

# *European Union and the Future Internet*

ChinaCom 2007  
22-24 August 2007, Shanghai, China

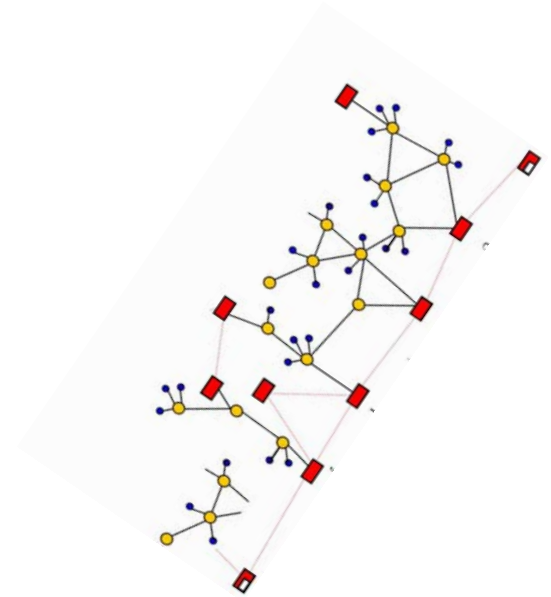


<b>1</b>	<b>Context – Internet and Trends</b>
<b>2</b>	<b>EU Innovation Policies</b>
<b>3</b>	<b>Future Internet and the EU</b>

# Is the current Internet reaching its Limits?

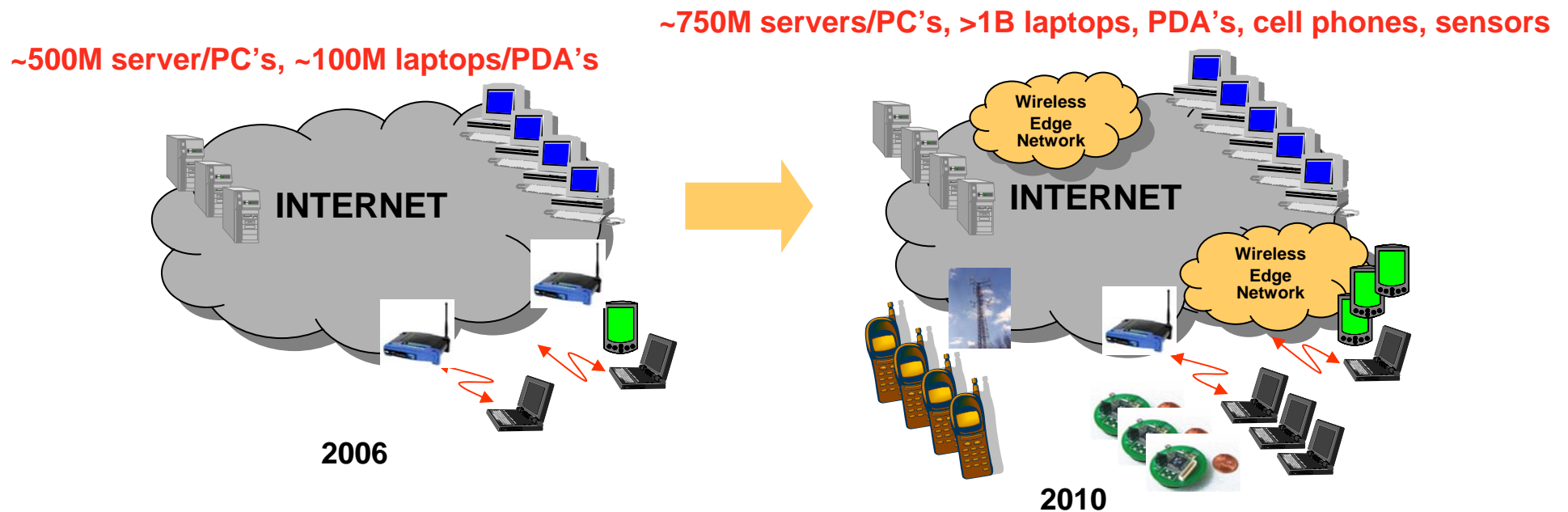
What has happened since the 1960's:

- ▶ The mobile revolution
- ▶ The web revolution
- ▶ The peer-to-peer revolution
- ▶ The internet of objects revolution



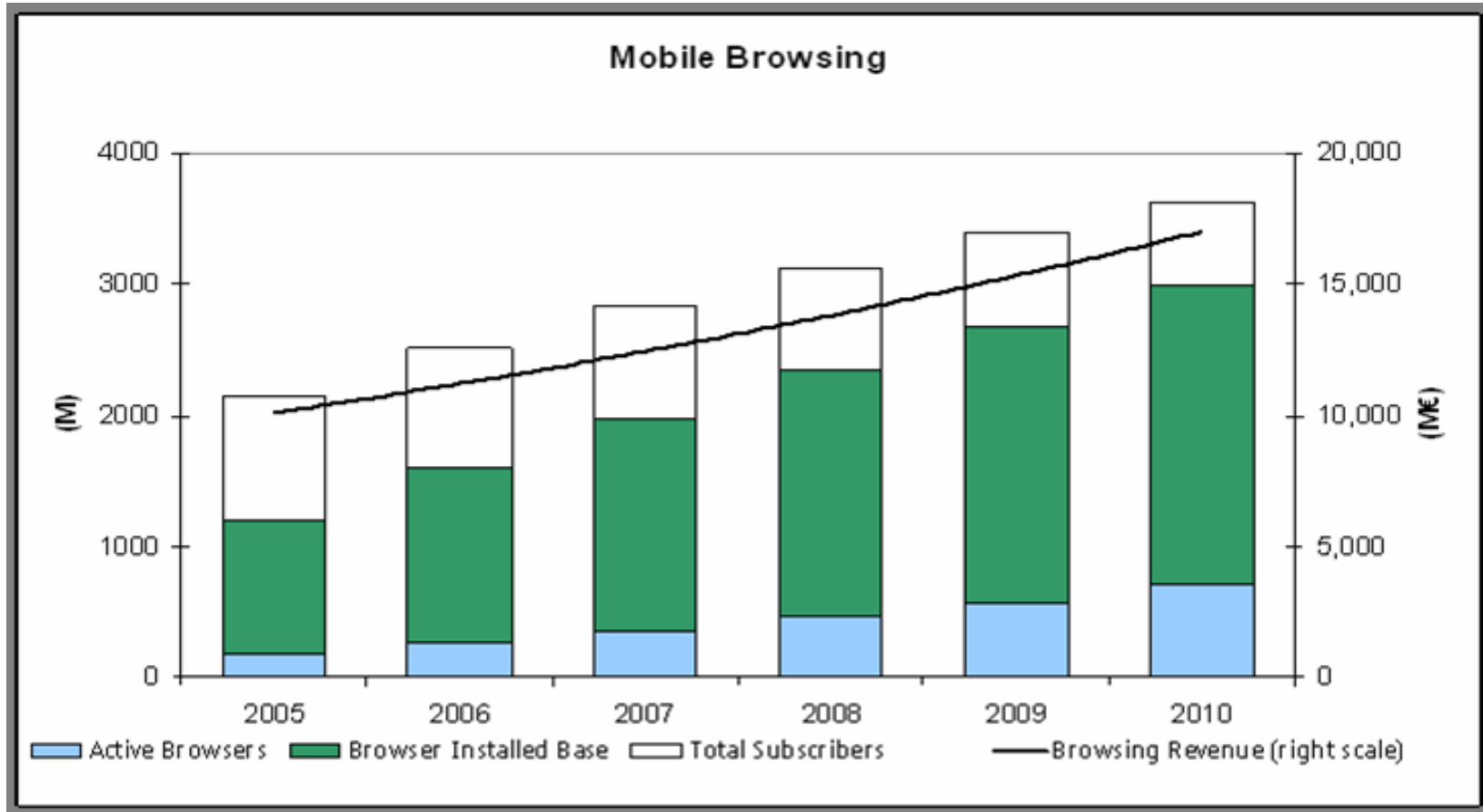
# Mobility: the key driver for the future Internet?

- **Historic shift from PC's to mobile and embedded devices...**
  - >400M mobile phones with Internet capability, rising rapidly
  - New types of data devices (blackberry, PDA, iPod, iPhone)
  - Sensor deployment just starting: ~5-10B units by 2015
  - >2B cell phones vs. 500M Internet-connected PC's

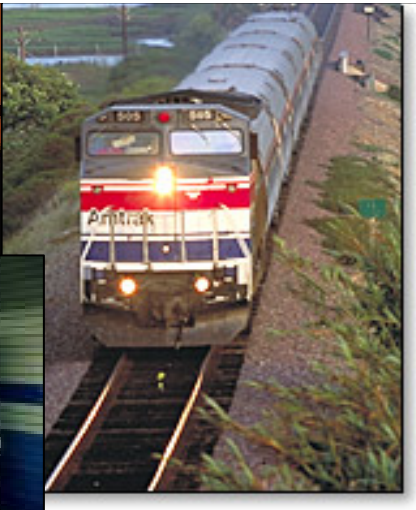


Source WINLAB

# The promise of Mobile web access



A significant proportion of subscribers have terminals enabled for browsing. The active user population is rapidly growing, and despite the downward pressure on prices, mobile browsing is a strong revenue generator. Source: W3C-



**Transportation**

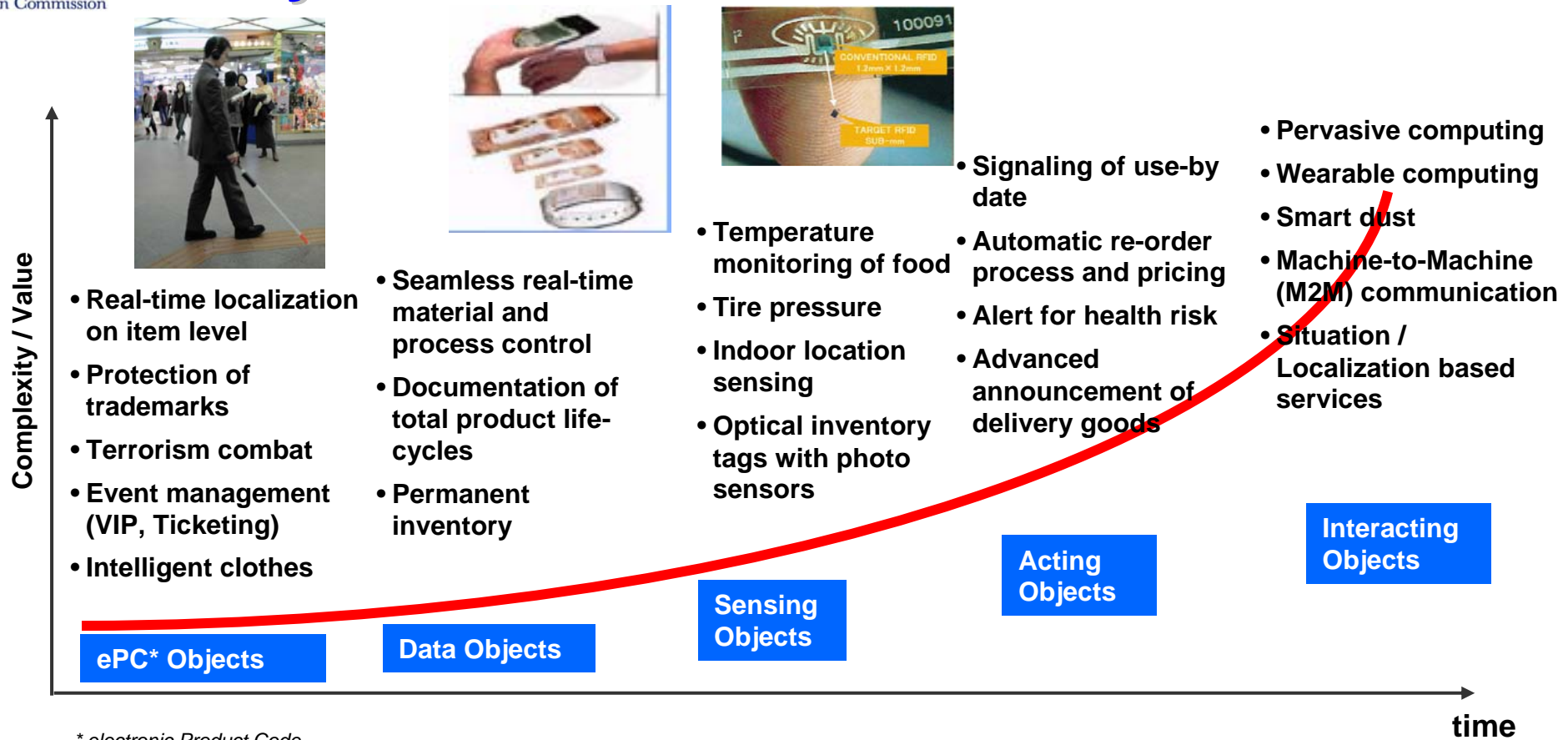
**Critical Infrastructure**

**Internet and its Evolving Roles**

**Telecommunications  
Banking & Finance**



# beyond RFID/sensors: The Internet of the Things



Sources: Siemens CT / STA / CD S, Mitsubishi Electric Research

- ❑ RFID applications will increase in future.
- ❑ RFID is a pacemaker technology from object-related wireless communications to autonomous cooperative computer and communication systems
- ❑ A key driver for B3G systems



# The current Internet is reaching its limits

- The current Internet, was never designed to be a **critical part** of an economy's infrastructure.
- In the future the Internet should be able to sustain a **tripling of the number of people** connected and the addition of billions—perhaps even **hundreds of billions—of devices** (sensors, tags, micro controllers).
- Users will likely expect to be part of the **creative flow** of content and process, not just consumers.
- When a network is this critical to just about everything, governments will seek control of what remains today a decentralized and somewhat anarchic system. **How to balance the need for control with the creativity that spawns innovation—and profit?**



# David D. Clark's four goals for a new Internet architecture (August 2005)

## 1. MOBILITY

-IP addresses for all mobile devices: sensors, phones, embedded processors

## 2. SECURITY

-user and machine authentication  
-spam and virus control

## 3. PROTOCOLS

-better traffic routing arrangements between ISPs

## 4. INSTRUMENTATION

-all network elements able to detect and report emerging problems

# Future of the Web is mobile devices

(Bill Joy, September 2005)

1. **The Near Web:** a PC at arm's length.
2. **The Here Web:** the anytime, anywhere, anyplace Web. The Internet is always "here", because you access it through a device you always carry.
3. **The Far Web:** the version of the Internet that you visualize through a big screen and that you access using a remote control.
4. **The Weird Web.** The weird Web is for applications like voice. Not just Voice over IP, but a voice driven Web.
5. **The B2B (e-commerce) Web:** this is the first of two intangible Webs (no physical device that you can touch).
6. **D2D (Device to Device) Web** or "pervasive" Web: where systems arrange themselves into wireless mesh networks. This Web doesn't exist yet.

# The Internet Only Just Works

(Mark Handley, July 2006)

- **Short Term Threats:**

- Spam
- Security
- DOS attacks
- New types of applications

- **Medium Term Threats:**

- Congestion Control (TCP not ready to cope with wireless, gigabit links)
- Inter Domain Routing (BGP is vulnerable)
- Mobility
- Architecture ossification

- **Long Term Threats**

- Address Space depletion

# ‘New Way to look at Networking’, by Van Jacobson (September 2006)

## ■ Networking Generations

- Generation 1: The phone system (focus on the wires)
- Generation 2: The Internet (focus on the endpoints)
- Generation 3: Dissemination (focus on the data)

■ The overwhelming use (>99% by most measurements) of today’s networks is for a machine to acquire a named chunk of data (such as, webpage/image/music/video/e-mail)

■ Acquiring named chunks of data is not a conversation (what TCP/IP is good for), it’s a dissemination!

■ In a dissemination, the data matters, not the supplier

■ Packet switching (Generation 2) used existing wires, it just used them differently

■ Dissemination network (Generation 3) should use the Internet, just use it differently

The solution is not wrong, it is the problem that is a new problem

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# Lisbon strategy, the i2010 initiative

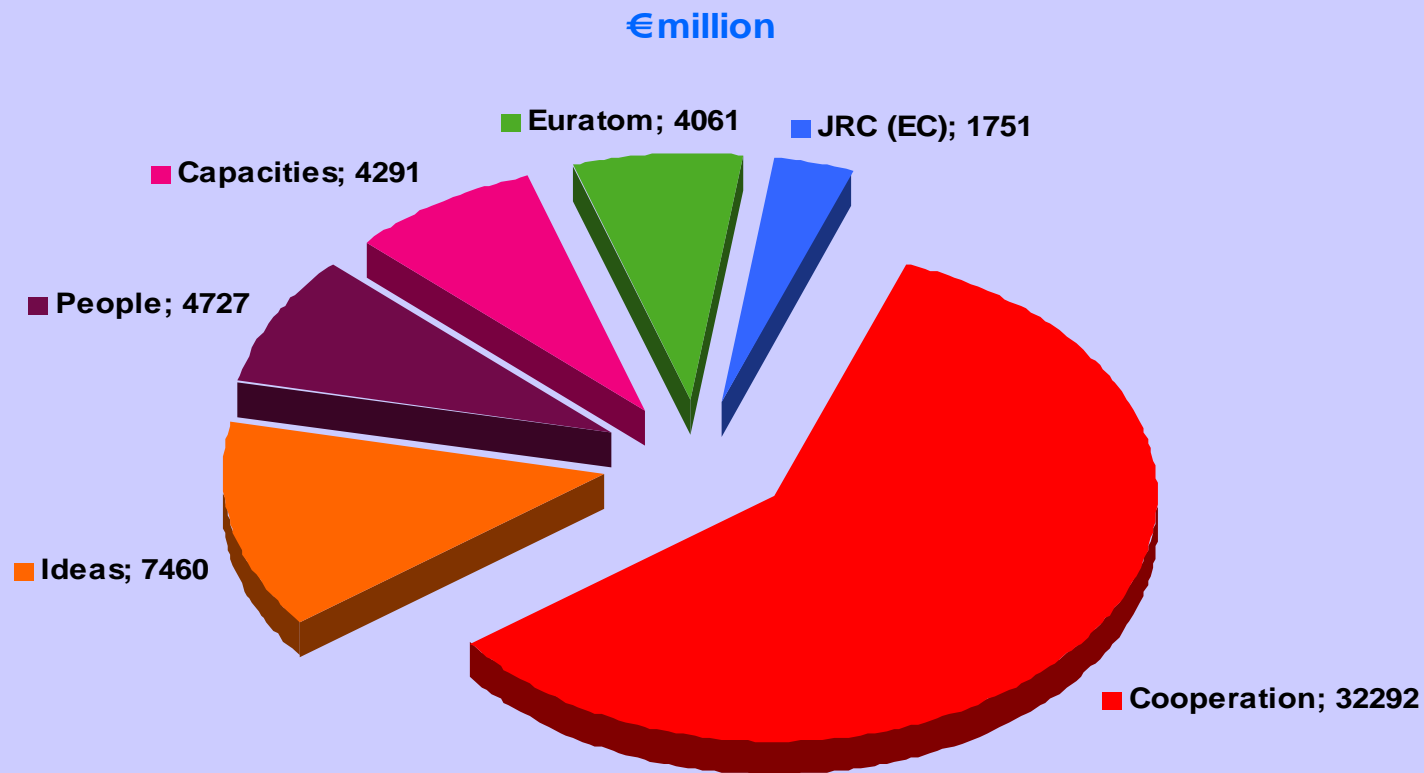
- **The Lisbon European Council (3/2000) emphasized**
  - the potential for growth, competitiveness and job creation of the **shift to a digital, knowledge-based economy**
  - the importance of the access to an **inexpensive communications infrastructure** and a **wide range of services** for Europe's businesses and citizens
- **i2010 initiative**
  - Objective: to ensure that Europe's citizens, businesses and governments make the **best use of ICTs** in order to
    - improve industrial competitiveness
    - support growth and the creation of jobs
    - help address key societal challenges

# i2010: Three priorities (3 I's)



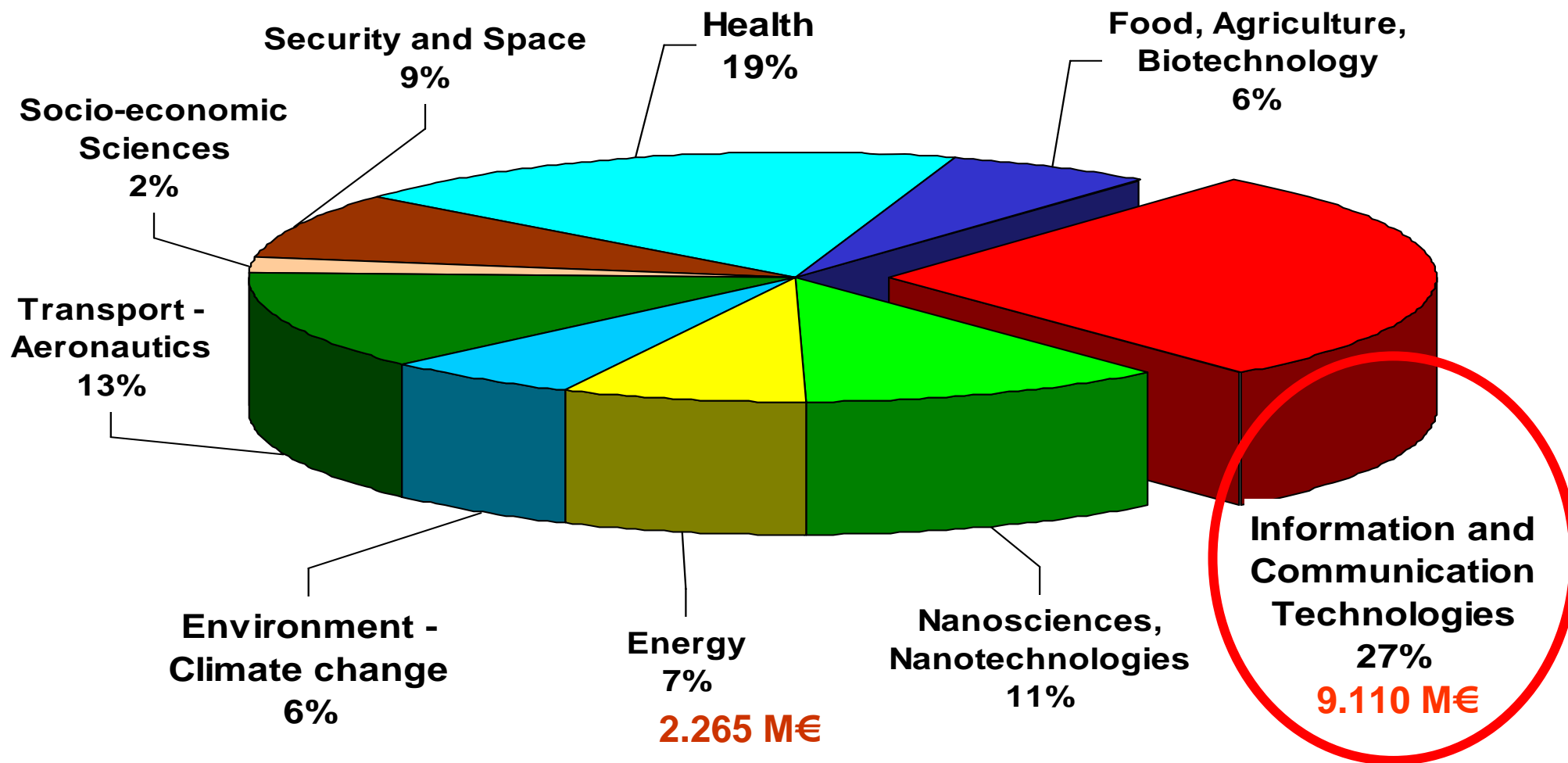
- A Single European Information Space
  - i. The completion of a **Single European Information Space** which promotes an open and competitive internal market for information society and media
- Innovation and investment in research
  - ii. Strengthening **Innovation and Investment** in ICT research to promote growth and more and better jobs
- Inclusion, better public services and quality of life
  - iii. Achieving an **Inclusive European Information Society** that promotes growth and jobs in a manner that is consistent with sustainable development and that prioritises better public services and quality of life

# FP7 budget (€54 582 million, current prices)





# FP7 Cooperation Themes (32 292 M€)



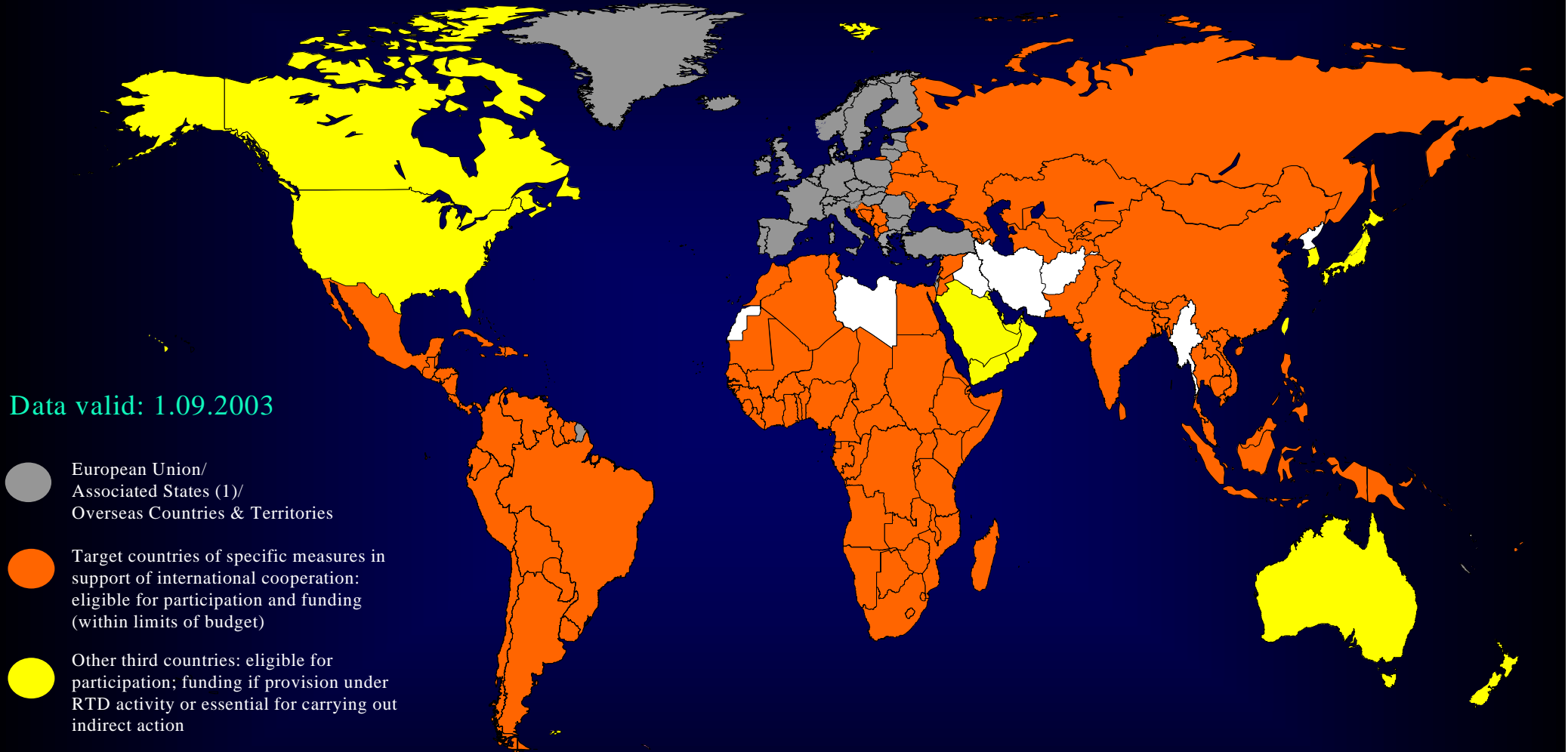
Source: Competitiveness Council 24 July 2006



# SIXTH FRAMEWORK PROGRAMME 2002-2006

## Participation by legal entities from third countries

- Integrating European Research <sup>(1)</sup> -



Data valid: 1.09.2003

- European Union/  
Associated States (1)/  
Overseas Countries & Territories
- Target countries of specific measures in  
support of international cooperation:  
eligible for participation and funding  
(within limits of budget)
- Other third countries: eligible for  
participation; funding if provision under  
RTD activity or essential for carrying out  
indirect action
- Currently no cooperation

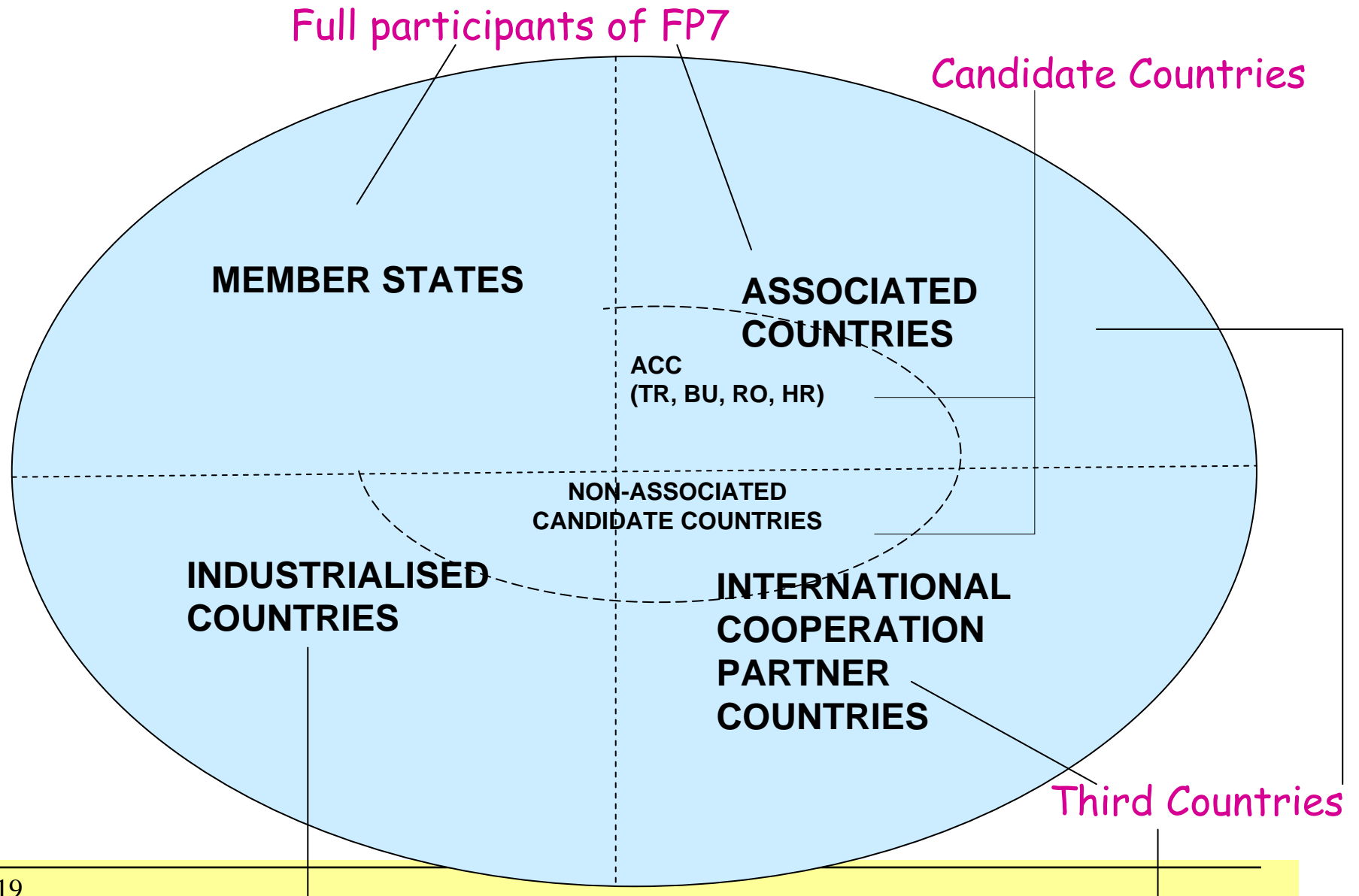
<sup>1</sup>EC Framework (non-nuclear)

(1) Switzerland associated on provisional  
basis as of 1.01.2004

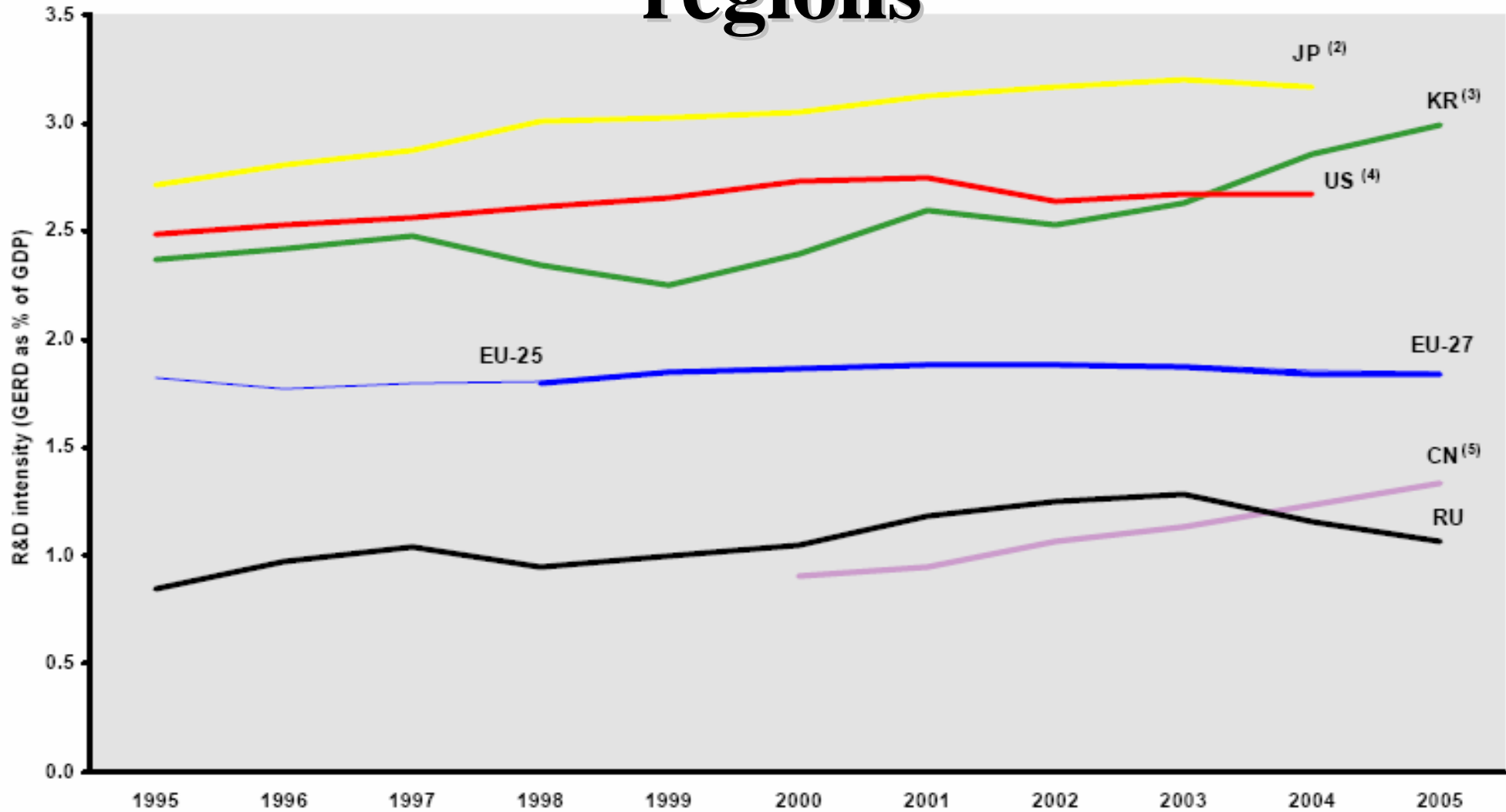
The European Commission does not guarantee the accuracy of data included in this map and accepts no responsibility whatsoever for any consequence of its use. The boundaries shown do not imply on the part of the European Commission any judgment on the legal status of any territory or the endorsement or acceptance of such boundaries.

European Commission, DG RTD-06

# FP7 - Participating countries



# R&D intensity in major world regions



# Chinese Participation in the IST Programme – FP6 (2002-2006)

- 50 proposals with Chinese partners retained in FP6
- Total Commission support to Chinese partners is about 8 M€
- 73 Chinese organisations involved including 6 European companies subsidiaries (France Telecom, Nokia, Philips, Siemens, Thales, Thomson)

# Some key Chinese organisations involved in projects

- Beijing Municipal Office Of Informatisation
- Beijing University Of Aeronautics & Astronautics
- Beijing University of Posts & Telecommunications
- Capinfo
- China Academy of Telecommunication Research of MII
- China Telecom
- Huawei Technologies Co.
- Red Flag Software Co.
- Shanghai Jiaotong University
- The State Administration of Radio, Film & Television
- Tsinghua University
- ZTE Corporation

# Most successful Chinese organisations

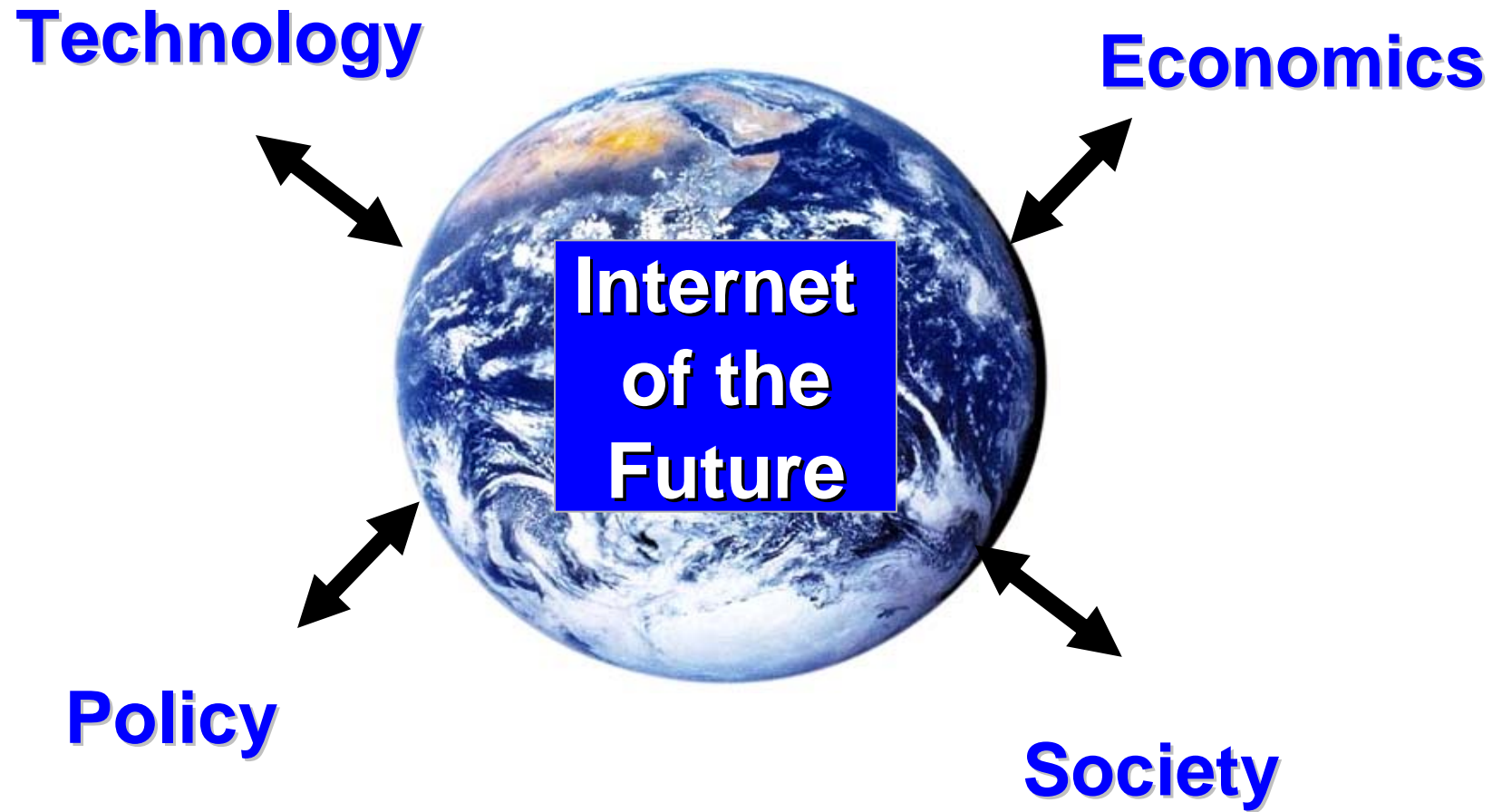
Organisation	N° of participation
Tsinghua University	9
Beijing University of Posts & Telecommunications	7
Beihang University	5
China Academy of Telecommunication Research of MII	5
Beijing Software Enterprise Advisory Center	4
Computer Network Information Center, CAS	4
Institute of Computing Technology, CAS	4
Huawei Technologies	3
China Telecom	2
Peking University	2
Shanghai Institute of Microsystem and Information Technology, CAS	2
Shanghai Jiao Tong University	2

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**Technology**

**Economics**



**Internet  
of the  
Future**

**Policy**

**Society**

# Technological Drivers

- **Mobility on different levels:**
  - Terminal mobility
  - Service mobility
- **Number of devices will increase:**
  - more people connected
  - more & more diverse devices
  - more devices directly communicating (M2M)
- **Bandwidth will increase through:**
  - freeing up spectrum, e.g., in TV bands
  - cognitive radio, i.e., local spectrum re-usage
  - Technology advances in new radios

# Socio-Economic Drivers

FI will play a dominant role in *organizational change* by:

- Contributing to the development of new products & markets,
- Creating new and far closer relationships between businesses, the public sector, citizens and consumers,
- Reshaping the structure of organizations leading from hierarchical to network-centered structures,
- Creating new channels of knowledge diffusion & human interactivity,
- Revolutionizing business models, cost structure & competition strategies

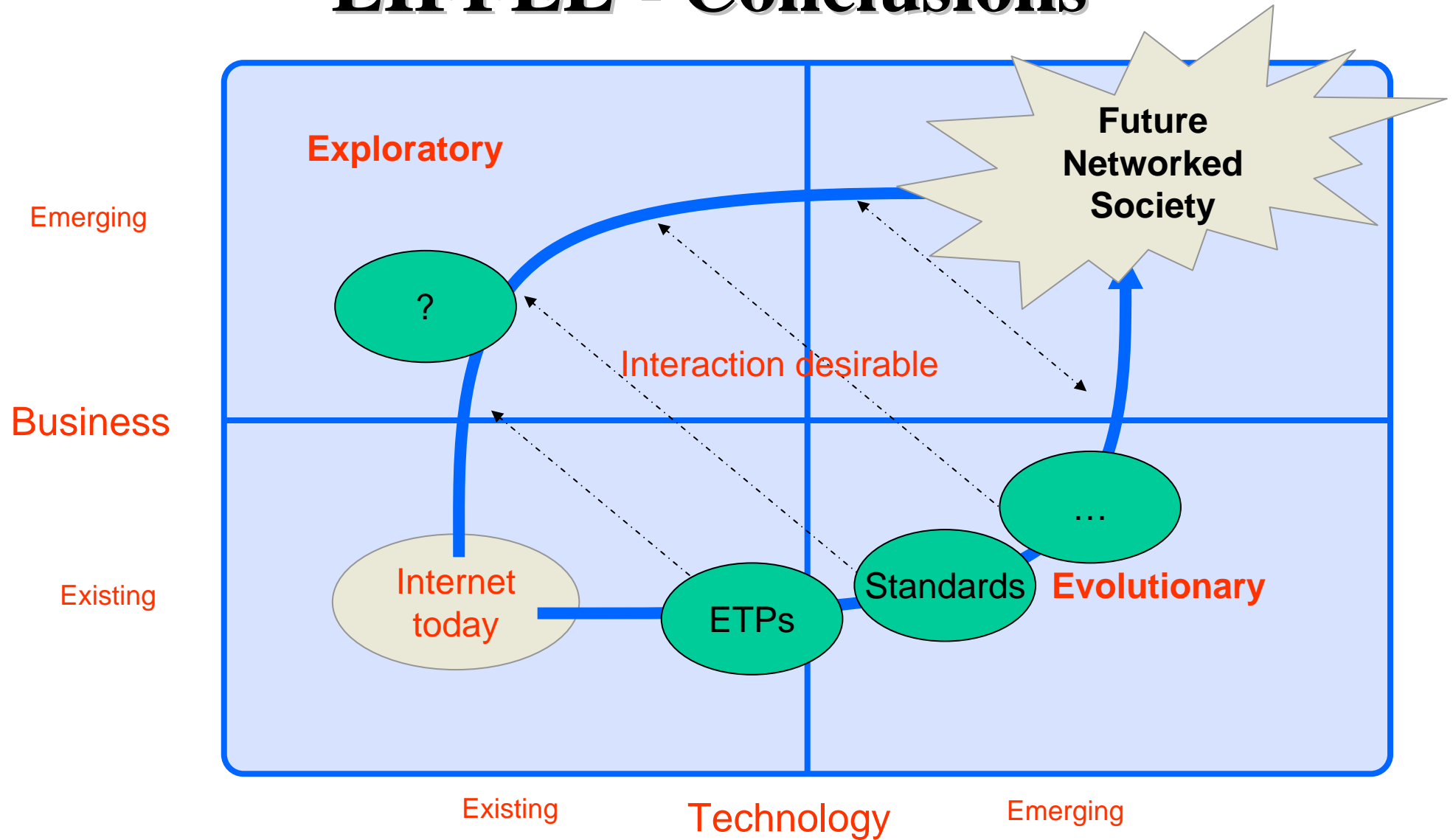
# Policy Considerations

- Technical, Business and Sociological Challenges need reflection from and solution through **policy** and **governance mechanisms**.
- The internet must remain a vector for:
  - freedom of expression
  - economic growth
  - multilingualism and cultural diversity
- The internet of tomorrow should:
  - remain open, transparent and interoperable
  - protect and secure the environment
  - respect intellectual property rights

# FP6 Next Generation Internet Activities

- **Examples of running projects**
  - NoEs federate the EU computer & networking science community: Euro-NGI, E-NEXT, CRUISE.
  - IPs on large industrial initiatives: Ambient Networks, MAGNET, E2R, E-SENSE, NOBEL
  - STREPS focused research projects: OBAN, WIP, EVERGROW, ANA...
- **Numerous Workshops and consultation exercises**
  - Internet of Things workshop in March 06
  - Future Internet workshop Dec 2006 (book available)
  - OECD/ NSF workshop jan 2007
  - Work within the ETPs (Telco's initiative in the making)
  - EIFFEL, FIRE and eMOBILITY published position papers, 2007

# EIFFEL - Conclusions



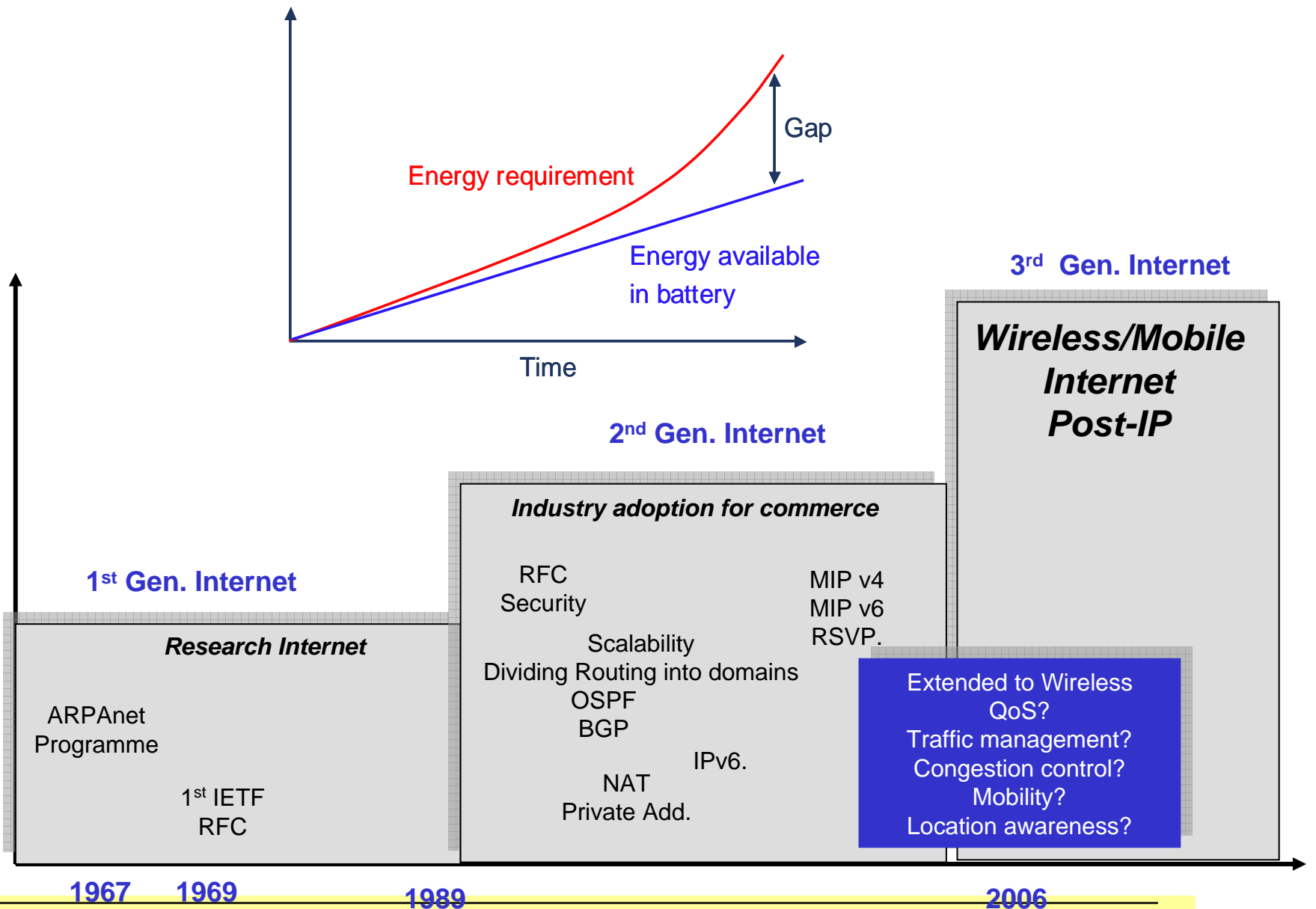


## **Post-IP Working Group**

**Participation open to all e.Mobility  
members**

**~35 Organisations currently active in  
White Paper**

# Problem





# Post-IP Definition

## Revolutionary Approach

Sources of Current Internet limitations:

- ❑ Architecture
- ❑ End-to-end paradigm
- ❑ Internet Protocols

### Post-IP approach:

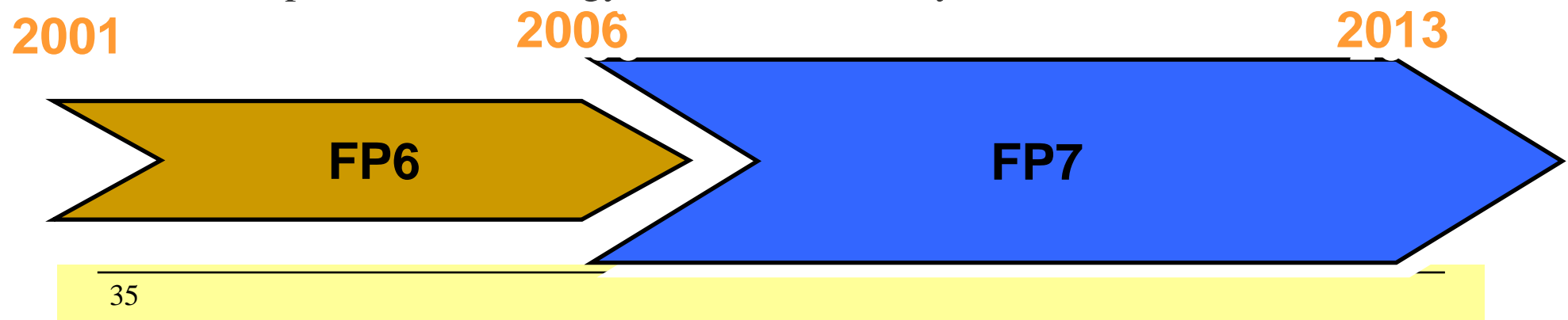
- ❑ New Architecture with management capability supporting multi-domain
- ❑ New Wireless-friendly (Energy and spectral efficiency) Protocols capable of supporting variety of wireless networks, from very low power sensor networks to wide area mobile networks

# Future Internet challenges for the EU

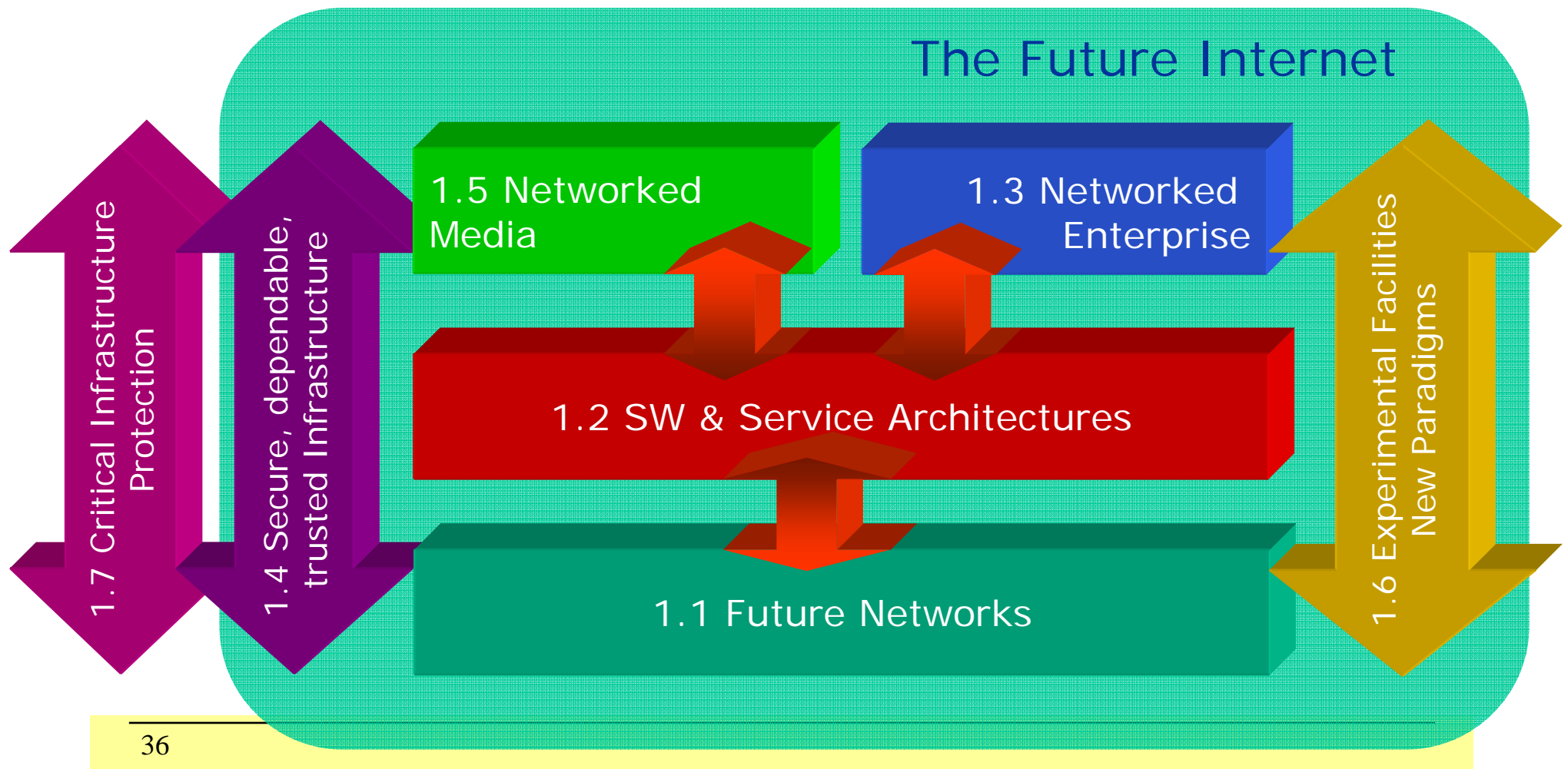
- 1. The scientific, technological and industrial challenge**
- 2. Keep the best of the current Internet:** Openness, interoperability, end-to-end, distributed architecture, network neutrality principle for services, resiliency.
- 3. Policy and regulatory dimension**
  - Freedom of expression, multilinguism
  - Governance (DNS, ONS); IGF Athens, ITU positions.
  - Multilateral partnership and cooperation (UN WSIS Tunis),
  - Policy roadmap: OECD workshop, publication of FoI in 2008, Min Conf 2008, European Spring Council 2008

# EU funded research in ICT (Information and Communications Technologies)

- 6<sup>th</sup> Framework Programme of Community Research (FP6)
  - 3.9 billion euro over 5 years
- FP7: 9 billion euro over 7 years
  - + European Research Council
    - pan-European funding agency for frontier research
    - to attract talented individuals
  - + European Institute of Technology
    - To promote technology transfer to industry



# Challenge 1 – Pervasive and trusted Network and Service Infrastructures



# Call 1 Summary View

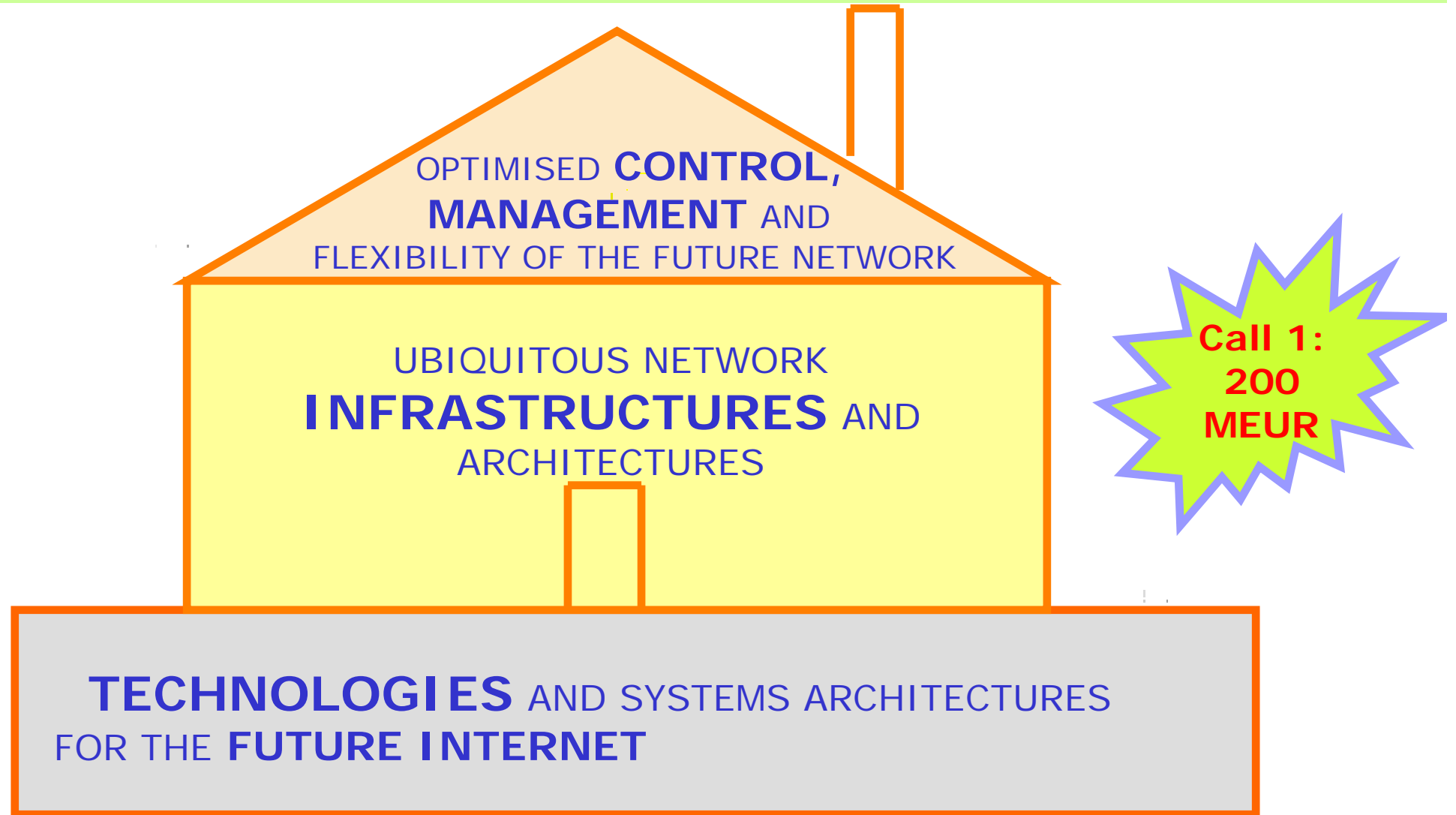
	Network of the Future	SW and Service Infrastructures	Networked Enterprise	Networked Media
Prop. Submitted	<b>172:</b> 38 IP; 4 NoE; 114 STP; 16 CSA	<b>186:</b> 18 IP; 1 NoE; 153 STP; 14 CSA	<b>91:</b> 13 IP; 75 STP; 3 CSA	<b>100:</b> 18 IP; 3 NoE; 75 STP; 4 CSA
Prop. retained	<b>46:</b> 9 IP; 3 NoE; 29 STP; 5 CSA	<b>26:</b> 5 IP; 1 NoE; 18 STP; 2 CSA	<b>10:</b> 2 IP; 6 STP; 2 CSA	<b>20:</b> 3 IP; 1NoE; 15 STP; 1 CSA
<b>Industry Participation (CP)</b>	<b>≈50%</b>	<b>45%</b>	<b>39%</b>	<b>48%</b>
Academics/R&D centres	≈50%	≈50%	58%	51%
SME's	≈20%	25%	≈30%	28%
Associated States	8%	4%	3% TU/NO/Serbia	6% TU/NO/CH/IL
Third Countries	CN, US, Bra, Jpn, Cnd, Sing	0 -	<b>CSA Only</b> (Jpn, CN, Ko, Bra, S-Af, Ind, Ru, Sing)	0 -
Oversubscription Ranked/Retained	2,3	3,2	3,5	2,5

## Typical Figures:

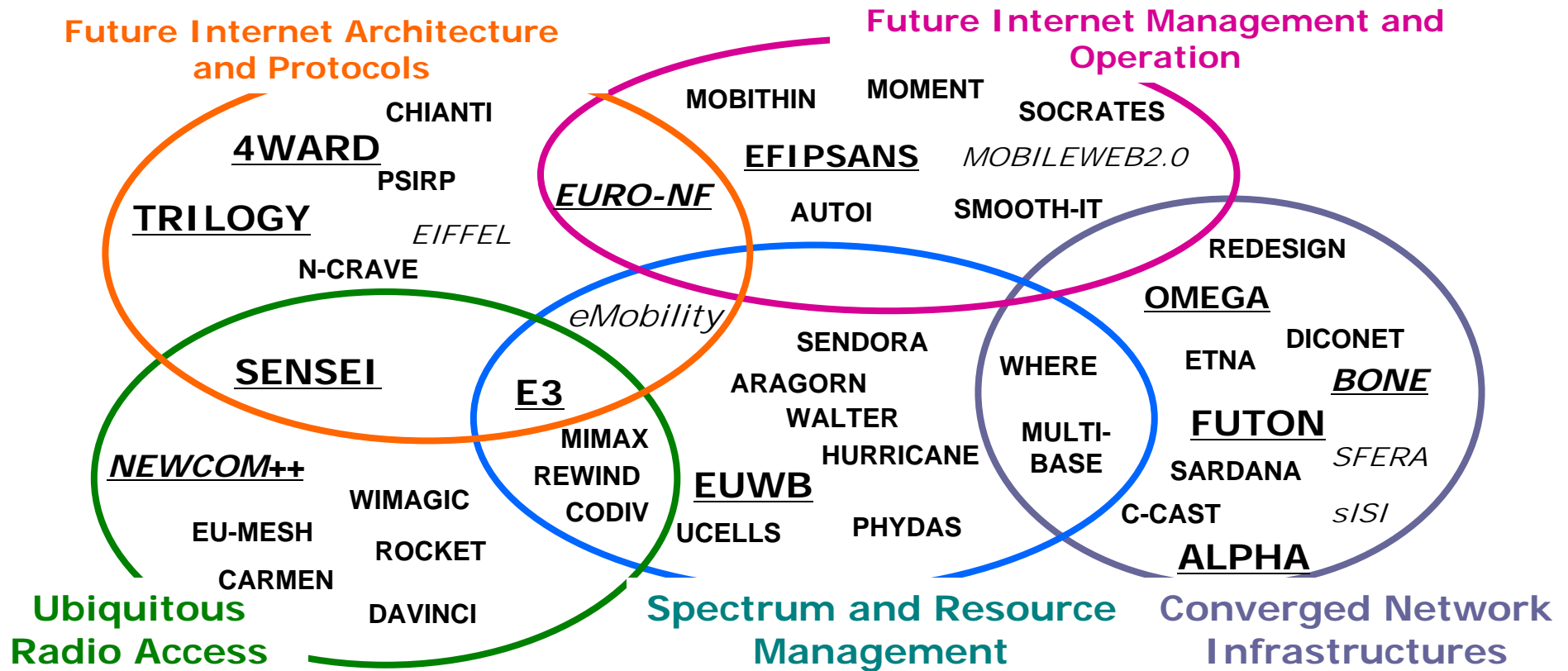
STP: 6-8 partners; IP: 12-16 partners; CSA 4-7 partners;

Duration: 30 – 42 months; some IP's at 24 month

# Objective 3.1.1.1: THE NETWORK OF THE FUTURE



# Network of the Future: Retained Portfolio



INTEGRATED PROJECT (IP)

NETWORK OF EXCELLENCE (NoE)

SPECIFIC TARGETED RESEARCH PROJECT (STREP)

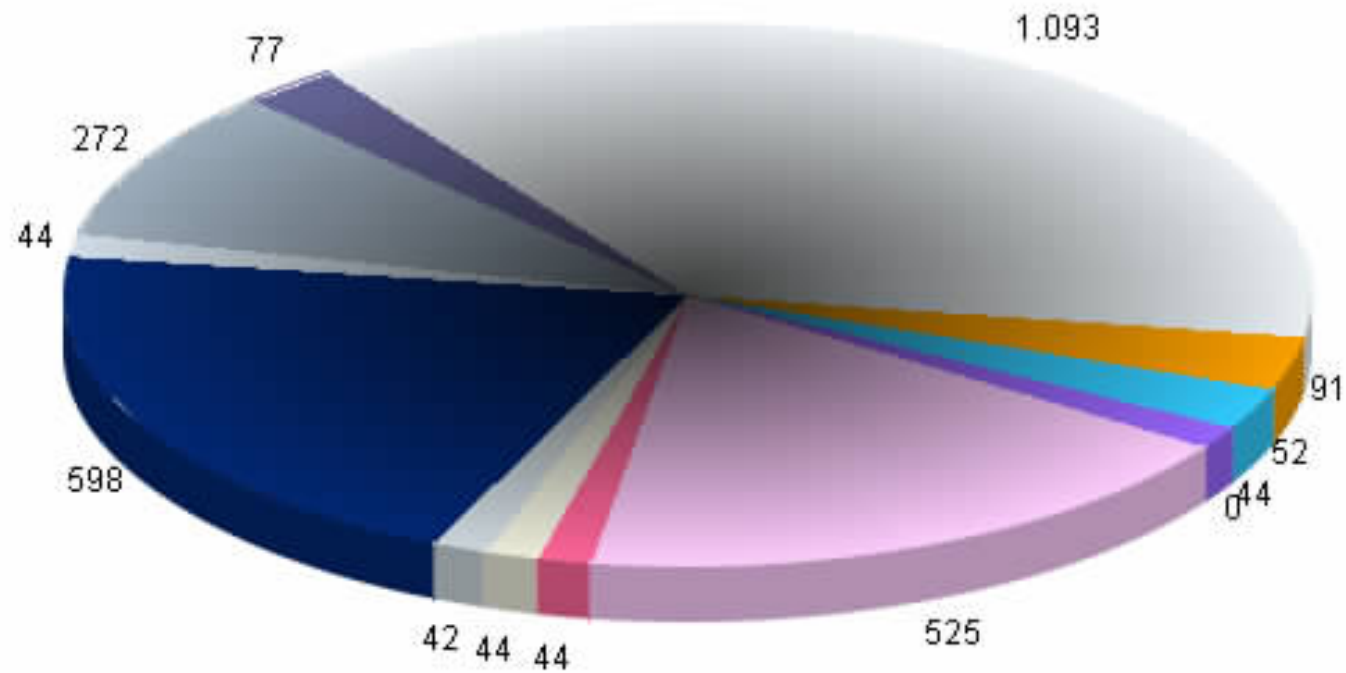
Coordination and Support Action (CSA)

# Future Internet Approaches

- Overlays
- Peer-to-Peer
- Publish-Subscribe
- Delay-Tolerant Networking
- Cache and Forward Architecture
- Autonomic Communications
- Instrumentation



# Retained ICT Proposals – Asia (k€)



# **SUMMARY**

- **More and more bandwidth, more and more applications, more and more devices**
- **What is the impact from and response from the internet**
- **How to ensure a prominent position for Europe in the internet of tomorrow**

# For More Information

<http://www.eurochina-it.org>

<http://www.cordis.lu/ist>

<http://www.cordis.lu/era/fp7.htm>



<http://europa.eu.int>

[http://europa.eu.int/information\\_society/index\\_en.htm](http://europa.eu.int/information_society/index_en.htm)

[ist@cec.eu.int](mailto:ist@cec.eu.int)



**Thank you for your  
attention**

Top 20 economies (ranked by total subscriber numbers) as at 31 December 2005

Total subscribers, number of mobile broadband subscribers, penetration rate and price of OECD mobile low-user basket in USD.

Economy	Total mobile cellular subs.(000s)	Of which, total mobile broadband subs. (000s)	Penetration (per 100 Inhabitants)	OECD low-user Basket (USD)
1. China	393'428.0	*	29.9	\$2.90
2. United States	201'650.0	4'360.4	67.6	\$5.21
3. Russia	120'000.0	*	83.6	\$5.96
4. Japan	94'745.0	17'792.6	74.0	\$20.51
5. India	90'000.0	*	8.16	\$2.39
6. Brazil	86'210.0	175.0	46.25	\$26.52
7. Germany	79'200.0	2'289.0	95.8	\$17.34
8. Italy	72'200.0	10'262.0	124.3	\$14.43
9. United Kingdom	61'091.0	4'536.8	102.2	\$14.02
10. France	48'058.4	1'583.0	79.4	\$30.00
11. Mexico	47'462.1	...	44.3	\$14.00
12. Indonesia	46'910.0	...	21.1	\$4.30
13. Turkey	43'609.0	*	59.6	\$12.57
14. Spain	41'328.9	939.0	96.8	\$22.14
15. Korea (Rep.)	38'342.3	12'530.9	79.4	\$14.18
16. South Africa	33'960.0	216.1	71.6	\$13.26
17. Philippines	32'810.0	*	39.5	\$5.29
18. Poland	29'166.4	12.9	75.7	\$7.76
19. Thailand	27'379.7	*	43.0	\$4.35
20. Taiwan, China	22'171.7	113.9	97.4	\$26.29
<b>WORLD</b>	<b>2'168'434.0</b>	<b>60'249.1</b>	<b>33.5</b>	<b>\$12.77</b>

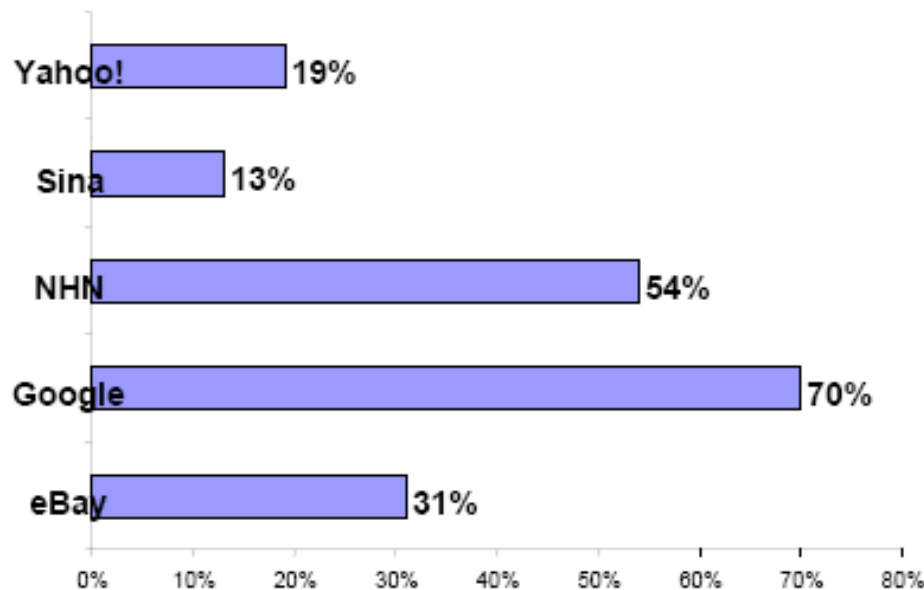
Note: \* 3G not commercially available, as of 31 December 2005. / ... Data unavailable.  
«Mobile broadband» is  $\geq$  256 kbit/s in one or both directions

# The Internet as the New Frontier

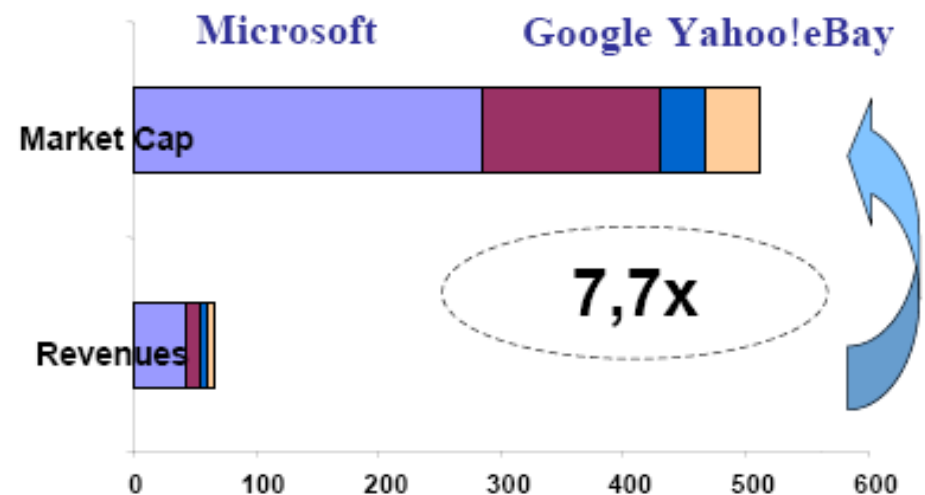
A tremendous growth compared to other players of the IT industry ...

... which translates into more attractive valuation

Growth in Q3 over year



Market Cap compared to revenues



Incumbent telcos are in the 0-5% range

Incumbent telcos are in the 1-1.5x range

Innovation ? Disruption ? Technology vs Applications?  
 Coherence of action ? EU Competitiveness ? EU added value?