

Universal Mobile Telecommunications System

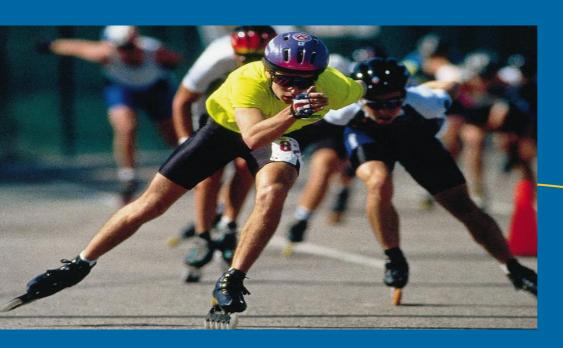
Mobile multimedia communications

The future is now





How the world shares ideas.



The promise of Unified Networks becomes a reality for a new generation

Providing consumers with advanced data services and new applications that will improve their everyday lives is the key to gaining tomorrow's competitive edge in telecommunications. The next generation of networks, known as third generation or 3G, will enable the development of applications that will increase people's entertainment options and productivity to a degree unheard of today. And Nortel Networks is on the fast track to making those 3G networks a reality - by meeting the Universal Mobile Telecommunications System (UMTS) standards and by offering true Unified Networks with a packet-switched backbone that can deliver any communication service anywhere.

Enter the e-world

Imagine merging the wealth of information found on the World Wide Web with the freedom and convenience of mobile telecommunications. That is the e-world: the mobile multimedia experience.

To tap into the new business opportunities that e-world will bring, several milestones must be met: beginning with the development of new expertise and partnerships to initiate and establish a new value chain to answer consumer demand. followed by the convergence of the telecommunications world with the Internet Protocol (IP) world. These two steps are the cornerstones of bringing online a new generation of highbandwidth, high-performing, reliable networks that will both simplify and enrich consumers' lives.



Nortel Networks has the strength and know-how to deliver these best-in-class networks of near-ubiquitous global connectivity, thus bringing a new concept to the industry: Unified Networks. To this end, Nortel Networks draws on the strengths of various technologies based on our GSM, CDMA and IP expertise.

Wireless office applications for productivity



Virtual field service support

Here's valuable support for service engineers and emergency repair crews of all kinds. What about getting an expert online and exchanging pictures, while talking to explain the problem? You can even send job progress updates to base control or receive mapping details to reach a specific location.

- unified interactive messaging (virtual assistant)
- teleconference
- sales order placement
- file transfer
- intranet services
- teletraining
- fleet management

An intranet in your pocket

You're on your way to meet your best customers, when you discover you don't have the updated new product presentation! No problem, just access your company intranet and quickly download the files onto your laptop. Your customers will be impressed. Are they ready to order? Check inventories on the intranet and fill in an e-order form, while talking to the logistics manager. Then get an after-sale support e-visit card and send it directly to the customer's computer.

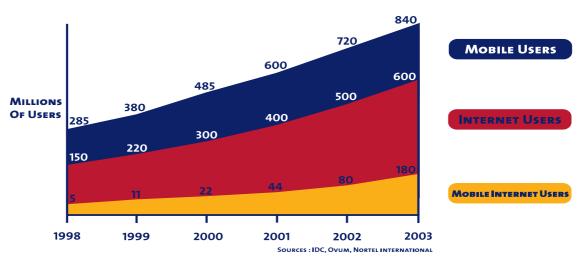


UMTS: enabling the next communications

market boom

At the end of the second millennium, wireless telecommunications is an industry in transition. The mobile telephony market has been increasing at an incredible rate, with 485 million global users forecast in the year 2000. And these users are adopting more and more new services as soon as they are offered, pushing current networks close to their limits.

MOBILITY AND THE WWW



MOBILITY AND INTERNET SIMILAR GROWTH
MOBILE INTERNET PENETRATION TO REACH 20% IN 2003

Competition among wireless network operators is getting stronger, leading to price wars which erode average revenue per user. On the fixed network side of business, multimedia applications and Internet-based services are consuming huge amounts of bandwidth while generating extraordinary volumes of traffic.

These market pressures explain the growing interest in emerging **UMTS technology. UMTS paves** the way to a world of personal multimedia mobility. Nortel Networks, in partnership with our customers, is ready to help the world share ideas more conveniently than ever before by delivering our unique concept of wireless Webtone - reliable access to personalized information and interactive multimedia services. Unified Networks deliver Webtone. Web: user-driven innovation, accessibility of rich multimedia.

content, rapid service evolution. Tone: the implicit trust, on hearing a dial tone, that ubiquitous global connectivity is reliably present.

Wherever you go, UMTS is there

UMTS services will be ubiquitous and seamless, enabling users to access communications, information and entertainment services regardless of their location, local network, or type of terminal.

The concept of the virtual home environment (VHE) will be fundamental to the end-user's experience of UMTS. The consumer will be able to use each service in a way that is intuitive and consistent with the context within which it is delivered, without having to learn different modes of interaction.

New prospects add depth to your business.

With UMTS capability you will liberate your customers from the location constraints of wired communications and deliver - affordably - higher levels of flexibility, control, personalization, and spontaneity.

UMTS will also help operators create true differentiation in the marketplace, thanks to the incredible variety of services it will enable. You'll be able to develop loyalty and trust with your customers, extend your market reach and, perhaps most importantly, develop new business opportunities with new customers and partners. Examples of these prospects include new distribution channels, enhanced customer services, and advertising opportunities with retailers, banks and content providers.

Personal communications for fun and education



Score and replay!

Football team supporter? Sports fanatic? Your team just scored, and you get the news in real time. Now, let's see that instant replay. That's not all - attach a message to the video and send it to your friends!

• video/music on demand

- interactive games
- sports reports, action replay (video)
- tele-tourism
- · virtual school
- video telephony

Wireless Internet labs: a Nortel Networks initiative

Nortel Networks is already committed to building Internet labs in North America, Europe, and Australia to assess the business value of the wireless Internet environment. We also support the development of service-delivering equipment, including the innovative Distributed Networked Services Platform (DNSP), which enables operators to connect subscribers to value-added data services anywhere, anytime, on any device.

The personal music collection that goes anywhere

Your cyber jukebox is ready: get set to customize your virtual CD. Imagine having personalized access to an Internet jukebox or being able to send songs to friends.



Your trusted partner at every link of the value chain

Evolution to Unified Networks

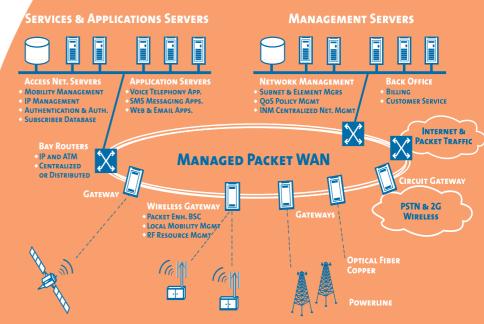
When the first UMTS commercial services are delivered in Europe by the end of 2001, the stage will be set for Nortel Networks' unique IP-optimized Unified Network concept.

A completely IP-based network will significantly simplify network operations. All components of a Unified Network will have the same IP interface to the network. All network management traffic will travel in a standard format through this IP interface and be routed to the network management system.

Expanding the mobility dimension and exploiting converging technologies accelerates the path towards 3G and makes mobile multimedia services more accessible and more affordable.

In an end-to-end IP network, service development and creation will be much easier and faster compared with today's circuit-switched environment. Third parties can use the open IP architecture to develop service logic residing outside the core network, using standard hardware and software components.

UNIFIED NETWORKS



DISTRIBUTED, SERVER BASED, PACKET ARCHITECTURE

The importance of UMTS in maximizing current investment

Nortel Networks sees UMTS technology as an important component of the Unified Networks vision. Our strategy consists of building UMTS network architecture around an IP-optimized Nortel Networks core network carrying all traffic types. This vision is based on our world-recognized leadership in CDMA and GSM access network technologies, as well as packet-switched technology.

Our customers may leverage our open interface equipment to develop flexible strategies of their own, adapting the 3G rollout to their own timelines and investment levels. With the UMTS Unified Networks strategy, data

carriers as well as new wireless entrants will be able to offer, in the medium term, full mobile multimedia services connecting a UMTS access network to a new or existing packet-switched (IP or ATM) network.

Along with the standardization process, Nortel Networks is also developing an intermediate phase for our UMTS Unified Networks based on mature GSM/GPRS technology to maximize GSM operator investments. This interim phase will allow incumbent GSM operators to implement a short-term, powerful data network for mobile multimedia applications.

Truly mobile information for the utmost in convenience



Let's go to a movie! What's playing? Is there a queue? Can we get there on time? All the answers are at your fingertips - it's as easy as connecting to the Internet while talking, looking for movie details and cinema location, ordering e-tickets and even finding public transportation timetables. While you're at it - order some popcorn. It'll be waiting for you when you arrive.

- video and graphic oriented navigation tool
- traffic intelligent information system
- car control
- · emergency services
- tele-medicine
- check on children
- e-newspapers and magazines
- bank account management
- e-ticket (concert, cinema, travel)
- interactive shopping
- location based/personalized information and advertising
- intelligent research (best price, performance)
- home appliances monitoring
- industrial equipment supervision

Navigate with ease anywhere

Ever missed an important appointment because of traffic jams? No more! Just connect your auto-PC and get a traffic status map of the whole area, combined with live video of main highways. Find the least crowded route or fastest shortcut and arrive at your meeting on time.



UMTS Unified Networks to fully realize the potential of multimedia

The following technical specifications will increase understanding of the evolution path Nortel Networks is planning to usher our operators successfully into the next century of communications.

The UMTS Access Network, based on ATM technology, will support both Frequency Division Duplex (FDD) and Time Division Duplex (TDD) mode radio interfaces, allowing flexible, high-bandwidth bearer support, together with efficient spectrum use.

The UMTS Base Stations will provide data rates up to 384 Kbps for full mobility and up to 2 Mbps for local mobility.

The UMTS Access Network will be connected to the IP-optimized core network through a Nortel Networks' gateway function named the UTRAN Gateway.

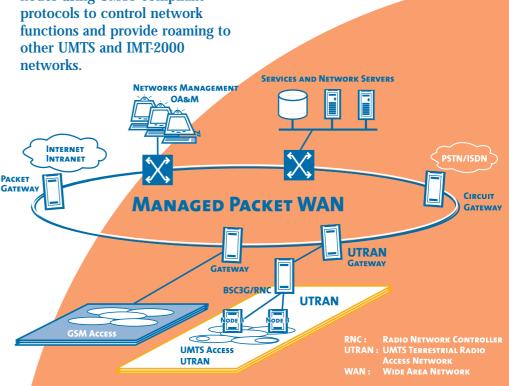
Using an evolution of the Nortel **Networks Serving GPRS Super** Node (SGSN), the UTRAN Gateway contains integrated control and switching functions moved from the GSM/GPRS NSS technology. The UTRAN gateway simplifies network engineering by eliminating separate circuit/packet switching and backhaul connection to the UTRAN.

Speech call services are provided by the Voice Gateway/Call Server integrating the transcoder function and allowing GSM's rich set of voice-service capabilities to be used in a UMTS context. The Voice Gateway/Call Server ensures that aspects such as PSTN interworking and regulatory requirements for voice calls are fully met.

The UMTS network may contain call server functions for a number of different speech clients used in the mobile station. Nortel Networks can also offer a range of VoIP products to support MSbased VoIP clients.

Home database and CAMEL functions are provided by evolved HLR and ServiceBuilderTM SCP nodes using UMTS compliant protocols to control network functions and provide roaming to other UMTS and IMT-2000 networks.

Based on an evolution of our **Gateway GPRS Super Node** (GGSN), the Packet Gateway allows access to external packet networks while providing tunneling of packet data to the UTRAN gateway, secure access to intranets and corporate networks, plus traffic firewall and filtering functions.



The GSM evolution

phase allows operators to **optimize** investment

To address the needs of current GSM operators, Nortel Networks plans to deliver UMTS in two major steps. In the first step, available for deployment during the year 2000, the UMTS Access Network will be connected to an existing GSM network implementing a release 1999 core network based on GPRS technology.

The UMTS Access Network RNC will include support of the A-Interface for circuit connection to legacy GSM systems and Iu interfaces to provide efficient packet connection with the SGSN.

As the second step in UMTS delivery, to fully realize the potential of UMTS Access
Network user data rates up to 2
Mbps, the GSM operator's core network must be evolved to an IP-optimized network to integrate packet technology for all services. In this way the promise of the UMTS Unified Networks distributed architecture will be achieved and the 64 kbps restriction on circuit-mode services will be removed.

The core network will support circuit-mode services up to 64 kbps and packet-mode services up HLR/CAMEL to 2 Mbps. The GPRS SGSN/GGSN **GGSN** are based on our proven multiservice switch/router, **INTERNET** PassportTM, and Bay Networks 3G TCU **INTRANET** GATEWAY MSC platforms which support both **PSTN/ISDN SGSN** ATM and IP. 2G TCU 2G BSC 3G BSC/RNC **GSM/GPRS** Access **UMTS Access (UTRAN)**



Trust Nortel Networks for the **best**in technology and commitment to your future

To reduce the need for new investment on the part of the operator or service provider, Nortel Networks is active in supporting standardization of protocols, defining open interfaces, and making it possible to implement multi-vendor network architecture.

Flexible configurations and the modularity of Nortel Networks UMTS equipment, based on open interfaces and high radio/capacity

performances, will allow operators to add full mobile multimedia capacities to their current network as quickly as desired.

The convergence of today's key services - mobility and the Web - via UMTS networks will bring about easy-to-use interactive multimedia services with patent value for many kind of users, from consumers to business professionals. It will also mean providing high voice quality services and continually meeting the challenging demand for more capacity.

Making this all happen reliably and cost-effectively is the goal of Nortel Networks. Our strategy is to help operators offer advanced integrated voice and data services that ensure long-term revenue growth. Our customer-oriented approach allows operators to develop a flexible wireless networking strategy, whether you wish to leverage existing investments, or take the fast track into new commercial opportunities.

The revolution of exciting, powerful, third generation networks is coming soon. Let Nortel Networks keep you up to date with all the advances you need to meet the future successfully.

CDMA or GSM - choose the experts

Nortel Networks is recognized for developing innovative solutions for high quality services and optimized capacity in GSM and CDMA technology. Our multifaceted expertise and leadership are the basis for providing you with top performing networks optimized for UMTS.

We have entered an alliance with Matsushita Communication Industrial Co. Ltd. (Panasonic) in order to collaborate on Wideband CDMA (W-CDMA) market development and to deploy a series of experimental networks systems, services and terminals. The W-CDMA experimental systems have two main objectives. First, optimize UMTS radio technology performance according to different environments and develop engineering models.

Second, evaluate the impact of end-user applications to provide a basis of customized solutions to precisely meet future multimedia market needs.

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Note: Some of the network components discussed in this brochure are currently under development by Nortel Networks and may be commercially available at a future date. For more information please contact your Nortel Networks representative.