

AI platform brings wide-sweeping transformation to China Unicom's networks and services

Who: China Unicom and Huawei

What: Deployed an AI-based network operations and management platform to use data to automate and simplify national network planning, operation and management, while improving customer experience, cost-effectiveness and sustainability as it rolls out 5G networks and services.

How: China Unicom's Intelligent Network Innovation Center worked with Huawei to develop and deploy an AI-powered network operations and management platform, based on Huawei's AUTIN system.

Results:

- Improved network planning efficiency by 300%, supported fast capacity expansion, ensured customer experience, and improved return on investment (ROI).
- Proactive detection of network risks in advance, thereby helping to reduce network outages by 25% and improving customer satisfaction.
- AI-based demarcation and localization of anomalies has helped China Unicom achieve over 90% accuracy in network optimization and reduced time spent on optimization by 90%.
- Reduced annual power consumption by 100 million kWh, which is equivalent to 40,000 tons of standard coal or 27,000 tons of carbon or 78,000 tons of carbon dioxide.

China Unicom faced a problem common to many communication service providers: As it rolled out 5G alongside its existing 2G, 3G and 4G networks it encountered greater operational complexity, an issue that was compounded by regionally disparate, siloed operations and legacy equipment. As a result, it struggled to capture and analyze the data it needed to attain consistently high levels of network efficiency, network availability and customer experiences, and to drive 5G service innovation.

The inability to quickly identify, capture and analyze the right data was also curtailing China Unicom's ambition to offer customers highly personalized services and to take full advantages of 5G's capabilities to support new enterprises, mixed reality, smart city and autonomous driving services.

"Basically, we have different kinds of models and different kinds of equipment in our networks and the interfaces between data are sometimes very complex. At the same time data can be scattered across all ends of our business and separate vendors use their own protocols. All of these factors combine to make our data collection work incredibly hard," said Yu Wang, Director of Shanghai Network R&D Center, AI Intelligent Operation Center, China Unicom.

Where China Unicom differs to many CSPs, however, is in the scale of its operations. It serves 310 million mobile network users and 90 million broadband users, manages 2 million LTE sites and is rolling out 250,000 5G sites during 2021.

The needs for greater network operation automation based on real-time intelligence was pressing, so China Unicom collaborated with Huawei to build an AI-based platform to centralize data gathering, analysis and operational management support for the whole of China.

Based on Huawei's AUTIN and other operation and management platforms, it uses AI models to collect and analyze networks and operations data. Its functions are wide-ranging and include automatically evaluating the best locations for network sites, self-healing of networks, enabling new 5G service partnerships and making it possible to precisely target marketing efforts.

Centralizing data collection

Prior to putting in place its AI-driven operations and management platform, each of China Unicom's 31 provincial divisions had collected data about separate wireless and fixed network operations and then aggregated it to a central platform. The process was slow and laborious, and also the data quality was hard to assure. With its new system, called the 'Middle-End Network Platform', China Unicom can automatically access the data it needs from anywhere on its network, making data collection more efficient and allowing more diverse data services to be included.

The result is a centralized source of information that the CSP can draw on during network planning, construction and maintenance. By applying AI simulation to a pool of network optimization data, for example, China Unicom can automatically evaluate the optimal locations for new sites. It can also use augmented reality and AI technologies to identify and solve network equipment installation problems, thereby reducing network construction time.

In addition, the platform facilitates network operation and maintenance by using AI learning to automatically predict and prevent faults based on 1000+ KPIs, with a prediction accuracy of 85%, according to China Unicom. Its capabilities include automatically generating cross-domain rules covering wireless, transmission and power equipment domain. for automatic fault compression and correction.

The platform further supports network optimization by identifying 13 types of problems, such as interference, coverage, and load and automatically dispatching trouble tickets. Automated machine learning (AutoML) then triages problems and applies intelligent closed-loop management to ensure network optimization.

The platform also informs 5G network build by providing suggestions for improving 5G site planning and penetration rates, based on an analysis of the 5G business opportunities in a given area using data such as which customers already have 5G terminals.

Collaborating on AI-driven transformation

China Unicom and Huawei relied on TM Forum's Business Process Framework (eTOM) and AI Closed-loop Anomaly Detection and Resolution Automation (CLADRA) project to help identify, design, develop and operationalize AI & data analytics at China Unicom and to re-engineer its business operating processes as it transforms into an agile digital enterprise.

By working closely with TM Forum, China Unicom was able to take a standardized approach to planning and capability delivery, lifecycle management, operations readiness and support, and fulfillment assurance billing. TM Forum's Framework, for example, provided China Unicom and Huawei with a common ontology and information model, which it used to effectively increase IT and operations agility in line with strategy; to embed AI technologies into the right applications; and to automate business and operational processes.

TM Forum's AI Maturity Model, meanwhile, helped China Unicom realize and prioritize AI capability-embedding and deliver on its business goals, while TM Forum's AI Closed-Loop Reference Architecture enabled it to build smart network operations platforms for end-to-end network planning, capability development (construction), O&M, and the optimization of products, services and resources using closed loop patterns. TM Forum's AI Closed-Loop Reference Architecture has played an important role in improving the maturity of business process automation with fast- and slow- closed loop workflows applied to business processes, using AI to drastically reduce network faults and labor-intensive network operations.

Serving enterprises nationally and creating new partnerships

China Unicom harnessed automated diagnosis of network performance and self-healing to save millions of working hours and reduce related costs by tens of millions of dollars during a single year of operation. During the Covid-19 pandemic, network maintenance engineers were able to remotely assure the high-quality network and enable the sending of 61 million SMS messages related to epidemic prevention and control in a single province within a 20-day period.

China Unicom's AI-based network operations and management platform

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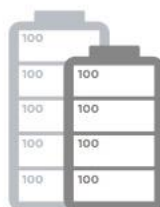
1000+ KPIs,
with a prediction accuracy of
85%



over
90%
accuracy in network
optimization and
reduced time spent
on optimization by
90%

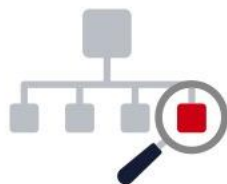


improved network planning efficiency by **300%**



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One of the notable benefits of the new AI-driven platform is the way it allows China Unicom to both improve its service to large national Chinese enterprises and to forge new 5G partnerships through intensive network operations.

For example, in the past, China Unicom's PCC [Policy and Charging Control] platform was set up by different provinces. But today, its intelligent network platform uses a nationwide PCC platform to support QoS assurance across the whole country.

In addition, enterprise customers now benefit from China Unicom's ability to conduct end-to-end fault diagnosis for private line networks across the entire country.

China Unicom can also accurately target potential 5G adopters, and generate automated and detailed suggestions for improving 5G site planning and penetration rates. Using the platform allows China Unicom to guarantee a superior service to more than 250,000 "VIP" customers and identify potentially high-target customers. By the end of July 2021, in the 661 cities where China Unicom uses AI and data analytics for precision marketing, 36.5% of its subscribers were using 5G, giving it the highest 5G penetration rates of any CSP in these cities, according to China Unicom. It also achieved the country's highest levels of customer satisfaction for 5G services in the same cities and period of time.

China Unicom also uses the platform to automatically provision and orchestrate different services through a central command. Because the platform incorporates the operation platforms for 5G private networks, 5G PCC

and network slicing, explains Yue Zhao, Director of Shanghai Network R&D Center, AI Intelligent Operation Center, China Unicom, it can be used to support future service innovation.

Indeed, the platform is designed for both internal and external users. “The capabilities of this intelligent network platform are made available to our partners, so they can leverage the capabilities to develop their own orchestration platform,” explains Zhao.

Increasing energy efficiency

Driving greater energy efficiency is another key concern for China Unicom and through the platform it now harnesses AI to reduce the average power consumption of cell sites by 15 kWh per month. The energy saving mechanisms are designed to support channel shutdown, symbol shutdown, cell lockout, and deep dormancy, and they have proven to deliver accuracy rates of more than 95%, without impacting customer experience, according to China Unicom. The result is a reduction of around 100 million kWh in China Unicom’s annual power consumption, which is equivalent to 40,000 tons of standard coal, or 27,000 tons of carbon or 78,000 tons of carbon dioxide.