

FP7 ICT Work Programme 2011-2012

Objective ICT-2011.1.1: Future Networks

Target Outcomes

The target is the development of energy-efficient future network infrastructures that support the convergence and interoperability of heterogeneous mobile, wired and wireless broadband network technologies as enablers of the future Internet. This includes ubiquitous fast broadband access and ultra high speed end-to-end connectivity, with optimised protocols, addressing and routing capabilities, supporting open generic services and applications. "Clean-slate" and evolutionary approaches to network architecture are equally valid. User driven research is a priority.

a) Wireless and mobile broadband systems

- **LTE-Advanced and post-LTE systems**; with focus on medium term evolution of LTE systems towards higher rate LTE-Advanced with support to standardisation; in the longer term, R&D targeting new radio transmission paradigms and system designs taking into account the need for radical cost and energy per bit reduction and lower electromagnetic field exposure.
- **Enabling technologies for flexible spectrum usage** for mobile broadband, including new ambitious approaches to cognitive radio as well as proof-of-concept reference implementations, taking into account commercial and regulatory constraints and opportunities.
- **Novel radio network topologies**, taking into account the need for autonomy, energy efficiency, high capacity backhaul, low EMF radio exposure, and smaller low power base stations, mixed analogue-digital RF design, and novel signal processing methods.
- **Integration of radio technologies with optical fibre networks**, for consolidation of mobile and wireless networks into integrated communication systems (using e.g. femtocells) which can deliver ultra high speed wireless access in the home, the street or in the enterprise.



b) High capacity end-to-end infrastructure technologies

- **Ubiquitous fast broadband access**: convergence and interoperability of dynamic heterogeneous broadband and mobile network technologies; robust and reliable broadband networks with optimised interconnection of heterogeneous core, metro and edge networks, wired and wireless, including hybrid optical-coaxial and radio/copper/fibre access, in multiple operator and service provider domains; seamless transparent end-to-end connectivity using optimised protocols and routing for energy efficiency and cost reduction.
- **Ultra high capacity all-optical networks** supporting ever-increasing service bandwidth demands: including network virtualisation; reducing the need for electronic-optical conversion, to solve the problem of the unsustainable growth of power consumption of electronic routers; targeting WDM technologies enabling transportation of 160 wavelengths at 40-100 Gb/s and higher, in combination with enabling technologies such as coherent transmission, complex formats, OFDM; solutions beyond 100G Ethernet.
- An efficient **functional split between optics and electronics and between circuit, flow and packet switching** as well as **integration with packet transport** in the data, control and management planes should be addressed.
- The work on optical core and access networks provides the system perspective to the development of the necessary photonic components and sub-systems undertaken in Objective 3.5.



Funding schemes

- a), b), c), d): IP, STREP
- e): NoE, CSA

c) Novel Internet architectures, management and operation frameworks

- **Future Internet architectures that are resilient, trustworthy and energy-efficient** and designed to support open access, increasing heterogeneity of end-points (multimode devices, people, things) and networks (ad-hoc networks, opportunistic networks, networks of networks), with the need of a seamless and generalised handover, in support of the complete range of services and applications. Networks should sustain a large number of devices, many orders of magnitude higher than the current Internet, handle the large irregular information flows, and be compatible with ultra high capacity end-to-end connectivity.
- **Visionary and "clean-slate" multi-disciplinary research on new architectures** is encouraged, consisting of iterative cycles of research, design and large-scale experimentation of innovative architectures for the Future Internet from an overall system perspective.
- **Network management and operation frameworks** to support generic service platforms, information exchange, addressing and naming, personal networks, scalability issues, agile connectivity, and the explosion of traffic and endpoints. Work should also address Internet mobility, virtualization, and backward compatibility strategies with the current Internet. Self- or distributed management approaches should lead to a better control of new heterogeneous networks. Optimisation of control and management may also address tighter integration between network functionalities and overlay service functionalities and optimise integration of services provided by data centres and server farms with the network capabilities.

d) Flexible, resilient, broadband and integrated satellite communication

- **Innovative system architectures and technologies** making possible the advent of ultra high capacity satellite communication systems, radically lowered transmission cost, broadband end-to-end connectivity one order of magnitude higher than that of current operational systems, seamless integration capabilities with Future Internet terrestrial based networks, mobile and fixed, notably through capability of dynamic joint reconfiguration of satellite-terrestrial protocols and

integrated network management..

- **Novel technologies and architectures for resilient and flexible networks** enabling global, multi service, secure and dependable communication (including mobility), for institutional missions. It requires network availability and efficiency, fast information processing and reaction, and interoperability with terrestrial public safety networks, and integration with navigation systems and sensor networks.

e) Coordination and Support Actions and Networks of Excellence

- Coordination and support for European network/service requirement definition, exploitation of results and (pre)standardisation.
- Definition of a joint policy framework fostering the development and integration of terrestrial, mobile, fixed and satellite communications to achieve broadband for all and serve the institutional/public service demand.
- Support to concrete initiatives/projects for international cooperation, notably with USA and Japan, in identified priority topics such as cognitive radio.
- Networks of Excellence should be tightly focussed on a critical mass of researchers and actors in new and emerging key topics for the Future Network development, in particular acting as a bridge between academic research and industrial exploitation.

Expected Impact

- Strengthened positioning of European industry in the fields of Future Internet technologies, mobile and wireless broadband systems, optical networks, and network management technologies.
- Developing the technology for the future generations of the European high-speed broadband and mobile network infrastructure.
- Increased economic and energy efficiency of access/transport infrastructures (cost/bit).
- Contributions to standards and regulation as well as the related IPRs, with a predominant role for Europe in standardization bodies and fora.
- Industry adoption of integrated all optical networks and of spectral-efficient broadband wireless systems, novel Internet architectures and technologies.

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Future Networks FP7 Project Portfolio
http://cordis.europa.eu/fp7/ict/future-networks/projects_en.html