



Information Society  
Technologies

## *Future and Emerging Technologies*

## *Nature-inspired ICT in FP 6 & FP 7*

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European Commission*



# Plan of the Talk



- **Present (FP6)**
- **Future (FP7)**

# Bio-IT in FET Initiatives in FP6



- **Beyond Robotics**
  - COGNIRON, NEUROBOTICS, EURON (NoE)
- **Complex Systems Research**
  - ECAGENTS, PACE
- **Bio-inspired Intelligent Information Systems**
  - DAISY, FACETS, CILIA
- **Presence and Interaction in Mixed Reality Environments**
- **Situated and Autonomic Communications**
- **Simulating Emergent Properties in Complex Systems**
- **FET Open Scheme**



*“Reverse Engineering of the brain” -> “true intelligence” in IT*

## Objectives:

- Explore new avenues in design of intelligent information systems
- Attribute meaning to complex stimuli and generate actions towards high-level goals
- Autonomous growth in perception, motor and cognitive abilities
- Ultimately: Build systems with flexible, autonomous, goal-directed behaviour responding to internal and external changes

## Focus areas:

- Characterising large assemblies of interconnected neurons, i.e. computational properties, structure and other physical constraints
- Information processing in perception, motor or cognitive domains
- Mechanisms of evolution, development and plasticity

# Presence & Interaction in Mixed Reality Environments



Convey the sense of *being there* and of *participating, acting, doing, influencing and changing things there*

## Objective:

- To further the understanding of Presence in order to create novel ICT systems that match human cognitive and affective capacities and recreate the experiences of presence and interaction in mixed reality environments

## Focus areas:

- Understanding different forms of Presence (i.e., aspects of perception, interaction, emotions and affect)
- Design and development of essential ICT Building Blocks capturing different forms of Presence and based on a range of relevant HW and SW ICT technologies (rendering, 3D representation, tracking, haptics, light control, etc.)
- Building novel Systems supporting Presence & Interaction (open system architectures integrating the essential building blocks, open source authoring tools, open APIs)

# Simulating emergent properties in complex systems



Framework of mathematical and computational techniques for simulation of complex systems

## Objective:

- We can engineer components of systems: How can we predict aggregate behaviour?
- How can we infer models from (often incomplete) data?

## Research challenges:

- How to cope with uncertainty in simulation of engineered and natural systems?
- How to describe systems acting on multiple scales?
- How to integrate simulations on different levels?



A world pervaded by ubiquitous communication facilities with self-organising and self-preserving functionalities

## Objectives:

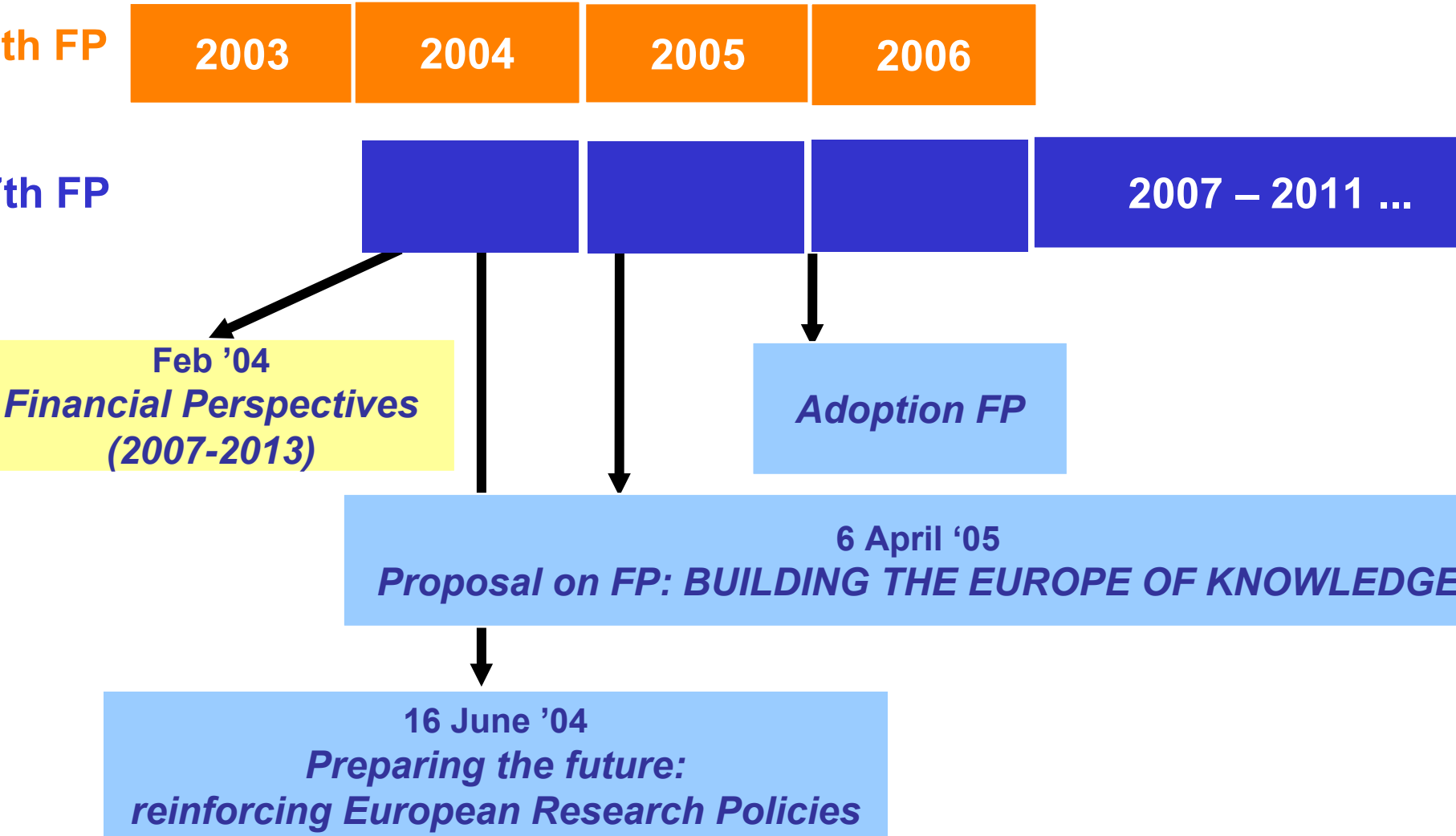
- To define a self-organising communication network concept and technology that can be situated in multiple and dynamic contexts
  - ranging from sensor networks to virtual networks of humans
  - defining decentralised optimisation strategies
  - benefiting from cross-layer or non-layered approaches
- To study how strategic needs of social or commercial nature impact on future communication paradigms, and how networks and applications can support society and economy, enabling a service oriented, requirement and trust driven development of communication networks
  - to develop networking technologies (hardware/software combinations) that can evolve and create maximal synergy with the other types of non-technological networks that constitute their context

# Plan of the Talk



- Present (FP6)
- Future (FP7)

# The Roadmap to FP7



# Four specific programmes of the FP7



## Cooperation' (44432 M€)

- Research activities carried out in transnational cooperation
- Collaborative projects and networks
- Coordination of research programmes
- International cooperation between the EU and third countries

## Ideas' (11862 M€)

- Autonomous European Research Council to support investigator-driven “frontier research”
- Carried out by individual teams competing at the European level
- In all scientific and technological fields, including engineering, socioeconomic sciences and the humanities.

## People' (7129 M€)

- Support to training and career development of researchers (“Marie Curie” actions)

## Capacities' (7486 M€)

- Research infrastructures
- Research for the benefit of SMEs
- Regional research driven clusters, incl. EU’s “convergence” regions
- “Science in Society” issues

# Nine themes of the specific programme 'Cooperation'



- Health;
- Food, Agriculture and Biotechnology;
- **Information and Communication Technologies;**
- Nanosciences, Nanotechnologies, Materials and new Production Technologies;
- Energy;
- Environment (including Climate Change);
- Transport (including Aeronautics);
- Socio-economic Sciences and the Humanities;
- Security and Space.

# Theme ICT



## ■ **Six** Technology Pillars:

- *Nano-electronics, photonics and integrated micro/nano-systems*
- *Ubiquitous and unlimited capacity communication networks*
- *Embedded systems, computing and control*
- *Software, Grids, security and dependability*
- *Knowledge, cognitive and learning systems*
- *Simulation, visualisation, interaction and mixed realities*

## ■ **Four** Technology Integration Areas

- *Personal environments*
- *Home environments*
- *Robotic systems*
- *Intelligent infrastructures*

## ■ **Three** areas of applications research

+ **New Perspectives**

+ **Future and Emerging Technologies**

# NiSIS opportunities in the ICT theme



- **New Perspectives** *in ICT drawing on other science and technology disciplines* (physics, materials, biotechnologies, life-sciences, cognitive and social sciences etc):
  - Miniaturisation of ICT devices to sizes compatible and interacting with **living organisms** (like novel ICT components and computing systems based on synthetic biomolecular structures)
  - New computing and communication sciences **inspired by the living world** to fully ecocompatible ICT devices inspired by natural systems
  - **modelling and simulation of the living world** (like simulation of human physiology across several biological levels).

# NiSIS opportunities in the ICT theme



## ■ Future and Emerging Technologies

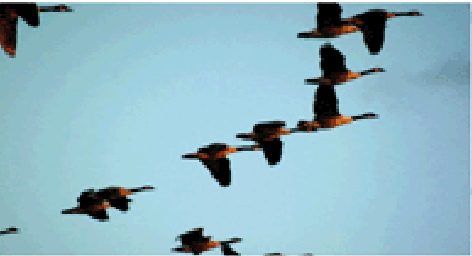
- To attract and foster **trans-disciplinary** research excellence in emerging ICT-related research domains.
- Foci include:
  - exploring the new miniaturisation and computing frontiers including for example the exploitation of quantum effects;
  - harnessing the complexity of networked computing and communication systems;
  - exploring new concepts of and experimenting with **intelligent systems** for new personalised products and services.

# NiSIS opportunities – also the ‘Ideas’ programme



- “Frontier research”:
  - intrinsically risky endeavour that involves the pursuit of fundamental advances in science, technology and engineering
  - without regard for established disciplinary boundaries or national borders
- “Investigator driven” approach
- Grants will be provided for individual teams
- Any grouping of researchers, from one single institution or several institutions, in one country or across national borders
- Implementation by European Research Council (ERC)
  - Proposals evaluated on the basis of the sole criterion of excellence
  - Judged by peer review
  - Emphasis on interdisciplinary, high risk pioneering projects
  - New groups and less experienced researchers as well as established teams

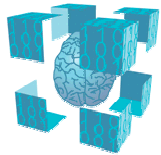
# Collaborations for researchers' contributions to FP content



Nature-inspired Smart Information Systems

NiSIS  
NiSIS

**ONCE-CS**



**NEURO-IT.NET**



# Information on IST



- **IST on CORDIS**

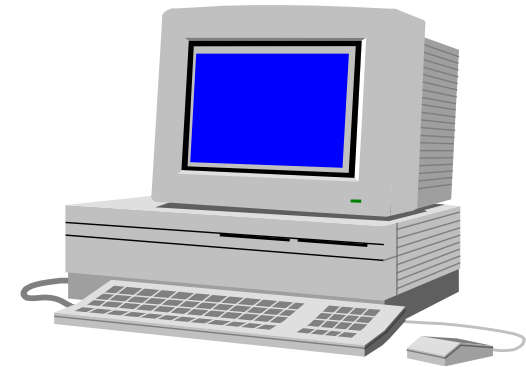
<http://www.cordis.lu/ist/>

- **FP7**

<http://www.cordis.lu/fp7/home.htm>

- **Future and Emerging Technologies**

<http://www.cordis.lu/ist/fet/home.html>



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