



# China Telecom Chongqing

CHONGQING

**Intelligent Network Reconstruction for a  
Metro Network with Intelligent O&M** 



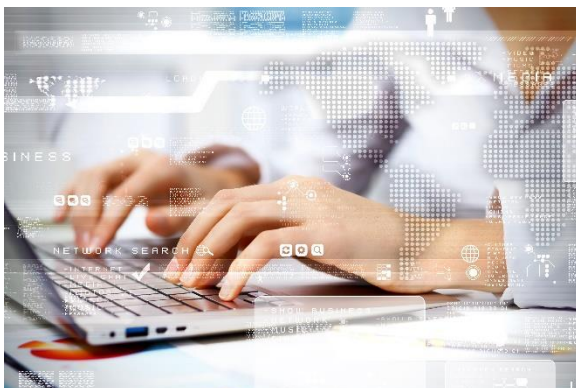
# 10-Year Reconstruction & Business Transformation

Intelligent Network Reconstruction  
at China Telecom



## Background

In 2016, China Telecom held a release conference in Beijing for its *China Telecom CNet2025 Network Architecture White Paper* under the theme of "10-Year Reconstruction for Business Transformation". This marks the comprehensive kickoff of its intelligent network reconstruction, which is one of the four major initiatives it has taken to implement its transformation strategy. The release of this white paper also marks the formal implementation of this strategy at China Telecom.



China Telecom specified the new features of target networks in the white paper.

**Simple:** The network maintains as few network layers, technology types, and interfaces as possible to reduce the complexity and cost of operations and maintenance.

**Agile:** The network provides software programming capabilities and scalable resources to facilitate service deployment and assurance.

**Open:** The network provides abundant open capabilities to meet the requirements of Internet applications.

**Centralized:** Network resources can be centrally planned, deployed, and utilized. This alleviates the problem of high costs and low efficiency for decentralized and domain-based management.

Networks with the preceding features will enable China Telecom to improve user experience by providing network capabilities such as network visualization, resource on demand, and self-service.

**Network visualization:** provides an application-based network resource view for users.

**Resource on demand:** provides on-demand and automated resource deployment for services.

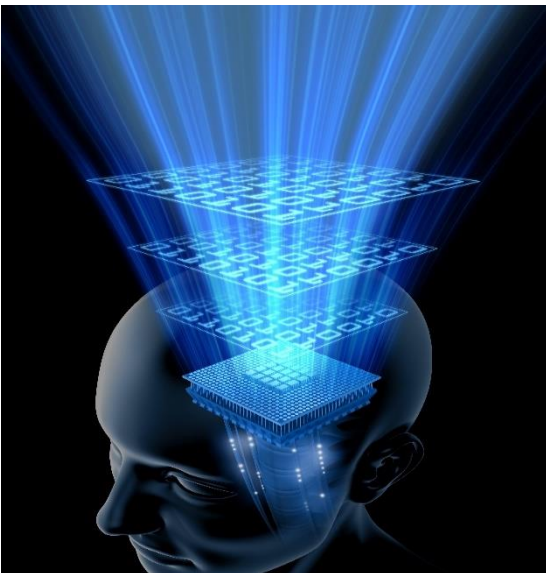
**Self-service:** provides self-service management for user networks.

## Challenges

In 2018, China Telecom Chongqing reviewed their network fault status and discovered that the home side and access side had high fault rates but the affected user scope was small. In comparison, the network side and cloud side had low fault rates but the affected user scope was large. This is problematic because a fault on the network or cloud side could result in numerous complaints.

Analysis of network-side work orders showed that more than half of the work orders were triggered by explicit faults, such as delay, jitter, and packet loss at the network layer, as well as port-down event, high CPU usage, and high memory usage. Explicit faults can be reported to the work order system through alarms; however, implicit faults, which accounted for about 25% of the work orders, are difficult to detect before they cause service interruption. Implicit faults include fiber deterioration, optical module deterioration, and configuration errors, and they may always affect users. These faults last for long periods of time, are difficult to proactively locate even after causing major problems, and easily result in numerous complaints.

China Telecom Chongqing focused on the network side and cloud side as key assurance areas in its intelligent O&M transformation. It then comprehensively started intelligent network reconstruction to build a metro network with intelligent O&M through innovative practice.



## Solution

Carriers' intelligent O&M transformation cannot be achieved without the support of a powerful platform, and carriers are in urgent need of precise and efficient technologies to truly improve O&M efficiency and user experience.

iMaster NCE is the industry's first network automation and intelligence platform that integrates management, control, analysis, and AI functions. It effectively connects physical networks with business intents and implements centralized management, control, and analysis of global networks. In addition, it enables resource cloudification, full lifecycle automation, and data analytics-driven intelligent closed-loop management according to business and service intents, and it also provides open network APIs for rapid integration with IT systems. Furthermore, it enables networks to be simpler and more open, secure, and intelligent, accelerating service transformation and innovation of carriers and enterprises.

During intelligent O&M transformation, China Telecom Chongqing adopted iMaster NCE to pilot scenario-specific high-value applications such as home broadband service visualization, dial-up fault diagnosis, and deterioration risk warning according to use cases developed through joint innovation based on AI and big data.

### Visualized home broadband services, measurable user experience

Perceiving user experience in advance has always been one of the main concerns that carriers have. User experience is an integral part of watching videos, playing games, downloading files, browsing the web, and other similar applications.

iMaster NCE collects the connectivity status of users and servers to visualize the network quality of home broadband users on the entire network, and it determines user experience based on defined measurement indicators. iMaster NCE measures the experience of home broadband users through service dimensions such as videos, games, downloads, and web browsing.

iMaster NCE utilizes big data analytics to identify heavy users of certain applications, such as videos or games. Carriers can then push differentiated value-added services, such as video optimization or game acceleration packages, to these users to boost revenue.

### Diagnosis of dial-up faults, automatic identification of mass faults

Dial-up service exceptions do not trigger NE alarms. As a result, fault locating is inefficient and based on experience, and service interruption may last for more than 10 hours.

iMaster NCE collects relevant data and reports indicator information in real time. When a fault occurs, iMaster NCE can identify the number of affected users and detect the fault in a timely manner. With the AI algorithm, iMaster NCE can mine and aggregate abnormal indicators, such as abnormal user login and logout, from mass information, shortening fault locating time from hours to minutes.

### Warning and rectification of deterioration risks before user complaints

Deterioration risks threaten user experience. However, carriers usually respond passively when they receive user complaints because it takes long periods of time to clear the large number of alarms reported by NMSs.



iMaster NCE aggregates network problems and associates them with user experience based on big data and AI to identify potential risks when components deteriorate. In addition, iMaster NCE performs fault aggregation and demarcation by improving network quality and user experience, shortening fault locating time from hours to minutes.

Proactive fault prediction and prevention effectively lower user complaint rates.

## Effectiveness

Through joint NetCity innovation with Huawei, China Telecom Chongqing started intelligent O&M transformation on the most important network side and cloud side. Within one year, China Telecom Chongqing successfully launched scenario-specific high-value applications such as home broadband service visualization, dial-up fault diagnosis, and deterioration risk warning. This effectively improved the O&M efficiency and user experience of the metro network, marking the first step of transformation to intelligent O&M.

A representative from China Telecom Chongqing said: "The successful joint innovation between China Telecom Chongqing and Huawei enabled both parties to fully display their respective advantages. iMaster NCE can identify problems before users complain, which greatly improves the efficiency of maintenance personnel. We hope AI can do more things and free up maintenance personnel, so that they can focus on more important things."



## Follow-up Plans

China Telecom Chongqing will widen the scope of its successful practice. It will expand the test scope to the main urban area of Chongqing and start comprehensive intelligent network reconstruction. In addition, it will serve users in a better way through network transformation that features proactive O&M, fault prediction, and intelligent network management.

## Services Provided by Huawei

iMaster NCE is based on the unified cloud platform. It flexibly packs feature modules based on application scenarios and provides multiple offerings, such as NCE (Super), NCE (IP Domain), NCE (Transport Domain), and NCE (Access Domain). A single-domain iMaster NCE product can evolve towards the multi-domain iMaster NCE architecture. In addition, the Manager, Controller, and Analyzer modules of iMaster NCE can be purchased and deployed on demand.



China Telecom Chongqing and Huawei jointly launched the IDN metro network innovation project. This project introduced technologies such as big data and AI through iMaster NCE deployment and successfully piloted high-value applications such as home broadband service visualization, dial-up fault diagnosis, and deterioration risk warning. This project effectively improves O&M efficiency and user experience, marking the first step of metro network transformation towards intelligent O&M.