How China Mobile Zhejiang overcame 3 major problems in its 5G bearer network

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China Mobile Zhejiang has been at the forefront of mobile bearer networks in China since the inception of 4G. In response to the challenges 5G service development place on bearer networks, the China Mobile subsidiary established a joint project team with Huawei in 2016 to research 5G bearer networks. The team went on to construct the largest 5G test bearer network in China in 2018.

Making the 5G bearer smart

IDC predicts that by 2021, at least 50 percent of the world's GDP will derive from digitalized sources and that China's digital economy will account for 55 percent of its total economic output. Digital products, operations, and partnerships will promote growth in all industries. A Gartner survey revealed that 83 percent of respondents are set to complete digital transformation in 2019.

Digital transformation of the global industry has undoubtedly entered the fast lane. And operator networks are the cornerstone of this transformation, in particular 5G networks.

5G will see a far wider range of services than 4G and industry verticals will have much higher demands, which will in turn increase

the requirements on network deployment, adjustment, and O&M. Traditional device-centric network architecture and the 4G O&M model, which is reliant on manual operations, are unsustainable for 5G. Smart and automated O&M that improves the efficiency of network deployment and O&M are essential.

China Mobile Zhejiang and Huawei launched a NetCity project in 3Q 2018 to explore a 5G bearer smartification solution that could give China Mobile Zhejiang an early edge in 5G bearer networks.

NetCity is a future city construction project jointly initiated by Huawei and global operators. It provides broadband-based, cloudified, smart network infrastructure to help people develop smart societies. The main idea behind NetCity matched China Mobile Zhejiang's strategic development demands for 5G bearer smartification.

At the heart of the IDN is the Network Cloud Engine (NCE), which comprises four engines: intent, automation, analysis, and intelligence. The intent engine translates business intent into a web language and simulates network design and planning. The automation engine turns network design and planning into concrete network commands that automate network devices through standard interfaces. The analysis engine mainly collects and analyzes user network data including bearer delays, jitter, packet loss rates, and so on, using real-time telemetry and other technologies. Building on the work of the analysis engine, the intelligent engine provides risk prediction and processing suggestions by using AI algorithms and continuously upgrading the experience database.

The IDN builds a data-driven digital twin network using the four engines, which supports intent-driven auto-configuration and data-driven, real-time situational awareness and global insight into network O&M across the full lifecycle, as well as predictive operations that are customer- and service-experience-centric. IDN is China Mobile Zhejiang's preferred tool for exploring 5G bearer smartification.

Intent-driven bearing

China Mobile Zhejiang and Huawei set up a work group to solve the network problems encountered during the construction of the 5G bearer network, including the long base station deployment cycle, difficult fault location, and insufficient network reliability. Initial results have been achieved so far.

Long deployment cycles of base stations: The team found that the main contributing factors were decentralized management across departments, manual operations for all processes, excessive configuration steps, high skill requirements, and susceptibility to errors.

They planned and introduced a smart platform to support automated and online full-process management of resource planning, network design, the configuration of new network elements, service configuration provisioning, and service verification.

The automation engine turns network design and planning into concrete network commands that automate network devices through standard interfaces.

Completing hardware instillation could then automatically trigger service configuration, reducing personnel skill requirements, improving base station deployment efficiency, and shortening the base station deployment cycle.

Fault location: The mainly difficulties were found to be the separate presentation of hardware information, a lack of detailed base station paths, zero bearer network awareness when base station services deteriorated, a passive response to complaints from adjacent departments, multiple teams performing fault location, low fault location efficiency, and the inability of the network to self-verify that faults have been cleared.

The project team implemented end-to-end path/quality visibility on base station services using a service-layer flow performance monitoring mechanism. Faults can now be detected in seconds and quickly demarcated and located within minutes, so problems can be solved before customers complain. At the same time, when preset network KPI threshold values such as delay, jitter, and packet loss rate are exceeded, warning alarms are reported automatically, preventing faults and avoiding passively responding to work orders.

The project team analyzed and designed an intelligent clock solution to solve the problem of long planning and deployment cycles involving the 1588 clock and the requirement to take sites offline to measure fiber symmetry. The solution allows clock path planning and configuration to be completed in one click. It works with the base station to automatically compensate fiber asymmetry, enabling the deployment of the clock without having to take sites offline, which greatly improves the efficiency of 1588 clock deployment. Functions like monitoring the health of the network clock, performance history playback, and automatic fault tracing allow 90 percent of faults to be automatically located in minutes, making clock O&M simpler.

Insufficient network reliability: The project team discovered that the main factor affecting reliability was that services couldn't accurately detect multiple points of failure or correctly switch to available paths, leading to service interruptions. In response, they designed a better network protection mechanism that enables the fast perception of multiple faults to ensure permanent 1:1 service protection and rapid recovery following faults, thus ensuring services are always online. The team is continuing to carry out analysis and research on issues such as difficulties in analyzing large numbers of equipment alarms and impact assessments on new services on the network.

Thanks to the NetCity project, China Mobile Zhejiang 5G bearer network's deployment and operations efficiency has been significantly enhanced. As the level of intelligence of the whole 5G bearer network continues to improve, O&M efficiency will continue to be optimized, supporting China Mobile Zhejiang's 5G service innovation and commercial success.