Exploiting the full opportunity
of 2.5G and 3G networks

Contents

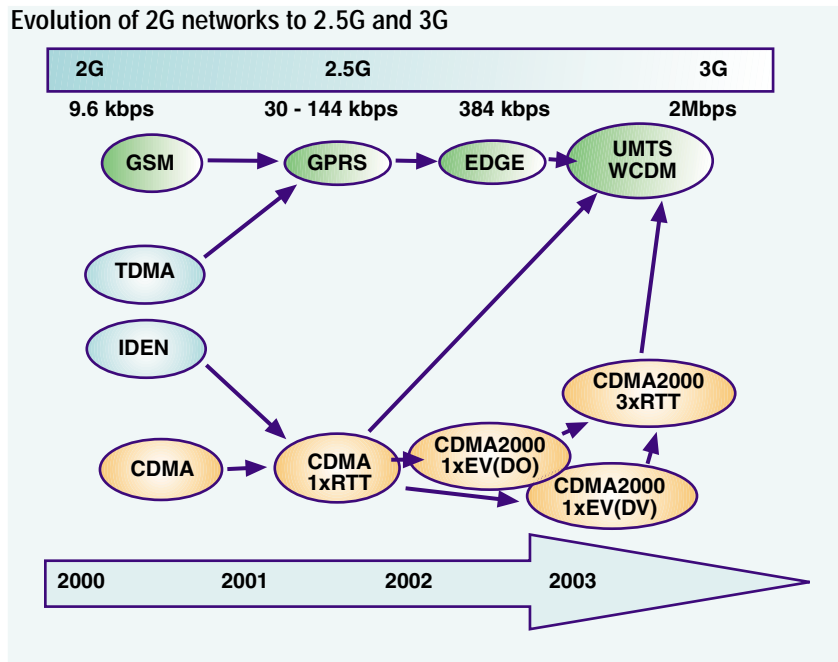Introduction

3G is generating a lot of excitement in the telecommunications, Information Technology (IT) and Internet industries. This powerful new infrastructure will allow ubiquitous, always-on, high-speed access to voice, data and multimedia services. This paper outlines the IBM view on how this new level of Internet access will bring with it a multiplicity of new business opportunities.

For governments, 3G spectrum license auctions have proven to be an opportunity to collect tremendous fees from Wireless Service Providers. In April 2000, the UK 3G license auction earned the British Exchequer a total of $35 billion from five Wireless Service Providers. For Telecommunications Equipment Manufacturers, 3G network infrastructure is a complete redeployment of new equipment, replacing the legacy 2G infrastructure. Nokia has valued this market as high as $30 billion for the 2001-2004 period. For Internet content providers, 3G represents the wireless high-bandwidth Internet Protocol (IP) — based channel they dreamed of for delivering multimedia content to mobile subscribers. For IT providers, because 3G is about delivering data and applications in addition to voice services, it requires a full-scale wireless e-business infrastructure on top of the existing network infrastructure to access, deliver and manage data content. For Wireless Service Providers, 3G means the ability to deliver new data services to subscribers that could reverse the trend of declining Average Revenue per User (ARPU) and increasing profits for voice services.

Today, however, as Wireless Service Providers assess the high costs of deploying 3G services and the accompanying technical difficulties such as 3G handset and network infrastructure readiness, many plan to leverage their 2.5G networks (packet data overlays over existing 2G networks) as short-term drivers for wireless data revenue growth over the next 2-3 years.

Evolution of 2G networks to 2.5G and 3G

2G	2.5G		3G
9.6 kbps	30 - 144 kbps	384 kbps	2Mbps

GSM → GPRS → EDGE → UMTS WCDM

TDMA

IDEN

CDMA → CDMA 1xRTT → CDMA2000 1xEV(DO) → CDMA2000 3xRTT

CDMA2000 1xEV(DV)

| 2000 | 2001 | 2002 | 2003 |

The 2.5G/3G business opportunity for Wireless Service Providers

Today's 2G networks have limited data capability. Wireless Application Protocol (WAP) subscribers on GSM phones have been disappointed with long connection times and slow bit rates, typically around 9.6 kbps. As 2G networks move to 2.5G, subscribers will enjoy always-on connectivity as well as higher bit rates in the multiples of ten kbps that will allow them to experience IP-based data services comparable to those available today through a dial-in modem.

Two or three years ahead, 3G networks will bring even higher bit rates at lower cost, allowing affordable multimedia services and providing an end-to-end IP connection for the mobile subscriber. Subscribers will then enjoy capabilities similar to today's fixed-line Internet services with significant add-ons such as location-based and highly personalized services.

For Wireless Service Providers, the advent of 2.5 and 3G networks represents a shift from what was a voice-centric business model to one focused on providing multimedia data-oriented services. They are beginning already to see significant revenues for data services. As an example, the NTT DoCoMo i-mode data offering currently represents 16% of their ARPU and NTT DoCoMo expects that with the Freedom of Mobile Multimedia Access (FOMA),

Examples of bit rates and costs of data transmission for 2G, 2.5G and 3G networks

Bit Rates	2G	2.5G	3G
CDMA Family	19.2 kbps	40-60 kbps (1xRTT)	300-600 kbps and up
GSM Family	9.6 - 14.4 kbps	20-30 kbps per GPRS channel	144 kbps (high mobility) to 2Mbps (stationary)
Cost of transmission per Mbps	$ 0.80 and up	$ 0.20 and up	$ 0.02 and up

its 3G offering will account for 50% of the overall traffic in 2005. Other Wireless Service Providers also expect 2.5G and 3G data services to represent significant percentages of their revenues and profits. The Universal Mobile Telecommunications System (UMTS) Forum predicts that by 2010 data services will represent $300 billion or 66% of all worldwide 3G revenues.

Subscriber services
For consumers, 2.5G and 3G networks will bring access to the Internet, with near wireline transmission quality. 2.5G services will mostly be text-based with still images and short audio clips. Services will include e-mail, instant messaging, image downloads, non-graphical m-commerce (mobile commerce) transactions and text-based Web browsing for realtime information such as weather, traffic reports, stock quotes, sports results, games and directories. As networks migrate to 3G, these same services will be enriched with multimedia content including full audio and video clips.

For enterprises, 2.5G networks will allow access to business applications and databases including corporate e-mail and intranets, increasing mobile worker, sales force and field force productivity. This ability to extend corporate IT systems to managers and employees on the move is already producing real cost savings. One large public utility which equipped its 600-member field force with wireless devices accessing corporate network maintenance systems realized a return on investment within eight months. In the future, 3G capabilities will enable even greater benefits from wireless business applications through Voice over Internet Protocol (VoIP), rapid file transfer and videoconferencing.

The Wireless Service Provider challenge

In a 2G voice-centric world, Wireless Service Providers enjoy a vertically integrated value chain model in which they control the services they produce and their distribution channels. In the current shift from voice to data services, many new players including content providers, content aggregators and Application Service Providers (ASPs) are entering the value chain and need to be leveraged as part of the Wireless Service Provider's strategy.

Examples of Data Services for 2G, 2.5G and 3G networks

Services	2G	2.5G	3G
e-mail	Short Messages (SMS)	Text-based with small attachments	Full Attachments
Instant Messaging	Short Messages (SMS)	Text-based	With Audio/Video Clips
Web Browsing	Short Text Screens	100KB Web (text+image) page takes approx. 30 seconds to download	100KB Web page takes approx. 2 seconds to download
Streaming Audio/Video	No	Short clips	Yes
VoIP	No	Limited	Yes
File Transfers	No	500KB document takes approx. 2 mn to download	500KB document takes approx. 10 seconds to download
Access to Corporate Applications	Very limited	Text-based	Yes
Access to corporate intranet, Databases	Very limited	Text-based	Yes
Location-based Services	No	Limited	Yes

The key challenge for Wireless Service Providers is to reverse the decline in ARPU and reduce churn. With voice services becoming a commodity, data services and value-add voice services represent excellent opportunities to improve profitability. The value chain for data services is both more sophisticated and complex than the voice counterpart and revenue from these services will be split among many parties. Content providers, application providers, aggregators, Wireless Service Providers and financial institutions will all want their piece of the pie. Through providing the wireless

infrastructure and their own selected services, the Wireless Service Providers
can create an environment which encourages other companies to participate
with additional revenue-generating services. In this environment, the Wireless
Service Provider's contribution to the value chain will vary from just transport
and delivery of data to being a provider of sophisticated services to consumers
and enterprises.

Wireless Service Providers can manage this value chain by achieving the
wireless data "virtuous circle": low cost of entry and appealing content driving
more data subscribers, which will attract more content providers eager to sell
their services to a large and growing subscriber base, which in turn will attract
more subscribers. A key enabler of this strategy is the wireless e-business
infrastructure. It has to be flexible and scalable enough to capture new content
and subscribers, and intelligent enough to provide marketers information
about which content appeals most to current and prospective customers. The
wireless e-business infrastructure must therefore have the ability to match the
right content to each subscriber and offer highly personalized services. The
Wireless Service Provider must provide a seemingly unlimited set of content
and applications, while staying in control of the value chain. This means
development of revenue streams from both subscribers and content providers.

Personalized services
The ability to provide subscribers highly personalized services is critical in
preventing churn and maximizing the ARPU for data services. Always-on
capability of 2.5G networks will allow Wireless Service Providers to "push"
realtime information to subscribers. Examples might include pushing urgent
e-mails to executives, critical medical information from hospitals or patients
to doctors, and emergency hotline information to the police. In addition to
realtime notification options, subscribers could customize personal profiles
and receive personalized information. The executive could choose to receive
only urgent e-mails from customers. The doctor might choose to receive
medical information only for patients listed in critical condition. A police
officer could choose to receive emergency hotline information only when
the location of the caller was less than five miles from the officer's current
location. As 2.5G and 3G networks are capable of identifying the subscriber's
current location, Wireless Service Providers hold a unique personalization
parameter for use in planning and delivering useful services. Providing
realtime driving directions, guidance to the nearest service station, and

locations of friends and relatives are among the many services which could be sold by content providers purchasing the location information from the Wireless Service Provider.

The 3G business case

The tremendous expense of deploying 3G, including enormous 3G license costs, national 3G network deployment and 3G handset subsidies, make it challenging for Wireless Service Providers to realize a Return on Investment (ROI) in less than 10-12 years and to develop an attractive business plan. Cumulative costs of deploying all the 2G networks in the United States between 1990 and 2000 were about $250 per subscriber. The example below demonstrates that, to deploy a 3G network, each Wireless Service Provider will need to invest more than the entire industry invested in 2G networks for the United States.

**Example of 3G deployment costs for a Wireless Service Provider**

	Costs
3G license	$0 to $600 per subscriber
3G network infrastructure deployment	$100 to $300 per subscriber
3G handset subsidies	$200 to $300 per handset
3G wireless e-business infrastructure	$2 to $4 per subscriber

For these reasons, many Wireless Service Providers are focusing on maximizing return for their ongoing 2.5G deployments, a reasonable capital expenditure in the range of $20 per subscriber, and developing a full range of 2.5G services before leaping to 3G. China Mobile, the leading Chinese GSM carrier with 78 million subscribers, is among these, announcing that, as the coming four years will still see predominantly 2.5G technology, they will be moving cautiously toward 3G.

The Infrastructure to deliver 2.5G/3G

Delivering wireless data services with an adequate level of openness, performance and reliability requires a specialized e-business infrastructure acting as middleware between the 2.5G/3G networks and the various content and applications. Following is a brief description of some key components of this infrastructure.

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Wireless e-business infrastructure
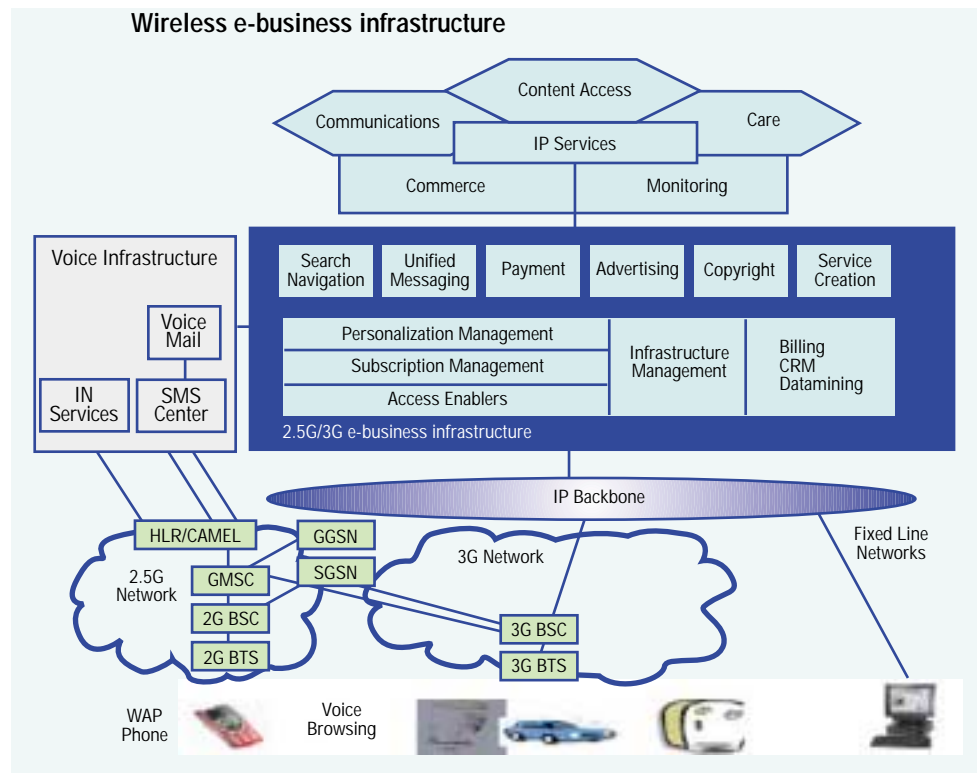
Access Enablers interface with the different networks and devices:

- Gateways provide protocol translation from http to wtp, sms and fax.
- Transcoders translate html pages to formats supported by the smaller screens of the mobile devices like wml and chtml.
- Content push is an important feature that differentiates the wireless Internet services from the fixed-line Internet services and provides the ability to deliver unsolicited content to the end user. An example of content push would be an airline check-in application, where once a passenger has checked in for a flight, flight updates can be delivered periodically to their mobile device. This type of content push has been rated highly by customers in terms of its value.
- Synchronization is important for keeping all the data coherent as it is moved and stored on various devices and servers.

Subscription Management allows the subscriber to configure services and gain access to services for which he is approved. Access control and security are key functions for this layer. Subscription Management also links to provisioning and billing systems.
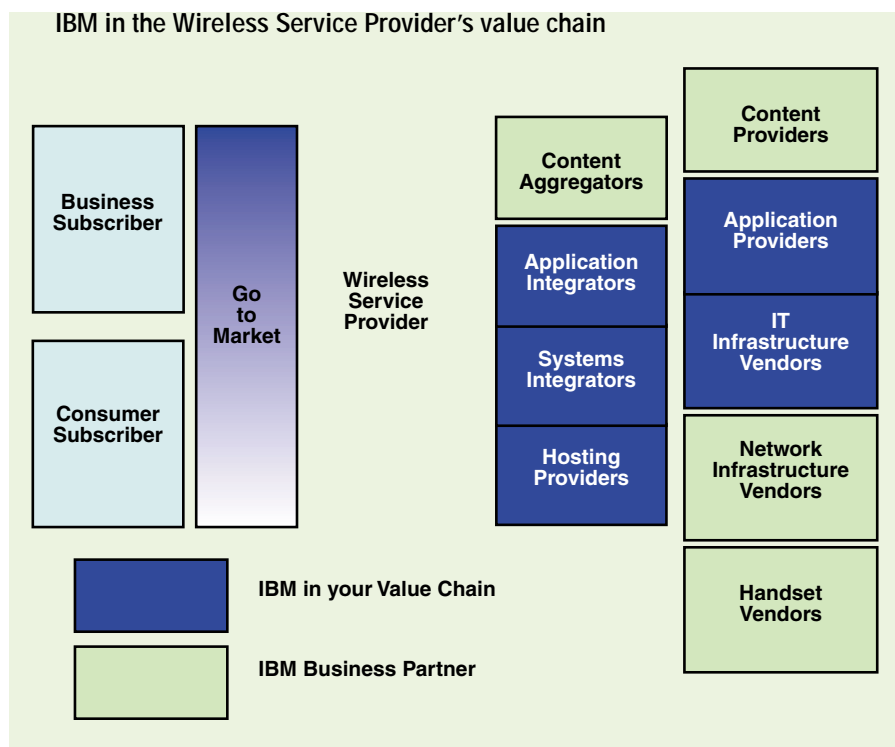
Personalization Management provides tailored services to the subscriber, depending on subscriber location, time of day, subscriber preferences or habits registered from previous use. To make personalized services available, the Wireless Service Provider needs to have data mining capabilities to analyze subscriber transactions and refine understanding of the customer's needs and habits. This capability is an important asset which can be marketed to content providers and advertisers.

Infrastructure Management helps keep the wireless e-business infrastructure up and running by scaling to accommodate varying subscriber and content access, delivering rapid response times, and providing data integrity and transaction logging. Other key elements of the infrastructure include Device Management, such as Over the Air (OTA) provisioning of terminals to manage the level of software on devices in a cost-effective manner, and Quality of Service (QoS) Management to help ensure customer service commitments are met.

On top of these infrastructure functions, most Wireless Service Providers will deliver services of their own, including search and navigation, unified messaging, wireless payments, advertisement content management and copyright management for distribution of protected content to their subscribers. The infrastructure also must accommodate other content providers to deliver services such as banking, shopping, entertainment, business applications, telematics and home automation.

IBM in the Wireless Service Provider's value chain

As a global market leader in e-business solutions and development of wireless e-business infrastructure, IBM can help Wireless Service Providers maximize their ROI in 2.5G and 3G data services through a variety of offerings. With more than 1500 dedicated wireless professionals, IBM provides assistance in all phases of wireless e-business infrastructure deployment, from strategy, technology analysis and design, to systems integration and deployment.

IBM in the Wireless Service Provider's value chain

Business Subscriber	Content Aggregators
Consumer Subscriber	Application Integrators
Go to Market	Systems Integrators
Wireless Service Provider	Hosting Providers

Content Providers

Application Providers

IT Infrastructure Vendors

Network Infrastructure Vendors

Handset Vendors

■ IBM in your Value Chain

■ IBM Business Partner

IBM also provides support through resources like the IBM Wireless Network Innovation Lab, which is working with Wireless Service Providers across the globe to implement next-generation wireless end-to-end solutions using best-of-breed off-the-shelf products. To provide leading-edge integrated solutions for Wireless Service Providers, IBM is working with other industry leaders including:
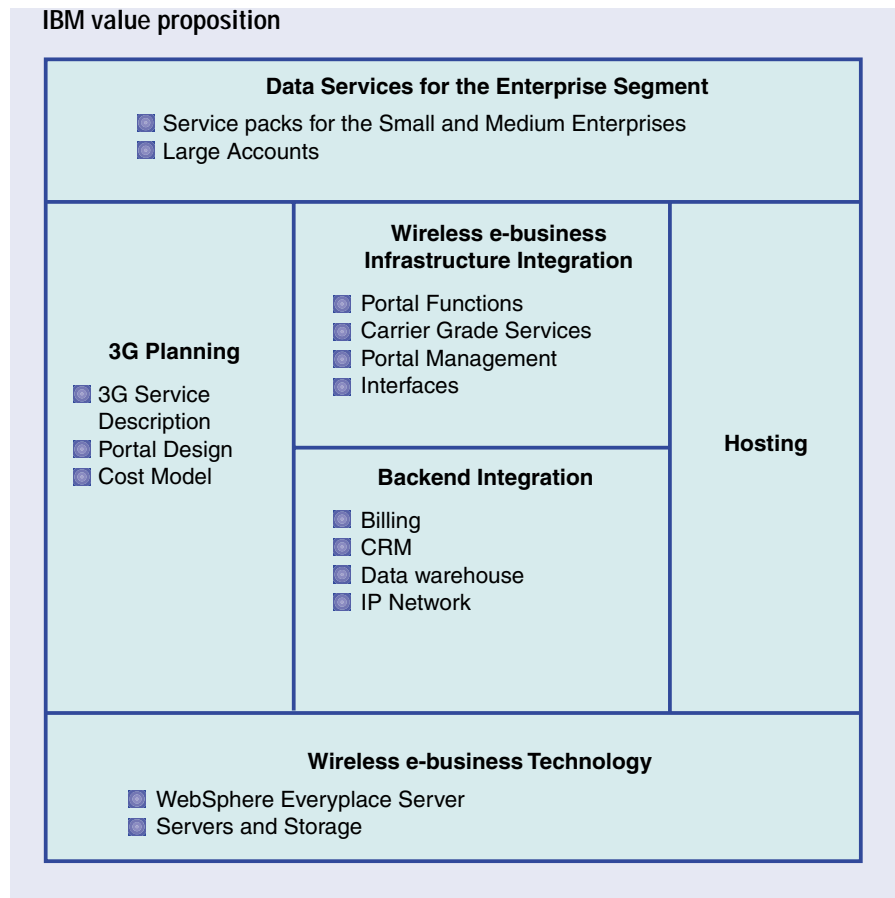
• Handset vendors, such as 3Com,® Ericsson™ and Palm™
• Network infrastructure vendors such as Alcatel,® Ericsson, Nokia,® Nortel Networks™ and Lucent®
• Content providers and aggregators like SAP™ Portals and Webraska for Location-based Services

For Operations Support Systems/Business Support Systems (OSS/BSS), IBM has alliances with leading software vendors including Portal Software,™ Siebel® Systems and TTI Telecom.

The IBM value proposition

Some of the areas in which IBM is currently assisting Wireless Service Providers include:

- 3G Planning — consulting on 3G e-business infrastructure architecture, cost assessment and assistance to Wireless Service Providers in preparing their 3G license bid books and go-to-market strategies
- Infrastructure integration — design, integration and operational services for 2.5G wireless e-business infrastructure
- Backend integration — consulting, design and integration services for BSS and OSS, including billing, Customer Relationship Management (CRM) and data warehouse systems along with deployment of the core IP backbone for 2.5G and 3G networks
- Hosting — assisting Wireless Service Providers in becoming wireless ASPs, as well as hosting wireless e-business infrastructure and application content in IBM Hosting Centers
- Data Services for the Enterprise Segment — design and delivery of corporate services offerings for Wireless Service Providers
- Wireless e-business technology — research and development relationships along with IBM WebSphere® Everyplace Server and IBM WebSphere Portal Server platforms to provide core software assets for a carrier-grade wireless e-business infrastructure

IBM value proposition

Data Services for the Enterprise Segment

- Service packs for the Small and Medium Enterprises
- Large Accounts

3G Planning

- 3G Service Description
- Portal Design
- Cost Model

Wireless e-business Infrastructure Integration

- Portal Functions
- Carrier Grade Services
- Portal Management
- Interfaces

Backend Integration

- Billing
- CRM
- Data warehouse
- IP Network

Hosting

Wireless e-business Technology

- WebSphere Everyplace Server
- Servers and Storage

To find out more about how IBM can assist you in preparing for and benefiting from 2.5G and 3G technology and services, contact your local IBM representative or visit **ibm.com**/solutions/wireless

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