AISWare AI^2 Edge

White Paper of AsiaInfo AISWare AI^2 Edge V2.1

As an integrated software and hardware product for intelligent edge scenarios across the entire industry, AISWare AI² Edge deploys AsiaInfo's rich and powerful AI capabilities to the edge in a cloud-edge and software-hardware integration manner, empowering core service scenarios in the industry, helping enterprises upgrade their intelligence, serving society, and benefiting people's livelihoods.

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AsiaInfo Technologies Limited (stock code: 01675.HK)

AsiaInfo is a leading software product and service provider in China, with rich experience in software product development and large-scale software engineering implementation. After 30 years of development, it boasts advanced technology and success cases in the fields of 5G, cloud computing, big data, artificial intelligence (AI), Internet of Things (IoT), digital intelligence operation, business and operation support system. Its customers span across telecommunication, radio and television, energy, government affairs, transportation, finance, postal service and other industries.

In 2022, AsiaInfo completed the acquisition of iResearch Consulting Group ("iResearch"), a leading company in the field of business decision-making services, and formed a new brand of "iResearch Digital Intelligence". This acquisition enables AsiaInfo to extend its core competence from product R&D, service delivery, data operation, and system integration to consulting planning and intelligent decision-making, thus becoming a leading full-stack capability provider of digital intelligence.

AsiaInfo has always been committed to enabling digital intelligence technologies such as 5G, AI and big data to reach hundreds of industries and create digital intelligence value with customers. With the goal of "leading products and services", AsiaInfo has focused its product R&D on digital intelligence, cloud network, IT and middle office products, to become an industry pacesetter. Specifically, its cloud network products are leading in the world, its digital intelligence products are leading in China, and even in the world, while its IT products are among the top ones in China.

Looking forward, AsiaInfo will strive to become the most reliable digital intelligence value creator. Relying on the full-stack capability of digital intelligence, it will innovate the customer value and facilitate digital China.

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I. Introduction

In the context of the rapid development of AI, big data and other technologies, edge intelligence is upgraded from a single function to multiple intelligent value-added services, such as real-time crisis warning, operation management, precision marketing and other innovative applications, which are used to improve the efficiency of enterprise operations, optimize user experience and save labor costs. Diversified demands for "universal security", "safety in production" and "efficiency improvement" have become new driving forces of the industry. The conventional way of using AI, namely the centralized processing of AI computing power provided by data centers, is difficult to meet the requirements of many scenarios with "low latency, massive data, privacy and security, and local autonomy".

AISWare AI² Edge will make full use of AI computing power to provide services for a wide range of security business scenarios through hierarchical deployment and efficient collaboration in the cloud, edge and end. This helps relieve the pressure on computing services of centers, reduces the cost of data backhaul, and enables offline processing capabilities without relying on the cloud, while enabling autonomy in the customer's local region.

This White Paper will describe the AISWare AI² Edge from several aspects, including overview, technical architecture, key functions, customer value, and product advantages.

II. Abbreviations and Terms

The abbreviations or terms are as follows:

Table 2-1 Abbreviations or Terms

Abbreviations or terms	Full name in English
AI	Artificial Intelligence
AISWare AI² Edge	AsiaInfo Artificial Intelligence Edge
GPU	Graphic Processing Unit
IDC	Internet Data Center

III. Overview

The AISWare AI² Edge, uses the data acquired by the camera not only for security needs but also for other value-added services, such as enterprise management, customer flow analysis, and accurate marketing, in a bid to improve user efficiency while maximizing the enhancement of the user experience.

3.1 Trends and challenges

With the in-depth development of industrial Internet and the popularity of IoT-perception technology, the real-time processing requirements of business and the exponentially increasing data transmission cost bring new challenges to the centralized cloud computing model. Edge computing can meet the needs of future industrial digitalization due to its inherent advantages of low latency, highly real-time feature, and data security. As a result, the industry has paid a lot of attention and given a rather optimistic estimate of the future of edge computing. According to IDC, more than 50 billion terminals and devices will be connected in 2020, and 40% of the data will need to be analyzed, processed and stored at the network edge. The market size of edge computing will exceed trillions and will become an emerging market on par with cloud computing.

Edge intelligence means that each edge computing node has the ability to compute and make decisions to maximize the value of the data acquired by the sensing layer. In the

"cloud, edge and end" collaborative intelligent security system, massive data will be structured and presented to the user. The data is no longer massive real-time unstructured data, but structured information that has been deeply analyzed by AI.

China has made the greatest efforts in terms of smart city construction compared with the rest of the world, with 48% of the number of pilot cities. The universal security sector features the fastest implementation of the smart city construction as well as relatively mature technology and services. According to the National Bureau of Statistics, China's fiscal expenditure on public safety continues to rise, nearly doubling to RMB 1,378.1 billion in 2018 compared to 2012.

Although the edge AI + universal security is promising, it still faces numerous challenges. Due to the highly decentralized scenarios and deployment locations close to the business site, higher requirements are placed on vendors in terms of delivery, deployment, and operation and maintenance. In business, the highly individualized needs of the industry pose a challenge to the requirements of low-cost and standardized replication of products.

3.2 Product definition

Based on the base of integrated cloud, network, edge and end capability, the AISWare AI² Edge combines AI capabilities with core business scenarios of the industry through extensive end-side perception, efficient inference at the edge and collaborative analysis in the cloud to enable intelligent transformation in the industry.

3.3 Product orientation

AISWare AI² Edge provides scenarios of cloud, edge, and combination of cloud, network, edge and end, etc. to meet the requirements of customers and partners in different industries for multiple factors such as latency, cost, and complexity of scenarios. Since its launch in the market, it has been widely used in various application scenarios such as smart park management, smart campus management, financial network risk control, comprehensive community governance, smart guard in power plants, smart site supervision, smart IDC management, supervision of rail transit safety, etc. It has played a prominent role in providing digital transformation for customers.

IV. Overall Product Architecture

AISWare AI² Edge, which closely fits the business needs of cloud-edge collaboration and intelligent development in the market, provides collaborative management solutions of end, edge, cloud and network; The end side is responsible for data acquisition, the edge side is responsible for AI intelligent analysis, the cloud is responsible for centralized monitoring, policy issuing and AI model optimization, while the network side mainly solves the problem of efficient and safe transmission of data and video in complex environments through private 5G network technology.

The overall product architecture is shown in the following figure:

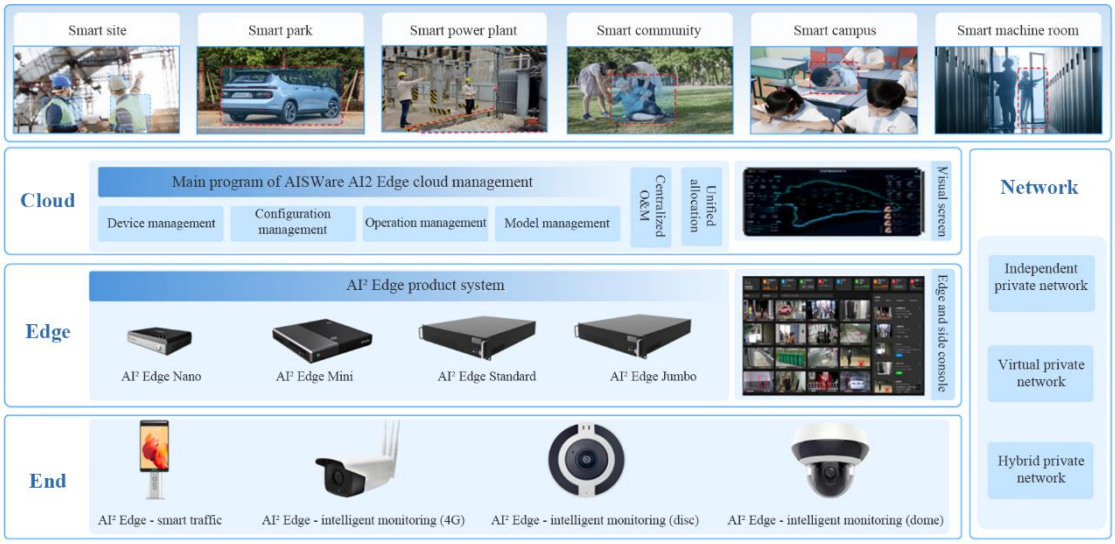

Figure 4-1 Overall Architecture of AISWare AI² Edge

4.1 Product form introduction

In terms of hardware form, AISWare AI² Edge is equipped with high-performance AI intelligent computing power, and ready to use out of the box with software and hardware integrated, and provides a variety of specifications and models to meet the monitoring needs of different scenarios.

On the end side, a variety of intelligent devices including intelligent cameras and radars that can effectively acquire multimodal data are available. On the edge side, all-in-one machine products of the edge AI are available with four product models including Nano, mini, standard and Jumbo.

Figure 4-2 Introduction of AISWare AI² Edge Form

On the software side, AISWare AI² Edge provides an integrated cloud-edge AI video analytics platform. AI video analytics platform operates with "1 (cloud) + N (edge) + X (algorithm)" model to provide diverse personalized solutions for industrial enabling scenarios; to achieve the goal of "three enabling" of "stackable capacity", "pluggable capability" and "programmable business", so as to complete the integration of engineering capability and industrial enabling of AI technology.

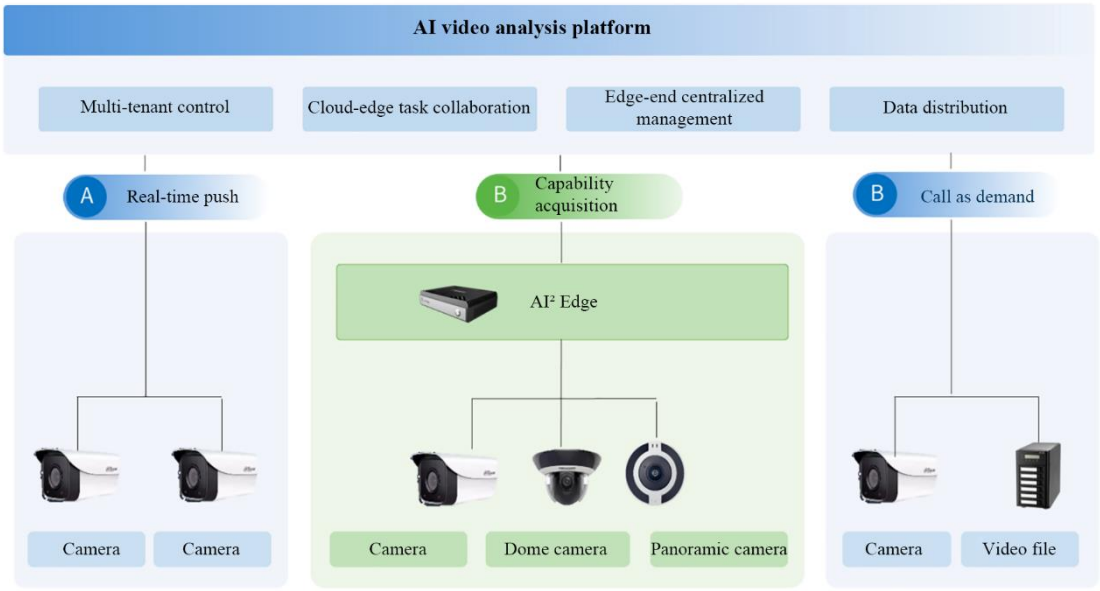

Figure 4-3 AI Video Analytics Platform Architecture

4.2 Introduction to system solution

AISWare AI² Edge, through flexible deployment methods, non-intrusive enabling of existing monitoring networks, can meet the intelligent development demand of cloud

intelligence scenarios, edge intelligence scenarios and hybrid intelligence scenarios, as shown in the following figure:

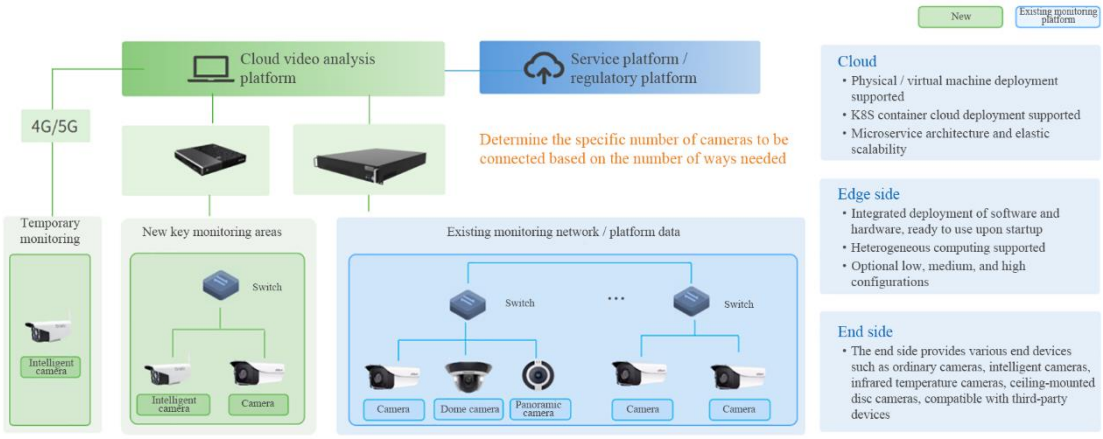

Figure 4-4 Product System Solution

V. Function Architecture of Products

Based on the base of integrated cloud, network, edge and end capability, the AISWare AI² Edge combines AI capabilities with core business scenarios of the industry through extensive end-side perception, efficient inference at the edge and collaborative analysis in the cloud to enable intelligent transformation in the industry. The function architecture of AISWare AI² Edge is shown below:

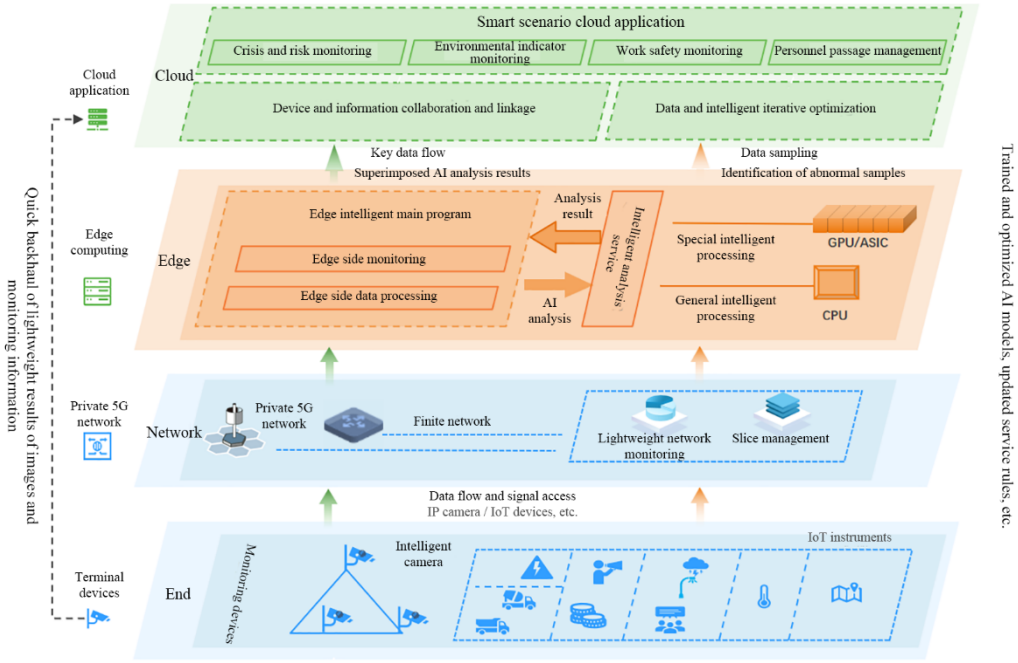

Figure 5-1 Function Architecture of AISWare AI² Edge

In particular, the cloud is mainly responsible for:

- Unified management / configuration of end devices / edge devices
- Unified access of AI analysis results
- Comprehensive presentation of AI analysis results
- Cloud-edge collaboration and model updates

The edge side is mainly responsible for:

- Video streaming access
- Video decoding, posterizing time, AI analysis
- Showing AI analysis results at the edges
- Uploading AI analysis results to the cloud

The end side is mainly responsible for:

- Single-scenarios intelligent camera access
- Uploading identification results to the cloud via 4G/5G / WIFI networks
- The network side mainly addresses the efficient acquisition and transmission of data:
  - Wired network
  - Wireless / WiFi network
  - 4G/5G network

5.1 Basic functions

The basic functions are shown in the following table:

Table 5-1 List of Basic Functions

Function point	Description of function point
Preset model management	Support for unified display of all models and model information of AISWare AI² Edge, including:
	1. Life cycle management of models
	2. Parameter management of model system
Camera information management	Support for unified management of monitoring devices, currently mainly for management of cameras, including:
	1. Display and operation
	2. Tianji of single device
	3. Import of batches of devices
Personnel information management	Support for the unified management of information of personnel within the scope of security deployment and control, including:
	1. Personnel information display
	2. Personnel information registration
	3. Registration photo verification and feature extraction
Vehicle information	Support for the unified management of information of vehicles within the

Function point	Description of function point
management	scope of security deployment and control, including:
	1. Vehicle information display
	2. Vehicle information registration
Blacklist and whitelist management	Support for the configuration and unified management of blacklist and whitelist, including:
	1. Blacklist management
	2. Whitelist management
	3. Grouping management of blacklist and whitelist
	4. Grouping list configuration
Setting of monitoring tasks	Support for visual configuration of tasks, including:
	1. Task information configuration
	2. Selection of identification models
	3. Model parameter configuration
	4. Selection of monitoring devices
	5. Division of monitoring areas
Monitoring video configuration	Provide interface-based monitoring configuration and maintenance capabilities, including:
	1. Monitoring layout configuration
	2. Monitoring alarm configuration
	3. Monitoring preview
Monitoring results management	Unified management and classification analysis of the identification results of monitoring tasks, including.
	1. Monitoring video playback
	2. Identification result query
	3. Classification analysis of results
Model operation management	Support for unified management capability for model operation, including:

Function point	Description of function point
	1. Model deployment recommendation
	2. Inference service monitoring
	3. Resource monitoring and management
	4. Scheduling task management
	5. Online trial of models
	6. Online download of models
	7. Online update of models
System management	Unified user right management, including:
	1. User management
	2. Role management
	3. Authority management

5.2 Special functions

Introduction of the main special functions of AISWare AI² Edge.

5.2.1 Rich algorithms are used to enable core scenarios of the industry

According to the characteristics of different industries, the algorithm models for scenarios of universal security, safety in production and efficiency improvement are preset; We can customize and develop industry-specific models according to industry needs to meet the differentiated and personalized needs of different industries.

Figure 5-2 Rich Prefabricated Models

5.2.2 Cloud-edge collaboration for lean operation in enterprises

With perfect cloud-edge collaboration capability, the edge AI cloud software platform can centrally manage the edge AI all-in-one machines and intelligent end-side devices, and provide multi-dimensional collaboration capabilities including data collaboration, application management collaboration, and business collaboration.

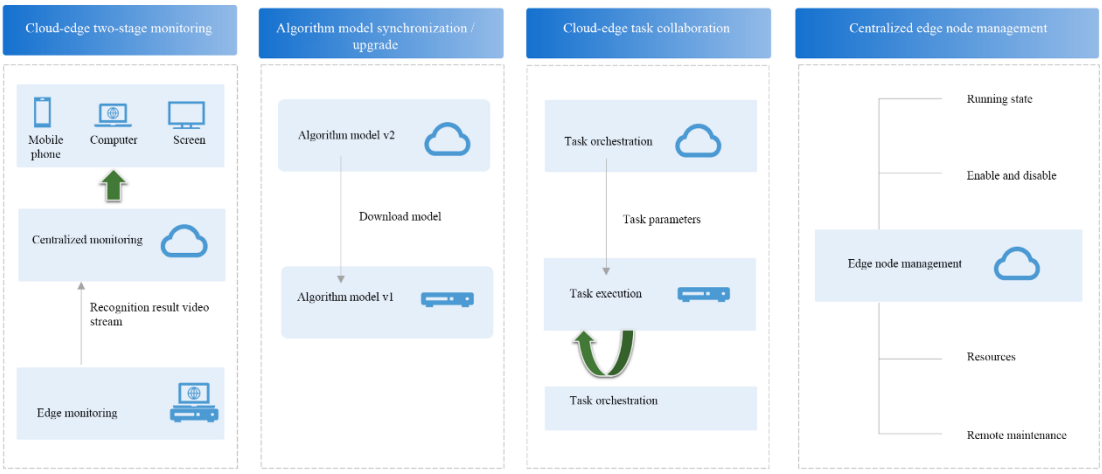

Figure 5-3 Strong Cloud-Edge Collaboration

5.2.3 Standard products for out-of-the-box open integration

Edge AI offers highly efficient, multi-specification all-in-one machines, presets industry mock-ups, out of the box, and minimal in operation and maintenance. You can obtain real-time video, alarm, and statistical analysis data by invoking standard APIs of all-in-one machines, thus facilitating the integration with third-party systems.

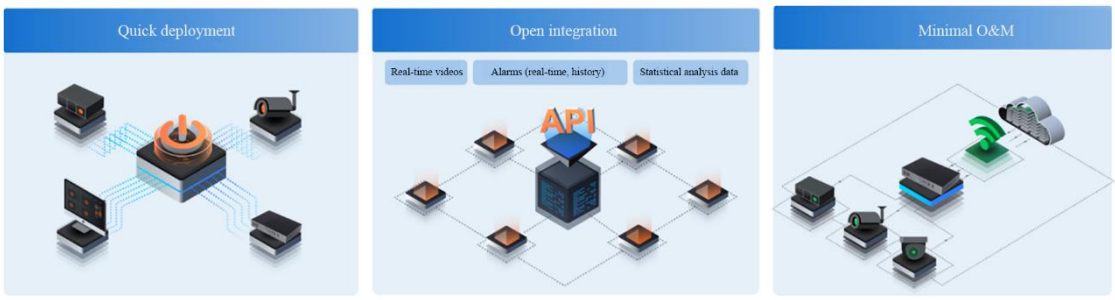

Figure 5-4 Open Integration Out of the Box

5.2.4 Software and hardware integration for stable, efficient and safe enabling

The edge AI software and hardware computing forces are fully combined to maximize the performance and stability of end-to-end processing of AI video analysis tasks. Under the same hardware configuration, AISWare AI² Edge all-in-one machines run more efficiently and stably.

VI. Product Advantages and Features

The following presents the advantages and features of AISWare AI² Edge.

- **Ubiquitous intelligence**

AISWare AI² Edge is known for rich industrial AI visual perception and recognition.

By linking to industry attributes and running through business processes, we can provide more algorithms by deeply engaging 14 industry mock-ups such as communities, parks, power plants, campuses, data centers, and construction sites.

AI recognition model base is built for industry application scenarios to provide deeply customized industry-based characteristic algorithms.

- **Global reach**

AISWare AI² Edge provides full coverage of cloud-network-edge-end collaboration.

Providing full-stack products of cloud, network, edge and end links can facilitate the end-to-end solutions to deliver AI capabilities to the edge scenarios required by the industry.

Cloud achieves centralized management and collaboration to edge and end-side products, providing multi-dimensional capabilities such as data collaboration, application management collaboration, and task scheduling collaboration.

- **Ultimate efficiency**

AISWare AI² Edge provides highly efficient AI integrated software and hardware products.

AsiaInfo boasts industry-leading integrated hardware and software products, including edge AI all-in-one machines and end-side AI devices.

Multiple specifications and forms meet the requirements of service scenarios.

Rapid deployment and minimal operation can lower delivery and maintenance costs.

VII. Core Values

AISWare AI² Edge features the following values.

- **Improved security capabilities to reduce the loss of life and property**
  - Ubiquitous security algorithms are preset, including electronic fence, fire identification, and stranger recognition.
  - The intelligent monitoring analysis (in place of manual monitoring) allows us to proactively discover safety hazards around the clock, greatly improving the efficiency and safety.
- **Lower regulatory costs to standardize the operation process**
  - It provides AI recognition capability for core production scenarios of industries, centrally monitors the compliance of operations, reduces the probability of safety accidents, and effectively reduces regulatory costs.
- **Higher production efficiency to capacitate forewarning and hindsight**
  - Millisecond delay is conducive to timely identification and early warning of problems in the production process, so as to minimize production faults.
  - Quick location of the time period before and after the occurrence of problems can improve the efficiency of analysis and processing.

VIII. Product Differentiation Advantages

The following presents the differentiation advantages of AISWare AI² Edge.

- **Cloud-network-edge-end collaboration**

The arrangement, scheduling and iterative upgrade of AI capabilities are completed in cloud through the cloud-network-edge-end collaboration, and the AI capabilities are delivered to the edge through the virtual private network.

- **High-efficiency software and hardware integration**

Hardware, software and algorithm are deeply integrated to provide ultimate efficiency.

Algorithm white-box, open cooperation, and unified standards can be reversely integrated with the third party algorithm model.

- **Standard product + industry customization**

For standard scenarios with industry characteristics, we provide standard product mock-ups with industry characteristics, and on this basis, support personalized customization.

IX. Application scenarios

The following presents the application scenarios of AISWare AI² Edge.

9.1 Empowering the construction site of intelligentization to facilitate efficient production and safe operation

At the construction site, all-round three-dimensional real-time supervision is made to personnel operation management, real-time inspection and supervision, safety accident prevention, etc. We provide total process solutions covering work safety, environmental protection, on-site fire protection, and asset management for government regulators, owners, supervisors, engineering construction and other related parties.

Figure 9-1 Empowering the Construction Site of Intelligentization

9.2 Empowering data centers to facilitate unattended operation and professional inspection

AISWare AI² Edge uses the AI technology to provide an intelligent inspection and maintenance platform integrating hardware and software through sensing terminal devices such as cameras, face access control, and robots, and provides professional

security monitoring and IT O&M and inspection for the IDC (Internet Data Center) rooms.

Figure 9-2 Empowering Data Center Management

9.3 Empowering intelligent communities to facilitate community governance and livelihood services

Based on camera, face access control, robot and other front-end perception devices, the AI technology is integrated to build a three-dimensional monitoring system for the communities. Diversified real-time AI algorithms for “people, vehicles and things” provide all-round support for community governance, safety prevention and control, and services for people’s livelihood.

Figure 9-3 Empowering Intelligent Communities

9.4 Empowering smart parks to facilitate efficient management and lean services

The park management is enabled with AI technology to achieve visual, digital, and intelligent management of parks. The park management and service capabilities are comprehensively raised to improve the efficiency of daily production and operation while reducing labor costs.

Figure 9-4 Empowering Intelligent Communities

9.5 Empowering smart campuses to facilitate safety control and intelligent management

AISWare AI² Edge facilitates the transformation of smart campus management, effectively improves campus safety control, operation management, aided teaching and other capabilities. It provides a full range of smart campus solutions to support diverse application scenarios such as campus personnel management, security control, and wisdom class.

Figure 9-5 Empowering Smart Campuses

9.6 Empowering smart power plants to facilitate work safety, cost reduction and efficiency increase

AISWare AI² Edge is applied to thermal power plants, wind farms, PV power stations, etc. Based on AI vision, online real-time analysis realizes the visual supervision of work safety. The online scalability of identification requirements is supported on demand, so that all power plants can improve their operation and management capabilities, prevent safety accidents, and reduce human inputs.

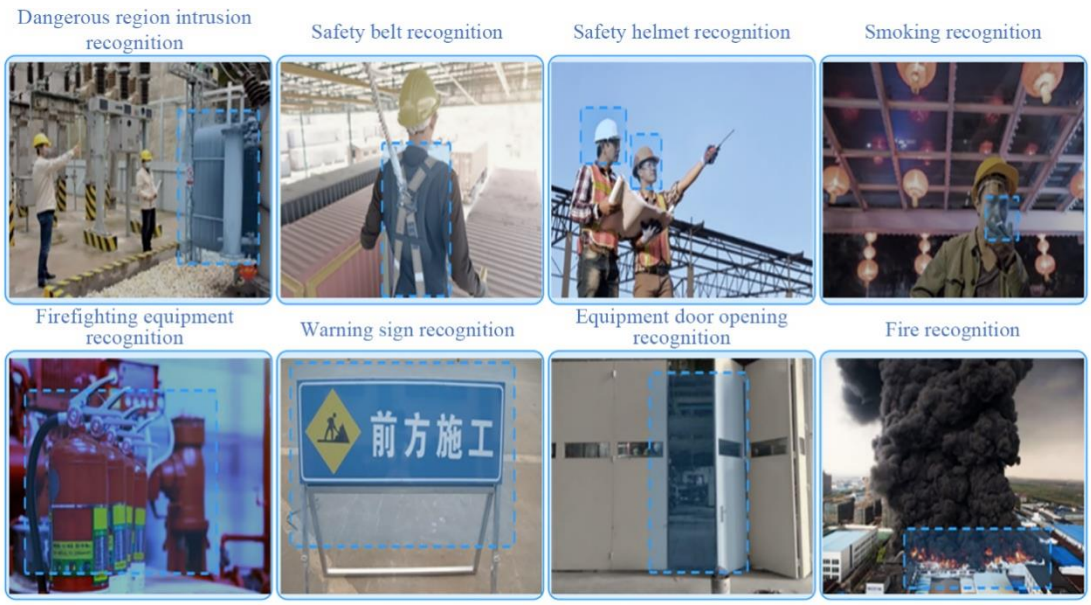

Figure 9-6 Empowering Smart Power Plants

X. Success Stories of Product Customers (Application Cases)

The following presents the customer success stories of AISWare AI² Edge.

10.1 Smart park: AI video security of Zhongguancun No. 1

Located in Zhongguancun Science City, Zhongguancun No. 1 is positioned to be a global innovation center of key and core technology (AI). Covering a gross floor area of about 500,000 square meters, the Park plans to build a smart park based on information construction, focusing on its operational efficiency and value-added services. AsiaInfo devises a solution to enable the visual, digital and intelligent park management with the AI technology, enhance park management and service capabilities, improve the daily operation support capability, and build a smarter and safer park environment.

The smart park solution for Zhongguancun No. 1 can enable:

AI + security: perimeter intrusion detection, crisis identification in key regions, and key potential risk identification.

AI + passage: Control of security risk officers, staff management, and care for key personnel.

AI + operation: Equipment and goods management, vehicle parking management, and electric vehicles into the building.

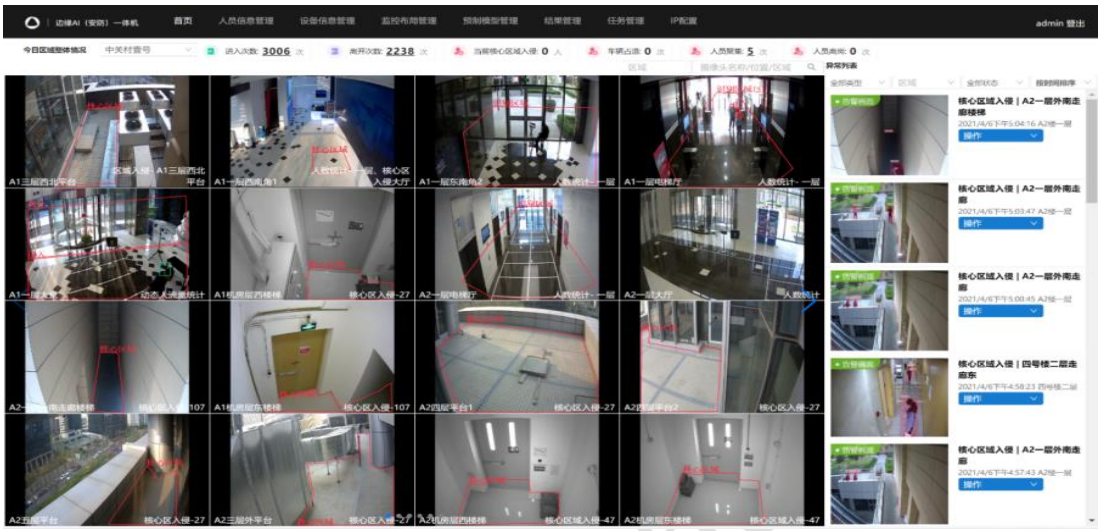

Figure 10-1 AI Video Security of Zhongguancun No. 1

10.2 Smart machine room: AI video capability management of China Mobile Information Technology

Now, a lot of workers are involved in the site management of Beijing mobile rooms, such as manual identity verification and man marking throughout the factory operation. After analysis, pain points are found, including difficult identity verification, unwieldy level of equipment safety, hidden safety hazards of computer rooms, too high escort costs, difficult marking in multiplayer scenes, and difficulties in monitoring violations.

Core AI algorithms based on image are applied to three specific scenarios: AI identity verification before access, AI marking of personnel in the computer room, and device and environment monitoring in the computer room. The engineering personnel will confirm the access authority through identity verification, delimit the scope of access by electronic fences, and track the motion trails. They will give real-time early warning when the personnel are out of range of activities or exposed to dangerous actions. Meantime, the environment of the computer room is all-weather monitored in real time to realize the on-site operation supervision and management of the attendant personnel.

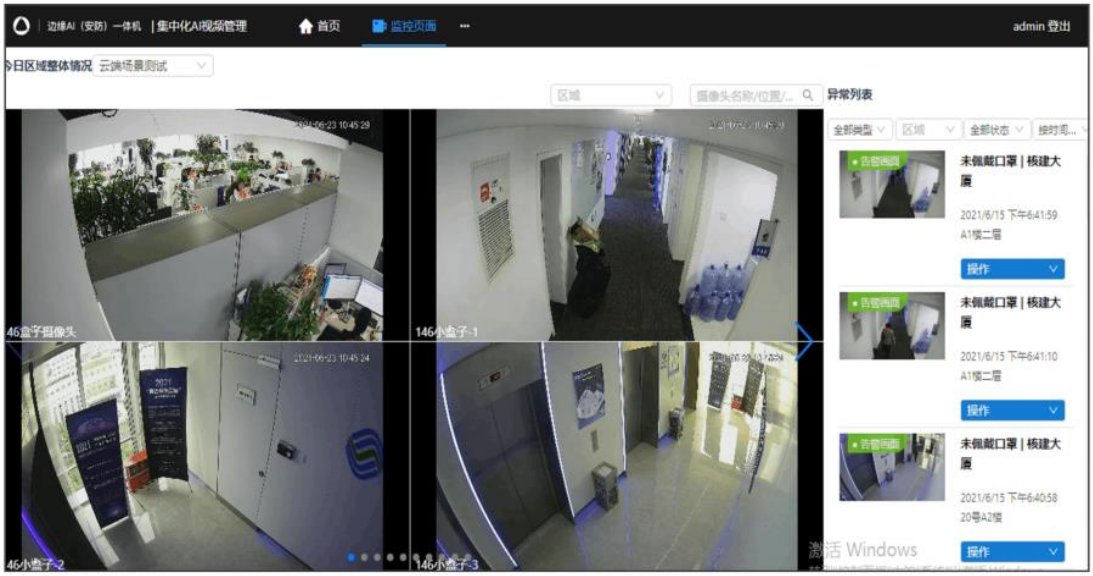

Figure 10-2 AI Video Capability Management of China Mobile Information Technology

Based on real-time image acquisition and analysis, the intelligent marking system in the computer room can effectively replace the engineering staff to realize the supervision and management of the construction site, make up for the shortage of man marking, and minimize the hidden engineering safety hazards in the computer room.

10.3 Smart site: AI video supervision of urban renewal site in Beijing

In the urban renewal site of Xicheng District, AsiaInfo uses AI to enable the construction site, and employs the digital and visual intelligent system to conduct all-round three-dimensional real-time supervision on the site, such as standardized operation management, real-time inspection and supervision, and prevention of safety accidents, so as to realize the site work safety informatization.

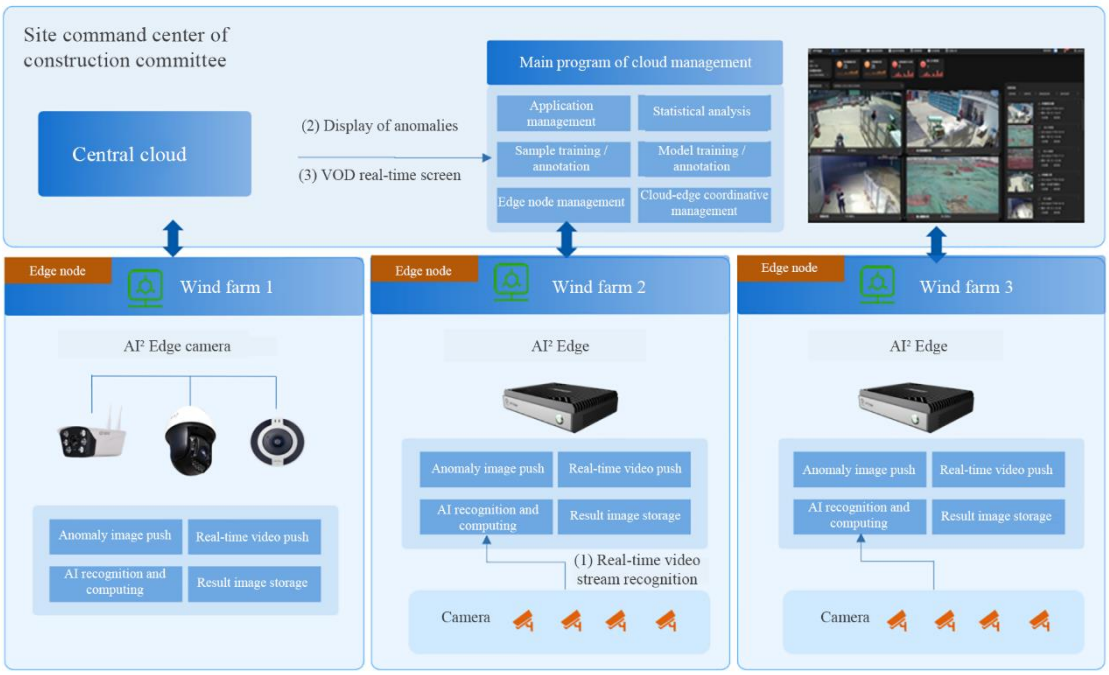

Figure 10-3 AI Deployment Solution of Urban Renewal Site in Beijing

10.4 Intelligent rail: AI intelligent management of Shanghai rail transit

Allowing for the underground and above-ground multilayer space of Shanghai rail transit, crowd gathering and public safety risks, AISWare AI² Edge provides a cloud-edge integrated solution, by taking advantage of the complete monitoring network and numerous cameras. Centralized monitoring of site operation situation (pedestrian flow analysis, pedestrian density analysis, warning of dangerous events, etc.) and collaboration of cloud-edge-end devices through the cloud; at the edge end, the existing monitoring network is enabled through the all-in-one machine, so as to analyze in real time the behaviors such as inbound identification, outbound identification, human target detection, mask wearing recognition, smoke and fire identification, busy lane identification, and intrusion detection in dangerous areas.

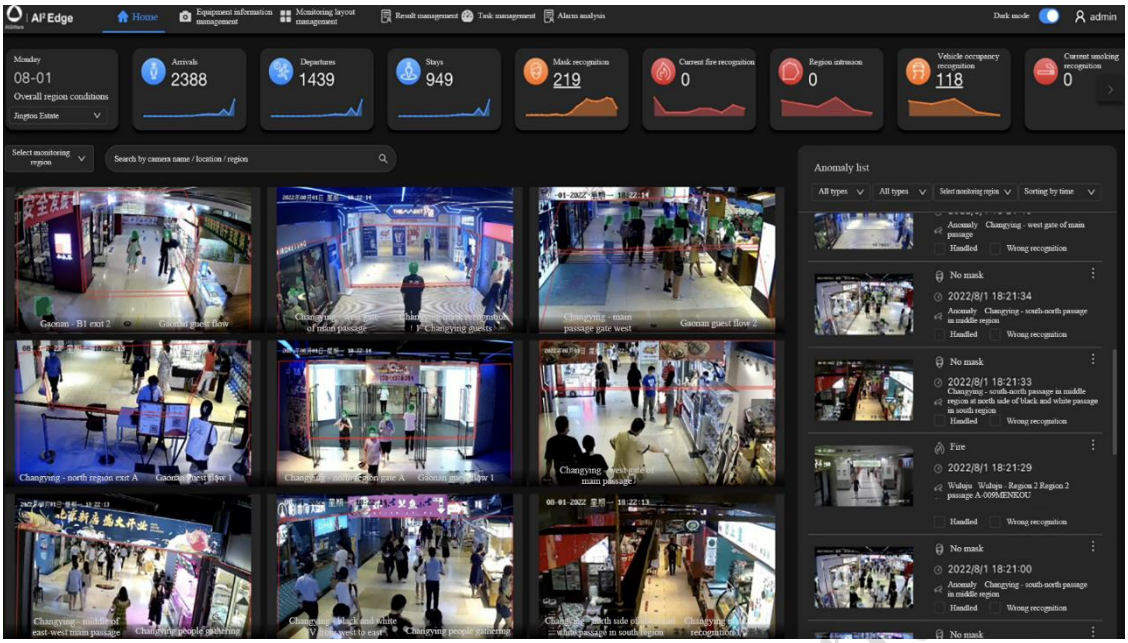

Figure 10-4 Intelligent Management of Shanghai Rail Transit

XI. Qualifications and Honors

The following shows the AISWare AI² Edge qualifications and honors:

Figure 11-1 AISWare AI² Edge Qualifications

Figure 11-2 AISWare AI² Edge Qualifications

XII. Contact Us

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