# Guiding your path to digitalization

## Introduction to BlackBear TechHive

BlackBear TechHive 2024

# We consult, we design, we manufacture, and we support.

## Experience

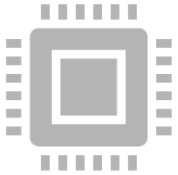
30+ years experience in the Industry

## Cross-domain expertise

Logistics, networking, manufacturing, cybersecurity, ecommerce

## Compliance

ISO9001:2015 CE/FCC/UL and industry-specific certifications



## Internal R&D

Hardware, software, mechanical, AI, machinery

## Manufacturing & testing

Wholly owned and operated factories

## Service

Prompt technical support and afterservice

**We are digitalization providers for industrial automation, utilities, and smart cities.**

**Our professional and dedicated teams help source and engineer quality solutions that fit your specific requirements.**

# Our Structure

BlackBear

Global resources

BlackBear Cyber Security

**BlackBear Cyber Security**
concept is ingrained in all our solutions, protecting against risk and threats of the digital world.

OT Security

atop Technologies

**ATOP Technologies**
is our backbone, connecting our companies through **networking** and **logistics** communication technologies

Networking Pick-to-Light

BambooDynamics

**Bamboo Dynamics**
guides us towards the cutting edge of future development for **transmission** and **wireless positioning**.

Logistics

**Errevi Elettric**
tailors integrated **logistics automation solutions**, delivering automation to our customers.

Automation

Manufacturing

**Manufacturing**
is our heart, where we test and produce **electronics** for all our innovations.

Manufacturing

salea
Growing Sustainable Business

**Salea**
supports **omni-channel ecommerce** for businesses to achieve true digitalization.

Ecommerce

**Furthermore...**
We also leverage knowledge and expertise in **ceramics**, **hospitality**, **fine arts** and more.

Others

# Global Presence

From Americas, to Europe and Asia, we have physical offices across the globe to provide world-class service to customers.

# ATOP Technologies Inc.

*Industrial Networking*

# Smart Grid & Substation

Corporate overview

# ATOP at a glance

**Founded**
1989

**Identity**
Taiwanese
Family-Company

**Chairman**
Eric Chan

**Capital**
US$ 5M

**Revenue**
US$ 35M

**Employees**
232 (Worldwide)

**Offices**
Taiwan, India, Indonesia, Italy, PRC, Thailand, USA, Colombia

**Quality System**
ISO9001:2015

**Environmental**
ISO14001

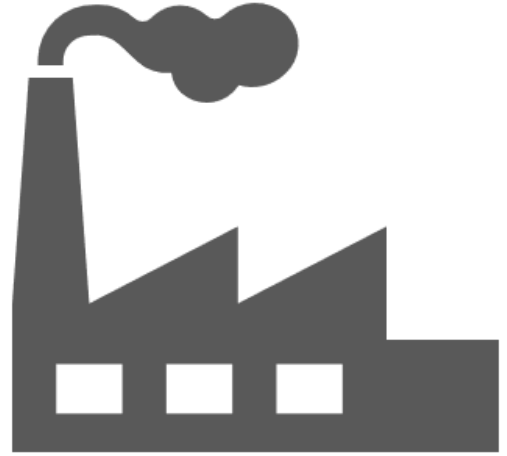
# Business units

## Industrial Networking

Ethernet and non-Ethernet based solutions for utilities, vertical markets and factory automation

## Pick-to-Light

Solutions for mass-picking or mass-putting for warehouses and logistic provides with high turnover rates



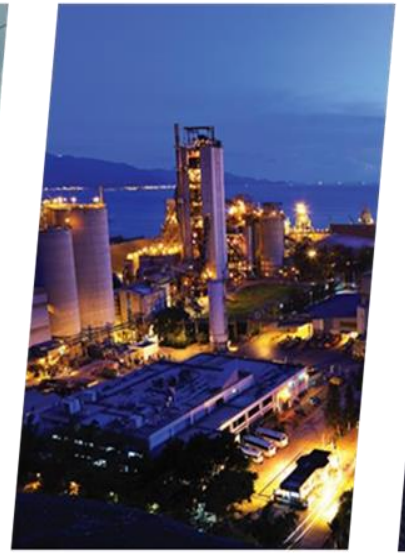
## Contract Manufacturing

Manufacturing and testing services of industrial-grade solutions in ATOP's manufacturing facilities

# Application Industries

Substation & Smart Grid

Railway & Trackside



Automation

ITS & Public Transport

Marine

Oil&Gas

# Industrial Networking Devices

## Cybersecurity and Device management Arena

IEC62443-4-2 compliant solutions

Networking

Switches

Unmanaged

Managed

Profinet switches

Gigabit – Fiber Gigabit

Entry Level

Harsh Environments

L3 switches

EN 50155

IEC 61850-3

PoE switches

Secure Unmanaged-Managed switches – secure routers

Marine

Oil & Gas

NAT Switches

Wireless

Serial Servers /
Modbus Gateways /
Edge Computers /
Protocol Gateways

Wi-Fi APs
Wi-Fi Routers
Wi-Fi Mesh

3G/4G/5G
Gateways
NB-IOT

Wired

4G/5G Wired/ Wireless Routers

Precision Timing

Grandmaster clock

Boundary clock

Transparent clock

Media
converters

PoE Injectors
Remote i/o

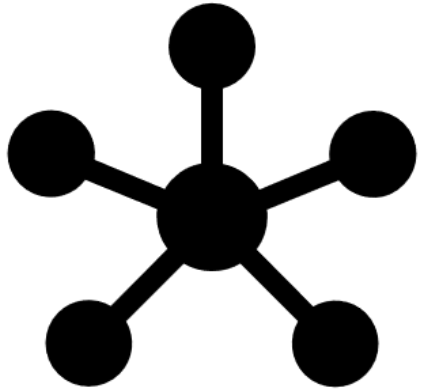
# About our **Roadmap**: *a look to the future*

## Cyber Security

IEC62443 Corporate & Product, Security Compliance and Certification. Deployed on all intelligent products, on top of BlackBear Gateway (BBINS).

## IoT Connectivity

Wi-Fi, Cat 1, Cat. M1, NB-IOT and LTE/4G Industrial Connectivity Solutions, providing a full range from high-throughput to long-distance/low-power infrastructure.

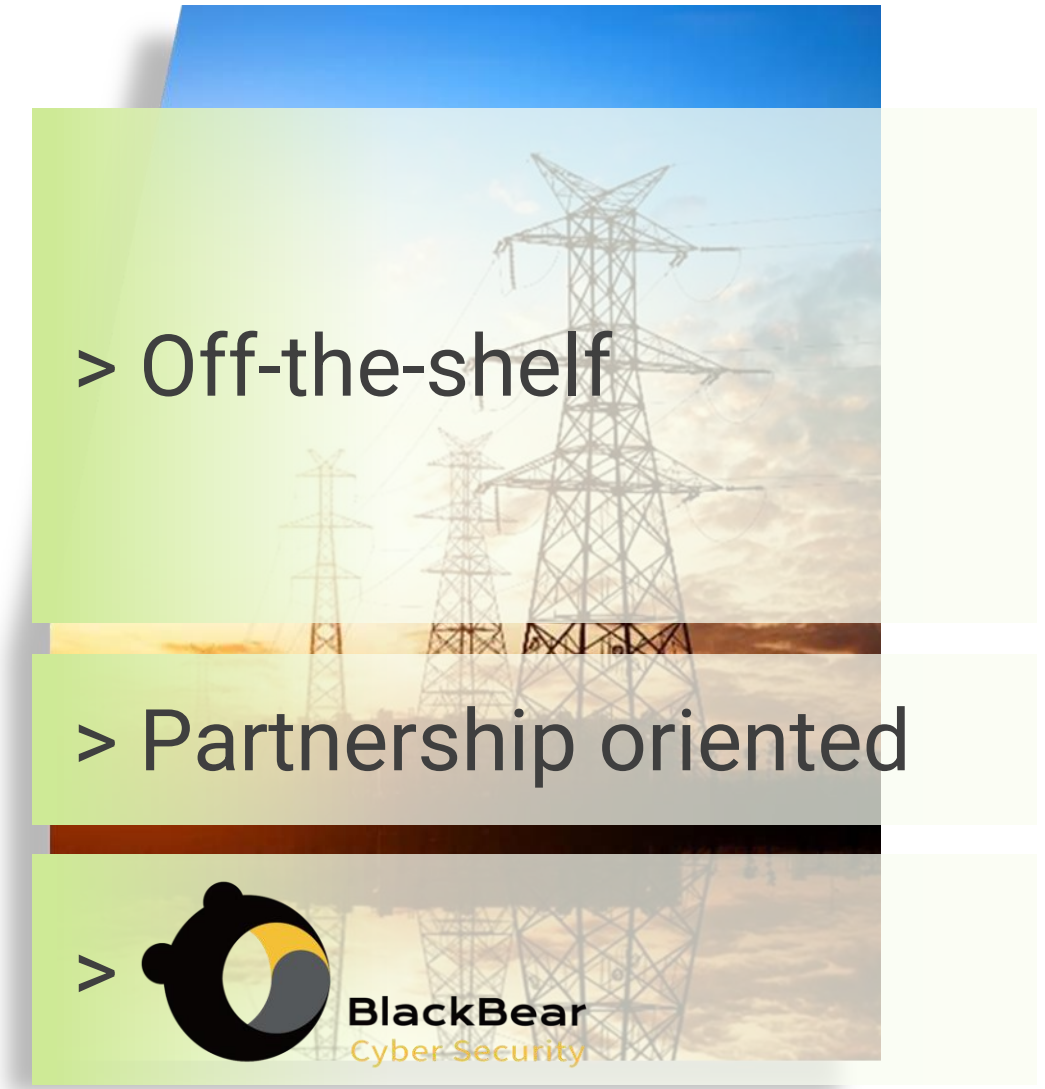


## Management

Network Management Software is the ideal platform to identify, configure, deploy, track and monitor BlackBear solutions and monitor them either over Private Cloud, SAAS or on-premise.

# Substation & Smart-Grid - Products

- IEC61850-3 **Industrial Ethernet Switches** HSR/PRP high-availability
- IEEE1588v2 Hardware-based **Precision Time Protocol Grandmaster**, Boundary & Transparent clock
- **Smart-Grid Protocol Gateways**, support for IEC60870-5-101/3/4, Modbus, DNP3.0 and IEC61850 Modbus Redundant Concentrators
- **Wireless solutions** for Micro-grids or nano-Grids.
- **Customized** solutions
- **Cybersecurity Level 3**, Military-grade Rugged solutions for **Advanced Asset Protection**



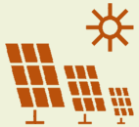
# Smart Grid – Product Map & Competence

Power generation | Dispatching | Power transmission | Power distribution | Electricity retailing | Energy storage

Power Flow


Power plants


Nuclear


Solar farm


Wind farm


Transmission lines

Access:
- ✓ Cellular industrial gateway, for critical infrastructures, low power, or high-performance

Network infrastructure:
- ✓ IEC61850-3 managed switches
- ✓ IEC61850-3 Layer-3 switches
- ✓ Precision time protocol GM, BC, TC combined with high-availability

**Cybersecurity for critical infrastructure**

Retrofitting and integration:
- ✓ Smart-Grid Protocol Gateways
- ✓ Industrial serial server/converter


Substations


Large-scale factory


Transmission lines


Distribution substations

**Cybersecurity solutions for critical infrastructure**

Network infrastructure
- ✓ Process & Bay layer 61850-3 managed switch
- ✓ Grand Master , Boundary clock and TC
- ✓ IEC61850-3 Modbus concentrators
- ✓ Smart-Grid protocol Gateway
- ✓ IEC61850-3 serial server and edge gateway
- ✓ Media converter


Transmission lines

Access:
- ✓ Cellular industrial gateway, for critical infrastructures, low power
- ✓ Cellular industrial routers, high-performance

Integration
- ✓ Telematics-control unit
- ✓ Smart-Grid Protocol GW

Network infrastructure


Consumers & Commercial facilities


Factories


Charger stations

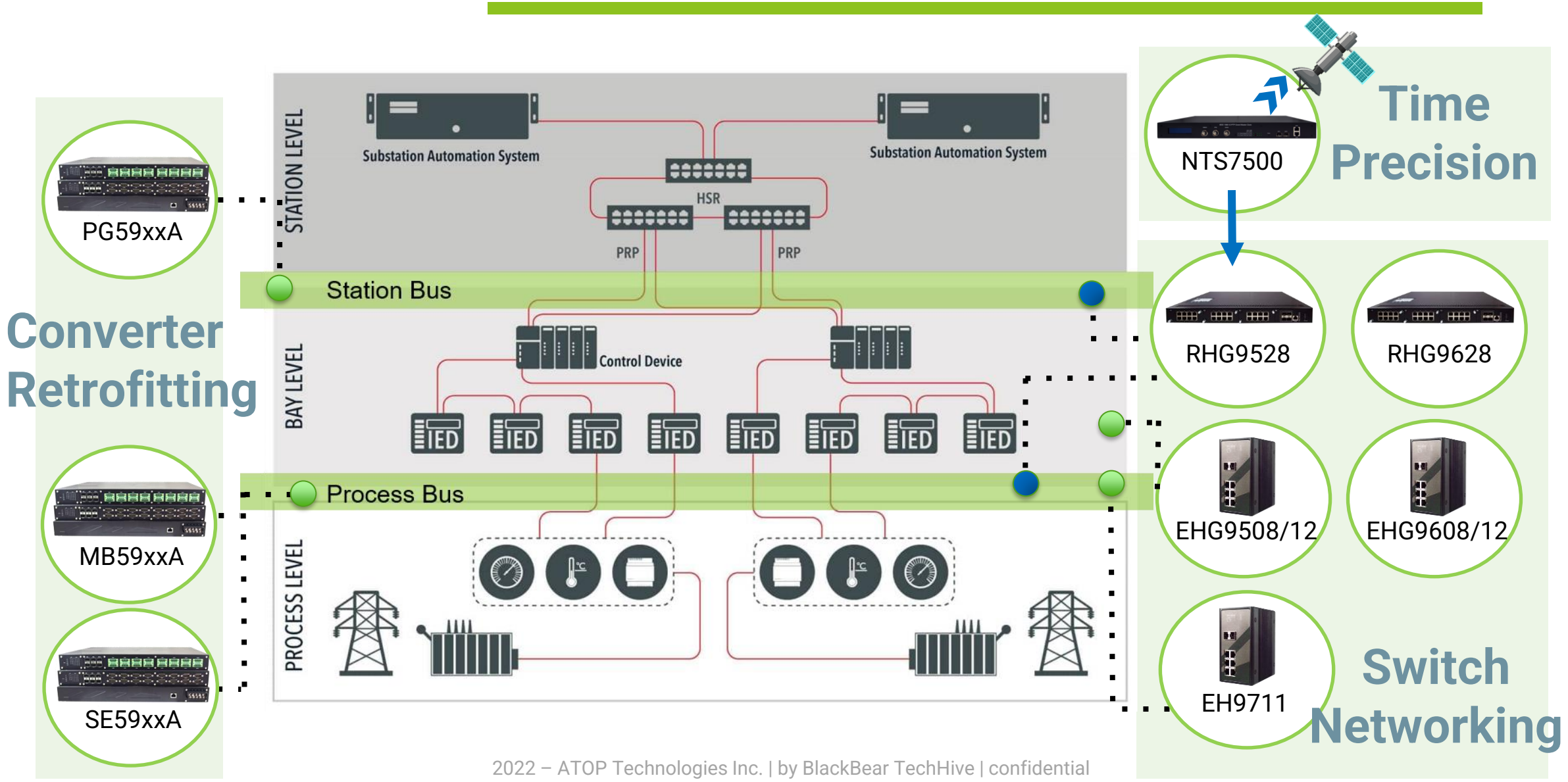

Battery Energy system

*Solar & Wind Farm*
- ☑ Cybersecurity
- ☑ Industrial EMC protection
- ☑ Tailor-made Gateway
- ☑ Power protocol support
- ☑ Customized EMS
- ☑ < 20ms Fast-recovered ring
- ☑ Long-distance comms
- ☑ Reliable remote connection

*Substation & Large-scale factory*
- ☑ IEC 61850-3, IEEE 1613 hardened
- ☑ Management solution
- ☑ High precision-timing
- ☑ Power protocol support
- ☑ HSR/PRP high-availability
- ☑ Cyber-security focus
- ☑ Long-distance comms
- ☑ Redundant data collection

*Factories & Charger stations & Battery Energy System*
- ☑ Cybersecurity
- ☑ Industrial ruggedized hardware
- ☑ Power protocol support
- ☑ SDK based unit
- ☑ AWS certified Cellular GW
- ☑ Reliable remote connection
- ☑ Virtualization (Docker)*
- ☑ Management solution

# Substation & Smart Grid–Portfolio



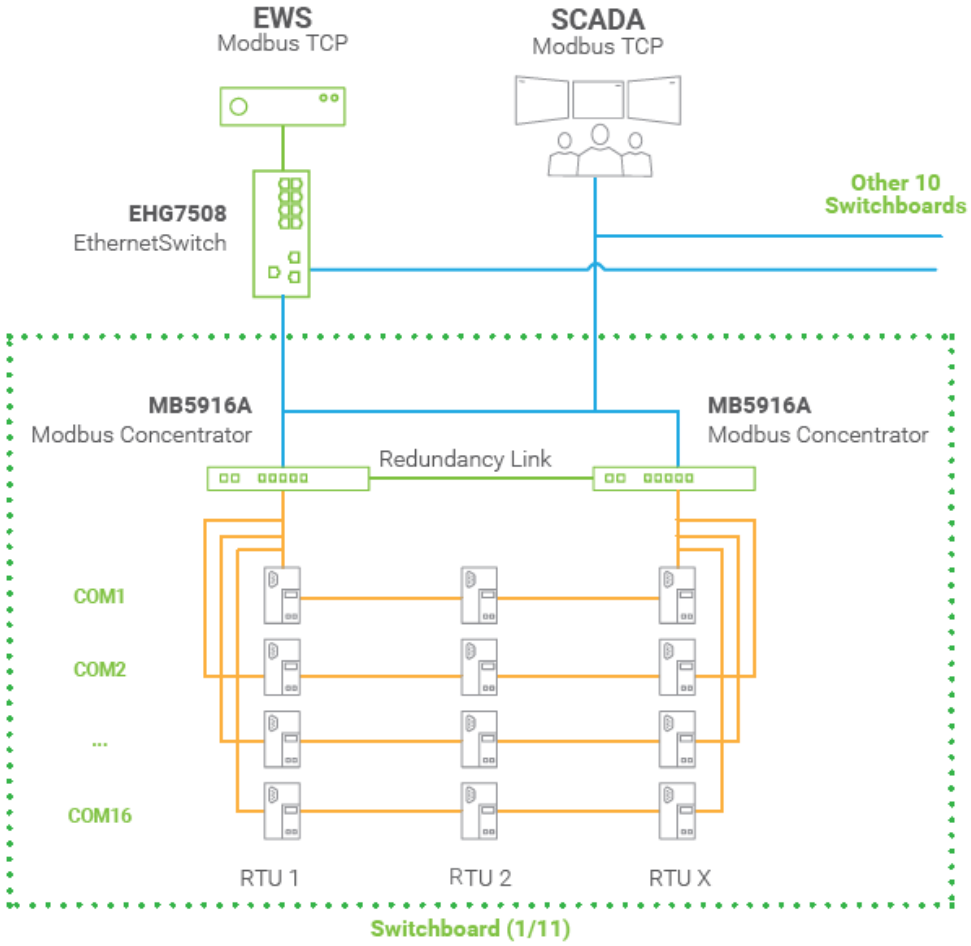
# Smart Grid - Success Story

- **Application:** High-Voltage substation
- **Location:** Malaysia, RAPID Petronas project
- **System integrator:** Schneider Electric
- **Requirements:** Redundancy and data concentration
- **Solutions provided:**
  - Definition of the Ideal Network Topology
  - Customs designed redundant Concentrators
  - Managed switches with RSTP redundancy
- **System description:**
  Manage via Modbus TCP SCADA the substation infrastructure (Modbus RTU based). Each switchboard is made of 190 slaves that need to be accessed simultaneously for data, diagnostics and configuration. Data access via Standard Gateway is not possible since a complete data update is needed every 1s. There are 2 Modbus Concentrators per switchboard, that alongside communication will provide diagnostics to the EWS.
- **Partners**:

PETRONAS

Schneider Electric

# Implementation details




- Implementation
- MB5916A Modbus concentrators will poll each IED via serial port (Modbus RTU).
- Obtained data will be remapped in a memory in a way to be easily accessible, for any specific enquiry from the master (Modbus TCP) and will be returned with high speed.
- Architecture allows link failures to be detected and second concentrator can take over, issuing relay alarms and specific status registers change to immediately inform control room of malfunction
- Design is EMC level 3-4, IEC 61850-3 certified

# IN PROGRESS: Renewables – Solar Power

## Use case

- Solar power PV Gateway

## End customer

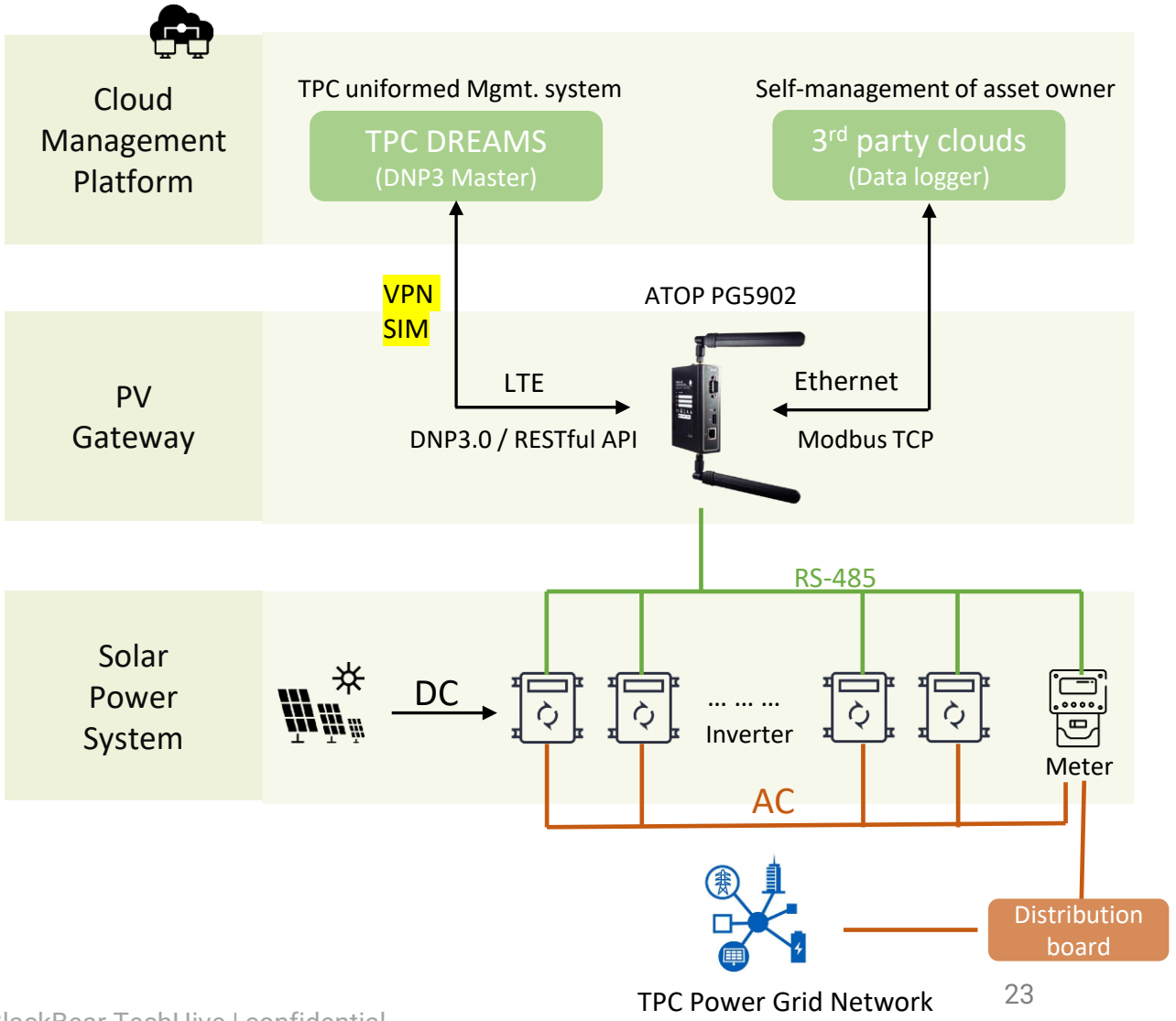
- Taiwan Power Company (TPC)
- Share capital: $11 billion USD

## Why PV Gateway

- Solar power will be affected by weather heavily and will cause unstable problem of power grid network.
- To enhance the stability, PV Gateway is used to collect the information of power generation, control the inverter based on various weather forecast

## Why Atop?

- ✓ Mature capability to get PV Gateway of DREAMS certification
  - DNP3 and Modbus conformance test, & competence
  - DNP3 to Modbus data collection & control test
  - DREAMS cloud management & RESTful API test
  - Reliability & Cybersecurity
- ✓ Industrial grade HW design with wide-range temperature
- ✓ Tailor-made HW and SW for regional power companies



# DEPLOYED: MV Substation

## Use case

- Substation Automation

## End customer

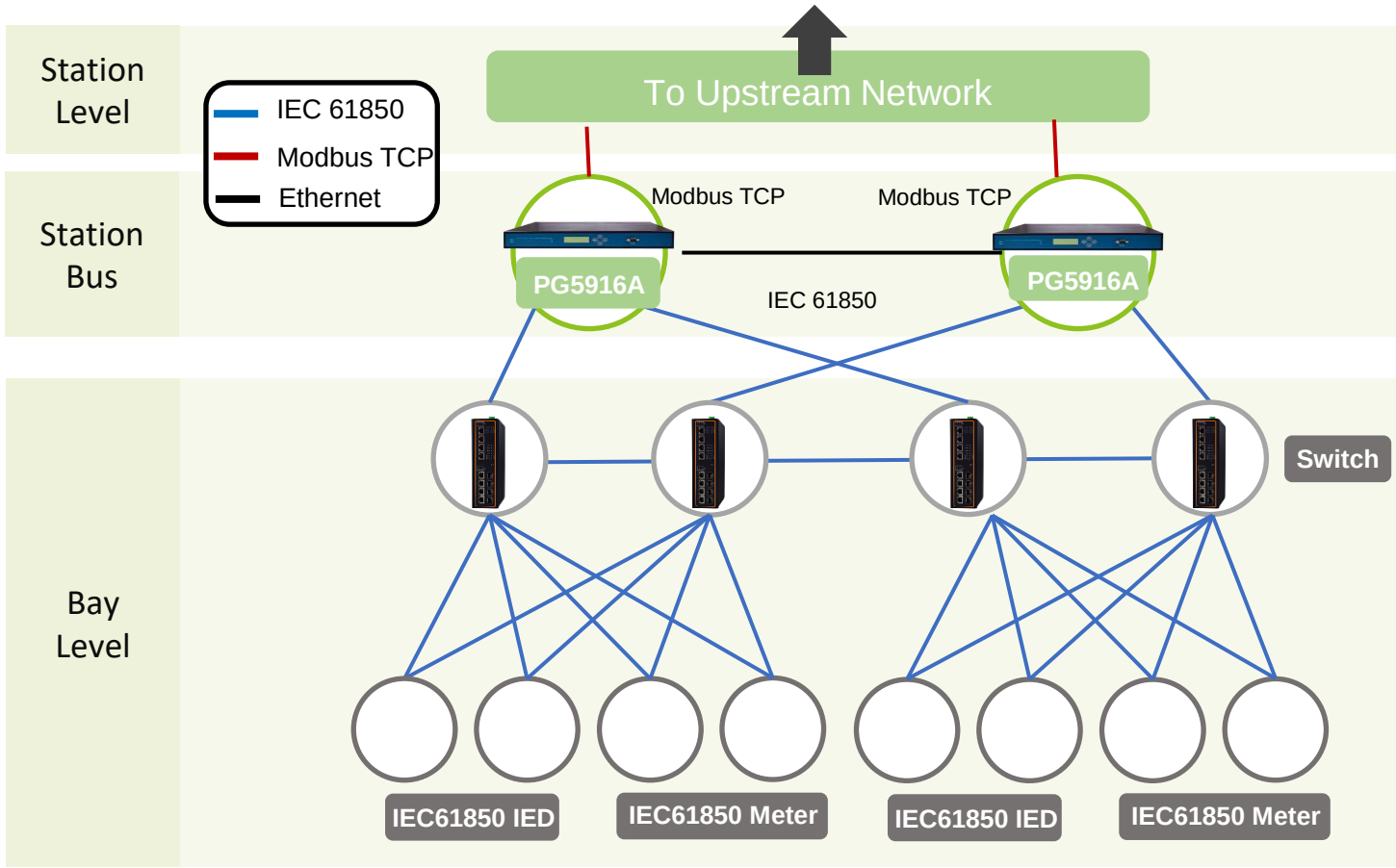
- Schneider Electric(SEA)
- Revenue(2021): $28.9 billion USD

## Why ATOP Protocol Gateway

- Protocol compatibility- More and more new devices adopt IEC 61850 protocol due to the trend towards IEC 61850 standard
- Seamless redundancy- Long failover time may lead to a severe loss
- Reliable HW design according to IEC 61850-3

## Why ATOP?

- ✓ Efficient protocol conversion
- ✓ IEC 61850-3 and IEEE1613 certified HW design with wide-range temperature
- ✓ Self-healing redundant design (Patented)



# DEPLOYED: Robust & Secure Connectivity

## Use case

- Full managed switch, MACsec secure switch, BlackBear BIG Unidirectional Gateway

## End customer

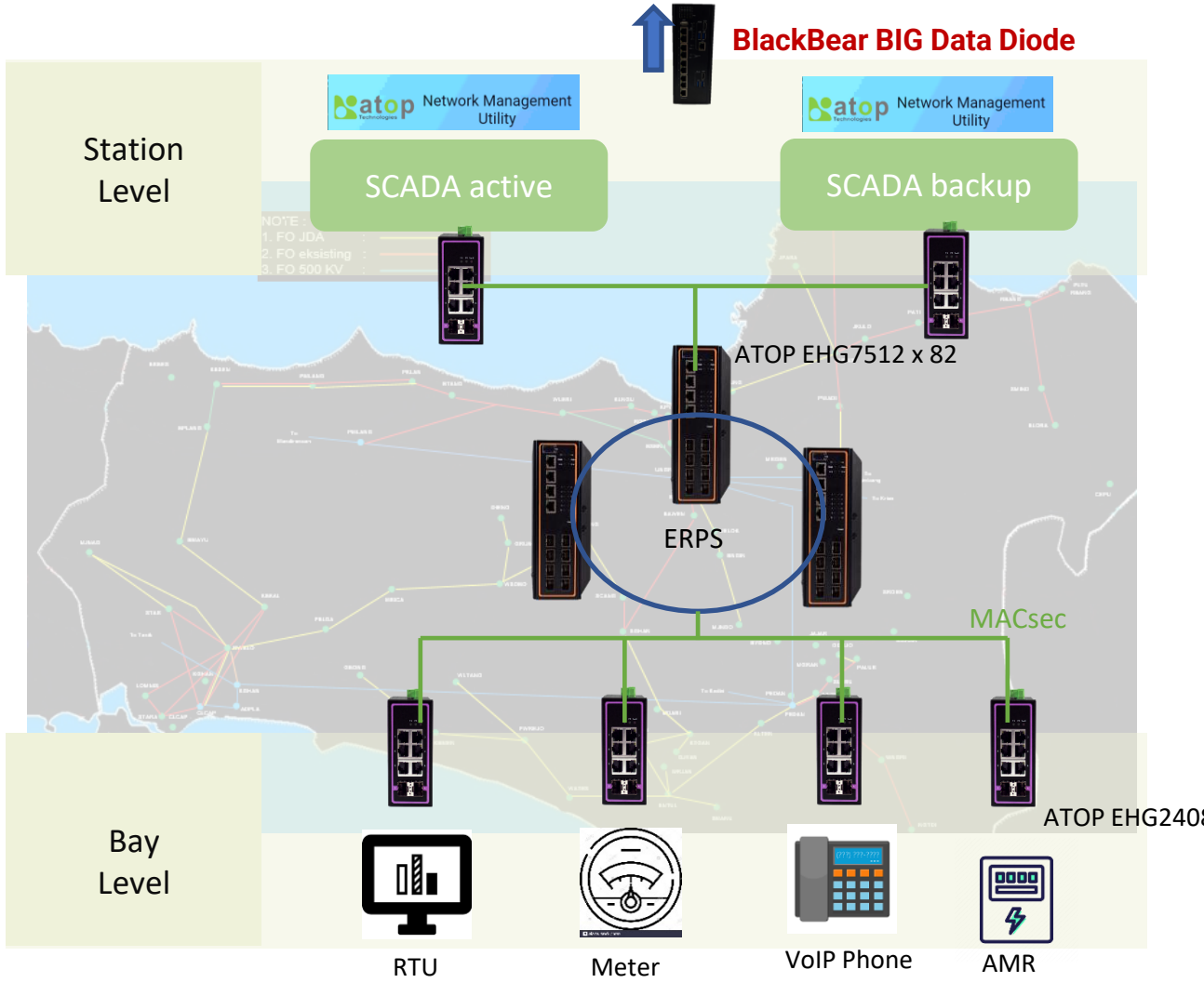
- PT Perusahaan Listrik Negara (Indonesia, Central Java 80 sites, up to 50m ppl)
- Revenue(2021): $19 billion USD

## Why EHG7512 & EHG2408

- EHG7512 :10Gbps SFP Uplink ports (long-distance 80KM)
- EHG7512: ERPS, <20ms fast recovery ring
- EHG2408: MACsec encryption transmission

## Why ATOP?

- Superior Cybersecurity (Unidirectional gateway, combined with MACsec)
- Turnkey solution provider, with on-site support
- Unified management software (NMU)
- Data diode, BIG9000, for file transfer from SCADA to cloud.



# IN PROGRESS: High-avail & PTP, substation

## Use case

- IEC61850-3 switch

## End customer

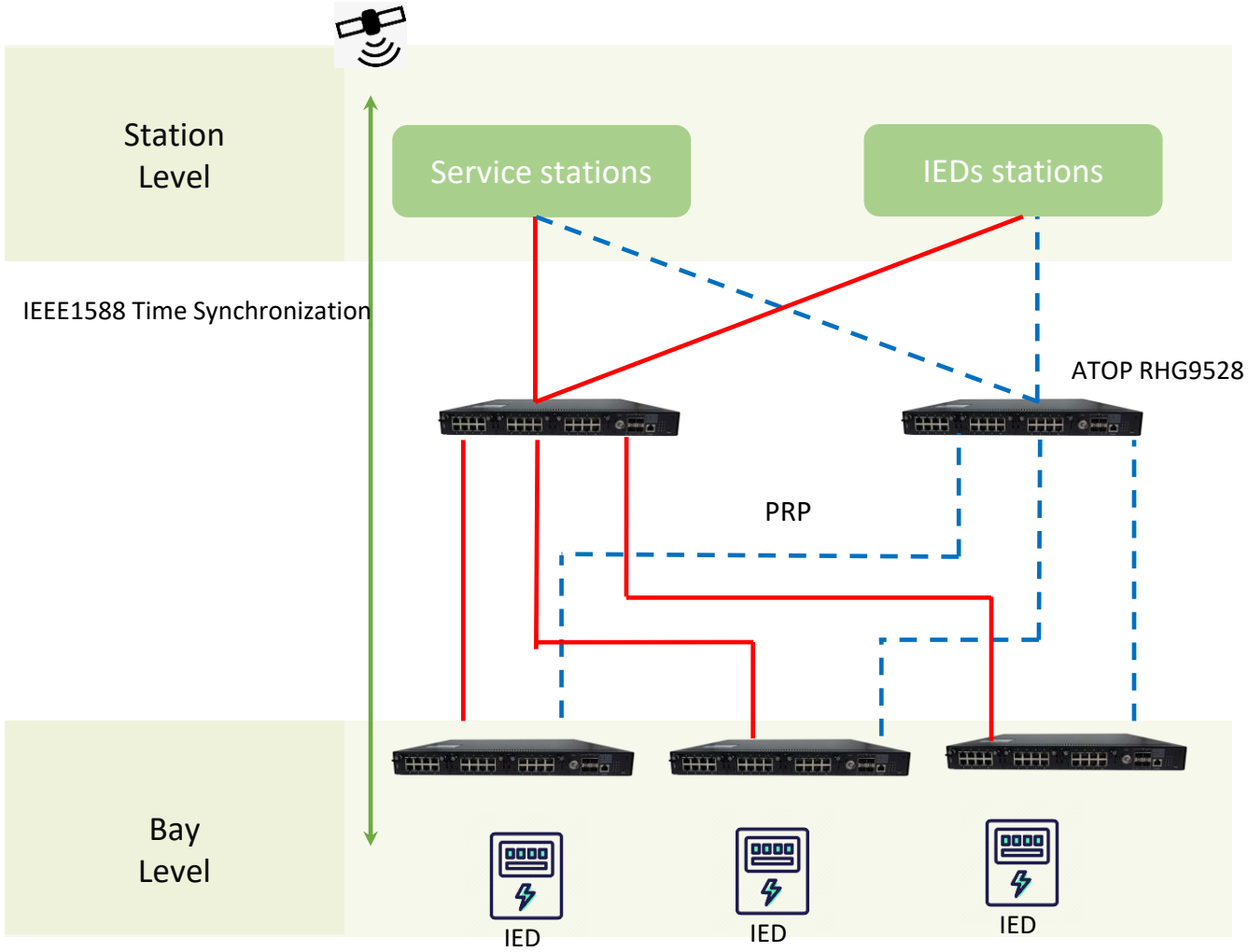
- RTE (France), SFR (SI)

## Why RHG9528

- 10Gbps SFP uplink ports
- IEEE1588 power profile
- ERPS, <20ms fast recovery ring
- High-available connection

## Why ATOP

- Security according to IEC62443-4-2, compliance according to IEC62351
- Comply with IEC61850-3 & IEC1613
- Comply with IEEE1588 power profile
- Various I/O module options
- High requirement with time precision <25ns accuracy based on Paragon-X

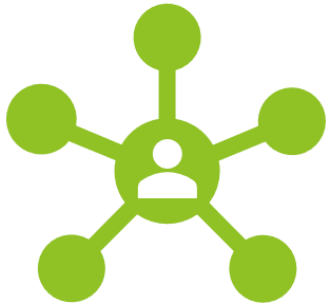


# IEC61850 Networking

*About Industrial Ethernet Switches for Power Substation*

## Certified

CE/FCC/UL
IEC61850-3 certified
IEEE 1613 certified
KEMA certified
IEC62443-4-2



## Versatile

Modular design
Layer-3 switching
Management System
Full-Gigabit
Power input options

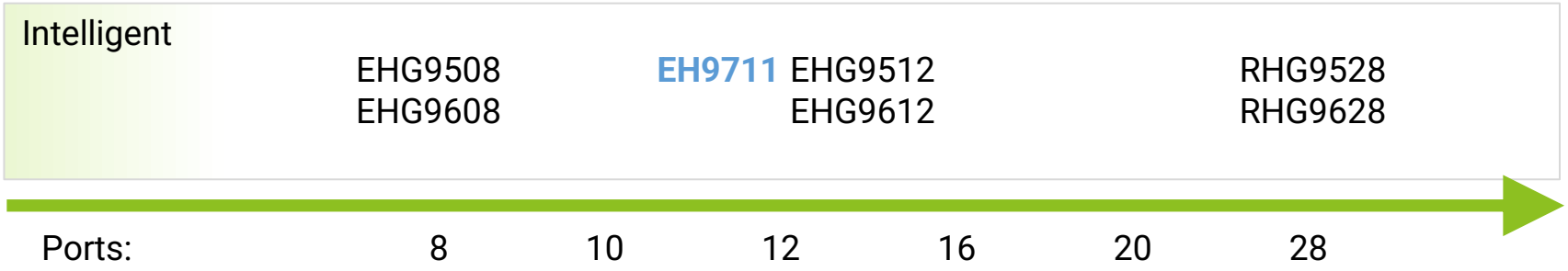
## Redundant

HSR/PRP support*
MRP Master/Client
STP/RSTP/MSTP
ERPS and compatible

## Precise

Support for IEEE1588v2
HW- E2E Transparent clock
HW- P2P Transparent clock
HW Boundary clock

# IEC61850 Ethernet Switches for Smart Grid




| | Switch | RJ45 ports | SFP ports | HSR/ PRP | IEEE1588v 2 TC | IEEE1588v 2 BC | Power input |
|---|---|---|---|---|---|---|---|
| >> EH9711-3SFP* | Layer-2 | 8 x 100 | 3G | x | ✓ (full) | ✓ (full) | 24~48/88~300DC 88~264AC |
| >> EHG9508-2SFP | Layer-2 | 6G | 2G | x | ✓ (E2E) | x | 24~57/110~370DC 100~240AC |
| >> EHG9512-4SFP | Layer-2 | 8G | 4G | x | ✓ (E2E) | x | 24~57/110~370DC 100~240AC |
| >> EHG9608-2SFP | Layer-3 | 6G | 2G | x | ✓ (E2E) | x | 24~57/110~370DC 100~240AC |
| >> EHG9612-4SFP | Layer-3 | 8G | 4G | x | ✓ (E2E) | x | 24~57/110~370DC 100~240AC |
| >> RHG9528 | Layer-3 | Max 24G | 4x10G + Max 24G | Max 4G RJ45/ SFP | ✓ (full) | ✓ | 24~370DC or 90~264AC |
| >> RHG9628 | Layer-3 | Max 24G | | | ✓ (full) | ✓ | 24~370DC or 90~264AC |

* Soon available

# Features in EH9711 Series

Focus

## Comprehensive Connectivity

- 8 x FE ports + 3x Gbps SFP ports
- 1 x RS-232 console port (RJ-45 connector)
- 4 x DIP switched for Ring control

## Compact and Robust

- Dimensions (mm): 77 x 167 x 138
- IEC61850-3 & IEEE1613
- -40°C to +75°C Temp. Operation

## Trusted and Secure Platform

- Secure industrial network design based on **IEC62443-4-2**
- Precision time synchronization with SyncE and **IEEE1588v2 P2P/E2E TC & BC with delay within 50ns**

## Reliable & Redundant Design

- Wide Power input range: **24-48VDC, 110-240VAC/110-300VDC**
- ITU-T G.8032 ERPS Ring/MSTP/RSTP/STP supported

Focus

# High-availability IEC61850-3 Modular switch with HSR/PRP and HW PTP

- IEC61850-3 and IEEE1613 Certified
- Modular design, Up to 24x Gig and 4x 10Gig ports
- Support for HSR/PRP, up to 4x Gigabit ports
- Hardware IEEE1588v2 PTP BC/TC (E2E and P2P)
- Rugged design for harsh environment -40~85 °C
- Modular architecture
- Multiple power supply options

Focus

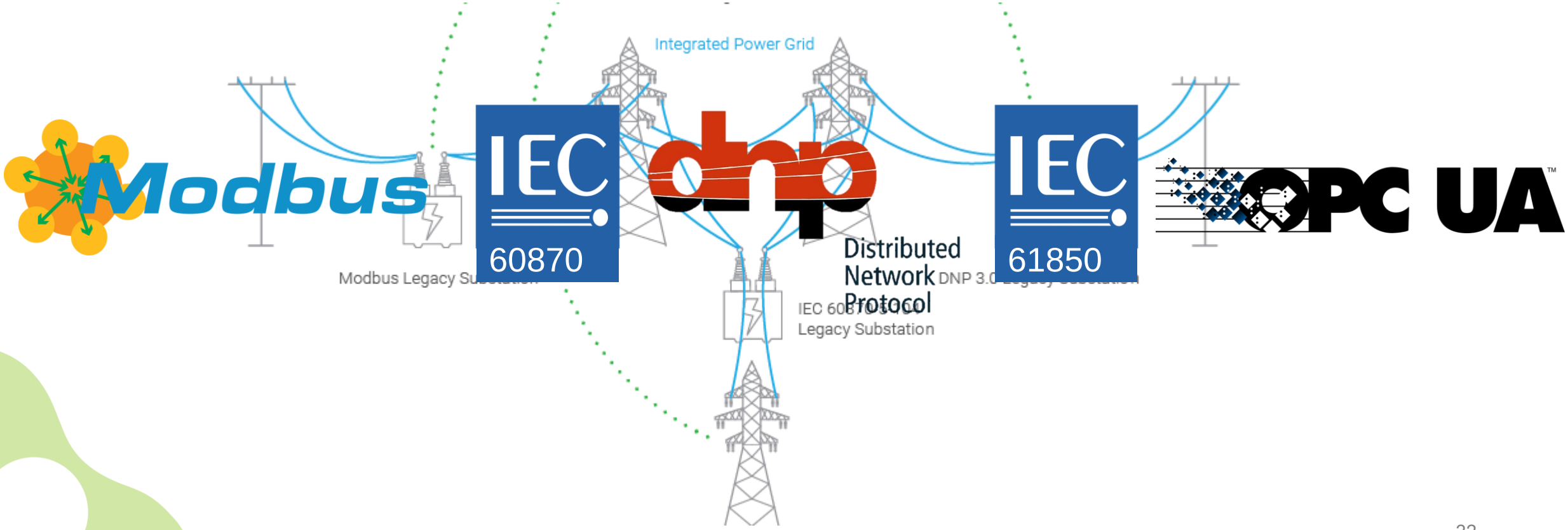
# Precision timing for substation


- Provides ns-accurate timing through the network via IEEE1588v2 (Precision time protocol)
- Support for PTP Power profiles (IEEEC37.238 & IEC/IEEE61850-9-3)
- Primary reference time comes from a GNSS source (GPS/GLONASS/BEIDOU/GALILEO)
- In case of GNSS source failure, after a first Sync, the accuracy is preserved with a small drift by using highly accurate OCXO oscillator
- 2 Fiber ports, 2 RJ45 ports for IEEE 1588v2 and NTP/SNTP
- Additional modules provide IRIG-B, BJT, DCF77, time distribution
- PPS and 10MHz wave output
- IEC62439-3 Clause 5 PRP (Parallel Redundancy Protocol)

# Substation Retrofitting & Interconnections

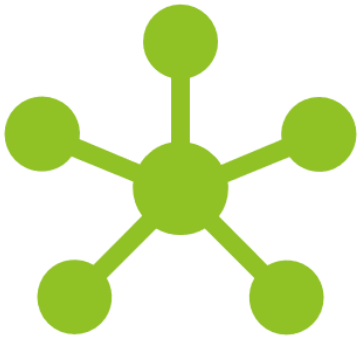
*Seamless integration*

- ATOP Protocol Gateways



# Substation Retrofitting & Interconnections

## *About Protocol Gateways*



### Options

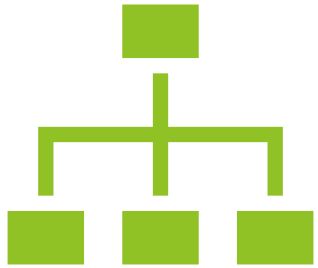
9 hardware versions,
up to 6 LAN ports
up to 16 COM ports
different ruggedness
versions with 4G

### Compliance

CE/FCC, UL61010* or
UL62368*, IEC61850-3*,
IEEE1613*,
Marine DNV.GL*
IEC62443-4-2**

### Feature-rich

IPsec, OpenVPN, PPTP
RSTP redundancy,
NTP/SNTP Client,
SNMPv1/v2c/v3,
Firewall/Port FWD*

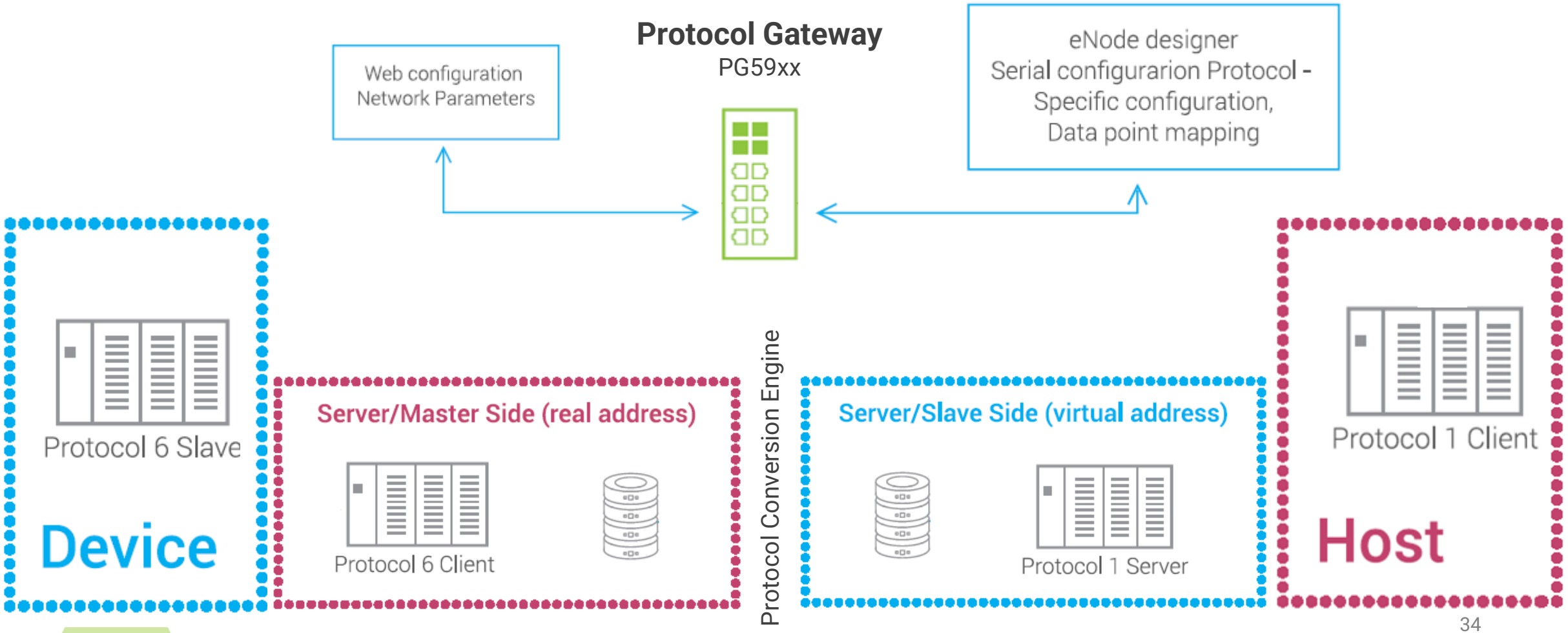


### Management

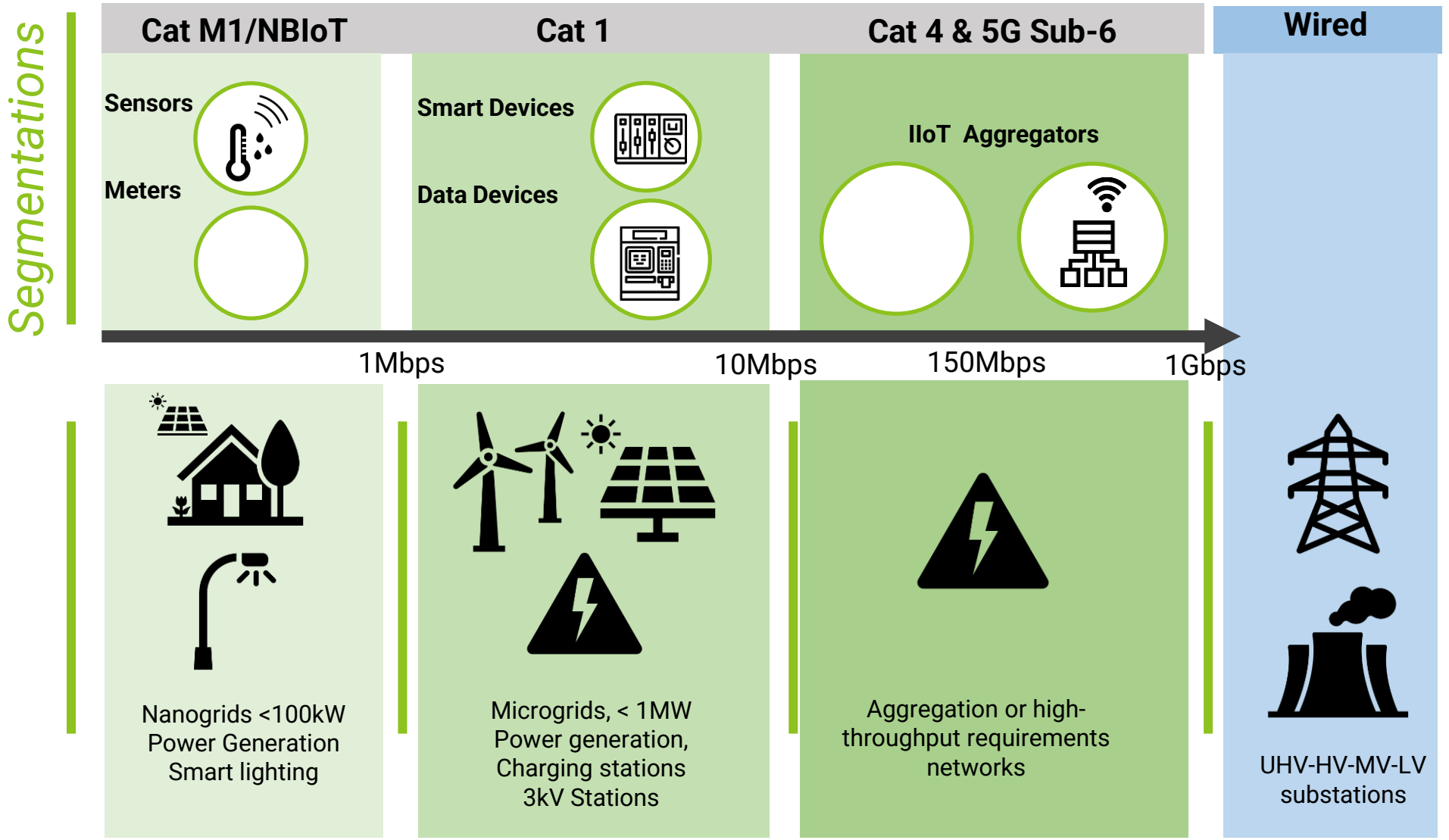
Web configuration,
eNode Designer utility
ICD design utility
SNMP, telnet, etc..

# Substation Retrofitting & Interconnections

*Seamless integration*



# Wireless connectivity



# BlackBear Cyber Security

Our focus on OT Cyber Security for Critical infrastructures

# Different Secure Policies of OT (IACS) and IT

| Industrial Automation and Control System | VS | Information Technology |
|---|---|---|
| **Availability** | Focus | **Confidentiality** |
| **Over 15 years** | Component lifecycle | **3-5 years** |
| **Low** (limited system resource) | Options to add Security SW | **High** (ex: anti-virus on PCs) |
| **High** (from Win95/98/XP...) | Heterogeneity | **Low** (<2 generations, Win 7/10) |
| **Keep operating with threats** | Threat protection | **Remove threat and remediate** |
| **Quarterly or annual maintenance** | Upgraded or Patch Mgmt | **ASAP during uptime** |
| **Closed** (private network) | Networking | **Open** (Connect to the Internet) |

# Great Wall

**Single layer of protection**

No single measure is secure enough to prevent intrusions !!!

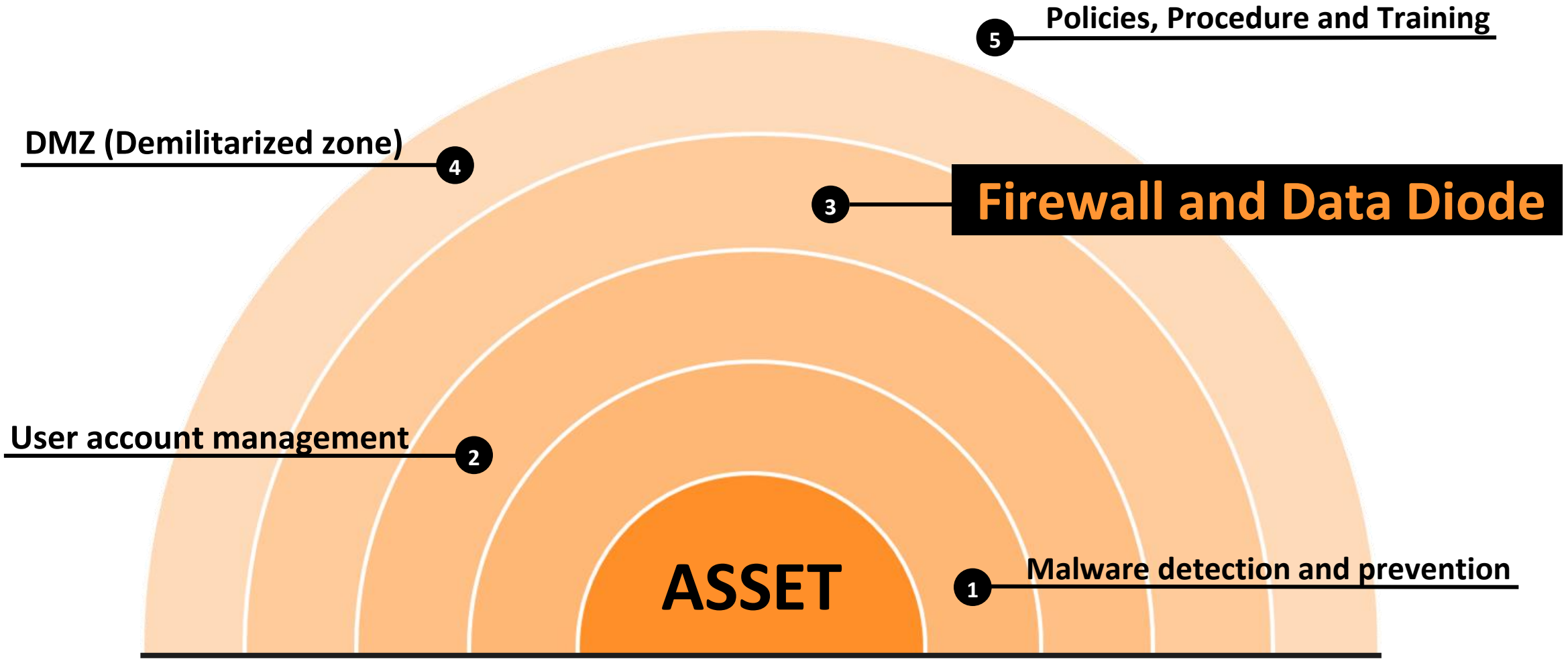
## Secure Strategies of IACS

# Defense in Depth

**Multiple layers of protection**

For every transition to the next layers
Attacker must spend time and effort !!!

# Defense of Depth in IACS



Best choice for utilities

## Firewall

Software-based

Based on # of Rules

Network proxies

Routable

Periodically

**High**

## VS

Mechanism

Latency

IP Information Security

Routability

System Update

Compromisability

## Data Diode

Hardware-based

Low to Moderate

Protocol proxies

Deterministic

Little to None

**Low**

# What is BlackBear Unidirectional Gateway ?

FPGA-based unidirectional gateway with 1Gbps wire-speed

Industrial-grade EMC, rugged hardware

IACS side: 8-port Gigabit managed secure switch, with / w-out PoE

USB dongle for two-factor authentication before secure upgrade and configuration import / export

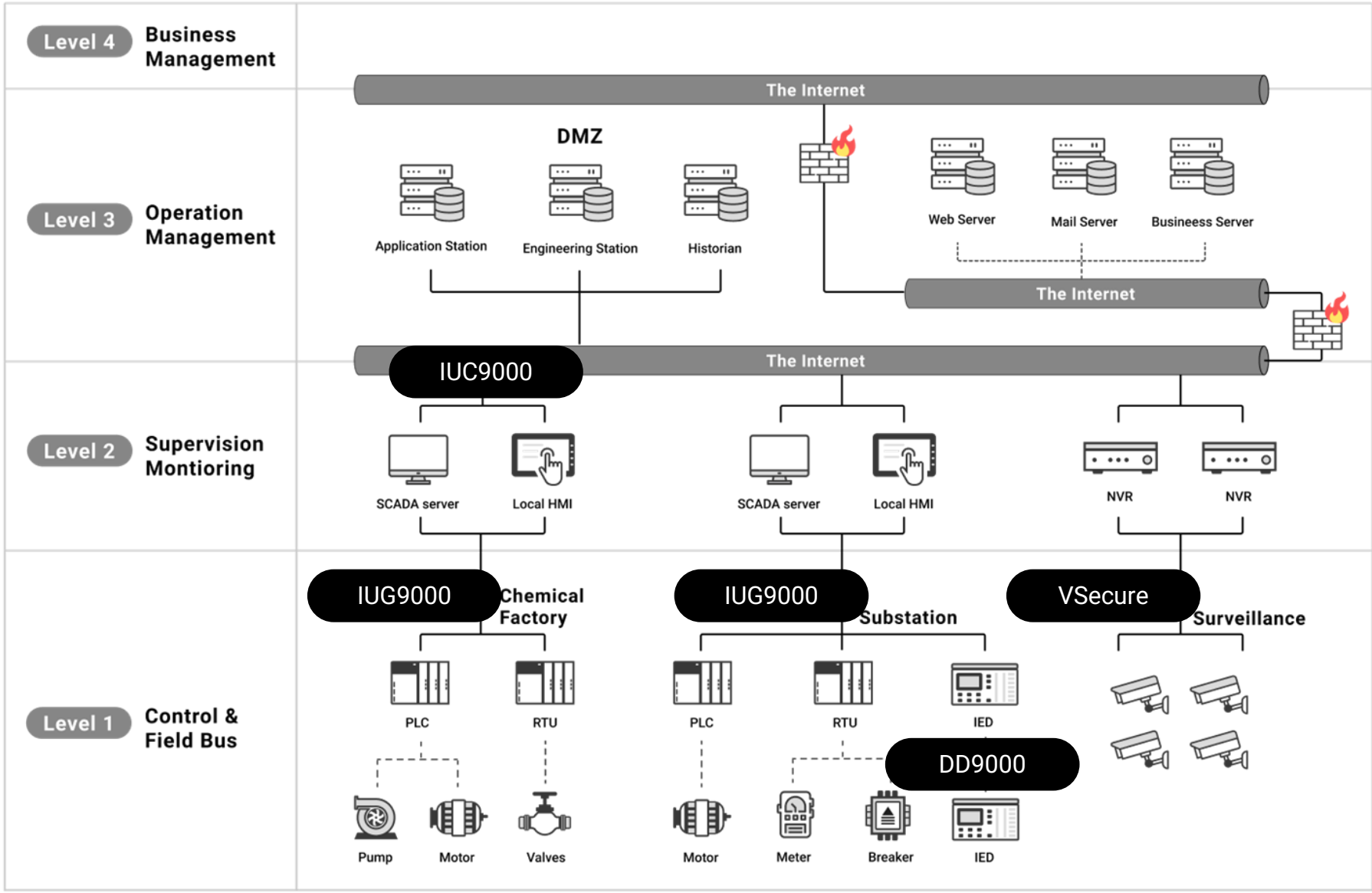

MACsec data encryption with **1Gbps** wire-speed

Support multiple industrial protocols

-40 / 70°C operating temperature

IEC62443-4 compliance
( to be completed by Q4-2021 )

# Where is it **USED** ?



BlackBear

**Contact us:**

Website LinkedIn

# Thank you!