AsiaInfo 亚信科技 | 5G 原力进化

White Paper of

AISWare AI² Edge Intelligence V3.1

AISWare AI² Edge Intelligence is an integrated software-hardware edge AI device as the core product, combining AI, IoT, cloud-network-edge-end synergy and other technologies with the core industrial business scenarios in depth, empowering many industries such as communications, energy, transportation and so on, and helping enterprises to reduce costs and increase efficiency.

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AsiaInfo Technologies Limited (Stock Code: 01675.HK)

AsiaInfo Technologies Limited ("AsiaInfo Tech") started in 1993 and was successfully listed on the Main Board of the Hong Kong Exchanges and Clearing Limited on December 19, 2018. As the largest provider of telecom software products and related services in China, AsiaInfo Tech has developed industry-leading R&D capabilities with a loyal customer base.

AsiaInfo Technologies (China) Inc., as an indirect wholly-owned subsidiary of AsiaInfo Tech, is a leading software product and service provider in China, boasting extensive experience in software product development and large-scale software engineering implementation. With 30 years of deep market presence, AsiaInfo has advanced technological capabilities and numerous successful cases in 5G, cloud computing, big data, artificial intelligence, the Internet of Things (IoT), smart operations, and business and network support systems. AsiaInfo's clientele spans across industries including telecommunications, broadcasting, energy, government, transportation, finance, and postal services.

In 2022, AsiaInfo acquired iResearch Consulting Group Co., Ltd. (iResearch Consulting) and integrated it into the new brand iDigital, expanding AsiaInfo's capabilities from product development, delivery services, data operations, and system integration to consulting planning and intelligent decision-making, establishing itself as a leading provider of end-to-end capabilities in digital intelligence.

AsiaInfo is committed to empowering various industries with technologies such as 5G, AI and big data, collaboratively creating digital value with customers. AsiaInfo aims to lead in both products and services, focusing on continuous product development in the areas of data and intelligence, cloud and network, IT, and middle office products. The cloud and network products maintain international leadership, while data and intelligence products achieve domestic leadership and some international advancements. In the IT domain, AsiaInfo's products stand at the forefront within the domestic landscape.

In the future, AsiaInfo strives to become the most trusted leader in digital intelligence, leveraging its comprehensive capabilities in the field to innovate customer value and contribute to the digital transformation.

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Capability Maturity Model Integration (CMMI) Certificate Level 5 (L5)

Cloud Managed Services Capability Assessment Certificate: Excellent Level

Digital Trusted Services - R&D Digital Governance Capability Certificate

Enterprise Credit Grade (AAA) Certificate

Information System Construction and Service Capability Assessment CS L4

ISO9001 Quality Management System Certificate

ISO20000 IT Service Management System Certificate

ISO27001 Information Security Management System Certificate

Service Certificate of Information System Security Development L2

Service Certificate of Information System Security Integration L2

Awards (Part)

Awards from International Telecommunication Union (ITU)

Award for Science and Technology Progress of Wu Wenjun Awards

Best Network Slicing Trail at 5G World Summit

French Design Awards

Global Telecoms Awards

IDC Future Operation Leadership

iF Design Golden Award of Hannover Industrial Design Forum

Leading Artificial Intelligence Enterprise in China

Leading Enterprise of Advanced Smart City

Outstanding Catalyst Contribution to TM Forum Assets

The Best Innovation and Future Techco of TM Forum

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Contents

1 Executive Summary

With the rapid development of edge computing, computing capabilities are swiftly migrating towards the edge, and AI is gradually expanding from central nodes closer to data sources and service environments on the edge. Edge intelligence-related technologies have matured, presenting extensive application prospects across various industries and emerging as a key enabler for productivity. An increasing number of industry customers are planning to leverage edge intelligence technology to streamline their business operations. Compared to centralized cloud processing, edge intelligence, characterized by reduced data traffic, lower latency, and enhanced privacy, better aligns with the needs of industry customers.

AISWare AI² Edge Intelligence is a vital component of AsiaInfo Technologies' Cloud-Network-Edge-End product ecosystem. Centered around integrated hardware and software in edge intelligence devices, this product seamlessly combines AI, IoT, and cloud-network-edge-end collaboration technologies with industry-specific core service scenarios. It empowers communications, energy, transportation, and various other industries, aiding enterprises in cost reduction and efficiency improvement.

This whitepaper will provide a comprehensive overview of AISWare AI² Edge Intelligence, covering aspects such as product overview, technical architecture, key functionalities, customer value, and product advantages.

2 Abbreviations and Terms

Common terms for AISWare AI² Edge Intelligence products are shown in Table 2-1.

Table 2-1 Term explanation

Abbreviation or Term	Full Name	Explanation
AI	Artificial Intelligence	Artificial Intelligence
AISWare AI² Edge Intelligence	AsiaInfo Artificial Intelligence Edge	AsiaInfo Artificial Intelligence Edge
GPU	Graphic Processing Unit	Graphic Processing Unit
IDC	Internet Data Center	Internet Data Center

3 Product Overview

AISWare AI² Edge Intelligence products encompass AI² Edge Intelligence Cloud, AI² Edge Intelligence Gateway, AI² Edge Intelligence SmartEye, and AI² Edge Intelligence Computing All-in-One Machine. Through cloud-network-edge-end collaboration, these products apply edge computing, AI, and IoT technologies to various industry-specific edge scenarios, assisting enterprises in achieving intelligent upgrades and realizing cost reduction and efficiency improvement.

3.1 Trends and challenges

As the Industrial Internet penetrates deeper and the ubiquity of IoT perception technology increases, the centralized cloud computing model confronts new challenges such as escalating costs associated with exponential data transmission and the imperative for real-time processing in service operations. The intrinsic advantages of edge computing, characterized by low latency, heightened real-time capabilities, and robust data security, position it as a requisite for the evolving landscape of industrial digitization. The industry has accorded substantial attention and articulated sanguine estimations regarding the future trajectory of edge computing. Drivers such as the imperative for enterprise intelligent transformation, the commercialization of 5G and AI technologies, and the swift evolution of edge intelligence chips have propelled the edge intelligence market into a phase of accelerated development, in which more and more enterprises are opting for edge intelligence to implement intelligent applications. As the predominant application technology in current edge intelligence, computer vision has transitioned from an initial technological bubble to a phase of industrial implementation. The industry scale has demonstrated steady annual growth, with core enterprises in specific sectors securing substantial capital backing and, in some instances, achieving profitability.

Gartner's projection posits that by 2025, more than 50% of critical enterprise data will be generated and processed outside conventional data centers or cloud environments. Edge intelligence has gained acceptance among industry

customers, gradually finding application in production processes, and is perceived as a technology poised to deliver substantial enhancements in productivity in the future.

Advancements in edge intelligence software and hardware technologies are progressively geared towards heightened efficiency. Emerging elements such as novel lightweight algorithm frameworks, more efficacious chips, streaming video analysis frameworks, and edge software technologies characterized by cloud-network-edge-end collaboration and enhanced efficiency are poised to facilitate the more effective commercialization of edge intelligence products. Gartner contends that while the commercial success of edge intelligence is confirmed, the corresponding IT infrastructure remains in developmental stages. Over the next 2 to 5 years, the ascent of mainstream IT infrastructure will support edge intelligence services, characterized by closer integration with complementary software technologies and heightened efficiency. The emergence of a multitude of applications by enterprises leveraging this foundation is anticipated.

Despite the sanguine development prospects for edge intelligence, it confronts a plethora of challenges. The decentralized nature of scenarios and proximity to service sites necessitates elevated standards from vendors in terms of delivery, deployment, and O&M. Fragmented and personalized demands in service operations pose challenges for achieving low-cost, standardized product replication.

3.2 Product definition

AISWare AI² Edge Intelligence is a vital component of AsiaInfo Technologies' Cloud-Network-Edge-End product ecosystem. At its core lies an integrated hardware and software edge intelligence device, combining AI, IoT, cloud-network-edge-end collaboration technologies, and deep integration with industry core service scenarios. This product empowers various industries, including communications, energy, and transportation, facilitating enterprises in cost reduction and efficiency improvement.

3.3 Product positioning

AISWare AI² Edge Intelligence is a crucial element within AsiaInfo Technologies' Cloud-Network-Edge-End product ecosystem. It offers a variety of scenarios, including cloud, edge, and cloud-network-edge-end combinations, to meet the diverse requirements of different industry customers and partners concerning factors such as latency, cost, and scene complexity. Since entering the market, these products have been widely applied in scenarios such as smart campus management, intelligent school administration, risk control in financial outlets, community comprehensive governance, intelligent power plant monitoring, smart construction site supervision, intelligent IDC management, and rail transit safety supervision, significantly contributed to assisting customers in achieving digital transformation.

4 Product Architecture

The overall product architecture is as shown in the following figure:

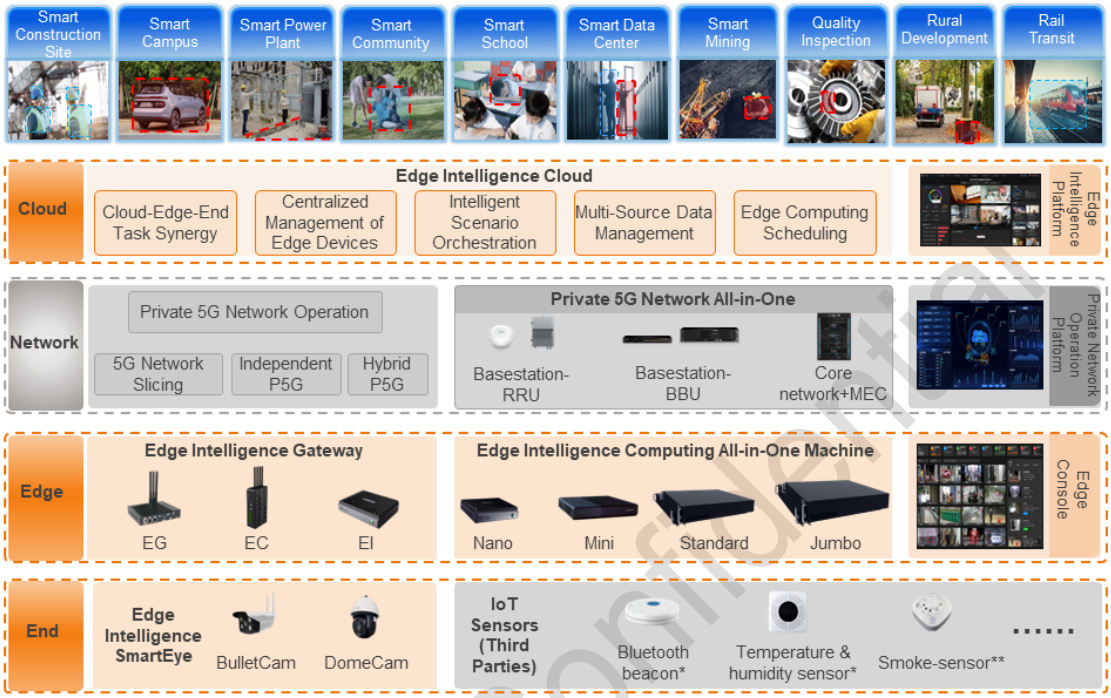

Figure 4-1 AISWare AI² Edge Intelligence Overall Architecture

On the end side, AISWare AI² Edge Intelligence SmartEye offers pre-configured algorithmic scenarios, simplifying deployment and networking solutions through intelligent capabilities at the end.

On the edge side, there are various specifications of AISWare AI² Edge Intelligence Gateway and AISWare AI² Edge Intelligence Computing All-in-One Machine, catering to diverse requirements of data acquisition, processing, computation, and AI inference in different scenarios. These devices also have the capability to control intelligent devices on the end.

On the cloud side, AISWare AI² Edge Intelligence Cloud adopts a "1 (cloud) + N (edge) + X (algorithm)" model, empowering industries with diverse and personalized solutions, with the aim to achieve goals of stackable capacity, plug-and-play capability, and configurable business orchestration. It encapsulates engineering capabilities for AI technologies and industry empowerment.

5 Basic Functions

The basic functions are shown in the table below:

Table 5-1 Basic Functionality Checklist

Product	Functional Module	Function Description
AISWare AI² Edge Intelligence Cloud	Device Management	Centralized management of end devices, including: physical model, log management, alarm management, command issuance, operational statistics, grouping, and labeling.
	Cloud-Edge Collaboration Management	Support for collaborative operations between the cloud and edge nodes, including: cloud-edge task collaboration, data collaboration, edge node management, and edge application management.
	Cloud Service Management	Support for cloud-based edge intelligence service management, including: scene monitoring, task scheduling, algorithm management, and management of person/vehicle recognition libraries.
	Terminal Device Management	Support for connecting terminal devices, including: data collection configuration, video stream configuration, device registration, protocol adaptation, and SDK and certificate management.
	Data Management	Support for centralized storage and analysis of data from connected devices.
	Operation Management	Including operational dashboards, tenant management, role management, and user management.
	Data Openness	Support for opening platform-received events, video streams, device data, and analysis results through data subscription.
AISWare AI² Edge Intelligence Computing	Edge Intelligence Nano	Low-power, fanless, wide-temperature, compact version capable of analyzing AI inferences for 8 video streams, with built-in edge console and edge model library, supporting a maximum of 2 concurrent models.

Product	Functional Module	Function Description
All-in-One Machine	Edge Intelligence Mini	Medium-sized version suitable for wall mounting, capable of analyzing AI inferences for 24 video streams, with built-in edge console and edge model library, supporting a maximum of 6 concurrent models.
	Edge Intelligence Standard	Standard 2U device version installed in edge machine rooms, capable of analyzing AI inferences for 48 video streams, with built-in edge console and edge model library, supporting a maximum of 12 concurrent models.
	Edge Intelligence Jumbo	Standard 2U high-performance device version installed in edge machine rooms, capable of analyzing AI inferences for 128 video streams, with built-in edge console and edge model library, supporting a maximum of 32 concurrent models.
AISWare AI² Edge Intelligence Gateway	Edge Intelligence Gateway-EG	Version for data collection from IoT devices.
	Edge Intelligence Gateway-EC	Version for IoT edge computing, capable of running edge computing applications, and supporting collaborative task management between cloud and edge.
	Edge Intelligence Gateway-EI	Version for IoT edge computing + AI inference, capable of running edge computing applications and 2 AI models, supporting collaborative task management between cloud and edge.
AISWare AI² Edge Intelligence SmartEye	BulletCam	Product for deployment on the edge, capable of pre-installing 3 AI algorithms, directly performing AI recognition.
	DomeCam	Product for deployment on the edge, capable of pre-installing 5 AI algorithms, directly performing AI recognition, and supporting intelligent patrol.

6 Featured Functions

Rich Algorithms Empowering Core Industry Scenarios

Tailoring to the unique characteristics of various industries, AISWare AI² Edge Intelligence is pre-equipped with algorithm models designed for general security, safety production, and efficiency enhancement scenarios. Additionally, these products provide the flexibility to customize and develop industry-specific models according to the specific needs of each sector, addressing the differentiation and personalization requirements across diverse industries.

Figure 6-1 Rich Pre-set Models

Cloud-Edge Collaboration Empowering Lean Operations for Enterprises

AISWare AI² Edge Intelligence Cloud offers comprehensive cloud-edge collaboration capabilities, centralizing the management of AISWare AI² Edge Intelligence Computing All-in-One Machine, AISWare AI² Edge Intelligence Gateway, AISWare AI² Edge Intelligence SmartEye, and intelligent terminal devices. It provides multidimensional collaboration capabilities, including data collaboration, application management collaboration, and service collaboration.

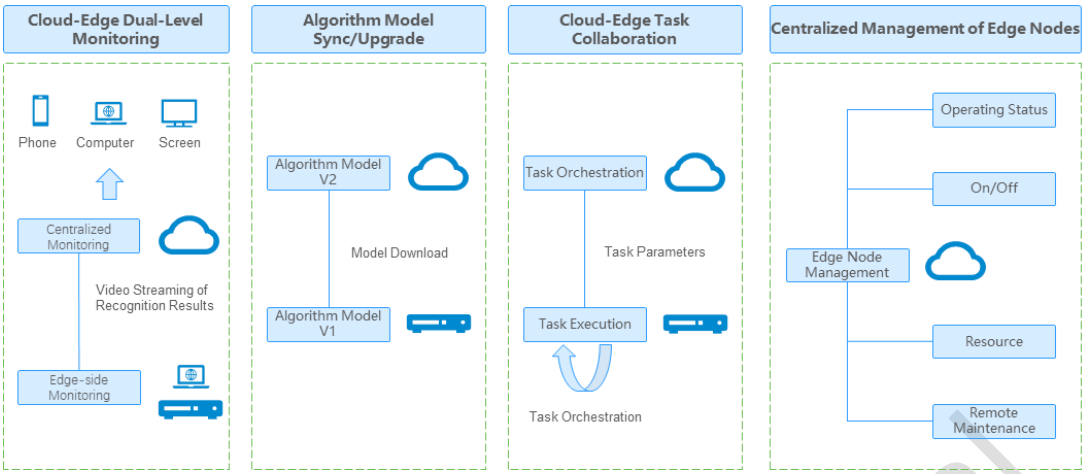

Figure 6-2 Robust Cloud-Edge Collaboration Capabilities

Standard Products with Plug-and-Play Open Integration

AISWare AI² Edge Intelligence offers high-performance and multi-specification integrated devices with pre-set industry templates for immediate use and minimal maintenance. These devices can be seamlessly integrated with third-party systems through the invocation of standard API interfaces, providing access to real-time video, alarms, statistical analysis data, and other information.

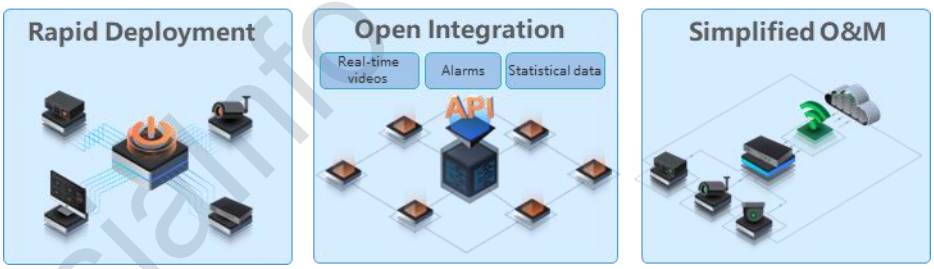

Figure 6-3 Open Integration with out-of-box

Integrated Software and Hardware Empowering Stability, Efficiency, and Security

The performance and stability of end-to-end processing for intelligent analysis tasks are maximized through the seamless integration of edge intelligence software with hardware. With the same hardware configuration, AISWare AI² Edge Intelligence Computing All-in-One Machine operates more efficiently and stably.

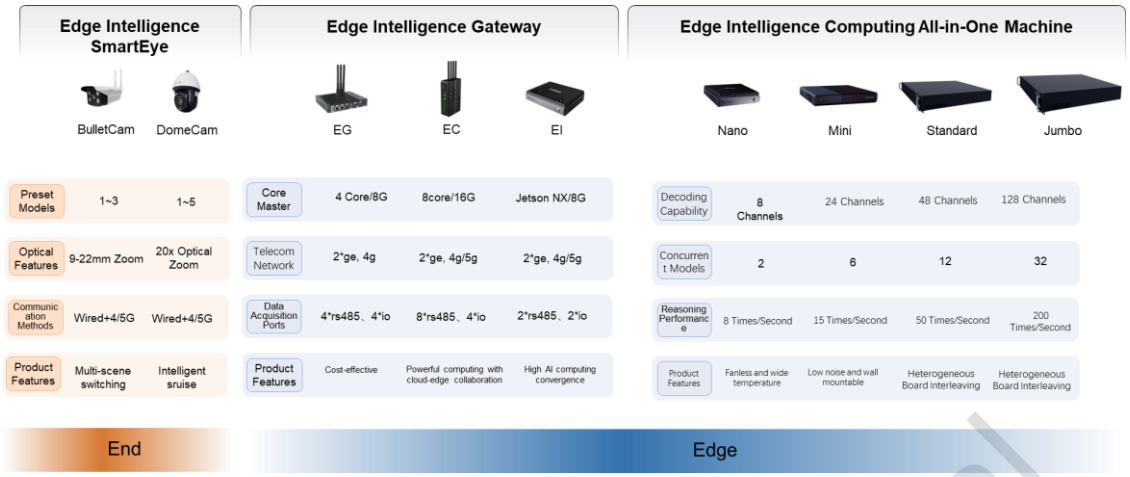

Figure 6-4 Integrated Software and Hardware Product Specifications

7 Unique Advantages

Compared to other similar products, the primary advantages of AISWare AI² Edge Intelligence lies in the comprehensive sensing capabilities, all-encompassing collaborative capabilities, and exceptional efficiency.

7.1 Ubiquitous Intelligence

AISWare AI² Edge Intelligence possesses rich capabilities for industry-specific intelligent scenarios:

- Multiple-source perception terminal access: Integrating sensors and intelligent terminals using standard/non-standard protocols from various global manufacturers
- Multi-dimensional perception data fusion: Supporting intelligent scenarios that fuse data from various dimensions, such as visual perception, communication perception, thermal sensing, and ranging
- Focus on industry-specific scenarios: Providing specialized scenario models for industries such as communications, energy, and government affairs

7.2 Comprehensive Collaboration

AISWare AI² Edge Intelligence offers comprehensive cloud-network-edge-end collaboration capabilities:

- Full-Stack Edge Intelligent Products: Providing a full-stack product covering cloud, network, edge, and end, forming a closed-loop solution
- Diverse network connection methods: Meeting flexible networking requirements to deliver AI capabilities to the edge scenarios required by industries
- Support for integrating third-party products: Compatible with mainstream cameras and IoT device protocols, non-invasively empowering existing video networks and IoT systems

7.3 Ultimate Efficiency

AISWare AI² Edge Intelligence provides highly efficient AI integrated products:

- High efficiency: Benchmarking international standards and offering hardware-software integrated products that lead in performance across hardware configuration, operational efficiency, and communication performance
- Simplified O&M: Creating a minimalist delivery and operational capability with rapid deployment and out-of-the-box functionality while reducing after-sales costs
- Stable operation: Meeting demands of complex service environments and ensuring long-term, fault-free operation

8 Scenario Solutions

AISWare AI² Edge Intelligence is applied in various industries such as construction sites, campuses, power plants, schools, and transportations. The following are exemplary solutions tailored for various scenarios.

8.1 Smart Construction Site

AISWare AI² Edge Intelligence Computing All-in-One Machine and SmartEye are applied across various construction sites, annually saving enterprises in labor costs, reducing the time for identifying risks to seconds, proactively preventing major risks, and effectively avoiding the occurrence of safety incidents.

8.1.1 Application Scenarios

AISWare AI² Edge Intelligence Computing All-in-One Machine is widely used in various service scenarios at construction sites, such as safety accident early warning, personnel access management, epidemic prevention management, standardized operation management, and material supervision.

8.1.2 Service Requirements

The traditional construction site supervision model faces challenges such as difficult personnel management, complex hazards, high supervision investment, and poor safety awareness. Intelligent measures are essential to strengthen safety protection management at construction sites, standardize operation processes, reduce safety risks, ensure project quality, and improve operational efficiency.

- Difficult personnel management: The instability of construction personnel and frequent discrepancies between reported and actual worker information, as well as a lack of effective management for the substantial flow of people entering and exiting the site which poses heightened risk of accidents

- Multiple hazards: Risks of electric shock, collapse, mechanical accidents, and falls from height
- Large investment in environmental supervision: Difficulty in supervising indicators related to environmental protection, such as dust control and mud removal for urban construction
- Safety awareness issues: Diverse workforce with varying levels of qualifications and inadequate safety awareness

8.1.3 Solution

Optimizing intelligent cameras' algorithm for the complex scenarios at construction sites to achieve cost-effectiveness with streamlined deployment, facilitating parallel processing of multiple algorithms with switchable capabilities. Uploading results of intelligent cameras and edge devices to the cloud for centralized monitoring, thereby enabling comprehensive cloud-edge-end collaboration.

Figure 8-1 Empowering Smart Construction Sites

8.2 Smart Campus

AISWare AI² Edge Intelligence Computing All-in-One Machine furnishes campuses with collaborative management capabilities spanning end, edge, and cloud, facilitating an end-to-end service process coverage from discovery to warning, thereby enabling intelligent management for campuses.

8.2.1 Application Scenarios

AISWare AI² Edge Intelligence Computing All-in-One Machine is widely deployed in various campus management scenarios, including comprehensive security, fire safety, facility management, convenient passage, and canteen hygiene.

8.2.2 Service Requirements

Campuses serve as fundamental units within cities and are crucial focal points for urban intelligence. Traditional park construction involves a plethora of cameras, yet dependence on manual monitoring or periodic patrols for issue detection results in inefficiency and high labor costs.

- Manual monitoring and patrols reliance: Active monitoring by security personnel and periodic patrols
- Untimely discovery of crucial facility failures: Identification of equipment failures only after customer complaints
- Inability to detect fire hazards promptly: Sudden fires, blocked fire exits, and violations of smoking regulations
- Passive management of personnel and vehicles: Dealing with unauthorized parking and gatherings after disputes occur

8.2.3 Solution

The solution, anchored by AISWare AI² Edge Intelligence Computing All-in-One Machine, empowers campus monitoring and management with AI to achieve visual, digital, and intelligent campus management, comprehensively elevating management levels and service capabilities while reducing labor costs.

Figure 8-2 Empowering Smart Campuses

8.3 Smart Power Plant

AISWare AI² Edge Intelligence Computing All-in-One Machine infuses AI into power plant monitoring and management to achieve unattended and intelligent management at booster stations, comprehensively enhancing the management level and service capabilities of power plant campuses while reducing labor costs.

8.3.1 Application Scenarios

AISWare AI² Edge Intelligence Computing All-in-One Machine is extensively utilized in various smart power plant scenarios, including unattended booster stations, PV power generation monitoring, and centralized monitoring of maintenance centers.

8.3.2 Service Requirements

Although traditional power plant construction incorporates numerous cameras, it still relies on manual issue discovery. Cameras are primarily used for retrospective tracing and failed to provide timely warnings. Additionally, booster stations, power generation units, and other facilities are widely distributed and located in remote areas with poor network environments, resulting in heavy reliance on 24/7 shift duty and regular personnel inspections.

- 24/7 duty reliance: Human monitoring of video, booster stations, and security facilities depends on personnel's day and night shifts and patrols
- Daily maintenance depends on manual labor: Hidden dangers in power generation facilities cannot be actively discovered, relying on personnel patrols or repairs after faults occur
- Serious fire hazards: Power generation facilities are more prone to sudden fires, while firefighting issues cannot be discovered in a timely manner
- Remote locations of power generation facilities: Wind and solar power facilities are located in remote areas with poor network conditions, severely affecting centralized monitoring effectiveness

8.3.3 Solution

The solution encompasses various power plant scenarios, including thermal power generation, wind power fields, PV power stations, etc. Leveraging AI-based online real-time analysis to achieve visual safety production supervision. It supports online expansion for various identification needs, helping power plants enhance operational management capabilities, prevent safety accidents, and reduce labor costs.

Figure 8-3 Empowering Smart Power Plants

9 Use Cases

AISWare AI² Edge Intelligence has demonstrated its value in multiple industry projects, aiding customers in achieving cost reduction and efficiency improvement goals.

9.1 Smart Campus: AI Video Security in a Technology Park

Situated in Beijing's Zhongguancun Science City, the campus covers an area of approximately 500,000 square meters with a vision to become a global hub for hard technology (AI) innovation. The park plans to leverage information technology to build a smart campus, focusing on enhancing operational efficiency and adding value to services.

9.1.1 Customer Requirements

The customer aimed to introduce intelligent monitoring capabilities into the current smart campus to implement AI video surveillance for two plots at Zhongguancun No.1, Zone 22 and Zone 20, encompassing 100 cameras. The goal was to enable analysis of pedestrian flow, intrusion detection, and violation monitoring, covering key monitoring points in the park to enhance overall smart campus surveillance capabilities.

9.1.2 Deployment Solutions and Outcomes

AsiaInfo's Smart Campus solution empowered the park with AI technology, achieving visual, digital, and intelligent management. This implementation significantly improved campus management and service capabilities, thereby enhancing daily operational support and establishing a more intelligent and secure campus environment.

AsiaInfo's Smart Campus Solution Achievements:

- AI + Security: Detection of perimeter intrusion, crisis recognition in critical areas, and identification of potential risks.

- AI + Passage: Deployment of personnel monitoring, staff management, and attention to key individuals.
- AI + Operations: Management of equipment and items, parking lot management, and monitoring of electric vehicle entry.

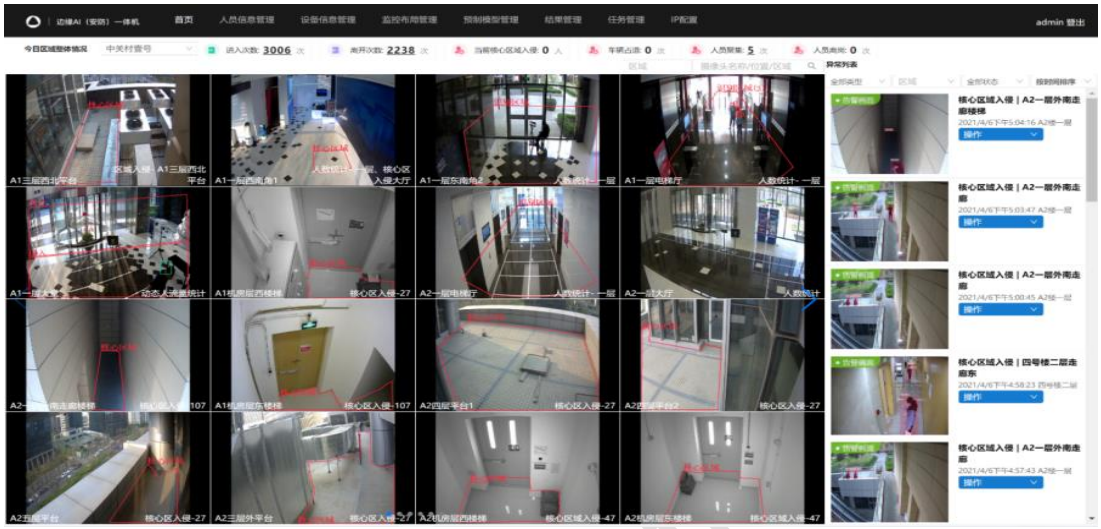

Figure 9-1 Smart Campus AI Video Security

9.2 Smart Power Plant: Unmanned Substation in a Renewable Energy Power Plant

This renewable energy generation company specializes in the investment, development, construction, and O&M of wind power projects, committed to environmental protection and energy conservation. The company holds a leading position in the industry in terms of its independent development and construction capabilities, profitability, and development speed in wind power business, achieving industry-leading performance in metrics such as approved capacity additions, newly operational capacity, cost per kilowatt-hour, and profit per kilowatt-hour. This project primarily focuses on the unmanned requirements of the wind power substation.

9.2.1 Customer Requirements

The company owns numerous wind power substations distributed in remote areas, responsible for transmitting the electricity generated by wind turbines to the grid for long-distance transportation. These substations are widely

distributed and remote, relying on personnel for 24/7 shifts and regular inspections. Currently, the substation is actively working towards achieving reduced or even unmanned operation, eliminating the need for on-duty personnel in the future and opting instead for centralized remote surveillance of substation security through cameras. AI monitoring is sought for fire incidents, substation gates, fences, core areas, and identification of unfamiliar individuals.

- The existing monitoring network is primarily based on Dahua and has already been integrated with 22 provincial control centers and 9,670 video cameras across 329 substations. Consequently, it is imperative to implement AI capabilities without disrupting the current deployment of the monitoring network
- The need to achieve intelligent analysis and early warning/alerts for various operational security scenarios in the substations, including fire incidents, substation gates, fences, and core areas

9.2.2 Deployment Solutions and Outcomes

Through the deployment of AISWare AI² Edge Intelligence Computing All-in-One Machine at the substation, a distributed AI video capability platform was established, enabling the rapid implementation of unmanned substations, daily security monitoring, and analysis of behaviors such as wind power maintenance operations. The solution effectively reduced costs, enhanced operational efficiency, improved employee work efficiency, and provided security supervision. Additionally, the solution supports the future expansion of AI video recognition algorithm scenarios.

Smart Power Plant Solution Achievements:

- Real-time video stream access: Connecting video streams from substations to the local AISWare AI² Edge Intelligence Computing All-in-One Machine
- Warning messages/images: Alerts generated by the AI integrated device, including 15 seconds of pre and post-event video, are uploaded through

the three-tier network to headquarters, where regional companies can view warning information according to their permissions

- Algorithm Deployment: The headquarters takes responsibility for the centralized management and control of AI video recognition algorithms, allowing the issuance and updating of standard AI recognition algorithms to the edge intelligence integrated devices deployed at the substations

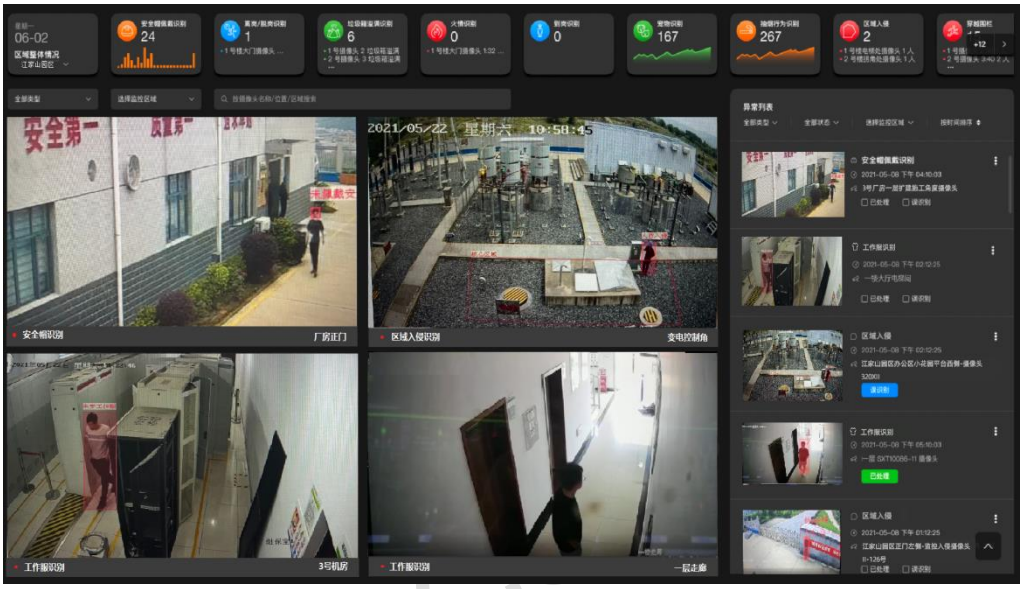

Figure 9-2 Unmanned Operation at the Substation

10 Certificates and Awards

Figure 10-1 Certificates and Awards

11 Contact Us

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