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Electrical Scada for Power Management Systems Applications

Energy and Digital World (EDW) 2024 – Knowledge Session 1.4, 14.30-15.30

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1. Portfolio Overview
2. Power Management Systems and enabling products
3. MicroSCADA
4. Feeder Automation
5. OT Fleet Management Solutions

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Portfolio Overview

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Digital transformation from the field to the boardroom

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Sustainability, Reliability, Efficiency & Performance

Regulation

Active network management requirements

Flexible demand management

Network Control Room

Cybersecurity & secure connectivity

Digital substation & smart field devices

Multi-purpose communication networks & edge compute capabilities

5G

Energy storage
Aggregation
Value stacking

Connected Enterprise

Asset health, lifecycle & maintenance mgmt.

Plant & field work mgmt.

Fleet & remote mgmt.

DER integration & management

Leverage of:
Big data, AI, ML, 5G, Cloud applications, Analytics & BI

Customer relationship value enhancement

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Grid Automation Products: Portfolio Overview

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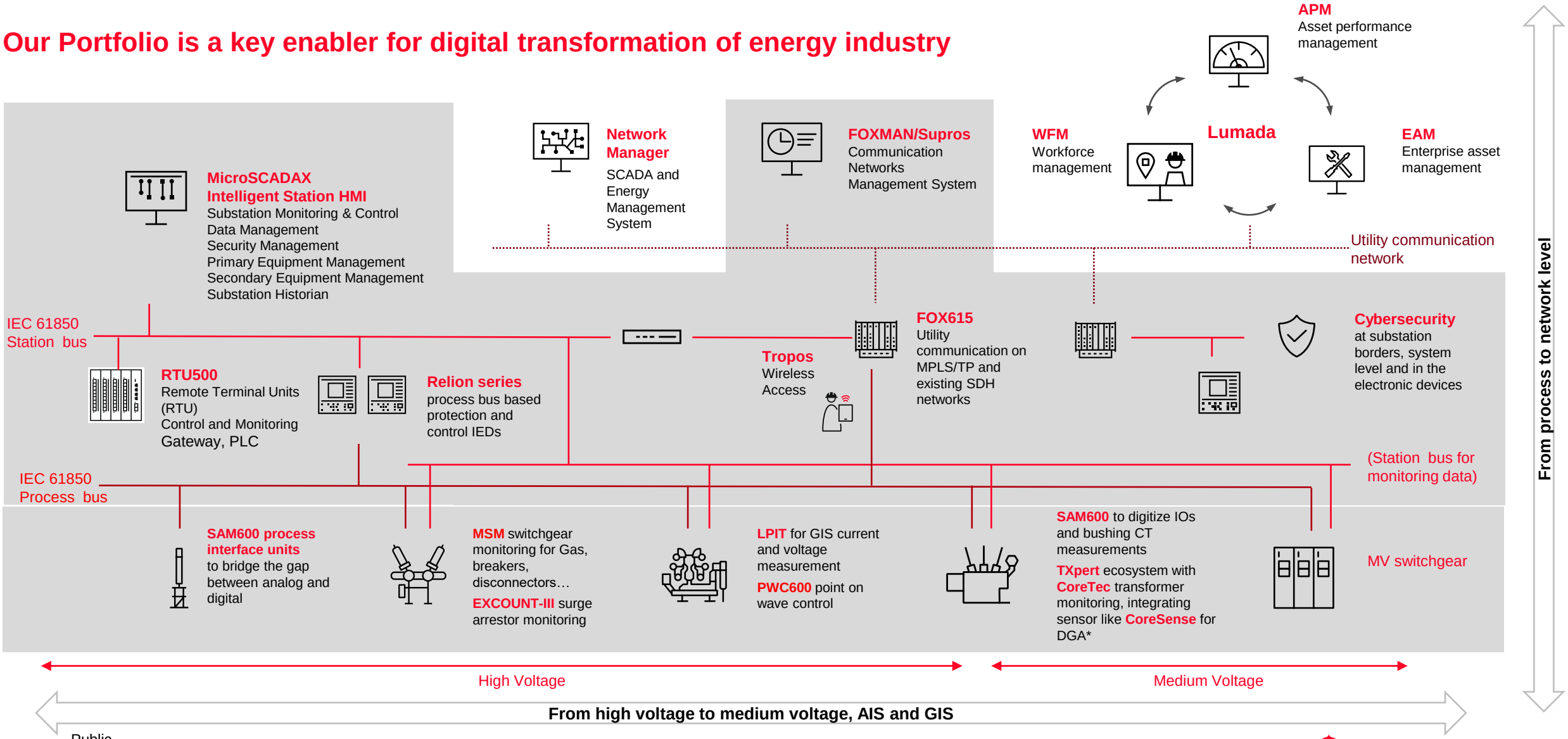
Our Portfolio is a key enabler for digital transformation of energy industry



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Power Management System (PMS)

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Main business opportunities and solutions

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What are the main Solutions

Power Management System (PMS):

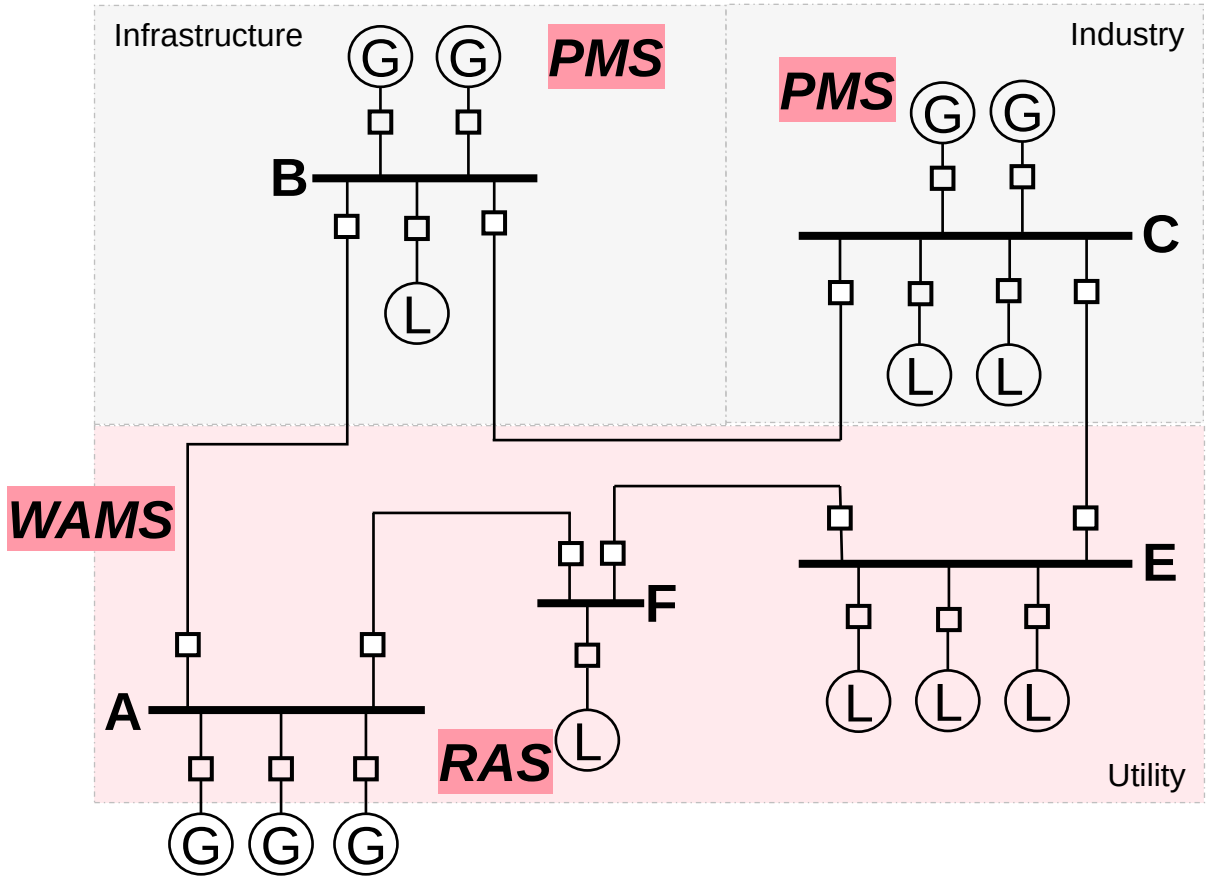
- Power **intensive** large in Industries and Infrastructures
- Connected to weak public grid
- Captive generation for Security and Resilience of power supply

Remedial Action Schemes (RAS):

- Utilities in Transmission and Distribution grids
- Over loaded infrastructure
- Pre-determined condition causing system instability

Wide Area Monitoring Systems (WAMS):

- Provides dynamic representation of the system
- Represents the system state in real time
- Suitable for online dynamic studies
- System wide disturbance monitoring and protection possible.



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Who our customers are? Main industrial sub-segments

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Oil & Gas

Chemicals

Mining & metals

Food & Beverage

Power gen. & water

Cement

Aluminum

Data centers

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Key business drivers

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- Prevention of Blackouts
- Reduction of Energy Costs
- Reduction of Investment Costs
- Reduction of Operational Costs
- Environmental, Health & Safety (EH&S) Risk Management

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Our value proposition: PGGA power distribution systems contribute to…

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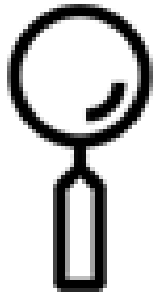
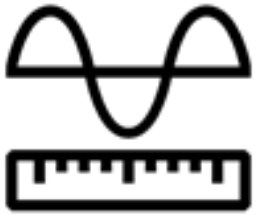


…Maximize uptime
By avoiding unplanned outages

…Deep visibility and control
Through increased automation

…Maintain safe operations
Through advanced protection

…Reduced lifecycle costs
Through asset management



…Improve power quality
By keeping voltages within the limits

…Peace of mind
Through high value services

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Overview of PMS solution

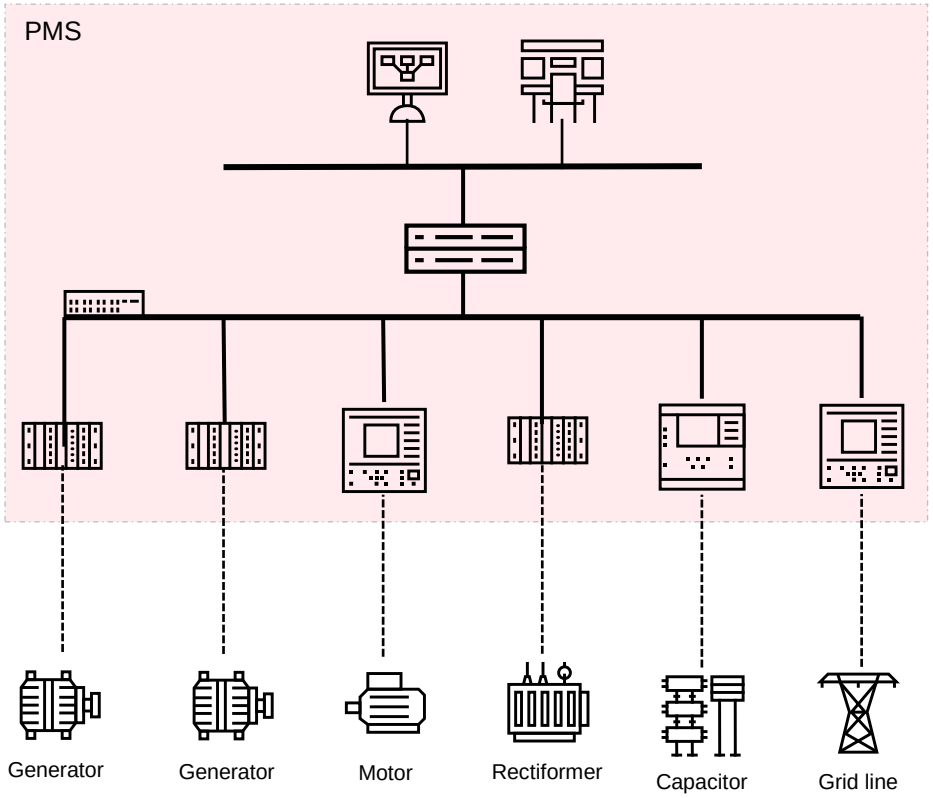
Main elements

HMI
MicroSCADA

Central controller
MicroSCADA/RTU500

Communication network
Ethernet switch

Sub-controllers
RTU500/Relion/SAM



Power Management System (PMS)
The goal of PMS is to **prevent blackouts**, increase plant availability, reduce energy costs, and ensure reliability and energy efficiency.

Main elements:
HMI:
- Supervision of critical equipment
- Monitoring system parameters
- Set operation parameters
- Guidance to operator
- Reports

Central controller:
- Host for core PMS applications

Communication network:
- Fast and reliable information exchange between central controller and other devices

Sub-controllers:
- Data acquisition/input-out units
- Host for PMS sub-functions

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Enabling Products

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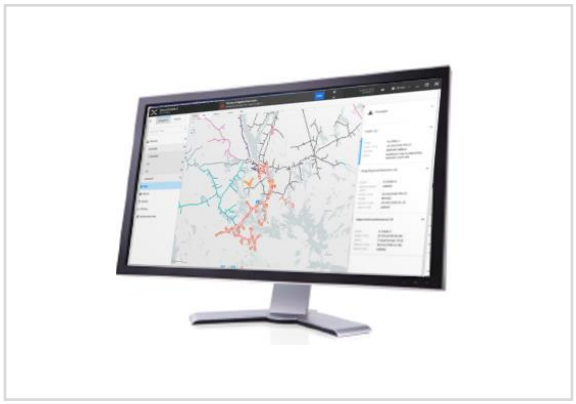
MicroSCADA X – product portfolio

MicroSCADA X SYS600 Control System

Monitoring, Control, Alarms, Events, Historical reports and trends, Automation functions, Communication services and gateway functionality



MicroSCADA X DMS600 Distribution Monitoring

Distribution Management, Network Topology, FLIR, Network Calculation, Outage management

SDM600 System Data Manager

Centralized user account management, Centralized activity logging, Disturbance recorder file handling & report creation

MicroSCADA X SYS600C Compact System

Industrial grade computer for harsh environment. Control software pre-installed at the factory

Enabling products for the automation - Relion the power of One

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Relion 670 and 650 series

Solutions for every application

- 670 Series:

Support for the most demanding requirements of protection and control applications

Ordering as pre-configured or customized

Advanced protection and control features

Multi-object protection capability

High level of functional integration

- 650 Series:

Simple ordering, always pre-configured for:

Single breaker applications

Relion REB500

Unique platform, with Relion look and feel

- Distributed busbar protection system:

Scalable for up to 60 feeders (bay units) and a total of 32 busbar zones

Modular and flexible architecture

Centralized layout: Installation of bay units and central unit in one or several cubicles

Distributed layout: Bay units distributed with short connections to CTs, isolators, circuit breakers, etc.

SAM600 IO system

Bridging the gap between analog and digital technologies

SAM600 modular process bus IO system is placed in the field to connect conventional equipment to IEC 61850 process bus

High accuracy for revenue metering while covering the whole dynamic range for protection

Fast data acquisition and communication for time critical protection applications





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Enabling products for the automation – RTU500 series central controller

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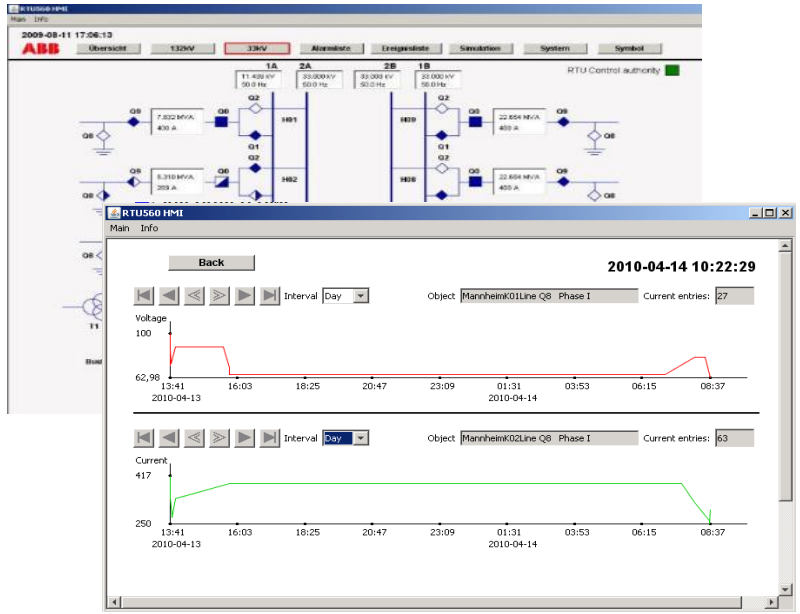
RTU560 features

- Maximum flexibility with the highest number of supported protocols for sub and host communications.
- Optimize your investments with our long-life cycle policy and benefit from our agile migration concepts.
- Integrated HMI
- Redundancy suitable for all types of redundant requirements
  - Power supply, CPU, communication
  - Replacement of redundant power supply or communication unit during operation

Automation functions

- Acquisition of Controller and SCADA information
- Calculation of load to be shed
- Adjustable safety margin of 0..10% by the operator
- Transmission of quantity of loads to be shed to ADMS
- Transmission of load shedding trigger event to ADMS
- Manual mode allowing operator to enter data normally received by SCADA manually
- Notification of remote shedding to SCADA
- HMI to monitor status of the remote load shedding and allowing operator interaction
- Generation of report following a remote load shedding event
- Centralized DR collection and analysis
- Fleet management



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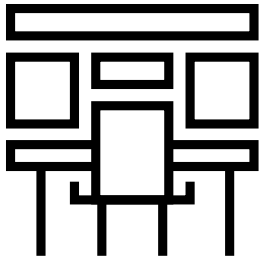

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Operating the Digital Grid

MicroSCADA X / DMS600 / SDM600

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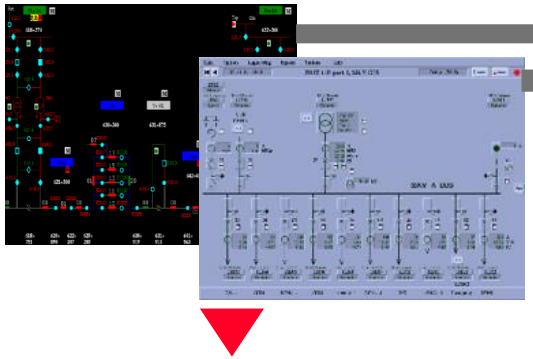
Workplace generations and our commitment on life-time

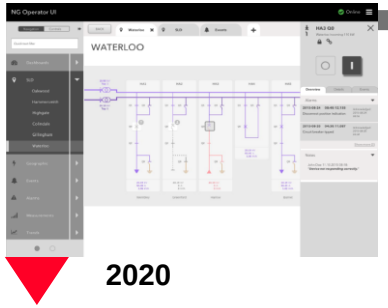
X-Window

Exceed – Classic Workplace

Remote Desktop – Workplace Pro/Pro+

Web enabled HMI – Workplace X





2000-2005 2007 2010 2013 2020

Server

7.x | 8.1 | 8.2 | 8.3 | 8.4.x | 9.1 | 9.2 | 9.3 | 9.4 | 10.0 | 10.1 | 10.2 | 10.3 | 10.4 | 10.5 | 10.6

OS

iRMX VMS UHC SCO Novell NT 2000 XP/2003 7/2008 8/2012 10/2016 10/2019 10/2022

Unix Windows

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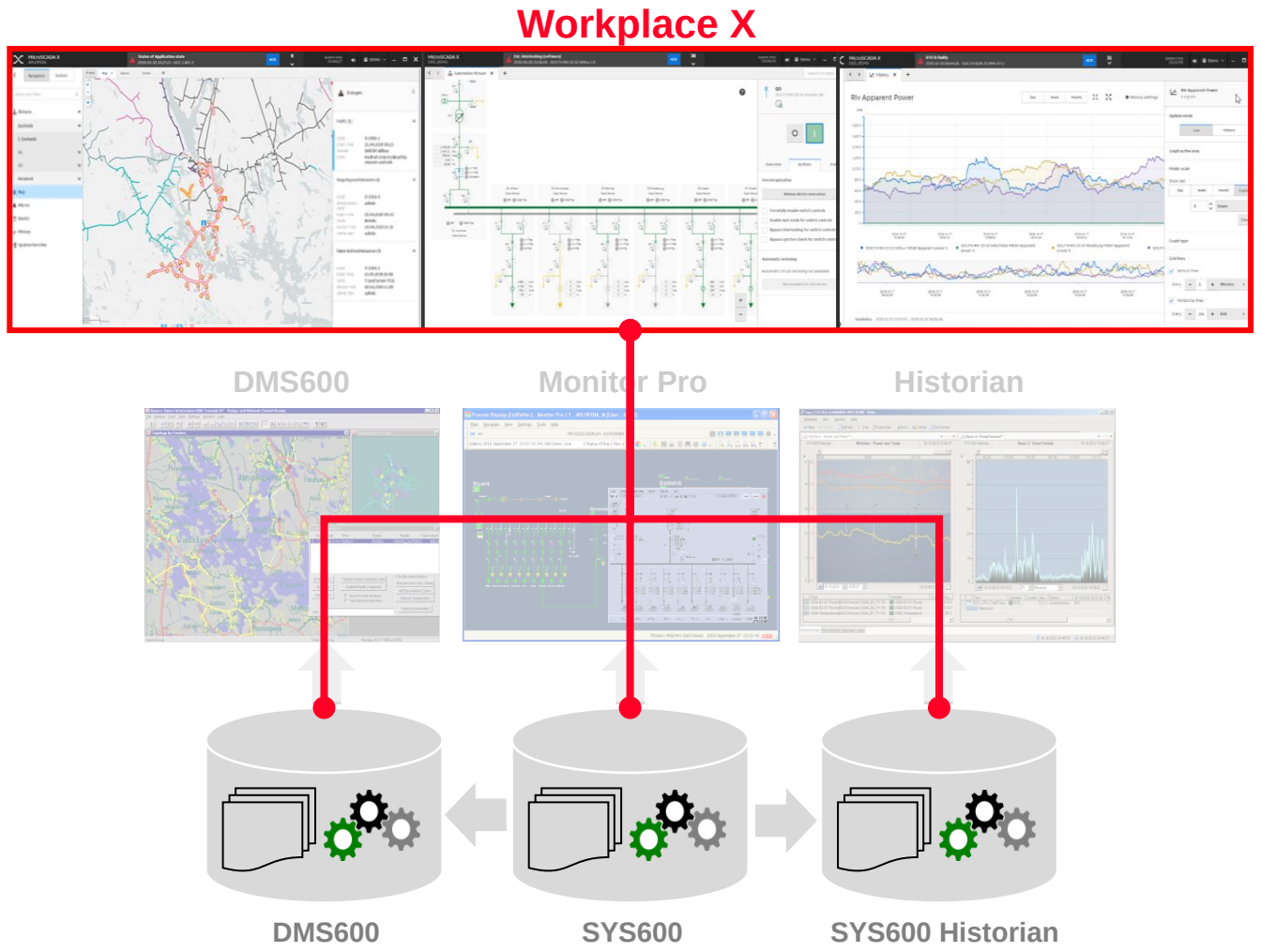
Workplace X

Compatibility

- SYS600 10.X and DMS600 4.X are fully backwards compatible with previous versions
- Workplace X is an additional possibility compared to the previous versions
- Workplace X can be used in parallel to previous generation User Interfaces



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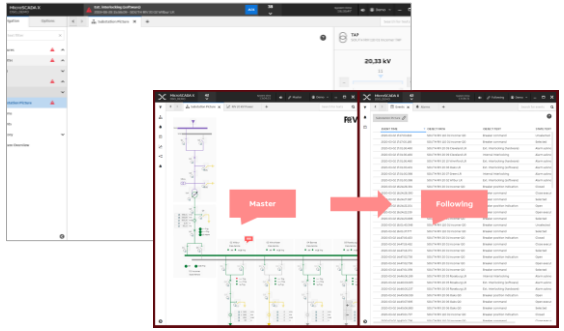
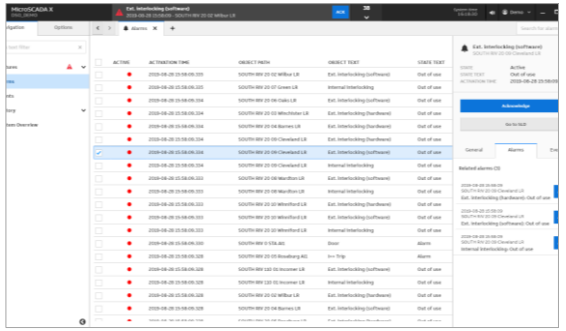
HMI-Workplace X functional overview

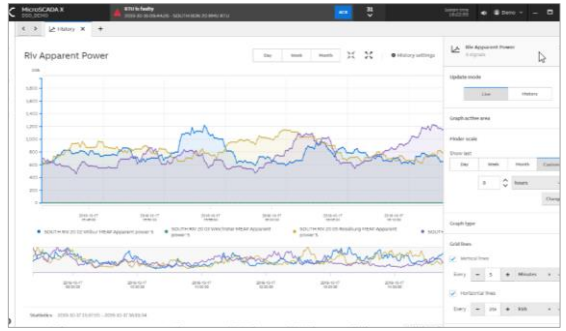


Workplace overview

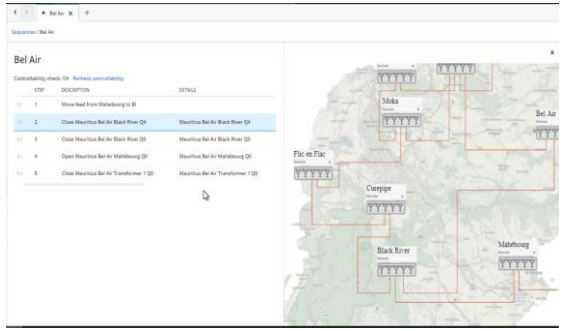
Process pictures



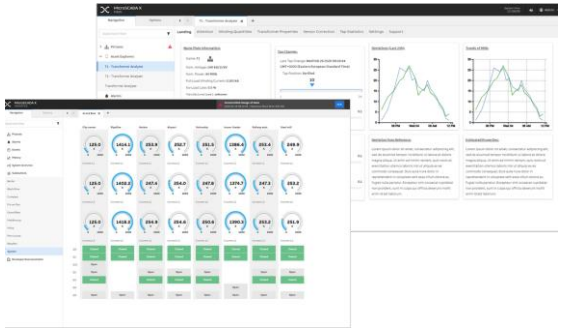
Alarms and events



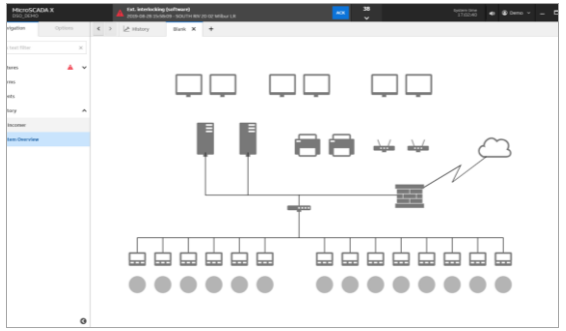
Measurements



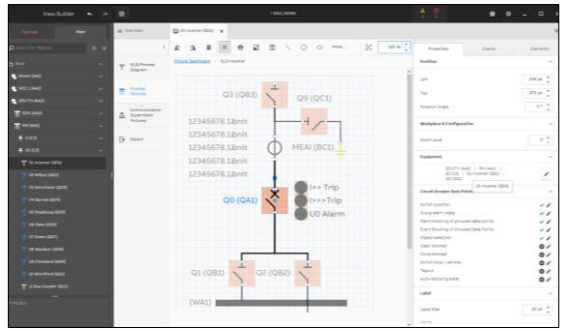
Functionalities



Customization



System overview



View Builder

Public

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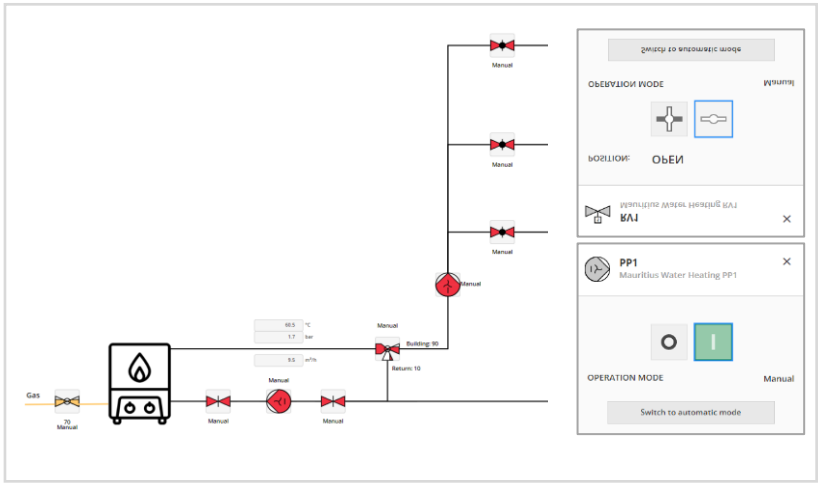
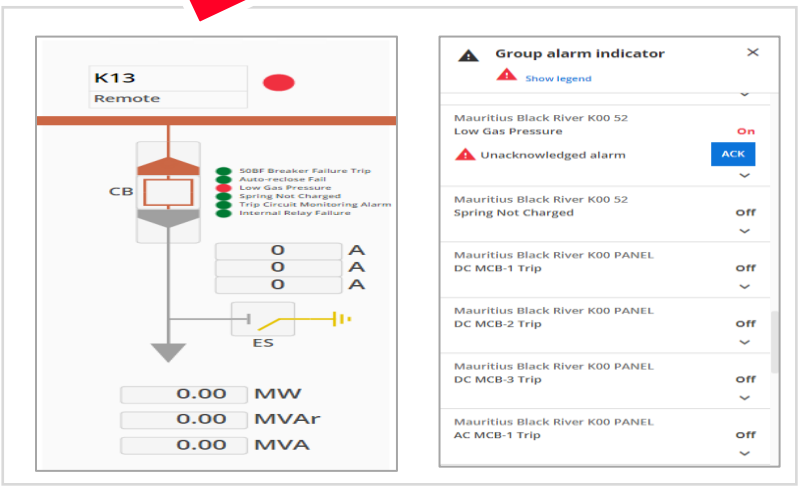
HMI-Workplace X functional overview

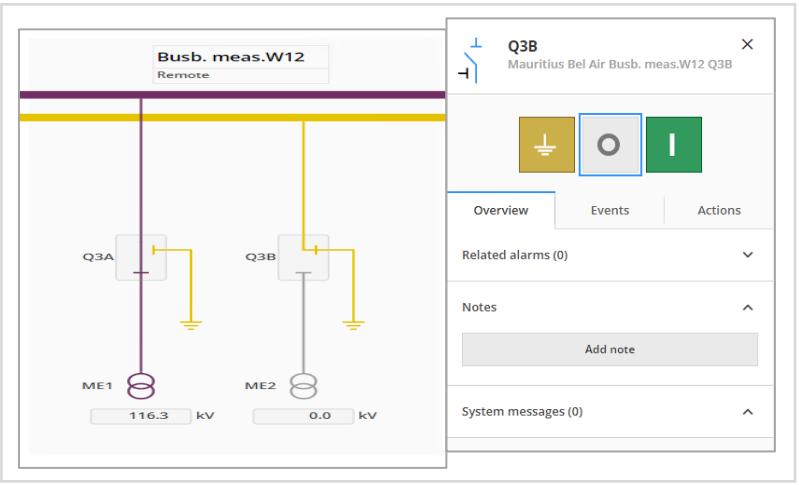
New in SYS600 v10.6



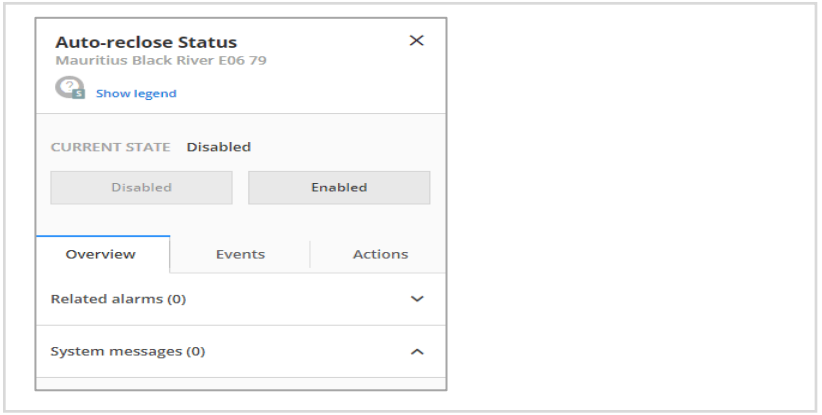
Pipeline Library Support



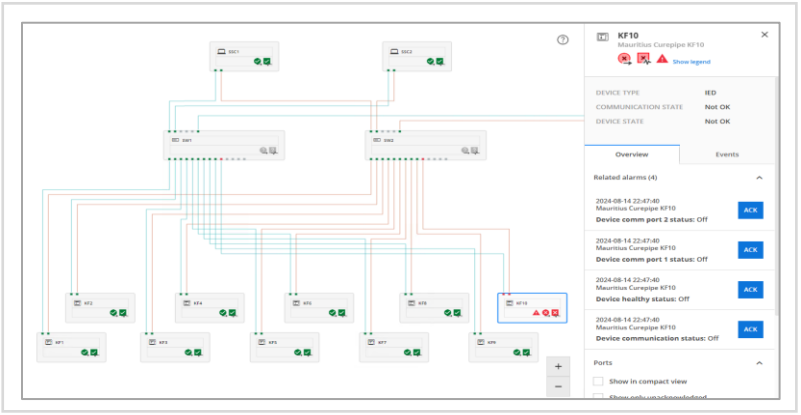
Group Alarm Symbol and Control Panel



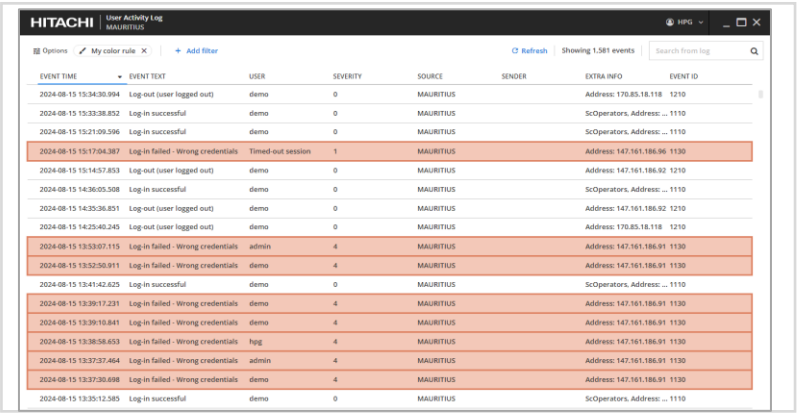
Three state switches



Generic Controls



System supervision symbol & Pictures



User Activity Log

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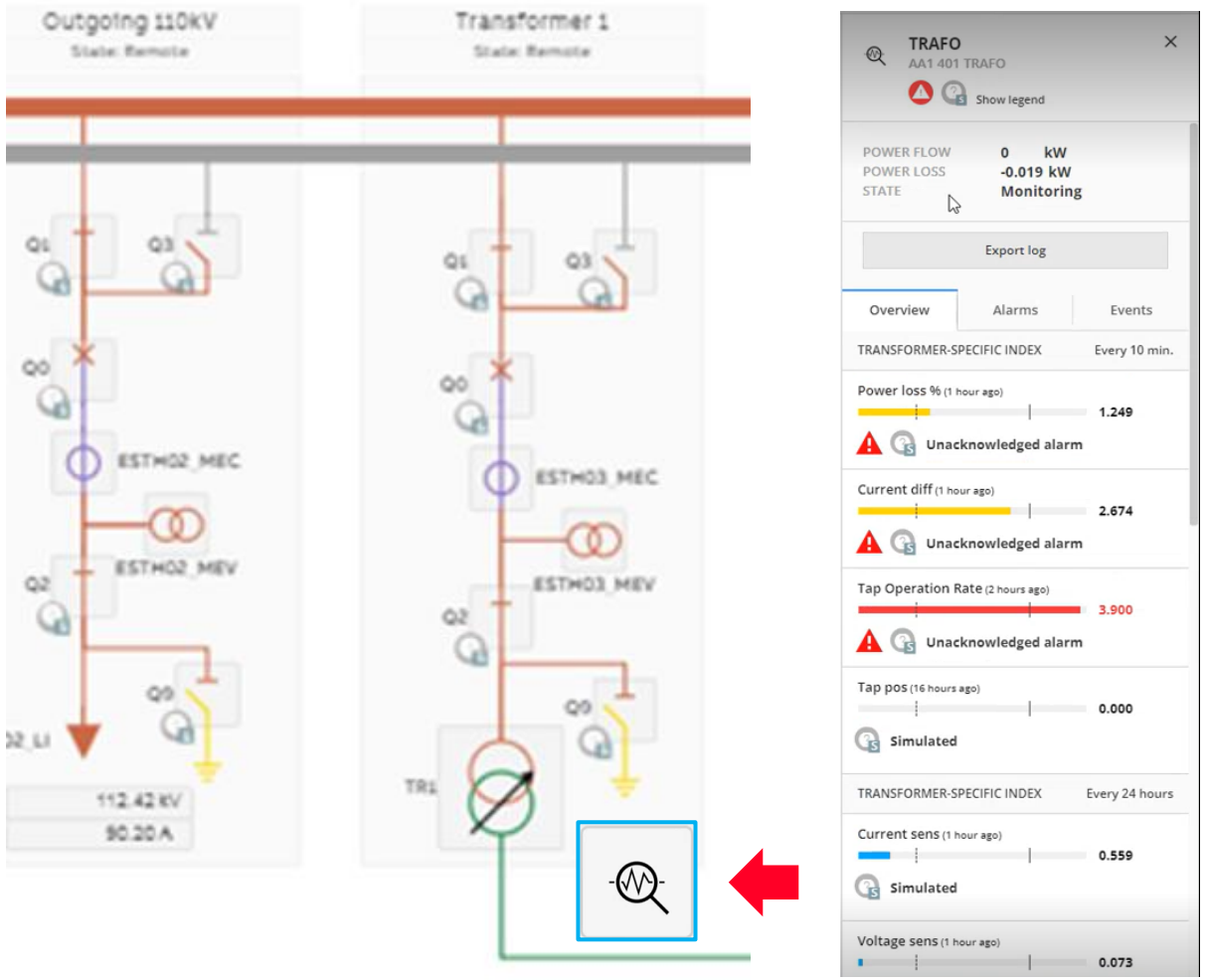
Workplace X – Transformer Analyzer

Transformer Analyzer

Workplace X functionality

- Separate symbol for the analyzer function
  - Indicating main status of the analyzer
- Right Pane with condition indicators
  - Normal, warning and alarm levels
  - Data export for detailed analysis by transformer experts



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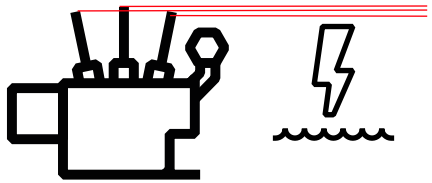
Transformer monitoring functions

Transformer through-fault monitoring

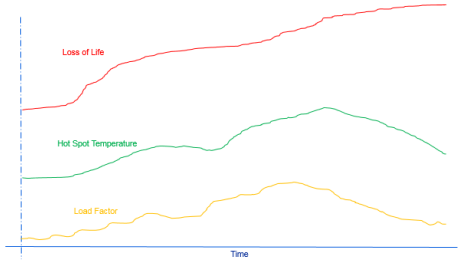
- Through-faults create mechanical stresses in the transformer, eventually leading to damages, and expensive maintenance
- This function integrates the winding current when above a set level of I2t, to indicate the mechanical stresses brought about by external faults
- Alarms/Warnings from the function can be used to prevent energization of the transformer until the relaxation time

Available as options in RET, REG, REC, RED, REL670 types



- Every through-fault captured generates a report which is stored in the IED, and can easily be retrieved
- Details of the selected fault record are visually displayed showing the fault duration and fault values
- The function can be set following guidelines according to IEEE C57.12.00-1993 standard
- One instance of the function can store up to 100 recordings,

Transformer insulation loss of life monitoring



- Monitoring of hot spot temperature, top oil temperature and insulation loss of life
  - Alarms are generated when hot spot and top temperatures are reached
- Quantities such as ambient and oil temperature can be calculated or measured

Available as options in RET, REG, REC670 types

- Time constants can be calculated by the function
- Loss of life is calculated in days and years, and stored in the non-volatile memory
  - Calculation method can be selected as IEC or IEEE
- Applicable on Hitachi Energy and non-Hitachi Energy transformers

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DMS600 – Workplace X UI functional overview.

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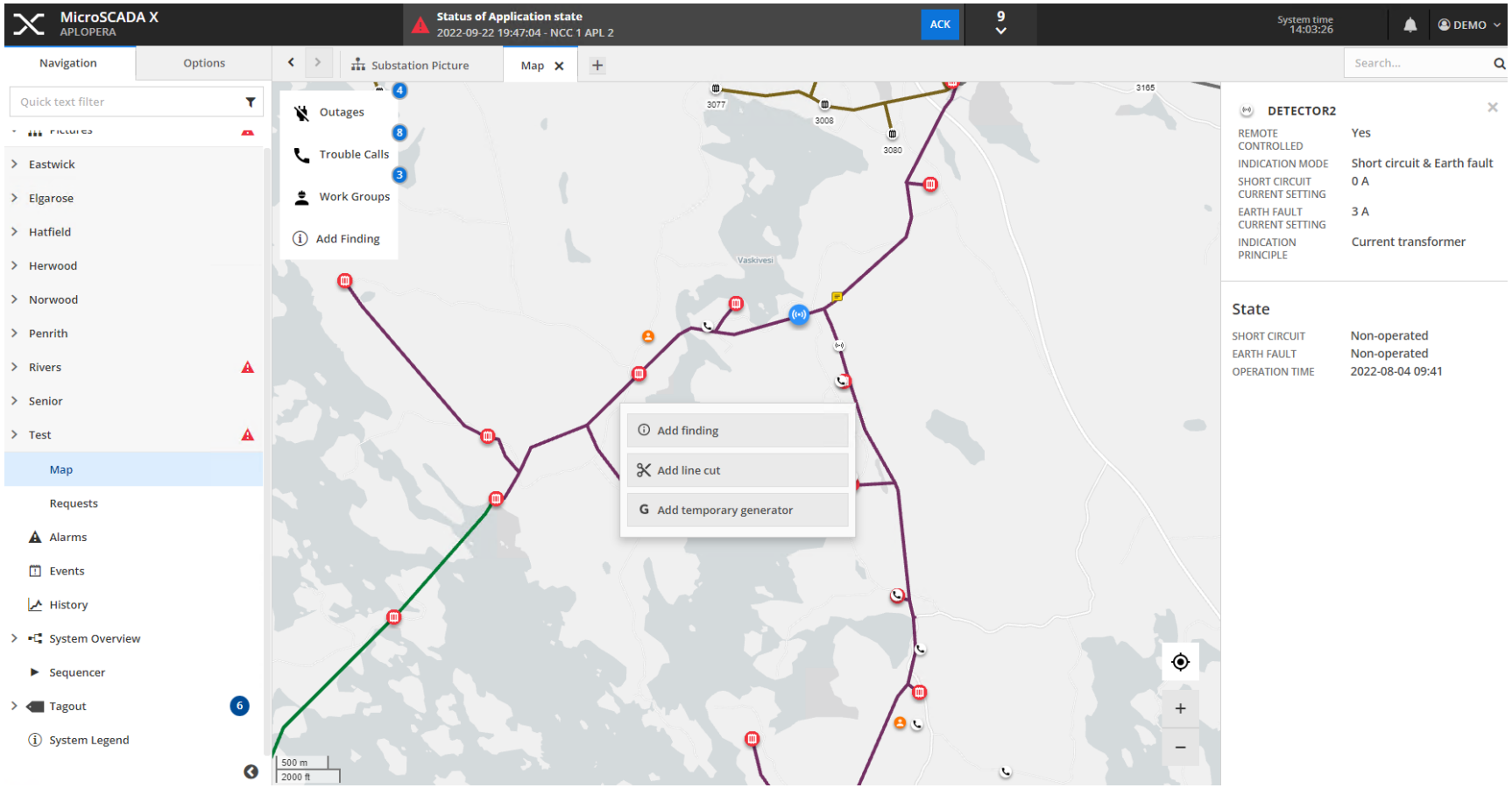
UI functional overview

Workplace X

- With MicroSCADA X DMS map view is integrated with the SCADA views into the same workplace
- The map view includes
  - Real-time network visualization
  - Fault and maintenance outages
  - Field crews
  - Customer trouble calls

Seeing easily whole situation

→ **Optimal operational decisions**



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MicroSCADA X SDM600 in a Nutshell

SDM600 is a comprehensive software solution for the automatic retrieval and analysis of disturbance record data, management of service and cybersecurity-relevant data across your substations.

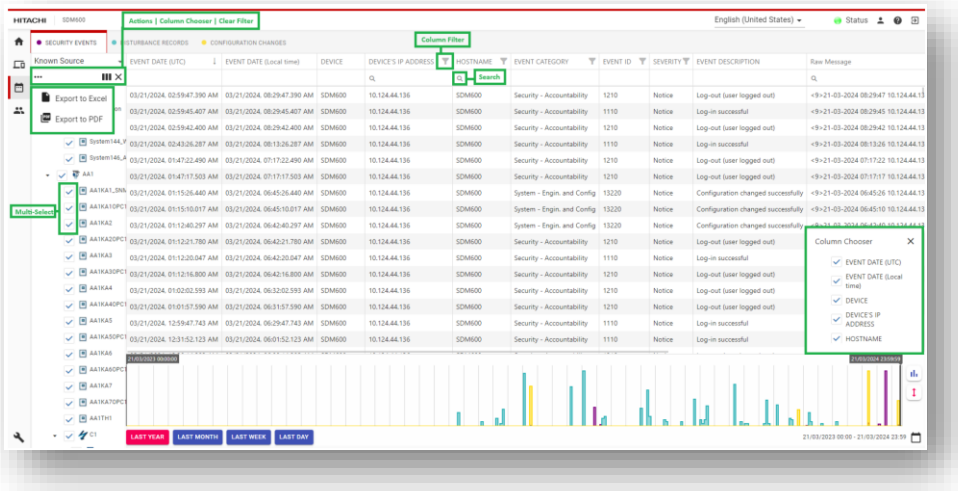
System Wide Cybersecurity Event Logging With SDM600

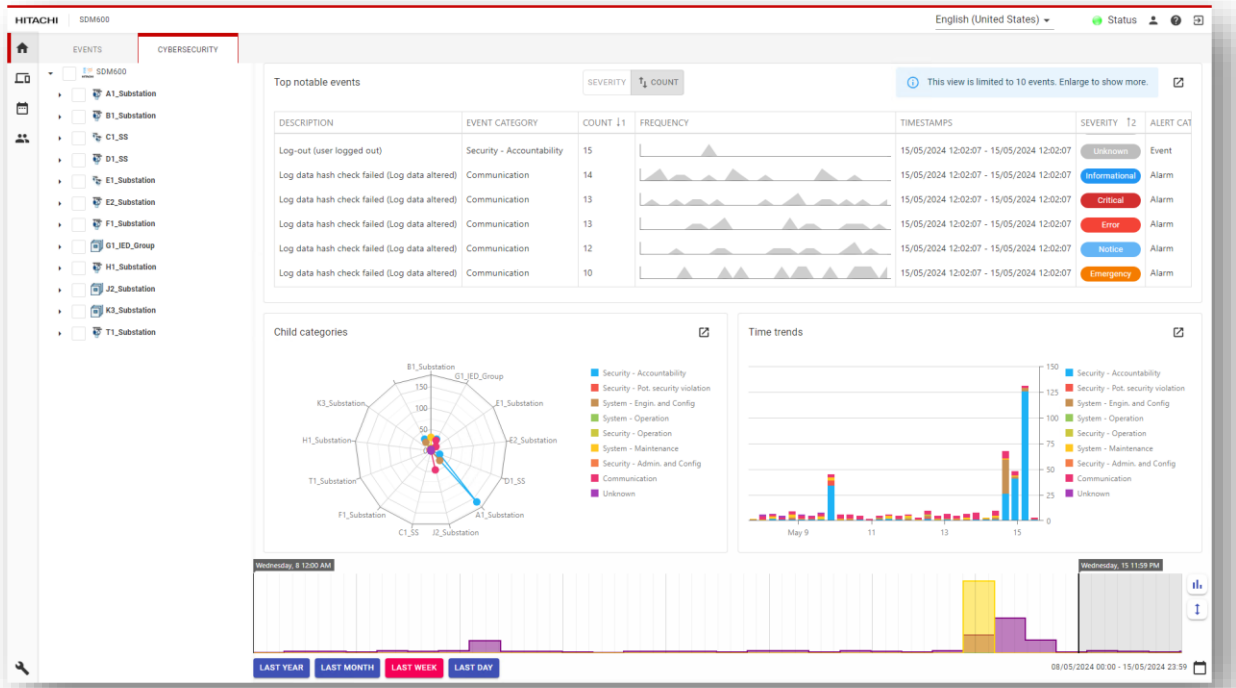
Cybersecurity Dashboard

SDM600 1.3.5 comes with a cybersecurity dashboards that can be used to visualize cybersecurity events statistics on different part of the system under SDM600 supervision.

The dashboard is composed out of:

- Top notable events list
- Spider web of various cybersecurity events categories
- Time trends of the cybersecurity events categories.





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Feeder Automation

Extending our Portfolio
Converged measurement, control & communication

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Advanced distribution system protection with REF650

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Reliable protection, control, and monitoring device

Enhanced flexibility for multi-application purposes

Compact and modular

Easy to install and cost-efficient

Touch screen local human machine interface (LHMI)

Precision accuracy thanks to shunt technology

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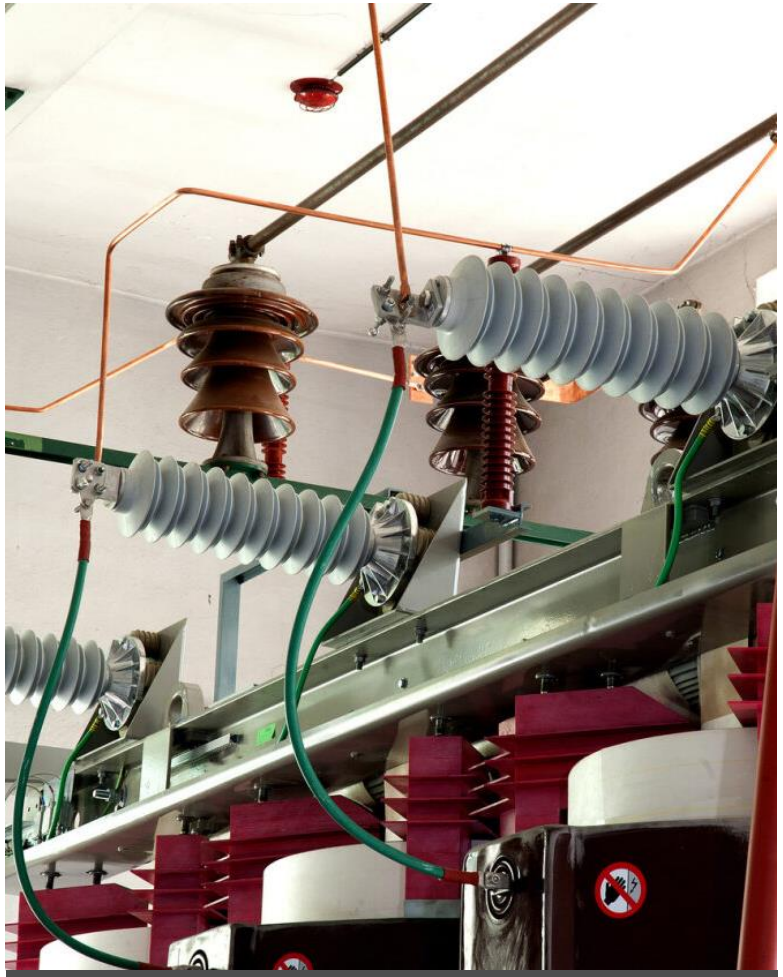
REF650 | Ready for any challenge.

Data centers



Distribution Substations / Primary Substations

Distributed Energy Resources (Wind, solar)

REF650 multi-application feeder protection and control

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Primary apparatus monitoring package

Interconnection protection

User-exchangeable hardware modules

LHMI with 7-inch touch screen

Multi-application feeder protection and control

Recovery mode

Front and back status LEDs and service ports

RoHS and REACH compliant*

Enhanced environmental spec's

Certified with IEC61850 Ed2.1

Retractable CTT terminal connector with short-circuiting

Enhanced device and system diagnostics

4.8kHz DR

Two form factors:
3U 1/2, 3U 1/1

Freely configurable

Web HMI

Static output module with direct breaker tripping and TCS

Rack mount
Wall mount
Flush mount

Automatic execution order with PCM600

User-settable 1A/5A current inputs

Admittance-based EF

Public

*REACH under preparation

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REF650 | Designed for...

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Serviceability

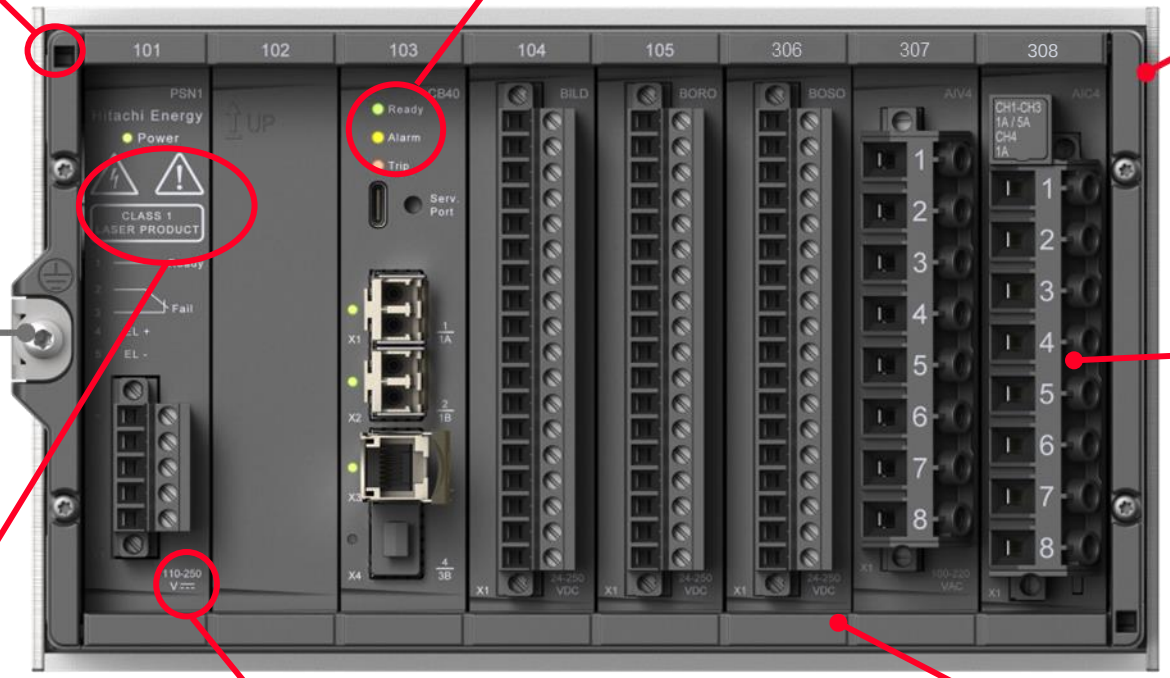
Locking rib used to lock all module cards; takes away the need for screws and enhances the serviceability

Manufacturing

Same module card is IEC/ANSI standard compliant; decreases the number of variants and article numbers

Flexibility

Rear side prepared to become front during wall mounting; only mounting kit needs to be changed



Usage

Grounding feature has a dedicated placement on all products, which makes wiring and installation plans much easier

Preventing Mistakes

Connector design updated for 1A and 5A to prevent wrong connector being put on wrong module card

Safety

Safety marking has dedicated placement and is prepared for both one- and two-slot power supply sizes

Usage

Correct voltage range included in rear side marking to prevent human mistakes during wiring

Quality

All markings have their dedicated placement for consistency, easy access, and visibility

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Two form factors. Take your pick.

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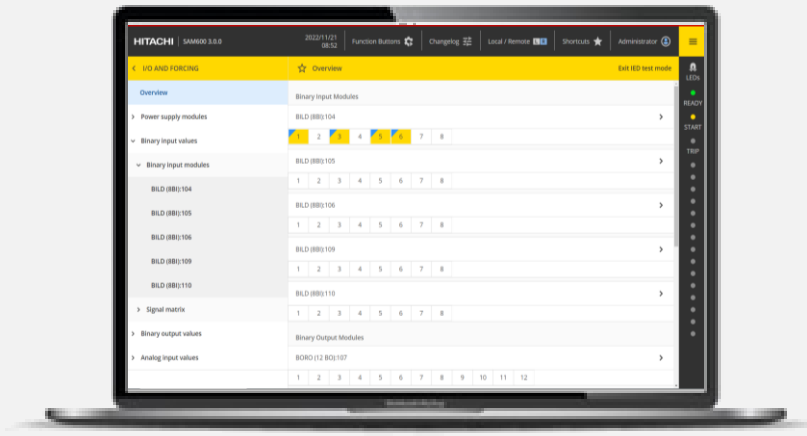
3U form factor

3U 1/2 form factor

New web-based user interface



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REF650 | Display front options and features

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- **Display alternatives:**
  - 7’’ touch-screen LHMI
  - No LHMI
  - Web HMI is available for all alternatives above, with the exact same layout as LHMI
- **LED indications:**
  - 15 configurable indication LEDs, three colors in three groups
  - Three status LEDs
  - Virtual text LED indications
- **Usability:**
  - The SLD is completely freely configurable, with 12 available pages
  - The start screen is user-selectable and configurable
  - Five virtual function keys, freely configurable
  - Multiple User Sessions (maximum 8)

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Web HMI

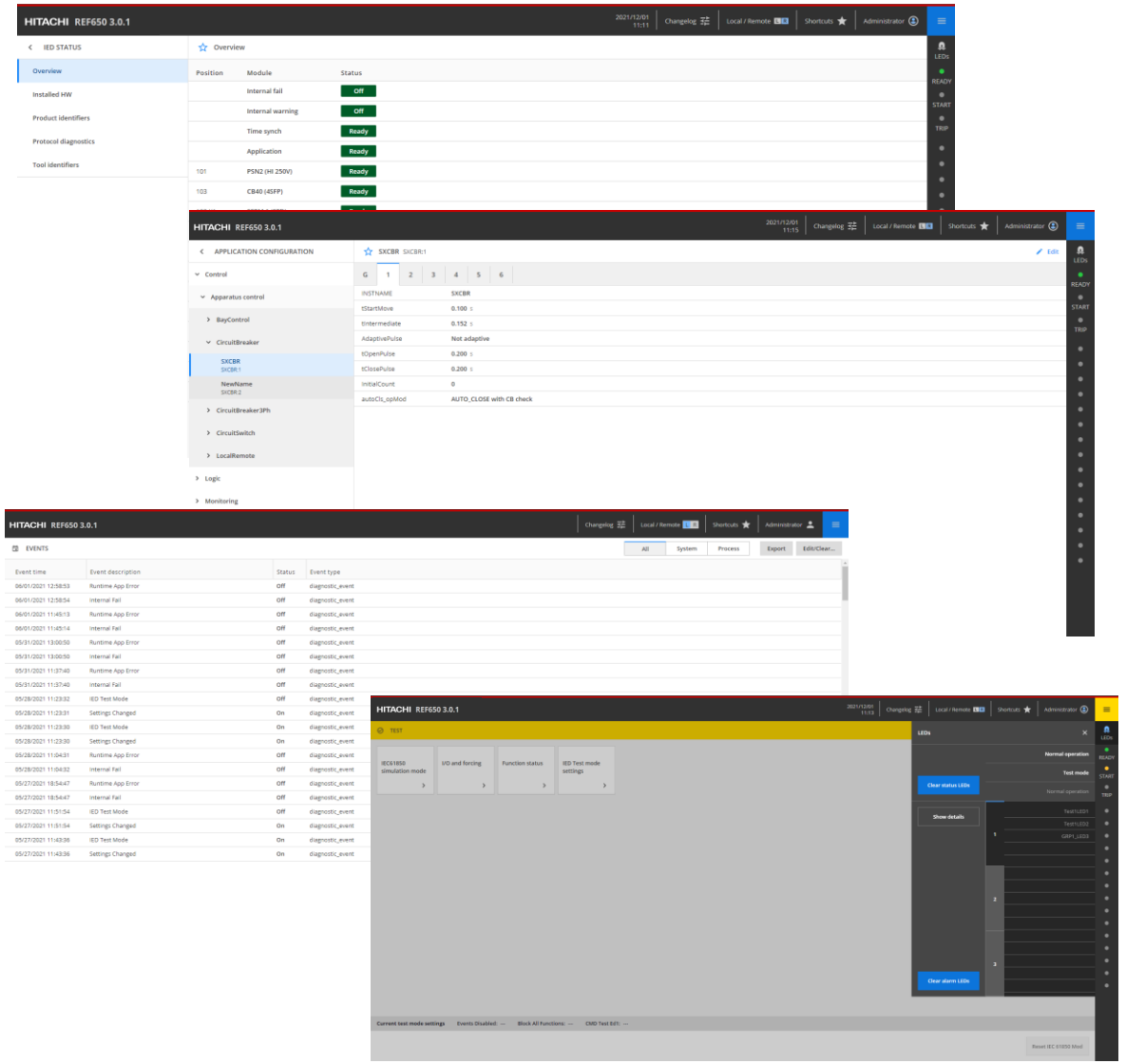
Web HMI standout features:

- Adjustable layout of views
- Supports multiple (up to two) concurrent sessions
- Disturbance Records and Event list can be stored locally on laptop
- Virtual LED menu
- Access through device Ethernet ports (USB-C acts as Ethernet port) with laptop or tablet browser

Features applicable to both LHMI and Web HMI:

- Test menu updated, including forcing and simulation (nominal values) of analog inputs
- Shortcut feature implemented which makes navigation fast: user can reach almost any content within two interaction steps

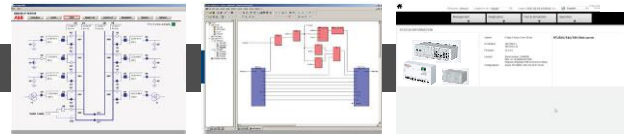
User can interact simultaneously with LHMI and Web HMI



RTU500 series overview

RTU500 series modules

RTU500 series functions and software



RTU560 product line

RTU530 product line

Feeder automation	Secondary distribution substations	Primary distribution substations	Transmission/ subtransmission

In the future RTU520 and RTU540 disappear

Full featured solution

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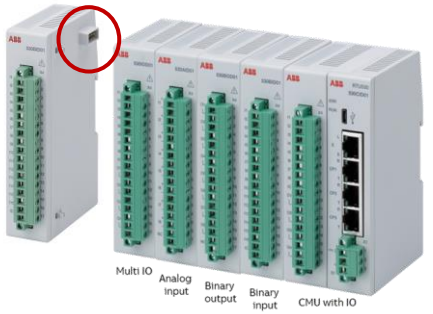
From analoque to digital

- Suport classic and electronic (low power) CTs and VTs
- Independent of vendors

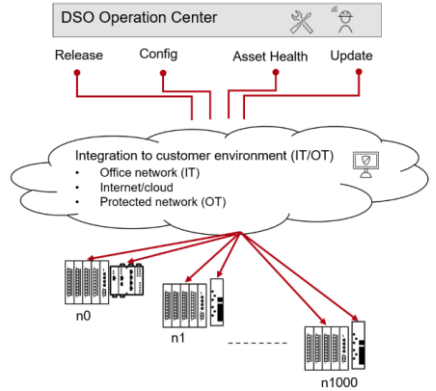
Data availbility

Storage of measurements/events, even communication is not available



High performance

- From Modbus to I/O bus
- Scale from small to large



Fleet Management

One management for all

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Solutions based on RTU530 platform

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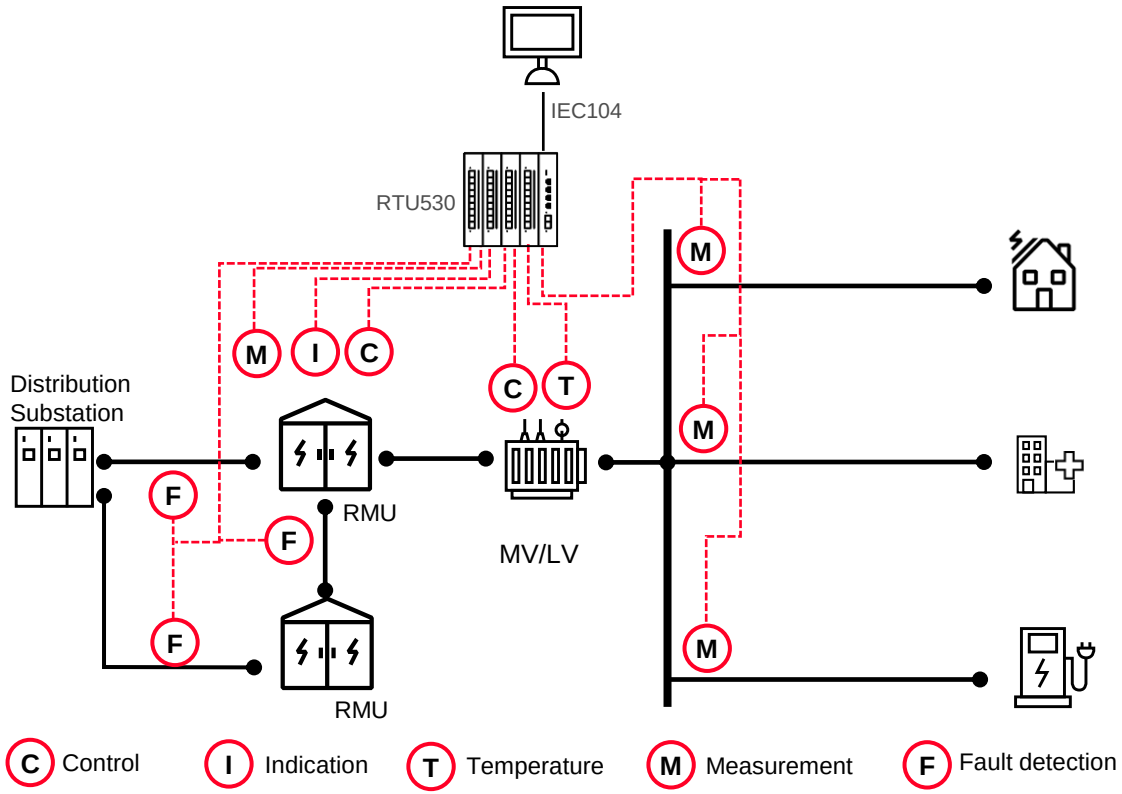
Applications

RTU530 measurement, fault detection and I/O module for more grid visibility to ensure the power quality and higher grid resilience:

- Detect overload or unbalanced situation to protect primary equipment (transformers)
- Detected earth faults (ground cable and overhead lines)
- Supply detailed information about power consumption and load flows in the network
- Support the installation decentralized energy resources (DER)
- Monitor the MV and LV network power flow and power quality (bandwidth of voltage and frequency, power factor)
- Remote control
  - Switchgear (Distribution substation, RMU, pole top installation)
  - Transformer (Voltvar regulation)

Secondary distribution application example



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OT Fleet Management Solutions

Staying up to date and in control of your fleet of devices

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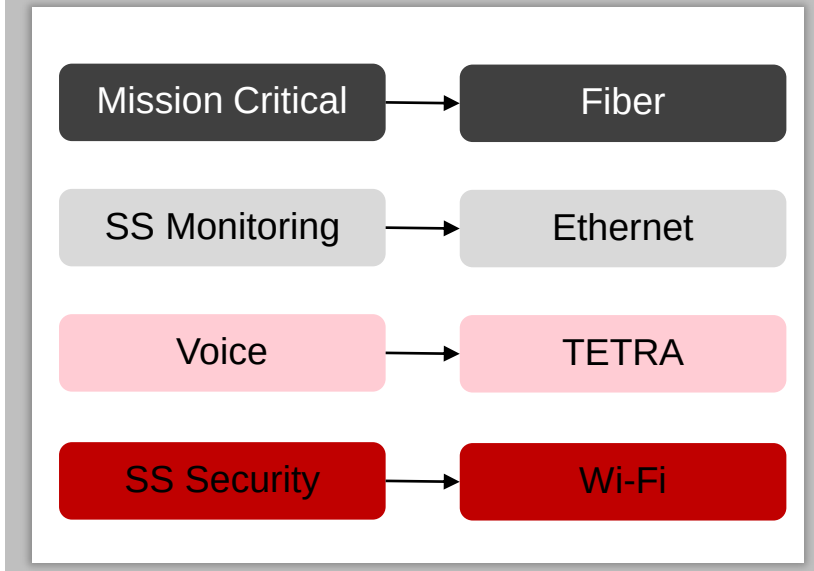
One Network/ One Application

High specialization, no flexibility:

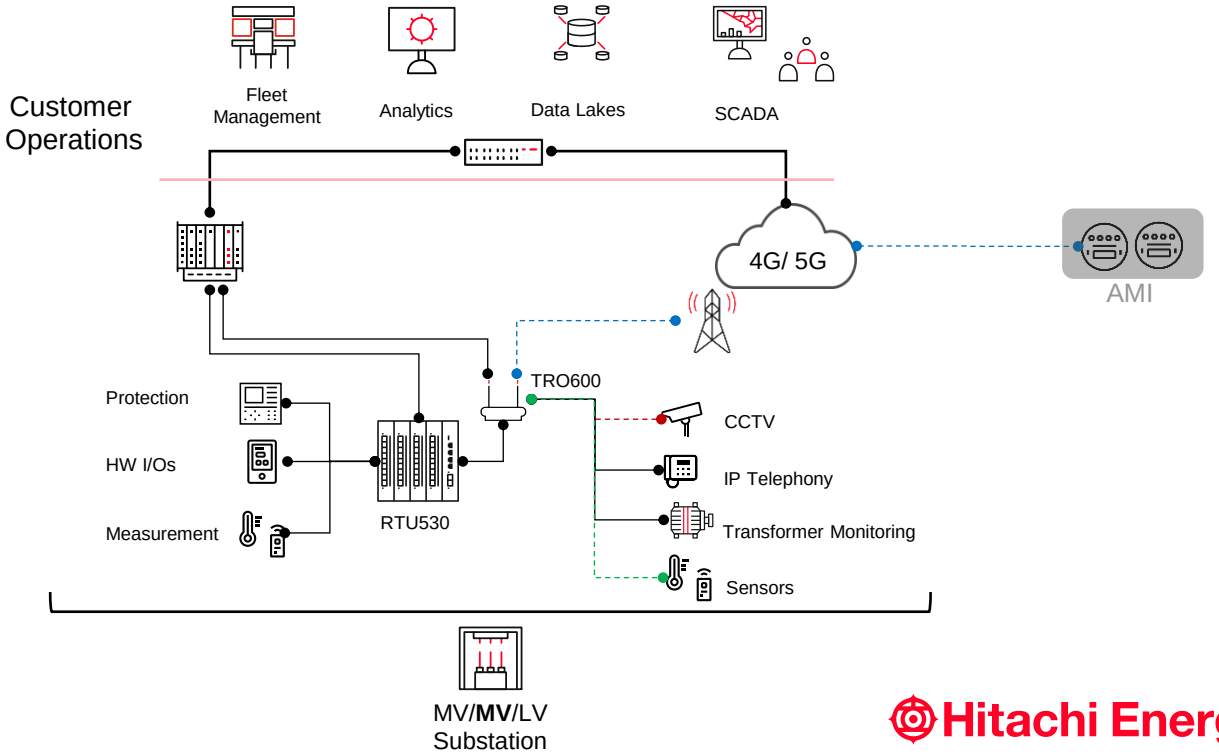
- Each network served a single or limited number of applications
- As applications are added, a new network is deployed
- Over time, numerous parallel networks in operation, increase OPEX significantly



Multi Purpose Converged Networks

High flexibility, scalable capacity:

- As more flexible, multi-technology devices become available, utilities can benefit from hybrid and converged networks that can:
  - Serve many applications with various requirements
  - Scale economically
  - Reduce OPEX and CAPEX



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Hybrid Tropos Wireless Architecture for Digital Grid

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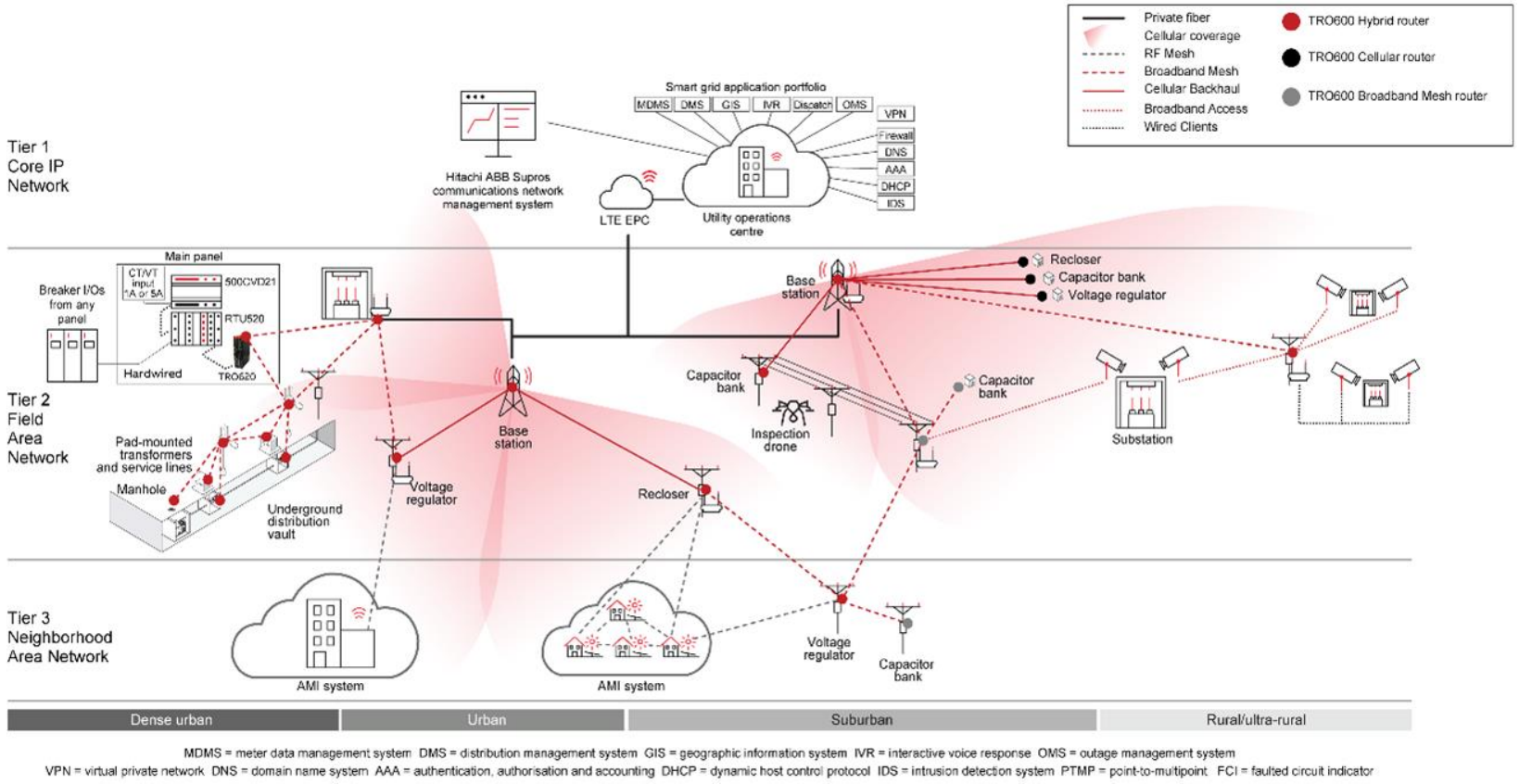
Smart grid application

- No single communication technology is perfect for every operational need.
- The hybrid strategy combines the best of public and private LTE with unique patented Tropos self-healing broadband mesh, all managed through a single network management system.
- Best fit communications technology for each application and use case spanning environments from the dense urban to the ultra rural.



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Hybrid Tropos Wireless Architecture for Digital Mining

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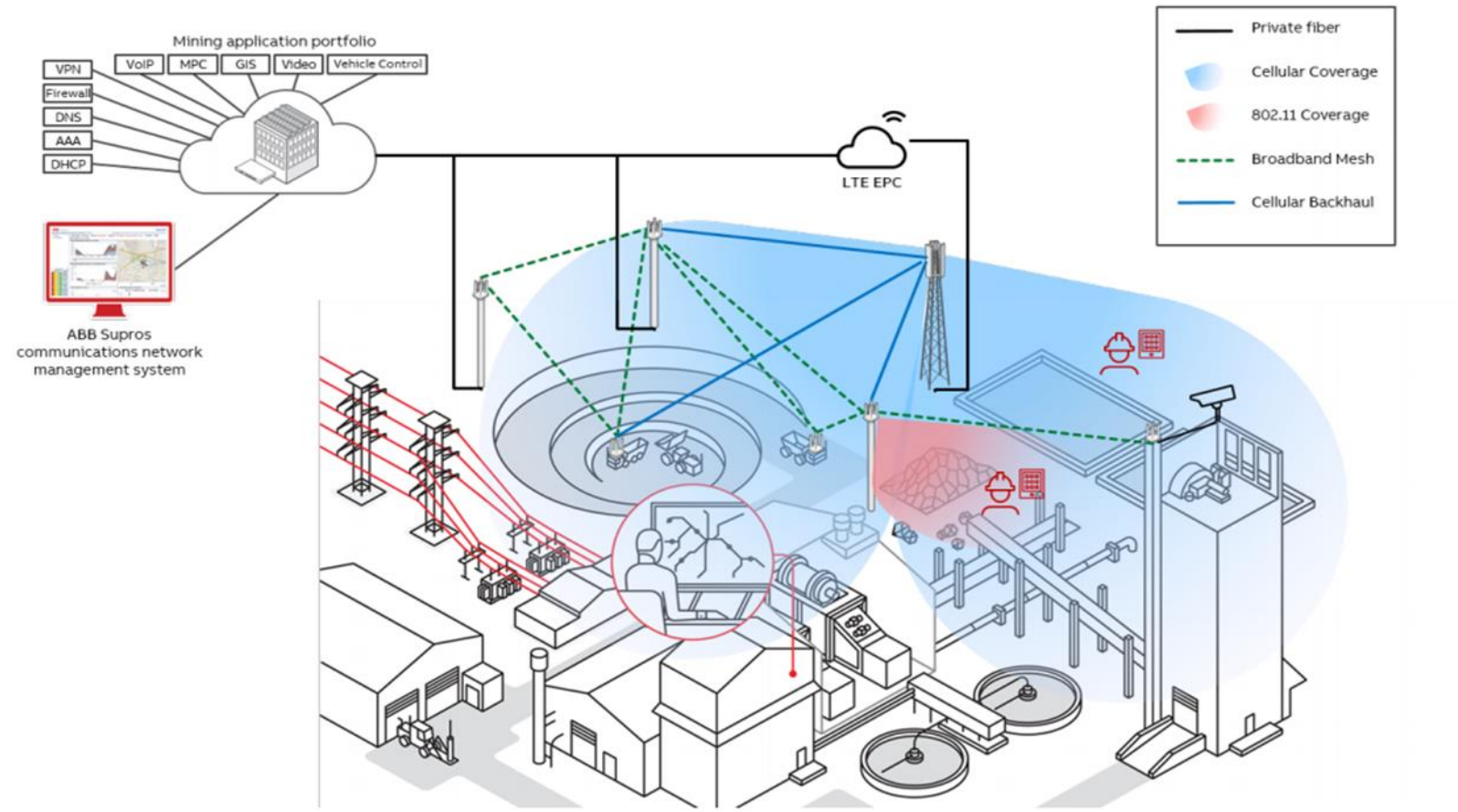
Mining application

- No single communication technology is perfect for every operational need.
- The hybrid strategy combines the best of public and private LTE with unique patented Tropos self-healing broadband mesh, all managed through a single network management system.
- Best fit communications technology for each application and use case spanning open pit and underground mines.



VoIP voice over internet protocol; **MPC** mining production and control; **GIS** geographic information system; **VPN** virtual private network; **AAA** authentication authorization and accounting; **DHCP** dynamic host control protocol; **IDS** intrusion detection system; **PTMP** point to multi point; **FCI** faulted circuit indicator; **DNS** domain name system; **LTEEPC** long term evolution evolved packet core

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Hybrid Tropos Wireless Architecture for Digital Oil Field

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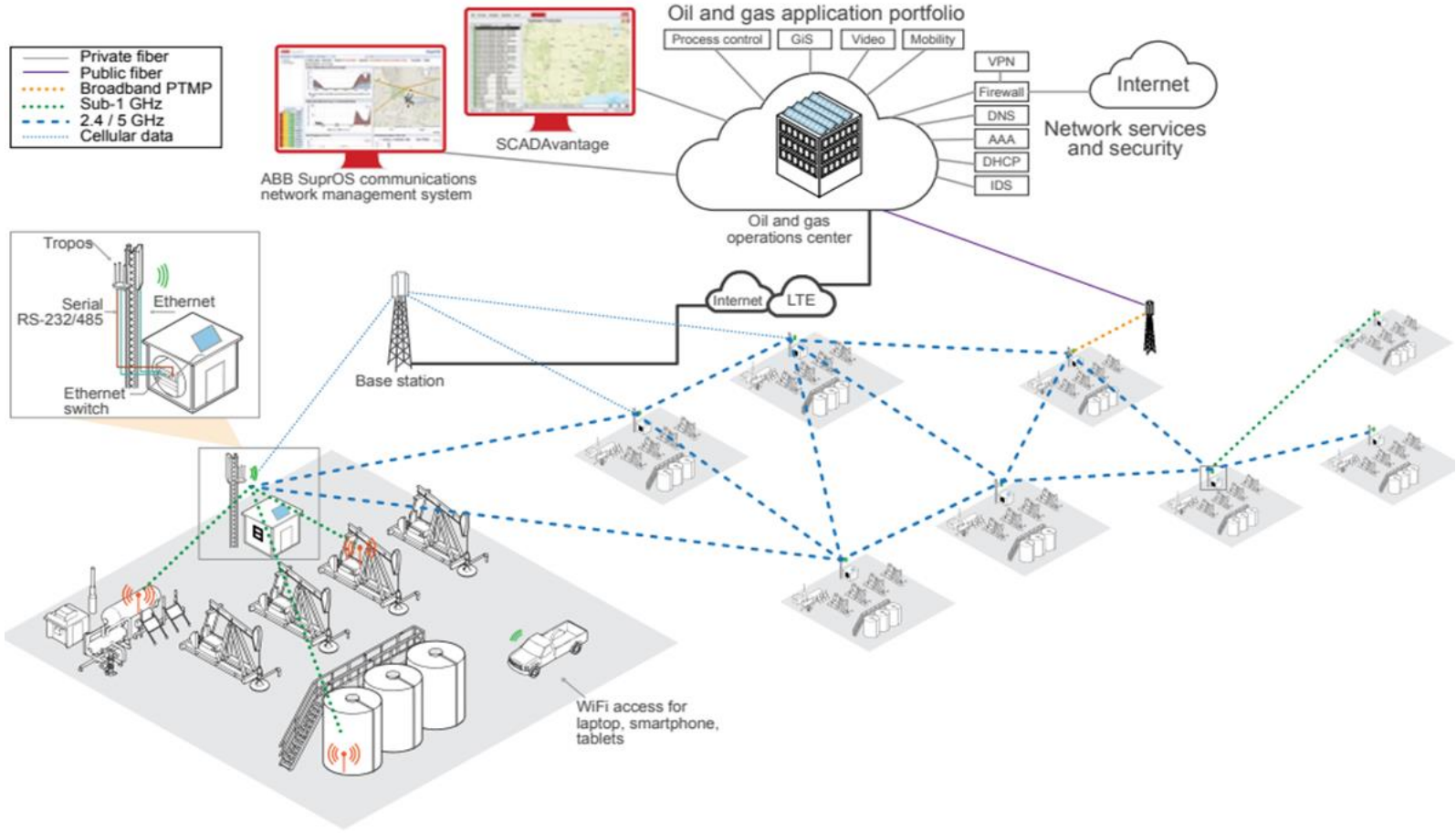
Oil and gas application

- No single communication technology is perfect for every operational need.
- The hybrid strategy combines the best of public and private LTE with unique patented Tropos self-healing broadband mesh, all managed through a single network management system.
- Best fit communications technology for each application and use case spanning environments from the upstream to downstream.



GIS = geographic information system; VPN = virtual private network; DNS = domain name system; AAA = authentication, authorisation and accounting
DHCP = dynamic host control protocol; IDS = intrusion detection system

Public

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Hitachi wireless portfolio

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Product Type	Most extreme outdoor broadband mesh router bridges to core fiber	Outdoor broadband mesh router bridges to core fiber	DIN-rail broadband mesh edge node	DIN-rail broadband mesh client node	DIN-rail broadband mesh edge node	DIN-rail client node
Solution	TropOS 6420-XA	TropOS 6420	TropOS 2420	MicrOS 411	TRO620	TRO610
						
Utility Use Case	Best reliability and performance for high endpoint density			cost-effective at intermediate distance	Multi-application deployments	Cost optimized IoT deployments
Technology	Mesh			Mesh client node	Mesh / Cellular / Optical	Cellular
Frequency band	2.4/5.8 Ghz	2.4/5.8 Ghz	2.4/5.8 Ghz	2.4 Ghz	2.4/5.8 Ghz / 4G LTE	4G LTE
Communication Network Management System	The carrier-class SuprOS NMS provides network-wide visualization tools from a single console across solutions from ABB Wireless and select partners. FCAPS management for full fault, configuration, administration, performance, security.					

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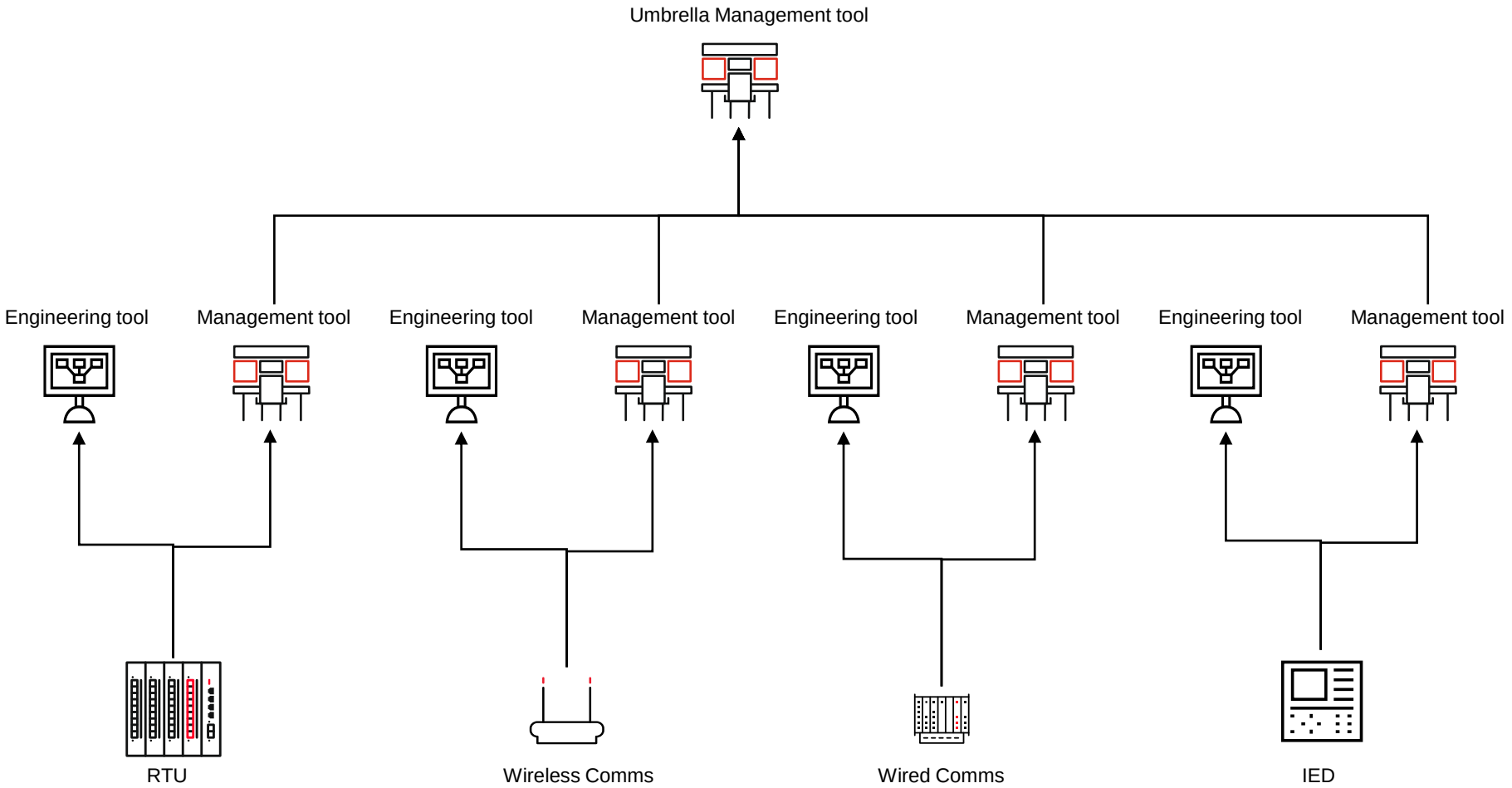
What do traditional distribution automation topologies look like?



- **Difficult to scale and interconnect**
- **Difficult to troubleshoot and isolate issues**
- **CAPEX and OPEX intensive**
- Usually an **artefact of multi vendor topology**
- Also happens often with **single vendor multi portfolio implementations**
- Compounds when customers choose **multiple vendors for the same element**
- True challenge is that **fleet management is not standardized**

Converged Fleet Management

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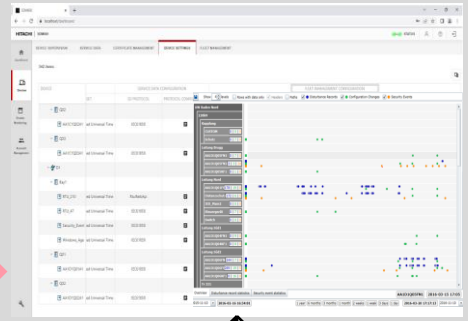
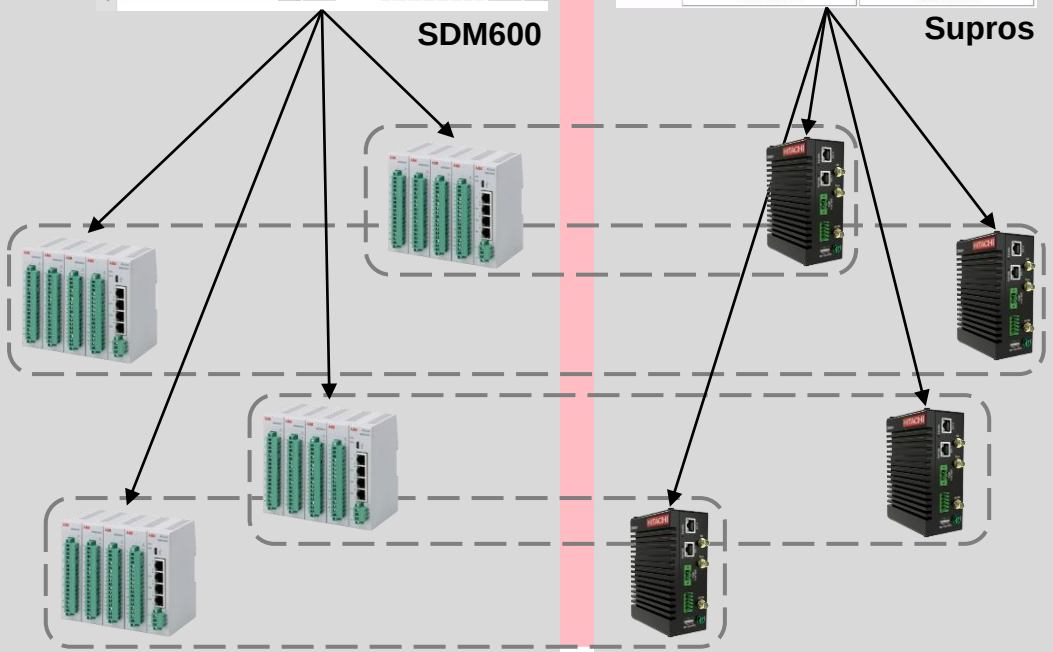
RTU Fleet Management

RTUtil
Multiprog
HMI Editor

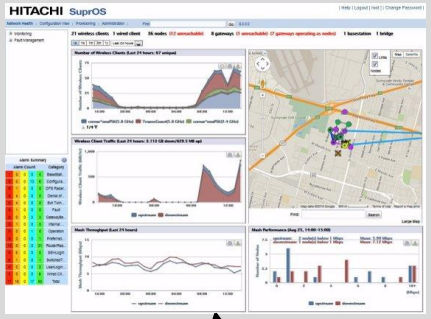


SDM600



RTU Lifecycle Mgmt

Wireless Fleet Management



Supros

Wireless Lifecycle Mgmt

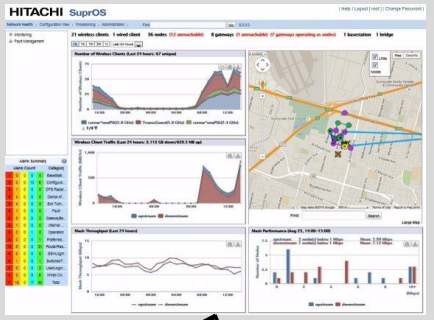
In SDA, RTU and TRO are very often collocated and requested together:

Hence, we needed:

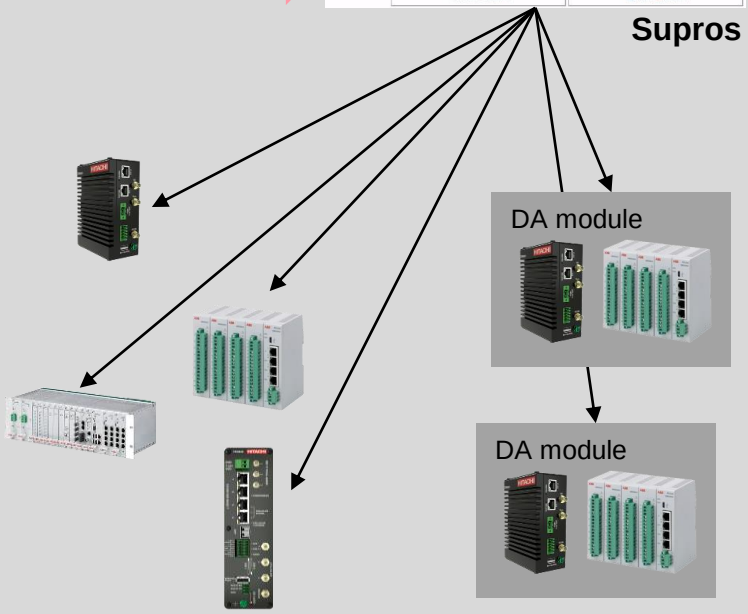
1. **Single platform** for integrated communication and OT plane management
2. **Scalability up to 100,000 devices** in a single NMS
3. **Simpler (low-touch/zero-touch) device deployment** and on-boarding
4. Lower **operational costs** due to single platform and faster issue resolution time

Integrated Fleet Mgmt (TRO+RTU)

RTUtil
Multiprog
HMI Editor



Supros



For simple fleet

For composite fleet

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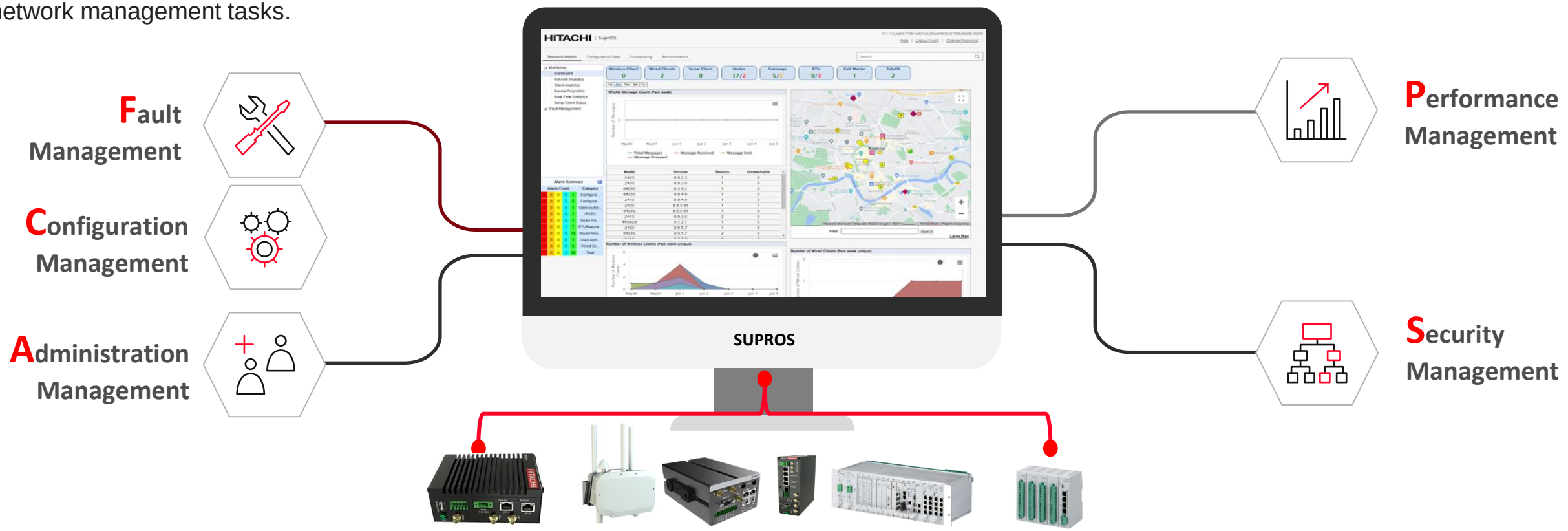
SuprOS Network management: provides FCAPS

FCAPS is an acronym for **fault, configuration, administration/accounting, performance, security**, the management categories into which the ISO model defines network management tasks.



FCAPS is basic NMS functionality. We provide unique features: management, integration of Tropos, RTU500 control devices.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