Why Chinese 4G matters to the rest of the world

TD-LTE represents China's bid to take a **global leadership role in 4G**, driven by China Mobile with support from a powerful ecosystem. However, TD-LTE is not only of interest to the Chinese. Other countries are also in the mix, and a non-Chinese operator may well be the first to adopt the technology.

TD-LTE ATTRACTED EXTENSIVE attention from a global audience at the 2010 World Expo in Shanghai. China Mobile organized a demo together with several vendors to display radio, chipset and end devices. At the NGMN (Next Generation Mobile Networks) Industry Conference & Exhibition 2010, which was also held in Shanghai, TD-LTE was showcased in combination with its entire ecosystem.

Before 4G became a reality, China's homegrown TD-SCDMA technology made the country's journey toward 3G complex and tortuous. In recent years, China has pushed its own standards in a host of areas. TD-SCDMA is a significant opportunity for China to establish a global communication standard in 3G, to lead the technology development and to acquire additional intellectual property.

Consequently, China Mobile, which is China's most powerful operator, has been assigned to operate TD-SCDMA. The number of subscribers (more than 13 million in November 2010) is growing rapidly, but the network is limited to a Chinese territory of 5.6 million sq km. As the 4G era begins, the Chinese government has included next-generation information technology (including next-generation mobile communication) as a strategically important industry in the country's latest five-year plan. The Chinese Ministry of Industry and Information Technology (MIIT) and China Mobile are organizing seminars and trials to improve technical standards and promote system implementation, and China Mobile will take the lead to initiate large-scale field trials with thousands of base stations in several Chinese cities in 2011.

GROWING INTEREST OUTSIDE CHINA

An increasing number of operators worldwide are showing interest in TD-LTE. In India, the US technology company Qualcomm has acquired a 20MHz unpaired spectrum to speed up the development of TD-LTE there. Qualcomm and its local partners, Indian shareholding companies Tulip Telecom and Global Holding Corporation, plan to deploy TD-LTE networks in four of India's largest regions. The Japanese company Softbank and the Taiwanese company FarEastTone have also reportedly expressed an interest in TD-LTE as an update of their PHS and WIMAX networks, respectively.

TD-LTE shares more than 90 percent of its technology with "mainstream" LTE (LTE FDD). The data rate performances of TD-LTE and of LTE FDD have been hotly debated in the industry. In practice, however, TD-LTE networks exhibit only a slightly lower end-user perceived data rate than LTE FDD networks.

One after the other, infrastructure providers have declared their TD-LTE solutions ready for commercial deployment. Ericsson and Reliance have presented results from a TD-LTE field trial that achieved balanced peak rates of 80Mbps in the downlink and 20Mbps in the uplink. The trial achieved full mobility, with flawless delivery of applications such as HD multimedia streaming and live TV with mobile speeds of between 50 and 70 km per hour.

A trial organized by MIIT provided evidence that TD-LTE could, for the most part, support the same applications as LTE FDD. Some industry analysts have forecast that an extra six to twelve months will be required to improve the stability of the radio access system and resolve other maturity issues before TD-LTE can catch up with LTE FDD.

Several international and Chinese compa-

Frequencies available for TD-LTE

3GPP has proposed several frequency bands for TD-LTE deployment. 2.3GHz and 2.6GHz are two important bands. Globally, eight TDD frequency bands are available, including three bands currently occupied by FDD technologies. New spectrum, such as 3.4GHz and 3.6GHz are expected to be allocated for TDD, driven by 3GPP and the ITU.

Potential frequency bands for TD-LTE

Operating band	*Frequency*	*Spectrum*	*Region*
33	1900-1920MHz	20MHz	Europe
34	2010-2025MHz	15MHz	China, Europe
35	1850-1910MHz	60MHz	TDD bands in the US and
36	1930-1990MHz	60MHz	Canada, currently occupied by
37	1910-1930MHz	20MHz	FDD technologies
38	2570-2620MHz	50MHz	Europe, Middle East, Africa, China
39	1880-1920MHz	40MHz	China
40	2300-2400MHz	100MHz	China, India

nies expect to have TD-LTE devices available in the second half of 2011. Chipset vendor Sequans and other Chinese chip companies, including Leadcore Technology, HiSilicon, Spreadtrum and Chongyou Information Technology, have all worked on the chipset platform for TD-LTE, and plan to launch related products in the first half of 2011.

INCREASING ADVANTAGES OVER WIMAX

TD-LTE is usually seen as a competitor to other time-division duplex technologies. However, to an increasing extent, TD-LTE is showing advantages compared to WIMAX, and several mobile WIMAX operators have announced their interest in TD-LTE. This migration has been facilitated by vendors that offer technology upgrades from WIMAX to TD-LTE. Although mobile WIMAX is already a mature technology with commercial availability, its market growth has not met expectations. According to Infonetics Research, mobile WIMAX (802.16e) had about 7 million subscribers by the end of 2010. In contrast, HSPA had more than 320 million subscribers by November 2010, according to Wireless Intelligence.

To most WIMAX operators, WIMAX offers a shorter time to market, while LTE is a more backwards-compatible network technology that could enable mobile broadband access and inherit nearly all cellular applications from 2G and 3G, facilitating a more long-term business model.

With only eight defined bands for TD-LTE, several challenges will emerge in the network's deployment worldwide, especially on the device and international roaming side. Spectrum politics could lead to a fragmented market, with complex demands on mobile devices. Realistically, however, it is not only TD-LTE but also LTE FDD that faces such problems (19 bands have been defined for LTE FDD). Europe is moving toward a harmonized approach to spectrum for LTE, while harmonization in Asia and the US is still proceeding slowly. This differs from the introduction of 2G and 3G mobile. In Europe, regulators provided a common band for all radio transmission. When moving to 3G, European operators adopted a common 2100MHz band, which made it easy to support a global roaming service. It will be difficult for LTE to repeat the 2G and 3G success story, which was based on simple and harmonized spectrum requirements. This raises questions for the entire LTE industry.

CONCLUSION

TD-LTE is strongly supported by the Chinese government because it is seen as a network technology that has evolved from TD-SCDMA. China Mobile has tended to be the main driver to define the technology standard and push the ecosystem forward.

However, the impact of TD-LTE is not limited to China. An operator in India, Japan or a European country could instead be the first to deploy a commercial TD-LTE network.

TD-LTE has a promising future for three important reasons. The first factor is frequency availability – given the scarcity of existing paired bands, many unpaired spectrums have been allocated for TDD radio technology. Second, with a unified standard, TD-LTE and LTE FDD could share most of their technology structure, making things easier for equipment suppliers. Third, TD-LTE offers business advantages. A TD-LTE network could inherit nearly all applications from 2G and 3G, allowing operators to move faster in establishing profitable business models. This gives TD-LTE an advantage over other TDD wireless technologies such as WIMAX. ●

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The price of spectrum could be a strong advantage

▶ One important feature of unpaired bands is that they are often perceived as less valuable than paired bands and can thus usually be acquired at a lower price. As wireless technology spreads, large amounts of paired spectrum are becoming extremely scarce, so operators will consider a better use of unpaired, discrete bands. This makes TD-LTE an appropriate alternative.

▶ The availability of unpaired spectrum will lay a solid foundation for TD-LTE deployment worldwide, and auctions of unpaired frequency bands (coupled with paired bands) continue to be held in many countries:

Danish unpaired spectrum auction (May, 2010): 3 Denmark acquired 25MHz of unpaired spectrum in 2.6GHz; Telenor Denmark and Telia Denmark acquired unpaired and paired spectrum as well.

German unpaired spectrum auction (May, 2010): Vodafone, T-Mobile, Telefónica and E-Plus bid on the spectrum auction, a total of 50MHz unpaired spectrum in the 2.6GHz band. Vodafone and Telefónica finally shared the unpaired frequency bands around 2GHz and 2.6GHz.

Austrian unpaired spectrum auctions (September, 2010): Telecom Austria and Hutchison 3G both opted for 50MHz of unpaired band at 2.6GHz. The two operators ultimately shared the band, each taking 25MHz.

India unpaired spectrum auction (June 2010): Reliance India Communication acquired a countrywide broadband wireless access license (20MHz of unpaired band at 2.3GHz). Reliance Industries Limited conducted a TD-LTE field trial with Ericsson in December 2010.

▶ Operators who have acquired TDD bands may be the first to commercially deploy TD-LTE networks, ahead of China Mobile. Because the 3G license process in China began very late compared with other countries, China Mobile did not launch its 3G until early 2009. However, China offers the largest potential market for TD-LTE, with more than 800 million mobile subscribers.