

Challenges and Opportunities in ICT a European perspective

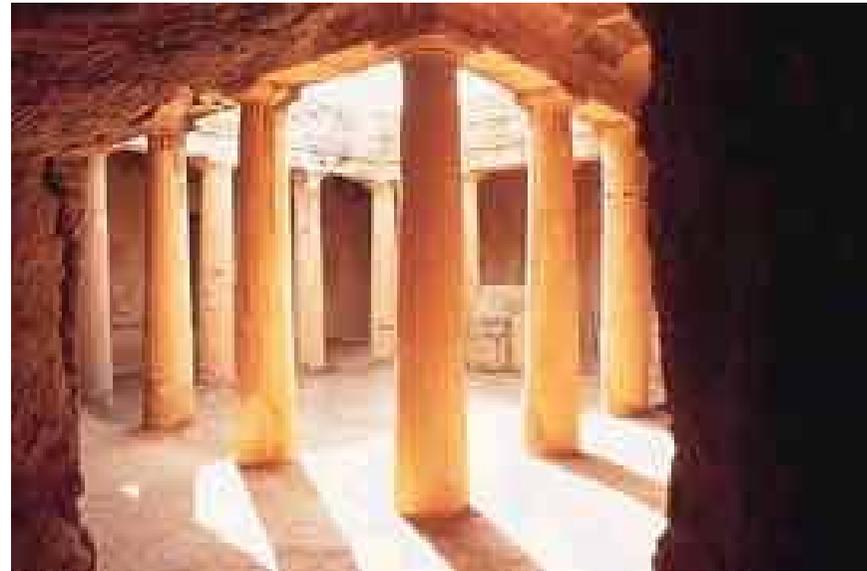


**Dr. Joao Schwarz da Silva
Director- INFISO-D
European Commission**

**Cyprus, 12th May 2005
6th International Conference on
Mobile Data Management (MDM05)**



**Information Society
Technologies**

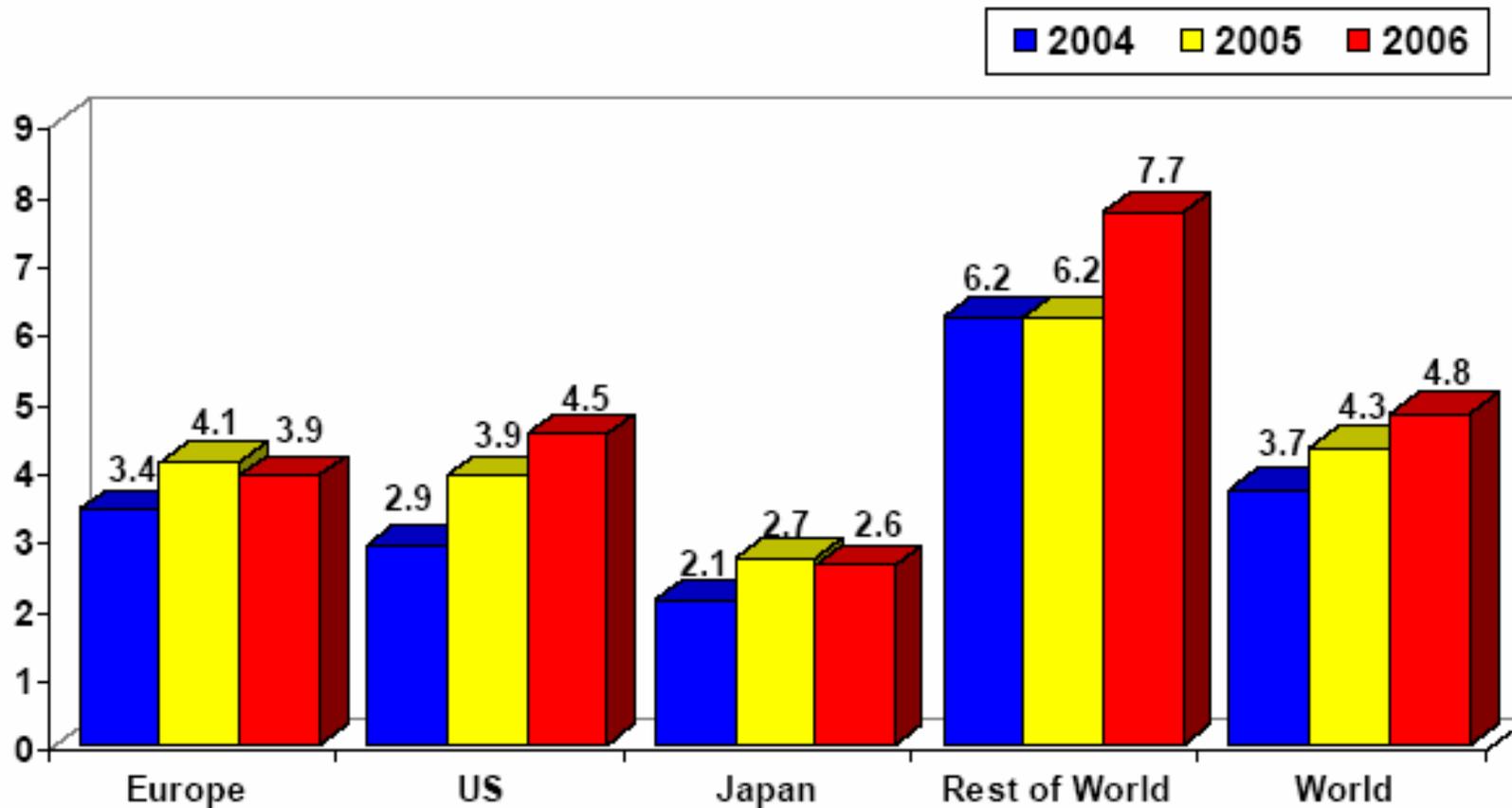


Contents

- **The ICT market**
- **Key Challenges Ahead**
 - **User expectations**
 - **Convergence**
 - **Interoperability**
 - **Explosion of devices and data**
 - **Vulnerability and Privacy**
 - **User generated content**
 - **The scale of networking**
 - **A word about wireless**
 - **The new shape of innovation**
- **The 7th Framework Programme**
- **Conclusions**



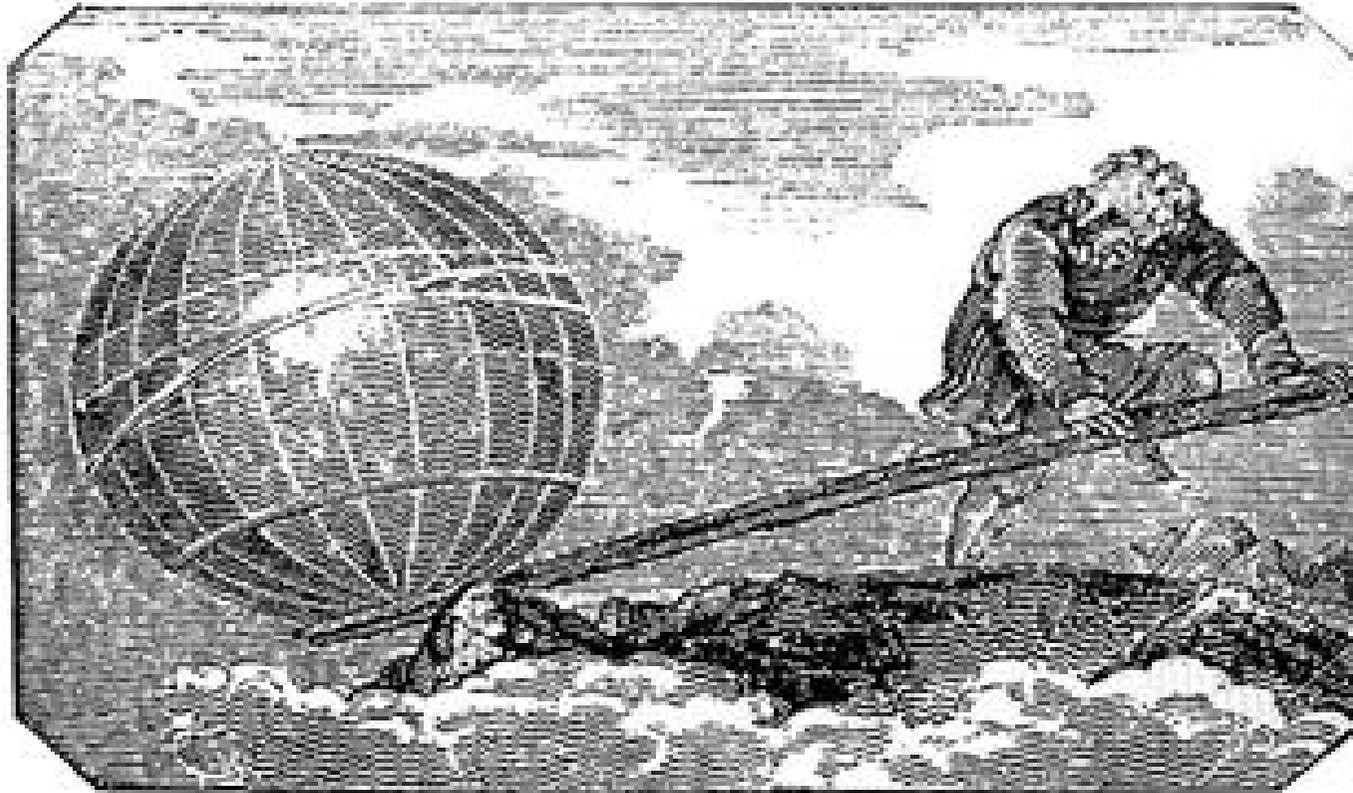
Worldwide ICT market, 2004-2006, in %



*Worldwide Market Value 2005: 2,044 billion Euro
EU share 620 billion Euro*



Understanding the Lever of ICT



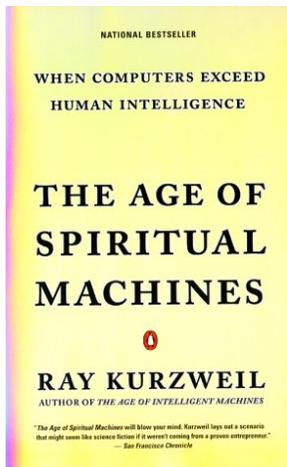
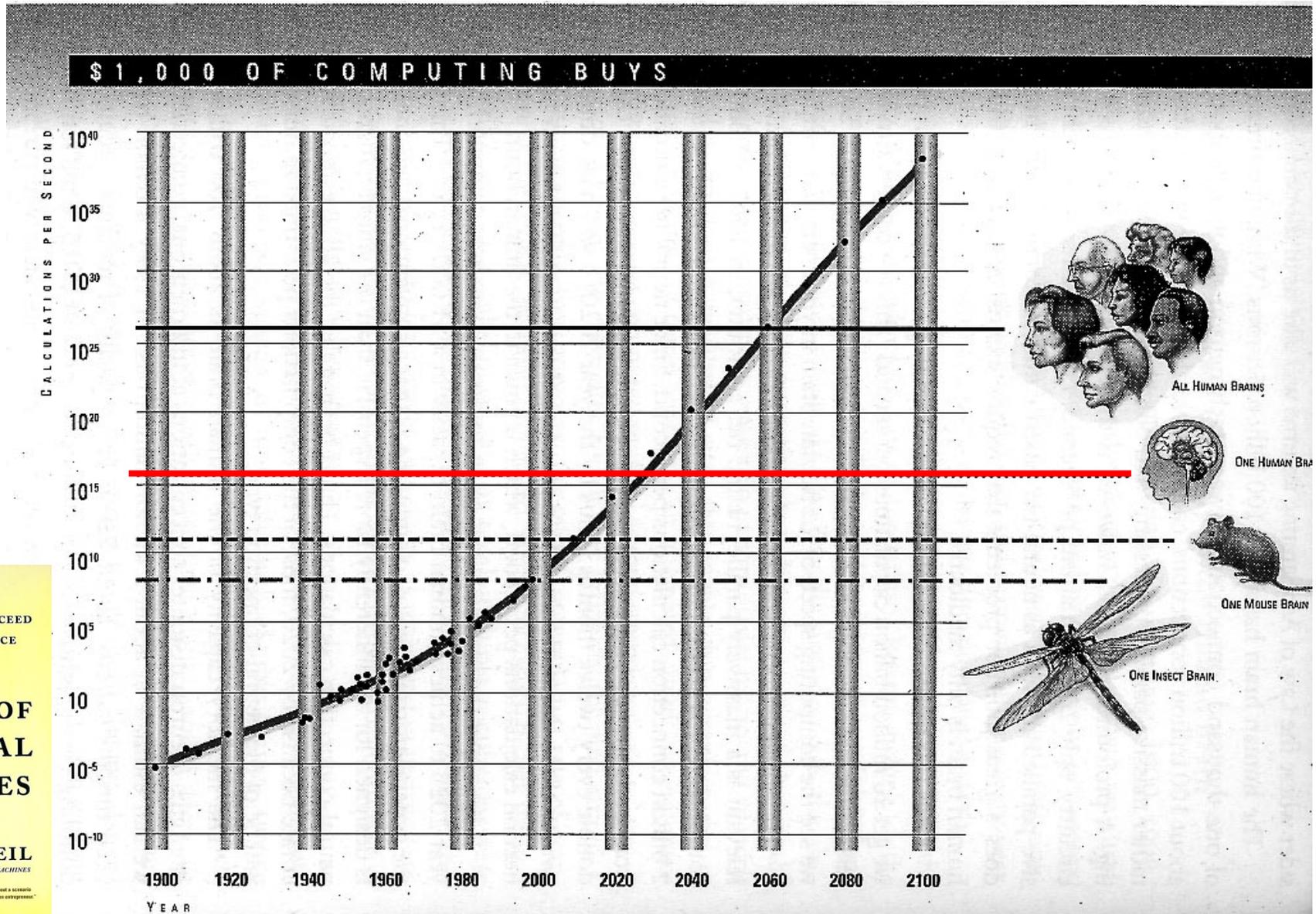
"Give me a lever, a fulcrum, and place to stand and I will move the world."

Archimedes of Syracuse (287-212 BC), quoted by Pappus of Alexandria, *Synagoge*, c. 340 AD

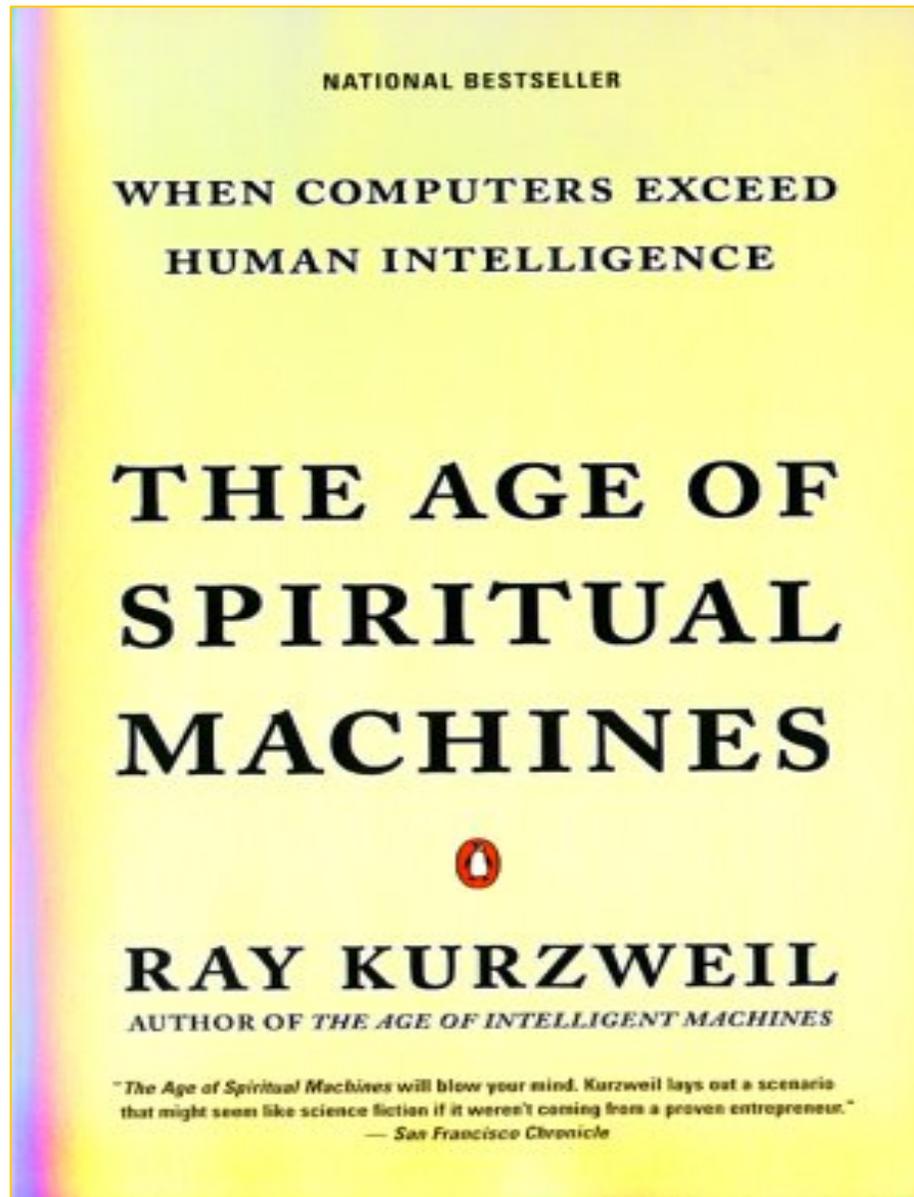


The exponential growth of computing, 1900-2100

By about 2020 \$1,000 circuitry = 20 billion calculations per second = human brain



Progress – yes, but at which rate?



When we think about the future in the next 50-100 years we tend to think of progress at the current rate

But we've been around long enough to know paradigm shifts are not occurring at a current rate.

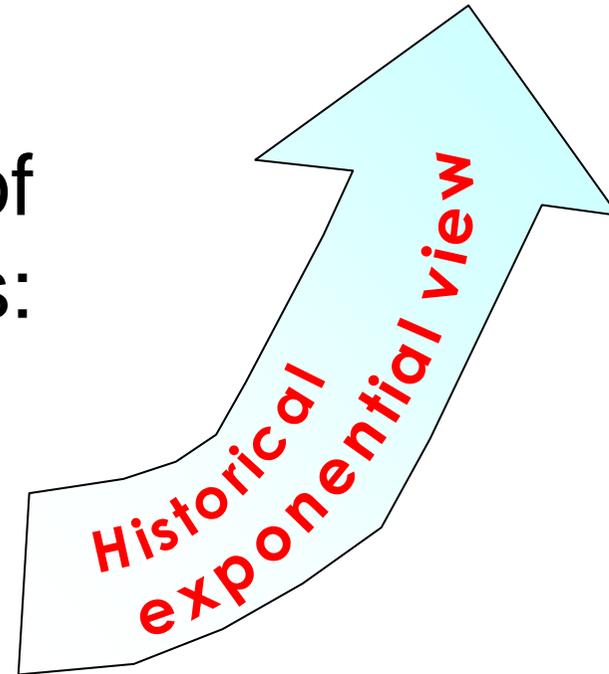
Power of technology progress

We dramatically underestimate the power of future technology progress:

Intuitive Linear View

We tend think of a future period at today's rate of progress...

our memories are dominated by our recent experience.

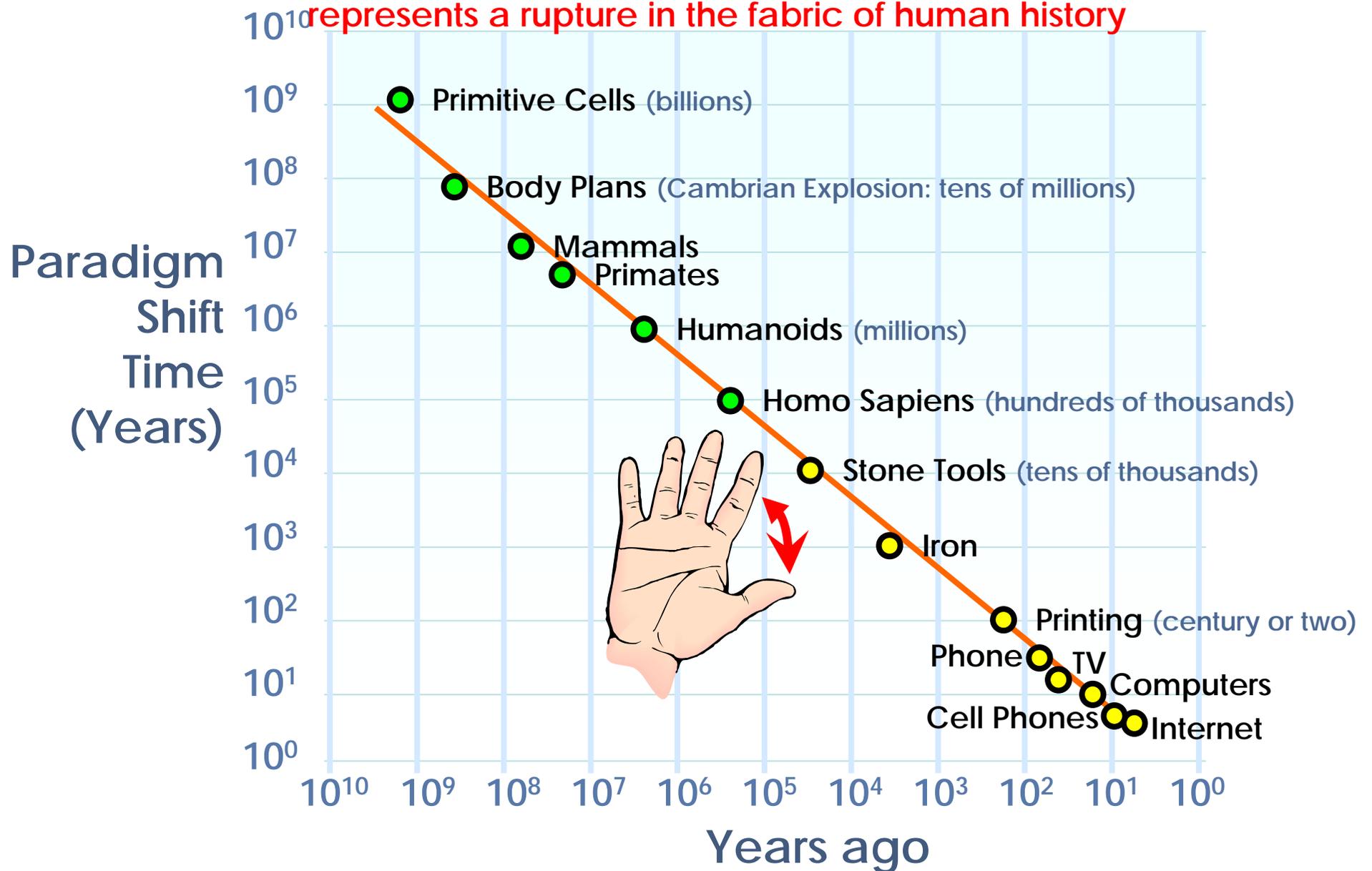


But we are doubling our rate of progress every ten years...

So in this century we will experience 20,000 years of progress at today's rate.

Countdown to singularity

Singularity is technological change so rapid and so profound that it represents a rupture in the fabric of human history



User Expectations



The user does not wish to be considered exclusively as a consumer.

- **All-in-one device:** convergence or divergence of applications?
- **Quality of Experience:** devices with intuitive, flexible, interactive and enabling interfaces, active guidance, personalised services, context awareness, price not an issue if the service proposition is compelling.
- **Life assistant services:** citizens wish to remain independent and mobile even in advanced years.
- **Privacy safeguarding:** requirements will increase in reaction to the growing possibilities of information interception and user profiling (location awareness and identity).
- **Security technology:** is demanded by users to cope with tracking services and surveillance systems

Challenges:

Bridging the gap from technological availability to actual market take-up

Creating opportunities for user-based innovation



The world of Convergence

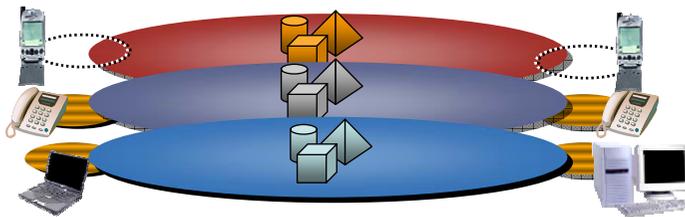
BROADBAND
Communication,
Entertainment,
E-Business

MOBILE
Communication,
Entertainment,
Pictures and Video

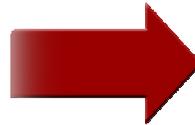
BROADCAST
Services,
Entertainment

CE
Pre-Recorded
Content
Personal Media

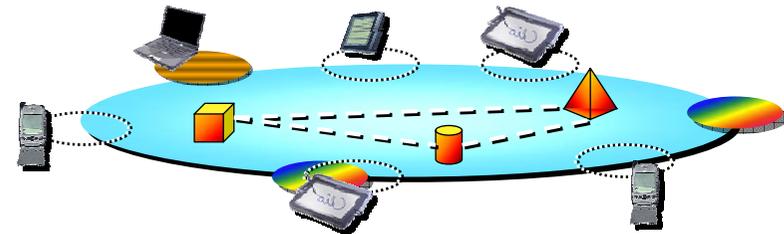
Simple Networks



Each island offers
numerous services on
distinct devices



Service Enabled Networks



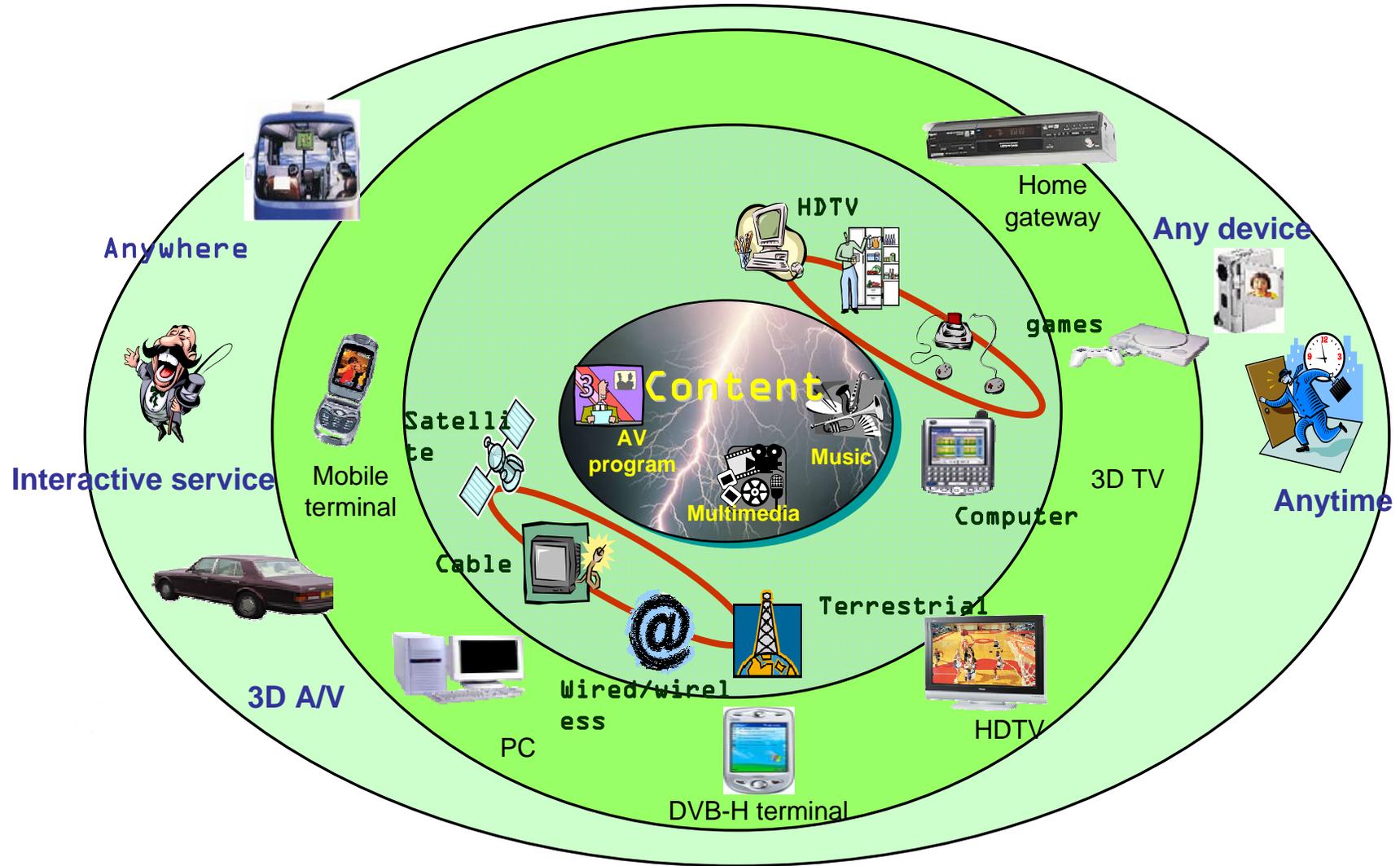
A converged archipelago
offers all services on all
devices

Challenges:

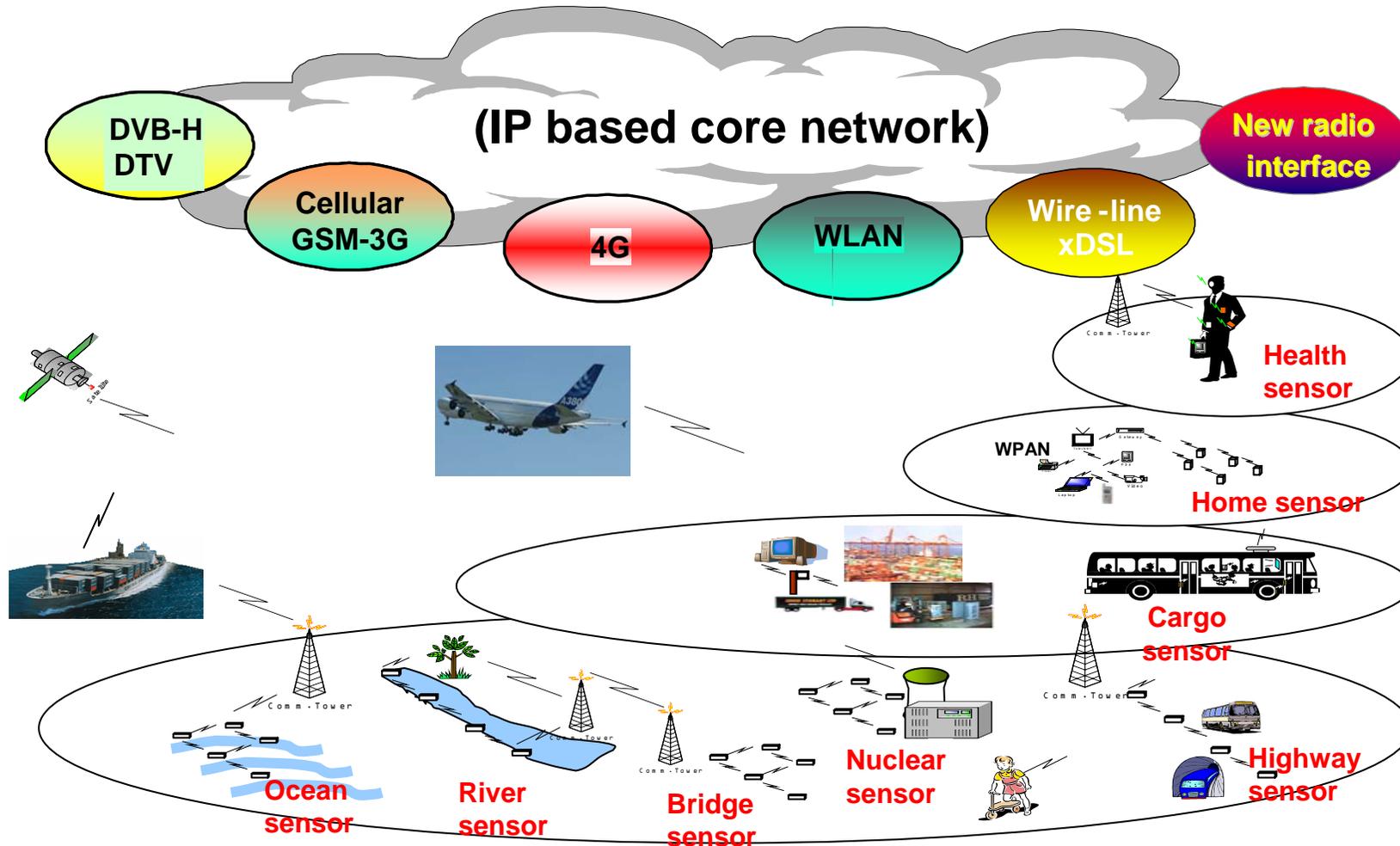
Providing end-to-end service at minimal OPEX and CAPEX
Ensuring the creation and management of convergence
Moving from product supply to solution provision



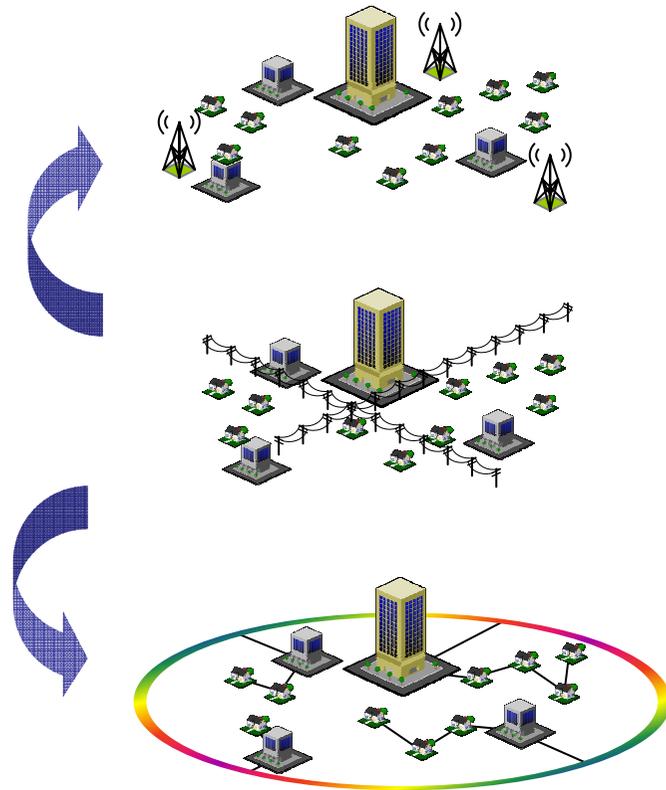
Services convergence



Networking convergence



Interoperability



- ***At the Network/Device Level***

- Wireless/Mobile/Fixed/Cable/ISP/Broadcasting networks need to interoperate

- ***At the Service/application Level***

- Services need to run across homogeneous or heterogeneous networks

- ***At the Media/Content Level***

- Different media formats must coexist

Challenges:

Ensuring smooth technological transitions

Creating opportunities for disruption and innovation

Contributing to setting the right collaborative standards

Optimising for innovation through a more agile IP regime

Coping with the trend towards the “patenting of software”



Interoperability at Home

Internet, Music and TV/video everywhere

VoD, Video streaming, music download, storage



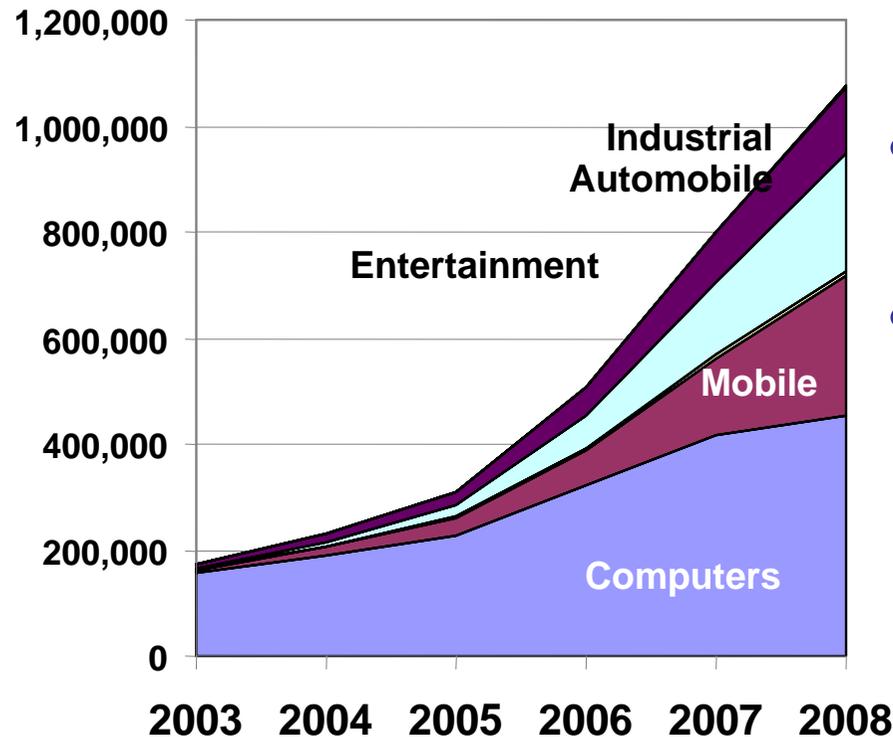
Challenges:

Ensuring content management interoperability
Striking the appropriate balance between right holders and consumers rights



Explosion of Devices and Data

Amount of data received or transmitted
(in Petabytes/Day)



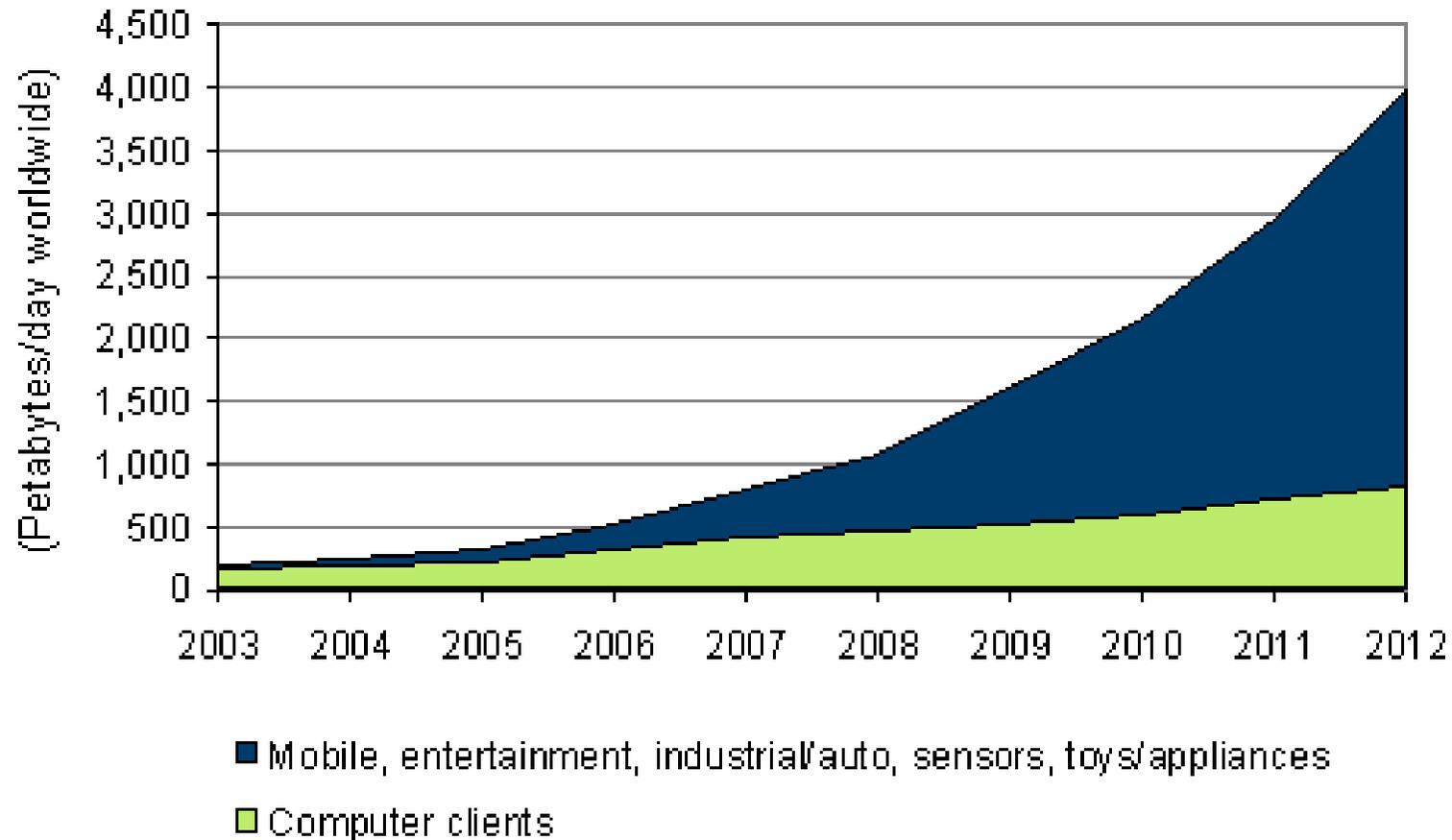
- Information explosion and overload
- Number of communicating data devices growing from 2.4 billion to 23 billion in 2008 and one trillion by 2012

Challenges:

- Designing and managing an information infrastructure where all devices communicate with and understand one another
- Creating an advanced digital eco-system for the agile enterprise



Network Edge Payloads 2003-2012

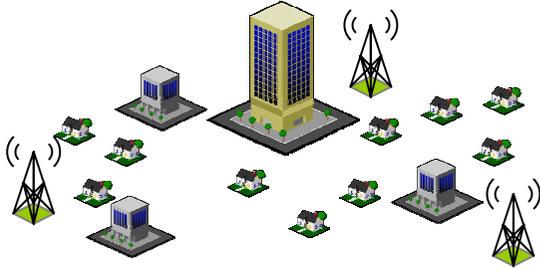


Payload measures bandwidth consumed at the end device (e.g in PCs the Files or records uploaded or downloaded)

Source IDC 2004

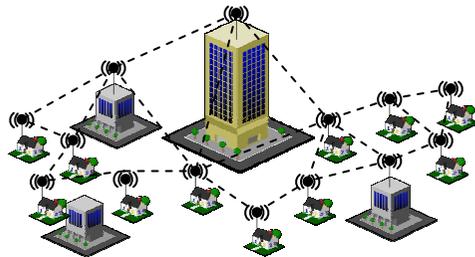


The scale of networking



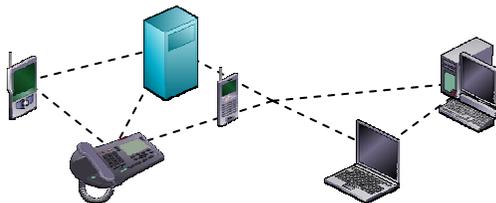
The wide area networks of yesterday (eg: GSM)

> *A Million nodes @ €50k*



The Nomadic local area networks of today (eg: WiFi)

> *Millions of Nodes @ €100*



The Sensor and Personal area network of tomorrow

> *Billions of Nodes @ €1*

Challenges:

- Removing social, geographical, economic and capacity impediments through the provision of cost effective infrastructures, allowing an “Always on” network existence.
- Contributing to accrued facilities based competition.



Ubiquitous computing

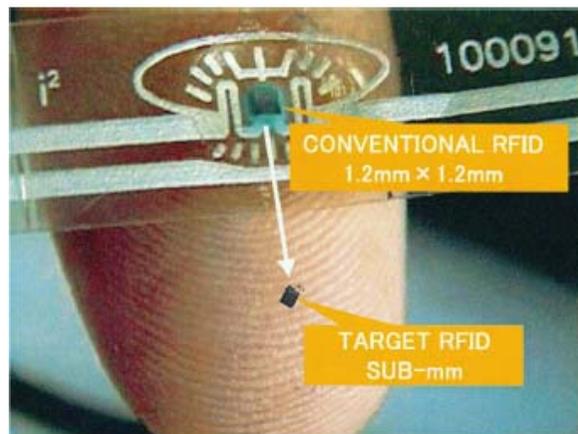
Suppose that you could get a 0.1€ “computer”.

- ***What would you do with it?***
 - Play, Work, Sense, Actuate
 - Communicate, Compute, Access
 - Search for info, Find directions
 - Extend your perception of the world
 - Track content and location
- ***How would you configure it?***
 - In a stand alone mode
 - In a fixed networked environment
 - In ad-hoc networked environment
- ***Should it be visible?***
- ***How do you interface with it?***
- ***How do you power it?***



Deep Networking

- Small, inexpensive, low-powered sensors and actuators, deeply embedded into the physical environment in very large numbers, interacting and forming wired and wireless networks to communicate, adapt, act, respond, and coordinate high-level tasks. (e.g. Monitor the state of devices and provide necessary online diagnostics, maintenance support, etc.)
- As these micro devices are networked, the Internet will be pushed deeper than the current network edge. This will enable a hundredfold increase in the size of the Internet.



Challenges:

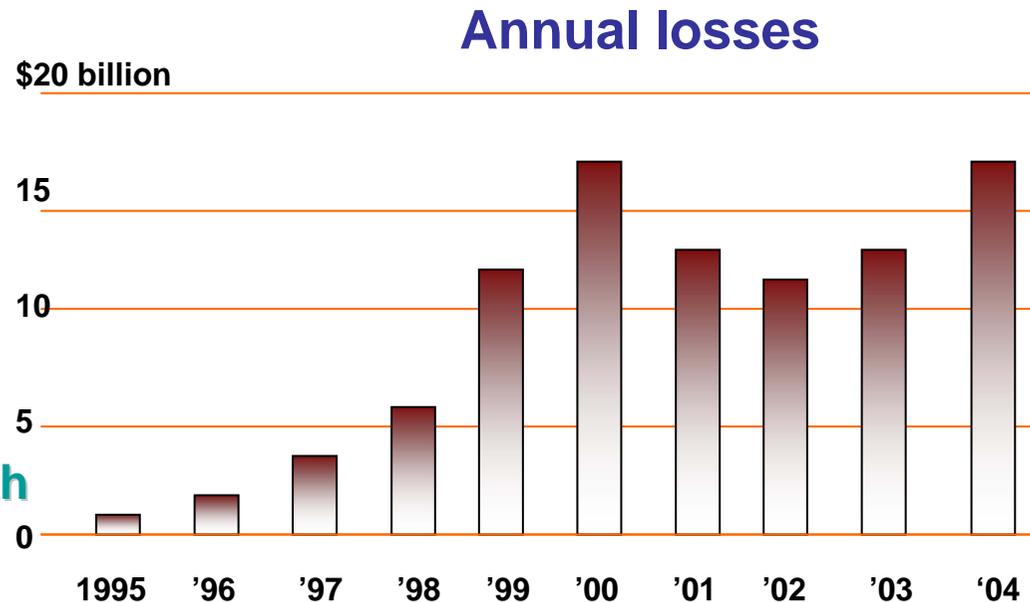
New methods of networking devices to one another and to the Internet must be developed.



Vulnerability and Privacy

- Increased connectivity, diversity of devices, global resource sharing and richer applications increase complexity, amplifying the vulnerability of the network and escalating the privacy concerns.

- 150 Zombies a week
- 60% of all e-mail is spam
- 80% of all PCs infested with malware



Challenges:

- Pervasive connectivity will increase vulnerability and privacy concerns, requiring radically new software solutions,
- Establishment of “trusted” devices, servers and gateways will be required to accommodate dynamic network infrastructure and provide end-to-end security,
- Containing the damage caused to businesses by malware, including the cost of fixing systems and lost revenue.



Did you say barriers?



Content Explosion

- No shortage of content, either from private, corporate or public sources
- Aggressive growth
- Five years ago, the world's information content was 2 Exabytes: Total volume of information generated in 1999.
 - 1 Exabyte (EB) = 1,000,000,000,000,000,000 bytes OR 10^{18} bytes
 - 2 Exabytes: Total volume of information generated in 1999.
 - 5 Exabytes: All words ever spoken by human beings.

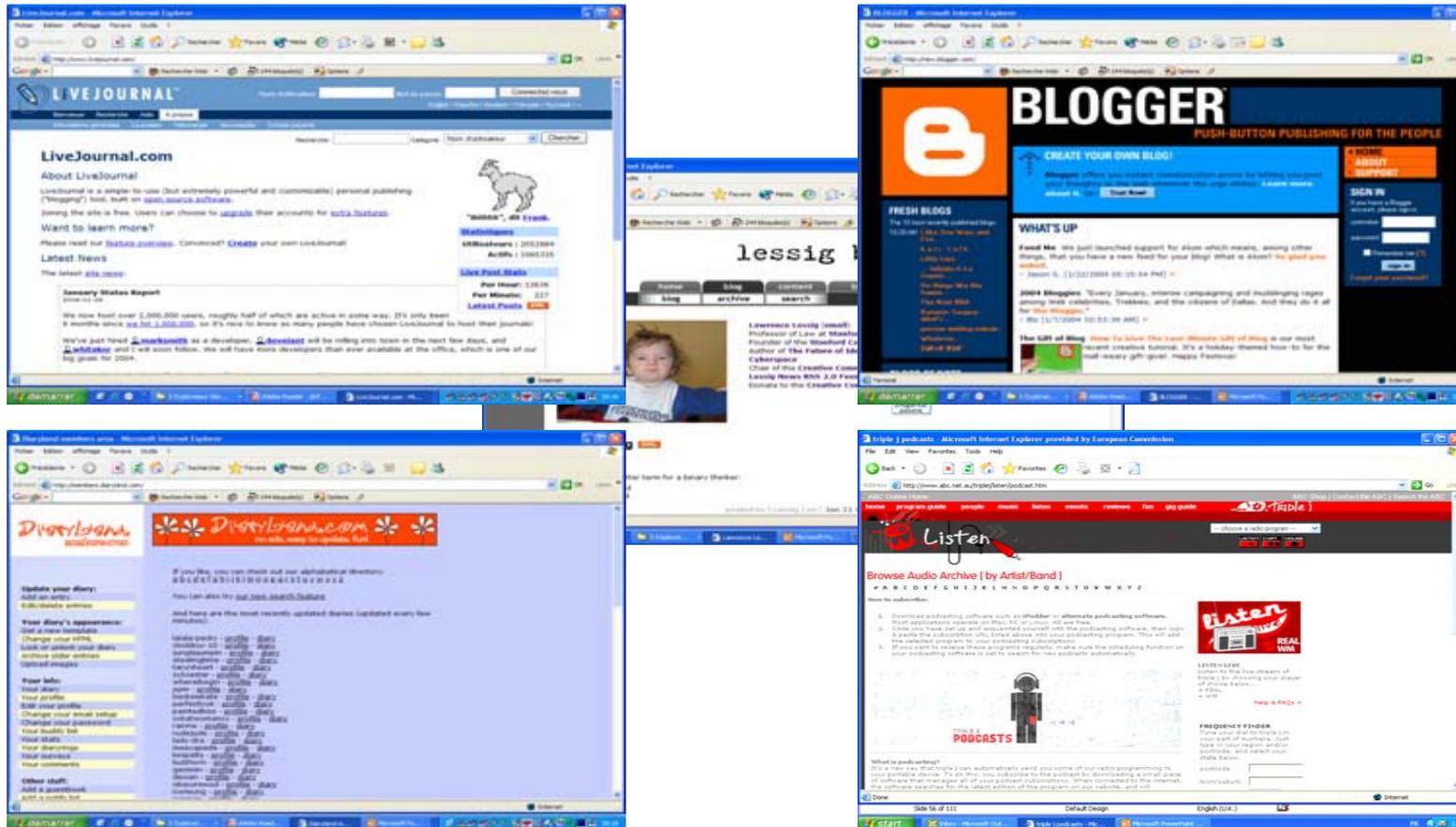
Storage Medium	<i>Scanned</i>		<i>Compressed</i>		% Change Upper Estimates
	2002 Terabytes Upper estimate	2002 Terabytes Lower estimate	1999-2000 Upper estimate	1999-2000 Lower estimate	
Magnetic	4,999,230	3,416,230	2,779,760	2,073,760	80%
Film	420,254	76,69	431,690	58,209	-3%
Paper	1,634	327	1,200	240	36%
Optical	103	51	81	29	28%
<i>Total</i>	<i>5,421,221</i>	<i>3,416,281</i>	<i>3,212,731</i>	<i>2,132,238</i>	<i>69%</i>

Migrating to digital media

Source: http://www.sims.berkeley.edu/research/projects/how-much-info-2003/printable_report.pdf



The birth of the user generated content

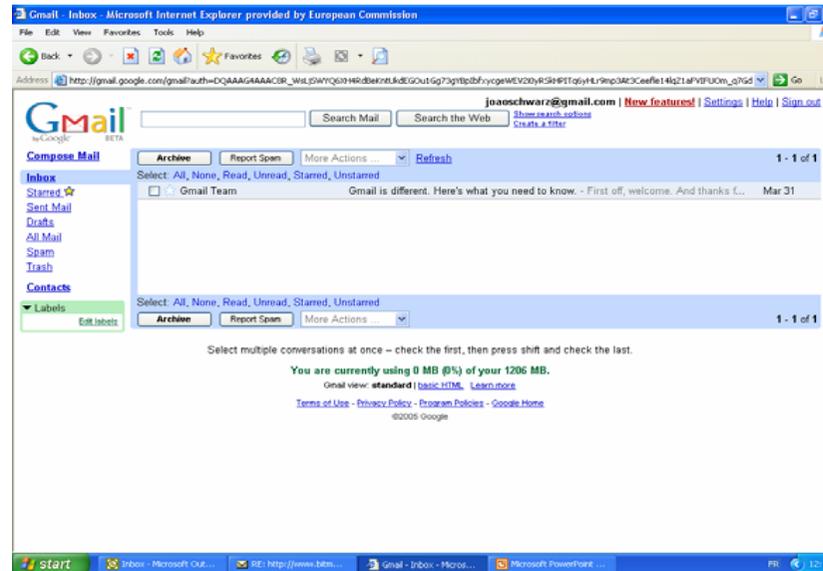


Challenges:

Coping with massive increase in content produced by the audience
Empowering the user (peer-to-peer networking)



Storing your life. Today: Gmail



- Free, search-based webmail service with 2,000 megabytes (2 gigabyte) of storage. Google search quickly recalls any message you have ever sent or received. No more need to file messages to find them again.

- All replies to each retrieved email are automatically displayed (“threaded”). Relevant text ads and links to related web pages are displayed adjacent to email messages.



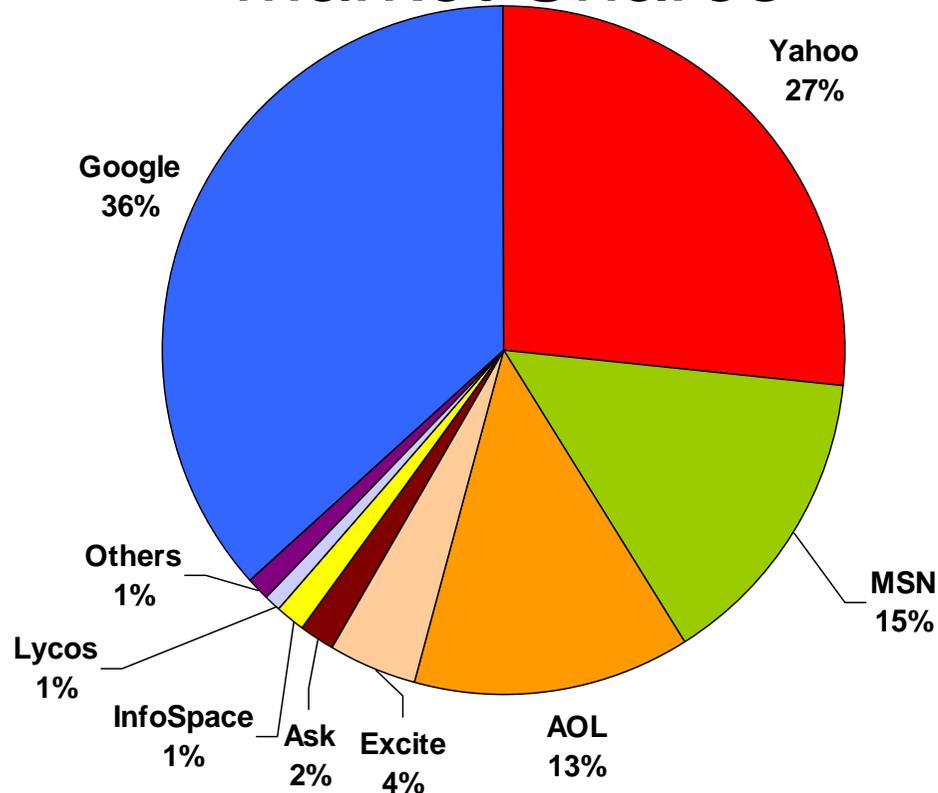
Tomorrow: Lifelogs

- Gmail preserves, for the first time, everything we've ever typed. Gmailers are all bloggers (who don't know it).
- Next, we'll store everything we've ever said. Then everything we've ever seen. This storage (and processing, and bandwidth) makes us all networkable in ways we never dreamed.



How will we search for information?

Market Shares

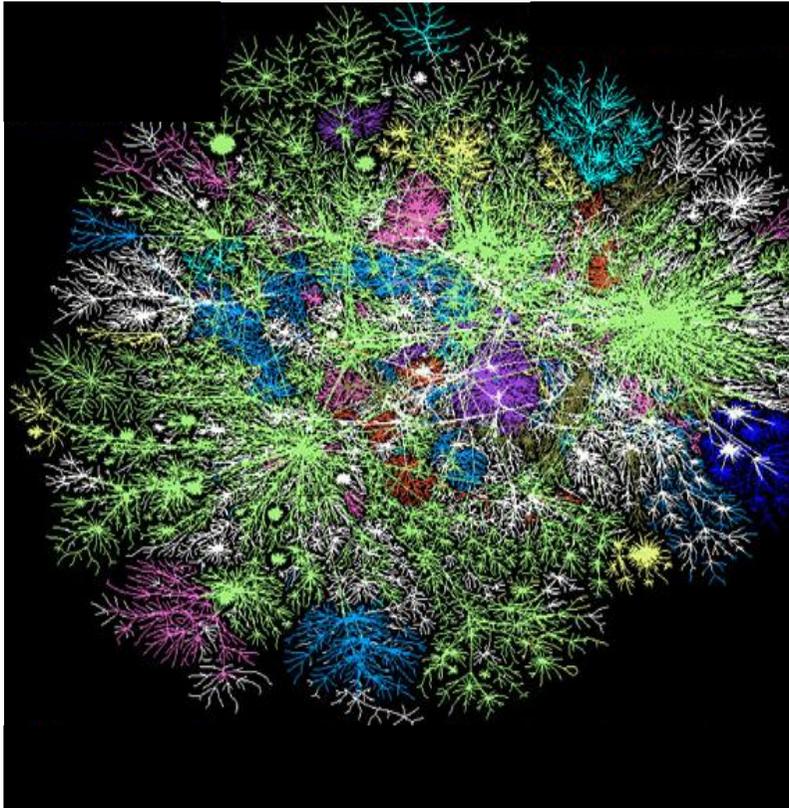


Challenges:

- How can we preserve the cultural and linguistic diversity of Europe?
- What should be done to ensure that Europe masters the technologies for multimedia searching?



Networked nervous system



In our move towards a Networked Global Community of content objects, resources, devices, human beings, how can our collective IQ be augmented?

How do we assess, select, implement, monitor, share and adapt?



Communities of Purpose

File Edit View Favorites Tools Help

Back Forward Stop Home Favorites Refresh Print Mail Stop

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About
Radar Networks

March 13, 2005

Communities of Purpose: The Third Type of Community

I've been thinking about different types of communities recently. Two forms of community that are often discussed are "communities of interest" where the members share a common set of interests (e.g. a community of people interested in Japanese culture), and "communities of practice" where the members share a common set of skills (e.g. a community of marketing professionals). To these I would add a third type called a "community of purpose," where the focus is on a shared goal (e.g. a political activist community or a community collaborating on a common project). Most existing community tools today are either focused on building communities of interest or communities of practice. But I am more interested in creating tools that help people create more productive communities of purpose. To do this we need to merge the functionality of groupware and knowledge management with emerging community tools for social networking, blogging, and wikis.

March 13, 2005 in [Collaboration Tools](#), [Collective Intelligence](#), [Group Minds](#), [Groupware](#), [Knowledge Management](#), [Semantic Web](#), [Social Networks](#), [Technology](#), [Web/Tech](#) | [Permalink](#) | [Comments \(0\)](#) | [TrackBack \(2\)](#)

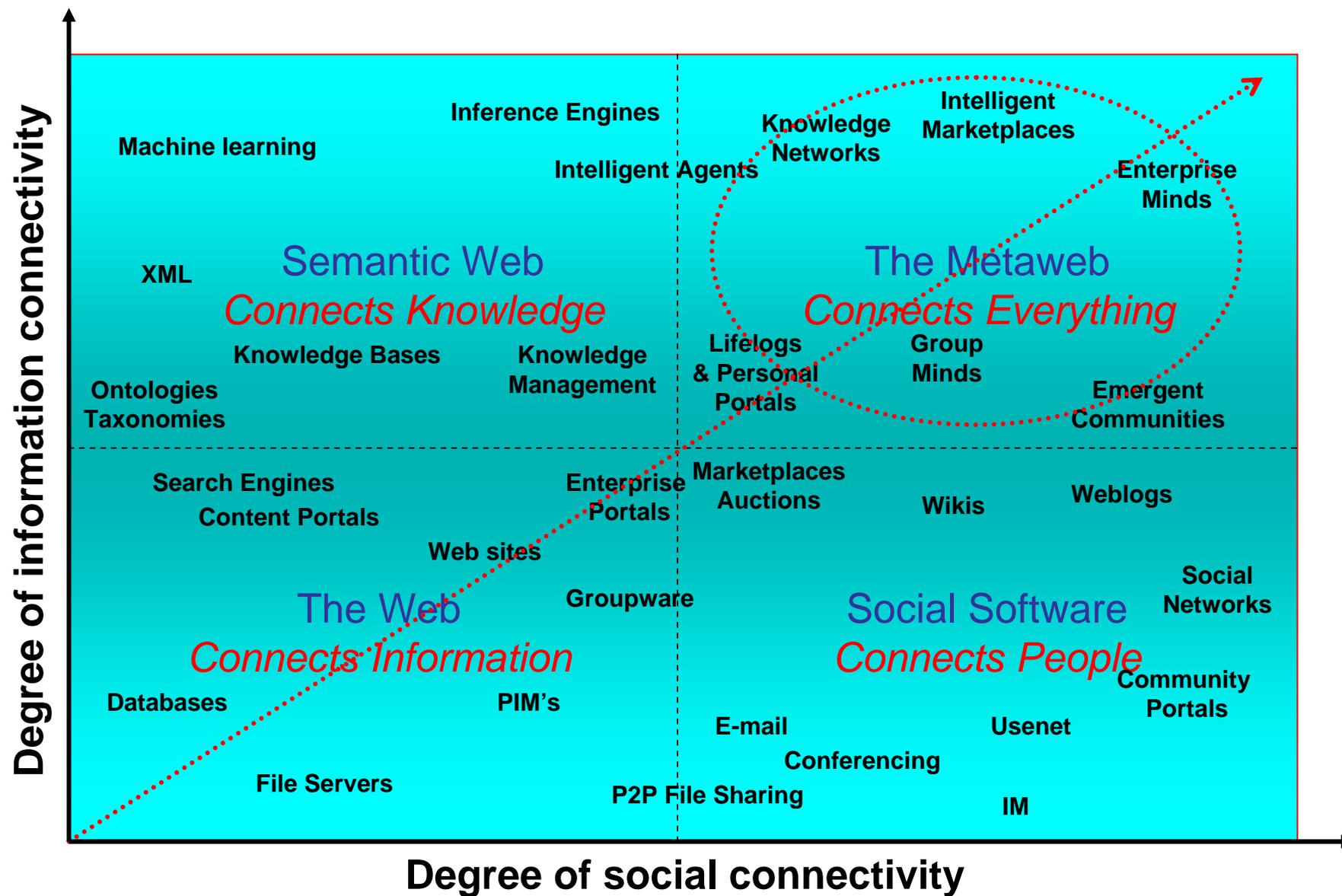
March 12, 2005

Featured Past Articles

- [Minding the Planet: A Physics of Ideas: Measuring The Physical Properties of Memes](#)
- [Proposal For A New Constitutional Amendment: A Separation of Corporation and State](#)
- [Marketing with Memes -- A New Kind of Meme That Raises Your Blog's Google Rankings!](#)
- [Minding the Planet: Can You Imagine What Would Happen if MoveOn.Org Used the GoMeme Concept?](#)
- [From Application-Centric to Data-Centric Computing: The Metaweb](#)
- [Critical Comparison of Existing Social Network Sites](#)
- [A New Way to Find Patterns in Distributions of Numbers](#)
- [How to Build a Network Automaton](#)
- [New Version of My "Metaweb"](#)



Towards the Metaweb



Source: Nova Spivak, 2004

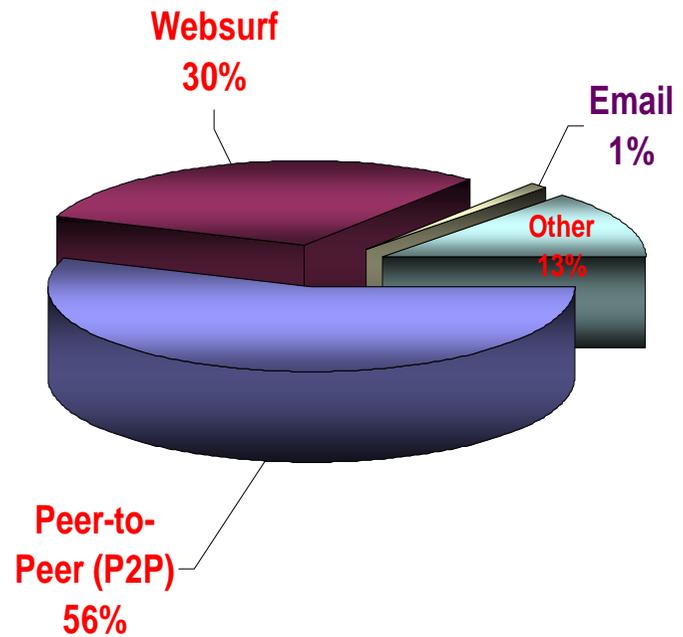
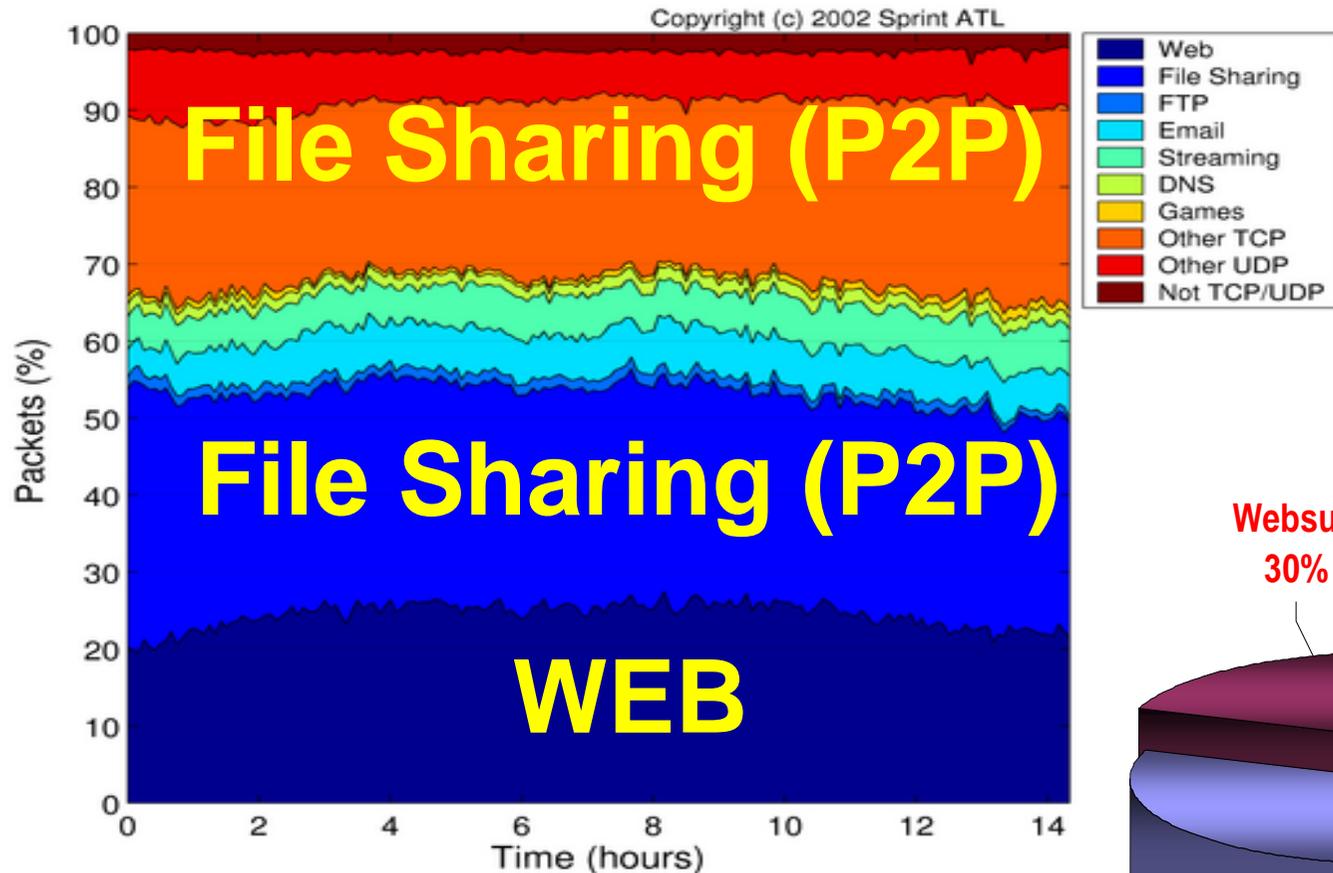


Towards the Metaweb

- Shift from *application-centric* computing to *data-centric* computing
- Increasingly higher levels of *metadata* will be added to the content
- Content becomes *smarter* ... information on how to display, use and interpret is built-in to the content
- The *intelligence* for interpreting the data is moved out of the applications and *into the content itself*
- Application providers should expect to lose control over their closed formats, with content becoming fully portable across various tools
- Content will have an *identity* and behaviour
- There will be a shift from *desktop computing* to *network computing*
- Data objects will be *accessible from everywhere*, they will be responsible for maintaining their own state, relationships and contents, as well as managing their own access, rights and usage policies



File Sharing is dominant

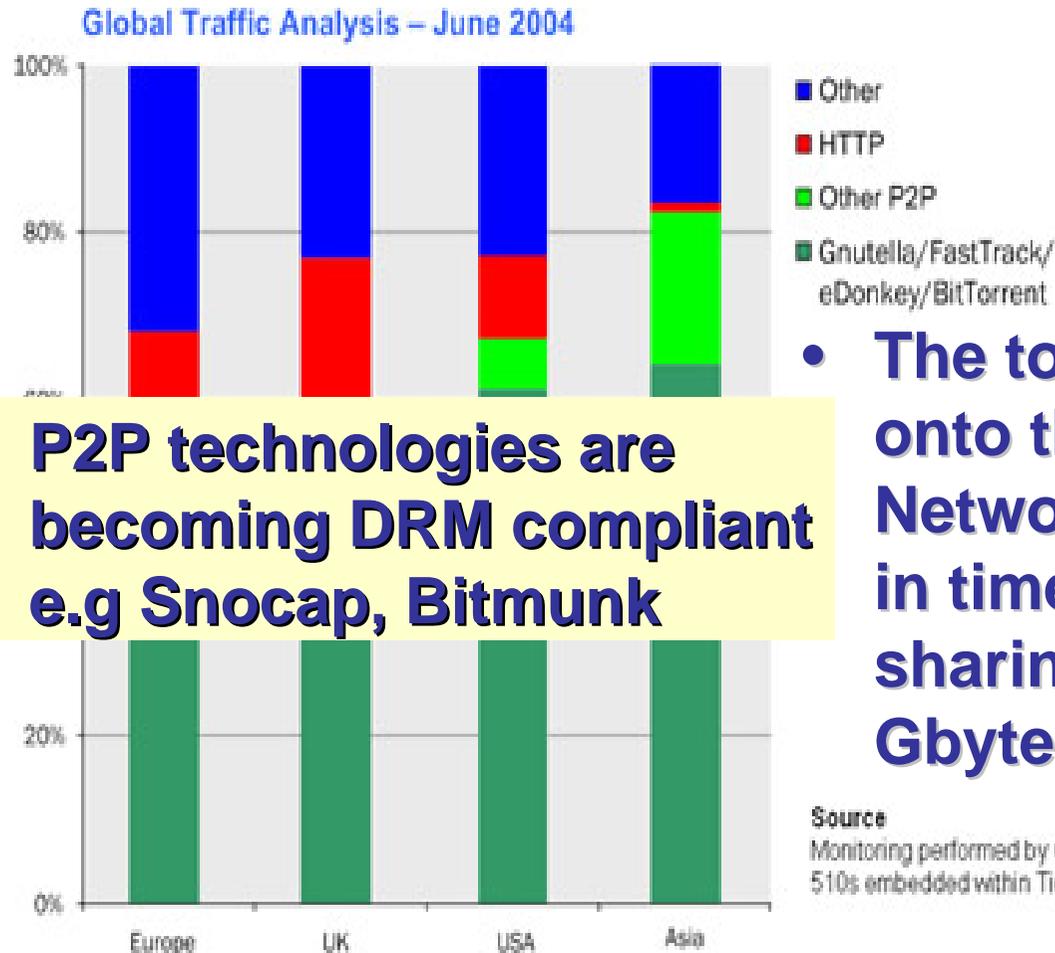


International demand for bandwidth grew 42 percent in 2004, because of P2P traffic increase.



Global P2P Traffic Levels

- Peer-to-Peer is the “killer application” for broadband with a global reach and a global user-base.



- P2P technologies are becoming DRM compliant e.g Snocap, Bitmunk

- The total population logged onto the major Peer to Peer Networks at any one point in time is about 8 Million sharing over 10000000 Gbytes of data.

Source
Monitoring performed by CacheLogic StreamSight
510s embedded within Tier 1 and 2 ISPs – June 2004



Dark (Peer-to-peer) Networking

- The darknet is not a separate physical network but an application and protocol layer riding on existing networks.
- There will be short-term impediments to the effectiveness of the darknet as a distribution mechanism, (BitTorrent → Exeem)
- Napster, Kazaa, Morpheus, edonkey, Bit Torrent.... Grouper (file sharing between friends)
- Will peercasting end-up replacing broadcasting?
- Does DRM for video need to look like DRM for music?
- Will the content industry as we know it, evaporate one day?



The Darknet and the Future of Content Distribution
Peter Biddle, Paul England, Marcus Peinado, and
Bryan Willman
Microsoft Corporation

As encrypted networks grows in popularity, is there a danger that these so-called darknets will replace bigger and bigger chunks of the Internet?

It's not a danger - it's a requirement. Historically, corporations had physical walls. Firewalls try to emulate them, but it's not the way we work anymore. We need virtual boundaries around our workgroups - which may include a lot of people from other organizations - not around corporations. The only way to accomplish that is with darknets.

Ray Ozzie , Groove Networks
Wired , [Issue 12.08](#) - August 2004



Internet Radio Stations



StationRipper™
The Advanced Internet Radio Recorder

Home Download Buy Support News

StationRipper™ allows you to record Internet Radio broadcasts. Users on broadband connections regularly report 3,000-6,000 new songs can be downloaded every 24 hours with the [registered version!](#)

- Record Shoutcast Audio and Video streams, and Podcasts.
- Records up to 600 stations at one time.
- Buy the music you are ripping.
- Integrate with iTunes - auto-generate iTunes playlists of songs recorded.
- Keeps track of the songs you've already recorded, only keeping the songs you don't already have.
- Lets you easily find stations to record, via the StationRipper™ Portal, Shoutcast, or other web sites. Or you can drag and drop from iTunes radio to start recording.
- Keeps a list of the music and stations you've recorded, allowing easy playback and re-recording of stations.
- Listen to any station being recorded with a single mouse click.
- Ignore songs under a certain size.
- Auto-record whatever was being recorded the last time you ran StationRipper™.

March 29, 2005 - Version 2.14 is available! This release allows you to default ID3 tags, and has a couple of other fixes. Check out the [change log](#) and download it from the [download page](#).

March 11, 2005 - Version 2.13 is available! This release brings iTunes integration to StationRipper, along with a couple of fixes. Check out the [change log](#) and download it from the [download page](#).

February 25, 2005 - Version 2.12 is available! Minor Update of StationRipper check out the [change log](#). Download from the [download page](#).

February 20, 2005 - Version 2.11 is available! Minor Update of StationRipper check out the [change log](#). Download from the [download page](#).

February 18, 2005 - Version 2.10 is available! Large Update of StationRipper, with some major new features, including ripping of Podcasts. check out the [change log](#). Download from the [download page](#).

Read full news [here](#)

The [StationRipper Portal](#) is up - check it out for some of the best stations to listen to.

<http://www.stationripper.com/>



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"I know personally for a fact that various members of the movie industry are really getting interested in how to use the Internet as a distributed method for distributing content," Vinton Cerf , 14 April 2005

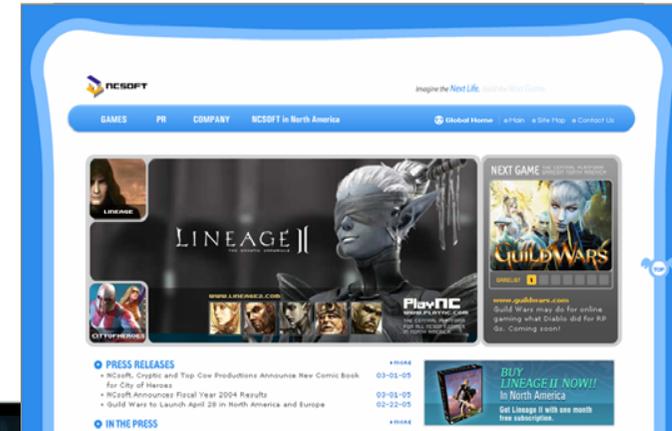


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Virtual/augmented reality



Challenges:

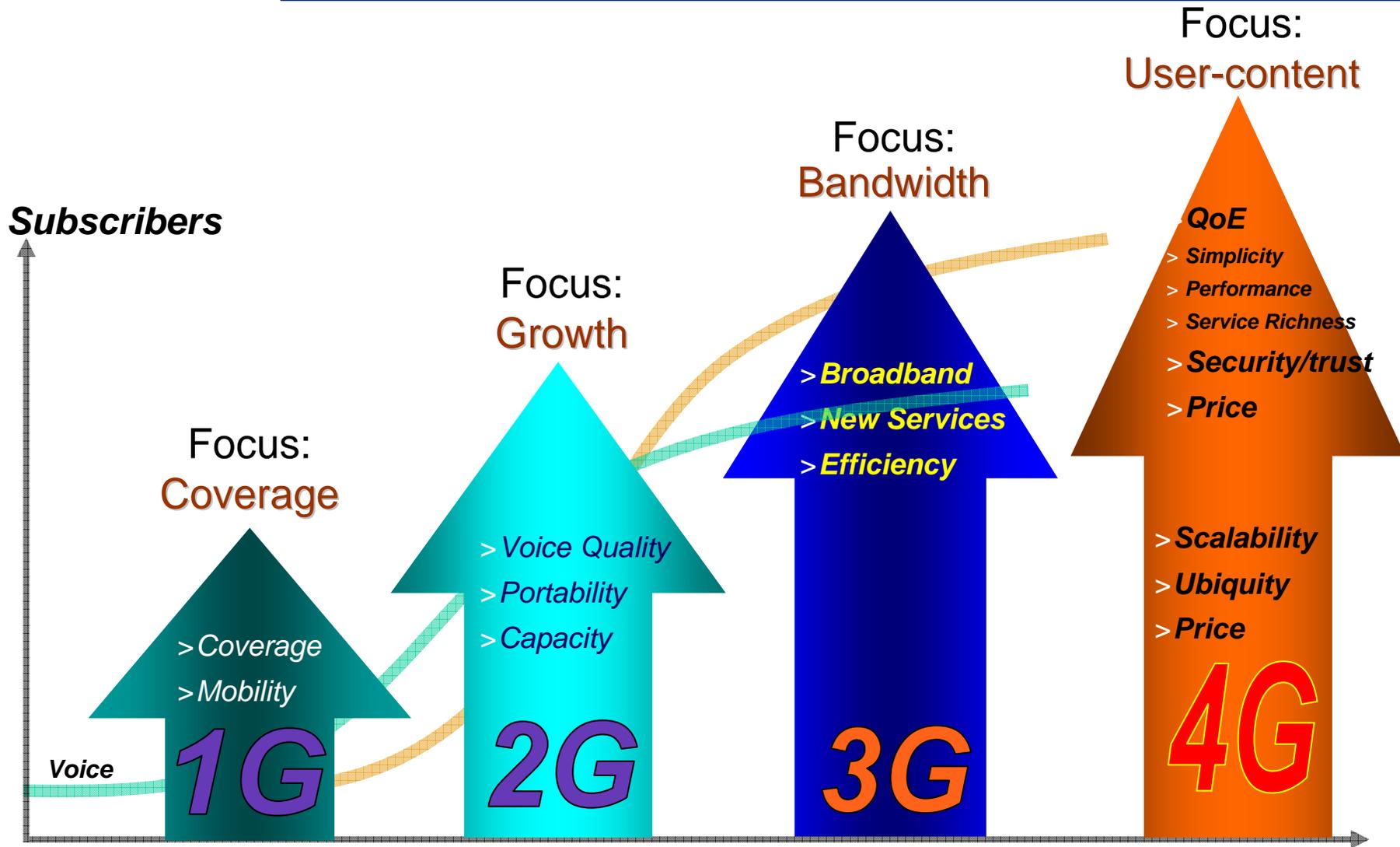
Which legal regime applies to the virtual world?

Can virtual possessions be traded in the real world?

<http://www.mmorpg.com/> , <http://www.ncsoft.net/eng/index.asp> , <http://www.lineage2.co.kr/>



Wireless Evolution



Global B3G activities

Dominated by global IT industry

- IEEE activities in
 - IEEE 802.11a, b, g, h, n
 - IEEE 802.15
 - IEEE 802.16, a, d, e
 - IEEE 802.20
 - IEEE 802.21
- Claims from start-ups and IT companies to provide 4G solutions
 - Flarion (Fast Low Latency Access with Seamless Handoff and OFDM)
 - Arraycomm – advanced antenna technology and SDMA
 - Navini Networks – Advanced beamforming technology for range & coverage
 - IP Wireless – TD-CDMA with IP core network
 - Aperto Networks – Fixed Broadband Wireless Access vendor
 - Redline Communications – Fixed BWA
 - Airspan – Fixed BWA
 - Alvarion – Fixed BWA
 - Intel – Active in 802.16 development and its promotion in WiMAX
- Many activities are on short-range and WLAN enhancements

Europe

- UMTS
- UMTS enhancements
- Research on systems beyond 3G in FP6

China

- 3G licenses not yet granted
- Research on beyond 3G in 863 FuTURE Project
- Joint Research Center Shanghai

Korea

- Reluctant with wide-spread 3G deployment
- HPI / WiBro (WiMAX derivative) under development (3.5G)
- Research on systems beyond 3G

CJK – China, Japan, Korea

- Cooperation on government level, one working group on mobile communication
- Cooperation between SDOs

Globally

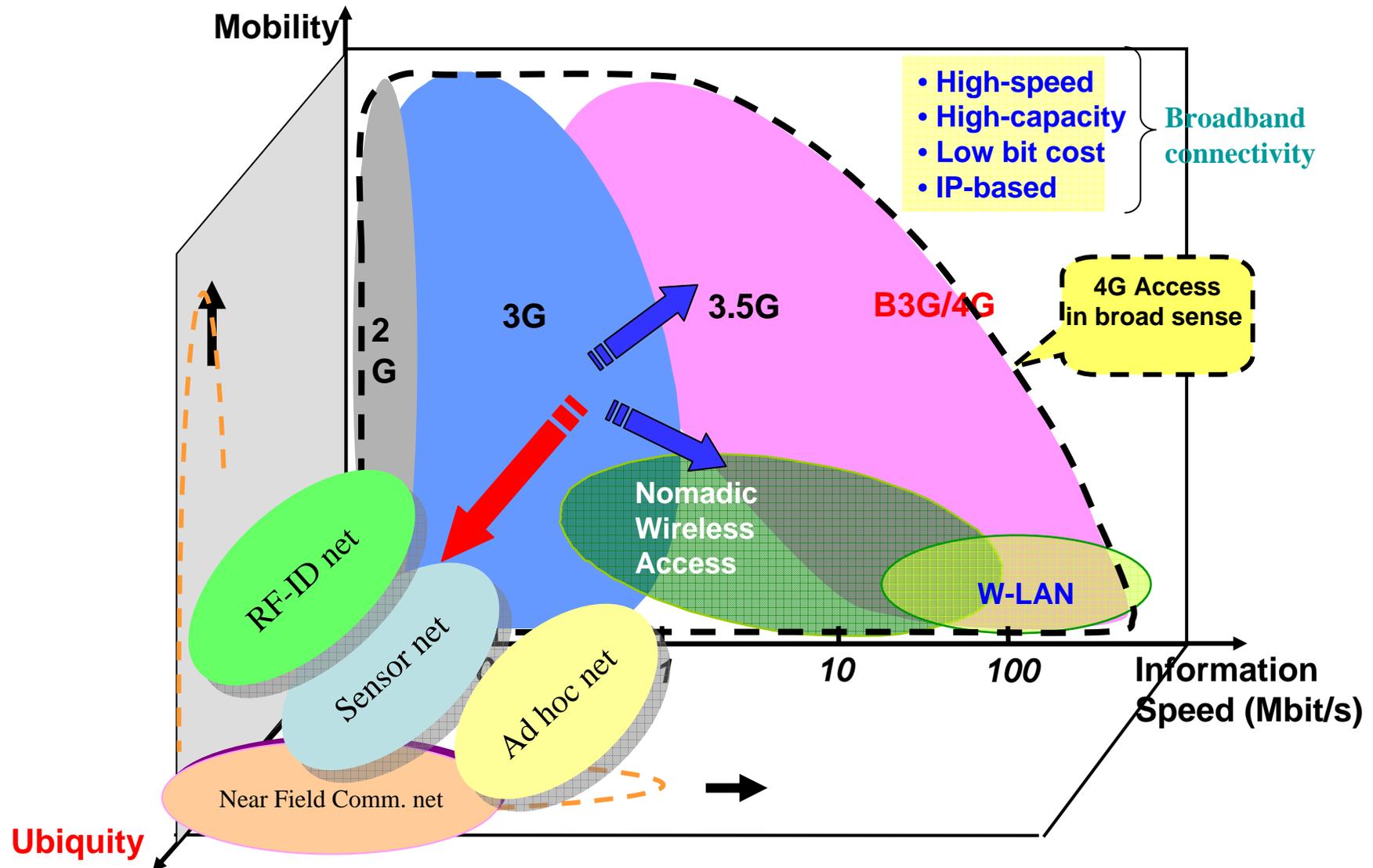
- ITU-R Framework Recommendation
- WWRF, since 2001

Japan

- 3G deployments of 3G
- Enhancements on systems beyond 3G
- DoCoMo proposal Super 3G
- cdma2000, WCDMA

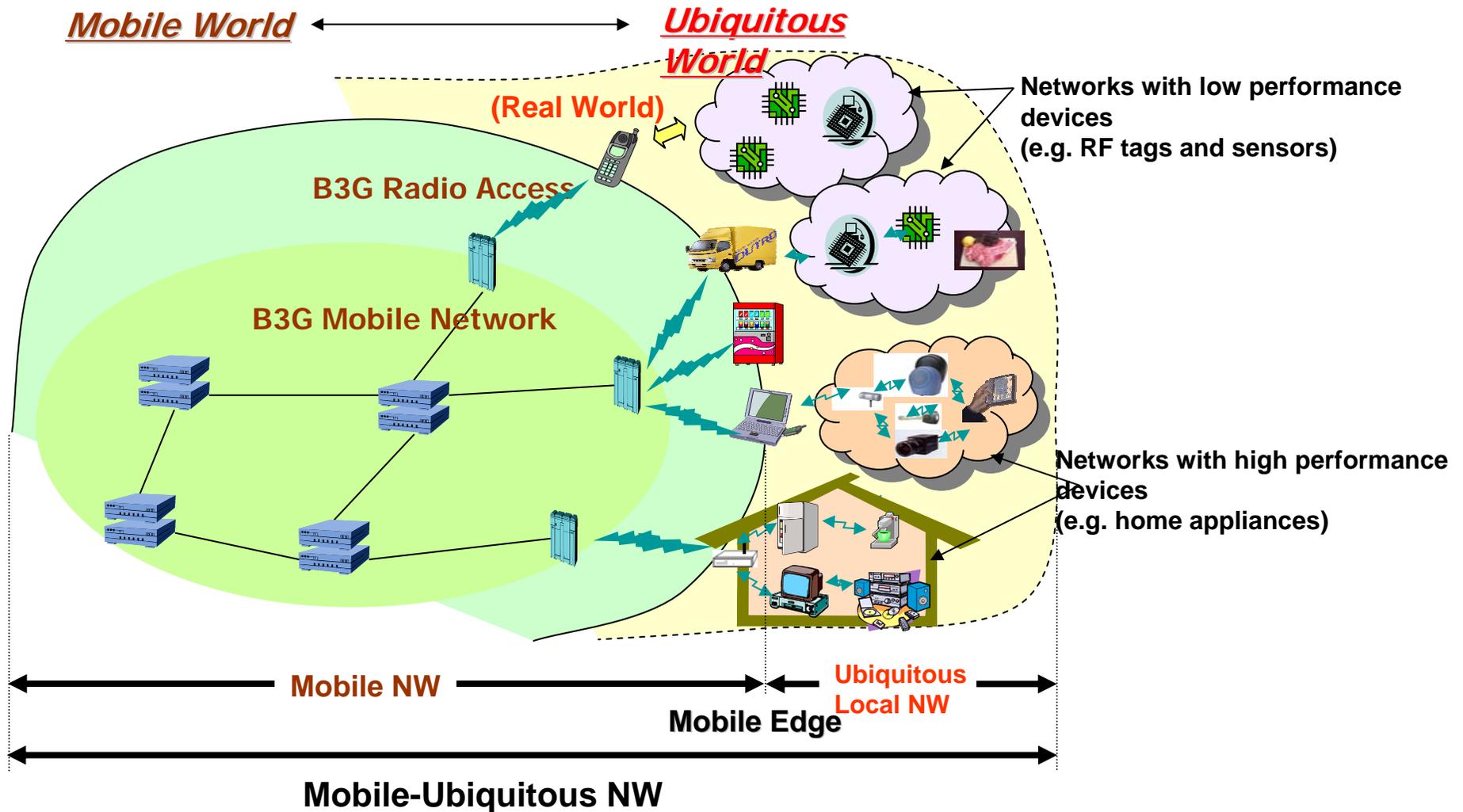


Where should we go next?



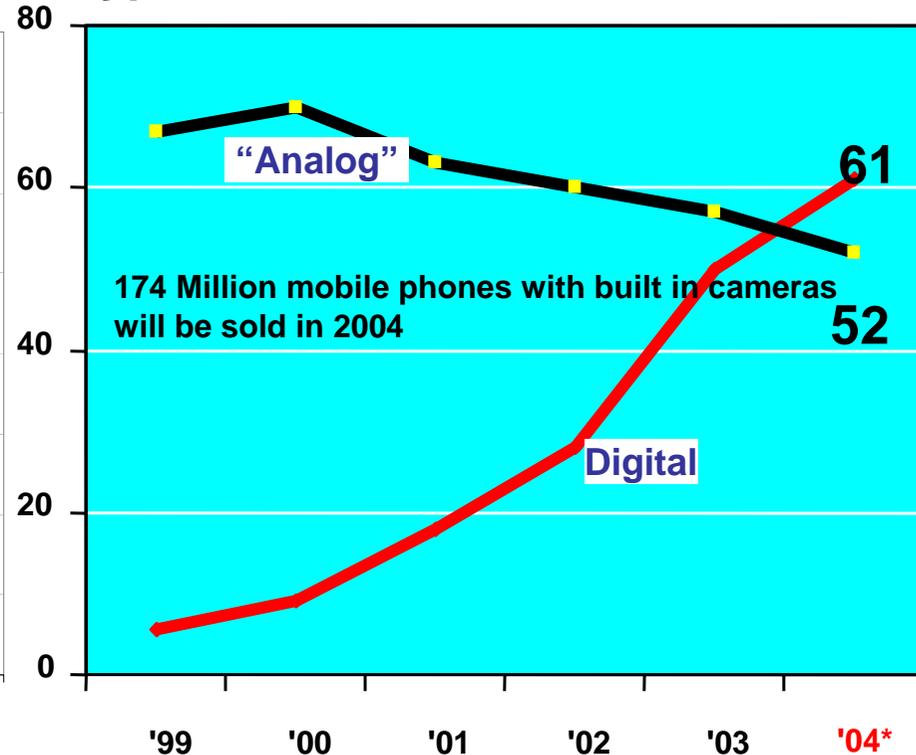
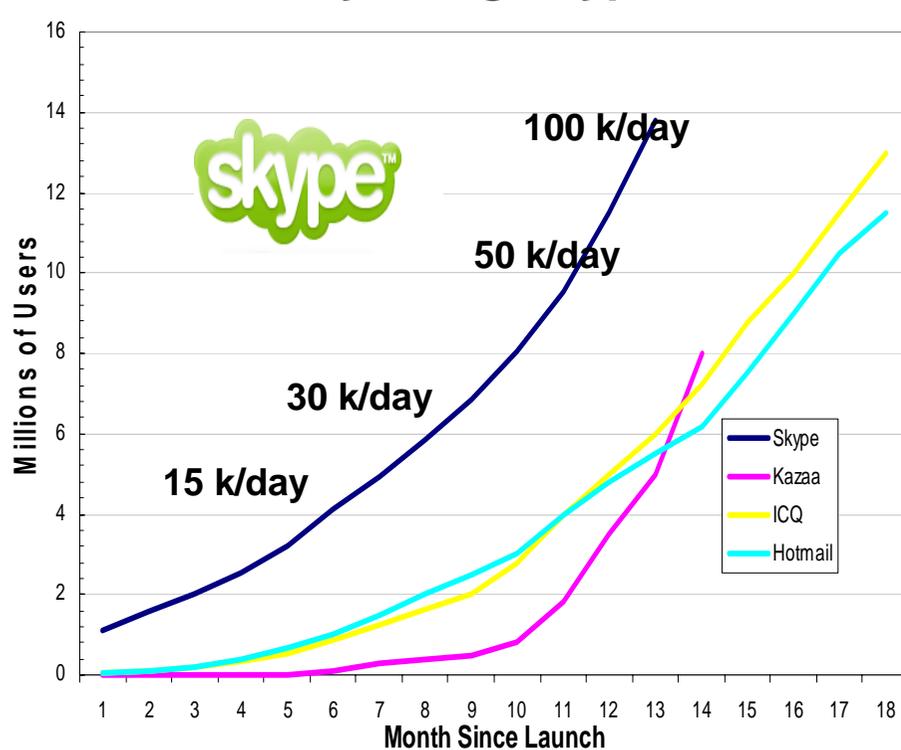
Mobile Ubiquitous Networking

Broaden communication parties, networking, and business opportunities



The new shape of innovation

As of April 2005, Skype has more than 35 million registered users and is adding more than 155,000 new users per day. On average, 2 million people are simultaneously using Skype. 100 Million Skype downloads.



Challenges:

- Moving beyond an industrial or information economy to the creation of an advanced innovation eco-system capable of coping with the speed of change
- Creating change as the best means to manage it



Key Components for success



- Technology
- Standards
- Regulatory framework
- Financial support
- Innovation support
- EU dimension
- R&D Framework





***Moving to the 7th Framework
Programme of R&D
2007-2013***



ICT in FP7 - Objectives

- *“To enable Europe to master and shape the future developments of ICT so that the demands of its society and economy are met”*
- Thereby:
 - Strengthen the **competitiveness of all industry** in Europe
 - Master ICT for innovation and growth
 - Reinforce the **competitive position of European ICT** sector
 - Build industrial and technology leadership
 - Supporting EU policies
 - Mobilise ICT to meet public and societal demands
 - Strengthening the European science & technology base
 - A pre-condition for success



ICT in FP7 “Striking the Right Balance”

- **Reinforce leadership and open new fields**
 - Reinforce areas where Europe has *recognised strengths*
 - Build capacity to seize *new opportunities* as they emerge
- **Mainstream ICT and Push the limits of technology**
 - Boost innovation from ICT use and new forms of content
 - Widen the performance and functionality of technology
 - Combination of *market or applications-pull* and *technology and science-push*
- **Balance between basic and applied research**
 - Flow of ideas from theory to practice and from academia to markets.



Building on Europe's Strengths

- **Industrial & technological leadership in key ICT fields**
 - Telecom, embedded IT, nano-electronics, micro-systems, rich audio-visual content etc
- **Capacity to draw on multiple disciplines**
 - ICT, biology and Biotechnology, physics, materials, social science,..
- **Handling complexity**
 - Transform progress in complex technologies into reliable products
 - e.g. infrastructures: energy, telecom, trains; complex devices: mobile, home,
- **Strengths in “vertical” markets**
 - e.g. automotive, aerospace, pharmaceuticals
- **Partnering and collaboration**
 - consensus-building, pursuing common goals



Seizing new Opportunities

- **Expanding prospects of ICT**
 - New needs, new areas; e.g.
 - New forms of digital content, new personal devices and systems, shifting computing & communication “out of the box”;
 - more dependable ICTs,...
- **Extended borders of ICT R&D**
 - ICT-bio-nano-cogno
- **Wider range of actors**
 - Large firms, SMEs, universities, public research labs etc.
 - Industry and technology suppliers in ICT sectors
 - Users from ICT-intensive sectors
 - Researchers in ICT, bio- and life-sciences, cognitive sciences, social sciences etc.



Stimulate Innovation from ICT Use

- **Bring technology closer to people and organisational needs**
 - Make ICT simpler to use, available and affordable
 - Make ICT more trusted and reliable
- **Involve the user early**
 - A European tradition: user participation early in the process
 - Strong user industries in Europe
 - automotive, aerospace, medical, pharmaceuticals, financial services, etc.
- **Support innovative digital content and services that adapt to users' context**
 - Respond to evolving societal demand: e.g. higher ICT literacy, ageing,...



FP7-Indicative Budget Breakdown (M€)

• Cooperation,^[1] (9 Themes)	44735	61,1%	Rel.Share
– Health	8373		19%
– Food, Agriculture and Biotechnology	2472		5%
– Information and Communication Technologies	12756		28%
– Nanosciences, Nanotechnologies, Materials and new Production Technologies	4865		11%
– Energy	2951		7%
– Environment (including Climate Change)	2552		6%
– Transport (including Aeronautics)	5981		13%
– Socio-economic Sciences and the Humanities	798		2%
– Security and Space	3987		9%
• Ideas (European Research Council)	11942	16,3%	
• People (Marie Curie Actions)	7178	9,8%	
• Capacities	7536	10,3%	
– Research Infrastructures	3987		
– Research for the benefit of SMEs	1914		
– Regions of Knowledge	160		
– Research Potential	558		
– Science in Society	558		
– Activities of International Co-operation	359		
• Non-nuclear actions of the Joint Research Centre	1824	2,5%	
• Total	73215	100%	

^[1] Including Joint Technology Initiatives (including financial plan, etc) and the part of the coordination and international cooperation activities to be funded within the themes.



Tentative Roadmap for FP7

2005

June	Council - Orientation debate
September	Commission - Proposals on Specific Programme and Rules for participation and dissemination
November	Commission - Proposals under Articles 169 and/or 171
November	Council - Orientation debate on Specific Programmes
December	EP - 1st reading on EC Framework Programme

2006

Feb/Mar	Council - Common position on EC FP EP - 1 st reading on EC Rules
April	Common position on EC Rules
May/June	EP - 2 nd reading on EC FP; Opinion on SPs; 2 nd reading Rules (earliest)
July	Council and EP - Adoption of FP and Rules
July	Council - Adoption of the SPs
Oct	Commission - Adoption of Work programmes and necessary materials
Nov	Commission - Publication of 1 st calls



Conclusion

- **The EU Framework Programme seeks to permit our enterprises and our creators to establish and/or access, under the best economic conditions, new world markets:**
 - **By anticipating the likely technological disruptions**
 - **By nurturing technological development and innovation**
 - **By creating the right synergies between the key stakeholders**
 - **By establishing the conditions for new value chain actors to emerge**
 - **By stimulating innovative usages**
 - **By shedding light into the new world markets**



Final word

“The problem in times of turbulence is not the turbulence; it is acting with yesterday’s logic.”

Peter Drucker

If you’re trying to look far ahead, and what you see seems like science fiction, it might be wrong.

But if it doesn’t seem like science fiction, it’s definitely wrong.

*Christine Peterson,
Foresight Institute*



Come and join our R&D efforts

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Thank You

