UMTS to Mobilize the Data World

A report on the progress of UMTS

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Preface

3G Americas provides this report on the tremendous progress of Third Generation UMTS technology in preparation for the dozens of commercial launches to occur in 2003. Our organization is committed to the GSM evolution of GSM/GPRS/EDGE and UMTS (WCDMA) and its seamless deployment throughout the Americas.

The first vision of what UMTS might become emerged in a workshop report in 1995. Standardization work did not begin until after the UMTS Task Force's published results in mid-1996 and ETSI's subsequent UTRA decision in January 1998. Thus, based on the historical patterns demonstrated by introductions of other new wireless technologies, it could be expected that UMTS would first be realized somewhere between 2002 and 2004.

As the business case emerges for wireless data services, we are also seeing the completion of UMTS trials, deployments of UMTS infrastructure, commercial announcements of dual-mode GSM/UMTS handsets, and a general readiness of the marketplace for the mobilization of data throughout the world with UMTS.

Additionally, 2003 will see the deployment of EDGE throughout the Americas and other regions of the world. EDGE and UMTS are complementary technologies, able to interoperate and be deployed in tandem within an operator's network. The flexibility of the GSM family of technologies allows for optimal capacity, cost efficiency, and global interoperability as the leading standard chosen by over 785 million subscribers.

Introduction

Wireless services are globally revolutionizing both personal and business relationships. With over 1.1 billion wireless users and forecasts for massive new investments in advanced wireless networks, wireless access is increasingly providing the means for business success, social mobility, and personal convenience. The commercialization of extraordinary developments in miniaturization, memory capacity, and materials are adding mobility to the power of the computer, the Internet, and the ordinary citizen. One estimate suggests that the value of mobile and wireless professional services will grow from $3 to $30 billion globally by as early as 2006.[1] While business market enterprise applications are expected to lead the demand for 3rd Generation (3G), commercial applications like the videophone and wireless games should follow quickly. Wireless access to e-mail, corporate virtual networks, multi-media messaging, shopping, entertainment, and public services will further transform the pace and nature of the world's communication activities even as the demand for voice services will continue to grow. Multi-media Messaging Services (MMS) will garner global revenue of about $342.8 billion by 2008, with MMS messages increasing from 646 million in 2002, to 3.1 billion in 2003, and then to nearly 700 billion by 2008, according to various analysts.[2] Informa Media forecasts that by

[1] Based upon an analysis by IDC cited in *"Report Global Mobile Services Market Jumps to $3B"* July 10, 2002; Wireless News Factor, www.wirelessnewsfactor.com

[2] *"Mobile Messaging: Operator Revenue and Investment Analysis and Forecasts"* December 17, 2002; Telecom Trends, www.telecomtrends.net / *"Mobile Messaging: Who Is Driving It and What Should the Operators Do to Ensure Success"* December 17, 2002; Telecom Trends, www.telecomtrends.net

2008, the global games market will be worth $40 billion – with online, mobile, and interactive TV games accounting for a third of this total.[3] "Anytime, anywhere" will increasingly describe the reach of corporate and personal wireless devices.

Enabling such services will be advanced networks that conform to a series of International Telecommunication Union (ITU) standards known as "Third Generation," or "3G." Broadly stated, the radio technologies that meet these standards enable wireless data to be transmitted at high velocity to mobile devices using cellular radio transmissions, conforming to varying criteria depending upon the speed of the mobile user. While there are five accepted technologies in the 3G standards "family," the standard known as the Universal Mobile Telecommunications System (UMTS) is expected to be the pre-eminent 3G technology because of its ability to deliver large amounts of wireless voice and data quickly and efficiently. UMTS satisfies all the specifications of the ITU for 3G services, regardless of the speed of the user. Leading carriers, infrastructure vendors, handset manufacturers and investors have committed to its future deployment.

The dawn of 3G services using UMTS is already breaking. Despite the recent attention given to delays in the deployment of UMTS, extraordinary progress has been made on the technology taking it from a theoretical concept to a functioning global standard within less than a decade. Many forget that it has taken more than fifteen years for GSM to become the de-facto world standard – approaching nearly one billion subscribers today. The first live commercial launches of UMTS in Japan, and phase one launches in Austria, Finland, the Isle of Man, Italy, Monaco, Portugal, United Kingdom, Spain, and Sweden provide glimpses into the mobile world of the future, while additional contracts, trials, and demonstrations are preparing the way for mass deployment. UMTS networks are already built in several areas and under deployment in many others. Users are selecting from a growing variety of dual-mode mobile terminals that give them access to both their current Second Generation Global System for Mobile Communications (GSM™) networks and the new UMTS networks. This paper explains why, how, and when UMTS will become a major delivery vehicle for advanced wireless services.

The attractiveness of UMTS Technology

UMTS emerged from discussions led by the European Telecommunications Standards Institute (ETSI) as its preferred solution for meeting the challenges of 3G services. An alliance of telecommunications standards bodies supported by wireless vendors and operators formed an industry group known as the 3rd Generation Partnership Project (3GPP) to formalize UMTS' definition and standardization. 3GPP is a collaboration agreement established in 1998 bringing together organizational partners such as ARIB, CWTS, ETSI, T1, TTA, and TTC. The first results of its efforts were made public in 1999 and became known as Release 99 (Rel'99) UMTS, which presented an evolution of the GSM standard. Since the introduction of Rel'99, operational standardization and continuous enhancements have been underway through the 3GPP, now composed of 436 operator and vendor members from throughout the world.

The heart of the attractiveness of UMTS is its ability to deliver increased capacity for both voice and data, which enables much faster data services. It provides (in the Release '99 version) more than 100% higher data speeds than EDGE and 25% more voice capacity than the most aggressively engineered GSM system, and the voice spectral efficiency of UMTS will likely

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[3] *"The Dynamics of Games: A Global Boom Industry"* July 3, 2002; Informa Media, www.bookshop.informamedia.com/games

increase with future feature improvements. UMTS offers voice capacity advantages mainly through the benefits of interference averaging offered by its code division spread spectrum technology, combined with very fast and tight power control.

Another principle asset is UMTS' ability (again, in the Release '99 version) to support peak theoretical data rates as high as 2 Mbps, in the first phase, in a fixed environment. This far surpasses the theoretical peak data rates offered by alternative data technologies such as General Packet Radio Service (GPRS) at 115 Kbps, CDMA2000 1x at 153 Kbps, and Enhanced Data for GSM Evolution (EDGE) at 473 Kbps.[4] UMTS is spectrally more efficient for high data throughput service than EDGE or CDMA20001xRTT. The wide bandwidth of UMTS, along with its unique technical characteristics, enables UMTS to deliver extraordinary high performance.

The ability to support high-speed data service is important to the end user. A study performed by Total Research Corporation showed that end users who are using the wireless network to create a "mobile office" believe that the data speeds of the wireless network should be about three times that of dial-up rates. Based on typical dial-up rates (28.8–56 Kbps), this means the wireless network should be capable of providing rates from 100 Kbps to 170 Kbps. The chart in Figure 1 below shows the results from interviews with IT managers. This chart indicates an absolute minimum of 56 Kbps is required for high-speed wireless data services and the preferred minimum average speed should be between 146-384 Kbps. Clearly a technology like UMTS is able to meet these data speed needs.

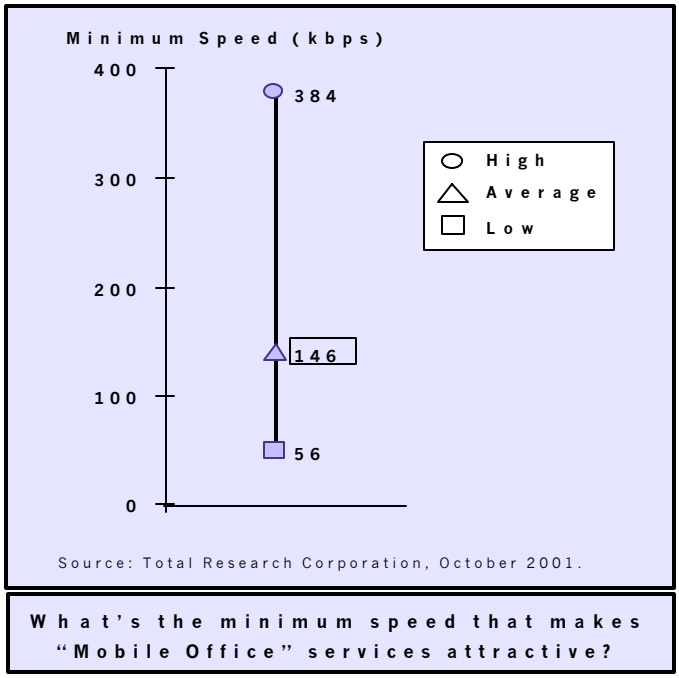


Figure 1. Minimum speeds to make the "Mobile Office" attractive

[4] *"Data Capabilities for GSM Evolution to UMTS,"* November 2002; Rysavy Research, www.3gamericas.org/English/Technology_Center/WhitePapers/rysavyresearch.cfm

Finally, it should be noted that future evolutions are already being standardized. High Speed Downlink Packet Access (HSDPA) will more than double the data spectral efficiency of Rel'99 UMTS and increase the peak data rates possible to more than 14.2 Mbps,[5] which is larger than that expected with 1XEV-DO and 1XEV-DV. Clearly, UMTS and its evolution offer the technical capabilities suited for future wireless voice demands and new high-speed wireless data applications.

UMTS also shares the same core IP (Internet Protocol) network with another 3G technology being adopted by GSM operators – EDGE. This allows operators the flexibility to deploy both technologies in a complementary and interoperable environment and thereby serve different market demands throughout their licensed areas. Dual-mode EDGE-UMTS devices will provide consumers transparent access to 3G services, either from EDGE or UMTS, throughout an operator's network.

Lastly, based upon licenses and/or commitments by more than 100 operators throughout the world, UMTS is expected to become the world's most popular 3G technology. Its rate of adoption by wireless carriers translates into economies of scale and scope for cost efficiency, international roaming capability, and a priority technology for software and applications developers, all enabled by the global openness and standardized platforms of this technology.

Services that UMTS Delivers

Just as jet aircraft transformed global air transportation, UMTS' rapid transmittal speed will greatly enhance user satisfaction and transform the wireless industry. The development of services is well underway, with current contracts between infrastructure/terminal vendors and service providers, as well as between service providers and content providers, creating Java™ games, streaming media, multi-media messaging platforms, maps for location services, and international roaming. An example of one unique application that can only be enabled by a 3G standard like UMTS is videostreaming (due to the guaranteed QoS).

The transmission of moving pictures in real time or as recorded video is indisputably one of the core functions of 3G/UMTS infrastructures. Mobile videostreaming will be an indispensable component of a wide variety of offerings in m-commerce, entertainment, and information. Areas of applications for videostreaming include messaging, product presentations in m-commerce, entertainment, movie schedules with previews, remote monitoring, and weather, traffic and sports reports.

Other applications that will be greatly enhanced by UMTS include:

- Location-based services
- Personalized news and homepages
- Multi-media messaging
- Full motion video image transmission
- Multi-media shopping
- Animated chat
- Games
- Music
- Large capacity data transmissions
- Two-way video calls
- Multi-tasking (e.g. browsing while having a voice conversation)

[5] *"Data Capabilities for GSM Evolution to UMTS,"* November 2002; Rysavy Research, www.3gamericas.org/English/Technology_Center/WhitePapers/rysavyresearch.cfm

UMTS vendors are developing and implementing 3G mobile applications to support providers as they set up their mobile business. Most manufacturers provide a complete platform with a set of advanced applications ready to use for 3G/UMTS practical tests. This ensures that mobile providers will have stable services from the very start, plus very simple options for adaptation and expansion.

For example, Siemens IC Mobile has already implemented seven UMTS standard applications:[6]

- City on Air
- Personalized News and Homepages
- Multi-media Messaging
- Multi-media Shopping
- Animated Chat
- Videostreaming
- Games

The first presentation of UMTS services in a moving car was demonstrated in Berlin back in June 2002. Cooperation partners DaimlerChrysler, Siemens, Sun Microsystems, T-Mobile, Jentro and MBDS/Nice University Sophia Antipolis demonstrated a comprehensive portfolio of multi-media services in a specially fitted Mercedes-Benz S-Class, made possible through the use of the broadband UMTS mobile phone standard. Contents were transferred into the test vehicle at an average transmission rate of 128 Kbps bringing to reality the vision of live video and music downloads, video telephony, and an ingenious off-board navigation system using up-to-data cartographic data via UMTS for destination finding. DaimlerChrysler equipped the UMTS test vehicle with the appropriate operating units, monitors, and the link to the car infrastructure and the specification of the UMTS services. T-Mobile provided the UMTS network and together with Siemens IC Mobile established the UMTS infrastructure in the test radio network in Berlin.

Clearly, the ability of UMTS to support such applications offers many exciting new services that can generate new revenue streams for service providers. Moreover, all of these services are currently being offered through UMTS on commercially deployed networks providing increased capacity, cost efficiency, and increased speed for delivering better and faster services.

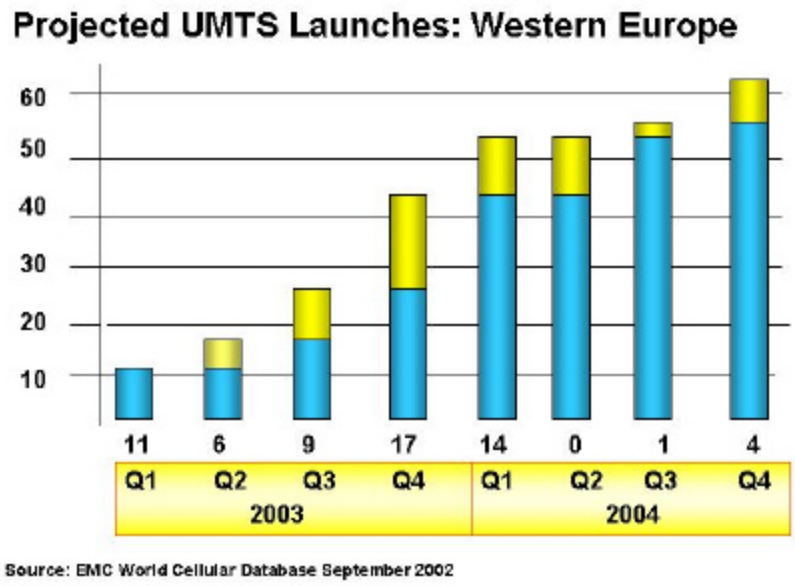
Progress of UMTS

Commercial Launches

UMTS will begin to display its advantages in significant numbers this year as up to 43 operators will commercially launch UMTS services in Europe.[7]

[6] White Paper- *"3G rollout – on to 3rd-generation mobile telephony: Siemens UMTS applications in 15 countries,"* 2002; Siemens Information and Communication Mobile

[7] *Table: Projected UMTS Launches: Western Europe*; EMC. EMC qualifies "commercial launch" as the ability for a consumer to be able to purchase a handset and services. Thus, this forecast does not count "friendly-user" trials as launches.



Hutchison 3G UK Ltd. is expected to be the first European company with commercial 3G services. Hutchison has already introduced its brand "3" on its website where customers may preview UMTS handset selections, including two from NEC, and the Motorola A830. They can even pre-register as a "founder," with the ability to receive discounts and participate in demonstrations of services at one of Hutchison's "flagship stores." Hutchison's customer demonstrations of UMTS services will begin by early 2003.

Shortly after the launch of Hutchison in the UK, sister company H3G will launch in Italy. Parent Hutchison Whampoa in Hong Kong, operating as Orange, has announced its home turf launch after 1Q 2003. All three operators, in UK, Italy, and Hong Kong respectively, will use the brand "3". Hutchison has entered a global framework agreement with Ericsson for the supply of its Video Gateway System, currently being trialed in all three countries. This video telephony service will provide real-time video and audio communications between users with 3G handsets as well as between handsets and PCs.

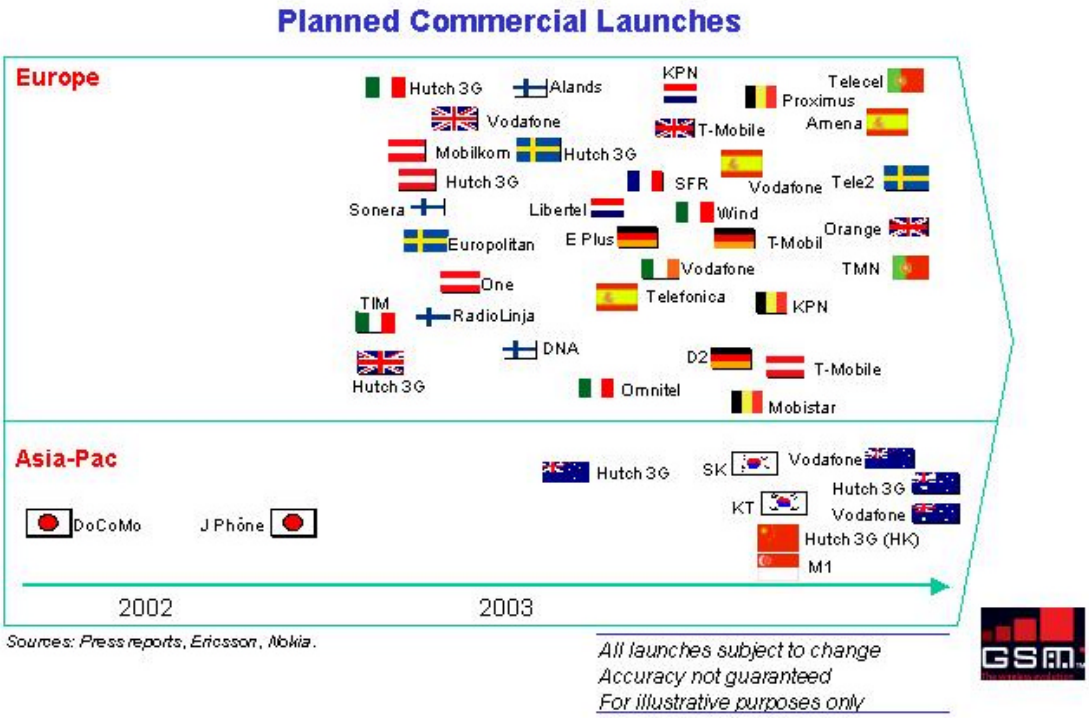
Hutchison is not alone in its focus on video services. In the first week of January 2003, NTT DoCoMo unveiled its own 3G videostreaming service that also operates between mobile handsets and desktop PCs. NTT DoCoMo launched the world's first UMTS service in October 2001 when it launched its FOMA network in Japan and currently offers five FOMA handsets. Also in Japan, J-Phone launched its UMTS system in December 2002 with coverage of about 60% of the country's population and offers dual-mode handsets (PDC/UMTS) from NEC, Sanyo, and potentially Nokia.

These pioneering efforts are being matched by other operators. Mobilkom (Austria) announced phase one of its launch on September 25, 2002, bringing its Ericsson/Nortel multi-vendor network to life, and commercial launch is set for Q2 2003. Operational tests confirm that the network meets coverage requirements, and a series of successful events including a demonstration of live video telephony between Vienna and Graz using form factor UMTS handsets have been completed. 3G-to-2G handovers were also tested in mid-January 2003 and optimization of the network for commercial launch is currently ongoing.

Other operators are remaining quiet about specific launch plans, given recent criticism of UMTS delays in media and financial circles. However, vendors report confidentially that most committed operators are in very advanced stages of deployment with a number of customers. According to vendor forecasts, at least half a dozen operators in Europe will commercially launch during the first half of 2003, with many more to follow during the second half of the year. Operators in Korea, Australia, Singapore, Taiwan, and Hong Kong are also anticipating UMTS launches this year. Bernd Eylert, 2002 Chairman of the UMTS Forum states, "2003 will be characterized by dozens of UMTS deployments."

At the 3GSM World Congress 2003 in Cannes, Rob Conway, CEO of the GSM Association stated, "We expect more than 30 WCDMA launches happening in the near term. The commitment of these and other operators to the successful deployment and robust use of WCDMA should not be doubted."

We expect more than 30 commercial rollouts of W-CDMA in the next 12 months– GSM Association Feb 2003



Planned Commercial Launches – Operator Listing

European Operators:

- Alands
- Amena
- D2
- DNA
- E Plus
- Europolitan
- Hutch 3G
- KPN
- Libertel
- Mobilkom
- Mobistar
- Omnitel
- One
- Orange
- Proximus
- RadioLinja
- SFR
- Sonera
- T-Mobile
- Tele2
- Telecel
- Telefonica
- TIM
- TMN
- Vodafone
- Wind

Asia-Pacific Operators:

- DoCoMo
- Hutch 3G (HK)
- J-Phone
- KT
- M1
- SK
- Vodafone

Commitments

A central factor in the strength of UMTS is the large number of global commitments by wireless carriers to its deployment. Today, more than 100 UMTS licenses have been awarded worldwide in more than 35 countries.[8] In addition, (planned) operator commitments (not requiring 3G licenses) account for several additional UMTS networks in Canada (Rogers) and the United States (AT&T Wireless). In total, this represents the *vast majority* of operators to 3G services in the world. Over 100 operators worldwide selected UMTS for their evolution to 3G, most of whom are currently GSM operators. The total number of UMTS subscribers is forecast to reach nearly 81 million by the end of 2006, with 42% in Western Europe and 48% in Asia-Pacific according to Ovum.[9]

A complete list of operator commitments/licenses for UMTS as developed by EMC and updated as of January 2003 is provided in the Appendix of this paper.

Trials

Numerous ongoing trials throughout the world have demonstrated live UMTS calls, high-speed data sessions, interoperability between infrastructure and terminal/PC card manufacturers, roaming, and handoff.

In December 2002, AT&T Wireless together with Ericsson, Nortel Networks, Sony, and Motorola completed the first UMTS/WCDMA call in a live network environment in the Americas. With initial packet data speeds up to 384 Kbps, the call demonstrated true 3G capabilities, which include quick downloads of such bandwidth-demanding applications as e-mail with attachments and streaming audio and video. The joint effort was part of a trial in Dallas, Texas of the first 1900 MHz UMTS/WCDMA system in the Americas, with more than 100 cell sites in the Dallas area operational at the end of 2002. Ericsson provided the radio access network, Nortel the core network, and mobile terminals provided by both Ericsson and Motorola.

"It's really exciting to take what we've learned from our laboratory trials and apply those lessons to a live network environment," said Angel Ruiz, President and Chief Executive Officer of Ericsson Inc. "In other parts of the world, we've seen live tests before in the 2 GHz band. But this is a landmark in the development of UMTS/WCDMA in the 1900 MHz frequencies and its progress in the Americas."

AT&T Wireless also announced in December 2002 that they will be first to deploy and launch true wideband 3G wireless data services in the Western Hemisphere. By the end of December 2004, the company plans a commercial launch in sections of four U.S. cities having a high concentration of mobile professionals: San Francisco, San Diego, Seattle, and Dallas. The announced 3G build and launch will follow a planned deployment of high data speed EDGE technology by AT&T Wireless in 2003. AT&T Wireless' planned global standard technology evolution will enable it to offer customers the most advanced voice, data, messages, music, information, and video services as it progresses from GSM/GPRS technology to EDGE and then to UMTS.

Siemens IC Mobile reports that preparations for introducing UMTS mobile telephony are well underway with 21 mobile providers from 16 countries (as of June 2002) involved in so-called

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[8] *"UMTS Status Update"* January 2003; EMC (see Appendix)

[9] *"251 mil. 3G subs expected by 2006"* September 4, 2002; 3G Mobile, Volume 4, Number 16

'UMTS trials'.[10] The solutions will be initially tested in practical tests with limited user groups and then expanded continuously. UMTS trials with Siemens applications were completed in the following countries:

Austria	Monaco
Belgium	Norway
China	Poland
Finland	Portugal
Germany	Russia
Isle of Man	Singapore
Italy	Spain
Malaysia	Taiwan

Monaco Telecom, a subsidiary of Vivendi, Siemens, and NEC began testing mobile multi-media applications over the entire principality's UMTS network in December 2001 – as the first European country to test multi-media applications in an urban environment of tall buildings and dense population.

Meanwhile, Vodafone (Spain) is very close to commercial launch of its currently operational UMTS network. Nortel and Vodafone publicly announced in October 2002 that the UMTS deployments were on track and UMTS equipment was successfully deployed in 23 cities and 98 towns across Spain. Live circuit and packet calls, as well as extensive live air testing, were completed on over 600 BTS, and a friendly user trial is planned for early 2003. Vodafone, utilizing the UMTS network supplied by Nortel, met the Spanish government regulatory requirements for coverage and functionality in June 2002. Live 3GPP UMTS roaming calls between Spain and J-Phone (Japan) were completed in 4Q 2001. In addition, Nortel is rolling out UMTS networks in Iberia with Vodafone Portugal, Xfera, and Optimus. The vendor is also under contract to rollout with Telefonica in 2003.

Several operators are also exploring the potential of UMTS networks to deliver high-speed mobile data services for business customers. In January 2003, T-Mobile and Lucent Technologies announced plans to deploy a UMTS network in the city of Nuremberg. This initiative, which will involve enterprises in the Nuremberg region, will demonstrate how business customers can benefit from secure, high-speed data mobile services and integrated end-to-end enterprise applications. Lucent is also working on a similar UMTS pilot network deployment with Telefonica Moviles in Spain.

Additionally, KT ICOM (Korea) announced a successful demonstration of international videophone roaming between UMTS mobile networks in Korea and Japan with J-Phone. LG Electronics provided KT ICOM's network equipment and the mobile video telephony devices, while Ericsson provided J-Phone's network. KT ICOM plans to begin full-scale commercial UMTS service in 1H 2003.

Motorola's Personal Communications Sector (PCS) has completed formal interoperability testing (IOT) with all major 3G infrastructure vendors and is currently conducting IOT/field trials on 19 different European networks and in two Asian markets. Most are expected to turn into friendly user trials beginning in early 2003. Motorola is one of the vendors offering a suite of

[10] White Paper- *"3G rollout – on to 3rd-generation mobile telephony: Siemens UMTS applications in 15 countries,"* 2002; Siemens Information and Communication Mobile

services to network operators and infrastructure vendors including prototypes, test mobiles, IOT and field trial services to insure successful deployment of UMTS networks.

Infrastructure

According to leading vendors, UMTS infrastructure is ready. UMTS networking equipment for both radio access and the IP core is already deployed on a large scale and is either operational or ready to be turned up at the discretion of operators. Ericsson estimates that combined vendor shipments included about 30,000 UMTS base stations during 2002.

A complete list of operator and vendor contracts compiled by EMC is provided in the Appendix of this paper. Hundreds of contracts are listed with more than 70 operators in 27 countries with 8 different infrastructure vendors including Alcatel, Ericsson, Lucent, Motorola, NEC, Nokia, Nortel Networks, and Siemens.

Infrastructure vendors continue to achieve milestones in the final development and trialing of UMTS. Some examples are provided below.

Ericsson demonstrated the first UMTS voice call with a Vodafone, UK network, in April 2001. Furthermore, in September 2002, Ericsson was the first to demonstrate UMTS/GSM handover, which was achieved by use of a reference design handset, developed by Ericsson Mobile Platforms, based on the EMP dual-mode (UMTS/GSM) mobile phone platform "U100". Another important milestone was achieved in early 2003 when an end-to-end solution for video telephony was demonstrated by use of the "U100" platform in an Ericsson network system. The U100 platform from Ericsson Mobile Platforms is used by major handset manufacturers, like LG Electronics and Sony Ericsson, in the development of commercial UMTS products. By November 2002, Ericsson shipped more than 10,000 UMTS base stations to more than 35 operators in 24 countries.

Nokia started WCDMA system trials with commercial hardware in April 2001 and initiated volume deliveries to its customers in September of the same year. The first 3GPP end-to-end voice call (AMR) – based on 3GPP Rel'99 version December 2000 – was made in August 2001 and the first IP packet data call occurred in February 2002.

The first commercial and 3GPP compliant release of WCDMA software was ready to be downloaded to the customers' networks for introduction to first users in September 2002.
The relevant milestones for dual-mode 3G systems were reached in 4Q 2002.

Nokia has delivered thousands of base stations and related equipment to operators worldwide and the first Nokia-delivered 3G network was successfully launched in Japan by J-Phone in December 2002.

Nortel Networks demonstrated the world's first UMTS calls using an IP-based UTRAN (UMTS Terrestrial Radio Access Network) in October 2002 at Nortel Networks Global Technology Center in Ottawa, which gives operators more flexibility in routing wireless traffic to create wireless data network efficiencies that drive down the cost of delivering traffic, and simplifies provisioning and management of UMTS radio equipment – particularly in areas of high demand. Traditional wireless networks and previous UMTS demonstrations used ATM as the terrestrial transport protocol.

Nortel Networks and Qualcomm announced in October 2002 the completion of 3GPP UMTS-compliant 3G-to-2G handover calls in a lab environment in Paris using Qualcomm's user equipment and Nortel's end-to-end network equipment. The handovers demonstrated networking capabilities designed to support global roaming and seamless voice services between different networks, cities, countries, and operators, regardless of the type of handset used. This was an important milestone in launching 3G networks. Operators will need to support their current subscriber base on both GSM and UMTS to offer uninterrupted service as they transition to 3G. Migrating to wireless data network technologies such as UMTS can position operators to boost capacity and significantly reduce capital outlays and the cost of delivering traffic across their networks.

Alain Biston, General Manager, UMTS Networks, Nortel Networks said "3G-to-2G network handovers will enable operators to combine GSM and UMTS offerings to provide wide coverage right from the launch of their UMTS networks." Don Schrock, President of Qualcomm CDMA Technologies further emphasized, "The 3G-to-2G handoff capability demonstrated by these milestone calls is critical to enable the launch of 3G networks and allow seamless roaming onto existing 2G networks."

Another achievement important to operators in North America came when Nortel Networks and Qualcomm completed the industry's first voice and data calls in October 2002 which demonstrated mobility across commercial cell sites using live 1900 MHz radio spectrum at 384 Kbps. To date, U.S and Canadian regulatory bodies have not indicated exactly when 2100 spectrum, which is traditionally used for UMTS service elsewhere in the world, will be made available in North America. (Note: U.S. regulators have recommended the 1710-1755 spectrum band paired with another 45 MHz within the 2110-2170 band for future spectrum auctions for advanced wireless services.)

Lucent Technologies announced in April 2002 the completion of the industry's first high-speed data call on *commercial* 3G UMTS wireless equipment designed to support mobile service providers in the U.S. employing 1900 MHz spectrum. Lucent also completed of a series of end-to-end UMTS packet data calls (for 2.1 GHz) with Qualcomm in January 2002. This was the first such demonstration of UMTS packet data services with *commercial* 3G infrastructure and chipsets for mobile devices. Another milestone by Lucent was a series of UMTS data calls using a new breakthrough wireless modem PC card jointly developed with Option in November 2002. Lastly, in September 2002, Lucent completed the successful seamless handoff of a wireless data call from a "WiFi" or Wireless Local Area Network (WLAN) to UMTS network (WLAN), enabling mobile laptop users to browse the Internet while roaming between the two network types with no interruption in the session.

Handsets & Chipsets

The first dual-mode GSM/UMTS handset, the Motorola A830, was unveiled at the 2002 3GSM World Congress in Cannes. Two other single-mode UMTS handsets were also revealed including NEC's model used at the Isle of Man trial and Qualcomm's trial handset, the TM5200. Since that time, most handset vendors are providing UMTS dual-mode models. New model announcements and large supplies of UMTS dual-mode handsets will be available in 2003.

Motorola currently offers two dual-mode UMTS handsets, the A830 and A835. Motorola's A830 began shipping at year-end 2002 for a supply contract worth $700 million with Hutchison 3G (volumes not disclosed). Motorola is also providing chipsets and handsets to Siemens through an OEM contract.

Nokia launched the world's first 3GPP compliant dual-mode mobile phone, the Nokia 6650, operating both in the GSM 900/1800 frequencies and on the WCDMA protocol in September 2002. The first deliveries for operator-controlled live network tests of the Nokia 6650 phone began during 4Q 2002. Commercial shipments are expected to start within the first half of 2003.

In connection with the Nokia 6650 launch, Nokia and the Finnish operator Sonera demonstrated advanced Sonera services on a live 3G WCDMA network and in October 2002, passed type approval tests in Europe and Japan.

Siemens Mobile and NEC's joint venture "Mobisphere" provided equipment for the UMTS networks in Monaco and the Isle of Man. Mobisphere's key objective was the coordination of UMTS product development. NEC provided a prototype single-mode UMTS handset with an advanced WAP browser, color display, and animated functionality. NEC's prototype 3G phone was developed for use with the mmO2/Manx Telecom and Monaco Telecom's 3G projects on the Isle of Man and in Monaco.

In addition, NEC developed its N2002 3G handset for use with the FOMA commercial service in Japan. NTT DoCoMo sells the handset exclusively for the Japanese market behalf of NEC.

NEC and Matsushita (Panasonic) are also jointly developing a mobile 3G handset platform and applications for UMTS.

Fujitsu and Sagem offer another UMTS handset vendor partnership for dual-mode UMTS smartphones where Fujitsu (Japan) focuses on application platform development and Sagem

(France) develops a communications platform. Introduction of new technologies for UMTS are expected by 2H 2003.

LG also announced UMTS handset availability in 2H 2002. LG handsets were used in Mobilkom Austria's UMTS test network.
www.lge.com/c_product/h_network/products/umts_mobile.shtml

Samsung's SGH-Z100 was used by Vodafone and Nortel for the first UMTS trial test in Spain in November 2002. The UMTS mobile phone with WAP, MMS, and Java, supports applications such as video telephony service with a built-in rotating digital camera and high-quality TFT color screen that reproduces 260,000 different color shades and 40 polyphonic ring tones.
http://211.45.29.106/news/telecommunications/com_news_1036999860671_001500.html

Sanyo's V-SA701, announced in January 2003 for J-Phone (Japan), is a Vodafone Global Standard phone for UMTS service with global roaming services offered through a smart card called a USIM. In addition to being standardized for UMTS services, USIM cards are also compatible with SIM cards for use on GSM networks, the de facto standard for 2G mobile networks. Although more time is required before 3G networks are launched worldwide on a full-scale basis, Vodafone Global Standard is backward compatible and can be used "anywhere in the world" since USIM cards are compatible with GSM networks.
www.3g.co.uk/PR/Jan2003/4658.htm

Sony Ericsson has committed to delivering dual-mode UMTS handsets in 2003 based on the U100 platform solution from Ericsson Mobile Platforms.

Alcatel has stated it will develop handsets in alliance with an undisclosed partner. The vendor estimates its launch of the dual-mode UMTS handset in 2004-2005 when the mass market for UMTS evolves.

Taking a slightly different track, *Lucent Technologies* announced joint development agreements in 2002 with two different manufacturers of wireless PC modem cards to create devices to support high-speed data services on UMTS networks. These UMTS wireless modem PCMCIA cards, including Option's ***3G***lobeTrotter™, and a forthcoming UMTS addition to the Merlin™ family of PC modem cards from Novatel Wireless, support high-speed data connections on laptops, PDAs, and other mobile devices.

Conclusions

UMTS is far from tomorrow's technology. It is being installed, tested, and prepped *today* on several continents for delivering a suite of services that will quickly differentiate UMTS networks from all predecessors and competitors. Additionally, UMTS and EDGE technologies will serve on a complementary basis for many operators' networks throughout the world. With its leading technical performance capabilities for efficiency and speed, UMTS will provide the means for unprecedented levels of user satisfaction and consequent new revenue streams for operators. UMTS has made significant recent progress towards becoming one of the most widely deployed 3G technologies in the world, with a multitude of contractual commitments, trials, and actual deployments currently underway. These demonstrate the maturity of the UMTS technology and the enduring commitment of the industry and investors to the massive diffusion of UMTS. UMTS is beginning to serve its first customers now, and they will soon appreciate the convenience, excitement, innovation, and efficiency that UMTS will bring to the entire wireless landscape.

Appendix

UMTS Status Update: Licenses and Networks

Source: EMC World Cellular Database, January 2003

	Country	Operator	Status	Start Date	Opening
1	Argentina	-tba-	Potential Licence		
2	Australia	3G Investments	Licence Awarded		Jun 2004
3	Australia	CKW Wireless	Trial		Jun 2003
4	Australia	Hutchison	Licence Awarded		Q2 2003
5	Australia	Optus	Licence Awarded		Dec 2003
6	Australia	Telstra	Licence Awarded		Jun 2003
7	Australia	Vodafone	Licence Awarded		2005
8	Austria	3G Mobile	Status Unclear		
9	Austria	Connect Austria	Trial		Q2 2003
10	Austria	Hutchison 3G	Licence Awarded		Q2 2003
11	Austria	Mobilkom	Trial		Q3 2002
12	Austria	T-Mobile Austria	Licence Awarded		Q4 2002
13	Austria	tele.ring	Licence Awarded		Q1 2005
14	Belgium	-tba-	Potential Licence		
15	Belgium	BASE	Licence Awarded		Q3 2003
16	Belgium	Belgacom Mobile	Licence Awarded		Q3 2003
17	Belgium	Mobistar	Licence Awarded		Q3 2003
18	Bulgaria	-tba-	Potential Licence		
19	Canada	Rogers AT&T Wireless	Planned		2005
20	China	China Mobile	Potential Licence		
21	China	China Telecom	Potential Licence		
22	China	China Unicom Limited	Potential Licence		
23	China	CNC	Potential Licence		
24	Croatia	-tba-	Potential Licence		
25	Czech Republic	-tba-	Potential Licence		
26	Czech Republic	Eurotel Praha	Licence Awarded		2005
27	Czech Republic	RadioMobil	Licence Awarded		2005
28	Denmark	HI3G Denmark	Licence Awarded		2004
29	Denmark	Orange Denmark	Licence Awarded		2004
30	Denmark	TDC Mobil	Licence Awarded		2004
31	Denmark	Telia Denmark	Licence Awarded		2004
32	Estonia	-tba-	Potential Licence		
33	Finland	Finnish 3G	Licence Awarded		2003
34	Finland	Radiolinja	Licence Awarded		2003
35	Finland	Sonera	Licence Awarded		2003
36	Finland	TeliaSonera	Licence Awarded		2003
37	Finland - Republic of Åland	Alands Mobiltelefon AB	Licence Awarded		2004
38	Finland - Republic of Åland	Song Networks	Licence Awarded		2004
39	France	-tba-	Potential Licence		
40	France	Bouygues Telecom	Licence Awarded		Q4 2004
41	France	Orange France	Trial		Q1 2004
42	France	SFR	Licence Awarded		Q2 2004
43	Germany	E-Plus	Licence Awarded		Q1 2004
44	Germany	Group 3G	Status Unclear		
45	Germany	MobilCom Multimedia	Status Unclear		
46	Germany	O2	Licence Awarded		Q4 2003

47	Germany	T-Mobile	Licence Awarded		Q4 2003
48	Germany	Vodafone D2	Licence Awarded		Q2 2003
49	Greece	Cosmote	Licence Awarded		2004
50	Greece	Panafon SA	Licence Awarded		2004
51	Greece	STET Hellas	Licence Awarded		2004
52	Hong Kong	Hong Kong CSL	Licence Awarded		2003
53	Hong Kong	Hutchison	Licence Awarded		Q2 2003
54	Hong Kong	SmarTone 3G	Licence Awarded		2003/4
55	Hong Kong	Sunday	Licence Awarded		2003
56	Hungary	-tba-	Potential Licence		
57	India	-tba-	Potential Licence		2004/2005
58	Indonesia	-tba-	Potential Licence		Q1 2005
59	Ireland	Hutchison Whampoa	Licence Awarded		2005
60	Ireland	O2	Licence Awarded		2006
61	Ireland	Vodafone Ireland	Licence Awarded		2006
62	Isle of Man	Manx Telecom	Trial	Dec-01	2001
63	Israel	Cellcom Israel	Licence Awarded		2004
64	Israel	Partner Communications - Orange	Licence Awarded		2004
65	Israel	Pelephone	Licence Awarded		2004
66	Italy	H3G	Licence Awarded		2003
67	Italy	Ipse 2000	Licence Awarded		
68	Italy	TIM	Licence Awarded		2003
69	Italy	Vodafone Omnitel	Licence Awarded		May 2003
70	Italy	Wind	Licence Awarded		H1 2003
71	Japan	J-Phone	In Service	Dec-02	
72	Japan	NTT DoCoMo	In Service	Oct-01	
73	Korea	KT ICOM	Licence Awarded		Jun 2003
74	Korea	SK IMT	Licence Awarded		
75	Latvia	-tba-	Potential Licence		
76	Latvia	LMT	Licence Awarded		2004
77	Latvia	Tele2	Licence Awarded		2004
78	Liechtenstein	Orange	Licence Awarded		Q3 2003
79	Liechtenstein	Tele2	Licence Awarded		Q3 2003
80	Lithuania	-tba-	Potential Licence		
81	Luxembourg	-tba-	Potential Licence		
82	Luxembourg	Orange Communications	Licence Awarded		Q3 2003
83	Luxembourg	P&T Luxembourg	Licence Awarded		Q3 2003
84	Luxembourg	Tele2	Licence Awarded		Jan 2003
85	Malaysia	Maxis Communications	Licence Awarded		Dec 2004
86	Malaysia	Telekom Malaysia	Licence Awarded		Dec 2004
87	Monaco	Monaco Telecom	Trial	Dec-01	
88	Netherlands	3G Blue	Licence Awarded		Q4 2003
89	Netherlands	Dutchtone	Licence Awarded		Q4 2003
90	Netherlands	KPN Mobile	Licence Awarded		Q2 2004
91	Netherlands	O2	Licence Awarded		Q1 2004
92	Netherlands	Vodafone Libertel	Trial		Q2 2003
93	New Zealand	-tba-	Potential Licence		
94	New Zealand	Maori Spectrum Trust	Licence Awarded		Dec 2005
95	New Zealand	Telecom New Zealand	Licence Awarded		Dec 2004
96	New Zealand	TelstraClear	Licence Awarded		Jun 2005
97	New Zealand	Vodafone New Zealand	Licence Awarded		Dec 2004
98	Norway	-tba-	Potential Licence		
99	Norway	Broadband Mobile	Licence Revoked/Surrendered		

100	Norway	Netcom	Licence Awarded		2003
101	Norway	Tele2 Norway AS	Licence Awarded		2003
102	Norway	Telenor Mobil	Licence Awarded		2003
103	Pakistan	-tba-	Potential Licence		2006
104	Philippines	-tba-	Potential Licence		2005
105	Poland	-tba-	Potential Licence		
106	Poland	Centertel	Planned		Jan 2005
107	Poland	Polkomtel SA	Licence Awarded		Jan 2005
108	Poland	Polska Telefonia Cyfrowa	Licence Awarded		Jan 2005
109	Portugal	OniWay	Licence Awarded		Q3 2003
110	Portugal	Optimus	Licence Awarded		Q1 2004
111	Portugal	TMN	Licence Awarded		Q1 2004
112	Portugal	Vodafone Telecel	Licence Awarded		Q1 2004
113	Romania	-tba-	Potential Licence		
114	Russia - Moscow	Mobile TeleSystems	Trial		
115	Russia - Moscow	Moscow Cellular Communications	Trial		
116	Russia - Moscow	VimpelCom	Trial		
117	Russia - St Petersburg	North-West GSM	Trial		
118	Singapore	-tba-	Potential Licence		Q1 2006
119	Singapore	MobileOne	Licence Awarded		Q3 2003
120	Singapore	Singapore Telecom	Trial		2003
121	Singapore	Singapore Telecom	Licence Awarded		Q4 2003
122	Singapore	StarHub	Licence Awarded		2005
123	Slovak Republic	EuroTel Bratislava	Licence Awarded		2006
124	Slovak Republic	Orange	Licence Awarded		2006
125	Slovak Republic	Profinet	Licence Revoked/Surrendered		
126	Slovenia	-tba-	Potential Licence		
127	Slovenia	Mobitel	Licence Awarded		Jul 2003
128	Spain	Amena	Licence Awarded		H1 2004
129	Spain	Telefónica Móviles	Licence Awarded		H1 2004
130	Spain	Vodafone España	Licence Awarded		H1 2004
131	Spain	Xfera	Licence Awarded		H1 2004
132	Sri Lanka	-tba-	Licence Tender		
133	Sweden	HI3G	Licence Awarded		2003
134	Sweden	Orange Sweden	Licence Awarded		2003
135	Sweden	Svenska UMTS-Nät	Licence Awarded		2003
136	Sweden	Vodafone Sweden	Licence Awarded		2003
137	Switzerland	Orange	Licence Awarded		Q4 2003
138	Switzerland	Swisscom Mobile	Licence Awarded		Q3 2003
139	Switzerland	TDC dSpeed	Licence Awarded		Q4 2003
140	Switzerland	Team 3G	Licence Awarded		
141	Taiwan	Asia Pacific Broadband Wireless Communications	Licence Awarded		2003
142	Taiwan	Chunghwa Telecom	Licence Awarded		2004
143	Taiwan	FarEasTone	Licence Awarded		2004
144	Taiwan	Taiwan Cellular Corporation	Licence Awarded		2004
145	Taiwan	Taiwan PCS	Licence Awarded		2003
146	Thailand	-tba-	Potential Licence		2004
147	Thailand	CAT/TOT	Licence Awarded		2005
148	Turkey	-tba-	Potential Licence		
149	Turkey	-tba-	Potential Licence		
150	Turkey	-tba-	Potential Licence		
151	Turkey	-tba-	Potential Licence		
152	UAE	Etisalat	Trial		

153	UK	Hutchison 3G	Trial		2003
154	UK	O2	Licence Awarded		2003
155	UK	Orange	Licence Awarded		2004
156	UK	T-Mobile	Licence Awarded		2003
157	UK	Vodafone	Licence Awarded		2003
158	USA	AT&T Wireless Group	Planned		2004
159	Venezuela	-tba-	Potential Licence		

Source: EMC World Cellular Database, January 2003

UMTS Infrastructure Supply Contracts

Source: EMC World Cellular Database, January 2003

	Country	Operator	System	Supplier
1	Australia	Hutchison	W-CDMA	Ericsson
2	Australia	Hutchison	W-CDMA	Motorola
3	Australia	Optus	W-CDMA	Nokia
4	Austria	Connect Austria	W-CDMA	Ericsson
5	Austria	Connect Austria	W-CDMA	Nokia
6	Austria	Hutchison 3G	W-CDMA	Motorola
7	Austria	Hutchison 3G	W-CDMA	Nokia
8	Austria	Hutchison 3G	W-CDMA	Siemens
9	Austria	Mobilkom	W-CDMA	Ericsson
10	Austria	Mobilkom	W-CDMA	Nortel Networks
11	Austria	T-Mobile Austria	W-CDMA	Nokia
12	Austria	T-Mobile Austria	W-CDMA	Nortel Networks
13	Austria	T-Mobile Austria	W-CDMA	Siemens
14	Belgium	BASE	W-CDMA	Ericsson
15	Belgium	Belgacom Mobile	W-CDMA	Nokia
16	Belgium	Belgacom Mobile	W-CDMA	Siemens
17	Denmark	TDC Mobil	W-CDMA	Ericsson
18	Finland	Alands Mobiltelefon AB	W-CDMA	Ericsson
19	Finland	Finnish 3G	W-CDMA	Ericsson
20	Finland	Finnish 3G	W-CDMA	Nokia
21	Finland	Radiolinja	W-CDMA	Nokia
22	Finland	Radiolinja	W-CDMA	Siemens
23	Finland	Sonera	W-CDMA	Ericsson
24	Finland	Sonera	W-CDMA	Nokia
25	Finland	TeliaSonera	W-CDMA	Nokia
26	France	Orange France	W-CDMA	Alcatel
27	France	Orange France	W-CDMA	Nokia
28	France	SFR	W-CDMA	Alcatel
29	France	SFR	W-CDMA	NEC
30	France	SFR	W-CDMA	Nokia
31	France	SFR	W-CDMA	Siemens
32	Germany	E-Plus	W-CDMA	Ericsson
33	Germany	E-Plus	W-CDMA	Nokia
34	Germany	MobilCom Multimedia	W-CDMA	Ericsson
35	Germany	MobilCom Multimedia	W-CDMA	Nokia
36	Germany	O2	W-CDMA	Alcatel
37	Germany	O2	W-CDMA	Nokia
38	Germany	O2	W-CDMA	Nortel Networks
39	Germany	T-Mobile	W-CDMA	Nokia

40	Germany	T-Mobile	W-CDMA	Nortel Networks
41	Germany	T-Mobile	W-CDMA	Siemens
42	Germany	Vodafone D2	W-CDMA	Ericsson
43	Germany	Vodafone D2	W-CDMA	Siemens
44	Hong Kong	Hong Kong CSL	W-CDMA	Nokia
45	Hong Kong	Hutchison	W-CDMA	-tbc-
46	Hong Kong	SmarTone	W-CDMA	Ericsson
47	Ireland	O2	W-CDMA	Nokia
48	Ireland	O2	W-CDMA	Nortel Networks
49	Ireland	Vodafone Ireland	W-CDMA	Nokia
50	Isle of Man	Manx Telecom	W-CDMA	NEC
51	Isle of Man	Manx Telecom	W-CDMA	Nortel Networks
52	Isle of Man	Manx Telecom	W-CDMA	Siemens
53	Italy	H3G	W-CDMA	Ericsson
54	Italy	H3G	W-CDMA	NEC
55	Italy	H3G	W-CDMA	Siemens
56	Italy	TIM	W-CDMA	Ericsson
57	Italy	TIM	W-CDMA	NEC
58	Italy	TIM	W-CDMA	Siemens
59	Italy	Vodafone Omnitel	W-CDMA	Nokia
60	Italy	Vodafone Omnitel	W-CDMA	Nortel Networks
61	Italy	Wind	W-CDMA	Alcatel
62	Italy	Wind	W-CDMA	Nokia
63	Japan	J-Phone	W-CDMA	Ericsson
64	Japan	J-Phone	W-CDMA	NEC
65	Japan	J-Phone	W-CDMA	Nokia
66	Japan	NTT DoCoMo	W-CDMA	Ericsson
67	Japan	NTT DoCoMo	W-CDMA	Lucent
68	Japan	NTT DoCoMo	W-CDMA	NEC
69	Korea	KT ICOM	W-CDMA	LGIC
70	Liechtenstein	Orange	W-CDMA	Nokia
71	Monaco	Monaco Telecom	W-CDMA	NEC
72	Monaco	Monaco Telecom	W-CDMA	Siemens
73	Netherlands	Ben Nederland	W-CDMA	Nokia
74	Netherlands	Ben Nederland	W-CDMA	Siemens
75	Netherlands	KPN Mobile	W-CDMA	Ericsson
76	Netherlands	O2	W-CDMA	Ericsson
77	Netherlands	Vodafone Libertel	W-CDMA	Ericsson
78	Norway	Netcom	W-CDMA	Nokia
79	Norway	Netcom	W-CDMA	Siemens
80	Norway	Tele2 Norway AS	W-CDMA	Siemens
81	Norway	Telenor Mobil	W-CDMA	Ericsson
82	Norway	Telenor Mobil	W-CDMA	Nokia
83	Portugal	Optimus	W-CDMA	Ericsson
84	Portugal	Optimus	W-CDMA	Nortel Networks
85	Portugal	TMN	W-CDMA	Alcatel
86	Portugal	TMN	W-CDMA	Ericsson
87	Portugal	TMN	W-CDMA	Siemens
88	Portugal	Vodafone Telecel	W-CDMA	Ericsson
89	Portugal	Vodafone Telecel	W-CDMA	Nortel Networks
90	Singapore	MobileOne	W-CDMA	Nokia
91	Singapore	StarHub	W-CDMA	Nokia
92	Slovenia	Mobitel	W-CDMA	Ericsson

93	Spain	Amena	W-CDMA	Ericsson
94	Spain	Amena	W-CDMA	Siemens
95	Spain	Telefónica Móviles	W-CDMA	Ericsson
96	Spain	Telefónica Móviles	W-CDMA	Nortel Networks
97	Spain	Vodafone España	W-CDMA	Nortel Networks
98	Spain	Xfera	W-CDMA	Ericsson
99	Spain	Xfera	W-CDMA	Nortel Networks
100	Sweden	3G Infrastructure Services	W-CDMA	Nokia
101	Sweden	Hl3G	W-CDMA	Ericsson
102	Sweden	Orange Sweden	W-CDMA	Alcatel
103	Sweden	Svenska UMTS-Nät	W-CDMA	Ericsson
104	Sweden	Vodafone Sweden	W-CDMA	Ericsson
105	Sweden	Vodafone Sweden	W-CDMA	Nokia
106	Switzerland	Orange	W-CDMA	Nokia
107	Switzerland	Swisscom Mobile	W-CDMA	Ericsson
108	Switzerland	TDC Switzerland	W-CDMA	Ericsson
109	Taiwan	Chunghwa Telecom	W-CDMA	Nokia
110	Taiwan	FarEasTone	W-CDMA	Ericsson
111	UK	Hutchison 3G	W-CDMA	NEC
112	UK	Hutchison 3G	W-CDMA	Nokia
113	UK	O2	W-CDMA	Nokia
114	UK	O2	W-CDMA	Nortel Networks
115	UK	Orange	W-CDMA	Nokia
116	UK	T-Mobile	W-CDMA	Nokia
117	UK	T-Mobile	W-CDMA	Nortel Networks
118	UK	T-Mobile	W-CDMA	Siemens
119	UK	Vodafone	W-CDMA	Ericsson
120	USA	AT&T Wireless Group	W-CDMA	Ericsson

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