White Paper of

AsiaInfo AISWare AgileNet V3.0

AISWare AgileNet, designed by AsiaInfo Technologies, is a product portfolio of P5G with secure, reliable, and extreme-performance towards the modernization of network architecture for verticals, along with the full-stack solutions of digital intelligence on top of the network architecture.

Disclaimer Statement

AsiaInfo Technologies (China), Inc., hereinafter as "AsiaInfo Technologies" or “AsiaInfo”, exclusively owns all intellectual property rights, including but not limited to copyrights, trademarks, and patents, as well as technical secrets related to the Product and its derivatives, along with all related documentation, including all information within this document and any attachments.

The information within this document is confidential and intended solely for use by the recipient(s) designated by the user. Without prior written permission from AsiaInfo Technologies, any user of this document shall not take any actions with respect to this Product or the information contained herein to any third party, including but not limited to managers, employees, and affiliates other than the designated recipients. The aforementioned actions encompass but are not limited to developing, updating, compiling and decompiling, assembling, lending, transferring, selling, disclosing, authorizing, distributing, or any other actions. Nor shall any such third party be permitted to use the Product and the information in this document for any purpose whatsoever.

Without prior written permission from AsiaInfo Technologies, users shall not copy, modify, or distribute this document for any purpose. Altering, removing, or damaging any trademarks used in this document is strictly prohibited.

This document is provided as original, and AsiaInfo Technologies makes no warranties regarding the correctness, accuracy, reliability, or any other aspect of this document or its consequences after use. All information in this document is subject to further modification without prior notice, and AsiaInfo Technologies disclaims any responsibility for errors or inaccuracies that may be present in this document.

AsiaInfo Technologies shall not be held responsible for any and all types of liabilities, infringements, or damages resulting from the use of the Product or the information within this document. This exclusion of liability encompasses all forms of damages, including but not limited to direct, indirect, incidental, special, or punitive damages, regardless of whether AsiaInfo Technologies was notified of the possibility of such damages beforehand. The exclusion of liability applies to all forms of legal claims, including those arising from negligence or other torts.

AsiaInfo Technologies' products may include third-party software. Please refer to the copyright statements in the third-party software documentation for details.

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.

Certificates (Part)

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

The Best Standard Contributor of TM Forum

The Most Innovative Application of AI & Automation of FutureNet Asia

The Most Influential Enterprise in China Software Industry

Top 100 China Software Business Revenue List for consecutive years

Contents

1 Executive Summary

According to GSMA, “P5G refers to a network architecture exclusively used by devices authorized by the end-user organization. Typically, this architecture is deployed at one or more specific locations owned or occupied by the end-user organization. Devices on public networks cannot access or operate on the private network without specific authorization.” In simple terms, it refers to a 5G network that exclusively serves a specific organization or enterprise. In the 3GPP standard, these networks are referred to as NPN (Non-Public Network).

P5G is in contrast to the operator's public network, and its fundamental objective is to upgrade the communication architecture for enterprises (including government and other organizational units), driving a new wave of digital transformation.

This white paper introduces AsiaInfo's proprietary products in the P5G field, including 5G Base Station, 5G Core Network, 5G Multi-access Edge Computing (MEC), Intelligent Link Product (iLink), and P5G Operation Platform,. It analyzes the advantageous characteristics of each product and their corresponding value, describes typical application scenarios for P5G, and provides an in-depth analysis of P5G deployment by incorporating real customer application cases.

2 Abbreviations and Terms

Table 2-1 Term explanation

Abbreviation or Term	Full Name
5GC	5G Core Network
MEC	Multi-access Edge Computing
MEP	MEC Platform
UOMC	Unified Operation and Maintenance Center

Abbreviation or Term	Full Name
AMF	Access and Mobility management Function
SMF	Session Management Function
UPF	User Plane Function
UDM	Unified Data Management
PCF	Policy Control Function
AUSF	Authentication Server Function
NSSF	Network Slice Selection Function
N3IWF	Non-3GPP InterWorking Function
gNB	Next Generation NodeB
BBU	Baseband unit
EU	Extention Unit
pRRU	pico Remote Radio Unit
RedCap	Reduced Capability
SD-WAN	Software Defined WAN
SRS	Sounding reference signal
MOCN	Multi-Operator Core Network
VoNR	Voice over NR
TSN	Time Sensitive Network

Abbreviation or Term	Full Name
PDU	Protocol Data Unit
SSC	Session and Service Continuity
NFV	Network Function Virtualization
SLA	Service-Level Agreement
SPV	Single Point Vulnerability
AGV	Automated Guided Vehicle
DPDK	Data Plane Development Kit
DNS	Domain Name System

3 Product Overview

3.1 Trends and challenges

At present, 31 countries/regions globally have introduced or planned local 5G spectrum policies to drive the P5G development. Taking Germany as an example, numerous industrial giants such as Audi, BMW, Siemens, Bosch, BASF, and others have applied for and constructed their own 5G networks.

Currently, the internal communication of enterprises primarily relies on wired and Wi-Fi networks. However, facing the rapidly evolving demands of digitization, these networks are experiencing increasing pressure and beginning to show limitations. The surge in high-definition video content, the introduction of mobile devices such as robots and drones, the requirements of ultra-low latency applications, and the development of tens of thousands of IoT devices pose new challenges for enterprise connectivity. Wired networks lack flexibility with high expansion costs, while Wi-Fi networks face issues related to coverage, continuity, and reliability.

5G networks were designed from the outset to cater to a diverse range of customers and application scenarios, including end consumers and vertical industries. P5G leverages the advantages of 5G to provide higher bandwidth, lower latency, and ultra-high reliability while maintaining flexibility. This addresses the shortcomings of wired and Wi-Fi networks.

3.2 Product definition

AISWare AgileNet is an All-in-One product portfolio of AsiaInfo Technologies including 5G Base Station, 5G Core Network, 5G Multi-access Edge Computing (MEC), Intelligent Link Product (iLink), and P5G Operation Platform, with which AsiaInfo provide multi-scenario solutions for verticals along with end-to-end and full-stack services of P5G planning, design, deployment, operation, maintenance and integration for vertical customers.

3.3 Product positioning

AISWare AgileNet, designed by AsiaInfo Technologies, is a product portfolio of private 5G with secure, reliable, and extreme-performance towards the modernization of network architecture for verticals, along with the full-stack solutions of digital intelligence on top of the network architecture.

4 Product Portfolio

Figure 4-1 presents the overall architecture of AsiaInfo's P5G system, including the following products:

- AISWare AgileNet-CN: P5G core network product implements a lightweight 5GC and an IMS to support VoNR services, enabling audio and video communication within and outside the private network
- AISWare AgileNet-RAN: P5G radio network product provides radio access network for industry-specific networks, including Extension Pico base station and All-in-One base station for comprehensive coverage
- AISWare AgileNet-MEC: Edge-computing platform product implements the management of Multi-access Edge Computing (MEC), edge applications, and services, and opening up network capabilities
- AISWare AgileNet-OM: P5G operation platform facilitates the operation, maintenance, and capability opening of private network products to reduce the complexity of industry customers utilizing private networks
- AISWare iLinkS: iLink switching product achieves intelligent interconnection within the private network from the radio network to the core network, reducing network configuration and operational complexity
- AISWare iLinkG: iLink gateway product achieves secure, flexible, and interconnected networks between private networks to reduce the operational costs and complexity of specialized lines

Figure 4-1 The overall architecture diagram of the product system

5 Basic Functions

5.1 Core Network

AISWare AgileNet-CN provides the following network entities:

- AMF: Access and Mobility Function
- SMF: Session Management Function
- UDM: Unified Data Management
- AUSF: Authentication Server Function
- NSSF: Network Slice Selection Function
- PCF: Policy Control Function
- UPF: User Plane Function

AISWare AgileNet-CN product is built upon the 5G standard determined by the 3rd Generation Partnership Project (3GPP) and customized to meet the needs of industry customers, forming a lightweight 5G core network with sufficient function, stable performance, convenient deployment, and on-demand customization.

5.1.1 Control plane network elements

In the space of 3GPP standards, a multitude of 5GC control plane network elements have been defined to cater to the diverse requirements of various network scenarios within the public 5G network framework. However, the advent of P5G introduces a context where network requirements are notably simpler. Unnecessary network elements can pose challenges such as increased resource consumption and intricate deployment processes, arising a pressing need of streamlining and merging network elements. Figure 5-1 illustrates the streamlining solution implemented by AISWare AgileNet-CN.

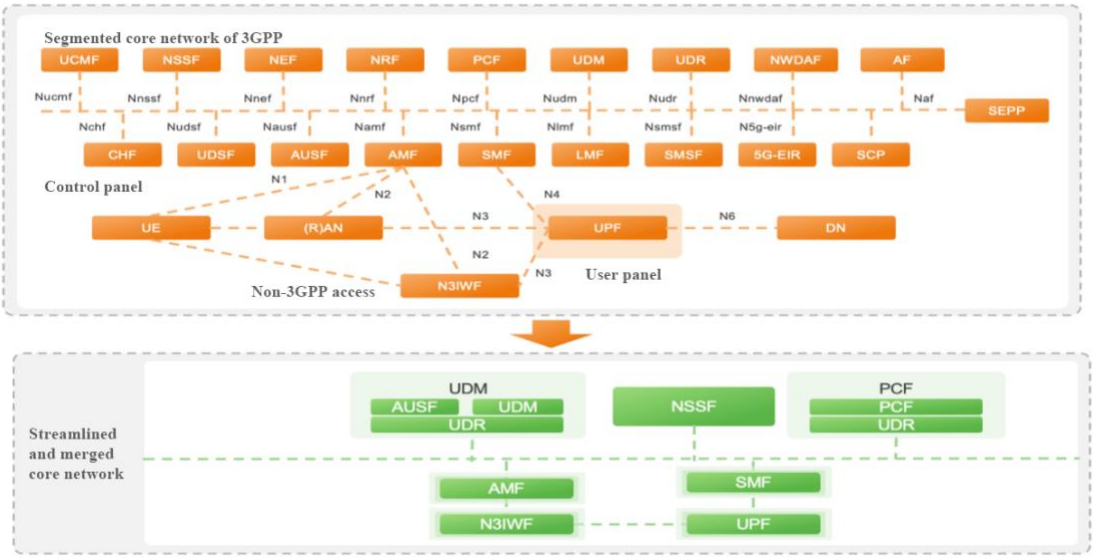


Figure 5-1 Core Network Simplification and Consolidation

The functions of AsiaInfo 5GC control plane network elements are as shown in the table below:

Table 5-1 Functions of Control Plane Network Elements

AsiaInfo 5GC Network Elements	Corresponding 3GPP Network Elements	Function Description
AMF	AMF	Responsible for User Equipment (UE) registration, connection, access authentication and authorization, mobility and reachability management.

AsiaInfo 5GC Network Elements	Corresponding 3GPP Network Elements	Function Description
		Facilitating the transmission of Session Management (SM) messages between UE and SMF.
SMF	SMF	Supporting the interaction with the separated data plane, formulating policies and flow templates based on its configuration or interaction with PCF, and selecting and controlling UPF and SSC modes for sessions. Managing the establishment, updating, and release of sessions, and maintaining Protocol Data Unit (PDU) session state, group management, and controlling and coordinating UPF for billing data collection and traffic control, etc. Responsible for the management of IP allocation in UE with capabilities including DHCP, ARP proxy, or IPv6 Neighbor Discovery proxy functions.
UDM	AUSF&UDM& UDR	Storing and managing user data and configuration files. The UDM incorporates UDR and AUSF, enabling access authentication for both 3GPP and non-3GPP UE.
PCF	PCF&UDR	Responsible for user policy management and implementation, including session policies and mobility policies. The Policy Control Function (PCF) incorporates User Data Repository (UDR).
NSSF	NSSF	Determining the specific network slicing service to offer to the UE based on the provided NSSAI or S-NSSAI during network entry, and subsequently deciding the specific AMF which providing access services for that UE.

5.1.2 User plane network elements

UPF serves as the user plane network entity in 5G Core Network. Public network UPF, with its complex features and high cost, may not be conducive for applications in vertical industries. Functions such as content billing and roaming are unnecessary for private network and should be streamlined, in which P5G industry requires a low-cost and lightweight UPF.

Additionally, apart from emphasizing lightweight and cost-effective, private network UPF is also required to accommodate essential customized network element functionalities, such as frame routing, Ethernet sessions, and 5G LAN, to meet unique and personalized application requirements from diverse verticals.

The functions of AsiaInfo's UPF are outlined in the table below:

Table 5-2 Function of User Plane Network Entity

AsiaInfo 5GC Network Elements	Corresponding 3GPP Network Elements	Function Description
UPF	UPF	Responding to SMF requests, UPF serves as an interconnection point between RAN and DN, as well as a PDU session anchor, and is responsible for network user plane processes, such as encapsulating and decapsulating the GTP-U protocol on the user plane, as well as handling packet routing, forwarding, packet inspection, and QoS flow mapping. Executing the implementation of policy rules for the user plane, including functions such as internal control, redirection, and traffic steering.

5.1.3 Core Network OMC

Unified Operation and Maintenance Center for Core Network (UOMC-C) serves as a centralized management center for end-to-end core network equipment, providing a unified web interface for the operational and management needs of 5G core networks, IMS core networks, and edge computing platforms. Additionally, it offers northbound interfaces to integrate with higher-level network

management systems, meeting the unified operation and maintenance requirements for private networks.

On the southbound side, UOMC-C interfaces with core network control plane and user plane elements, providing functionalities such as access, configuration, performance monitoring, alarm management, resource allocation, topology querying, security, logging, backup and recovery, signaling tracing, and more. It also interfaces with edge computing platforms to offer capabilities for access, configuration, application management, and rule management. The northbound interfaces adhere to standardized interfaces, enabling integration with higher-level network management systems to meet northbound FCAPS data collection requirements.

For the northbound side, UOMC-C integrates with higher-level OSS network management or private network operation platforms to address private network operational management FCAPS/SLA monitoring requirements. It also integrates with enterprise platforms through open API interfaces to fulfill enterprise performance monitoring and network operation needs.

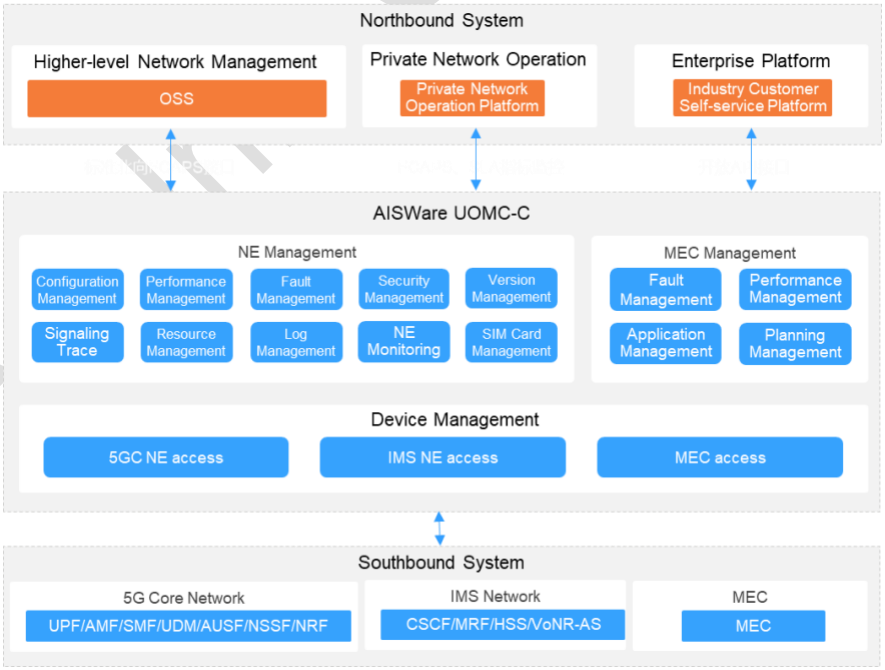


Figure 5-2 UOMC-C Architecture

5.2 Radio Access Network

AISWare AgileNet-RAN product is developed based on the 3GPP R16 standard. P5G RAN product comprises Extension Pico Base Station and All-in-One Base Station, catering to various deployment scenarios of indoor or outdoor environments.

5.2.1 Extension Pico Base Station

AsiaInfo Technologies Extension Pico Base Station comprises three main components: the Baseband Unit (BBU), the Extension Unit (EU), and the Remote Radio Unit (pRRU).

Extension Pico Base Station is a compact and low-power indoor digital distributed base station designed to provide 5G mobile communication signal coverage in indoor scenarios. The product's network configuration is highly flexible, suitable for indoor environments such as manufacturing plants, logistics warehouses, hospitals, office buildings, and transportation stations. It caters to various application scenarios, including video transmission, industrial control, sensor data transmission, and mobile office. The product supports multiple 5G frequency bands, allowing for selection based on the radio environment on-site.

As illustrated in Figure 5-3, the architecture of Extension Pico Base Station comprises 3 primary units:

- Remote Radio Unit (pRRU): Responsible for amplifying and processing radio frequency signals
- Extension Unit (EU): Responsible for extending and remotely deploying multiple pRRUs
- Baseband Processing Unit (BBU): Responsible for processing baseband signals for communication transmission

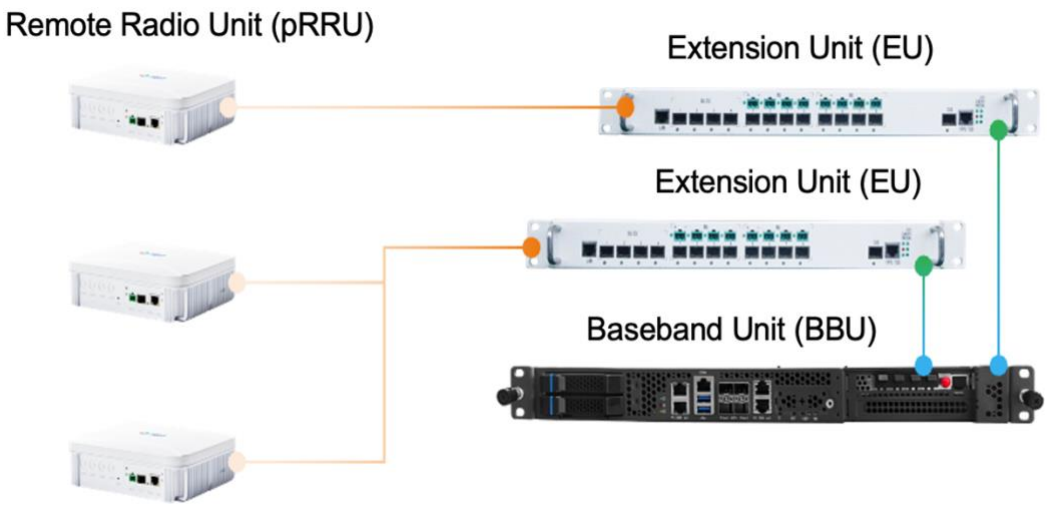


Figure 5-3 P5G Extension Pico Base Station

Features of Extension Pico Base Station:

- Multi-Frequency Bands: Supporting various P5G frequency bands (2.6GHz, 3.3GHz, 3.5GHz and 4.9GHz).
- High Performance: High transmission rates, large user capacity, and low service latency.
- High Uplink Capacity: Supporting various TDD frame structures to enable high uplink speeds.
- Bluetooth Positioning: Supporting integration with Bluetooth beacons for Bluetooth terminal positioning.
- Network Slicing: Supporting multiple service radio network slices to facilitate radio resource allocation.

Key Performance Indicators of Extension Pico Base Station:

Table 5-3 pRRU Performance Indicators

No.	Parameter	Specification
1	Frequency band	N41: 2515～2675MHz

		N78：3300~3600MHz N79：4800~4960MHz
2	OBW	N41/N79:160MHz N78:300MHz
3	IBW	60M/100M
4	RF channel count	4T4R
5	Output power	4*0.25W
6	Error vector magnitude	256QAM:<3.5%
7	Frequency error	≤0.01ppm
8	ACLR	≤-45dBc
9	Spurious emission	Complies with 3GPP standards
10	Receiver sensitivity	Complies with 3GPP standards
11	Blocking	Complies with 3GPP standards
12	Antenna interface	Built-in antenna or external antenna (SMA-F)
13	Power supply method	Powered by optoelectronic composite cable, with a distance of ≥200m
14	Power consumption	≤35W
15	Operating temperature	-5～+55℃
16	Operating humidity	5%～95%
17	Protection level	IP31
18	Weight	≤2.5kg

19	Product dimensions	219mmX174.5mmX62mm
20	Installation method	Supports wall mounting, ceiling mounting, and other installation methods

Table 5-4 EU Performance Indicators

No.	Parameter	Specification
1	Power supply capacity	8×40W, power supply capacity of 40W for each remote supply port
2	Transmit interface on the main unit/extension unit side	Main unit/extension unit side: 4×10Gbps, interface protocol eCPRI
3	Transmit interface on the remote unit side	Remote unit side: 8×10Gbps, interface protocol CPRI
4	Networking mode	Star configuration
5	Cascade capability	2 level
6	Long-distance capability	Optoelectronic composite cable, 200 meters
7	Clock synchronization	Supports clock synchronization extraction from the main unit interface Supports dual-mode operation with GPS or BD, with automatic switching function
8	Input voltage	220V AC (176V to 264V) AC power module
9	Output voltage	-48V DC (-40V to -57V) DC power module
10	Power consumption	≤55W（static）
11	Operating temperature	-20～55℃
12	Operating humidity	5% ~ 95%
13	Waterproof and dustproof rating	IP31

14	Noise requirements	＜40dBA

Table 5-5 BBU Performance Indicators

No.	Parameter	Specification
1	Size	410mm*410mm*44mm
2	Weight	Approximately 7.5kg
3	Power supply method	AC 220V/DC -48V
4	Chassis protection	Protection level IP20, suitable for indoor working environment requirements
5	Installation method	Placed in a standard equipment rack
6	Cooling method	Air-cooled cooling
7	Operating temperature	-5℃~+55℃
8	Power consumption	350W
9	Number of cells	2 cells x 4T4R

5.2.2 All-in-One base station

AsiaInfo Technologies P5G All-in-One base station, as shown in Figure 5-4, adopts an integrated design with 5G BBU and RRU to realize the complete 5G NR access function, providing users with a convenient and reliable 5G radio coverage network.

All-in-One base station has the advantages of compact structure, small size, and convenient engineering construction, especially suitable for applications in smart mines, smart campuses, and other 5G+ vertical industries. It is also applicable in suburban, rural areas, and other scenarios which require extensive 5G coverage.

Figure 5-4 P5G All-in-One Base Station

All-in-One base station features:

- Easy deployment, flexible backhaul, low power consumption, and low maintenance costs, effectively reducing construction and O&M pressures
- Excellent environmental adaptability with resistance to vibrations, salt spray, and sandstorms
- Supporting the sharing of private and public networks, and the base station can interface with multiple 5G core network (MOCN)
- Based on independently developed protocol stacks and system software, the system is stable, secure, and reliable

- Flexible clock synchronization solutions that support GPS/Beidou/1588V2

Table 5-6 All-in-One base station overall specifications

No.	Parameter	Specification
1	Overall power consumption	300W
2	Timing	GPS/BD/1588
3	External power supply voltage	AC：220V
4	Interface	1 * Gigabit Ethernet Optical Port, 1 * Gigabit Ethernet Electrical Port, 1 * Power Input Port, 1 * GPS Antenna Port, 2 * RF Main Antenna Ports
5	Indicators	Power, operation, alarm
6	Basic functions	Supporting system internal handover with NG/Xn interfaces; supporting MOCN; Supporting VONR
7	Number of cells	1
8	Connected users in connected state	200
9	Activated users	100
10	Antenna channels	2T2R
11	Transmit power	Single channel 40W
12	Downlink peak rate	300Mbps@30MHz (ideal conditions)
13	Uplink peak rate	150Mbps@30MHz (ideal conditions)
14	Operating temperature	-40~+55℃
15	Operating humidity	5%~95%

16	Dimensions (mm)	402*328*195.2 (maximum overall dimensions including connectors) 382*285*195.2 (effective dimensions)
17	Weight (kg)	18
18	Volume (L)	21

Table 5-7 All-in-One base station RF specifications

No.	Parameter	Specification
1	Operating frequency	N28（Uplink: 703~748 MHz, Downlink: 758~803MHz）
2	Duplex mode	FDD
3	Output power accuracy	-40℃~+15℃: +/-2dB +15℃~+30℃: +/-2dB +30℃~+55℃: +/-2dB
4	Carrier bandwidth	5G NR:10MHz/20MHz/30MHz
5	Subcarrier spacing	15KHz/30KHz
6	EVM	QPSK:<18.5%, 16QAM:<13.5%, 64QAM:<5%, 256QAM:<3.5%
7	ACLR	<-45dBc
8	Frequency error	<0.05ppm
9	Transmitter dynamic range	>10dB
10	In-band spurious	TS 38.104&&TS 38.141 6.6.4.2.2.1 Category B
11	Spurious emission	TS 38.104&&TS 38.141 6.6.5.2.1 Category B

12	Sensitivity	-97dBm@room temp -95dBm@over temp
13	RSSI measurement accuracy	+/-3dB@-55dBm~-77dBm

5.2.3 RAN OMC

Unified Operation and Maintenance Center for Radio Network (UOMC-R) serves as a centralized management center tailored for radio networks. It is equipped with the capability to centrally manage radio network base station equipment, offers a unified system O&M web interface to support the management of AsiaInfo Technologies Extension Pico Base Station and high-power All-in-One Base Station, and facilitates the connection and management of base stations from third-party vendors that comply with China Mobile interface specifications. Simultaneously, UOMC-R opens northbound interface for integration with higher-level network management systems, addressing the comprehensive requirements for private networks including monitoring, operation, and management.

On the southbound side, UOMC-R offers a range of functionalities for base station equipment, including access, configuration, performance monitoring, alarms, resource management, security, logs, MR measurements, and signaling tracing.

On the northbound side, UOMC-R interfaces with higher-level network management or private network operation platforms, meeting the monitoring and operational needs specified by FCAPS/SLA for private network operations. Furthermore, UOMC-R integrates with enterprise platforms, exposing API interfaces to fulfill enterprise performance monitoring and network operational requirements.

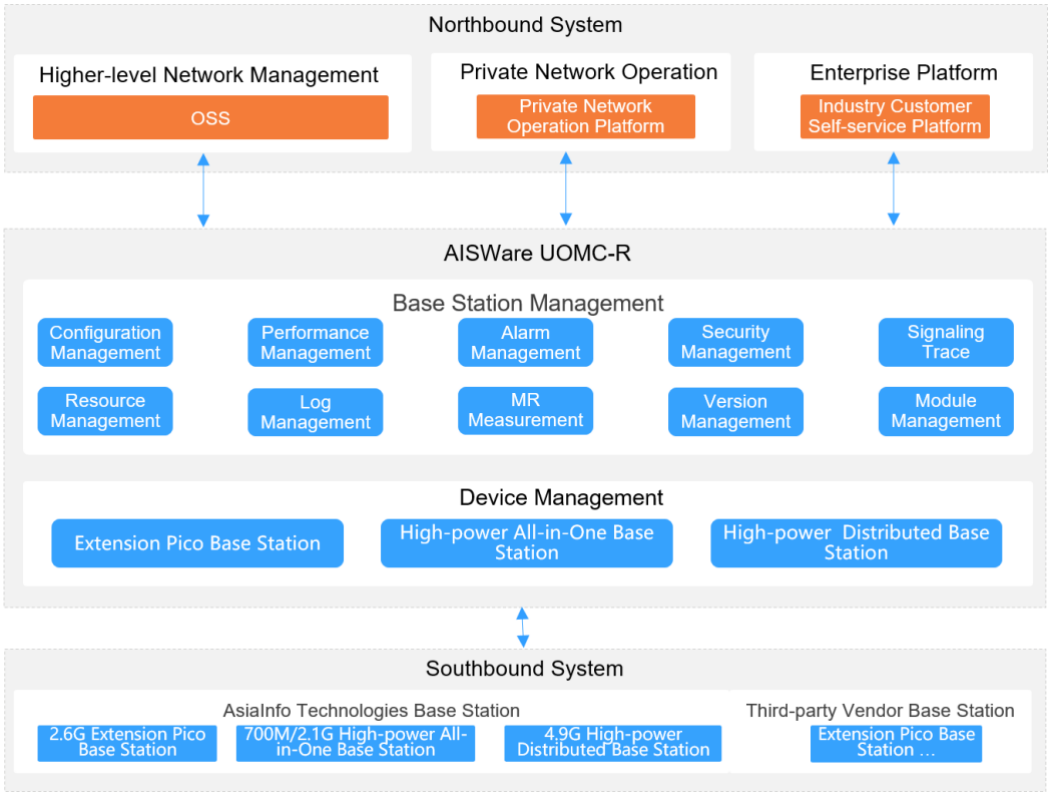


Figure 5-5 UOMC-R Architecture

5.3 Edge Computing

AISWare AgileNet-MEC product supports a fully software-based delivery model and facilitates the deployment of MEC integrated devices. AISWare AgileNet-MEC product integrates Edge IaaS, MEO, MEP, and numerous edge applications internally, supporting flexible network access capabilities within a compact footprint. Leveraging AsiaInfo Technologies self-developed Edge IoT gateway and Edge AI integrated device, Edge MEC product seamlessly incorporates AI capabilities and IoT connectivity into the overall solution. Figure 5-6 illustrate the MEC architecture of AsiaInfo Technologies product.

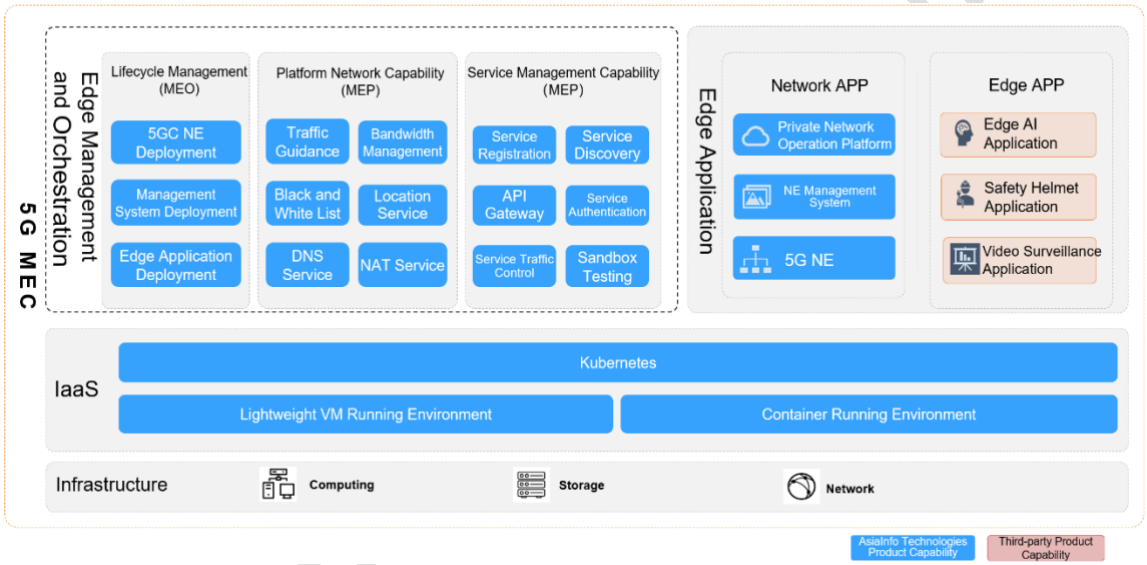


Figure 5-6 MEC Architecture

On the basis of general-purpose computing, storage, network, and acceleration hardware, AsiaInfo Technologies MEC product leverages lightweight K8S to provide IaaS capabilities, enabling the support and management of cloud-native applications.

MEP encompasses MEC application management, service management, as well as the deployment and management of traffic rules and Domain Name System (DNS) rule configuration, etc. Serving as a core capability platform, MEP also provides foundational services, including radio network information services, bandwidth management, traffic guidance, UE identification services, and location services.

5.4 Operation Platform

AISWare AgileNet-OM provides private network capabilities and offers industry customers differentiated network provisioning assurance and industry service operation capabilities. It supports vertically integrated end-to-end self-operation and intelligent operation and maintenance in a scenario-based manner, creating a model for 5G+ industry digital operations. The product provides following core functionalities:

- Centralized Resource Management: Combining device data acquisition with asset management to achieve unified management and monitoring of P5G resources, edge devices, and enterprise IT resources.
- Centralized Service Management: Offering functions such as network slicing activation management, DNN provisioning, 5G LAN group application, TSN template management, and group member subscription management, supporting the activation of P5G in various forms, as well as the activation of flexible and self-service slice networks, collaborating with edge applications capabilities to independently build and operate networks, and enabling on-demand, self-service processing of private network services with centralized, scenario-based management.
- Network Monitoring and Analysis: Achieving centralized monitoring and analysis for P5G, network slicing, and DNN networks across multiple dimensions, providing real-time reconstruction of radio, transmission, and core network topologies, offering a comprehensive overview of the network's quality, monitoring and analyzing network operations, centrally managing network faults and anomalies, and performing unified network health analysis.
- Service Monitoring and Analysis: Based on the capabilities of traditional network monitoring and analysis, focusing on end-to-end connection analysis and perception capabilities for typical ToB scenarios, utilizing terminal soft probes, network probes, and application probes to achieve end-to-end traceability and boundary analysis for service operations, and implementing quality analysis for various protocol-based services according to specific scenarios.

- Self-operation of Private Network SIM Cards: Based on the independent management of SIM cards within private network campus to achieve lifecycle management, real-time monitoring of card status, and usage monitoring for IoT cards in the campus, as well as ensuring the refinement, online operation, and scenario-based management of the cards.

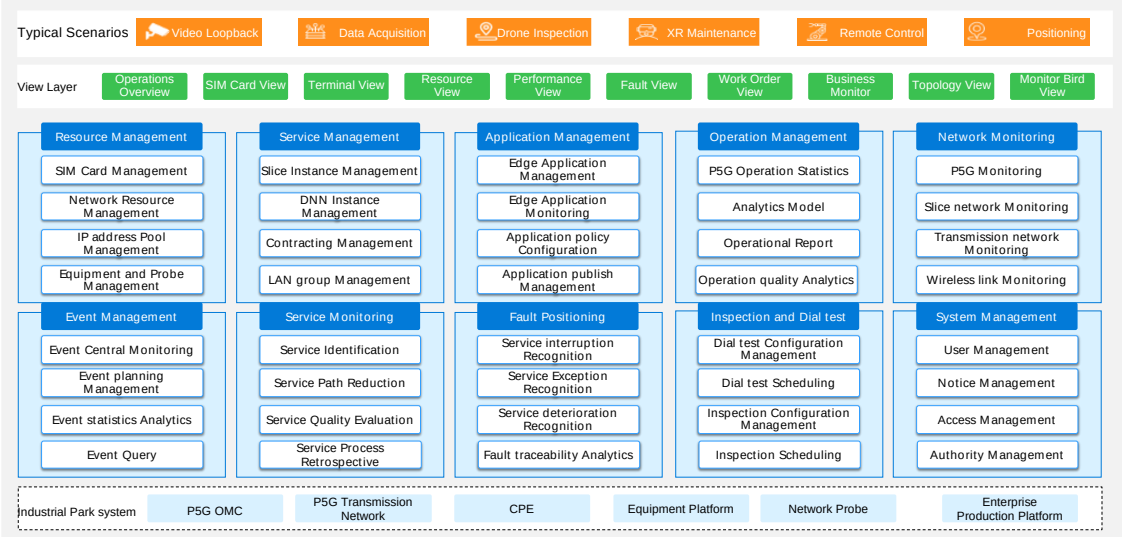


Figure 5-7 Operation Platform Architecture

5.5 Intelligent Link Product

5.5.1 Intelligent Link Switch

AISWare iLinkS, Intelligent Link Switch product includes 3 types: Standard Edition, Advanced Edition, and Professional Edition, meeting the network interconnection needs in various P5G scenarios. The main features of iLink switches are as follows:

- High Reliability: Field-replaceable modular power supplies on-site, fans supporting 2+2 backup and intelligent speed adjustment; supporting real-time monitoring of the temperature, power supply, and fan status of the chipset.
- Comprehensive Security Strategy: Supporting security controls at the user level, switch level, and network level; IPv4/IPv6 ACL can simultaneously match Layer 2, Layer 3, and Layer 4 information within a single rule.

- Rich QoS Management: Supporting multi-level scheduling with mechanisms such as WDRR/SP and TD/WRED for congestion protection; the monitoring granularity for both inbound and outbound directions can be flexibly adjusted based on the port's speed.
- SDN Architecture: Supporting SDN capabilities through open API interfaces, significantly simplifying the management and maintenance complexity of the network.
- Energy Efficiency: Utilizing an intelligent fan speed adjustment scheme to support real-time power consumption detection, reduce operational costs for customers, and create an energy-efficient network.
- Data Center Features: Supporting priority-based traffic control, explicit congestion notification, facilitating Multi-Chassis Link Aggregation (MLAG) for cross-device link aggregation, and supporting overlay tunneling technologies such as VXLAN/NVGRE.

5.5.2 Intelligent Link Switch Management

AISWare iLinkS-Manager, Intelligent Link Switch Management product primarily accomplishes the management of various forms of iLink switches, simultaneously supports the management capability of devices from third-party manufacturers, and achieves unified management, O&M, and configuration of network devices to meet the requirements for rapid online interconnection of customer networks and simplify the O&M management of customer networks.

The architecture of AISWare iLinkS-Manager is shown in Figure 5-8, supporting the access and data collection of protocols such as SNMP, NETCONF, REST, and Telemetry on the southbound side, promoting operational capabilities such as the management analysis of resource, alarm, and performance, QoS configuration, and one-click deployment.

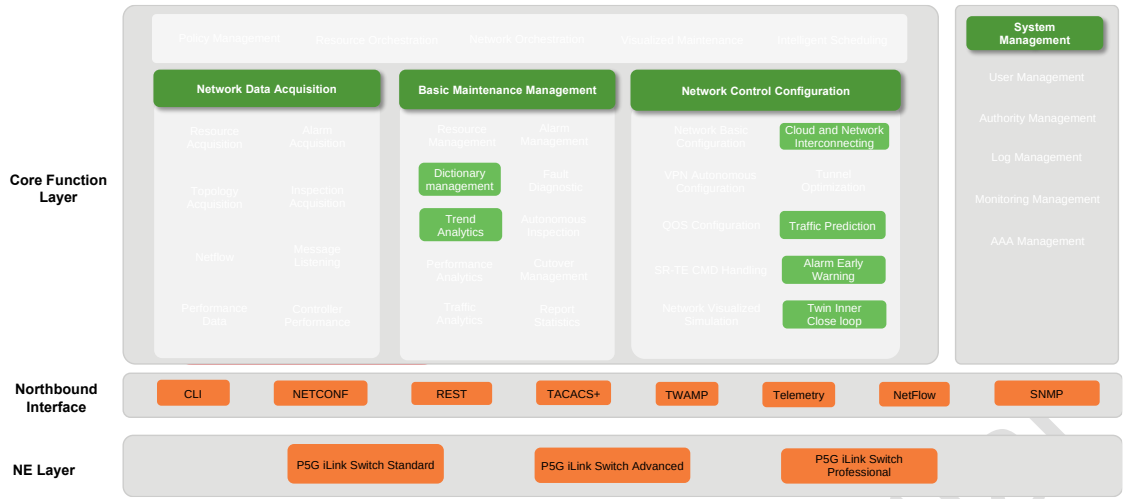


Figure 5-8 AISWare iLinkS-Manager Architecture

5.5.3 Intelligent Link Gateway

The AISWare iLinkG, Intelligent Link Gateway product includes 3 forms of devices: Small Access, Medium Access, and Small Aggregation, catering to various P5G scenarios of private line interconnection. The main features of iLink Gateway product are as follows:

- Graphical Orchestration: Resource management and configuration deployment are entirely orchestrated through graphical interfaces, significantly simplifying the service provisioning process.
- Intelligent Routing: Real-time monitoring of link status allows for intelligent switching based on parameters such as latency and jitter, ensuring SLA guarantees.
- Status Visualization: Real-time monitoring of network elements and tunnels, as well as automatic detection and classification of alarms, to facilitate network issue localization and simplify operational management.
- Multi-Tenant Isolation: Achieving complete isolation of tenant data and differentiated forwarding through the IPSec VPN's multi-tenant carrying capacity.
- Security and Flexibility: Supporting dual-WAN port protection and switching, end-to-end data encryption, and compatibility with radio access methods such as LTE/5G.

- Delegated Authority and Domain: Flexible configuration of account permissions to enable the isolation of different types of accounts, such as administrators, distributors, and customers.

5.5.4 Intelligent Link Gateway Management

AISWare iLinkG-Manager, Intelligent Link Gateway Management product is primarily responsible for managing various forms of SD-WAN gateway devices. It achieves zero-touch configuration deployment between sites by uniformly issuing configurations through the management platform. Additionally, it provides value-added features such as visualization of topology and traffic, intelligent routing, and template configuration.

The functional architecture of AISWare iLinkG-Manager product is illustrated in Figure 5-9. In the southbound direction, it supports multiple protocol accesses and data collection methods such as SNMP, REST and OVSDB. It also supports gateway device resource, alarm, and performance management, as well as operational capabilities such as visual configuration and tunnel management.

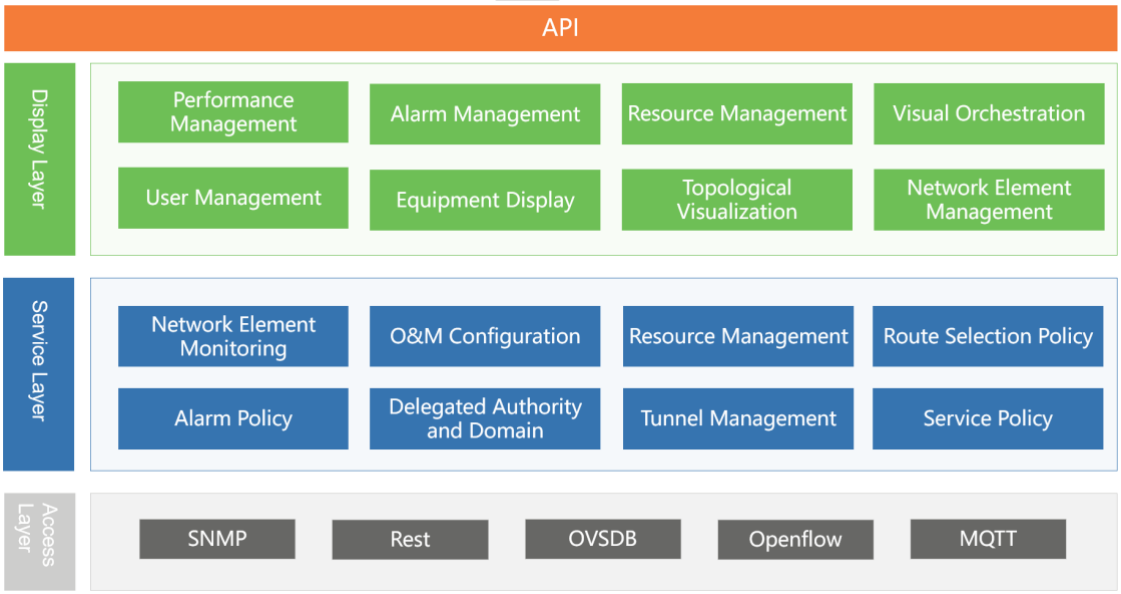


Figure 5-9 AISWare iLinkG-Manager Architecture

6 Featured Functions

6.1 Computing Native Network

AsiaInfo's computing native network, without changing the basic functions and architecture of 5G network, is achieved through enhancing the functionalities of 5G BBU elements and 5G MEC, as illustrated in Figure 6-1.

In the context of 5G radio networks, the innovation method of abstracting and virtualizing the CPU capabilities of 5G BBU, coupled with the transformation of these capabilities into communication and computing functionalities, enables 5G BBU to simultaneously support communication and computing services. In 5G MEC, a novel design introduces a unified scheduling and orchestration decision-maker, pooling the computing capabilities of 5G BBU in the radio network, to facilitate the joint scheduling and orchestration of computing applications and communication resources.

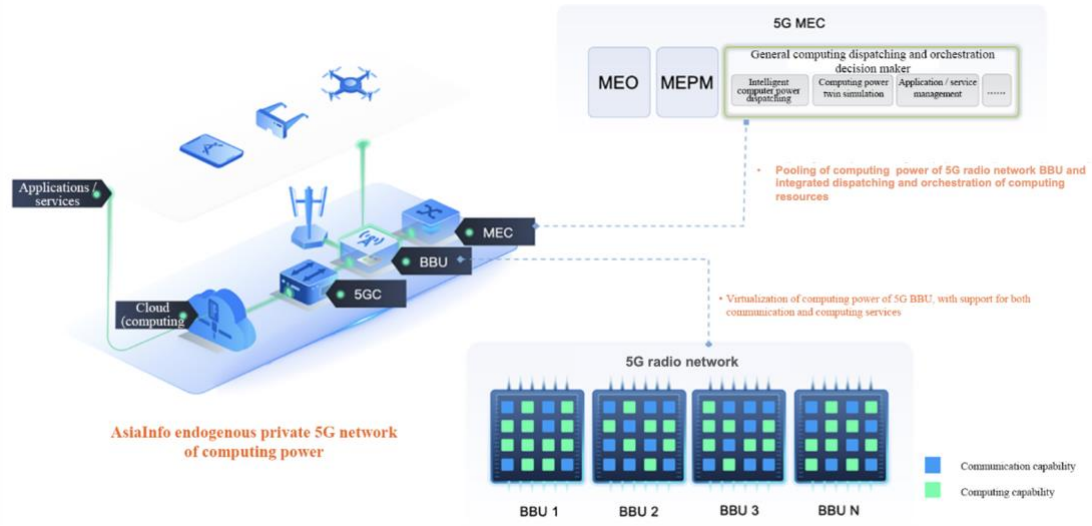


Figure 6-1 Computing Native Network

The 3 core values of Computing Native Network are:

1. Reducing Investment: Acquiring additional computing cards and servers by operators would lead to a substantial increase in TOC and result in extra investment expenses. AsiaInfo's Computing Native Network allows

operators to avoid additional investment costs, facilitating a reduction in investment;

2. Enhancing Resources: Transforming the idle communication capability of CNN enabled 5G base stations into computing capability, utilizing time-division multiplexing to improve resource utilization;

3. Improving Capabilities: The Computing Native 5G base station not only delivers necessarily network capabilities but also provides general computing capabilities, as well as runs edge applications for multiple industries, expanding the capabilities of the base station.

The 6 core technologies of Computing Native Network are:

1. Computing Virtualization: Achieving intelligent time-division multiplexing of computing capabilities by virtualizing the computing resource of 5G BBU to simultaneously deliver computing and communication capabilities. Alternative solutions, driven by the necessity of maintaining the exclusivity of communication for network elements, require operators to invest in additional computing serves or cards;

2. Computing Resource Scheduling at Edge: Overcoming efficiency challenges related to centralized cloud-based computing scheduling, particularly concerning network bandwidth or latency issues, this technology integrates a unified scheduling and orchestration decision-maker within 5G MEC that monitors real-time state of 5G BBU loads and schedules computing applications onto available 5G BBU resources, thereby improve overall scheduling efficiency.

3. Network Lossless

    a) Network Architecture Lossless: following the 3GPP 5G network deployment architecture, this approach eliminates the necessity for additional investment in network architecture;

    b) Protocol Lossless: maintaining 3GPP 5G network control and user plane protocols unchanged, this approach facilitates the transformation of idle communication capabilities into computing capabilities;

c) QoS Lossless: implementing communication service priority mechanisms to rigorously confine the intrinsic computing isolation boundary and intelligently adjust computing security boundaries in real-time.

4. Deploying dynamic allocation and scheduling services of computing resources within 5G MEC, the intelligent scheduling of 5G BBU resources is achieved through 4 steps:

   Step One. Resource Situation Awareness: Based on AI regression algorithms, analyzing the "tide effect" of 5G BBU resource utilization and predicting future trends to achieve situational awareness of 5G BBU cluster resources.

   Step Two. Node Evaluation and Recommendation: Based on graph neural network algorithms, analyzing data such as network topology and resource characteristics on both the supply and demand sides, as well as dynamically matching effective 5G BBU node sets, to optimize resource recommendations for BBU cluster resources.

   Step Three. Dynamic Node Resource Allocation: Based on machine learning algorithms, tracking real-time communication and computing resource consumption of 5G BBU clusters and nodes, as well as allocating optimal segmentation thresholds, to achieve optimal resource partitioning for 5G BBU nodes.

   Step Four. Task Orchestration and Scheduling: Based on dynamic programming algorithms, analyzing the current task from cost, performance, efficiency, and security perspectives, as well as planning the optimal resource orchestration and scheduling solution, to achieve optimal scheduling for 5G BBU cluster resources.

5. Federated Learning System over Computing Native 5G BBUs Clusters: Deploying federated learning server and client services separately on 5G MEC nodes and selected 5G BBU sub-clusters; establishing federated model calculations between multiple nodes, and enabling multi-party joint

model training and inference that meet data privacy protection requirements to break the "data island".

6. Computing Native Digital Twin: Realizing digital twin modeling for computing native network resources, constructing a digital twin simulation operating environment and simulation capability, and achieving flexible service orchestration, user experience self-optimization, and intelligent network O&M for computing native networks.

6.2 Cloudified Core Network

AsiaInfo's 5GC network products are built on cloud-native technology, leveraging containerization and microservices which allow for flexible deployment of 5GC network elements on private or public cloud. The cloud native architecture provides convenient elastic capabilities, enhanced security, and lower performance overhead.

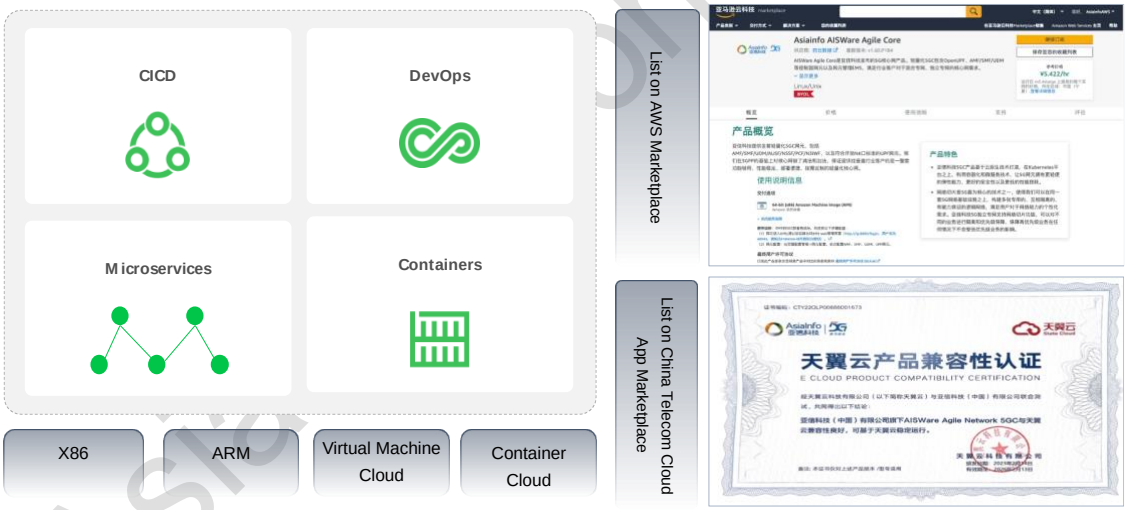


Figure 6-2 Cloudified Core Network

Currently, AsiaInfo's 5GC network products have taken the lead in completing compatibility tests with Amazon Web Services (AWS) and State Cloud, and have successfully been listed on the application marketplace.

6.3 5G LAN

AsiaInfo's 5GC network supports 5G LAN services, providing 5G users with services similar to LAN through 5G network. Terminals from the same LAN

group, regardless of their geographical distribution, can engage in one-to-one and one-to-many communication. Users from different LAN groups are isolated from each other.

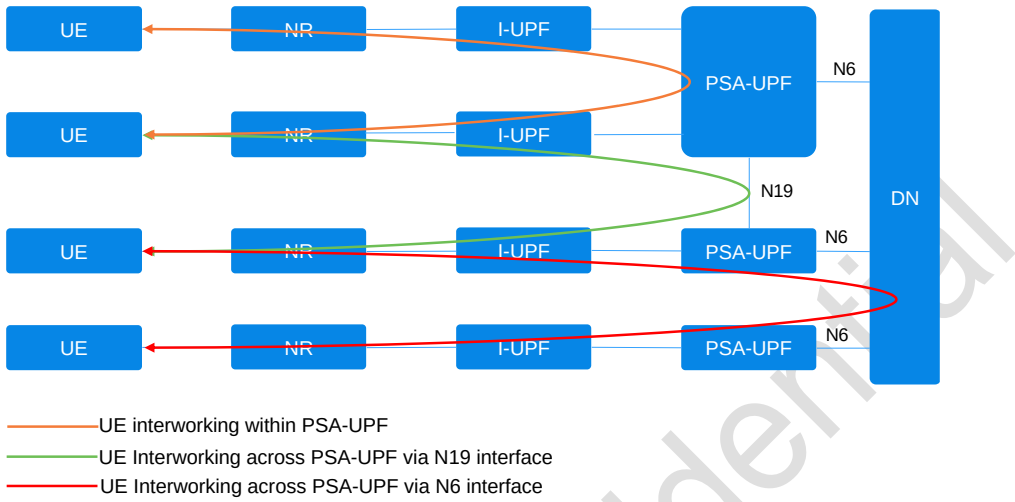


Figure 6-3 5G LAN

5G LAN offers technical capabilities for convenient interconnection of 5G industrial terminals, especially devices with L2 connectivity like PLC. It has the following advantages:

- **Direct Interconnection:** Users in the 5G LAN form a local network, enabling direct communication within the same LAN group.
- **Spatial Scalability:** Users of 5G LAN can be distributed in different locations, not confined to the same building. Members of 5G LAN can even be in different cities.
- **Mobility:** Based on the attributes of 5G as a mobile network, users moving to different areas can maintain 5G LAN connectivity and continue mutual communication.
- **Security:** Different 5G LAN groups are isolated from each other with no mutual interference. Isolation is achieved at the second layer of the network, providing a similar effect to VLAN isolation.
- **Flexible LAN Formation:** Users can quickly join 5G LAN groups through signing up in the UDM to enable the swift establishment of 5G local networks.

- **Layer-Two Forwarding Capability:** 5G LAN supports both layer-two and layer-three data forwarding, particularly the layer-two forwarding capability meets the requirements of protocols operating, a capability which 4G networks does not possess.

6.4 VoNR

Based on AsiaInfo's self-developed IMS capabilities, users in campuses with P5G coverage can engage in flexible voice communication. This includes communication between mobile terminals within the private network, communication between mobile terminals within the private network and fixed telephone terminals, as well as communication between the private network and public network terminals. All these functionalities are achievable while maintaining compliance with legal and regulatory requirements.

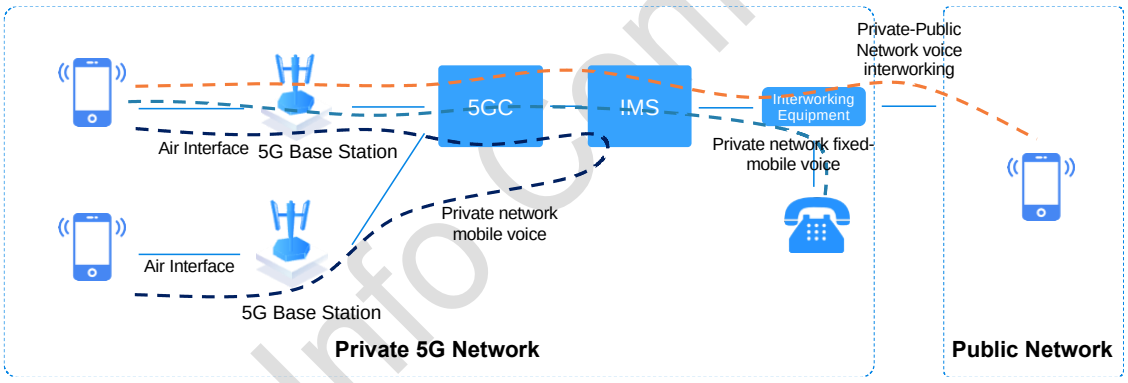


Figure 6-4 Flexible Voice Communication Capability

6.5 MOCN

AsiaInfo's 5GC and Base Station products both enable MOCN feature, in which the network configuration for sharing base stations between P5G and public 5G networks is supported in various industry deployment scenarios. Different PLMNs are allocated for public and private network, allowing P5G users and public 5G network user to access separate core networks through the same base station. This ensures the security of private network data while providing network coverage for public network users in remote areas.

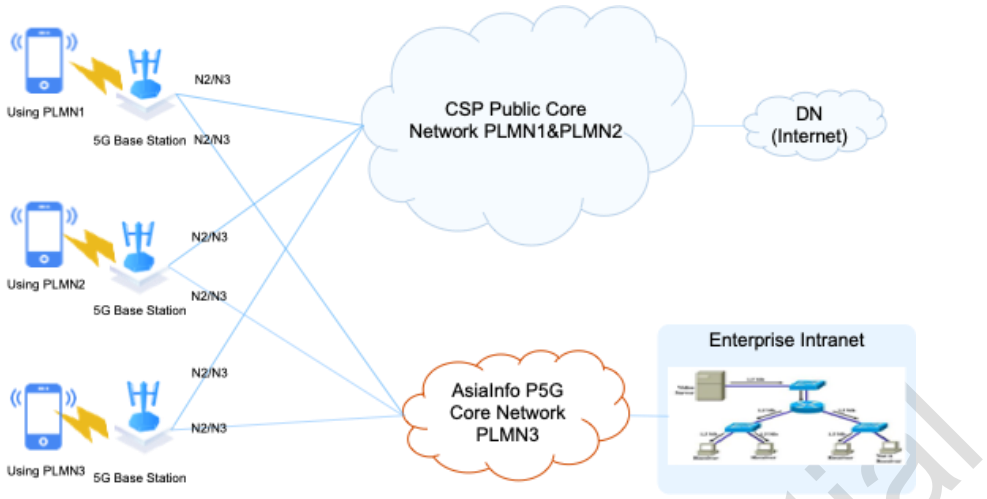


Figure 6-5 Shared Base Station Networking

6.6 One-click Deployment

AISWare iLink products are continuously evolving that provides a range of device models, from low to high-end, to adapt to diverse networking configuration demands based on specific scenarios. AsiaInfo's Intelligent IP Network Management offers product configuration templates based on service scenarios. The templates are compatible with both AsiaInfo's iLink switches and switches from different vendors, providing scenario-based pre-configuration capabilities, involving inputs of initial configuration parameters, which can be set as default values, through template interface, and uniformly deploying configurations in bulk, in order to facilitate the rapid online connectivity for enterprise customers.

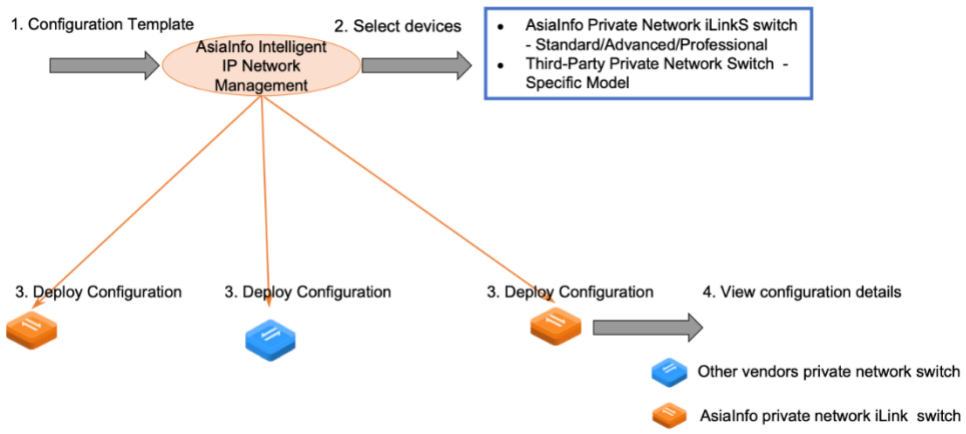


Figure 6-6 One-click Deployment

The added template of One-click Deployment includes the following fields: Selecting device manufacturers and models for the basic configuration and filling in details such as VLAN, interface, mode, IPv4, IPv6, static route prefix, mask, next hop, tag, preference, BFD, description; optional configurations include OSPF attributes, MPLS&LDP properties, DHCP attributes, etc.

After finalizing the configuration template, the next step is to select specific devices, whether single or multiple selections, that have already been managed for unified SSH login. AsiaInfo's Intelligent IP Network Management translates the configuration template information into proprietary configuration commands tailored to the selected device models, facilitating automatic deployment.

6.7 RedCap

5G defined three main scenarios of eMBB, uRLLC and mMTC. Correspondingly, the 5G-era IoT landscape comprises Broadband IoT, Critical Mission IoT, and Massive IoT. While the 3 scenarios adeptly cater to IoT needs of high data rates, low latency, and low data rates, IoT applications with moderate requirements have not been covered. RedCap is specifically designed as a cellular IoT technology to fill the blank space for medium-demand applications.

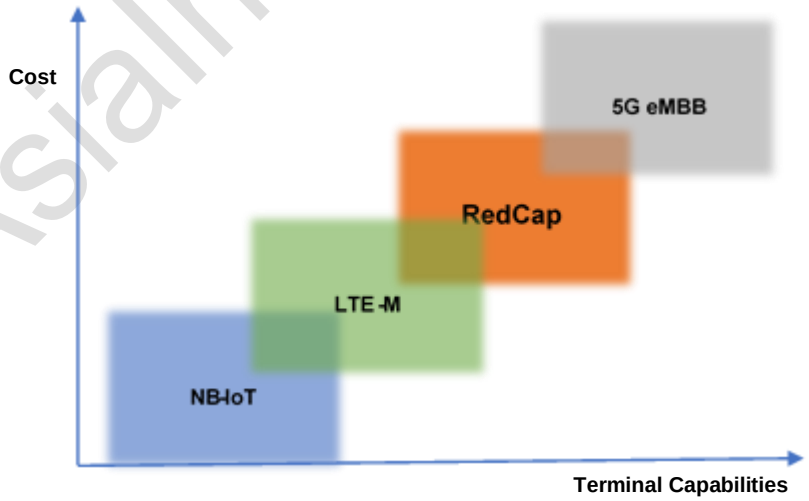


Figure 6-7 RedCap Positioning

Advantages of RedCap:

- RedCap was introduced in the 3GPP R17 release, tailoring NR terminal capabilities to better match moderate network connection needs.
- Compared to LTE IoT technologies, RedCap possesses 5G capabilities that can be combined with technologies such as millimeter-wave technology, 5G network slicing, and 5G positioning technology in the future to provide enhanced IoT services.
- Reducing terminal costs.

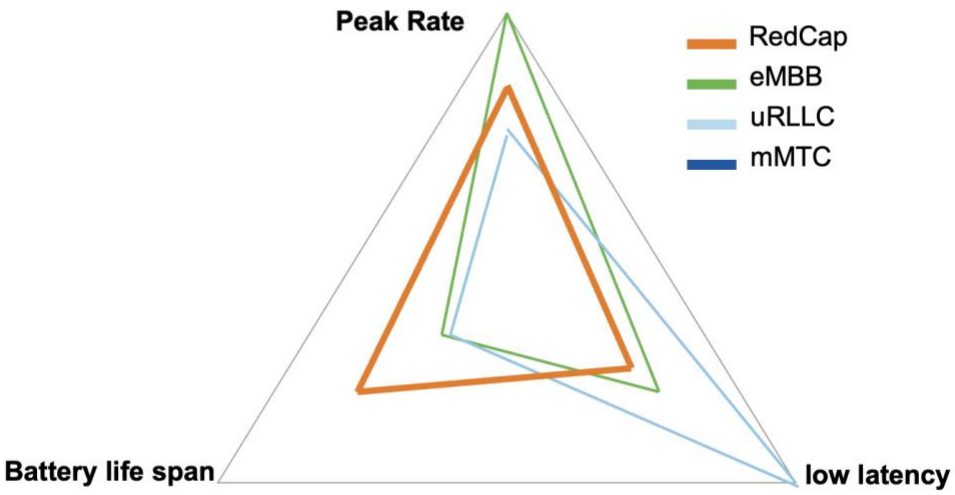


Figure 6-8 RedCap Capability

Applicable Scenarios:

Suitable for moderate IoT applications such as wearable devices, industrial radio sensors, and surveillance cameras.

6.8 5G NR Relay Backhaul

During the P5G construction in remote areas, the deployment of base stations is constrained by wired transmission infrastructure. 5G NR Relay Backhaul can overcome such limitation by supporting flexible deployment of small cells

across the entire frequency band in areas where optical fibers are scarce. This enables coverage in edge or isolated gaps, enhancing the 5G network capacity and coverage performance.

5G NR Relay Backhaul is based on commercial CPE. The core network UPF can forward and parse data from base stations at different hierarchical levels. Comparing to other radio relay backhaul technologies, 5G NR Relay Backhaul possesses the following advantages:

- Simple Networking, as exiting base stations can achieve data backhaul by connecting directly to CPE through wired connections
- Cost-Effective, and the commercial CPE products are mature

Applicable scenarios include:

- Areas such as remote regions or offshore platforms where deploying optical fibers is challenging
- Emergency support and temporary capacity expansion

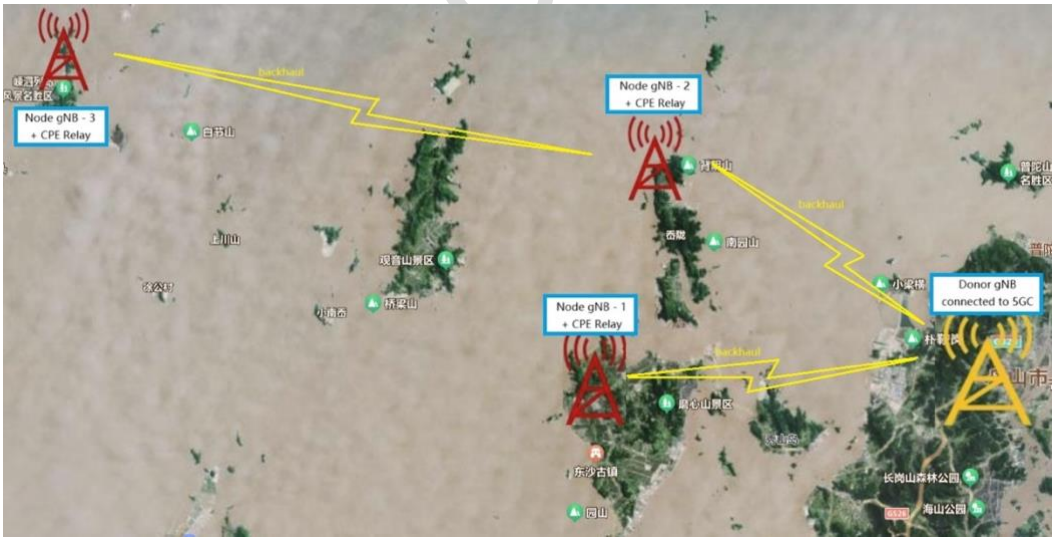


Figure 6-9 5G Relay Scene Illustration

6.9 Time-Sensitive Network

Time-Sensitive Network (TSN), aiming to achieve deterministic minimum time delays in non-deterministic Ethernet, is a set of protocol standards developed

by TSN working group within the IEEE 802.1 working group. It defines time-sensitive mechanisms for Ethernet data transmission, adding determinism and reliability to standard Ethernet to ensure real-time, deterministic, and reliable data transmission.

Industrial control, the core component of industry, imposes high requirements on networks such as low latency, low jitter, and high reliability, making TSN the crucial transmission technology in OT domain of the Industrial Internet.

Traditional TSN is typically based on wired networks, while wired networks face limitations such as high costs and poor flexibility in many application scenarios.

5G URLLC can provide radio access transmission with low-latency and high reliability.

Therefore, the integration of 5G and TSN can offer deterministic transmission guarantees for service-critical applications.

6.10 SRS indoor High-Precision positioning

Estimating the distance between the terminal and the antennas of various base stations based on the delay (t1, t2, t3) of the uplink SRS signals transmitted from the terminal to multiple base stations.

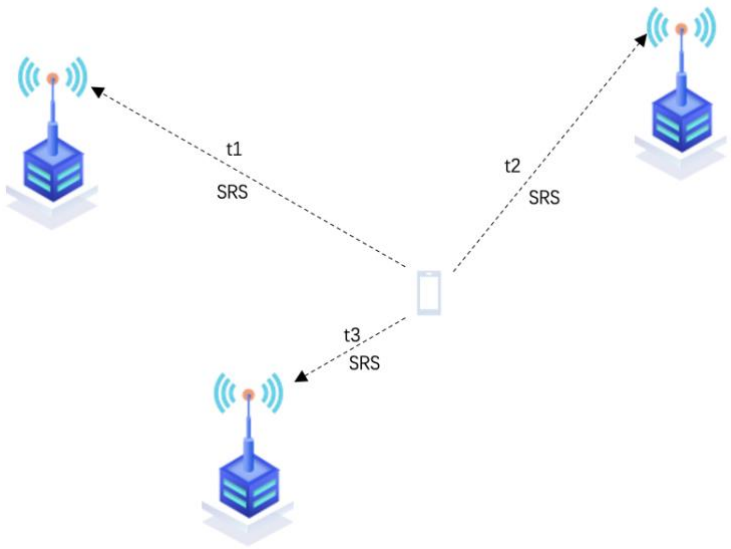


Figure 6-10 SRS Positioning Principle

Combining the distance estimates from 3 adjacent base stations, utilizing the trilateration principle, and using the coordinates of the three base stations to deduce the position of the terminal.

This is employed for indoor positioning, supporting scenarios such as AGV.

6.11 5G Network Slicing

Network slicing is one of the fundamental technologies in 5G networks, supporting private, isolated, and capable logical networks on a set of physical 5G network architecture. This allows meeting users' personalized demands for network capabilities.

AsiaInfo's P5G products provide slicing capabilities as a native feature. All network elements inherently support slicing capabilities, possess end-to-end slicing capabilities at the network level, and providing fully automatic end-to-end slicing activation as well as SLA monitoring and assurance.

Taking the example of the requirements for a private network in the steel industry, there are 5 major service scenarios, and the network requirements for the steel industry private network are shown in Table 6-1 as an illustration.

Table 6-1 Steel Industry Private Network Requirements

Applicable Scenarios		Network Requirements				
5G Autonomous drive Vehicles	Function	Uplink Bandwidth	Downlink Bandwidth	Transmission Latency	Reliability	Coverage Area
	Control signaling issuance	≥ 1Mbps	No specific requirement	≤50ms	≥ 99.99%	Production line
	High-definition video transmission	≥ 50Mbps	No specific requirement	≤50ms	≥ 99.99%	Production line
Machine Vision	Function	Uplink Bandwidth	Downlink Bandwidth	Transmission Latency	Reliability	Coverage Area

Quality Inspection	Control signaling issuance	≥ 1Mbps	No specific requirement	≤20ms	≥ 99.99%	Production line
	High-definition photo transmission	≥100Mbps	≥ 20Mbps	≤100ms	≥ 99.99%	Production line
5G AR Remote Assistance	Function	Uplink Bandwidth	Downlink Bandwidth	Transmission Latency	Reliability	Coverage Area
	Video feedback	≧500Mbps	No specific requirement	≦100ms	≧99%	Production line

Among the 5 major service scenarios, the 5G autonomous drive vehicle PLC control and the slag-adding robot arm PLC control are categorized as low-latency services, which require low latency down to the millisecond level. Any delay beyond this threshold will automatically halt the operation. 5G ultra-high-definition video detection, machine vision inspection, drone inspection, and AR remote assistance are categorized as large-bandwidth services, which require the transmission of data through cameras, necessitating significant uplink bandwidth. PLC control-type services utilize network slicing to ensure low latency and reliability. For example, techniques such as 5QI or PRB reservation are employed in radio network base stations, and the core network is deployed in close proximity with MEC. Distinguishing various application scenarios through different slicing identifiers not only facilitates independent end-to-end monitoring of services, but also contributes to visual, manageable, and controllable service operations.

6.12 Agile AI Apps at edge

AsiaInfo offers an agile P5G, conducts in-depth analysis of P5G application scenarios, and creates flexible access solutions for various IoT devices. Simultaneously, AsiaInfo provides intelligent edge applications within the MEC edge computing nodes. This realizes AsiaInfo's agile private network solution

that combines edge intelligence and cloud collaboration, empowering the highly integrated development of industry private networks and application scenarios, forming an intelligent and agile private network.

- Integration of AISWare AIoT Edge Intelligence Solution

  AISWare AIoT products provide All-in-One IoT edge gateway equipment supporting various communication protocols, facilitating centralized management of different protocol edge devices and creating an intelligent edge device management solution. On the field side, devices need to achieve cloud-edge-end integration through the edge platform, uploading production data to the cloud for real-time monitoring, intelligent operations, and production process optimization.

  The integration of P5G products with AISWare AIoT products in the edge intelligence solution achieves unified registration management, device monitoring, and policy triggering for diverse edge devices, facilitating coordinated development among the cloud, network, and edge.

- Integration of AISWare AI Cloud Collaboration Solution

  AsiaInfo's AISWare AI product provides AI application capabilities. Leveraging the basic MEC functionality of the P5G, it incorporates AI application algorithms to synergize with intelligent edge devices, resulting in the development of a cloud-based intelligent edge All-in-One machine.

  As shown in Figure 6-11, AsiaInfo's edge AI product integrates conventional industry AI algorithms, achieving intelligent adaptation between edge devices and MEC algorithms, as well as creating an industry-specific intelligent solution based on MEC cloud-edge intelligence collaboration. It supports real-time analysis of video content, automatically detects abnormal information, proactively conducts risk prevention and control, and provides intelligent services for edge AI-enhanced scenes in communities, campuses, buildings, schools, malls, hospitals, factories, construction sites, mines, power plants, and other scenarios based on AI recognition models.

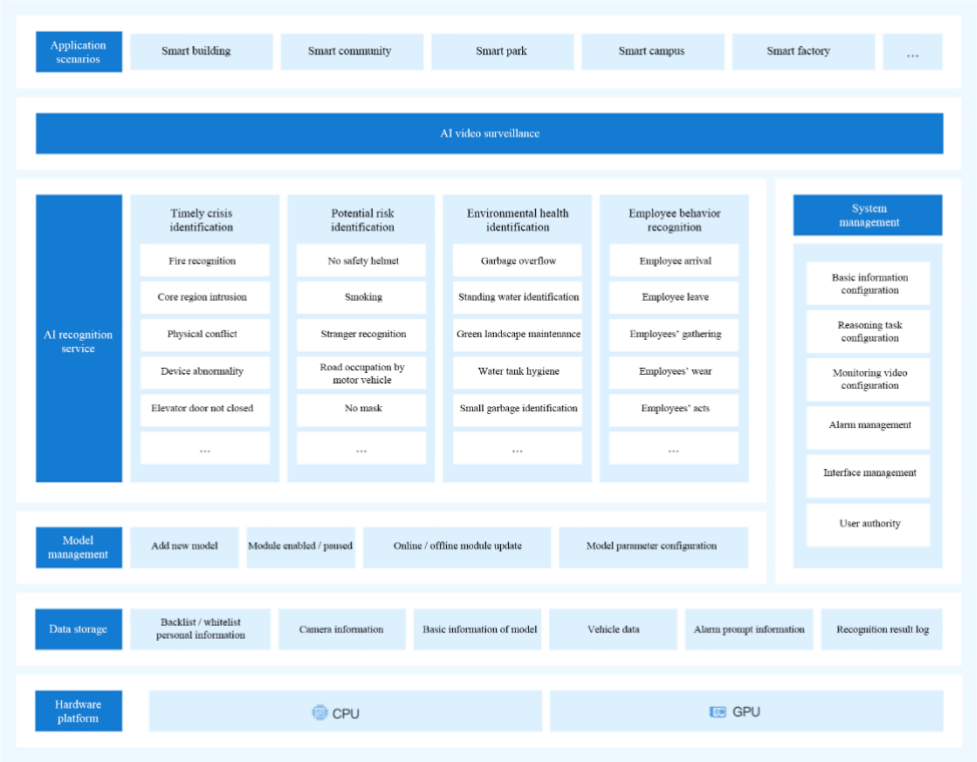


Figure 6-11 AsiaInfo's Agile AI Apps at edge

6.13 Service assurance

The complexity of diversified P5G service scenarios, end-to-end networking, and configuration results in industry customers are not familiar with P5G service assurance, while they urgently request a comprehensive P5G assurance system to provide integrated and digital capability support for industry private networks. AsiaInfo's private network operation platform establishes a comprehensive P5G service chain that integrates terminals, networks, and service for different industry scenarios, offering an integrated, comprehensive, and intelligent assurance system.

As shown in Figure 6-12, AsiaInfo's P5G operation platform aims for panoramic monitoring, intelligently reconstructing various scenario resource topologies through the full professional data collection and consolidated analysis of the architecture layer, resource data layer, and application service layer. Starting from scenario service, it achieves real-time end-to-end monitoring across terminals, networks, and service applications, providing industry customers with panoramic monitoring service capabilities.

Figure 6-12 P5G Panoramic Monitoring

As shown in Figure 6-13, AsiaInfo's private network operation platform combines multidimensional data from signaling, user, and service aspects. It bridges service chains from aspects such as across terminal devices, network devices, basic hardware architecture, and service applications, constructs an end-to-end service fault localization model, utilizes proactive discovery and methods such as simulating service behaviors to enrich the typical scenario fault feature library, and achieves rapid fault localization for service and trace analysis of abnormal events.

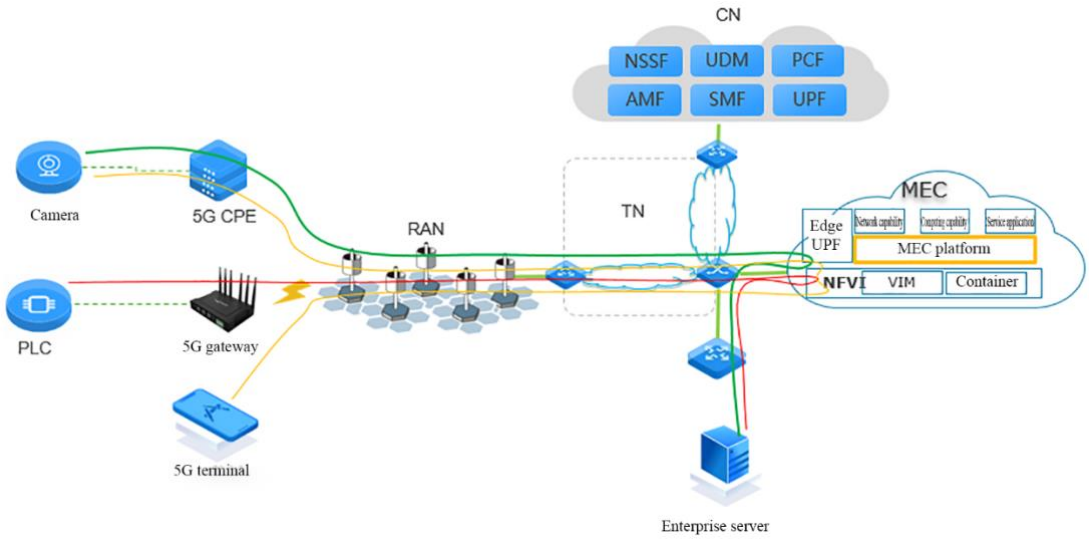


Figure 6-13 P5G Service Monitoring and Fault Location

As shown in Figure 6-14, AsiaInfo's private network operation platform realizes the construction of a comprehensive service quality map for the service domain, network domain, and perception domain. Starting from the overall

quality assessment of the network, it creates a five-in-one private network-end network trend real-time perception and quality analysis system for regions, networks, users, terminals, and services. It identifies service characteristics based on service messages, adapts and matches evaluation models for different scenarios, completes dedicated line-level SLA indicator analysis, provides real-time visibility of terminal-level SLA quality, and real-time visibility of service-layer quality.

Figure 6-14 P5G Service Quality Management

As shown in Figure 6-15, AsiaInfo's private network operation platform deeply integrates IT, CT, and OT technologies, adapting the capabilities of multiple system service services and targeting towards key industries such as smart campus, smart power, smart ports, smart mines, smart healthcare, and smart agriculture. Based on TOSCA modeling, it constructs network slice templates and industry-specific commodities for private networks, provides ready-to-use service templates for industry scenarios, and enables rapid activation of private network services.

Figure 6-15 P5G Industry Template

6.14 Automatic dial testing of smart service perception

AsiaInfo's P5G product not only provides network capabilities but also utilizes terminal probes for end-to-end dial testing of smart service perception, allowing for intelligent evaluation of campus network perception and providing differentiated network service assurance for various scenarios.

In the industry-specific P5G scenarios, customers have stringent requirements for end-to-end service quality. Any violation of SLA could potentially lead to serious service incidents. AsiaInfo's P5G product offers customers comprehensive and precise perception of service metrics, flexible deployment orchestration, and rapid intelligent troubleshooting capabilities, ensuring a secure journey for enterprise-level operations. Figure 6-16 outlines AsiaInfo's P5G solution of automatic dial testing for smart service perception.

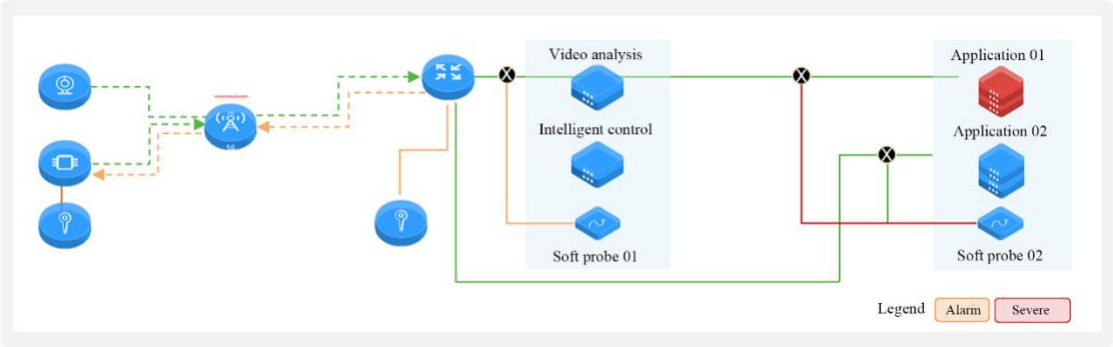


Figure 6-16 Automatic Dial Testing for Smart Service Perception

AsiaInfo's P5G product supports triggering network service tests based on service characteristics of different scenarios. It conducts service quality analysis through probes at various nodes while utilizing artificial intelligence to dynamically analyze threshold values and monitor abnormal daily service performance indicators. This achieves the P5G abnormal prediction and intelligent diagnosis of network anomalies, as depicted in Figure 6-17.

Figure 6-17 Intelligent Diagnosis of SLA Metrics

7 Unique Advantages

AsiaInfo's P5G products demonstrate unique advantages in the following 4 aspects: exclusive capabilities tailored to industry-specific requirements, flexible networking capabilities to meet various needs, the integration of communication and computing capabilities, and intelligent and simplified operational and maintenance capabilities.

7.1 Industry-specific capabilities

- Supporting characteristics such as vibration resistance, salt spray resistance, and nuclear radiation resistance to meet the specific environmental requirements of industries such as energy, mining, chemical, and transportation
- Providing essential capabilities urgently needed in industries such as 5G LAN, stable low-latency TSN, RedCap, and precise positioning to meet the communication needs of critical application scenarios such as industrial data acquisition, PLC control, and AR-assisted design
- Possessing VoNR capabilities to enable high-quality audio and video calls within the private network, as well as secure and compliant voice interoperability between private network and public network terminals

7.2 Flexible networking capabilities

- Technologies such as localized deployment of core network either entirely or partially, 5G NR relay backhaul, and MOCN can meet diverse networking requirements in special scenarios such as enclosed campuses and offshore wind power.
- Cloudified core network allows deployment on various public and private clouds, significantly improving reliability, reducing deployment time, and lowering maintenance costs. The product is already available on the AWS cloud and China Telecom Cloud application markets.

7.3 Joint Communication and Computing

- Champion the industry to leverage native computing capabilities inside 5G Base Station for apps at edge; no extra cost for computing servers or cards, reduce telco's Opex
- The independently-developed intelligent integrated orchestrator for comprehensive coordination and scheduling achieves mutual sensing and understanding between computing application service guarantees and network quality guarantees, as well as the coordination and scheduling of intelligent decision-making communication services and computing tasks
- Based on the federated learning system of computing native network, the capacity realizes distributed computing for AI applications, which is characterized by high performance, low energy consumption, data privacy, etc.

7.4 Smart and simplified operation

- Automatic management of SIM cards to realize end-to-end lifecycle management including provisioning, activation, and deactivation of dedicated network SIM card resources
- Service-level SLA monitoring to support enterprise application-level SLA monitoring management and to meet detailed management requirements for enterprises
- Intelligent fault localization leverages intelligent analysis based on private network data to achieve rapid localization of faults, enhancing the overall reliability of private network

8 Scenario Solutions

AsiaInfo's P5G products encompass typical application scenarios such as smart nuclear power, smart thermal power, smart mining, smart port, smart steel, and typical applications in the operation of P5G.

8.1 Smart Nuclear Power

AISWare AgileNet has been successfully implemented in the nuclear power industry. Below is an introduction based on a typical application case.

8.1.1 P5G scenario for Smart Nuclear Power

In response to the global advocacy for energy efficiency, environmental conservation, and emission reduction, countries worldwide are aggressively accelerating the development of nuclear power as a key component of future power supply restructuring. The investment scale in nuclear power is expected to far surpass that of conventional power plants. Nuclear power enterprises are strategically planning the implementation of smart nuclear power initiatives, utilizing IoT technology to establish a comprehensive data collection network system for power plant systems and equipment to elevate the digital monitoring capabilities. Moreover, the establishment of wireless network coverage for power plants provides the essential groundwork for the digitization, mobilization, and comprehensive tracking of operational and maintenance processes. P5G, given the robust technological and industrial capabilities, emerges as the top priority for nuclear power enterprises.

Figure 8-1 P5G scenario for Smart Nuclear Power

8.1.2 Service requirements for Smart Nuclear Power

P5G empowers the digital transformation and upgrading of nuclear power industry. The needs within the nuclear power plant include equipment/material

management, site/environment management, work activity management, personnel safety management, etc.

Single Point Vulnerability (SPV) devices refer to equipment which a single device failure can lead to the shutdown, stopping, power reduction, or significant power fluctuation of the power station. SPV device management is an important requirement for the nuclear power industry in the use of P5G. A nuclear power plant experienced 6 unplanned shutdowns and stopping events in a year due to equipment failures, reflecting deficiencies in equipment management. P5G can achieve continuous monitoring, data collection, and data warning for SPV devices, as well as tracking and monitoring of radioactive sources and hazardous materials. This can significantly enhance the management and safety assurance capabilities of nuclear power enterprises.

In the context of smart nuclear power, P5G requirements can be broadly classified into 3 categories: video security monitoring, personnel equipment management, and mobile office.

- Video security monitoring services mainly include the following:
  - Supervision of equipment wearing, behavioral supervision, safety witnessing
  - Monitoring the status of radioactive sources and hazardous materials
  - Real-time monitoring of important work sites, temporary construction sites, and accident sites
  - Access management to critical and sensitive areas

Table 8-1 Network Requirements for Video Security Surveillance

Application Scenarios	Network Requirements			
Video Security Surveillance	Uplink Speed	Downlink Speed	Transmission Delay	Numbers of Connections
	≥ 50 Mbps	No specific requirement	≤ 50 ms	≥ 100

- Personnel and equipment management service mainly includes the following:
  - Personnel positioning, personnel counting, and traffic monitoring.
  - Data collection and early warning for SPV devices or other important system devices.
  - Traceability of the movement and circulation of radioactive sources and hazardous chemicals.
  - Radiation monitoring information network, real-time transmission of on-site radiation level data.
  - Simplification of operation and maintenance for widely distributed system equipment such as lighting, cabinet fans, fire alarm probes, fire doors, etc.

Table 8-2 Network Requirements for Personnel and Equipment Management

Application Scenarios	Network Requirements			
Personnel and Equipment Management	Uplink Speed	Downlink Speed	Transmission Delay	Numbers of Connections
	≥ 10 Mbps	≥ 10 Mbps	≤ 200 ms	≥ 2000

- Mobile office service mainly includes the following:
  - Operation Inspection: Inspection personnel use radio networks to enter problems and defects in real-time, upload photos, videos (real-time communication), inspection data, and record the situation of abnormity.
  - Operation Control: Facilitating remote monitoring of operational control and electronic records of operational control to realize digitized mobile applications such as operating procedures, drawings, and operation sheets.
  - Mobile Maintenance: Achieving ticket retrieval, ticket exchange, and witness quality and safety control points through mobile terminals.

Table 8-3 Network requirements for mobile office

Application Scenarios	Network Requirements			
Mobile Office	Uplink Speed	Downlink Speed	Transmission Delay	Numbers of Connections
	≥ 10 Mbps	≥ 50 Mbps	≤ 100 ms	≥ 500

8.1.3 P5G solution for Smart Nuclear Power

P5G for smart nuclear power, based on safety production requirements, is divided into the production area and the front area that needs to be separately designed for each area.

Production Area: Including the nuclear island, conventional island, BOP (Balance of Plant) facility, and emergency command center. Adopting a stand-alone P5G solution with core network sinking, physically isolated independent networking, and connection to the nuclear power intranet through network security devices.

Front Area: Including office buildings, maintenance buildings, etc., adopting a hybrid P5G solution to keep all the data within the campus, maintain a connection with the signaling and operator core networks, and connect to the nuclear power intranet through MEC.

Given the unique radio environment in the nuclear power scenario, the P5G design must take into account electromagnetic compatibility requirements and the shielding of radio signals by the nuclear island. Radio design deployed inside the nuclear island facility uses a low-power, multi-base station distributed system architecture to ensure controllable base station power, minimizing electromagnetic interference on sensitive electrical and control equipment within the island to an acceptable level.

For extensive coverage outside the nuclear island, high-power macro base stations can be employed and positioned at higher points in the plant to increase coverage range and reduce equipment, design, and construction costs.

For underground areas with personnel presence, duty, or inspection within the conventional island and BOP sub-items, as well as areas with weak coverage, blind spot mitigation design can be implemented.

- 5G Network Design for Production Area

  As shown in Figure 8-2, the production area adopts a dedicated construction plan to establish an independent P5G.

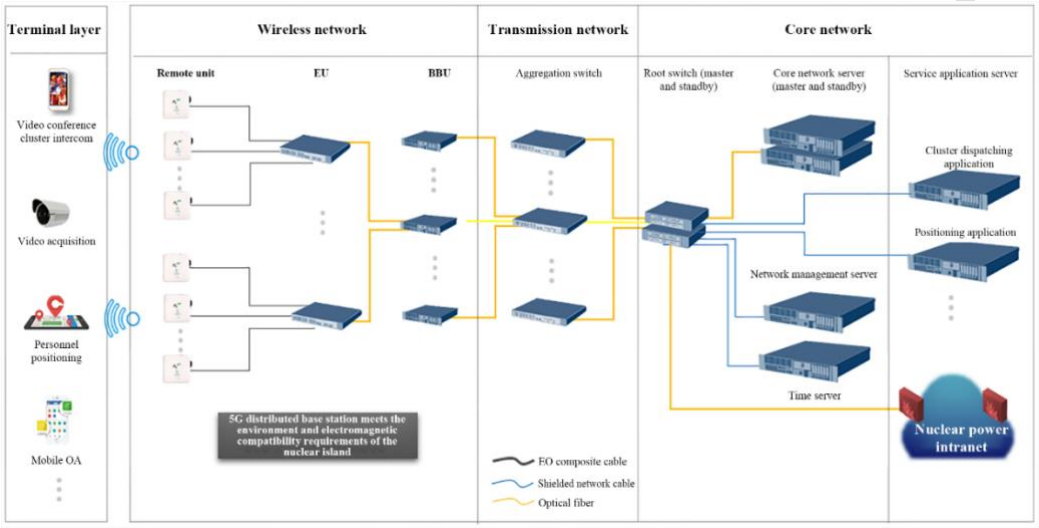


Figure 8-2 5G Network Design for Nuclear Power Production Area

5G Core Network: Deploying a lightweight 5G core network to provide disaster recovery in active-standby mode or through a pooled configuration. The system is dual-powered and can be integrated with cluster scheduling systems and positioning application systems as needed, enabling value-added services such as scheduling communication and indoor positioning. 5G core network servers, network management servers, and application servers are arranged in the office building in the front area of the plant.

Transmission Network: Using aggregation switches to connect multiple BBU devices and converging to the root switch set in primary and backup configurations.

5G Radio Network: Deploying distributed base stations in various rooms on the nuclear island and using macro base stations for wide-area coverage in external areas.

- Nuclear Island: Deploy pRRU or passive antennas in all rooms, with passive antennas used in the orange and red zones, and pRRU used in the yellow, green, and white zones. All EUs and BBUs are deployed in the yellow, green, and white zones. All radio equipment must undergo electromagnetic compatibility testing.
- Conventional Island & BOP: Deploying high-power RRUs in elevated and open areas for wide-area coverage. For areas where signals are difficult to cover, such as the underground areas of the PX pump room, use EUs and pRRUs for blind spot mitigation.
- 5G Network Design for Front Area

  As shown in Figure 8-3, the front area adopts a specialized public network solution, constructing a hybrid P5G through slicing technology in conjunction with UPF/MEC sinking.

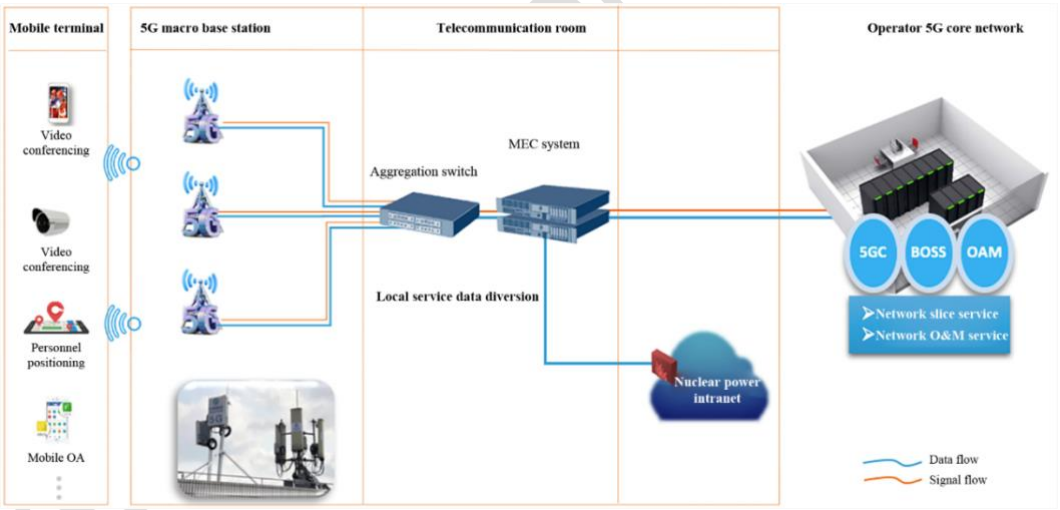


Figure 8-3 5G Network Design of Nuclear Power Plant Front Area

5G Core Network: In accordance with the safety requirements of the power plant, control measures are implemented to prevent data from leaving the plant area, in which sinking the UPF to the internal data center within the power plant area and deploying MEC. Mobile devices in the front area can only access MEC through signals from base stations within the plant area, as a separate TA needs to be planned for radio coverage within the plant

area, and a black and white list is configured in the core network, allowing only mobile devices within the plant area to access MEC through this TA.

Transmission Network: Controlling the direct connection from base stations within the plant area to UPF to ensure that specific terminal data paths from the front area do not exit the plant area.

5G Radio Network: Macro stations need to be planned for the front area, utilizing public network frequency bands and deployed within the plant area. A special TA is planned for the front area to ensure that traffic from terminals accessing through this TA, with specific subscriptions of specific slices and DNNs, is routed to the MEC system within the plant area.

8.2 Smart Thermal Power

8.2.1 P5G scenario for Smart Thermal Power

Figure 8-4 P5G scenario for Smart Thermal Power

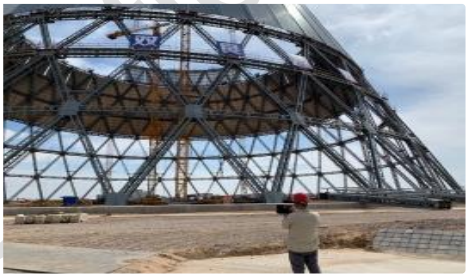
In the construction of P5G for the smart thermal power, a certain thermal power plant fully leverages the advantage of the centralized control of four power generation units, optimizes design from the source to foster innovation, and adheres to the comprehensive architecture specified in the construction norms for smart power enterprises. The architecture encompasses two platforms – intelligent power generation ICS and smart management IMS – and three networks – production control network, management information network, and

industrial radio network. The objective is to establish an integrated system for management and control.

8.2.2 Service requirements for Smart Thermal Power

The traditional thermal power plants suffer from low levels of automation and intelligence, facing issues such as relying on container offices during major maintenance, consuming significant manpower and resources, inefficient offline inspections, and safety hazards during personnel patrols. As shown in Figure 8-5, the P5G for smart thermal power introduces innovative intelligent applications such as video security, AR showcase, personnel positioning, autonomous drive aerial vehicle inspections, etc. These applications enhance the automation level of thermal power plants and tackle existing issues in decision-making within these plants.

Video Security



AR Showcase

Drone Inspection

Personnel Positioning

Figure 8-5 Smart Thermal Power Service Requirements

Table 8-4 describes the network performance requirements for applications such as video feedback, AR displays, and location management in a smart thermal power plant.

Table 8-4 Video Transmission Requirement Metrics

Application Scenarios	Network Requirements		
Video Security, UAV Inspection	Uplink Speed	Downlink Speed	Transmission Latency
	≥ 40 Mbps	No specific requirement	≤ 100 ms

Table 8-5 AR Display Requirements

Application Scenarios	Network Requirements			
AR Display	Uplink Speed	Downlink Speed	Transmission Latency	Coverage Area
	≧500Mbps	No specific requirement	≦100ms	Factory

Table 8-6 Personnel Positioning Requirements

Application Scenarios	Network Requirements				
Personnel Positioning	Uplink Speed	Downlink Speed	Transmission Latency	Numbers of Connections	Coverage Area
	No specific requirement	No specific requirement	≦100ms	>1000	Production Line

8.2.3 P5G solution for Smart Thermal Power

The requirements for the informationization construction of the smart thermal power plant necessitate the P5G establishment capable of supporting physical isolation to fully ensure information security. The P5G construction plan in thermal power plants must focus on 2 main aspects:

- Electromagnetic compatibility safety

  The instrumentation and control devices sensitive to electromagnetic interference within the thermal power plant need to ensure that the

deployment and application of radio networks do not disrupt the existing instrumentation and control devices. In the radio electromagnetic environment of the power plant, the stable operation of network equipment must be guaranteed to ensure the safe production operation of the plant.

The radio communication network system is required to meet the electromagnetic compatibility requirements of the IEC 61000 series or GJB151B series standards, ensuring the system can be utilized safely and reliably across all areas within the coverage range without affecting the normal operation of other equipment and systems in Guodian Shuangwei power plant.

- Network information security

The P5G radio system in the thermal power plant must adhere to security protection regulations for monitoring systems and comply with the specified requirements outlined in *General Plan for Security Protection of Electric Power Monitoring Systems*, ensuring the security of service data within the power plant. The radio communication network system involves the utilization of specialized communication systems or private communication protocols with the aim of safeguarding the network against vulnerabilities such as illegal intrusion or attacks, as well as emphasizing the isolation of wired and radio access sides from the external environment, to secure the radio communication data transmission.

The P5G for smart thermal power adopts a SA networking architecture and employs a completely new 5G network model. The system comprises: core network, radio access network, application platform, and access terminals, complemented by a unified network management system. The system features high bandwidth, high reliability, high performance, and high-security characteristics.

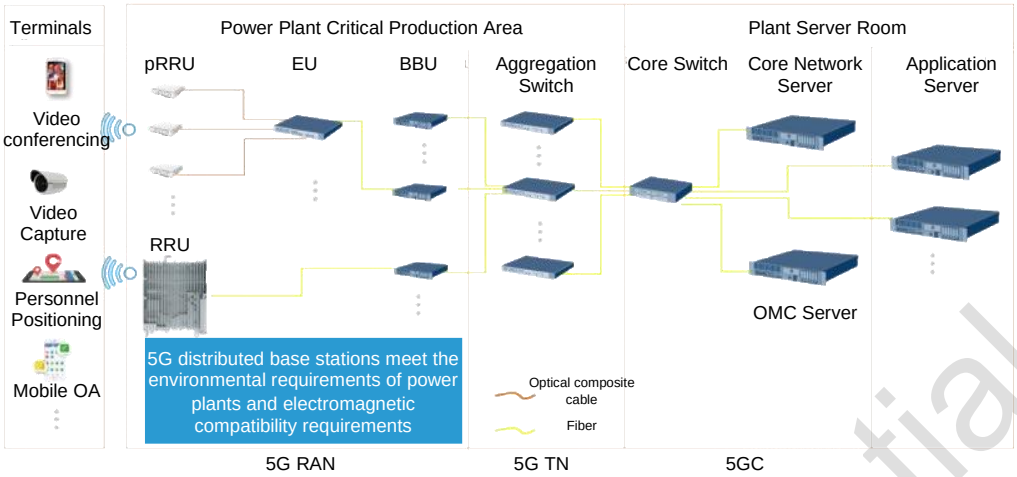


Figure 8-6 Smart Thermal Power 5G Private Network Architecture

The P5G adopts a flat networking architecture where radio base stations are converged to the core switch through 10 Gigabit optical fiber transmission. The transport layer utilizes a fully 10 Gigabit access and reserves expansion ports.

For coverage in outdoor areas of the power plant, high-power small base station equipment can be deployed, while indoor areas can utilize high-power small base stations in conjunction with an indoor distribution system for coverage enhancement.

The P5G for smart thermal power conducts data exchange with the power plant's internal network through secure isolation devices and achieves complete physical isolation from the public network. The 5G connections within the campus are authenticated through specialized SIM cards, ensuring the uniqueness and authenticity of network user identities. Simultaneously, the OMC network management system monitors the behavior of internet users to guarantee network environment security.

8.3 Smart Mining

8.3.1 P5G scenario for Smart Mining

Mines are currently one of the most important sources of energy for people's daily lives and industrial production that play a crucial role in the tangible economy. At the present stage, the mining industry has reached a pivotal point of transformation. P5G possesses indispensable advantages in manufacturing, including low cost, high reliability, reinforced security, and industry-specific customization. It can accommodate various production and operational scenarios, supporting enterprises in enhancing efficiency, reducing costs, and fostering innovative development.

Figure 8-7 P5G scenario for Open-Pit Mining Application

8.3.2 Service requirements for Smart Mining

Mining industries often operate in remote areas with poor network coverage, a large number of personnel and vehicles, and limited management capabilities. Key challenges for clients include:

Incomplete network coverage: Open-pit mines are often located in remote areas, making it difficult to establish communication networks and power architecture. The high cost of communication coverage and the use of outdated communication methods such as fixed telephones and broadcasts create an urgent need for comprehensive communication technology facilities.

Low management efficiency: The substantial workforce, the multitude of construction vehicles, and the dispersed locations in the mining sector lead to challenges such as the incapability of real-time monitoring the overall situation of personnel and vehicles across the entire area, the ineffectiveness of obtaining timely information about the contractors' current locations and operational dynamics, and the incompetence of controlling contractor work standards and personnel safety.

Emergency event dispatching: Safety holds paramount importance in the mining industry. The lack of real-time knowledge about personnel distribution poses a considerable challenge in formulating strategic commands and efficiently deploying resources during critical situations, which significantly impedes the effectiveness of rescue operations.

Quality control of inspections: The mining operation covers a wide area with lengthy transportation routes, as well as challenging working environments for vehicles, makes it difficult to scientifically and reasonably plan inspection routes, divide inspection teams, and maintain control over the standardization and quality of inspections.

China has set forth plans to establish a smart mining system by 2035, striving for the fundamental intelligence of various medium and large-scale mines. The key service requirements for smart mining encompass:

1. With the aim of smart mining, achieving smart mining, transportation, and production aligned with the industrial internet's requirements, as well as reducing safety incidents and enhancing operational efficiency. This involves establishing environmentally friendly mines to optimize resource utilization.

2. Achieving production visualization involves real-time perception of the production process, making it visible, controllable, and manageable, such as smart positioning of personnel and vehicles.
3. Automation and Autonomous Drive Operations: Realizing remote mining, driving, and inspection, eliminating primitive mining practices, and enhancing overall efficiency.
4. Integrated Management of Smart Maintenance: Visualizing service quality, managing networks, ensuring safety controls, and facilitating remote operations.

8.3.3 P5G solution for Smart Mining

Based on the needs of the mining industry, AsiaInfo provides a P5G solution with distributed capabilities, delivering high bandwidth, low latency, and large-scale machine communication, all while addressing security concerns. This solution, utilizing low-frequency and high-power 5G All-in-One base stations to achieve coverage for all roads and operational areas in the mine, meets the demands of low cost, extensive coverage, adaptability to outdoor environments, and simple installation. The All-in-One base station facilitates direct data transmission to the core network without the need for edge machine rooms, reducing costs for mining customers.

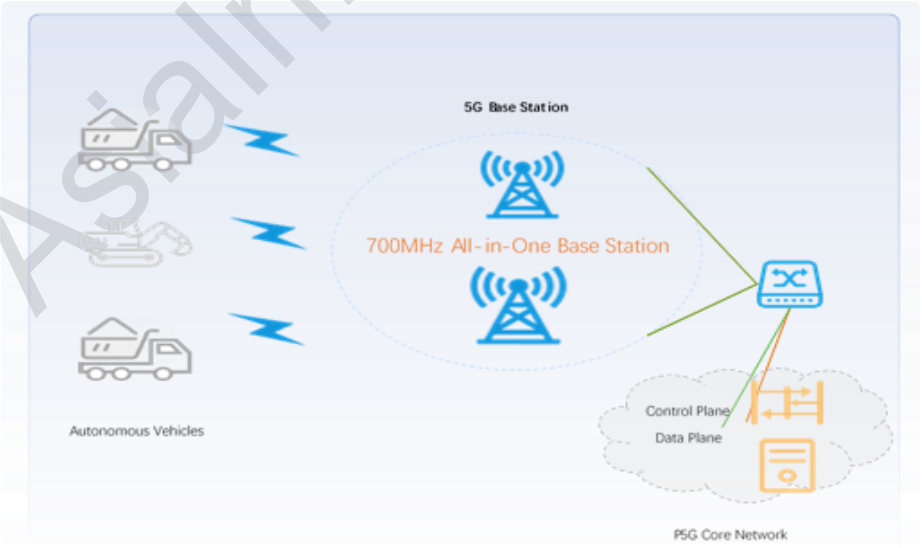


Figure 8-8 P5G Solution for Mining Industry

8.4 Smart Port

P5G are widely employed in smart ports. The following discussion provides a detailed exploration of the P5G applications from the perspectives of network scenarios and service requirements.

8.4.1 P5G scenario for Smart Port

The advent of P5G technology has provided opportunities for various industries to undergo digital transformation and enhance production efficiency. Ports, with dual attributes of industry and transportation, have a pressing need for smart and automated production and operations. The production processes at port terminals involve vertical transportation systems, horizontal transportation systems, and overall security monitoring systems.

By fully leveraging the P5G characteristics of high bandwidth, low latency, extensive IoT capabilities, etc., the rapid integration of 5G networks with operations such as remote control of port machinery, autonomous drive container and AGVs dispatch, and intelligent security monitoring can be achieved. This integration can enhance the automation efficiency and intelligent operational capabilities of port terminals, contributing to the establishment of environmentally friendly, efficient, and intelligent smart ports.

As shown in Figure 8-9, the vertical transportation system at ports includes two major types of large-scale machinery: bridge cranes and rail cranes. Bridge cranes handle the loading and unloading of containers from ships to shores, while rail crane equipment manages operations such as loading and unloading, as well as cargo handling, for various goods.

Figure 8-9 The Remote Control of Port Machinery

8.4.2 Service requirements for Smart Port

Traditional port machinery operations are primarily manual high-altitude work on-site, leading to challenges such as harsh working environments and high labor costs, in which there is an urgent demand for remote control operations in ports. Some ports have undergone transformation, incorporating fiber optics and Wi-Fi networks for video feedback and control signal transmission.

However, fiber optic feedback poses challenges in terms of high architecture costs and disruptions during maintenance or replacement periods. Wi-Fi data transmission suffers from low bandwidth and poor stability. Leveraging the high bandwidth of 5G technology can meet the network bandwidth requirements for high-definition video feedback from bridge and rail crane cameras. The low latency characteristics of 5G technology can satisfy the real-time requirements of control signal transmission, and the flexible networking capabilities of P5G can address the need for production data to remain within the port area and ensure data isolation.

Table 8-7 describes the network requirements for remote control of port machinery.

Table 8-7 Remote Control Requirements for Port Machinery

Application Scenarios	Network Requirements

Remote Control of Port Machinery	Uplink Speed	Downlink Speed	Transmission Latency	Reliability
	≥ 30 Mbps	≥ 100 Mbps	≤ 18 ms	≥ 99.9%

The horizontal transport system in the port mainly includes autonomous drive container trucks and AGVs, transporting containers between the shore bridge and the yard. The yard refers to the area where containers are stacked in the port terminal. Figure 8-10 illustrates the scenario of autonomous drive container trucks and AGVs dispatch.

Figure 8-10 Autonomous Drive Container Trucks and AGVs

Ports are densely populated industrial areas, and container trucks drivers are prone to fatigue driving that pose safety risks. Currently, automated ports mainly utilize intelligent container trucks based on sensors and visual cameras, as well as AGVs guided by magnetic fields for transportation. LTE-U private networks are employed for remote vehicle dispatching. However, smart container trucks are limited by the sensitivity of vehicle perception devices, and the construction cost of magnetic guidance systems is high with inflexible route configurations. Autonomous driving technology based on 5G can meet the high-precision positioning needs of vehicles, as well as the low-latency and highly reliable transmission of perception information. Table 8-8 outlines the requirements of autonomous drive container truck and AGV dispatching operations for 5G networks.

Table 8-8 Requirements for Autonomous Drive Container Trucks and AGV Dispatch

Application Scenarios	Network Requirements			
Autonomous Drive Container Trucks and AGV Dispatch	**Uplink Speed**	**Downlink Speed**	**Transmission Latency**	**Reliability**
	≥ 30 Mbps	No Specific Requirement	≤ 20 ms	≥ 99.9%

The port security surveillance system mainly includes cameras, drones, etc., to achieve security monitoring, equipment and facility inspections, coastal line inspections, and other tasks in the port. Figure 8-11 illustrates common methods for deploying intelligent surveillance.

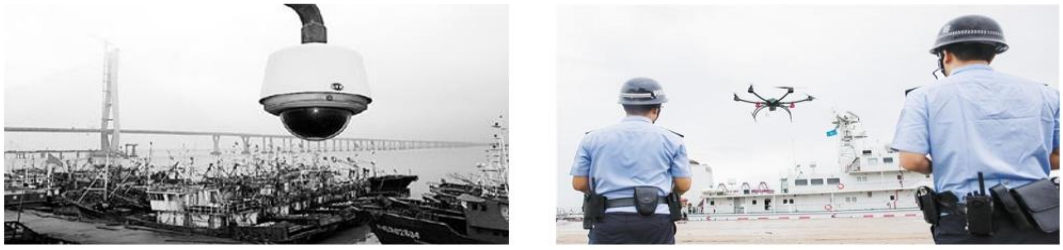


Figure 8-11 Smart Security Monitoring

Real-time monitoring is a crucial means to construct an efficient and automated port. The monitoring encompasses personnel, vehicles, vessels, cargo, and the entire production and operation processes. Utilizing integrated monitoring on the ground and in the air at the port, technologies such as drone inspections and ground-based surveillance are employed to reduce manual intervention.

Current Wi-Fi solutions face challenges such as blind spots in security monitoring, insufficient capacity, and poor stability. The P5G solution integrates 5G networks, AR/VR, high-definition cameras, and drone inspections, enabling comprehensive coverage and real-time visual monitoring of the port area.

Table 8-9 outlines the network requirements for smart security monitoring, including the corresponding network performance indicators.

Table 8-9 Requirements Indicators of Smart Security Monitoring

Application Scenarios	Network Requirements

Smart Security Monitoring	Uplink Speed	Downlink Speed	Transmission Latency	Numbers of Connections
	≥ 40 Mbps	No Specific Requirement	≤ 100 ms	≥ 50

8.4.3 P5G solution for Smart Port

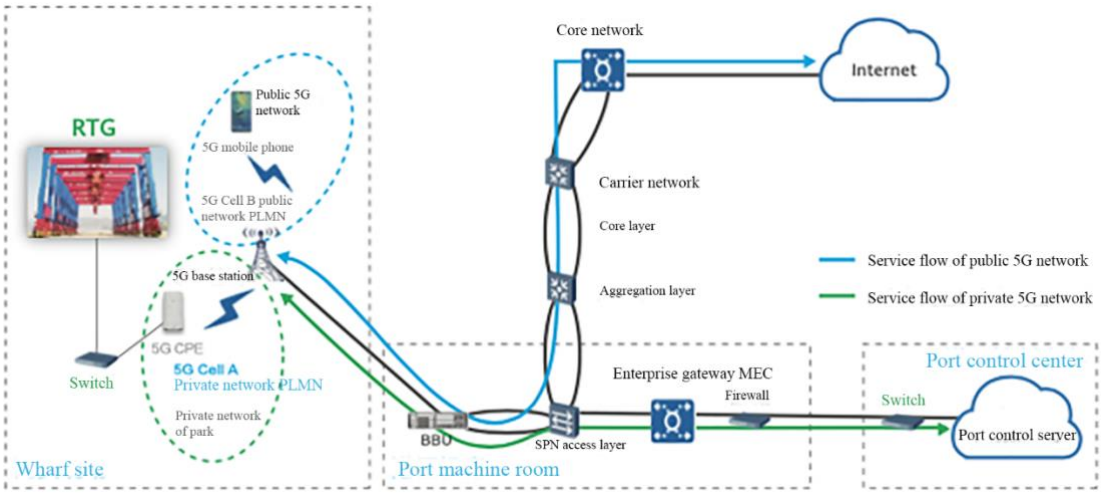


Figure 8-12 P5G Solution for Smart Port

Figure 8-12 depicts a design example of P5G for smart port that employs a hybrid P5G architecture. Utilizing the existing 5G network of operators, the P5G is constructed by deploying distributed UPF along with MEC systems.

The solution utilizes the shared base stations provided by the telecommunications operator at the port while activates the 5G public network PLMN and the P5G PLMN. standard mobile users access the 5G public network, whereas specialized terminal equipment within the port connects to the P5G, ensuring logical segregation.

The deployment of the 5G core network UPF and MEC systems in the port area data center facilitates the diversion of port service data. Standard public network data is directed to the general internet, while port private network data is channeled to the port control center, guaranteeing the security and fulfilling the network performance requirements of the port's P5G data.

8.5 Smart Steel

In the steel industry, P5G can address the demand for smart solutions, effectively solving corresponding service challenges.

8.5.1 P5G scenario for Smart Steel

The steel industry represents a typical and highly complex sector within the industrial manufacturing field, involving significant complexity and risks. The new features introduced by 5G networks will substantially improve the risk profile of the steel industry and enhance its level of smartness.

In the production scenarios of the steel industry, 6 major service scenes, including autonomous drive gantry cranes, ultra-high-definition video security surveillance, machine vision quality inspection, slag-adding robots, autonomous drive aerial vehicle inspections, and AR remote assistance, require reliable communication network support provided by P5G technology. This enables the realization of smart solutions for the steel industry. Figure 8-13 illustrates the application scenarios of smart steel.

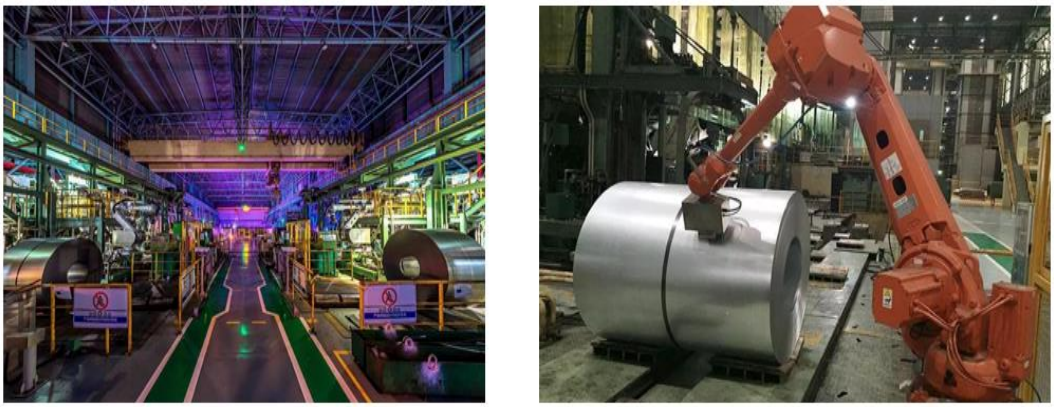


Figure 8-13 Application Scenarios of Smart Steel

8.5.2 Service requirements for Smart Steel

The network performance requirements for different application scenarios in the steel industry can be broadly categorized into 2 types: One demands low-

latency network indicators, such as scenarios involving slag-adding robots and PLC control, while the other one requires high uplink network bandwidth, as seen in scenarios involving machine vision and quality inspection.

The autonomous drive trolley's PLC remote control has a high demand for low-latency performance with a limit of not exceeding 50ms. Additionally, it needs to provide the operator with a first-person perspective from multiple locations with high-definition video to ensure precise and real-time remote control. Table 8-10 outlines the network requirements for autonomous drive trolleys.

Table 8-10 Network Requirements of 5G Autonomous Drive AGV

Application Scenarios		Network Requirements				
5G Autonomous Drive AGV	Function	Uplink Speed	Downlink Speed	Transmission Latency	Reliability	Coverage Area
	Control signaling transmission	≥ 1Mbps	No Specific Requirement	≤50ms	≥ 99.99%	Production Line
	High-definition video transmission	≥ 50Mbps	No Specific Requirement	≤50ms	≥ 99.99%	Production Line

In scenarios of machine vision quality inspection, where control signals are transmitted and low latency performance is crucial, the requirement of latency is less than 20ms. High-definition image transmission imposes a high requirement on uplink bandwidth that need to exceed 100Mbps. Table 8-11 outlines the network requirements for machine vision quality inspection.

Table 8-11 Requirements of Machine Vision Quality Inspection

Application Scenarios		Network Requirements				
Machine Vision Quality	Function	Uplink Speed	Downlink Speed	Transmission Latency	Reliability	Coverage Area

Inspection	Control signaling transmission	≥ 1Mbps	No Specific Requirement	≤20ms	≥ 99.99%	Production Line
	High-definition video transmission	≥100Mbps	≥ 20Mbps	≤100ms	≥ 99.99%	Production Line

In the scenario of equipment fault maintenance, AR technology can address pain points such as a scarcity of technical experts' resources and high travel costs for technical support, effectively enhancing the efficiency of enterprise equipment maintenance. Table 8-12 outlines the network requirements for AR remote assistance.

Table 8-12 Requirements of AR Remote Assistance

Application Scenarios		Network Requirements				
5G AR remote assistance	Function	Uplink Speed	Downlink Speed	Transmission Latency	Reliability	Coverage Area
	Video Feedback	≧ 500Mbps	No Specific Requirement	≦100ms	≧99%	Production Line

8.5.3 P5G solution for Smart Steel

Figure 8-14 presents a P5G solution for smart steel, a typical hybrid P5G with distributed UPF and MEC application.

On the radio side, the solution considers the distribution of service bandwidth and uplink service, as well as the characteristics of high signal penetration loss and interference in steel industry workshops, to conduct a detailed plan and

design of the radio network solution, including the base station location, base station equipment type, and frequency selection.

On the core side, practical considerations dictate requirements such as whether to retain user data within the campus, in which the strategy of distributed UPF to the factory area can be applied. Tailoring the solution to customer requirements, particularly in cases of both low latency and substantial uplink services, the solution entails the establishment of 1 to 2 end-to-end 5G slicing instances and involves configuring diverse network resources to ensure distinct and optimized service performance.

The demand for network assurance of industrial production in the steel industry is heightened, requiring the storage of spare parts and components such as MEC, CPE, and AR routers within the campus.

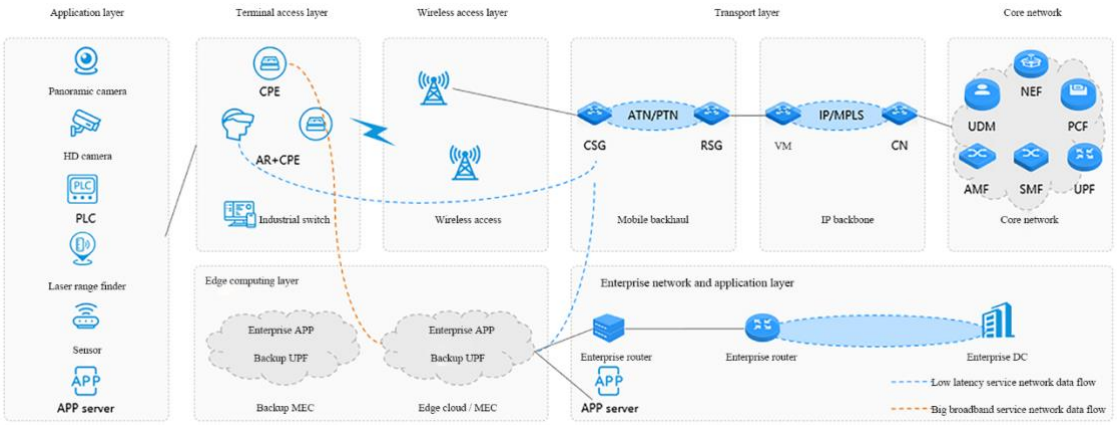


Figure 8-14 P5G Solution for Smart Steel

8.6 P5G Smart Operation

8.6.1 P5G scenario for smart operation

The integration of 5G with vertical industry scenarios has become a new engine for economic growth in the context of P5G scenarios. Based on CT, it deeply integrates IT and OT to achieve differentiated network assurance, coordinated equipment collaboration and ecological management at the campus edge, network quality perception, low-cost, and standardized replication of exemplary spaces. This leads to the creation of advanced

factories with widely connected production units, fully utilized data elements, and efficient empowerment of innovative applications.

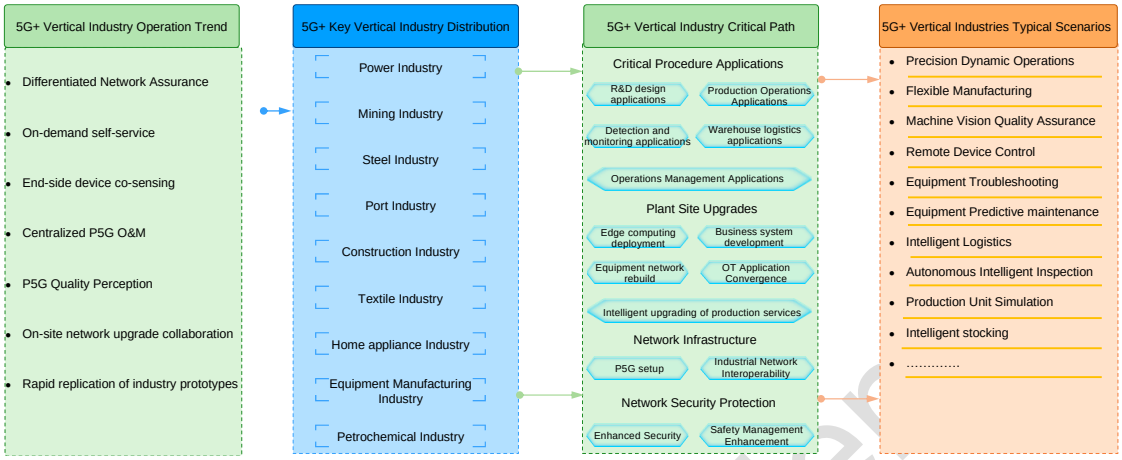


Figure 8-15 The key Operational Scenarios of 5G+ Vertical Industries

8.6.2 Service requirements for P5G smart operation

The impact of digital transformation on vertical industry application scenarios is gradually extending from peripheral support to core production processes, enabling collaborative operations of equipment within industrial campuses. The deployment of 5G operations addresses gaps in this process, driving the development of scenario monitoring, opening up industrial-grade scenario services, and enhancing on-demand deployment capabilities. This further extends the 5G+ industrial ecosystem in vertical industries.

To address the fragmentation, industry specificity, personalization, and scenario-based needs of vertical industries, there is an urgent need for an integrated operational service platform to achieve on-demand, flexible deployment, and collaborative operations. Guided by scenario-based

requirements, this promotes the low-cost and rapid replication capabilities of industry 5G+ exemplary spaces.

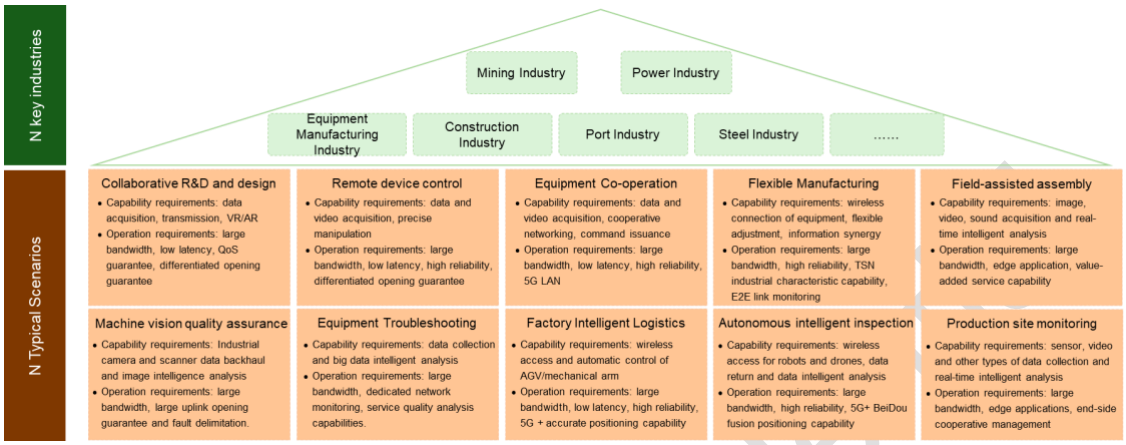


Figure 8-16 Vertical Industry Requirements for Private Network Operations

8.6.3 P5G solution for smart operation

P5G operations are based on the campus's independent 5G networking architecture, connecting to the campus OMC network management platform and the campus production system to achieve integrated operation and intelligent operation and maintenance monitoring of the private network.

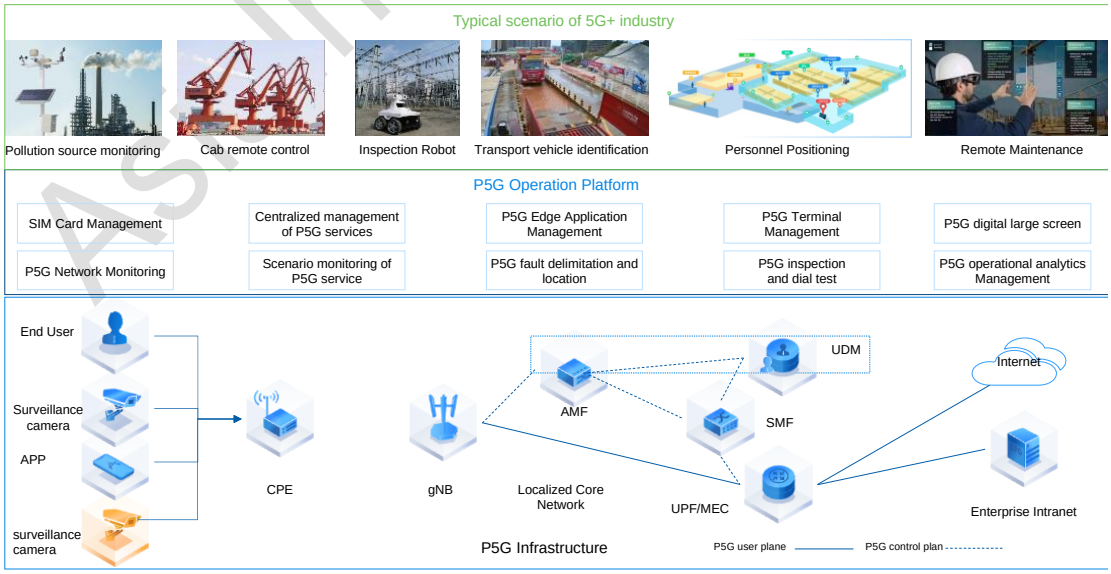


Figure 8-17 Overall Solution for P5G Operations

The P5G operation extensively connects to basic network equipment, completing self-operation of SIM cards, network monitoring, service scenario monitoring, and fault diagnosis under independent networking, reducing the threshold for industry customers. The core functions include:

- Private Network SIM Card Management: Aimed at independent networking scenarios, it interfaces with card vendors and P5G core network management to activate SIM cards, manage their lifecycle, and achieve autonomy for SIM cards within the campus.
- Private Network Service Centralized Monitoring: Providing scenario-based, differentiated, and refined industry-specific capabilities for network slicing, 5G LAN, TSN, secondary authentication, and more.
- Edge Application Management for Private Networks: Opening edge application market, deploying edge applications, monitoring edge applications, and providing open-edge value-added services. Enabling configuration and personalized expansion of edge sub-applications based on edge PaaS, AI algorithms, and more to meet various customer service scenario innovations.
- Private Network Terminal Management: Offering intelligent terminal and module management for the private network, realizing terminal information management, scenario-based management, and geographical location distribution management.
- Private Network Digital Display: Meeting the digital monitoring needs of private network clients for core service and key equipment. Providing clients with customizable large screens which tailored to individual preferences to enhance the effectiveness of digital monitoring.
- Private Network Monitoring: Offering multi-dimensional network end-to-end monitoring for private networks, sliced networks, DNN, etc., which can reconstruct the network topology of radio, transmission, and core networks, allowing customers to intuitively detect and analyze network quality.
- Private Network Service Scene Monitoring: Building upon private network monitoring to achieve end-to-end connection analysis and perception for

typical ToB service scenarios. Utilizing network probes for packet analysis, collaborating with module software probes and application probes to trace service end-to-end, and conducting service quality analysis for various protocol scenarios according to specific scenes.

- Private Network Fault Localization: Supporting fault localization and display for service connection interruptions, abnormal terminations, and connection deterioration. Combining with dial testing and other methods to identify service root causes and trace faults.
- Private Network Inspection and Dial Testing: For centralized monitoring scenarios, supporting N3 and N6 port task dial testing management to realize the collection of key network indicators, fault localization, and delay localization.
- Private Network Operational Analysis Management: Implementing analysis and statistics of private network operational data, establishing operational analysis for core service indicators, generating service reports for key service data, and conducting an overview analysis of network operational quality.

9 Use Cases

AsiaInfo's P5G products provide operators and industry customers with a full-stack end-to-end P5G solution and services, support personalized applications with an agile network, and facilitate the digital transformation of industries.

9.1 A P5G case for Nuclear Power Plant

AsiaInfo's P5G products have been successfully deployed in multiple nuclear power plants. A detailed introduction to the project requirements, construction solutions, and outcomes are provided in below.

9.1.1 Client requirements

The overall goals of the construction at a nuclear power plant are to utilize IoT technology to establish a data collection network system for the power plant's systems and equipment, to enhance the digital monitoring level of the power plant's status, to establish radio network coverage for the power plant to provide a foundation for digitization, mobilization, and end-to-end tracking of operational and maintenance processes. The radio network at the power plant needs to support specific service requirements, as illustrated in Table 9-1, which shows common service demands for smart nuclear power applications.

Table 9-1 Smart nuclear power application scenarios and service requirements

No.	Category	Service Requirement
1	Improvements in Equipment/Material Management	Continuous monitoring of SPV equipment or other critical equipment
2		Data collection for SPV equipment or other critical equipment
3		Data alerts for SPV equipment or other critical equipment
4		Monitoring the status of radiation sources and hazardous chemicals

No.	Category	Service Requirement
5		Traceability tracking for the movement of radiation sources and hazardous chemicals
6		Simplified operational solutions for streetlights, illumination, cabinet fans, fire detectors, and fire doors
7	Improvements in Site/Environmental Management	Access management of key sensitive areas
8		Continuous monitoring of important environmental parameters
9		Data collection for important environmental parameters
10		Data alerts for important environmental parameters
11		Electronic fences for important equipment and areas
12		Reminders for high-risk work site areas
13		Work time reminders for high-risk work site areas
14		Monitoring of important work sites, temporary construction sites, and accident sites
15		Construction of Autonomous Drive factory buildings
16		Monitoring of manhole covers, leak detection, and parking space management
17		Establishment of a radiation monitoring information network, real-time transmission of on-site radiation level data, and personnel dose data
18		Prevention of unauthorized access to hotspots
19		Precise positioning of personnel, personnel counting, and personnel flow monitoring
20	Improvements in Work Activity Management	Real-time input by inspection personnel of discovered problems and defects
21		Upload of photos, videos, and inspection data by inspection personnel to record any abnormalities
22		Automatic planning of inspection plans, routes, and content, and effective management of inspection tasks

No.	Category	Service Requirement
23		Autonomous Drive inspections in some remote areas
24		Remote monitoring of operational activities
25		Reduction of on-site operational errors
26		Digitization and mobile application of operating procedures, drawings, and operation sheets
27		Mobile maintenance
28		Multimedia dispatching
29		Instant communication
30		Emergency response
31		Factory distribution
32		Warehouse management
33		Tool tracking management
34		On-site positioning of fixed assets and search for lost equipment
35	Improvements in Personnel Safety Management	inspection Safety
36		Operational safety
37		Radiation safety
38		Supervision of tool wearing
39		Behavioral supervision
40		Safety Witnessing
41		Enhanced Security

9.1.2 Solution and effects

The solution adopts a combination of independent private network in the production area and hybrid private network in the front of the plant to achieve full coverage of 5G signals, meeting the 5G communication needs across the entire

nuclear power plant. Figure 9-1 illustrates the overall scheme of P5G for a nuclear power plant.

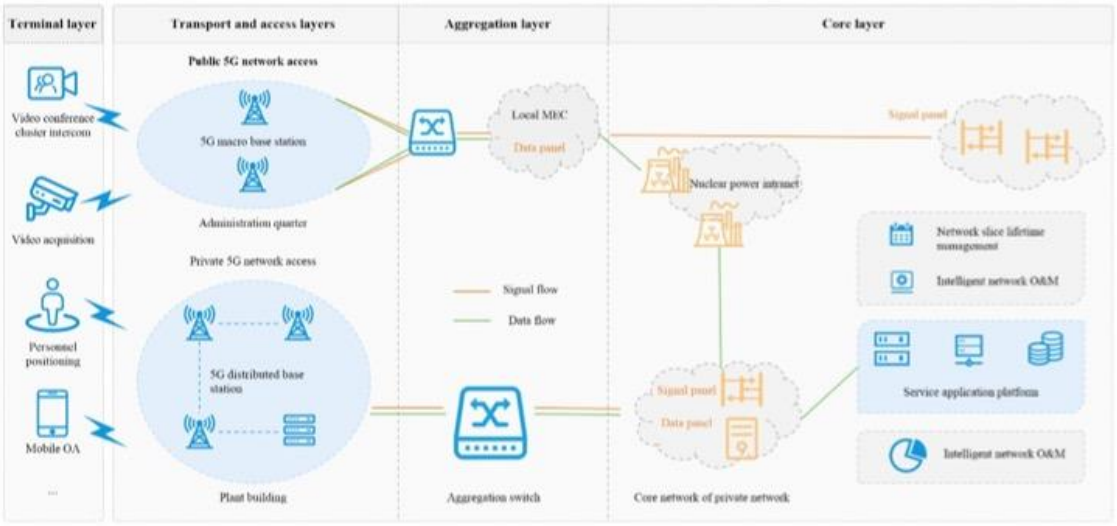


Figure 9-1 The P5G Solution for a Nuclear Power Plant

5G key features for the nuclear power plant include:

- Meeting Key Requirements: Safety in production, efficient maintenance, radiation protection, human error prevention, online training and exams, etc.
- Network Security: P5G in the production area is configured and managed according to Level 3 information security protection, while the hybrid private network in the front of the plant (local MEC) is configured and managed according to Level 2 information security protection, ensuring robust network security.
- Electromagnetic Compatibility: Ensuring that relevant equipment meets strict Electromagnetic Compatibility (EMC) requirements to guarantee that devices will not impact the normal operation of other equipment and systems in the nuclear power plant, with a main focus on devices such as DCS devices and on-site safety instruments.

The P5G operation platform for nuclear power builds capabilities of operating and managing P5G services tailored for the nuclear power industry, enables functionalities such as slice activation, self-operation of SIM cards, integrated operation and maintenance, device management, personnel positioning, and

integrated voice services under independent networking mode, and continuously explores new intelligent applications, leading to the empowerment of the digitalized power plants development. The main function of P5G operation platform for nuclear power are illustrated in Figure 9-2.

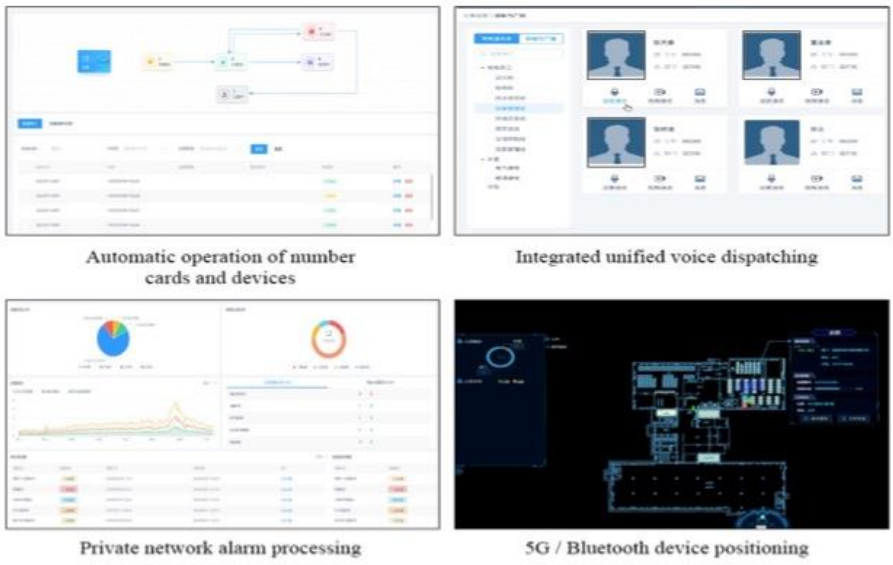


Figure 9-2 Main Functions of P5G Operation Platform for Nuclear Power

AsiaInfo's P5G and the comprehensive smart nuclear power solution bring substantial economic benefits to nuclear power customers. Estimated economic benefits for a single nuclear power unit include:

- Utilizing centralized dispatch through 5G communications to shorten the overhaul period by methods such as reducing the establishments of temporary communication and the broadcasting/fixed-line searches, decreasing operational costs by approximately 1.5 million RMB per year.
- Introducing an electronic work order system to reduce personnel work package time costs and the economic costs associated with paper-based work packages, decreasing operational costs by approximately 3 million RMB per year.
- Employing an intelligent inspection to enable real-time transmission of inspection data to the backend and enabling personnel to work in a mobile office setup, which significant reduces manual costs and paper costs related

to recording, organizing, and analyzing data during manual inspections, decreasing operational costs by approximately 0.5 million RMB per year.

- Continuously introducing other intelligent operational systems to assist the operation and maintenance of the nuclear power plant, decreasing operational costs by approximately 7.5 million RMB per year.

Through the P5G deployment, the overall digital operational capabilities of nuclear power enterprises are significantly improved, providing the foundation for the digitization, mobilization, and end-to-end tracking of processes involved in the operation and maintenance of nuclear power service.

9.2 A P5G case for Thermal Power Plant

AsiaInfo's P5G products have been successfully deployed in the thermal power industry. The following text provides a detailed introduction to the project requirements, construction solutions, and outcomes.

9.2.1 Client requirements

A specific thermal power plant is a demonstration project for a green coal-fired power station and a smart coal-fired power station, as illustrated in Figure 9-4.

Figure 9-3 P5G Project for a Thermal Power Plant

This thermal power plant is the first smart power plant built by the enterprise as a benchmark. The project fully leverages the advantage of four machines and one control that entails the centralized control of four power generation units, optimizes design from the source to foster innovation, and adheres to the comprehensive architecture specified in the construction norms for smart power enterprises. The architecture encompasses two platforms – intelligent power generation ICS and smart management IMS – and three networks – production control network, management information network, and industrial radio network. The objective is to establish an integrated system for management and control. The P5G industrial radio network, as an important part of the architecture layer, provides network support for the plant's mobile applications, personnel positioning, autonomous drive aerial vehicles, augmented reality, and other intelligent tools.

Building on the capabilities of the 5G network, the project will also use technologies such as ubiquitous sensing, digital twin, big data, cloud computing, and artificial intelligence to establish a smart power plant ecosystem with features of self-analysis, self-diagnosis, self-management, self-optimization, self-recovery, self-learning, and self-improvement throughout its entire lifecycle.

The high-performance, high-security, and high-reliability advantages of the P5G will provide intelligent network support for the safe production of the power plant. The project adopts a unified planning with step-by-step implementation construction mode and conducts smart engineering construction during the architecture period. During the production period, efforts are made to achieve the goal of full workforce labor productivity. The aim is to firstly realizing autonomous drive inspection and fewer personnel operation, whereas the ultimate goal is to achieve fewer personnel operation and fewer personnel management.

9.2.2 Solution and effects

In accordance with safety regulations, the entire plant's P5G radio network is constructed with the core network embedded, ensuring seamless coverage of 5G radio signals throughout the factory area. Simultaneously, reliability and

stability of network signals are guaranteed in key construction and production zones. This network architecture caters to 5G usage requirements across all stages, from the engineering and architecture phase to production and operation, addressing the data transmission needs of high-definition video feedback, large-scale data collection, AR/VR remote assistance, intelligent inspection robots, and autonomous drive aerial vehicles for intelligent inspections.

As illustrated in Figure 9-5, the P5G integration solution for a specific thermal power plant possesses the following characteristics:

- Providing a comprehensive access solution to support ICS 2.0 design and realize a smart power plant.
- 5G radio coverage with a distributed core network to establish a telecom-grade, seamless, high-bandwidth, and low-latency network within the power station.
- Clusters of 5G mobile applications that complement on-site mobile operations which offer fundamental IaaS platforms, data backup, triple-level security, service deployment zones, and other specific measures.
- Facilitating 5G service proxy communication with ICS systems in Zone One of the production network by employing optical isolation devices to achieve minimal boundary access to Zone One of the production network.
- Featuring a private network operations platform for unified management of all boundaries and architecture to reduce operational complexities.

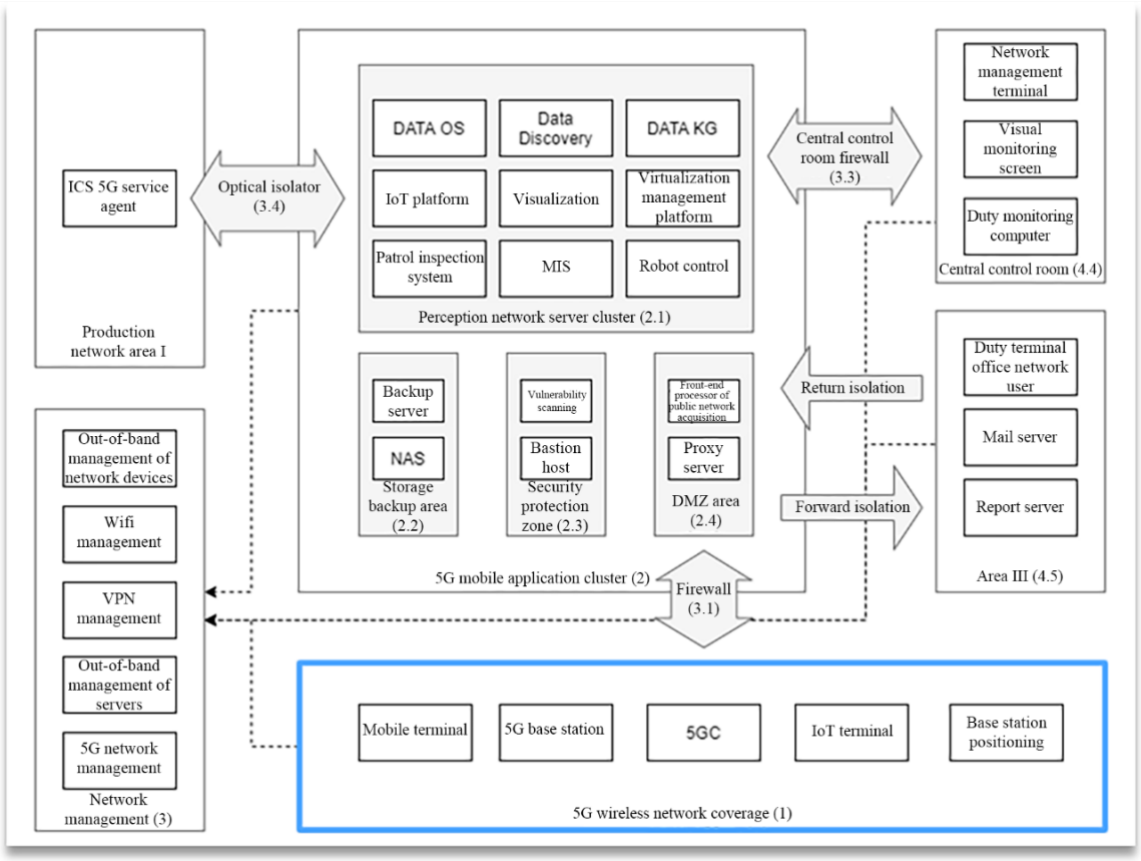


Figure 9-4 P5G Integration Solution for a Specific Thermal Power Plant

9.3 A P5G case for Open-pit Mine

AsiaInfo's P5G has achieved successful commercial deployment in a large open-pit coal mine. The following section provides a detailed overview of the application case.

9.3.1 Client requirements

The customer requires to establish a P5G in the enclosed areas of an open-pit mine to support autonomous drive driving of multiple trucks and remotely operated excavators. The project was implemented at an open-pit coal mine in Xinjiang, which serves as a demonstration mine for a mining conglomerate, imparting significant significance to the P5G project.

The core customer requirement for this project was the implementation of industrial radio networks for equipment management within the industrial plant

area. With the full coverage of industrial radio networks, various applications such as autonomous driving, drone inspections, belt inspection robots, video surveillance, and real-time retrieval of equipment information became feasible. Remote diagnostics of equipment were efficiently executed using the plant area's industrial radio network.

The 5G network's secure access control system facilitated the interconnection of the secure 5G network in the plant area with the production network, employing MEC platform system devices. It utilizes the extensive coverage of 5G to install onboard equipment for on-site engineering vehicles that provides capabilities for real-time voice, video transmission, and communication. The adoption of autonomous driving technology in the plant area relies on a robust internet architecture. Autonomous driving stands out as the most direct beneficiary technology under the 5G network, allowing for significant optimization and comprehensive application of high-precision map navigation and remote control procedures.

9.3.2 Solution and effects

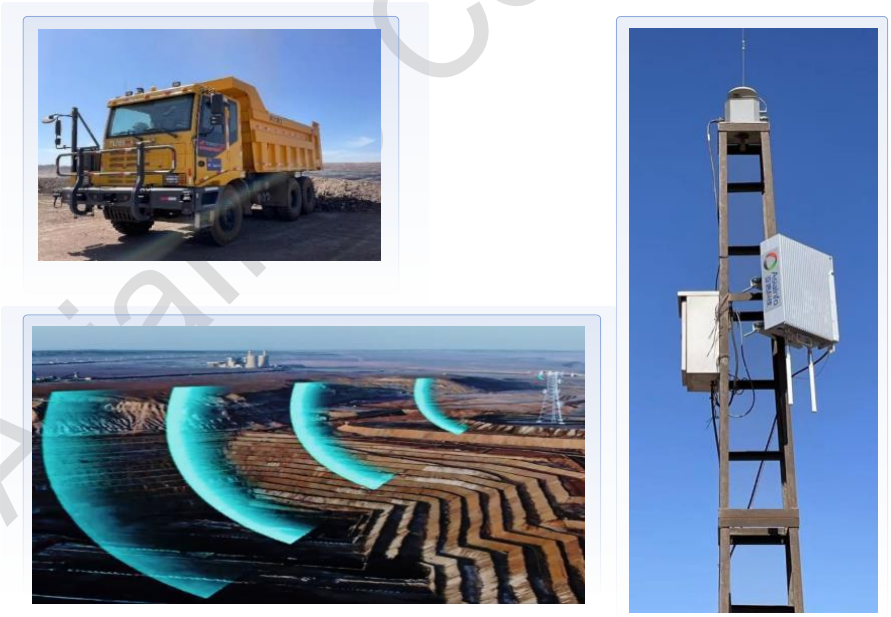


Figure 9-5 P5G Construction for a Large Open-Pit Coal Mine in Xinjiang

The smart mine project in Xinjiang utilizes 5G radio communication systems. The total engineering scope comprises one set of 5G core network, two 5G high-power 700MHz All-in-One base stations, and the associated facilities. The

system is composed of 5G base station systems, fiber optic transmission systems, switches, core networks, and a firewall system. It completes the P5G radio network deployment and coverage across the mine, providing service traffic such as uninterrupted communication and data transmission. Additionally, it is complimented by a P5G that provides on-site instant communication tools and application tools for managing external personnel operations.

The solution achieves high-speed data communication as well as smart management and control. Through the issuance of control commands via the P5G, it completes the bidirectional transmission and multifaceted integration of various vehicular data, enhancing the operational efficiency of the entire autonomous driving fleet in the mine. The solution innovatively combines autonomous driving transportation systems with digital twin technology, bridging key aspects of the mining operation process with smart scheduling, analytics, and monitoring.

Following the implementation of autonomous driving throughout the mine, transportation efficiency is improved by over 10%, fuel consumption is reduced by 10%, and operational costs decrease by 10%.

9.4 A P5G Operation case

AsiaInfo's P5G operation platform has achieved successful commercial deployment in a large open-pit coal mine. The following section provides a detailed overview of the application case.

9.4.1 Client requirements

The service development of new power system is presenting a trend of massive terminal access, frequent information exchange, and extending control to the peripherals. The trend poses new requirements for the flexibility of power grid communication access, service carrying capacity, security isolation capability, and comprehensive operations. Among these requirements, the technical characteristics of 5G networks, including high speed, low latency, high reliability, and large connectivity, align well with demands of the new power system service. It can effectively address the

reliable communication challenges in the last mile, expanding the scope and capabilities of detection and control in the new power system.

9.4.2 Solution and effects

The Smart Power P5G operating platform establishes an operational mechanism for the convergence of three major telecommunications networks by operators, collaborative governance, and comprehensive service assurance for the power industry. It achieves online transaction processing, comprehensive network monitoring, and real-time terminal management. The platform enhances network carrying capacity, facilitating the intelligence and precision of power grid service management.

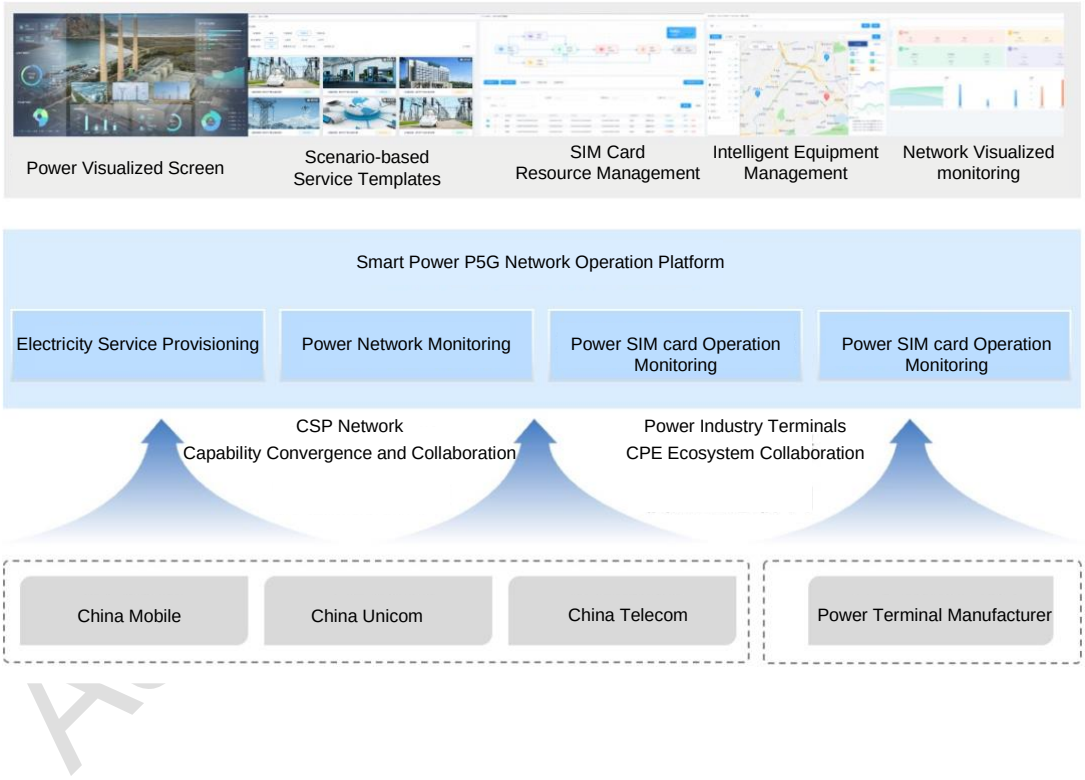


Figure 9-6 Overall Architecture of a Smart Power P5G Operating Platform

Providing 5G network coverage and differentiated operational capabilities for the power information management region and production region, the platform constructs an end-to-end solution covering generation, transmission, transformation, distribution, and utilization to offers ready-to-use industry

scenario service templates and centralized O&M support across these five key segments.

- Power Generation: Through the deployment of 5G network slicing and the utilization of 5G radio access, the power dispatch center achieves unified control over power plants, resolving issues in local power plants and distributed power sources where fiber optics are not covered, addressing control blind spots and the high cost of building new optical cable routes, and realizing ubiquitous terminal connectivity.
- Power Transmission: Utilizing 5G slicing networks and Beidou, the continuously operating reference stations (CORS), to facilitates applications such as 5G+Beidou autonomous drive drone power line inspections and high-definition video monitoring of transmission lines. This achieves real-time transmission of high-definition images for monitoring and online defect identification, as well as enhances the efficiency and intelligence of line inspections.
- Power Transformation: Utilizing applications such as power 5G robot inspections and AR/MR inspections on the power transformation side, the system achieves real-time transmission of high-definition videos. This setup facilitates remote expert collaboration in real-time, enhancing the efficiency of intelligent substation inspections. The approach significantly improves inspection accuracy and safety.
- Power Distribution Side: Integrates 5G wireless technology with power distribution operations, verifying the capability of 5G to support power distribution automation and differential protection. Enables quick issuance of distribution dispatch commands, precise fault location, and friendly interaction between power sources and loads, enhancing the operational management and reliability of the distribution network.
- Power Usage Side: Leveraging 5G communication's large connectivity and high bandwidth, supports applications like "5G+Power Usage Information Collection" and "5G+Electric Vehicle Charging Stations," addressing issues related to the economic and secure access of service operations. Facilitates

rapid deployment, frequent data collection, and enhances the quality and management of energy services for professional customers.

- Construction Site Monitoring: Utilizes the characteristics of 5G communication's large connectivity and high bandwidth for dynamic monitoring and tracking of equipment, facilities, personnel, and visitor trajectories at the construction site, aiming to improve on-site safety and construction progress.
- In the context of smart power scenarios, the P5G operating platform provides capabilities based on standardized, planned, and collaboratively governed three-network convergence under virtual and hybrid networking.
- Offering differentiated 5G slicing template design and DNN activation management capabilities based on the service requirements of 5G network latency, jitter, connectivity density, isolation, uplink/downlink, and bandwidth, achieving standardized and unified network management for the power industry to enhance the security management for power networks.
- The platform enables flexible slicing capabilities for massive device access, providing intelligent device management to support safety production. It facilitates the fine operation of distributed photovoltaics, power distribution automation, autonomous drive drone inspections, etc.
- Leveraging public networks for dedicated purposes and offering flexible slicing capabilities tailored to various service scenarios, the platform accomplishes the massive integration of devices and provides centralized management for intelligent devices, contributing to enhanced safety in production environments.
- Establishing support for distributed photovoltaics, power distribution automation, drone inspections, and other major categories across the generation, transmission, transformation, distribution, and utilization phases, facilitating refined operations such as centralized online applications for SIM cards, on-demand SIM card purchases, lifecycle management, real-time monitoring of SIM card data usage, detailed analysis of ledger usage, etc.,

in order to effectively allocate machine cards and reduce 5G SIM card costs, achieving the online and refined management of power assets.

- Providing open and integrated capabilities from three major telecom operators to achieve an overview of the power system network, enable collaborative closed-loop processes for visualization and work orders, and ensure rapid localization of network faults. The platform also incorporates end-to-end connectivity for perceiving the quality of network services.

A power company has introduced AsiaInfo's P5G operating product, jointly opening and integrating the slicing capabilities of the three major operators and realizing the first nationwide P5G operating service platform.

Launch of the nationwide first provincial 5G power demonstration network

Publishing Network Platform Operation Benchmark-Power Private Network Operation Platform

Figure 9-7 Successful Launch of a Power Private Network Operation

10 Certificates and Awards

AsiaInfo's P5G products have obtained network certification for P5G radio network and the full set of 5G core network elements, along with other qualifications and awards. The products underwent through validation of fundamental functionalities, network performance, and network security, laying a solid foundation for the large-scale commercial deployment.

10.1 MIIT Certificates

As shown in Figure 10-1 and Figure 10-2, AsiaInfo P5G radio network and the full set of P5G core network elements have passed the network access test of the Ministry of Industry and Information Technology (MIIT) and has been granted the network certifications.

Figure 10-1 AsiaInfo P5G radio network certificates

Figure 10-2 AsiaInfo P5G core network certificates

10.2 Application marketplace of public cloud vendors

AsiaInfo's P5G products have passed the compatibility test of China Telecom Cloud and have been successfully listed on the China Telecom Cloud App Marketplace. AsiaInfo P5G solutions are based on the public cloud service model, providing industry customers with standardized software, hardware, and service offerings. It supports flexible selection of various product combinations to meet the diverse needs of customers. Being listed on the China Telecom Cloud App Marketplace further expands the products into new market channels.

Figure 10-3 AsiaInfo P5G obtained compatibility certification from China Telecom Cloud

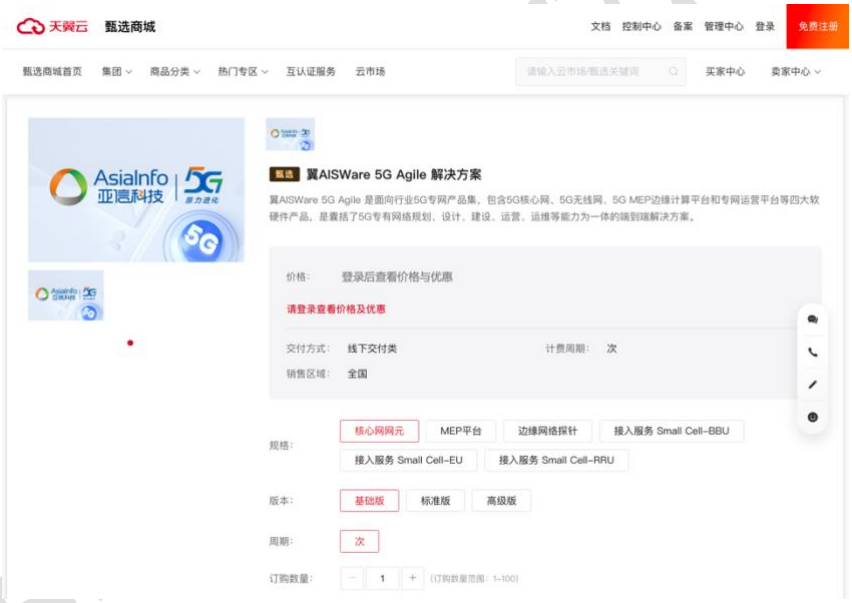


Figure 10-4 AsiaInfo P5G list on China Telecom Cloud App Marketplace

AsiaInfo P5G core network product, based on the cloud-native architecture, officially passed the AWS Amazon Cloud technology test and obtained the certification on December 2, 2022. It is now available on the AWS Marketplace, signifying AsiaInfo's P5G products fully meet the comprehensive technical requirements of cloud service providers and launch a new public cloud service model for P5G product system. This model significantly shortens the pathway and time for AsiaInfo's P5G products to reach customers, which is expected to

become one of the main expansion methods for standardized P5G products targeting industry customers in the future.

Figure 10-5 AsiaInfo P5G list on AWS Marketplace

10.3 Awards

AsiaInfo Technologies has been honored with the “Best Network Slicing Trail” at 5G World summit in 2021, recognizing its exceptional contributions to network slicing in the telecommunications and industry application domains. Refer to Figure 10-6 for the award certificate.

Figure 10-6 AsiaInfo Technologies "Best Network Slicing Trail"

As illustrated in Figure 10-7, AsiaInfo Technologies, in collaboration with its partners, clinched the first prize in the 5th "Bloom Cup" 5G Application Competition with the Smart Nuclear Power P5G Project.

Figure 10-7 The 5th "Bloom Cup" 5G Application Competition

FutureNet Asia is a premier summit in the Asia-Pacific telecommunications industry, aiming to explore the industry's future development path, particularly focusing on network automation and intelligence. AsiaInfo's Self-aware Network Customer Experience Management Solution stood out among numerous entries from global companies, earning "The Most Innovative Application of AI & Automation". AsiaInfo's intelligent customer experience management system demonstrates exceptional capabilities in comprehensive user service perception and experience analysis, aiding telecommunication operators in reducing user complaints and enhancing overall customer satisfaction.

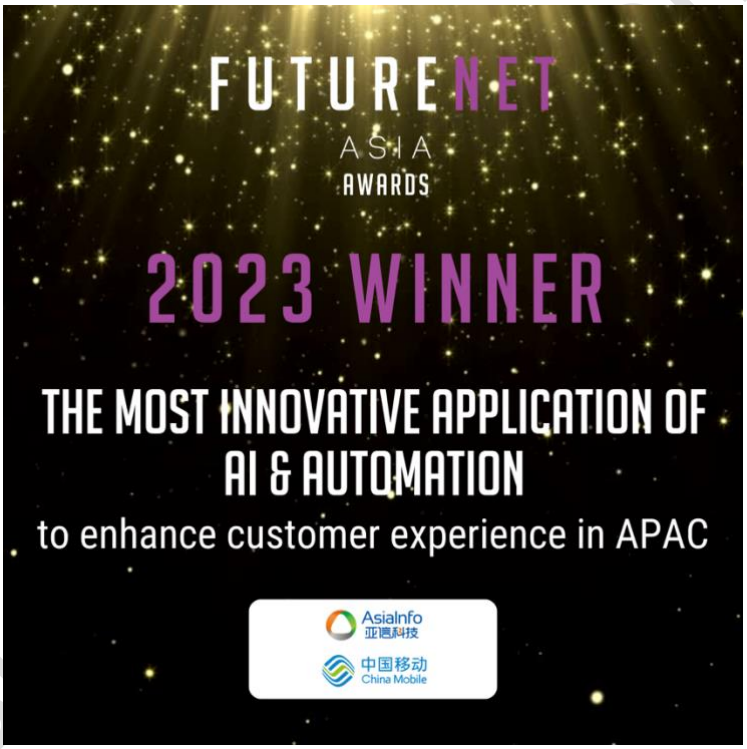


Figure 10-8 The Most Innovative Application of AI & Automation

In 2023, AsiaInfo Technologies was awarded the first prize for technological advancement by Chinese Association of Automation (CAA) for the project Key Technologies and Applications of Computing Native Network.

In the same year, AsiaInfo Technologies also received the second prize for technological advancement from China Computer Federation (CCF) for the innovative application of P5G products and solutions at a thermal power plant in Inner Mongolia.

Figure 10-9 The Second Prize for Technological Advancement from CCF (2023)

11 Contact Us

AsiaInfo Technologies (China) Limited

Address: AsiaInfo Plaza, Coutyard#10 East, Zhongguancun Software Park Phase II, Xibeiwang East Road, Haidian District, Beijing, P.R.China

Postcode: 100193

Fax: (+86) 010-82166699

Tel: (+86) 010-82166688

Email：5G@asiainfo.com

Web: www.asiainfo.com

Thank you

Customer Value Innovator & Digital Transformation Promoter with Full-Stack Data Intelligence Capabilities