

3G TECHNOLOGY

International Mobile Telecommunications-2000 (IMT — 2000), better known as 3G or 3rd Generation, is a generation of standards for mobile phones and mobile telecommunications services fulfilling specifications by the International Telecommunication Union.[1] Application services include wide-area wireless voice telephone, mobile Internet access, video calls and mobile TV, all in a mobile environment. Compared to the older 2G and 2.5G standards, a 3G system must allow simultaneous use of speech and data services, and provide peak data rates of at least 200 kbit/s according to the IMT-2000 specification. Recent 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to laptop computers and smartphones.

The following standards are typically branded 3G:

- * the UMTS system, first offered in 2001, standardized by 3GPP, used primarily in Europe, Japan, China (however with a different radio interface) and other regions predominated by GSM 2G system infrastructure. The cell phones are typically UMTS and GSM hybrids. Several radio interfaces are offered, sharing the same infrastructure:

- o The original and most widespread radio interface is called W-CDMA.
- o The TD-SCDMA radio interface, was commercialised in 2009 and is only offered in China.
- o The latest UMTS release, HSPA+, can provide peak data rates up to 56 Mbit/s in the downlink in theory (28 Mbit/s in existing services) and 22 Mbit/s in the uplink.

- * the CDMA2000 system, first offered in 2002, standardized by 3GPP2, used especially in North America and South Korea, sharing infrastructure with the IS-95 2G standard. The cell phones are typically CDMA2000 and IS-95 hybrids. The latest release EVDO Rev B offers peak rates of 14.7 Mbit/s downstreams.

The above systems and radio interfaces are based on kindred spread spectrum radio transmission technology. While the GSM EDGE standard ("2.9G"), DECT cordless phones and Mobile WiMAX standards formally also fulfill the IMT-2000 requirements and are approved as 3G standards by ITU, these are typically not branded 3G, and are based on completely different technologies.

A new generation of cellular standards has appeared approximately every tenth year since 1G systems were introduced in 1981/1982. Each generation is characterized by new frequency bands, higher data rates and non backwards compatible transmission technology. The first release of the 3GPP Long Term Evolution (LTE) standard does not completely fulfill the ITU 4G requirements called IMT-Advanced. First release LTE is not backwards compatible with 3G, but is a pre-4G or 3.9G technology, however sometimes branded "4G" by the service providers. WiMAX is another technology verging on or marketed as 4G.

History

The first pre-commercial 3G network was best launched by NTT DoCoMo in Japan branded FOMA, in May 2001 on a pre-release of W-CDMA technology.[7] The first commercial launch of 3G was also by NTT DoCoMo in Japan on 1 October 2001, although it was initially somewhat limited in scope;[8][9] broader availability was delayed by apparent concerns over reliability.[10] The second network to go commercially live was by SK Telecom in South Korea on the 1xEV-DO technology in January 2002. By May 2002 the second South Korean 3G network was by KT on EV-DO and thus the Koreans were the first to see competition among 3G operators.

The first European pre-commercial network was at the Isle of Man by Manx Telecom, the

operator then owned by British Telecom, and the first commercial network in Europe was opened for business by Telenor in December 2001 with no commercial handsets and thus no paying customers. These were both on the W-CDMA technology.

The first commercial United States 3G network was by Monet Mobile Networks, on CDMA2000 1x EV-DO technology, but this network provider later shut down operations. The second 3G network operator in the USA was Verizon Wireless in October 2003 also on CDMA2000 1x EV-DO. AT&T Mobility is also a true 3G network, having completed its upgrade of the 3G network to HSPA.

The first pre-commercial demonstration network in the southern hemisphere was built in Adelaide, South Australia by m.Net Corporation in February 2002 using UMTS on 2100 MHz. This was a demonstration network for the 2002 IT World Congress. The first commercial 3G network was launched by Hutchison Telecommunications branded as Three in March 2003.

Eritel Launched the first 3G network in Africa

By June 2007, the 200 millionth 3G subscriber had been connected. Out of 3 billion mobile phone subscriptions worldwide this is only 6.7%. In the countries where 3G was launched first – Japan and South Korea – 3G penetration is over 70%.[11] In Europe the leading country is Italy with a third of its subscribers migrated to 3G. Other leading countries by 3G migration include UK, Austria, Australia and Singapore at the 20% migration level. A confusing statistic is counting CDMA2000 1x RTT customers as if they were 3G customers. If using this definition, then the total 3G subscriber base would be 475 million at June 2007 and 15.8% of all subscribers worldwide. [[File:Example.jpg]]

[edit] Adoption

In December 2007, 190 3G networks were operating in 40 countries and 154 HSDPA networks were operating in 71 countries, according to the Global Mobile Suppliers Association (GSA). In

Asia, Europe, Canada and the USA, telecommunication companies use W-CDMA technology with the support of around 100 terminal designs to operate 3G mobile networks.

Roll-out of 3G networks was delayed in some countries by the enormous costs of additional spectrum licensing fees. (See Telecoms crash.) In many countries, 3G networks do not use the same radio frequencies as 2G, so mobile operators must build entirely new networks and license entirely new frequencies; an exception is the United States where carriers operate 3G service in the same frequencies as other services. The license fees in some European countries were particularly high, bolstered by government auctions of a limited number of licenses and sealed bid auctions, and initial excitement over 3G's potential. Other delays were due to the expenses of upgrading equipment for the new systems.

[edit] Europe

In Europe, mass market commercial 3G services were introduced starting in March 2003 by 3 (Part of Hutchison Whampoa) in the UK and Italy. The European Union Council suggested that the 3G operators should cover 80% of the European national populations by the end of 2005.

[edit] Canada

In Canada, Bell Mobility, SaskTel^[12] and Telus launched a 3G EVDO network in 2005.^[13] Rogers Wireless was the first to implement UMTS technology, with HSDPA services in eastern Canada in late 2006.^[14] Realizing they would miss out on roaming revenue from the 2010 Winter Olympics, Bell and Telus formed a joint venture and rolled out a shared HSDPA network using Nokia Siemens technology.

[edit] Iraq

Mobitel Iraq is the first mobile 3G operator in Iraq. It was launched commercially on February 2007.

[edit] Turkey

Turkcell, Avea and Vodafone launched their 3G networks commercially on 30 July 2009 at the same time. Turkcell and Vodafone launched their 3G service on all provincial centres. Avea launched it on 16 provincial centres. It was after Turkey's monopoly mobile operator Turkcell accepted number portability, mobile operators attended frequency band auction and frequencies for 3G usage distributed around mobile operators. Turkcell got A band, Vodafone B and Avea C. Currently Turkcell and Vodafone have 3G networks on most of crowded cities and towns.

[edit] Philippines

3G services were made available in the Philippines on December 2008.[15]

[edit] Syria

MTN Syria is the first mobile 3G operator in Syria. It was launched commercially on May 2010.

[edit] China

China announced in May 2008, that the telecoms sector was re-organized and three 3G networks would be allocated so that the largest mobile operator, China Mobile, would retain its GSM customer base. China Unicom would retain its GSM customer base but relinquish its CDMA2000 customer base, and launch 3G on the globally leading W-CDMA (UMTS) standard. The CDMA2000 customers of China Unicom would go to China Telecom, which would then launch 3G on the CDMA2000 1x EV-DO standard. This meant that China would have all three main cellular technology 3G standards in commercial use. Finally in January 2009, Ministry of industry and Information Technology of China awarded licenses of all three standards: TD-SCDMA to China Mobile, W-CDMA to China Unicom and CDMA2000 to China Telecom. The launch of 3G occurred on 1 October 2009, to coincide with the 60th Anniversary of the Founding of the People's Republic of China..

[edit] North Korea

North Korea has had a 3G network since 2008, which is called Koryolink, a joint venture

between Egyptian company Orascom Telecom Holding and the state-owned Korea Post and Telecommunications Corporation (KPTC) is North Korea's only 3G Mobile operator, and one of only two mobile companies in the country. According to Orascom quoted in BusinessWeek, the company had 125,661 subscribers in May 2010. The Egyptian company owns 75 percent of Koryolink, and is known to invest in infrastructure for mobile technology in developing nations. It covers Pyongyang, and five additional cities and eight highways and railways. Its only competitor - SunNet, uses GSM technology and suffers from poor call quality and disconnections.[16] Phone numbers on the network are prefixed with +850 (0)192.[17]

[edit] Africa

The first African use of 3G technology was a 3G videocall made in Johannesburg on the Vodacom network in November 2004. The first commercial launch was by Emtel-ltd in Mauritius in 2004. In late March 2006, a 3G service was provided by the new company Wana in Morocco. In East Africa (Tanzania) in 2007 a 3G service was provided by Vodacom Tanzania.

[edit] India

In 2008, India entered the 3G arena with the launch of 3G enabled Mobile and Data services by Government owned Bharat Sanchar Nigam Ltd. (BSNL). Later, MTNL launched 3G in Delhi and Mumbai. Nationwide auction of 3G wireless spectrum was announced in April 2010.

The first Private-sector service provider that launched 3G services is Tata Docomo, on November 5, 2010. And the second is by Reliance Communications, December 13, 2010. Other providers like Bharati Airtel, Vodafone, Idea and Aircel are expected to launch 3G services by January 2011. (Nov 20 th 2010 Now peak level 3G technology Spectrum)

[edit] Features

[edit] Data rates

ITU has not provided a clear definition of the data rate users can expect from 3G equipment or providers. Thus users sold 3G service may not be able to point to a standard and say that the

rates it specifies are not being met. While stating in commentary that "it is expected that IMT-2000 will provide higher transmission rates: a minimum data rate of 2 Mbit/s for stationary or walking users, and 384 kbit/s in a moving vehicle,"[18] the ITU does not actually clearly specify minimum or average rates or what modes of the interfaces qualify as 3G, so various rates are sold as 3G intended to meet customers expectations of broadband data.

[edit] Security

3G networks offer greater security than their 2G predecessors. By allowing the UE (User Equipment) to authenticate the network it is attaching to, the user can be sure the network is the intended one and not an impersonator. 3G networks use the KASUMI block crypto instead of the older A5/1 stream cipher. However, a number of serious weaknesses in the KASUMI cipher have been identified.[19]

In addition to the 3G network infrastructure security, end-to-end security is offered when application frameworks such as IMS are accessed, although this is not strictly a 3G property.

[edit] Applications

The bandwidth and location information available to 3G devices gives rise to applications not previously available to mobile phone users. Some of the applications are:

- * Mobile TV – a provider redirects a TV channel directly to the subscriber's phone where it can be watched.
- * Video on demand – a provider sends a movie to the subscriber's phone.
- * Video conferencing – subscribers can see as well as talk to each other.
- * Tele-medicine – a medical provider monitors or provides advice to the potentially isolated subscriber.
- * Location-based services – a provider sends localized weather or traffic conditions to the phone, or the phone allows the subscriber to find nearby businesses or friends.

[edit] Evolution

Both 3GPP and 3GPP2 are currently working on extensions to 3G standard that are based on an all-IP network infrastructure and using advanced wireless technologies such as MIMO, these specifications already display features characteristic for IMT-Advanced (4G), the successor of 3G. However, falling short of the bandwidth requirements for 4G (which is 1 Gbit/s for stationary and 100 Mbit/s for mobile operation), these standards are classified as 3.9G or Pre-4G.

3GPP plans to meet the 4G goals with LTE Advanced, whereas Qualcomm has halted development of UMB in favour of the LTE family.[5]

On 14 December 2009, Telia Sonera announced in an official press release that "We are very proud to be the first operator in the world to offer our customers 4G services." [20] With the launch of their LTE network, initially they are offering pre-4G (or beyond 3G) services in Stockholm, Sweden and Oslo, Norway.

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