

European Research on Future Internet

in Framework Programme 7

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Contents

- Rationale for Future Internet Research
- Ongoing research and initiatives
- Opportunities in FP7

FP: Framework Programme



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Changing requirements to the Internet

- Internet has become a **critical part** of an economy's infrastructure
- Net-delivered services are reshaping the world (search, media, games etc.)
- **Tripling of the number of people** connected
- Addition of billions—perhaps even **hundreds of billions—of devices**
- **Creative flow** of content and processes, increasingly generated by users, not just consumers
- **Balance the need for control with the creativity**, that spawns innovation—and profit?



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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 wireless internet of objects revolution ?

- 25 August 2005 – NSF announces the GENI initiative at SIGCOMM
- 19 Dec 2005 – MIT publishes **“The Internet is Broken”** by David Clark



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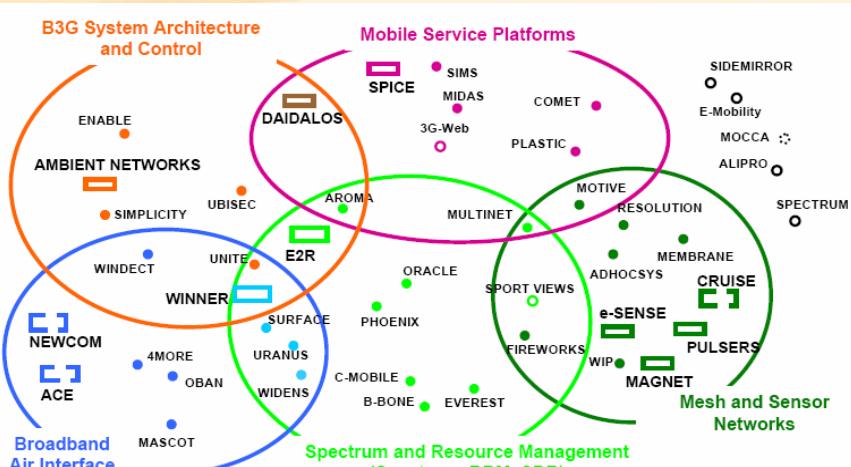


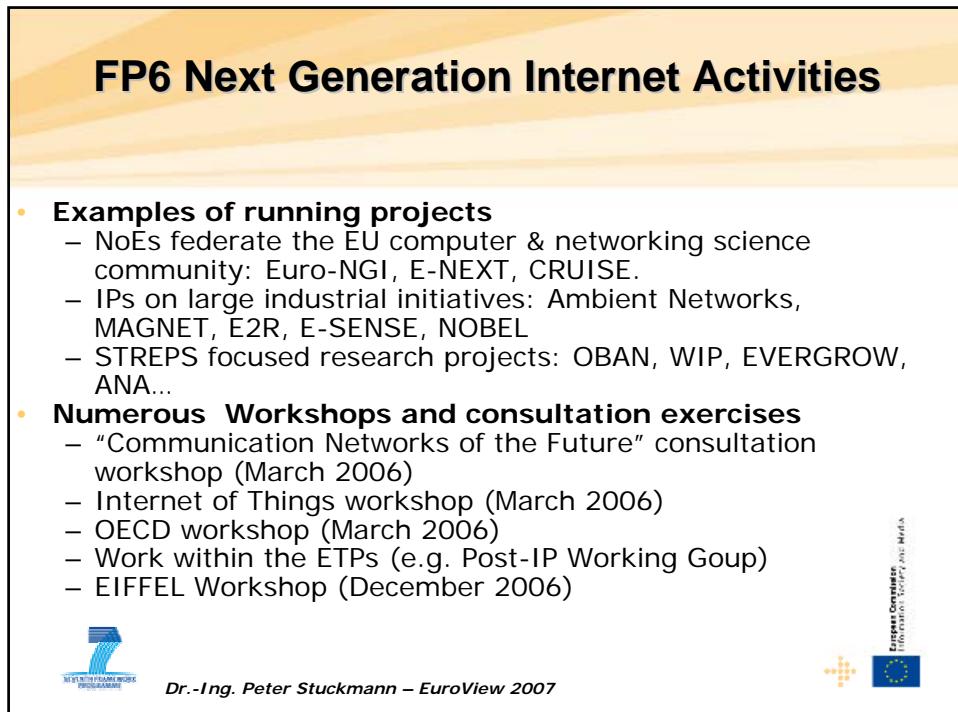
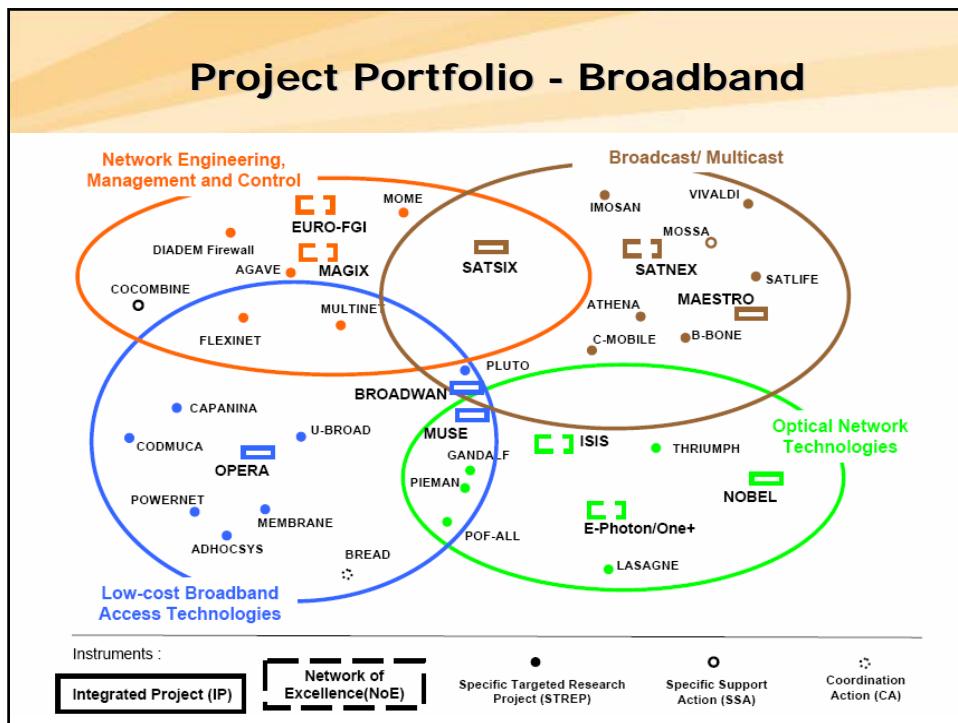
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Project Portfolio - Mobile





Conclusions from FP7 Consultation

"Communication Networks of the Future", 29 March 2006

- **Major trends:**

- Openness and user/ endpoint control (open wireless networks, P2P, user-generated content, etc.)
- Heterogeneous and interoperable solutions
- New core network technologies, such as enhanced Ethernet based optical packet forwarding

- **There should be room for new concepts and paradigms**

- Autonomic network management
- Alternative protocols that will complement or even replace TCP/IP
- New architectures and new routing, identification and addressing schemes - free from the constraints the Internet has imposed

- Europe should focus on the major drivers: mobile and wireless communications, nanotechnologies and optical technologies

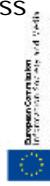
Report available for download:

ftp://ftp.cordis.europa.eu/pub/ist/docs/ct/report-communication-networks_en.pdf



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EIFFEL initiative

Evolved Internet Future for European Leadership

- EIFFEL agreed on 6 October 2006

www.future-internet.eu

- Likely evolution scenarios, technological and socio-economic drivers
- Technical Challenges
- Policy challenges, risks and opportunities for Europe
- Planning and Coordination Group

- Possible ingredients of an EU based initiative:

- Support Actions, Targeted Projects
- Experimental facilities
- Roadmap and Milestones



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FIRE initiative

Future Internet Research and Experimentation

- Experimentally-driven long-term research
 - Open to fresh bottom-up ideas, no backwards-compatibility constraints
 - Integrating and validating new concepts developed in multiple research disciplines
- Setting up large-scale testing environments for the ICT research in the field
 - Creating a European Lab for testing potentially disruptive internet concepts
 - Possibly building on ONELAB and on the advanced testbeds of SAC projects (SAC=Situated and Autonomic Comms.)
 - Federating upfront existing and planned testbeds for emerging technologies:
 - e.g. in line with the framework provided by PANLAB
 - Open to relevant testbeds from outside the Objective, e.g. EU, national, regional



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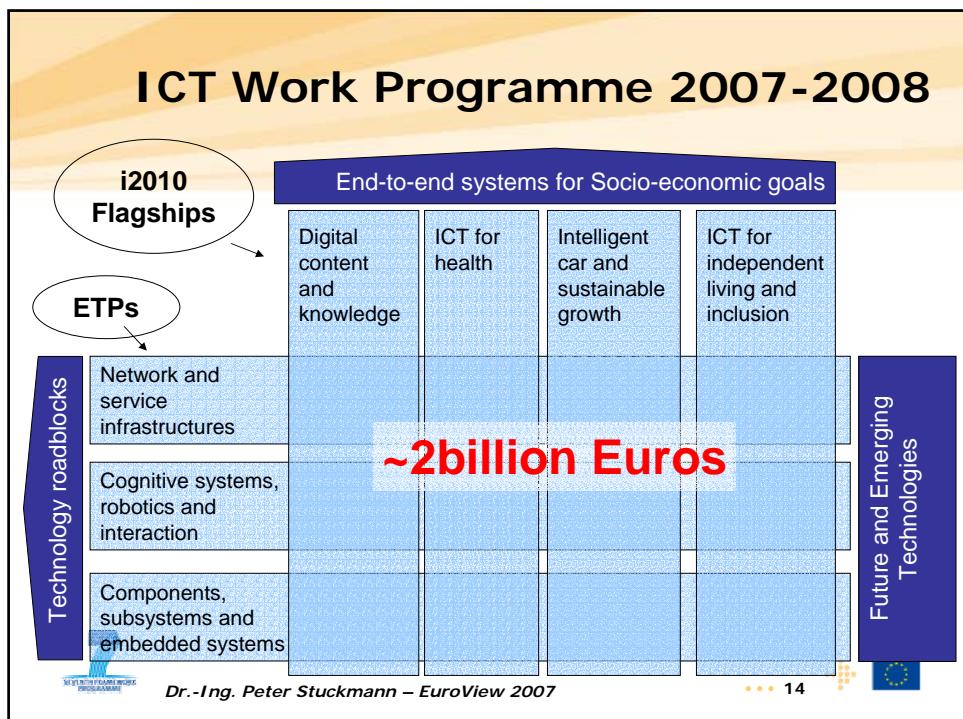
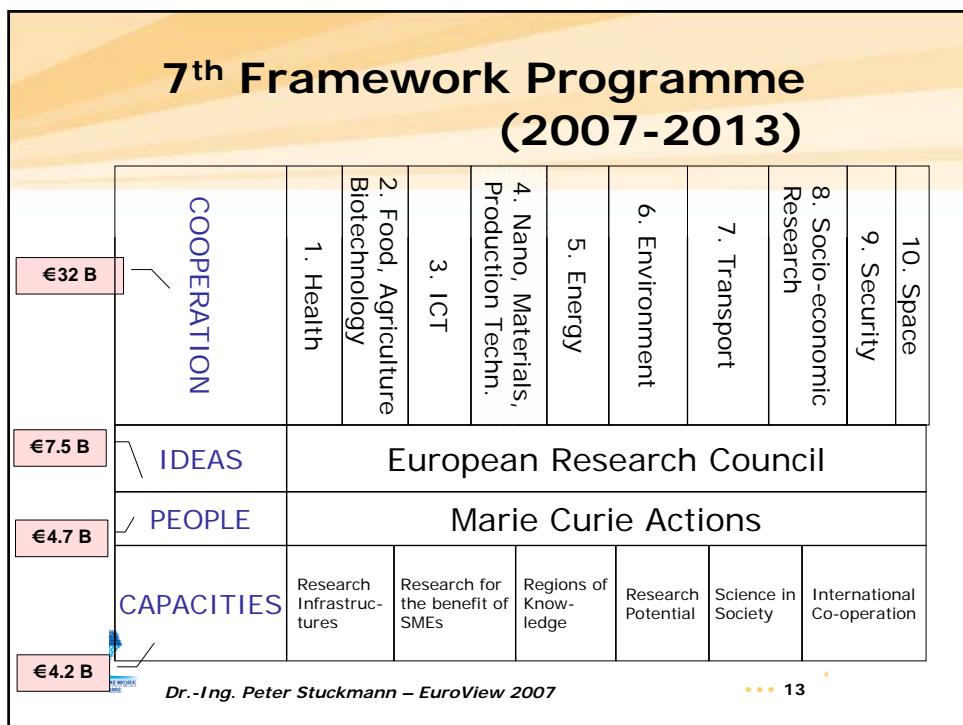
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Challenge 1: Pervasive and trusted network & service infrastructures

- Network and service infrastructures underpin economic progress and the development of our societies
 - 2 billion mobile terminals in commercial operation, 1 billion Internet users, 400 million internet enabled devices
- A growing and changing demand
 - for increasing user control of content/services
 - for networking 'things' - TV/PC/phone/sensors/tags ...
 - for convergence: networks/devices/services - video/audio/data/voice/...
- Current technologies can be, and need to be improved significantly
 - for scaling up and more flexibility
 - for better security, dependability and robustness
 - for higher performance and more functionality
- Europe is well-positioned: industry, technology and use
 - networks equipment and services, business software, middleware, security, home systems ...

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Today

5 – 10 years

- "Convergence" emerging but:
 - user handles separate networks
 - a multiplicity of devices
 - disparate services
- Billions of devices connected
- Security and trust are "added on"
- Robustness/dependability a key hurdle
- Difficulty to cope with the fragmentation of the value chain

- Anywhere, anytime, any device
 - seamless, ubiquitous
 - broadband, mobile
 - reconfigurable to load/use/context
- Trillions of devices connected
- "Built-in" security and trust
- Highly dependable software and systems
- Full support to distributed value chains and to the networked enterprise

Objective 1.1 The Network of the Future

- **Ubiquitous Network Infrastructures and Architectures**
 - Convergence and interoperability of heterogeneous network technologies
 - Flexible and spectrum-efficient radio access
 - High-speed end-to-end connectivity with optimised protocols and routing
 - Context awareness
 - Support of trillions of connected devices
- **Optimised Control, Management and Flexibility of the Future Network Infrastructure**
 - Seamless end-to-end network and service composition and operation across multiple access technologies, operators and business domains
 - Reconfigurability, self-organisation and -management
 - Management in real-time of new forms of ad-hoc communications with intermittent connectivity requirements and time-varying network topology
- **Technologies and System Architectures for the Future Internet**
 - Overcoming the expected long-term limitations of current Internet technology
 - Scalability from a device, service attributes and application environments perspective
 - Security and trusted domains
 - New forms of routing and content delivery in a generalised mobile and wireless environment

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Technologies and System Architectures for the Future Internet

*"Technologies and systems architectures for the Future Internet, aimed at **overcoming the expected long term limitations of current internet capabilities**, architecture and protocols, driven by the need for: generalised mobility; scalability from the perspective of devices, service attributes and application environments; security; trusted domains; **new forms** of routing and content delivery with dynamic peering of end to end delivery and control, of ad-hoc connectivity in a generalised wireless environment. The **work of exploratory nature** will address how various classes of new requirements constrain the foreseeable evolution of the internet and **identify corresponding long term solutions.**"*

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Expected Impact

- Global standards,
- Reinforced European industrial leadership in wired and wireless networks,
- New industrial/service opportunities in Europe
- Lower capital expenditures and lower operational expenditures



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Objective 1.1 The Network of the Future Response to Call 1 (Deadline was 8 May 2007)

- Eligible proposals: 37 IPs, 4 NoEs, 114 STREPs, 16 CSAs
- High-quality proposals in the area of Future Internet
- Both academically-driven and industry-led projects proposed
- Example long-term topics covered:
 - post TCP/IP protocol research (new approaches to inter-domain routing, high-speed congestion control, load balancing, etc.)
 - radical architectural approaches built on strong mobile and wireless background
 - virtualization for networking resources
 - information-centric paradigm in place of the old host-centric approach
- Negotiation phase to start in September 2007
- Project start typically expected for January 2008, but earlier possible



IP: Integrated Project

FP/STREP: Focused Project

NoE: Network of Excellence

CSA: Coordination and Support Action

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Call 2 - Objective 1.6: New Paradigms and Experimental Facilities

- **Experimentally-driven** long-term research related to the Future Internet
 - “Advanced networking approaches to architectures and protocols: to cope with the increased scale, resilience, complexity, mobility, security and transparency of the Future Internet, coupled with their validation in large scale testing environments based on a combination of physical and ‘virtual’ infrastructures”
- **Interconnected testbeds** to support large scale validation
 - “Interconnected testbeds addressing: novel distributed and reconfigurable protocol architectures; novel distributed network and service architectures, infrastructures and software platforms; advanced embedded or overlay security, trust and identity management architectures and technologies”
- Part of Challenge 1 - **complementary** to “Technologies and systems architectures for the Future Internet”, part of Objective “The network of the Future” (Call 1, 200M)
- Call 2 - Budget: 40 M€
- IPs, STREPs, NoE, CSA called
- opening June, **deadline October 2007**



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More Information

- FP7 web site with **ICT WP 2007/2008 for download**
<http://cordis.europa.eu/fp7/ict>
- The ICT Challenge 1 web site
<http://cordis.europa.eu/ict/ch1/>



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