

Telecommunications Tower Base Station Energy Monitoring Solution

Telecommunications tower base station energy monitoring solution, AC&DC multi-channel metering, overall local solution guidance.



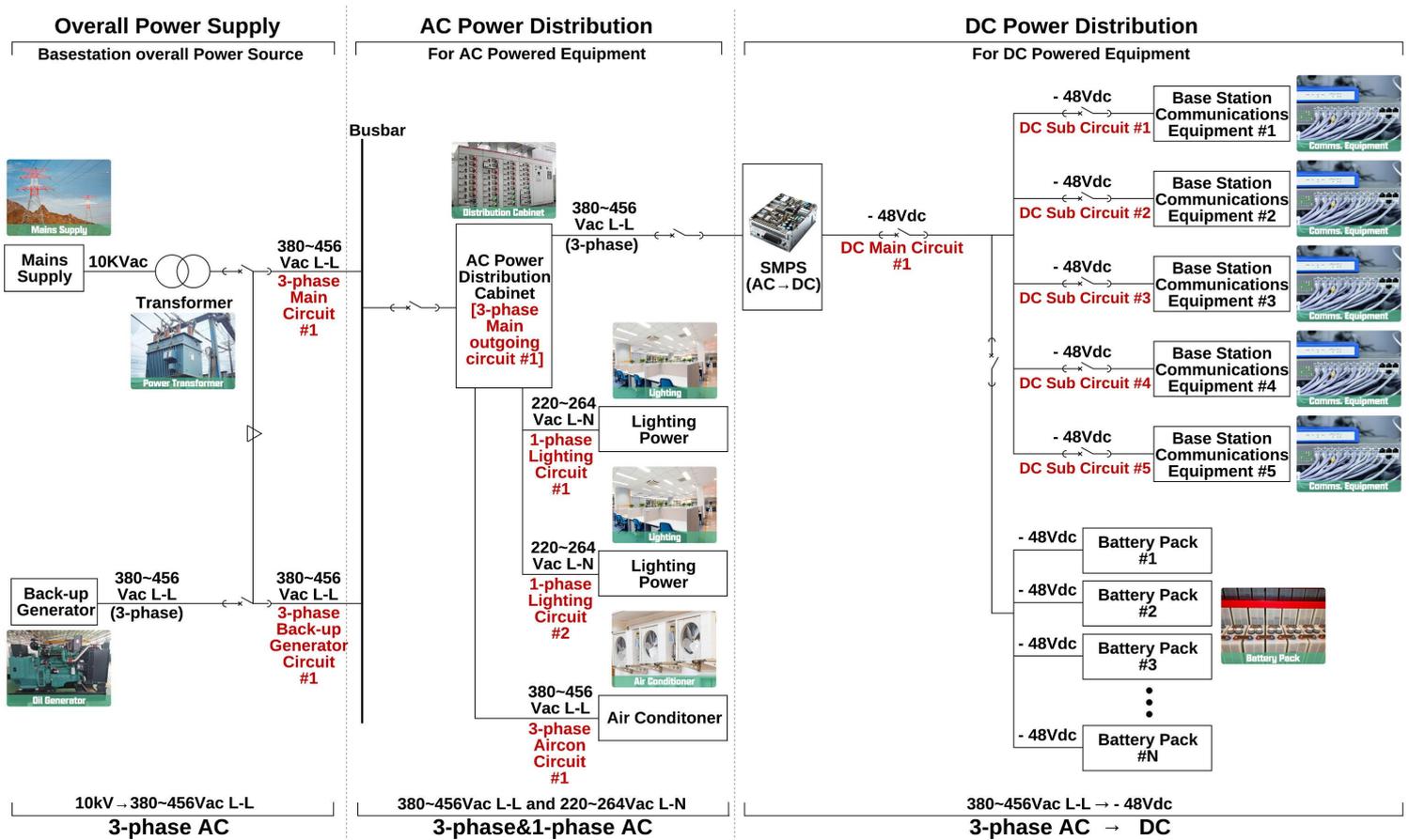
Ver. Date: Jan,22th 2024

Acrel Co., Ltd.

No.253 Yulv Road, Jiading
District, Shanghai, China

0. Application Scenario

- (1) This solution was designed for **precise sub energy monitoring of telecommunications tower base station**.
- (2) Normally, the power system of base station could be divided into AC part and DC part [-48Vdc]. And usually request a multi-channel metering regarding the different energy usage like for different telecommunications service provider's **base station communications equipment** [DC side]. Or for either the **mains supply, back-up generator, lighting, airconditioner** of base station. [AC side] Thus, multi-channel DC or AC energy meter will be the key to solve such request.
- (3) This solution was majorly for local energy monitoring, different from Acrel IoT Cloud energy monitoring solution which is designed for **base station online cloud energy monitoring**. In other hands, this solution could be also adapted to 3rd party IoT energy monitoring system by the integration between Acrel energy meter to 3rd party IoT gateways via RS485 [MODBUS-RTU protocol]. Or by the integration between Acrel IoT gateway and 3rd party IoT system via 4G, WiFi, Ethernet [MQTT or MODBUS-TCP protocol].



(1) Power system structure and major energy monitoring point of telecommunications tower base station

1. Scenario Preset

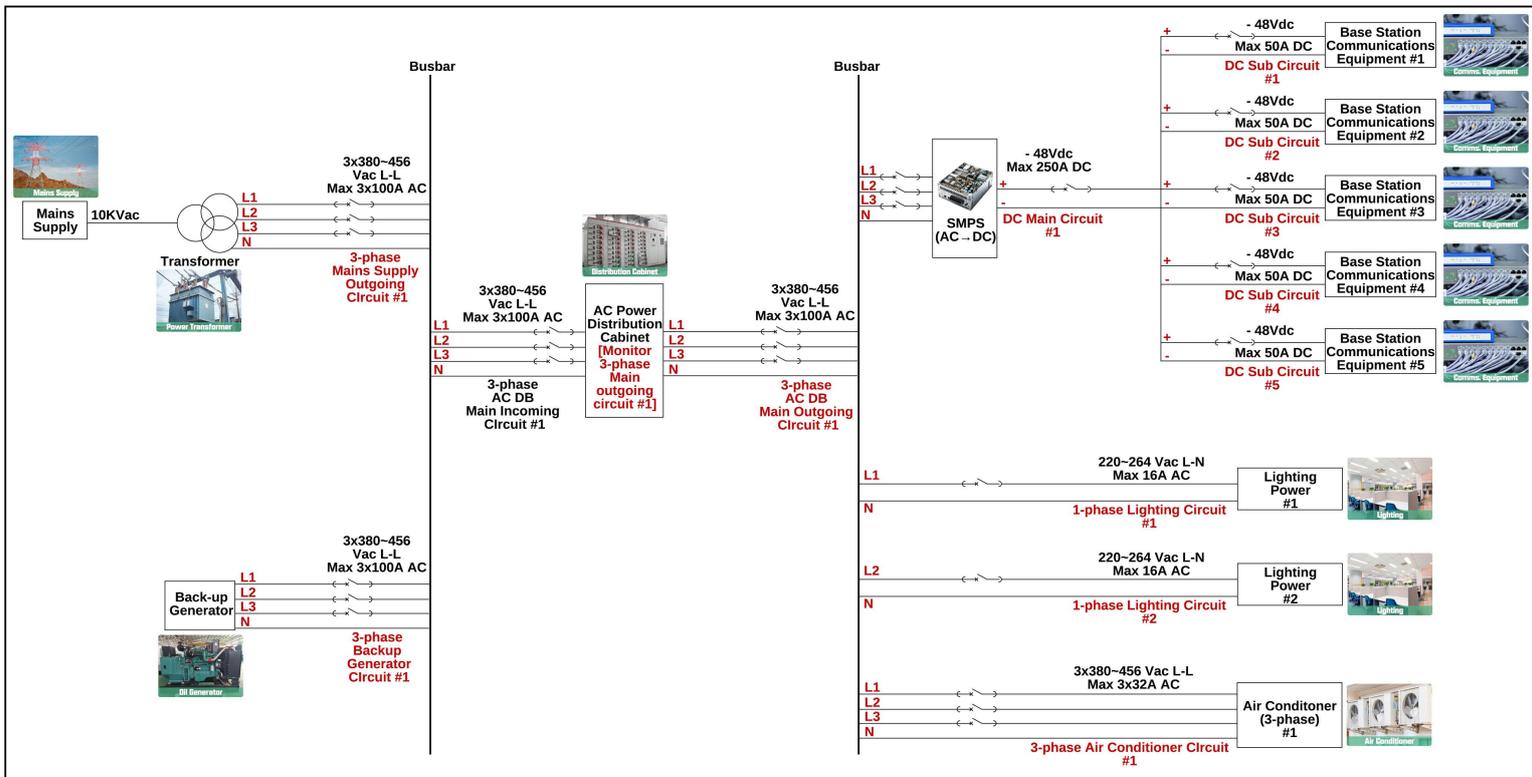
In order to see how will Acrel hardware devices actually deployed on actual site, we will preset a scenario according to actual site sample as following [divided as AC and DC parts]:

(1) AC Power System Side: 6 circuits AC need to be monitored in total:

- 1* AC circuit 3-phase for "Mains Supply" [Rated voltage 3x380-456Vac L-L, rated current 3x100A AC, circuit's cable cross-sectional diameter within 16mm.]
- 1* AC circuit 3-phase for "Back-up generator" [Rated voltage 3x380-456Vac L-L, rated current 3x100A AC, circuit's cable cross-sectional diameter within 16mm.]
- 1* AC circuit 3-phase for "AC Distribution Cabinet" [Rated voltage 3x380-456Vac L-L, rated current 3x100A AC, circuit's cable cross-sectional diameter size within 16mm.]
- 1* AC circuit 3-phase for "Air Conditioner" [Rated voltage 3x380-456Vac L-L, rated current 3x32A AC, circuit's cable cross-sectional diameter within 16mm.]
- 2* AC circuit 1-phase for "Lighting Power" [Rated voltage 230Vac L-N, rated current 16A AC, circuit's cable cross-sectional diameter within 16mm]

(2) DC Power System Side: 6 circuits DC needed to be monitored in total:

- 5* DC circuits for 5 "Base Station Communications Equipments" [Rated voltage -48Vdc, rated current 50A DC, circuit's cable cross-sectional diameter within 20mm.]
- 1* DC circuit for "DC Main Circuit" [Rated voltage: -48Vdc, rated current 250A DC, circuit's cable cross-sectional diameter within 40mm.]



Telecommunications Tower Base Station #1

(1) Scenario Preset for monitoring Telecommunications Tower Base Station

2. Devices Deployment

According the scenario preset of actual set, following was how should we deploy the Acrel hardware devices for monitoring all crucial points:

For AC Power Metering - Mains Supply 3-phase Circuit #1, Back-up Generator 3-phase Circuits #1, AC DB Main Outgoing 3-phase Circuit #1, Air Conditioner 3-phase Circuit #1

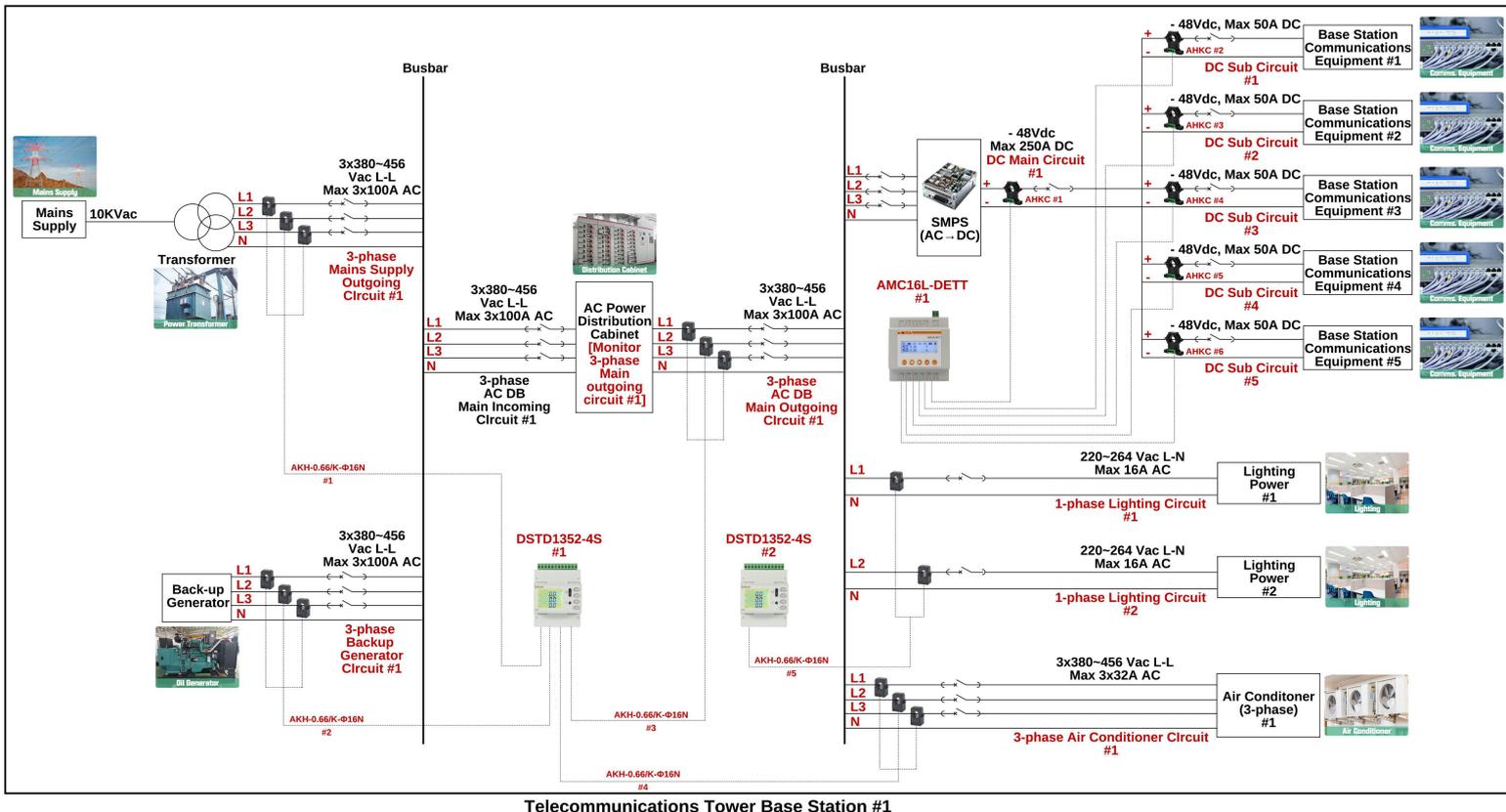
- 1* DTST1352-4S Multi-circuit AC Energy Meter [For monitoring 4 circuits 3-phase]
- 4* AKH-0.66/K- 16N 100A/50mA Split-core Current Transformer [1 set contain 3 CTs, paired with DTSD1352-4S for current signal input]

For AC Power Metering - Light Power 1-phase Circuit #1~2

- 1* DTST1352-4S Multi-circuit AC Energy Meter [For monitoring 2 circuits 1-phase]
- 1* AKH-0.66/K- 16N 100A/50mA Split-core Current Transformer [1 set contain 3 CTs, paired with DTSD1352-4S for current signal input]

For DC Power Metering - Base Station Equipments DC Sub Circuit #1~5, DC Main Circuit #1:

- 1* AMC16L-DETT Multi-circuit DC Energy Meter [For monitoring 6 circuits DC]
- 5* AHKC-EKA (50A/5V) Split-core Hall Effect DC Current Transducer [Paired with AMC16L-DETT for current signal input]
- 1* AHKC-EKB (250A/5V) Split-core Hall Effect DC Current Transducer [Paired with AMC16L-DETT for current signal input]



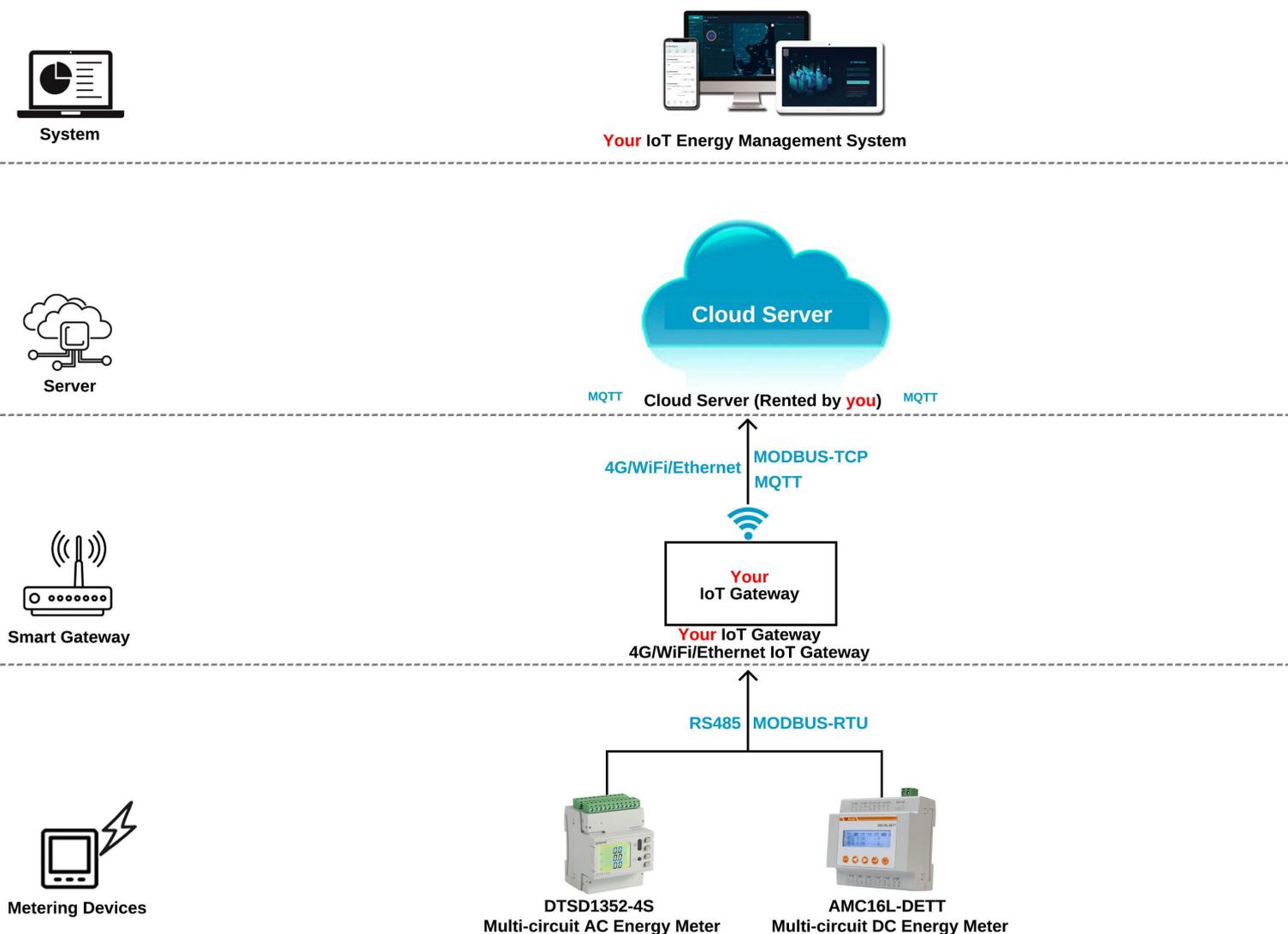
Telecommunications Tower Base Station #1

(1) Scenario Preset for monitoring Telecommunications Tower Base Station

3. Communication Structure&Logic [When integrated with 3rd party IoT gateway]

IoT Energy Monitoring is the trend of future. So, if the customer/your side **already have your own IoT system platform and your own IoT gateway** which has been already integrated with your IoT system. And in this case you don't need Acrel IoT gateway and IoT system, but you want to receive the data from Acrel Energy Meter to your system instead. Then, then **integration** between **Acrel Energy Meter AMC16L-DETT Multi-channel DC Energy and DTSD1352-4S Multi-channel AC Energy Meter** and **your IoT gateway** will be the key for overall system integration.

(1) Both **AMC16L-DETT Multi-channel DC Energy Meter** and **DTSD1352-4S Multi-channel AC Energy Meter** support **RS485** communications based on **MODBUS-RTU** protocol. So, if your IoT gateway also support downstream communications of **RS485 [MODBUS-RTU]**, then it will be possible to do the integration of this part. [Acrel side will provide MODBUS Mapping of energy meter for technical assistance]



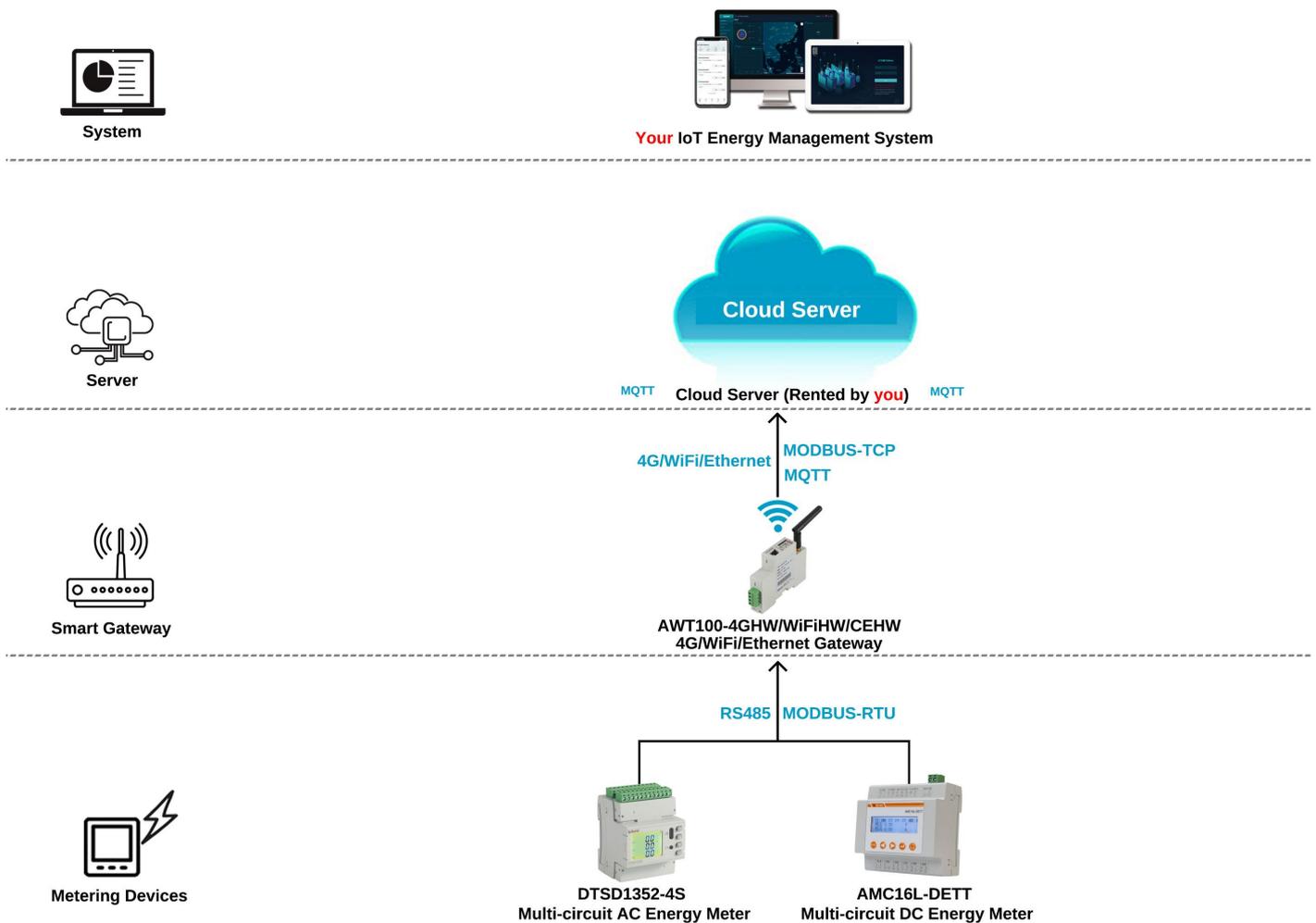
(1) Integration Communications Structure

3. Communication Structure&Logic [When integrated with 3rd party IoT System]

IoT Energy Monitoring is the trend of future. So, if the customer/your side **already have your own IoT system platform** but **don't** have IoT gateway which has been already integrated with your IoT system. And in this case you don't need Acrel IoT system, but you want to receive the data from Acrel Energy Meter to your system instead. Then, then **integration** between **Acrel AWT100 Series IoT gateway** [either 4G, WiFi or Ethernet version] and **your IoT system** based on either **MQTT or MODBUS-TCP protocol** will be the key for overall system integration.

(1) Both **AMC16L-DETT Multi-channel DC Energy Meter**, **DTSD1352-4S Multi-channel AC Energy Meter** and **AWT100 IoT gateway** support **RS485** communications based on **MODBUS-RTU** protocol. And between these devices, the integration of RS485 [MODBUS-RTU] part has been already done in factory stage. [Since they are all Acrel produced products]

(2) Thus, to make the overall communications structure complete, we only need to do the integration between **Acrel AWT100 IoT gateway** with **your IoT system** via **4G, WiFi or Ethernet communications methods** based on **either MQTT or MODBUS-TCP protocol**. To do this part, Acrel side will provide either MQTT or MODBUS-TCP protocol file to your side for system integration.



(1) Integration Communications Structure

4. Hardware Devices Overview [Energy Meter & IoT Gateway]

Model 1: AMC16L-DETT Multi-circuit DC Energy Meter

- Monitoring: Up to 6 circuits [DC Metering]
- Rated Voltage: -48Vdc
- Rated Current: 5Vdc (via -A/5Vdc hall sensor)
- Communicaiton: RS485 Interface, MODBUS-RTU Protocol
- Auxiliary Power Supply: -40~-60Vdc
- Power Output: 1 set of +12V/100mA,-12V/50mA power output serving as power supply of paired Hall Sensors.
- Data Storage: 2mb room for alarm and energy data.
- Certificate&Standard: IEC; CE

DC Metering
Base Station
6-channel
RS485 (MODBUS)



Model 2: DTSD1352-4S Multi-circuit AC Energy Meter

- Monitoring: Up to 4 circuits 3-phase or 12 circuits 1-phase or mixed [AC Metering]
- Rated Voltage: 3x380~456Vac L-L & 3x220~264Vac L-N
- Rated Current: 50mA (via -A/50mA CT)
- Communicaiton: RS485 Interface, MODBUS-RTU Protocol
- Auxiliary Power Supply: 85~265Vac/Vdc
- Certificate&Standard: CE

1-phase&3-phase
Multi-circuit
4-channel
RS485 (MODBUS)



Model 3: AWT100 Seires IoT Gateway

- Upstream Methods: Optional 4G [Module:AWT100-4GHW] or WiFi [Module: AWT100-WiFiHW] or Ethernet [Module AWT100-CEHW] (Protocol: MQTT, MODBUS-TCP)
- Downsteam Methods: RS485 (MODBUS-RTU)
- Support: Up to 25 monitoring circuis via RS485 Interface within 300m.
- Auxiliary Power Supply: 85~265Vac L-N (via AWT100-POW power supply module) or 24Vdc (default)
- Certificate&Standard: CE-RED

IoT Gateway
4G/WiFi/Ethernet
MQTT&MODBUS
RS485 Downstream



4. Hardware Devices Overview [Paired Current Sensor for Energy Meter]

Model 1: AKH-0.66/K- 16N 100A/50mA Split-core CT

- Current Ratio: 100A/50mA AC
- Accuracy: Class 0.5
- Aperture: 16mm
- Application: Paired with DTSD1352-4S AC energy meter for current input
- Noted: 1 set include 3 CTs



Model 2: AHKC-EKA Split-core Hall Sensor

- Current Input Range: 0~50A DC
- Current Output Range: 0~±5Vdc
- Aperture: 20mm
- Auxiliary Power Supply: ±12Vdc (Supplied by AMC16L-DETT)
- Application: Paired with AMC16-DETT DC energy meter for current input



Model 2: AHKC-EKB Split-core Hall Sensor

- Current Input Range: 0~250A DC
- Current Output Range: 0~±5Vdc
- Aperture: 40mm
- Auxiliary Power Supply: ±12Vdc (Supplied by AMC16L-DETT)
- Application: Paired with AMC16-DETT DC energy meter for current input



5. Overall Model Selection&Quoation

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

AC Metering Devices Set					
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	AC Multi-circuit Energy Meter DTSD1352-4S	Monitoring: Up to 12 circuits 1-phase or 4 circuits 3-phase or mixed [AC Metering] Communication: RS485 (MODBUS-RTU) Rated Voltage: 380~456Vac L-L & 220~264Vac L-N Rated Current: 50mA (via -A/50mA CTs) Auxiliary Power Supply: 85~265Vac/Vdc	2 pcs		
	Split-core Current Trasformer AKH-0.66/K K-φ16N 100A/50mA	Current Ratio: 100A/50mA AC Aperture: φ16mm (diameter) Accuracy: Class 0.5 Application: Paired with DTSD1352-4S for current input Noted: 1 set include 3 CTs	5 pcs		
DC Metering Devices Set					
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	DC Multi-circuit Energy Meter AMC16L-DETT	Monitoring: Up to 6 circuits [DC Metering] Communication: RS485 (MODBUS-RTU) Rated Voltage: -48Vdc Rated Current: 5Vdc (via -A/5Vdc Hall Sensor) Power Output: 1 set of +12V/100mA,-12V/50mA power output serving as power supply of paired Hall Sensors. Auxiliary Power Supply: -40~-60Vdc	1 pcs		
	Hall Sensor AHKC-EKA	Current Input Range: 0~50A DC Current Output Range: 0~±5Vdc Aperture: φ20mm Auxiliary Power Supply: ±12Vdc Application: Paired with AMC16-DETT for current input	5 pcs		
	Hall Sensor AHKC-EKB	Current Input Range: 0~250A DC Current Output Range: 0~±5Vdc Aperture: φ40mm Auxiliary Power Supply: ±12Vdc Application: Paired with AMC16-DETT for current input	1 pcs		