

# Networked Embedded and Control Systems

ICT Proposers' Day  
Köln, 1 February 2007

FP-7 ICT Call 2  
Objective ICT-2007.3.7



*Networked Embedded and Control Systems  
ICT Proposers Day, 01/02/2007*



## Objective 3.7: Cooperating Objects and Wireless Sensor Networks

- *Today electronics and software are embedded in billions of devices and objects. Pervasive data will change how these intelligent objects dynamically pool information, cooperate under severe constraints and reliably interact and control the physical world*

### Three target Outcomes:

- 1) **Middleware** for seamless connectivity and inter-working
- 2) **Cooperating Objects and Wireless Sensor Networks**
- 3) **Control of large-scale, complex distributed systems**

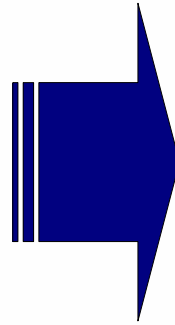
# 1<sup>st</sup> Target Outcome: Middleware (1/3)

- New **Middleware platforms** that
  - support composability, scalability, minimal power consumption
  - provide predictable connectivity and QoS
  - Priority only on selected application domains, i.e. :
    - Private/home/building, Nomadic, Manufacturing
- **Research should aim at**
  - programmability, dynamic reconfiguration and ontologies
  - Services enabling privacy, security and trust
- **Support** (through CSAs) also for
  - Industry-driven initiatives for sharing software source code with open interfaces for third party appl.development
  - Standardisation in broader embedded systems domain

## 2<sup>nd</sup> Target Outcome: Cooperating Objects and Wireless Sensor Networks (2/3)

- **Broad definition : “Objects” are entities that**
  - cooperate spontaneously / jointly execute a given task
  - operate under severe resource constraints
- **Research should aim at:**
  - New methods and algorithms to support cooperation schemes
  - HW/SW sensor platforms including OS, kernels
  - Programming abstractions to facilitate application development
  - Support/tools for commissioning, deployment, maintenance

co-existence-> (ad-hoc) communication -> cooperation->  
and control/coordination (if needed) - > common goal



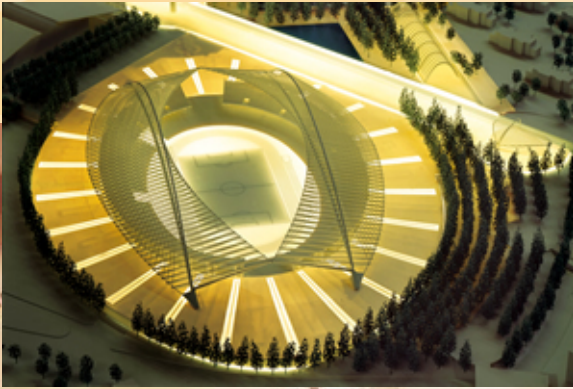
**Gain efficiency through coordinating efforts**

## 2<sup>nd</sup> Target Outcome: Cooperating Objects and Wireless Sensor Networks (2/3)

- **Further research challenges :**
  - scalability, dynamic resource recovery
  - semantics for object/service definition
  - incorporating advanced control aspects
  - security and privacy-relevant features
- **Type of research**
  - generic, BUT driven by real-world applications.  
Projects should '*prove*' feasibility and scaling
- **International cooperation** with USA and other countries is encouraged

## 3<sup>rd</sup> Target Outcome : Control of large-scale complex distributed systems (3/3)

- **“Large-scale systems”** like
  - Electrical grids, airports, seaports
  - Infrastructures for energy supply
  - Manufacturing plants
- **Known but difficult issues to be addressed**
  - Performance, robustness, availability. Safe, secure and predictable behavior
  - Integration of energy generation, transport and consumption



Public

Public and/or Private



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## 3<sup>rd</sup> Target Outcome: Control of large-scale complex distributed systems (3/3)

- **Research should aim at:**
  - Modeling and design methods, reconfigurable architectures, and scalable algorithms
  - Mastering complexity and uncertainty
    - *e.g. delays, bandwidth limitations in communication links, fading/distorted links, unavailability of nodes*
  - Closing the control loop over (wireless) sensor networks
- **Interdisciplinary consortia required**
  - Applying computer, systems, control and communications science and engineering to *large-scale complex systems*
- Support (through CSAs) for
  - **International cooperation with the USA, Russia, Western Balkans**

# Expected Overall Impact

- Prepare for the needs of tomorrow's large scale infrastructures
- Control of 10 times more complex systems at 10% of today's effort
- 100% available plants whilst reducing maintenance cost
- Reducing industrial accidents
- Seizing new markets by providing new services tailored to customer needs
- Easy and low cost deployment for monitoring of the environment and natural resources

# Instruments and *provisional Budget*

- Focus 1: **Middleware**
  - STREPs only
  - CSA for source code sharing and for standardisation initiatives
- Focus 2: **Cooperating Objects and WSNs**
  - STREPs only
  - NoE
- Focus 3: **Control of large-scale systems**
  - STREPs only
  - CSA for international cooperation
- **Total for this objective in call 2 : 47 M€\***
- **STREPS: 41 M€\* - NoE: 4 M€\* - CSAs: 2 M€\***

\* amount to be confirmed after the Commission decision on 2008 budget proposal

# Related areas in FP7

- **Middleware :**
  - **ICT-2007.1.2:** Service and Software Architectures,...
  - **ICT-2007-1.3:** ICT in support of the networked enterprise
- **Cooperating objects and sensor nets:**
  - **ICT-2007.2.1/2.2:** Cognitive Systems, Interaction, Robotics
  - **ICT-2007.6.2:** ICT for Cooperative Systems (transport)
- **Large scale systems and control :**
  - **ICT-SEC-2007.1.7:** Critical Infrastructure Protection
  - **ICT-2007.2.1/2.2:** Cognitive Systems, Interaction, Robotics
  - **ICT-2007.6.3:**  
ICT for Environmental Management and Energy Efficiency
  - **ICT-2007.8.x :** FET (e.g. pervasive adaptation, complex systems)
- **Outside ICT :**
  - Manufacturing (NMP programme, MANUFUTURE platform),
  - Energy, production & distribution (Smart GRIDS platform)

# Contacts and further information

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- **INFO Day: Brussels, 22-23 May 2007**
  - <http://cordis.europa.eu/ist/embedded/>
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- **General info on FP7:**
  - <http://ec.europa.eu/research/fp7/>
- 
- **ICT:**
  - <http://cordis.europa.eu/fp7/ict/>

