Its Dangerous to put limits on Wireless

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European Commission
DG-INFSO-E-4

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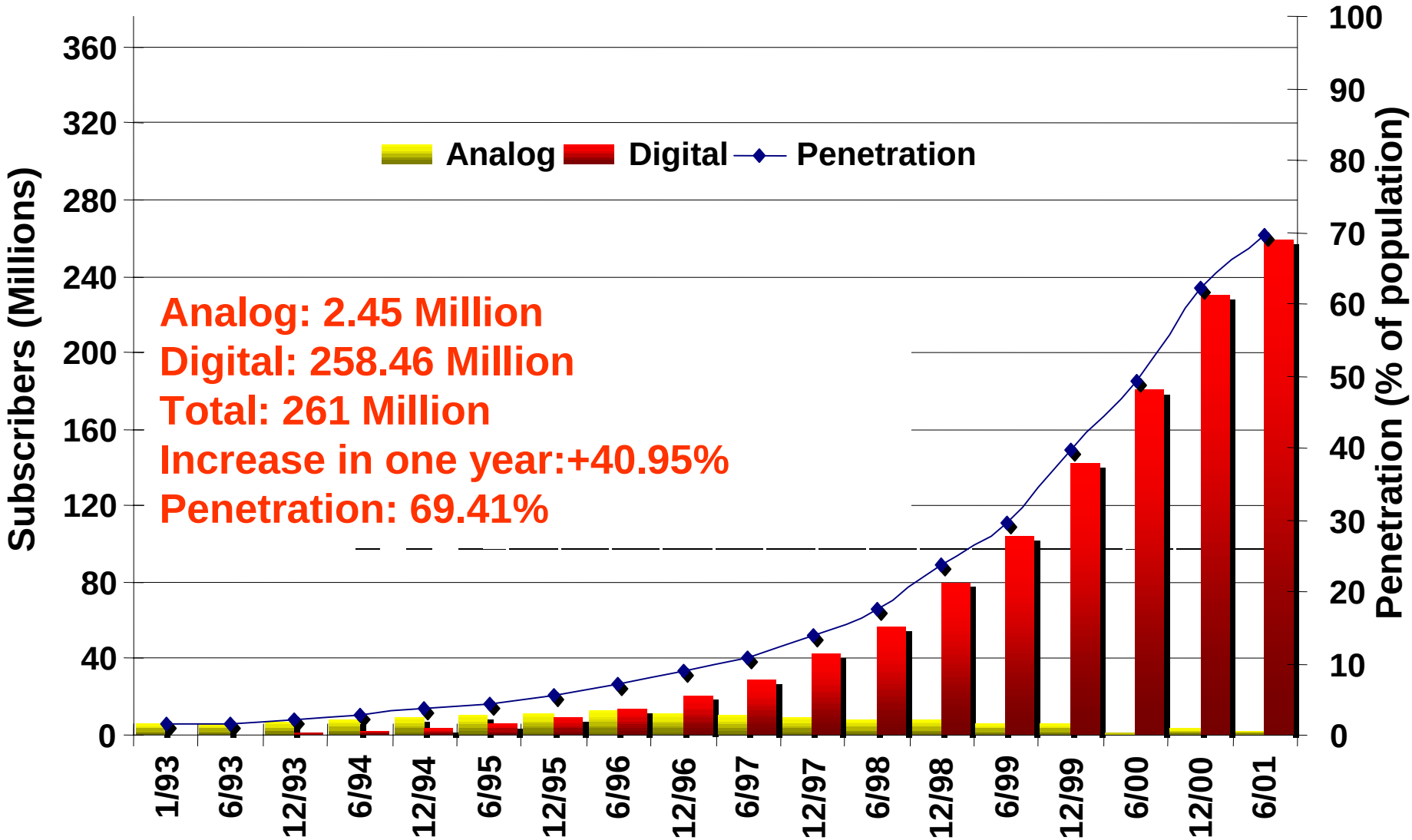
Outline

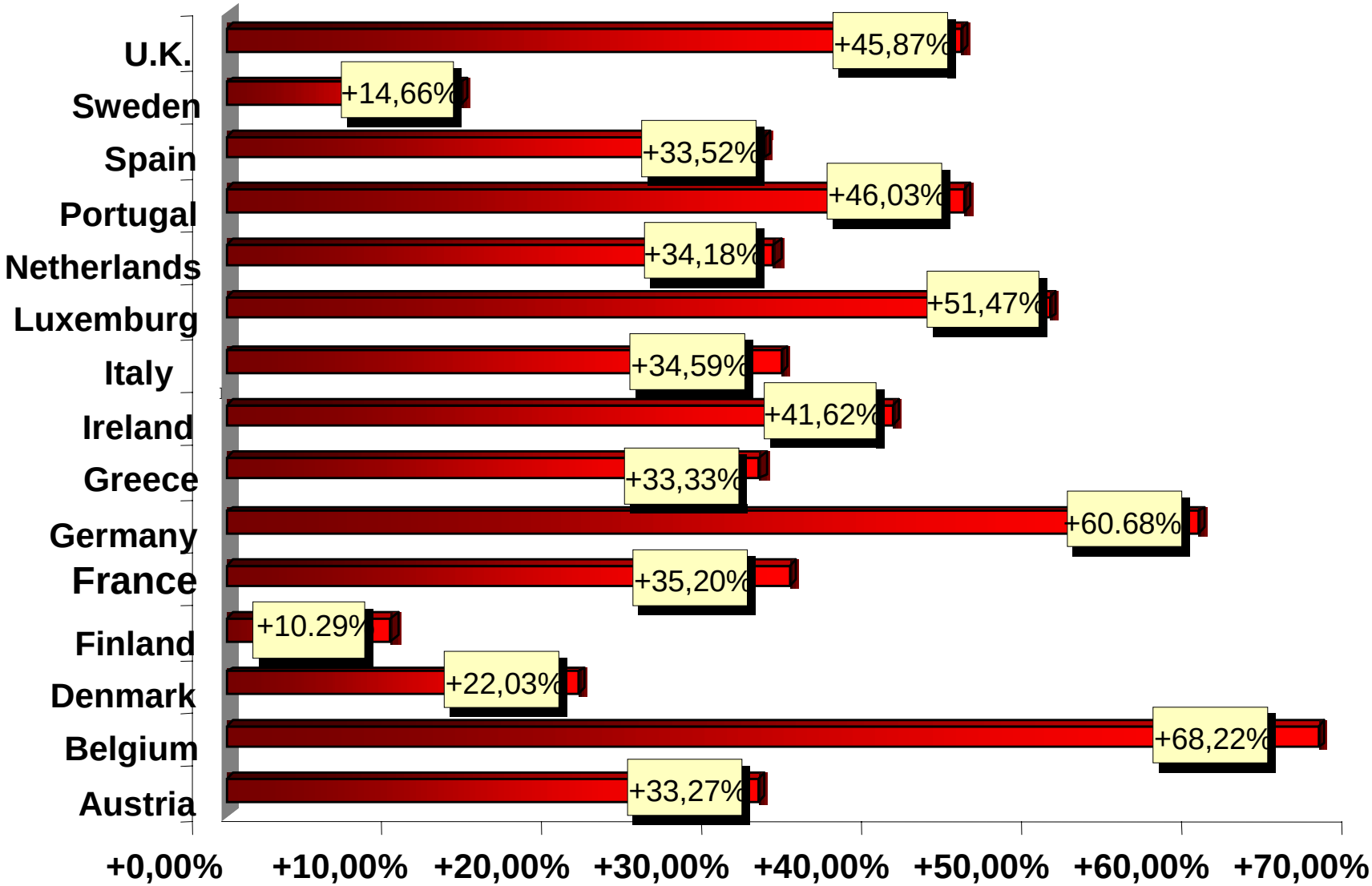
- *Wireless today (GSM,BWFA,WLAN,UMTS)*
- *Mobility-bit rate-coverage trade-off*
- *The probable wireless future*
- *4G - A service perspective*
- *The Satellite Challenge*
- *FP6 - a contribution to the wireless future*

Subscribers (EU) - June 2001

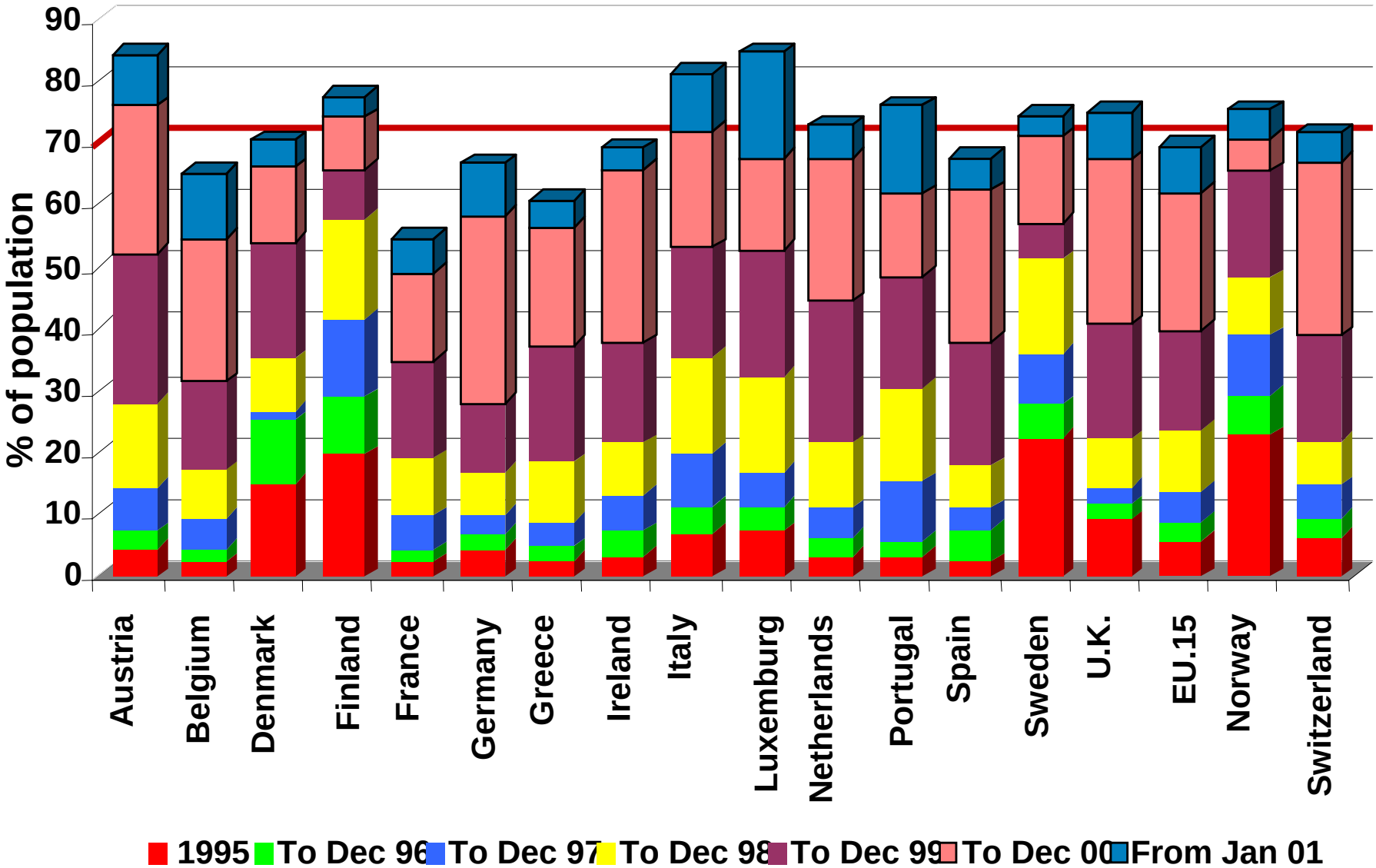


Analog: 2.45 Million
Digital: 258.46 Million
Total: 261 Million
Increase in one year:+40.95%
Penetration: 69.41%

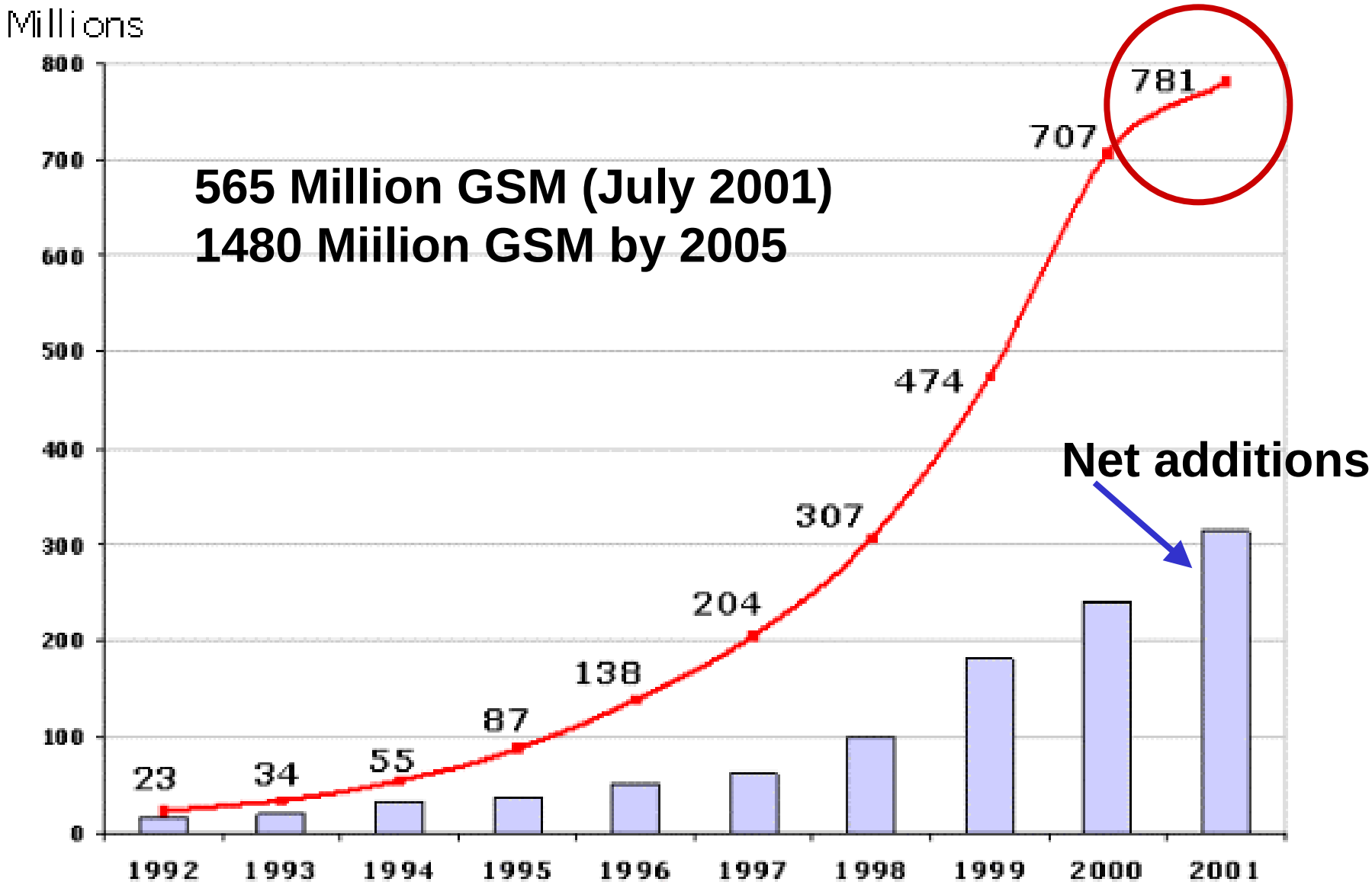
EU Subscription Growth (6/00 to 6/01)



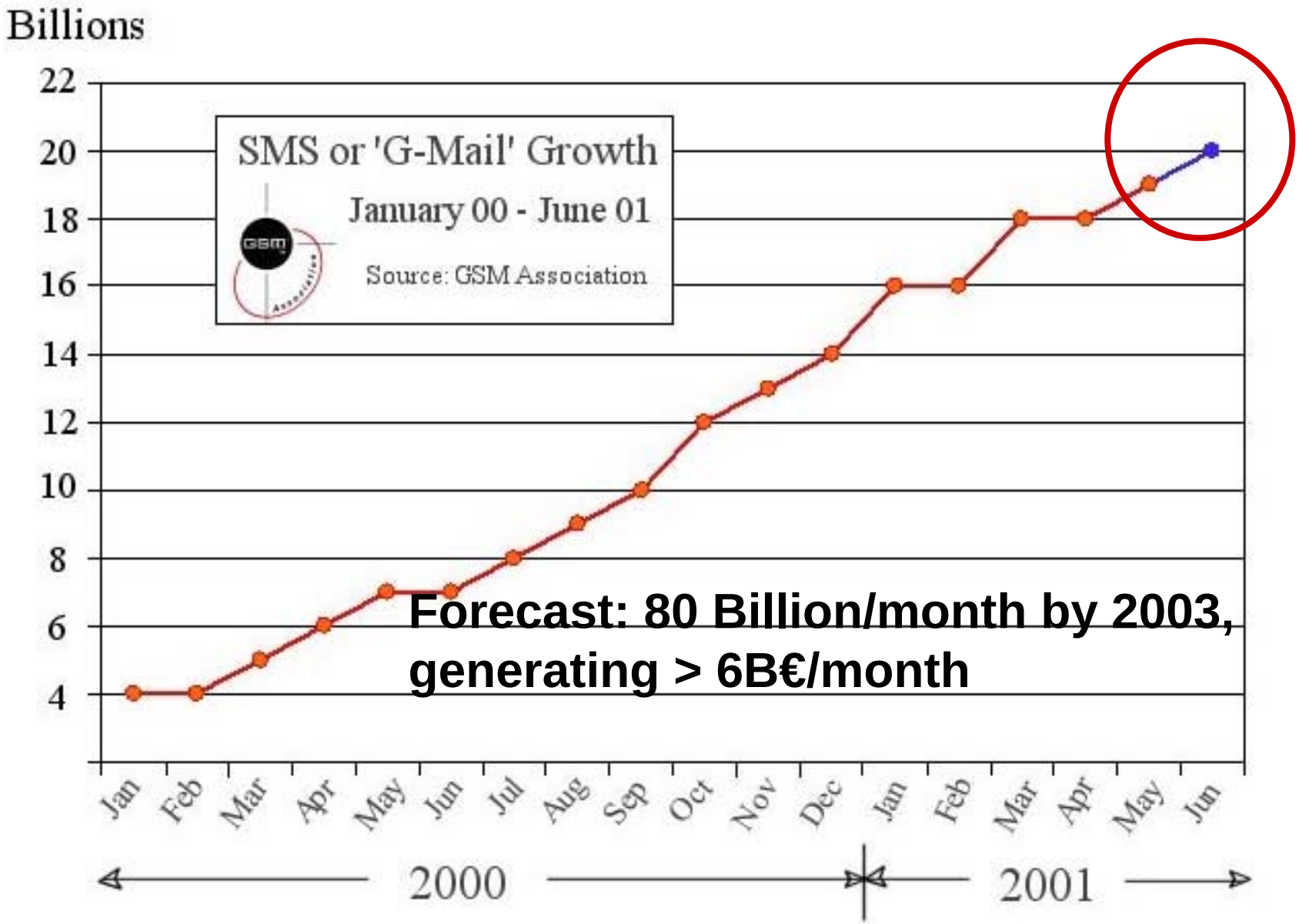
Cellular Penetration Rates In Europe



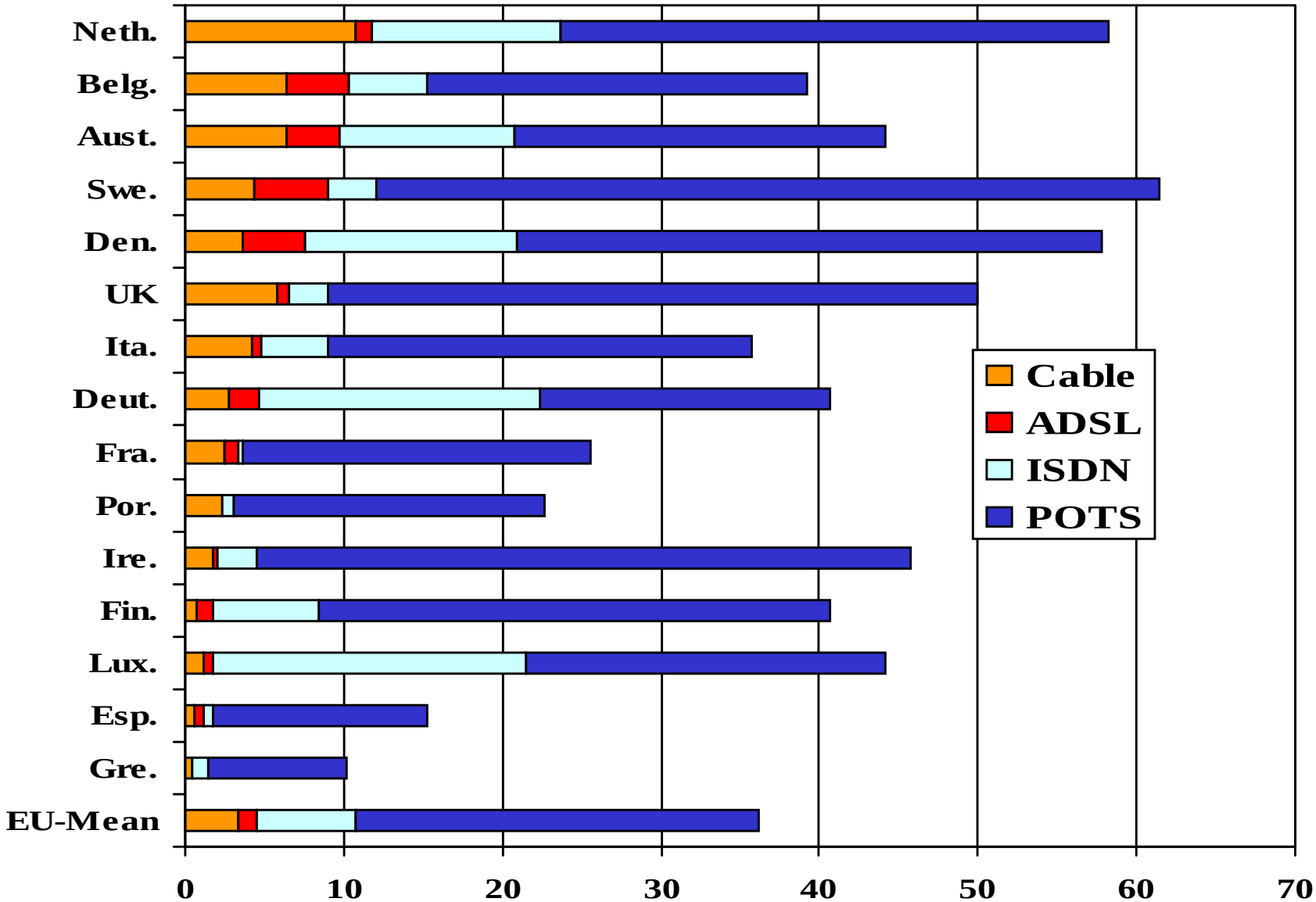
World Cellular Subscribers



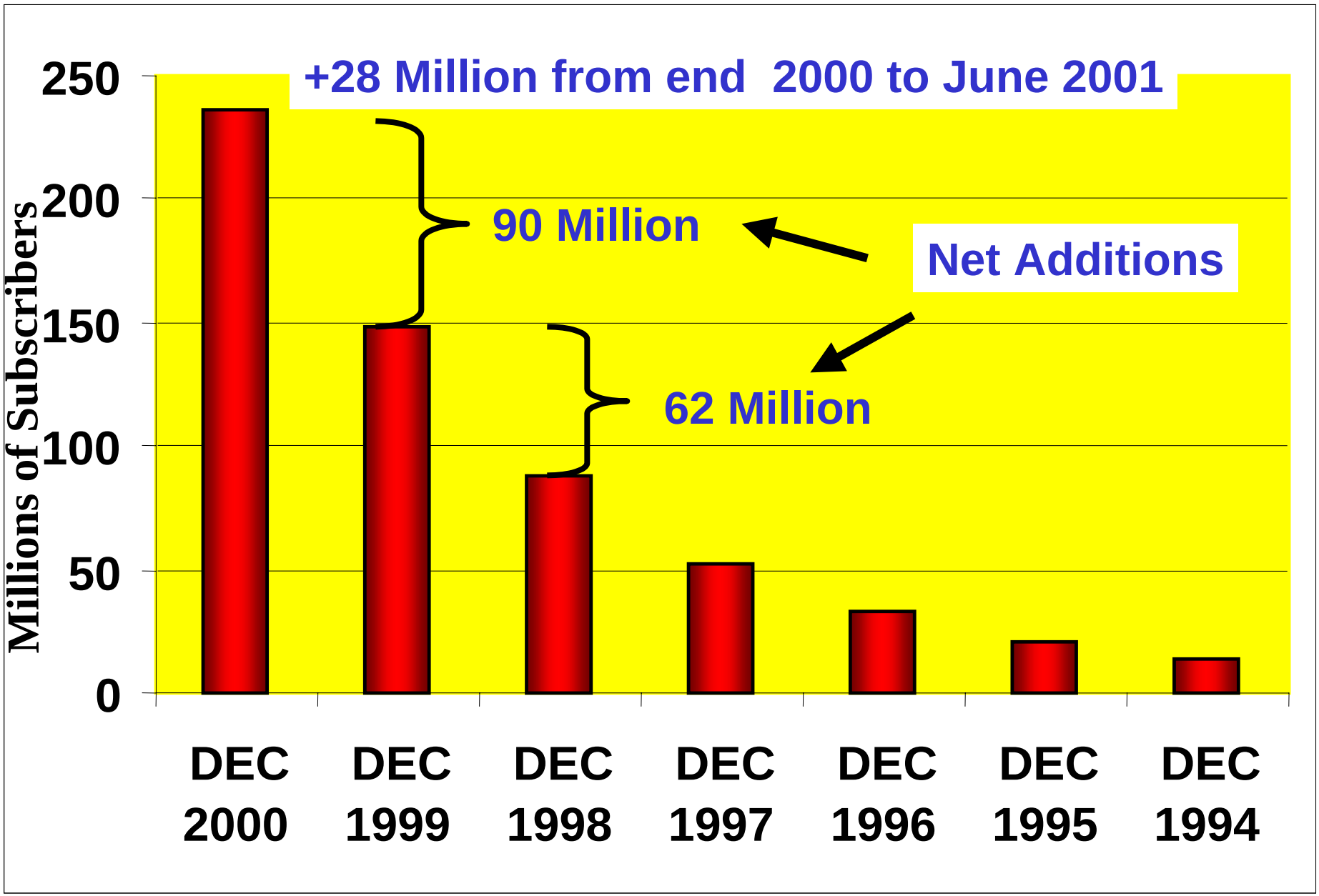
World SMS Traffic



Internet Penetration in Europe (June 2001)



GSM Annual Subscriber Growth (EU)



3G Licensing Summary (EU)

MS	Total proceeds (bn €)	Population (mill)	value of proceeds per capita (€)	Pop. density (inh./sq km)	Assignment method
UK	38.5	59	652	244	Auction
D	50.8	82	620	230	Auction
F	19.6 rev 2.476	58	334 rev 42	108	BC + SC
I	13.8	57	242	189	Auction
NL	2.7	16	170	457	Auction
A	0.83	8.1	103	97	Auction
DK	0.49	5.13	96	123	Sealed-bid auction
B	0.45	10.2	44	314	Auction
EL	0.48	10.9	44	80	Auction
P	0.4	10	40	108	BC + SC
CH	0.14	7.1	19	171	Auction
E	0.5 10.5	39	13.3 361	78	BC + SC
S	0	8.9	0	20	BC + NSC
FIN	0	5.2	0	17	BC + NSC

UMTS - Towards Personalised Instant and Context Aware Services

Personal Communications

Advanced Telephony
Instant messaging
Reach media

Mobile Internet

Banking, Shopping
WEB Browsing
News

Map viewer
City Navigator
Tourism services

Location Based Services

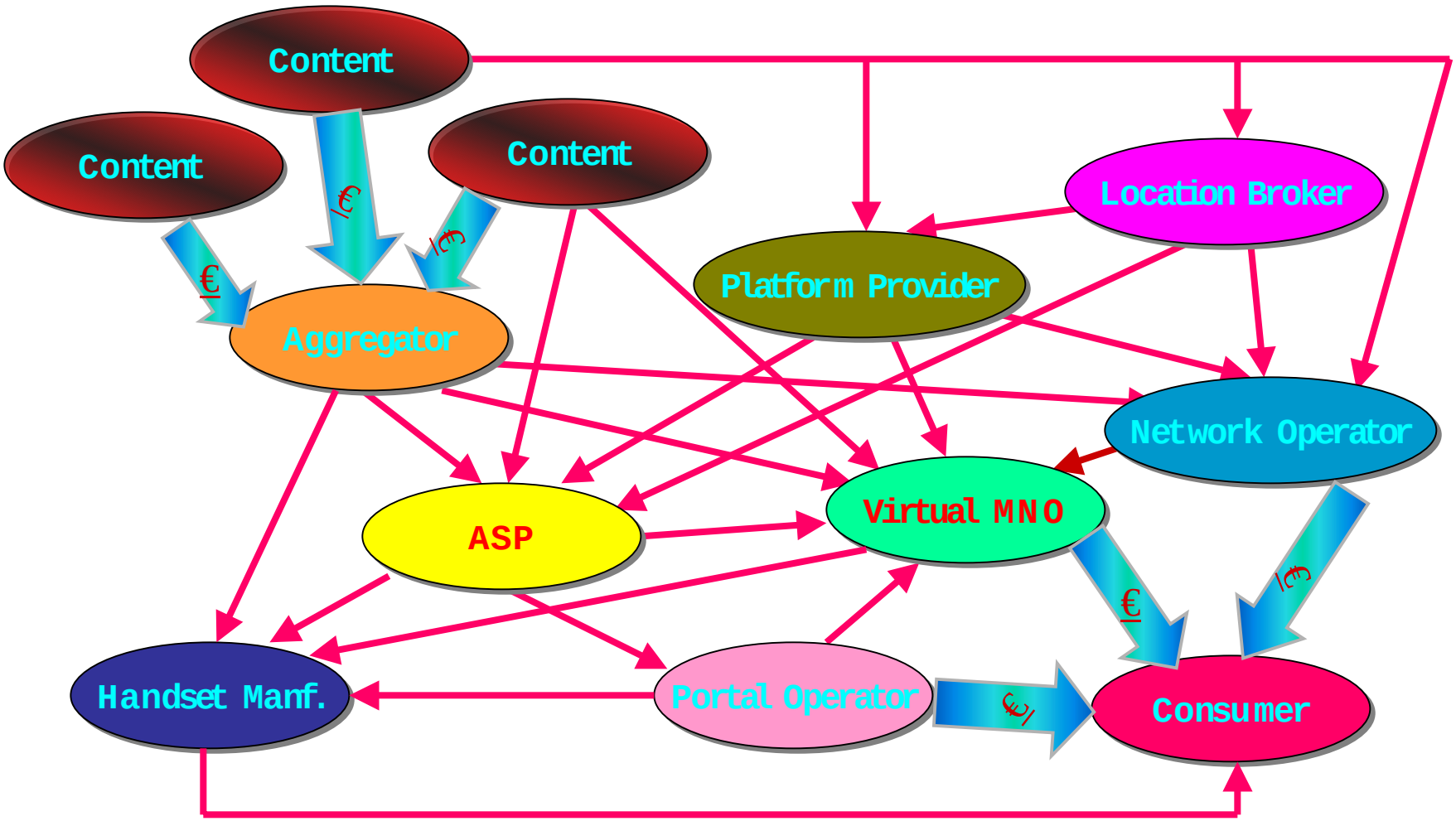
Medical Diagnostics
Remote learning
Administration

Social Services

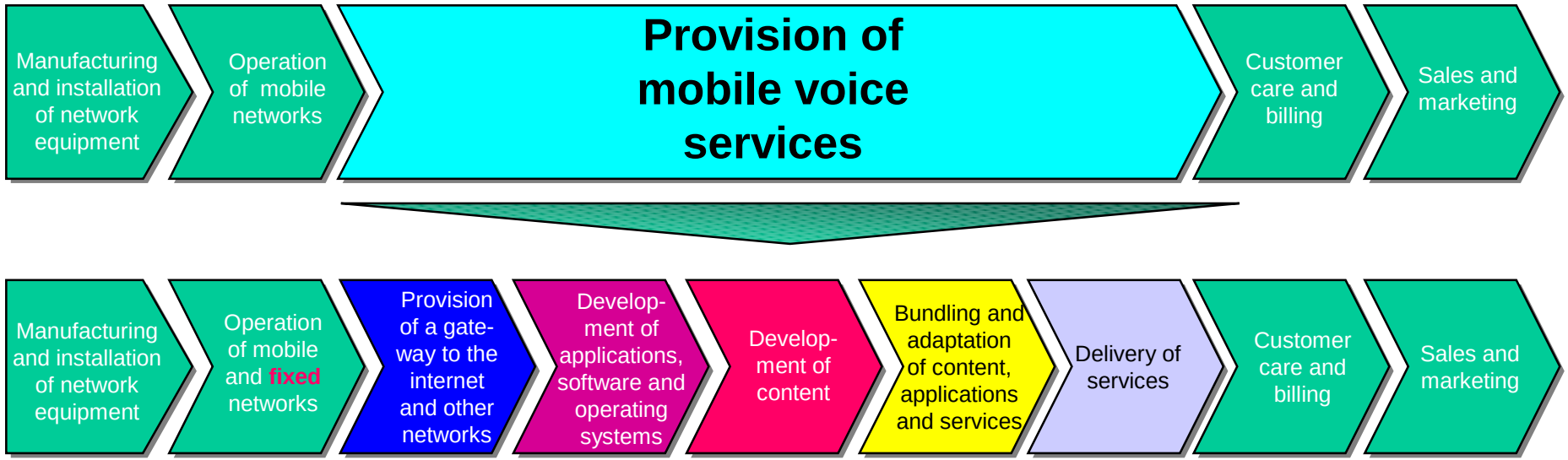
Stream audio and video
Games
Sports

Entertainment

Beyond Communications
The new GPRS/UMTS “€” Network



The new GPRS/UMTS Value Network



Nokia
Ericsson
Alcatel
Lucent
Siemens
Nortel
Japan Inc

Vodafone
Cegetel
T-Mobile
FT/Orange
MCI Worldcom

Microsoft
Symbian
Palm
Phone.com

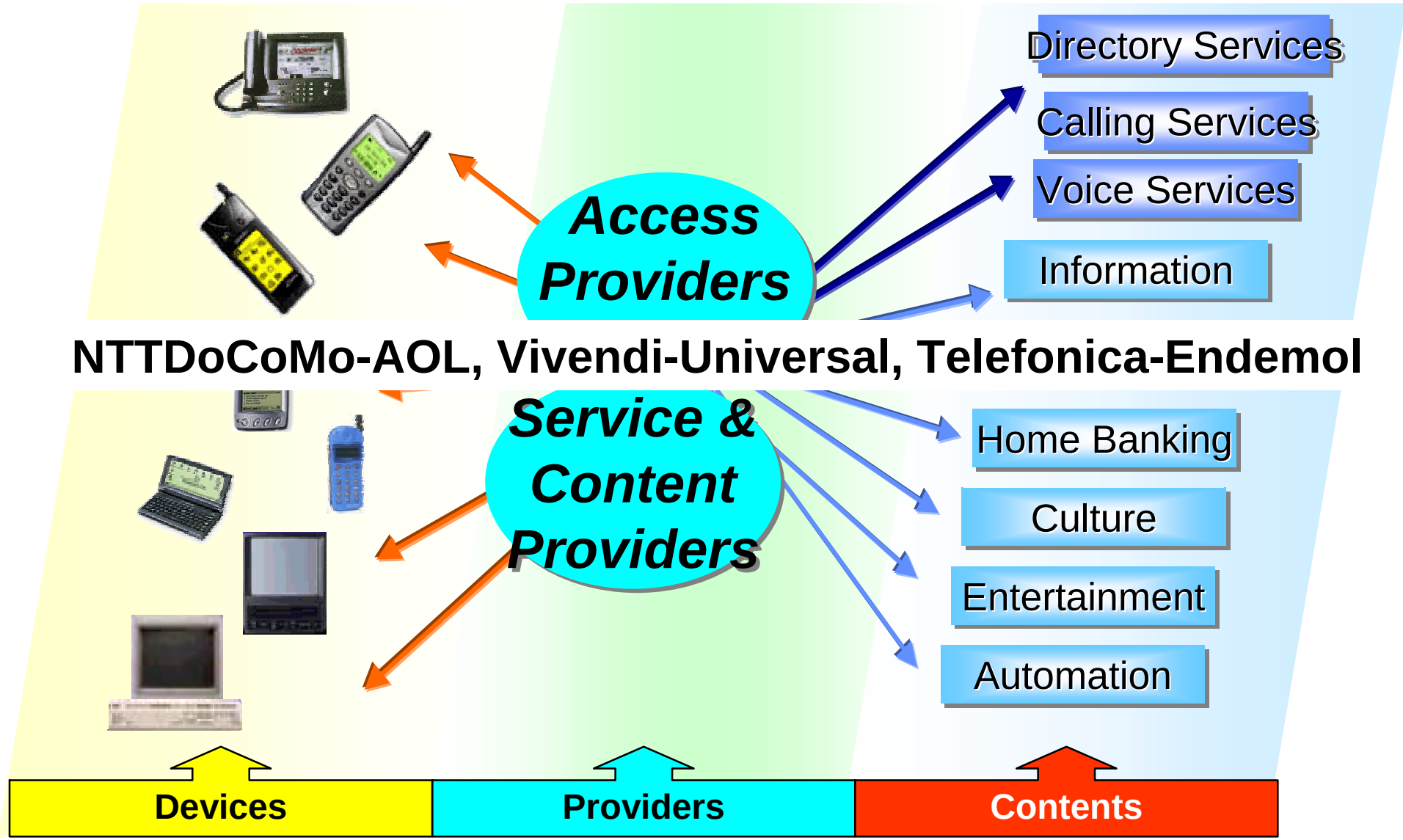
Bertelsmann
CNN
Michelin
Vivendi

Yahoo!
OpenMobile
T-Motion
Sonera Zed

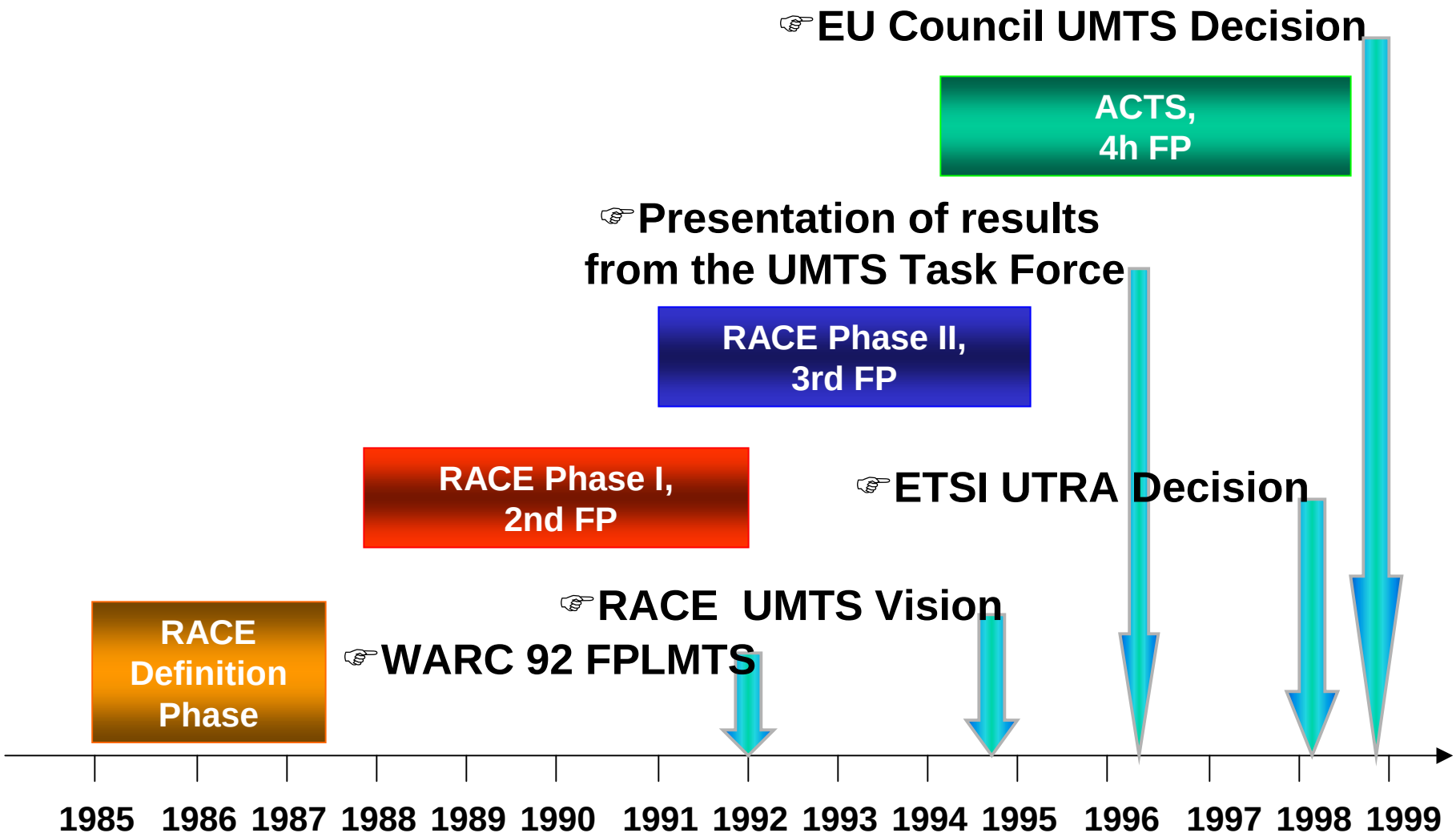
Iobox
AvantGo
Vodafone
T-Mobile
Sonera

Palm.Net
Vodafone
FT/Orange
Sonera

Linking contents to all terminals



Major R&D UMTS Milestones



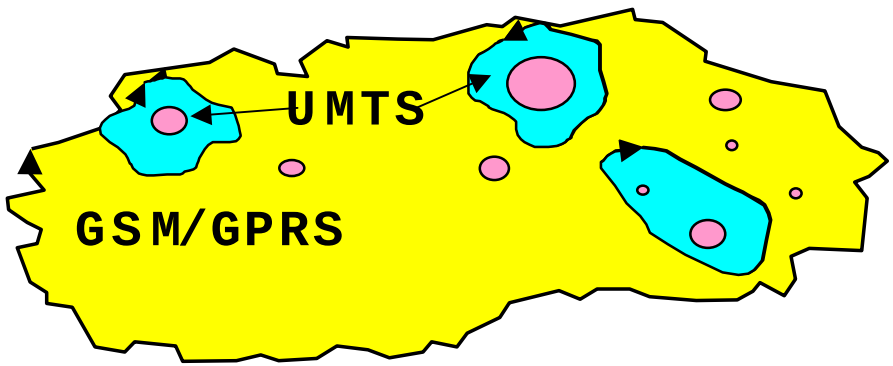
Fragmentation of licensing conditions

- differences in approaches: auctions / beauty contests
- differences in timing of licence issuing
- differences in number of licences
- differences in charges for licences and in payment modalities
- because of decision to allocate proceeds to national budgets: differences in state revenues
- differences in licence duration
- differences in spectrum assignment per operator
- differences in deployment conditions
- differences on modalities for access ("national roaming", MVNO treatment)

Only one Technology: UMTS

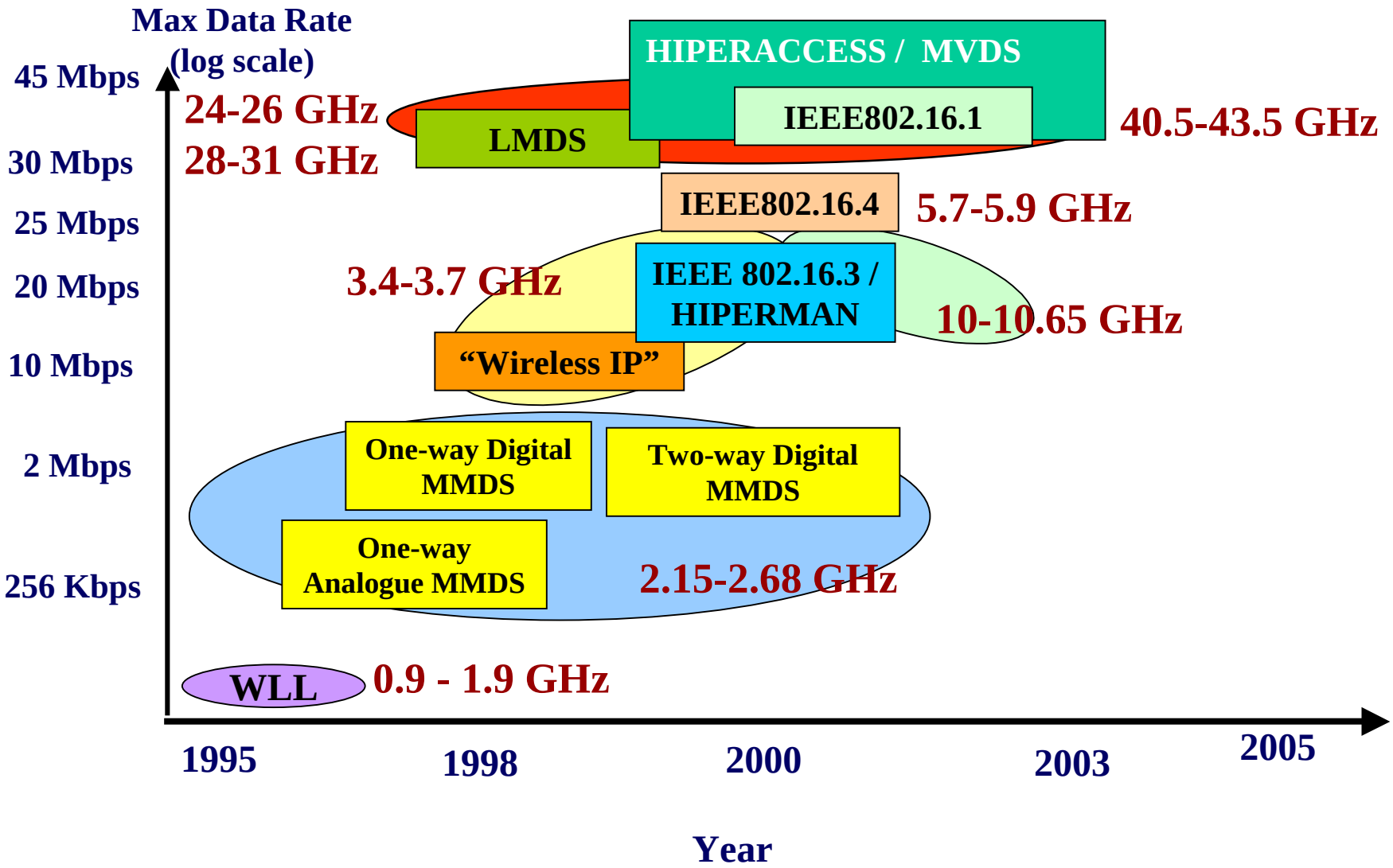
UMTS Issues

- *Licensing and Infrastructure Costs , Network sharing options*
- *Equipment availability, interoperability issues, Standards development*
- *Impact of terminal capabilities on infrastructure cost*
- *Asymmetric and bursty traffic, broadband broadcast/multicast*
- *Hot spots and competition from WLANs*
- *Environmental (masts, radiation) concerns*
- *Spectrum extensions, refarming*
- *Need to ensure the seamless progressive deployment of UMTS islands in a GSM/GPRS sea.*
- *Lack of visibility and definition of services and applications*

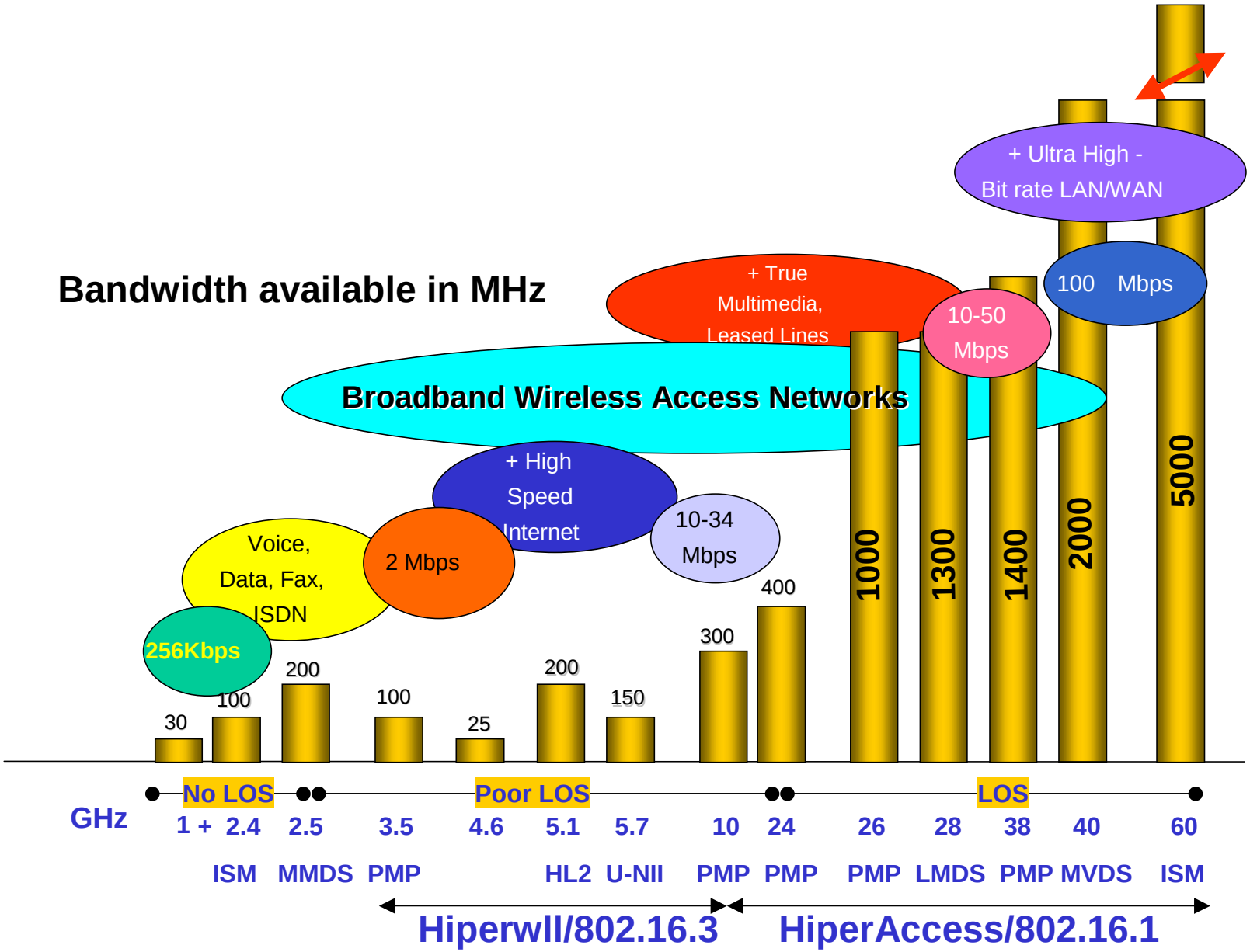


GPRS should provide an opportunity for a better understanding of service suites and pricing policies that will stimulate 3G adoption and usage

Broadband Fixed Wireless Access



Broadband Fixed Wireless Access



Broadband Fixed Wireless Access

<20GHz

- *Cheaper technologies*
- *Bigger cells*
- *Lack of established standards*
- *Less spectrum available. Difficult to get more that 2Mb/s per user*
- *Systems need to be made very efficient*
- *Less than 1000€ per Customer Subscriber Equipment*

>20 GHz

- *Low cost two ways terminal still a challenge*
- *Small cells (up to 5 Km, due to rain attenuation)*
- *Line of sight necessary: low coverage that may need overlapping cells or repeaters or reflectors*
- *European harmonised spectrum: 40.5-43.5 GHz*
- *Up to 155 Mb/s per user*

Today: **it is seen as a competitive solution to ADSL and Cable, further contributing to the unbundling the local loop (high data rates). Regulators now willing to consider FWA for mobile backhaul.**

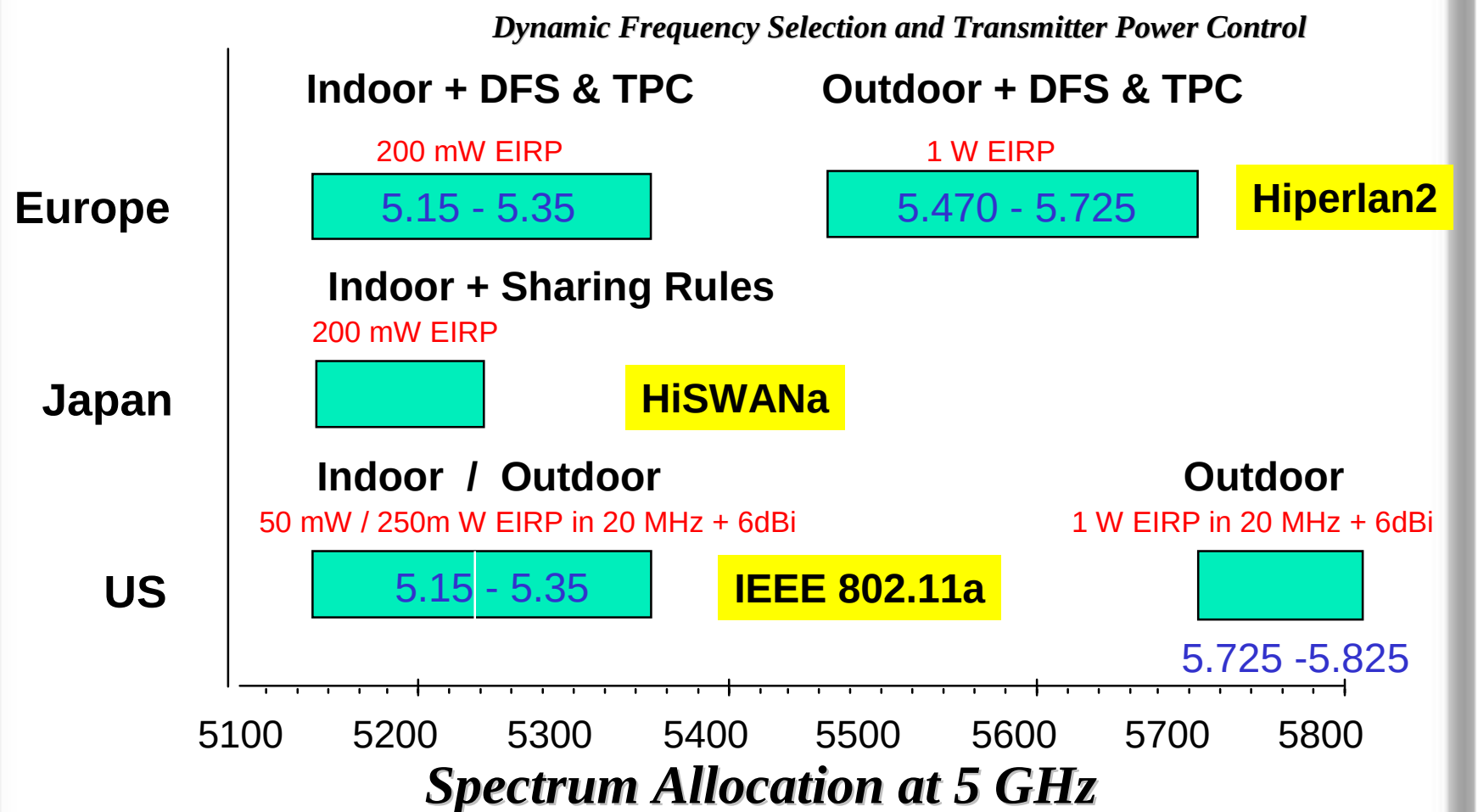
In the future: **provision of broadcasting and interactive service s (Multimedia Wireless Systems)**

EU status (Band Fragmentation)

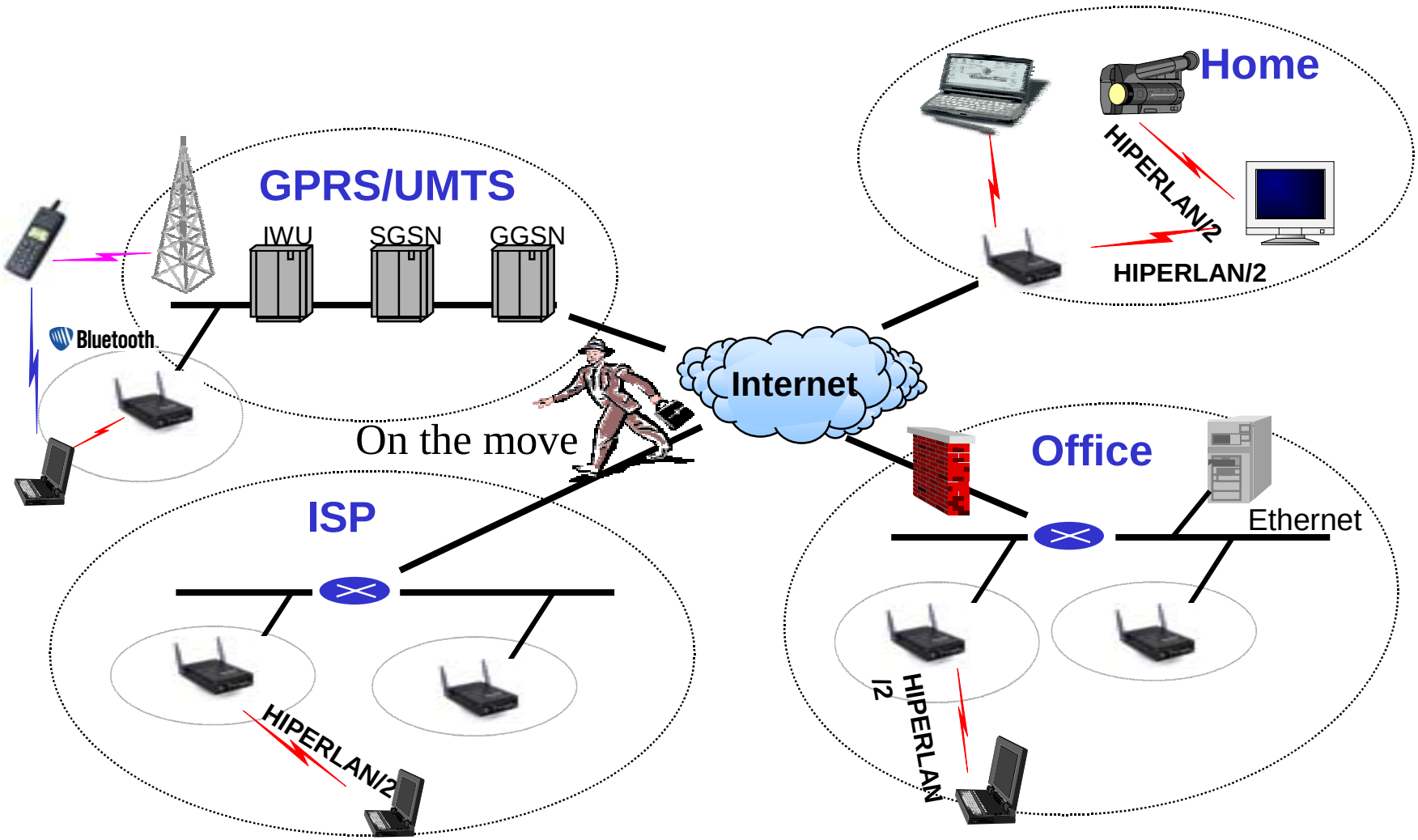
FREQ. (GHz) / COUNTRIES	2.029-2.281	2.40-2.62	3.4-3.6 ERC Rec	3.6-4.2	10.15-10.65 ERC Rec	24.5-26.5 ERC Rec	27.5-29.5 ERC Rec	40.5-43.5 ERC Dec
AUSTRIA (AUCTION)			P		Reserved for other applications	T *Jan 2001*	P	P
BELGIUM (BEAUTY CONTEST)			P Dec 2000		P Dec 2000	P Dec 2000	P Under study	P Under study
DENMARK (BEAUTY CONTEST)			T(4) *Dec 2000*		P	T (4) *Dec 2000*	P	
FINLAND (1ST COME-1ST SERVED)			A(6)		A(2), P(2)	A(6), P(1)		Committed to ERC/DEC(99)15
FRANCE (BEAUTY CONTEST)			A July 2000			A July 2000		
GERMANY (BEAUTY CONTEST)		A	A/T		Reserved for other applications	A/T (2)	Reserved for other applications	P
GREECE (AUCTION)			T(4) Nov 2000			T(5) Nov 2000		
IRELAND (BEAUTY CONTEST)	A(2) June 2000	A(1)	A(2) June 2000		P(1)	A(4) July 2000		Committed to ERC/DEC(99)15
ITALY (TO BE DECIDED)						P		P
LUXEMBOURG (1ST COME-1ST SERVED)			A(1)			P		
NETHERLANDS (AUCTION)		T (1) June 2000	T (1) June 2000		Reserved for other applications	T (5) June 2000	P	P
PORTUGAL (BEAUTY CONTEST)				A(3) *Nov 1999*		A(6) *Nov 1999*	A(2) *Nov 1999*	P
SPAIN (BEAUTY CONTEST)			A(6)			A(2) Jan 2000		Committed to ERC/DEC(99)15
SWEDEN (1ST COME-1ST SERVED)			A(3) *1996 -97*	P		P	P	P
UK (AUCTION)	A(2) *Dec 1997*	A(1) *Oct 1997* *May 1999*	A (2) *Nov 1995*	A(1)	A(4) *Nov 1997*	Reserved for other applications	T *Oct 2000*	P

Wireless Local Area Networks

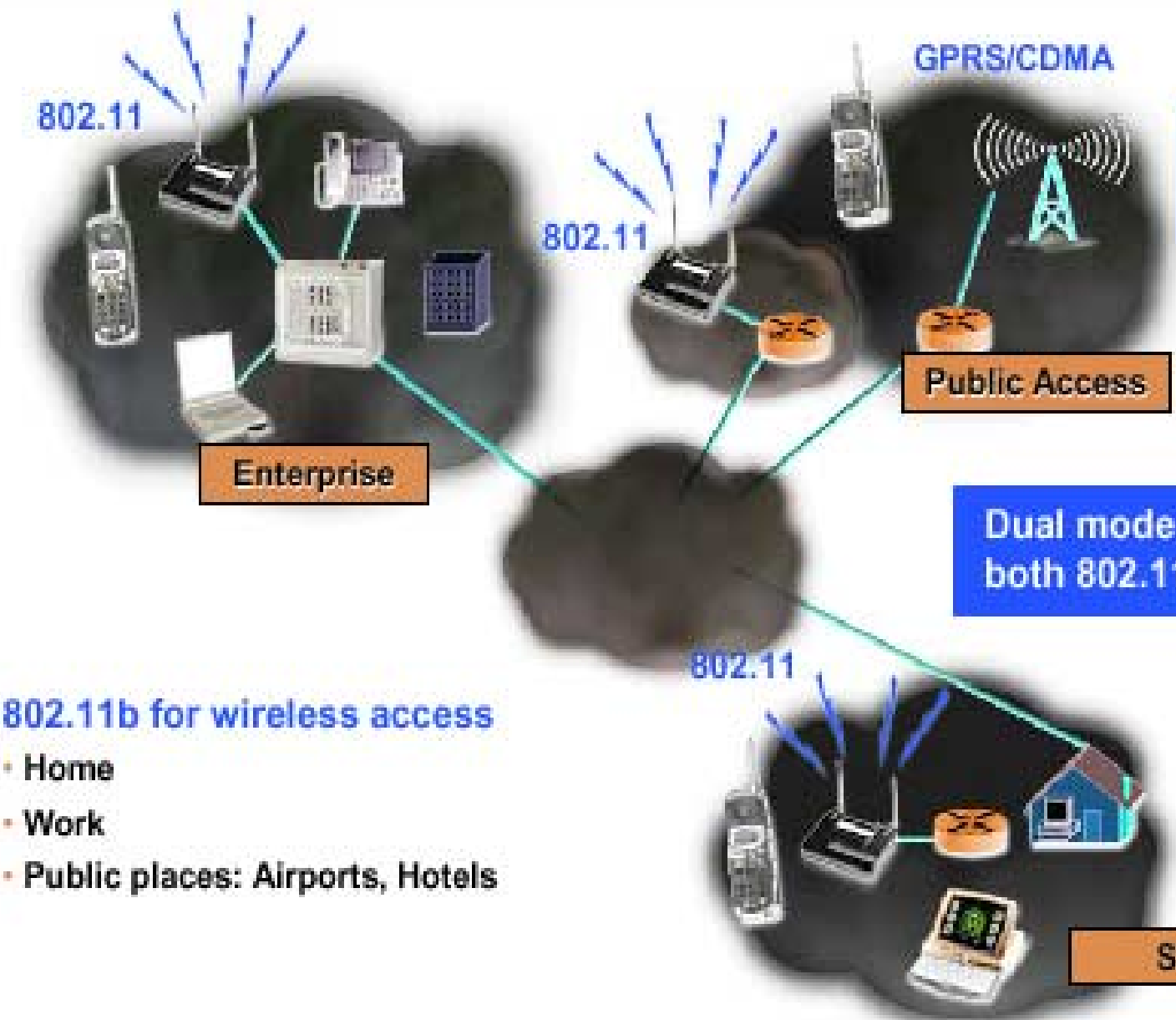
4.5B€ market by 2006 of which 2.4B€ for home networking



H2 Application Scenarios



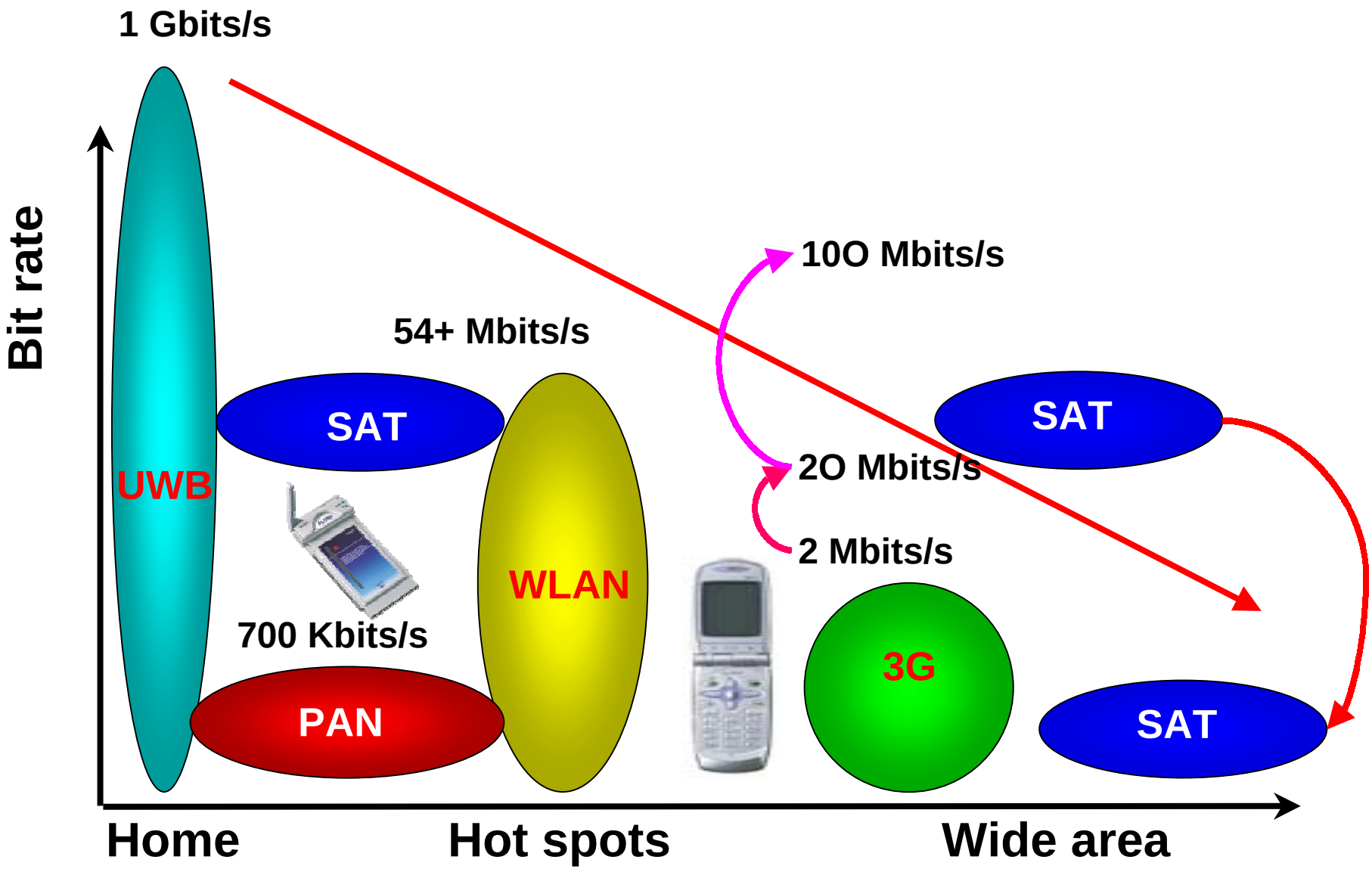
Mobility and Bit Rate trade-offs



802.11b for wireless access

- Home
- Work
- Public places: Airports, Hotels

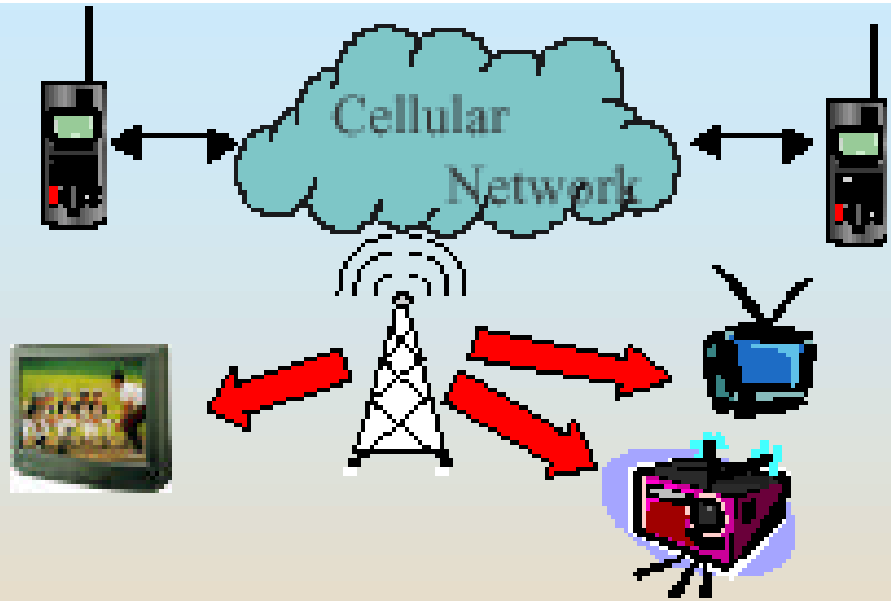
Coverage and Bit rate trade-offs

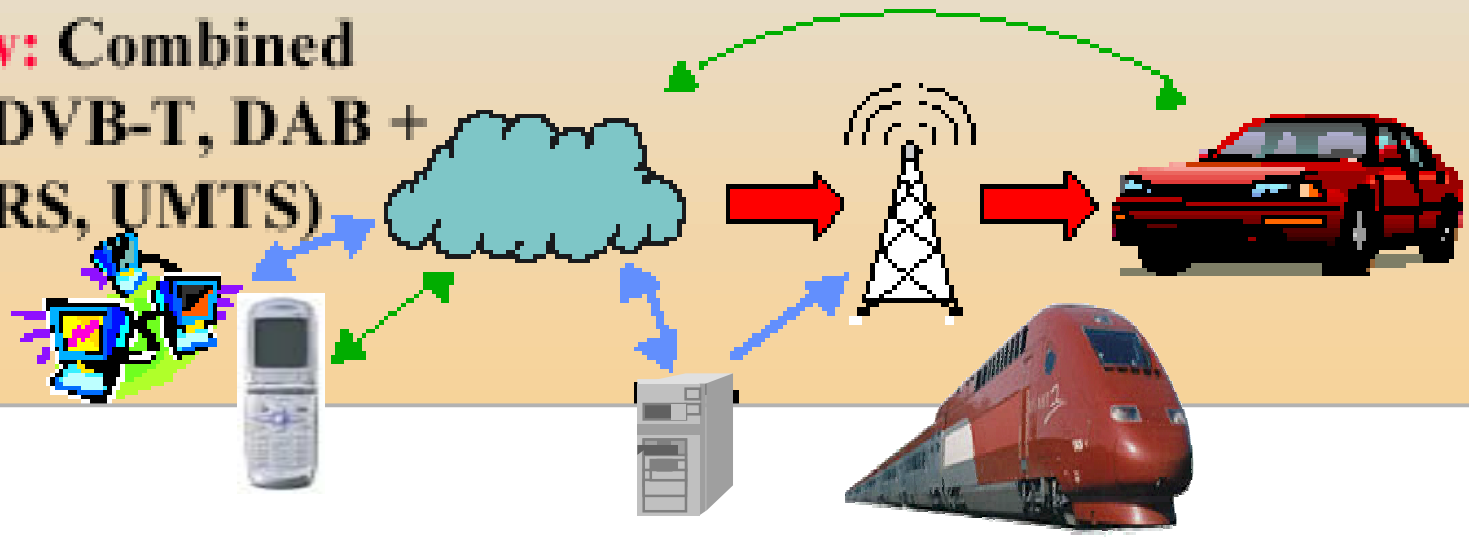


Mobile - Broadcasting Convergence

(A Cooperative model)

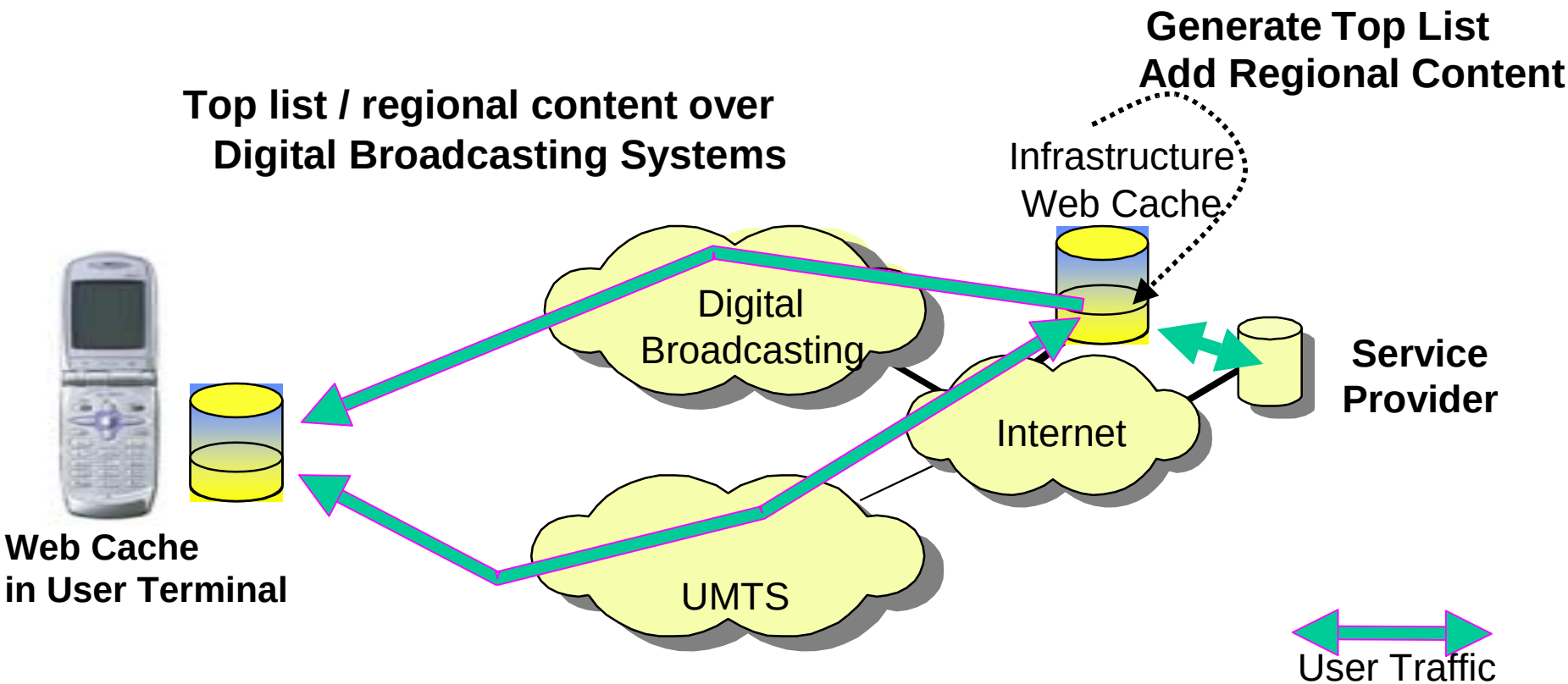
- **Today:** Mobile radio (GSM, GPRS, [UMTS]) 9.6 kbit/s - 2 Mbit/s
- **Today:** Digital broadcast (DVB-T, DAB) 1 - 15 Mbit/s
- **Tomorrow:** Combined network (DVB-T, DAB + GSM, GPRS, UMTS)





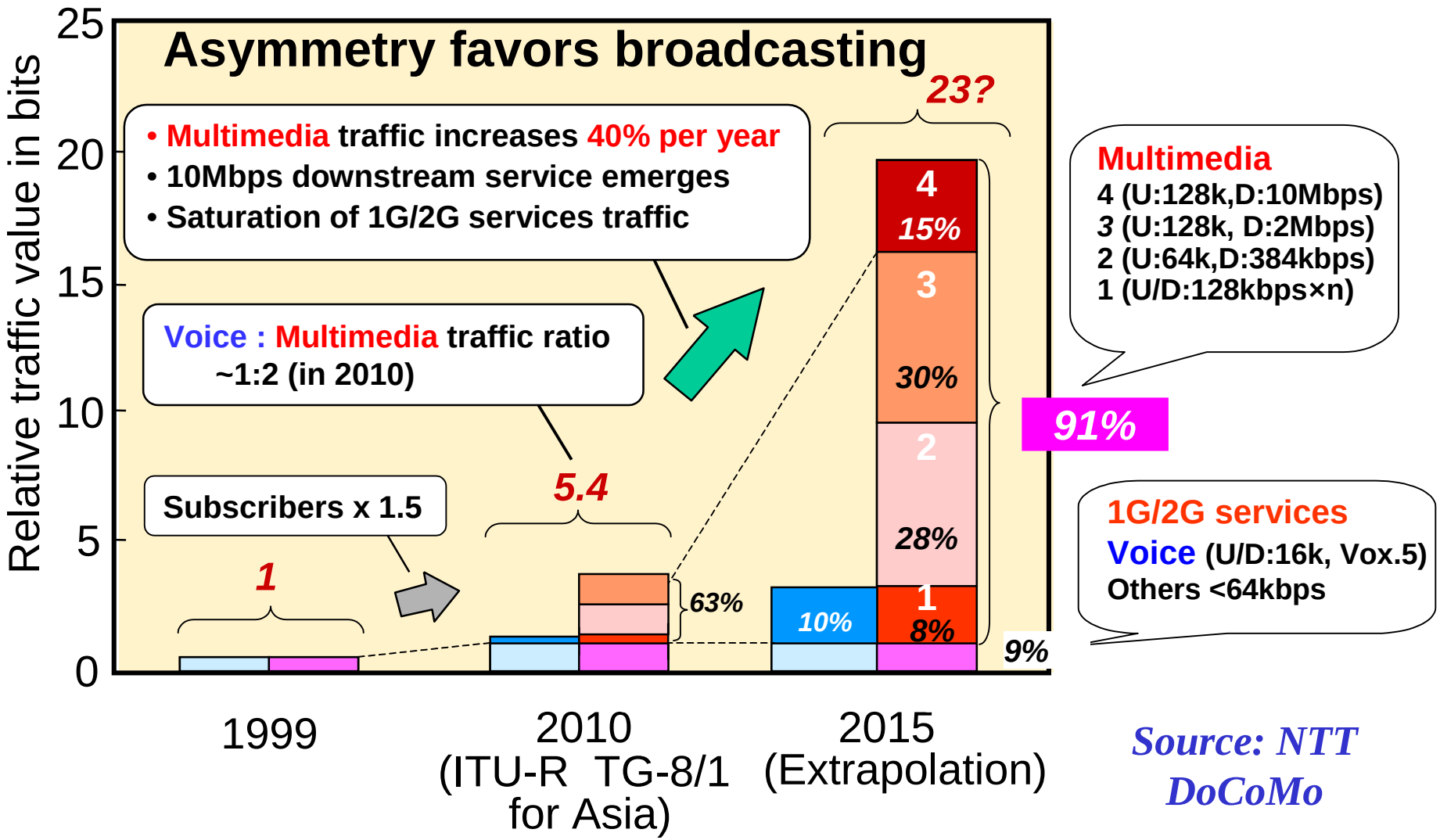
“Asymmetric-Multicast UMTS”

Mobile - Broadcasting Convergence



Interactive traffic over UMTS

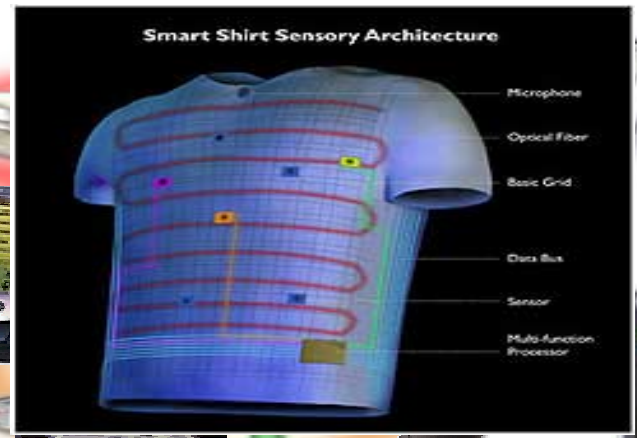
Will traffic go asymmetric?



Source: NTT DoCoMo

The "Probable Wireless Future"

Optimally connected anywhere anytime



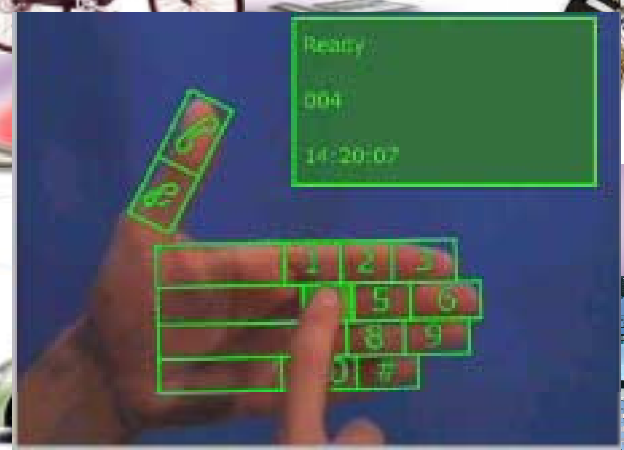
Body Area ***Fixed/Cellular/Broadcasting***

Perceptive interfaces

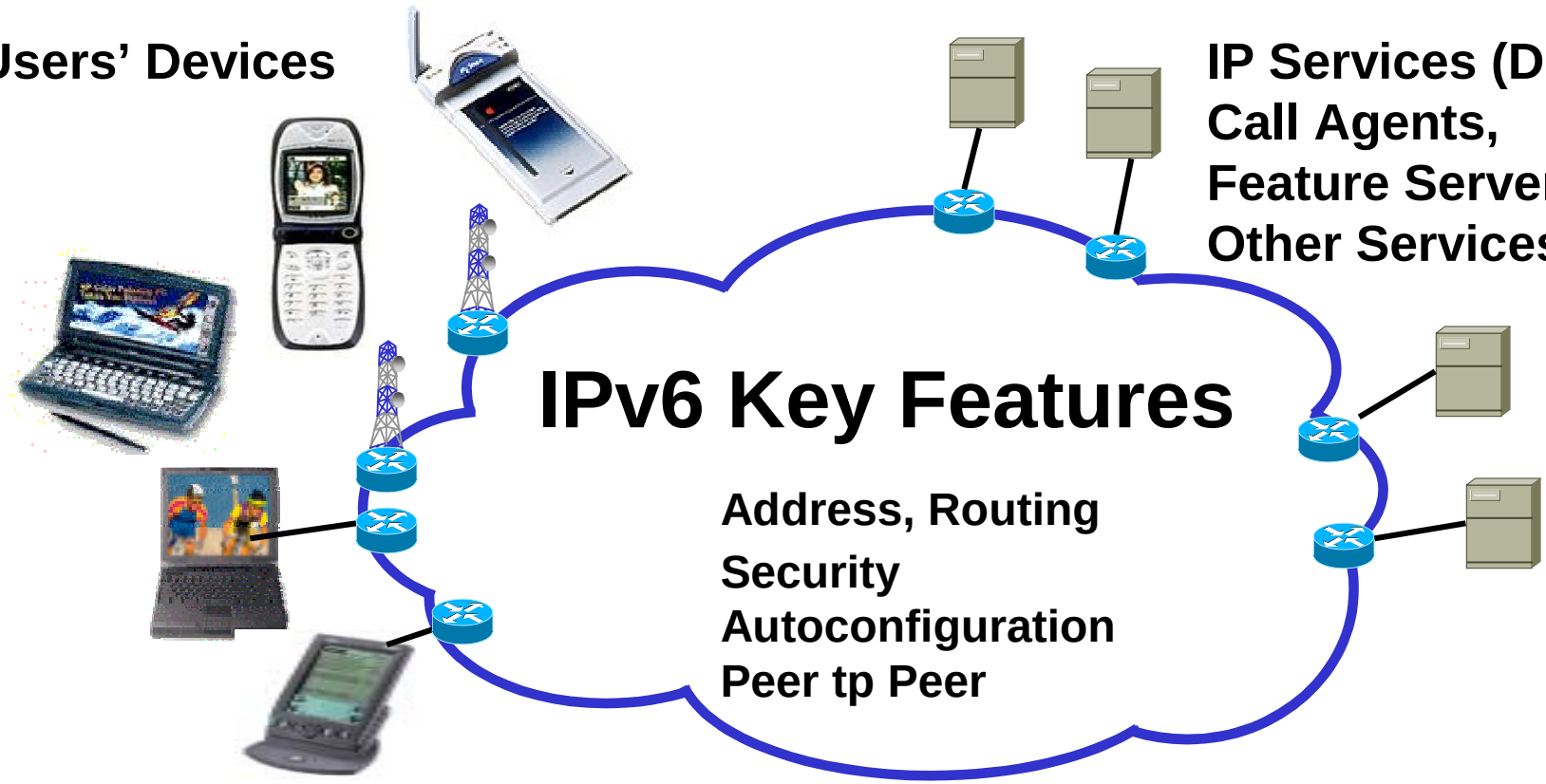
Sense*:* sounds, video images

Recognize*:* words, people, gestures, gaze

Respond*:* process commands, access information



The future network



-Edge routers provide mobility service (mobile IPv6), allowing roaming across many access networks (cellular, WLAN, wired)

-Servers/services can be located anywhere, by anyone

The current Internet - IPv4 -

- **Address space with IPv4 is being rapidly depleted**
  - **At the current rate by "2005-2006" the number of addresses will be fully depleted**
  - **The further development of 3G will be seriously compromised without IP addresses**

- **To cope with the problem, industry has offered a number of "patches" that further compromise security of transactions**

- **Some 75% of the IPv4 allocated addresses are in the US**

- **US universities such as Stanford or MIT have more addresses than China**

A larger IP address space is needed

- **Overall Internet traffic is growing very fast**

  ~320 million users in 2000, ~480 million as of Oct 2001

- **The number of cellular users is growing**

  ~ 650 million mobile phone users in 2000, over ~ 1 billion by 2003

- **The number of cars to be equipped with sensors, actuators, GPs, Yellow page services is growing**

  ~1 Billion cars in 2010, 15% should get GPS and Yellow Page services

- **The number of "always-on"Internet appliances for Home users will reach billions**

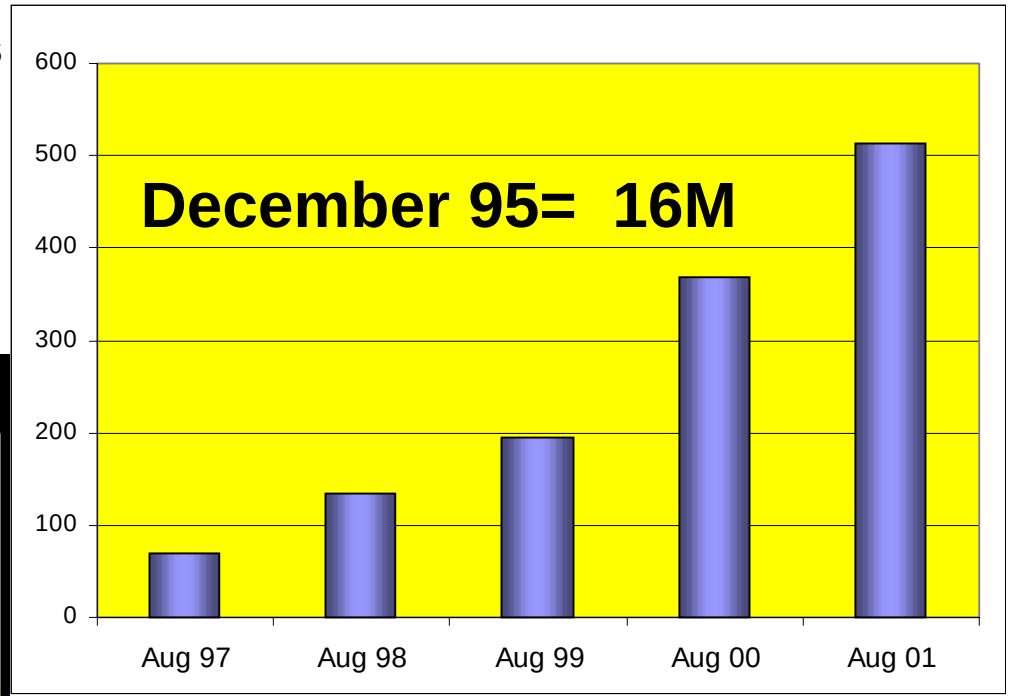
Emerging population/geopolitical & Address space

China, India, Japan, Korea needs global IP addresses

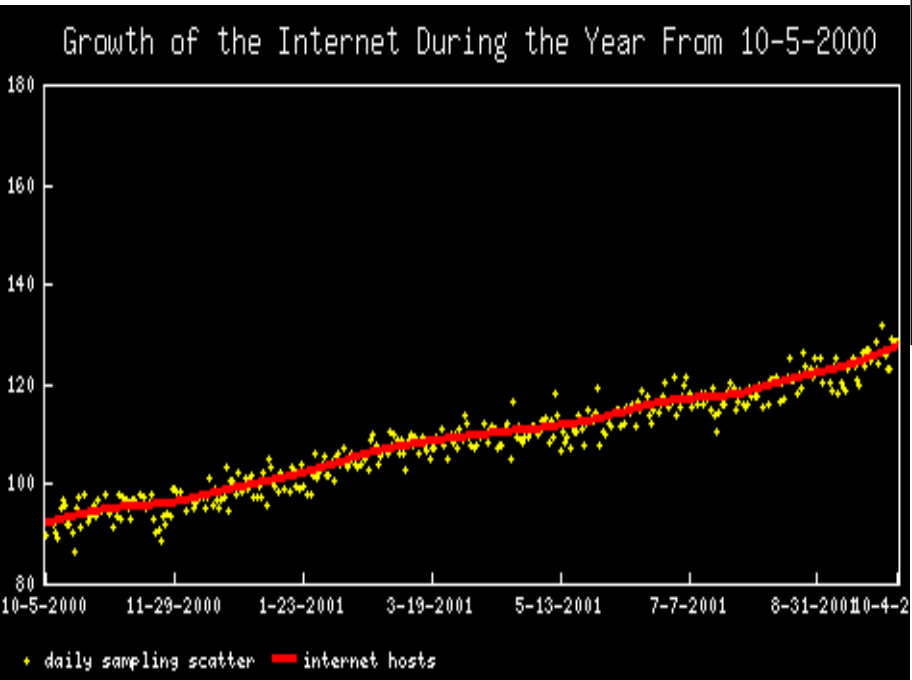
How to move to e-Economy without Global Internet access?

The size of Internet

513 Million Internet users
August 2001
http://www.nua.ie/surveys



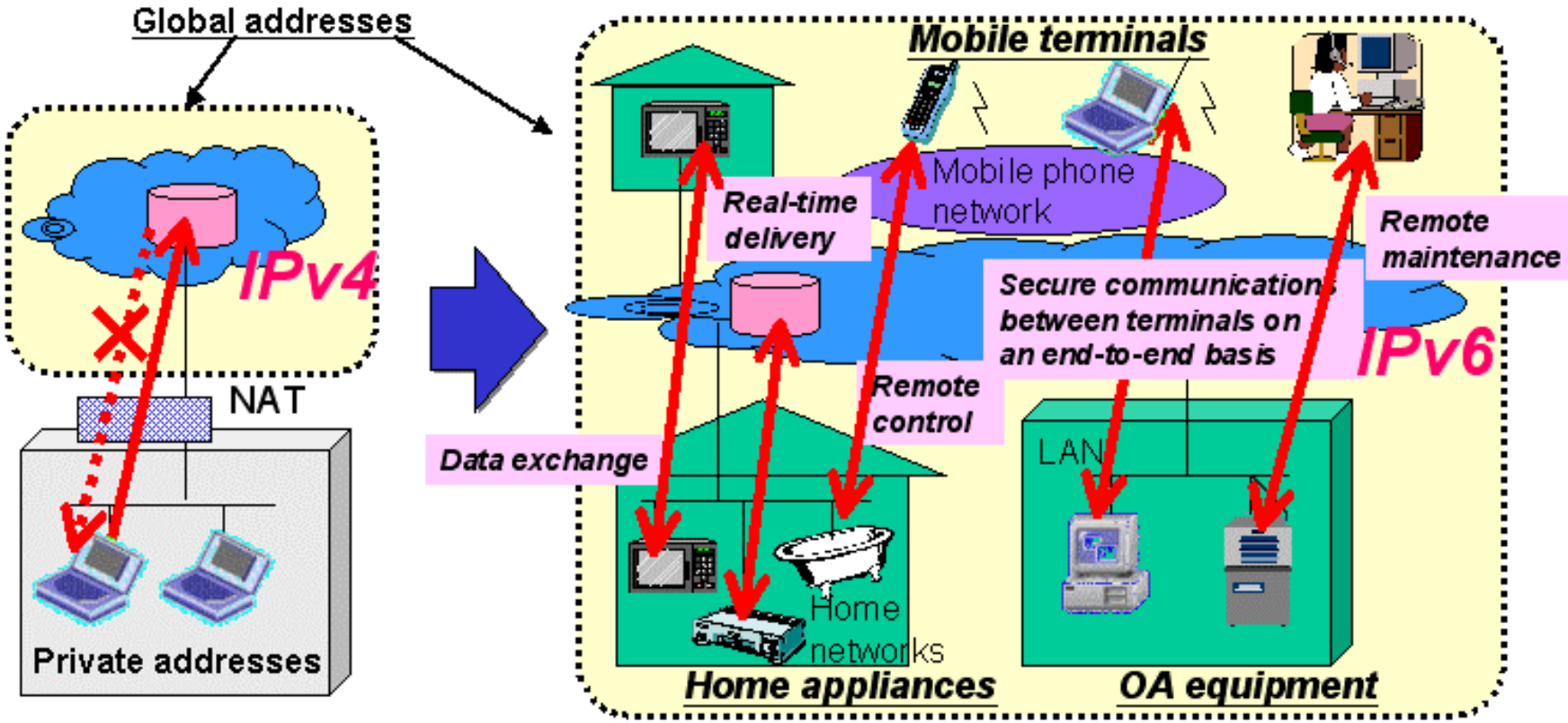
127 Million Hosts, 480 Million Internet users
5 October 2001
http://www.netsizer.com/



There is no substitute for IPv6

- **Enough Addresses**
  - **From private addresses to global addresses in every terminal and device.**
- **Address Autoconfiguration (plug and play)**
- **Increased Network Efficiency**
  - **Can reduce network load up to 50%**
  - **Route Optimization could double Internet-wide performance!**
- **Increased Functionality**
  - **New services, new business opportunities, lower costs, higher performance, more robustness, from a one way road (dead end) to a two way highway.**
- **Competition enhanced**

IPv6 creates new business opportunities



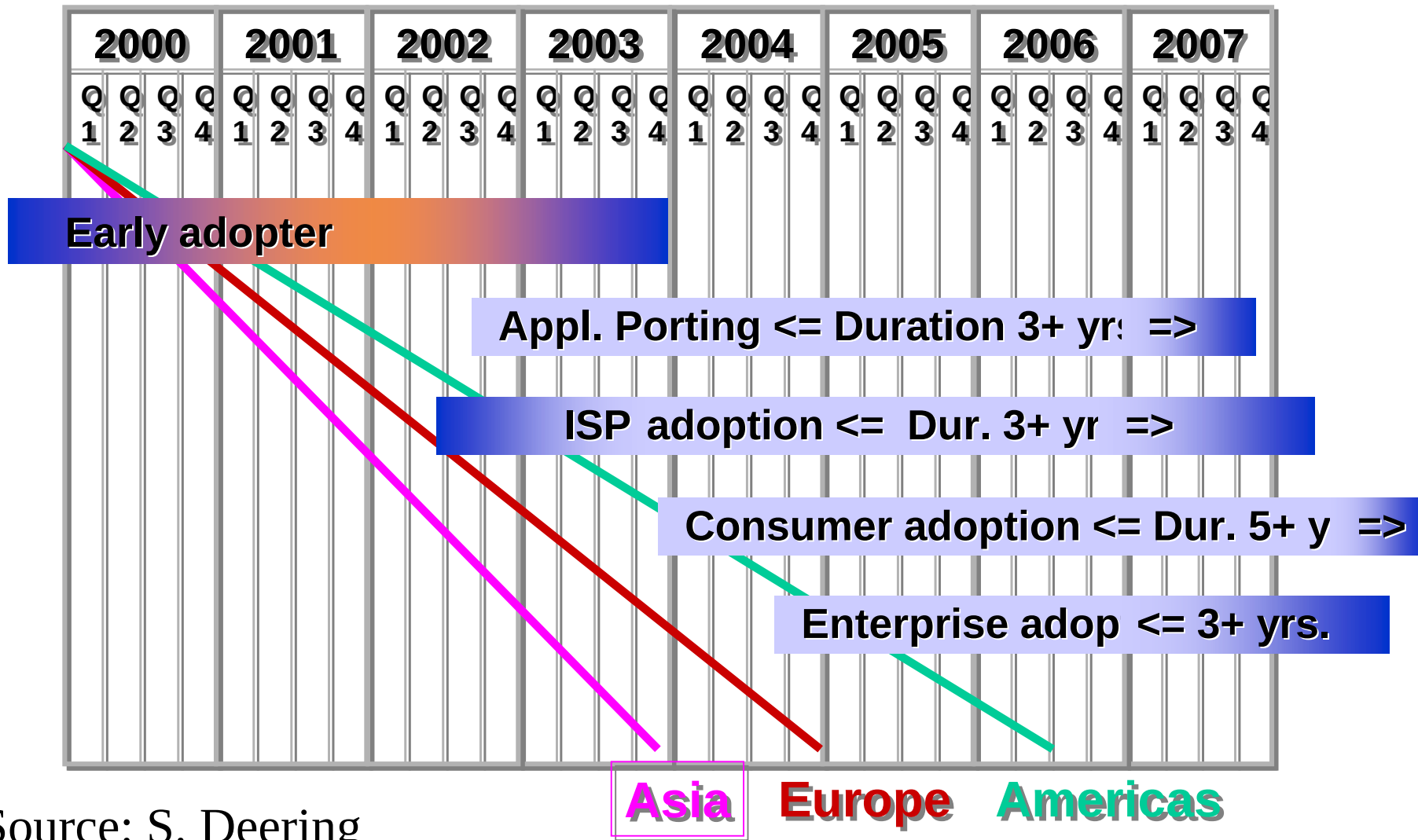
IPv4: One-way access

- Transform private addresses to global addresses using NAT
- One-way access from terminals to the Internet
- Client & server type business model

IPv6: Two-way access

- All terminals provided with respective global address
- All terminals capable of peer-to-peer access
- Home appliances and mobile terminals connected to IPv6
- Possibilities for new type of Internet business

IPv6 Timeline
(A pragmatic projection)



Source: S. Deering

IPv6 for Europe

- **IPv6 is seen as a key enabler for 3G/UMTS mobile multimedia services and wireless is the killer application for IPv6**
  - **The adoption of IPv6 by 3GPP is the first and the biggest real business case for IPv6**
- **Major European mobile manufactures have announced or are considering an All-IP network based on IPv6 to be ready by 2002**
- **EC took the initiative to set up the IPv6 Task Force**

IPv6 is critical to the continued viability of the networked economy

4G Perspective

Seamless personalized access from a range of networks and environments

Seamless personalized access for a range of applications

Seamless and secure access from a range of devices

The Goal of 4G should be:

To ensure the delivery of personalized (auto-configured) end-to-end services, with desirable properties (e.g., security, authentication, price, performance, reliability), provided by multiple service providers and/or aggregators, across self-configured and competing heterogeneous wired and wireless (shared) networks, through multiple plug&play input/output devices.

Its main characteristics are:

Re-configurable Infrastructures

Connectivity enhancement

Infinite creativity on content applications and services

Unlimited business models

User independence from operator

Re-configuration and adaptation at all levels

User Perspective

More Flexibility

Optimise against tariffs, QoS, Optimise against context and location, Handles digital signatures, Protects against viruses

Cheaper

Cheaper Applications/devices, Shared SW Resources

Better Usability

Easy Auto-Configuration, Simpler Interfaces

Lower the usability threshold

Service Provider Perspective

Cope with scalability, Optimisation of heterogeneous Networks, New QoS,Billing Models, Myriad of applications, Lowering the complexity of service provisioning.

Manufacturer Perspective

Changes Development Cycle, Reduces complexity, Component Reuse, Easier integration of new features

Lower Costs

General Infrastructure Requirements

Services everywhere. **The infrastructure should give users and devices convenient and widespread access to an open set of services supplied by, or based around, people, places and things.**

Scalability. **The infrastructure has to perform well and remain manageable in the face of potentially large scale (trillions of devices).**

Simple model of configuration by users. **The overheads for users for configuring services and devices must be very low.**

Layered infrastructure. **The infrastructure should be layered so as to minimise the dependencies on the infrastructure of individual devices that do not require higher-level services.**

Desirable functional features

Network creator, **sets up a micro-local network to link together nearby devices. Transponders could be built into communicators which co-operate with nearby communicators to set up a self organising network, allowing calls to 'trickle through' from end to end with no need for cellular base stations or a fixed network.**

Network detector, **listens for presence of various networks. Can detect whether POTS, xDSL, cable modem, and also detect DECT, GSM-GPRS, UMTS, 802.11, Hiperlan, etc.**

Network locator, **identifies where the user is so that the preferred operator can see where he is, offering an appropriate connection to the network. Route “calls” to a nearby terminal automatically wherever the user wanders.**

Service Optimiser, **automatically optimises against the various available tariffs, QoS, context, location.**

Desirable functional features

Negotiator, **automatically negotiates with nearby terminals and networks for connectivity.**

Network converter, **allows a bridge between different networks.**

Compressor, **compresses signals to fit across a limited bandwidth connection.**

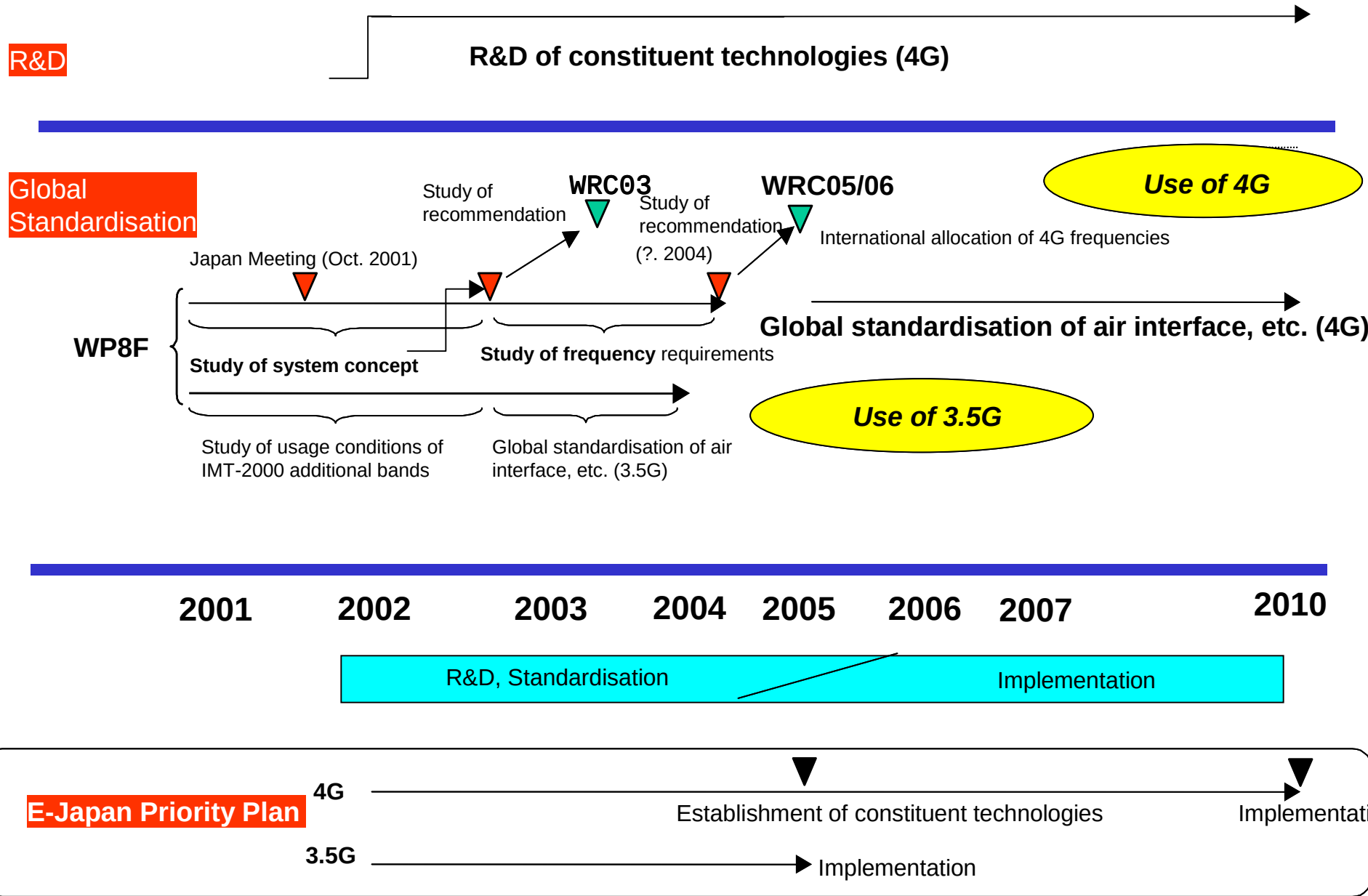
Translator, **allows protocols to be converted to allow otherwise incompatible devices to communicate.**

Protector, **electronic condom - prevents corruption of devices by viruses, incompatible protocols and physical layer problems.**

Identifier, **universal security device that authenticates the "user" and provides digital signatures across various platforms.**

Encryptor, **which encrypts and decrypts transmissions for security across unsecured networks.**

4G Implementation Plan (Japan)



Elements of the Strategy

Promotion of R&D and international standardization

- Promotion of international standardization with international competition and cooperation taken into consideration
- Setup of forum for promotion of R&D and standardization

Establishment of R&D framework

- General establishment of R&D bases
- Installation of test beds
- Development and promotion of pilot experiments in regions
- Cooperation among research institutes such as universities and academic societies, and its reinforcement

Priority R&D projects

① ***Ultra-broadband mobile communication technology***

② ***Wireless ad-hoc network technology***

③ ***Software radio technology***

④ ***User-oriented application technology***

⑤ ***Mobile platform technology***

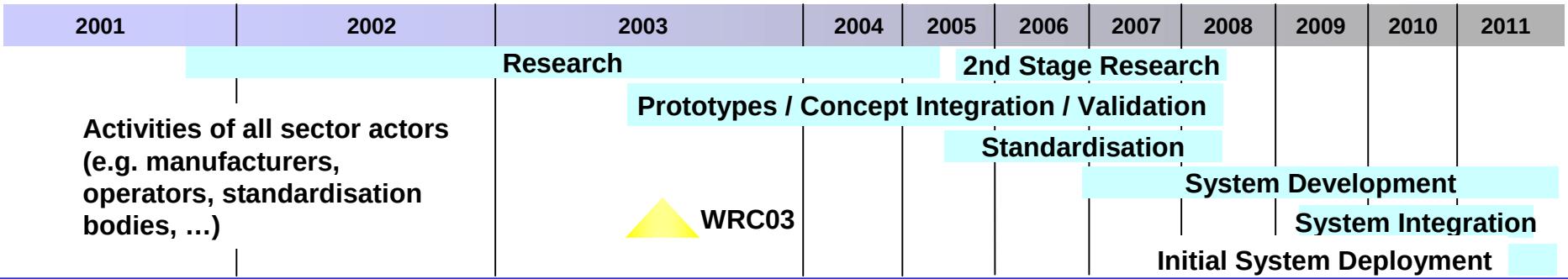
Environment for creation of application market

- Promotion of R&D and standardization with creation of application market taken into consideration
- Promotion of development and standardization of mobile commerce

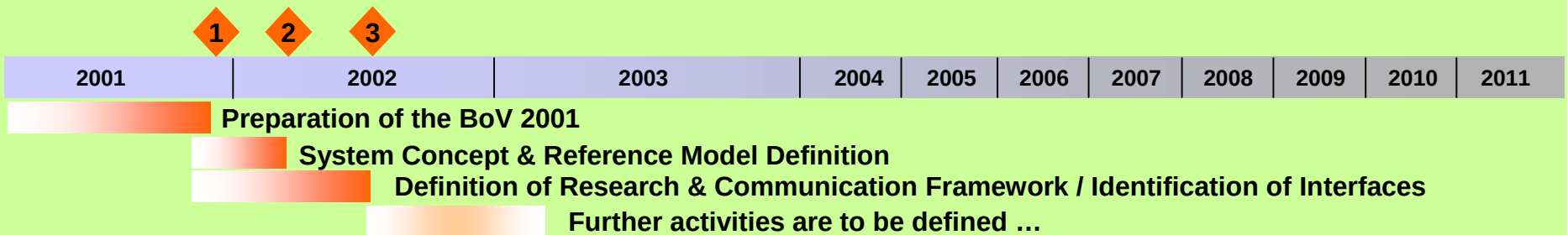
Promotion of international cooperation

- Proactive contribution to ITU activities
- Cooperation with Europe, U.S.A. and Asian countries in R&D and international standardization

4G Implementation Plan (WWRF)



WWRF Milestones & Activities for 2001 and Beyond



1. **Book of Visions 2001 published – Initial set of WWRF research tasks**
2. **Initial system concept & reference model established for research**
3. **Initial WWRF research framework established and communicated to national & international research programmes and relevant standardisation bodies**

Pillars of the Wireless World

Semantics aware Services

Software Defined Radio

Smart Antennas & Basestations

Co-operative Networks & Terminals

4G Radio Interfaces

Peer Discovery

Heterogeneous Ad-hoc

Augmented Reality / Cyberworld

E2E Security & Privacy

An Indicative Timetable

21 February 2001: Commission proposal to Council and Parliament

3 March 2001: Presentation to informal Council meeting

April 2001: Starting the IST consultation process

Discussions on-going, notably on the instruments and on the budget

June 2001: Research Council

July 2001: Parliament's first reading at EP6

We are here

Oct/Dec 2001: Research Council position

March 2002: Parliament second reading

Spring 2002: Conciliation procedure

June 2002: Final adoption

FP6 Structure and IST Content

12770M€

INTEGRATING EUROPEAN RESEARCH

PRIORITY THEMATIC AREAS

- Genomic and biotechnology for health
- Information society technol
- N notechnologies, intelligen
- new production processes
- Aeronautics and space
- Food safety and health risks
- Sustainable development and global change
- Citizens and governance in the knowledge society

ANTICIPATING S/T NEEDS

- Research for policy support
- Frontier research, unexpected developments
- Specific SME activities
- Specific international cooperation activities
- JRC activities

STRUCTURING THE ERA

- Research and innovation
- Human resources & mobility
- Research infrastructures
- Science and society

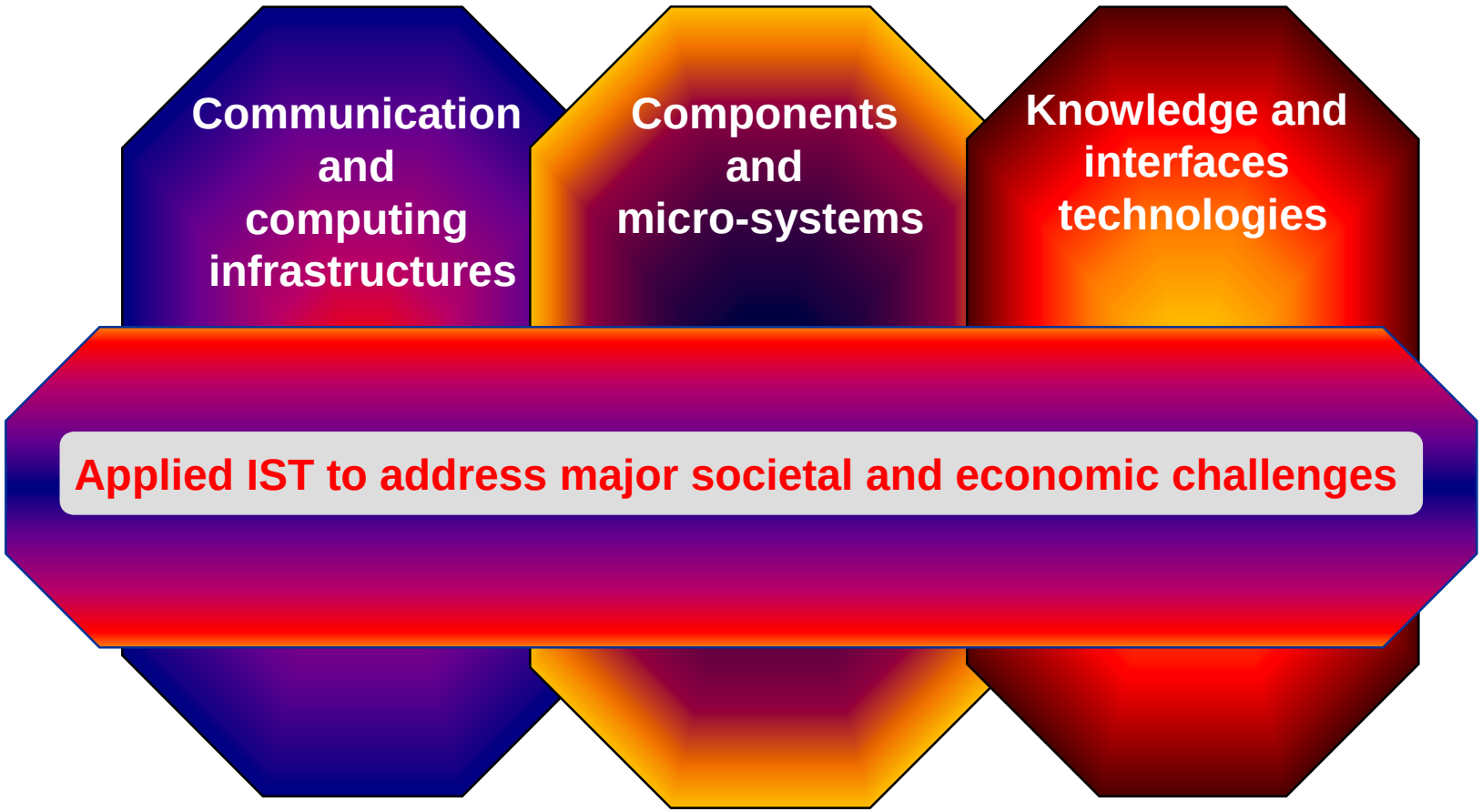
3050M€

STRENGTHENING THE FOUNDATIONS OF ERA

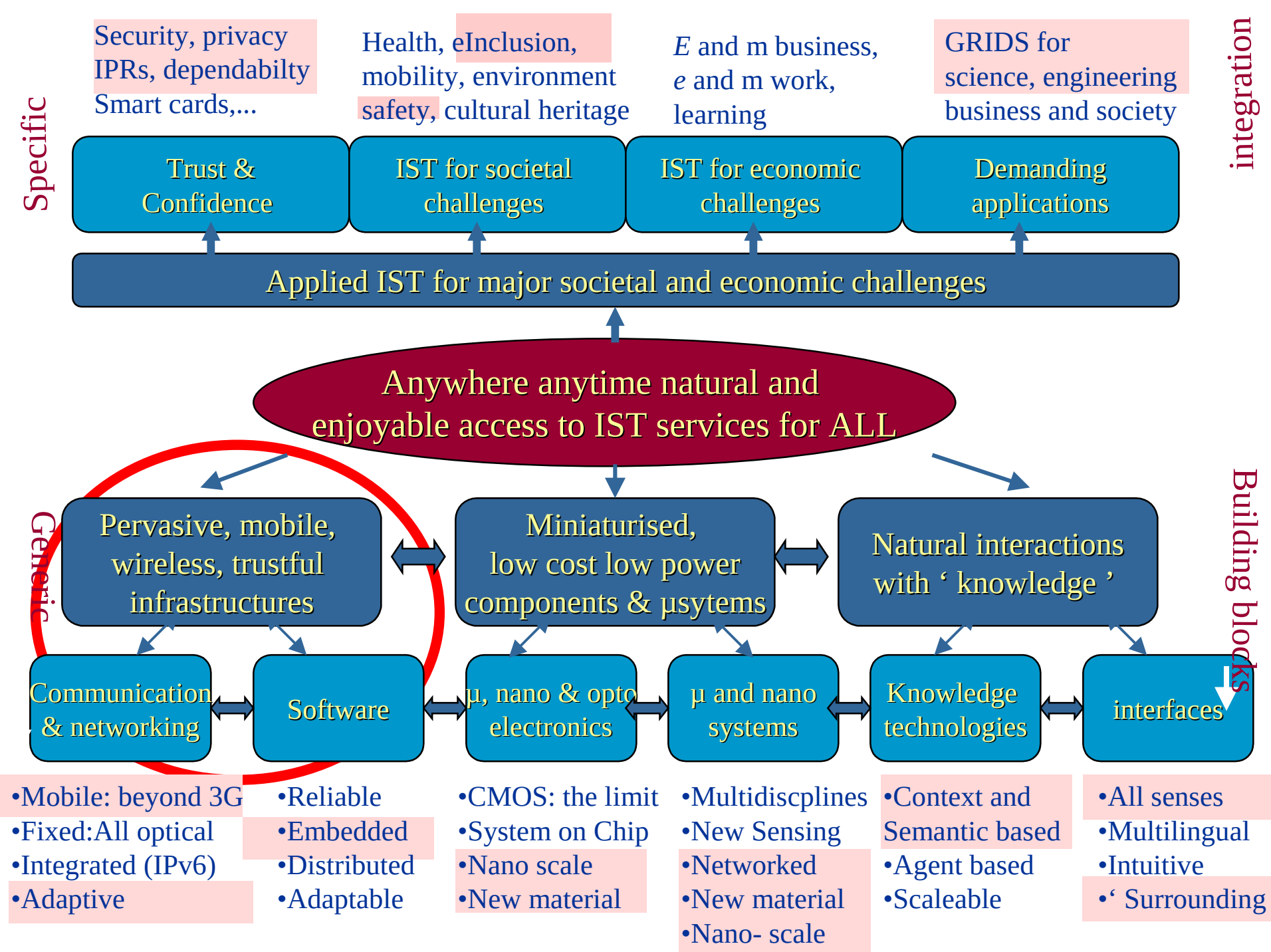
- Coordination of research activities
- Development of research/ innovation policies

450M€

IST in FP6: 4 domains



Three building blocks + applied IST


Security, privacy
IPRs, dependabilty
Smart cards,...
Health, eInclusion,
mobility, environment
safety, cultural heritage
E and m business,
e and m work,
learning
GRIDS for
science, engineering
business and society
Specific
integration
Trust & Confidence
IST for societal challenges
IST for economic challenges
Demanding applications
Applied IST for major societal and economic challenges
Anywhere anytime natural and enjoyable access to IST services for ALL
Generic
Building blocks
Pervasive, mobile, wireless, trustful infrastructures
Miniaturised, low cost low power components & µsytems
Natural interactions with ‘ knowledge ’
Communication & networking
Software
µ, nano & opto electronics
µ and nano systems
Knowledge technologies
interfaces
•Mobile: beyond 3G
•Fixed:All optical
•Integrated (IPv6)
•Adaptive
•Reliable
•Embedded
•Distributed
•Adaptable
•CMOS: the limit
•System on Chip
•Nano scale
•New material
•Multidiscplines
•New Sensing
•Networked
•New material
•Nano- scale
•Context and Semantic based
•Agent based
•Scaleable
•All senses
•Multilingual
•Intuitive
•‘ Surrounding

FP6 Instruments

- **Three new instruments currently envisaged:**
  - **Integrated Projects**
  - **Networks of Excellence**
  - **Article 169**
- Discussion ongoing on another instrument
- Possibility of starting FP6 with classical instruments also under discussion.

Integrated projects

- Benefit from a budget of up to several tens of M€
- Community funding up to 50% of the overall budget
- May cover risky research but must have clearly defined objectives in terms of scientific and technological knowledge or products, processes or services
- IPs can be built around clusters of projects dedicated to different aspects of the same objective
- IPs selected on the basis of calls for proposals
- IPs benefit from a large autonomy, including the possibility to launch calls for participation
- IPs have the possibility to define projects of a limited scale as components of their programmes
- IPs activities must include dissemination, transfer of knowledge, economic and societal impact assessment
- IPs can adapt the content of their programmes according to needs
- Participation: *industry-academia collaboration, SMEs*

Networks of Excellence

- Benefit from a budget of up to several M€/year
- Community funding of up to 25% of the resources which the participants offer to integrate. The objective is to create a critical mass of expertise and bring together in a virtual centre of excellence, the designated capacities and resources of research centres
- NEs define a common programme of activities in terms of research themes but NOT on the basis of precise pre-defined objectives or results
- NEs must implement a gradual integration of work programmes, provide a precise breakdown of activities, and ensure a significant volume of exchanges of personnel
- NEs benefit from a large autonomy, including the possibility to launch calls for participation
- NEs are selected through calls for proposals
- Support to researchers from other countries via mobility instruments

Some Key Questions

Technologies- Where are the disruptions to come?

Seamless Services- How will users requirements evolve? Device coms? Security? QoS on a best effort basis?

Post 3G- What will it be? How about legacy networks?

From body-area networks to aerial platforms- What will be the degree of network co-operation and Integration?

All IP networks- Is there room for anything else?

Reconfigurability-How far will networks exhibit a dynamic behaviour?

Regulations and Spectrum- How fast can and will regulators adapt?

In Conclusion
the work in the 6th FP will …

- **Guide** *the evolution of the wireless tidal wave,*
- **Design** *the future wireless services and infrastructures*
- **Devise** *novel spectrum management technologies,*
- **Anticipate** *the requirements for new frequency spectrum*
- **Provide** *the response to evolving policy issues,*
- **Strengthen** *the competitiveness of industry,*
- **Create** *know-how and expertise,*
- **Reduce** *the digital divide gap.*

Further info can be found

http://www.cordis.lu/ist/ka4/mobile/index.htm

CORDIS: IST: KA4: Mobile: Home page - Microsoft Internet Explorer

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Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://www.cordis.lu/ist/ka4/mobile/index.htm Links

Google Search Web Search Site Page Info Up Highlight

ACTIVITIES

- Home page
- **News and events**
- Newsletter subscription
- **Projects**
- Concertation and Cluster
- **Statistics**

BACKGROUND

- Past events
- Regulatory and legislative documents
- Library
- Mission of Unit E4
- Areas of current work
- ACTS Mobile (4FP)

LINKS

- Fora, Associations,

IST MOBILE SUMMIT 2002 - 16-21 June 2002, Thess

Welcome to

The site of the R&D initiatives on "Mobile and personal communications and systems including satellite based systems and services"

http://www.iti.gr/summit2002 Internet

Start Inbox - Microsoft Outlook CORDIS: IST: KA4: ... Microsoft PowerPoint - [Ni... FR 16:41

Join us at the next IST Summit

http://www.iti.gr/summit2002/