Embedded Systems in the 6th Framework Programme

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Research Policy: gaining momentum

Lisbon Strategy 2010

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, …

eEurope

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

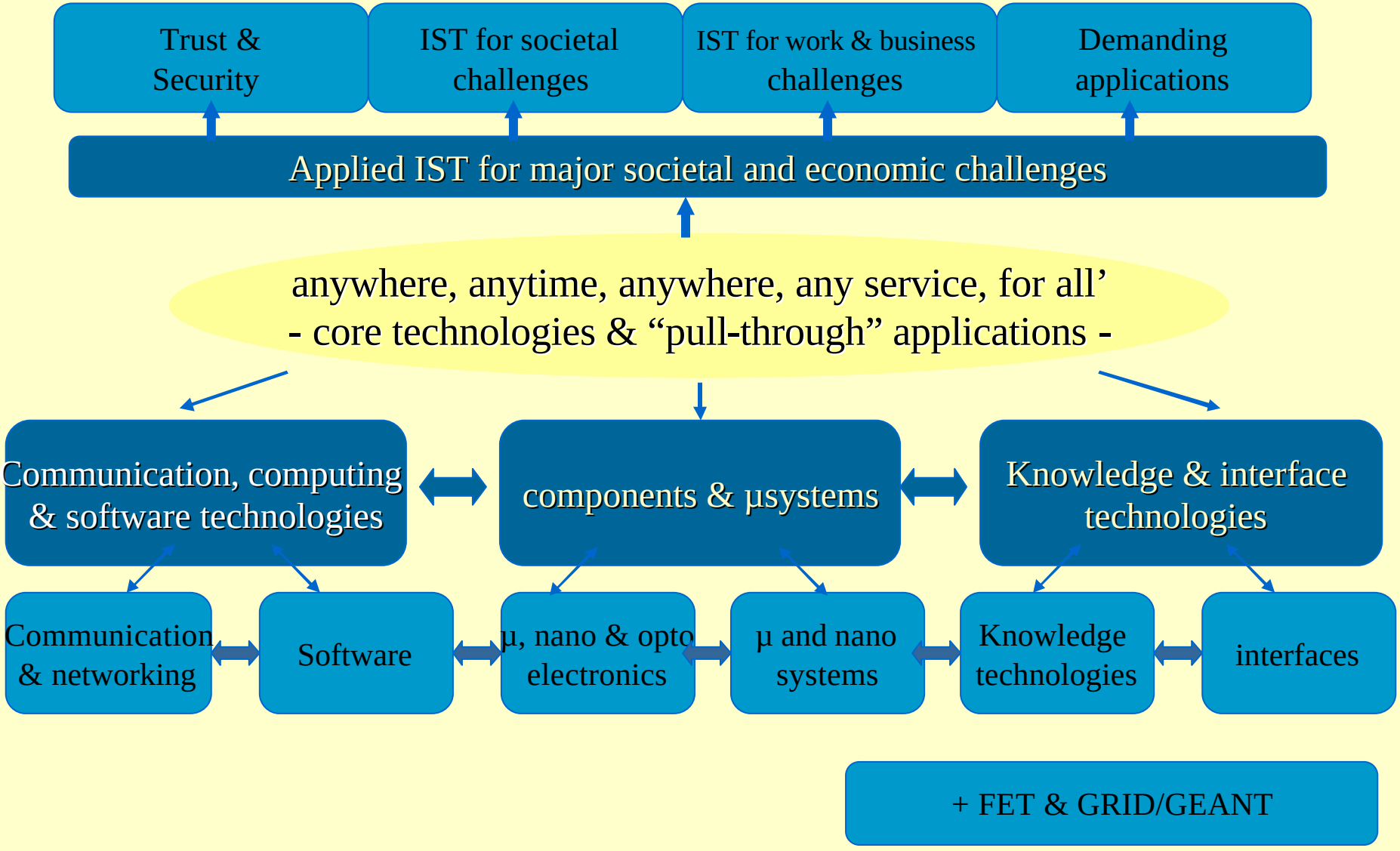
FP6 is Not Business as Usual!

- 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€**	→ **~100M€ 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€**	→ **~200M€ for GEANT/GRID**
– Science/Society	80 M€	
• Joint Research Centre	760M€	
	16270 M€	

IST in FP6 : Research Priorities



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 Workprogramme 2003-2004

Preparing 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

Call 1

Networked AV systems & home platforms

Networked businesses & governments

eSafety of road & air transports

eLearning & access to cultural heritage

eHealth

Products and Services engineering 2010

FET Proactive Initiatives

General Accompanying Measures

Advanced displays

Optical, opto-electronic & photonic functional components

Open development platforms for software & services

Cognitive systems

Embedded systems

Call 2

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

General Accompanying Measures

FET-Open

Continuous Call

WP 2003-4: Budget and Call Planning

Year	2003	2004	2005	2006
Indicative Budget	835 M Euro	891 M Euro	935 M Euro	964 M Euro
Calls	Calls 1 & 2 drawing on 2003 and 2004 budgets	Call 3 drawing on 2005 budget	TBD	TBD

WP 2003-4 **WP 2005-6**

WP 2003-4: Budget and Call Planning

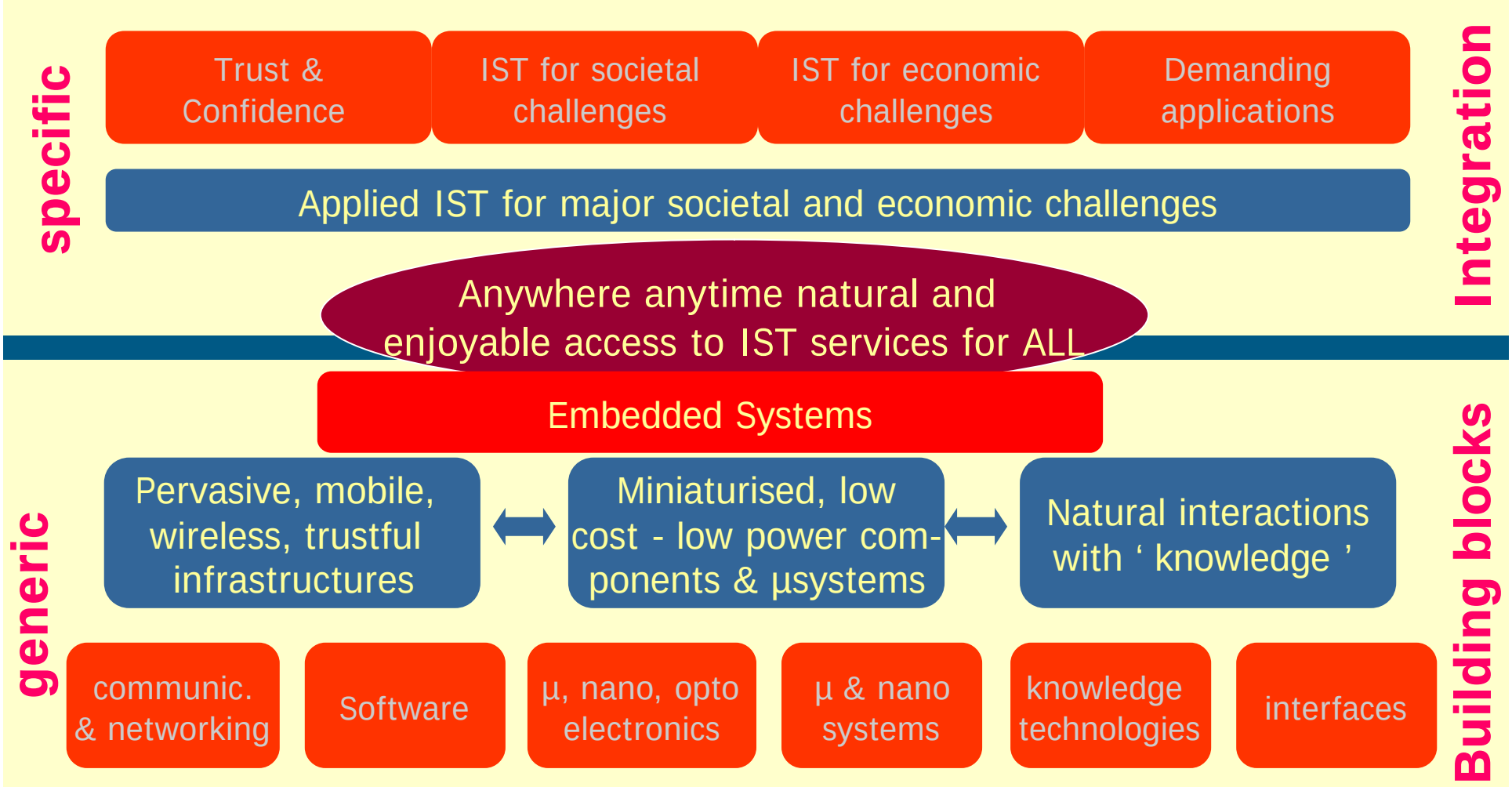
- Call 1 open 17/12/2002, deadline 24/04/2003
- Call 2 open 17/06/2003, deadline 15/10
- Call 3 open ?, deadline ? ‘04

- 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

Call 2

1- Strategic Objectives	***Budget***
Advanced displays	**25**
Optical, opto-electronic, photonic functional components	**45**
Embedded systems	**50**
Open development platforms for software and services	**55**
Cognitive systems	**25**
Applications and Services for the Mobile User and worker	**60**
Cross-media content for leisure and entertainment	**55**
GRID-based Systems and solving complex problems	**45**
Improving Risk management	**30**
eInclusion	**30**
2- Research Networking	
Research Networking test beds	***25***
3- General accompanying actions	**8**

IST in FP6


specific
Integration
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
generic
Building blocks
Pervasive, mobile, wireless, trustful infrastructures
Miniaturised, low cost - low power com-ponents & µsystems
Natural interactions with ' knowledge '
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,...

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

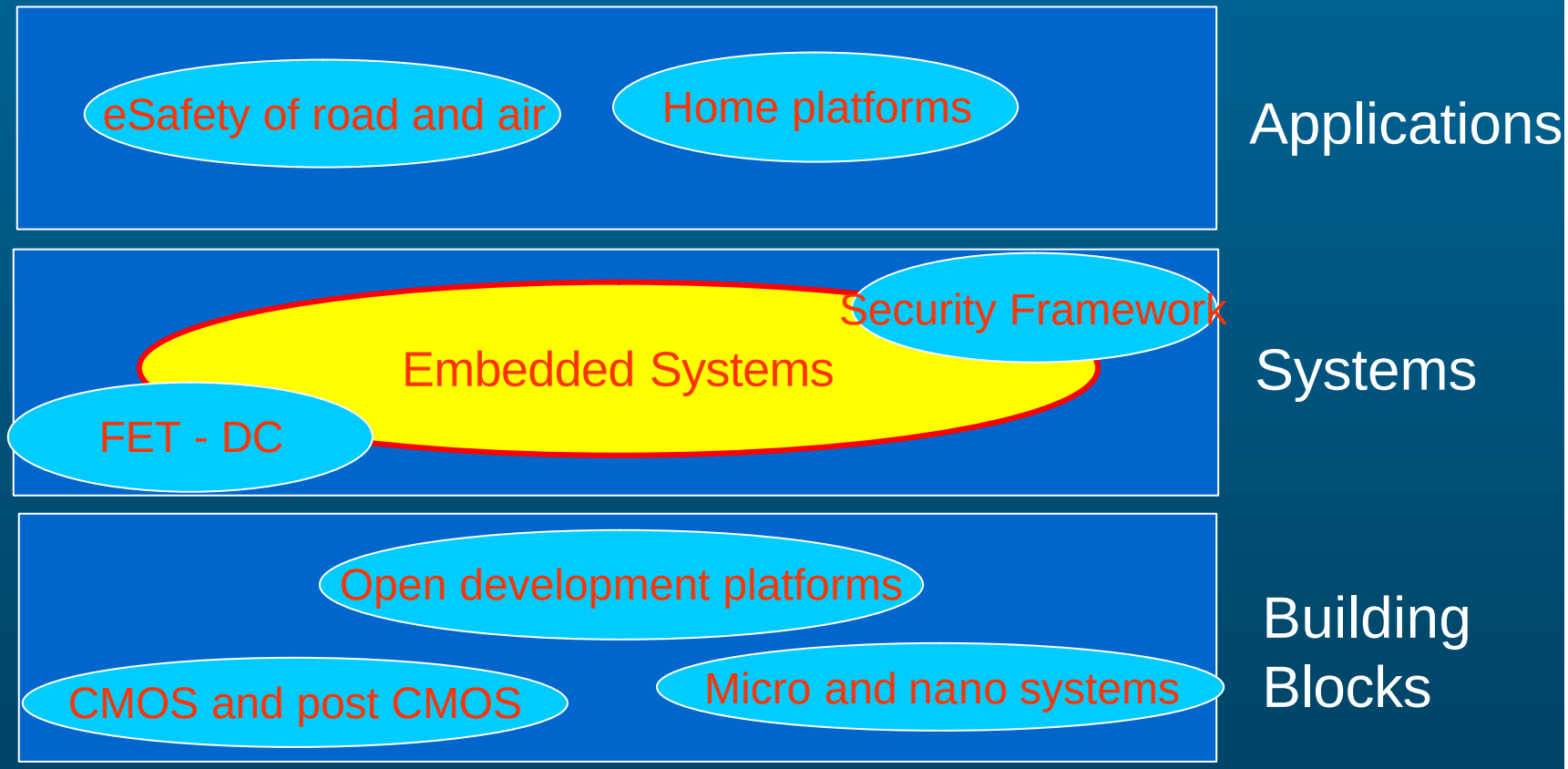
Challenging research domains such as:

- 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

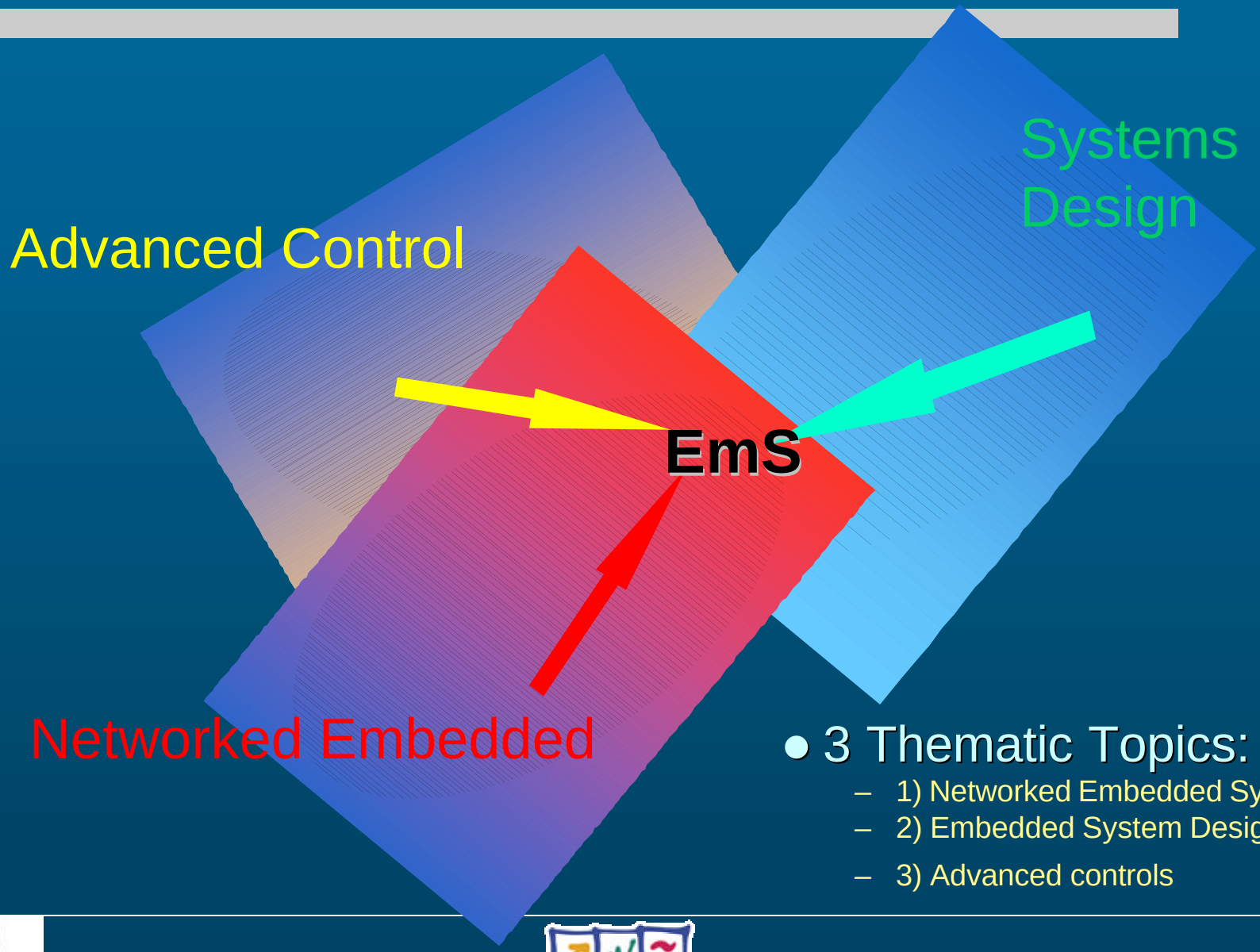
Embedded systems in IST: future directions

- 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



Embedded Systems in the 2nd IST Call



- 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