

European Research on Future Internet

in Framework Programme 7

Dr.-Ing. Peter Stuckmann
European Commission
DG Information Society and Media



Contents

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



FP: Framework Programme

Dr.-Ing. Peter Stuckmann – EuroView 2007

... 2



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?



Dr.-Ing. Peter Stuckmann – EuroView 2007



European Commission
Information Society and Media

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



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 4



European Commission
Information Society and Media

Contents

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



FP: Framework Programme

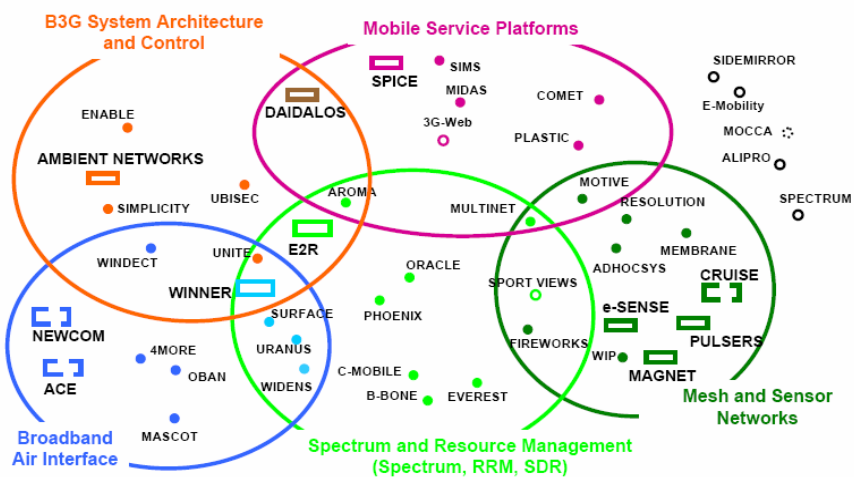
Dr.-Ing. Peter Stuckmann – EuroView 2007

... 5



European Commission
Information for the public

Project Portfolio - Mobile



Instruments :

Integrated Project (IP)

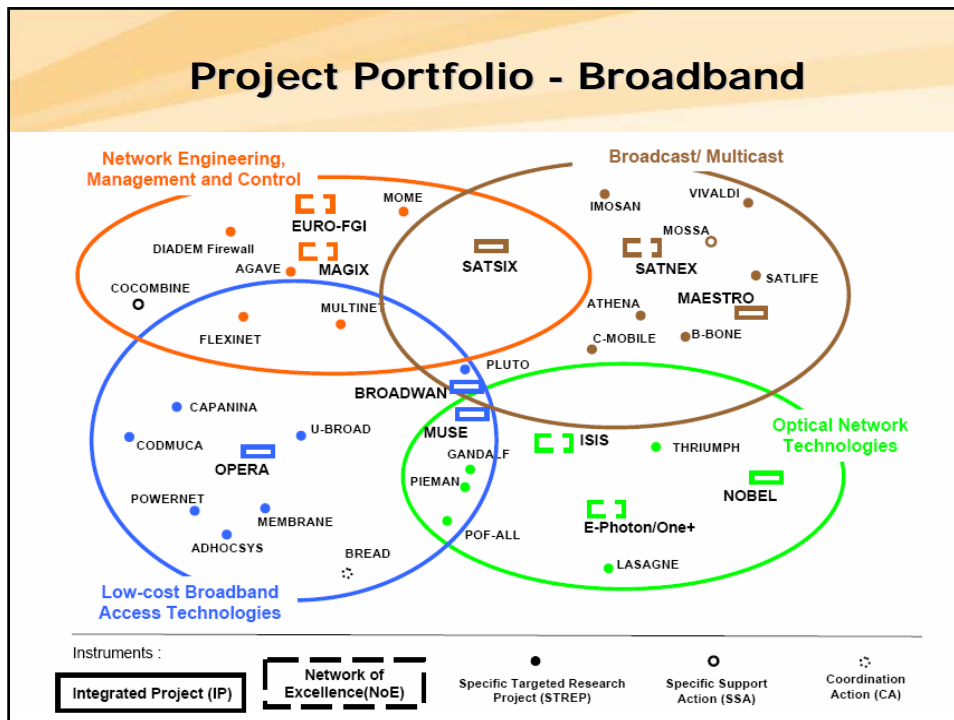
Network of Excellence (NoE)

Specific Targeted Research Project (STREP)

Specific Support Action (SSA)

Coordination Action (CA)

Project Portfolio - Broadband



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**
 - “Communication Networks of the Future” consultation workshop (March 2006)
 - Internet of Things workshop (March 2006)
 - OECD workshop (March 2006)
 - Work within the ETPs (e.g. Post-IP Working Group)
 - EIFFEL Workshop (December 2006)



Dr.-Ing. Peter Stuckmann – EuroView 2007



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:

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



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 9



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



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 10





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



Dr.-Ing. Peter Stuckmann – EuroView 2007

11



European Commission
Information Society and Media

Contents

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

FP: Framework Programme



Dr.-Ing. Peter Stuckmann – EuroView 2007

12



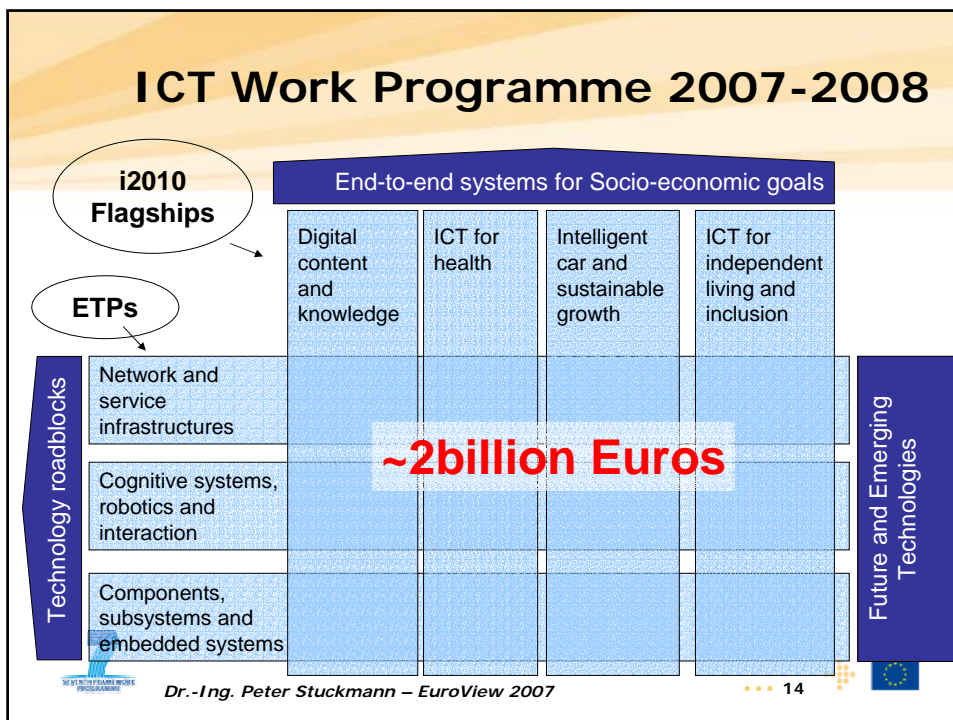
European Commission
Information Society and Media

7th Framework Programme (2007-2013)

€32 B	COOPERATION	1. Health	2. Food, Agriculture Biotechnology	3. ICT	4. Nano, Materials, Production Techn.	5. Energy	6. Environment	7. Transport	8. Socio-economic Research	9. Security	10. Space	
€7.5 B	IDEAS	European Research Council										
€4.7 B	PEOPLE	Marie Curie Actions										
€4.2 B	CAPACITIES	Research Infrastruc- tures	Research for the benefit of SMEs	Regions of Know- ledge	Research Potential	Science in Society	International Co-operation					

Dr.-Ing. Peter Stuckmann – EuroView 2007 ••• 13

ICT Work Programme 2007-2008



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 ...

DEUTSCHE TELEKOM

Dr.-Ing. Peter Stuckmann – EuroView 2007

... 15



Challenge 1 targets

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



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.**”*



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



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 19



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

Dr.-Ing. Peter Stuckmann – EuroView 2007

... 20



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**



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 21



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/>



Dr.-Ing. Peter Stuckmann – EuroView 2007

... 22

