

MV-LV Substation Communication and Monitoring



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Introduction

The liberalization of energy production and wide-scale adoption of distributed generation, electric vehicles, solar panels, heat pumps, windmills have brought with them a host of opportunities but also challenges to all the (new) stakeholders in the exploding energy (world) market. The transition towards a more sustainable energy production and a further electrification comes with major investments in the distribution grid.

The bi-directional and variable energy flows and the increasing electricity urge for a dramatic increase in closer monitoring and analysis of the energy flows in general. The exploding amount and diversity of relations between these energy stakeholders in the evolving energy market based on Solar, EV, heath pump coupling and other green energies result in the simple fact that DSO SCADA monitoring demand much more attention to control the electricity MV/LV substations in the near future.

Ritter Starkstromtechnik, Bausch Datacom and RiTTec, members of the Ritter Group, are the ideal mix for products for the new energy evolutions, being respectively System Integrator, Hardware designer and Software specialist.

System

Monitoring the Grid requires a flexible system that can last years and this starts with EDGE platforms (Remote Terminal Units) in the field that are capable to counter the aggressive new developments in grid technology. This means powerful machines that can receive upgraded firmware following the ever changing necessities of the electricity distribution companies.

A powerful Management Tool on the other hand is required to control the devices in the field. This management tool needs to be conceived also as a long time system ready to be upgraded when new evolutions occur. Our Management System and firmware of the devices in the field are conceived to use the most modern IT software available at each moment. (Docker Technology)

Security

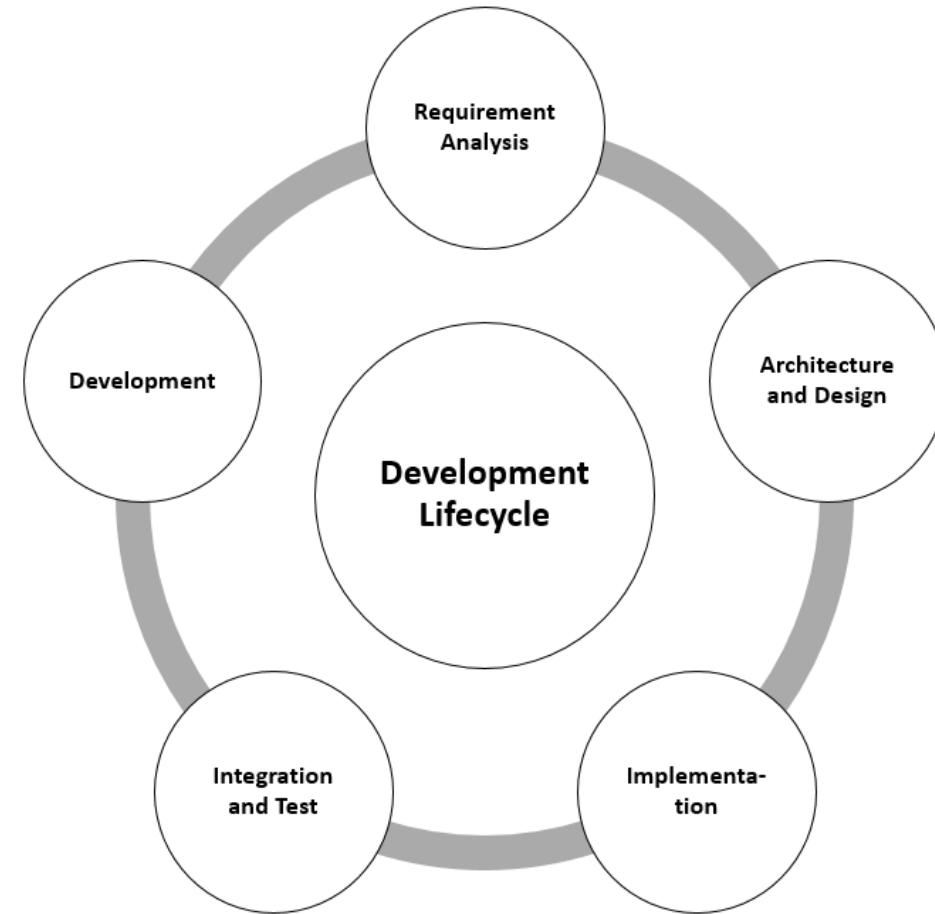
All RiTTec-Bausch Datacom software is designed and conceived out of one basic view. Security! The security issue is maybe the biggest danger to all technology evolutions.

As IT integration in almost all devices in the energy market is a non-stoppable trend, the danger is imminent. Therefore all engineering of software (but also hardware) need to start from a security concept.

RiTTec's software is exactly doing this, counteracting all possible security hazards for the future. The company follows strictly all security normations and certifications in order to comply with the general accepted guidelines but anticipates also to much more dramatic evolutions in the field of security.

Security-First-Design-Lifecycle (SLDC)

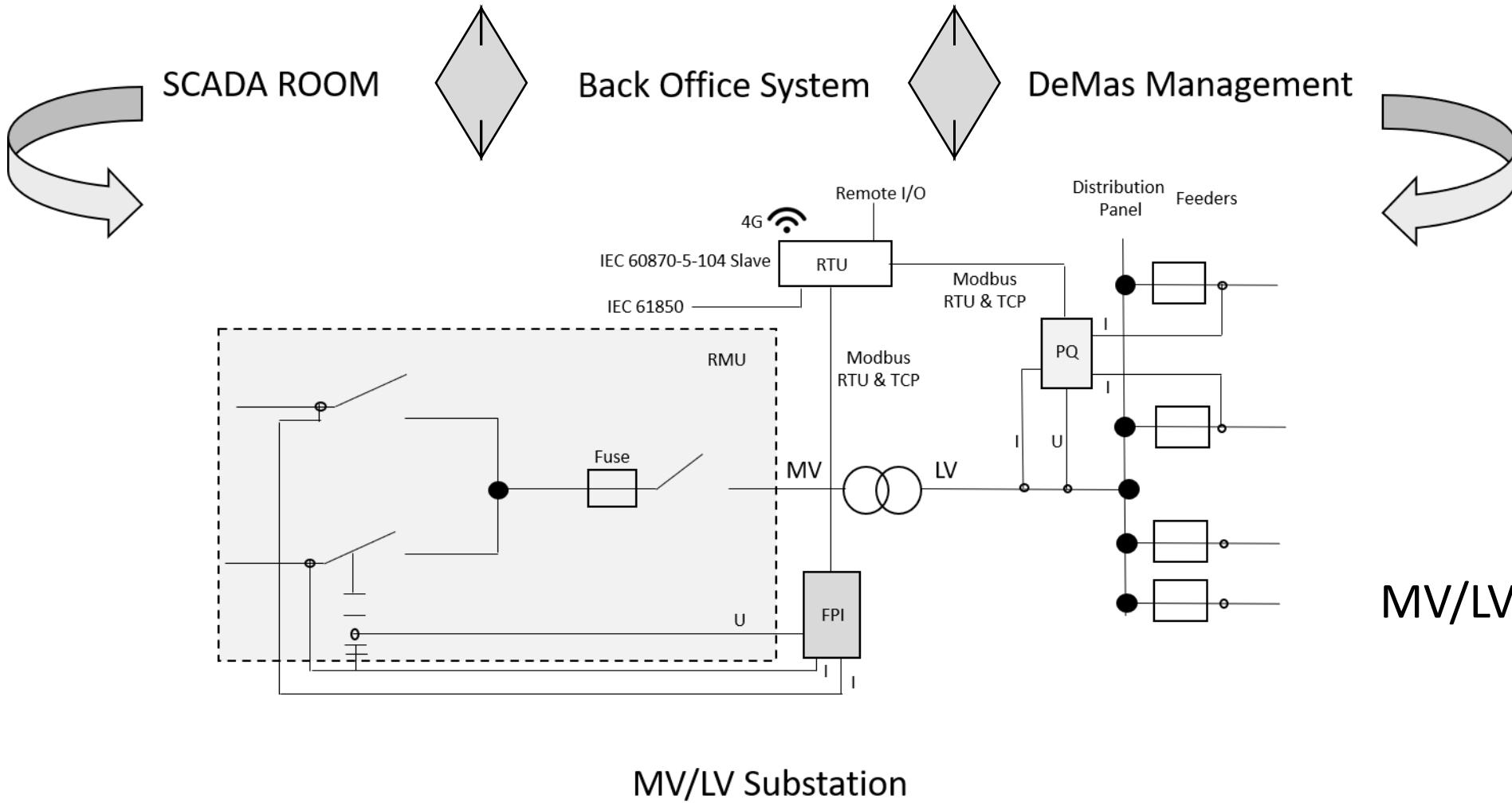
- Secure Concepts:
e.g. -XSS, - SQL injections
- Using BSI standards 2020
- Manual and Automatic Tests
e.g. Cypress
- ISO 27K certified Data Center and HW/SW development



LV/MV Substation Monitoring

Nowadays we see a major evolution in the equipment of the secondary transformer cabins (10-36kV to 230 and 400V) in Europe. All network operators in Europe are starting the modernisation of this infrastructure over the next 5 to 10 years. The theme is the following: in the coming years, meter and power quality data, alarms, etc. will also have to be collected on the lower segments of the distribution network, especially in the secondary transformer substations.

These metering and status data per station are not always as numerous and precise as necessary in the higher segments, but the measuring points are much more numerous (from a few hundred to 40,000-50,000 cabins and more per infrastructure of a network operator). The budgeting for the monitoring of a cabin is therefore much sharper, thus cost-effective systems are necessary.

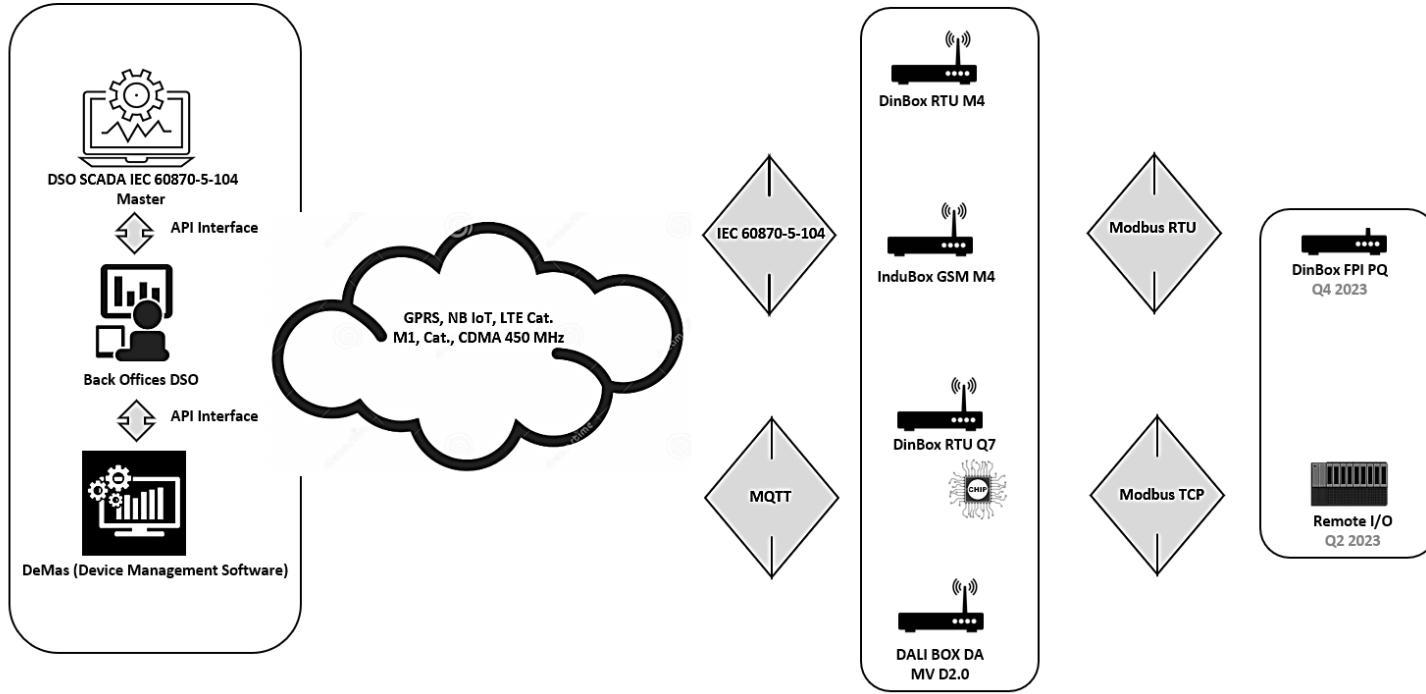


The Edge Platforms

Bausch Datacom proposes a diversified portfolio of mobile wireless (GPRS, LTE Cat.1, M1, NB IoT...) EDGE platforms with metrology (PMD Class 1, 2), SCADA protocolling (60870-5-104,61850), communication protocolling (Modbus TCP & RTU, MQTT, HTTPS...), security (VPN Ipsec, TLS...) integrated.

The portfolio will be enlarged with separate extensions such as a Remote I/O system and Power Quality and Fault Passage Indication equipment. These extensions can be interfaced with the main RTU's through Modbus TCP, RTU or other protocols.

Portfolio



Infrastructure Services:

- Remote Mass Firmware upgrade
- Remote Mass Configuration
- Automatic commissioning
- Status of RTU's
- Node Red configuration
- Tokenization of Data (2024)

Energy Services:

- Real Time State Estimation (2024)
- Congestion Modelling (2024)
- Tokenized Energy Trading (2024)

Functionality:

- GPRS/LTE Cat. 1/M1/IoT...
 - TLS/VPN IPsec ...
 - SCADA 60870-5-104, 61850, MQTT, Modbus protocols
 - Input/Output/Relay
 - Last Gasp
 - Fault Passage Indication (MV/LV)
 - Power Quality PMD Class 1
 - Equipped with crypto anchor (2023-2024)
- ...

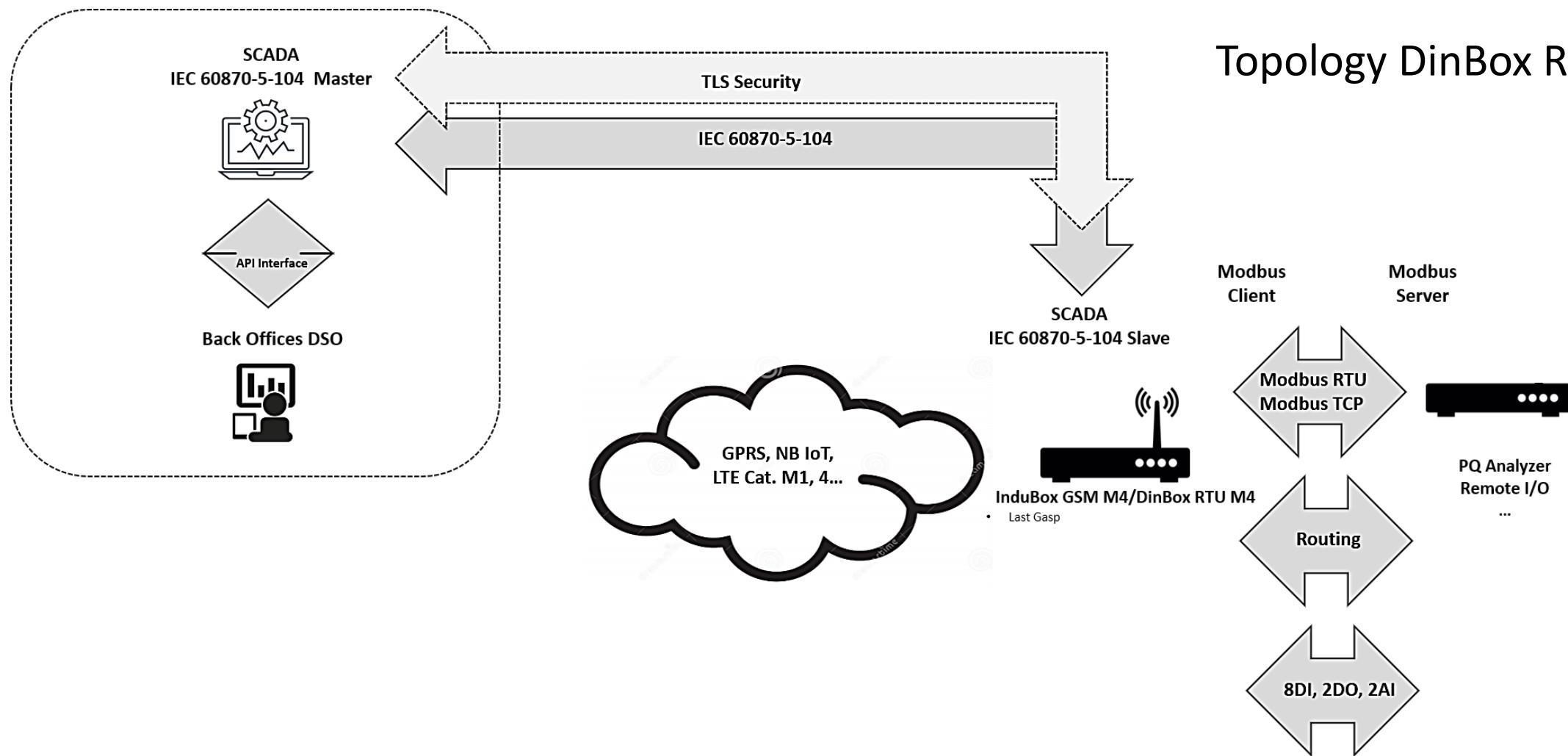


DinBox RTU M4

- LTECat.M1 - GPRS Communication
- IEC 60870-5-104/Modbus mapping
- Modbus RTU
- Modbus TCP
- MQTT/Modbus mapping
- DeMas Backend Services: Firmware over The Air / Commissioning / Security / Remote parametrization...
- 8 digital inputs, 2 digital outputs
- Ethernet Routing
- TLS Security
- VPN IPsec ike V1
- Supercap 'Last gasp'
- Applications:
 - Substation IP communication with SCADA systems or central dispatch
 - IEC-60870-5-104 protocol between substation and control station
- SCADA installations in industries such as power and distribution, water and gas applications, oil and gas production, Distributed Control Systems (DCS), PLC...



Topology DinBox RTU M4

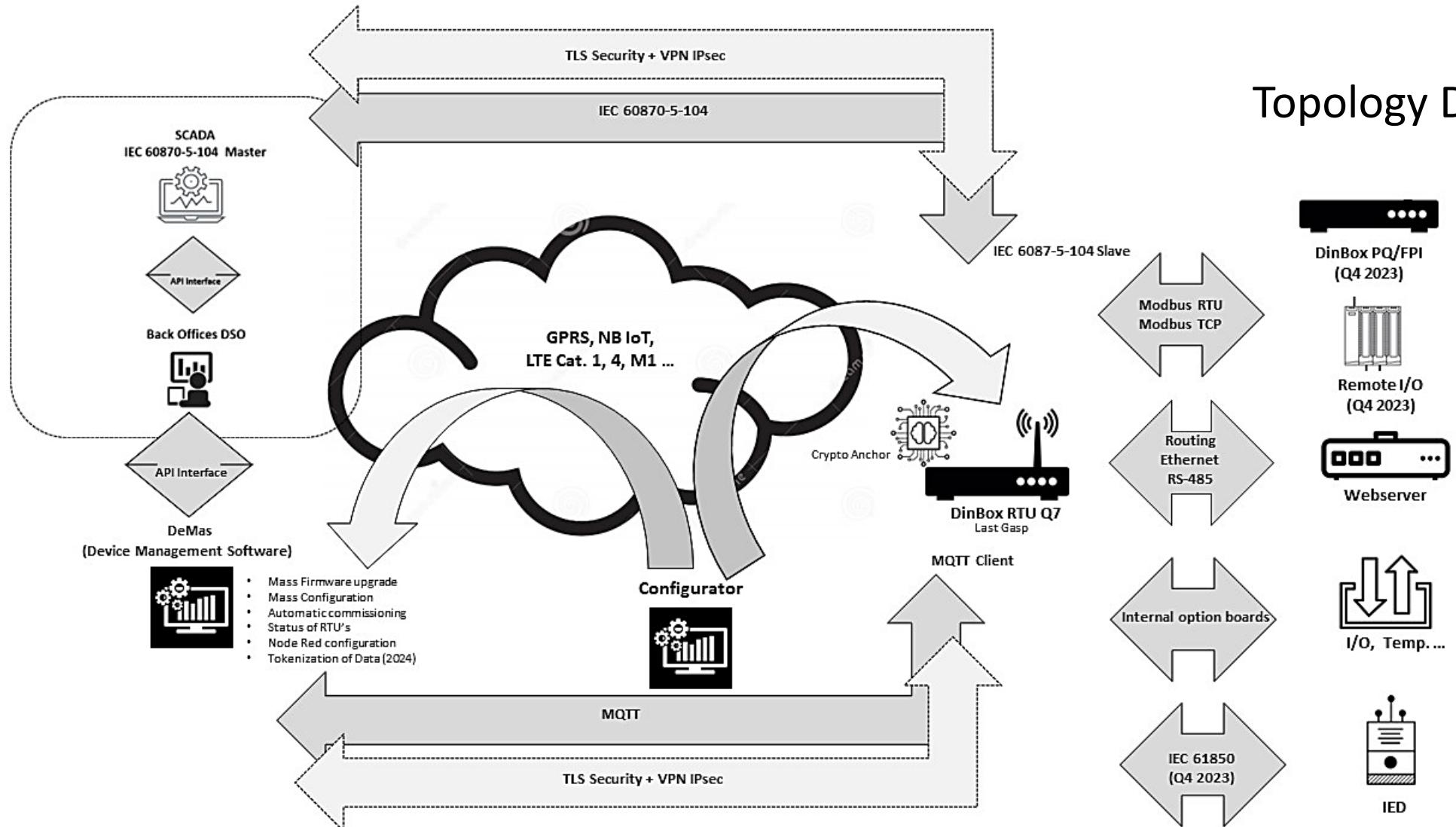


DinBox RTU Q7

- 4G LTE Cat-1/2G GPRS fallback
- IEC 60870-5-104/Modbus mapping
- MQTT/Modbus mapping
- Modbus RTU
- Modbus TCP
- IEC 61850 (non-GOOSE applications)
- DeMas Backend Services: Firmware over The Air / Commissioning / Security / Remote parametrization...
- Internal I/O extension boards(s)
- Ethernet Routing
- TLS Security
- VPN IPsec IKE v1
- Supercap 'Last gasp'
- Applications:
 - Substation IP communication with SCADA systems or central dispatch
 - IEC-60870-5-104 protocol between substation and control station
- SCADA installations in industries such as power and distribution, water and gas applications, oil and gas production, Distributed Control Systems (DCS), PLC...

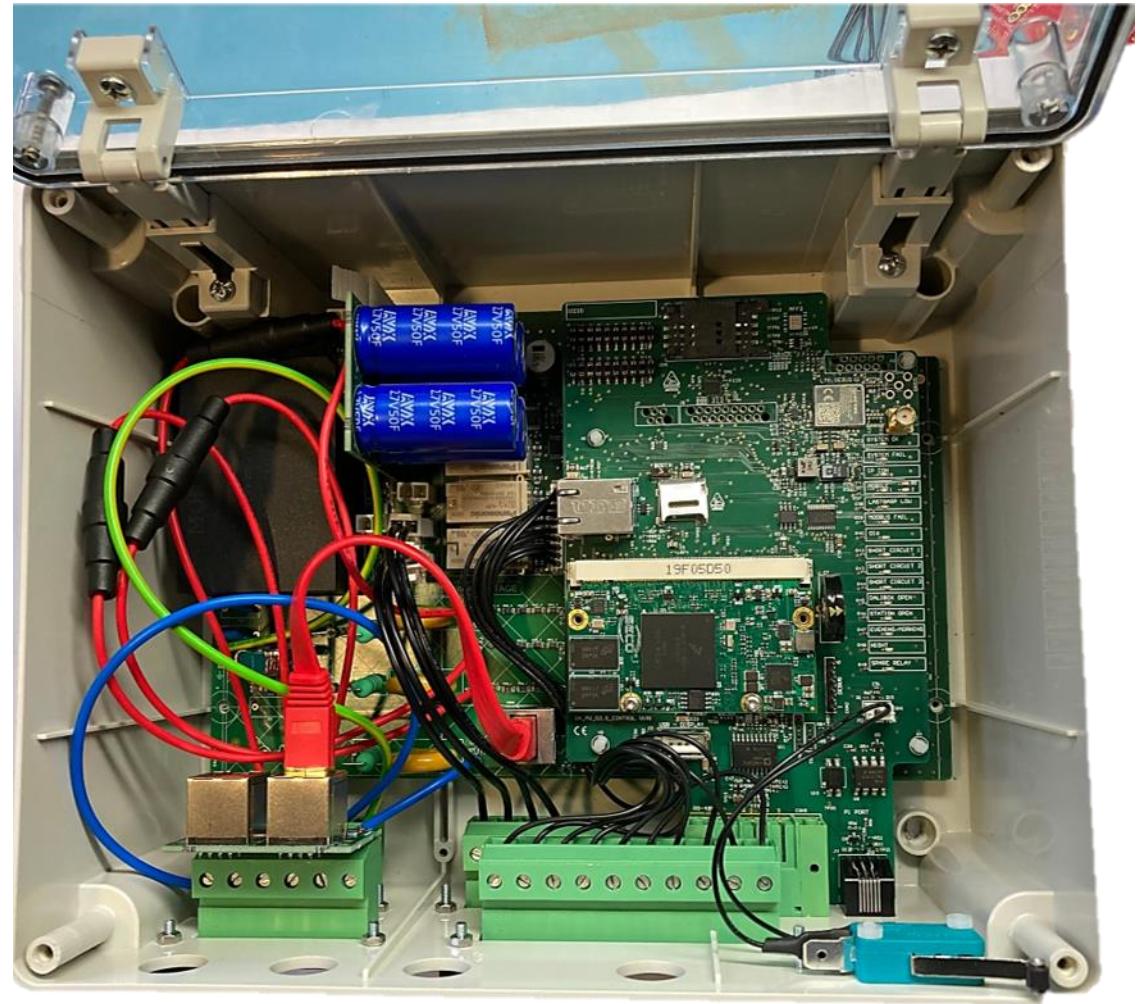


Topology DB RTU Q7



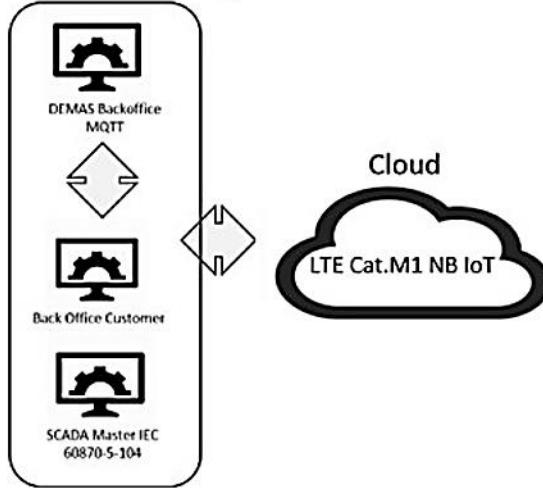
DaliBox MV D2.0

- 4G LTE Cat-M1/NB 1&2
- IEC 60870-5-104/Modbus mapping
- MQTT/Modbus mapping
- IEC 61850 (non-GOOSE)
- Remote I/O through Modbus TCP and/or Modbus RTU
- Ethernet Routing
- TLS Security
- VPN IPsec IKE v1
- Supercap 'Last gasp'
- DeMas Backend Services: Firmware over The Air / Commissioning / Security / Remote parametrization...
- External Display optional
- Internal Metering transformer load
- Applications:
 - Substation IP communication with SCADA systems or central dispatch
 - IEC-60870-5-104 protocol between substation and control station
- SCADA installations in industries such as power and distribution, water and gas applications, oil and gas production, Distributed Control Systems (DCS), PLC...

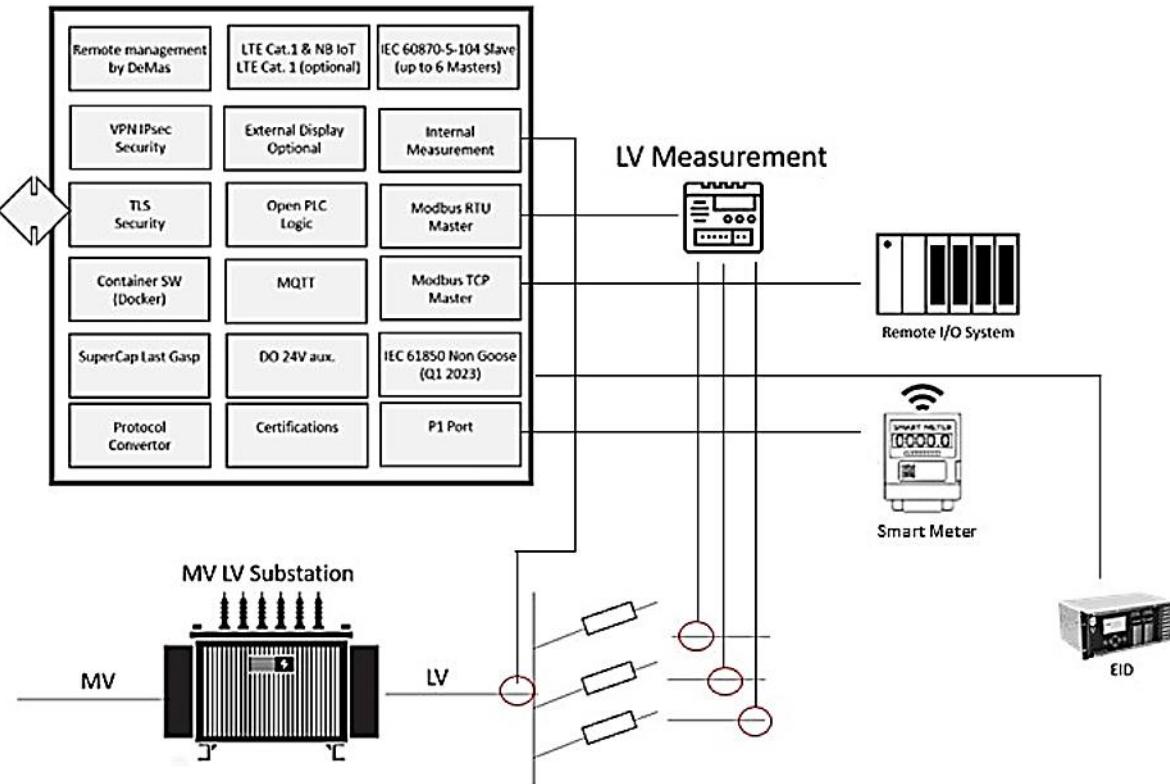


Topology DaliBox MV D2.0

Remote Substation Management



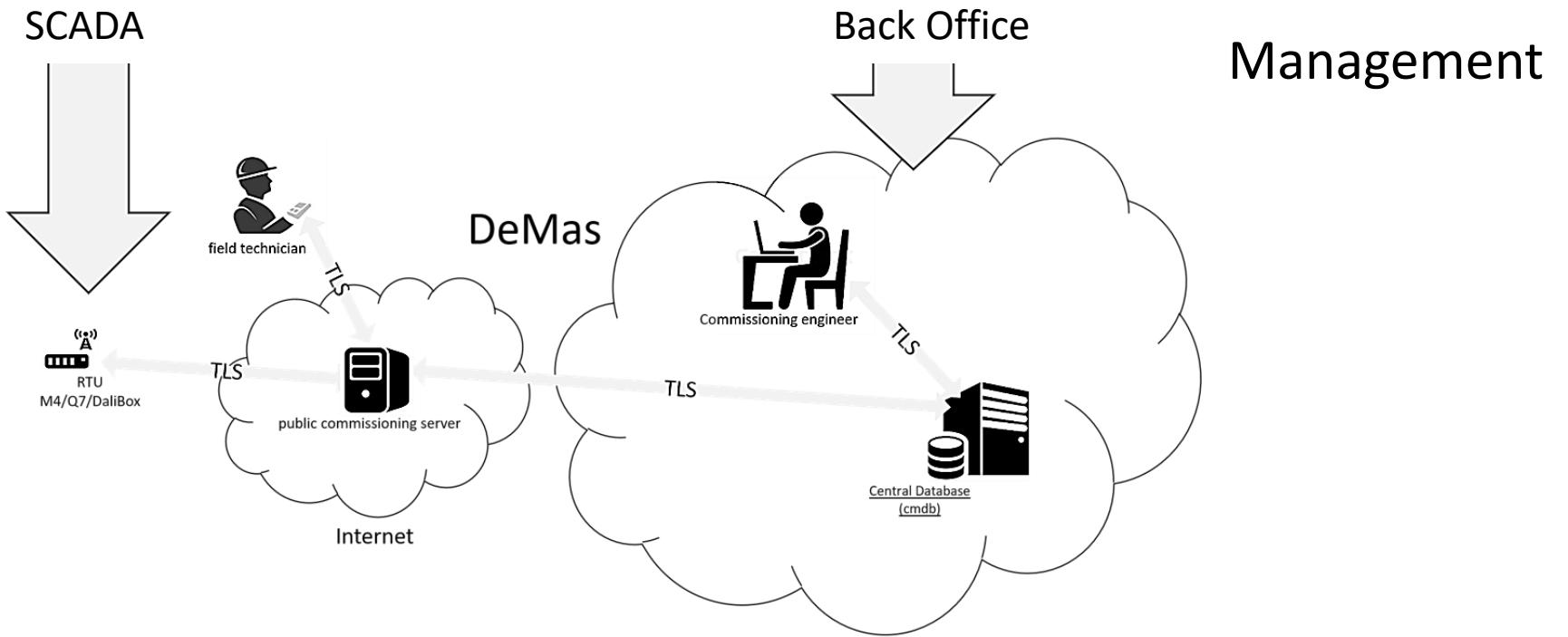
EDGE Platform



The DeMas Management

The DeMas software is a powerful central management tool to organize your infrastructure of Edge Platforms (Remote Terminal Units) in the field. It is based on a Docker Container software technology that allows smooth and swift extension of functionality and applications.

It offers not only the organization and update of the existing infrastructure but is capable to add any application which is evolving from the new paths in energy control and business models (ownership and trading of energy).



RTU management user roles

Commissioning engineer:

preparing the configuration to be provisioned to the newly deployed device, e.g. by managing and linking an inventory database.

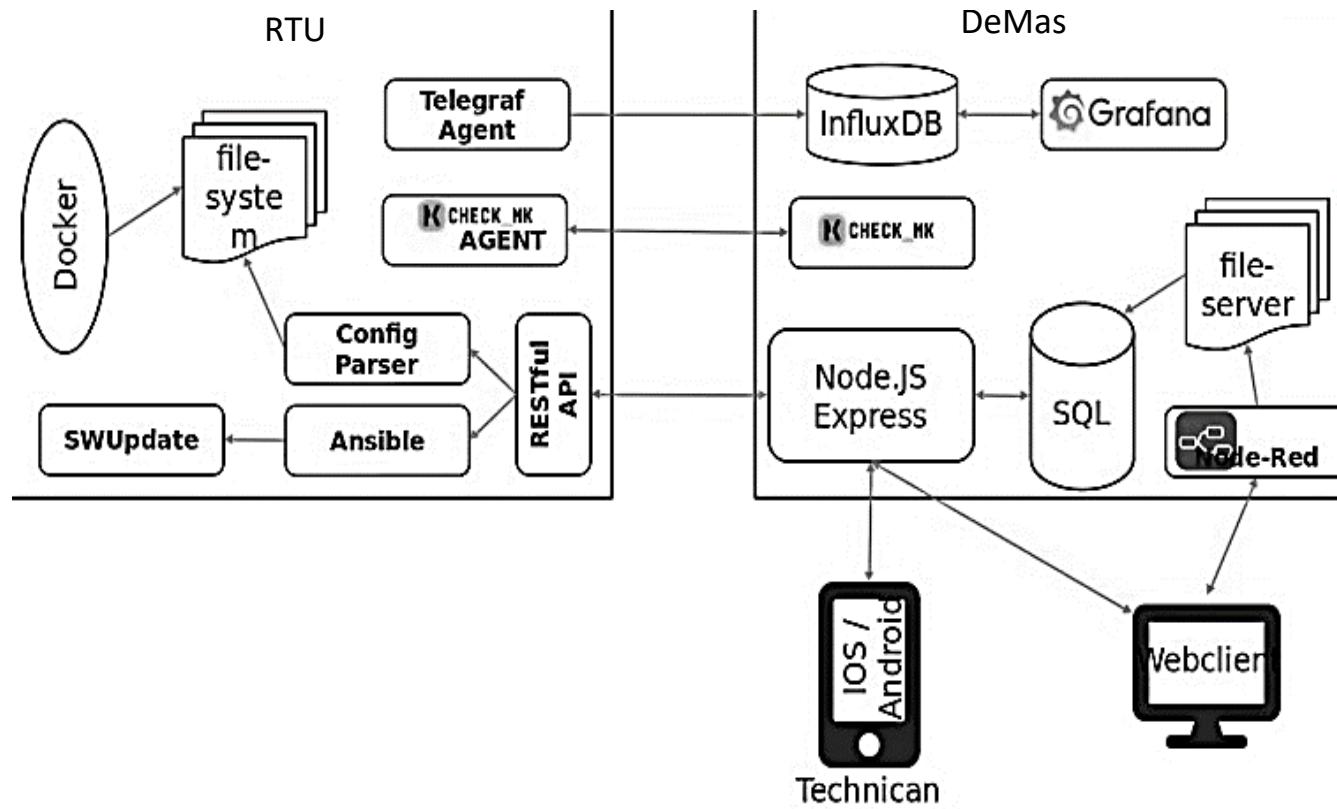
Field Technician:

deploying the RTU and identifying it in the system and attaching the relevant metadata to it.

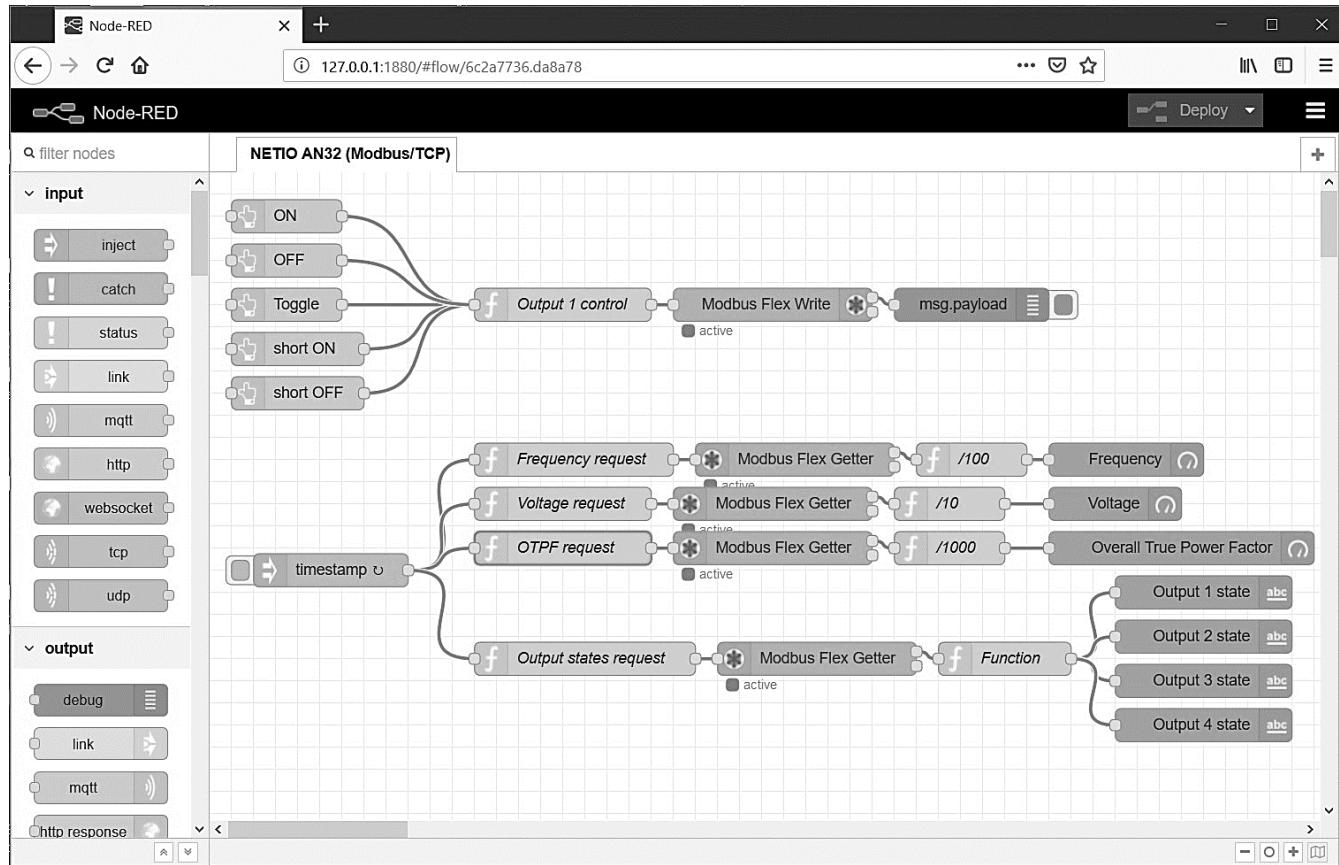
Functionality

- RTU management (HW/SW)
- Configuration (i.e. mapping)
- Location management
- Installations order management
- Commissioning
- Change management
- Monitoring
- Decommissioning

EDGE-DEMAS Architecture



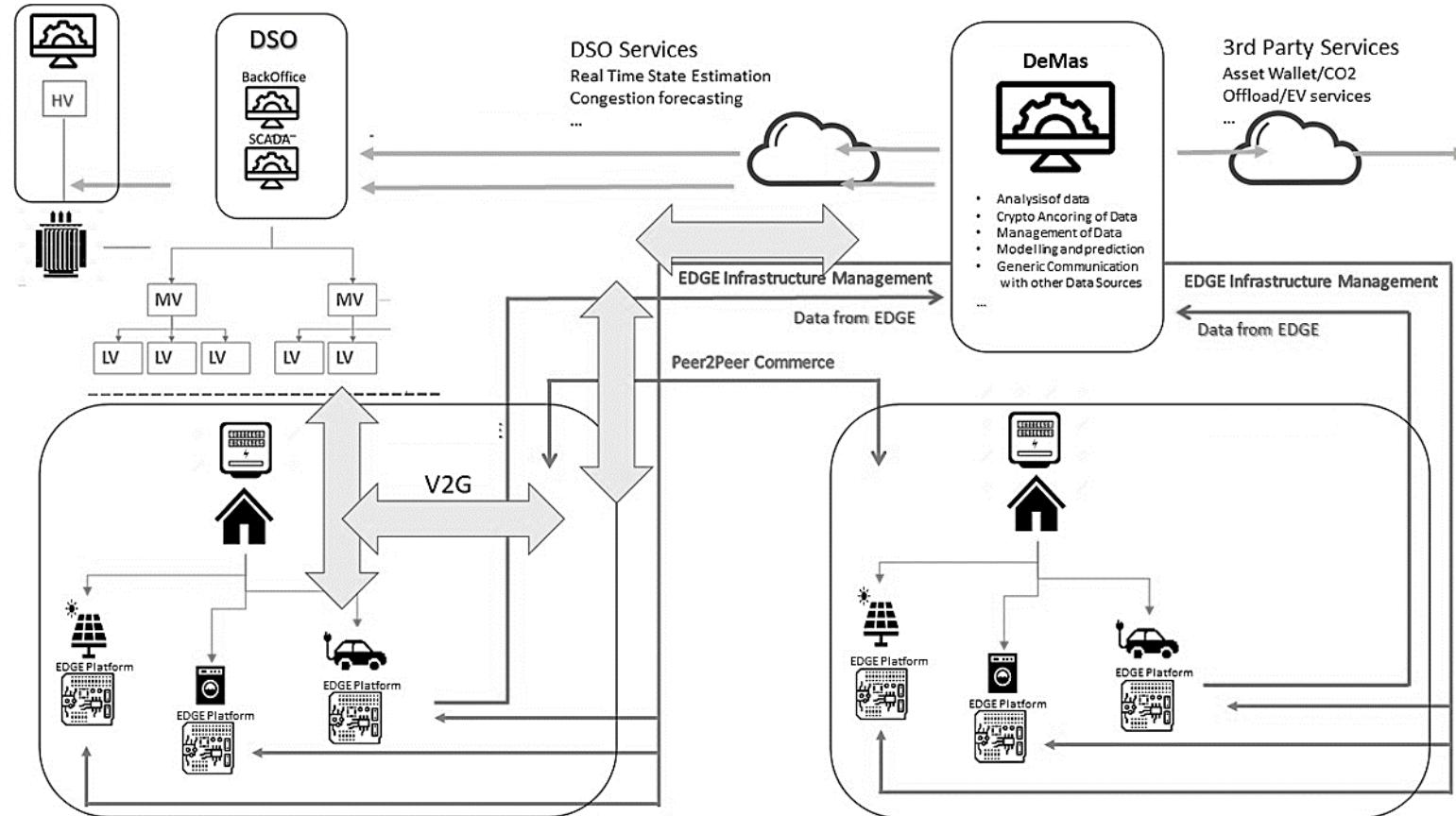
Node Red Configurator



Future Technology

Bausch Datacom and RiTTec have recently joined forces with Solar Panel and EV market leaders to develop technology that can facilitate a system of capitalization and trading of energy for private consumers and companies based on green energy coming from Solar Parks, EV infrastructure, battery loads ... while taking in account the influence on the electricity grids.

Crucial in this system is importing blockchain and crypto anchoring – technologies originated in the financial market – and techniques such as Machine Learning, Artificial Intelligence and Open-Source protocolling. By introducing these technologies, a system of ownership and trading of green energy can be built and distributed on a global scale together with the possibility to offer services to DSO's concerning the impact of this new evolution.



Crypto Anchoring,
Machine learning
& Artificial Intelligence
for a fully
permissionless financial
& predictive - system for
green energy “

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