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January 27, 2003

Marlene H. Dortch
Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, S.W.
Washington, DC 20002

Re: WT Docket No. 02-379

Dear Secretary Dortch:

3G Americas, an organization of wireless operators and vendors throughout he Americas who support deployment of GSM, TDMA, GPRS, EDGE and UMTS technologies, submits the attached comments in response to the Commission's NOI in this proceeding. 3G Americas' submission is intended to respond to the Commission's request for data and information on the status of competition in the CMRS industry.

Should the Commission have any questions regarding these Comments, please contact the undersigned.

Sincerely,

Michael R. Gardner
Washington Counsel for 3G Americas

cc: Chris Pearson
Executive Vice President
3G Americas, LLC

Before the
Federal Communications Commission

Washington, D.C.

In the Matter of

Implementation of Section 6002 (b) of the Omnibus Budget Reconciliation Act of 1993	) WT Docket No. 02-379)
Annual report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services	))

To: The Commission

COMMENTS OF 3G AMERICAS

Submitted by:

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January 27, 2003

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Summary

In response to the Commission's NOI in this proceeding, 3G Americas, an organization of wireless operators and vendors promoting the deployment in the Americas of GSM, TDMA, GPRS, EDGE and UMTS technologies – provides the Commission an overview of these technologies – their technical attributes and their deployment, particularly throughout the Americas.

Included for the Commission's consideration is a global market analysis, including growth factors from wireless data based on September 2002 subscriber estimates. 3G Americas' Comments also document GSM's evolution in the Americas, confirming that GSM has become the fastest growing wireless technology in the Americas, registering a 37% year-over-year growth through 2002 according to the EMC World Cellular Database. The paper also focuses on GSM's increased voice capacity, GSM's high speed packet data capability on global scale, as well as a global scale and cost of deploying GSM technology.

3G Americas' Comments also document the roaming capabilities of GSM and its significant benefits for consumers; finally, these Comments provide an overview of GSM migration from second generation to third generation technology, including a detailed focus on EDGE's ability to expedite the transition to 3G wireless services.

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COMMENTS OF 3G AMERICAS

I. INTRODUCTION

3G Americas unites wireless operators and vendors in the Americas for GSM, TDMA, GPRS, EDGE and UMTS technologies. Working with regulatory bodies, technical standards bodies, and other global organizations, 3G Americas uniquely focuses on the issues facing the Americas. The mission of 3G Americas is to promote, educate, and advocate for the success of GSM, TDMA, GPRS, EDGE, and UMTS and their seamless evolution to future generations, thereby advancing the wireless industry in the Americas for the benefit of consumers. The organization fully supports the third generation technology migration strategy GSM/GPRS/EDGE and UMTS adopted by many operators in the Americas that will globally account for the vast majority of next-generation subscribers.

The Board of Governors of 3G Americas include AT&T Wireless (USA), Cable & Wireless (West Indies) Cingular Wireless (USA), Ericsson, HP, Lucent Technologies, Motorola, Nokia, Nortel Networks, Openwave Systems, Research In Motion, Rogers Wireless (Canada), Siemens, Telcel (Mexico) and Telecom Personal (Argentina).

II. MARKET ANALYSIS

Wireless data has the potential to produce significant new revenues for cellular operators. Applications include short message service, multimedia messaging, wireless application protocol (WAP) applications, streaming media, mobile office, e-mail, and workforce automation. The widespread launch

of next-generation cellular-data services in 2002 has set the stage for broad adoption, especially with user awareness increasing, choices of terminal equipment expanding, coverage becoming ubiquitous, and application and content becoming optimized for wireless access. Use of wireless data, which constituted 500 million dollars of revenue in the United States in 2001[1], is expected to grow tenfold over the next five years. In Europe, leading operators are reporting fifteen percent of revenues from data, with strong growth momentum. In Japan, NTT DoCoMo's popular I-mode service using a relatively slow packet data network is used by 76% of its customers and generated 18.5% of the company's overall revenues in early 2002. For this year, the GSM Association predicts over 360 billion SMS messages will be sent. For the future, the UMTS Forum Report 17 of February 2002 predicts service revenue from 3G networks of $320 billion in 2010, $233 billion of which will be generated by new mobile data services.

Success of wireless data has thus far been limited to specific areas, including SMS, I-mode in Japan, and wireless LANs in the US. However, a number of important trends will ultimately make wireless data as significant as wireless voice. First, computing itself is becoming ever more mobile, and notebooks and PDAs are prevalent. With the miniaturization of electronics, mobile telephones are becoming powerful computing platforms. Second, lifestyles and work styles are becoming increasingly mobile, with a mounting percentage of the population traveling for work, pleasure, or in retirement. Third, the Internet is becoming progressively more intertwined in the fabric of people's lives, providing communications, information, service enhancements for memberships and subscriptions, community involvements, and commerce. In this mix, wireless data is a powerful catalyst for the creation of new services and new business opportunities for operators as well as third-party businesses.

In this new world of Internet anywhere, services like GPRS are just the first step, but a very important step. As the benefits of these services become apparent, as the services themselves become more powerful thanks to higher throughput rates and quality-of-service mechanisms, and as service costs drop due increased spectral efficiency, use will constantly grow. Data will soon account for an

[1] Source: CTIA.

increasing percentage of cellular traffic. Already, data represents more than fifty percent of traffic of worldwide telecom networks, and the trends cited above will create similar usage rates for wireless data.

1. Growth Factors for Wireless Data

With data constituting a rising percentage of total cellular traffic, it is essential that operators deploy data technologies that meet customer requirements for performance and that are spectrally efficient, especially as data applications can demand significant network resources. Operators have a huge investment in spectrum and in their networks—data services must leverage these investments. It is only a matter of time before 745 million GSM, 135 million CDMA, and 105 million TDMA second-generation customers[2] migrate to the new generation of wireless data networks. This presents tremendous opportunities and risks to operators as they choose the most commercially viable evolution path for migrating their customers.

The GSM evolution to the Universal Mobile Telecommunications System (UMTS) not only supports a broad range of data services, but it does so with minimum new investment and in a spectrally efficient fashion that maximizes revenue and profit potential. As the wireless data market evolves, users will demand increased capabilities, such as higher throughputs, quality-of-service controls, and multimedia support. The GSM evolution to UMTS satisfies this need through a series of continual enhancements.

Some important observations regarding global wireless technologies include:

- General Packet Radio Service (GPRS) offers a sophisticated always-on IP service for GSM networks and supports a wide range of enterprise and consumer applications.
- EDGE doubles GPRS capacity and triples data throughputs.
- As one of the first cellular technologies to feature adaptive modulation and coding schemes and incremental redundancy, EDGE is spectrally more efficient for lower data rates (below 100 Kbit/s) than GPRS, WCDMA, and CDMA2000 1XRTT.

- EDGE can readily be deployed in spectrum that operators are using for GSM and GPRS, and in many cases it requires no additional hardware. EDGE traffic can share both spectrum and the transceiver timeslot resources with speech and GPRS traffic.
- EDGE and WCDMA radio access networks can be combined in one seamless network to provide efficient narrowband and wideband data capabilities, using the same quality-of-service architecture.
- High Speed Downlink Packet Access (HSDPA) offers one of the highest data-throughput rates of any cellular-data technology specified, with peak rates of 10 Mbit/s.
- With the UMTS Multi-radio network, a common core network supports GSM, GPRS, EDGE, WCDMA, and HSDPA, offering high efficiency for both high and low data rates, and for high and low traffic density configurations.
- Ongoing UMTS evolution includes significant enhancements with each new specification release, including higher throughput rates, improved multimedia support, and integration with wireless LAN technology.

III. THE GSM EVOLUTION IN THE AMERICAS

Operator and consumer decisions are quickly ratifying the appeal of GSM in the Americas. AT&T Wireless, Cingular Wireless and T-Mobile USA are the three major national carriers that have chosen the GSM technology evolution in the United States. The trend continues throughout the region. Cable & Wireless Panama became the first operator in the world to launch a commercial GSM network at 850 MHz in mid-November 2002, removing any doubts about the feasibility of deploying GSM in the Americas' most popular frequency bands. They will soon be joined by Cable and Wireless West Indies, Cingular Wireless, Dobson Wireless, and Telecom Italia's TDMA properties in Brazil--all planning to offer the latest in GSM applications and technology to current and future customers using the 850 MHz bands.

[2] September 2002 subscriber estimates.

GSM has become the fastest growing wireless technology in the Americas, registering a 37% year-over-year growth through September 2002 according to the EMC World Cellular Database. GSM subscribers globally as of September 2002 totaled more than 745 million subscribers representing growth of 28% during the same twelve months. EMC figures also revealed that GSM subscribers in Latin America grew by 53% during this same period. GSM is the world's leading wireless technology, representing over 75% of all digital cellular subscribers today. Another 13% of the world's digital subscribers are CDMA and 10% are TDMA. GSM provides an unmatched roaming footprint spanning more than 550 networks in over 184 countries. GSM is expected to pass TDMA in 2007 as the technology of choice in Latin America.

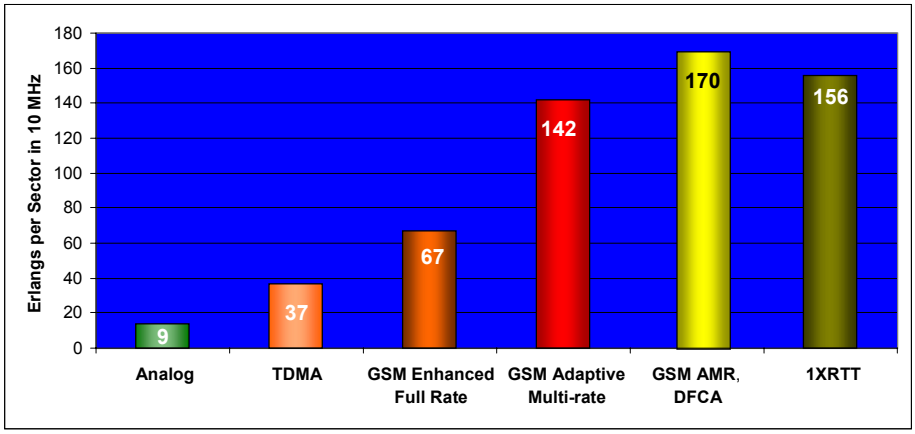
GSM's global dominance is expanding to the Americas because of its numerous advantages for both current and future network evolution. These include increased voice capacity, high-speed packet data on a global scale, a smooth, cost-effective migration to evolved networks, and generational compatibility among the various stages of network evolution. This report provides a summary of the advantages GSM provides to operators and consumers in the Americas, especially for those currently served by TDMA networks.

At least four compelling factors are convincing wireless operators to migrate to GSM: increased voice capacity, high-speed packet data, global scale, roaming and perhaps most importantly the smooth and cost-effective migration to 3G.

1. Increased Voice Capacity

In a real-world environment, a GSM network can handle roughly 45% more simultaneous calls than a comparable TDMA network and seven times more than an analog network. GSM also supports Adaptive Multi-rate speech transcoding (AMR), a new voice-coding technology, available now, that boosts capacity to four times more than TDMA.

GSM Advantage: Capacity Comparison



Assumptions: 4/12 re-use for BCCH channels and 1/1 re-use on the hopping layer, a fractional frequency load of 25% with EFR and 52% with AMR, a grade of service with 2% blocking, 95% of the speech samples have a FER better than 2.5%, and there is an SDCCH every fourth carrier. The average GSM AMR coder rate is greater than 8 Kbit/s, making it comparable to 1XRTT EVRC 8 Kbit/s. A 200 kHz guard band is also assumed.

Rysavy Research, 2002

Although some capacity-constrained TDMA operators believe that they can't free up enough spectrum to deploy GSM, frequency optimization techniques such as AMR, frequency hopping, dynamic power control, discontinuous transmission, and dynamic frequency and channel allocation, allow an operator with a saturated network to use a GSM overlay to continue growing its customer base while adding the ability to offer revenue-generating, market-differentiating data services. Adding a GSM overlay to a TDMA network is a straightforward, cost-effective process, even for operators with saturated networks. The result presents the operator with a TDMA network that can continue to drive revenue indefinitely in a state of "peaceful co-existence" with the GSM network that introduces customers to GSM's unique capabilities.

The example of a TDMA operator that deploys a GSM 850 MHz overlay illustrates the opportunity to sustain service to current TDMA customers while introducing GSM in the same frequency bands. To create channels for GSM service, one option is to switch the TDMA network's 7/21 frequency re-use pattern to a 5/15 pattern, which increases capacity by as much as 50%, or to a 4/12 pattern, which increases capacity by up to 90%. Those capacity gains allow the TDMA network to handle more calls while freeing up enough bandwidth to launch GSM in the existing spectrum. As a

result, the TDMA network improves its quality of service (QoS) and continues to drive revenue indefinitely even after the GSM service launches. Deploying GSM in 850 MHz is also attractive because using a lower frequency reduces the cost of deploying GSM at 1800 or 1900 MHz because each cell site covers a larger area.

Additionally, operators with dual-band 850/1900 TDMA networks are using the 1900 spectrum to build GSM volumes by introducing GSM's multiple advanced features to their customer bases while they complete the overlay process.

2. High-Speed Packet Data on a Global Scale

Packet data is an asset for all wireless operators, regardless of technology, because it allows them to compete more on services and less on price. That ability is critical at a time when voice is rapidly becoming a commodity in most markets.

Although CDMA 1XRTT's real-world data rate of 30-70 kbps is slightly faster than General Packet Radio Service's (GPRS') average throughput of 30-40 Kbps, both support the same types of applications and services---and that speed advantage is only temporary. Major GSM operators in the Americas have already deployed infrastructure for Enhanced Data Rates for Global Evolution (EDGE), a 3G technology that offers data rates of 80-130 Kbps (theoretical peak rate of 473 kbps) and plan to launch commercial service in 2003.

A total of eight operators in the Americas representing over 81 million current subscribers have already committed to EDGE, while Asian operators Starhub, TAC, Peoples Phone, and Singtel Optus, as well as Australia's Telstra have also made commitments to deploy EDGE.

GSM operators can complement EDGE and GPRS with Wideband CDMA (W-CDMA), a 3G technology that's the air interface for Universal Mobile Telecommunications System (UMTS). As a result, the terms "UMTS" and "W-CDMA" often are used interchangeably. W-CDMA delivers data rates of up to 2.4 Mbps with average speeds of 200-300 Kbps. It's been in commercial service in Japan since 2001.

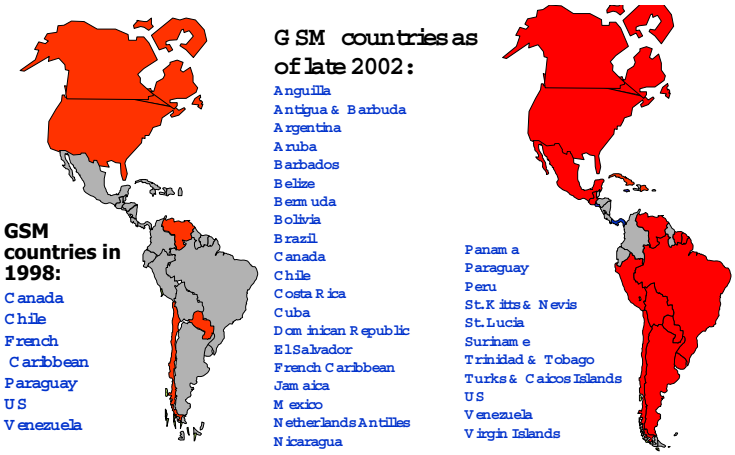
Technology	Benefits
GPRS with coding schemes 1 to 2	IP packet data service delivers effective throughputs of up to 40 Kbit/s.
GPRS with coding schemes 1 to 4	Includes an option for operators to boost speeds of GPRS service by 33%.
EDGE	Third-generation technology effectively triples GPRS data rates and doubles its spectral efficiency.
UMTS	WCDMA radio link supports flexible, integrated voice/data services with peak rates of 2 Mbit/s.
HSDPA	An enhancement to WCDMA and fully backwards compatible, HSDPA will offer peak data rates of 10 Mbit/s, higher than any other cellular-data service.
Quality-of-service	Available for both EDGE and WCDMA, QoS mechanisms support multiple classes of applications.
Multimedia support	A comprehensive multimedia framework enables voice-over-IP and video applications.
WLAN integration	Future networks will integrate cellular networks with WLAN hot spots.

Table 1: Summary of Data Capabilities for GSM to UMTS (Rysavy Research, November 2002)

3. Global Scale and Costs

The global scale of GSM and its growing presence in the Americas provide a solid base for cost-effective 3G deployment in the region. More than 75% of the world's digital cellular phones are GSM, and they run on more than 550 networks in 184 countries. Now, GSM is poised to become the dominant technology in the Americas as well. Today, over half the digital subscribers in the Americas use either GSM or TDMA, according to EMC, an independent analyst firm. As TDMA operators convert to GSM, the technology will have the largest share of the Americas wireless market. What all those numbers add up to is enormous volumes of GSM infrastructure and terminals, which drive down equipment costs so that GSM operators can price their devices and services competitively.

GSM expansion in the Americas



Source: GSMA Nov 2002

As they look toward the future, GSM operators in the Americas will benefit from the global adoption of GSM-based advanced solutions. More than 100 operators worldwide have already committed to deploying UMTS and some analysts predict UMTS will capture 85% of the worldwide 3G market. Although that market share is impressive, it's also to be expected: UMTS builds on the global scale of GSM, which already has over 75% of the worldwide digital wireless market, a share that will continue to grow as TDMA operators deploy GSM overlays. The result is that UMTS infrastructure and terminals will enjoy the same global cost structure as GSM — if not even better.

Global scale also provides the strongest rationale for an operator to select the GSM evolution over the alternatives. Each step on the GSM path to 3G enjoys the cost structure that comes with 550 networks in 184 countries.

Market share is an important metric because as more customers and operators use a particular technology, its equipment volumes increase, and as volumes increase, costs decrease overall. Plug GSM's numbers into that equation, and the math shows that GSM operators enjoy lower infrastructure and handset costs than carriers utilizing other technologies.

4. Roaming Capabilities

For GSM operators, roaming is an enormous business opportunity. According to the GSM Association:

- At least 20,000 international roaming agreements are currently in place
- Roaming generated US$12 billion in revenue in 1999
- Roamers use 2 billion minutes each month
- Roaming revenue generates between 15% and 30% of an operator's annual revenue

In-country roaming is another significant opportunity. In Latin America, for example, in-country roaming revenue grew from US$133 million in 1998 to US$205 million in 2001, according to Pyramid Research, an independent analyst firm. Pyramid expects in-country roaming revenue to grow to US$391 million by 2007.

Support for multi-bands including 850 MHz phones is an asset for two reasons. First, as multi-band 850 MHz phones become more common, operators with GSM 850 networks will be able to attract more roaming revenue. Second, thanks to the GSM roaming capabilities and worldwide coverage, GSM 850 operators will be able to offer their customers nationwide, region wide or even worldwide coverage without having to bear the expense of building networks in as many places as possible. That ability helps make an operator attractive to lucrative corporate customers with offices in multiple regions or employees who travel.

Another reason why vendors will produce multi-band terminals is the minimal cost of adding multiple bands. For example, in fall 2002, some operators are selling the 850/1900 Nokia 3590 for US$129 before any rebates. As of mid-November 2002, Motorola, Nokia, Siemens and Sony Ericsson together already offer a total of 10 GSM 850/1900 terminals, with many more on the way from additional vendors, such as Samsung. Characteristic of future offerings, the first EDGE terminal--the Nokia 6200, announced on November 18, 2002--offers service in all three GSM bands popular in the

Americas--850, 1800 and 1900 MHz. Additionally, Motorola recently announced the T725 tri-band EDGE phone for release in late 2003.

5. Smooth and Cost Effective Migration to 3G

The GSM migration from second-generation to third-generation technology incorporates constant enhancement in capability and efficiency. This progression enables an increasing number of applications, both due to performance and lower usage costs. Second-generation cellular data support is limited to basic data applications, such as messaging, text-based e-mail, and download of ring tones, and it lacks adequate connectivity for efficient Internet access. The addition of GPRS makes a new world of applications feasible, including enterprise applications, web browsing, consumer applications, and some multimedia applications. EDGE expands the capability of GPRS, enabling richer Internet browsing, streaming applications, a greater scope of enterprise applications, and more multimedia applications. With UMTS and HSDPA, users can look forward to video phones, high-fidelity music, rich multimedia applications, and extremely effective access to their organizations. The broadening scope of supported applications will stimulate higher customer demand and usage, and thus higher revenue for operators.

In assessing the potential applications of cellular-data services, it is helpful to note the approximate throughput requirements for different applications. These are as follows:

- Microbrowsing (e.g., WAP): 8 to 16 Kbit/s
- Multimedia messaging: 8 to 32 Kbit/s
- Video telephony: 64-384 Kbit/s
- General purpose web browsing: 32 Kbit/s to 384 Kbit/s
- Enterprise applications, including e-mail, database access, virtual private networking: 32 Kbit/s to 384 Kbit/s
- Video and audio streaming: 32-384 Kbit/s

In looking at these, one can see that GPRS already meets the requirements of many applications. As data capabilities continue to improve, and the cost of service (e.g., $ per Mbyte) decreases, not only will more existing networking applications become feasible for wireless networking, but developers will develop more mobile content and new mobile applications. Coupled with complementary developments such as location-based services, mobile commerce infrastructure, and multimedia messaging, data applications will constitute an increasing revenue stream for operators.

It should be noted that it is challenging to predict just what applications will drive the wireless data market, and what their exact bandwidth requirements are. Note the wide range of bandwidths suggested in the bulleted list above for different applications. It is also not clear whether consumer applications will have greater bandwidth requirements than business applications, though this could well be the case if streaming entertainment becomes popular. Given this uncertainty, it is imperative that data services be flexible, have high spectral efficiency, and support a wide variety of applications. The data services in GSM evolution to UMTS provide exactly this capability, as summarized in the following table.

The relative evolution of data capability from GPRS to UMTS and the stages that operators will go through in evolving their networks is show below. This progression, as shown in figure 1, happens in multiple phases, first with the addition of GPRS, next the first phase of 3G capability using EDGE and UMTS radio access networks, followed by evolved 3G capability through enhancements such as all IP networks.

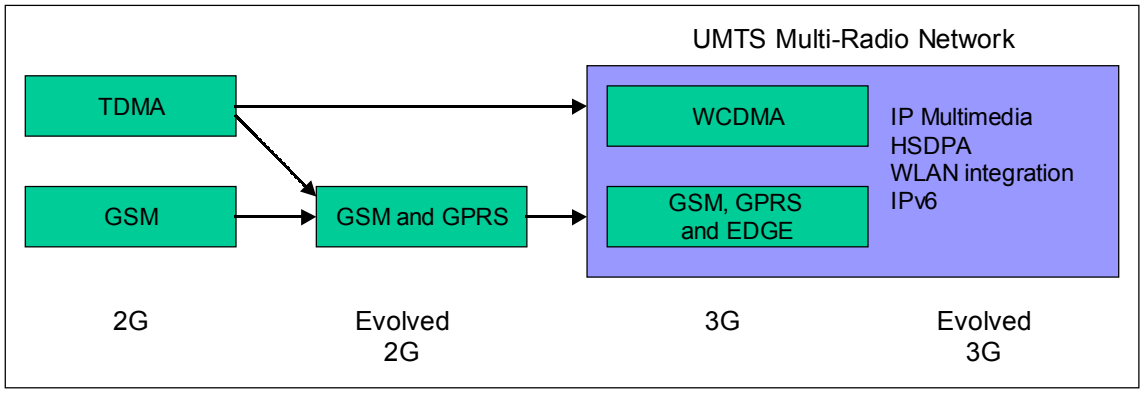


Figure 1: Evolution of Cellular Technologies

Operators with existing GSM networks have enhanced their networks to support GPRS through the addition of the GPRS infrastructure. They have been able to do this using existing cell sites, transceivers and interconnection infrastructures. Meanwhile, operators deploying new GSM networks (e.g., AT&T Wireless, Cingular Wireless, Rogers Wireless, Telecom Personal) have deployed GSM and GPRS simultaneously. TDMA operators who have chosen the GSM evolution path are deploying overlay networks that largely function independently of the TDMA network. These deployments have leveraged existing cell-site facilities, networking transports, and central site resources. Like GSM, GPRS enjoys global scale with over 200 deployed networks. Some analysts forecast total worldwide sales in 2003 of more than 100 million GPRS terminals, which would give GPRS the largest share of the wireless data market. That level of growth quickly develops critical mass: As volumes increase, the cost of GPRS terminals decreases, which in turn increases the size of the GPRS market because falling equipment prices make the service affordable to more people.

The first major upgrade to GPRS is EDGE, a relatively straightforward upgrade to GPRS for GSM carriers. Though EDGE is a highly sophisticated radio technology, it uses the same radio channels and time slots as GSM and GPRS, so it does not require additional spectral resources. In fact, by deploying EDGE, operators can use their existing spectrum more efficiently. For newer GSM/GPRS networks in areas such as the Americas, EDGE is mostly a software upgrade to the BTS and the BSCs, as the transceivers in these networks are already EDGE capable. Some carriers have reported the cost to upgrade to EDGE from GSM/GPRS as low as US$1 to $2 per POP.[3] The same packet infrastructure supports both GPRS and EDGE. Once operators have deployed EDGE, they can enhance its applications capabilities by deploying the IP Multimedia Subsystem in their core networks, which will also support a WCDMA radio access network.

[3] *POP* refers to population.

All networks will be able to take advantage of EDGE because the majority of terminals will support EDGE, facilitating a natural and smooth evolution.

To expand capability and capacity further, operators can deploy UMTS, which is a complementary technology for EDGE, or an alternative. Worldwide, GSM and new 3G operators are beginning UMTS deployments. Though UMTS involves a new radio access network, several factors will facilitate deployment. First is that most UMTS cell sites can be collocated in GSM cell sites, facilitated by multi-radio cabinets that can accommodate GSM/EDGE as well as UMTS equipment. Second is that much of the GSM/GPRS core network can be used. While the SGSN needs to be upgraded, the mobile switching center needs only a simple upgrade and the GGSN stays the same. Once deployed, operators will be able to minimize the costs of managing GSM and UMTS networks, as these networks share many of the same aspects, including:

- Packet-data architecture
- Quality-of-service architecture
- Mobility management
- Subscriber account management

Deployment of UMTS will occur in several stages, beginning first with a portion of the coverage area having UMTS, progressing through continuous UMTS coverage, and then reaching highly integrated, multi-radio operation. The following chart shows this progression.

Deployment Stage	**Characteristics**
Initial UMTS deployment	Only a portion of coverage area has UMTS. GSM provides continuous coverage. UMTS provides enhanced features and capacity relief for GSM.
Enhanced interworking of UMTS and GSM/EDGE	Continuous UMTS coverage. Higher loading in UMTS. Access network chosen based on service and load demands.
Full Multi-radio network capability	Dense deployment of UMTS, including micro cells. Integration of GERAN and UTRAN core equipment. Seamless quality-of-service integration. Addition of new radio technologies, such as WLANs.

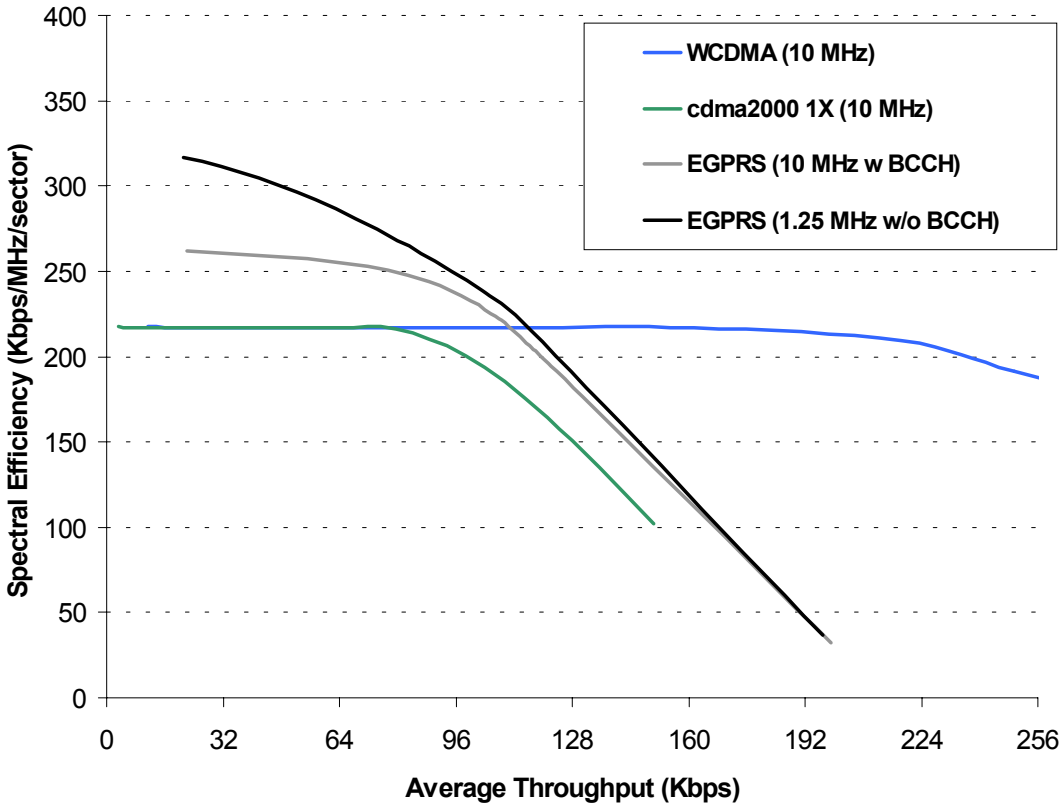
Table 2: Deployment Progression of UMTS

Over time, the separate GSM/EDGE access network (called GERAN) and UMTS access network (called UTRAN) and core infrastructure pieces will undergo consolidation, as shown in further detail in Figure 1. This will lower total network cost and improve integrated operation of the separate access networks.

GPRS, EDGE and UMTS offer operators a series of generationally compatible options to tap the data market. Operators can select the best combination of GPRS, EDGE and W-CDMA because subscribers are automatically switched between networks depending on factors such as coverage. For example, an operator might initially deploy W-CDMA only in major cities, with customers handed to its EDGE or GPRS networks when they travel outside W-CDMA coverage. As a result, W-CDMA customers will always have access to some level of high-speed packet data. The following section discusses the attributes of each of these mutually compatible solutions.

Compared to GPRS, EDGE offers twice the data capacity and three times the throughput. The business case is even more compelling in light of the cost: some operators, for example, expect to spend $1 to $2 per POP to deploy EDGE on top of its recently installed GSM/GPRS network, which requires only new software and channel cards at the base stations. (The amount depends on factors such as whether an operator uses the EDGE deployment as an opportunity to replace old cell site equipment.)

As a result, the investment in EDGE doesn't take long to start generating a return. The low upgrade cost also means that an EDGE operator can price its service competitively and thus attract the widest possible market. EDGE supports a theoretical maximum data rate of 473 kbps, with real-world rates of 80-130 kbps, depending on factors such as the terminal's design. But throughput isn't the only metric worth noting. At data rates below 100 kbps, EDGE is the most spectrally efficient wireless technology available when comparing it with CDMA2000 1XRTT, GPRS and WCDMA. That asset is particularly attractive to operators with saturated networks. With EDGE, they can offer high-speed data services without first purchasing additional spectrum — if it's even available — or increasing the chances that users on all services will suffer more dropped or blocked calls.

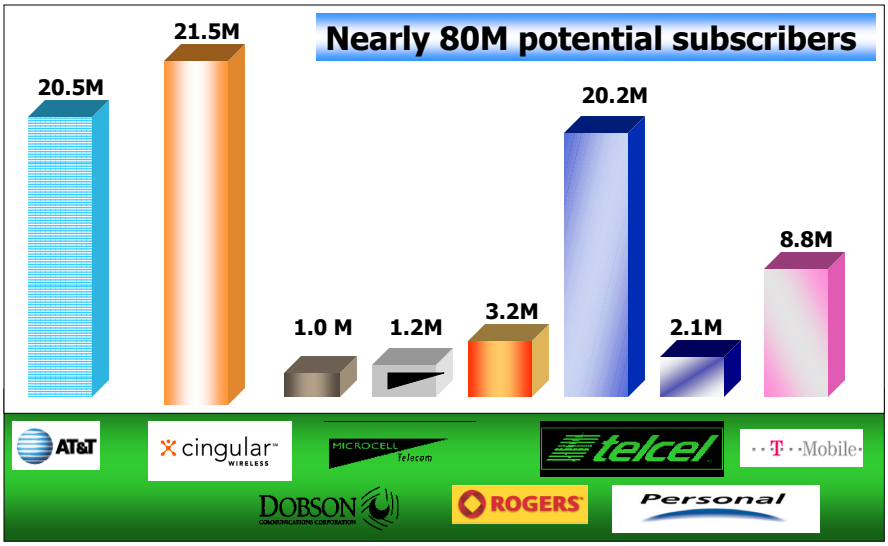


Spectral Efficiency Based on Average Throughput

Source: Peter Rysavy, Rysavy Research, November 2002

Just as important, EDGE infrastructure is being installed now. AT&T Wireless and Cingular Wireless are among the several operators that are already deploying EDGE infrastructure for a commercial launch in 2003. EDGE soon will be the fastest wireless service available from major mobile operators in the Americas.

EDGE Commitments in the Americas



Source: EMC World Cellular Database, Sept 2002

EDGE also highlights the flexibility of GSM's migration path. For example, an operator might initially deploy EDGE only in major cities, where the population density translates into a large pool of potential customers. As EDGE customers travel outside of the cities, they would be automatically switched to the operator's GPRS network. With the two technologies complementing each other, EDGE customers know that wherever they travel, they'll have some level of high-speed packet data service. As the wireless data market matures and adoption increases, the operator then can expand EDGE coverage outside of cities.

EDGE also can complement W-CDMA by allowing the operator to put the right service in the right market. For example, an operator might not be able to make a business case for deploying W-CDMA in sparsely populated areas. But the low cost of deploying EDGE makes it an ideal service outside of cities, where it serves not just customers who live in rural areas but W-CDMA customers traveling to those areas with dual mode WCDMA/EDGE handsets.

IV. CONCLUSION

The GSM migration to 3G will become the pre-eminent technology platform for the Americas and defacto world standard due to its increased voice capacity, high speed packet data, global scale, roaming and efficient evolution to 3G services. The GSM to GPRS to EDGE to UMTS pathway provides the most practical and efficient migration from 2G to 3G services. This evolution occurs in successive stages, with each stage increasing data throughputs and spectral efficiency, and adding new features such as quality-of-service and multimedia support. The migration and benefits of the evolution from GSM to UMTS is both practical and inevitable. Combined with the ability to roam globally, huge economies of scale, widespread acceptance by operators, complementary services such as multimedia messaging and a wide variety of competitive handsets, the result is a compelling technology for both users and operators. UMTS is already the world's most selected third-generation technology, with support from nearly all major regional standardization bodies. It offers an excellent migration path for existing TDMA and GSM operators and a path also available to CDMA operators. Specific benefits and features of the GSM evolution to UMTS begin with GPRS, an IP-based packet-data capability for GSM networks with average user-perceived throughputs of up to 40 Kbit/s, and the option to increase these with coding schemes 1-4. GPRS support for a wide range of business and consumer applications will drive demand for data service and will generate new revenue for operators. Beyond GPRS, EDGE provides a cost-effective 3G solution for operators to upgrade to an ITU-approved 3G technology. EDGE provides operators significantly higher data rates and improved efficiency. Using advanced radio networks, EDGE promises to be one of the most spectrally efficient technologies available for cellular-data services. The risk of implementing EDGE into a network is minimal as it is an incremental investment that leverages the existing GPRS network.

As demand for data services grows, operators can deploy UMTS networks, which bring an entire new set of capabilities, particularly the support for high-bandwidth applications. Whereas EDGE is

extremely efficient for narrowband data services, the WCDMA radio link is extremely efficient for wideband services. Combined with a comprehensive quality-of-service framework and multimedia support, a network using both EDGE and WCDMA provides an optimal solution for a broad range of usages. This solution is further enhanced by the deployment of High Speed Downlink Packet Access, an extremely fast data service with peak speeds of up to 10 Mbit/s, the highest rate available for any cellular technology. With the continued growth in mobile computing, powerful new handheld computing platforms, an increasing amount of mobile content, multimedia messaging, mobile commerce, and location services, wireless data will inevitably become a huge industry. GPRS/EDGE/UMTS/HSDPA provides an optimum framework for realizing this potential.

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