



4.5G: Booming in 2016

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The mobile devices we carry are getting smarter. High- and ultra-high definition video (2K and 4K, respectively) are being woven into the fabric of our lives. Users today demand faster mobile broadband networks and better experiences.

For operators, this means a vast, burgeoning market.

At the same time, IoT and broadband trunking will create entirely new business opportunities. Of course, every opportunity also presents challenges. The enormous demand on networks raises many questions for telecom operators. During the wait for 5G, how can LTE (and LTE-A) evolve? How can operators maximize the value of their networks? How can they create and exploit more business opportunities?

In October 2014, Huawei proposed 4.5G as an interim standard, and defined 4.5G's targets and key technologies. The standard became a widely shared rallying point for operators moving beyond LTE. After a year of intensive research and collaboration, the 4.5G industry is now beginning to take shape. 2016 will be the first year in which large-scale commercial 4.5G networks are rolled out worldwide.

4.5G: READY FOR PRIME TIME

As year-end 2015, a dozen world-class operators were already rolling out and testing Gbps, NB-IoT, and broadband trunking services.

Working with the world's leading operators, Huawei has begun testing and verifying 4.5G technologies in commercial networks in Norway, China, Kuwait, Germany, Spain, Japan, South Korea, the UAE, Canada, and Turkey. About 60 4.5G networks deployed by Huawei will start commercial operation this year.

- (1) At the 2015 Global MBB Forum, hosted by HKT and Huawei last November, HKT became the world's first operator to publicly demonstrate peak speeds of 1 Gbps. It marked the beginning of the gigabit era, made possible by 4.5G.
- (2) In December 2015, TeliaSonera and Huawei announced the activation of the world's first commercial 4.5G network in Oslo. In live outdoor tests, they demonstrated peak speeds of up to 1 Gbps.
- (3) In December 2015, Huawei, Vodafone, and u-blox announced the first successful commercial trial of pre-standard Narrowband Internet of Things (NB-IoT). A u-blox module installed in a water meter connected the meter to the mobile network, allowing the water supplier to read it remotely. This is the type of connection and functionality that will help 4.5G support IoT.

4.5G: DEFINITION, VISION, AND GOAL

4.5G is the next step in network evolution beyond LTE; it is a stepping stone on the way to 5G. Using existing equipment, 4.5G enables faster connections and a better user experience. It also incorporates new technologies such as NB-IoT and broadband trunking, allowing operators to leverage their existing networks to better serve the communication needs of industry markets.

There are three core concepts for 4.5G: Gbps, Experience 4.0 and Connection+. These concepts will raise network speeds and capacity; give users the HD video experience; generate new services; and help operators stay competitive in the coming years.

4.5G STANDARDS

3GPP announced in October 2015 that the new LTE standards would be named LTE-Advanced Pro, making this the official name of 4.5G for standards purposes. The name indicates that 4.5G is the next step in LTE standards, following the earlier adoption of LTE-Advanced. LTE-Advanced Pro is defined as LTE Release 13 and higher. Key features are Licensed-Assisted Access (LAA), 3D/FD-MIMO (FD: Full Dimension), NB-IoT, massive carrier aggregation, latency reduction, downlink multiuser superposition transmission (MUST), and single cell-point to multi-point (SC-PTM).



The key technologies defined in the standards support the three core 4.5G concepts. For example, 256-QAM, massive carrier aggregation, and massive MIMO enable Gbps speeds, which increase a network's capacity. Connection+ enables very large numbers of connections, which means the network can support NB-IoT and LTE trunking (LiTRA). Experience 4.0 is realized through expanded VoLTE and HD video coverage and better quality.

WHAT WILL 4.5G DO FOR US?

4.5G will bring massive changes. It is going to make life smarter.

4G networks do not provide the support that virtual reality and 4K/8K ultra-HD video require. 4.5G's gigabit-level speed and superior cell capacity mean that it can accommodate the huge demand for these services, so 4.5G will make immersive experiences an everyday occurrence.

The new technologies will also unblock the connection and coverage bottlenecks that have hampered the growth of new applications in 4G. We will see thing-to-thing connections, enabling smart transport, smart healthcare, and smart education. Entire industries will move from the computer age into an age of automation and smart technology. Stable, fast, dynamic connections will be available at any time, person-to-person, person-to-thing, and thing-to-thing. We will progress into a Better Connected World. 4.5G will pull us into smarter, connected lifestyles.

Telecom operators will have a bigger voice through 4.5G, and more opportunities to grow new business. Once 4.5G is commercially deployed, operators will no longer simply be vendors of voice and data. They will shape the market, rather than responding to it. They will seize the opportunities in industry markets and vastly grow their businesses, shoring up their position against the pressures of OTT companies. Smart lifestyles will emerge for the first time, as operators use the power of their networks to create new markets in services for smart cities, security, HD voice and video, and remote controlled equipment.

Once 4.5G networks are in place, operators can develop 4.5G services at little additional cost. 4.5G will help them to maximize returns on their 4G infrastructure investment. For telecom operators, this is a rare opportunity to expand their business. It will also bring significant changes to existing business practices and profit models.

4.5G will support growth in new services, new devices, and new experiences. And it will pave the way for 5G. The evolution of current standards gives the industry the opportunity to expand the functionality of 4G networks, to protect its investments, and to start building market demand for 5G. Ultimately, 4.5G helps today's mobile operators capitalize on their market assets.