



Czech Innovation Day & Brokerage Event 2009

ICT ■ Brokerage ■ 2009

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Embedded Systems and Control

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European Commission
Information Society and Media

Call 5 , ~720 M€

Launch 31 Jul 09, DL 3 Nov 09

Challenge	Objectives
Challenge 1: Pervasive and Trusted Network and Service Infrastructures	1.1 The Network of the Future (call 5) 1.2 Internet of Services, Software & virtualisation 1.3 Internet of Things and enterprise environments 1.4 Trustworthy ICT 1.6 Future Internet Experimental Facility and Experimentally-driven Research
Challenge 3: Components, systems, engineering	3.1 Nanoelectronics Technology 3.5 Engineering of Networked Monitoring and Control Systems 3.7 Photonics 3.9 Microsystems and Smart Miniaturised Systems
Challenge 4: Digital Libraries and Content	4.2 Technology-Enhanced Learning 4.3 Intelligent information management
Future and emerging technologies	8.4,5,6,9,10 FET-Proactive
Horizontal support actions	9.2 Supplements to support International Cooperation, ongoing projects

Challenge 3: Components, systems, engineering

Trends, challenges & opportunities

Trends in miniaturisation, diversification, increasing SW content and emphasis on systems approach remain valid

Challenges:

- Multi-disciplinarity
- Integrated SW/HW systems
- Heterogeneous micro-systems
- Widely distributed systems

Cross cutting issues:

- Efficient energy management
- Minimising environmental footprint of manufacturing

New opportunities - New types of devices and intelligent systems:

- Nano-scale integration, new materials
- Photonics and organic electronics
- Quantum and molecular technologies
- Embedded ICT in ever broader range of devices, objects and processes

Expected Impact

- Exploration of alternative paths and fostering of new types of collaborations
- Reinforced EU knowledge and skills
- Increased critical mass of resources and knowledge
- More international cooperation
- Higher attractiveness of EU to investments
- Closer cooperation between Member States

- Maintained leading position of EU in product innovation and design
- Wider use of smart systems in various application sectors
- Higher energy efficiency and reduction of waste in manufacturing
- Contribution to evolution of traditional industries (printing, clothing)
- Emergence and growth of new companies
- Strengthened competitiveness of EU industry through risk sharing



9 Objectives: ICT-2009.3.1 to 9

CSA

Call 5	3.1 Nanoelectronics Technology > 1 IP/STREPs/NoE	35M€
Call 4	3.2 Design of SC components ... > 1 IP/STREPs	25M€
Call 4	3.3 Flexible, organic and large area electronics IP/STREPs/NoE	60M€
Call 4	3.4 Embedded Systems Design 2 IPs/STREPs	28M€
Call 5	3.5 Engineering of Networked Monitoring & Control Systems 2IPs/STREPs/1NoE	32M€
Call 4	3.6 Computing systems STREPs	25M€
Call 5	3.7 Photonics IP/STREPs/EraNet+(10M€) ERANet+ ->Call 4	60M€
Call 4	3.8 Organic photonics... STREPs/NoE	30M€
Call 5	3.9 Microsystems and smart...systems IP/STREPs	80M€

Coordination, roadmaps and networking



Objective ICT-2009.3.5 **Engineering of Networked Monitoring and Control systems**

The activities in this area address engineering technologies for large-scale, distributed and cooperating systems for monitoring and control

- **Foundations of Complex Systems Engineering**
- **WSN and Cooperating Objects**
- **Control of Large-Scale Systems**
- **International Cooperation**
 - **USA, India, Western Balkans**

Call 5
Deadline 3 Nov 2009
Indicative budget 32 M€

**It is fine to address only one of the above,
if sufficient for the purpose of your proposal**



Relevance of the area

- Monitoring and control is an important scientific and technological field and market sector
 - Europe has a 32% market share of a 188+ B€ world-wide market (See EC study, www.decision.eu, 2008)
- It is based on rigorous sensing/measurements, modelling, decision making, control and actuation, and optimisation
- Sensors–actuators networks and Wireless Sensor Networks constitute a critical enabling technology, and cooperation amongst smart objects an important extension thereof
- Large-scale deployments constitute the next major challenge, extending from instantiation to management and maintenance to updating



Embedded Systems and Control Target Outcomes

Embedded Systems Design

Theory and novel methods for embedded system design

- heterogeneity, predictability of non-functional properties (performance, fault tolerance, life expectancy and power consumption)
- robustness validation
- adaptivity and self-awareness
- self-configuration

one IP: end-to-end design methodologies and associated tool chains
STREP: specific methods and tools

Modules and tools for embedded platform-based design

- integrated design environment for ES
- software, HW/SW and system design tools
- interoperability of tools primarily from SME vendors
- technology for efficient resource management

one IP: address design tool integration
STREP: specific issues or topics

Coordination of national, regional and EU-wide R&D strategies (CSA)

- align research agendas

Complementary to ARTEMIS JTI

Engineering of Networked Monitoring and Control Systems

Foundations of Complex Systems Engineering

robust, predictable and self-adaptive behaviour for large-scale networked systems; foundational multi-disciplinary research

Wireless Sensor Networks and Cooperating Objects

support spontaneous ad-hoc cooperation between objects; experimenting large-scale applications of wireless sensor networks

Control of Large-Scale Systems

scalable and modular architectures and platforms; Standardisation is encouraged

International Cooperation

Computing Systems (Streps)

Parallelisation & programmability

- automatic parallelisation
- high-level parallel programming languages
- holistic approach: underlying hardware / operating system / system software
- exploiting dynamic (run-time) information
- testing, verification and debugging

Methodologies, techniques and tools

Continuous Adaptation

beyond strict separation between compiler, runtime and hardware

Virtualisation

portability, flexibility, optimised use of resources

Customisation

rapid extension and/or configuration of existing systems

System simulation and analysis

Simulation and analysis of complex multicore systems

Technology implications

System architectures, tools and compilers for next-generation semiconductor fabrication

Coordination (CSA)



Complementary to ARTEMIS JTI

Foundations of complex systems engineering

- To develop *novel* scalable methods for sensing, control and decision-making. to achieve robust, predictable and self-adaptive behaviour for large-scale networked systems
- Scope : foundational multi-disciplinary research in modelling, sensing, monitoring and actuation, adaptive, cooperative control and decision making.

Note : Activities to encourage and enable multi-disciplinary education in the areas of systems engineering and monitoring and control are welcome.

Instruments: One NoE and STREPs



Wireless Sensor Networks & Cooperating Objects

- To develop architectures, hardware/software integration platforms and engineering methods for distributed systems composed of heterogeneous networked smart objects
- Scope : Research challenges include e.g :
 - **methods and algorithms to support spontaneous ad-hoc cooperation between objects;**
 - **network-centric computing with dynamic resource discovery**
 - **semantics that allow object/service definition/instantiation;**
 - **lightweight operating systems and kernels;**

Instruments: One IP and STREPs

Control of large-scale systems

- To enable optimal operation of large-scale dynamic systems through proactive process automation systems applicable across several sectors, going far beyond what current SCADA and DCS/PLC can deliver today.
- Scope : The architectures should facilitate re-use, enable QoS, reduce the reconfiguration effort. Standardisation of monitoring and control systems in industrial environments is encouraged in all projects.

Note: Pro-activeness requires e.g. novel predictive models for higher performance and fault adaptation and recovery.

Instruments: One IP and STREPs

ICT-2009.3.5 d) **International cooperation**

- Facilitation and promotion of cooperation with the Western Balkan Countries, U.S.A and India (separately) with mutual benefits.

Instruments : CSAs



Expected Impact of proposed R&D

On top of (one of) a, b, c, d !

- Strengthened competitiveness of the industry supplying monitoring and control systems through next generation process automation products that are superior in terms of functionality, accuracy, dynamic range, autonomy, reliability and resilience.
- Higher energy efficiency and reduction of waste and of resource use in manufacturing and processing plants; **improved ease-of-use and simplified operation and maintenance of monitoring and control systems, also for non-experts**; and more effective management systems for natural resources and the environment.
- Reinforced European inter-disciplinary excellence in control and systems engineering and associated **modelling and simulation tools** as well as in **real-time computing, communications, wireless sensor (and actuator) networks and cooperating objects**.



Summary of Instruments and Budget

a) Foundations of complex systems engineering: One NoE and STREPs

← (4 Mi)

b) Wireless Sensor Nets and Cooperating Objects: One IP and STREPs

c) Control of large-scale systems : One IP and STREPs

d) Int. cooperation: CSAs (1Mi)

Total 32 M€: at least 27 M€ are for IPs + STREPs



More Information

FP7

<http://ec.europa.eu/fp7/ict>

Embedded Systems and Control

- Networked Embedded and Control Systems

<http://cordis.europa.eu/fp7/ict/necs>

- Ongoing FP7 projects

ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/necs/booklet-necs_en.pdf

Contacts

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