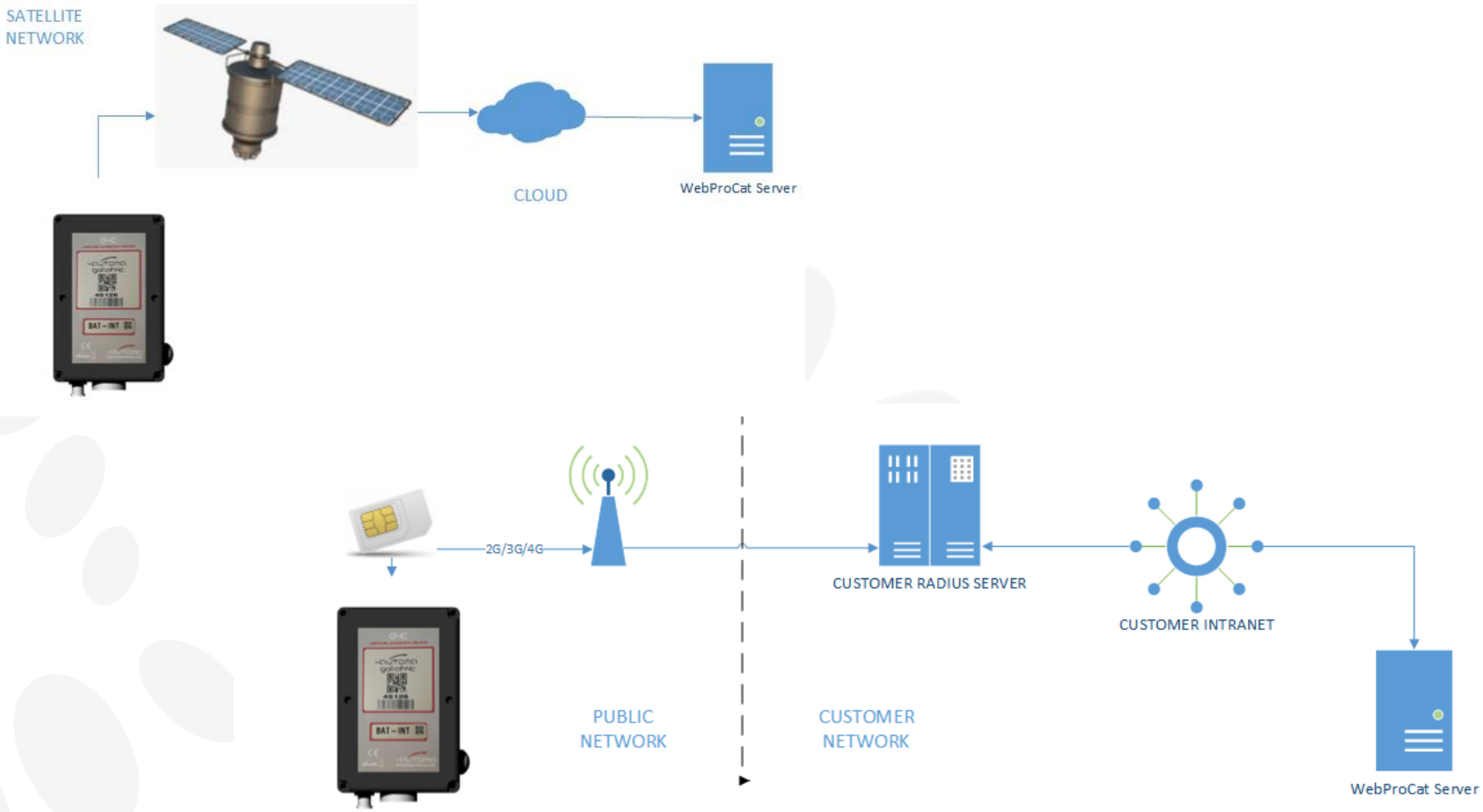
Remote Monitoring Communication



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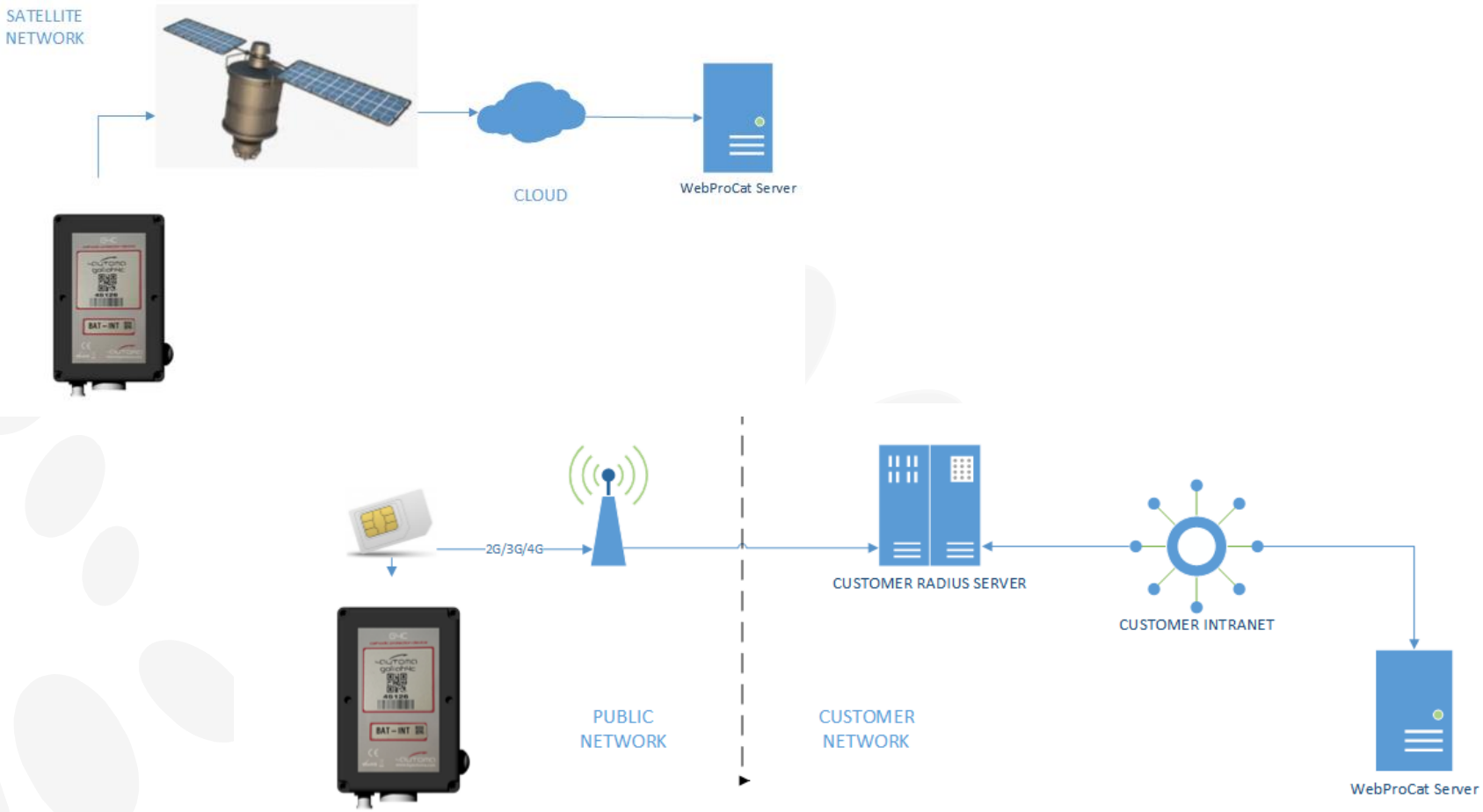
Remote Monitoring Communication



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Remote Monitoring Operation

MEASUREMENT FREQUENCY:

- 1 measure per second (standard operation);
- 20 measures per second (on demand).

MEASUREMENTS SENT TO SERVER:

- Daily report (standard operation), it means → Calculation of the:
  - Minimum, average, maximum, mode, standard deviation of the 86 400 simples;
  - Number of seconds and times in a day that the measurement exceeds the threshold;
- Intensive measurement: second by second measurement (on demand);
- High frequency measurement: all 20 measurements per second (on demand).

TRANSMISSION FREQUENCY:

- Daily transmission to send the daily report, the requested intensive or high frequency measurements;
- Real time monitor (on demand).

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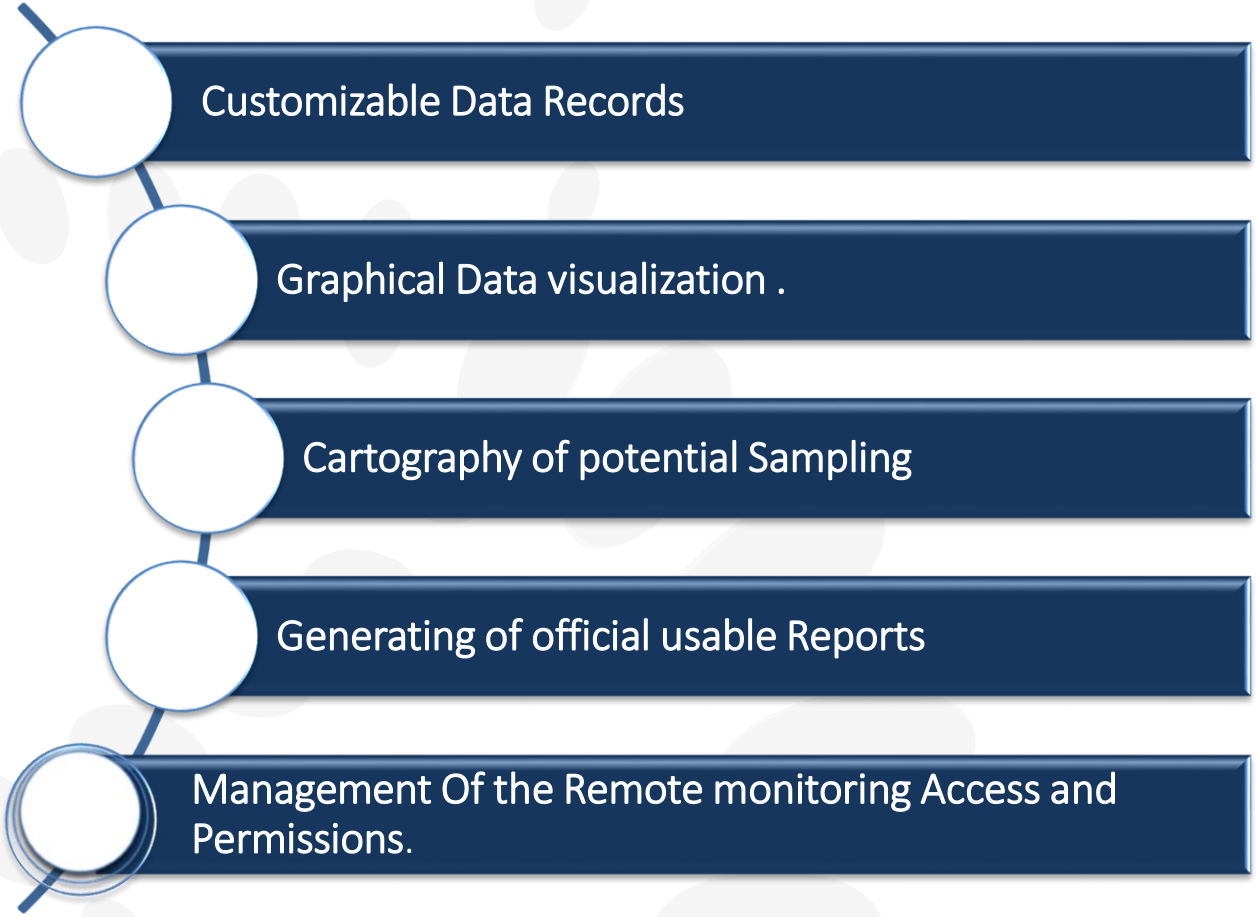
Remote Monitoring Data Server



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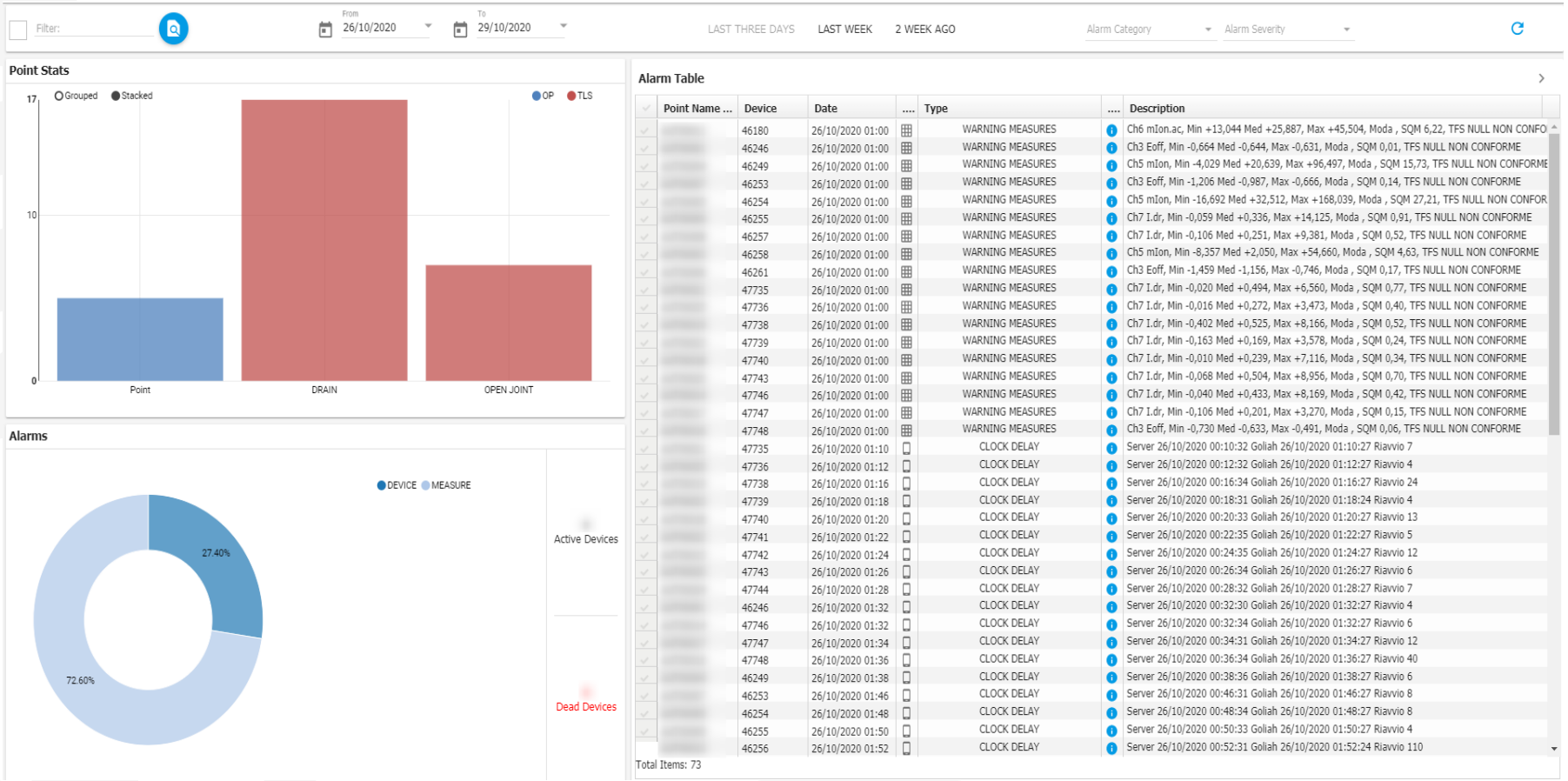
Customizable Data Records



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Measurements & Graphical data visualization

T...	Date	C...	UM	Min	Avg	Max	Mode ...	SQM	V...	TFSMi...	TFSM...	NFSMi...	NFSM...	Sample ...	V...
	Wed, 28/10/2020 0...		Eoff	-1.270	-1.084	-0.774	-1.170	0.125		0	6819	0	5	1	
	Wed, 28/10/2020 0...		Eon.ac	+0.003	+0.013	+0.030	+0.010	0.004		0	0	0	0	1	
	Wed, 28/10/2020 0...		Eon.dc	-1.436	-1.126	-0.791	-1.190	0.144		0	6116	0	11	1	
	Wed, 28/10/2020 0...		I.shu	-5.000	-1.465	+3.903	-0.360	1.485		71578	39	2161	16	1	
	Wed, 28/10/2020 0...		mIon	-0.589	+1.437	+6.145	+0.390	0.956		420	0	160	0	1	
	Wed, 28/10/2020 0...		mIon.ac	+0.094	+0.439	+1.208	+0.280	0.183		0	0	0	0	1	
	Tue, 27/10/2020 01...		Eoff	-1.227	-1.024	-0.704	-1.090	0.129		0	12214	0	18	1	
	Tue, 27/10/2020 01...		Eon.ac	+0.004	+0.011	+0.050	+0.010	0.003		0	0	0	0	1	
	Tue, 27/10/2020 01...		Eon.dc	-1.358	-1.062	-0.721	-1.120	0.144		0	11730	0	24	1	
	Tue, 27/10/2020 01...		I.shu	-5.000	-1.486	+3.997	-0.360	1.476		72189	22	2133	10	1	
	Tue, 27/10/2020 01...		mIon	-0.338	+1.113	+4.101	+0.380	0.668		244	0	102	0	1	
	Tue, 27/10/2020 01...		mIon.ac	+0.087	+0.325	+1.018	+0.230	0.118		0	0	0	0	1	
	Mon, 26/10/2020 0...		Eoff	-1.206	-0.987	-0.666	-1.050	0.137		0	14710	0	28	1	
	Mon, 26/10/2020 0...		Eon.ac	+0.003	+0.010	+0.026	+0.010	0.002		0	0	0	0	1	
	Mon, 26/10/2020 0...		Eon.dc	-1.345	-1.026	-0.682	-1.070	0.151		0	14040	0	58	1	
	Mon, 26/10/2020 0...		I.shu	-5.000	-1.484	+3.630	-0.370	1.509		70881	23	2279	17	1	
	Mon, 26/10/2020 0...		mIon	-0.421	+1.044	+4.022	+0.400	0.627		237	0	110	0	1	
	Mon, 26/10/2020 0...		mIon.ac	+0.081	+0.279	+0.803	+0.240	0.066		0	0	0	0	1	
	Sun, 25/10/2020 01...		Eoff	-1.167	-0.899	-0.635	-0.660	0.131		0	21854	0	145	1	
	Sun, 25/10/2020 01...		Eon.ac	+0.003	+0.009	+0.027	+0.010	0.002		0	0	0	0	1	
	Sun, 25/10/2020 01...		Eon.dc	-1.296	-0.933	-0.651	-0.670	0.144		0	19983	0	162	1	
	Sun, 25/10/2020 01...		I.shu	-5.000	-1.313	+2.753	-0.370	1.323		76420	0	1672	0	1	
	Sun, 25/10/2020 01...		mIon	-0.391	+0.826	+3.504	+0.400	0.503		191	0	70	0	1	
	Sun, 25/10/2020 01...		mIon.ac	+0.071	+0.230	+1.991	+0.220	0.046		0	0	0	0	1	
	Sat, 24/10/2020 01:...		Eoff	-1.153	-0.902	-0.627	-0.640	0.118		0	18129	0	170	1	
	Sat, 24/10/2020 01:...		Eon.ac	+0.003	+0.008	+0.027	+0.010	0.001		0	0	0	0	1	
	Sat, 24/10/2020 01:...		Eon.dc	-1.286	-0.936	-0.642	-0.970	0.132		0	16548	0	176	1	
	Sat, 24/10/2020 01:...		I.shu	-4.999	-1.357	+2.482	-0.400	1.334		75212	0	1850	0	1	
	Sat, 24/10/2020 01:...		mIon	-0.255	+0.826	+3.682	+0.370	0.512		197	0	73	0	1	
	Sat, 24/10/2020 01:...		mIon.ac	+0.068	+0.209	+0.773	+0.200	0.039		0	0	0	0	1	
	Fri, 23/10/2020 01:00		Eoff	-1.170	-0.932	-0.621	-1.010	0.145		0	18778	0	105	1	

Total Items: 186

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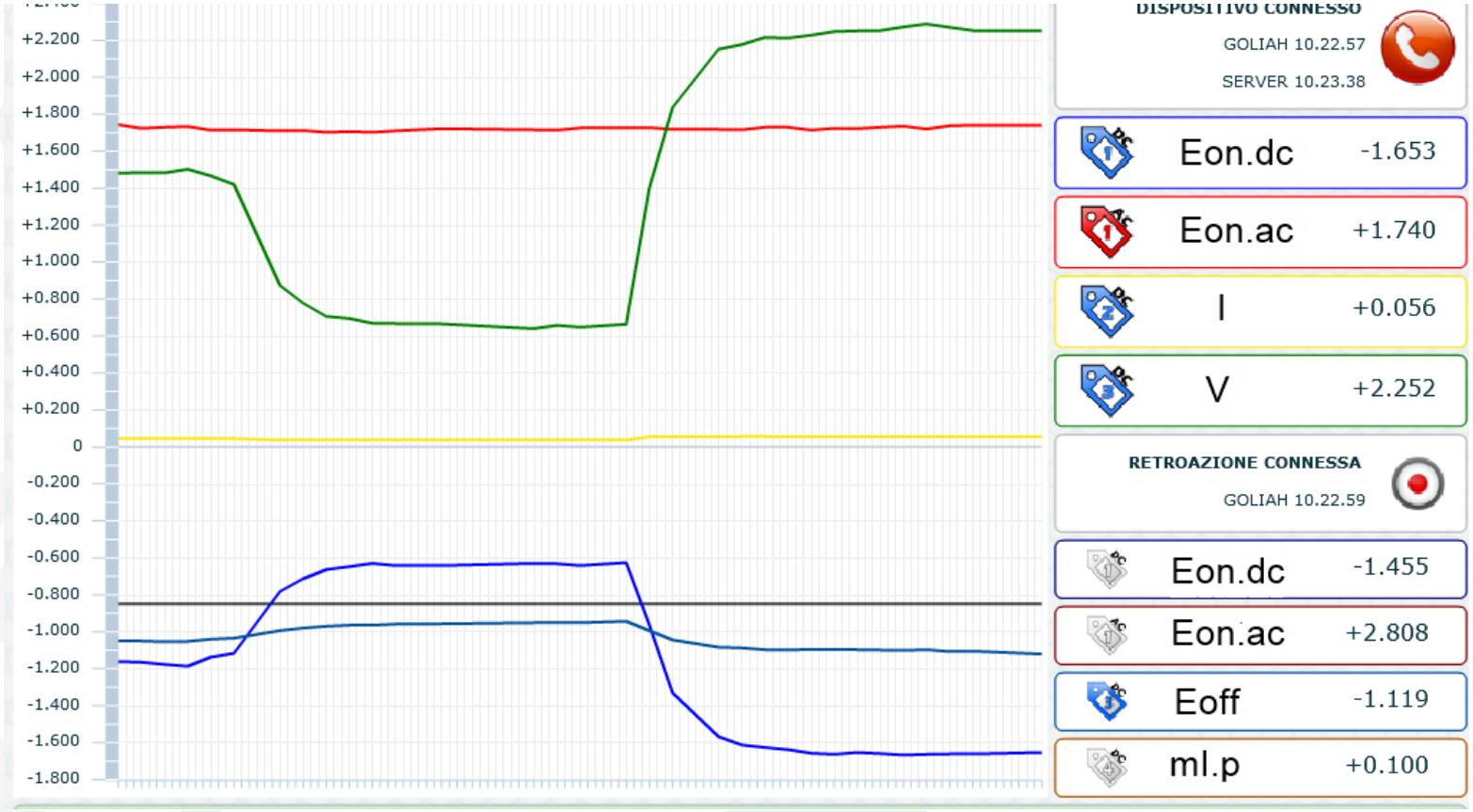
Measurements & Graphical data visualization



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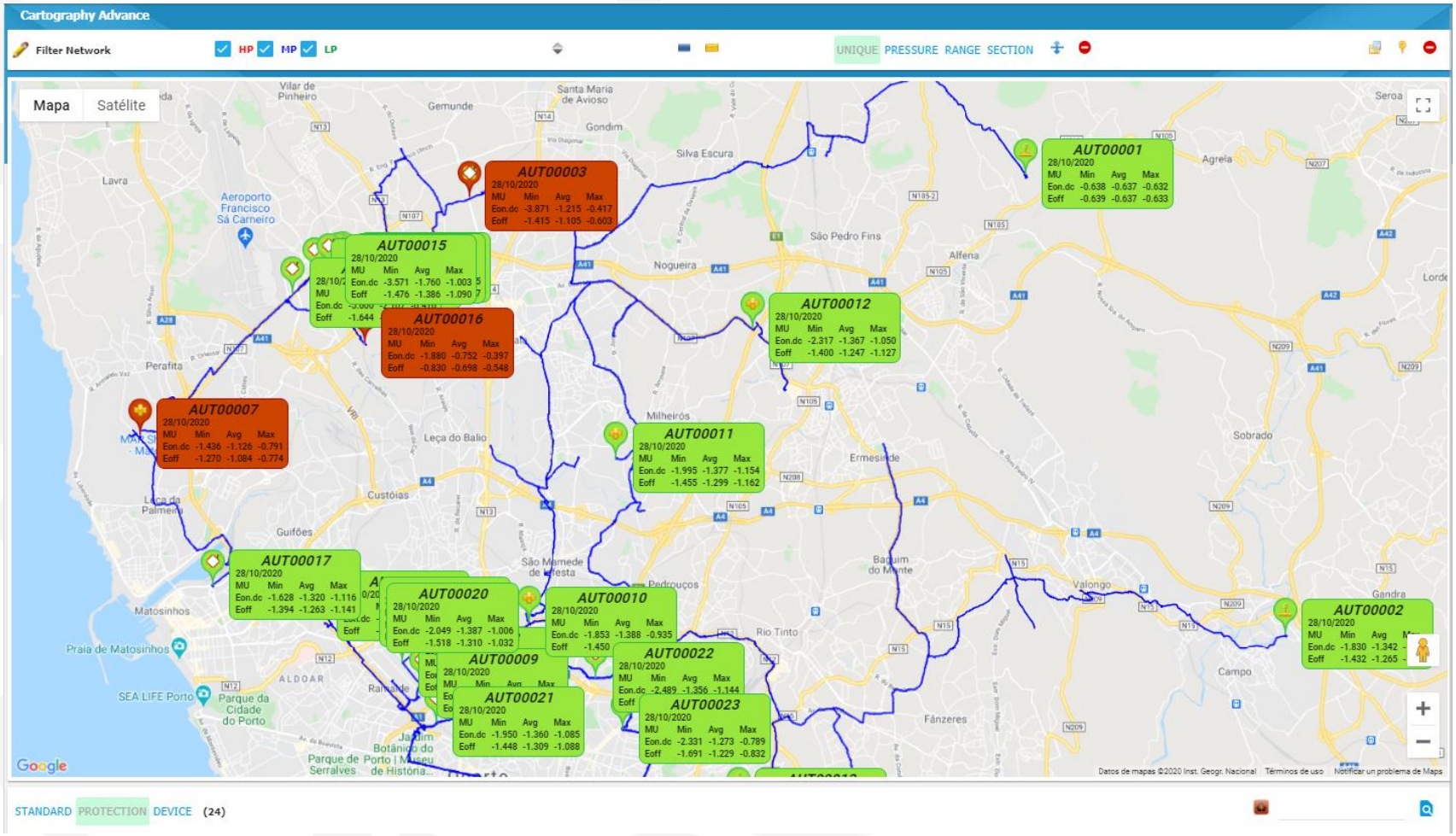
Cartography Visualization



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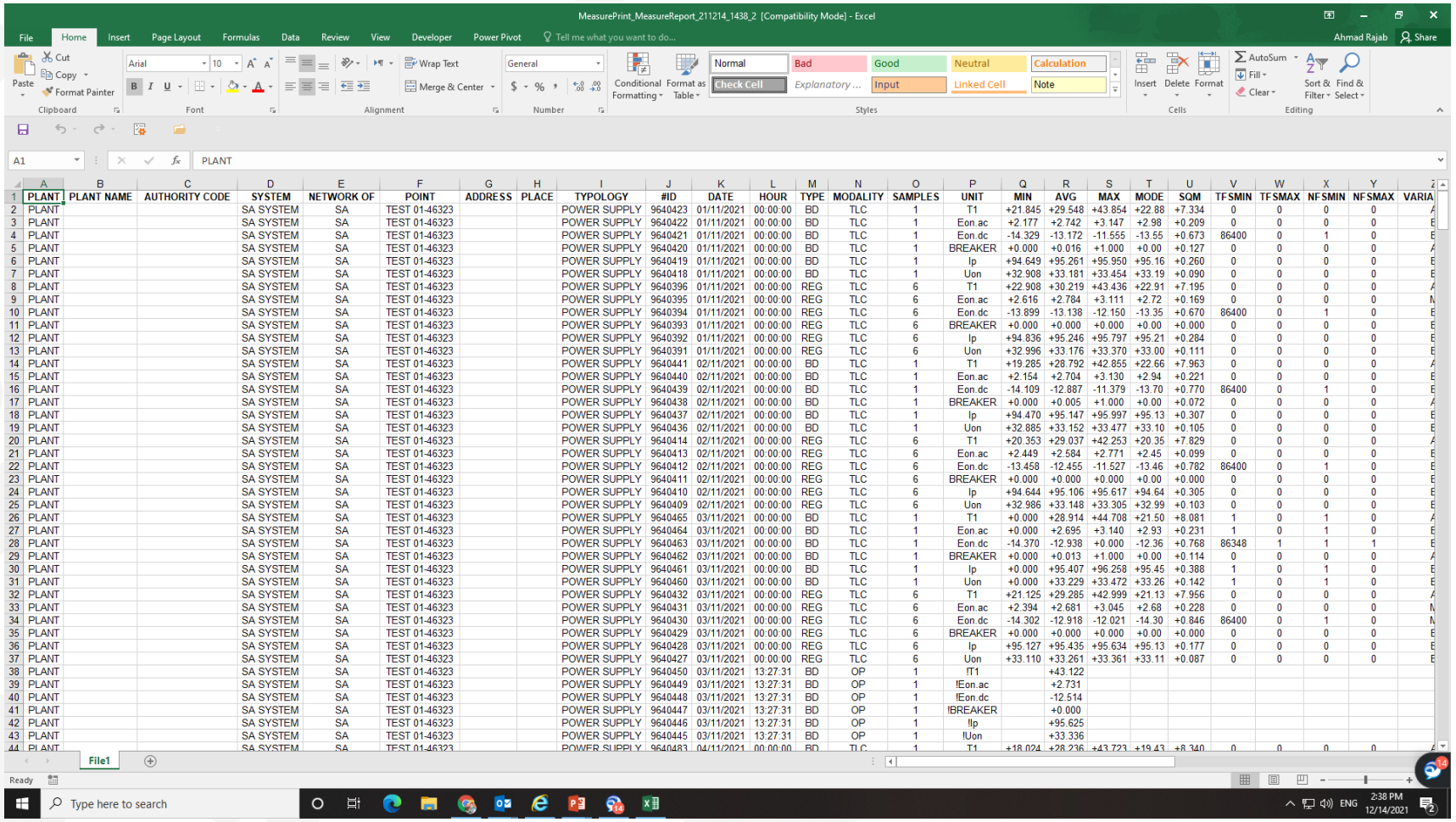
Generating Official Usable Reports

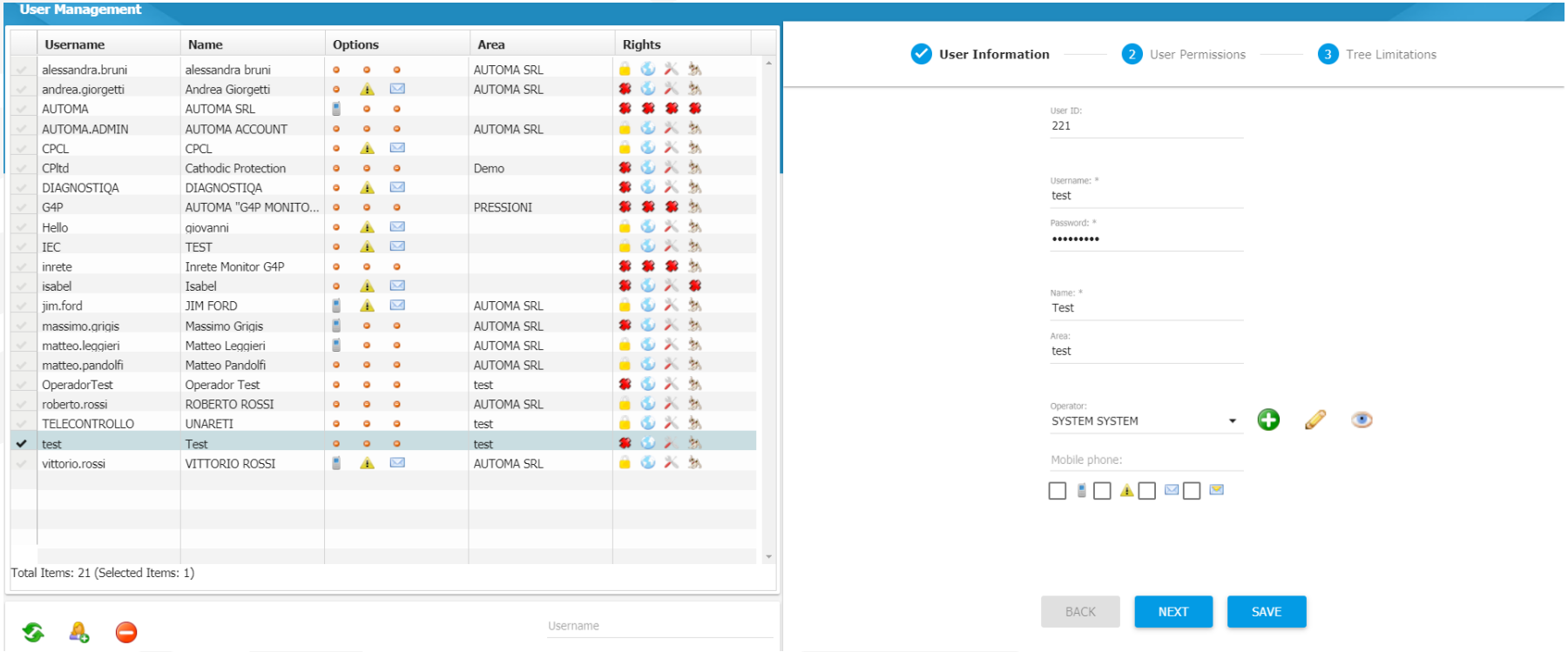


MeasurePrint_MeasureReport_211214_1438_2 [Compatibility Mode] - Excel

PLANT	PLANT NAME	AUTHORITY CODE	SYSTEM	NETWORK OF	POINT	ADDRESS	PLACE	TYPOLOGY	#ID	DATE	HOUR	TYPE	MODALITY	SAMPLES	UNIT	MIN	AVG	MAX	MODE	SQM	TFSMIN	TFSMAX	NFSMIN	NFSMAX	VARIA
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640423	01/11/2021	00:00:00	BD	TLC	1	T1	+21.845	+29.548	+43.854	+22.88	+7.334	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640422	01/11/2021	00:00:00	BD	TLC	1	Eon.ac	+2.177	+2.742	+3.147	+2.98	+0.209	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640421	01/11/2021	00:00:00	BD	TLC	1	Eon.dc	-14.329	-13.172	-11.555	-13.55	+0.673	86400	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640420	01/11/2021	00:00:00	BD	TLC	1	BREAKER	+0.000	+0.016	+1.000	+0.00	+0.127	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640419	01/11/2021	00:00:00	BD	TLC	1	Ip	+94.649	+95.261	+95.950	+95.16	+0.260	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640418	01/11/2021	00:00:00	BD	TLC	1	Uon	+32.908	+33.181	+33.454	+33.19	+0.090	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640396	01/11/2021	00:00:00	REG	TLC	6	T1	+22.908	+30.219	+43.436	+22.91	+7.195	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640395	01/11/2021	00:00:00	REG	TLC	6	Eon.ac	+2.616	+2.784	+3.111	+2.72	+0.169	0	0	0	0	N
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640394	01/11/2021	00:00:00	REG	TLC	6	Eon.dc	-13.899	-13.138	-12.150	-13.35	+0.670	86400	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640393	01/11/2021	00:00:00	REG	TLC	6	BREAKER	+0.000	+0.000	+0.000	+0.00	+0.000	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640392	01/11/2021	00:00:00	REG	TLC	6	Ip	+94.836	+95.246	+95.797	+95.21	+0.284	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640391	01/11/2021	00:00:00	REG	TLC	6	Uon	+32.996	+33.176	+33.370	+33.00	+0.111	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640441	02/11/2021	00:00:00	BD	TLC	1	T1	+19.285	+28.792	+42.855	+22.66	+7.963	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640440	02/11/2021	00:00:00	BD	TLC	1	Eon.ac	+2.154	+2.704	+3.130	+2.94	+0.221	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640439	02/11/2021	00:00:00	BD	TLC	1	Eon.dc	-14.109	-12.887	-11.379	-13.70	+0.770	86400	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640438	02/11/2021	00:00:00	BD	TLC	1	BREAKER	+0.000	+0.005	+1.000	+0.00	+0.072	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640437	02/11/2021	00:00:00	BD	TLC	1	Ip	+94.470	+95.147	+95.997	+95.13	+0.307	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640436	02/11/2021	00:00:00	BD	TLC	1	Uon	+32.885	+33.152	+33.477	+33.10	+0.105	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640414	02/11/2021	00:00:00	REG	TLC	6	T1	+20.353	+29.037	+42.253	+20.35	+7.829	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640413	02/11/2021	00:00:00	REG	TLC	6	Eon.ac	+2.449	+2.584	+2.771	+2.45	+0.099	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640412	02/11/2021	00:00:00	REG	TLC	6	Eon.dc	-13.458	-12.455	-11.527	-13.46	+0.782	86400	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640411	02/11/2021	00:00:00	REG	TLC	6	BREAKER	+0.000	+0.000	+0.000	+0.00	+0.000	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640410	02/11/2021	00:00:00	REG	TLC	6	Ip	+94.644	+95.106	+95.617	+94.64	+0.305	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640409	02/11/2021	00:00:00	REG	TLC	6	Uon	+32.986	+33.148	+33.305	+32.99	+0.103	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640465	03/11/2021	00:00:00	BD	TLC	1	T1	+0.000	+28.914	+44.708	+21.50	+8.081	1	0	1	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640464	03/11/2021	00:00:00	BD	TLC	1	Eon.ac	+0.000	+2.695	+3.140	+2.93	+0.231	1	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640463	03/11/2021	00:00:00	BD	TLC	1	Eon.dc	-14.370	-12.938	+0.000	-12.36	+0.768	86348	1	1	1	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640462	03/11/2021	00:00:00	BD	TLC	1	BREAKER	+0.000	+0.013	+1.000	+0.00	+0.114	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640461	03/11/2021	00:00:00	BD	TLC	1	Ip	+0.000	+95.407	+96.258	+95.45	+0.388	1	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640460	03/11/2021	00:00:00	BD	TLC	1	Uon	+0.000	+33.229	+33.472	+33.26	+0.142	1	0	1	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640432	03/11/2021	00:00:00	REG	TLC	6	T1	+21.125	+29.285	+42.999	+21.13	+7.956	0	0	0	0	A
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640431	03/11/2021	00:00:00	REG	TLC	6	Eon.ac	+2.394	+2.681	+3.045	+2.68	+0.228	0	0	0	0	N
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640430	03/11/2021	00:00:00	REG	TLC	6	Eon.dc	-14.302	-12.918	-12.021	-14.30	+0.846	86400	0	1	0	N
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640429	03/11/2021	00:00:00	REG	TLC	6	BREAKER	+0.000	+0.000	+0.000	+0.00	+0.000	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640428	03/11/2021	00:00:00	REG	TLC	6	Ip	+95.127	+95.435	+95.634	+95.13	+0.177	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640427	03/11/2021	00:00:00	REG	TLC	6	Uon	+33.110	+33.261	+33.361	+33.11	+0.087	0	0	0	0	E
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640450	03/11/2021	13:27:31	BD	OP	1	!T1		+43.122								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640449	03/11/2021	13:27:31	BD	OP	1	!Eon.ac		+2.731								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640448	03/11/2021	13:27:31	BD	OP	1	!Eon.dc		-12.514								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640447	03/11/2021	13:27:31	BD	OP	1	!BREAKER		+0.000								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640446	03/11/2021	13:27:31	BD	OP	1	!Ip		+95.625								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640445	03/11/2021	13:27:31	BD	OP	1	!Uon		+33.336								
PLANT			SA SYSTEM	SA	TEST 01-46323			POWER SUPPLY	9640483	04/11/2021	00:00:00	BD	TLC	1	T1	+18.024	+28.236	+43.723	+19.43	+8.340	0	0	0	0	A

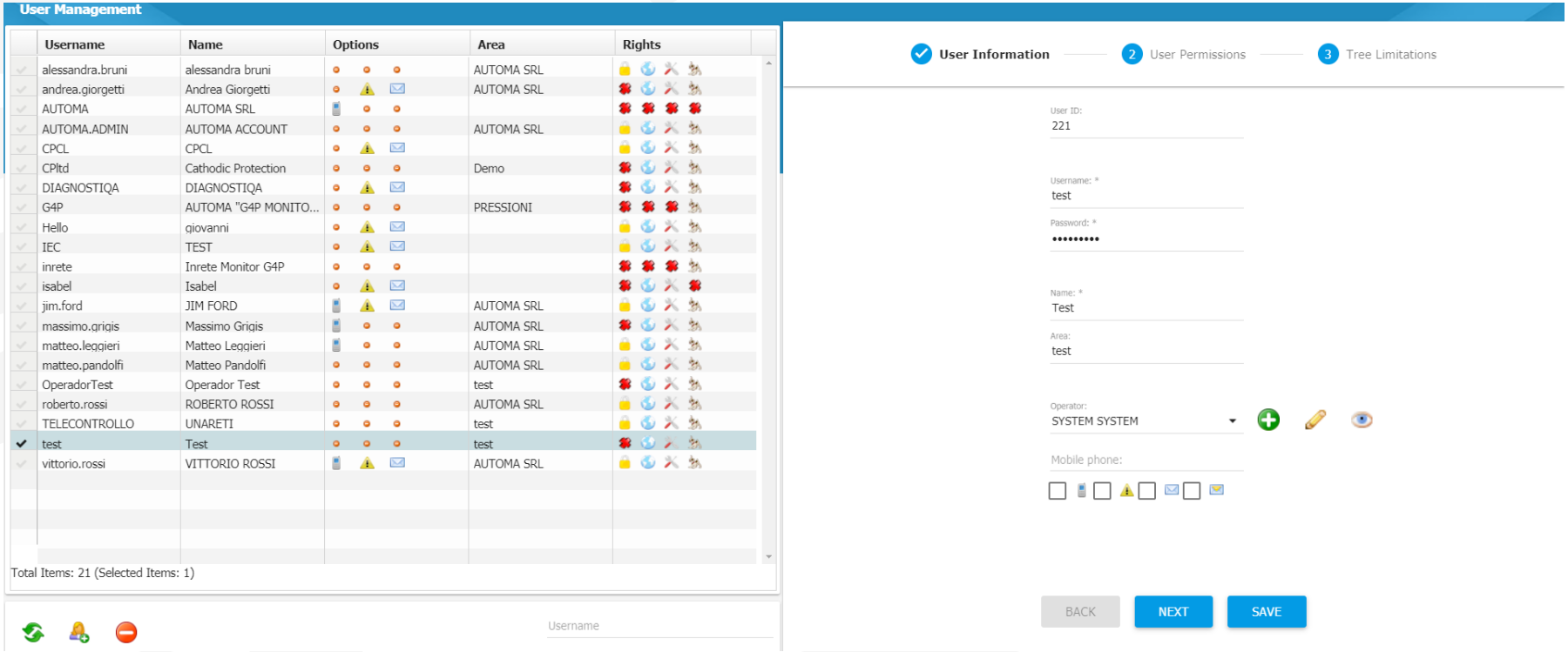
A Further Step into Digitizing CP Monitoring and Control Process

Device Management Application



A Further Step into Digitizing CP Monitoring and Control Process

Device Management Application

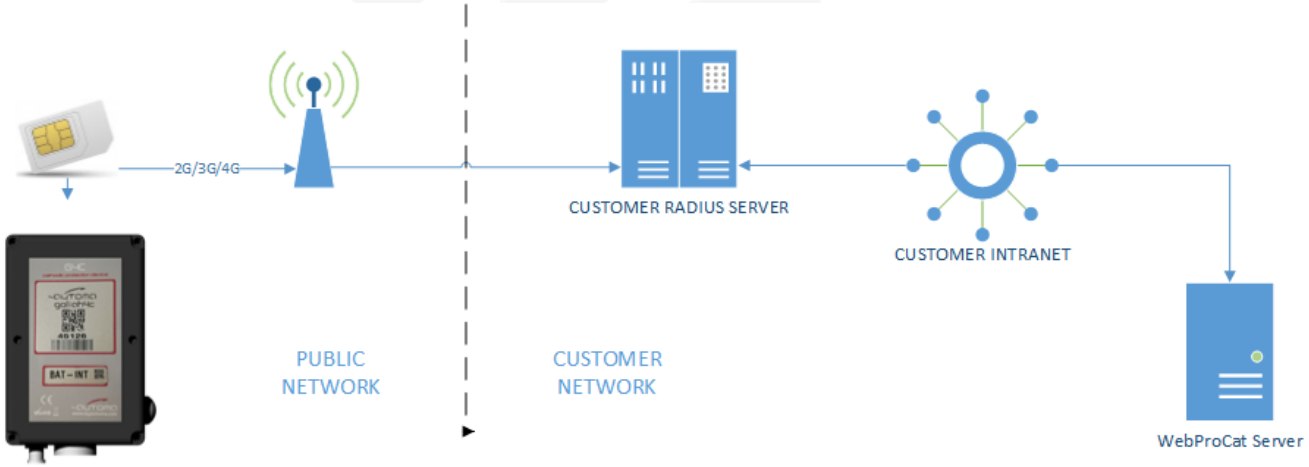


A Further Step into Digitizing CP Monitoring and Control Process

Data Protection During Communication

- Private APN of the SIM card provider;

- Communication protocol between the devices and the software in the server is a binary proprietary protocol with basic encryption; therefore. the level of security is intrinsically very high.



A Further Step into Digitizing CP Monitoring and Control Process

Server Protection

- Server hosted in Manufacturer Server: a secure access to the server is granted via HTTPS protocol and by limiting/filtering the ports and IP addresses that can access the server;

- Server in the customer's infrastructure: it is possible to implement any standard security mechanism such as DMZ, firewalling, HTTPS, etc.

A Further Step into Digitizing CP Monitoring and Control Process

Thank You

Thank You

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