
Research on Embedded Systems in IST : current status and future prospects

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Outline

- Introduction
 - Embedded Systems in the IST FP6
 - ARTEMIS platform
 - Joint Technology Initiatives
 - Prospects for FP7
 - Outlook
-

Knowledge is key to the Lisbon agenda

7th R&D Framework Programme:

- Collaborative R&D
- Person-driven research
- Technology Platforms
- Mobility



EU: Largest knowledge-based economy by 2010 ?

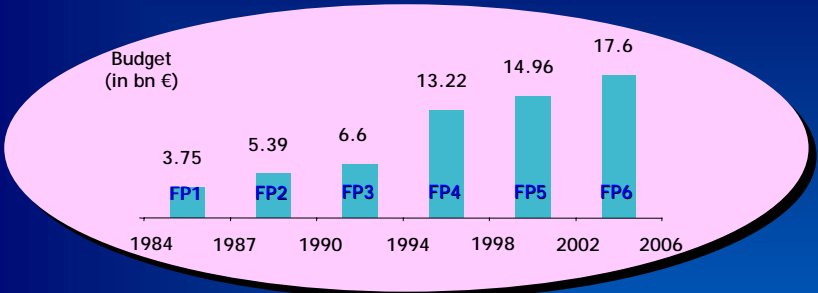


- Single European information space
- Investment in ICT
- Inclusion, better public services, quality of life

Education & Training:

- Lifelong learning
- Modernising universities
- Bologna process
- Entrepreneurship

More than 20 years of Framework Programs



Year	Budget (in bn €)	Program
1984	3.75	FP1
1987	5.39	FP2
1990	6.6	FP3
1994	13.22	FP4
1998	14.96	FP5
2002	17.6	FP6

EU activities require:

- Collaboration & cross-disciplinarity
- Consensus & partnership

FP evolution in last 20 years:

growing, but only 5 % of public R&D spending in Europe

ICT in FP7: Building on Europe's strengths



Mobile communications



Health applications



Consumer goods



Airplanes



Cars

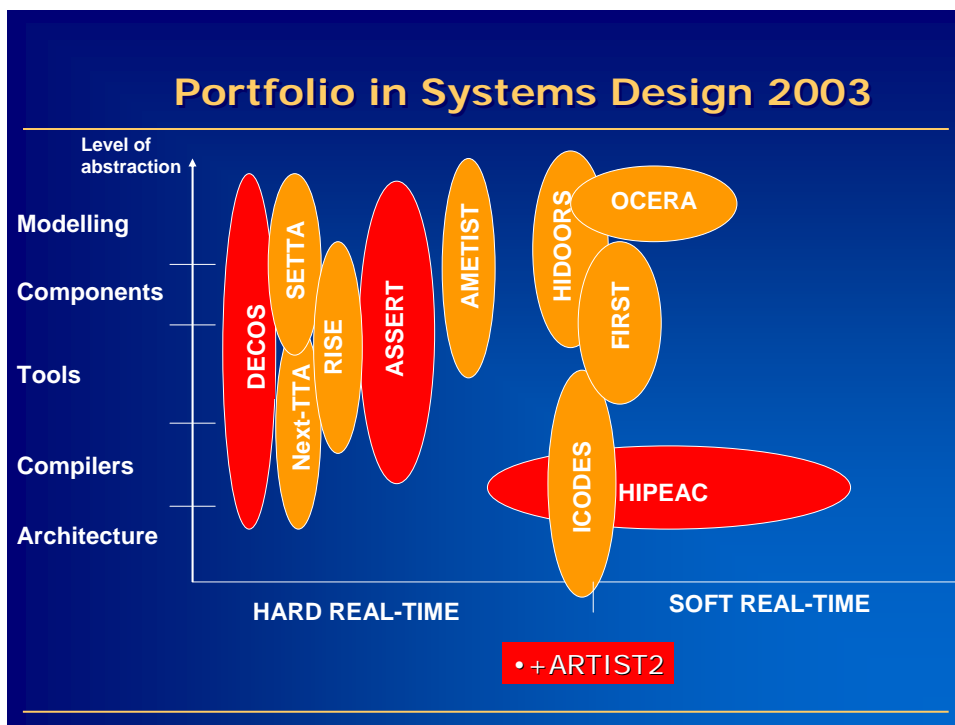
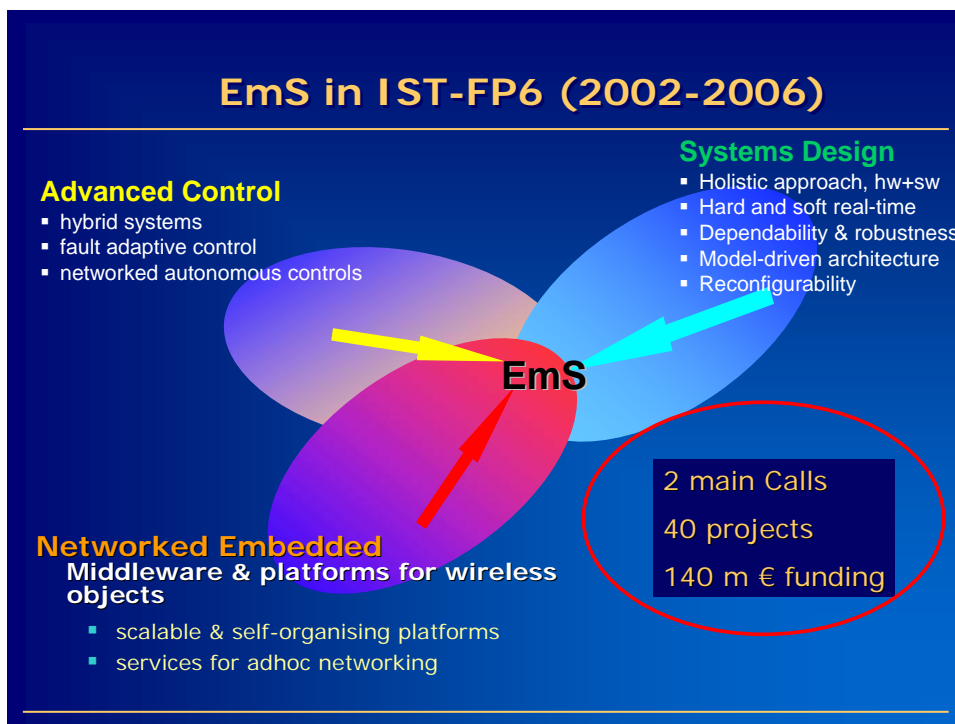


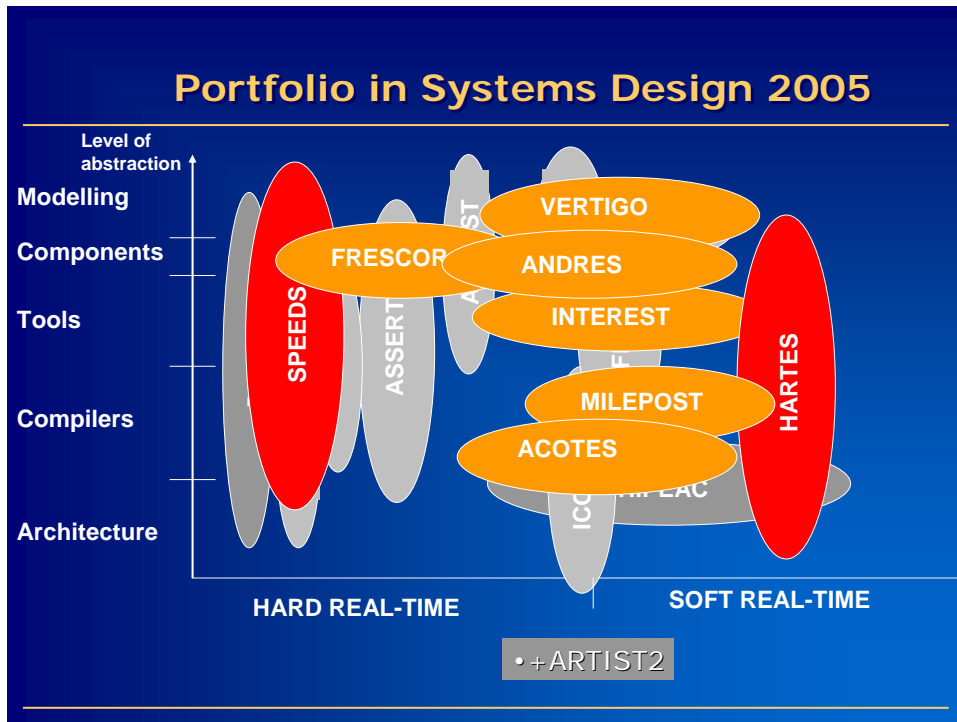
Manufacturing

- **Industrial & technological leadership in key ICT fields**
 - Telecoms, embedded IT, nanoelectronics, microsystems, rich optoelectronics, audio-visual content etc.
- **Expertise in handling complexity**
 - Transform "complex technologies" into reliable products
 - Infrastructures: energy, telecoms, transport
 - Complex devices: mobile, home
- **Strengths in many markets**
 - Automotive, aerospace, machinery, pharmaceuticals, automation, ...
- **Experience in partnering & collaboration**
 - Pan-European partnerships & consensus-building

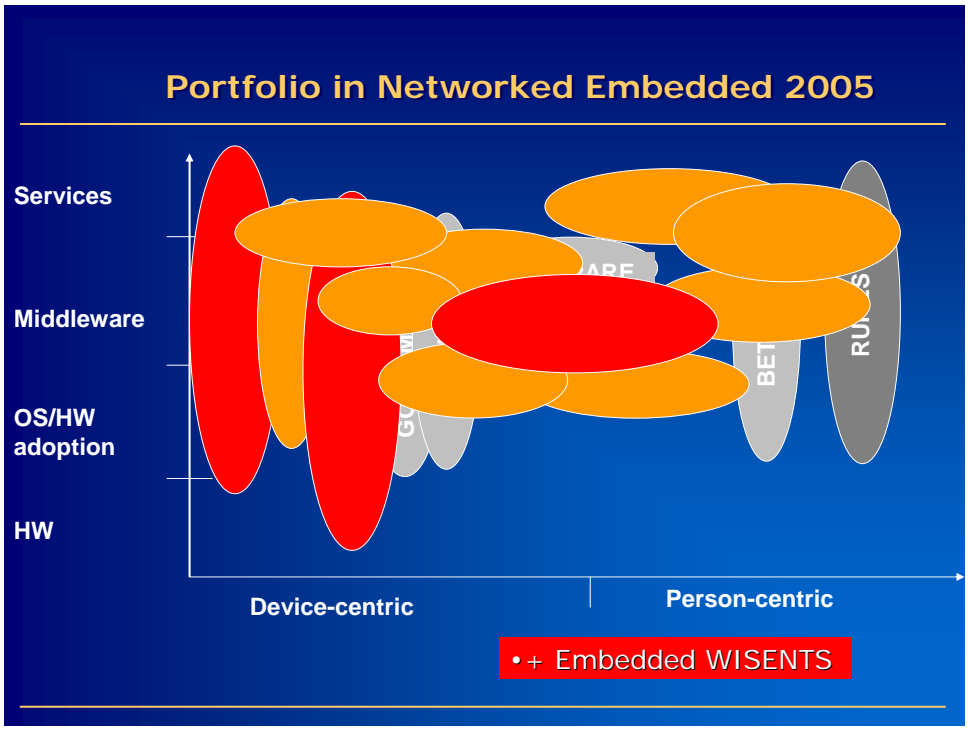
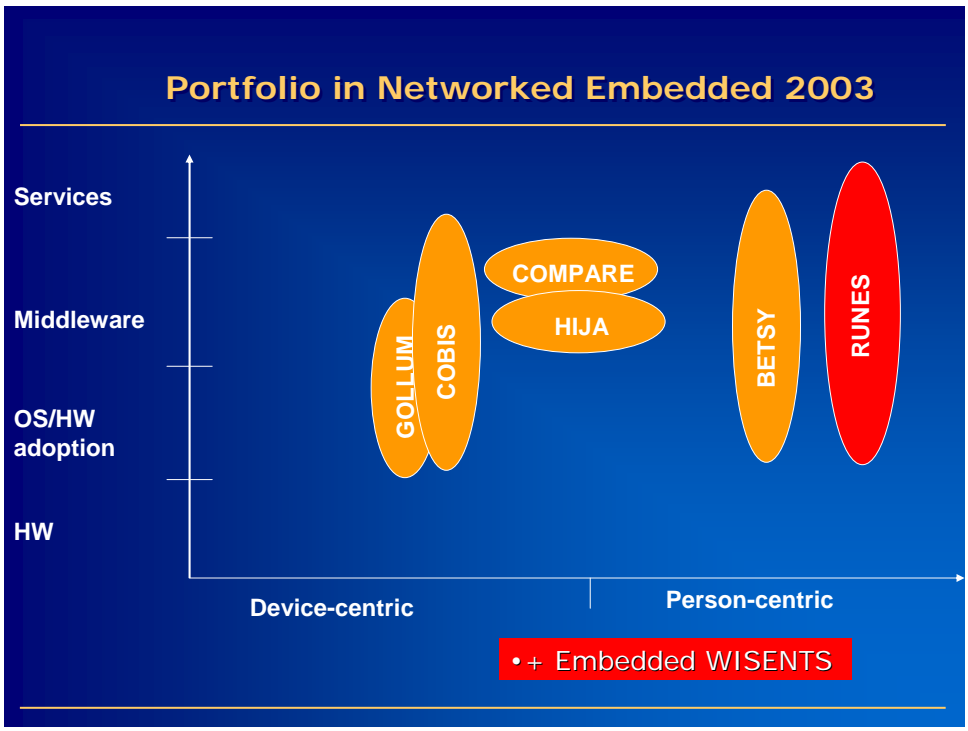
Outline

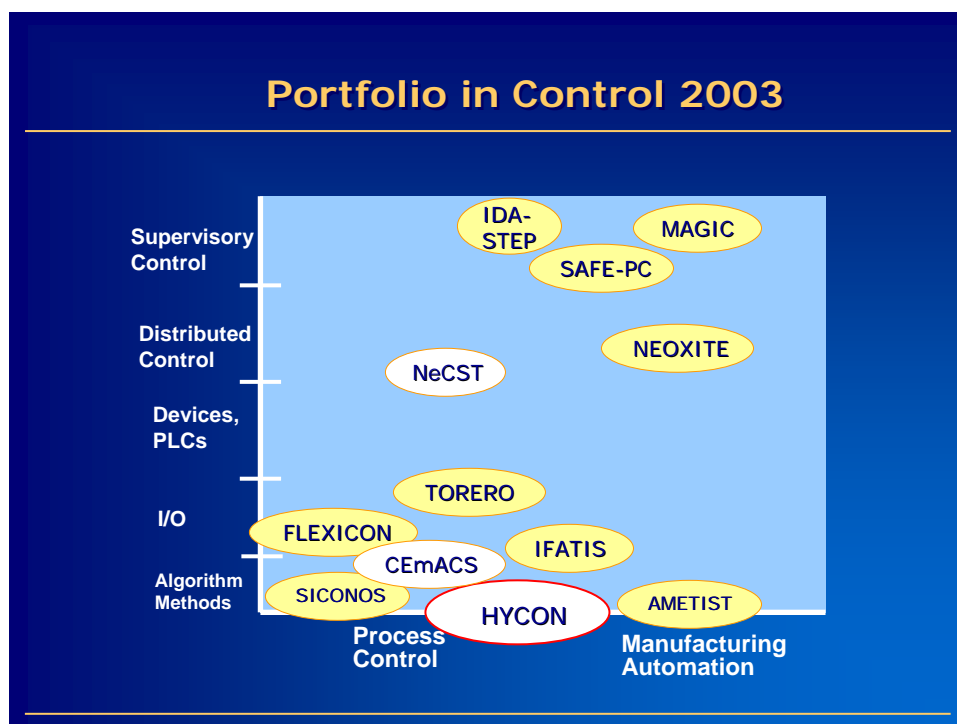
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- ### Portfolio in Networked EmS
- #### Examples of topics
- Service-Oriented Computing in industrial and home automation
 - Middleware platforms for heterogeneous devices
 - Automotive middleware
 - Platforms for embedded peer-to-peer systems
 - Coordination of unmanned aerial and underwater vehicles
 - End-to-end system architecture for wireless sensor networks
 - Self-organising platforms for wireless sensor networks
 - civil security, healthcare and other applications





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The Artemis Technology Platform

Advanced research and technology in embedded intelligence and systems

Aim and scope

- Develop and drive joint European vision on Embedded Systems
 - R&D and educational challenges
 - structural challenges: IPR, open source, standards, infrastructure,...
- Align fragmented R&D efforts along common strategic agenda at Community, intergovernmental and national levels

ARTEMIS Steering Board includes 10 of the top-25 EU companies in terms of global R&D



ARTEMIS Objective

- World leadership in intelligent electronic systems
 - embedded everywhere



ARTEMIS Vision: "... An ongoing, major evolution of our society in which all systems, machines and objects will become digital, communicating and self-managed"

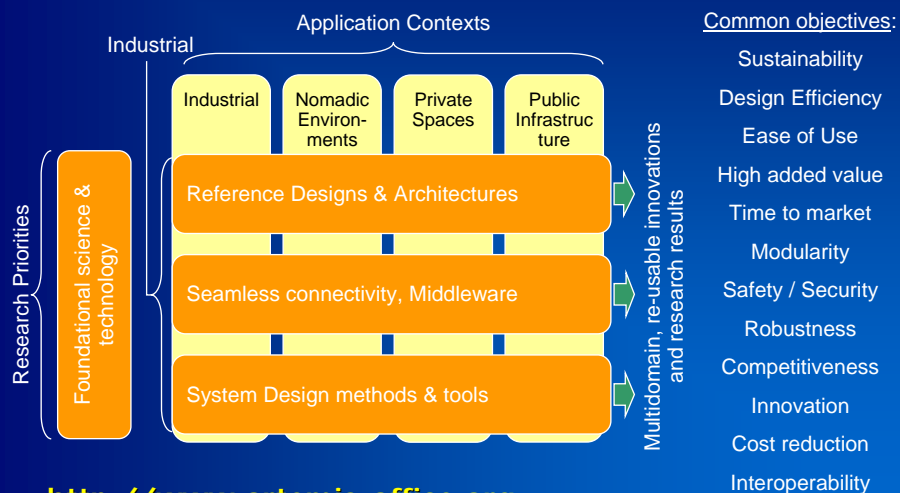
ARTEMIS SRA - Application Contexts

Focus research on technologies with high re-usability

- **Identified four, strategically significant "Application Contexts":**
 - **Industrial systems**
 - Automotive: "Frugal, safe car"
 - Aerospace: "Customisable, efficient, safe air transport "
 - Manufacturing & process Industries: "Efficient, flexible manufacturing"
 - **Private spaces:** "Efficiency, safety and pleasure in the home"
 - Includes Medical sector
 - **Nomadic Environments:** "Walk, Talk, Hear, See"
 - **Public Infrastructure:** "Secure and dependable environment"

ARTEMIS SRA Structure

- ARTEMIS approach cuts barriers between application sectors, stimulating creativity and yielding multi-domain, re-usable results



- <http://www.artemis-office.org>

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PPP

JTIs – motivation and benefits

- **Bringing together fragmented efforts, building critical mass (ERA)**
 - Combine, for the first time, national, EC and private funding in a single R&D programme that focuses on joint objectives (SRA)
- **Combining the strengths of trans-national (EUPE) and European programmes – while overcoming their weaknesses**
 - No budget uncertainty (e.g. complete funding)
 - No duplication of evaluation/monitoring procedures in Europe
 - Shorter time-to-contract
 - No additional red tape for participants

OUTSIDE FP7

This could pioneer new ways for running industrial R&D programmes in Europe !

Proposed Joint Technology Initiatives in IST

To implement parts of the Strategic Research Agendas of **ENIAC** and **ARTEMIS**, aligning fragmented R&D efforts at European level in the fields:

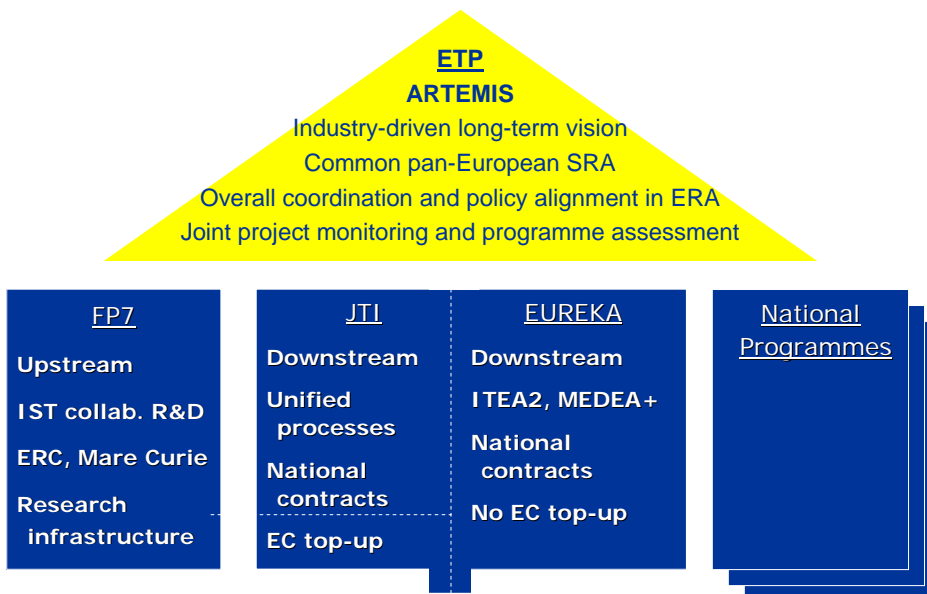
Nanoelectronics:
addressing the needs of silicon-based technologies & beyond

- shrinking of CMOS logic & memory devices
- development of value-added functions for System-on-Chip or System-in-Package solutions
- equipment & materials
- design automation

Embedded Computing Systems: ubiquitous, interoperable & cost-effective embedded systems

- reference designs and architectures
- middleware for interoperability and seamless connectivity
- integrated design software tools for rapid development & prototyping

Synergetic approach for executing SRA

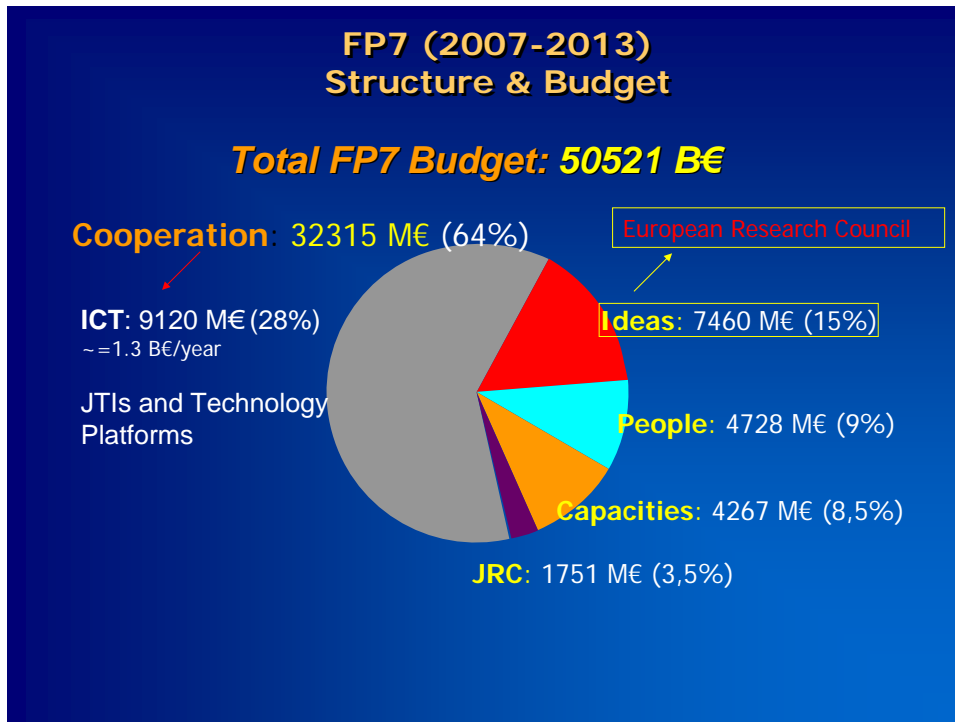


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FP7 Specific Programmes Preliminary budget agreement, Graz, May 2006

<p style="text-align: center;">"Cooperation" Collaborative R&D, pre-defined themes, JTIs</p>	<p>€ 32.315 bn (65 %)</p>	<p>€ 50.521 bn</p>
<p style="text-align: center;">"Ideas" Frontier research, individual grants</p>	<p>€ 7.46 bn (15 %)</p>	
<p style="text-align: center;">"People" Human potential, mobility</p>	<p>€ 4.728 bn (9 %)</p>	
<p style="text-align: center;">"Capacities" Infrastructure, SMEs, science and society</p>	<p>€ 4.267 bn (8 %)</p>	
<p style="text-align: center;">Joint Research Centre (non-nuclear)</p>	<p>€ 1.751 bn (3 %)</p>	
+		
<p style="text-align: center;">EURATOM EURATOM Programme</p>	<p>€ 2.751 bn € 1.31 bn</p>	<p style="text-align: center;">Total € 54.582 bn 2007-2013</p>



- ### Implementation of ICT in the "Cooperation" part
-
- **Continuity of instruments**
 - Collaborative projects;
 - Networks of Excellence;
 - Coordination/support actions

 - **+ New schemes**
 - Joint Technology Initiatives
 - Coordination (ERA-NET; ERA-NET+; Article 169)

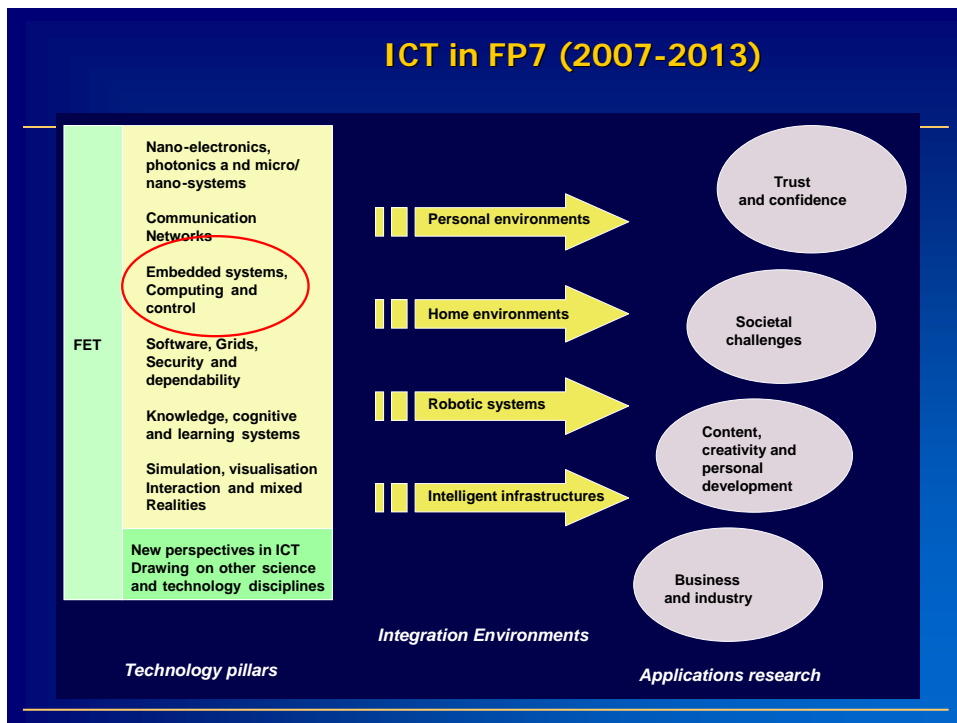
 - **Simplification, a high priority**
-

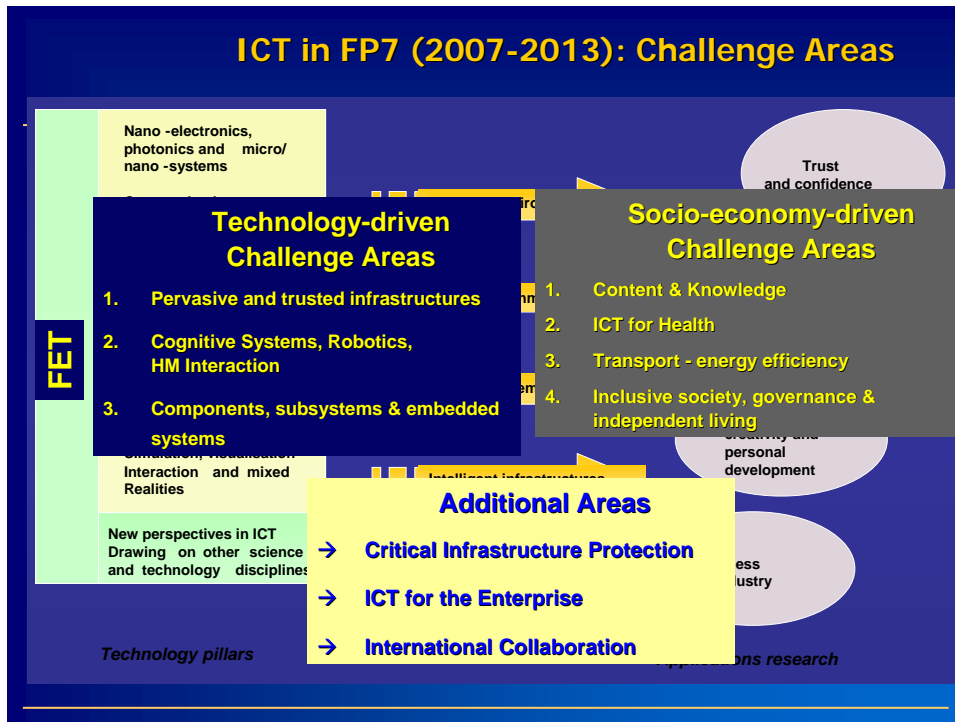
ICT: Main Themes

- **ICT Technology Pillars**
 - pushing the limits of performance, usability, dependability, cost-efficiency
- **Integration of Technologies**
 - integrating multi-technology sets that underlie new functionalities, services and applications
- **Applications Research**
 - providing the knowledge and the means to develop a wide range of ICT-based services and applications

- **ROADMAP:**
 - WP publication in **October 2006**
 - Launch of first Call in **November 2006**

Future Emerging Technol.





- ### EmS in FP7: Likely challenges
- (from SRA and consultations)
- **Design of modular, composable, predictable systems**
 - Obtain orders of magnitude increase in productivity
 - Resource and context-aware systems
 - **Cooperating Objects: Spontaneous, scalable, robust and secure**
 - From node-centric to data-centric
 - Open middleware platforms, SW-HW, wireless sensor networks and middleware for seamless interconnectivity
 - **Novel versatile computing architectures**
 - Extreme flexible architectures: power, performance, lifecycles
 - heterogeneous, communication-centric, reconfigurable, programmable, resource-aware, secure platforms
 - **Next-generation control of large-scale distributed infrastructures**
 - From SCADA to NEC (networked embedded control)
 - Efficiency, robustness and security

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Embedded Systems in FP7

Strategy

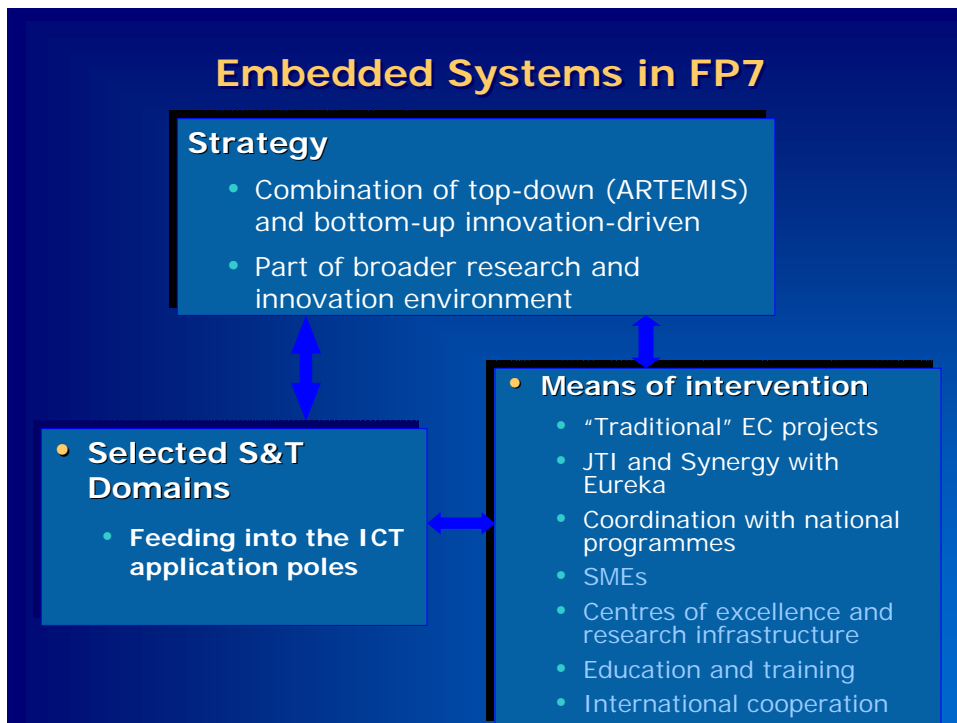
- Combination of top-down (ARTEMIS) and bottom-up innovation-driven
- Part of broader research and innovation environment

Selected S&T Domains

- Feeding into the ICT application poles

Means of intervention

- "Traditional" EC projects
- JTI and Synergy with Eureka
- Coordination with national programmes
- SMEs
- Centres of excellence and research infrastructure
- Education and training
- International cooperation



JTI vs. FP

- **Upstream vs. downstream**
 - Industrial vs. foundational R&D
 - Inquiry-driven, targeted proactive and targeted reactive foundational research
 - Industrial vs. academic participation
 - Funding rates (50-75% in FP)
- **Who would participate**
 - FP: all MAS; JTI: mainly countries committing budget

ICT-FP7: State of Play

Annual Work programmes under FP7

- **Orientations, objectives and structure**
- **Budgets and mechanisms within each priority research topic**
- Drafting first Work Programme texts **End JUL**
- **Consolidation & improvement**
- Opinion by IST-C and adoption by the Commission **End OCT**
- First Calls for proposals **DEC or JAN**

ICT 2006 in Helsinki



ist 2006 event Helsinki
21-23 November 2006

- Conference*
- Exhibition*
- Networking & workshops*

ec.europa.eu/information_society/istevent/2006

Thank you

European research on the web:

- <http://ec.europa.eu/fp7>
- http://ec.europa.eu/information_society/istevent/2006/
- FP7 Specific programme:**
- <http://ec.europa.eu/comm/research/future/>

Embedded Systems:

- <http://cordis.europa.eu/ist/embedded>

ARTEMIS Technology Platform:

- <http://www.artemis-office.org>

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