Smart Village

IDS Solution

Current Situation & Pain Points

Current Situation

Manual Meter

- Inability to manage power consumption

High Line Loss

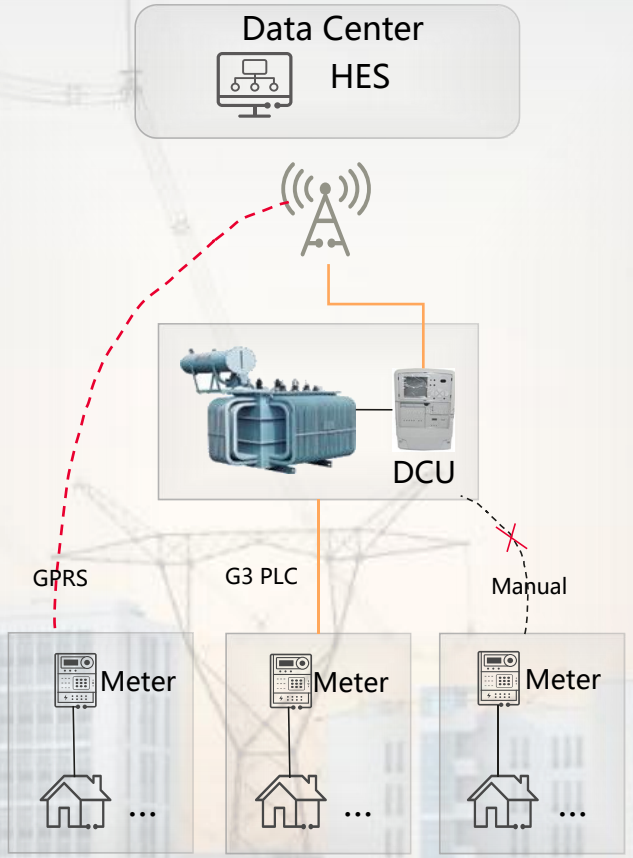
- Meter Reading Blind Area
- Power Aged Equipment

Poor Power Supply Reliability

- Affect the safe and stabl operation of transformer

Poor Power Consumption Experience

Current Business Process



Pain Point

Automatic Meter Reading

- Highly reliable automatic collection of electricity meter data underpins refined transformer district management

Line Loss Calculation

- Line Loss Calculation underpins refined transformer district line loss management and O&M

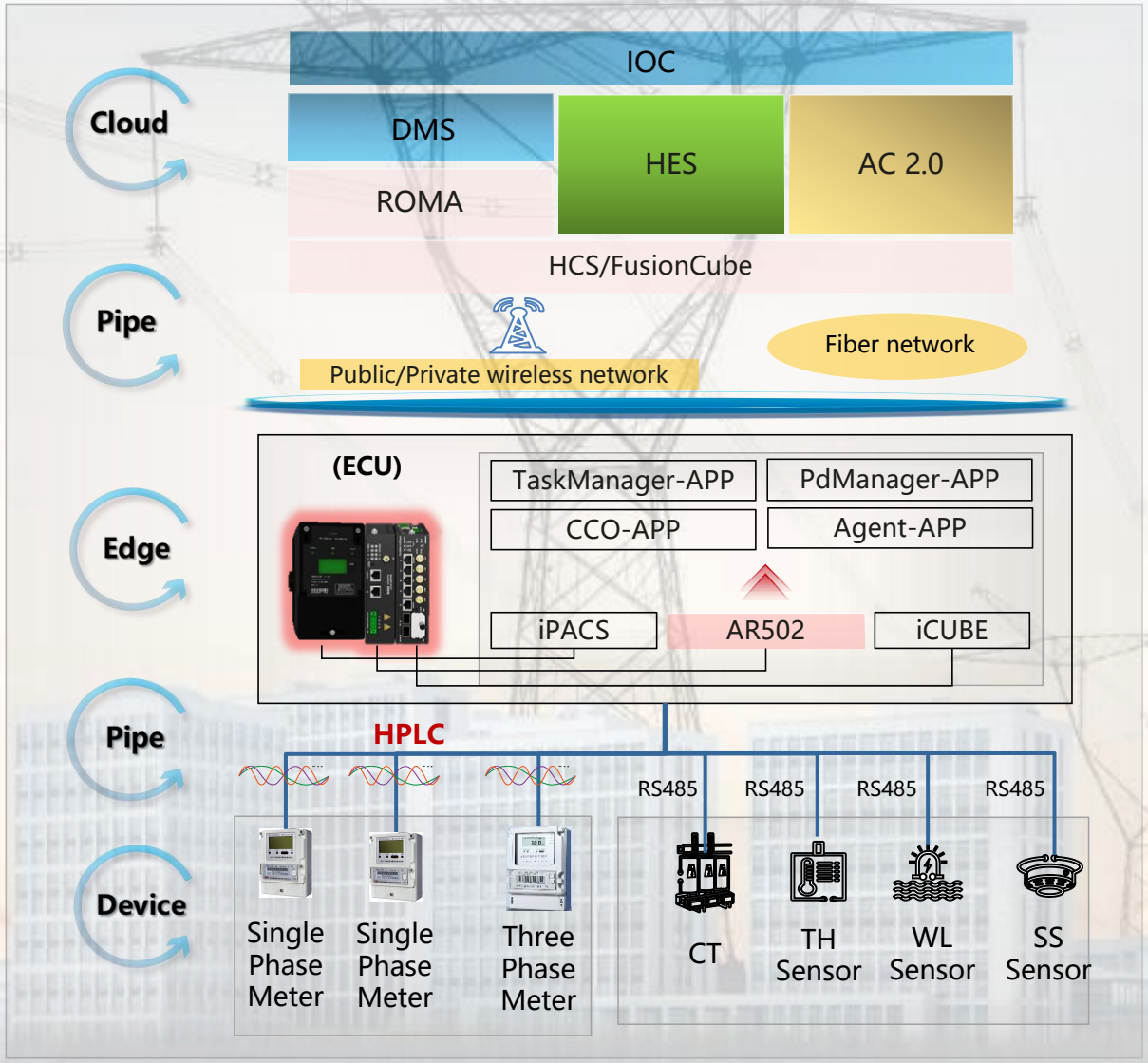
Distribution Monitoring

- Abnormal alarm for three-phase imbalance, overvoltage and overload in transformer districts to enhance power quality

Power Distribution Room Monitoring

- Sensor-based real-time monitoring ensures transformer operating environment stability

IDS Solution Architecture



Cloud

- Support the deployment of systems such as IOC, HES, DMS, AC2.0, and ROMA, as well as features including meter reading data collection, transformer area line loss analysis, power distribution monitoring, IOC large-screen monitoring, and network management and operation maintenance;

Pipe

- Support dual-channel communication via fiber optics and wireless networks(5G/LTE),enable the construction of a power distribution communication network with high reliability and low latency to ensure reliable data transmission;

Edge

- The ECU is deployed via containerized applications, supports access to multi-service scenarios, and enables real-time data collection and rapid decision-making for the power distribution network;

Pipe

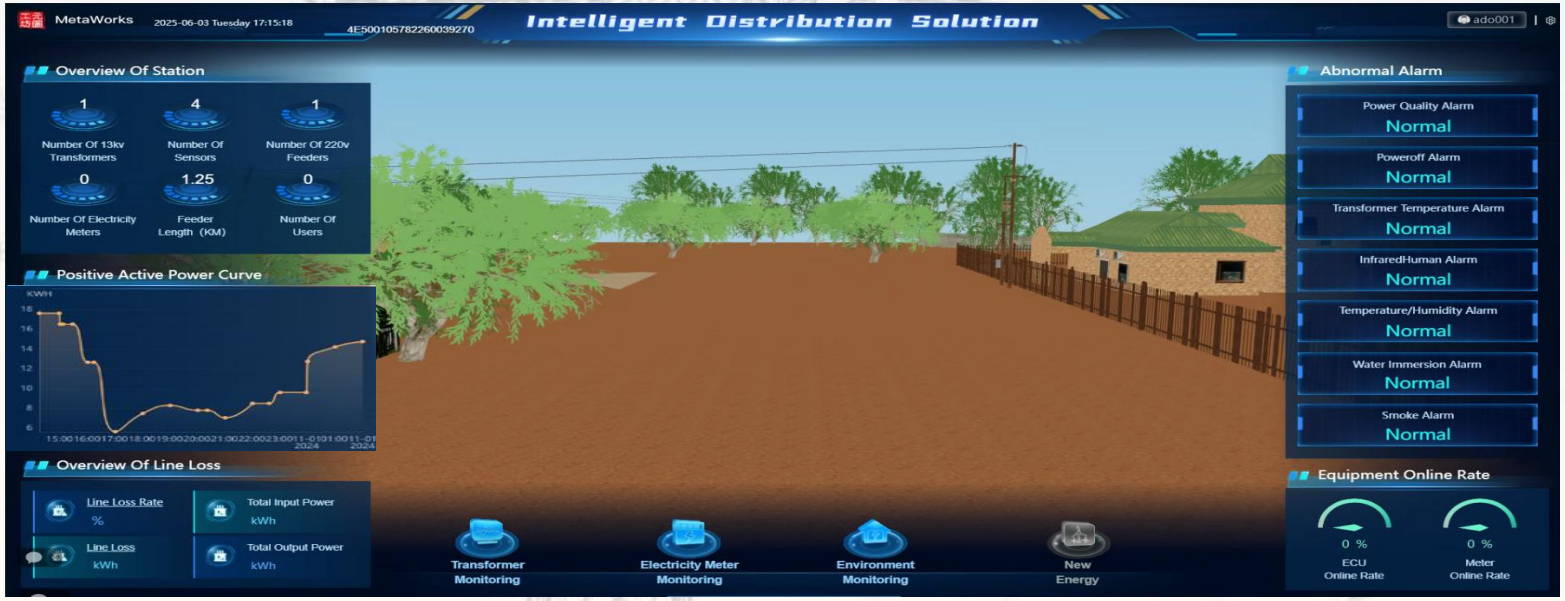
- The new-generation HPLC technology features high data rate, strong anti-interference capability, high reliability, high data collection success rate, and support for full connectivity of low-voltage power distribution network devices;

Device

- Edge-side devices such as smart meters, sensors, and current transformers are capable of performing terminal data collection and reporting;

Cloud-IOC

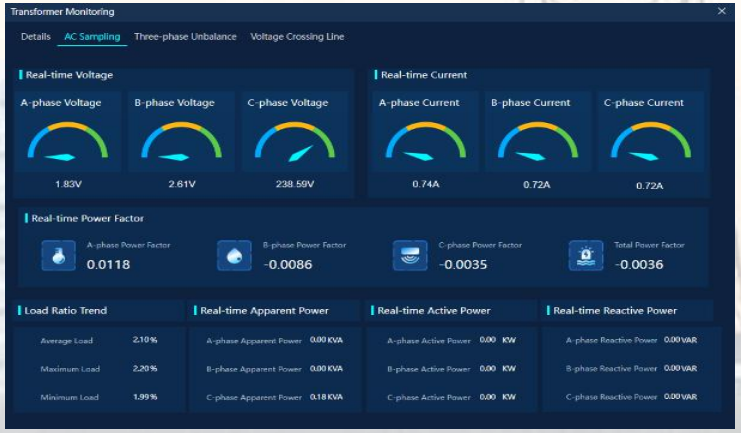
Transformer Area Overview



Unified display of scenarios, locations, devices and information

Support smart operation and efficient decision-making

Transformer Monitoring



Meter Monitoring

EV Monitoring

Cloud-HES

Meter Reading	Load Profile	Load Control	Online Analysis	Group Programming	Event Collection
➢ **On-Demand reading** ➢ **Scheduled Meter Reading** • Daily/Monthly frozen Data • Alarms and Events	➢ **On-demand Individual & group Reading** • Instantaneous Value • Energy • Batch config profile scheme	➢ **Connection/ Disconnection** ➢ **Demand limit** ➢ **Threshold Configuration**	➢ **Online status real-time** ➢ **Online Rate Statistics (Meters & ECU)**	➢ **Clock Synchronization** ➢ **Upgrade Firmware**	➢ **Standard Event** ➢ **Tamper Detection Event** ➢ **Relay Event** ➢ **Power-quality Event** ➢ **…**

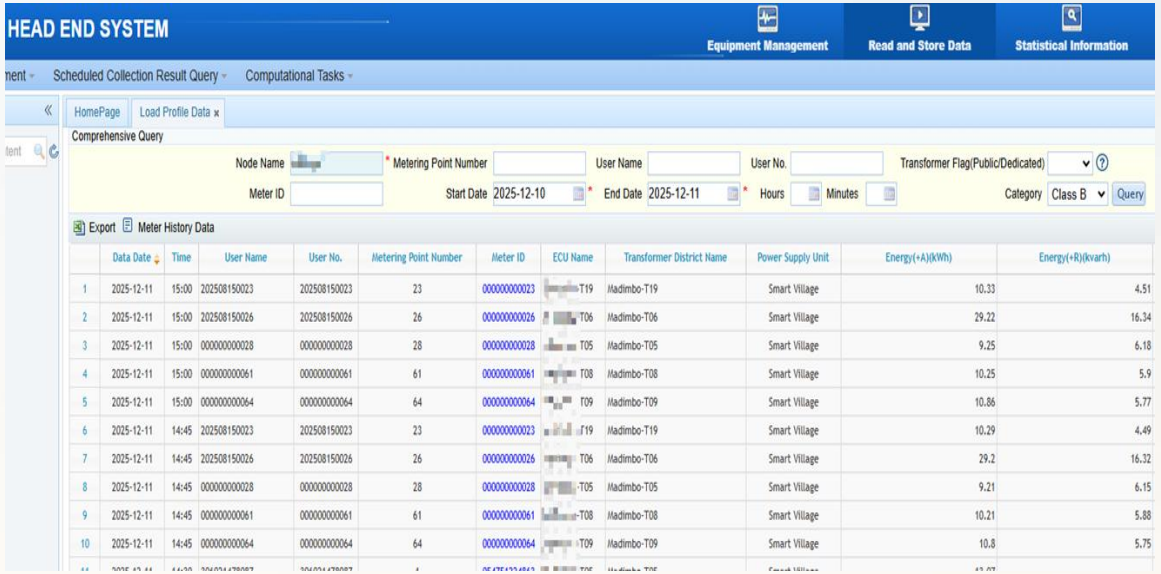
HES realizes automated meter reading, load control, and centralized analysis of smart meter data through automated and intelligent means, supporting refined management and efficient operation of the power grid.

Low efficiency in manual meter reading, dispersed data with poor timeliness, passive load management, and decision-making that relies on experience without sufficient data support.

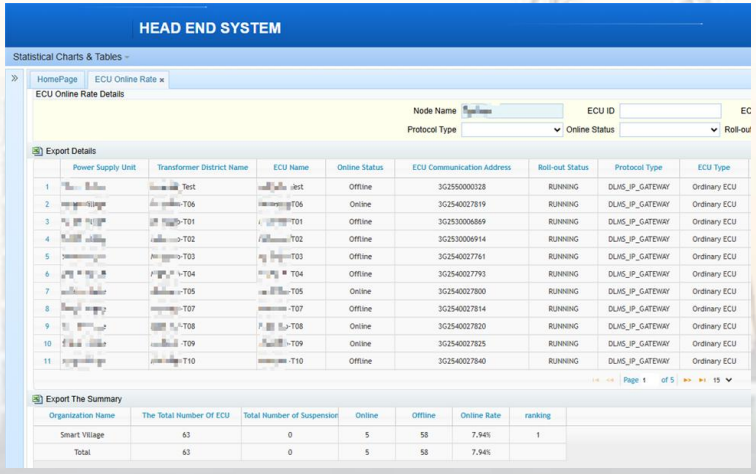
Cloud-HES

Transformer Area Overview

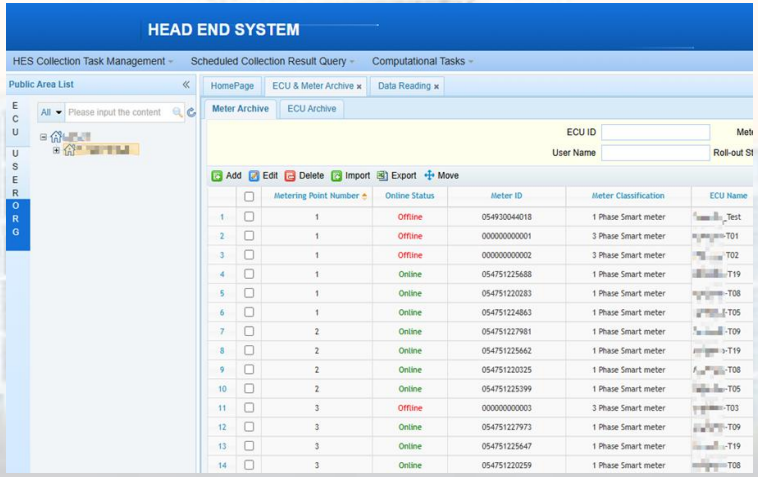
Load Profile Data



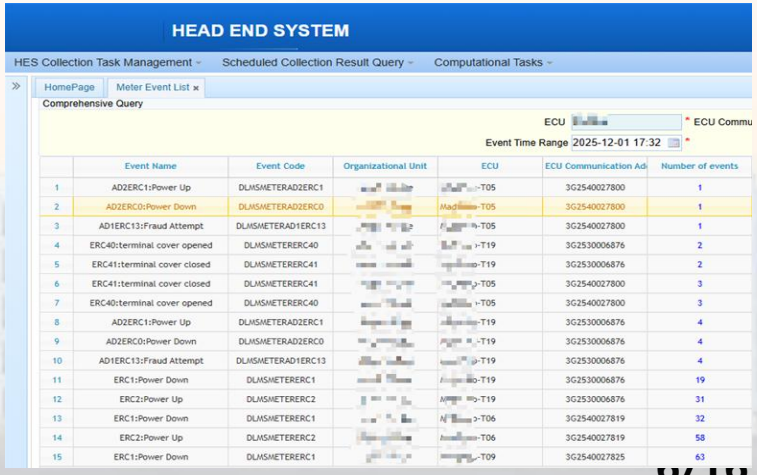
ECU Online Rate



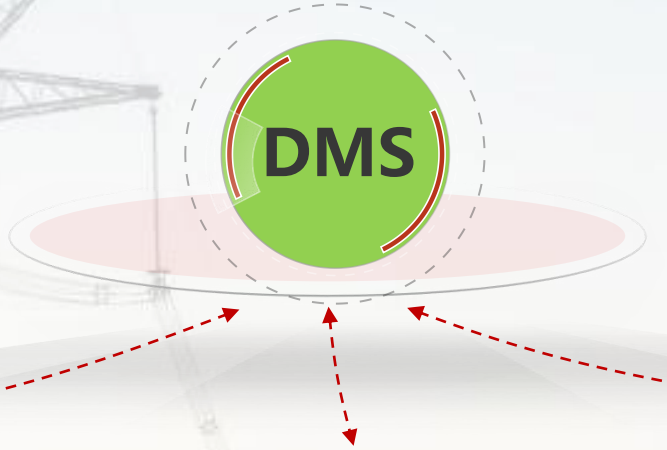
Meter Online Status



Meter Event



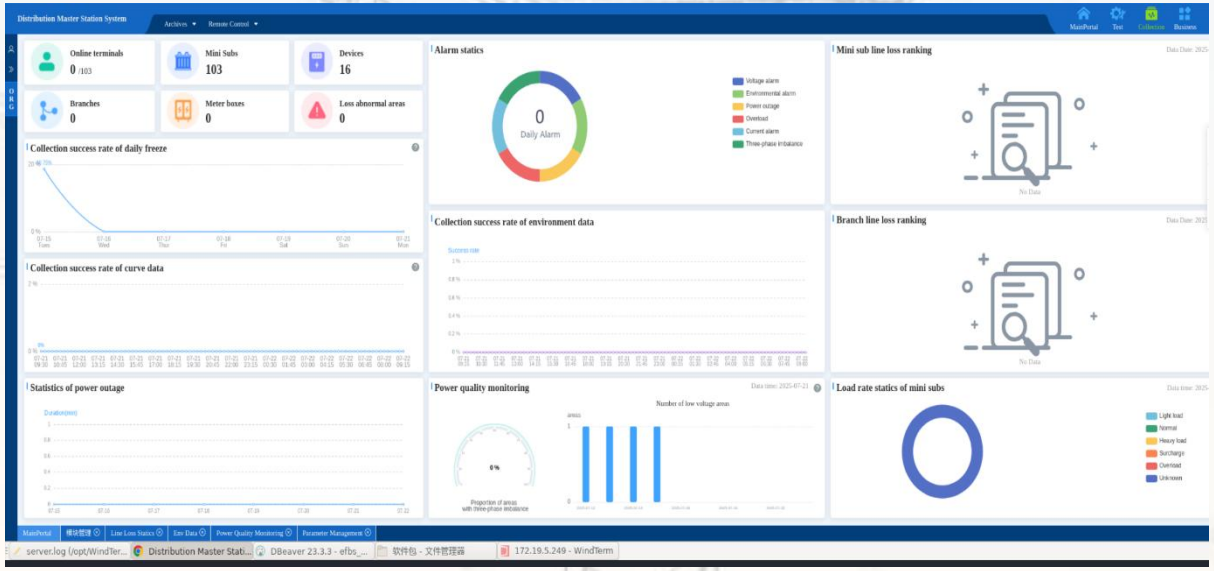
Cloud-DMS



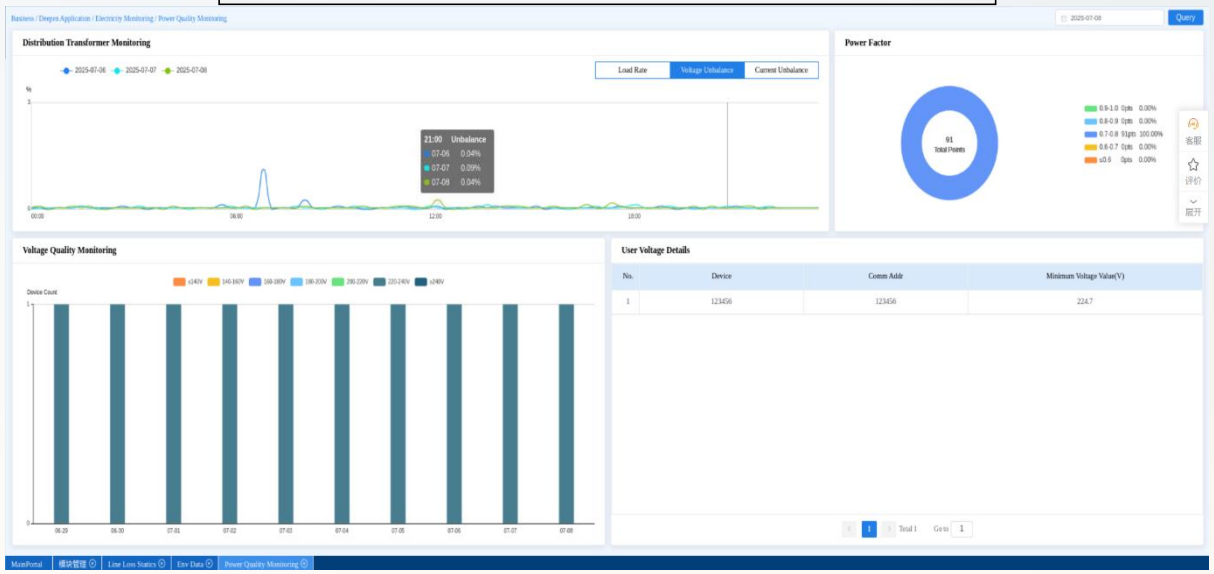
	Line Loss Analysis	Power Quality Monitoring	EV Monitoring
Key Capabilities	➢ Daily, Hourly, 30-Minute Line Loss Calculation ➢ Abnormal Diagnosis • Transformer Overload Alarm • Three Phase Unbalance Alarm • Power On/Off Event	➢ Transformer Power Quality Analysis • Three Phase Unbalance Data • Power Factor Data • Abnormal Voltage Data • Transformer Load Rate Data	➢ Transformer Environment Monitor • Smoke Monitor • Water Monitor • Temperature and Humidity Monitor
Key Value	**Transformer Line Loss Analysis** High power loss, lack of awareness of line loss	**Power Quality Monitor, Abnormal Event Alarm** Low power supply reliability and lack of power quality visibility	**Remote Operation and Maintenance, Timely Response** Manual Patrol Inspection, Low Efficiency

Cloud-DMS

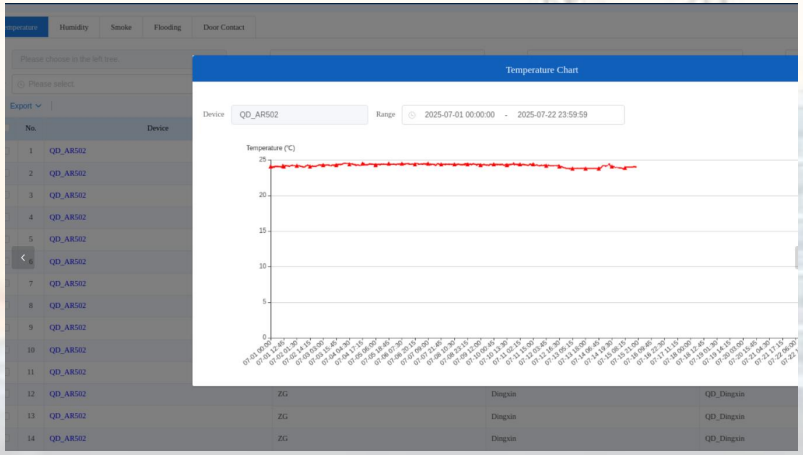
Transformer Area Overview



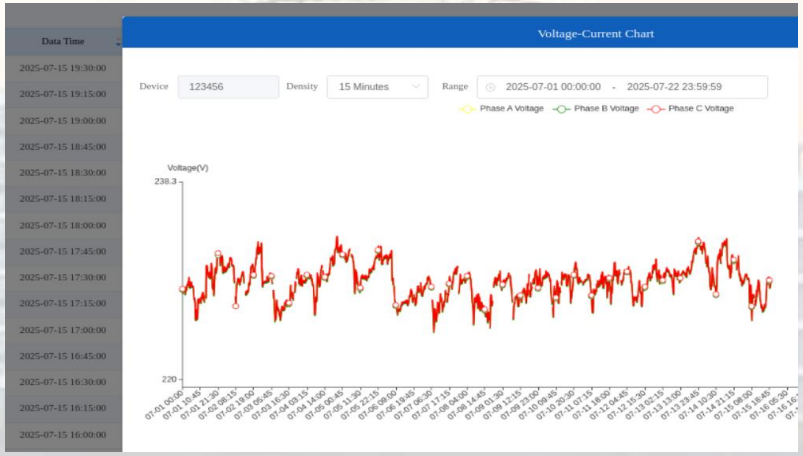
Power Quality Overview



Transformer Temp Curve



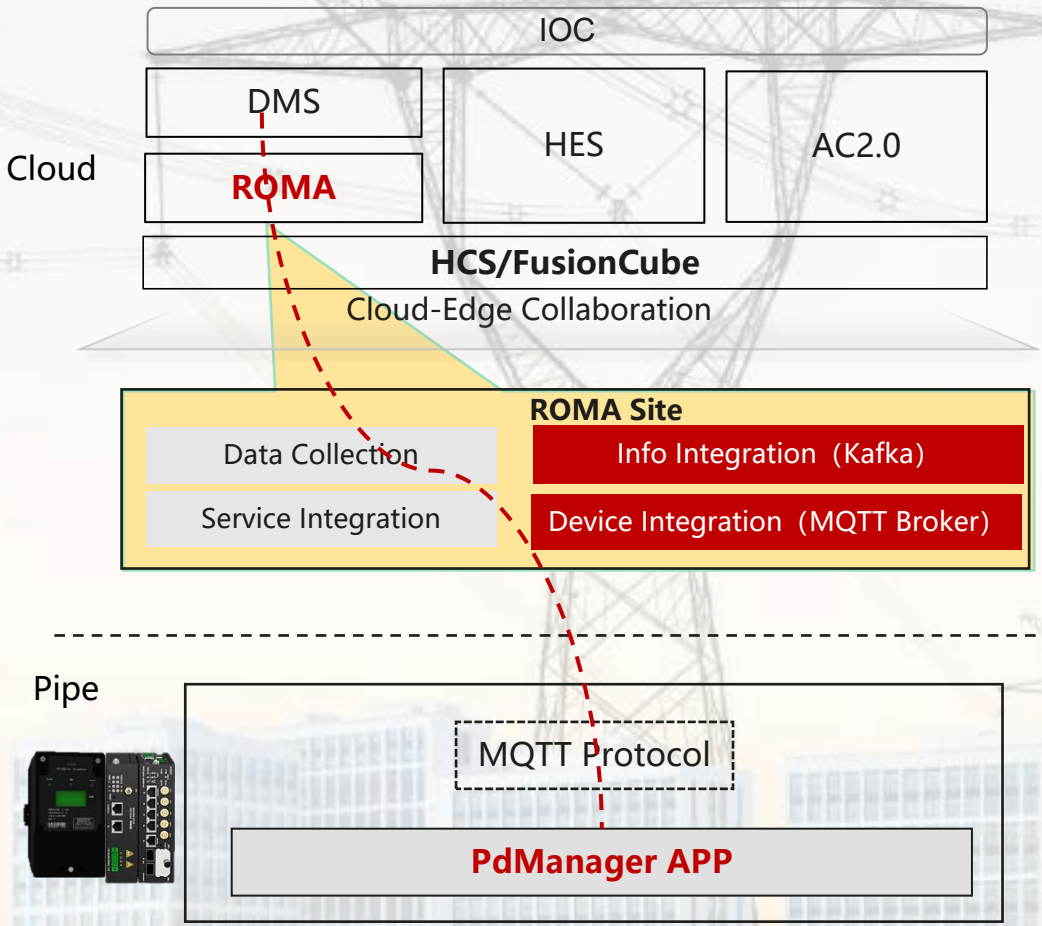
Transformer Voltage & Current Curve



Transformer Voltage & Current Data

Device	Data Time	Terminal	Mini Sub	Line	Power Company	Phase A Voltage(V)	Phase B Voltage(V)	Phase C Voltage(V)	Phase A Current(A
123456	2025-07-15 19:30:00	Test0328	test0422	testLine	Suzhou	228.900	228.900	229.000	0.050
123456	2025-07-15 19:15:00	Test0328	test0422	testLine	Suzhou	228.700	228.600	228.700	0.051
123456	2025-07-15 19:00:00	Test0328	test0422	testLine	Suzhou	228.400	228.400	228.500	0.051
123456	2025-07-15 18:45:00	Test0328	test0422	testLine	Suzhou	229.100	229.100	229.200	0.050
123456	2025-07-15 18:30:00	Test0328	test0422	testLine	Suzhou	229.500	229.400	229.500	0.050
123456	2025-07-15 18:15:00	Test0328	test0422	testLine	Suzhou	229.400	229.400	229.500	0.050
123456	2025-07-15 18:00:00	Test0328	test0422	testLine	Suzhou	228.900	228.800	228.900	0.050
123456	2025-07-15 17:45:00	Test0328	test0422	testLine	Suzhou	229.100	229.100	229.200	0.050
123456	2025-07-15 17:30:00	Test0328	test0422	testLine	Suzhou	229.300	229.300	229.400	0.050
123456	2025-07-15 17:15:00	Test0328	test0422	testLine	Suzhou	228.800	228.800	228.800	0.050

Cloud-ROMA



Key Capabilities

Full-domain IoT

Standard IoT Protocols, Shielding Terminal Access Differences, and Unified Data Reception

Full-domain Data Sharing

Massive Data Unified Convergence, Unified Integration, and Rapid Service Launch

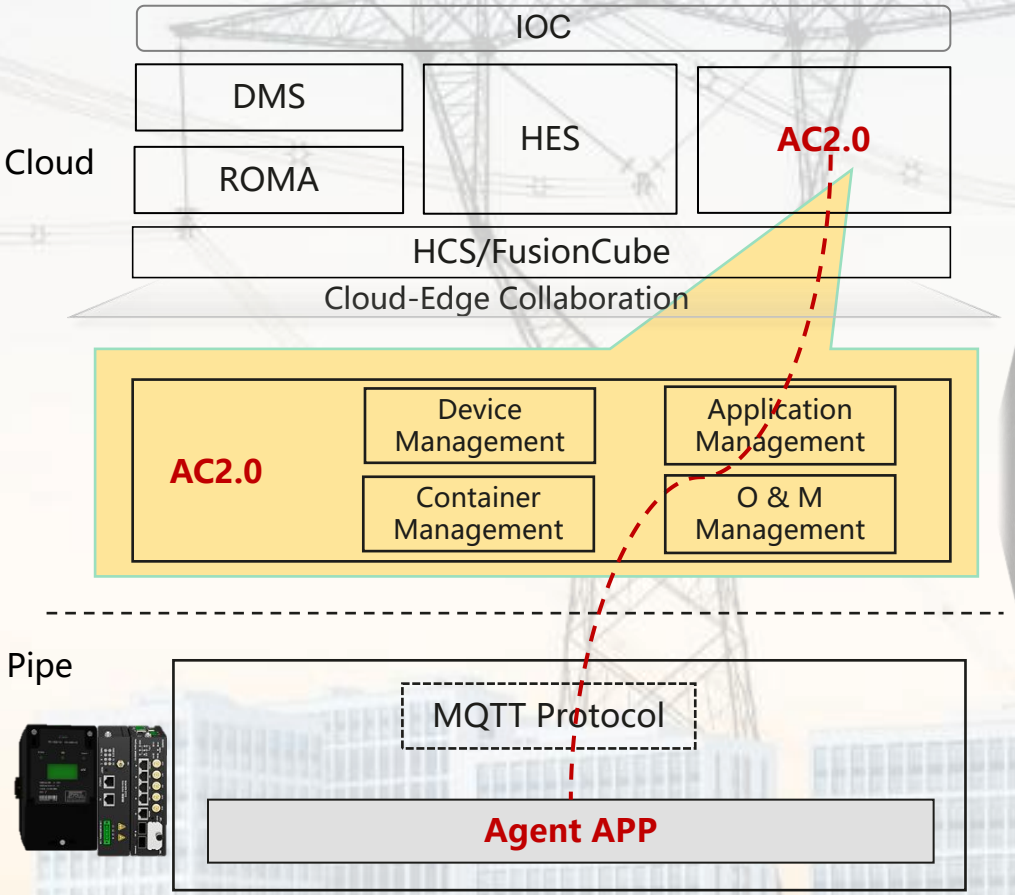
Full-domain Business Presentation

Real-time Data Forwarding, Supporting Real-time Service Display, and Flexible and Scalable

Key Value

- **Smooth Expansion of Massive Terminal Access:** With the development and expansion of future business, massive terminals can be smoothly accessed without the need for multiple connections with upper-layer applications.
- **Smooth Expansion of system platform:** For systems with different types of terminals, such as electricity meters, sensors, charging piles and other equipment, shield the large number of customized development dockings caused by different manufacturers due to system differences.

Cloud-AC 2.0



Key Capabilities & Values

ECU Management

- **Massive ECU One-Page Unified Overview:** Real-time display of the online rate, failure rate, operating status and alarms of massive ECUs simplifies operation and maintenance
- **Massive ECU Application Deployment and Upgrade:** One-click application deployment and upgrade, analysis and summary of upgrade failure results, and one-click batch retry.

HPLC Management

- **Massive HPLC Networking & Communication Management:** Visualized network topology, remote HPLC reset, and configurable communication frequency bands.
- **Massive HPLC Firmware upgrade:** Support remote firmware upgrade

Device Management

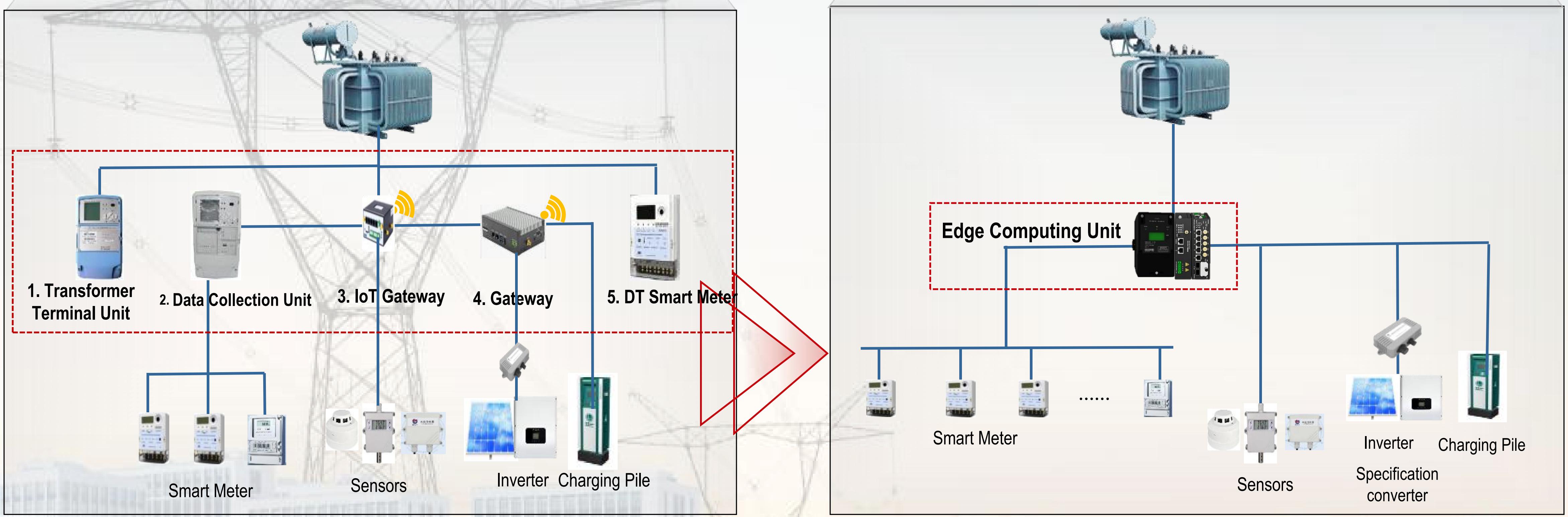
- **Multi-form Deployment:** Container and Host Process Deployment
- **Unified Device Access:** Shielding hardware and software differences between different ECUs, the system realizes unified access and standardized operation and maintenance management

System Openness

- **Security Access Plugin:** Meet the requirements of secure device access and flexibly adapt to the access protocols of different device

Edge-ECU

As Is / To Be



Siloed Systems, Data Silos

5 All in 1

Edge-ECU

iPACS: AC Module

- Accuracy: Active Power Class 0.5S, Reactive Power Class 2S, meeting the accuracy requirements for distribution transformer metering and power quality monitoring
- Collect voltage、current、power, and daily and monthly frozen data on the transformer
- Record power outage, restoration, under-voltage, over-voltage and other distribution transformer alarm events

iCUBE: HPLC Head

- Supports up to 1000 HPLC Terminals
- Supports 15-level Automatic Relay
- 4-level QoS, meeting the quality requirements of different services
- Supports different meter protocol and standards, such as DLMS and IEC

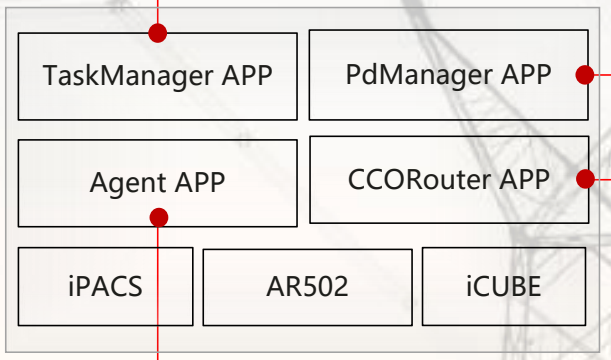
AR502H-V2: Edge Computing Module

- CPU：ARM 4 CORE A55，1.6 GHz；Storage：4GB DDR4，2GB SLC NAND
- Supports hard disk expansion, with a maximum expandable capacity of 256 GB
- Supports automatic switching between wired and wireless communication, and dual SIM cards
- 2*10 GE SFP+ OP， 2*RS485(RS232) IF，1*DI IF，1*DO IF
- Supports SNMP/MQTT，Fast Integration with ROMA
- Supports IPSEC, IPS/AV/URL and other security requirements
- Supports management of 32 containers and on-demand APP deployment
- USB Flash Drive-based Provisioning for Rapid Deployment

Layered Decoupling

Edge Analysis

Edge-ECU



TaskManager APP

- Data Acquisition Task Management
- iPACS Data Acquisition
- Meter Data Acquisition
- Meter File Management
- Meter Alarm Acquisition

PdManager APP

- Line Loss Calculation and Analysis
- Power Quality Monitoring
- Environment Data Monitoring

...

CCORouter APP

- Meter Networking Management
- Concurrent Meter Reading Control
- HPLC Information Query/ Frequency Band Switching

Agent APP

- Network Management Information Registration
- ECU Management
- HPLC Management
- Container/APP Management

Key Capabilities & Value

- TaskManager APP is mainly used for task management of meter data acquisition, automatic meter reading, local storage, and reporting to Hes.
- PdManager APP is mainly used for line loss calculation, power quality monitoring, and abnormal monitoring of environment quantities. By monitoring power quality of distribution transformer, combined with daily frozen meter data and abnormal alarm event, it helps customers reduce line losses and ensure the safety of distribution transformer.
- CCORouter APP is mainly used for meter network management and concurrent data acquisition , and improve the acquisition success rate through HPLC frequency switching.
- Agent APP is mainly used for the registration and access of ECU and HPLC. It cooperates wit AC2.0 to realize one-click APP distribution, deployment/upgrade and remote log retrieval, achieving cloud-edge operation and maintenance collaboration.

Pipe-HPLC

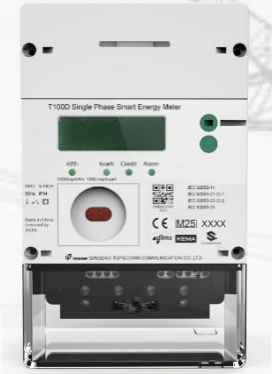
	PRIME PLC	G3 PLC	HPLC
Peak Value of Application Layer Communication Bandwidth	<1KBps	20K-40KBps	1MBps (Mean Value 200KBps)
Frequency Band	<500K	3K-150K（EU） 500K（FCC）	2–12 MHz & 2.4–5.6 MHz
Single Data Acquisition Time	10-30s	5-10s	0.2-3S
Cascade Levels	8	8	15
Self-Organizing Network Time Consumed	3 hour	1 hour	~5 min(300 meters)
Remote Upgrade	Not Support	Not Support	Support
Disconnection Recovery	>3 hour	>1 hour	3 min

Key Value

Daily Frozen Data Acquisition Success Rate	100%
30Min Frozen Data Acquisition Success Rate	99%
Anti-Attenuation	>100dB
Network Management	Support

Note: Laboratory test data:100 smart meters in a typical distribution transformer area, with copper wiring.

Device-Smart Meter



Single-Phase Smart Energy Meter

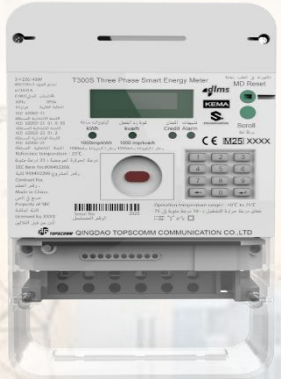
[Model] : T100D
[Voltage] : 220V,230V,240V
[Current] : 5(80)A,5(100)A,10(100)A
[Accuracy] : Active Class 1.0, Reactive Class 2.0
[Protocol]: DLMS
[Switch] : Built In
[Dimension]: 210mm×130mm×75mm
[Basic Function] : Single phase full electric parameter measurement; Support functions such as cost control, multi rate, freezing, and event recording; Supports communication methods such as carrier, 4G, RS485, RJ45, Modbus , infrared, etc.

Three-Phase Smart Energy Meter

[Model] : T300D
[Voltage] : 3×230V/400V
[Current] : 10(100)A
[Accuracy] : Active Class 0.5s,Reactive Class 2.0
[Protocol]: DLMS
[Switch] : Built In
[Dimension]: 255mm×170mm×85mm
[Basic Function] : Three-phase full electric parameter measurement; Support functions such as cost control, multi rate, freezing, and event recording; Supports communication methods such as carrier, 4G, RS485, RJ45, Modbus, infrared, etc.

Single-Phase Prepaid Smart Meter

[Model] : T100S
[Voltage] :220V, 230V,240V
[Current] : 5(80)A,5(100)A,10(100)A
[Accuracy] : Active Class 1.0, Reactive Class 2.0
[Protocol]: DLMS, STS
[Switch] : Built In
[Dimension]: 210mm×130mm×75mm
[Basic Function] : Single-phase full electric parameter measurement; Support functions such as cost control, multi rate, freezing, and event recording; Supports communication methods such as RS485, RJ45, Modbus, infrared, etc.



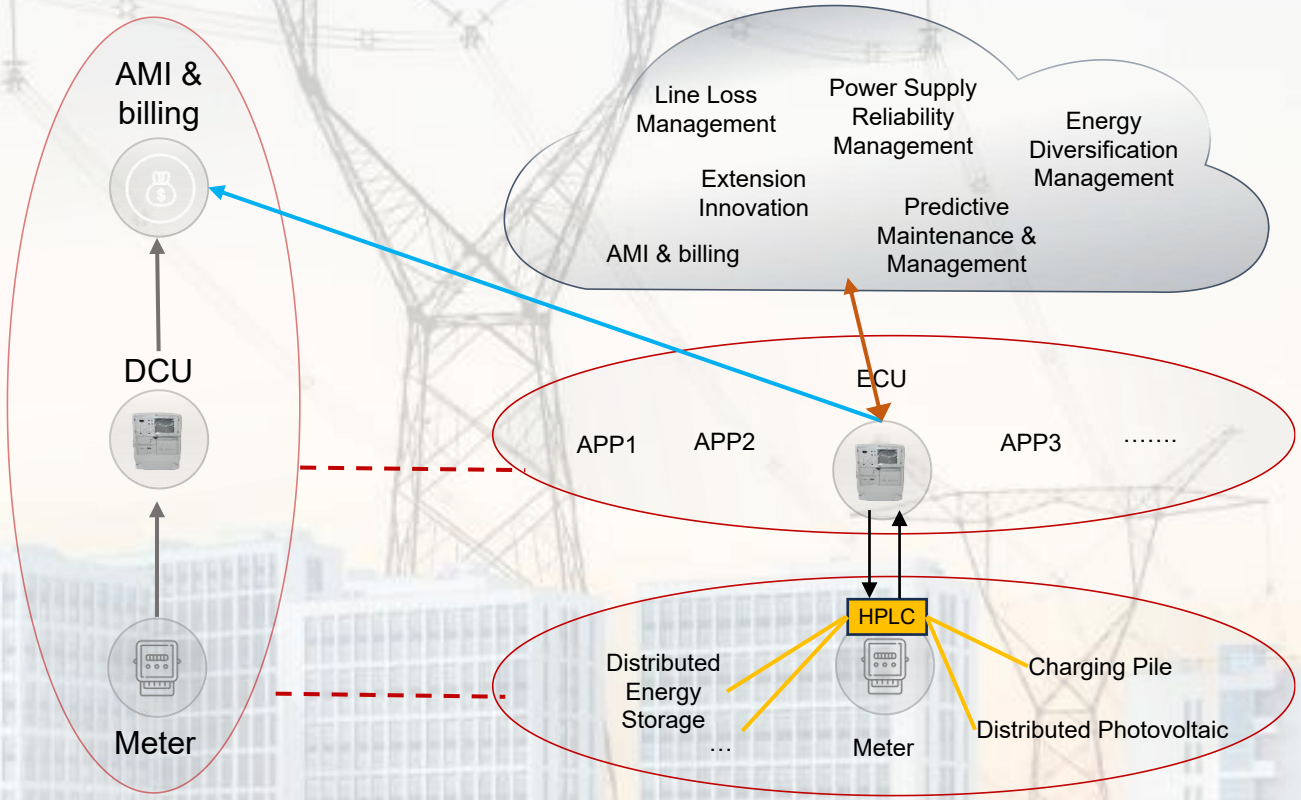
Three-Phase Prepaid Smart Meter

[Model] : T300S
[Voltage] : 3×230V/400V
[Current] : 10(100)A
[Accuracy] : Active Class 0.5s, Reactive Class 2.0
[Protocol]: DLMS, STS
[Switch] : Built In
[Dimension]: 255mm×170mm×85mm
[Basic Function] : Three-phase full electric parameter measurement; Support functions such as cost control, multi rate, freezing, and event recording; Supports communication methods such as RS485, RJ45, Modbus, infrared, etc.

AMI & IDS

AMI:
Vertical Information of Metering

IDS:
Horizontal Digitalization of Low-voltage Service



Key Differences

Data	Data Silos	Data Centralization
Process	Billing	Low-voltage Service
Organization	Single Department	Cross-departmental Collaboration
Mechanism	Planning+Tendering+Construction	Platform+Innovation+Transformation
Personnel	Single Role Responsibilities	Digitalization Talent
Ecosystem	Vendor Lock-in	On-demand Opening

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