LTE, are you ready?

By Xu Yan

Act 1: Imagine that you are traveling on a high speed train in Europe and you urgently need some documents for an unscheduled project meeting. Exceeding 1GB, however, these documents include files and pictures that can be downloaded quickly providing that your computer and data card are connected. This would remove the headache of having to jump off the train and rush to an Internet cafe.

Act 2: Suppose now that you are traveling in Fiji and have just recorded the torch lighting ceremony with your high definition camera. The several hundred MB files can be uploaded onto YouTube.com within one minute through your mobile phone connected with your camera, enabling people around the world to share your experience.

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In a mobile broadband world based on long-term evolution (LTE), these scenarios are no longer just dreams. As a solution for future 3GPP UMTS/HSPA evolution, LTE can reach a peak downlink data rate of 100Mbps and a uplink data rate of 50Mbps, increasing frequency efficiency by two to four times when compared with 3GPP R6.

In October 2007, Huawei successfully demonstrated its LTE-based multi-channel HDTV in an air interface. Results showed that the downlink data rate reached 140Mbps and uplink 50Mbps. According to the latest statistics, 80% of LTE standards were confirmed in 2007 and LTE will see its commercialization in 2009. In a research company's November 2007 report, LTE is set to emerge as the successor of mobile broadband technology over the middle and long-term, with an estimated user base of 24 million by 2012.

Huawei has already performed LTE demonstrations with leading operators such as T-Mobile, Orange, Vodafone, Telefonica, and Telecom Italia. A belief that **LTE has a bright future is far from enough, then how operators can best accelerate the arrival of the LTE era?**

Taking the initiative to secure users

Users have for some time demonstrated a solid demand for high-speed data services. The 3G R99 remains unable to carry services such as video sharing, high definition television (HDTV) and online gaming, given its time delay and limited speeds. On the other hand, users are expecting anywhere, anytime broadband services. Facing a market replete with competition, operators cannot afford to just wait for LTE, but must instead lead the way to enhanced broadband service provision.

Fig. 1 illustrates that, in terms of network evolution, HSPA/HSPA+ can provide higher bandwidth and a faster network speed, which can even match that of a fixed network. HSPA/HSPA+ represents a powerful tool to meet existing market needs.

When constructing or upgrading mobile broadband networks, operators need to select solutions that support all-performance HSPA and HSPA+ roadmap, and select partners with long-term experience in the field. Operators globally have begun to do so. In Europe, Vodafone Spain has deployed its HSPA network and has recorded its elevated performance, and Telecom Italia has implemented its HSPA services in Italy. In the Asia-Pacific region, Singapore's StarHub has deployed the very first commercial HSUPA, and EMOBILE has released the fastest HSDPA network in Japan. Choosing Huawei's HSPA solutions, these operators now provide their users with high-speed services boasting 7.2Mbps uplink and 1.92Mbps downlink.

In the near future, Huawei will help operators introduce LTE and 4G technologies into existing networks, employing technologies such as 64QAM and MIMO in the HSPA+ phase. This will provide 21Mbps downlink and 28.8Mbps uplink mobile broadband services to assist operators to secure LTE user groups. Operators need therefore to provide LTE-like services to help users form their using habits, and to spearhead the smooth evolution to actual LTE services. Multimedia broadcast multicast service (MBMS) has been specified in the performance requirements of an LTE evolved universal terrestrial radio access

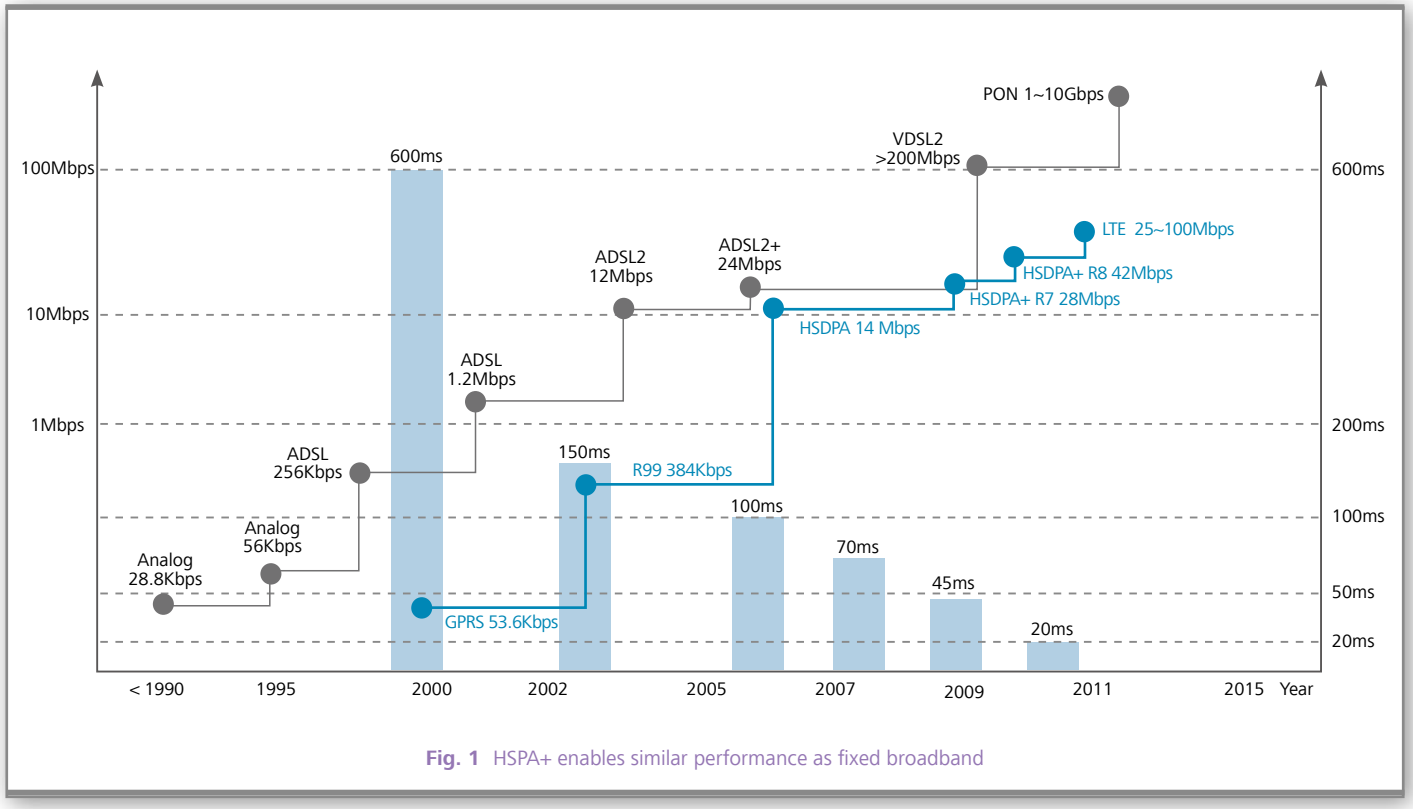

Fig. 1 HSPA+ enables similar performance as fixed broadband

network (E-UTRAN).

Correspondingly, mobile TV services such as HDTV and holographic television will become killer applications. With MBMS Phase1 already successfully operating in Hong Kong and with Huawei's successful tests with Qualcomm, MBMS has already undergone actual commercial application, and MBMS-based mobile TV services are increasingly garnering the attention of operators.

Based on Huawei's Mobile TV solution, each cell can carry four 128KB or eight 64KB TV channels. The forward access channel (FACH) and MBMS share lub transmission resources, removing the need for additional bandwidth after Mobile TV deployment. Huawei plans to enhance its MBMS solution in 2008 with each cell able to carry fourteen 128KB or sixteen 64KB TV channels, giving users an improved HSPA-based service experience. Once MBMS across an HSPA/HSPA+ network is accepted, smooth evolution to LTE-enhanced MBMS services will be seen, including the evolution of service usage modes and user habits.

Building a network for smooth evolution

Network lifecycle extension and smooth evolution play important roles in operators' unceasing drive to reduce TCO. The impending arrival of LTE networks has encouraged operators to use software to upgrade their existing networks, especially wireless access networks, so as to realize smooth evolution and save legacy resources.

As a mature solution, Huawei's next generation base stations construct a unified-wireless access platform. Via these base stations, operators can build a base station platform in which various systems coexist. The platform facilitates the changes of network systems and capacities by adjusting radio frequency (RF) and baseband modules. Operators can realize a dual-mode network by inserting GSM and UMTS modules into the same cabinet, along with LTE RF modules. These can share the same power, transmission, antenna feeder, and baseband resources, and modules can be added to cope with increased user and service quantities.

Huawei has also proposed the innovative idea of evolving networks by introducing software radio technology. Simple software operation allows operators to switch a GSM RF module to a UMTS or LTE one, or use a single RF module to support two network systems. This delivers the advantageous capability of adjusting network performance and service models, as well as defining network attributes based on service needs.

Paving your way to All-IP

Telecom and Internet networks are becoming further converged with an increasingly vague boundary between telecom and IT technologies. The telecom world is undergoing an evolution to All-IP and FMC, including fixed network and future-oriented LTE.

Traditional architecture will differ significantly in an LTE network, with the base station controller (BSC) or radio network controller (RNC) integrated into the access or core layers in a dual network structure. Base stations are connected to the system architecture evolution (SAE) through IP, and services are accessed through gateways. The traditional circuit switched domain is removed and service access, bearing, switching, coordination, charging, and control are packet domain and IP-based. Mobile network IP transformation can be realized through three steps.

First comes the IP transformation of interfaces. IP transmission can be used between 3G base stations and BSCs. In this case, lease and construction costs are reduced in traditional time division multiplexer (TDM) transmission, and sufficient bandwidth is provided for high-speed data services. In the GSM system, the IP transformation of A interfaces can reduce transcoder (TC) and network costs, enabling transcoder free operation (TrFO) and enhanced voice quality. Interface IP transformation has less impact on the entire network architecture and is easy to achieve. Successful examples can be seen with StarHub in Singapore, Etisalat in Saudi Arabia, EMOBILE in Japan, and China Mobile, who have all selected Huawei's IP RAN/IP BSS solution to deploy their networks.

The second stage involves the IP transformation of the kernel. As the keys for mobile network IP transformation, prerequisites to avoid failure are strong network capabilities and a thorough knowledge of transmission and data communications. The Huawei-developed BSC features an IP kernel and supports the IP interfaces between base stations and core networks, it also realizes IP-based switching and achieves control. Data sent from a base station to the BSC through IP is not switched or decoded, but is transmitted to the core network directly through an IP switch. Highly-integrated digital signal processing (DSP) and multi-kernels can be applied to enhance equipment performance, reduce power consumption and save resources.

The final stage describes the IP transformation of services. When NEs and the entire network are transformed to IP, service access can be simplified to a connection between servers and gateways. With the help of an OSS/BSS system, operators can deploy and manage telecom services just as Internet service providers run their Web services.

The IP transformation of the mobile network is an important step for LTE All-IP and flat network architecture, and also a preparation for LTE network architecture. The evolution from existing networks to LTE is a smooth and gradual process through mobile network IP transformation. It is thus time to get ready for the rise of the LTE mobile broadband network.

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