Embedded Systems in the 6th Framework Programme

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DG INFSO - European Commission

Research Policy: gaining momentum

European Research Area
FP6, Eureka, COST, national R&D programmes

... towards a ‘single market for research’

"EU: Largest knowledge-based economy by 2010"

... towards an Information Society for all
Broadband access, e-business, e-government, security, skills, e-health, ...

Barcelona, June 2002: increase EU R&D spending to 3% of GDP

Lisbon Strategy 2010
FP6 is Not Business as Usual!

- A policy tool and catalyst
  - $25+1 = ?$
  - not just a funding machine
- More “strategic” thinking
  - New instruments, focused objectives
  - Technology platforms
- Strong focus on International Co-operation
  - 285 M€ in Priority Areas, 315 M€ for specific activities, additional funding under Human Resources & Mobility
- Overhaul of R&D management

FP6 Indicative Breakdown of Amounts

- Focussing and Integrating
  - Genomics 2255 M€
  - Information Society Technologies 3625 M€ → ~100 M€ for GEANT/GRID
  - Nanotechnologies, int. 1300 M€
  - Aeronautics and space 1075 M€
  - Food quality and safety 685 M€
  - Sustainable development 2120 M€
  - Citizens and governance 225 M€
  - Anticipation of S&T needs
    - Anticipating needs 555 M€
    - SMEs 430 M€
    - Specific INCO 315 M€

- Strengthening ERA foundations 320 M€
- Structuring ERA
  - Research and Innovation 290 M€
  - Human resources 1580 M€
  - Research Infrastructures 655 M€ → ~200 M€ for GEANT/GRID
  - Science/Society 80 M€
- Joint Research Centre 760 M€

16270 M€
WP 2003-4 : the Approach

• A two year WP to ensure concentration of effort and visibility
• More limited number of calls (three over two years)
• Concentration on a limited set of ‘Strategic Objectives’
  – 23 Strategic Objectives for the two years
    • 12 in 2003, 11 in 2004 (one of which in common with Priority 3)
• Instruments
  – ~2/3 of budget targeted to new instruments
  – for each Objective: ~4 to 6 IP/NoEs and some STREPS,
• Indications of effort expected to be devoted to each Strategic Objective
IST Work programme 2003-2004

Preparation for post-CMOS
- Micro & nano systems
- Broadband access for all
- Mobile & wireless systems beyond 3G
- Towards a global dependability & security framework
- Multimodal interfaces
- Semantic-based knowledge systems

Advanced displays
- Optical, opto-electronic & photonic functional components
- Open development platforms for software & services
- Cognitive systems
- Embedded systems

Networked AV systems & home platforms
- Applications & services for the mobile user & worker
- Cross-media content for leisure & entertainment
- GRID-based systems for solving complex problems
- Improving risk management
- eInclusion
- Research Networking test-beds

FET Proactive Initiatives
- Networked businesses & governments
- eSafety of road & air transports
- eLearning & access to cultural heritage
- eHealth

Products and Services engineering 2010
- Cognitive systems
- Embedded systems
- Applications & services for the mobile user & worker
- Cross-media content for leisure & entertainment
- GRID-based systems for solving complex problems
- Improving risk management
- eInclusion
- Research Networking test-beds

Call 1
- Networked AV systems
- eSafety of road & air transports
- eHealth

General Accompanying Measures
- Research Networking test-beds

FET-Open
- Continuous Call

WP 2003-4: Budget and Call Planning

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
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<tbody>
<tr>
<td>Indicative</td>
<td>835 M Euro</td>
<td>891 M Euro</td>
<td>935 M Euro</td>
<td>964 M Euro</td>
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<td>Budget Calls</td>
<td>Calls 1 &amp; 2 drawing on 2003 and 2004 budgets</td>
<td>Call 3</td>
<td>TBD</td>
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WP 2003-4

WP 2005-6
WP 2003-4: Budget and Call Planning

- Call 1 open 17/12/2002, deadline 24/04/2003
- Call 2 open 17/06/2003, deadline 15/10
- Call 3 open ?, deadline ? ‘04

- Joint call with priority 3 on ‘products and services engineering in 2010: still open for CA, SSA with deadline 16/09 ‘03
- FET Open scheme: open 17/12/2002 for continuous submissions until 31/12/2004

<table>
<thead>
<tr>
<th>Call 2</th>
<th></th>
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<tbody>
<tr>
<td><strong>1- Strategic Objectives</strong></td>
<td><strong>Budget</strong></td>
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<tr>
<td>Advanced displays</td>
<td>• 25</td>
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<tr>
<td>Optical, opto-electronic, photonic functional components</td>
<td>• 45</td>
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<tr>
<td>Embedded systems</td>
<td>• 50</td>
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<tr>
<td>Open development platforms for software and services</td>
<td>• 55</td>
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<td>Cognitive systems</td>
<td>• 25</td>
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<td>Applications and Services for the Mobile User and worker</td>
<td>• 60</td>
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<tr>
<td>Cross-media content for leisure and entertainment</td>
<td>• 55</td>
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<tr>
<td>GRID-based Systems and solving complex problems</td>
<td>• 45</td>
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<tr>
<td>Improving Risk management</td>
<td>• 30</td>
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<td>eInclusion</td>
<td>• 30</td>
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<td><strong>2- Research Networking</strong></td>
<td></td>
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<tr>
<td>Research Networking test beds</td>
<td>• 25</td>
</tr>
<tr>
<td><strong>3- General accompanying actions</strong></td>
<td>8</td>
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</table>
IST in FP6

- Trust & Confidence
- IST for societal challenges
- IST for economic challenges
- Demanding applications

Applied IST for major societal and economic challenges

Anywhere anytime natural and enjoyable access to IST services for ALL

Embedded Systems

- Pervasive, mobile, wireless, trustful infrastructures
- Miniaturised, low cost - low power components & µsystems
- Natural interactions with 'knowledge'

Building blocks
- Communic. & networking
- Software
- µ, nano, opto electronics
- µ & nano systems
- Knowledge technologies
- Interfaces

Embedded Systems - what they are

- **Embedded HW/SW systems**
  - ...and systems of systems
  - resource constrained
- **Reactive to their environment**
  - "real-world" systems
  - control, perception and cognition
- **Computationally intensive**

Connecting the physical to the virtual world
Trends & challenges

- **Miniaturisation**
  - size, cost, power reduction

- **Anywhere - anything connectivity**
  - 8 bn microcontrollers, 600 m DSPs,...

- **Convergence**
  - the most diverse technologies in the same system
  - added value shifting from hw to sw

- **Consumerisation**
  - shorter life-cycles vs. long life-times

  **complexity!**
  - to design, to test, to maintain, to use…

  in consumer electronics, automotive, avionics, telecoms, process industry, manufacturing automation,...

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Embedded Systems - technology challenges

Closing the productivity gap

- Holistic design, high-level models, languages and tools
  - hw, sw and the environment
  - high-level perception & control
- Composability & scalability
- Dependability
- QoS reasoning (e.g. trade off cost vs. quality)
- Multidisciplinarity: hw, sw, control and networks

Challenging research domains such as:

- unified computation and interaction model
  - resource constraints, trust, failure, location
- trust and security
  - systems correct by construction; reliability; safety; privacy
- adaptation, coordination, self-configuration of networked ES
  - physical embeddedness is the challenge
Embedded systems in IST: future directions

- Ambient intelligence & embedded systems
- ERA & the new instruments
  - Technology platforms
- Two key areas (very tentative):
  - Embedded system design
  - “Cooperating objects”
    - What long term objectives? Who should be involved? How to organise the activities? How to leverage funding? Are the players committed?
- Be one step ahead

Embedded Systems - relation to other areas

- eSafety of road and air
- Home platforms
- Open development platforms
- CMOS and post CMOS
- Micro and nano systems
- Embedded Systems
- Security Framework
- FET - DC
- Systems
- Applications
- Building Blocks
Advanced Control

Networked Embedded

Systems Design

3 Thematic Topics:
- 1) Networked Embedded Systems
- 2) Embedded System Design
- 3) Advanced controls

1. - Networked Embedded Systems

• Middleware and platforms
  - hiding the underlying complexity
  - providing efficient distribution of resources at low cost

• Focus on:
  - middleware for small wireless devices
  - scalable and self-organizing platforms
    • adhoc networking of very small devices
    • mastering complexity....

➢ Work is expected to crystallise around Integrated Projects
➢ STREPs could explore emerging technologies
2. - System Design

- Design concepts, methods and tools, development of warrantable SW components and system integration
- Emphasis on:
  - handling of complex real-time constraints
  - design of ultra-stable and dependable systems

- Work is expected to crystallise around integrated projects
- STREPs could explore emerging technologies

3. - Advanced Control

- Advanced controls for real-time systems with emphasis on hybrid systems
- Advanced controls for networked embedded systems with emphasis on networked autonomous and fault adaptive control and management

- Work is expected to crystallize around networks of excellence
- Relevant parts could be integrated in the two previous areas
Observations on Call 1

At first sight:

- No obvious gaps in coverage of priorities
- Balance between new and traditional instruments
- Significant concentration of effort
- No surprises in participation balance; good SME participation
- Good participation of organisations from associated candidate countries
- Oversubscription depending on area