

How China Mobile Zhejiang became a pacesetter in 5G transport networks

Already a 4G leader in China, China Mobile Zhejiang is demonstrating outstanding performance in the 5G transport field. Together with Huawei, it recently completed the Phase-II pilot construction of its 5G transport network. Supporting up to 120 gNodeBs, it's the largest network of its type in China. It also leads in terms of 5G features, including Segment Routing and FlexE.

By Diao Xingling, Huang Haifeng, Communications World



High network requirements

Compared to 3G and 4G, 5G delivers higher bandwidth, many more connections, and lower latency: it's at least 10 times faster than 4G, its connection density is expected to reach 1 million per square kilometer, and low latency is required by applications like autonomous driving.

Shen Gangwei, Vice GM for the Department of Planning and Technology of China Mobile Zhejiang, believes that these requirements in major service scenarios greatly impact transport networks and access and aggregation equipment rooms, increasing pressure on operators.

5G's higher service requirements

A portrait of Shen Gangwei, a middle-aged man with glasses, wearing a light blue button-down shirt and dark trousers. He is standing against a dark background. A green semi-transparent box is overlaid on the left side of the image, containing a quote and his name.

“ Networks are not built in one day. Resources must be well-prepared with a clear plan. China Mobile Zhejiang realized the importance of basic resources preparation during the construction of 4G networks. ”

— Shen Gangwei, Vice GM for the Department of Planning and Technology, China Mobile Zhejiang

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From the perspective of wireless and core network evolution, 5G places new requirements on the transport network in terms of bandwidth, latency, synchronization, flexibility, network slicing, and service provisioning.

First, the transport network requires more flexible and agile connections, which necessitates SDN for hierarchical management. Second, the need for rapid service provisioning and deployment requires network slicing to build a full-service, all-scenario 5G transport network. Third, the distribution of 5G service units, centralized units, and distributed units is significantly different from 4G. Therefore, L3 functions will need to be moved downwards on the future transport network. Finally, the bandwidth capabilities of 5G networks will increase continuously. Currently, Packet Transport Network (PTN) devices mainly use GE and 10GE interfaces and can support 100GE interfaces. In the 5G era, the bandwidth will evolve to 10GE, 25GE, 200GE, and 400GE at different network layers. This tremendous bandwidth growth will drive the birth of new technologies.

In the early stage of development, Shen says that, “China Mobile Zhejiang will expand and upgrade its live PTN. In the future, we will introduce new technologies and devices such as Software-defined

Packet Transport Network (SPTN).”

The key step

The transport network is the foundation of 5G development. However, networks aren't built in a day and resources must be well-prepared and planned, lessons that China Mobile Zhejiang learned during the successful construction of its 4G networks. According to Shen, “Conducting research and preparing transport resources earlier will mean faster network construction and stronger network bearer capabilities.”

According to 5G site construction requirements and technical standards, the impact of 5G on the transport network is mainly felt in the metro network. “We started 5G research and began preparing basic resources in 2016,” says Shen. “Our research focuses on physical resources such as access and aggregation equipment rooms, rack space, power environment, auxiliary power supplies, and optical fiber resources on the metro network, as well as the network environment.”

The operator started to prepare network resources for access and aggregation equipment rooms in 2017, conducting multiple surveys on live networks and



collecting large amounts of data. And this paid-off-a bottleneck in network was identified.

China Mobile Zhejiang used its findings to consolidate and optimize its resources during 2018, including equipment rooms, optical fibers, power, and auxiliary power supplies.

Building a “5G City”

Constructing a network model and doing theoretical research are far from enough to put a network into commercial use. Pilot tests on the live network are also required.

China Mobile Zhejiang has a unique advantage in live-network testing. Hangzhou is among the first batch of cities where China Mobile carried out 5G field trials, covering multiple scenarios such as scale tests, application development and incubation, service experience promotion, and 5G agile R&D.

Its 5G field tests achieved good results and, on the

eve of World Telecommunications Day 2018, China Mobile Zhejiang officially launched its 5G City plan, revealing that it will be partnering with Huawei to transform Hangzhou into an innovation hub and pilot city for 5G networks, with continuous coverage available across vertical industries. Plans include an E2E 5G trial network with more than 100 sites by the end of 2018.

The 5G field test was an E2E verification that covered the wireless, transport and core networks. Shen explains that, “The field trial helps us find the shortcomings of our theoretical research. We’ve since improved our model and completed a new round of planning for transport network construction. We’ll work with Huawei and other suppliers to increase the scope of testing and verification, and continue to improve the model in the next stage.”

When it comes to planning a 5G transport network, he states that 5G is currently in the phase of testing live networks and researching service applications. In the early stage, 10G to 100G will meet the access

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requirements of a small number of gNodeBs under an overall strategy of expanding the live network's capacity. Doing so includes upgrading the aggregation nodes and access rings, starting with the management and control system, and then gradually moving the L3 functions downwards.

In the mid-phase, China Mobile Zhejiang will consider network-wide capacity expansion according to 5G service volumes and network traffic. In hotspot areas and core urban areas, it will deploy 200G or 400G interfaces to meet E2E capacity expansion.

SDN, L3-to-edge deployment, and network simplification will be almost fully completed at this stage.

In the long-term, over 400 Gbps of traffic will be introduced at the core layer to address rapid traffic growth. China Mobile Zhejiang will adjust and upgrade the capacity of the boards and devices on its live networks, and introduce cost-effective new network construction technologies to pave the way for transport networks.

5G networks carry a large number of service applications, the development of which needs to be in sync with network construction.

At present, 5G standards have basically been determined, some technologies have been verified, and 5G service applications are proliferating, especially IoT applications. However, 5G field trials suggest that more research and testing is needed on 5G terminals, equipment manufacturing, and live-network capacity expansion. Moreover, continuous network improvements are needed to meet the requirements of high bandwidth, massive connections, and low latency.

As well as its network trials, China Mobile Zhejiang has promoted the development of the 5G industry and applications, especially services related to manufacturing, lifestyle, society, culture, and IoT applications.

In 2016, China Mobile and Zhejiang Provincial Government jointly built a 5G Joint Innovation Center and a center for 5G technologies and service applications that supports infrastructure construction and 5G technical standards. It also

A flourishing 5G ecosystem



China Mobile Zhejiang's next step will be to expand its 5G trial network to cover multiple areas. In addition, it will promote research into applications such as industrial Internet, Internet of Vehicles (IoV), Smart City, and VR/AR.



launched the trial commercial use of 5G products and services.

In 2017, the operator and local government worked with various enterprises to set up the 5G New Technology Research Joint Lab to promote a complete 5G industry chain, covering chips, algorithms, network devices, and terminals, aiming to position the lab as a benchmark for 5G technology research in China. On the eve of World Telecommunications Day 2018, China Mobile Zhejiang and several dozen organizations, including operators, device vendors such as Huawei, research institutes, and major companies in various industries, jointly established the 5G Industry Alliance of Zhejiang Province.

IoT and 5G

China Mobile Zhejiang has already deployed NB-IoT applications, such as remote monitoring and meter reading, with its NB-IoT coverage powering some of the largest-scale projects in the country. In fact, the operator's IoT connections have already exceeded the number of its mobile and fixed subscribers.

China Mobile Zhejiang's work in the 5G industry

will also promote the development of 5G transport networks. "We will closely cooperate with the Ministry of Industry and Information Technology (MIIT) and China Mobile Group in terms of the scale and progress of 5G transport network construction," says Shen.

China Mobile Zhejiang is ahead of China Mobile as a whole in the construction and preparation of network infrastructure resources, especially those for transport networks. And Shen hopes that Hangzhou will become a national 5G leader.

China Mobile Zhejiang's next step will be to expand its 5G trial network to cover multiple areas, such as West Lake, the Asian Games Stadium, IoT Town, and Zhejiang University. In addition, it will promote research into applications such as industrial Internet, Internet of Vehicles (IoV), Smart City, and VR/AR, as well as demonstrations of these technologies.

Thanks to its fearless persistence and planning in the 5G field, the operator has already made a name for itself as a 5G leader in China, and plans to keep it that way. 