NOKIA

PRESS BACKGROUNDER

LTE - Delivering the optimal upgrade path for 3G networks

Mobile networks continue to develop at an exciting pace. In ten years, mobile networks may well support services beyond that of today's multi-megabit fixed connections, while the amount of data traffic on mobile networks could surpass that of today's broadband connections in the next decade. As consumer demand grows for ever-richer services and connected lifestyles, mobile networks will evolve, and the mobile industry is already hard at work defining the technical solution that will allow mobile networks to meet the growing demand for wireless broadband services. The radio access technologies enabling these networks have been given the name Long Term Evolution of Universal Terrestrial Radio Access Network – or LTE for short.

LTE will be used for mobile, fixed and portable wireless broadband access, and will offer a number of benefits to operators, aimed at increasing capacity, reducing network complexity and thus lowering deployment and operational costs. It will enable operators to meet the growing demand for mobile data solutions, making it possible for richer services to be delivered to consumers more cost effectively.

What is LTE?

Simply put, LTE describes the evolution of mobile technology that will deliver users the benefits of faster data speeds and new services by creating a new radio access technology that's optimized for IP-based traffic and offers operators a simple upgrade path from 3G networks. Alongside LTE is work on the evolutionary development of the core architecture of mobile networks, called system architecture evolution (SAE). Together, they will offer operators networks with significant performance enhancements over 3G, with a target of two to four times the spectral efficiency of 3G/HSPA networks. This means LTE networks will be able to squeeze more bits of data into the same amount of spectrum as 3G and HSPA networks, translating into increased data speeds and/or increased capacity.

LTE is the result of ongoing work by the 3rd Generation Partnership Project (3GPP), a collaborative group of international standards organizations and mobile-technology companies. 3GPP set out in 1998 to define the key technologies for the third generation of GSM-based mobile networks (3G), and its work has continued to define the ongoing evolution of these networks. Near the end of 2004, discussions on the longer-term evolution of 3G networks began, and a set of high-level requirements for LTE was defined: the networks must transmit data at a reduced cost per bit compared to 3G; they must be able to offer more services at lower transmission cost with better user experience; LTE must have the flexibility to operate in a wide number of frequency bands; it should utilize open interfaces and offer a simplified architecture; and it must have reasonable power demands on mobile terminals. Standardization work on LTE is continuing, and the first standards are due to be completed in the second half of 2007, with some operators projected to deploy the first LTE networks in 2009.

LTE defines new radio connections for mobile networks, and will utilize Orthogonal Frequency Division Multiplexing (OFDM), a widely used modulation technique that is the basis for Wi-Fi, WiMAX, and the DVB and DAB digital broadcasting technologies. The targets for LTE indicate bandwidth increases as high as 100 Mbps on the downlink, and up to 50 Mbps on the uplink. However, this potential increase in bandwidth is just a small part of the overall improvement LTE aims to

provide. LTE is optimized for data traffic, and it will not feature a separate, circuit-switched voice network, as in 2G GSM and 3G UMTS networks.

Why use LTE?

The evolution to LTE may be compelling for many operators because of the reduced capital and operating expenditures it requires over previous 3G networks. A key aspect of LTE is its simplified, flat network architecture, derived from it being an all-IP, packet-based network, and the use of new techniques to get high volumes of data through a mobile network. This allows many of the network elements involved in the data transport between an operators' base stations and its core network in current cellular systems to be removed. This helps to reduce latency (the time it takes data to travel within the network), but also helps to significantly reduce cost, since fewer pieces of network equipment are needed to achieve the same results. Also driving down operators' cost per transmitted bit will be the use of OFDM, which offers high spectral efficiency, and the increased capacity LTE will offer – essentially allowing operators to squeeze more data into the same bandwidth of spectrum.

Another important feature of LTE is the amount of flexibility it allows operators in determining the spectrum in which it will be deployed. Not only will LTE have the ability to operate in a number of different frequency bands (meaning operators will be able to deploy it at lower frequencies with better propagation characteristics), but it also features scalable bandwidth. Whereas WCDMA/HSPA uses fixed 5 MHz channels, the amount of bandwidth in an LTE system can be scaled from 1.25 to 20 MHz. This means networks can be launched with a small amount of spectrum, alongside existing services, and adding more spectrum as users switch over. It also allows operators to tailor their network deployment strategies to fit their available spectrum resources, and not have to make their spectrum fit a particular technology.

In addition to the inherent benefits of a standardized system over a proprietary approach, LTE will benefit from a healthy intellectual property rights (IPR) environment. LTE's standardization by the 3GPP ensures wide industry support, flourishing competition and large economies of scale – three important factors for operators and, in the end, consumers. The standardization efforts also enable characteristics operators and users have come to expect, including interoperability among vendors, roaming, and international frequency harmonization.

Adding to LTE's appeal for operators using 3GPP-based networks is that it's clearly designed as an evolutionary upgrade, not a technology that demands a completely new system from the ground up. This means that existing network resources are reused when possible, with particular work going in to minimizing the radio network upgrades required. In addition, a key target is to enable LTE to interwork with 3GPP-based legacy networks, allowing for service continuity. Handovers between LTE and legacy systems will be in place from the outset, allowing the use of legacy networks to provide fallback coverage.

Nokia is strongly engaged in LTE development

Nokia strongly supports LTE, and is investing in LTE standardization and technical development. As consumer demand for mobile broadband access grows, networks will need to evolve, and LTE is the most attractive technology base for mobile services as it combines the benefits of IP-based fixed networks with the benefits of mobility.

Nokia has a strong portfolio of LTE-related intellectual property, and a long track record of OFDM research and development. The company is taking a leadership role in the development of LTE and its IPR framework through standards bodies like 3GPP and ETSI, and aims for full scale commercial deployment starting in 2009.