



LTE's Spectrum of Opportunity

Countries around the world poised to release spectrum for next-gen services.

Operators around the world have reached a perfect storm when it comes to the demand for mobile broadband services. So much so that they are now seeking an aggressive capacity-easing move to Long-Term Evolution (LTE) technology, all-IP data-optimized technology that offers ultra-fast broadband services. While the business proposition surrounding the move to LTE is clear, the spectrum operators need to make that transition is less so.

Radio spectrum is considered the lifeblood of every mobile operator, and today, this finite resource is quickly reaching its limit because of the heavy demand for high-speed data services. Regulators in many regions of the world are realizing the need to release new spectrum to unleash broadband services that are swiftly becoming so pervasive.

"Mobile data is growing fast. In some places, operators experienced a 14-fold increase during 2007. Many operators are reporting 3.5G networks are running at close to capacity during peak hours despite having deployed their available UMTS carriers," noted Darren McQueen, vice president wireless broadband product

management with Motorola. “Competitive flat rate pricing and easy-to-use Web-friendly smart phones are turning many customers into heavy users of service. These trends are causing operators to take a closer look at deploying LTE technology as soon as it is available in order to relieve the capacity crunch they may face with today’s 3.5G networks. The gating factor, however, is how fast regulators can release new spectrum in time for LTE commercial network availability at the end of 2009.”

Fortunately, for U.S. operators, regulators there have already released commercial spectrum suitable for LTE services, which means operators in this region will become one of the first LTE operators.

The Federal Communications Commission (FCC) in April 2008 auctioned 62 megahertz of spectrum in the 700 MHz band. The band is highly prized because the low frequency allows signals to travel farther and provide better in-building coverage than higher frequencies such as 1900 MHz. As a result, operators need fewer base stations to cover an area, which translates into lower overhead costs—a major asset for any operator looking to be aggressive on the pricing front.

Winners of the auction will get their hands on the spectrum on Feb. 17, 2009—when U.S. TV stations must by law complete the transition from analog to digital broadcasts, which includes vacating the 700 MHz band.

Verizon Wireless, which is jointly owned by Verizon Communications in the United States and Europe’s Vodafone, was the biggest winner in the 700 MHz auction. The CDMA operator spent \$9.63 billion to win a nationwide spectrum footprint covering 298 million pops, plus 102 licenses for individual markets covering 171 million pops for an LTE deployment.

Verizon Wireless plans to work with part-owner Vodafone to conduct field trials of LTE this year, select vendors in 2009 and conduct advanced device trials. In 2010, Verizon Wireless will rapidly accelerate deployments within its footprint.

Ken Hyers, analyst with Technology Business Research, predicts Verizon Wireless will be very aggressive in rolling out LTE as the operator is running out of data capacity and must compete with higher speed HSPA+ competitor AT&T Wireless who is rolling out new services before its own LTE launch.

“The operator’s entire reputation is built around network quality and coverage and having the best network,” Hyers said. “So Verizon is caught in between a rock and a hard place and will have to continue increasing data capacity. It has to move ahead with LTE trials next year in preparation of having LTE up by 2010.”

AT&T bid for fewer licenses than Verizon, having won much of the spectrum it wanted in FCC auctions held in 2002 and 2003. But the operator won a large chunk of 700 MHz spectrum and plans to combine that spectrum with the 700 MHz airwaves it

purchased from Aloha Partners to rollout LTE services. The operator's spectrum holdings in the 700 MHz band cover 100 percent of the top 200 markets, and combined with spectrum won in previous auctions, namely the 1.7 GHz spectrum, AT&T said it will be able to cover 95 percent of the U.S. population with new services.

Following the U.S. lead, indications are strong that Europe and much of the rest of the world regulators will release a significant amount of spectrum in the UHF band as broadcasters in various regions also vacate analog TV airwaves and transition to digital TV. The expectation is that the allocations will align, or as closely as possible, with the U.S. allocations in order to facilitate roaming.

The 790 MHz to 862 MHz band, also called the digital dividend band, "is considered the primary LTE band in Europe, but the spectrum is at least three years from being released because broadcasters remain on the spectrum," said Patrick Donegan, analyst with Heavy Reading. The exception is in the UK, where the regulator plans to hold auctions in 2009. France recently issued its plan for the spectrum as well as Finnish and Swedish governments who have already made the decision to make the band available for mobile applications.

Ofcom plans to make available 128 megahertz of spectrum that will be freed up for mobile broadband services in phases, as the digital TV switchover proceeds between now and 2012.

Spectrum in the 2.6 GHz band is also coming up for grabs throughout Europe and as such is likely to be the first band for LTE deployments. As much as 140 megahertz of the spectrum (2x70MHz) will be allocated for FDD services like LTE and another 50 megahertz for the unpaired TDD band that will most likely be used for WiMAX services. To date, Norway and Sweden have auctioned spectrum while Netherlands, Germany, Austria and the UK have auctions planned. Asian regulators are also considering the band with Hong Kong planning to run its 2.6 GHz spectrum auction before the end of 2008.

According to McQueen, the spectrum gives operators access to the full 20 megahertz of spectrum needed to make the most of LTE. Moreover, the 2.6 GHz band combined with the digital dividend band will provide an excellent complement for operators. The 2.6 GHz spectrum offers the potential for greater capacity and lower frequency spectrum enables better propagation, he said.

LTE may also play a role in the GSM 900 and 1800 bands, which are not only the most ubiquitous and most harmonized worldwide wireless spectrum available but also has the benefit of increased coverage and subsequent reduction in network deployment costs compared with deployments at higher frequencies. In some markets, operators will chose to migrate subscribers from their GSM frequency bands to UMTS to relieve pressure on their GSM networks and free up some spectrum

capacity on the band, explained McQueen. In other cases, operators may chose to use their 1800 MHz frequency band and deploy LTE in that band and simply leave the GSM network in place. After all, GSM networks around the world have been thoroughly optimized at this point and therefore, operators will simply leave them in place until some later point in time.

“Refarming at the 900 MHz band is a very interesting proposition in principle,” said Donegan. “It’s been agreed in principle at the EU level but national plans to implement it still need to be agreed on. There are a lot of complexities.”

According to McQueen, the advantage of refarming the 900 MHz spectrum for LTE rather than using WCDMA spectrum, which is also possible, is the fact that LTE can be deployed in channel widths as small as 1.4 megahertz, allowing operators to grow the network as the demand for GSM services diminish. In comparison, WCDMA networks would require an operator to clear, if available, a full 5-megahertz contiguous channel width.

The core UMTS band at 2.1 GHz will also see LTE deployments, especially in Asia, where Japan’s NTT DoCoMo and KDDI will roll out LTE services. Some 150 countries are using the band for WCDMA services, but many have not utilized the entire spectrum in the 2.1 GHz band, paving the way for potential LTE deployments alongside WCDMA networks.

In all, given LTE’s spectrum flexibility, the technology has a bright future since it literally can be squeezed into a number of spectrum swathes. In low spectrum bandwidth, for example, LTE’s very high spectral efficiency and edge of cell performance means that even in a 1.4 MHz channel LTE provides close to the average sector throughput performance of an HSPA 5 MHz carrier, McQueen said.

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