5G field trials show the power of applications

China Telecom Shenzhen is running one of the first six 5G field trials for China Telecom. In partnership with Huawei, the operator has invested in 5G innovation and begun researching how to commercialize 5G technology.

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5G applications based on the 5G trial network

In the Shenzhen Software Industry Base, China Telecom Shenzhen completed the deployment of China Telecom's first 5G pilot site in October 2017 and began the verification of 5G networking capabilities and solutions.

Based on the 5G trial network, China Telecom Shenzhen is exploring 5G application models. During the 5G Unmanned Aerial Vehicle (UAV) flight test and inspection demonstration, remote control personnel experienced VR capabilities and remote HD video transmission over a low-latency 5G network. Both the maiden test flight and inspection were completed successfully, demonstrating the ability of 5G to support UAV applications. This means that aerial photography, unattended inspection, logistics transportation, security identification, and other industrial applications will be driven by the rapid development of 5G in the telecom sector, creating a strong foundation for China Telecom to explore new vertical industries.

In tests on Gbps-level experience buses, 5G provided an average speed of more than 1 Gbps and a peak rate of 3 Gbps, allowing passengers to experience mobile 4K IPTV, 16-channel HD video streams, and VR applications while traveling. This paves the way for China Telecom's plans of 5G and IPTV convergence.

To achieve its goal of connecting 50 5G sites by the end of 2018 while constructing its transport network, China Telecom Shenzhen upgraded its existing IP RAN to deploy and verify 5G technologies, enabling the co-existence of both 4G and 5G. In addition, the operator gained valuable engineering experience and developed scenario-based solutions for subsequent 5G construction.

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Building application-oriented 5G transport networks

Addressing 5G challenges for the smooth evolution of live networks

While bringing a wide variety of services, 5G also brings challenges in terms of bandwidth, latency, connections, and the slicing of transport networks. GNodeBs, however, deliver five to ten times more bandwidth than eNodeBs. 5G services such as the Internet of Vehicles (IoV) require the latency to be one-tenth of what they are with 4G. In terms of connections, the cloudification of wireless and core networks brings full-mesh connections, requiring flexible scheduling on the transport network. In addition, 5G's differentiated services require network slicing, with a focus on isolation and the automated management of network slices on transport networks. To cope with these challenges, China Telecom Shenzhen assessed the existing IP RAN, opting to upgrade and expand core and aggregation devices and replace specific access devices for 5G transport. To quickly deploy 5G services and fully reuse the existing network, China Telecom Shenzhen implemented the smooth evolution solution for the transport network in pilot areas.

Network upgrade for co-existence of 4G and 5G

The co-deployment of eNodeB and gNodeB is the optimal choice for transport networks, and China Telecom Shenzhen verified different co-existence solutions. Access ring devices can be upgraded and expanded to satisfy the requirements of 50GE ring networking and allow 4G and 5G services to share the same access ring. When access devices need to be replaced, China Telecom Shenzhen can establish a new 5G access ring, which can share the core and aggregation layer to achieve unified service bearing.

E2E large capacity to meet HD video transmission requirements

As China Telecom continues to explore 5G services, the convergence of 5G and IPTV has become its focus. To meet the requirements

of 4K IPTV video transmission using 5G, the transport network must have large bandwidth transmission capabilities. China Telecom Shenzhen upgraded the access layer from an eNodeB GE ring to a 50GE ring, and upgraded the core and aggregation layer from a 10GE network to a 100GE network, allowing high-bandwidth connections between base stations and the core network.

FlexE deployed for vertical industries to deliver NSaaS

In addition to gaining experience in 5G network construction and verifying network technologies, China Telecom Shenzhen hopes to create a 5G demo network for China Telecom Guangdong and even China Telecom Group. It's also aiming to become a base for 5G service incubation and innovation. China Telecom Shenzhen has cooperated with multiple governments and enterprises to launch enterprise-based 5G services. Enterprise services and mobile broadband services have different network requirements. Therefore, in the pilot process, China Telecom Shenzhen proposed network slicing as a Service (NSaaS) to provide customized new services for customers in vertical industries. In the transport network field, FlexE (a hard slicing technology) is deployed to provide independent bandwidth resources for each enterprise application, ensuring the service quality of each and improving user experience.

Cloud-network synergy provides connections for various cloud services

Combining 5G with existing cloud services is a key direction for China Telecom Shenzhen and Huawei to explore 5G applications. The convergence of the existing telecom cloud services and 5G networks that provide high bandwidth, high reliability, and low latency will improve the competitiveness of telecom cloud services and expand the service scope. China Telecom Shenzhen aims to deploy an intelligent O&M platform on the 5G transport network to manage and control the path, bandwidth, and latency of cloud services, and to collaborate with the cloud management platform that delivers cloud services. In the smart policing demonstration of China

> The pilot network of China Telecom Shenzhen was already equipped with 5G capabilities. They also stated that it was essential to work with more industry chain partners to jointly innovate and explore more industry applications.

Telecom Shenzhen's 5G experience buses showcase, the 5G UAV uploads HD images to the police cloud in real time. The cloud superimposes the target information, action route, action area, and other information using AR technology, and displays the synchronized information on the shared command center screen for the 5G buses. This requires orchestration between the transport network and cloud so that high-bandwidth and low-latency connections are provided between the UAV and cloud.

Partnerships build intelligent 5G networks

After visiting the 5G showcases in Shenzhen, China Telecom executives said that the pilot network of China Telecom Shenzhen was already equipped with 5G capabilities. They also stated that it was essential to work with more industry chain partners to jointly innovate and explore more industry applications.

China Telecom cooperates with Huawei to explore the value of the 5G industry. Both parties leverage their advantages to develop the 5G service innovation base, build an industry ecosystem alliance, and research the usage scenarios and business models for 5G services. Huawei Wireless X Labs in Shenzhen simulates 5G technologies and usage scenarios, and works with upstream and downstream industry partners to jointly develop industry standards and plans. China Telecom leverages the resources of 5G trial networks and existing industry customers to develop new 5G applications, driving the development of the entire 5G industry and improving China Telecom's influence in the 5G field.

The world is changing from 4G to 5G, from people-to-people connections to all-connectivity, and from revenue growth driven by demographic dividends to revenue growth driven based on user experience. China Telecom Shenzhen will continue to play a leading role in creating a first-class innovation ecosystem and push forward 5G technological innovation. Based on its pilot projects, China Telecom Shenzhen will collaborate with upstream and downstream industry partners to promote the construction of the 5G ecosystem and construct robust networks for a digital China.