

# It's about services that make money –

## The AMPS and TDMA roadmap to 3G

Operators of AMPS and TDMA networks have a choice of 3G evolution strategies that ultimately result in the deployment of different 3G technologies.

Many operators are choosing to migrate to 3G through the GSM technology family: GSM, GPRS, EDGE and WCDMA. Others may consider CDMA2000, via its evolution phases 1X, 1xEV-DO and 1xEV-DV.

The choice to be made by TDMA operators is not one that can be based simply on technology issues; wider commercial issues need to be taken into consideration as well.

This paper sets out the business and technology rationales that have already convinced some leading TDMA operators to choose the GSM technology family as the best platform for them to compete in the global 3G communications market.

The first step in this evolution strategy is migrating from AMPS and TDMA to GSM.

### The business case for the global mobile standard

TDMA is a very successful digital mobile standard, especially in the Americas, where it serves

approaching 80 million subscribers. Worldwide, there are over 81.3 million TDMA subscribers (*Figures for end July 2001. Source: EMC World Cellular Database*).

However, GSM has become the most popular mobile standard in the world, with more than 565 million subscribers (July 2001) in 400 networks in 171 countries worldwide, and up to 20 million being added every month. In fact, outside of Japan, GSM accounted for 78 per cent of all new mobile subscriptions during the first five months of 2001 (see Figure 1). (*Source: EMC World Cellular Database*).

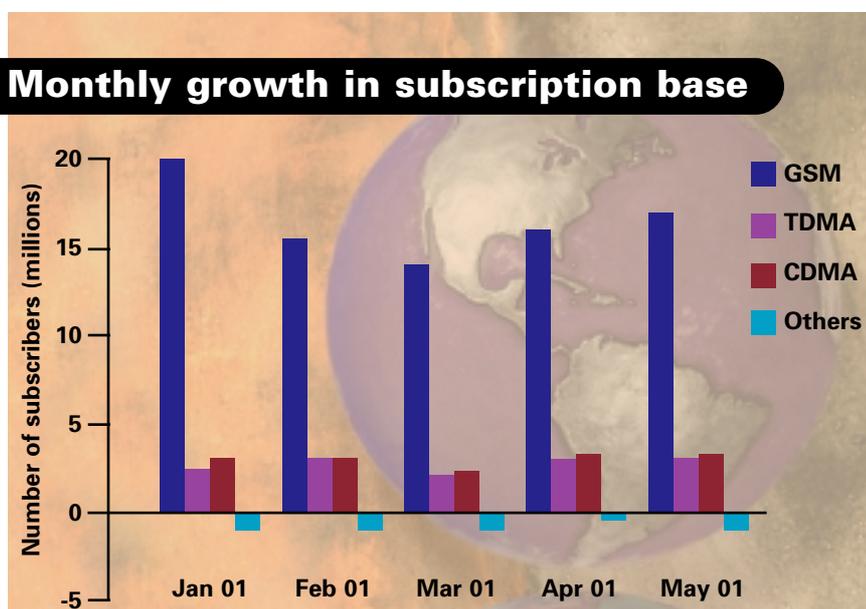


Figure 1

It is also apparent that UMTS, the 3G evolution of GSM that is based on WCDMA radio technology, will become the most widely accepted world system standard for 3G mobile communications.

After evaluation by operators around the world, 90 per cent have already chosen UMTS systems – including CDMA IS-95 in Japan and Korea, where GSM has had no presence in the past. It is estimated that by 2005 there will be 1.2 billion GSM/WCDMA subscribers, compared to 0.4 billion for all other standards combined. These 1.2 billion GSM/WCDMA subscribers will account for three-quarters of the

total mobile subscriber base. *(Industry source.)*

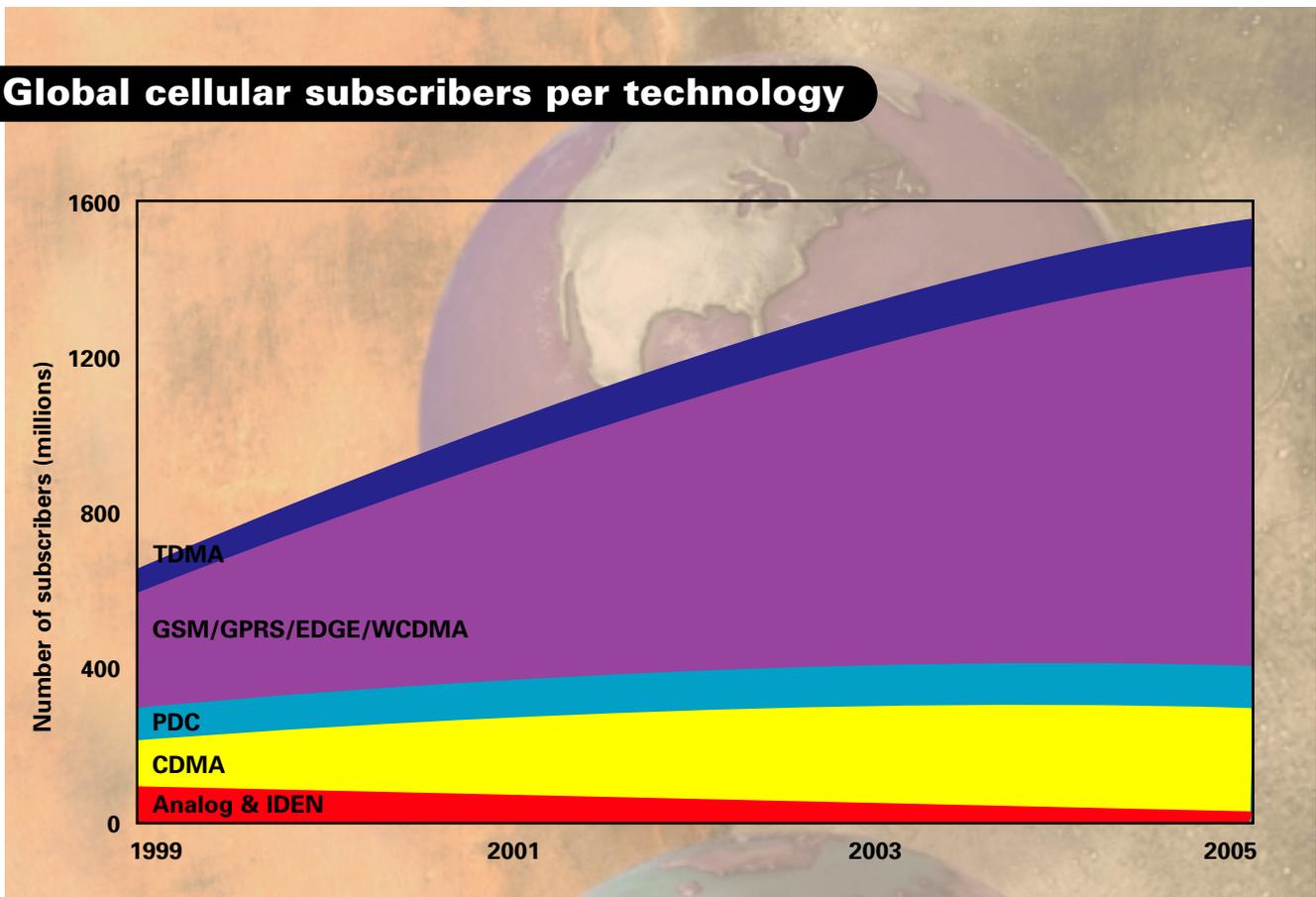
It is clear, therefore, that GSM/WCDMA subscribers will have the most globally accepted standard for international roaming. Subscriber roaming is a significant revenue generation opportunity for operators. In a study produced by Strategis Group for the UWCC, it was found that in just eight countries (US, Argentina, Brazil, Chile, Colombia, Mexico, Venezuela and Hong Kong) potential revenues from business and leisure international travel in 2000 could have reached \$482 million. This figure is expected to grow to over

\$930 million in 2003. The global presence of GSM/GPRS/EDGE/WCDMA is illustrated in Figure 2.

A global community of this scale results in substantial end-to-end economies of scale, from infrastructure through applications to handsets. Likewise, due to the size of the market, there are more major vendors and developers supplying GSM-based products than any other technology.

So, by choosing the GSM technology family, TDMA operators can benefit from the widest choice of handsets and applications, and the largest, most active development community.

**Figure 2**





GSM's economies of scale may also result in lower infrastructure, terminal or operating costs.

What's more, most leading GSM vendors, including Ericsson, Lucent, Motorola and Nokia, have now announced GSM systems for 850MHz – the band most widely used for current TDMA (and analogue AMPS) mobile services.

TDMA operators who have access to spectrum in the 850MHz and 1900MHz bands will be able to deploy GSM in the 1900 band straight away, while continuing to serve TDMA subscribers in the 850 band, where GSM can be migrated at the operator's own pace according to their business case and market demand. There are also operators in Asia (Malaysia, Thailand, Philippines, Hong Kong and Taiwan) with TDMA systems in the 850MHz band, who simultaneously have 1800MHz systems. The opportunity for this kind of staged migration to GSM is open to these operators.

Dual band, dual mode GAIT mobile phones with service translation will provide roaming between TDMA and GSM, allowing subscribers to access services regardless of which network they are on.

It is such commercial considerations that have already convinced several leading TDMA operators to choose the GSM technology family for 3G communications.

AT&T Wireless (US) was the first to announce its decision to move to GSM/GPRS in November 2000. Since then, Rogers AT&T Wireless in Canada, Telcel in Mexico, Telemovil in Bolivia, Cingular Wireless in the US and Telecom Personal in Argentina have also chosen, or indicated their preference for, the GSM path. AT&T Wireless has now launched service on its GSM/GPRS network in the US, and the installation of Rogers AT&T Wireless' Canadian GSM/GPRS network is complete, with service due to be launched this autumn.

TDMA operators are also recognizing the benefits of deploying EDGE, to provide increased capacity quickly and cheaply in existing frequency bands including 850MHz. This will enable them to reap the revenues from full 3G services, fast, with an evolved GSM/GPRS/EDGE network. AT&T Wireless and Cingular Wireless (US), Rogers AT&T Wireless (Canada) and Mexico's Telcel have already announced their intentions to launch EDGE.

### **Subscribers pay for services, not technologies**

GSM is evolving to enable higher data rates and increased capacity. But it is services and applications and value that drive the number of mobile subscribers, and level of usage. Innovation, functionality, smart packaging and competitive pricing – not raw data rates – will win and retain subscribers, and increase ARPU (Average Revenue Per User).

Subscribers already value GSM's service capabilities in areas such as global roaming and SIM card-based portability, and user-friendly services such as two-way text messaging. The service potential for GSM is set to expand exponentially, with the arrival of high-speed, packet data-based 'always on' Mobile Internet connectivity offered by GPRS; mobile portals; secure mobile transactions; multimedia messaging and seamless synchronization with Personal Information Management (PIM).

Furthermore, GSM networks are evolving into a layered, more open architecture in which the development and delivery of services is logically separated from the underlying network infrastructure that delivers them. This will enable



greater creativity and flexibility in the creation of service packages, with the involvement of many more players, such as media and entertainment companies, financial firms and retailers.

Because GSM has the largest global share of subscribers, the application developer community is aggressively and rapidly producing innovative Mobile Internet services in areas such as mobile commerce; infotainment – for example games, music and video, news; location-based services, and messaging and businesses services like mobile intranet.

The GSM brand will also support operators in their efforts to market Mobile Internet services effectively to customers across the world. It is an extremely well-known and trusted global brand, and that is likely to lead to faster acceptance and take-up by customers of new types of service.

All leading GSM vendors have established cross-industry partnerships and third-party application development programs that have already attracted many thousands of developers into the Mobile Internet arena. The inclusion of today's AMPS and TDMA operators and vendors in this global application and service development community will add considerable new resources and energy.

#### **Global players need a global standard**

GSM is the only mobile standard that offers a truly global footprint. It has a proven track record of innovation and meeting ever-increasing capacity

demands, and has an evolution path designed to cater for subscriber growth, and traffic growth in both voice and data.

The rise in usage of Mobile Internet and data services in general will drive a traffic boom. Data traffic is estimated to grow by a factor of seven between 2003 and 2006, while voice traffic will double over the same period (*Industry source*).

What's more, end-users will expect to have seamless global roaming, regardless of technology and location.

The trend towards 'meganetwork' mobile operators – serving five million or more subscribers – is already visible. Mobile service providers are getting bigger and competing on a global scale.

These operators need a common global solution, capable of handling the expected traffic boom, data capacity and number of subscribers. GSM is the only solution proven to be able to handle networks of this size, and on such a global scale.

The ubiquity of GSM is also driving global standards for open interfaces in all aspects of mobile communications and IT. GSM base stations and switches produced by any one vendor, for example, can interoperate with base stations and switches produced by any other. This kind of off-the-shelf availability and compatibility of network infrastructure from different competing suppliers enables the rapid roll-out of services – essential if operators are to compete on a global scale.

#### **Smooth, flexible migration strategy**

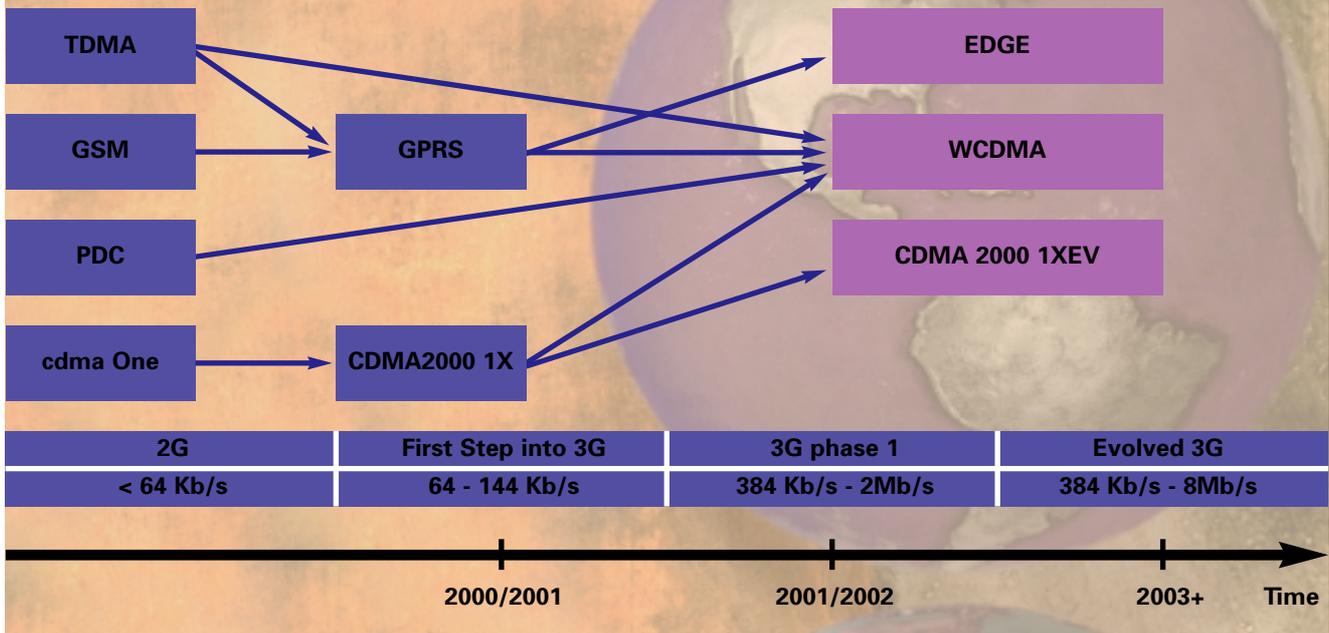
Figure 3 illustrates migration paths to 3G of each existing technology, including GSM.

The GSM evolution path is closely linked to the expected traffic boom resulting from exponential growth in Mobile Internet services, and continued strong growth in voice services. GPRS is being introduced as the first step to meeting increasing demand for data services, and will be followed by EDGE and WCDMA, which will increase capacity and add new data capabilities.

Following the GSM/GPRS/EDGE/WCDMA path offers a gradual, graceful upgrading of technology that is a lower risk than making a big leap, and allows for a 'pay as you grow' approach. Operators also get the chance to test and develop possible 3G services and business models as they go, and prepare the market for new types of service.

The migration path is a smooth, cost-effective process which allows operators to capitalize on existing investments by upgrading their original GSM network, re-using much of the same infrastructure, and without needing to change the operation and maintenance system. Both EDGE and WCDMA, for example, use the same GPRS backbone for packet data services. The 3GPP is currently defining standards for interoperability between GERAN (GSM/EDGE Radio Access Network) and UTRAN (Universal Terrestrial Radio Access

## Evolution of mobile systems



**Figure 3**

Network), allowing the two standards to co-exist in operators' networks.

The GSM evolution path, therefore, offers TDMA operators a way to deliver commercial Mobile Internet services in a timely manner with a low investment, while maintaining necessary quality of service for end-users throughout the evolutionary process.

### GPRS

For TDMA operators who deploy GSM, the first key step on the road to 3G communications is the deployment of GPRS, which introduces packet switching capability. Building the GPRS infrastructure is

fast and cost-efficient, as it is essentially an extension of the GSM network.

By the end of 2001 there will be 126 GSM/GPRS networks on air throughout the world (*Source: EMC World Cellular Database*), compared to only 18 CDMA 1xRTT networks (*Industry source*). GPRS will be offering data rates of up to 115kbit/s, with initial user data rates of typically 40-50kbit/s. This is sufficient to support many attractive Mobile Internet services, like sending and receiving e-mail on the move, on-line share dealing, and telematics applications. More important, GPRS enables users to be 'always on' to

the Mobile Internet – able to send and receive messages and access Mobile Internet sites in an instant.

The capabilities of these GSM/GPRS networks can then be enhanced by EDGE and, if the operator has the required spectrum, WCDMA. The GSM/GPRS packet core network becomes the foundation for GPRS/EDGE and WCDMA, to deliver the full suite of 3G services and applications.

### EDGE

By deploying EDGE, a 3G radio technology that boosts capacity and throughput through more efficient use

of radio spectrum in existing frequency bands, operators can offer typical user data rates of 100-120kbit/s, with up to 384kbit/s wide area coverage. This is enough to deliver full 3G Mobile Internet services, including new services such as watching movie previews, and sending multimedia messages such as digital postcards with video attachments.

EDGE can be implemented within an existing GSM license to bring 3G service capabilities, fast, to a current GSM-based network, without the need for additional spectrum. This allows operators to gain commercial experience with global packet data services and generate additional revenues from existing resources.

Adding EDGE to a GSM/GPRS network is straightforward, requires a low investment and carries little risk. EDGE uses the same TDMA frame structure, logic channel and 200kHz carrier bandwidth as today's GSM networks, so that, in most cases,

existing base station equipment, carrier bandwidth and timeslot structure can be re-used.

#### **New spectrum**

For operators that have licenses to operate in new 3G radio spectrum, the next step will be the introduction of wideband radio access with WCDMA, which has been developed to give user data rates of initially up to 2Mbit/s – enabling multimedia services.

WCDMA is the most widely accepted and geographically complete 3G technology in the world. It will be deployed globally, including in the Americas, China, Europe, Japan and Korea. It is intended for initial deployment in the 2GHz frequency band where new spectrum bands will allow the full benefits of the technology to be exploited. For example, just one 5MHz WCDMA carrier will be able to handle mixed services, ranging in speed from 8kbit/s to 2Mbit/s, and user devices

will be able to access several different services simultaneously.

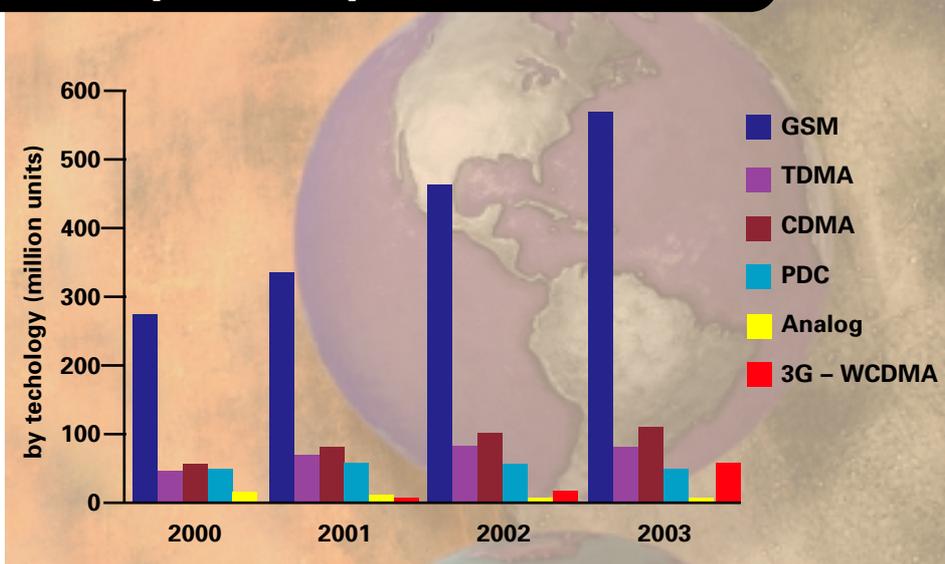
Development work on the evolution of WCDMA to deliver even higher data rates to support evolving applications is already underway.

#### **EDGE and WCDMA**

EDGE plays a valuable role, existing in parallel with UMTS/WCDMA. Operators will gain increased capacity and an early 3G market share by deploying EDGE to give rapid, cost-effective 3G coverage and seamless roaming, while UMTS/WCDMA is rolled out in a controlled way, focusing on urban areas first, allowing for balanced expenditure over time.

By rolling out EDGE and WCDMA at the same time operators can reduce cost. It is estimated that operators could save up to 50 per cent of capital expenditure with a combined EDGE/WCDMA rollout (*Source: Northstream report*).

## **Mobile phone shipment**



**Figure 4**

### Choice of mobile devices

In all consumer-driven markets, choice is an increasingly important factor in winning and retaining business. In mobile communications that means offering a choice of mobile devices. Design, form, features and image of mobile devices are key criteria in subscribers' mobile service purchase decisions.

In parallel, mobile subscribers are changing their phones more frequently as choice increases and the development cycle shortens. Younger consumers tend to change their phones more often and are early adopters of Mobile Internet services.

The availability of terminals is also crucial to the success of a mobile communications technology.

Leading handset manufacturers prioritize GSM/GPRS, as it is by far the largest-volume market, as illustrated in Figure 4.

GSM/GPRS mobile phones are available in a wide variety of styles, and with the best features and

capabilities. Almost all GSM phones are dual- or triple band, allowing seamless international roaming. As a result of the global GSM footprint, triple-band GSM phones are becoming the standard communications device.

Furthermore, GSM phones are also expected to be cheaper and offer lower usage costs than those for competing standards.

### Summary

In the Mobile Internet future, revenue will be driven by the value of services, applications and content, and not by pure technology advantage alone. The mass market take-up of the Mobile Internet is dependent on end-users being able to access this value-creating content quickly, easily and cheaply.

GSM is the only mobile standard with the evolution path, worldwide footprint, economies of scale, choice of user devices and large-scale independent application development community to make 3G-enabled Mobile Internet services a truly global success.

### Glossary of terms

<b>3GPP</b>	3GPP – Third Generation Partnership Project
<b>AMPS</b>	Advanced Mobile Phone System
<b>EDGE</b>	Enhanced Data rates for Global Evolution
<b>GAIT</b>	GSM ANSI 136 Interoperability Team
<b>GERAN</b>	GSM/EDGE Radio Access Network
<b>GPRS</b>	General Packet Radio Service
<b>GSA</b>	Global mobile Suppliers Association
<b>GSM</b>	Global System for Mobile communications
<b>TDMA</b>	Time Division Multiple Access
<b>UMTS</b>	Universal Mobile Telecommunications System
<b>UTRAN</b>	Universal Terrestrial Radio Access Network
<b>UWCC</b>	Universal Wireless Communications Consortium
<b>WCDMA</b>	Wideband Code Division Multiple Access

