Challenge 3 - Components, systems, engineering in FP7 Call 4

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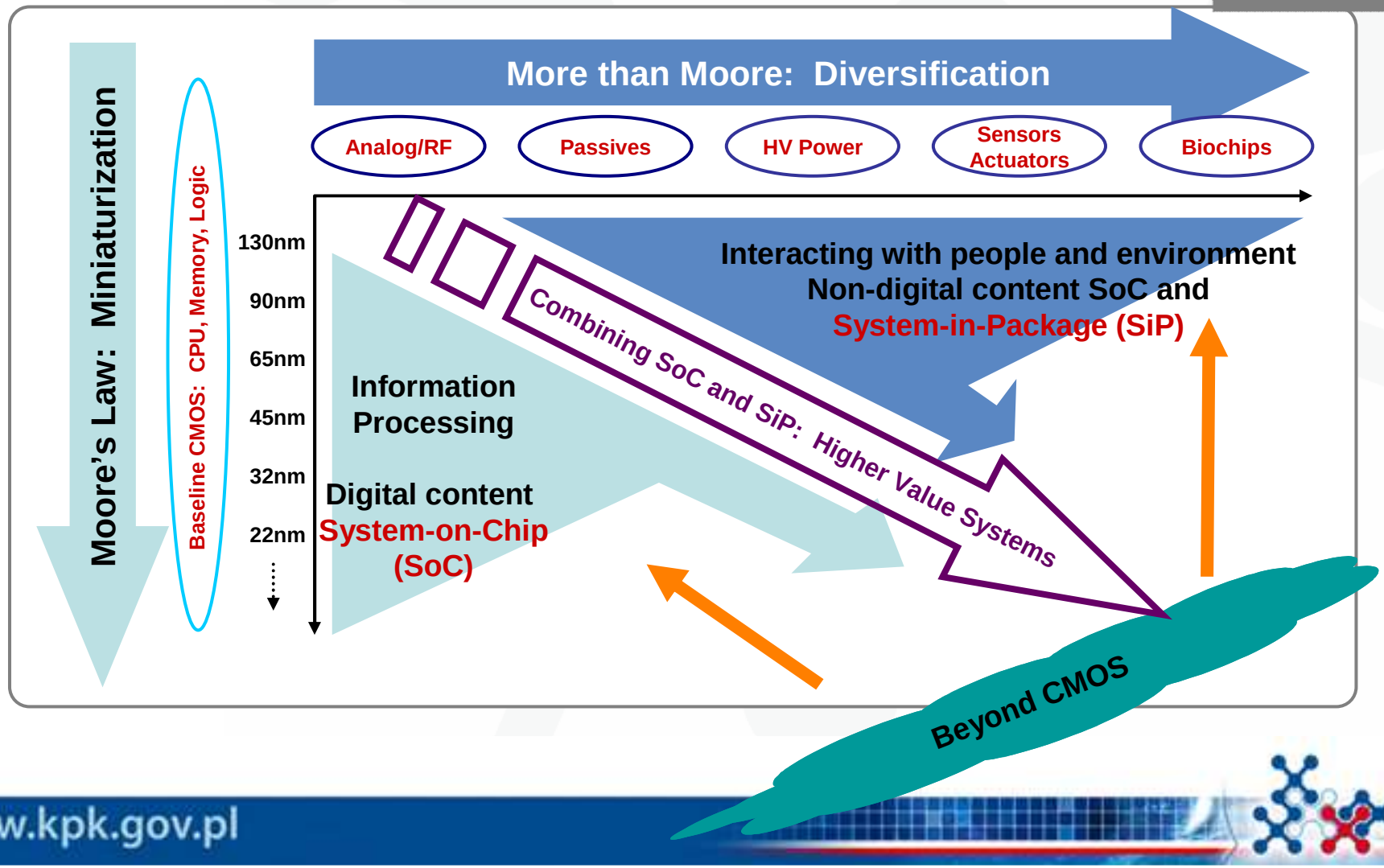
Presentation Agenda

1. ICT-2009.3.1 - Design of Semiconductor Components & Electronic-based Miniaturised Systems
2. ICT-2009.3.3 - Flexible, Organic & Large Area Electronics,
3. ICT-2009.3.4 - Embedded Systems Design
4. ICT-2009.3.6 - Computing Systems.
5. ICT-2009.3.8 - Organic photonics and other disruptive photonics technologies

Design of Semiconductor Components & Electronic-based Miniaturised Systems

European Roadmap for Nanoelectronics (background):



Design of Semiconductor Components & Electronic-based Miniaturised Systems

- ✓ Budget: **25 M€**
- ✓ Funding schemes:
  - **STREPs** and at least one **IP (21,5 M€)**
    - (Improved design platforms, interfaces, methods and tools)
  - **CSA (3,5 M€)** - (support measures)
- ✓ Contact: Antonis.Galetsas@ec.europa.eu
- ✓ Information Society and Media:

  http://ec.europa.eu/information_society

  http://cordis.europa.eu/fp7/ict/nanoelectronics/mission_en.html
- ✓ European research on the web:

  http://cordis.europa.eu

  http://www.eniac.eu

Design of Semiconductor Components & Electronic-based Miniaturised Systems

Rationale (1/2):

- ✓ **Existing Design Methods cannot keep pace with the new technology generations which result in:**
  - **Decreased component reliability & expected lifetime,**
  - **Increased process variability, EMC effects & power dissipation problems.**
- ✓ **Existing Design Methods cannot keep pace with the ever increasing component/system complexity which results in:**
  - **Increased design costs and time to market,**
  - **Requirements for Heterogeneous integration and architectural innovation,**
  - **Increased power consumption,**
  - **Difficult system testing and verification,**
  - **Decreased system reliability.**

Design of Semiconductor Components & Electronic-based Miniaturised Systems

Rationale (2/2):

- ✓ **New Design Methods are needed to address the challenges:**
  - **Address the whole design process in an integrated way, from system architecture to component/system manufacturing and testing,**
  - **Integrate in the design process, H/W & S/W, reliability, EMC, thermal effects, heterogeneous components,**
  - **Design reliable complex systems / chips containing 100 Billions of unreliable and variable devices,**
  - **Handle packaging requirements and innovative architectures,**
  - **Improve modelling and verifications at all levels.**

Design of Semiconductor Components & Electronic-based Miniaturised Systems

Objectives (1/2):

- ✓ **a) Improved design platforms, interfaces, methods and tools:**
  - Energy efficiency, thermal effect aware design,
  - Integration of heterogeneous functions,
  - Methods for reuse of IP blocks, test and verification,
  - Moving application boundary between HW/SW to fit performance needs,
  - Design platforms and interfaces for mixed/new technologies,
  - Design of reliable circuits with less reliable devices,
  - Reliability aware design including EMR/EMC requirements,
  - Design for manufacturability considering the variability of new processes,
  - Better modelling at all design levels,
  - Standardisation including interoperability aspects.

Design of Semiconductor Components & Electronic-based Miniaturised Systems

Objectives (2/2):

- ✓ **b) Support Measures:**
  - Bringing research results outside the consortia,
  - Setting up of networked centres of excellence and a design infrastructure to validate R&D results & IP Blocks,
  - Stimulation of International Cooperation.

Design of Semiconductor Components & Electronic-based Miniaturised Systems

Expected Impact:

- ✓ **Increased efficiency in product design with reduced costs & time to market,**
- ✓ **Design of innovative, reliable architectures and devices with new functionalities,**
- ✓ **Maintaining European lead in innovation & design for major application fields,**

Next Topic

1. ICT-2009.3.1 - Design of Semiconductor Components & Electronic-based Miniaturised Systems
2. **ICT-2009.3.3 - Flexible, Organic & Large Area Electronics, (FOLAE)**
3. ICT-2009.3.4 - Embedded Systems Design
4. ICT-2009.3.6 - Computing Systems.
5. ICT-2009.3.8 - Organic photonics and other disruptive photonics technologies

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

SEVENTH FRAMEWORK PROGRAMME

SIXTH FRAMEWORK PROGRAMME

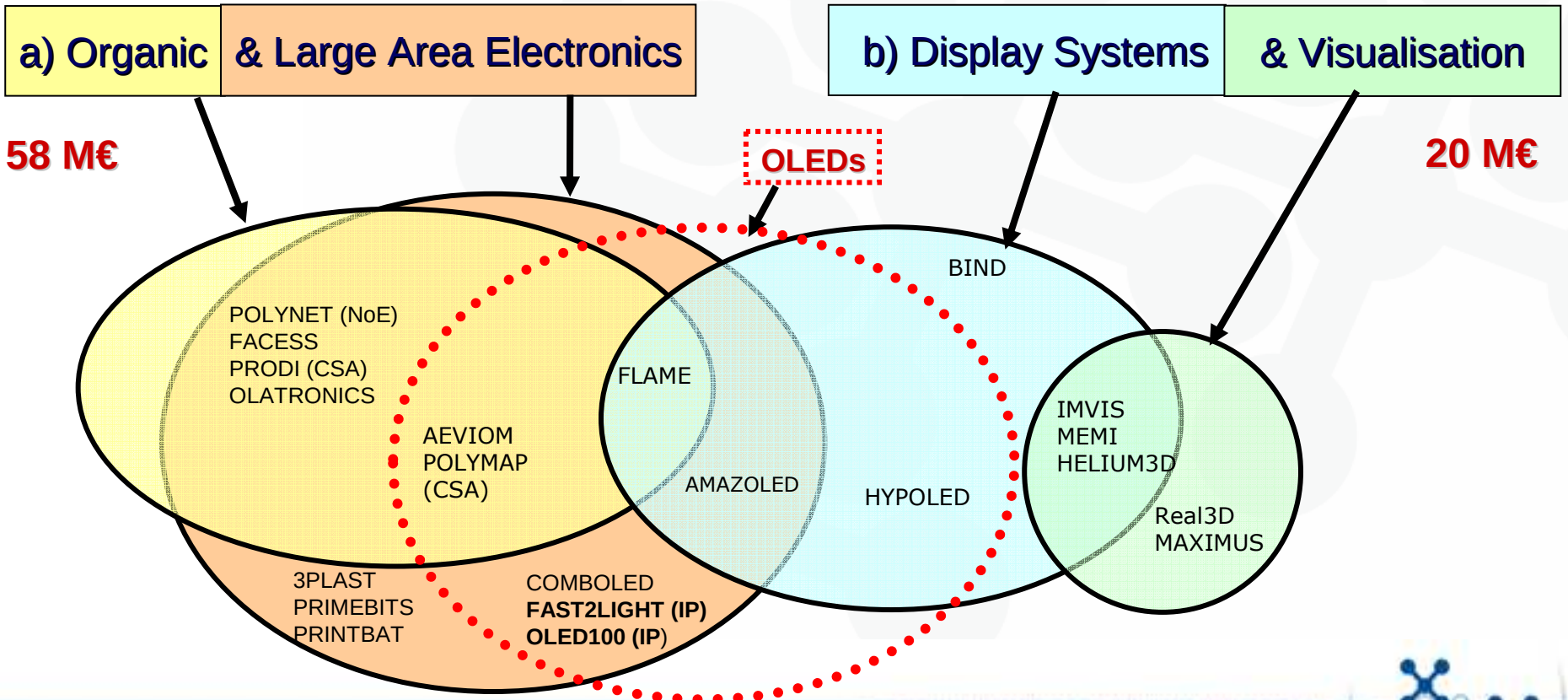
A bit of history:

- ✓ **In FP6 FOLAE was covered by 3 Specific Programmes:**
  - Information Society Technologies (IST),
  - Nanosciences, Technologies, Materials and New Production Technologies (NMP),
  - Sustainable development, global change and ecosystems (SUSTDEV).
- ✓ **Overall more than 100 M€ were invested in FOLAE during FP6**
- ✓ **17 projects were funded, covering a set of complementary activities ranging from research on materials or technologies and systems development to manufacturing processes**

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

- ✓ **In FP7 focus on large area electronics and OLEDs for flexible displays & lighting/signage:**



Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Rationale:

- ✓ **Substantial efforts have been launched in OLEDs, printing, encapsulation, heterogenous integration, community and R&D structuring activities.**

- ✓ **Call 4 is a unique opportunity to gather momentum, but:**
  - More effort are needed on pure electronic functionalities like logic, memory, RF, and compatible energy storage. Not yet covered: Power Transistors, CMOS, Bipolar. New process-tolerant device concepts are needed,
  - Thin film transistor performance is limited by materials and minimum feature size. To break the performance brickwall, consolidated R&D efforts in the EU among material scientists, device makers and process engineers are required ,
  - The distinction between organic/inorganic becoms irrelevant (except for OLEDs). What matters is efficient large-area in-line processes like solution and low temperature processing on flexible substrates implementing the best combinations.

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Objectives (1/3):

- ✓ **(a) Devices and building blocks:**
  - **Device concepts / manufacturing**,
    - Materials / Devices (organics/inorganics)
    - Large-area in-line processes, manufacturing
    - New architectures, tolerant design
  - **Building blocks / solid-state integration**,
    - D&A circuits,
    - CMOS
    - Power converters
    - Energy scavengers
    - Energy storage
    - Memories
    - Sensors
    - Active RF
    - Visual interface

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Objectives (2/3):

- ✓ **(b) Flexible or foil-based systems:**
  - **Integration in foils / heterogenous integration**,
    - Flexible / Stretchable substrates, textile,
    - Interconnects with discrete devices, functional foil lamination
  - **systems applications**,
    - e-paper, e-card
    - OLED/PV based systems
    - Signage
    - Chemical/physical/bio sensors
    - Energy storage
    - Transparent electronics

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Objectives (3/3):

✓ (c) Networks of Excellence:

- Structuring and integrating of the research capacities
- Training and education
- Coordination of R&D,
- Link between R&D institutions' activities and Industrial needs
- Standardisation.

✓ (d) Support measures:

- Promoting international collaboration
- Coordination of national, regional and EU-wide R&D programmes
- Access to prototyping and design competences
- Training and education for SMEs

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

- ✓ Budget: **60 M€**
- ✓ Funding schemes:
  - **IP** or **STREPs** – **54 M€** for:
    a) Devices and building blocks
    b) Flexible or foil-based systems
  - **NoE** – **4 M€** for: c) Networks of Excellence
  - **CSA** – **1,5 M€** for: d) Support measures
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  raquel.lopez-lozano@ec.europa.eu
  pedro.pires@ec.europa.eu

Flexible, Organic & Large Area Electronics

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Other useful links:

- ✓ **European research on the web:**
  http://cordis.europa.eu/fp7/home_en.html
  http://ec.europa.eu/comm/research/future/

- ✓ **Information Society and Media:**
  http://cordis.europa.eu/fp7/ict/programme/home_en.html

- ✓ **Directorate G:**
  http://cordis.europa.eu/fp7/ict/programme/challenge3_en.html

- ✓ **Challenge ICT-2007.3.2:**
  Organic and large-area electronics, visualisation & display systems :
  http://cordis.europa.eu/fp7/ict/organic-elec-visual-display/home_en.html

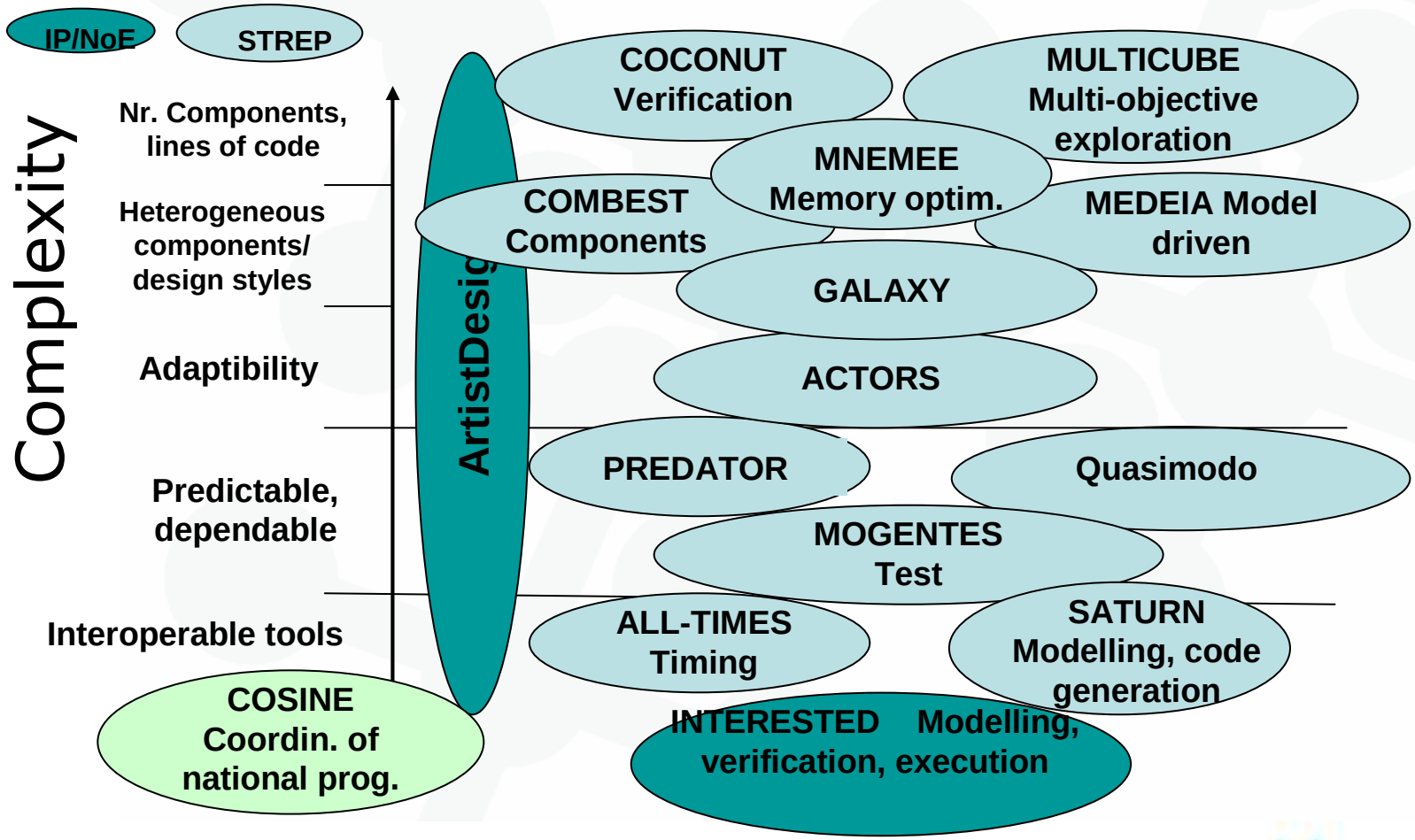
Next Topic

1. ICT-2009.3.1 - Design of Semiconductor Components & Electronic-based Miniaturised Systems
2. ICT-2009.3.3 - Flexible, Organic & Large Area Electronics,
3. **ICT-2009.3.4 - Embedded Systems Design**
4. ICT-2009.3.6 - Computing Systems.
5. ICT-2009.3.8 - Organic photonics and other disruptive photonics technologies

Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Embedded Systems projects (from FP7 ICT call 1) :



Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Objectives (1/2):

- ✓ **(a) Theory and novel methods for embedded system design:**
  - **Methods and tools that can increase system development productivity while achieving dependable, safe and secure embedded systems with predictable properties**,
    - Key issues are heterogeneity, predictability, methods for robustness validation and adaptability,
    - Unification of approaches from computer science, electronic engineering and control is encouraged
    - International cooperation should address foundational research and provide mutual benefits

Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Objectives (2/2):

- ✓ **(b) Modules and tools for embedded platform-based design:**
  - **Integrated design environment that can be extended and customised:**
    - Flexibility to support different applications,
    - Increased interoperability of tools primarily from SME vendors,
    - Open facilitating new industry players, support standards, easily import existing components and/or handle upgrades
  - **Key issues include:**
    - efficient resource management,
    - tools supporting design space exploration and,
    - model-driven development

- ✓ **(c) Coordination of national, regional and EU-wide R&D strategies:**
  - **Initiatives:**
    - to advance the European Research Area and ,
    - to align research agendas in the field of embedded systems.

Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Expected Impact:

- ✓ **Significantly increased productivity of embedded systems development,**
- ✓ **Improved competitiveness of European companies by reducing costs and time to market,**
- ✓ **Emergence and growth of new design tool vendors and high-tech companies (in particular SMEs),**
- ✓ **Reinforced European scientific and technological leadership in the design of complex embedded systems**

Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

- ✓ Budget: **28 M€**
- ✓ Funding schemes:
  - **STREPs** and 1 **IP** only – **27,25 M€** for:
    a) Theory and novel methods for embedded system design
    b) Modules and tools for embedded platform-based design
  - **CSA** – **0,75 M€** for:
    c) Coordination of national, regional and EU-wide R&D strategies
- ✓ Contact: philippe.reynaert@ec.europa.eu

Embedded Systems Design

ICT-2009.3.4, Challenge 3 in FP7 Call 4

Other useful links:

- ✓ **Embedded Systems:**
  http://cordis.europa.eu/fp7/ict/esd/home_en.html
- ✓ **Information Society and Media:**
  http://cordis.europa.eu/fp7/ict/programme/home_en.html
- ✓ **Embedded Systems Consultation Workshop report of 8 April 2008:**
  http://cordis.europa.eu/fp7/ict/esd/events_en.html
- ✓ **Embedded Systems on 26 Nov 2008 at ICT event in Lyon:**
  http://ec.europa.eu/information_society/events/ict/2008/conference/index_en.htm

Next Topic

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2. ICT-2009.3.3 - Flexible, Organic & Large Area Electronics,
3. ICT-2009.3.4 - Embedded Systems Design
4. **ICT-2009.3.6 - Computing Systems.**
5. ICT-2009.3.8 - Organic photonics and other disruptive photonics technologies

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

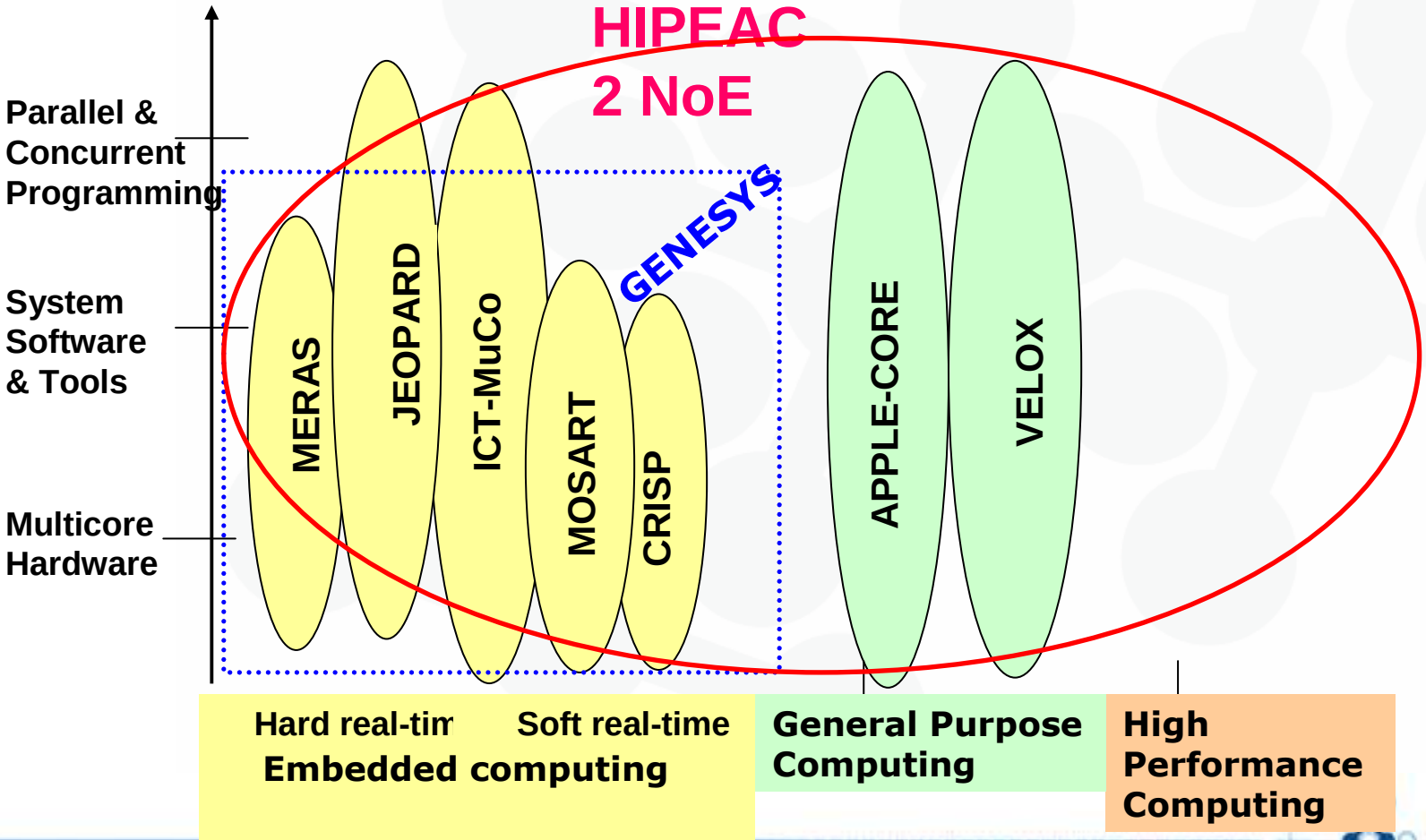
Call objectives base:

- ✓ **Consultation workshops:**
  - 19 November 2007 on Computing Systems,
  - 13 December 2007 on reconfigurable computing
  - 19 December 2007 on high-performance computing
- ✓ **Analysis of Call 1 results,**
- ✓ **HIPEAC roadmap,**
- ✓ **Member states and FP7 associated states consultations.**

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Call 1 results:



Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Objectives (1/4):

✓ (a) Parallelisation & Programmability:

- **Automatic parallelisation, new high-level parallel programming languages and/or extensions to existing languages taking into consideration that user uptake is a crucial issue**,
- Projects on programmability & parallelism of multi-core and/or reconfigurable architectures should adopt a holistic approach addressing issues related to the underlying hardware and to the system software,
- Research areas include:
  - beyond static auto-parallelisation by exploiting dynamic (run-time) information,
  - new support environments including testing, verification and debugging, program & performance monitoring and analysis
  - specific hardware support for parallel programming models

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Objectives (2/4):

- ✓ **(b) Methodologies, techniques and tools:**
  - **Continuous Adaptation: Multicore and/or reconfigurable systems that continuously adapt to a constantly changing environment by going beyond the strict separation between compiler, runtime and hardware,**
  - **Virtualisation technologies that ensure portability, flexibility, optimised use of resources and overcome legacy issues for multicore and/or reconfigurable systems. This includes hardware/software interfaces for efficient virtualisation as well as machine abstractions and performance models for virtualised homogeneous or heterogeneous systems,**
  - **Customisation: Rapid extension and/or configuration of existing systems, architectural templates and tool-chains to optimally address specific application needs and performance/Watt envelopes.**

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Objectives (3/4):

- ✓ **(c) System simulation and analysis:**
  - **System simulation and analysis: Advanced simulation and analysis of complex multicore systems to drastically improve the simulation speed of new complex, homogeneous or heterogeneous, multi-core systems ,**
- ✓ **(d) Technology implications:**
  - **Advanced system architectures, tools and compilers for next-generation semiconductor fabrication technology,**
  - **The key challenge is to bridge architecture, system and technology research efforts,**
  - **Example: 3D stacking**

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Objectives (4/4):

- ✓ **(e) High Performance Computing:**
  - **Coordination of R&D activities and strategies in High-Performance Computing,**
  - **Initiatives to align research agendas and coordinate R&D activities in high performance computing in order to advance the European Research Area; taking into account industrial and academic activities and programmes at regional, national and EU level as well as international supercomputing roadmaps.**

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

- ✓ Budget: **25 M€**
- ✓ Funding schemes:
  - **STREPs – 24,3 M€** for:
    a) Parallelisation & Programmability
    b) Methodologies, techniques and tools
    c) System simulation and analysis
    d) Technology implications
  - **CSAs – 0,75 M€** for:
    e) High Performance Computing
- ✓ Contact: Panagiotis.Tsarchopoulos@ec.europa.eu

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Expected Impact (1/2):

✓ For Target outcomes a), b), c), d):

- Increased performance, power-efficiency and reliability of homogeneous or heterogeneous multi-core and/or reconfigurable on-chip computing systems,
- Accelerated system development and production, enabling new products to be realised with a considerably shorter time-to-market,
- Reinforced European excellence in multi-core and reconfigurable computing architectures, system software and tools,
- Strengthened European leadership in cross-cutting technologies that are applicable to all market segments of computing systems, from embedded to high-performance computing.

Expected Impact (2/2):

✓ For Target outcomes e:

- Contribution to the creation of a European Research Area in High Performance Computing R&D,

Computing Systems

ICT-2009.3.6, Challenge 3 in FP7 Call 4

Other useful links:

- ✓ **Computing Systems Objective:**
  cordis.europa.eu/fp7/ict/computing/home_en.html
- ✓ **Events and Consultation Workshops: :**
  cordis.europa.eu/fp7/ict/computing/events_en.html
- ✓ **ICT2008 Lyon, 25-27 November 2008 :**
  ec.europa.eu/information_society/events/ict/2008/index_en.htm

Next Topic

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2. ICT-2009.3.3 - Flexible, Organic & Large Area Electronics,
3. ICT-2009.3.4 - Embedded Systems Design
4. ICT-2009.3.6 - Computing Systems.
5. **ICT-2009.3.8 - Organic photonics and other disruptive photonics technologies**

Organic photonics and other disruptive photonics technologies - ICT-2009.3.8, Challenge 3 in FP7 Call 4

General Principles:

- ✓ **Fill the gap in the Work Programme,**
- ✓ **Advanced research opening new opportunities,**
- ✓ **Priority given to novel or "breakthrough" approaches rather than incremental developments,**
- ✓ **Driven by application requirements,**

Move proof-of-principle out of the lab and support industrial competitiveness

Why ?:

Supports key EU policies:

- ✓ **Industry:**
  - exploit & reinforce EU's leadership in this field,
  - retain production in EU
  - recover lost terrain
- ✓ **Environment,**
  - environmentally friendly materials & processes
- ✓ **Energy efficiency,**
  - low energy consumption in use & production

Organic photonics and other disruptive photonics technologies - ICT-2009.3.8, Challenge 3 in FP7 Call 4

Objectives (1/2):

✓ a) Organic Photonics:

- includes polymer, CNT, bio, hybrids, ...,
- excludes large-scale manufacturing,
- lighting, illumination, projection, display:
  - OLED, OLEFET, ...,
- OPV for mobile ICT applications:
  - (efficiency >10%, lifetime >5 years)
- light guiding structures:
  - waveguides, POF, integrated circuits, ...
- “active” components
  - lasers, amplifiers, sensors, ...

Objectives (2/2):

- ✓ **b) Disruptive/cutting-edge photonic technologies & materials:**
  - exploiting effects @ limits of light-matter interactionexcludes large-scale manufacturing,
  - nanophotonics:
    - sub-wavelength structures,
    - plasmonics,
    - controlling quantum degrees of freedom,
    - metamaterials,
    - photonic crystals,
    - biological systems

Organic photonics and other disruptive photonics technologies - ICT-2009.3.8, Challenge 3 in FP7 Call 4

- ✓ Budget: **30 M€**
- ✓ Funding schemes:
  - **STREPs** – **25 M€** and **NoE** – **5 M€** for:
    - organic photonics
    - disruptive/cutting-edge photonic technologies & materials
- ✓ Pre-Proposals – until mid-March 2009.
- ✓ Contact: gustav.kalbe@ec.europa.eu

- ✓ International dimension expected (e.g. Australia, Russia, USA)

Other useful links:

- ✓ **FP7 – Photonics:**
  http://cordis.europa.eu/fp7/ict/photonics/home_en.html
- ✓ **Photonics21 Platform:**
  http://www.photonics21.org
- ✓ **EU R&D initiatives, projects, players, ...:**
  http://www.opera2015.org/home.asp

Thank you for your attention

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