Optimizing Mobile Backhaul:
Breaking the 4G Bottleneck

Challenge caused by data deluge

According to a mobile Internet white paper, mobile terminals have become people's primary portal to obtain information. Mobile phones today provide not only simple voice and SMS services, they also offer entertainment, SNS, video-on-demand/video surveillance, and high-speed Internet access services. In the future, video, SNS, and web browsing services will be the major data consumption services. Data consumed on video and micro blogs by Android/iOS devices will make up 50% of all data. Smartphones bring the surge of data consumption. The explosive increase in data consumption prompts global carriers to accelerate LTE deployment, and imposes an even higher demand on the mobile backhaul network.

The deployment of LTE improves the bandwidth of wireless air interfaces. However, the traditional mobile backhaul network has become a bottleneck for LTE deployment. It restricts the upstream and downstream traffic flow and compromises user experience. The bandwidth of LTE networks is dozens of times higher than that of 3G networks. This means that the LTE backhaul network must be able to continuously evolve to higher bandwidth, meet the dynamic requirements of wireless technology, and flexibly interoperate with hybrid networks.

New Technology Improves Service

Since there are no base station controllers (BSCs) in an LTE network, the backhaul path is longer and the service model becomes point to multi-point (P2MP). The capabilities of the backhaul network are also changing. The emergence of the heterogeneous network (HetNet) in the LTE requires intensive coverage. So a lot of small and micro base transceiver stations (BTS) must be deployed. The surge of network elements (NEs) and longer service path pose new challenges to the O&M of the backhaul network.

To tackle the challenges, a software defined networking-based (SDN-based) IPRAN solution was proposed for LTE backhaul network architecture and management. The number of BTS-side(size?) NEs can be greatly reduced, minimizing O&M workload and difficulty. The workload can be reduced to 10%. Meanwhile, advanced atomic routers, IPPFM, and uTraffic that implements visualized E2E management were also developed to realize predictable, assessable, and controllable LTE backhaul network management.

Video service will be the major application of the LTE network. LTE-based evolved multimedia broadcast/multicast service (eMBMS) enables one-to-many broadcasting to deliver high-quality content to users. The LTE backhaul network must support IP multicast.

In addition, the LTE network is transforming to IP-based architecture and packets transferred on LTE networks are all plain texts. So the LTE backhaul network is more prone to security risks from public and bearer networks. LTE pico cells are located in public areas and LTE hotspots are for public users. No physical protection can be provided for them like protection for traditional BTS. So the LTE network is more likely to be attacked from outside. Therefore, the LTE backhaul network must support IPSec encryption to protect data security.

These new technologies improve the capability of the backhaul network and thus need corresponding support systems and solutions.

Optimizing Services and Monetizing Data Deluge

Against the backdrop of new challenges and technology, how should carriers upgrade their mobile backhaul network? This and many other questions are on the minds of operators and we list a sample of questions below along with specific solutions Huawei has to address their questions:

• What is the capacity of the current mobile backhaul network? Can the current capacity support future LTE services?

• How should the new network be designed to ensure network reliability and scalability?

• Based on existing resources, how can we design Layer 2 and Layer 3 networks and corresponding service and protection solutions to meet LTE requirements?

Utilizing its mature mobile backhaul solution, Huawei conducted live network audit, including network capacity evaluation, service capacity forecast, simulation service forecast, E2E service bearing and protection solution design and through these efforts, Huawei was able to help address many of the customer's question and clear up confusion around current and future capacity needs of the mobile backhaul network. Huawei also simulated the service traffic and network capacity after LTE service provisioning, and spotted the network bottleneck, then proposed specific network expansion solution to address backhaul network reliability and scalability.

Finally, based on existing resources, Huawei successfully designed Layer 2 and Layer 3 networks and corresponding service and protection solutions to meet LTE requirements. The solutions helped the carrier implement precision network investment, ensured that the network design solution can meet LTE services' requirement on the mobile backhaul network, and guaranteed fast LTE service provisioning.

Huawei's mobile backhaul solution has been perfected through numerous successful deployments and can bring unique benefits to customers.
The LTE backhaul network evolution solution includes comprehensive audit, planning and design, solution verification and deployment, and Day 2 guarantee to ensure the smooth evolution of the LTE backhaul network. The solution implements the following functions:

1. In-depth current network audit to evaluate the preparedness of the LTE backhaul network. As a result, appropriate network reconstruction suggestions can be given to realize precision investment.

2. Refined service planning and QoS design to ensure different service levels for different services.

3. Solution verification-Huawei supports double solution verification by the service simulation tool and the Global Network Evolution & Experience Center (GNEEC). The GNEEC provides a simulation platform to conduct scenario-based solution verification to identify potential risks and to ensure successful solution implementation.

4. Service deployment-Huawei offers professional tools to support batch delivery of configurations to realize quick service implementation and provisioning.

5. Day 2 guarantee service to help customers complete service provisioning and fault location, shortening service provisioning time.
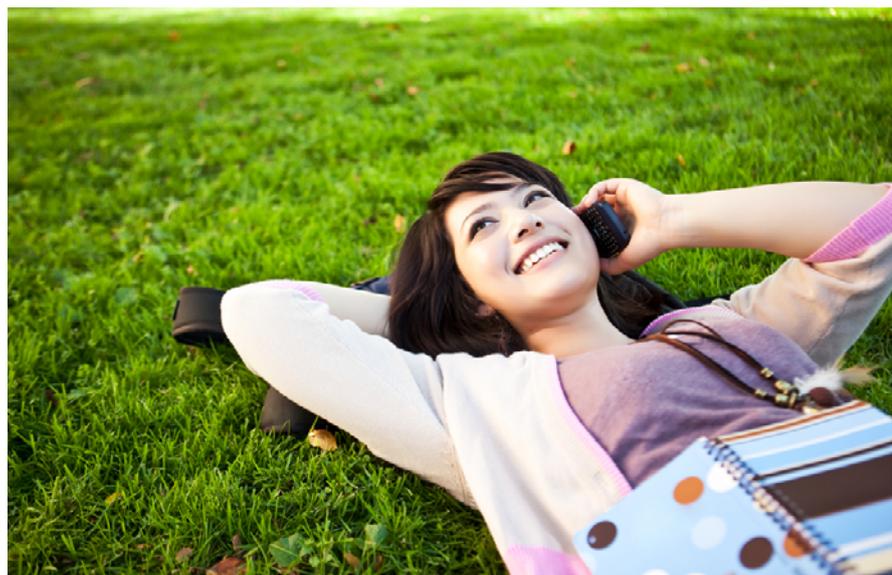
Huawei has successfully helped over 130 carriers globally deploy 136 IP mobile backhaul networks, developed comprehensive service solutions and platforms, accumulated rich experience, and cultivated professional talent. Huawei boasts leading technology, markets, and service solutions in fixed broadband (FBB), IP and mobile broadband (MBB), and provides unique technology and capabilities with its LTE backhaul network solution. Huawei will continue to explore the market and win even more customers. Huawei firmly believes, effective backhaul strategies and sound service solutions are key to quick LTE deployment and meeting customer requirements.

The strengths of Huawei's mobile backhaul solution can help carriers optimize their mobile backhaul networks, eliminate the bottleneck in 4G deployment, and monetize the deluge of mobile data traffic.

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