

- 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

Funding Schemes:

a), b), c), d): IP, STREP

e): NoE, CSA

Indicative budget distribution¹⁰

Call:

FP7-ICT-2011-8

Objective ICT-2011.1.2 Cloud Computing, Internet of Services and Advanced Software Engineering

The objective focuses on technologies specific to the networked, distributed dimension of software and access to services and data. It will support long-term research on new principles, methods, tools and techniques enabling software developers in the EU to easily create interoperable services based on open standards, with sufficient flexibility and at a reasonable cost.

Target outcomes

a) Cloud Computing

- Intelligent and autonomic management of cloud resources, ensuring agile elastic scalability. Scalable data management strategies, addressing the issues of heterogeneity, consistency, availability, privacy and supporting security.

¹⁰ The budget amounts for the 2011 'Factory of the Future', 'Energy-Efficient Buildings' and 'Green Car' PPPs, for the 2011 Future Internet PPP, for Call 7, for the 'SME initiative on Digital Content and Languages', for the 'FET Flagship Initiatives', for the Coordinated calls EU-Brazil and EU-Russia and for part of the FET Open Call (EUR 46 million) are from the 2011 budget, under the condition that the draft budget for 2011 is adopted without modification by the budgetary authority. The remaining amount for Call 8, Call 9, the 2012 PPP Calls and for the remaining part of FET-Open is expected to be added from the 2012 budget for which a new financing decision to cover the budget of that year will be requested at the appropriate time.

- Technologies for infrastructure virtualisation, cross platforms execution as needed for service composition across multiple, heterogeneous environments, autonomous management of hardware and software resources.
- Interoperability amongst different clouds, portability, protection of data in cloud environments, control of data distribution and latency.
- Seamless support of mobile, context-aware applications.
- Energy efficiency and sustainability for software and services on the cloud.
- Architectures and technologies supporting integration of computing and networking environments; implications of Cloud Computing paradigm on networks
- Open Source implementations of a software stack for Clouds

b) Internet of Services

- Service engineering principles, methods and tools supporting development for the Internet of Services, including languages and tools to model parallelism.
- Services enabled by technologies for seamless integration of real and virtual worlds, through the convergence with Internet of Things and Internet of Contents.
- Massive scalability, self-management, verification, validation and fault localisation for software-based services.
- Methods and tools to manage life cycle of secure and resilient Internet-scale applications from requirements to run-time and their adaptive evolution over time.

c) Advanced software engineering

- Advanced engineering for software, architectures and front ends spanning across all abstraction levels.
- Quality measure and assurance techniques which adapt to changing requirements and contexts, to flexibly deal with the complexity and openness of the Future Internet.
- Management of non-functional requirements typical of Internet-scale applications, like concurrency levels which will be orders of magnitude larger than in today's applications, huge data stores and guaranteed performance over time.
- Tools and methods for community-based and open source software development, composition and life cycle management.

d) Coordination and support actions

- Support for standardization and collaboration in software and services technologies.
- Support for the uptake of open source development models in Europe and beyond.
- Collaboration with Japanese entities on: cloud computing, particularly on common standards for data portability and on interoperability; services having more efficient energy usage.

Expected impact

- Emergence of European interoperable clouds contributing to an internal market of services in the EU whilst providing very significant business opportunities to SME's; improved trust in cloud-based applications and storage for citizens and business.
- Availability of platforms for easy and controlled development and deployment of value-added services through innovative service front-ends.

- Lower barriers for service providers and users to develop, select, combine and use value-added services through significant advances in cloud computing technologies and standardised and open interfaces.
- Efficient implementation of mainstream software applications on massively parallel architectures.
- Easier evolution of legacy software over time, thanks to innovative methods and tools managing the complete lifecycle of software from requirements to run-time.
- Fast innovation cycles in service industry, e.g. through the use of Open Source development model.
- A strengthened industry in Europe for software-based services offering a large choice of services satisfying key societal and economical needs, with reinforced capabilities to engineer and produce software solutions and on-line services.

Funding schemes

a), b), c): IP, STREP; d): CSA

Indicative budget distribution¹⁰

Calls

FP7-ICT-2011-8

Objective ICT-2011.1.3 Internet-connected objects

The objective is to provide the architecture and technological foundations for developing context-aware, reliable, energy-efficient and secure distributed networks of cooperating sensors actuators and other smart devices and objects. This should enable person/object and object/object Internet-based communications opening a new range of Internet enabled services. The key challenges of the architecture are to move beyond the sector specific boundaries of the early realisations of the "Internet of Things", to cope with the heterogeneity of the underlying technologies, and to enable integration of the novel set of supported services with enterprise business processes.

Target outcomes

- a) **An open networked architecture** for Internet-connected objects, with end-to-end characteristics that can conceal the heterogeneity of the underlying network technologies required to support the multiplicity of communication requirements across objects in the physical world, be resilient to disruption of these technologies, and optimally manage a large population of resource constrained devices.

The architecture should maximise interoperability across providers and consumers of information and services, allow for re-use of object entities in the physical world across several application domains, and provide a coherent framework with open interfaces to manage the physical entities. Due to the mobility of objects and multiplicity of applications contexts, the architecture should support self-management, self-configuration and self-healing properties as well as scalable look up and discovery of "Internet of Things" resources and services and their subsequent mapping onto entities of the real world.