



ACATS FORUM

Wireless Roadmap

NGN Concetration Meeting

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A Thematic Network Project supported by the European Commission

- ▼ Part 1: Existing Wireless Technologies & Evolution
Path Towards 3G
- ▼ Part 2: Future & Emerging Technologies
- ▼ Part 3: Market Analysis & Prospects
- ▼ Part 4: Open Issues



Existing Wireless Technologies & Evolution Path Towards 3G

1G – Analog

2G – Digital

- ▼ TDMA
- ▼ PDC
- ▼ GSM
- ▼ CDMA

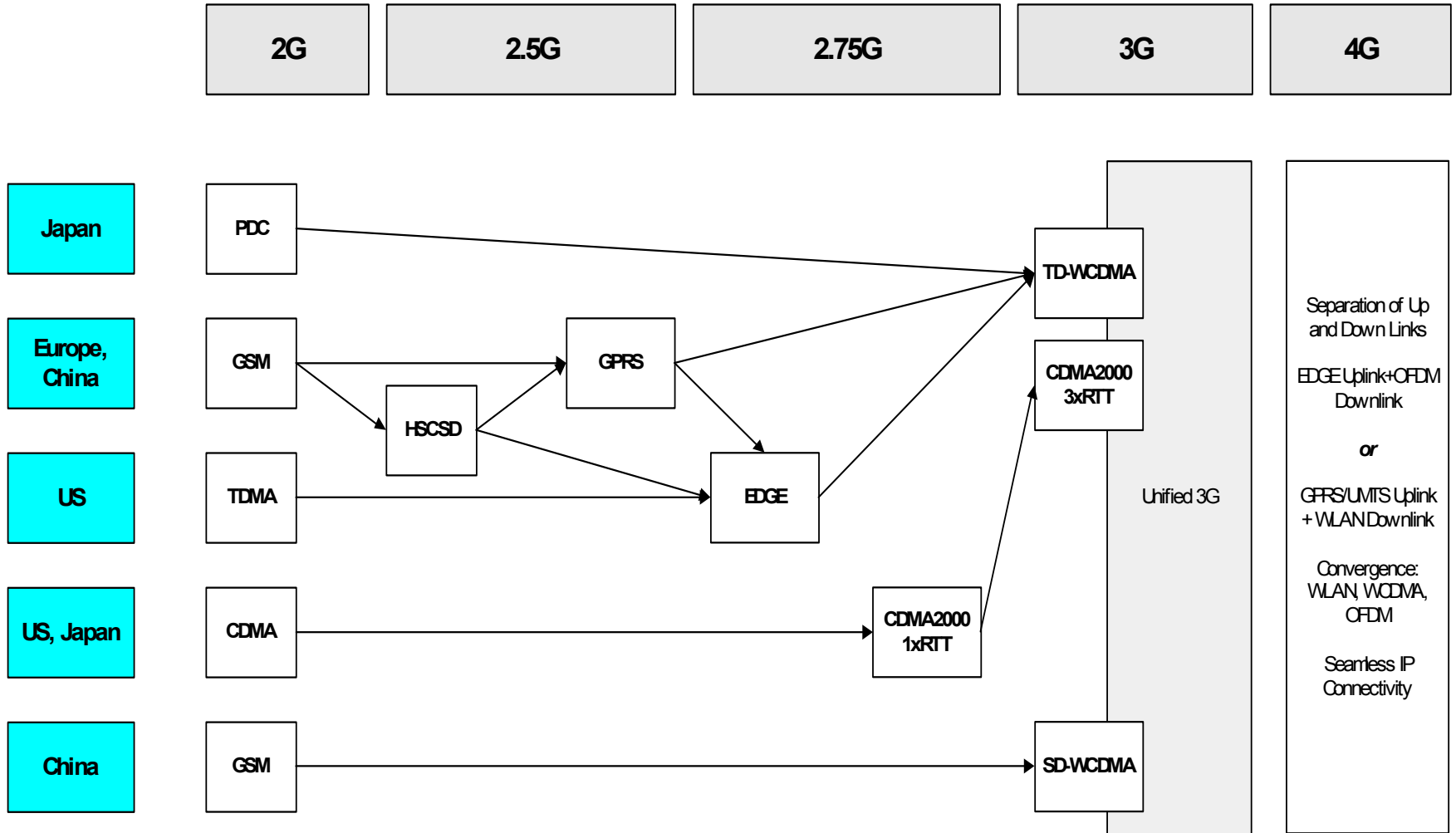
2.5G – Packet Digital

- ▼ GPRS
- ▼ EDGE
- ▼ CDMA2000

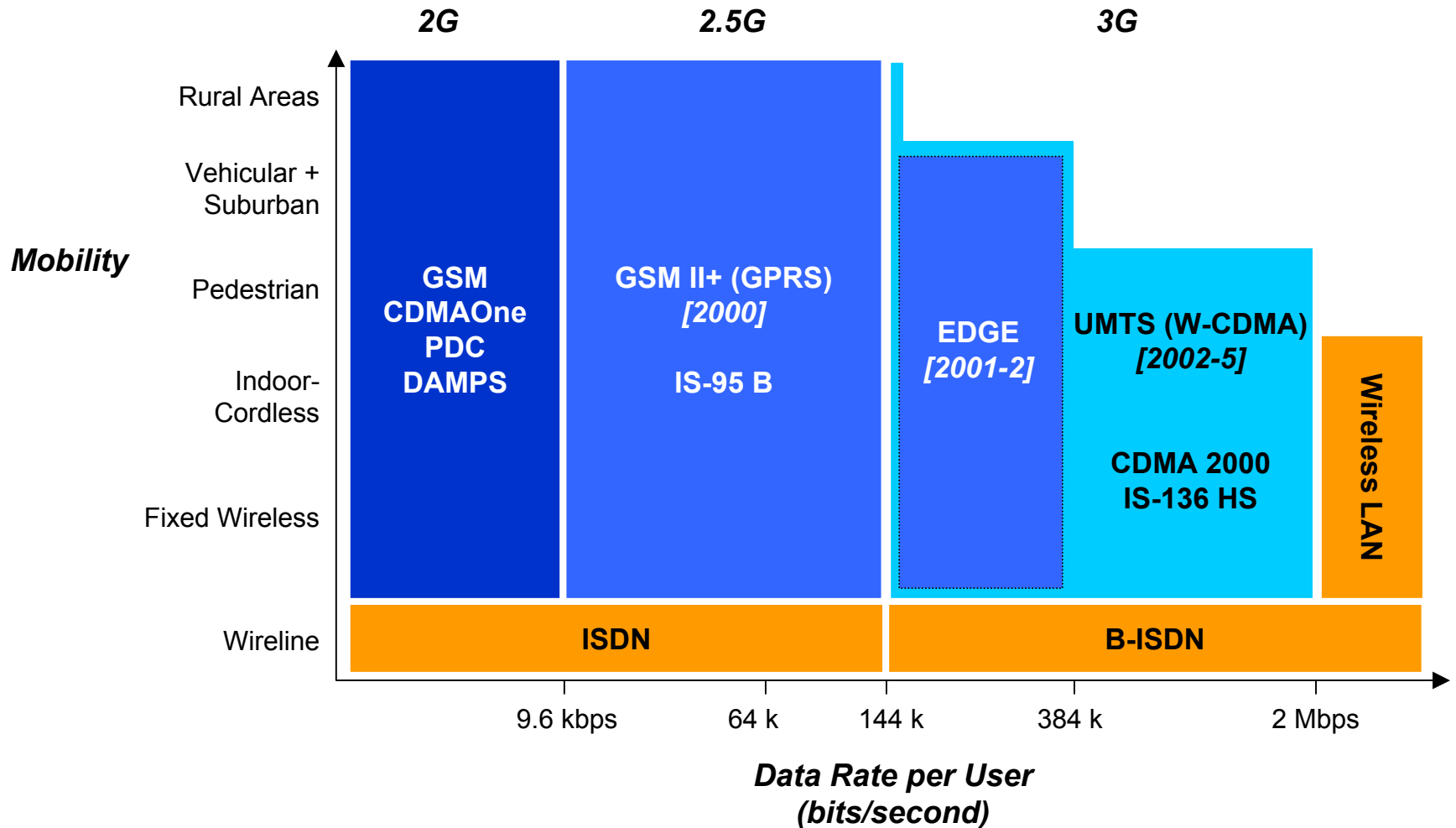
3G – High-Speed Digital

- ▼ W-CDMA





UMTS compared with the existing and future fixed/mobile technologies



Services Categories	Speed (Kbit / Sec)	Switching	Bit Flow	Examples of Applications
Voice	16		Symmetric	<ul style="list-style-type: none"> • Voice calls • Audio on Demand
Simple Messaging	14.4	Packet	Symmetric	<ul style="list-style-type: none"> • Low speed alarm / telemetry • Virtual Banking • SMS
Switched Low Speed Data	64	Circuit / Packet	Symmetric	<ul style="list-style-type: none"> • Interpersonal messaging • Traffic telematics
Medium Speed Multimedia	384	Packet	Asymmetric	<ul style="list-style-type: none"> • Remote surveillance / diagnostic • Web browsing • On-line newspapers • Games on demand • File transfer (DB access)
High Speed Multimedia	2.000	Packet	Asymmetric	<ul style="list-style-type: none"> • Remote surveillance / diagnostic • On-line shopping • Photo journalism • Games on demand • Narrow cast TV
High Interactive Multimedia	144	Circuit	Symmetric	<ul style="list-style-type: none"> • Video conferencing • Collaborative working

Increasing Customer Sophistication

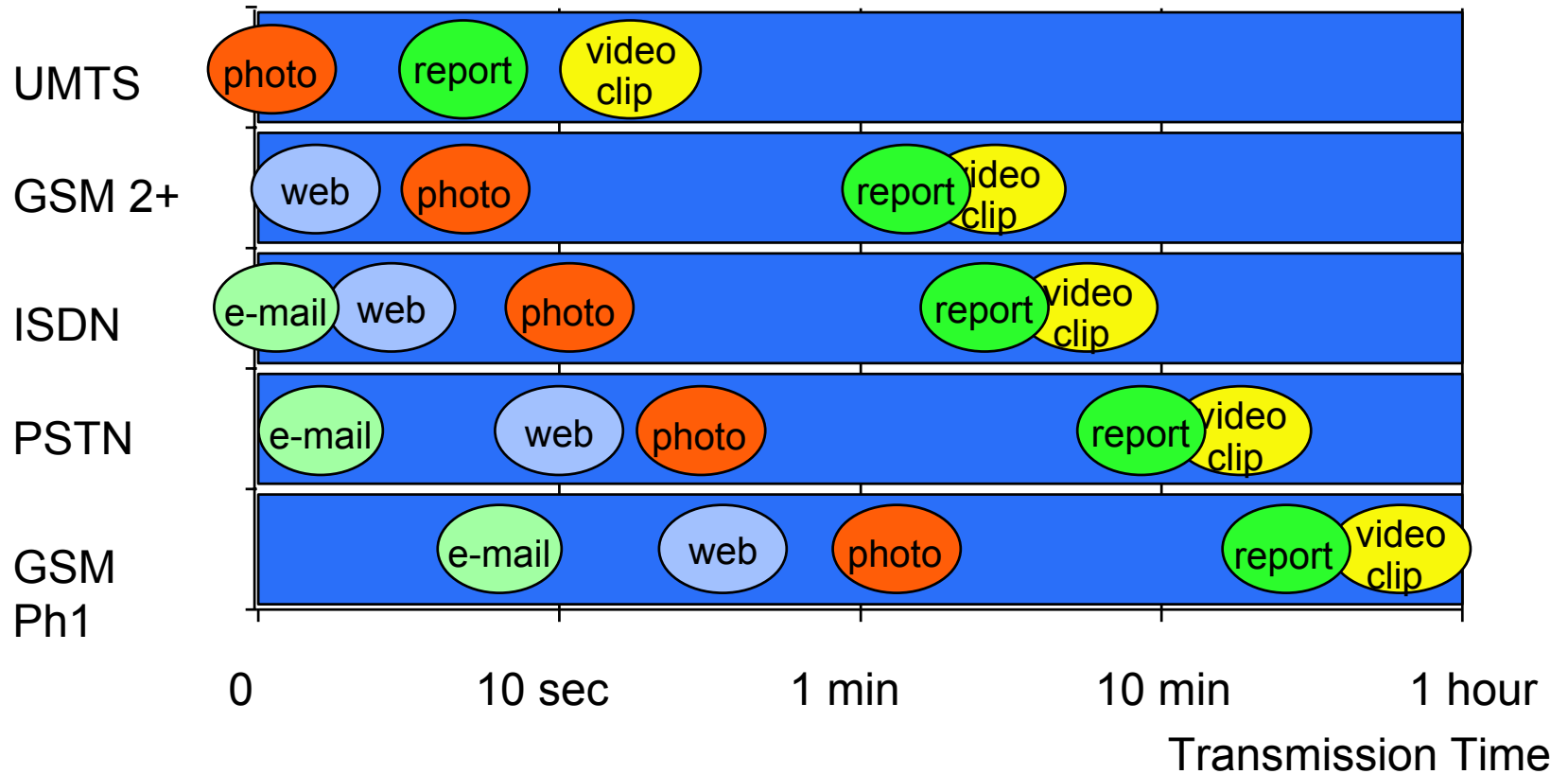


Future & Emerging Technologies

- ▼ Terminal diversity between: PC, mobile phone, PDA, pager, ...



▼ Higher data rates are needed!



▼ Impacts of mobility on applications

- ✎ Adjust applications to available capacity
 - E.g., change video coding
- ✎ Activate/deactivate applications according to available capacity
 - E.g., download emails when enough capacity
- ✎ Take into consideration also the cost of transmission
 - E.g., wait for low cost service or change the place to get cheap access

▼ Applications/services shall cope with

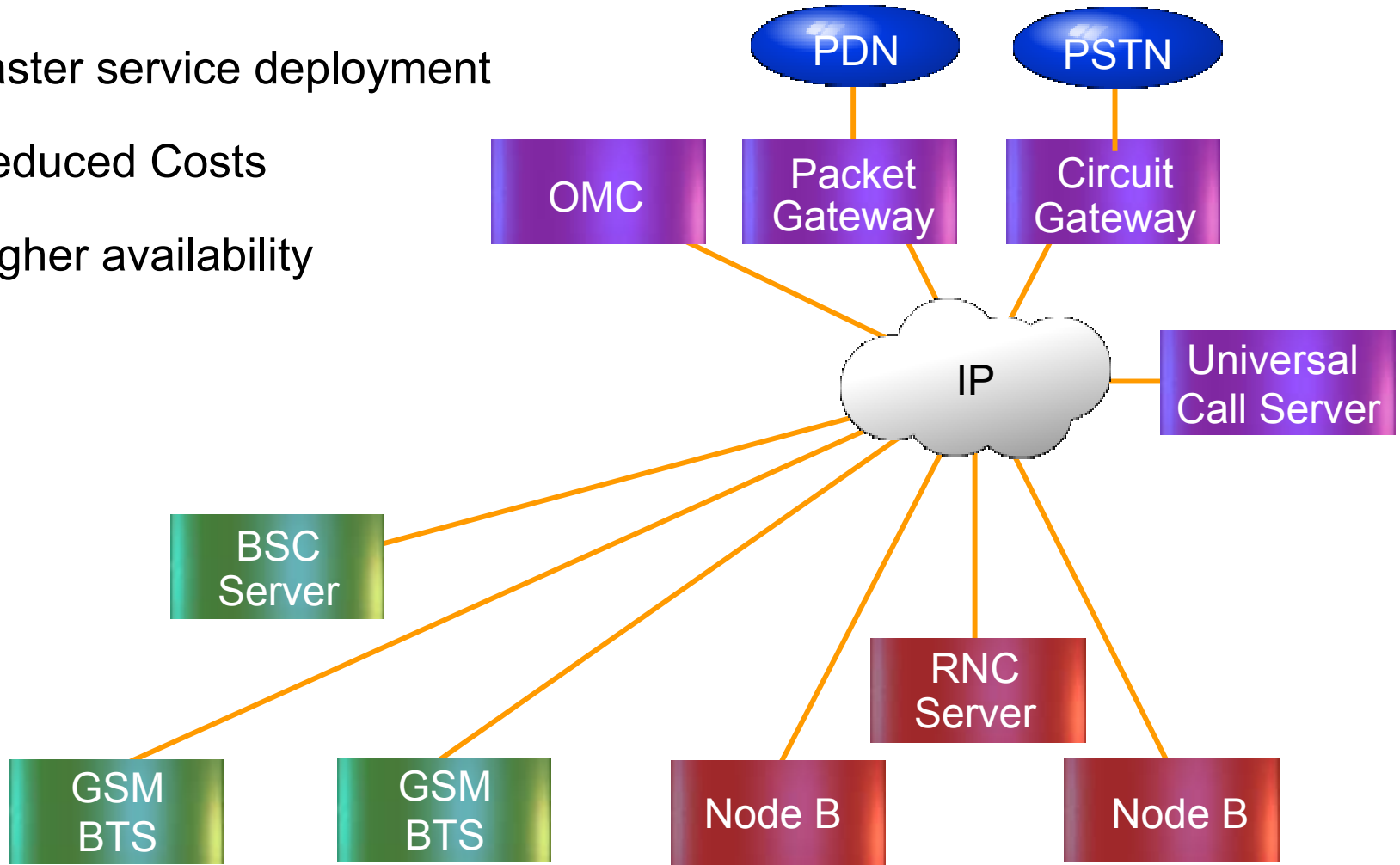
- ✎ Variable
 - bandwidth, transfer delay, processing capacity, terminal capabilities, transfer cost, temporary coverage loss, ...
- ✎ Different
 - terminal types, operating systems, manufacturers, radio protocols, ...

▼ Applications/services must be

- ✎ configurable, self-learning, adaptable, scaleable

▼ IP based, not telecom based!!!

- ▼ Faster service deployment
- ▼ Reduced Costs
- ▼ Higher availability

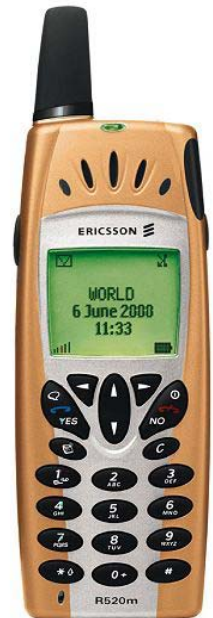


- ▼ Future high bandwidth services will be data services
- ▼ IP protocols optimised for data
- ▼ IP used widely throughout corporate and public networks
- ▼ IP telephony technology and standards evolving
- ▼ IP will be convergence layer for voice, data and multimedia services for fixed and mobile applications
- ▼ Single System for Residential, Office, Cellular, Satellite Environments

- ▼ 1994 – Ericsson
- ▼ New device communications capabilities
 - Personal, home, car, office, etc.
 - Hands-free headset.
 - Cordless telephone.
 - Synchronization of PDA, cell phone, computer.
 - Serial port emulation.
 - Wearable computing.
 - Wireless LAN access.
 - Ad-hoc network.
 - Peripherals: Printer, scanner, fax machine.
- ▼ Open Issues
 - Testing
 - Compatibility
 - Operability



 **Bluetooth™**



▼ PAN

▼ Personal Area Networking

▼ 2.4 GHz

▼ 10 m radius

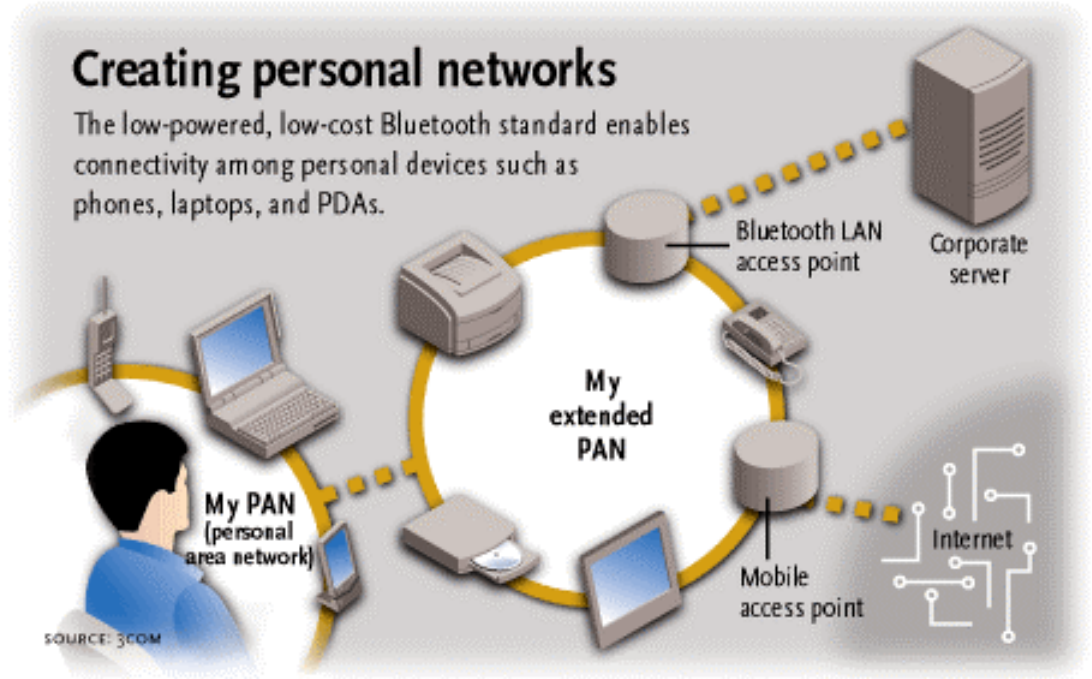
▼ No line-of-sight requirement, as with IR

▼ Eight pico nets, each with up to 10 devices

▼ 128 bit security encryption

▼ Variable speeds, based on slots used in each dir.

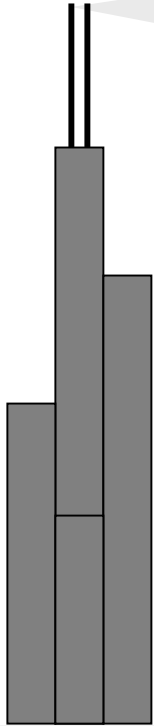
▼ Approx. 57 Kb/sec. To 723 Kb/sec.



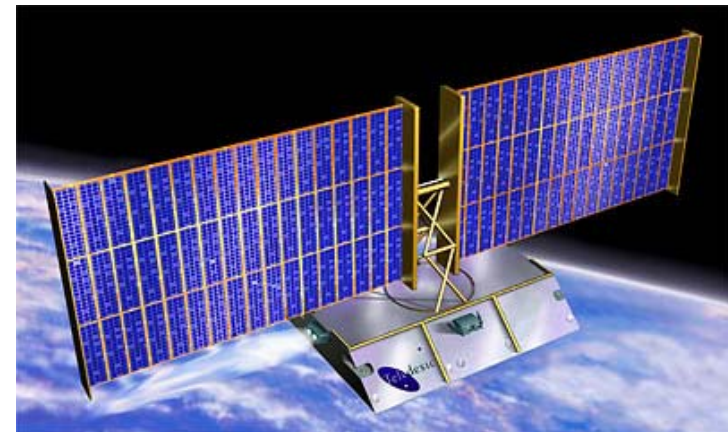
Source: 3Com

Emerging Technologies: Fixed Wireless

- ▼ MMDS - Multipoint Multichannel Distribution System
 - ↘ Also known as WDSL (Wideband DSL)
 - ↘ Spectrum in 2.1, 2.3 and 2.5 GHz bands
- ▼ Line of sight connection from tower to dish receiver
 - ↘ Up to 65 km apart
 - ↘ Sprint Broadband: 14+ cities
 - ↘ Worldcom: 5+ cities
- ▼ 5 Mb/sec max download (1.5 Mb/sec typical)
- ▼ 256 Kb/sec upload
- ▼ Oct, 01 FCC decision allows companies to reallocate spectrum for new broadband technologies
 - ↘ Non-line of sight
 - ↘ Up to 6 Mb/sec shared download
 - ↘ IPWireless.com



- ▼ Fixed Internet
 - ↘ Similar to fiber without cables
- ▼ 288+ satellites in LEO
 - ↘ 2 Mb/sec uplink at 28.6-29.1 GHz band
 - ↘ 64 Mb/sec downlink at 18.8-19.3 GHz band
- ▼ Scheduled launch 2005
- ▼ Sponsors
 - ↘ Craig McCaw
 - ↘ Bill Gates
 - ↘ Saudis
 - ↘ Motorola
 - ↘ Boeing



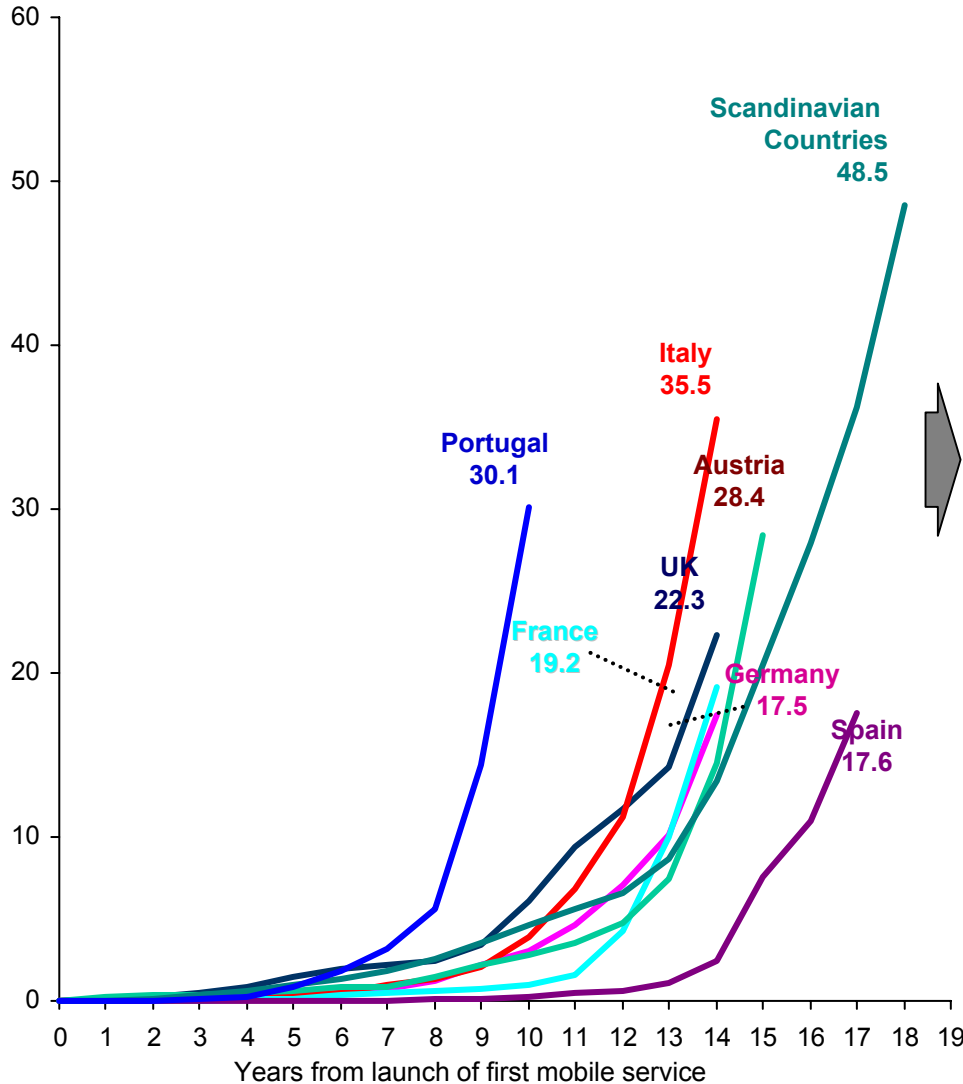
- ▼ Multi-Radio Systems
- ▼ Broadband Radio Access Networks (BRAN)
- ▼ IP Quality of Services
- ▼ WAP
- ▼ Intelligent Networks (IN)
- ▼ Integration of Broadcasting and Mobile
- ▼ Networked Audio Visual systems



Market Analysis & Prospects

Wireless telephony is a fast growing market, but the industry is changing

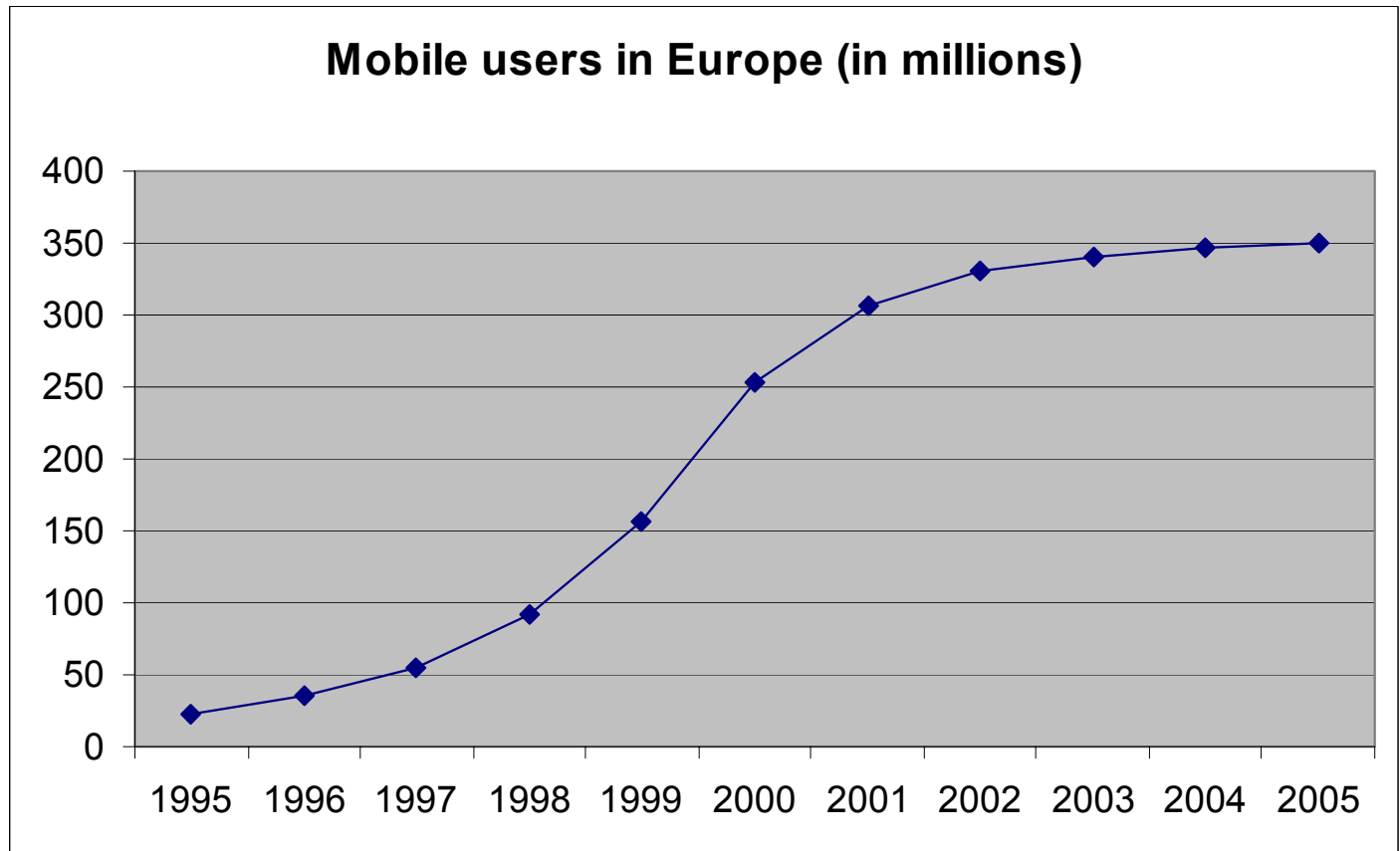
Penetration Growth from the Year of Introduction



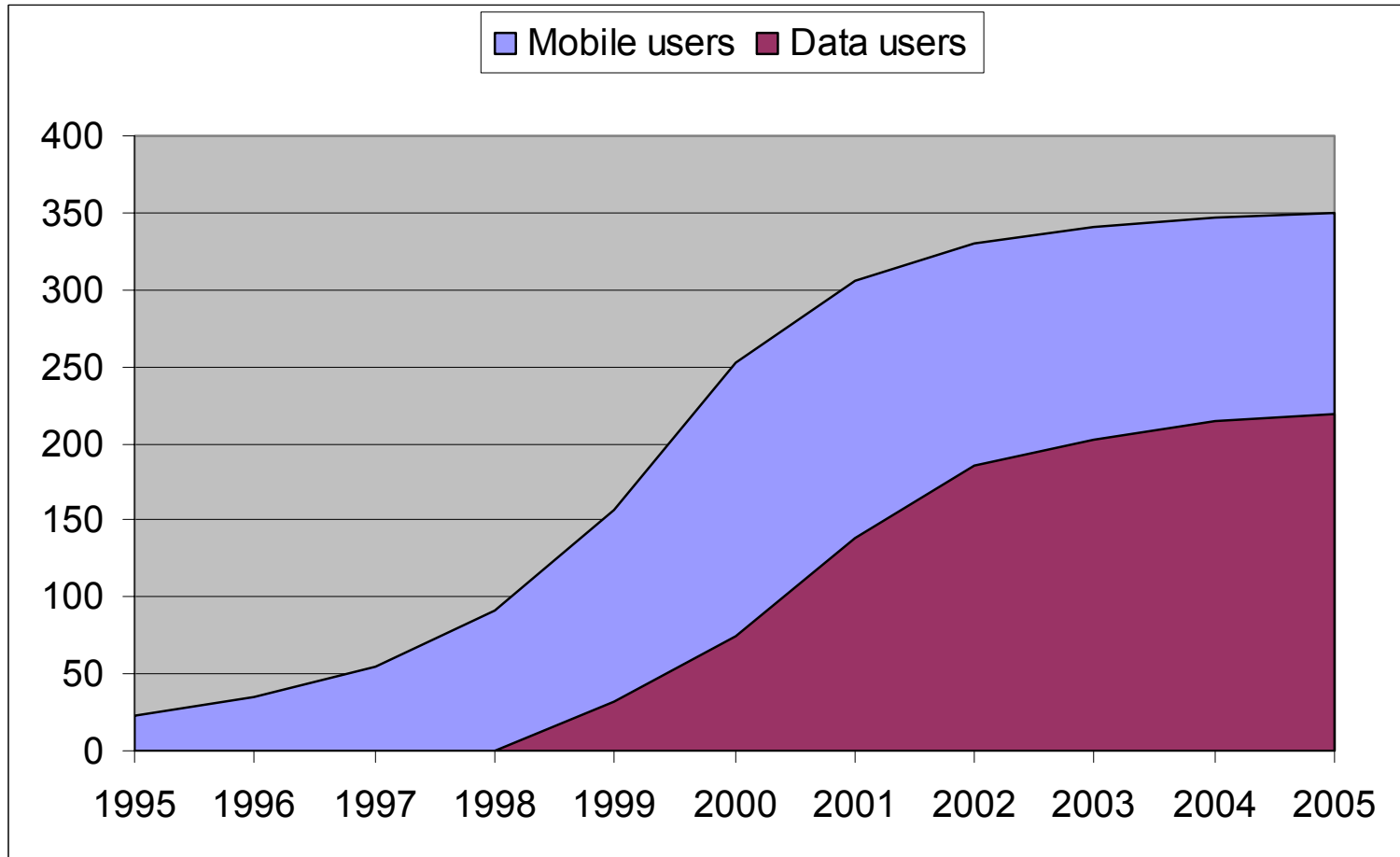
- ▼ Wireless markets have rapidly developed by focusing on voice services
 - Started as a premium service for business customers
 - Now a mass market product, mainly thanks to pricing structure innovation (pre-paid) and handset cost reduction
- ▼ Soon “net customer additions” will not be sufficient to maintain operators’ growth of revenues and profitability
 - New customers have higher acquisition costs but lower ARPU
 - Growing competition for market share generally implies price erosion

Innovation focus is shifting to data in order to ensure the industry growth

- Source: Durlacher Research Ltd, Eqvitec Partners Oy
- Total number of users by 2005: 350 M
- Penetration 87% at 2005!

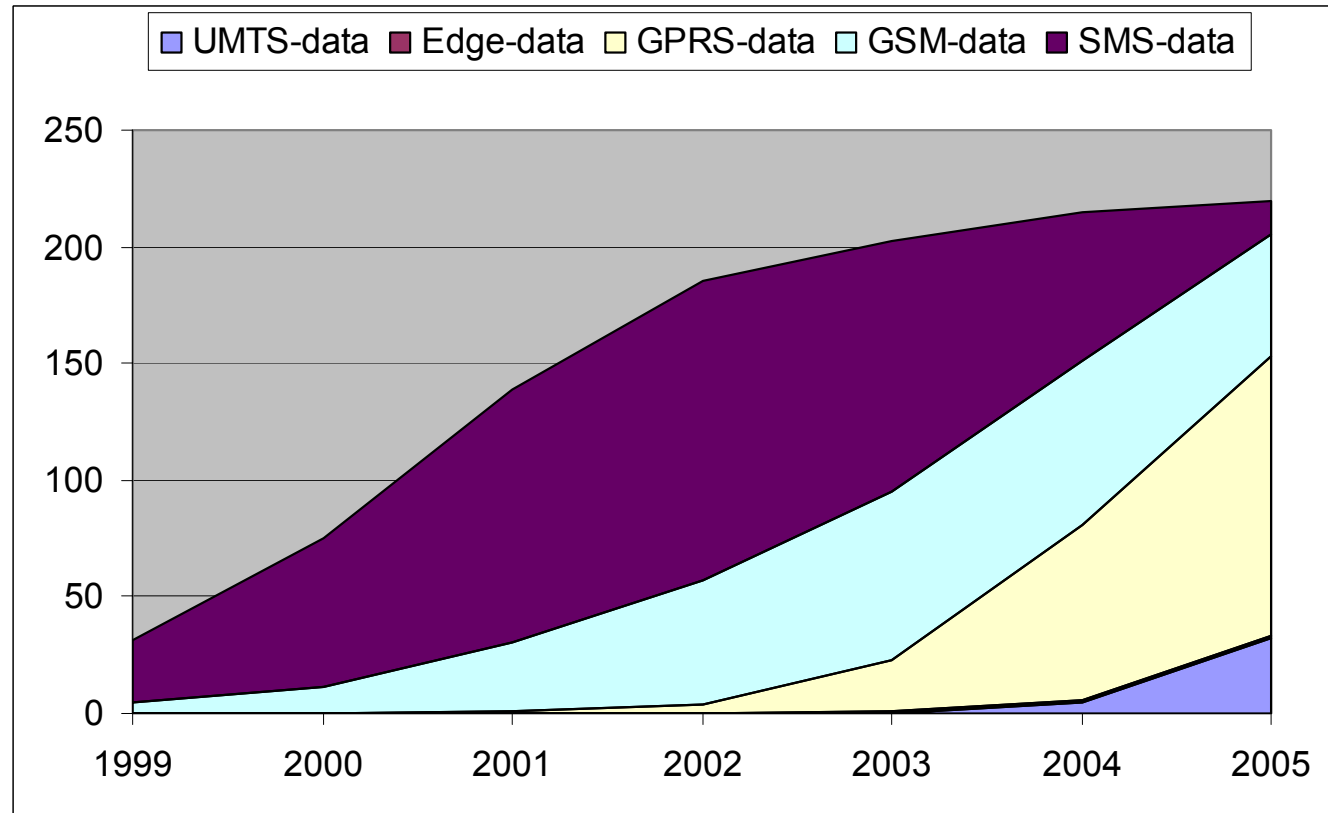


▼ But... how about data?



▼ How data users are divided into different categories?

Million data users

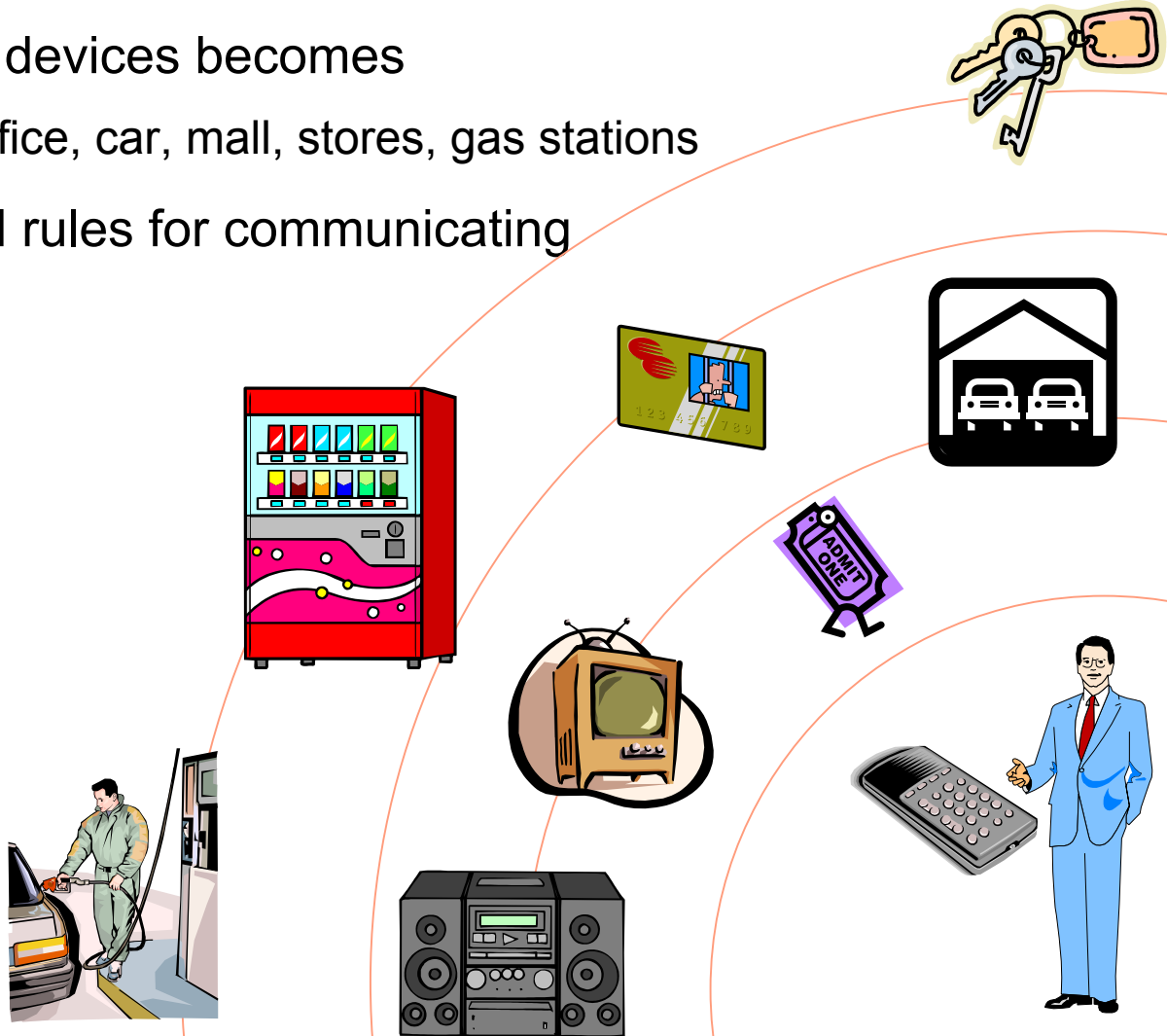


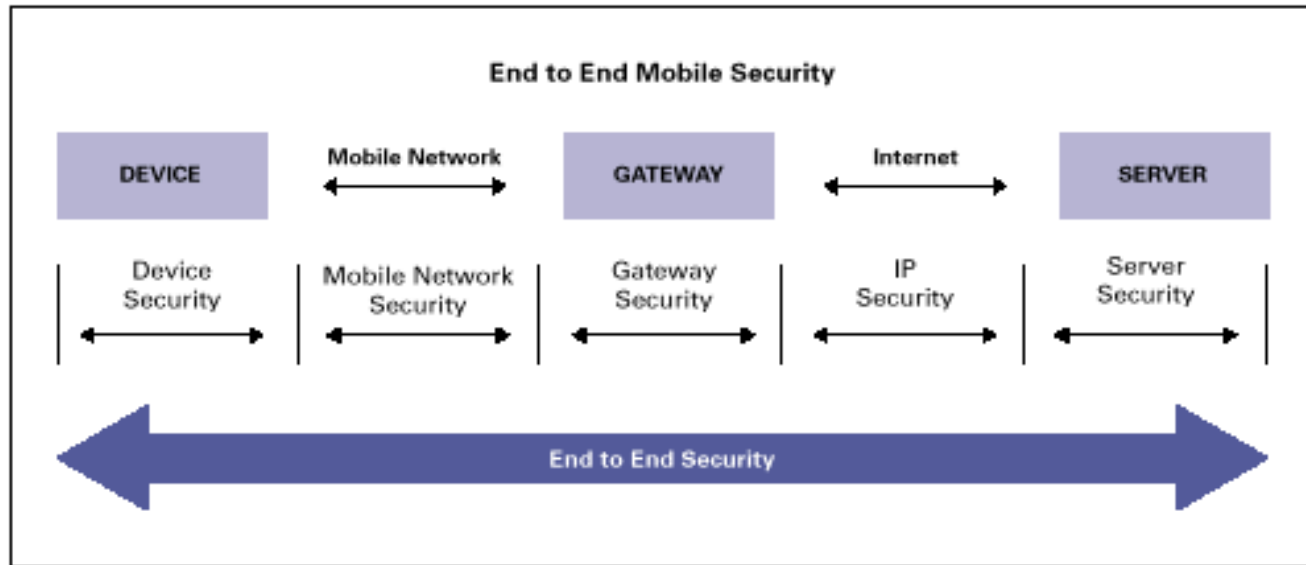
- ▼ By year 2005, out of 350 M mobile users, only 32 M needs UMTS (rest of the mobile users are happy with existing networks, GSM, GPRS, EDGE)
- ▼ Recent Market Analysis (8/2/2002) shows that 3G new entrants will face massive difficulty in gaining new mobile subscribers, even in markets that are currently evolving



Open Issues

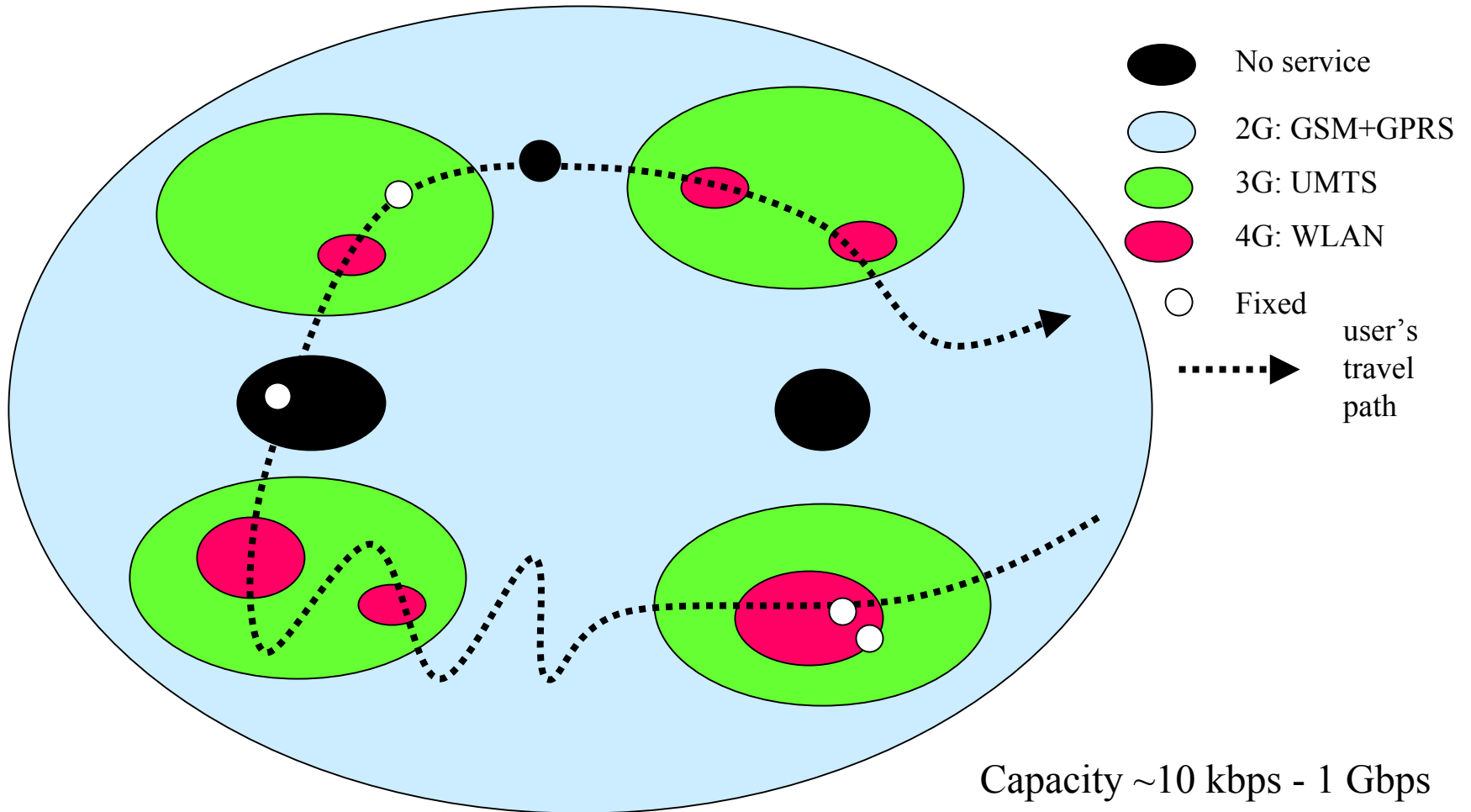
- ▼ Communication with devices becomes
 - ↘ Personal, home, office, car, mall, stores, gas stations
- ▼ We need pre-defined rules for communicating
 - ↘ Download
 - Information
 - Authorization
 - ↘ Upload
 - Identity
 - Financial data



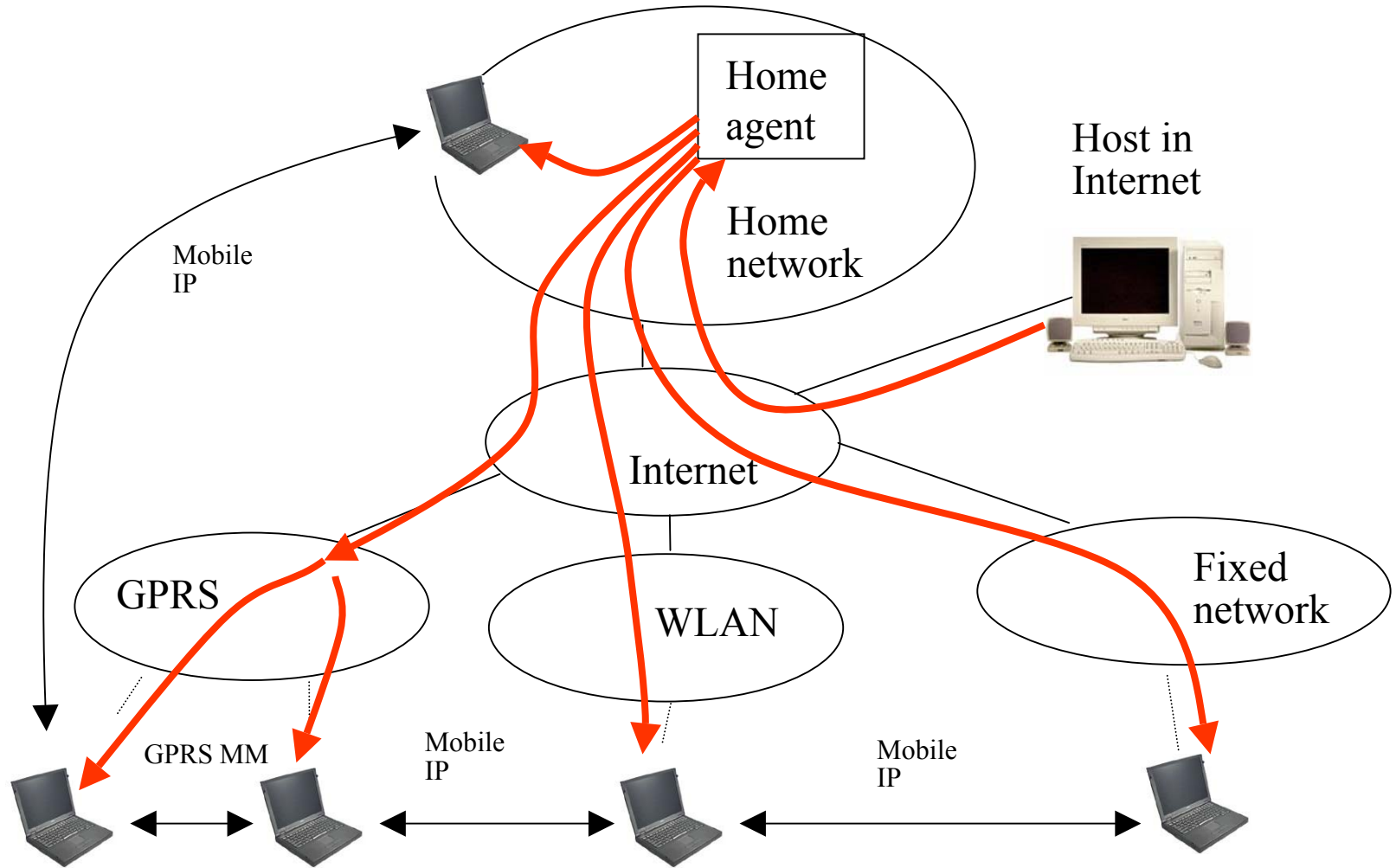


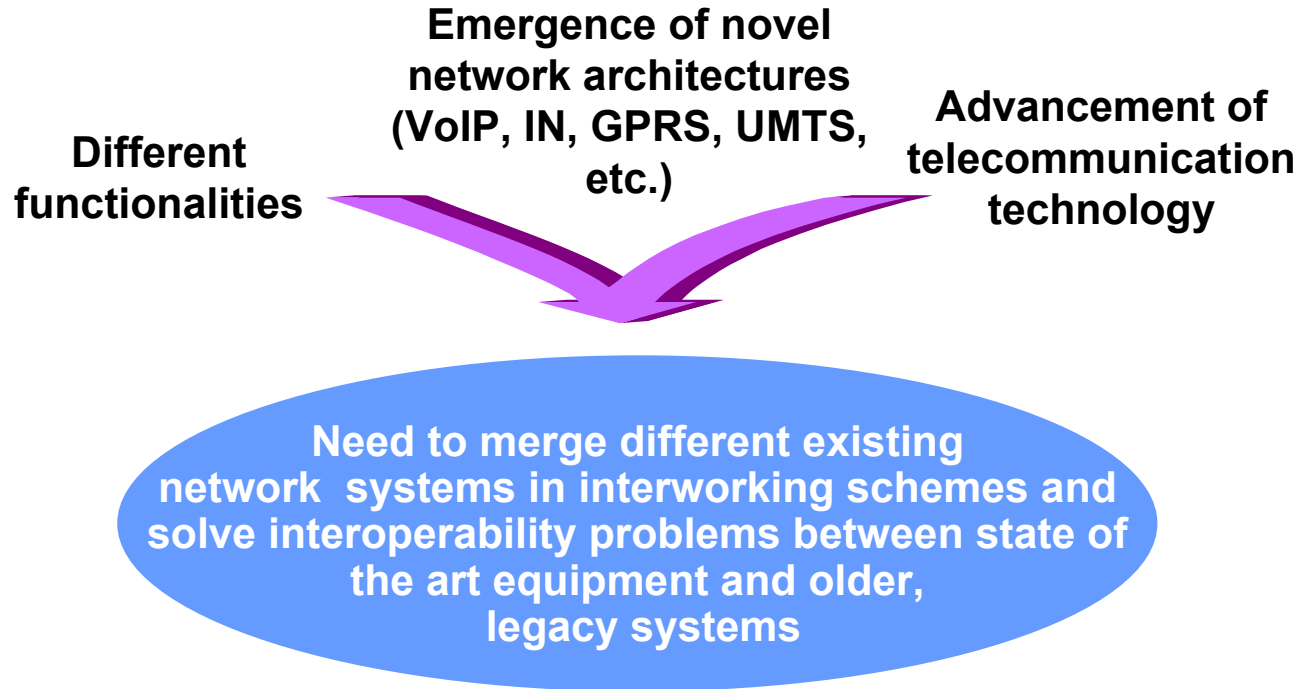
▼ Research Issues

- The security of the personal info-sphere
- The security of the virtual community
- The security of the infrastructure

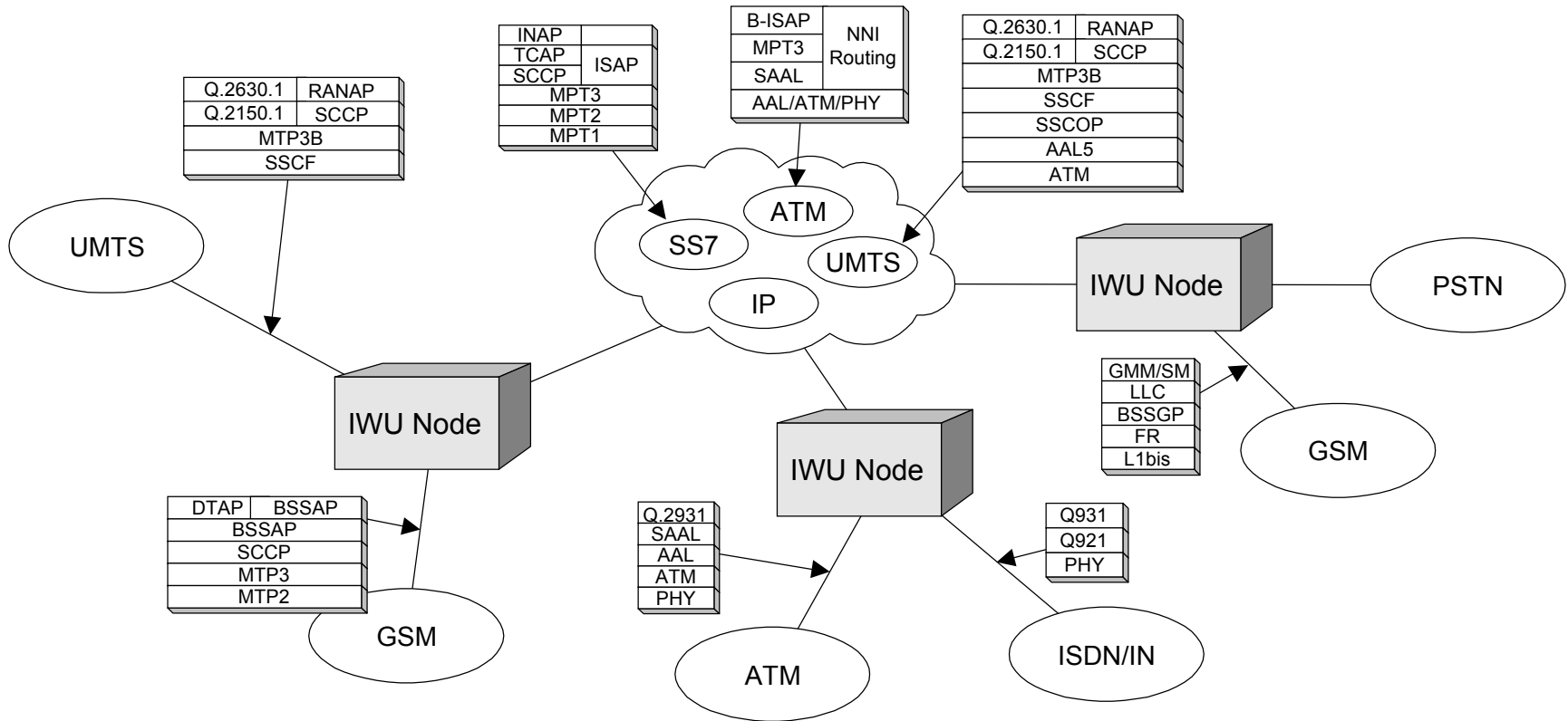


Interworking with Wireless IP Networks





There is a need to design and develop novel, low cost, flexible, highly efficient and scalable systems able to operate as a high performance protocol gateways, which will bridge the “compatibility” gap between different telecommunication networks, such as ISDN, SS7, IN, ATM, GSM, GPRS/UMTS and also provide interfaces to IP based networks.



Interworking nodes that bridge the “compatibility” gap between different telecommunication technologies

- ▼ Interoperability emphasises the need for validation/conformance testing
- ▼ More than 35% of the product development cycle and costs is devoted to testing phases
- ▼ Testing standards and specifications are currently under development from standardisation bodies and various organisations like ETSI, ITU, ANSI etc
- ▼ Notations under development include TTCN-v2, TTCN-v3,...
- ▼ Test specifications often contain ambiguities/errors, therefore testing procedures are essential!
- ▼ However, there is a long procedure involved from Abstract Test Suites to “executable” test suites against specific equipment