



The European FIRE Initiative Overview and Potential

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European Commission
Information Society and Media

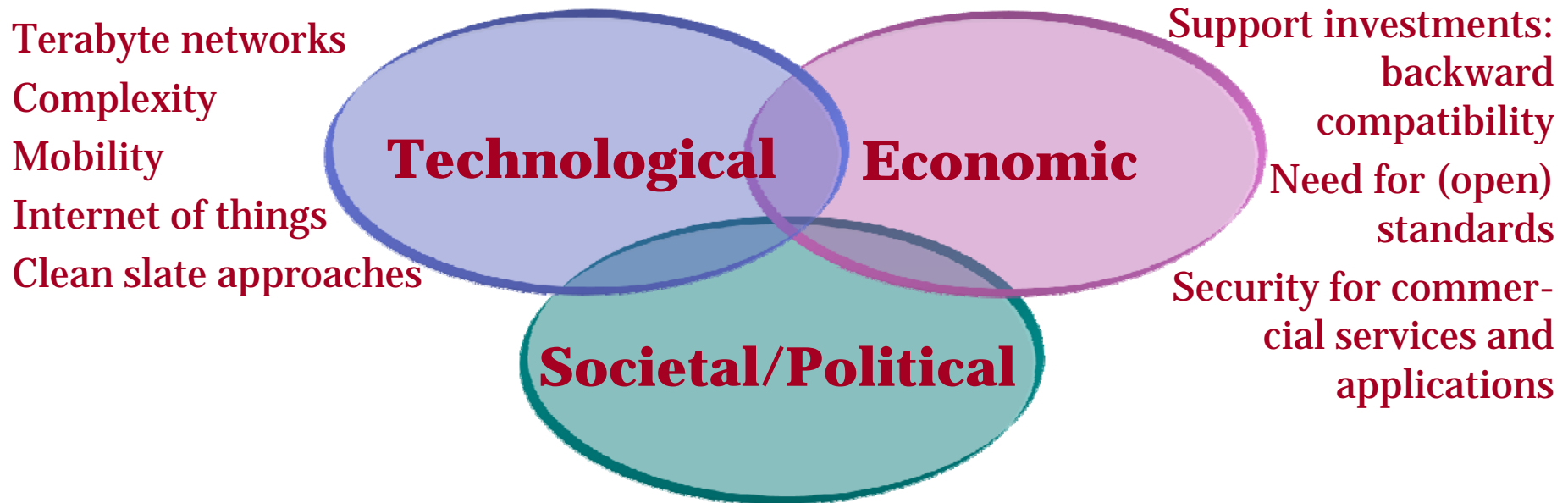




- ❑ The global context for Future Internet Research
- ❑ European Future Internet Research (ICT)
- ❑ Research under “The Network of the Future”
- ❑ Research under “Future Internet Research and Experimentation” (FIRE)



Dimensions of Future Internet



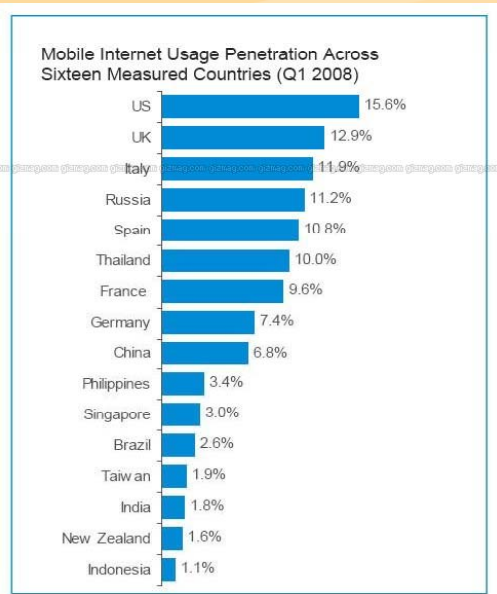
European competitiveness on future Internet (act where market forces fail)

Consumer protection / empowerment

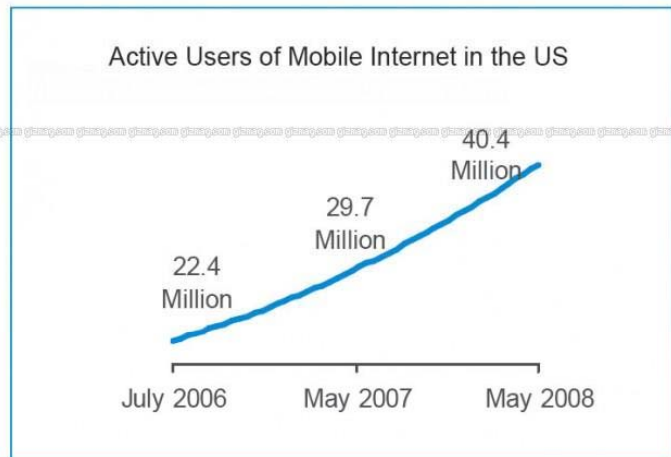
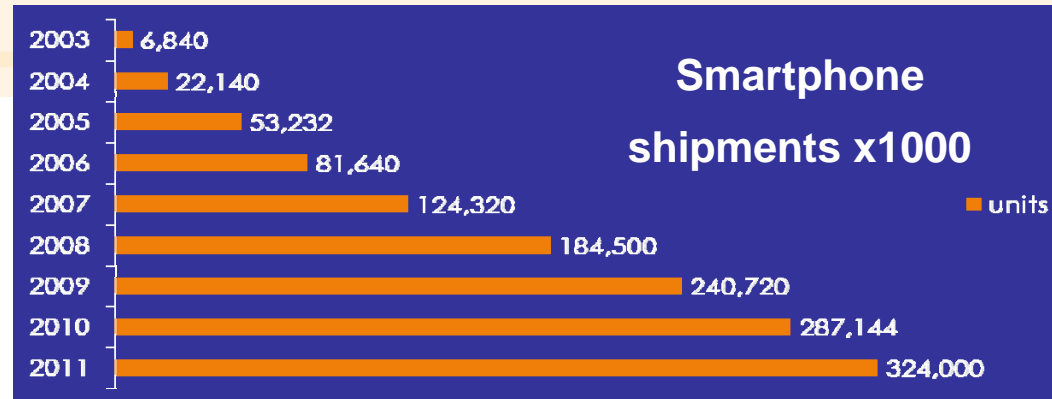
Social responsibility: preserve neutrality, openness, fairness, social role

Balance the need for security/accountability and the right to privacy

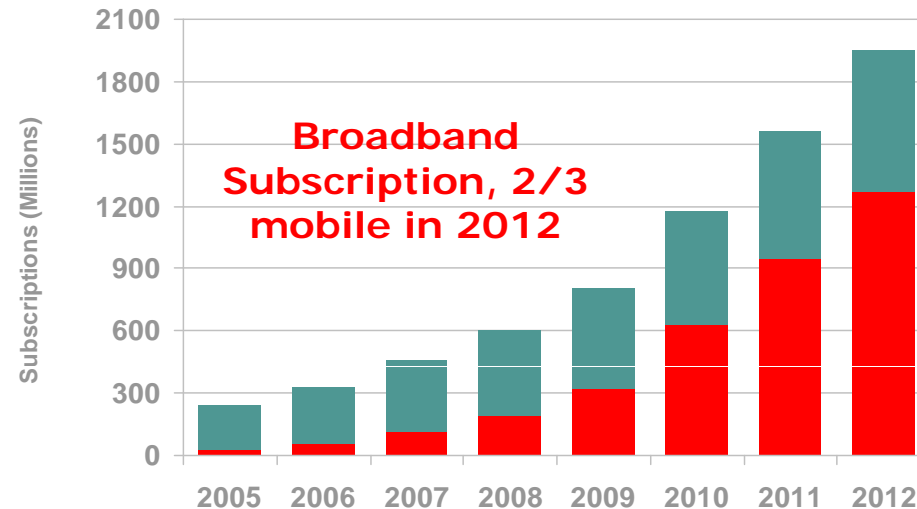
Internet is evolving towards a Mobile Internet



Source: Nielsen Mobile



Source: Nielsen Mobile



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Mobile Internet use generated over \$5 billion in 2007, and accounted for \$1.7 billion in Q1 of this year, i.e 33% increase. 400 Millions Mobile Internet users expected in 2012

Internet-based Services



GOOGLE



YAHOO



MICROSOFT



netlog

MYSPACE

PAYPAL



SKYPE

FLICKR



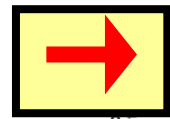
KazaA

BitTorrent



CISCO

AKAMAI
JUNIPER NETWORKS



1986

1996

2006

2026

 **FUTURE INTERNET WILL BE THE KEY ENABLER FOR THE UPCOMING SERVICES**



The societal context is changing

- ❑ Ageing population;
- ❑ Climate change, environment;
- ❑ Energy scarcity, transport reappraisal;
- ❑ Raw material, water;
- ❑ Globalisation, emerging new world leaders;
- ❑ Demographic pressures, migrations;
- ❑ Security and privacy concerns;
- ❑ Regionalisation trend



Social Networking – A Massive Move



- ❖ 1 Billion people in Social Networking Websites **WorldWide**
- ❖ 154 Million people accessing a Social Networking Website **every day**
- ❖ 3 Billion minutes spent on Social Networking **every day**
- ❖ 8 Billion pages accessed on Social Networking Websites **every day**



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Some illustrations of the FI “size”

Google indexed **26 Million** pages in 1998 – today it indexes **1 Trillion** pages

There are currently **210 billion** emails per day (73% spam)

In October 2008, **12.6 total billion** searches (US alone) were made - as compared to **13.5 billion videos** viewed

Facebook and MySpace each have over **100 million** users (3 out of 4 teenagers).

1300 Billion SMS messages in 2008

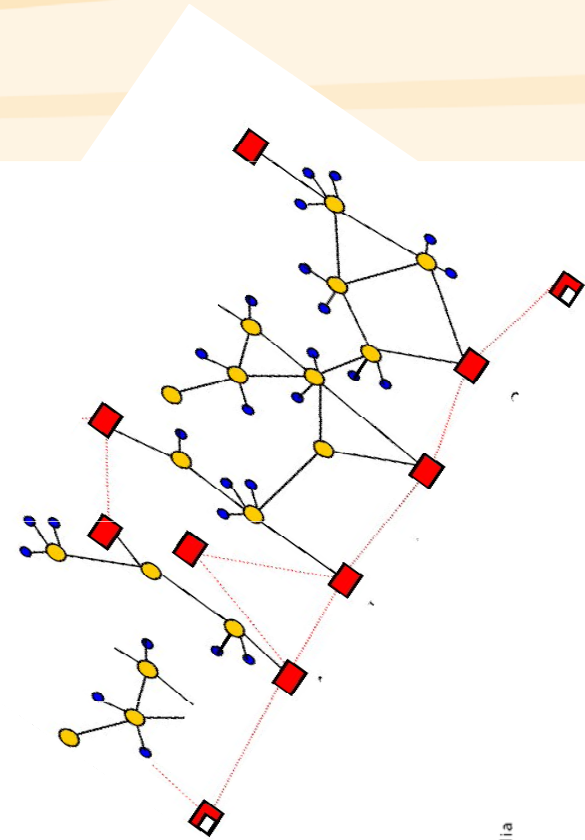
3.7 Million pictures uploaded every day in Flickr

User generated content such as YouTube generate more than **73 billion** streams in 2008

Is the current Internet reaching its Limits?

What has happened since the 1970's:

- ▶ The web & P2P revolution
- ▶ The mobile revolution
- ▶ The wireless internet of objects revolution



Future Internet - An Architectural problem

Management on a real-time basis of the allocation and use of networked resources allowing for dynamic and responsive service provisioning

Networks

Things/Objects

Content/Media

Software/Services

Security/Privacy

Governance

Applications

Exp. Facilities

The Challenges

Software and Service architectures

Different paths, different tariffs,
customisation, geo-location, context
Dynamic adaptation
Virtualisation of resources
Cloud computing
Open Software
Dependability/reliability
Liability

Hyper connectivity

Mobility and wireless
dominance, Devices-
Things come on-line,
Heterogeneity,
Re-configurability,
Self-configuration

Content / New Media

Service discovery,
Immersive worlds
3D search
Copyright

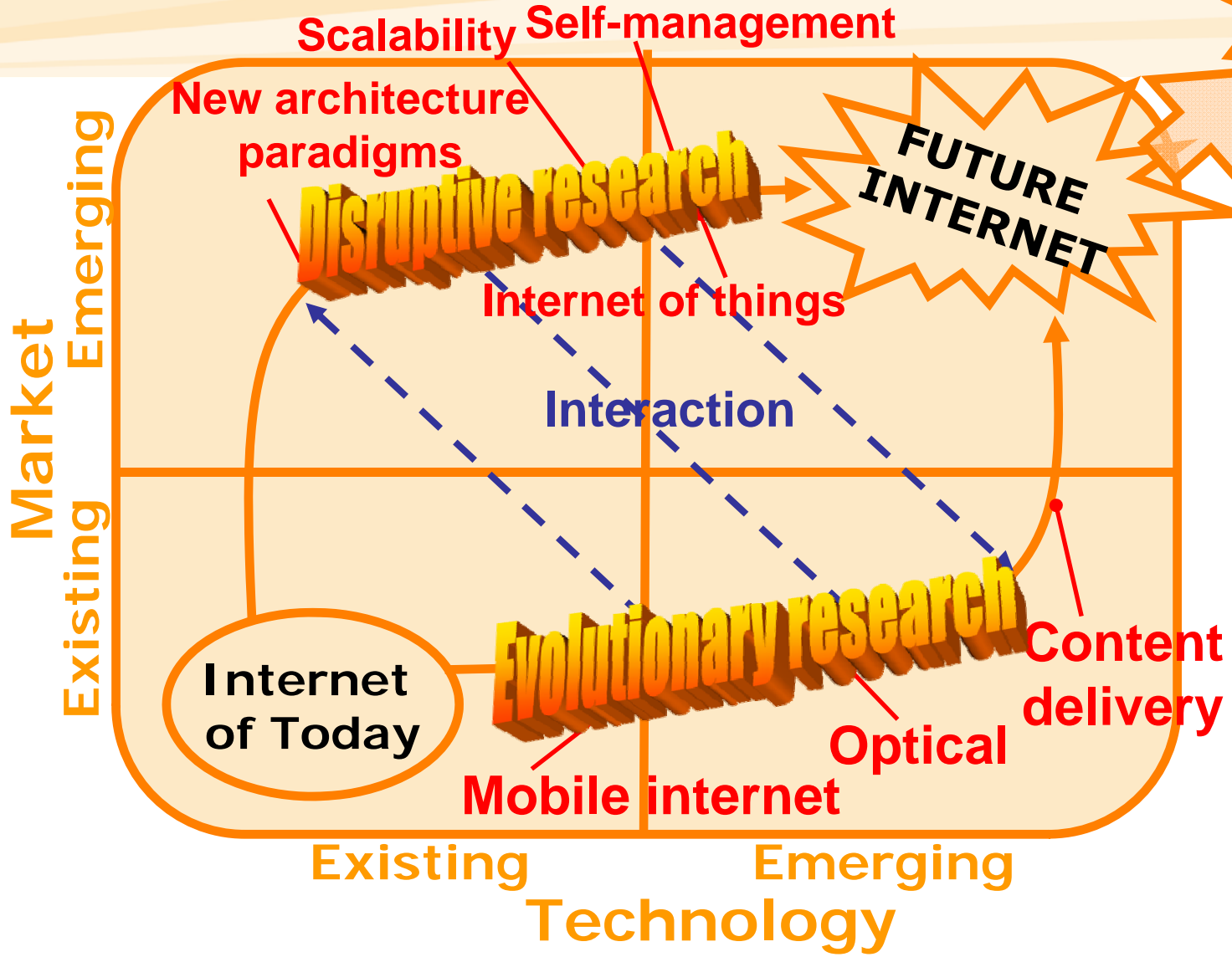
Policy drivers/concerns

Skills
Environment/ Energy
Transport
Health/Ageing
Public Procurement
Innovation
Standards and IPRs
R&D
Net Governance
Spectrum

Digital footprints

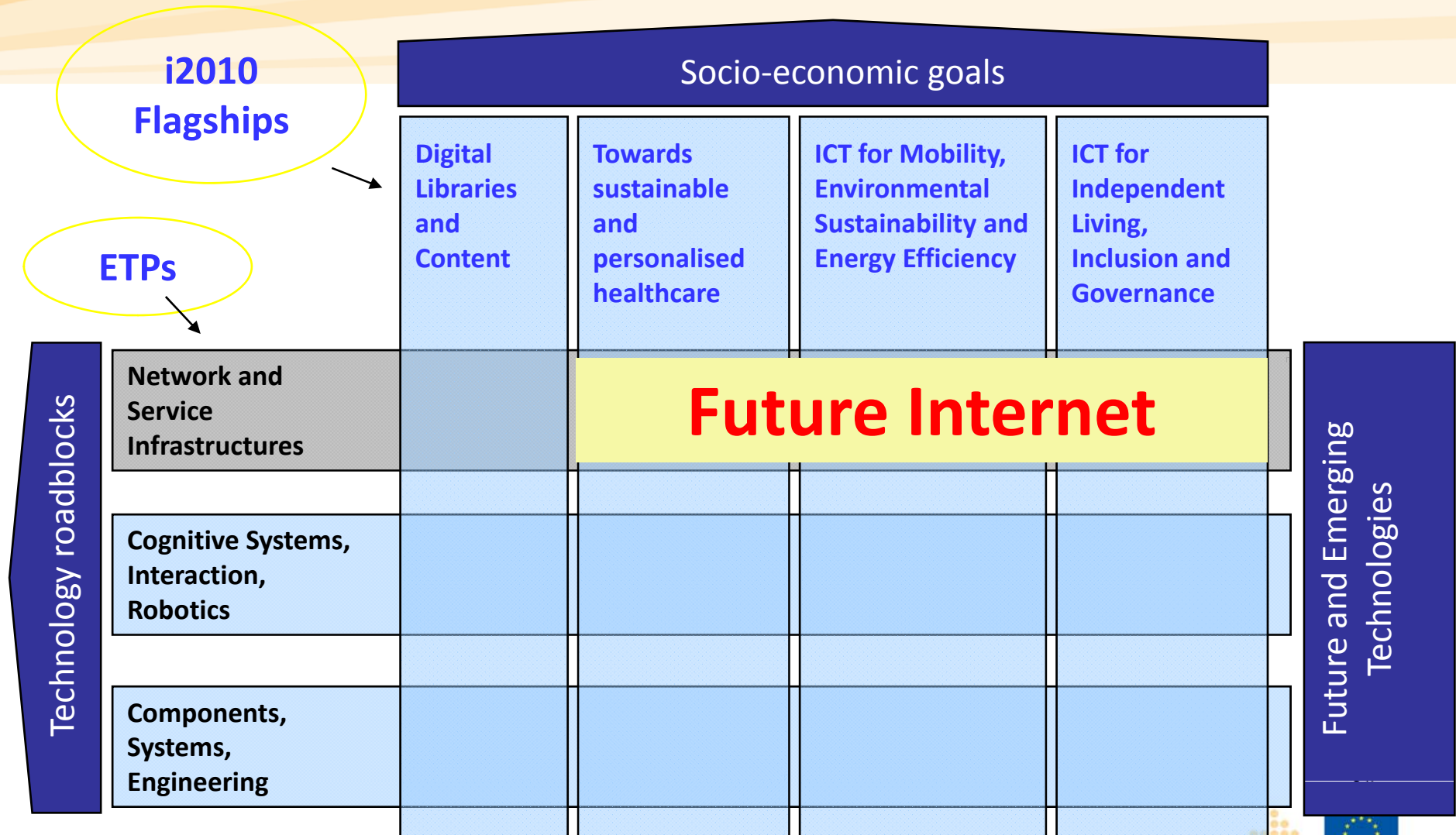
Privacy , security ,
trust, multiple
identities,
Information,
governance

Revolutionary vs Evolutionary



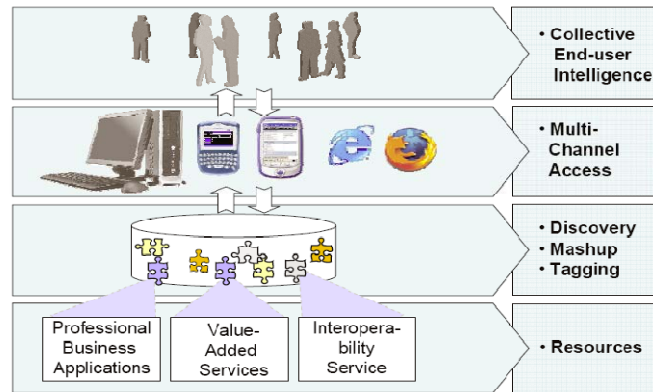
ICT Work Programme 2009-2010

~2 B€ total



Future Internet: Multiple Aspects

Internet of Services, Service Web



3D Internet



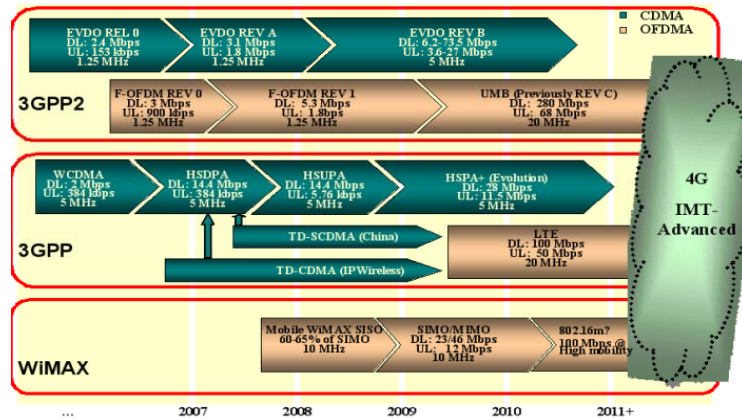
Trust



Security



Internet of Things

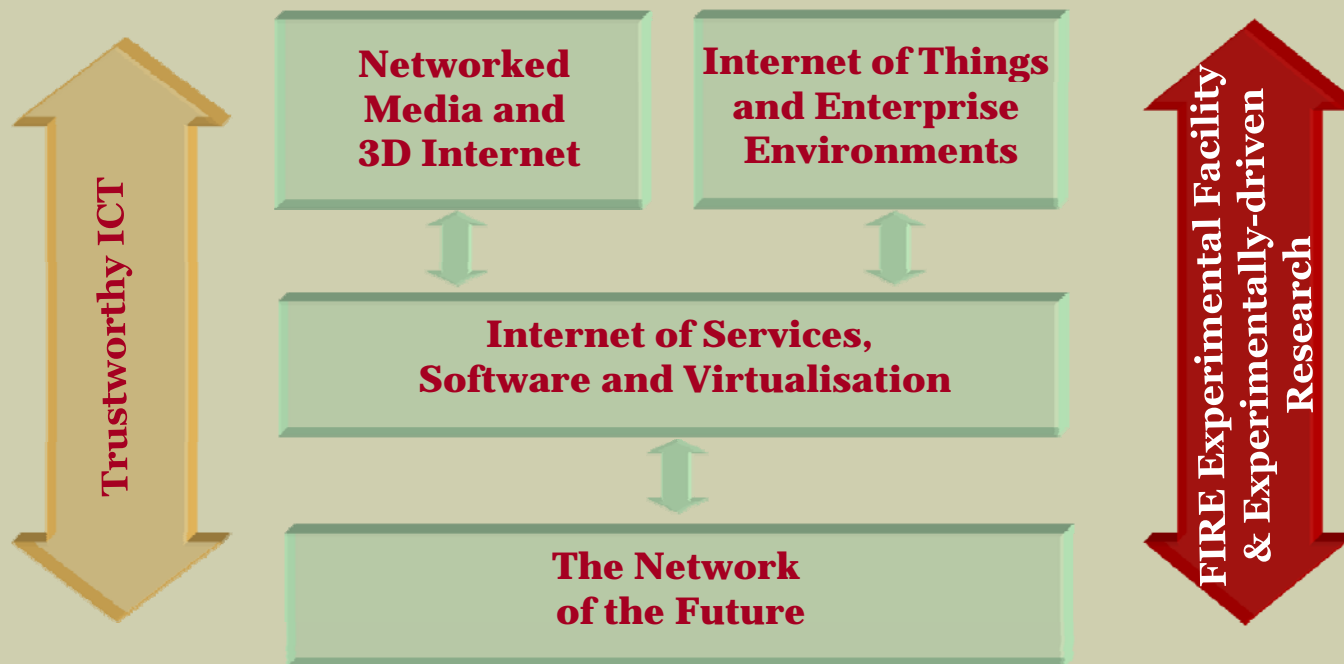


Networks of the Future

ICT Challenge 1

Pervasive and Trustworthy Network and Services Infrastructures

THE FUTURE INTERNET



**Planned EU contribution under the federating theme
“Future Internet” in 2009/2010: > 567 M€**



The European Approach towards the Future Internet

Science & Scientific Approach

EIFFEL
(with links to FIRE, FIND/GENI,...)

Projects Based Approach

EU Projects Assembly on Future Internet

Industrial & Commercial Relevance

ETPs (SRA)

Science based approach
Peer-review and peer-discussion
Long-Term, High-Risk, Exploratory
Advice & Challenge

Gather Projects Together,
Exchange Ideas, Voluntary
Coordination on Message
and Cooperation, Disseminate
Project centric

Provide larger view on
the stakeholders view,
Gather larger view,
Commercial reality, Industrial
Opportunities and Requirements

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Horizontal Interaction: data delivery, opinion delivery



Future Internet Projects

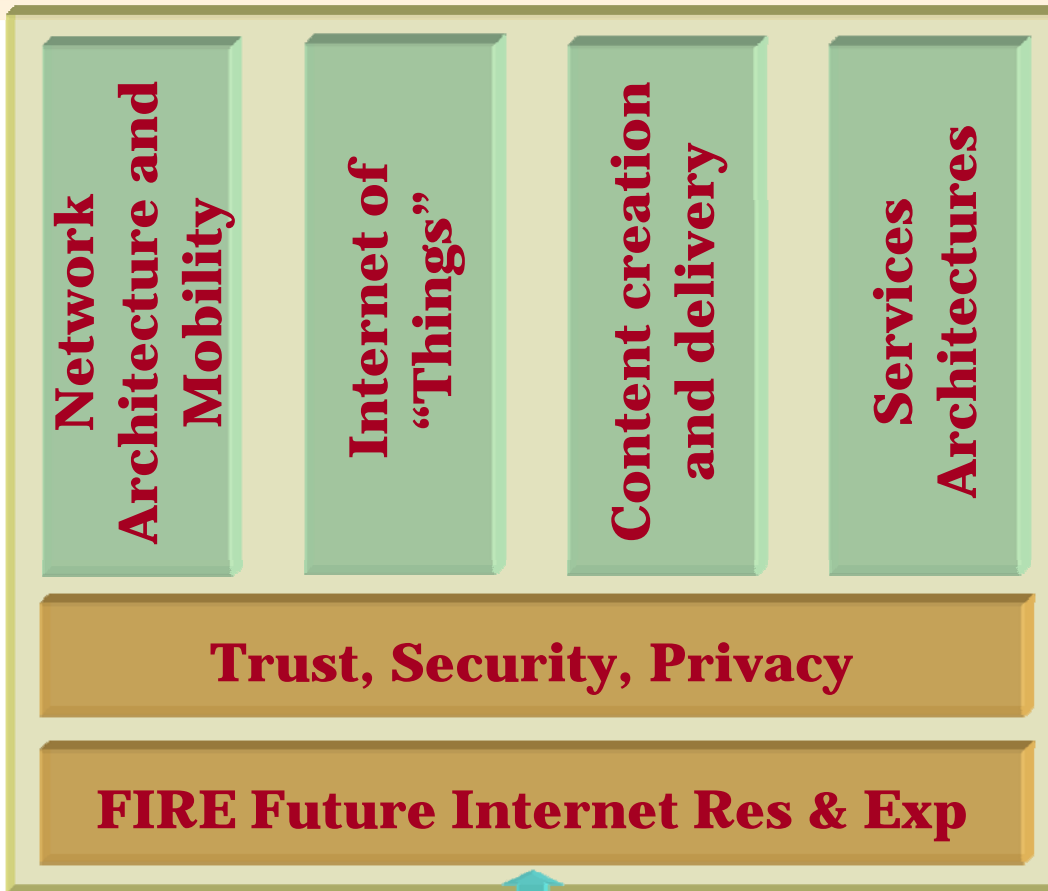
ASPIRE
COIN
 CuteLoop
 iSURF
CASAGRAS

TRILOGY
4WARD
EFIPSANS
E3
SENSEI
 CHIANTI
 PSIRP
 N-CRAVE
 MOBITHIN
 MOMENT
 AUTOI
 SMOOTH-IT
 SOCRATES
 ETNA
 SENDORA
 EURO-NF (NoE)
 sISI
 EIFFEL
 eMOBILITY
 MobileWeb2.0

ONELAB2
P11
 FIREWORK
 PARADISO
 OPNEXT
 ECODE
 N4C
 SmartNet
 Perimeter
 Echos
 ResumeNet
 SelfNet
 VITAL++
 WISEBED

FEDERICA

IP
 STP
 NOE
 SA



eMobility - NEM - NESSI - ePoss - ISI

P2P NEXT
TA2
2020 3D Media
 NAPA-WINE
 SEA
 ADAMANTIUM
 SAPIR
 VICTORY
 PetaMedia
 CONTENT
4NEM

IRMOS
NEXOF-RA
RESERVOIR
SLA@SOI
SOA4ALL
 OPEN
 SHAPE
 m CIUDAD
 PERSIST
 SERVICEFACE
 S-CUBE
 Service WEB 3.0
 NESSI 2010

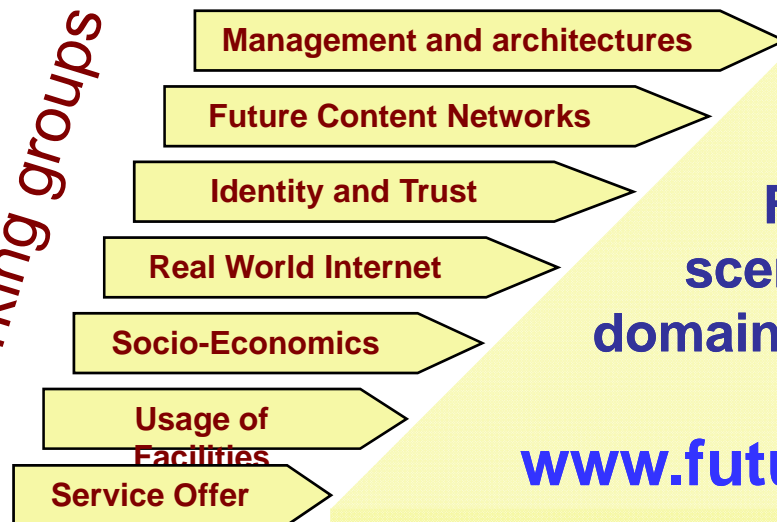
MASTER
TAS3
PRIMELIFE
TECOM
 AVANTSSAR
 AWISSENET
 WOMBAT
 PRISM
 SWIFT
 PICOS
 eCRYPT II
FORWARD
THINK-TRUST

The Future Internet Assembly

Work Programme Objectives

- Open interactions and cross-fertilization
- Reducing fragmentation of efforts
- Developing common deliverables
- Joint strategic research agenda

Working groups



Future Internet scenarios and cross-domain research challenges

www.future-internet.eu



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European Technology Platforms

- ❑ EU industry commitment
- ❑ Large scale partnerships, including SME's and academia
- ❑ System and end-to-end approach
- ❑ Demonstrating economic impact
- ❑ Strategic Research Agenda's
- ❑ Acting as vector of strategic co-operation with third countries
- ❑ Implementing research and downstream deployment issues (regulations, IPR, standards..)



Catalysing industrial Interest on Future Internet

www.future-internet.eu/fileadmin/documents/reports/Cross-ETPs_FI_Vision_Document_v1_0.pdf

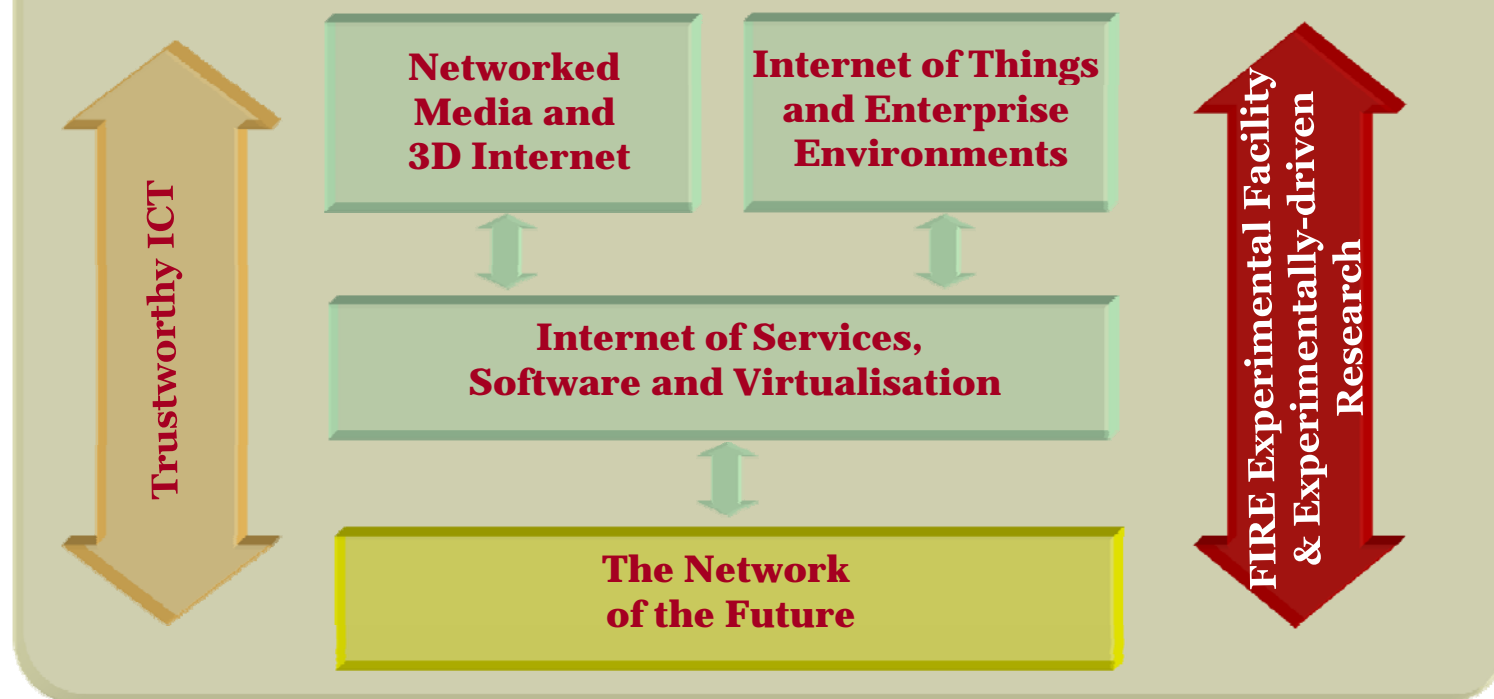


Future Internet: a global research issue

- GENI/NetSE, US
- New Network Architecture Forum, AKARI, Japan
- Future Internet Forum, Korea
- EU-ICT Programme
- EU Member States' Programmes
Germany, France, Spain, Italy, Finland, Sweden,
Belgium, Netherlands, ...

Pervasive and Trustworthy Network and Services Infrastructures

THE FUTURE INTERNET

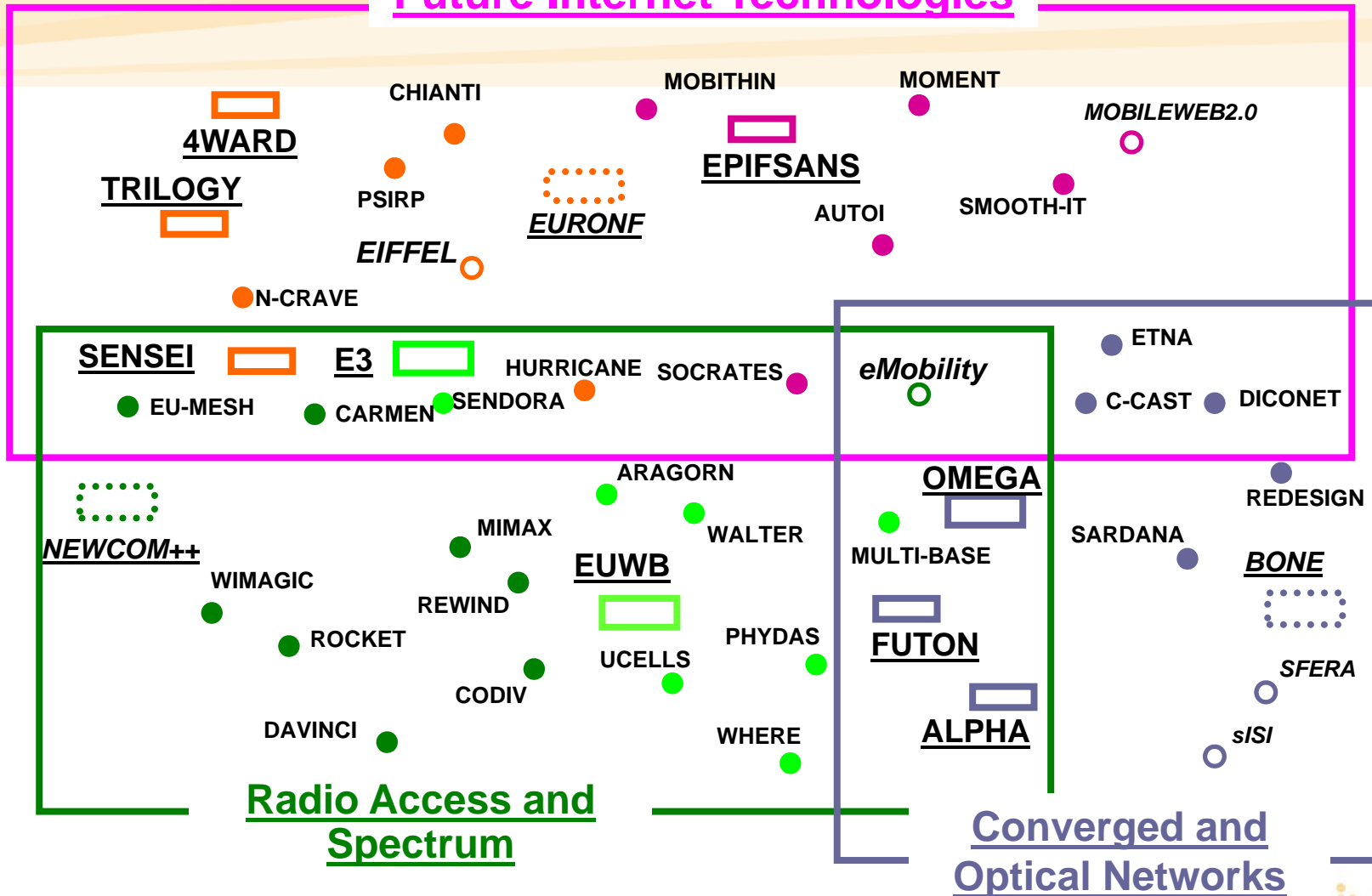


**Planned EU contribution for the Network of the Future
in 2009/2010: 190 M€**



Future Networks Project Portfolio & Clusters

Future Internet Technologies

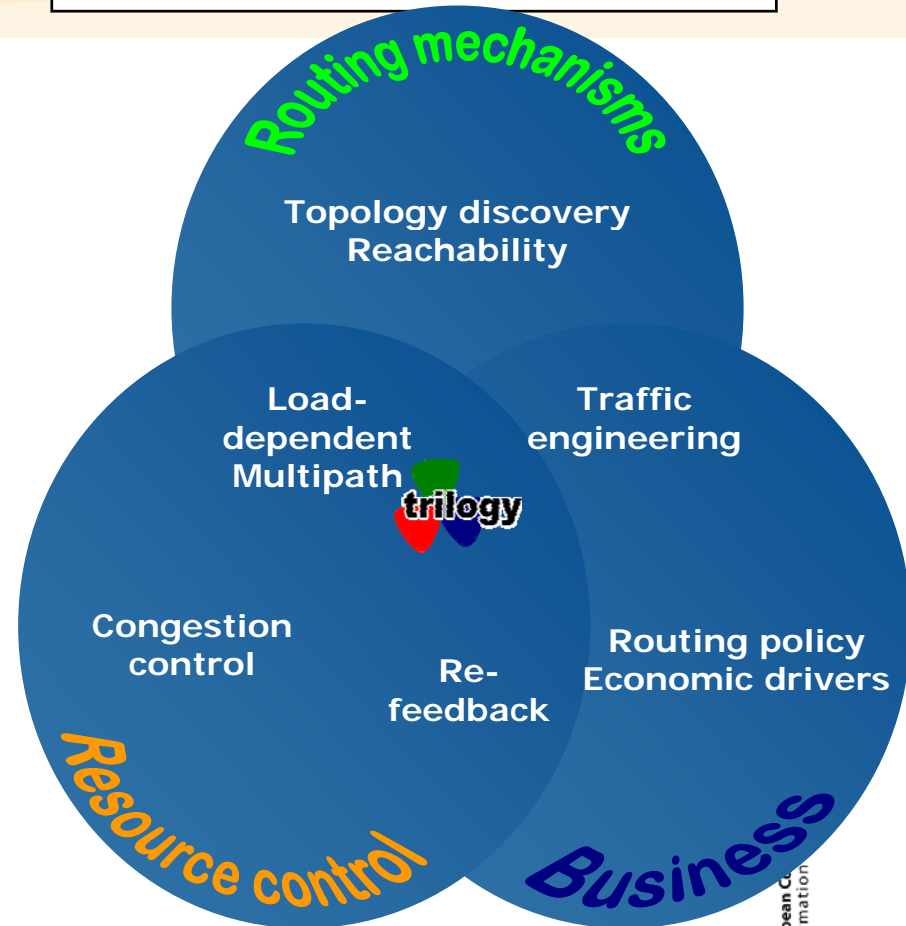


Trilogy – An Architecture for Change

Trilogy Concept

Main Objectives

- Develop a **unified control architecture for the Future Internet** that can adapt to local operational and business requirements
- Develop and evaluate **new technical solutions for key Internet control elements: reachability & resource control**
- **Assess commercial and social control aspects of the architecture**

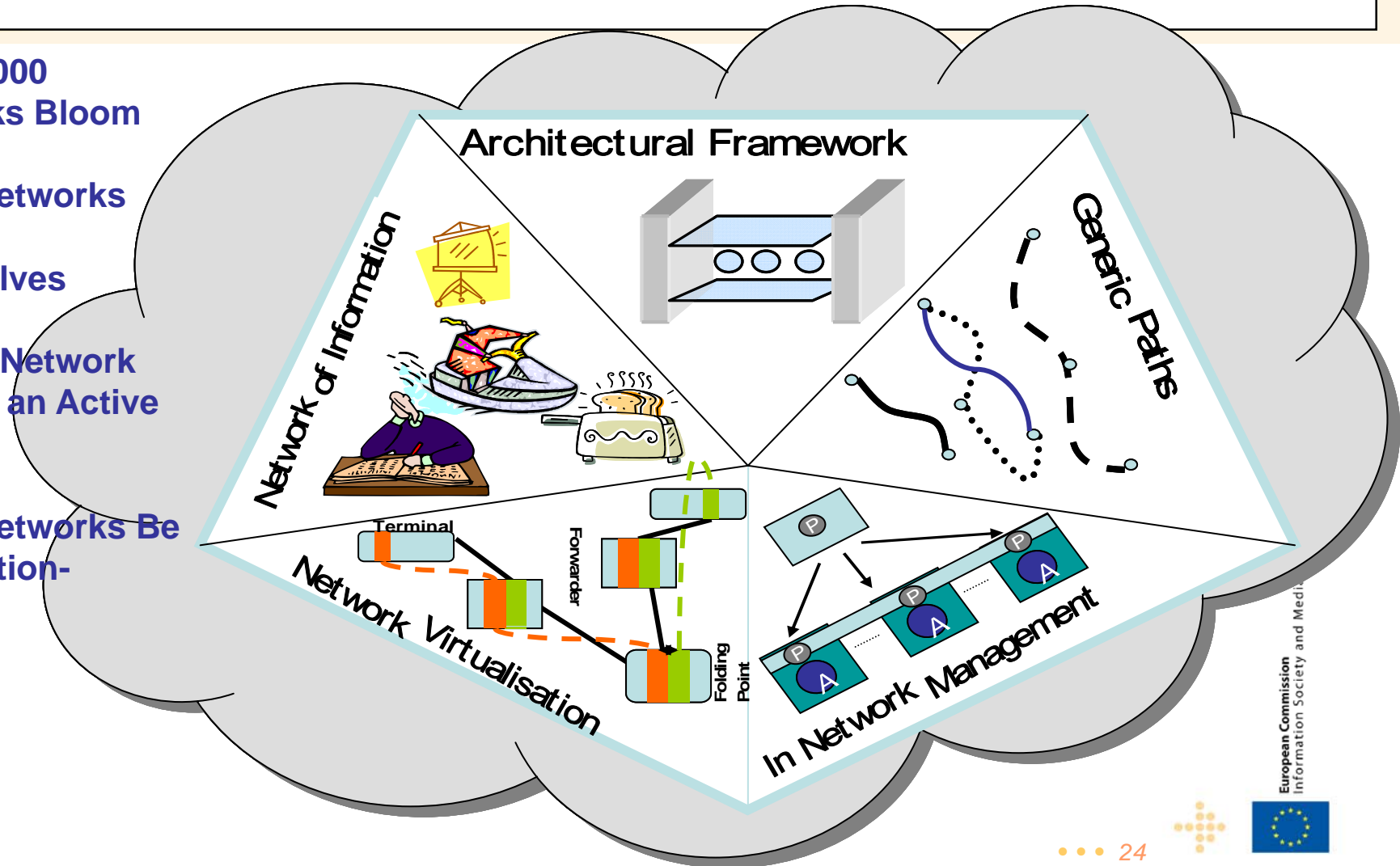


1: Let 1000
Networks Bloom

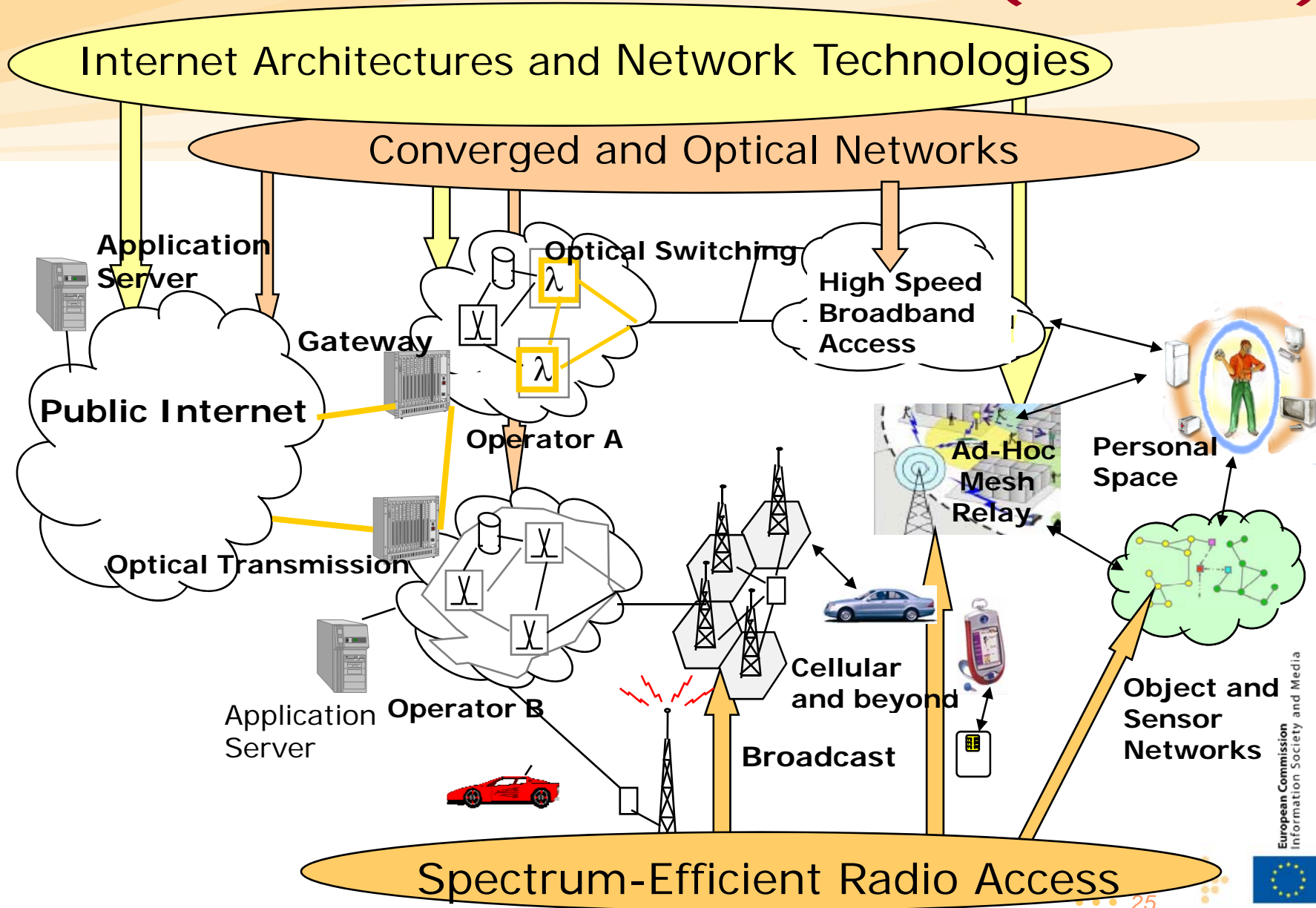
2: Let Networks
Manage
Themselves

3: Let a Network
Path Be an Active
Unit

4: Let Networks Be
Information-
Centric

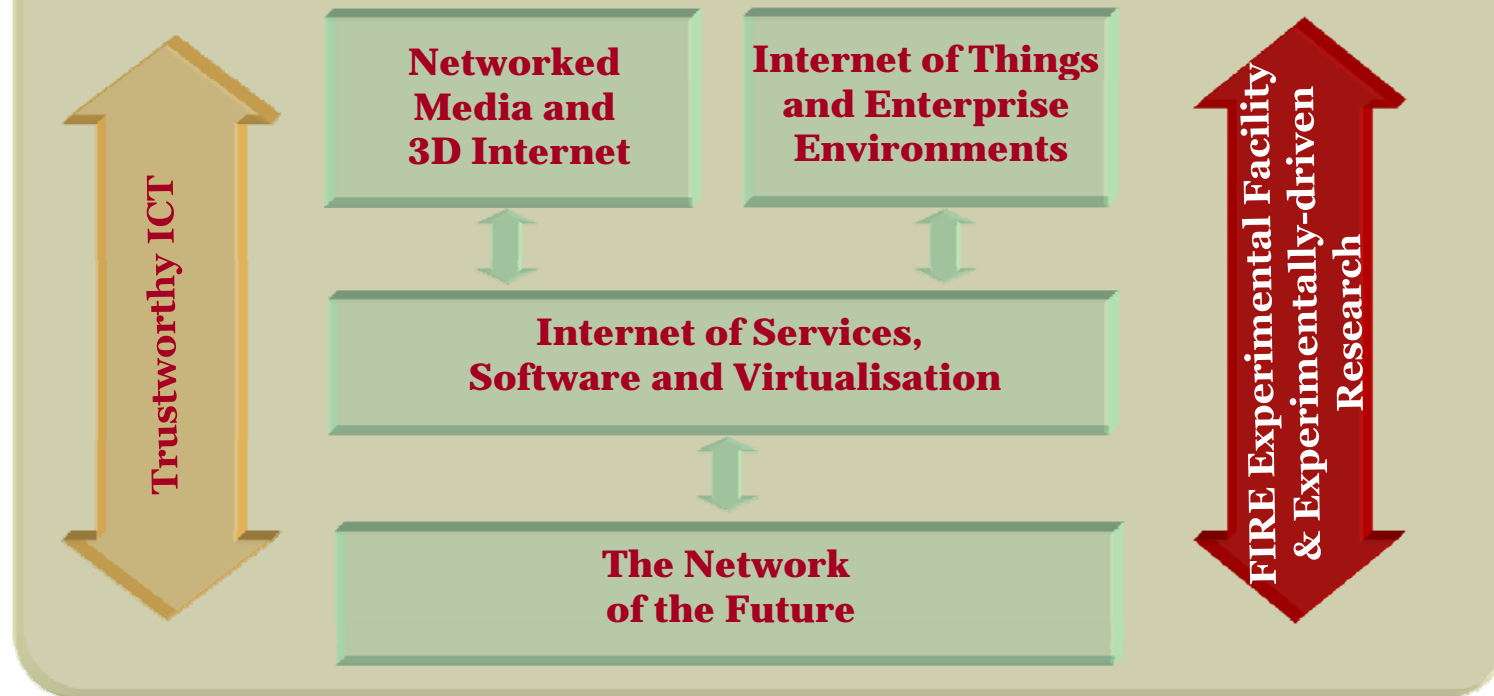


New Research "Network of the Future" (2009/10)



Pervasive and Trustworthy Network and Services Infrastructures

THE FUTURE INTERNET



Planned EU contribution for FIRE in 2009/2010: 50 M€



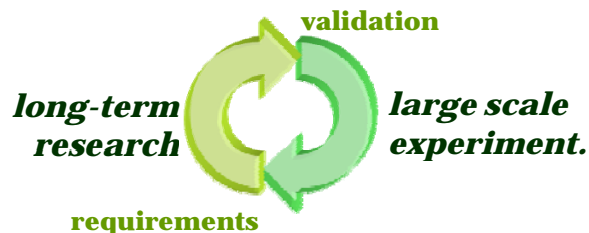


Purpose of FIRE

"creating a research environment for investigating and experimentally validating highly innovative and revolutionary ideas"

To investigate, test and compare, at large scale, new paradigms and future internet architectures, and their socio-economic impact

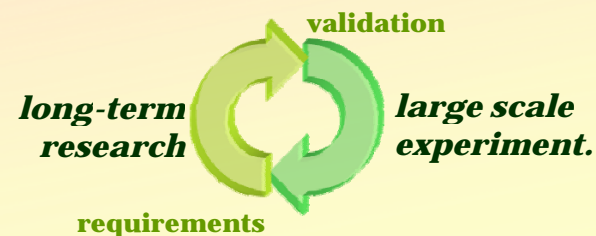
- e.g. transport/routing paradigms, dynamic topologies, service architectures ...
- e.g. socio economic impact of putting intelligence into the core, changing the end-to-end principle, ...





FIRE - Overview of Projects

experimentally-driven, multi-disciplinary research



Building the experimental facility






support actions



(from Call2 Objective 1.6: Community Funding 40 M€)



A first attempt comparing FIRE Facility prototypes

			
Context	<ul style="list-style-type: none"> • Converged Telecom/ Internet Service & Network Environments • Industry focus 	<ul style="list-style-type: none"> • Distributed system • IP networking • Research focus 	<ul style="list-style-type: none"> • Networking Research • Network technology agnostic environment • GÉANT, NRENs
Platform	SOA-NGOSS (e.g. to federate IMS based testbeds among themselves and with others)	PlanetLab – both public and private versions	Gigabit transmission equipment and computing nodes both capable of virtualization (physical infrastructure)
Focus	<ul style="list-style-type: none"> • Converging network, service platform and application infrastructures • Complete Control over Dedicated Resources • Reproducibility 	<ul style="list-style-type: none"> • Shared Resources • Real World Environment • Applications enduring over time • Partial Control • Variability 	<ul style="list-style-type: none"> • Virtual slices composed of networking and computing resources • Isolation of experiments in slices • Operational environment • Reproducibility & monitoring

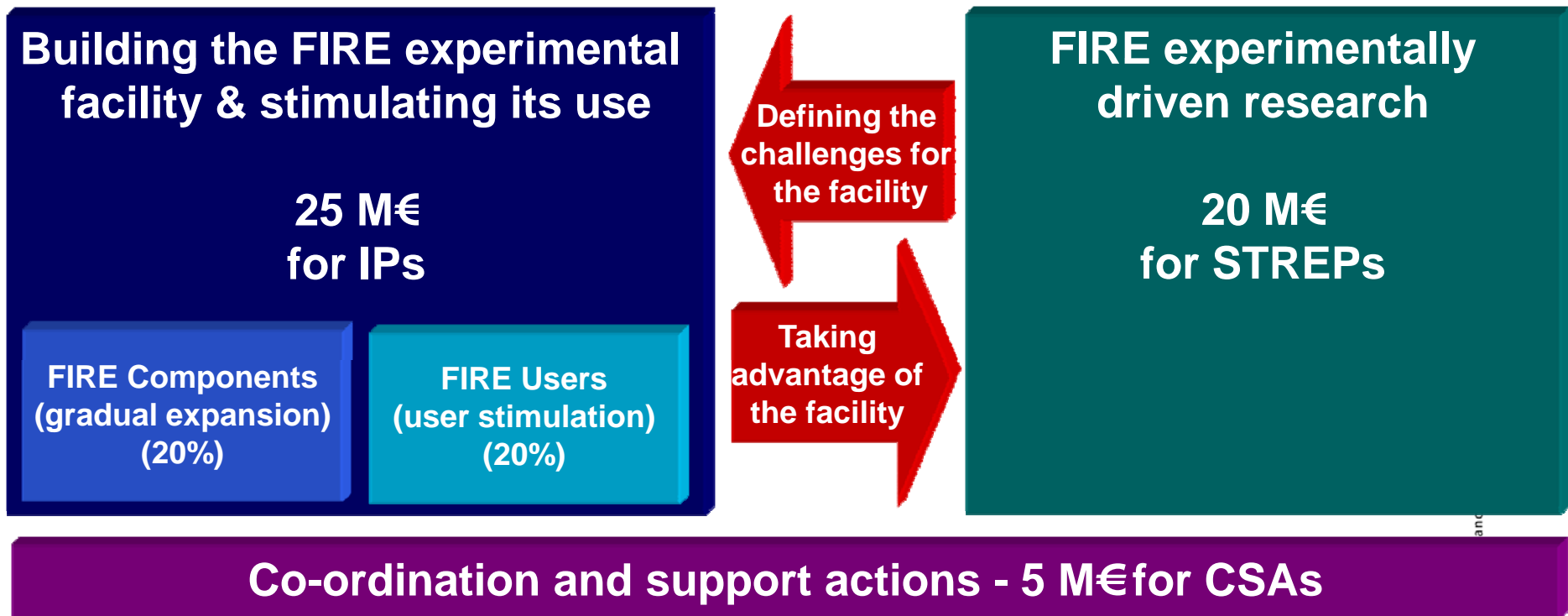


FIRE - main project partners

- **Industries/SMEs:** Albentia, Alcatel-Lucent, Ericsson, Dimes, Nokia, Thales, Intel, Italtel, NEC Europe, Thomson , Norut, Solinet, BCT, PLA, OCTO
- **Operators:** BT, France Telecom, Deutsche Telekom, Cosmote, OTE, RBB, Telefonica, Telekom Austria, Telekomunikacja Polska, Turkcell, VoiceGlobe, Vodafone-Panafon
- **Research Centers:** ETH, Fraunhofer, WIT, Create-Net, RACTI, CNIT, EURESCOM, CERTH, INRIA, CNRS, KTH, CTRC, IBBT, Club of Rome, MIT, NICTA
- **Universities:** Athens, Basel, Berlin, Bern, Braunschweig, Bucharest, Delft, Dublin, UPC, Geneva, Jerusalem, KCL, Lancaster, Liege, Lubeck, Lulea, Palermo, Passau, Patras, Madrid, Paderborn, Pisa, Poznan, Surrey, Tel Aviv, UPMC, Uppsala, Warsaw



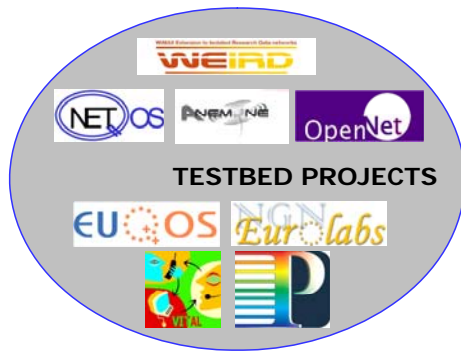
Next FIRE Call



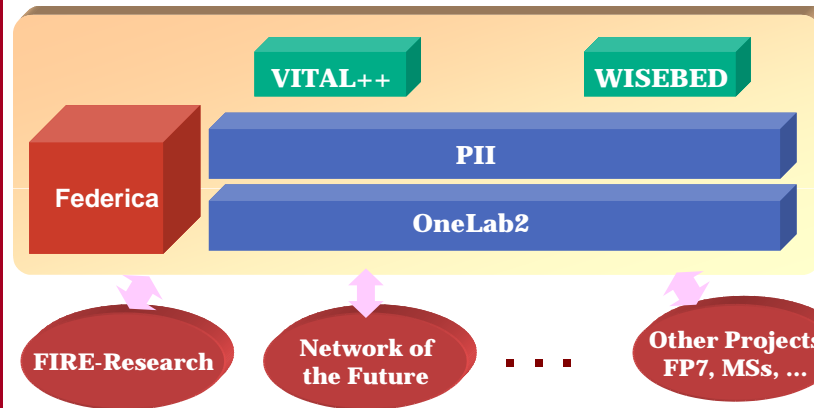


Building the FIRE Facility

FP6: Early design & prototyping



FP7 – WP 2007/08: Prototyping the federation concept



- open and dynamic
- focus on network connectivity layers
- supporting academia and industry
- proof-of-concept → pre-commercial tbs
- understanding the socio-economic dim.
- **availability & gradual expansion of prototype services starting in 2008**

FP7 – WP 2009/10: Building the facility and stimulating its use

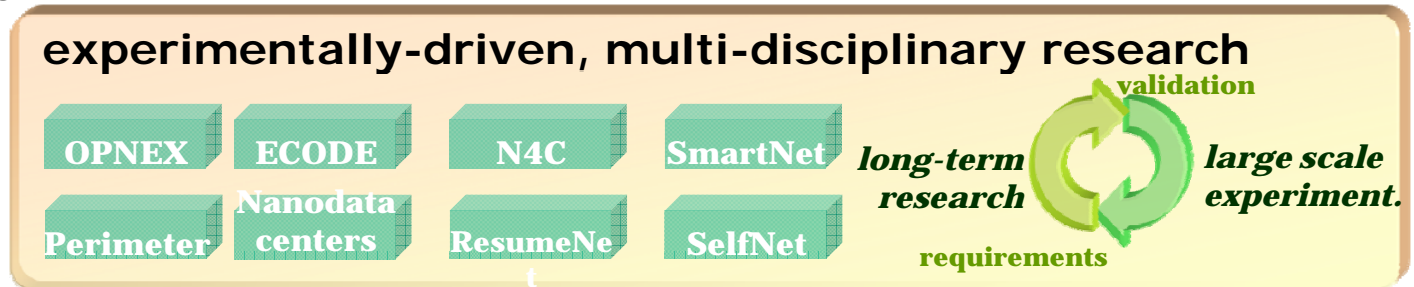
- building the **prototype** FIRE Facility based on **open coordinated federation of testbeds**
- supporting **FI Research** at different stages of R&D cycle
- **expanding scope towards service architectures**
- operational prototype of **FIRE Components** to be gradually expanded
- Stimulating **innovative use** of the FIRE Facility



Experimentally-Driven Research in WP 2009-2010

Starting Point:

- Situated Autonomic Communications Initiative under FP6–FET
- First wave of projects under WP 2007/08



Visionary multidisciplinary research under WP 2009/10:

- Defining the challenges for and taking advantage of the Experimental Facility
- Consisting of iterative cycles of research, design & large-scale experimentation of new and innovative network and service architectures for the Future Internet
- Research to consider the Future Internet as a complex system addressing it in a holistic vision and at all relevant levels and layers (taking a system perspective)
- Taking into account energy, low cost, environmental or socio-economic aspects

International Co-operation in WP 2009/10 (provisions relevant to FIRE / GENI)

- EU-ICT Challenge 1: Networks and services
 - Network of the Future (1.1): Future Internet Architectures and Network Technologies (Japan, USA)
 - FIRE (1.6): international co-operation with other initiatives in industrial and emerging countries [Co-ordination and Support actions - CSA]
- General rule: US partners can participate in EU-funded projects
 - Participation must be of mutual benefit
 - Funding only in exceptional cases





FIRE Challenges for 2009 and beyond

- ❑ Derive the architectural principles for a high-level modular federation of running & coming FIRE facility projects
- ❑ Have a working prototype of the integrated FIRE facility by end of 2010
- ❑ Match the offer of the FIRE prototypes with the demand by European research projects
- ❑ Establish FIRE Research as the Grand Challenge projects for the FIRE Facility
- ❑ Establish bilateral federations between FIRE prototype facilities and other EU national and international facilities





Upcoming events and calls

- ❑ Future Internet Assembly, Prague, CZ
 - 11 – 13 May 2009
 - Discussion of draft Expert Group Report
 - Offering by FIRE Facility projects
 - Use-cases for FIRE
- ❑ FIRE Week, Lulea, Sweden
 - Open Day 1 July 2009
 - Expert Group Report to be published
- ❑ EU ICT Work Programme 2009/10 Call 5
 - tentative closing 3 November 2009
 - budget: 50M€ Community contribution
 - 25 M€ for building the facility and stimulating its use

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cordis.europa.eu/fp7
www.future-internet.eu



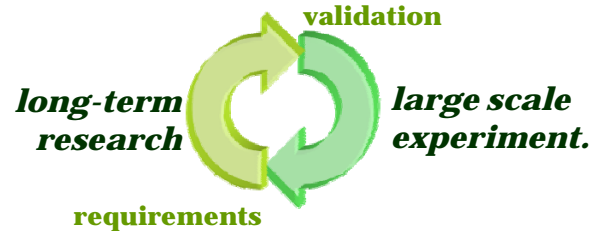


Key Messages about FIRE

Future Internet Research & Experimentation

- FIRE has two interrelated dimensions:

FIRE Research



FIRE Facility



- Facility projects Onelab2, PII, and Federica are already offering testbed services being gradually expanded
- FIRE Research under Call5 of Work Programme 2009/10
 - visionary, multidisciplinary & experimentally driven taking a holistic view of FI
 - “Grand Challenge” projects for the FIRE Facility
- FIRE Facility under Call5
 - expand FIRE towards higher services levels allowing for system-level testing
 - provide services to all of Challenge 1 and beyond
 - become operational at an early stage and stimulate innovative use

cordis.europa.eu/fp7/fire

