

EC view on testing service concepts: a European approach for testing the Future Internet

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Georgios Tselentis
Scientific Project officer

New Infrastructure Paradigms
and Experimental Facilities

Georgios.Tselentis@ec.europa.eu



Who, What?

EUROPEAN COMMISSION

Information Society and Media Directorate-General

Emerging Technologies and Infrastructures Directorate (F)

New Infrastructure Paradigms & Experimental Facilities Unit (F4):

Portfolio of more than 70 Projects in research areas and accompanying measures of research like:

- Situated and Autonomic Communication
- Quality of Services
- Test-beds for the Future Internet
- IPv6 promotion and take-up

Policy on issues related to Future Internet

Georgios Tselentis Scientific Project officer (for PII, coordinator call2)



History

Framework Programme 6 (2002-2006)



Reorganisation: creation of unit F4

Legacy of projects:

- Research on Future Internet (e.g. situated and autonomic communication from Future and Emerging technologies)
- Test beds (e.g. on federation of testing facilities, QoS etc.)



Framework Programme 7 (2007-2014)

Call 2 (2007)

- Experimentally driven Research on Future Internet
- Federation of testbeds



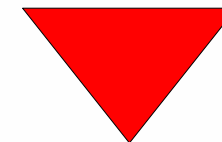
Internet evolves as an important & critical infrastructure for our society

Technological challenges

- Fast optical networks
- Mobility
- Internet of things
- Complex system
- ...

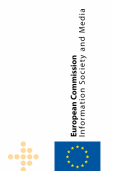
Socioeconomic challenges

- Changes to the Internet impact societal / economic structures
- Preserve innovative force / support investment in Infrastructure & Services
- Social responsibility
- Balance Security / Accountability / Trust / Privacy
- ...



Regulatory / Political

- Act where market forces fail
- Consumer protection / empowerment
- National security
- Protection of the private sphere
- OECD process on the future of the internet economy
- ...



The Policy context (1/2)

Internet and Networked Economy are at the heart of the EU ICT Policy agenda outlined in the i2010 initiative of 2005

-Finn Presidency Conclusions, Dec 2006:

“Information and communication technologies are crucial for innovation and competitiveness.....The 2008 Spring European Council will review the challenges of the next generation of internet and networks within the framework of the Lisbon Strategy”

- The Slovenian Presidency is currently working on these Conclusions

-The upcoming French Presidency (second Semester 2008) is currently reviewing the possibility to follow up with specific conclusions on Next Generation Networks & Future Internet



The Policy context worldwide (2/2)

-World Summit on Information Society (WSIS)

follow up:

-EU is actively involved in the IGF, through its 5 aspects:

- Openness
- Security
- Access
- Diversity and critical Internet resources

-Seoul OECD Ministerial meeting :

-EU supporting a ministerial declaration with focus on Internet take-up in domains of general interest.



Coming Up next

Envisaged policy focus for the upcoming i2010 period (draft)

■ Incentives towards high-speed internet usage aiming at an average 30% penetration rate of the EU population by 2010;

■ Actions to facilitate the transition to IPV6; Communication to be published shortly (end of May)

■ Promote the Internet of Things through a Recommendation on RFID, focusing on privacy and security issues.

■ Research, ICT Work programme 2009-2010: budget dedicated to Networked Platforms and services including the Internet of the Future will be similar to that of WP 2007-2008



Future of the Internet

Multiplicity of novel societal and economic usages are bringing to its limits an Internet architecture that was designed >30 years ago. What is at stake:

- ◆ Making the Internet Mobile
- ◆ Making the Internet secure, and trustable
- ◆ Bringing QoS to consumers
- ◆ Enabling novel –trusted- applications (RFID/sensor based) and opening new economic prospects
- ◆ Making the Internet truly end-to-end broadband
- ◆ Making the Internet manageable

Go beyond the capabilities of architectures, currently being deployed, primarily by incumbent operators.

A long term research issue



Initiatives started at national level worldwide and in EU

Worldwide:

USA: GENI/FIND, NSF

Japan: AKARI Project, New Network Architecture forum.

Korea: Future Internet Forum

EU:

German G-Lab initiative, French RNRT call 2007, Finland, etc.



EC Research investment on Future Internet

-How much is spent so far on research related to Future Internet under FP7?

-FP7 (WP 2007-2008) on cooperative research in Information and Communication technologies => ~2.2 Bn€ of which about **25% were dedicated to Networked Platforms and Services, including the Internet of the Future R&D** at European level



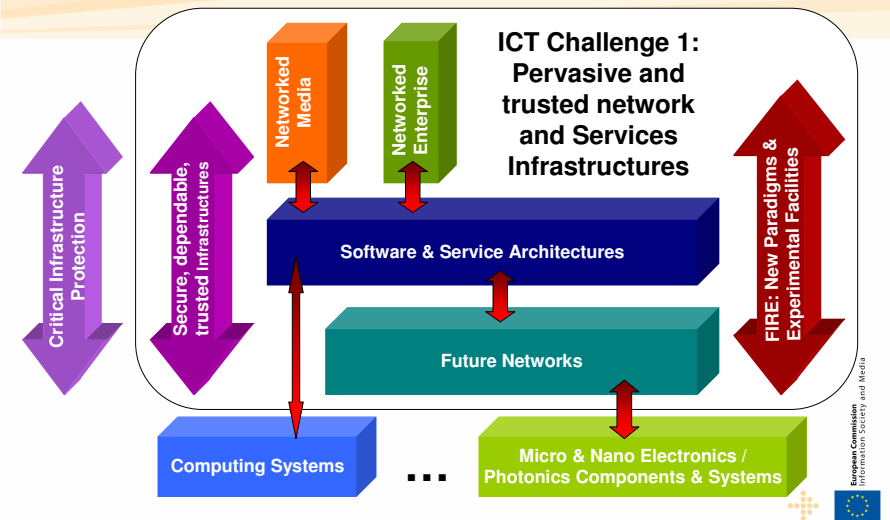
EU funding so far in FP7

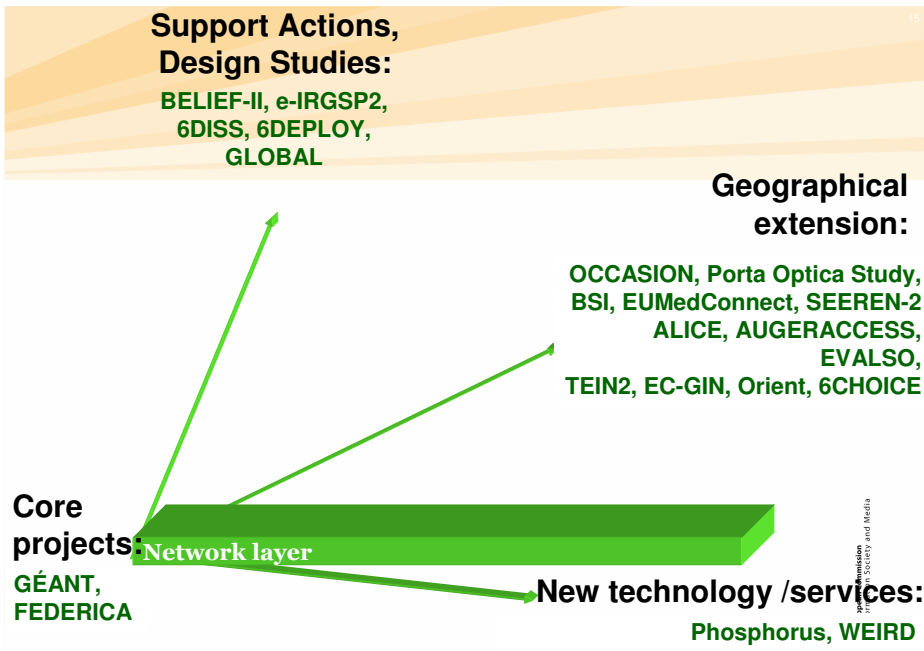
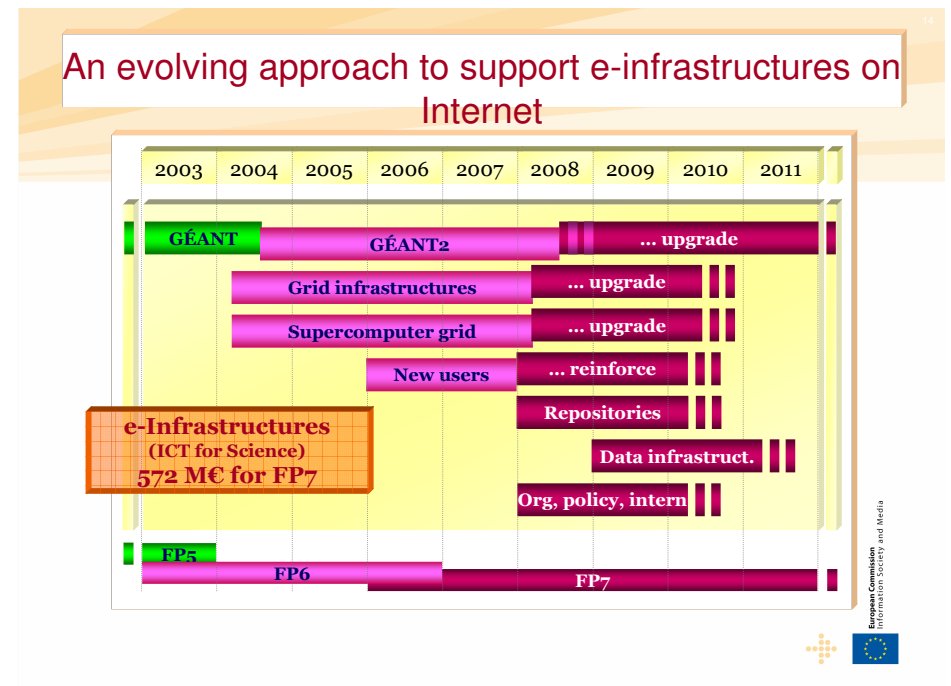
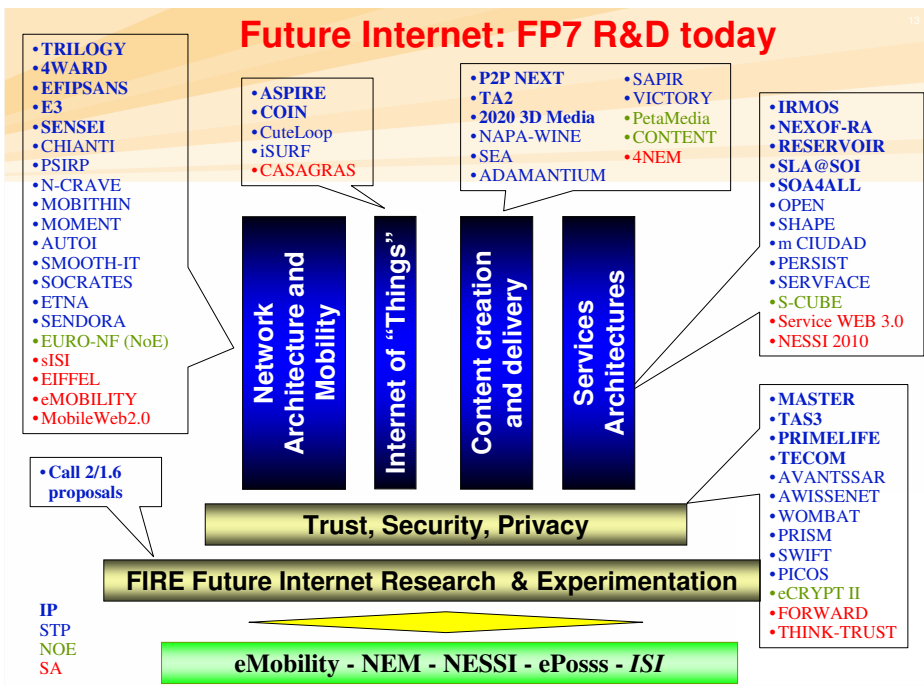
Following the first 2 calls of the ICT 2007-08 Work programme, about 200M€ (EU contribution) invested in related projects, with main focus on novel architectures, both from a clean slate or evolutionary approach, and taking into account:

- Impact of very high rate and mobility
- Scalability and sensor networks, > RFID;
- Trust, security, privacy embedded or overlays;
- Service architectures, virtualisation;
- Impact of rich media and media overload.
- Experimental facilities, testbeds, and experimentally driven research



Future Internet Research in the ICT Programme of the European Union





Why "light" a FIRE? (1/2)

Experimentally driven research:

In other established disciplines (e.g. experimental physics):

- Validate a scientific hypothesis with experiment
- Streamline research efforts through iterative cycles of research-experimentation-validation.

European Commission
Information Society and Media

Why "light" a FIRE? (2/2)

"Internet has to change as it is becoming a critical and important infrastructure for all sectors and all kinds of human interaction but was never designed for that."

Change can be evolutionary or revolutionary (disruptive) or combination of both.

Questions:

■ How to test and validate research (e.g. architectures and protocols) for Future Internet?

▶ Testing elements of future Internet on the current Internet is not obvious

■ How to design testing facilities for Future Internet?

▶ ...without knowing in advance what is going to be tested on them...



FIRE – Future Internet Research and Experimentation

Two related dimensions of FIRE

Experimentally driven advanced research



Building a European Experimental Facility



The Call 2 - Objective 1.6 "New Paradigms and Experimental Facilities" projects are the first steps under FP7 towards building FIRE



New Paradigms and Experimental Facilities (FIRE)

– Overview of Projects –

Co-ordination and Support Actions

FIREWORKS

PARADISO

Main focus on experimentally driven advanced research for the Future Internet

OPNEX

ECODE

N4C

SmartNet



Perimeter

Echos

ResumeNet

SelfNet

Main focus on interconnecting test-beds towards building an experimental facility for the Future Internet

VITAL++

WISEBED

PII

OneLab2

Testbed



Testbed

Integrated project

Focused project (STREP)

Coordination & support actions



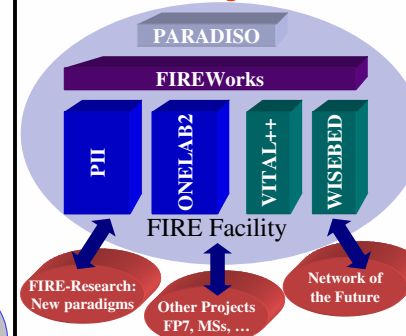
14 projects, 40,38M€

Gradually Building the FIRE Facility

FP6: Early design & prototyping



FP7 – WP 2007/08: Prototyping the concept of federating testbeds



Next: Expanding the concept & building the facility

- support experimentation that is **cutting across**
- perform research taking into account **socioeconomic** impact
- broaden involvement of large **user communities**
- support **sustainability**
- develop the facility in close cooperation with FIRE research projects

- focus on the telecom layers
- open and dynamic
- supporting academia and industry
- proof-of-concept → pre-commercial tbs
- discover the socio-economic dimension



Potential characteristics of future FIRE research

- ▶ **Design, prototyping and experimentation** with advanced paradigms and architectures for the Future Internet
- ▶ **Expand to more layers** (than the connectivity layer) e.g. service layer and address the Future Internet from a broad/complex system perspective
- ▶ **Maintain a strong link and feedback loop between advanced research and large scale experimentation**
- ▶ **Effectively involve end-users and evaluate socio-economic aspects** by using a multidisciplinary approach



Issues that need to be tackled under the FIRE initiative

- ▶ **Sustainability**: FIRE facility needs to have a roadmap for achieving eventually, and to a certain degree, a self-sustainable mode of operation
- ▶ **Critical mass**: FIRE facility needs a critical mass of participants to be attractive for testers to use and achieve a smooth operation
- ▶ **Federation**: There is a need to improve federation mechanisms in order to avoid duplication, take advantage of complementarity and thus increase the quality and quantity of the FIRE facility offering
- ▶ **Vision with tangible milestones**: FIRE initiative needs to continue to evolve according to the needs of the constituencies for providing the testing platform for Future Internet research. In this evolution clear milestones need to be defined in consultation with the stakeholders (experts meetings)



Next ICT Work Programme WP09-10 (1/2)

Draft proposal to continue to work towards a federation of issues as follows:

- The **"Network of the Future"** with a focus on solutions to cope with the issues of capacity, mobility, scalability and flexibility of the ICT infrastructure;
- The **"Internet of Services, Software and Virtualisation"** with a focus on issues such as virtualisation, dynamically composed service overlay over a modified network structure and service joint execution environments;
- The **"Internet of Things and Enterprise environments"** with a focus on networked object management and associated service and data discovery architectures, with integration in generic business environments.



Next ICT Work Programme WP09-10 (2/2)

- The **"Trustworthy ICT"** with a focus on secure, resilient and trustworthy networks and service architectures and composite end-to-end services, as well as identity management and business and personal data protection and privacy;
- The **"3D Media Internet"** with a focus on the architectural and related technological implications of 3D virtual environments over networked platforms.
- The **"Networked Media and 3D Internet"** with a focus on experimentally-driven research projects, which cut across several layers from connectivity via service architectures to applications, thereby addressing the Future Internet from a broad system perspective.



Next ICT Work Programme WP09-10

Future Internet experimental facility and experimentally-driven research (1/2)

- (A) Building the Experimental Facility and stimulating its use:

- experimentation of visionary approaches for network architectures and technologies, service architectures and platforms, networked media and trustworthy infrastructures for the Future Internet.
- Assessment of the socio-economic and environmental impact of changes to the Internet.
- Facility should be **dynamic, sustainable, open**

-HOW?:

- a) Earmark resources for gradually expanding the functionality of the prototype in a **demand-driven and open way**
- b) **Incentives for extending the use** of the experimental facility by research groups that propose innovative usage scenarios exploiting the multiple dimensions and scale of the facility.



Next ICT Work Programme WP09-10

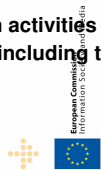
Future Internet experimental facility and experimentally-driven research (2/2)

- (B) Experimentally-driven Research

- Visionary multidisciplinary research, defining the challenges for, and taking advantage of, the Experimental Facility.
- **Iterative cycles of research**, design and large-scale experimentation of new and innovative network and service architectures and paradigms for the Future Internet from an overall system perspective.

- (C) Coordination and Support actions

- Coordination of related EU-level and Member States activities and international co-operation with other initiatives in industrial and emerging countries in order to exploit synergies
- Multidisciplinary networking of research communities addressing both technological and socio-economic and environmental aspects of the Future Internet
- Co-ordination of experience research and user-driven open innovation activities establishing common concepts, roadmaps, methodologies and tools, including the sharing of best practices across pilots and sectors.



Next ICT Work Programme WP09-10

Timetable and funding

- Challenge 1 “*Pervasive and Trusted Network and Service Infrastructures*” is expected to fund research of more than **half billion euros**.
- Around 20% is planned for research on the Network of the future in call 4
- Most actions are foreseen for call 5 to assure continuity
- Other funding related is available through the WP in other challenges and other programmes (RI)



Conclusions

The Internet has to change to satisfy new requirements and go beyond its limitations

New designs and patching will have effects on societal and economic structures: Technological and socio-economic aspects cannot be dealt in isolation

Need for multidisciplinary research across layers and disciplines

Need for experimentally-driven research including large scale experimentation to discover the technical, societal and economic implications of changes to the internet

Internet is a global issue: International co-operation a must

New Calls on Future Internet in the ICT Work Programme 2009/10 starting from end of 2008



PUT YOUR EXPERIMENTS ON FIRE !

For more information please stay tuned
at: European Future Internet Portal (www.future-internet.eu)
FIRE initiative
(http://cordis.europa.lu/fp7/ict/fire/home_en.html)

Thank you

