

# Energy Management

## Bridging the Communication Gaps for Renewable Energy with Intelligent Gateway Solutions

Cindy Huang, iGateway, IIOT, Advantech



# Pathways to Future Trends & Opportunities in Green Energy

## Digitalization

Energy digitalization means establishing energy storage solutions that can facilitate the integration of renewable energy into smart, flexible power systems. The effects of digitalization will impact the entire process, from generation and storage, to distribution and consumption. If businesses wish to take control of their energy needs, they will need to deploy real-time AI capable energy systems.

## Decentralization

Decentralization is becoming critical to achieving energy security. It will require significant contribution from businesses, especially larger enterprises, in the adoption of self-generation solutions that will allow them to manage their own energy needs through the construction of micro grids.

## Decarbonization

Advancements in decarbonization will require businesses to re-evaluate their objectives by exploring viable decarbonization pathways and alternative financing options in order to reduce emissions. A key consideration will be for businesses to partner with suppliers who can aid them in achieving energy efficiency targets through the deployment, operation, and management of renewable energy systems.

## Democratization

Energy democratization will continue to involve public effort in the transition toward renewable energy. By enabling independent energy producers and energy trading, the entire sector can be better guided, and be more responsive, by policies and decisions that are made on the basis of localized needs.



# Meet the Challenges of Future Energy Requirements

Integrating the energy mix from centralized power plants and renewables into new models of energy distribution



## Different geographical locations

Renewable energy sources come from many sources and can be dispersed in different geographical locations. The task is how to integrate distributed generation of electricity from different sources into a single clean and reliable power supply.



## Grid stability and reliability

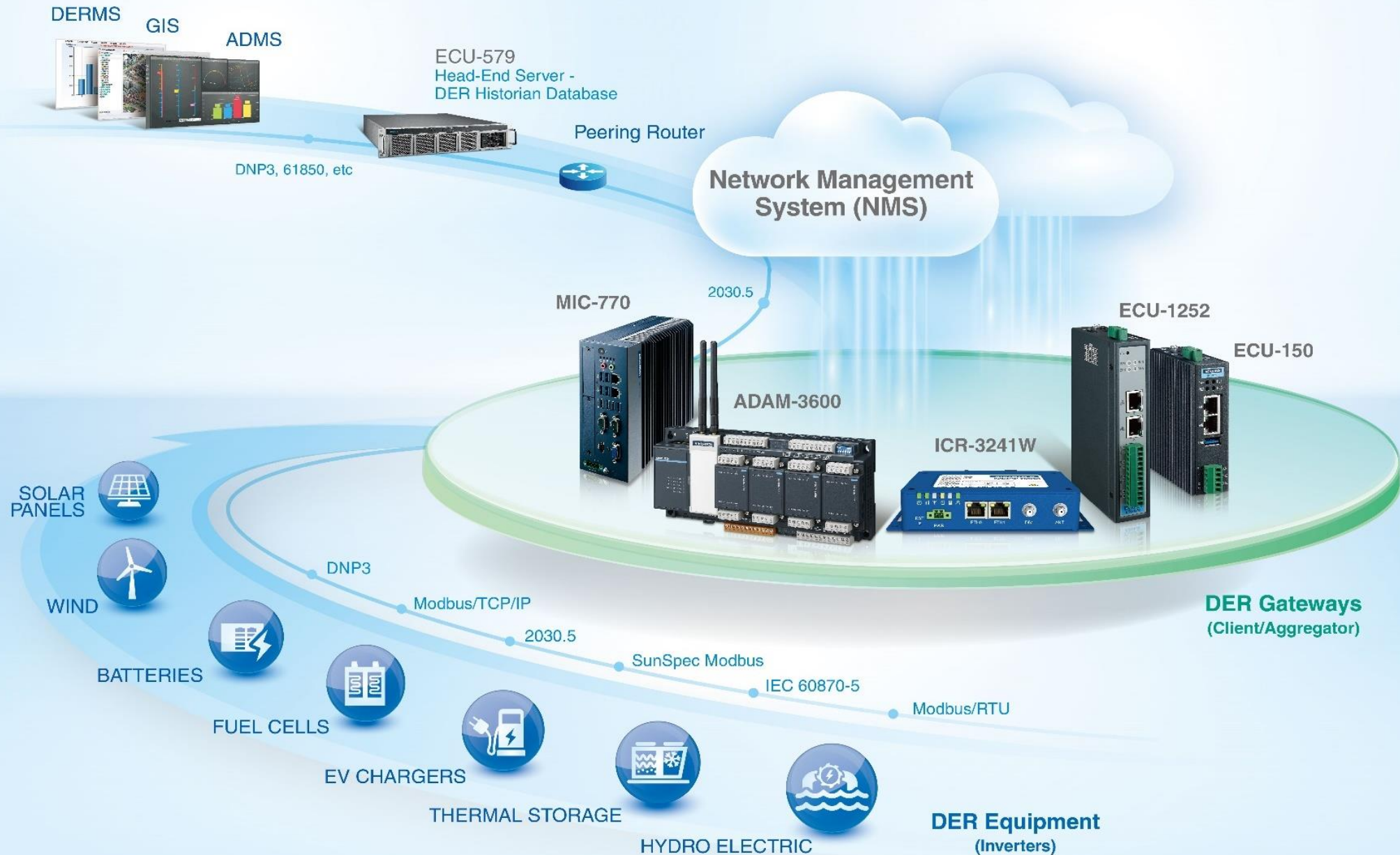
Minimizing transmission line and productivity loss while deploying distributed energy resources (DER) is crucial to maximizing grid resilience to utilize more sustainable energy resources.



## Load balancing in power systems

There are many consumption variables that can lead to undesirable unbalanced distribution. Therefore, a balanced loading of the electrical grid is critical to reduce technical losses and improve the efficiency of energy resources.

# Distributed Energy Resource Management



# IIoT Gateways

Compact, Industrial-grade, High Scalability



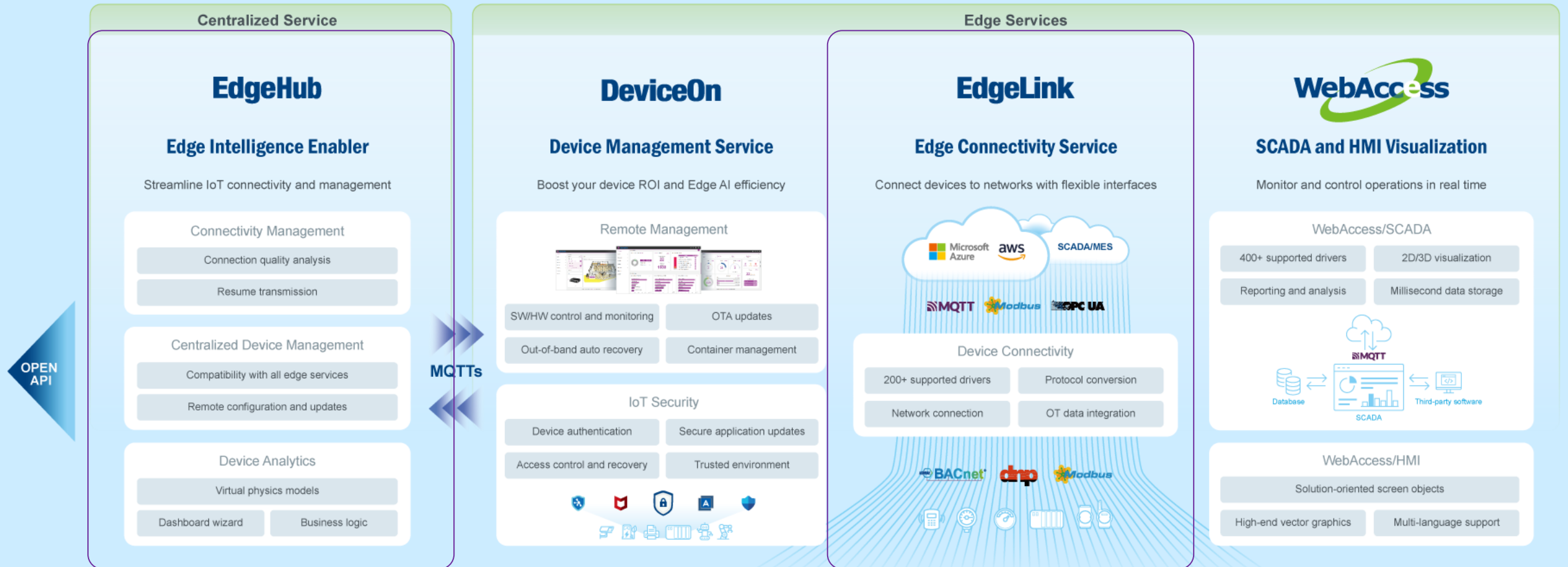
SCADA / MES



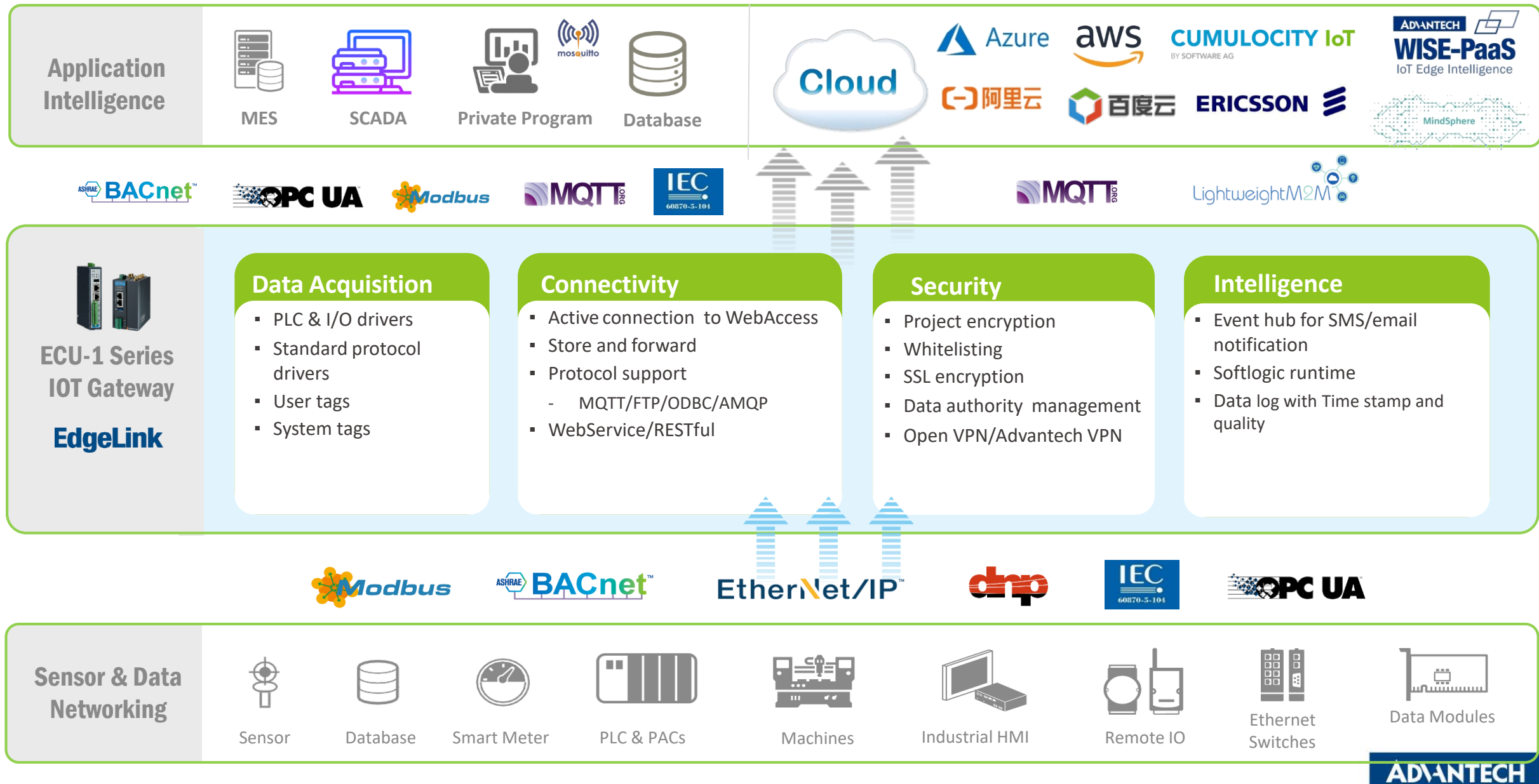
- ✓ Protocol Conversion
- ✓ Cloud Connectivity

- ✓ Flexible I/O Extension
- ✓ Edge Intelligence

# Advantech Edge Services – EdgeSync360



# Edgeline Software Architecture



# ECU-1 Series - IIOT Gateway Features

## Industrial-Grade Design and High Reliability

- Designed with industrial grade IC with long MTBF.
- IEC standard fulfills all mission critical applications.
- Wide operating temperature range (-40~70°C).
- Battery powered RTC, Watchdog, and TPM support.



## Protocol Conversion and Edge to Cloud Solution

- EdgeLink bundle with protocol support for data from field devices.
- No coding support for Azure/AWS/Cumulocity/Sparkplug MQTT.
- OPCUA/ODBC/JDBC IT software and SQL database for data support.

# ECU-1 Series - IIOT Gateway Features

## Open Platform and Flexible I/O Extension

- Linux environment offers open and standard platform.
- Develop your own applications with C, Python, or 3rd party libraries.
- Multiple communication interface.



ECU-1251

ECU-1051 ECU-150

## Azure and AWS Certified Device

- Built-in EdgeLink allows users to set up cloud solutions and manage the entire lifecycle of equipment, monitor factory energy consumption, and analyze renewable energy efficiency through AWS or Azure services.

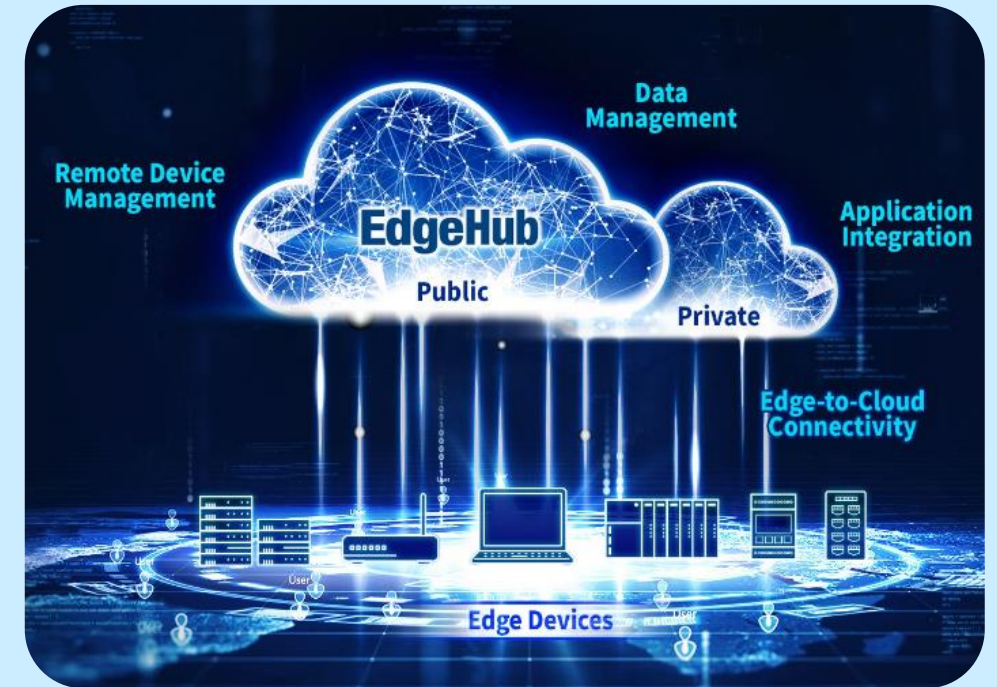
# ECU-1 Series - IIOT Gateway Features



## Flexible Modular Design\*

- The modular design optimizes product size while preserving expansion flexibility
  - 5G communication
  - Dual wireless communication
  - I/O expansion with iDoor modules (e.g. serial ports, CAN)

\*Applicable to the ECU-150



## Data & Device Management on Cloud

- Remote device monitoring and management
- OTA orchestration and configuration

# Target Application

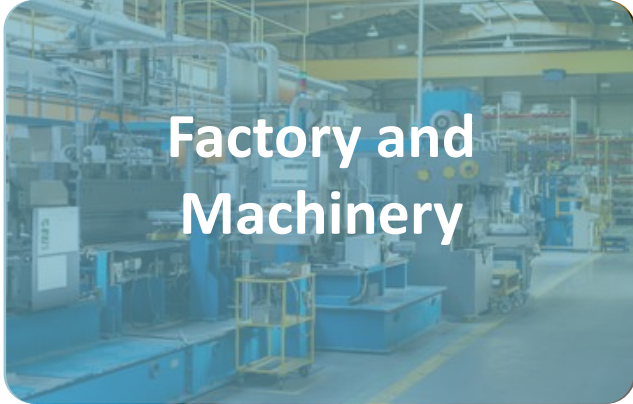


## Distributed Equipment



### Remote Operation & Maintenance

- BESS (Battery Energy Storage System)
- Solar power management
- Gas/Water pump station
- Wind power management



## Factory and Machinery



### Production Visualization

- Legacy machine upgrade
- Automotive
- Appliances manufacturing



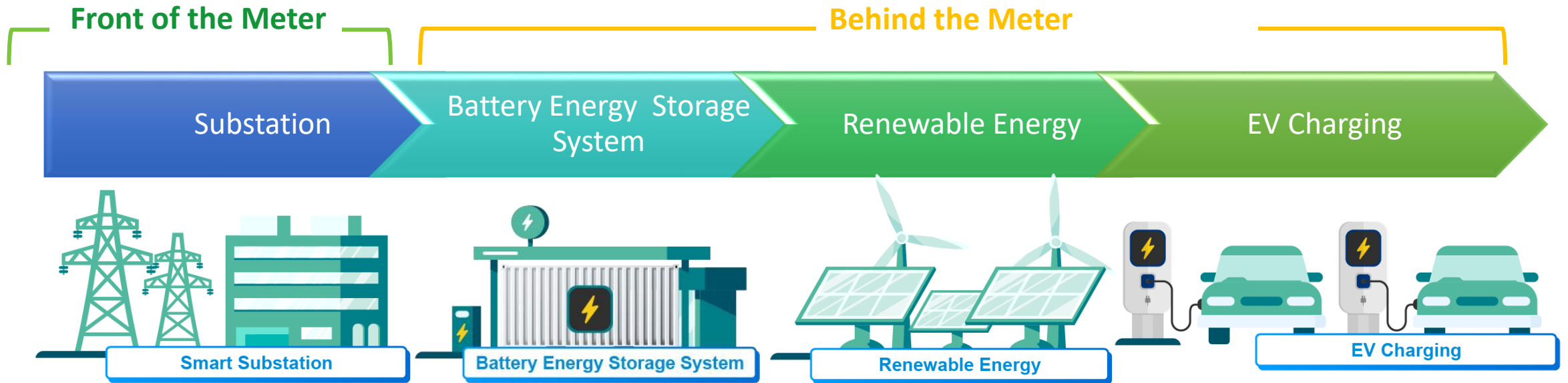
## Facility and Energy



### Facility Monitoring

- Facility Energy Management
- Water & waste water
- HVAC/FAN
- Tanks
- Compressor

# Bridge the Communication of Micro Grid



- **BESS monitoring & management**
  - EMS (Energy Management System)
  - BMS (Battery Management System)
  - ECS (Environment Control System)
  - PCS (Power Conversion System)
- **Distributed energy management**
  - PV (Photovoltaic) station management system
- **Charging station management**
  - ELMO (Electricity Load Management Optimizer)
  - CSMS (Charging Station Management System)



Special Communication  
Protocols

IEC-61850 MMS/GOOSE, CAN,  
Modbus

DLT645, DNP3, IEC-60850-5-  
101/103/104

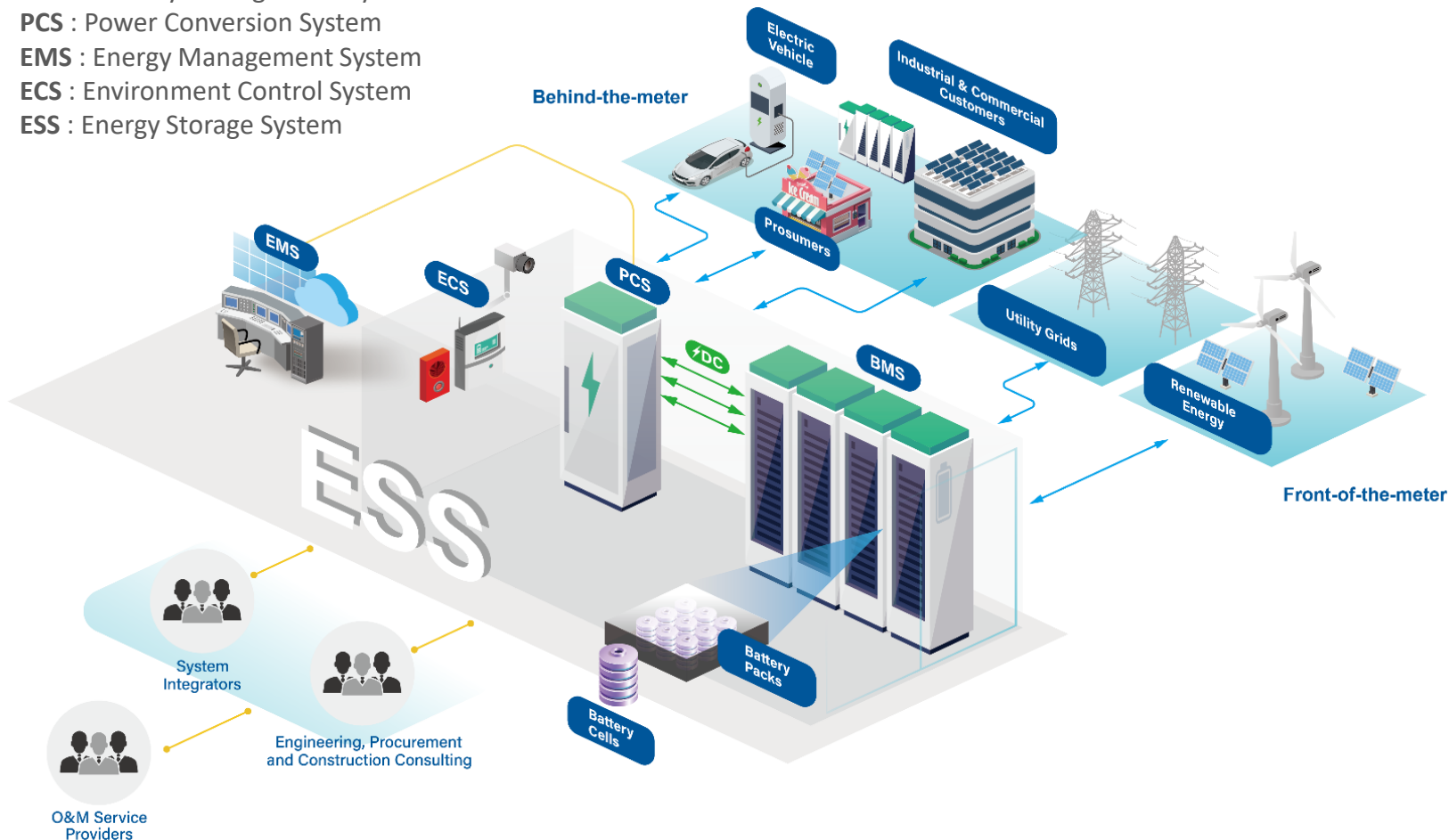
OCPP

# Battery Energy Storage System (BESS) Management

## Challenges

Battery Energy Storage System (BESS) often comprises multiple subsystems(e.g. EMS, PCS, ECS, BMS), each with its own specific functions and communication protocols. The gateway plays a critical role in ensuring smooth communication and data exchange among these subsystems, especially when they use various protocols and physical interfaces.

**BMS** : Battery Management System  
**PCS** : Power Conversion System  
**EMS** : Energy Management System  
**ECS** : Environment Control System  
**ESS** : Energy Storage System



## Solution:

- ECU gateway supports diverse protocols including DLT645, DNP3, IEC-60850-5-101/103/104, Modbus, OPC UA, CAN, IEC-61850\*. And ECU gateway can sustain wide temperature -40~70°C harsh outdoor environment

## Recommend Product:

- Industrial & commercial scale:
    - ECU-1051, ECU-1252
    - ECU-1260
  - Large Scale:
    - ECU-1370
- Tailor-made for BESS application, featuring highly integrated IO that is suitable for use as a central unit to connect PCS, EMS, BMS, and ECS

TODAY ~ 15. DEC. 2023

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