BAS Digital Twin Building Intelligent O&M System

数字孪生+空间智能

创造智能世界无限可能！

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BAS SMART LINK

Partners & Service Support

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Business Sector

Intelligent Energy

Intelligent National Defense

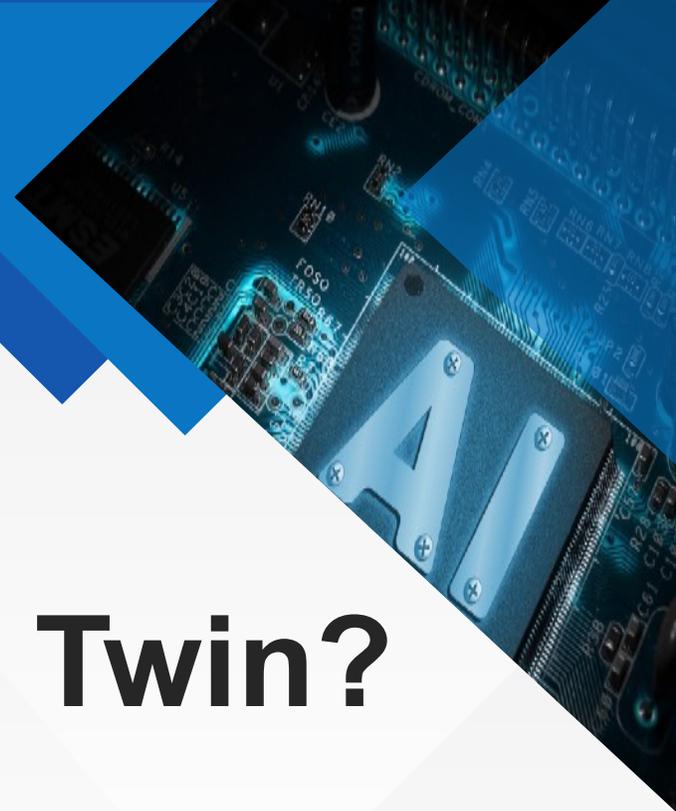**Intelligent Building**

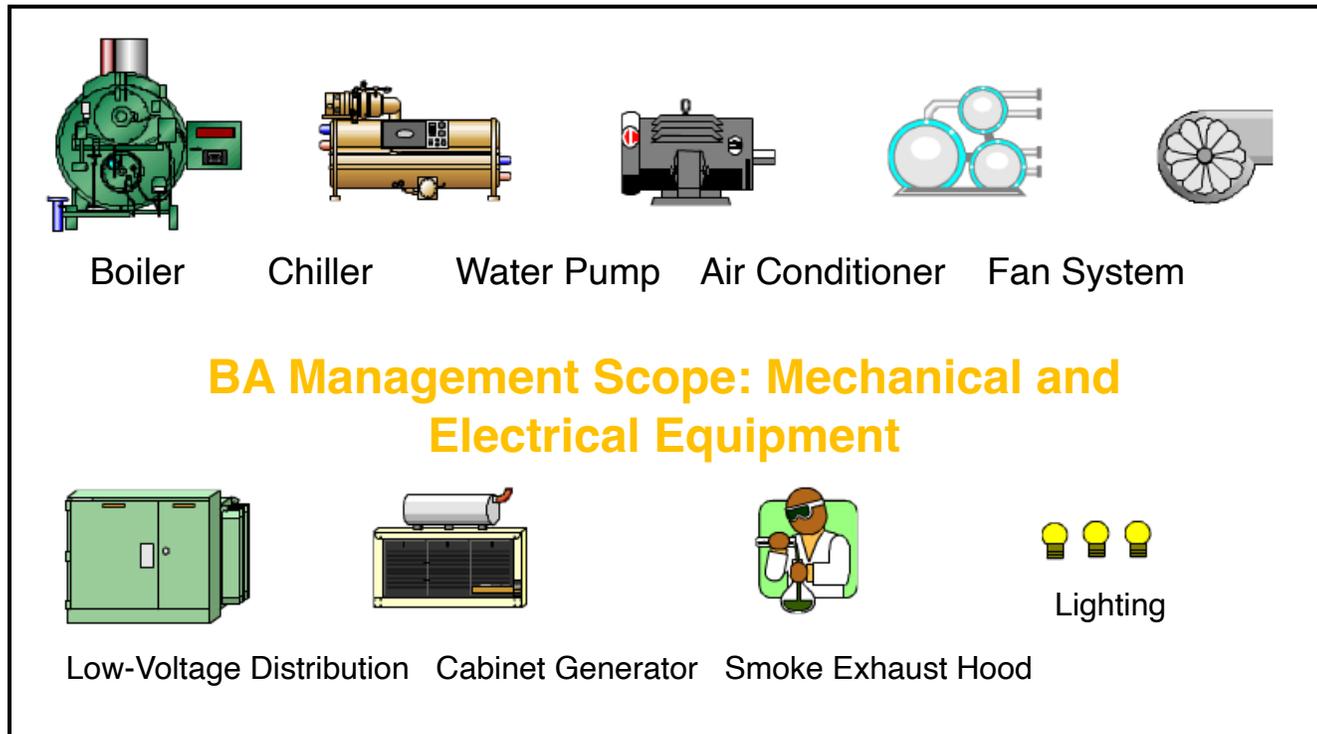**Intelligent Park**

Intelligent Utility

01 What is Digital Twin?

Origin of Building Intelligence — "BA"

A cigarette butt triggering a smoke alarm involves multiple building subsystems, and manual switching is required among multiple subsystems such as mechanical and electrical, weak current, and strong current.

- **Fire Alarm System**
- **Video Surveillance System**
- **Lighting System**
- **Broadcasting System**
- **......**

Fire Alarm System
Video Surveillance System
Lighting System
Broadcasting System

Boiler   Chiller   Water Pump   Air Conditioner   Fan System

BA Management Scope: Mechanical and Electrical Equipment

Low-Voltage Distribution   Cabinet Generator   Smoke Exhaust Hood   Lighting

?

Development of Building Intelligence — "IBMS"

The management scope of IBMS covers all intelligent subsystems such as weak current, strong current, and mechanical and electrical systems.
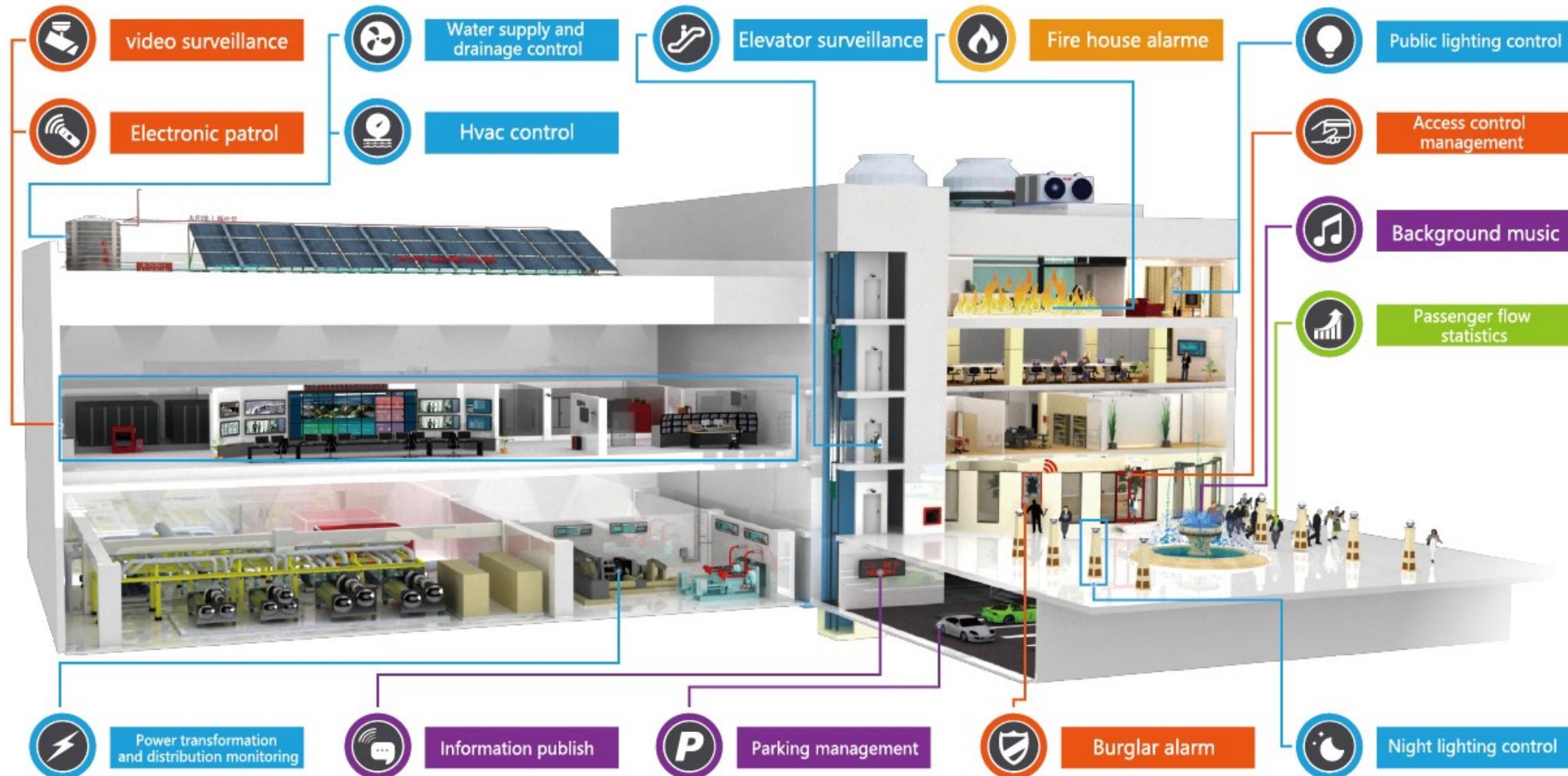
Building Intelligent Management Requires the Construction of IBMS Intelligent Integration System

BA

Industry Consensus

IBMS

- BMS/BAS (Building Automation System) is an intelligent subsystem.
- It consists of upper computer management software, DDC controllers, etc.
- It can realize centralized monitoring, control, or working condition management of equipment and facilities in buildings such as air conditioning, air supply and exhaust, water supply and drainage, power transformation and distribution, elevators, and lighting.
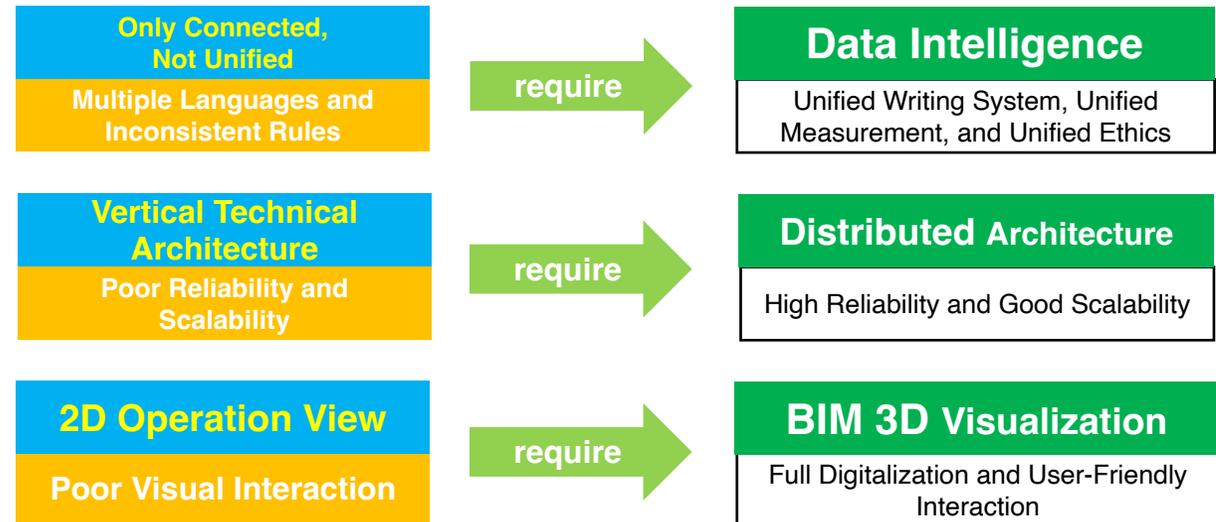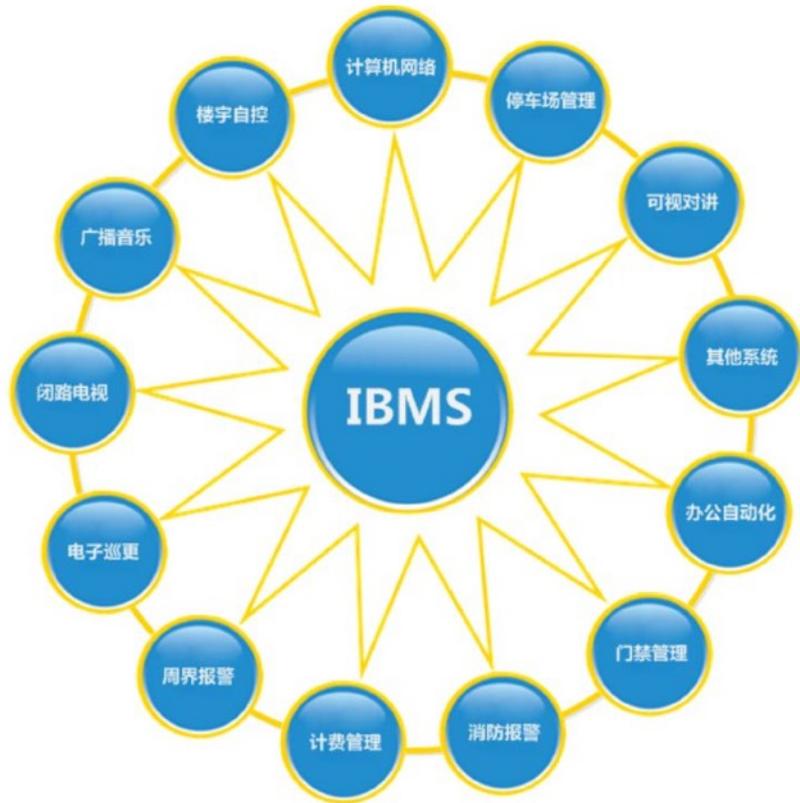
- IBMS (Intelligent Building Management System) is an intelligent integrated management platform at a higher level than intelligent subsystems.
- It is composed of integrated platform software, interface software, interface equipment, etc.
- It can realize comprehensive integrated management of BMS/BAS (Building Automation), video surveillance, access control system, alarm system, parking lot system, etc.
- It can easily realize the linkage between any subsystems.
- It can realize the integrated management of multiple IBMS.
- It greatly reduces the later management and operation and maintenance costs.

More Focused on the "Control" of Mechanical and Electrical Equipment

Superior in the "Management" of the Entire Intelligent System

# The Development of New Technologies Calls for a More Intelligent Building Information Integration System

Building intelligent management requires an integrated management system to connect data among building design, construction, and operation, enabling visualized, full-lifecycle, all-round, and integrated management of buildings, and providing reliable basis for all decisions throughout the building's entire lifecycle.

The development of new technologies promotes the implementation of more informatization systems and applications, making building operation and maintenance scenarios more complex. The traditional Information Integration Management System (IBMS) can no longer meet the application needs of intelligent operation and maintenance business, thus calling for a more intelligent information integration management system.

Only Connected, Not Unified		Data Intelligence
Multiple Languages and Inconsistent Rules	require	Unified Writing System, Unified Measurement, and Unified Ethics

Vertical Technical Architecture		Distributed Architecture
Poor Reliability and Scalability	require	High Reliability and Good Scalability

2D Operation View		BIM 3D Visualization
Poor Visual Interaction	require	Full Digitalization and User-Friendly Interaction

BAS

On the basis of inheriting the existing capabilities of IBMS, Digital Twin achieves greater friendliness, higher efficiency, and stronger intelligence.

I B M S
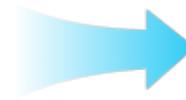
Digital Twin

1. Improve Enterprise Efficiency
The interconnection of various intelligent subsystems improves the collaborative efficiency of various tasks within the hospital.
2. Optimize Customer Experience
Data analysis and integration help better grasp customer needs and behaviors, thereby enhancing customer satisfaction and loyalty.
3. Reduce Enterprise Costs
Unified management and control reduce the costs of hospital logistics operation, maintenance, and management.

1. Better Interactivity
Compared with 2D views, 3D scenarios provide a more comfortable visual experience and a more user-friendly interactive interface.
2. Comprehensive Management Improvement
Full-scale Digital Twin provides more convenience for management. Compared with the traditional IBMS system, it enables more timely system linkage, more comprehensive information feedback, and more detailed management of hidden projects.
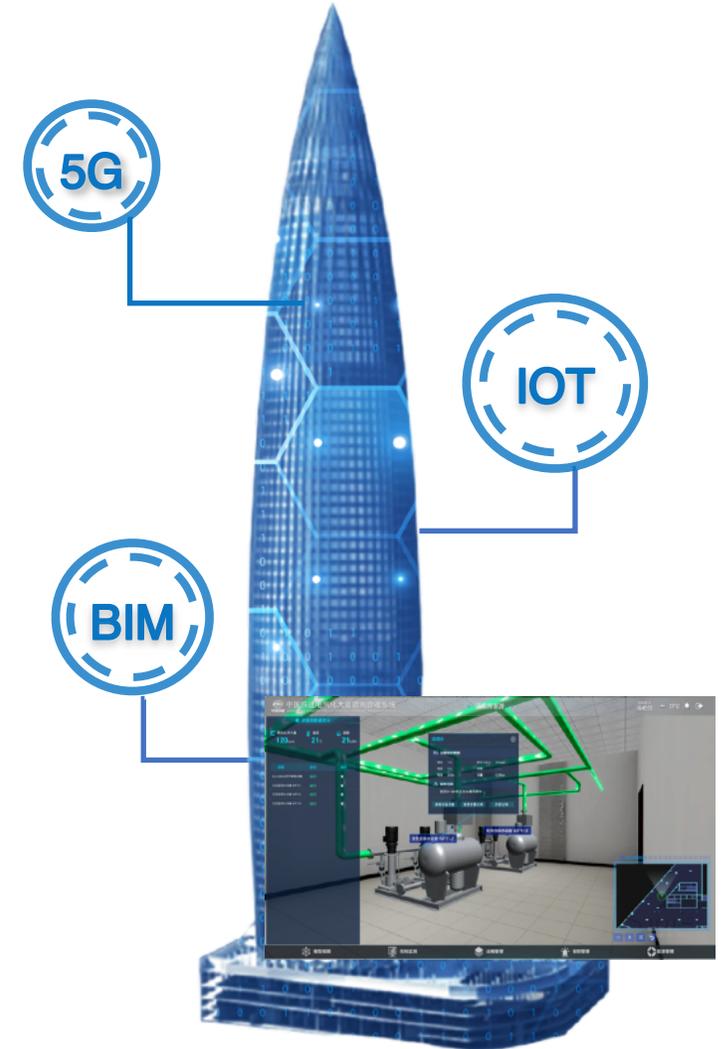3. Smarter Cost Control
Through big data + artificial intelligence, the most efficient energy-saving strategy with automatic execution is formed, thereby reducing human and material costs.

BAS

Intelligent Integrated Management System for Smart Buildings Based on BIM, IOT and 3DGIS

With the **3D model (BIM)** as the carrier, make full use of BIM digital assets in the design and construction stages, and combine advanced technologies such as 5G, IOT, big data, and artificial intelligence to build a centrally controlled 3D building intelligent integrated management system that is visible, controllable, and manageable. Create a new infrastructure benchmark for smart buildings.

5G

IOT

BIM

| 3D Management | Space Management | Equipment Management | Building Control Management | Data Management |
| | Property Management | Energy Management | Security Management | …… |

Efficient, Intelligent, Green, Cost-Reducing

Smart Building Digital Twin

Intelligent operation and maintenance requires a complete data model to drive valuable business applications.

BAS

Practical Buildings

Building Automation System
Intelligent Lighting
Management System
Fire Protection System
Security System
Intrusion Alarm System
Electronic Patrol System
Parking Management
System
Passenger Flow Statistics
System
Elevator System
Access Control System
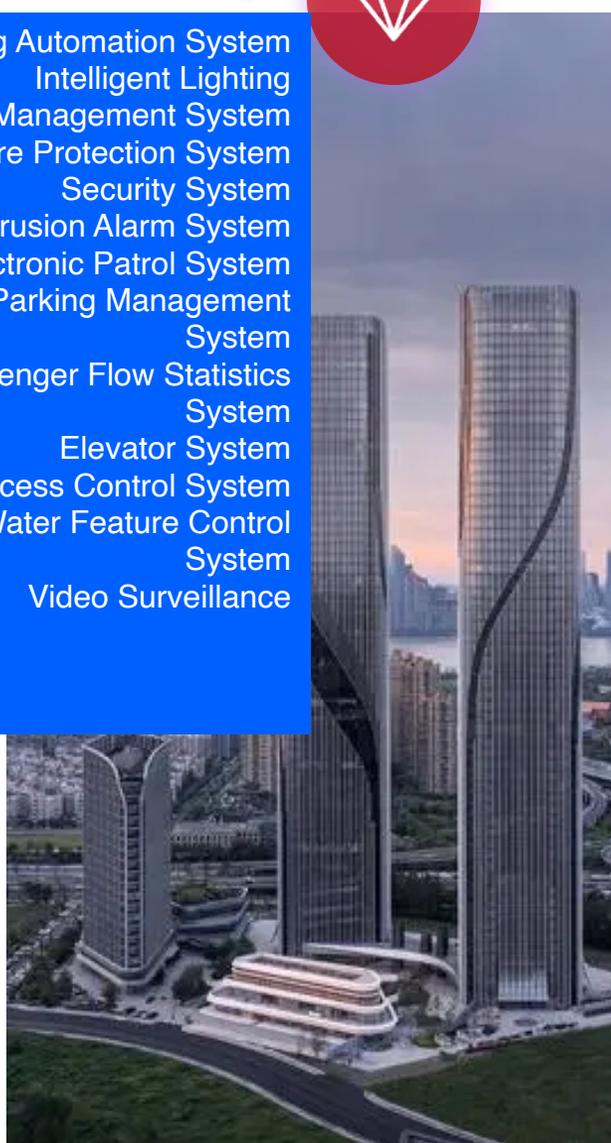Water Feature Control
System
Video Surveillance

Dynamic data + static data

Virtual Building

Building Automation
System
Intelligent Lighting
Management System
Fire Protection System
Security System
Intrusion Alarm System
Electronic Patrol System
Parking Management
System
Passenger Flow Statistics
System
Elevator System
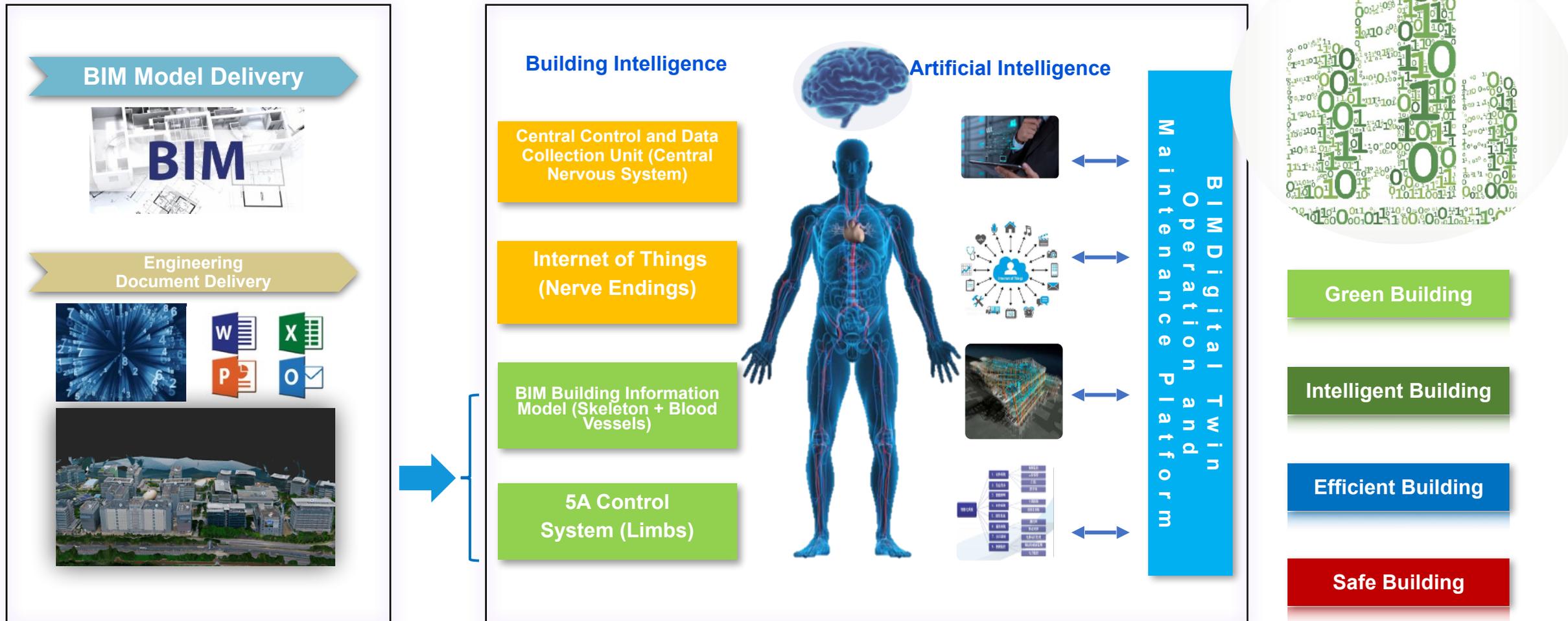Access Control System
Water Feature Control
System
Video Surveillance
......

Build an Operation and Maintenance Platform with Virtual-Physical Mapping Based on a Complete Data Model

While constructing a physical building, a completely replicated digital building is created.

BIM Model Delivery

Engineering Document Delivery

Building Intelligence

Artificial Intelligence

Central Control and Data Collection Unit (Central Nervous System)

Internet of Things (Nerve Endings)

BIM Building Information Model (Skeleton + Blood Vessels)

5A Control System (Limbs)

BIM Digital Twin Operation and Maintenance Platform

Green Building

Intelligent Building
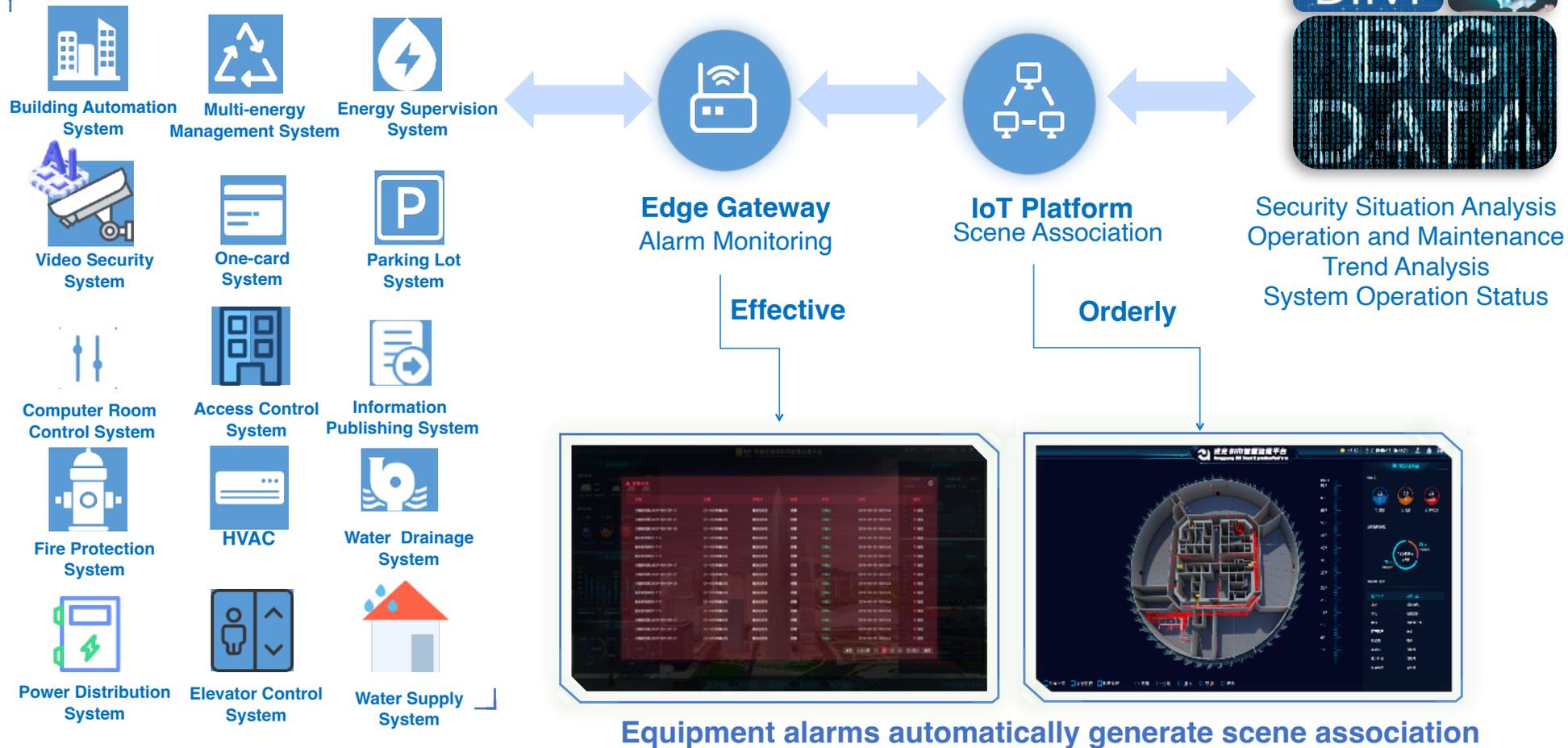
Efficient Building

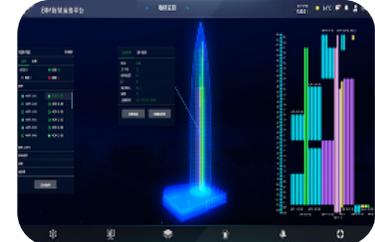Safe Building

IoT Integration Design

BAS

Based on the **IoT architecture system**, it realizes the IoT integration of electromechanical systems and intelligent systems.
Integrates and shares the AI capabilities of video systems, breaking through the security system itself to achieve global empowerment of AI capabilities.
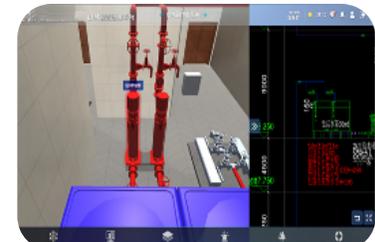Based on **BIM's 3D interaction method**, it is more intuitive and intelligent.

BIM **AI**
BIG DATA

Building Automation System

Multi-energy Management System

Energy Supervision System

Video Security System

One-card System

Parking Lot System

Computer Room Control System

Access Control System

Information Publishing System

Fire Protection System

HVAC

Water Drainage System

Power Distribution System

Elevator Control System

Water Supply System

Edge Gateway
Alarm Monitoring

IoT Platform
Scene Association

Security Situation Analysis
Operation and Maintenance
Trend Analysis
System Operation Status

Effective

Orderly

Equipment alarms automatically generate scene association

Intuitive Visualization

Scientific Management & Control

Efficiency and Safety

Efficiency Operation and Maintenance

Data Integration Design

BAS

BIM As-built Model

Project Delivery Documents

Fire Protection System

HVAC

Water Drainage System

Power Distribution System

Elevator Control System

Water Supply System

BIM Data

- 3D Scene Data
- Equipment Data
- Drawings Documents
- Planning Data
- Construction Data
- ...

Data Governance

- BIM Model-Data Separation
- BIM Model Lightweight
- BIM Data Standardization
- 3D Scene Lightweight
- Data Quality Management
- Metadata Management
- Data Classification & Archiving
- ......

Data Middle Platform

- Asset Information Center
- Organization Data Center
- 3D Model Center
- Project Data Center
- Asset Relationship Center
- Data Association Configuration
- Data Definition Service
- ......

Functional Applications

- Logistics Digital Dashboard
- Safety & Fire Digital Dashboard
- Asset Management
- Energy Consumption Management
- Pedestrian/Vehicle Management
- Safety Emergency Management
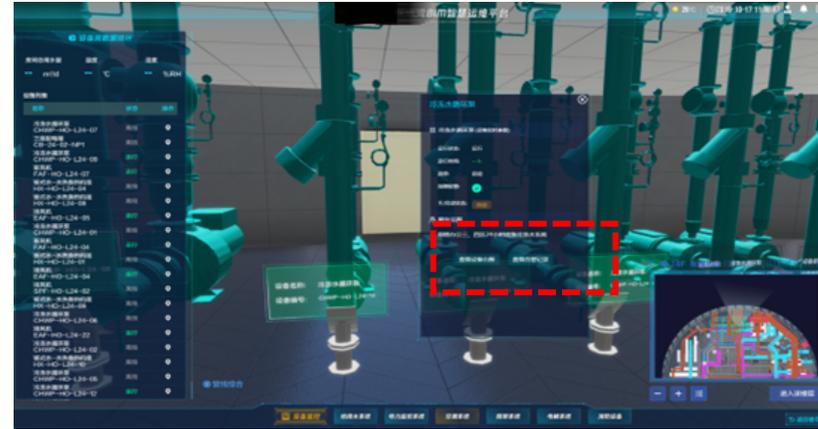- Fire Management
- ......

Relationship Integration Design

Establish a unified data coding system for assets, spaces, and systems. It standardizes data formats with unified data coding, connects upstream and downstream applications of intelligent monitoring and information management, and eliminates data application fragmentation. **It forms data relationship integration under a unified system to realize effective utilization and analysis of data in applications.**

Basic Information and
Asset Management of Facilities and Equipment

BIM View

data coding

data coding

Basic Information of Space and Tenants

Property Management System

Intelligent System

Relationship Integration Design - Visual Expression of Space, Assets and Systems

BAS
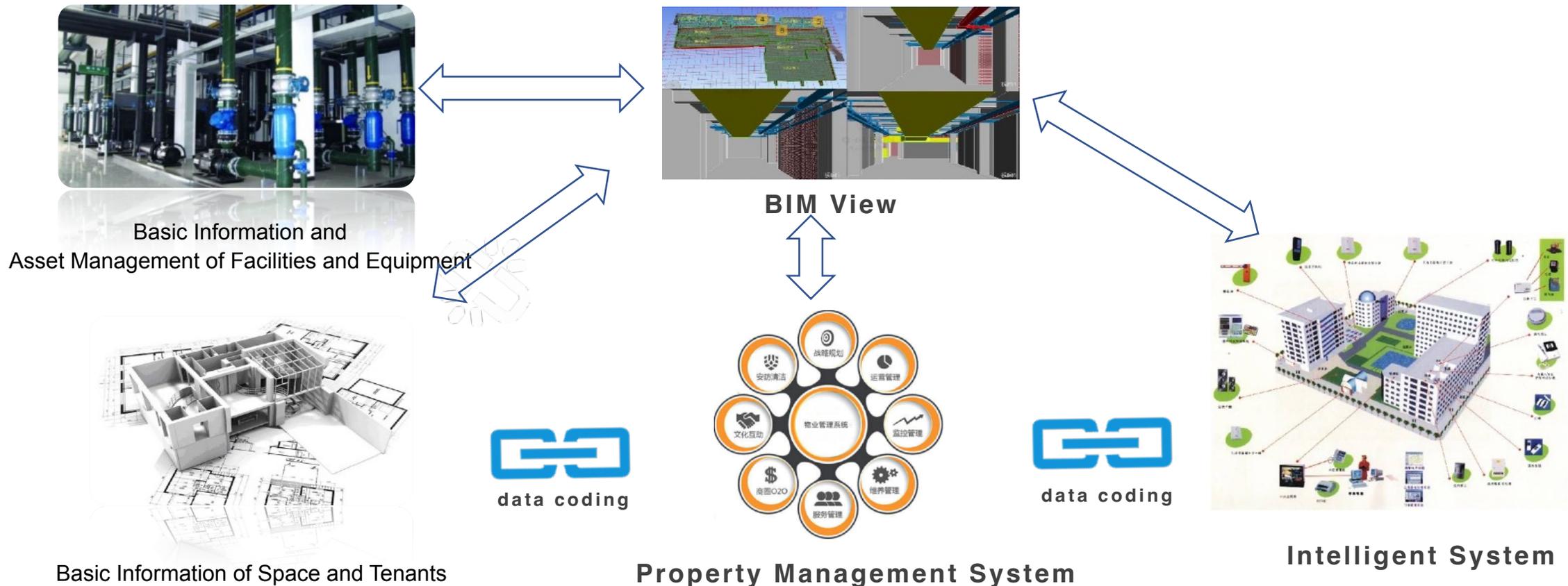
Logical Relationship Between Equipment Across Systems

The Correlative Relationship Between Equipment and Space

- **Popularization of Professional Content**
- **Visualization of Abstract Content**
- **Dataization of Experiential Knowledge**
- **Intelligentization of Autonomous Operation**
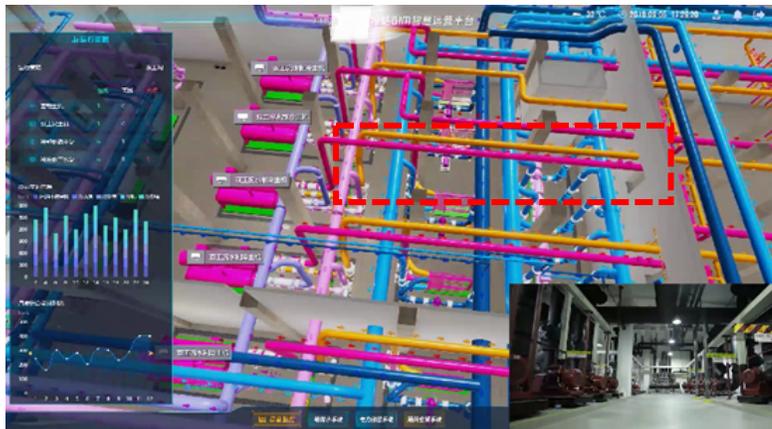
The Upstream and Downstream Logical Relationships Between System Equipment

The Professional Logical Relationships Within System Equipment

Overall Technical Architecture Design of Smart Operation and Maintenance
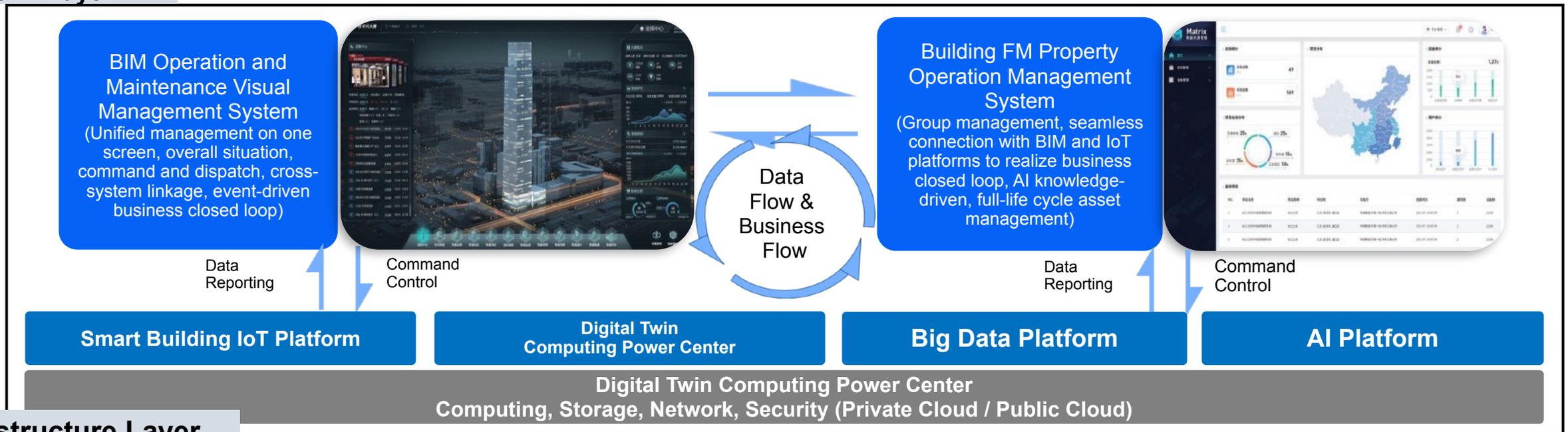
BAS

Application Layer

1 Computing Power Center, 4 Basic Platforms, 2 Operation and Maintenance Business Systems
Provide value-added application services for all business scenarios.

- **Smart Park**
- **Commercial Complex**
- **Office Building**
- **High-end Hotel**
- **Smart Factory**
- **Smart Hospital**
- **Smart Port**

Platform Layer

BIM Operation and Maintenance Visual Management System
(Unified management on one screen, overall situation, command and dispatch, cross-system linkage, event-driven business closed loop)

Data Flow & Business Flow

Building FM Property Operation Management System
(Group management, seamless connection with BIM and IoT platforms to realize business closed loop, AI knowledge-driven, full-life cycle asset management)

Data Reporting → Command Control

Data Reporting → Command Control

Smart Building IoT Platform	Digital Twin Computing Power Center	Big Data Platform	AI Platform

Digital Twin Computing Power Center
Computing, Storage, Network, Security (Private Cloud / Public Cloud)

Infrastructure Layer

Building 5A Intelligent System

Building Automation System	Fire Automation System	Security Automation System	Office Automation System	Communication Automation System

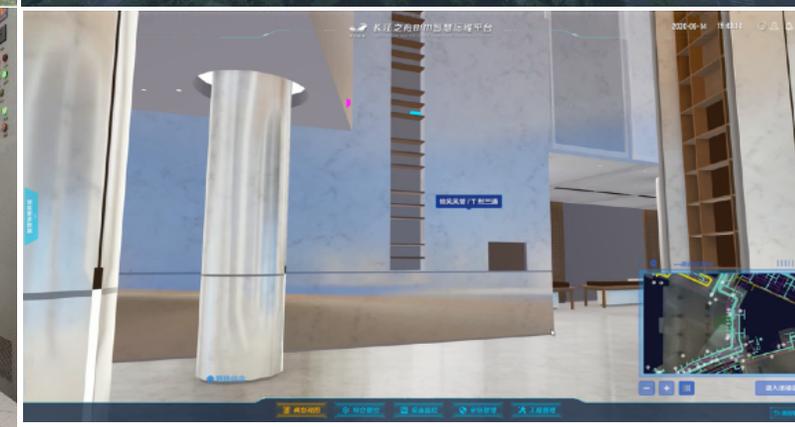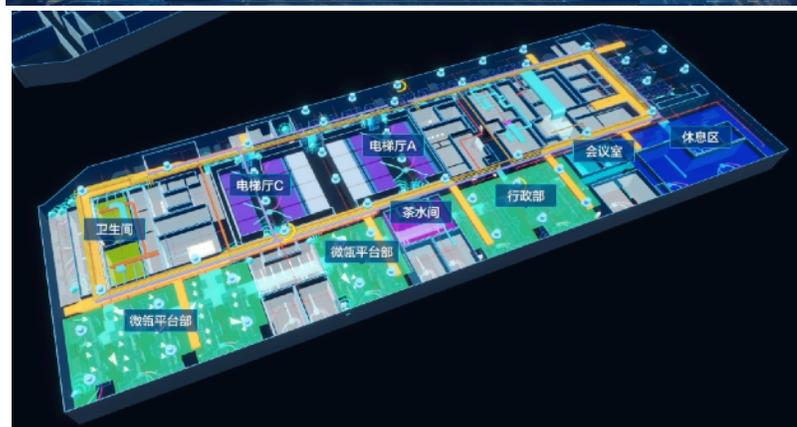**02** Value Application of Intelligent O&M Based on Digital Twin

BAS

Shocking Macro Large-Scale Scene

High-Precision Simulation Digital Twin

High-Precision Simulation Digital Twin

Building Space Visualization

Equipment Room Visualization

Scenario-Based Roaming

➤ **Macro Large Scene → Regional Large Scene → Building Monomer → Building Space (Civil Space, Equipment Room)**

Intelligent O&M Application Direction 1: Spatial Visual Monitoring

BAS

Shocking Macro Large-Scale Scene

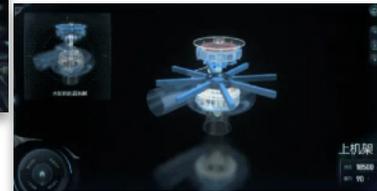High-Precision Simulation Digital Twin

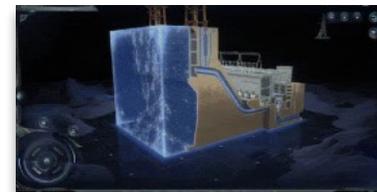High-Precision Simulation Digital Twin

Building Space Visualization

Basin Visualization

Power Generation and Power Distribution Equipment Visualization

Structure - Concealed Engineering Visualization

Underground Traffic Visualization

Scenario-Based Roaming

BAS

Based on BIM 3D models and integrated with real-time IoT data, it acquires system operation status and parameters in real time to master equipment operation conditions.

Air Conditioning (Equipment Room)

Intelligent Start-Stop Contro

Remote manual start-stop
Automatic start-stop with preset time and conditions

Air Conditioning Self-Perception and Self-Regulation

Monitors air environment and self-regulates equipment rooms...

Simulation and Unified Regulation

Unified setting of upper and lower temperature limits for air conditioning to prevent waste.

Water Supply and Drainage Specialty

Water Pump

Monitoring Object: Water pressure...
Significance: Low water supply pressure affects water usage.

Water Tank

Monitoring Object: Voltage, current...
Significance: Reflects water pump operation status

Water Pump Distribution Cabinet

Monitoring Object: Voltage, current...
Significance: Reflects water pump operation status

Lighting Specialty

Statistical Analysis

Partition Sorting

Intelligent Control

Manual/Automatic Control of Lighting Systems/ Equipment
Control of distribution boxes and circuits
Multi-mode intelligent control: full on, energy-saving, night mode, full off, etc.

Lighting Self-Inspection

Smart lighting self-inspection function: Staff only need to authorize on mobile terminals to remotely check the on-off status of lights.

## Power Distribution Specialty

Capacitor Cabinet

Monitoring Objects: Voltage, current, power factor...
Significance: If the power factor is too low, capacitors may need to be replaced, or some circuits may be unpowered, leading to issues.

Transformer

Monitoring Objects: Core temperature, fan operation, power...
Significance: As the terminal of power transmission and distribution, it plays a crucial role in user electricity consumption .
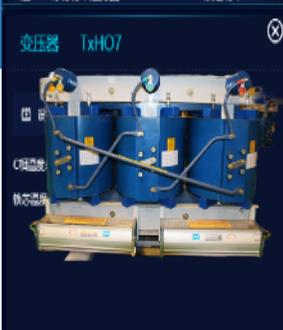
Distribution Cabinet

Monitoring Objects: Three-phase voltage, current, ambient temperature and humidity...
Significance: Overload, short circuit, excessive contact resistance, or leakage may cause electrical faults or even fires.

Intelligent O&M Application Direction 2: Visual Monitoring of Key Equipment & Systems

BAS

Equipment Operation Monitoring

Boiler

Steam Turbine

Water Pump

Fan

Equipment Monitoring Large Screen Terminal

Equipment Monitoring Mobile Terminal

Real-time Monitoring

- Operation Status Monitoring
- Over-temperature and Over-pressure Monitoring
- Online Monitoring of Boiler Heating Surface
- Vibration Monitoring
- Monitoring of Foreign Object Blockage in the Furnace

Hazard Source Monitoring

Liquid Level

Concentration

Pressure

Temperature

Real-time Monitoring

- Rotating Speed
- Temperature
- Pressure Value

Data Analysis

- Alarm Statistical Analysis
- Risk Analysis

Intelligent O&M Application Direction 3: Visual Fusion Application

BAS

Decision Analysis Based on "One Map"

Understand the real-time number of people in the building and the outdoor environment.

Accurate Fire Timing

Fire Floor

Fire Equipment Linkage Status: If not operating normally, an alarm is triggered immediately.

Automatically select the emergency plan and display relevant specific steps.

AI Intelligent Remote Fire Monitoring

1. Multi-information confirmation of camera flame recognition, smoke sensing, and temperature sensing to reduce the false alarm rate of fire alarms.
2. System interconnection and intelligent linkage improve emergency response speed.

One-Second Fire Rescue Initiation

1. Quickly switch to the "Fire Rescue Mode" view, a professional view for commanding fire operations professionally.

Automatic Plan Retrieval

1. The platform embeds multiple plans, enabling quick selection of emergency plans and step-by-step linkage to assist in command.

Rapid On-Site Handover

1. The digital twin transmits all on-site situations to assist the fire brigade in formulating operational plans.
2. Real-time recording and storage of on-site situations support retrospective review of fire compliance.

Intelligent O&M Application Direction 3: Visual Fusion Application

BAS

Video Wall - Serving as a Monitoring Room

Video Search and Quick Positioning

Video Monitoring Large Screen Configuration

Camera Online Status and Alarm Situation

Video Grouping

Video Wall Customization

Video Rotation

Video-Space Association - From Finding Cameras to Linking Cameras

Electronic Fence and
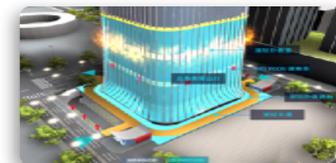
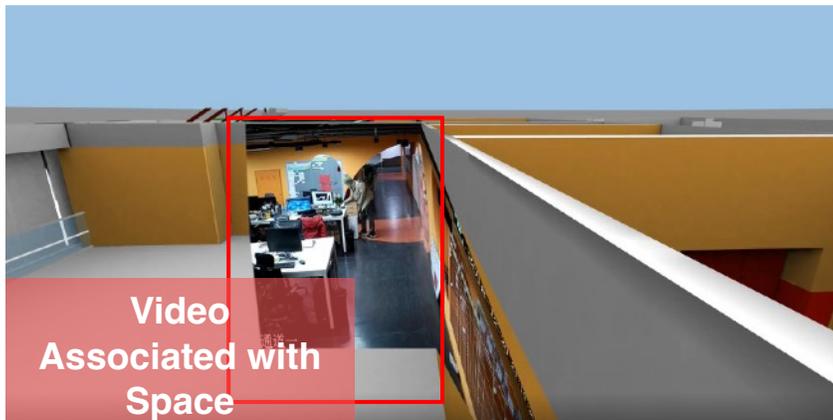Access Control & Video

Fire Protection

Equipment Location & Video

Alarm + Positioning + Video Viewing

Remote Pole Lifting + Video Confirmation

Elevator Interior and Exterior Video

Access Control + Video Confirmation

Video Fusion - Fusion of Dynamic Video and Static Model for a Global View to Understand Where the Video Screen Is

Video Associated with Space

Video Patrol - Conduct Remote Video Patrol Like Browsing TikTok

Mobile Terminal Remote Patrol

Set Patrol Route and Arrange Video Points

Automatically Generate and Complete Patrol Tasks

Automatically Generate Image Sets for Patrols

At 10:48, the administrator receives elevator alarm information

1、The administrator checks and locates the elevator's position and operating status.

2、Link the car video surveillance to check the situation of the trapped personnel

3、Activate the preset emergency plan and command rescue and comfort the trapped personnel through the BIM operation and maintenance platform.

4、after the rescue is completed, record the fault problem and maintenance information to provide data support and assistance for decision-making.

1 Report to the leader and feed back the current situation and handling conclusion.

2 Notify the colleague in charge of security, inform them of the on-site situation and comfort the trapped personnel.

3 Notify the colleague in charge of maintenance to find out the cause of the fault and solve it as soon as possible.

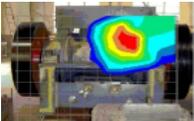4 Upload the fault cause and maintenance information to the operation and maintenance platform.

Drone/Robot Inspection Fusion

Integrate intelligent inspection robots and drones to realize all-weather, all-round, and fully automatic inspection work for hydropower stations. It provides services such as key data collection, micro-meteorological data collection, intelligent data analysis and presentation, video monitoring, and early warning of equipment safety hazards. This reduces the labor intensity of personnel, improves the intelligence and automation of inspections, and provides new technical monitoring methods and safety guarantees for unattended power stations.

### Capabilities of Robots and Drones Themselves

Equipment Temperature Measurement

Indicator Light Recognition

Face Recognition

Noise Detection

Switchgear Status Recognition

Instrument Panel Recognition

Reservoir Abnormality Detection

Crack Recognition

Gas Detection

融合

Visual Remote Supervision of Robot Operations

Platform Capabilities

Real-time Monitorin

Inspection Route
Inspection Task
Inspection Points
Battery Power

Online Control

Fixed-point Follow-up
One-click Arrival
PTZ Control
Lifting Control

Data Analysis

Inspection Content
Inspection Times
Fault Classification

Inspection Content

Inspection Times

Classification Statistics
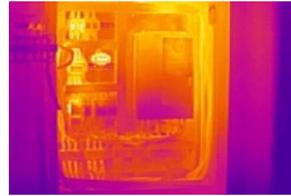
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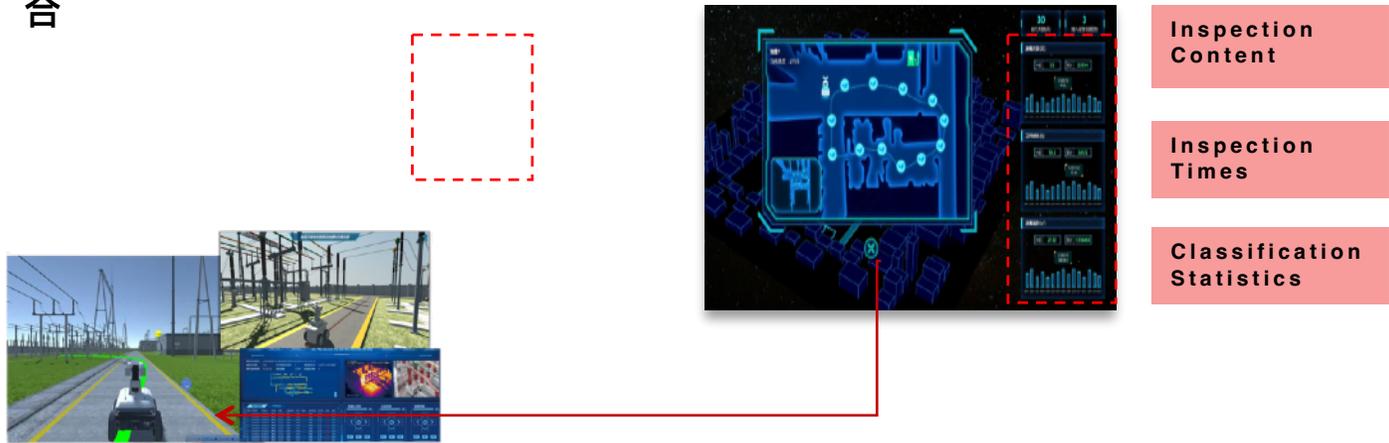
AR Video Fusion

Cross-Boundary Intrusion Monitoring in Hazardous Areas	Intrusion Monitoring in Key Areas	Real-Time Infrared Thermal Imaging Analysis	Hazardous Behavior Alarm	Wearable Smart Devices	Wearable Smart Devices

AI Video Analysis Service

Alarm Center

Video-Space Correlation

王五

Voice Communication
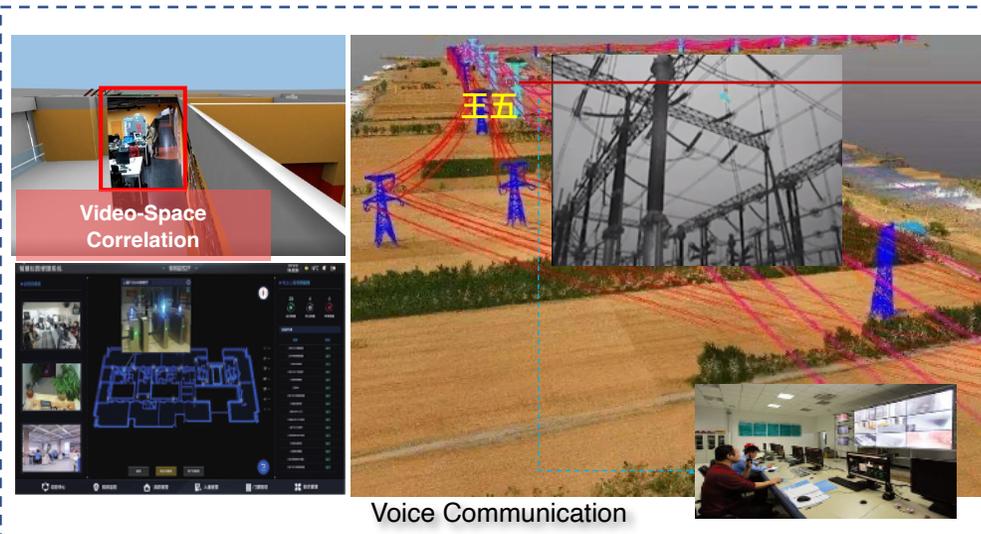
Online Transmission of Accident Repair Based on Twin Space

- Real-Time Monitoring of Accident Repair Site
- Voice Intercom Between Site and Control Room
- Real-Time Positioning of Repair Personnel on Site
- Remote Command and Dispatch for On-Site Maintenance

Personnel Positioning

It provides a comprehensive, visual, and intuitive management method, helping to maintain a "safe" and "healthy" working environment.

- Risk points of safe production are clear at a glance.
- Effectively monitor the production operation process.

- Make up for the weak links in the management of existing systems.
- Promote the management of the production site to develop in a safer and more standardized direction.

Comprehensive Display of Risk Points
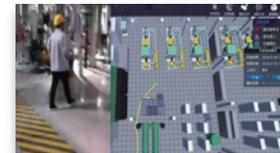
Real-time Positioning Linked with Video and Access Control

Visual Display of Hazard Points in Work Areas

Visual Monitoring of Personnel Positions

Key Analysis Data for Safety Control

- Key Hazard Sources
- Hazardous Chemicals
- Typical Hazardous Operations

Technical Means

- IoT Monitoring
- Intelligent Two-Ticket System
- Two-Ticket Integration

3D Equipment Linkage

Electronic Fence

Fault Equipment Positioning
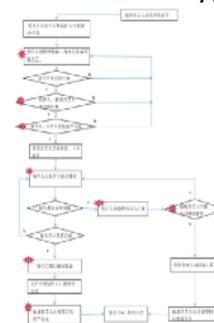
Work Ticket Linkage

After obtaining work ticket information from the work ticket system, personnel information is automatically extracted according to the work ticket information, and electronic fences are automatically generated based on information such as work location and work requirement arrangement. Electronic fences are generated automatically according to the work ticket information, and manual correction of electronic fences is completed. At the same time, work area control is realized in combination with the personnel positioning system. For areas not well covered by personnel positioning, work area supervision functions are realized through image recognition technology.

Fire Simulation Based on Digital Twin

Emergency Drill
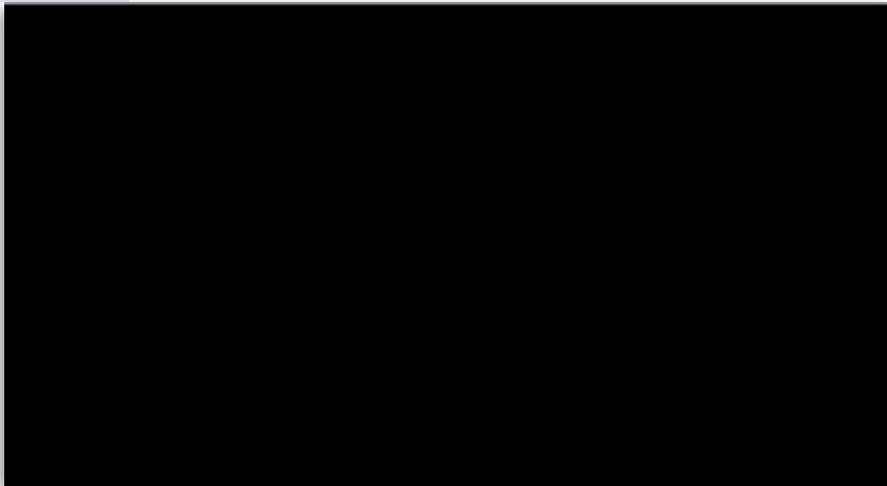
Energy Consumption Management Based on Digital Twin

Escape Route

BAS
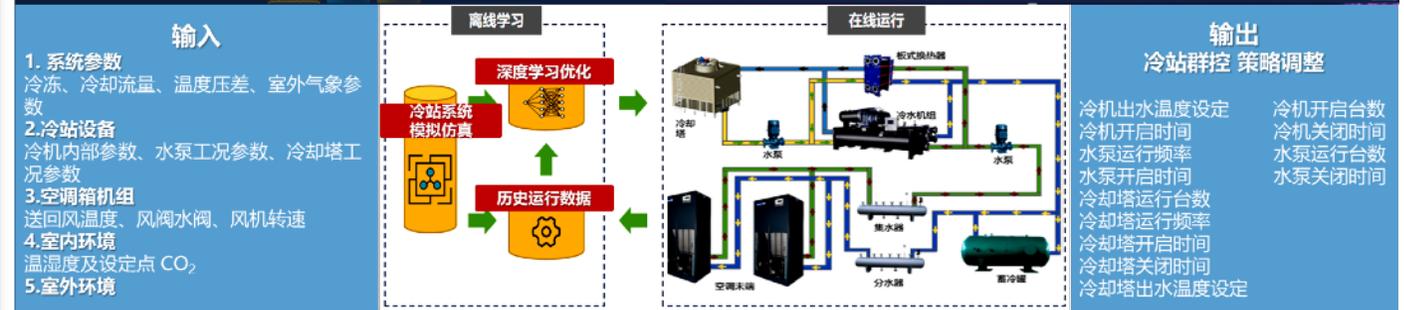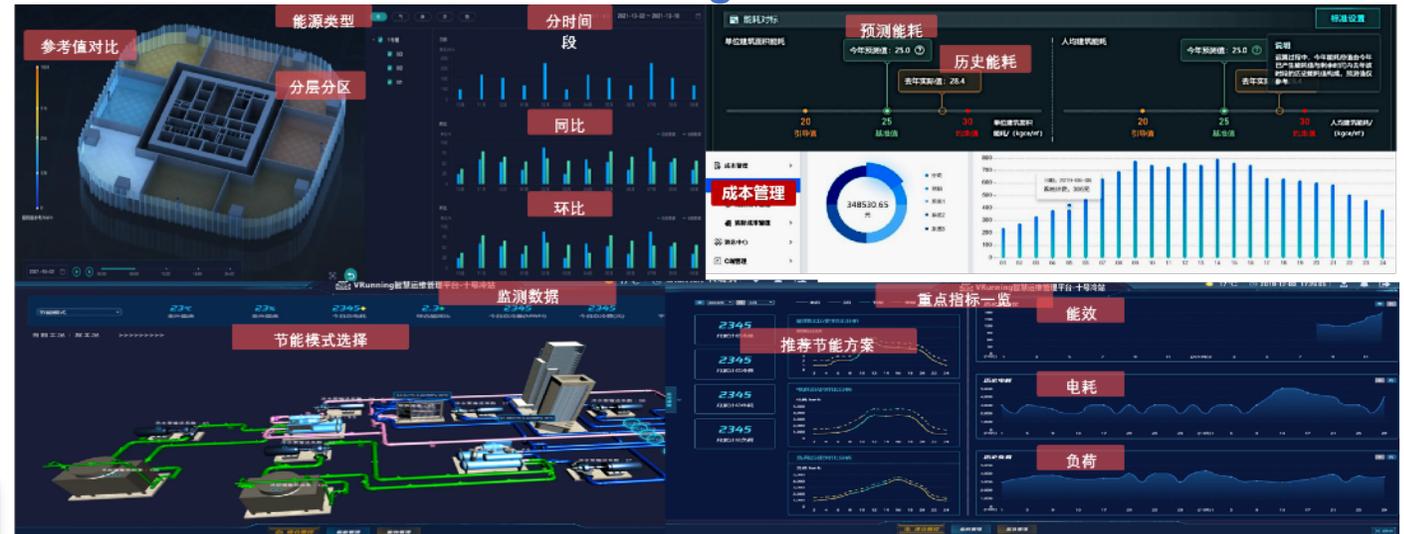
Virtual Maintenance Rehearsal

Based on the refined 3D equipment model, disassembly scenarios are formulated according to the standard equipment inspection process. After customizing the equipment disassembly steps, two operation modes of equipment disassembly and assembly are provided to realize simulated equipment installation and equipment disassembly.

Hydraulic Turbine Disassembly
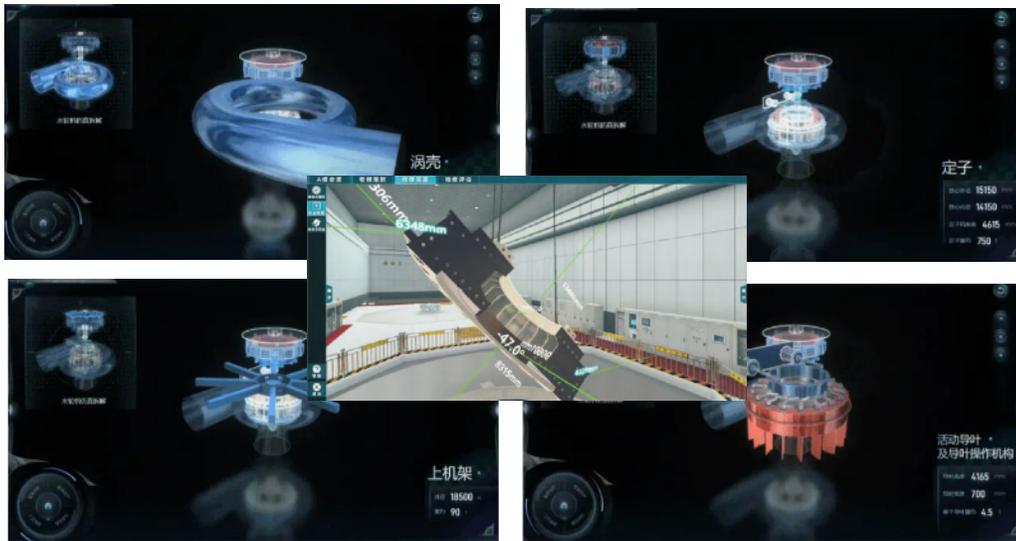
Transformer Disassembly

BAS

3D Simulation Training

Through the virtual drill environment, carry out training related to hydropower inspection, mobilize the enthusiasm and creativity of inspection personnel, enhance their comprehensive quality, and greatly ensure the safe and stable operation of power generation, transmission lines, distribution operation and maintenance, and energy-saving and efficient operations.

Authenticity, Openness, Targeted, Autonomy, Safety

| Daily Inspection | Equipment Training | Assessment and Scoring | Simulation Drill |

BAS

Virtual Inspection

- Realize functions such as simulated inspection to provide auxiliary decision support for power grid management.
- Terrain shortest path analysis to provide relevant repair paths for power emergency rescue.
- 3D simulation of hydropower station inspection, which can set the inspection operation speed and realize trajectory tracking and playback.

Intelligent O&M Application Direction 5: Predictive Maintenance

BAS

Predictive maintenance integrates equipment condition monitoring, fault diagnosis, fault (condition) prediction, maintenance decision support, and maintenance activities.

Step 1: Data Collection & Transmission

- Sensors for vibration, temperature, etc.
- Industrial IoT Gateway

One-click Configuration, High Flexibility, Safety Protection

Wireless Monitoring System
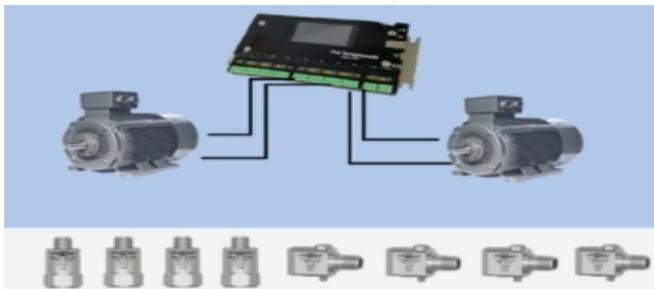
Online Monitoring System

Step 2: Fully Automatic Diagnosis Platform

6.7 Trillion Data Points

Diagnosis Rules: 6000+
Fault Conditions: 1200+
Modeling Available for Any Common Machine Type

Under accurate mechanical information and standard test conditions, the accuracy rate is 98%.

Diagnostic analysis based on graph analysis

The coupling is not aligned | Bearing wear

Time-domain sound signal | Analyst Review opinion

Complex faults require professional analysts to analyze!
Common faults are analyzed automatically

Step 3: Efficient Visual Management

Scalar Value Trend	Alarm Confirmation
Diagnostic Spectrum	Diagnostic Faults and Maintenance Recommendations
Hardware Management	Alarm Threshold Setting

Predictive Maintenance for Key Equipment Based on Core Data Models

Data Flow

Digital Twin

Hydraulic Turbine

Generator

Main Transformer Substation

发电敏感指标
- Vibration of Hydrogenerator Set
- Overspeed of Generator Set
- Air Gap of Generator
- Rotor Magnetic Flux
- Bearing Status
- Changes in Oil Pressure and Temperature

变配电敏感指标
- Partial Discharge of Main Transformer
- Core Grounding Current
- Hot Spot Temperature of Winding
- Main Tank Pressure Measurement
- Changes in Oil Chromatography and Micro-Water
- Voltage and Current of Transmission Cable
- GIS Insulation

1、Condition Monitoring → 2、Fault Diagnosis → 3、Condition Prediction → 4、Maintenance Decision

Feedback and Maintenance

Predictive knowledge graph for key hydropower equipment

Hydropower Station Maintenance Resource Control - Evaluation Index System

Predictive Knowledge Graph of Key Hydropower Equipment

Maintenance Strategy

Optimization Method

Remaining Service Life Prediction

Maintenance Strategy

Fault Tree Reasoning, Mathematical Model Analysis, Bayesian Network, Intelligent Maintenance Decision

Data Flow

Business Flow

Intelligent O&M Application Direction 5: Predictive Maintenance

BAS

| 1、Condition Monitoring | 2、Fault Diagnosis | 3、Condition Prediction | 4、Maintenance Decision |

Transformer　Circuit Breaker　**GIS**　Battery

Equipment Operation Condition Monitoring

**Vibration Monitoring
Current Monitoring
Voltage Monitoring
Temperature Monitoring
Number of Operations**

Fault Diagnosis

Condition Prediction

- Physics Model Driven
- Reliability Model Driven
- Data Driven

Smart Substation Management Platform

Feedback and Maintenance

Predictive Maintenance Decision System

- Maintenance Strategy
- Optimization Method

+

Remaining Service Life Prediction

Maintenance Strategy

Fault Tree Reasoning, Mathematical Model Analysis, Bayesian Network, Intelligent Maintenance Decision

03 Key Technologies of Intelligent O&M Based on Digital Twin

Complete Technical Architecture and Product System

BAS

Smart Park	Commercial Complex	High-End Office Building	High-End Hotel	Smart Factory	Smart Hospital	Smart Port

WEB Management Terminal	Command Center Large Screen	Mobile APP	WeChat Mini Program	Information Release Terminal

FM Asset Operation and Maintenance Management Platform	Energy Management Platform	Operation Cockpit	Carbon Asset Management Platform	Big Data Operation Analysis Platform

Smart Building IOT Platform	Digital Twin Platform

Infrastructure: Computing, Storage, Network, Security
(Public Cloud, Private Cloud, Hybrid Cloud)

Intelligent Equipment & Systems

HVAC	Water Supply and Drainage	Power Supply and Distribution	Lighting	Fire Protection	Video Surveillance	Elevator Monitorin	Access Control	Intrusion Alarm	Parking Lot	...

Internet of Things (IoT) System

1. The IoT system is a top priority in smart policing construction. Its success or failure directly affects whether intelligent subsystems and devices can achieve interconnection and linkage, whether data from the perception end can be collected, and whether intelligent business applications can be implemented, thus directly determining the success of the project.

2. The implementation and deployment of the IoT system are crucial to the project's success, and there are two main approaches:

   - Owner-led: The owner coordinates all suppliers of intelligent subsystems and devices to access the IoT system. The owner has a heavy workload in delivery coordination, and it is difficult to control the overall project delivery schedule. They also need to face the suppliers' requests for premium services for subsystems and devices.

   - IoT-led: The IoT system vendor is responsible for connecting all intelligent subsystems and devices to the IoT system. The owner has a light workload in delivery coordination, and the overall project delivery schedule is well-controlled. The owner only needs to coordinate with the IoT system vendor.

It is recommended to choose the IoT-led approach. At the same time, all vendors of intelligent subsystems and devices involved in the project are required to develop data and interfaces for free.

Important Materials Related to IoT Implementation:

Access methods for electrical, intelligent, sensor, and intelligent systems;

Data docking protocols (MQTT, OPC, Modbus, etc.);

Equipment ledger (equipment name, CAD number, affiliated system, spatial location, etc.);

As-built floor plans and system diagrams of each subsystem, etc.

Model Construction and Processing Capability

Based on the integration of data such as physical models, sensor updates, and operation history, mapping is completed in the virtual space to reflect the full-life-cycle process of the physical world. Through the access of data from multi-format and multi-precision BIM models (model formats such as 3DMax, Bentley, Revit), parametric models, oblique photography models, and point cloud models, the fusion expression of multi-modal data is realized, thus creating a 1:1 composite physical substation.

Model Construction and Processing Capability

BAS
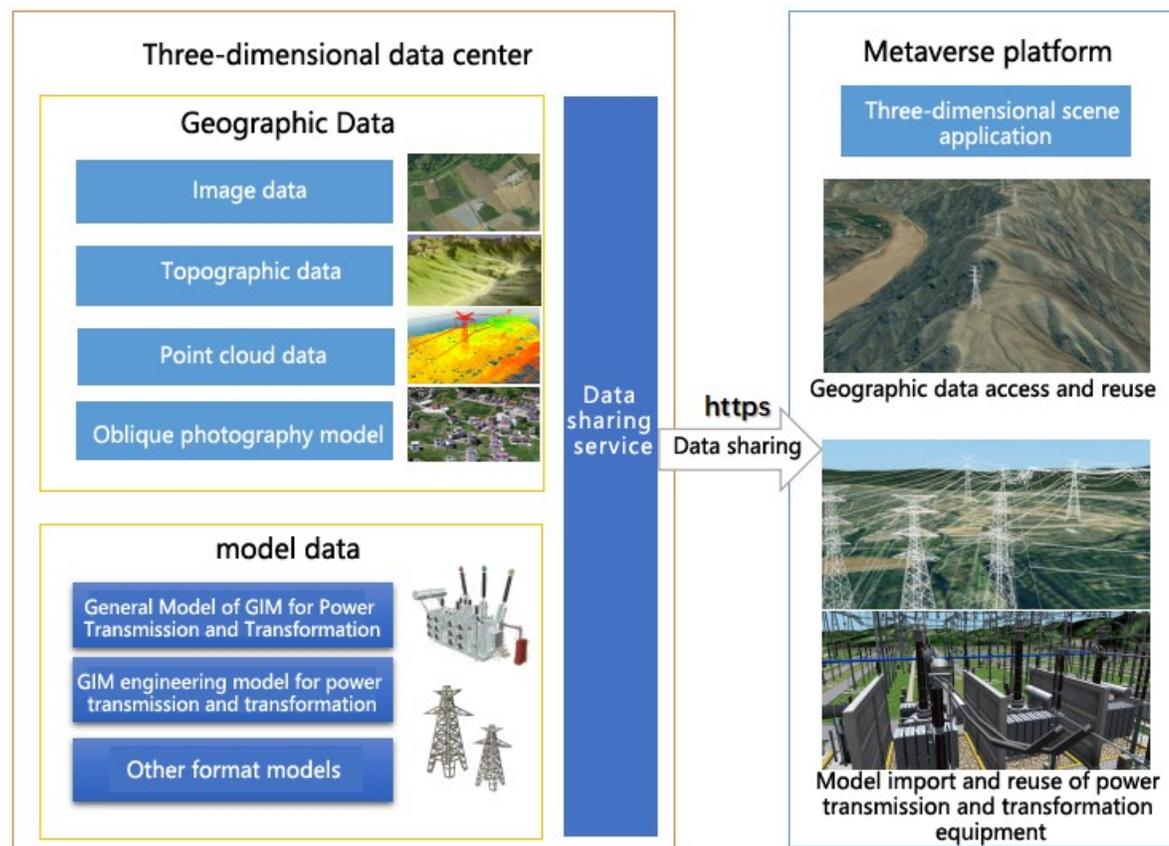
The BIM model contains the asset information, asset relationships, and construction models (asset models) of buildings. Based on the construction attributes of the BIM model, full-scale d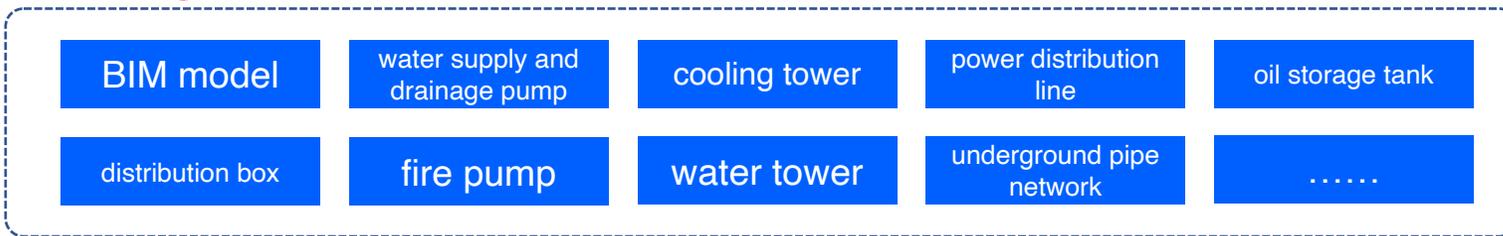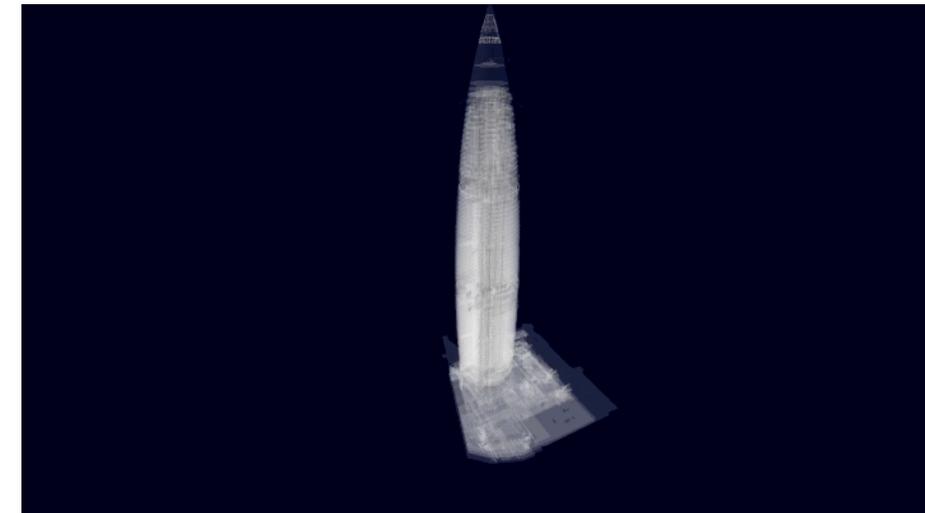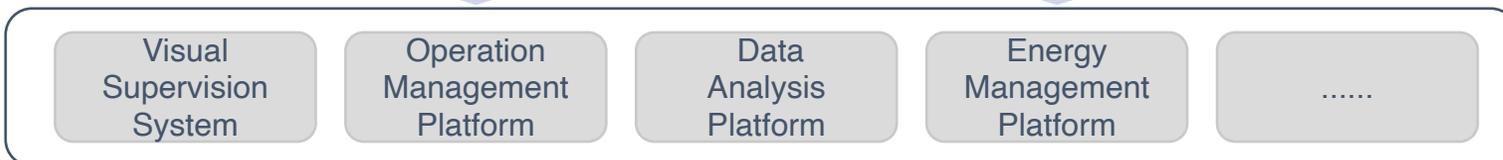igitization of physical buildings can be achieved. Making good use of design and construction BIM digital assets is of great value for the operation and maintenance phase of buildings.

The design and construction BIM model contains a huge amount of data, and a large portion of it is not needed during the building operation and maintenance phase. Therefore, it is necessary to perform digital model analysis, lightweight processing, and standardized rendering on the design and construction BIM model to meet the real-time response (second-level loading) visualization interaction experience requirements of the operation and maintenance phase.

BIM Original Model

BIM model	water supply and drainage pump	cooling tower	power distribution line	oil storage tank
distribution box	fire pump	water tower	underground pipe network	……

BIM Model: Digital-Physical Separation, Lightweight Processing, Standardized Rendering

Asset Model	Asset Information	Asset Relationship

Visual Supervision System	Operation Management Platform	Data Analysis Platform	Energy Management Platform	……

Visual Data Support	Asset Information Management	BIM Model Value Reuse	Open and Customizabl

Taking the China Resources Project as an example, the original BIM 3D drawings were 256G. After processing by BIM digital space services, the data that needs to be loaded for actual building operation is less than 9G.

Data Governance and Analysis Capability

BAS

Data flow

IoT System

Real-time Virtual Mapping and Interaction
Real-time Information Data Interaction

Digital Twin (Data Twin)

Data Collection

| Monitoring system | ... | Video surveillance | ... | Robot system |

Electrical monitoring integrated subsystem

Integrated transducer

| Transformer | ... | Breaker | ... | GIS |

Real-time monitoring

- Electricity / Corrugating
- Gas density
- Oil chromatographic components

t

Monitor the complementarity of data and information among subsystems

Data Governance

Monitoring data of multi-state quantity devices

AI data processing algorithm

| Data quality inspection | ... | Meta-information extraction |

| Grammar check | ... | Data correction | ... | Data classification | ... | Pattern extraction |

Substation meta-information database

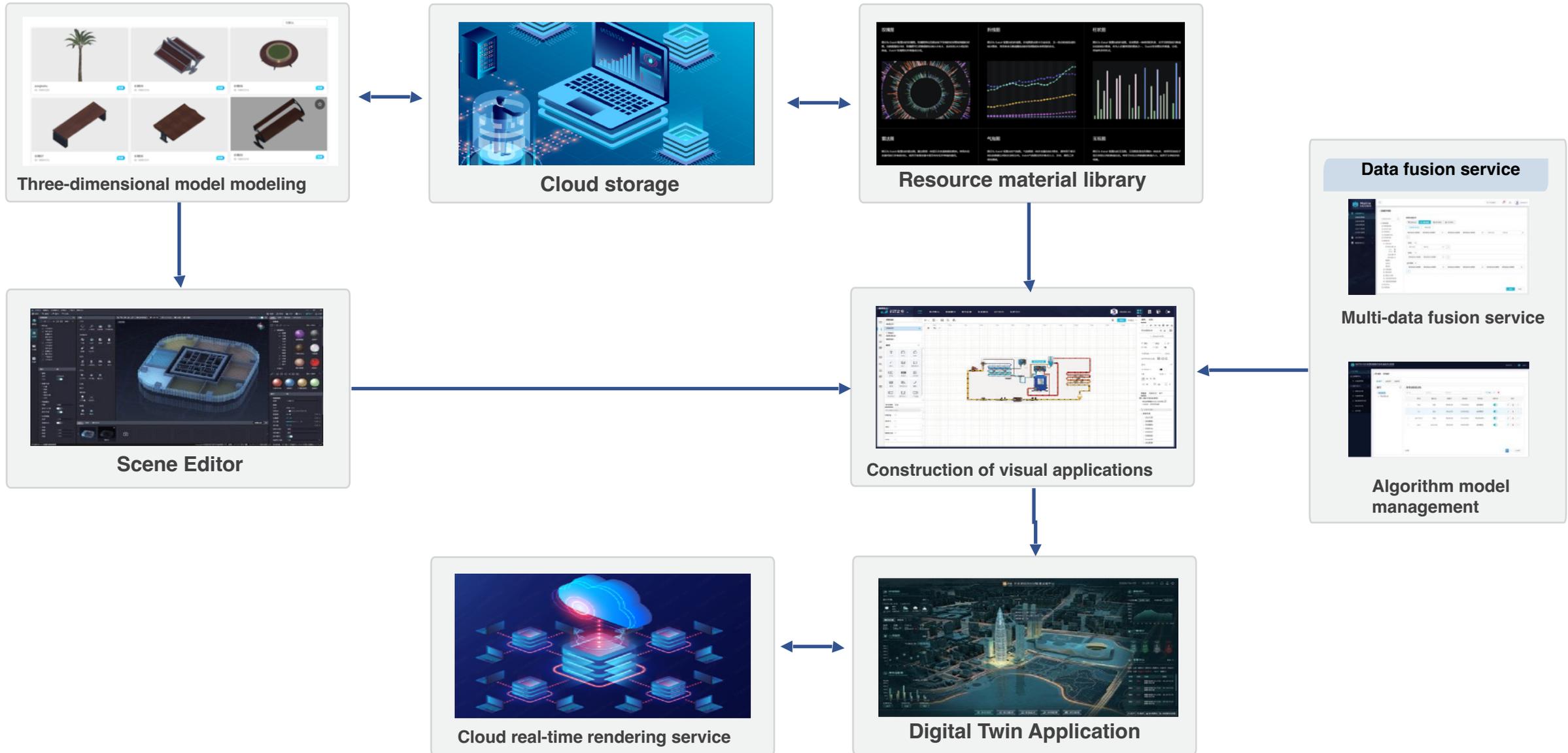| Monitoring equipment meta-information database | Data feature element information database | State pattern meta-information database |

Update and mine the historical database

Data Analysis

Monitoring data of multi-state quantity devices

AI data clustering and feature wavelet decomposition algorithm

| **Monitoring Subsystem 1** | ... | **Monitoring Subsystem n** |

| Transformer | ... | Breaker | ... | GIS |

| Data Feature 1 | Characteristic subwave 1 | | Data Feature 1 | Characteristic subwave 1 |
| ata Feature K | Characteristic subwave K | cross validation | ata Feature K | Characteristic subwave K |

AI device status monitoring and fault diagnosis algorithm

| Device perception | Anomaly detection | Fault diagnosis |

Data storage

Application Construction Process of Digital Twin Entities

Three-dimensional model modeling

Cloud storage

Resource material library

Scene Editor

Construction of visual applications

Data fusion service

Multi-data fusion service

Algorithm model management

Cloud real-time rendering service

Digital Twin Application

04 Typical Examples

Best Practices for Win-Win Cooperation and Joint Growth with Customers

BAS

School | Venue
Commercial | Hospital
Hotel | Rail Transit
Park | Office Building

City
Park
Building

Headquarters of China Resources

Run Wanxiang Tiandi Shopping Center

Tencent Binhai Mansion

Cofco · Landmark Plaza

CITIC Tower

Shanghai Lansheng Building

Yinchuan Youyue City

Nanning ASEAN Headquarters

Yangtze River Boat Hotel

Yangzhou Grand Theatre

Zhejiang Laboratory

Shimao Wisdom Gate

Tianchang National Fitness Center

Qingshan Thermal Power Plant

Ruicheng Smart City

Guangzhou Metro Demonstration Station

Shanghai Yuandian Building

Nanning China Resources Headquarters

Qianhai Holdings - Cold Station No. 10

Shenzhen Center for Disease Control and Prevention

International Intelligent Industry Expo Center

Yangzhou Construction Engineering Technology Park

Construction big data of Fuzhou City

Changzhou Innovation Port

Tokyu office Building in Japan

Rizhao Smart Community

Caohejing Zhaoxiang Park

The platform of Yantai Government Affairs Bureau

Jindi Weixin

Xi 'an Jingwei Tertiary Hospital

Thank you！

Jiangsu BAS Technology Co., Ltd