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Smart DC
Management System

redot winner 2020

iMaster NetEco
Data Center Infrastructure Management System

INTRODUCTION

The NetEco6000 is a continuously evolving data center infrastructure management system. By managing power supply and distribution devices, cooling devices, and the operating environment of equipment rooms, it provides highly reliable O&M and refined operation experience, and maximizes the efficiency and value of data centers. In addition, the NetEco 6000 provides the iCooling@AI energy efficiency optimization solution, which uses IoT, Big Data, and AI technologies to improve the power utilization (PUE) of data centers and achieve green and low-carbon operation of data centers.

APPLICATION SCENARIOS

- Medium and large data center
- Outdoor prefabricated data center
- Micro/Small data center

FEATURES & VALUE

Digital Visualization

Digital visualization and intelligent base for ultimate experience and overall control

Autonomous Maintenance

Digital and intelligent O&M, improving O&M quality and efficiency and reducing O&M costs by 35%
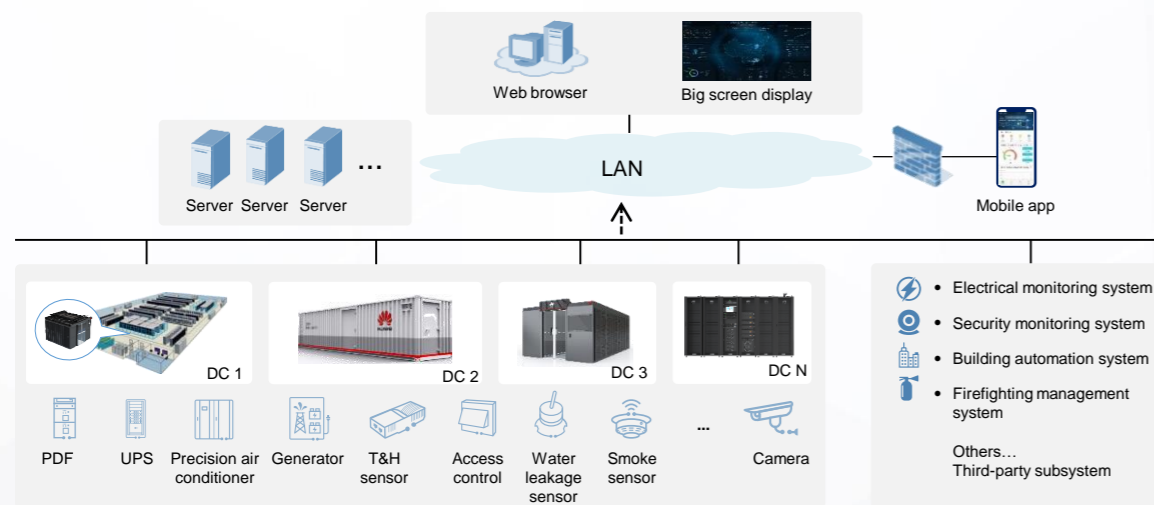
Intelligent Operation

Asset lifecycle management and intelligent capacity planning, improving resource utilization by 20%

AI PUE Optimization

iCooling-enabled intelligent optimization of system-level energy efficiency, reducing PUE by 8% to 15%

SYSTEM ARCHITECTURE

BASIC PARAMETERS

| Category	Specifications	Remarks
Deployment Mode	Single server, cluster server, and VM (FusionSphere or FusionCompute)	
Operating System/Database	EulerOS/GaussDB, Huawei developed	
Management Capability	≥ 3 million monitoring points (about 15,000 cabinets), supporting capacity expansion	
Number of Online Users	≤ 100	
Data Storage	Default 1 year, maximum support 3 years	

FEATURES OVERVIEW

Category	License	Feature	Remarks
Basic Features	NA	Device Monitoring, Big Screen Display, Alarm Management, Power Link Visualization, Cooling Link Visualization, Report Management, Energy Efficiency Analysis, and Fault Analysis	
Platform Interface	Southbound Interface	Device/System Integration (including video, access control, fire extinguishing, HVAC, and power supply and distribution)	
	Northbound Interface		
Optional Features	Temperature Nephogram	Temperature Map	
	3D View-Lite	3D View-Lite	
	Dashboard Report	Big Data Dashboard and Report Analysis	
	Basic Maintenance	Personnel and Shift Management, Electronic Inspection, App O&M, Knowledge Library, and O&M Process Management	Select one from the two.
	Digital Maintenance	Personnel and Shift Management, Electronic Inspection, App O&M, Knowledge Library, O&M Process Management, Conserve, Repair Management, Routine Drill, Entry and Exit Registration, and Supplier Management	
	AI Predictive Maintenance of Circuit Breaker	Breaker Health Prediction and Circuit Breaker Setting Analysis	
	AI Predictive Maintenance of Power Facility	Temperature Prediction, Fault Impact Analysis of Power Supply Links	
	AI Predictive Maintenance of Energy Storage	Lithium Battery Health Prediction	
	Intelligent Operation	Asset Management, Capacity Management, Tenant Management, Warehouse Management, and Automatic Detection of U Space	
	Cooling Optimization	AI PUE Optimization, Energy Efficiency Analysis	

CORE HARDWARE

Data collector-ECC800Pro

The Energy Control Center 800Pro (ECC800Pro) is located between the upper-level NMS and lower-level monitoring equipment. It is responsible for collecting, converging, processing, and reporting signals.

Networking Mode1: For PoE Ring Network in The Smart Module

ECC800Pro Data Center Collector
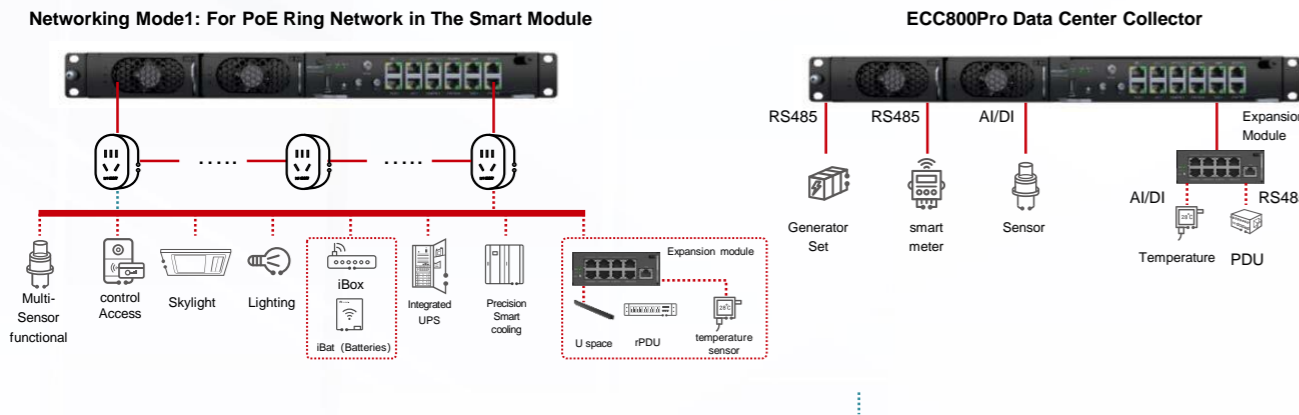
ECC800Pro Specifications

Entry	Description
Power supply	200V AC ～ 240V AC/ 100V AC ～ 120V AC
RS485 ports	2 RS485 ports in total(Without "multi-functional" ports), the default communication rate is 9600bps, One of the interfaces provides 12V DC power.
AI/DI ports	3 AIDI ports in total(Without "multi-functional" ports), each port supports access to sensors, such as Leak detection, smoke detection, door sensor, NTC, 4-20mA signals.
Muti-functional ports	2 "multi-functional" ports in total, which support RS485 signals or AIDI signals, and also provide 12V DC power.
DO ports	One DO port. Each port supports passive and active DO.
FE expansion	Supports two WAN ports, two LAN ports, and 100Mbps communications rate.
Port expansion	The PoE port can be extended by ETH in the smart module, so as to access more expansion modules; Support to connect 2 expansion modules outside the micro module.
Dimension	1 U rack，442mm*330mm*43.6mm (D*W*H)
Others	You can use a web browser to access the ECC800Pro for remote management.

Expansion Module Specifications

Entry	Description
RS485/AIDI Ports	8 RS485 ports in total, which can also be connected to AIDI signals. The default communication rate is 9600bps. Each port can provide 12V DC power. The maximum power supply current of a single port is 450mA, and the total power supply current of 8 ports is 1500mA.
Power Supply	Power supply is PoE input, support 10 / 100Mbps;

Note:1. Intelligent node refers to devices that communicate with the NetEco platform over communication protocols. Currently, the common devices in layer 1 of data centers (DCs) include the UPS, smart cooling, humidifier, PDF (electricity meter), PDU (monitoring type), ATS, diesel generator, camera, and access control device.
2. When the number of smart nodes is 4,000 or more, the server deployment adopts the cluster solution, which includes 3 servers.

CORE HARDWARE

Server- Taishan200

TaiShan200 is a next-generation data center server powered by Huawei Kunpeng processors. Efficient computing, high security, and an open ecosystem make TaiShan the choice for accelerating big data, software-defined storage (SDS), native, high-performance computing (HPC), and database applications. Taishan servers make computing in data centers greener and more diverse.

Centralized management server

Item	Standard Performance	Cluster
Model	Taishan200 2280	
Form Factor	2U 2-socket rack server	
Power Supply	Support 100~240VAC，240V DC	
CPU/RAM	Kunpeng 920 processors, 64-bit, 48-core, 2.6 GHz	Kunpeng 920 processors, 64-bit, 48-core, 2.6 GHz
Internal Storage	4*32GB DDR4 RDIMM, ECC	4*32GB DDR4 RDIMM, ECC
Hard Disk	2*1200GB + 8*1800GB, SAS 2.5" HDD, 10000RPM	2*1200GB + 16*1800GB, SAS 2.5" HDD, 10000RPM
Operating Systems	EulerOS V2.0 SP9	
Protocol	SNMP, Modbus, HTTP, TCP/IP, and DNS	

Notes:1. Intelligent node refers to devices that communicate with the NetEco platform over communication protocols. Currently, the common devices in layer 1 of data centers (DCs) include the UPS, smart cooling, humidifier, PDF (electricity meter), PDU (monitoring type), ATS, diesel generator, camera, and access control device.

2. When the number of smart nodes is 4,000 or more, the server deployment adopts the cluster solution, which includes 3 servers.

INTELLIGENT OPERATION MODULE

License	Feature	Description	Value	Content
Intelligent Operation	Asset Management	Manages allocated and inventory assets.	The built-in IT device model library enables users to manage asset status throughout the lifecycle.	• Supports lifecycle management of allocated and inventory assets, and records the inbound, allocation, relocation, unallocation, repair, and return processes of assets. • Allows users to record asset attributes, including the device model, department, and maintenance information, and to customize attributes. • Provides a device model library with built-in IT device model information of top *N* vendors in the past three years.
	Capacity Management	Collects and analyzes capacity resource usage data of data centers.	Automatic detection of U spaces enables intelligent allocation planning.	• Provides historical curve analysis, dashboards, and capacity reports for SPCN capacity usage. • Manages IT device connections, such as power connections to rPDUs and network connections to switches. • Recommends installation positions based on factors such as SPCN, customer ownership, and service division. • Supports automatic generation of allocation and unallocation work orders and interconnection with the ITSM to obtain service requirement order information.
	Tenant Management	Manages data center tenants and resource leasing.	Cabinet resources can be allocated and tenant groups can be analyzed to match colo scenarios.	• Supports allocation, pre-allocation, and resource statistics of area, cabinet, and U space resources. • Analyzes the status and trend of the data center leasing rate. • Analyzes VIP customers and customer groups to understand resource leasing preferences. • Identifies tenants whose electricity consumption exceeds the limit and lists detailed records. • Identifies tenants whose leases expire or lease rates are high, facilitating precision marketing.
	Warehouse Management	Manages the devices, spare parts, consumables, and tools in the warehouse.	In-stock assets are managed to ensure full lifecycle management of assets.	• Manages the asset inbound, outbound, and claiming processes. • Supports collection of inventory statistics and provides a message for spare parts and consumables with insufficient inventory, consumables whose validity period is about to expire, and spare parts and consumables whose outbound period is about to expire.
	Automatic Detection of U Space	Automatically identifies asset locations through the U space manager.	The accuracy of U space capacity management is 100%.	• Automatically identifies the installation positions of devices in each cabinet. • Automatically collects statistics on the available capacity of each cabinet. • Accurately traces asset changes in the equipment room in real time.

DIGITAL VISUALIZATION MODULE

License	Feature	Description	Value	Content
NA -Basic Features	Device Monitoring	Real-time monitoring of data center infrastructure.	Topology of the power and cooling system.	• Monitor data center infrastructure in real time, such as power equipment, cooling equipment, sensors, etc. • Can centrally manage multiple data centers.
	Big Screen Display	Display the KPI on the splicing LCD.	Professional customized big screen display	• You can flexibly display the alarm, energy efficiency, capacity and O&M dashboards on the big screen • Support customized development of big screen.
	Alarm Management	Viewing and Handling Alarms.	Alarm masking rules that support multiple conditions.	• Supports alarm browsing, query, masking, redefinition and threshold setting. • Notification methods include SMS, phone, email and WeChat. • Supports the expert experience library to record alarm handling experience and suggestions.
	Power Link Visualization	Displays the operating status of the power system.	Accurately locate problems and reduce repair time.	• Automatically generate power links, which can be customized and show power flow. • You can click the device or alarm icon on the link to quickly jump to view.
	Cooling Link Visualization	Displays the operating status of the cooling system.	Shortens the emergency handling duration and improves reliability.	• The flow direction can be displayed on the link, which can be defined. • You can click the device or alarm icon on the link to quickly jump to view.
	Report Management	Statistics and analysis of platform data.	Supports report customization and create scheduled report tasks.	• Built-in report templates, such as asset reports, capacity reports, energy consumption reports, etc. • The content, logo, etc. of the report can be customized. • Reports can be sent to designated users regularly.
	Energy Efficiency Analysis	Statistical analysis of data center energy efficiency indicators.	The calculation method of energy efficiency indicators can be customized, and different levels of PUE calculations are also provided.	• Supports different levels of PUE and historical curve analysis such as data center, room and smart module. • The threshold and reference value of PUE can be set, and an alarm is generated when PUE is too high. • Electricity cost calculation supports multistep electricity price. • Identify abnormal cPUE and energy consumption.
	Fault Analysis	Simulates and analyzes the service scope affected by a device fault.	Links can be analyzed in a dynamic manner, supporting real-time analysis and pre-drill.	• Analyzes the impact of device alarms and displays the impact scope on power distribution links. • Supports fault simulation pre-drill and displays the impact. • Generates fault impact analysis reports.
Temperature Nephogram	Temperature Map	Monitors the temperature field in the equipment room to quickly identify hot spots.	The data is accurate, which is collected by the sensor in real time.	• Supports three-layer temperature maps and automatically identifies top 5 hot spots. • Displays 2D or 3D temperature maps. • Adjusts the range of temperature rendering colors.
3D View -Lite	3D View-Lite	Provides 3D views of data centers.	The built-in 3D engine enables seamless integration and one-click switch between 2D and 3D views.	• Provides multi-layer 3D views of data centers, smart modules, and cabinets. • Automatically generates 3D views based on the floor plan. • Displays the SPC capacity information and temperature maps in 3D mode.
Dashboard Report	Big Data Dashboard	Provides personalized customization for big screens to meet customers' requirements.	The professional big screen supports flexible customization.	• Supports personalized customization of big screens, such as data statistics rules and display modes. • Allows users to set the theme and color of big screens.
Southbound Interface/Northbound Interface	Device/System Integration	Provides access capabilities for video, access control, fire extinguishing, HVAC, and power supply and distribution systems.	Multiple subsystems have been pre-integrated.	• Provides standard southbound and northbound interfaces. • Monitors performance and alarm information reported by subsystems. • Pre-integrates with multiple subsystem suppliers, enabling quick delivery.

INTELLIGENT O&M MODULE

License	Feature	Description	Value	Content
Basic Maintenance & Digital Maintenance	Personnel and Shift Management	Manages O&M personnel and shift.	O&M tasks can be automatically dispatched based on the shift plan.	• Configures basic information, positions, and agent groups for O&M personnel. • Provides a shift calendar to quickly view the shift time of each work group. • Allows users to set shift plans, shift handover plans, and personal shift adjustment plans. • Collects and analyzes abnormal shift handover data.
	Electronic Inspection	Supports electronic and mobile routine inspection of equipment rooms.	Inspection templates are provided to share expert experience, reducing inspection skill requirements.	• Allows users to plan inspection tasks and create inspection templates, such as inspection contents, sequence, methods, reference values, and precautions. • Automatically receives inspection tasks through the mobile app and invokes inspection content through QR codes or NFC to standardize the inspection process. • Generates equipment room inspection reports.
	App O&M	Supports remote access through mobile phones.	App permission control is supported and inspection data can be cached offline.	• Allows users to view active alarms, PUE, and device parameters on the app. • Allows users to view and process O&M tasks. • Allows users to record, bind, check, and count assets.
	Knowledge Library	Summarizes and shares O&M experience and technical documents.	The expert review mechanism ensures the quality of knowledge cases.	• Allows users to upload routine O&M experience and technical documents to the knowledge library. • Allows users to comment on, share, favorite, and reference knowledge items.
	O&M Process Management	Provides O&M process management based on ITIL standards and traces the data center O&M process throughout the management process.	ITIL standards and data center O&M process	• Supports process management such as problem, event, change, and risk management, and allows users to create, approve, and process work orders for tracing tasks. • Collects statistics on and analyzes trends of processes such as problems, events, changes, and risks. • Automatically prompts users to create risk work orders for abnormal inspection items.
Digital Maintenance	Conserve	Routinely maintains devices in the equipment room.	Maintenance statistics and calendars are supported.	• Allows users to create, approve, process, and track maintenance work orders. • Allows users to create the maintenance operation guide to avoid manual misoperations. • Supports maintenance statistics and calendars.
	Repair Management	Manages and tracks the repair process throughout the process.	Guidance is provided for device maintenance to avoid misoperations.	• Allows users to create, approve, and urge repair process orders. • Tracks the repair work order status throughout the process, for example, periodically pushes the repair status.
	Routine Drill	Performs drills for various emergencies.	Drill templates can be customized.	• Supports the formulation of emergency drill plans, periodically triggers tasks, reminds users, and tracks the task status throughout the process. • Collects statistics on the trend of emergency drill tasks.
	Entry and Exit Registration	Registers and manages the entry and exit of personnel and goods from the equipment room.	Personnel and goods are strictly controlled.	• Supports registration of basic personnel information, goods carried, access areas, and visitors. • Supports query of historical records.
	Supplier Management	Displays basic information and scoring management of solution suppliers.	Users can define scoring rules, contents, and tasks.	• Supports basic supplier information and classification management. • Allows users to customize supplier scoring content and rules. • Supports users to create supplier scoring tasks and scoring statistics.
AI Predictive Maintenance of Circuit Breaker	Breaker Health Prediction and Circuit Breaker Setting Analysis	Analyzes the setting value of the circuit breaker online and predicts the health status based on AI technologies.	AI technology replaces manual experience, improving the service life of circuit breakers and power supply reliability.	• Determines the rationality of the electrical parameter setting values of circuit breakers, including the current, breaking capability, and breaking delay. If the setting values are incorrect, an alarm and the alarm cause are generated. • Predicts the health change trend and maintenance time of circuit breakers. • Generates circuit breaker setting reports and health prediction reports.
AI Predictive Maintenance of Power Facility	Temperature Prediction	Predicts the contact temperature of power distribution facilities based on AI technologies.	AI-based dynamic load prediction enables users to identify risks in advance and prevent accidents.	• Presets temperature curve models that support AI deep learning. • Provides fault warning and alarm analysis based on the real-time temperature, current-carrying capacity, and ambient temperature of the power distribution cabinet of the power module.
	Fault Impact Analysis of Power Supply Links	Analyzes faults in a visualized manner based on electrical single-line links and AI technologies.	AI-based analysis models provide analysis support.	• Allows users to discover and make reasonable decisions. • Facilitates analysis based on manual simulation. • Analyzes the impact scope after a fault occurs to provide support for emergency handling.

iCooling@AI PUE Optimiztion
PUE Optimization Solution of Data Center Facility

INTRODUCTION

Based on the energy efficiency optimization concept of "Visualize - Diagnose - Adjust - Optimize", the iCooling@AI solution combines multiple complex technologies such as Sensing, Internet of Things (IoT), Big Data, and artificial intelligence to quickly reduce system-level energy consumption of the cooling system and improve the PUE of the data center.

With continuously AI algorithm engineering capabilities iteration，iCooling@AI enables algorithms to go online within 7 days in complex water-chilled and cold water scenarios, improving the PUE by 8% in just three months. iCooling@AI has the scenario-adaptive capability. Based on continuously self learning and training, iCooling@AI maintains high accuracy ensure to infer the optimal cooling strategy for the long-term and efficient operation of the data center.

FEATURES & VALUE

Simplicity

• Simlified hardware reconstruction and simple deployment based on mechanism-based algorithm + deep neural network AI algorithm + prior–verified experience data

• Adaptive algorithm effective works throughout the whole lifecycle without multiple re-deployment.

Green

• System-level energy efficiency optimization of whole cooling system, saving energy by 8% to 15%

Safety

• Supporting manual intervention and system rollback.

• The AI inference process compliance with DC O&M specifications (refrigerating system parameter range), and inference result meets the SLA requirements.
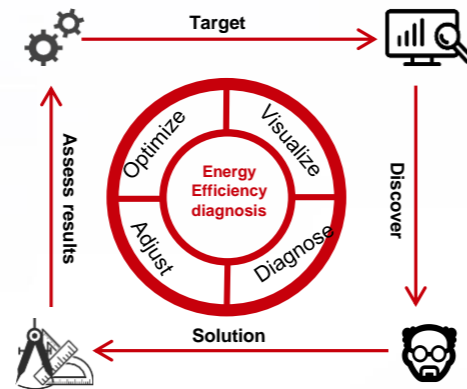

Recommended configuration

NO.	Item	Device Name	Brand and Model Requirements
1. Software			
1.1	Basic Software	Basic software, including 100 smart nodes	√
1.2	Features	AI PUE Reasoning	√
1.3	Integration	Northbound interface	Based on the site requirements.
1.4		Southbound interface	
2. Service			
2.1	Service·	Energy Efficiency Optimization Service	√
3. Hardware			
3.1	Server	Taishan200/2288X V5	2+, based on the site requirements
3.2	Lan Switch	24-port gigabit switch	based on the site requirements.

APPLICATION SCENARIOS

• Medium- and large-sized data center, water-cooled/air-cooled chilled water cooling system

• Medium- and large-sized data center, Huawei indirect evaporative cooling AHU/EHU cooling system

SYSTEM ARCHITECTURE(SA)
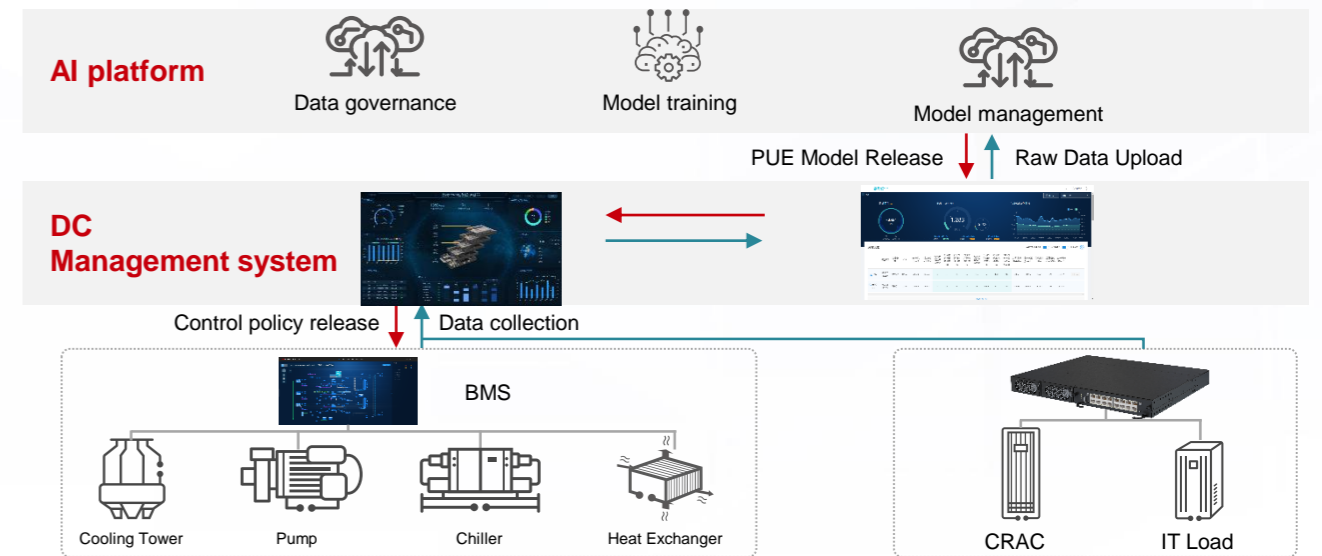
Scenarios Specification

Item	Name	Brand and Model Requirements
Management system	DCIM	NetEco6000
Chiller Control System	BA/BMS	Johnson Controls, Honeywell, Siemens
Chiller Station Equipment	Cooling tower	Variable-frequency is recommended,
	Chiller	Variable-frequency is recommended, air cooled chiller or water cooled chiller
	Cooling water pump	Variable-frequency is recommended
	Chilled water Pump	Variable-frequency is recommended, primary pump system
	Free cooling	Plate heat exchanger or dry cooler (delivered with the chiller)
Sensors	Sensor	Water temperature sensor, pressure sensor, flow sensor, smart meter and outdoor temperature and humidity sensor
Device	chilled water smart cooling	Variable-frequency is recommended, in-row, or in-room
Pipe System	Pipe System	header, single pipe, hybrid pipe