GSMA Foundry

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CASE STUDY



Coordinating **Agentic AI for Autonomous Networks**

China Mobile's and ZTE's new "Digital Employee" has significantly reduced the time it takes to resolve network faults.

Executive Summary

- To further the development of autonomous networks, China Mobile and ZTE have built the "Co-Innovation+" autonomous network open laboratory and are co-building a "Digital Employee" that can oversee a group of agents to manage network faults and optimise network performance
- Drawing on the combination of a knowledge graph, a graph neural network and a large language model, the Digital Employee uses AI deep-reasoning capabilities to pinpoint the most likely root cause of a fault and hence the solution.
- After being assigned the work scope, target KPIs and service level agreement (SLA), the Digital Employee prioritises the work order (WO) and identifies a temporary solution based on service impact, and then tracks the resolution.
- As well as recycling the knowledge generated by each event, the Digital Employee generates a daily knowledge summary, encompassing SLA achievements, overtime WO analysis and other performance data.
- In a pilot in two districts of Beijing, covering 38,000 network elements, the Digital Employee identified the root cause of faults with more than 90% accuracy and reduced the number of on-site visits required for corrective maintenance by 5%, according to China Mobile.
- In a trial in Shandong Province, the solution managed a team of six agents, and identified multiple root causes of faults with more than 90% accuracy, reducing the mean-time-to-diagnose (MTTD) faults from 15 minutes to 3 minutes, while lowering the overall mean-time-to-recovery (MTTR) across multiple vendors and domains by 11%, according to China Mobile.
- China Mobile and ZTE are further enhancing the system, which they expect will be deployed at large scale in 31 provinces in China by 2027.

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Challenge - autonomous networks need to mature

There is strong interest in the telecoms industry in autonomous networks, which could help operators to efficiently meet the growing demand for digital transformation across various industries. Whereas traditional network operations can be held back by high costs and low efficiency, autonomous networks could leverage artificial intelligence (AI) to automate and optimise operational processes, significantly reducing costs, while enhancing network performance.

In particular, autonomous networks are set to harness "agentic AI" in which specialist AI agents autonomously perform specific tasks, such as fault diagnosis or root cause analysis. But this technology needs to evolve further. Today, conventional agents tend to work in isolation with rigid linear workflows, making it difficult for the system as a whole to dynamically adapt to changing conditions.

Furthermore, existing agents tend to focus on local technical metrics, without accountability for overall business outcomes or the user experience. This creates a gap between technical performance and real-world value delivery. "While individual agents can learn, the agent team lacks mechanisms to evolve as a whole," explains China Mobile. "There's no 'central brain' to plan long-term strategies or develop new systemic capabilities proactively."

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Solution - a digital employee that can manage agents

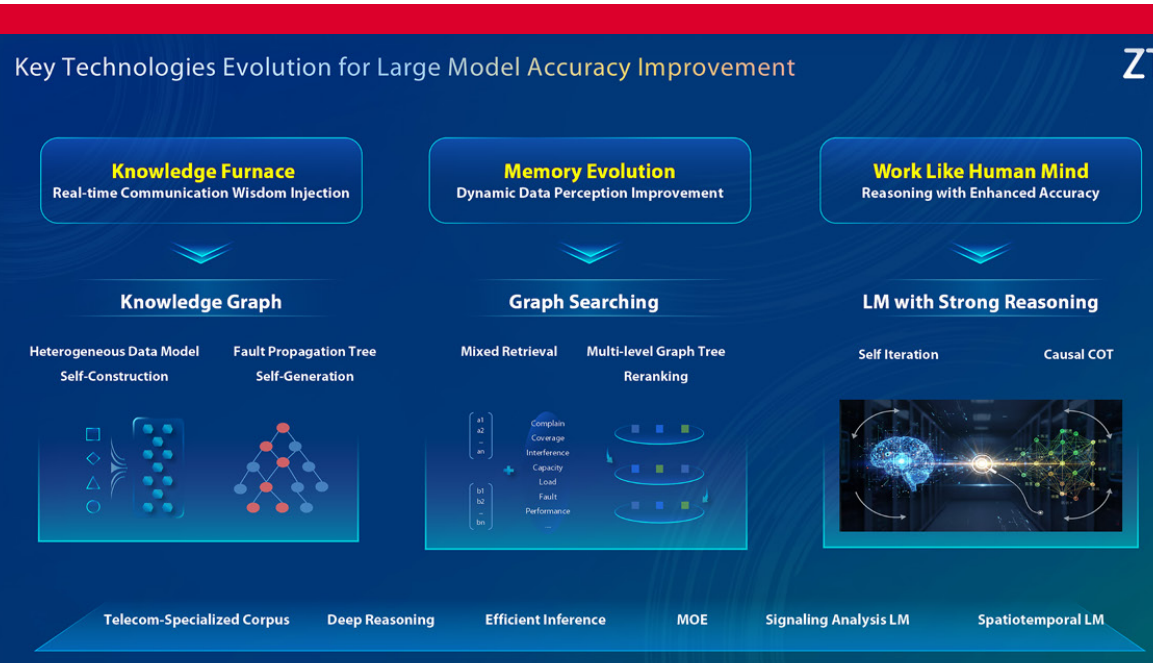
For China Mobile, which operates the world's largest mobile network, greater automation could yield major benefits. As it has to contend with massive numbers of daily alarms and work orders, the operator is looking to reduce the time it takes to resolve faults and the associated maintenance costs.

To that end, China Mobile is working with ZTE to improve fault monitoring. The two companies have launched an incubation project in Shandong Province in China to test the concept of a "digital employee". They are applying AI-based analysis methods to network data, including alarm, logs, complaints and performance, across equipment from multiple vendors, as well as operational support systems. The goal is to build a system that can manage a group of agents as they analyse vast amounts of network fault data, thereby reducing the mean-time-to-recovery (MTTR) and workload required to resolve cross-domain faults, especially in complex scenarios.

The resulting solution – called the Digital Employee - was developed by taking data about how network components are connected (network resource

- A resource graph that shows how everything in the network physically links together.
- A problem-propagation graph that shows how problems (alarms) in one part of the network can potentially trigger issues elsewhere. This helps to understand the connections between resources and how alarms propagate.

China Mobile and ZTE have also developed a new way to search these graphs, combining traditional techniques with graph neural networks. When live alarm data is inputted into the mix, the system is designed to instantly pinpoint the most relevant information on the graphs. It then applies large models' deep-reasoning capabilities to figure out





the most likely root cause. “This cuts through the complexity of managing different network specialties and data sources, giving us a clear, focused graph highlighting the most likely root cause(s) and propagation path of the issue,” explains China Mobile.

As different teams and systems manage and operate different parts of the network and operational processes, China Mobile and ZTE have also created specialised AI agents for each of these areas. Guided by the Digital Employee, these specialist agents collaborate with each other.

ZTE says these agents are equipped with advanced reasoning AI to think through problems step-by-step. Their thinking and deduction are visible to the other agents, so that the agents can respond and communicate to each other, when needed. The Digital Employee can also communicate with other agents/digital employee from other domains to enable the end-to-end automation of the fault management.

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The specialist agents can also dynamically consult the knowledge graphs and propagation path, cross checking with results that they have deduced to ensure high levels of accuracy and avoid hallucinations, ZTE explains.

The Digital Employee is assigned the work scope, target KPIs and service level agreement (SLA) of the scenario. Based on changes in the network alarm status and service impact, the Digital Employee prioritises the WO in real time and identifies a temporary solution. It also tracks KPIs to ensure the problem will be resolved in time. “This replaces the ambiguous ‘best-effort’ approach with clear objectives, enabling agents to autonomously plan long workflows and close tasks within specified SLAs,” says ZTE. The operator’s engineers can interact with the Digital Employee using an AI-based assistant, to access both its data and analytical conclusions.

Results - trials show faults are resolved faster

ZTE says the overall solution is designed to localise the root cause of an event in less than three minutes, enabling automated alerts to be dispatched to operations and maintenance staff within five minutes. That translates into a substantially improved response speed and resolution efficiency, compared to traditional manual methods.

In a pilot in two districts of Beijing, covering 38,000 network elements, the Digital Employee identified the root cause of faults with more than 90% accuracy and reduced the mean-time-to-diagnose (MTTD) by 20% and the number of on-site visits required for corrective maintenance by 5%, according to China Mobile.

In Shandong Province, the solution managed a team of six agents, which handled the full life cycle of fault events. The project partners found, that in the case of a cell outage, a graph search can identify multiple root causes (e.g., optical port link failure) with more than 90% accuracy, resulting in a 11% end-to-end reduction in MTTR. In this way, the solution effectively eased the pressure caused by frequent storm-related network faults during the rainy season (July and August), significantly reducing service loss.

In network performance optimisation tests in Fujian Province, the solution achieved an experience satisfaction rate of 98%, according to China Mobile,

which targets a minimum of 90% for this metric. Meanwhile, in Chongqing Province, the solution achieved a 95% automation rate for continuous upgrade and continuous deployment (CUCD) processes, according to ZTE. These results led China Mobile to conclude that the Digital Employee can enable operators to overcome challenges caused by insufficient technician experience, enhancing handling consistency, while freeing up human resources for leaner, more efficient operations. More broadly, the solution promises to help operators provide a stable and secure network environment, improve customer satisfaction, and support cross industry business development and society-as-a-whole.

For example, in the case of a heavy storm resulting in a significant increase in electric outages, the Digital Employee will analyse the service impact and prioritise events to schedule the WO to meet operational SLAs. If an equipment room suffers an outage that may have a high impact on services, the Digital Employee may suggest the operations team shut down the affected 5G network in designated areas, prioritising the stable operation of the 4G network, and extending the communication coverage time in key areas, such as transportation hubs and medical facilities.

> With this breakthrough, we demonstrate how human-AI collaboration redefines telecom innovation, delivering measurable value across China's most complex networks

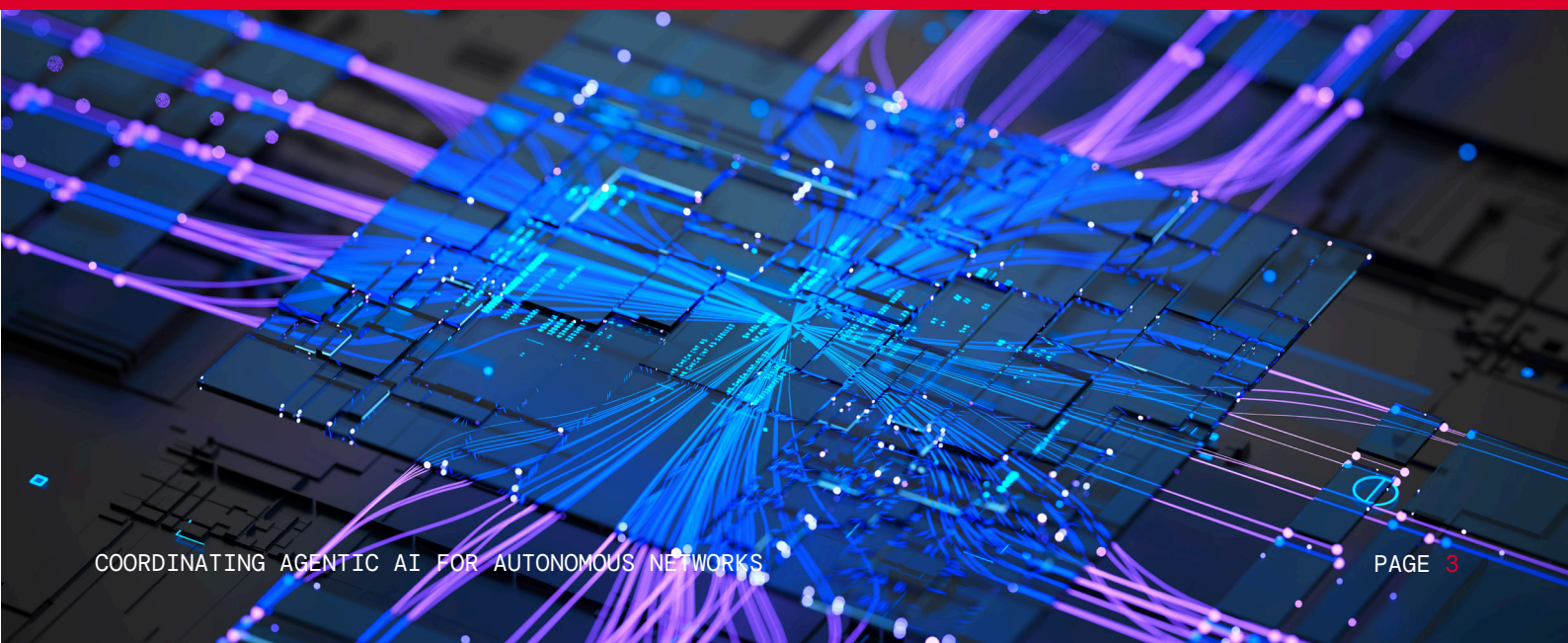
"As a cornerstone of autonomous networks, this innovation transforms operations and drives new-quality productivity," says China Mobile. "It enhances product competitiveness through full-stack AI upgrades, resolving critical bottlenecks and enabling end-to-end automation across workflows. With this breakthrough, we demonstrate how human-AI collaboration redefines telecom innovation, delivering measurable value across China's most complex networks."

Next steps - global expansion and further enhancements

China Mobile and ZTE are promoting their autonomous network solutions worldwide. They envision collaborating with local operators outside of China to develop autonomous network practices and drive intelligent upgrades in local telecoms industries.

While there are regional differences in technological maturity, regulatory frameworks, and demand, ZTE believes the advantages of autonomous networks— labour-saving, cost-saving, and time-saving—hold universal appeal. In developed markets, such as Europe and North America, autonomous networks could enable enterprises to further enhance operational efficiency, strengthening their competitiveness in the global market. In emerging markets, they potentially provide a "leapfrog development opportunity" to rapidly build efficient digital systems at lower costs.

Meanwhile, China Mobile and ZTE are making further enhancements to the Digital Employee. By 2026, China Mobile and ZTE are aiming to compete an iterative optimisation of the knowledge graph and graph neural network model to achieve a fault scope of 90% and root cause accuracy rate of 90%, and reduce the time required for non-site fault handling by 30%. At the same time, they plan to apply multi-agent communication protocols between fault monitoring agents, wireless agents and transmission agents to construct and verify a multi-agent collaborative mode.





By 2027, China Mobile and ZTE are hoping the Digital Employee will be deployed at a large scale in 31 provinces in China. In that timeframe, they also expect the reasoning in the large AI model to be continuously optimised through reinforcement learning technology.

The solution could also find a receptive market in other industry sectors. “Autonomous network technologies are highly transferable and can be seamlessly adapted to diverse scenarios and sectors,” ZTE says. “Self-healing and fault diagnosis capabilities initially developed for communication networks can be repurposed for fault detection and repair in industries such as manufacturing and security after minimal adjustments. This strong universality enables autonomous networks to rapidly deploy across multiple sectors, unlocking substantial commercial value.”

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About the GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

For more information, please visit the GSMA corporate website at gsma.com

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About the GSMA Foundry

The GSMA Foundry is the go-to place for cross-industry collaboration and making positive change happen, supported by leading technology organisations and companies. By bringing together members and key industry players, engaging, and unifying the end-to-end connectivity ecosystem, the GSMA is solving real-world industry challenges.

Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. This enables the mobile industry's mission: to connect everyone and everything to a better future.

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About ZTE

ZTE Corporation is a leading global provider of telecommunications solutions and services, delivering innovative technologies that power networks, enterprises, and consumers worldwide. Established in 1985, ZTE operates in over 160 countries, specializing in comprehensive end-to-end solutions across fixed, mobile, IT, AI and enterprise networks. With expertise in 5G, Autonomous Networks (AN), cloud computing, AI, and IoT, ZTE empowers customers to achieve network intelligence, operational efficiency, and sustainability. Renowned for its commitment to research and development, ZTE drives cuttingedge advancements that enable seamless connectivity and digital transformation, building a smarter, more connected future for its global partners and communities.

For more information, visit: www.zte.com.cn

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