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ZTE TECHNOLOGIES

Expert Views

AI Is Reshaping Wireless Communication Architecture and Ecosystem

Special Topic:

AI-Reshaped RAN (AIR RAN)

ZTE AIR RAN: Building Mobile Infrastructure for the AI Era

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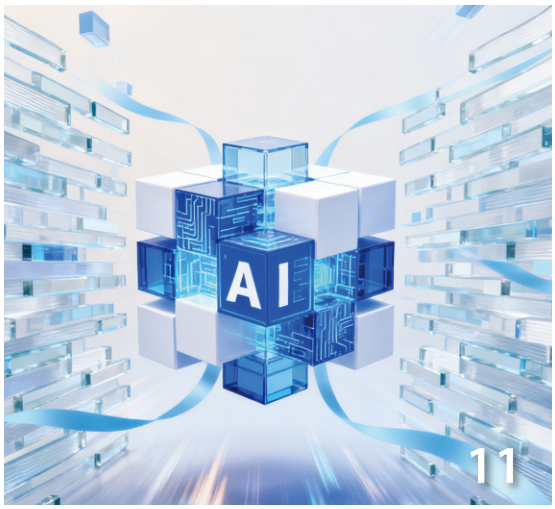

Success Stories

AI Is Reshaping Wireless Communication Architecture and Ecosystem

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With the global deployment of 5G-A networks and the accelerated standardization of 6G, the deep convergence of AI and wireless communications has become the most significant driver of innovation and the greatest disruptive force in the telecommunications sector. Extensive research within the telecom industry indicates that AI technologies are reshaping the underlying architecture and upper-layer application ecosystem of wireless communications by optimizing network performance, enhancing edge computing capabilities, and restructuring service models.

The telecom industry is systematically exploring AI-empowered wireless communication trends and cutting-edge technologies across multiple dimensions, including network performance enhancement, operational model transformation, AI-native architectures, and novel applications and business models.

AI Enables Intelligent Leaps in Performance, Operations and Management of Wireless Networks

Network optimization is one of the earliest and most fundamental applications of AI in telecommunications. Regarding transmission efficiency, research shows that AI, through improved channel measurement accuracy and signal demodulation optimization, can increase user-perceived speed of 5G-A networks by 30% and expand coverage radius by 15%.

In beam management, deep learning-based smart antenna systems can achieve up to 20% coverage expansion and up to 35% interference suppression, significantly improving network stability in densely populated urban environments. For example, millimeter-wave beam alignment technology supported by convolutional neural networks (CNNs) reduces beam search time to milliseconds, increasing edge user throughput by 40%.

3GPP Release 18 (Rel-18) defines the technical specifications for leveraging AI in scenarios such as channel state information (CSI) feedback, beam management, and positioning. AI-enhanced channel state feedback (CSF) can achieve a throughput gain of up to 95%. Furthermore, AI-driven distributed training architecture can reduce end-to-end latency for XR services to below 20 ms and energy consumption by 25%. ZTE, through cross-layer resource scheduling AI algorithms, achieves dynamic coordination of computing and communication resources, improving spectrum efficiency by 40%. Channel prediction models based on long short-term memory (LSTM) replace traditional linear estimation, improving CSI feedback accuracy by 18 dB.

In network operations, generative AI (GenAI) can predict and manage network load, optimize routing, and proactively address potential problems before potential failures impact service. This predictive capability not only improves network efficiency and reliability but also reduces operating costs. In customer service, GenAI is transforming how telecom companies interact with customers. Chatbots and virtual assistants powered by GenAI handle a wide range of customer queries, providing personalized and efficient service around the clock. These AI-driven systems learn from each interaction, continuously improving their ability to resolve customer issues.

Predictive maintenance, network optimization, anomaly detection, and automated troubleshooting using AI and machine learning can enable dynamic resource allocation, traffic load prediction, and congestion management. AI can automate customer service functions, from virtual assistants and chatbots handling queries to intelligent automation of service setup and management, enhancing user experience. ZTE is reshaping the operational paradigm through intent-based networking and large language models (LLMs), achieving a high-level L4 autonomous network and empowering efficient network operation and maintenance.

AI Is Driving a Paradigm Shift in Wireless Network Architecture

Radio access networks (RANs) are transitioning from traditional communication-centric infrastructure to converged computing and communication platforms. Simultaneously, driven by GenAI, AI and RAN are rapidly converging. Consequently, new architectures such as AI-RAN, digital twin RAN (DT-RAN), AI-agent networks, AI-native networks, and autonomous networks (AN) are emerging.

AI-RAN integrates RAN AI workloads on the same infrastructure, leveraging machine learning, automation, and real-time data processing to improve RAN efficiency and adaptability, enabling smarter resource allocation, intelligent interference management, optimized network slicing, automated network operation, AI edge computing, predictive maintenance, and failure detection. As a leader in intelligent RAN architecture for heterogeneous communication and dedicated networks, ZTE's AIR RAN solution sets a new benchmark for wireless network experience, energy efficiency, and maintenance efficiency.

DT-RAN creates an accurate, real-time model of the mobile network using enhanced data and models. The DT model reflects reality more accurately than a simplified aggregated model, enabling the simulation, evaluation, and optimization of physical network entities through synchronized digital replicas. For example, LLMs like ChannelGPT utilize multimodal data from wireless channels and the corresponding physical environment, along with their sensing capabilities, to simultaneously generate multi-scenario channel parameters, relevant map information, and wireless knowledge, as required for each task, based on finely tuned large models. In addition, supported by online multi-dimensional channel and environmental information, network entities will make accurate, real-time decisions for each wireless system layer.

The AI-native design philosophy introduced in 3GPP Rel-18 is driving the evolution of wireless networks from "function-oriented" to "cognitive-driven". Furthermore, agentic AI is a revolutionary approach that embeds intelligent, autonomous AI agents into field operations. The next-generation advanced wireless network architecture, agentic AI RAN, integrates agentic AI to enhance field operational capabilities. Agentic AI consists of a group of specialized agents that act as subject-matter experts (SMEs), each focusing on specific areas such as network troubleshooting, decision support, and workflow optimization. Leveraging this

structured, multi-agent AI system, organizations can extend their expertise, reduce problem-solving time, and improve operational efficiency. With agentic AI, network troubleshooting moves away from manual trial and shifts to a data-driven, AI-guided process. When technicians encounter problems, AI agents collaborate to provide precise, real-time suggestions. Agentic AI no longer simply reacts to service outages; it evolves towards proactive and predictive network maintenance.

Whether it's AI-RAN, DT-RAN, agentic AI RAN, or AI-native RAN, the essence lies in a paradigm shift from traditional systems to autonomous, intelligent, and continuously self-optimizing networks.

AI Powers New Services, Applications, Terminals, and Security in Wireless Networks

AI is reshaping wireless communication networks beyond connectivity, supporting a series of novel applications such as GenAI and robotics, and extending AI-driven traffic to wireless networks. ChatGPT is expanding the consumer base for content traffic, shifting from human users to machines, and has the potential to become the next killer application in the telecommunications industry. Furthermore, GenAI, with its ability to efficiently learn complex data distributions, generate synthetic data, and present the original data in various forms, has become a powerful AI paradigm, diversifying existing services and applications. GenAI technologies, especially those supporting LLMs and creative content generation, are beginning to play a key role in the transformation of telecommunications services.

In addition, GenAI is facilitating the creation of new services and content, enabling telecommunications companies to offer unique value-added services. From generating personalized content recommendations to creating digitally interactive virtual environments, GenAI is continuously expanding the range of services. For example, KT M Mobile has launched a new AI-powered eSIM activation service for its South Korean customers, marking a significant advancement in automated mobile service configuration. The new system uses advanced AI algorithms to automate eSIM activation, reducing the need for manual processing and potential errors. Meanwhile, ZTE's AIR Core, based on cloud-native and AI-native technologies, intelligently generates new services through experience orchestration, helping operators create new revenue streams and reshape network value.

Furthermore, the integration of AI into mobile phones is creating new revenue models beyond traditional smartphone sales. AI capabilities enable new business models, including subscription services for advanced AI features, personalized advertising, and enhanced application capabilities that leverage the processors on network devices. These innovations promise to diversify revenue streams, drive deeper customer engagement, and deliver continuously improving, personalized user experiences.

While AI will support entirely new applications, ranging from autonomous systems to immersive virtual experiences, it will also face more complex threats. AI-centric network architectures may introduce new attack vectors, necessitating robust security measures to mitigate potential threats. AI is revolutionizing cybersecurity by enhancing endpoint visibility, improving anti-malware defenses, and simplifying firewall management. Through behavioral analysis, AI systems can detect anomalous activity, thereby more effectively mitigating potential security threats. This proactive security approach highlights AI's ability to adapt to and respond to evolving cyber threats, ensuring robust network protection. AI can play a role in all aspects of cybersecurity: access control, anti-malware control, firewalls, behavioral analysis, application security, and more.

The convergence of AI and wireless communication is evolving from "tool empowerment" to "architectural restructuring", and from "cost reduction and efficiency improvement" to "value creation". In the future, the standardization of 6G's AI-native architecture, the engineering of new protocols and algorithms such as model context protocols (MCPs), and the establishment of cross-domain federated learning frameworks will be key to breakthroughs in higher-order autonomous networks. With the advancement of 3GPP Rel-20 and the introduction of disruptive technologies such as hybrid quantum cloud, wireless networks will gradually achieve a leap from "intelligent assistance" to "cognitive autonomy", ultimately building a ubiquitous, inclusive, and self-evolving new paradigm for wireless communication. ZTE TECHNOLOGIES

AI and RAN Deep Integration: Driving Telecom Business Model Innovation

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Zhan Yong

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Amid the global digital transformation wave, the deep integration of AI and RAN is reshaping the telecom industry's commercial landscape. With traffic dividends fading and competition intensifying, operators face the challenge of "increasing traffic volume with flat revenue growth": although mobile data traffic surged 245% year over year, it contributed just 3% to the revenue growth. Converting data "volume" into business "value" has become a critical challenge.

Rapid advancement in AI is unleashing the potential of RAN. AI and RAN convergence not only tackles pain points, including limited spectrum resources, high energy use, and complex O&M, but also drives business model innovation and ecosystem restructuring. It accelerates the shift from "connectivity as a service" to "intelligence as a service," unlocking new value growth curves for the industry.

Business Model Innovation: From Traffic Pipeline to Capability Supermarket

Traditional operators rely on traffic and voice revenue, a single, rigid model that struggles to meet diverse user needs and fierce competition. Other industries lead the way: logistics offers service tiers (next-day, same-day, even hourly delivery), while transportation offers business, first, and economy classes—both sharply boosting value through differentiation.

AI's deep integration with RAN is transforming mobile networks into diverse, intelligent, ecosystem-driven platforms. Through the synergy between "AI for RAN" and "RAN for AI", network capabilities are monetized, data is translated into revenue streams, and service capabilities are diversified. This creates an open, flexible, value-sharing digital ecosystem, unlocking entirely new growth paths for the telecom industry.

Network Capabilities Monetization: From Dumb Pipes to Golden Pipes

By deeply integrating AI and RAN, operators greatly enhance the value of connectivity and drives value-based operations. AI-enabled intelligent scheduling and resource allocation boost efficiency and user experience, breaking the limitations of the traditional dumb pipe. AI-driven precise service identification enables personalized offerings, transforming connectivity into an intelligent "golden pipe."

RAN capabilities (e.g., bandwidth allocation, latency optimization, and network slicing) can be encapsulated and exposed via APIs, enabling operators to build a flexible "capability supermarket." This shifts the RAN from providing mere connectivity to building an ecosystem, empowering enterprises, developers and third parties to rapidly innovate and meet diverse industry needs, while opening new revenue streams for operators.

- **AI for RAN:** AI algorithms optimize RAN resource allocation (spectrum, power, load balancing, and user steering) based on traffic load, service type and radio conditions. In high-load scenarios, AI can provide differentiated experience assurance tailored to services and scenarios, delivering Quality-on-Demand (QoD) services. For example, gaming platforms can subscribe to QoD APIs to provide their members with guaranteed low-latency, smooth gameplay, thereby improving user satisfaction.
- **RAN for AI:** RAN provides low latency, high-reliability connectivity and edge computing to support real-time AI inference. For instance, in autonomous driving, RAN offers tailored network slices via service APIs to ensure stable, secure, and ultra-low-latency transmission, fully enabling AI-driven applications.

Data Monetization: From Connectivity to Value Mining

Massive data generated in RAN system can be transformed into tradable data assets after AI-driven anonymization and compliance processing. These assets deliver deep insights for enterprise, enable data-driven business models, unlock hidden value, and create new revenue for operators. For example, mobility insights can help retailers optimize store location selection, improve layout planning, and design targeted promotional strategies.

- **AI for RAN:** AI algorithms analyze user behavior, traffic patterns and network status to deliver high-value insights. It identifies traffic hotspots, enables targeted experience packages for events (concerts, major matches), provides venue-specific experience guarantees, and supports data-driven urban planning and site selection.
- **RAN for AI:** RAN edge nodes enable real-time data processing, cutting transmission costs and enhancing privacy. For example, edge AI can process IoT data locally to instantly generate industry reports and predictive models to support enterprise decision-making.

Service Diversification: From Cloud to Cloud-Edge-Device Collaboration

With the booming development of AI applications, human-machine interaction is moving towards multimodal and personalized experiences. Interaction models are shifting from singular text or voice to multi-agent collaboration, encompassing both communication among AI agents and natural language interaction with humans. This transformation significantly enhances the intelligence and diversity of interaction.

In real-time interaction scenarios (e.g., AI glasses), the traditional cloud-based collaboration model is limited by network latency, making it difficult to meet low-latency requirements. Meanwhile, terminal devices are constrained by the "impossible triangle" of power consumption, size, and cost, making it challenging for them to independently support complex AI tasks.

The cloud-edge-device collaboration model breaks through these limitations by integrating the powerful computing capabilities of the cloud, the efficient processing of the edge, and the real-time responsiveness of the device. This provides users with a low-latency, highly immersive interactive experience, enabling seamless, personalized delivery of new AI services.

- **AI for RAN:** AI algorithms enhance RAN performance through intelligent resource

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allocation, proactive identification and resolution of potential issues before they impact service. It delivers reliable, high-bandwidth connectivity for AI agents, ensuring seamless handling of massive data workloads (e.g., video analytics and edge inference) with millisecond-level responsiveness.

- **RAN for AI:** New AI applications, such as AI agents, require low latency and strong uplink speeds (e.g., ubiquitous 20 Mbps) for instant HD image and video uploads. As the network element closest to users, RAN seamlessly integrates AI workflows to guarantee stable, low-latency connections through precise resource orchestration, while enriching AI application with real-time RAN data, such as enabling personalized recommendations and predictive insights. The cloud-edge-device collaboration supports flexible deployment, differentiated experiences (e.g., multimodal interactions), and rapid expansion of the entire AI services ecosystem.

Global Practices in AI and RAN Integration

Global operators are embracing AI. Currently, AI for RAN is focused on boosting efficiency and differentiated experience, which is the fastest path to AI monetization. RAN for AI targeting new business models remain exploratory and scenario-dependent.

- **European operators:** They focus on improving user experience and operational efficiency, pragmatically advancing AI for RAN. For instance, Deutsche Telekom's Guardian Agent markedly improves O&M efficiency.
- **Chinese operators:** The Chinese market is monetizing AI for RAN, quickly achieving monetization in terms of experience, energy efficiency, and O&M efficiency through the addition of intelligent computing boards to existing BBUs. China Mobile has deployed these boards across hundreds of thousands of sites by the end of 2025, leading global AI monetization.
- **Japanese & Korean operators:** These operators are highly active in GPU-based AI-RAN. SoftBank, a member of the AI-RAN Alliance, launched the world's first GPU-based AI-RAN in November 2024 to enable edge AI monetization, However, viable use cases remain scarce, and monetization prospects are uncertain.

The integration of AI and RAN injects strong momentum into business model innovation within the telecom industry. By achieving network capability monetization, data monetization and service diversification, operators are transforming from traditional connectivity providers into coordinators of the digital ecosystem, creating a vibrant "capability supermarket." This customer-centric model delivers personalized services, significantly enhancing user experience and satisfaction. It not only drives revenue growth and ecological collaboration but also provides solid support for the development of frontier fields like smart cities and autonomous driving, ultimately fueling the vigorous growth of the AI-driven digital economy. ZTE TECHNOLOGIES

ZTE AIR RAN: Building Mobile Infrastructure for the AI Era

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The rapid evolution of generative AI (GenAI) and the democratization of AI applications are accelerating the transition from the mobile Internet Era to the mobile AI Era. The deep integration of AI with 5G and 5G-Advanced (5G-A) has become the core driver for industrial transformation and societal development.

Aligning with this trend, ZTE has proposed a strategic transformation "From Connection to Connection + AI." This strategy is embodied in the AI reshaped solution (AIR Solution)—an integrated suite comprising AIR RAN, AIR Core, and AIR Net. This solution builds a new generation of mobile infrastructure centered on an AI-native architecture and end-to-end intelligent agent collaboration. This article focuses on the technical innovations and application practices of the AIR RAN solution, exploring its future potential driven by the synergy between network agents and service agents, and demonstrating its core value in reshaping mobile infrastructure for the AI era.

AIR RAN: Unlocking Three Core Values with Dual-Brain Intelligence

ZTE's AIR RAN solution centers on the deep fusion of AI and the radio access network (RAN), dedicated to creating an intelligent, digitalized mobile access infrastructure. The solution leverages a dual-layer intelligent architecture—comprising the Site Infrastructure Layer and the Network Service Layer—integrated with a "dual-brain" collaboration model. This continuous evolution provides comprehensive support for enhancing network efficiency, optimizing service experiences, and expanding application scenarios.

Site Infrastructure Layer: Continuous Breakthroughs in Digitalization

At the site layer, AIR RAN reshapes traditional wireless sites using AI, driving the digital and intelligent transformation of hardware across the board. Digitized hardware eliminates data blind spots, providing a solid foundation for intelligent applications through high-precision data acquisition.

Simultaneously, ZTE has introduced the

intelligent computing board as the site's smart engine, providing computational support for localized AI inference and real-time decision-making. The synergistic upgrade of sensing and computing capabilities significantly elevates the intelligence level of the site.

ZTE has accumulated a portfolio of leading technologies and products in the field of AI and RAN integration. The industry's first NodeEngine computing base station achieved a breakthrough in endogenous base station computing power. This was followed by the UniEngine all-scenario hyper-converged device and the AIREngine base station intelligent computing engine, which further deepened the application of AI at the base station and enhanced adaptability across diverse scenarios. These innovations have set a benchmark for the industry in AI and RAN integration.

Network Operation Layer: A Paradigm Shift to Autonomous Services

At the network layer, AIR RAN utilizes AI to drive a paradigm shift in wireless network operations and maintenance (O&M), moving from a "machine-assisted human" model to a "human-assisted machine" model, also known as agentic operations.

The network agent serves as a new service entry point, reshaping mobile network services through multimodal human-machine interaction, autonomous multi-objective strategy planning, and autonomous multi-agent collaboration. To overcome the costs and risks associated with trial-and-error strategy iteration in physical networks, digital twin technology establishes a precise mapping between the physical and digital worlds, enhancing the accuracy and efficiency of network decision-making.

Based on this digital-intelligent foundation, AIR RAN is dedicated to realizing three core values:

- **Network efficiency enhancement:** Optimizing spectral efficiency, energy efficiency, and O&M efficiency through intelligent technologies.
- **Service experience optimization:** Boosting

average revenue per user (ARPU) through differentiated experience assurance.

- **Scenario expansion & innovation:** Supporting new applications such as AI agents and embodied AI, spanning multi-dimensional scenarios across ground, water, low-altitude, and space.

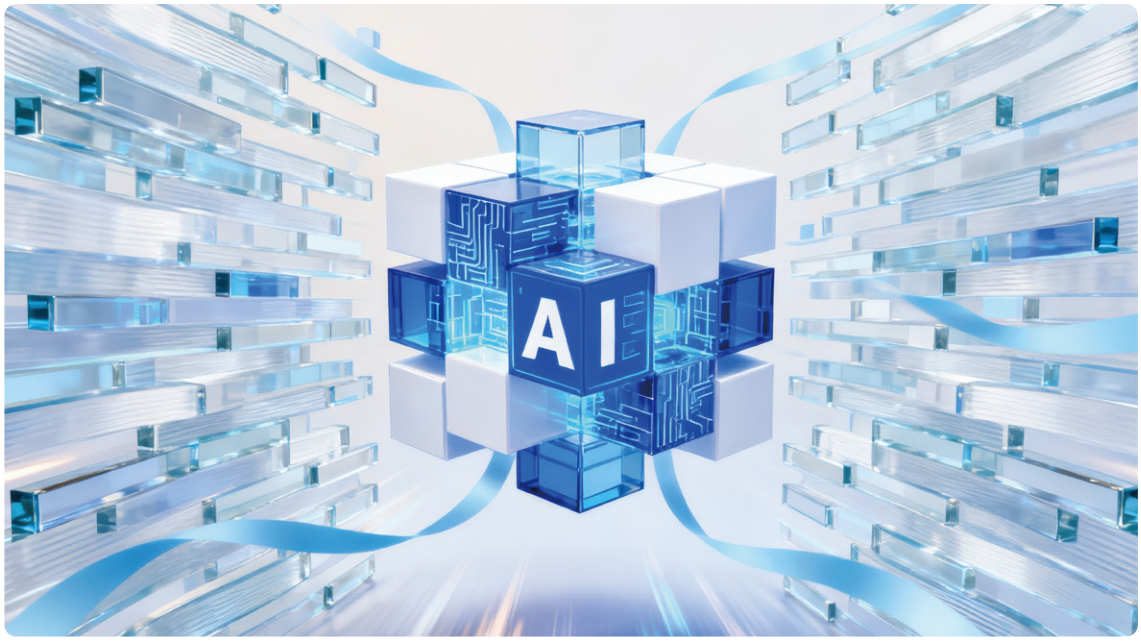
Unleashing Potential in Three Dimensions: AIR RAN's Scenario Exploration

Focused on real-world scenarios and value creation, AIR RAN has carried out extensive practices across network efficiency, service experience, and scenario expansion, demonstrating the immense potential of AI-driven mobile infrastructure.

Network Efficiency: A Comprehensive Upgrade in Energy, O&M, and Spectrum

In terms of network efficiency, AIR RAN focuses on three major objectives: maximizing energy savings without compromising experience, improving quality and efficiency using large language models (LLMs) and multi-agent systems, and enabling "soft expansion" where the network follows service demand.

- **Energy efficiency upgrade:** The intelligent energy-saving solution employs a dual-layer computing synergy between the network management LLM and the base station small model, forming a closed loop for traffic prediction, strategy optimization, and performance evaluation. The solution dynamically adjusts energy-saving parameters to balance performance and efficiency. In live deployments, this approach significantly extended the activation time of energy-saving strategies, reducing daily network power consumption by approximately 15%. This translates into substantial cost savings while ensuring a high-quality user experience, serving as a reference for sustainable development.
- **O&M efficiency upgrade:** AIR RAN reshapes the O&M paradigm through the enhancement of base station intelligence, intelligent upgrades of operation and maintenance center (OMC), and the collaborative application of telecom LLMs. Technologies involving multi-agent collaboration and "large + small model" synergy significantly improve fault diagnosis and resolution. For instance, through hazard identification, alarm correlation, and



root cause diagnosis, the system quickly pinpoints issues and generates work orders, allowing personnel to access analysis results directly. LLM-powered troubleshooting agents further assist in handling complex faults through multi-turn dialogue and multi-modal analysis, reducing the mean time to repair (MTTR) by approximately 20%. In optical module quality assessment scenarios, hazard identification capabilities drastically reduce alarm volume, significantly enhancing network stability.

- **Spectrum efficiency upgrade:** Addressing the continuous growth in mobile capacity demand, AIR RAN overcomes the technical bottleneck of traditional FMM SSCG (Sector Split), which was limited to a maximum of four cells, by increasing the number of split cells to six, while supporting adaptive intelligent adjustment. Compared to traditional 4T macro sites, the 6-cell solution delivers a capacity gain of up to 4.6 times, significantly boosting spectral efficiency and network carrying capacity to provide robust support for high-traffic scenarios.

Service Experience: Differentiated Assurance for Commercial Value Growth

Differentiated experience assurance is key for operators transitioning from traffic monetization to experience monetization. AIR RAN leverages AIREngine's service sensing, network insight, and intelligent resource allocation capabilities to help operators launch customized 5G packages.

For example, in scenarios like live video streaming and cloud gaming, AIREngine significantly improves user experience through precise bandwidth allocation and latency optimization. In real-world applications, video users saw increased uplink/downlink throughput, and gaming users experienced reduced latency. This led to a package conversion rate of 20%, effectively driving sales of new 5G plans. This end-to-end experience assurance scheme has become a critical path for operators to realize network monetization.

Scenario Expansion: Intelligence Across Diverse Environments

The combination of AI and 5G/5G-A is extending mobile networks beyond the ground to water environments, low-altitude airspace, and even space.

- **Ground:** 5G and AI synergy facilitates the digital upgrade of B2B scenarios, bringing

> Looking ahead, ZTE will continue to work with industry partners to deepen the integration and innovation of AI and 5G/5G-A, driving the collaborative evolution of network agents and service agents.

deterministic assurance capabilities into core production areas.

- **Water & low-altitude:** AI combined with integrated sensing and communication (ISAC) technology achieves precise target recognition, laying the foundation for the "low-altitude intelligent IoT" and "water intelligent IoT," and catalyzing innovative applications like drone delivery and low-altitude security.
- **Space:** Digital twin technology can precisely simulate space environments to support the planning and operation of satellite networks, guaranteeing ubiquitous intelligent services.

Dual-Domain Symbiosis: Building an Integrated Network–Service Growth Engine

The arrival of the mobile AI era is driving a transformation in business models from app-based entry points to AI agents. Service agents are generally categorized into two types: terminal-based "digital assistants" and entity-based "embodied AI."

Digital assistants facilitate intent-driven interaction via voice commands, simplifying user operations; embodied AI performs complex tasks through physical entities like robots in industrial manufacturing and healthcare. These service agents impose more diverse requirements on the network, such as high uplink bandwidth and low latency, further driving the evolution of the network agent service paradigm.

ZTE creates generative network services centered around service agents through its "experience assurance agent" technology, combining intent understanding, service recognition, and strategy generation. This paradigm shifts from traditional rule-based deterministic services to dynamic, on-demand response services, effectively supporting scenarios like smart travel for digital assistants and object recognition for embodied AI. Through collaboration between network agents and service agents, AIR RAN autonomously enhances uplink experience and reduces air interface latency, providing solid support for the ubiquity of intelligent applications.

ZTE's AIR RAN solution is not only a milestone in the evolution of mobile network technology but also a strategic cornerstone for mobile infrastructure in the AI era. Looking ahead, ZTE will continue to work with industry partners to deepen the integration and innovation of AI and 5G/5G-A, driving the collaborative evolution of network agents and service agents.

Technologically, ZTE will continuously optimize the AI-native architecture to enhance the intelligence of the compute-network convergence agents. In terms of applications, ZTE will expand into emerging scenarios such as the low-altitude economy, water monitoring, and satellite communications. Ecologically, ZTE aims to build an open and cooperative innovation ecosystem, working with partners to create an intelligent and inclusive future. ZTE TECHNOLOGIES

Empowering Service Agents with AgentGuard to Pioneer Mobile AI Era

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In the current wave of technological advancement, artificial intelligence (AI) is developing at an unprecedented pace, profoundly impacting every industry, including mobile communications.

During the traditional mobile internet era, the focus was on the "bit", emphasizing the digitization of information and the widespread availability of connectivity. Massive volumes of data flowed through networks as bitstreams, fueling the proliferation of countless applications. Today, with the rapid advancement of AI technologies, we are entering a new era—the mobile AI era—driven by "Token". Data is no longer merely a stream of bits; it is now infused with richer semantics and greater value, circulating and interacting across networks in the form of tokens.

The core of this transformation lies in the rapid development of large language models (LLMs) and AI agents.

LLMs and AI Agents Accelerate AI Inclusivity

With the rapid advancement of AI technology, particularly the rise of LLMs, AI applications are continuously expanding, gradually permeating every aspect of daily life. Technologies represented by DeepSeek are accelerating AI inclusivity by significantly reducing both training and inference costs, making AI no longer the exclusive privilege of a few tech giants, but increasingly a foundational capability accessible across all industries.

Meanwhile, general-purpose AI agents are also developing rapidly, driving AI's evolution from an "advisor" to an "executor" and becoming key enablers for AI's widespread adoption. By automating task workflows (e.g., order processing, data analysis) and enabling multimodal interactions (e.g., combined voice and visual commands), AI agents can boost efficiency by 4–5 times and achieve task completion rates exceeding 80%. The year 2025 is widely regarded as the "breakout year" for AI agents.

For AI democratization to succeed, it must integrate deeply with countless industries—inevitably bringing profound transformations in human-computer interaction paradigms and service models. AI agents act as intelligent assistants, capable of perceiving their environment, making autonomous decisions, and executing tasks. They can not only understand spoken language but also grasp underlying needs, make context-aware judgments, and carry out tasks on behalf of users.

Consequently, AI agents are reshaping how users access services and interact with systems: service entry points are shifting from traditional apps to AI agents (or "service agents"). Based on current terminal forms, AI agents are divided into two main categories:

- **Digital assistants on AI-powered devices:** Users can simply issue a voice command to activate these AI agents (digital assistants), which then think, plan, and execute tasks—transforming the conventional "open an app and perform step-by-step operations" model into a lightweight, intent-driven interaction paradigm.
- **Embodied intelligence in physical entities, such as robots:** These AI agents can carry out complex sequences of actions based on user instructions

and are applied in fields like industrial manufacturing and healthcare services.

AI Agents Reshape Human-Computer Interaction and Drive New Demands

The rapid advancement of LLMs—characterized by "small parameters, high intelligence"—combined with breakthroughs in terminal hardware technology, are driving the intelligent upgrade of terminal devices. In China, the penetration rate of AI-powered terminals is rapidly increasing, and AI capabilities are increasingly becoming a standard feature in communication devices, including smartphones, PCs, wearable devices, as well as home and enterprise gateways.

Built upon this ubiquitous AI foundation, embedded AI agents (digital assistants) are developing rapidly, becoming new entry points for interaction and services. These digital assistants can serve as over-the-top (OTT) entry points, such as life management assistants and travel assistants, or as intelligent agents like 5G New Calling and real-time translation. With these service agents, users can simply issue natural language instructions, and the AI will handle the thinking, planning, and execution.

This evolution shifts user behavior from the traditional "open an app" paradigm to an intent-driven, agent-based interaction model, delivering a more convenient and lightweight human-computer interaction experience.

However, each step of the digital assistant's autonomous reasoning, planning, and execution process requires multiple rounds of information exchange and inference with cloud-based LLM servers and application servers. This increases network performance demands by more than tenfold. For example, to ensure a smooth user experience, air interface latency must be within 160 milliseconds; to ensure accurate AI recognition, uploaded images must have a clarity of 1080P or higher, requiring an uplink rate of 20 Mbps or more.

Beyond digital assistants, AI agents are also catalyzing the emergence of various types of embodied intelligence, which will become the "emerging humans" of the future. To balance factors such as the size, weight, battery life, and cost of embodied intelligence, the industry is exploring a brain-body deployment architecture. This architecture is divided into end-cloud collaboration and end-edge-cloud collaboration. In end-edge-cloud collaboration, part of the computational load is offloaded to the edge, leveraging the edge's computing power and connectivity to allow the physical agent to operate more efficiently—reducing its onboard compute requirements, size, and weight.

To maintain real-time coordination, the edge-hosted model and the embodied agent must interact at frequencies of 10 Hz or higher, imposing even stricter requirements on network uplink

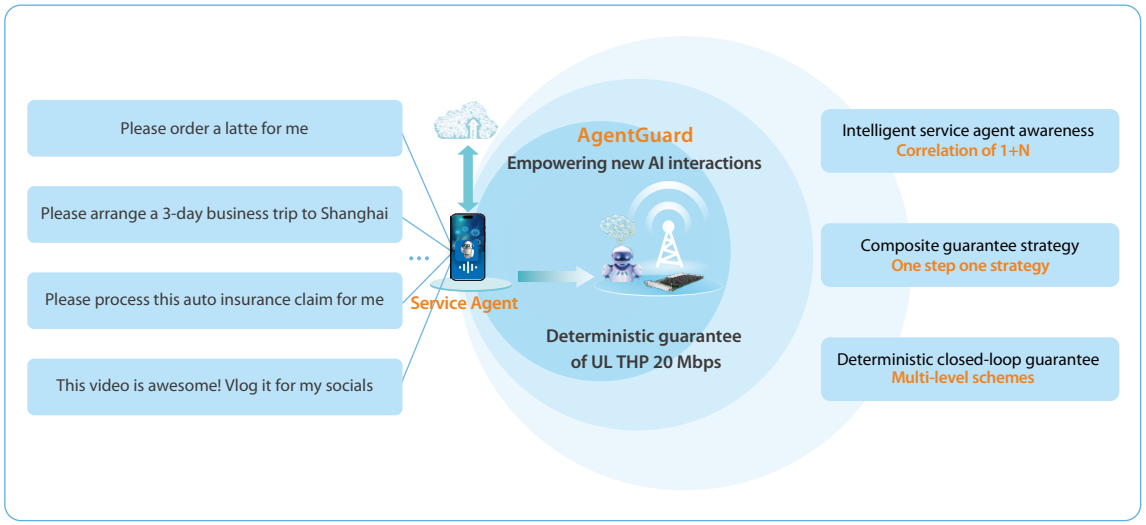

Fig. 1 AgentGuard empowering the new interactions of AI agents.

throughput and air interface latency.

A New Service Paradigm for AI Interactions

The rapid development of AI agents, including digital assistants and embodied intelligence, is driving a fundamental shift in the role of communication networks—from mere data transmission pipelines to collaborative hubs for intelligent agents. To address this, ZTE has developed the innovative 5G-A AgentGuard solution (Fig. 1), which leverages intelligent identification and guarantee technologies to build a more deterministic mobile network, empowering the flourishing development of AI services.

Based on mature 5G-A commercial networks and RAN-native AI capabilities, ZTE's AgentGuard transforms traditional rule-based network services into an intelligent, composite service guarantee mechanism that responds dynamically to the needs of service agents. It not only distinguishes whether a task is initiated by a user or a digital agent but also accurately identifies the agent's objective—such as ordering food or booking tickets—enabling more granular resource allocation. Crucially, to address the dynamic nature of AI agent-generated tasks, AgentGuard's policy has evolved from traditional coarse-grained business policies to a more refined, step-by-step approach, providing optimal network guarantees for each step of every task. Finally, through a multi-level joint guarantee mechanism encompassing cell, cluster, and network levels, ZTE's AgentGuard establishes a closed-loop deterministic guarantee policy, ensuring the smooth and accurate execution of digital agents.

At MWC Shanghai 2025, ZTE demonstrated the superior performance of AgentGuard in scenarios like digital assistant-based food ordering. ZTE's AgentGuard significantly enhances connection deterministic performance, boosting uplink data rates by over 20% and reducing task completion latency by more than 20%. This marks a significant innovation in network service models, driving the implementation of richer AI applications and significantly enhancing the user experience.

In the mobile AI era, AI capabilities are becoming foundational infrastructure—just like electricity and the internet. The synergistic development of LLMs and AI agents is breaking down technological barriers and reshaping industrial landscapes. As service agents evolve into intelligent partners for every individual and every industry, ZTE's AgentGuard will continue to provide robust support for these agents. Their co-evolution will jointly accelerate the arrival of the intelligent era.

We look forward to collaborating with industry partners to actively advance the standardization and large-scale deployment of these technologies—and together, step into the new intelligent world of AI agents! ZTE TECHNOLOGIES

5G-A × AI: Transforming Monetization from Volume to Value

ZTE is helping operators shift from "pipeline providers" to "intelligent connectivity providers" by enhancing connectivity and intelligence, creating a new 5G-A paradigm and unlocking value through experience monetization.

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Currently, telecom operators face a critical choice: whether to remain trapped between traffic growth and stagnant ARPU under the traditional business model, or to seize the opportunity presented by the deep integration of 5G-A and AI to explore a new blue ocean opportunity in connectivity services. This strategic choice will reshape the industry.

ZTE is helping operators transform from "pipeline providers" to "intelligent connectivity service providers" by upgrading both connectivity and intelligence, creating a new paradigm for 5G-A networks and unlocking new value through experience monetization.

As telecommunications evolve from 5G to 5G-A, operators are actively exploring ways to improve user experience, provide differentiated services, and optimize connection performance. For example, AT&T provides Turbo, a service that gives users the choice to purchase faster data speeds. Deutsche Telekom cooperates with Twitch to ensure an enhanced network experience in a live-streaming game environment that demands low latency and high bandwidth. Under the “Living Network” initiative, Thailand’s AIS provides 5G BOOST, 5G LIVE, and 5G GAME modes for consumers.

Since 2024, China Mobile has launched 5G-A packages in more than 14 provinces. Henan Mobile has introduced the innovative "Try & Buy" marketing model, offering low-latency and high-bandwidth mobile gaming acceleration add-on packages for gaming enthusiasts and dedicated live-streaming add-on packages for online influencers.

From Data Traffic to Experience Monetization

An innovative business model needs a robust operational system. In the context of experience-centric operation, ZTE works with partners to build a 5G-A intelligent guarantee system that enables precise identification of high-value users and intelligent delivery of service packages. Henan Mobile and ZTE successfully built a trial of experience monetization, enabling hierarchical experience guarantees and meeting users' requirements for high-quality network services. After the 5G-A package was put into trial commercial use, high-value user satisfaction improved markedly, accompanied by a 10% increase in the data of usage (DoU) and a 5% increase in ARPU. In the cells where the AIREngine intelligent computing board is deployed, a preventive guarantee mechanism is enabled for users who have

subscribed to the 5G-A package. The poor-quality occurrence rate is reduced by 80%, network load tolerance is improved, and both network resilience and scenario-based experience services are upgraded—successfully realizing new experience-driven monetization.

In accordance with the "Try & Buy" marketing model of Henan Mobile, ZTE provides users with an "Enjoy Now, Pay Later" service. By deploying wireless AI and the NWDAF intelligent plane of the 5G core, users experiencing poor service quality can receive on-demand service assurance. With the 5G-A network upgraded by the ZTE AIR RAN solution, the package admission capacity can be accurately estimated even under network congestion and complex interference scenarios. User experience is ensured through a closed-loop mechanism, with complaints traceable and root causes analyzed, delivering a deterministic experience for 5G-A package users.

- **Precise Sales Mapping and Package Provisioning Capacity Estimation**

Based on user distribution, AI-predicted network load and spectrum efficiency, and background resource reservation, the RAN estimates the precise scope and capacity for package provisioning at the service level, and reports the estimation results to the operation system to achieve precise control over the provisioning scale.

With AI-based prediction, the RAN can pre-assess whether user perception can be improved and whether sufficient capacity is available to support such improvement, thus avoiding "blind provisioning" that may lead to low package conversion rates or complaints from package users.

- **Multi-Dimensional, Full-Time Deterministic Experience Assurance**

Based on the NWDAF intelligent user-plane solution of the 5G core, in addition to triggering dynamic GBR dedicated bearer establishment when poor service quality is detected, the AIR RAN solution introduces the AIREngine into existing base stations, allowing VIP users to enjoy optimal time-frequency, power, and carrier resources, and providing multi-dimensional deterministic experience assurance. In addition, resources can be reserved for key services or killer applications of non-package 5G users within the network to ensure minimum user experience and reduce complaints.

- **Evaluable and Traceable Experience with Closed-Loop Assurance**

Package user experience can be perceived and quantified, forming an important part of experience monetization. The AIR RAN solution enables second-level, multi-service-aware KQI evaluation, and provides experience profiles at the cell, user, service, and grid levels, facilitating rapid identification of poor service quality and root cause analysis. For users who file complaints, historical profiles can be traced, thereby improving the satisfaction of high-value users.

Evolution Towards the AI Agent Era

With the evolution of AI applications, AI-based entry points are reshaping human-machine interaction, and service access is shifting from traditional apps to AI agents, including digital assistants based on AI terminals and embodied AI. The development of AI agents places higher requirements on communication networks, especially in terms of uplink capacity and low latency interaction. Wireless networks need to enhance connectivity to support the evolution of AI agent services. At the same time, experience monetization is evolving from live streaming and cloud gaming to AI agents.

By introducing AgentGuard into the wireless network and combining automated service flows that integrate intent recognition, service identification, network profiling, policy generation, and experience evaluation, ZTE transforms rule-based decision-making in traditional networks into on-demand, agent-centric services. With the continuous evolution of agents towards greater generalization and intelligent coordination, ZTE will continue to promote the evolution of networks, empower service agents with network agents, and embrace a new era of experience monetization. ZTE TECHNOLOGIES

Transforming Network Energy Efficiency with AIREngine

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With the widespread deployment of 5G networks, global operators face rising energy consumption that outpaces revenue growth. Data shows that network energy expenditures account for approximately 25% to 30% of operators' OPEX. Conventional energy-saving approaches often compromise user experience and fail to satisfy the varied demands of applications such as short videos, cloud gaming, and the industrial internet. ZTE's AI-powered intelligent RAN energy-saving solution addresses this challenge by leveraging the computing capabilities of the AIREngine—an intelligent board embedded in the BBU—and incorporating service-aware perception and real-time intelligent decision-making technologies. This enables accurate understanding of user experience and service requirements while significantly improving network energy efficiency. AIREngine allows base stations to not only sense services but also understand their requirements, optimizing energy efficiency without compromising user experience and helping operators move toward a green 5G era.

Service-Aware Optimization: From Traffic-Based to Service-Centric

Conventional energy-saving technologies generally depend on coarse-grained traffic-load-based management, often involving component or equipment shutdowns. However, AIREngine equips base stations with real-time, comprehensive service awareness capabilities, enabling more accurate and refined energy savings. AI-driven energy savings encompasses two main processes: AI-assisted identification of service patterns and optimization of energy-saving strategies based on service requirements.

AI-assisted service pattern recognition leverages the inherent computational capabilities of the base station together with streamlined AI models to comprehensively identify and analyze applications. As shown in Fig. 1, service data flows captured at the base station, with minimal plaintext parsing, are used to extract key service patterns and establish an offline service pattern library, enabling the following capabilities:

- **Accurate identification:** By analyzing merely 0.1% of packet header information, over 16,000 application categories and key features can be accurately identified with an accuracy rate exceeding 99%.
- **Dynamic modeling:** Customized KPIs are designed for specific services (e.g., live streaming, gaming, and IoT). For instance, stutter rates and initial frame delay are prioritized for short videos; end-to-end latency is strictly capped at ≤50 ms for cloud

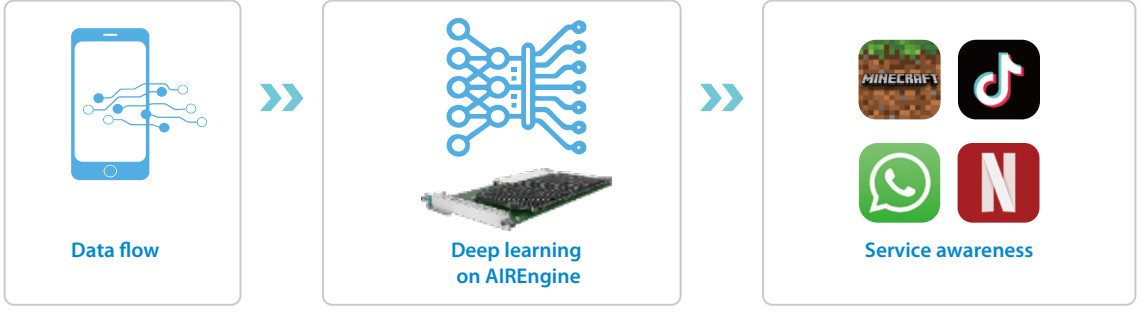

Fig. 1 Intelligent service identification.

Stage	Collection Granularity	Technical Method	Optimization Objective
Pre-event	minute	Prediction of traffic inflection points, preloading energy-saving strategies	Reduce the impact of unexpected service
In-event	second	Reinforcement learning for dynamic adjustment and optimization of energy saving	Ensure a real-time optimal balance
Post-event	minute	Gradual fallback algorithm to avoid network oscillations	Smooth transition to the normal state

Table 1 Three-level assurance strategy.

gaming, and ultra-low jitter (<1 ms) is maintained for industrial-grade applications.

Service-centric energy-saving strategy optimization introduces the dimension of "service distribution prediction" in addition to conventional "traffic load forecasting." It precisely predicts the temporal and spatial distribution of each service category, while accounting for the characteristics and applicability of energy-efficient technologies, as well as peak usage periods of key services, such as live streaming and gaming events. This approach efficiently improves energy savings during idle times and in less busy areas, all while maintaining a high-quality user experience. Additionally, it incorporates dynamic service models to iteratively optimize energy-saving technology activation and deactivation thresholds, effectively balancing network energy consumption with user performance.

Real-Time Intelligent Decision-Making: Balancing Energy Efficiency and User Experience

Conventional AI-driven energy-saving solutions usually apply "post-evaluation" approaches, which do not provide real-time feedback on the performance of the energy-saving network. The adjustment periods for these approaches may extend from several hours up to a whole day, lacking the flexibility required to effectively resolve network performance issues resulting from unexpected service changes. The "intelligent real-time decision-making" mechanism powered by AIREngine provides networks the capability of "autonomous neural reflex," allowing the dynamic optimization of energy-saving strategies within one second.

- **Real-time KPI monitoring and intelligent coordination:** By continuously collecting near real-time performance data from base stations, KPIs including latency, packet loss rate, and throughput are monitored to generate a Network Health Score. This system rapidly detects potential anomalies after energy-saving policies are activated, then implements real-time adjustments and optimizations. As a result, it effectively mitigates network performance degradation caused by energy-saving measures and maintains an optimal balance between energy efficiency and service performance.
- **Three-level assurance strategy:** Through "pre-event" monitoring, "in-event" prevention, and "post-event" assurance, this strategy achieves real-time, event-driven, and periodic assurance, providing comprehensive protection for stable network operation (see Table 1).

Recently, we completed the verification of the AIREngine-based AI energy saving solution in Jiangsu Province. The verification demonstrated that, while maintaining stable performance and user service perception indicators, the site achieved an additional daily energy consumption reduction of over 12%. With the advancement of 5G-A and 6G research, the enhanced energy-saving solution based on AIREngine is not only suitable for current 5G networks but is also capable of smoothly evolving to future architectures. By integrating LLM technologies, it enables more precise service intent prediction. Through the combination of single-site intelligence and network-level coordination, energy efficiency gains are maximized, helping operators achieve network carbon neutrality.

Driven by the digital economy and China's carbon peaking and neutrality strategy, the "service-aware + real-time intelligent decision-making" solution is reshaping network energy saving. It represents a breakthrough in the integration of AI and communications, enabling operators to achieve both OPEX reduction and user experience assurance. ZTE TECHNOLOGIES

AIREngine Ushers in Precision Era of RAN Operations

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The telecommunications industry is shifting from pipeline operations to experience-driven management. With the rapid growth of immersive services such as live streaming, video, cloud gaming, and VR/AR, user expectations have moved from basic network availability to service usability. However, the traditional KPI-centric operation model can no longer address the challenge of meeting KPIs while facing frequent user complaints, due to three limitations:

- **Coarse data granularity:** Traditional MR data only has a 5-second granularity and 20 UEs samples per cell, unable to reflect real-time user experience.
- **Limited positioning accuracy:** Hundred-meter-level geographic grids fail to precisely locate poor-quality areas, and complaint handling relies on manual correlation.
- **Weak root cause analysis:** Fewer than five types of poor-quality root causes can be identified based on network KPIs, with accuracy below 60%, insufficient for complex scenarios.

AIREngine Reshapes RAN's "Nerve Endings"

As the core component of native AI in base stations, AIREngine overcomes the computational bottlenecks of traditional base station boards. Through innovations in three core capabilities—smallest granularity perception, ultra-high precision positioning, and real-time data correlation—it generates insights from network performance to user experience, enabling a shift from extensive operations to precision network management.

Smallest granularity perception bridges the gap between the network perspective and the user perspective. Traditional analysis relies on cell-level KPIs, while AIREngine shifts its perspective to "every data service session of users", supporting the collection of second-level KQI for over 16,000 applications. Take short video for example, AIREngine precisely quantifies users' video experience by real-time monitoring metrics such as "1-minute playback stutter counter" and "5-second playback buffer download time", and outputs service quality scores via the equivalent MOS indicator (EMI), making the abstract "user experience" measurable.

Ultra-high precision positioning improves accuracy from 100 m to 30 m. AIREngine integrates algorithms such as UTDOA, AOA, and fingerprint positioning, leveraging 4G UE GNSS correlation and backfilling, a dynamic fingerprint database, and a multi-RRU joint solution to enhance 5G UE positioning.

Real-time data correlation resolves the cross-domain data correlation issues of "slowness, inaccuracy, and low efficiency". Traditionally, core network and radio network data are reported in different domains and need correlation on big data platforms, which suffer from issues such as long latency, high error rates, and low correlation rates. In contrast, AIREngine achieves "second-level KPI + KQI built-in correlation", eliminating cross-domain transmission latency and correlation errors caused by domain-separated collection. It enables real-time data correlation of user experience and network performance, transforming poor-quality analysis from "vague speculation" to "precise quantitative analysis".

High-Value Scenarios for AIREngine

The three core capabilities of the AIREngine have reshaped network operations and unlocked tremendous application value in practical scenarios.

Efficient Customer Complaint Handling

Traditional complaint handling suffers from slow issue localization, poor reproducibility, and limited

Fig. 1 Multi-dimensional visualization for high-speed rail 5G network.

root cause analysis. AIREngine overcomes these issues by fully collecting KPIs and KQIs, visualizing data on map-based grids, and enabling second-level tracing, improving complaint resolution from daily to hourly. It combines user-level service experience metrics with over 10 types of root cause identification, with identification accuracy exceeding 90%, and builds a three-dimensional complaint traceability system covering both user experience and network performance perspectives.

Premium Package User Group Analysis

For premium package users, AIREngine automatically categorizes users based on identifiers (e.g., 5QI, RFSP) in call detail records. With 5-second service experience metrics and 30-meter positioning, it enables group-level classified experience evaluation and automatic poor-quality statistics. It supports comparative analysis across different user groups at the same time and location, as well as trend analysis. Additionally, by monitoring real-time service experience metrics like EMI scores and stutter frequency, AIREngine proactively identifies quality risks, advancing early warnings from hours to minutes.

Multi-Dimensional Visualization for High-Speed Rail

To address challenges such as high costs and difficulty in reproducing problems with traditional drive tests in high-speed rail, multi-dimensional visualization for the high-speed rail 5G network has been realized based on AIREngine, enabling zero drive testing (see Fig. 1). Features include automatic cell parameter matching, precise identification and positioning of high-speed rail users, and evaluation metric statistics with geographic visualization at the line, section, cell, cell portion, and grid levels. It provides in-depth service analysis for experience evaluation and root-cause diagnosis of quality issues, along with network mirroring for playback and trend comparison. These features effectively address the operational challenges of the 5G network for high-speed rail.

5G-A Package Provisioning

Based on the grid-level data from AIREngine, end-to-end guarantees for package business operations can also be achieved:

- **Before provisioning:** With the input of business intentions and network conditions, algorithms such as time-series traffic load prediction calculate deployable grids, specifying the types of packages, the number of distributed packages, and the available package quantity.
- **After provisioning:** Service experience metrics for user groups are statistically analyzed based on RFSP and 5QI grouping. Package performance is evaluated, and optimization workflows are triggered.

This enables closed-loop management for 5G-A package provisioning, experience guarantee, and network optimization.

As 5G evolves toward intelligence and scenario-based deployment, AIREngine will further integrate generative AI models to achieve advanced autonomous network capabilities of "self-learning and self-decision", driving the ultimate transformation of network operation from "humans hunting for problems" to "AI-enhanced autonomous network ". In this crucial phase, AIREngine is both a technological innovation and a strategic direction for operators to step into the new blue ocean of "experience-centric operations". ZTE TECHNOLOGIES

Low-Altitude Intelligent Connectivity for Digital Skyway

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Driven by supportive policies, expanding application scenarios, and cutting-edge technologies, China's low-altitude economy is transitioning from conceptual exploration to large-scale development. As a diversified business cluster born from the deep integration of the general aviation and unmanned aerial vehicle (UAV) industries, it supports innovative applications such as aerial logistics, low-altitude tourism, and emergency rescue. With strong growth momentum, this sector is gradually becoming a new driver for the national economy.

The concept of the "low-altitude economy" was first introduced in China's National Comprehensive Three-Dimensional Transportation Network Planning Outline in February 2021 and was later identified in the 2024 Government Work Report as a new growth engine. Since then, nearly 30 provinces have introduced supportive policies. According to the Research Report on China's Low-Altitude Economic Development (2024) by the CCID Consulting, the sector is expected to surpass one trillion yuan in scale by 2026, entering a fast development phase.

Safety: Key to the Low-Altitude Economy

The low-altitude economy encompasses multiple fields such as general aviation, UAV logistics and delivery, low-altitude tourism, and emergency rescue, boasting broad development prospects. However, with increasingly frequent low-altitude flight activities and a complex flight environment, safety risks have risen significantly. It is urgent to establish an advanced regulatory system to ensure the safety of low-altitude flights.

However, traditional regulatory methods face numerous limitations. For instance, time difference of arrival (TDOA) spectrum detection can only monitor specific frequency bands, suffering from a high false alarm rate and low accuracy. Low-altitude radars have issues such as near-range blind spots and susceptibility to interference, making network formation difficult, all of which constrain the large-scale development of the low-altitude economy.

The integrated communication, sensing, computing, and intelligence (ICSCI), emerging in the 5G-A phase, utilizes electromagnetic waves emitted by communication base stations. This technology not only enables communication functions but also detects flying objects in the surrounding environment by analyzing reflected signals, assisting regulatory authorities in managing low-altitude aircraft.

ICSCI Empowers Low-Altitude Supervision

ZTE's ICSCI technology enables precise, full-domain perception of aerial targets and easily distinguishes target categories and aircraft identities, supporting "precise detection, clear categorization, and unambiguous identification" for low-altitude supervision.

Precise Detection

In complex environments, such as dense urban areas, a large number of strong reflected signals can lead to false alarms and missed detections. Leveraging deep learning algorithms, ZTE's ICSCI technology extracts features from echo data for clutter suppression and target recognition. Through extensive training data—including radar echo data containing both clutter and target signals—it learns the distinct feature patterns of clutter and targets, effectively separating them and reducing false alarm and missed detection rates.

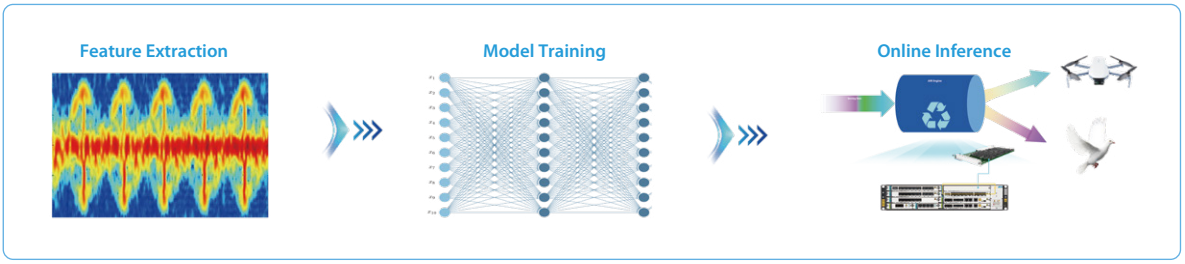

Fig. 1 Target type recognition based on the industry's first ISAC AI model.

Clear Categorization

AI enables accurate classification of diverse low-altitude targets such as UAVs, birds, and balloons through multi-modal data integration and deep learning models (Fig. 1).

First, multi-dimensional feature extraction is performed:

- **Behavioral features:** Different targets exhibit distinct motion characteristics—for instance, birds follow irregular flight trajectories;
- **Physical features:** Targets differ in radar cross-section (RCS) and reflected signal intensity;
- **Motion features:** Targets move at different speeds, with UAV rotors and bird wingbeats generating distinct micro-Doppler effects;
- **Polarization features:** Different target types display unique reflection characteristics in response to sensing signals of varying polarizations. By transmitting and receiving sensing signals with different polarization combinations and analyzing the polarization scattering matrix (PSM) of the echoes, the polarization features of targets can be obtained to identify their types.

Then, neural network models, such as LMP and LSTM, are utilized to extract spatial features from echoes, capture dynamic variation features in echo sequences, and learn the characteristics of different aerial targets for precise target recognition.

Unambiguous Identification

ZTE's ICSCI Technology, built on three core judgment capabilities—service feature judgment, wireless feature judgment, and terminal location judgment—can accurately identify UAV communication modules and their corresponding phone numbers, which are reported to the UAV management and control platform in real time. The platform classifies unregistered numbers as illegal UAVs and instructs the mobile communication system to implement network-based control over them, expelling illegal UAVs. Among these capabilities, service feature judgment leverages ZTE's DeepEdge functionality to rapidly identify UAV data streams (such as video transmission and flight control data) through a fingerprint feature library, enabling differentiation between UAVs and mobile phone terminals.

ZTE Actively Advances the Commercialization of the Low-Altitude Economy

Based on its ICSCI technology, ZTE has collaborated with operators and third-party partners to launch over 100 commercial and pilot low-altitude projects worldwide, covering diverse application scenarios, such as low-altitude logistics, low-altitude inspection, and low-altitude security in key facilities.

At the Beijing Yanqing UAV Industrial Park, ZTE has successfully conducted multi-type target recognition tests based on AI models, leveraging a large-scale, contiguous networking environment built on ICSCI technology. These tests enable birds to be "detected accurately and identified unambiguously," transforming passive prevention and control into proactive recognition—providing a "new solution" to bird strikes, a long-standing challenge.

In Hengqin, Zhuhai, based on the industry's largest-scale ICSCI network, the system excelled as an "Aerial Police" during the 25th anniversary celebration of Macao's return to China. It conducted 24/7 detection of UAVs and other aerial objects in the low-altitude airspace, supporting UAV security operations.

The low-altitude economy will not only transform mobility, but also exert a profound impact on daily lives and manufacturing models. ZTE remains committed to deepening its engagement in the low-altitude economy sector. Leveraging ICSCI technology, a digital "Skyway" is being built to enable the high-quality development of the low-altitude economy. ZTE TECHNOLOGIES

Intelligent Digital Site: Key to Unlocking the Future of Autonomous networks

A site's level of intelligence directly affects overall network performance and O&M efficiency. However, current site infrastructure still faces numerous challenges in terms of intelligence and sustainability.

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Propelled by the wave of digital transformation, network intelligence is accelerating at an unprecedented pace, becoming a key force for social progress and industrial transformation. On the demand side, with the widespread application of technologies such as 5G, IoT, and AI, user expectations for network performance, reliability, and flexibility have significantly increased. Whether for high-definition video conferencing, autonomous driving, or real-time control in the industrial Internet, the network must respond quickly and precisely schedule resources to meet diverse service needs. On the supply side, continuous technological innovation is driving breakthroughs. The maturity of technologies like cloud computing, big data, and edge computing provides powerful technical support for network intelligence, enabling more efficient processing of massive amounts of data and facilitating intelligent decision-making and optimization.

The advent of autonomous networks is a crucial milestone in the evolution of network intelligence. It not only enables automated operation and maintenance (O&M) but also enhances network performance and efficiency through intelligent management and optimization. A site's intelligence level directly affects overall network performance and O&M efficiency. Currently, site infrastructure still faces numerous challenges related to intelligence and sustainability. On one hand, the intelligence level of site equipment remains low, with insufficient sensing and control capabilities, limiting the extent of automated network O&M. On the other hand, site energy consumption is becoming a prominent issue, as traditional power supply and cooling methods struggle to meet sustainability goals, thus increasing operating costs and environmental pressure. To address these issues, intelligent digital sites have emerged as a critical solution enabling the comprehensive transition of autonomous networks into the L4 era.

ZTE's intelligent digital sites are defined by an integrated, three-dimensional framework encompassing vision, technical characteristics, and solutions. This framework covers the vision of holistic, online closed-loop management for the wireless network infrastructure, aiming for maximum resource efficiency and sustainable development, while enabling comprehensive upgrades of site infrastructure through intelligent sensing and control technologies.

Characteristics of the Intelligent Digital Site

The intelligent digital site leverages intelligent sensing and control technologies to optimize site resource utilization and management, significantly enhancing network performance and O&M efficiency. It collects real-time data on

operational status of site equipment and environmental conditions, supporting intelligent network decision-making. With the use of liquid cooling and intelligent energy-saving technologies, site energy consumption has been significantly reduced, contributing to green development goals. Furthermore, intelligent management reduces manual intervention, improving automation, efficiency, and lowering O&M costs.

Intelligent Sensing and Control: Activating and Coordinating Dumb Resources

Intelligent sensing and control technologies, embodied by devices such as beam tracking units and green Site Digital Unit (gSDU), transform dumb resources like antennas, power supplies, and optical cables into intelligent resources that are perceivable, manageable, and optimizable.

The beam tracking unit can achieve accurate, real-time acquisition of site parameters, including azimuth, downtilt, and GPS coordinates. It also supports full-dimensional, adjustable antenna beam steering and beamwidth, facilitating service-aware networking and user-centric beam steering. By integrating remote azimuth adjustment functionality, the beam tracking unit extends beam adjustment from the traditional vertical dimension to both vertical and horizontal dimensions. This allows dynamic adjustment of beam shape and direction based on user distribution and service changes, delivering "user-centric beam steering and service-aware networking" in the short term and ensuring a "premium network anytime, anywhere" in the long term.

The gSDU facilitates the telecommunications industry's transition to a green and intelligent future. Leveraging a dynamic, load-based wake-up mechanism, the gSDU precisely matches service demands to ensure user experience, while enabling deep sleep. Complemented by a multi-dimensional protection mechanism, simplified deployment, and network management visualization and control capabilities, it breaks functional limitations of legacy devices and addresses the shortcomings of traditional solutions in user experience, device health, and management efficiency. Thus, a true "zero-load, zero-consumption" status can be achieved, significantly boosting site energy utilization efficiency and expanding the application of extreme sleep technology.

In addition to the aforementioned site infrastructure, communication equipment still includes non-manageable and non-controllable passive resources, most notably repeaters. Network-controlled coverage extension devices based on base station standard protocols can effectively address this issue. These devices integrate modules for collaboration with base stations, share the same element management system (EMS), enable unified scheduling of time-frequency resources, and seamlessly integrate into the live network.

Liquid Cooling Technology Drives Energy Savings

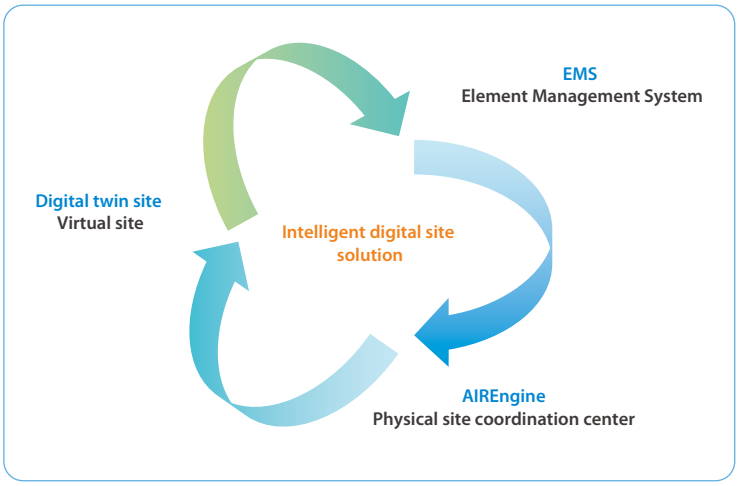
Applying liquid cooling technology to dissipate heat from the BBU provides higher heat dissipation efficiency and lower energy consumption compared to traditional air cooling, effectively reducing the PUE value of the equipment room. Furthermore, through intelligent control technology, the system can dynamically adapt to changes in equipment heat generation and ambient temperature, achieving optimal resource efficiency.

Sustainable Infrastructure

The construction of intelligent digital site infrastructure is executed with a strong focus on sustainability, adopting technologies such as flexible power supply, flexible cooling, and flexible installation, thereby enhancing site adaptability and flexibility.

Intelligent Digital Site Solutions

Intelligent digital site solutions utilize the EMS for centralized management and optimized scheduling of site infrastructure. They leverage the digital twin site (virtual site) for real-time monitoring and optimization, and rely on the



AIREngine (physical site coordination center) to enable coordinated operations and intelligent management of site equipment.

As a virtual mapping of the physical site, the digital twin site can perceive, diagnose, and predict its real-time state. It supports optimization and issues instructions to guide decision-making across the lifecycle of the physical entity. This integration of the virtual and the physical not only enhances site intelligence but also provides accurate data to support intelligent network decision-making, accelerating the evolution of autonomous networks toward the L4 era.

As an integral component of the intelligent digital site, the beam tracking unit supports a wide range of application scenarios and can significantly enhance network coverage accuracy and user experience. For instance, in areas such as dormitories, teaching buildings, or factory areas, where user distribution fluctuates over time, the beam tracking unit can automatically adjust antenna orientation to focus coverage on user-concentrated areas. In scenarios involving large transportation vehicles with predetermined routes, such as high-speed rail, ships, and aircraft, it adjusts antenna orientation based on movement, enabling the main beam to track user mobility and enhance coverage performance and range. At sites vulnerable to typhoons, the beam tracking unit can automatically detect and rectify antenna attitude misalignment, maintaining a stable coverage. With the rapid development of AI and large model technologies, the beam tracking unit's attitude sensing and three-dimensional dynamic adjustment capabilities will provide strong support for real-time and rapid network optimization.

The innovative air–liquid hybrid cabinet solution integrates liquid cooling through built-in modules to enable centralized heat dissipation, maximizing cold source utilization and significantly lowering energy consumption. Meanwhile, it adaptively adjusts cooling output and automatically switches operating modes based on equipment status and indoor/outdoor temperatures, enabling low-carbon and intelligent equipment room operations. Designed for centralized BBU deployment scenarios, the air-liquid hybrid cabinet delivers heat dissipation efficiency comparable to pure liquid cooling while retaining the convenience of air cooling. BBUs in live networks can be directly deployed in the cabinet. It is compatible with the standard equipment room, requiring no special specifications for power, load capacity, or height, and supports a wide range of application scenarios. In new construction scenarios, it supports low-energy operation while reducing the initial investment costs for air conditioners and standard indoor cabinets. In renovation scenarios, it delivers significant energy savings and supports cabinet consolidation, effectively improving space utilization.

The intelligent digital site solves the last-mile network intelligence challenge and removes bottlenecks for autonomous networks. It has not only made groundbreaking advancements in sensing, energy efficiency, and O&M efficiency, but also provided new ideas and directions for the future development of autonomous networks. With the continuous promotion and application of intelligent digital sites, we have reason to believe that autonomous networks will fully transition into the L4 era, bringing users more efficient, intelligent, and sustainable network services, and promoting the digital transformation and sustainable development of society. ZTE TECHNOLOGIES

Driving Value with AIREngine: Henan Mobile and ZTE Define a New Operational Model

As user expectations for telecommunications services evolve from basic availability to perceptible premium quality, operators must shift from data-based to experience-driven operations. Dedicated to refined customer operations, China Mobile has built a framework characterized by service visibility and differentiated experiences through exclusive service guarantees and benefits, strengthening user loyalty and expanding revenue potential.

In line with China Mobile Group's strategy, Henan Mobile, in close collaboration with ZTE, leverages AIREngine, an intelligent computing engine, to build a proactive network assurance mechanism and multi-dimensional integrated service system. Through real-time service experience evaluation, it proactively mitigates quality risks in high-density environments and ensures a stable, seamless user experience for high-frequency scenarios such as video streaming and gaming. Meanwhile, by integrating tailored benefits and differentiated services, Henan Mobile is establishing a regional benchmark for premium user experience.

AIREngine-Enabled 5G-A Campus Add-on Plan Delivers Outstanding Assurance

Henan Mobile has pioneered the rollout of various 5G-A add-on plans, including office, airport/high-speed rail, network, campus, live streaming, and gaming add-on plans. These plans accurately address the diverse network needs of different users, enabling them to easily enjoy the high efficiency and seamless experience of 5G connectivity. Among them, the 5G-A campus add-on plan, specifically designed for students, aligns with their stable base and strong peer influence. Crucially, it precisely meets their core demands for highly efficient course registration, low-latency gaming, and seamless video streaming. Thus, it serves as a benchmark case for validating 5G-A's scenario-specific service capabilities.

The successful implementation of this service—which precisely matches differentiated user needs and assures user experience—is underpinned by core technologies. As illustrated in Fig. 1, by leveraging the AIREngine, the RAN can select service-matching functionalities and schedule

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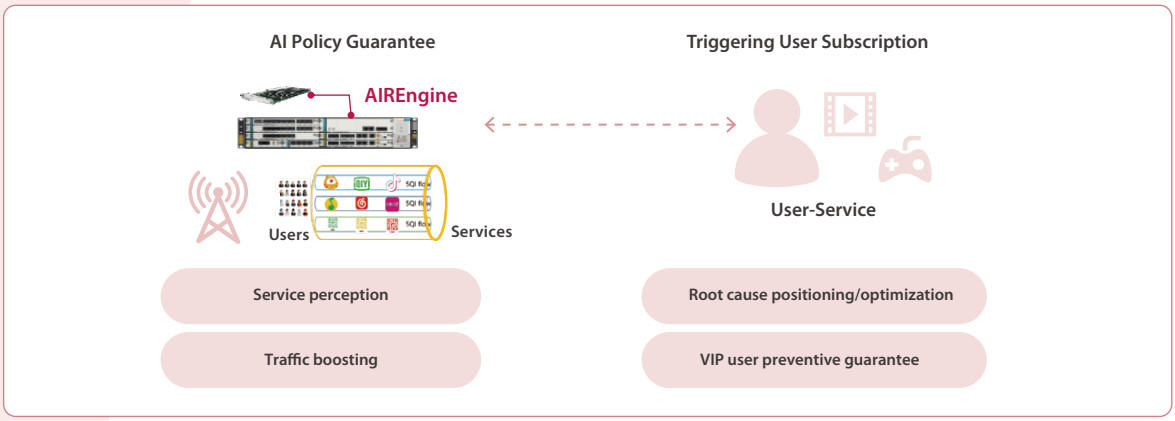

Fig. 1 The AIREngine enhances tiered and hierarchical assurance.

priority settings based on service requirements (e.g., high data rate, low latency, and jitter) identified through service awareness. Meanwhile, the AIREngine continuously learns and optimizes the underlying algorithms, iterating parameter configurations to enhance service assurance capabilities. When a student subscribes to the 5G-A campus add-on plan, an intelligent protection mechanism is automatically triggered during 5G network congestion, dynamically allocating network resources through a priority scheduling algorithm to ensure continuous high-rate network access, even under heavy traffic conditions.

The AIREngine delivers exclusive experience assurance for 5G-A add-on plan subscribers, showing significant performance gains in test areas:

- **Rate enhancement:** For video services, the measured downlink rate for subscribers within AIREngine-covered cells increased by 8% compared to non-AIREngine cells; for live streaming services, the uplink rate in AIREngine cells increased by 25%.
- **Latency optimization:** Latency for real-time services like gaming was reduced by 15%, successfully meeting the defined low-latency benchmark.

Innovative Model Ignites New Momentum for Revenue Growth

Henan Mobile partnered with ZTE to create a “Technology-Business-Ecosystem” triple innovation model. This collaboration not only maximizes the immense potential of the AIREngine in value-driven operations but also creates a replicable and scalable methodology. This case offers compelling validation for the value operation plan in the following three major dimensions:

- **Technical feasibility:** The AIREngine enables precision service provisioning on the RAN side, supports multi-dimensional assurance measures, and delivers deterministic user experience enhancement with real-time closed-loop self-healing aligned with service experience objectives, creating a new service paradigm where "experience is quantifiable and network performance is assured."
- **Business closed-loop:** Centered around "low-threshold experience access + scenario-based monetization conversion", it precisely matches user needs with tailored package offerings, achieving a seamless connection from user acquisition to monetization, and paving the way for operators to develop a sustainable profit model.
- **User recognition:** Leveraging a refined user segmentation strategy, this innovative service has been scaled successfully. Monthly subscribing users have exceeded 2,000, with revenue surpassing RMB 25,000, establishing it as a key growth driver for Henan Mobile's 5G value-added experience services. Through the operational logic of "low-cost experience to high-value conversion," it effectively activates the payment willingness of high-potential users, laying the foundation for the subsequent launch of higher-tier service plans.

Looking ahead, Henan Mobile and ZTE will continue to intensify their collaboration, using technology as the spear, commercial strategy as the shield, and the ecosystem as the foundation to deliver superior service experiences to users. ZTE TECHNOLOGIES

"Dual-Intelligence Collaboration" Network Experience Assurance System by Yunnan Mobile

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On April 13, 2025, as the dawn of the Dai New Year (1387 in the Dai calendar) illuminated Xishuangbanna, a grand event unfolded, blending national cultural inheritance with the innovation of digital and intelligent technologies. Faced with the network surge caused by over two million visitors, China Mobile's Yunnan Branch (Yunnan Mobile), in collaboration with ZTE, integrated large language model (LLM)-powered agents with ZTE's AIREngine intelligent computing engine to create a "dual-intelligence collaboration" network experience assurance system. This successfully set a benchmark in the field of communication assurance, offering an innovative solution to the "signal upgrade" special action, which provides significant value to the industry.

Full-Process Network Assurance System

As a crucial medium for information transmission, the stability and efficiency of mobile networks are critical to user experience. With the widespread adoption of 5G technology, the network architecture becomes increasingly complicated, and the traditional network operation and maintenance (O&M) mode faces huge challenges. To solve this problem, ZTE uses generative artificial intelligence (GenAI) technology to develop a telecom multi-agent

collaboration (TMAC) system that improves wireless network service quality, optimizes user experience, and enhances network O&M efficiency.

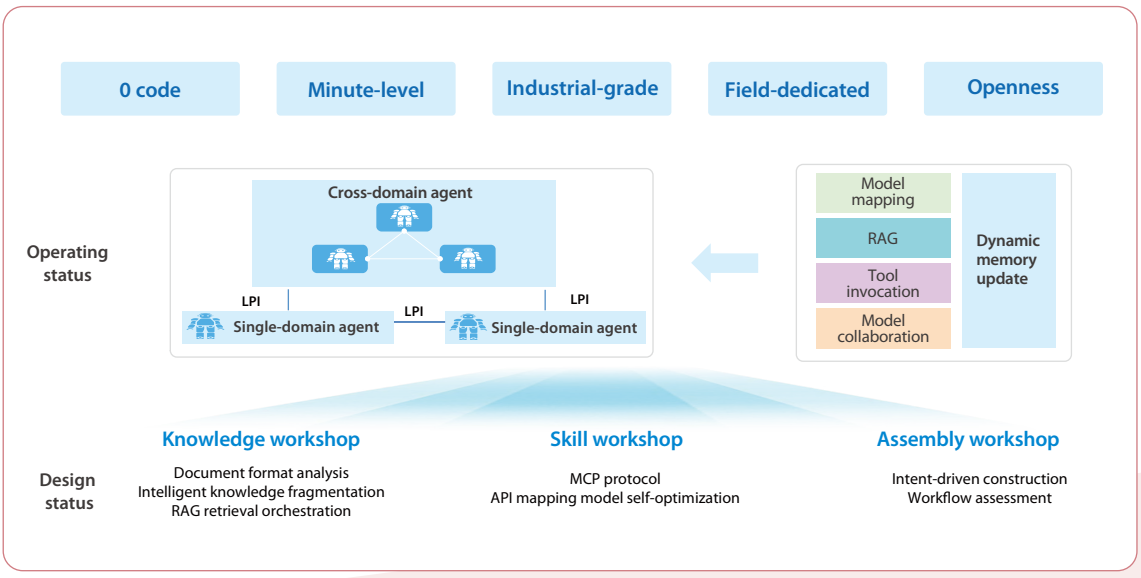
The TMAC solution consists of three parts: agents in the network; agent lifecycle management and monitoring; and the agent factory, which is a dedicated platform for agent design and skill improvement. As shown in Fig. 1, the agents in the network include both cross-domain and single-domain agents. These agents can be divided into interactive agents, insight collection agents, analysis agents, decision-making agents, and execution agents based on their roles. Agents can also be customized to meet uer requirements and can load knowledge and skills as needed to meet O&M requirements in different scenarios.

The TMAC solution builds a comprehensive data monitoring system by collecting real-time data from network devices, user behaviors, service traffic, and other dimensions. It leverages LLM agent technology and uses big data analysis and machine learning algorithms to mine network data for real-time network status monitoring and prediction. Based on the AI analysis results, the system automatically generates optimization policies and dynamically adjusts network resources through a closed-loop control system.

The TMAC solution offers the following innovations:

- **Cross-domain collaboration technology:** Breaks through the inter-domain restrictions of traditional network O&M, and implements collaboration across wireless, core, and transmission domains.
- **Efficient AI analysis engine:** Uses advanced machine learning algorithms to improve the accuracy and efficiency of network analysis.
- **Automatic closed-loop control:** Automates the entire network O&M process, from problem detection to policy execution.

Based on a commercial super-large-scale network management system, Yunnan Mobile has built a TMAC-based LLM O&M platform using a domestic intelligent computing server. By leveraging the innovative dual-engine architecture of ZTE's Nebula Telecom Large Model and the DeepSeek LLM, the capabilities of LLM agents are enhanced for rule compliance, general inference, analogical inference, temporal reasoning, and data statistics under complex scenarios. Through innovations such as natural language interaction, multi-agent collaboration, adaptive policy generation, and interactive geographical monitoring, Yunnan Mobile has established a full-process network assurance



▲ *Fig. 1 TMAC agent factory.*

system featuring all-domain perception, dynamic scheduling, and real-time optimization.

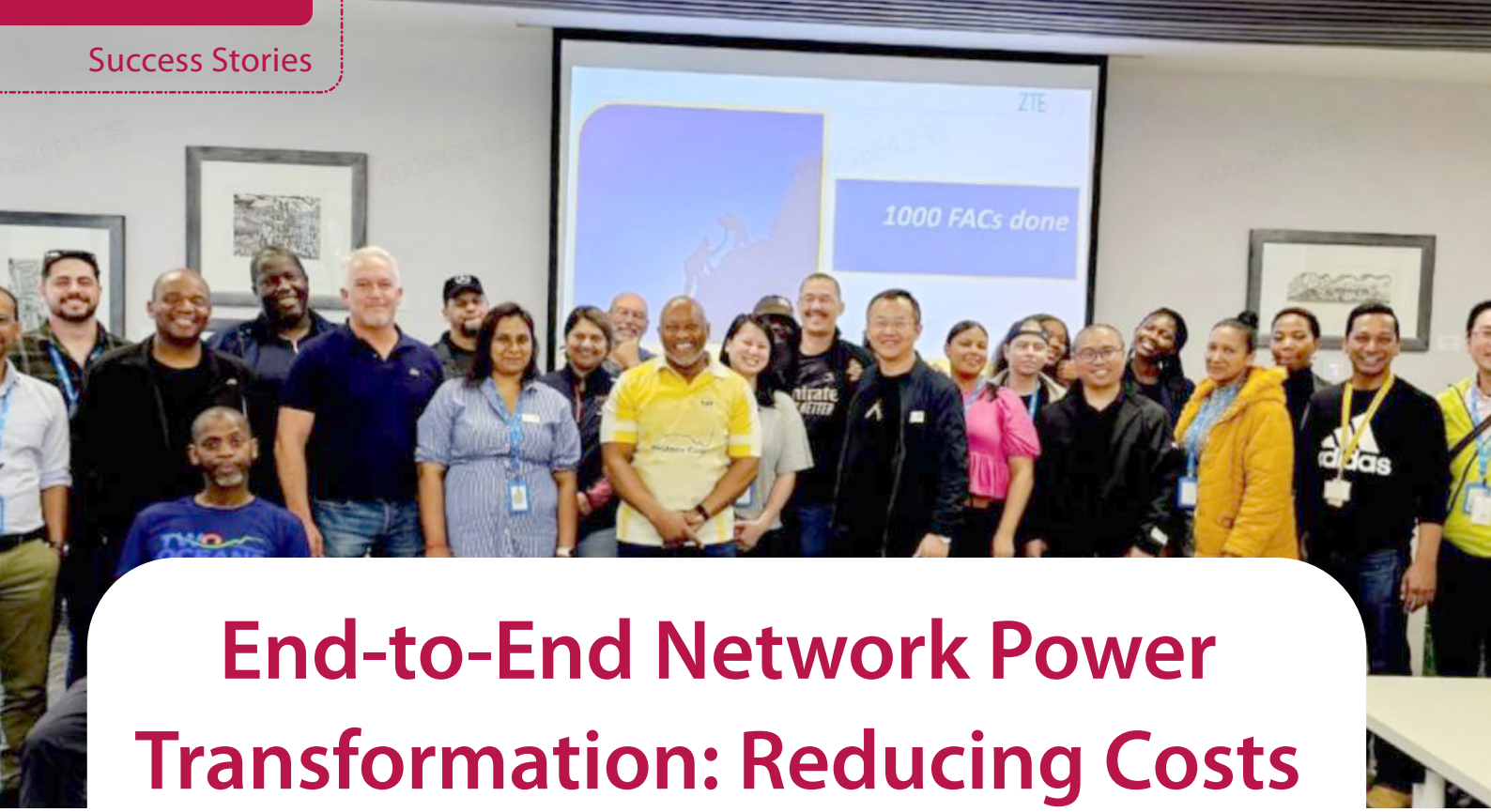
Key Application Outcomes of the Network Assurance System

For this water-splashing festival assurance, the LLM multi-agent system was employed to build a group intelligent decision-making center, providing precise assurance for 798 cells across 180 base stations in key areas such as the Spraying Square and the Gaozhuang Scenic Area. During the assurance period, the proportion of high-load cells decreased by more than 20% year-on-year. User experience remained optimal, and the assurance target of "zero perceptible latency, zero service interruption, and zero major complaints" was achieved.

While innovating the network assurance system, Yunnan Mobile paid close attention to user experience, deploying the AIREngine together with AI agents to build a "dual-intelligence" network experience assurance system. The AIREngine board carries an AI-driven service perception engine and builds a multi-dimensional traffic feature library through deep learning, enabling the intelligent identification of user scenarios and dynamic policy optimization to ensure a smooth user experience.

During the assurance period, the uplink experience rate of live-streaming users increased significantly. The uplink rate of instant messaging services increased by about 30%, the downlink latency of the code-scanning service decreased by about 15%, and the latency of short video and webpage traffic decreased by about 26%.

As a pioneering practice of the national "AI+" strategy, the LLM O&M platform transforms O&M experience into reusable digital assets through knowledge distillation technology, and constructs an industry knowledge map covering the entire process of planning, construction, maintenance, and optimization. This assurance practice jointly undertaken by Yunnan Mobile and ZTE not only verifies the reliability of LLM technology in extremely complicated scenarios, but also provides a "Yunnan model" that can be replicated and promoted for the digital and intelligent governance of multi-ethnic residential areas in Southwest China, enabled by dual-intelligence collaboration. It also provides valuable experience for the subsequent large-scale application of LLM agents to improve the O&M efficiency and intelligence of communication networks. ZTE TECHNOLOGIES



End-to-End Network Power Transformation: Reducing Costs and Boosting Efficiency for MTN South Africa

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Amid rapid global 5G deployment, ongoing energy crises, increasingly complex communication networks, and accelerated digital transformation, communication networks are facing multiple challenges such as surging energy consumption, operational complexity, and green transition. There is an urgent need for solution providers with end-to-end capabilities to achieve energy efficiency improvements through systematic transformation—from site-level hardware upgrades, to regional energy management, and ultimately, to network-wide intelligent optimization. This approach aims to build a new generation of efficient, low-carbon, and intelligent communication energy networks, helping operators significantly reduce operational costs and carbon footprints while ensuring network performance.

MTN is the largest multinational telecommunications operator in Africa, with a presence in 16 countries and a total subscriber base of 297 million. MTN South Africa, a wholly owned subsidiary of MTN Group, is the country's leading network provider, serving 39.2 million customers through a nationwide footprint of approximately 13,000 sites. With 97% 4G coverage and more than 44% 5G coverage, MTN South Africa is driving digital transformation and enabling technological innovation across key sectors of the economy.

Network-Wide Energy Transformation Challenges and Execution Gaps

The power supply situation in South Africa has been deteriorating significantly in recent years. In 2021, load-shedding accounted for 2.1% of total time, increasing to 10% in 2022. By 2023, load-shedding exceeded more than a quarter of each day. Furthermore, the load-shedding scenarios are highly complex, categorized into eight stages, with single-site outages lasting anywhere from 2.5 to 13.5 hours. MTN network, at that time, faced numerous challenges, including insufficient power supply and backup capacity,

inadequate AC input leading to prolonged off-grid operation with two to three daily interruptions, severe site theft resulting in frequent losses of cabinets, batteries, and cables, the lack of energy equipment monitoring causing low efficiency and high OPEX, and continuously declining network power availability (PAV) accompanied by significant customer churn.

These circumstances have made MTN South Africa's network-wide transformation exceptionally complex, involving upgrades for outdated power systems, batteries, and generators, solar integration for carbon reduction, hybrid energy solutions, anti-theft measures for sites, site monitoring systems, and energy operation efficiency improvements. Given the project's intricacy and urgency, MTN South Africa urgently required an end-to-end, integrated energy solution provider capable of executing a comprehensive network-wide upgrade to ensure timely delivery and rapidly transform the current network situation.

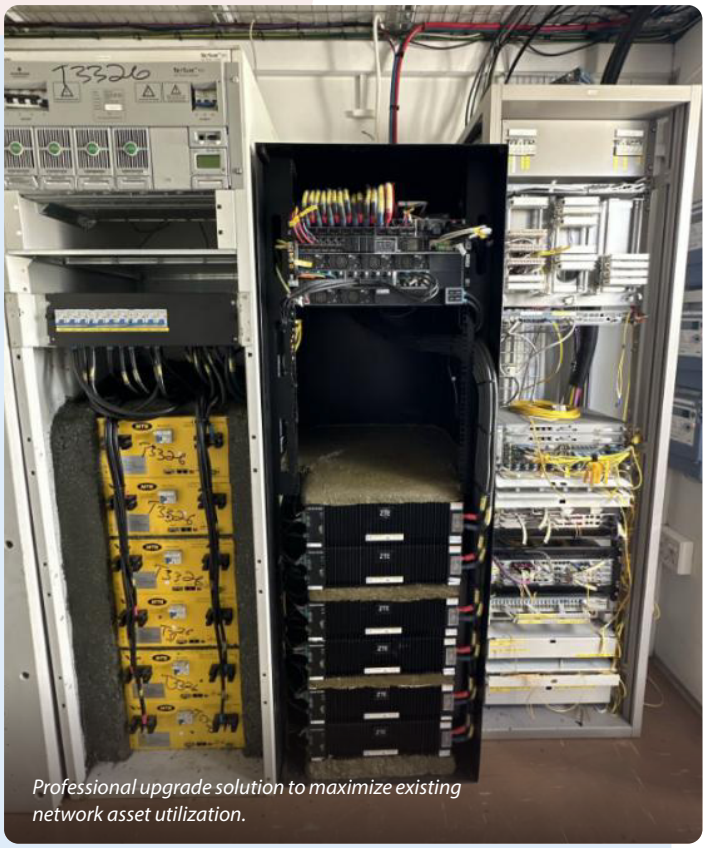
ZTE Empowers MTN South Africa's Comprehensive Network Transformation

To reverse the downturn and address escalating load-shedding and site transformation challenges, MTN South Africa partnered with ZTE to urgently implement end-to-end integrated energy upgrades across over 4,000 sites with low power availability. This comprehensive transformation enhanced backup power capacity and significantly improved site power availability. ZTE's "Net-Zero" Energy Network Solution embeds the design principles of "high efficiency, cost-effectiveness, flexibility, stability, and intelligent operation" throughout the entire power chain—covering generation, conversion, storage, consumption, and management. This holistic approach delivered network-wide operational efficiency improvements and cost reductions across the complete energy value chain.

Professional Solution Design & Network-Wide Optimization

ZTE maximized the reuse of MTN's existing network equipment to reduce investment costs, providing tailored "one-site-one-solution" approaches. Differentiated energy transformation for individual sites offers deep customization with strong scenario adaptability, delivering a low total cost of ownership (TCO) for network-wide upgrades while achieving high post-transformation energy efficiency.

- The power supply strategy combined legacy equipment reuse with targeted replacements. Existing ZTE power equipment receives full utilization through diverse architectural designs that maximize reuse of outdoor cabinets and indoor racks. Under-capacity third-party power supplies get replaced with ZTE's high-efficiency systems featuring 98% rectifier efficiency. Expandable units enable smooth capacity upgrades, permitting phased investment and reduced initial costs. Intelligent circuit breakers facilitate remote switching control, allowing differentiated backup for various loads through precise management while minimizing battery configuration requirements.
- Battery solutions employ performance-based optimization. Recently deployed batteries in good condition remain in service, while aging batteries get replaced with ZTE SmartLi lithium batteries featuring 150Ah high-density 3U designs that significantly conserve cabinet space. The lithium solutions support hybrid battery operation to fully leverage existing battery capacity and maximize legacy equipment value.
- Solar integration focuses on carbon reduction. ZTE's solar power modules seamlessly incorporate existing solar panels without connection modifications, ensuring minimal reconstruction for maximum benefits. For diesel generator sites, new solar installations are introduced to create hybrid energy systems. The industry-leading single-panel MPPT tracking technology delivers 20% higher power generation in shaded conditions.
- Space-constrained sites utilize ZTE's modular PadPower + PadBattery solutions that support flexible expansion and configuration to accommodate various challenging installation environments.



Professional upgrade solution to maximize existing network asset utilization.

ZTE iEnergy Boosts Operational Efficiency by 25%

ZTE has implemented the iEnergy energy management system across the entire network, supporting comprehensive management of power supplies, batteries, solar energy, generator facilities, and environmental monitoring. For MTN's critical sites where modifications are restricted, iEnergy integrates with management units to enable monitoring and control of third-party power supplies and lithium batteries in the existing network.

ZTE iEnergy enables intelligent O&M for batteries, solar panels, and generators, providing detailed maintenance guidance. This includes monitoring battery state of charge (SOC), state of health (SOH), and lifespan prediction to prevent battery failures and site outages. It also establishes generator maintenance schedules and refueling calendars, shifting operations from reactive to proactive management. Remote inspections and fault analysis further reduce on-site maintenance costs. As a result, overall site O&M efficiency has improved by 25%.

Comprehensive Anti-Theft Protection for Telecom Sites

ZTE implemented multi-tiered anti-theft solutions tailored to regional risk levels (low/medium/high) and to existing battery conditions, deploying battery security cabinets, equipment enclosures, epoxy resin reinforcement, and reinforced shelters to enhance physical protection. In addition, the solution integrates these measures with comprehensive network monitoring, enabling MTN to maintain real-time security oversight across all sites.

One-Stop Rapid Deployment

ZTE provides MTN with comprehensive energy transformation services encompassing site surveys, design, deployment, and maintenance, delivering end-to-end solutions for all operational scenarios.

With strong project execution capabilities and optimized resource integration, ZTE efficiently mobilizes its core delivery teams while coordinating local suppliers and subcontractors to accelerate network upgrades. With a peak delivery capacity of 1,000 sites per month—significantly exceeding MTN's requirements—the project successfully completed 4,200 site upgrades within six months, substantially mitigating outage-related losses for the operator.

In the MTN South Africa energy transformation project, ZTE implemented an end-to-end, full-scenario energy solution, enabling one-stop delivery and intelligent network-wide management. By deploying industry-leading technologies and parallel optimization strategies, ZTE increased MTN's network-wide PAV from 85% to over 98%, while significantly reducing OPEX.

The project addressed both network expansion requirements and infrastructure upgrade needs, while creating a unified ecosystem that reduced operational costs and enhanced efficiency. The exceptional outcomes were formally recognized by MTN in a letter of appreciation, which fully acknowledged ZTE's integrated capabilities in complex power scenarios and commended the mutually beneficial achievements. ZTE TECHNOLOGIES

ZTE's Signal Reach Program in Africa Advances Digital Inclusion with Sustainable Networks in Ethiopia

ZTE, in collaboration with Ethio Telecom, has achieved a major milestone in support of the Digital Ethiopia 2025 Strategy. This partnership successfully deployed 152 rural base stations across the country's remote regions, providing widespread 2G, 3G, and 4G mobile network coverage that benefits over 1,000,000 users in underserved areas. As a significant implementation of ZTE's Signal Reach Program in Africa, this initiative directly contributes to the Digital Ethiopia 2025 Strategy's goal of transforming Ethiopia into an inclusive, prosperous society by leveraging digital technologies across various sectors.

Remote deployments often face major challenges, including diverse geographies, limited infrastructure, unstable power supply, and high operational costs. ZTE's end-to-end Rural Ecosystem solution was instrumental in establishing this comprehensive, energy-efficient network. This solution integrates three key modules, EcoSite, EcoEnergy, and EcoDevice, to build a comprehensive network with wide coverage, energy adaptability, and accessible services for customers.

The EcoSite module features low-power, all-outdoor wireless base stations with multi-band compatibility and 5G readiness, flexibly matching network development across stages. With microwave backhaul technology enabling single-site coverage of up to 50 kilometers, this capability effectively overcomes transmission bottlenecks in remote areas. An innovative integrated Wi-Fi module supports remote O&M management. The EcoEnergy module presents an integrated energy solution that incorporates solar power and smart lithium batteries, and is managed by the iEnergy platform to enhance efficiency. Meanwhile, the EcoDevice module offers cost-effective smartphones, CPEs, and MiFi devices to ensure network accessibility for remote users.

For network construction, ZTE used an

innovative Lego-type modular tower construction plan. This method reduces construction costs by 80% and shortens deployment cycles by 75% compared to traditional methods. Additionally, ZTE's iEPMS 4.0 and intelligent tools like NetMAX were deployed to streamline network construction, operation, and optimization.

As of October 2025, Ethio Telecom's total customer base stands at an impressive 86.1 million. This robust growth is underpinned by a near-universal population coverage of 99.4% and a strong tele-density rate of 76.5%. Within this expansive reach, mobile voice customers remain the largest segment, totaling 83.61 million, while mobile broadband users now reach 47.06 million.

This remarkable growth, particularly in connectivity, is a testament to Ethio Telecom's decisive leadership in rural areas. The company has played an instrumental role in accelerating digital access, driving major advancements in 4G population coverage from 37.5% in 2024 to an impressive 70.8% in 2025. By prioritizing underserved regions and collaborating closely with technology partners such as ZTE, Ethio Telecom continues to actively reduce the digital divide, while simultaneously delivering tangible socio-economic impact through the digitalization of critical sectors like agriculture, education, health services, and enterprise businesses.

Over the past years, these efforts have solidified Ethio Telecom's commitment to expanding its nationwide digital footprint, making digital inclusion a core pillar of its transformation strategy. Through targeted rural network expansion and the effective deployment of its Telebirr mobile money service, the company has successfully enabled 57.59 million users—especially those in unbanked and underserved communities—to access digital financial and other essential digital services.

As of September 2025, the network jointly built by Ethio Telecom and ZTE has successfully covered over 100 low-density regions, with impact reaching far beyond mere connectivity. Rural farmers and herders in remote areas now access broader knowledge, skills, and information resources online and use the Telebirr platform for convenient electronic payments, helping to drive rural economic development. Following the network deployment, nearly 100 schools gained access to extensive online educational resources,

ZTE's Signal Reach Program in Africa advances digital inclusion in Ethiopia.

ZTE's Signal Reach Program in Africa helps bridge the digital divide in Africa.

and villagers can now receive prompt remote medical consultations. In environmental conservation, national parks such as Bale Mountains National Park utilize the network to support protection efforts for nearly 30% of Ethiopia's endangered species, while promoting local tourism development and boosting regional economies. Moreover, the project has trained hundreds of local technicians, creating a sustainable talent development system for ICT.

Recognized as one of the first Partner2Connect champions by the International Telecommunication Union (ITU), ZTE is committed to promoting global digital transformation and sustainable development. ZTE's Signal Reach Program in Africa aims to build low-energy, easily deployable networks in remote areas of 20 African countries through three pathways: innovative sites, green energy, and customized terminals.

In Liberia, EcoSite solar-powered sites have provided inclusive digital, financial, and energy services to more than 1,000,000 rural users. In Cameroon, a 360-kilometer backbone microwave network, traversing mountains and forests, provides reliable connectivity across a 2,000+ kilometer route, serving over 13 million users. In South Africa, the program achieved the first 5G ultra-long-range marine coverage in Africa. In Egypt, high-speed broadband networks have been built for over 1,500 villages, covering nearly 10 million people.

By combining technological innovation with its digital inclusion vision, ZTE is working with partners to bridge the digital divide and enable remote communities to benefit from the opportunities of the digital era. In the future, with the continued advancement of the Signal Reach Program in Africa, ZTE will continue to support the achievement of the United Nations Sustainable Development Goals (SDGs) and help Africa and the world move towards a sustainable digital future. ZTE TECHNOLOGIES

ZTE

To lead in connectivity and intelligent computing, enabling communication and trust everywhere