

ENIAC

Scientific Community Council

Forging a European Ecosystem



Reference

Paris meeting in March 2006



Rationale for SCC

- ▢ **Council is the representation of Europe's Nanoelectronics Scientific Community in the ENIAC Technology Platform**
- ▢ **SCC is an essential stakeholder in the realization of ENIAC's ambition and objectives**
- ▢ **... hence, a major building block of ENIAC's eco-system**

Mission of SCC

To establish, strengthen and optimize interactions and cooperation between Europe's Scientific Community and industry involved in nanoelectronics

Objectives of SCC

- ▢ Strengthen **interaction, knowledge exchange and transfer** between academia and industry, in order to increase “return-on-investment” of ENIAC undertaking
- ▢ Increase the **activity level** of Europe’s R&D ecosystem for nanoelectronics
- ▢ Provide strategic and operational guidance for **upgrading of education & training systems** and curricula in EU
- ▢ **Build bridges** between ENIAC and R&D initiatives and programs of the national PAs
- ▢ Establish **global coordination and cooperation**

Formation of SC Council

- One “official” scientific community representative from each participating EU (Associated) Member State (total 25-30)
- 2 representatives are invited to each of the 6 SRA Domain Teams (max 12 total)
- 2 representatives in each of the WGs “Organization” and “Research Infrastructures” (max 4 total)
- “Science and Education” is now ETCB (Education & Training Coordination Board): 3 reps from academia (+ 3 ind; 3 ROs)
- 8 representatives from Research Organisations (CNRS, CSEM, FhG, IBM Research, IMEC, LETI, Tyndall (was NMRC), VTT)
- Total number of representatives in Council: range **50 - 55**
- Council meets 1-2 times/year
- Council Chairman is a member of the ENIAC Steering Committee

Responsibilities and tasks of SCC (I)

- ▢ Enhance bi-directional communication:
 - advise the industrial ENIAC stakeholders in the Steering Committee about vital scientific issues
 - inform the scientific community at large about the industrial roadmap and key challenges for nanoelectronics related research
- ▢ Bridge between ENIAC and (inter)national R&D initiatives and programs, by actively engaging in and matching with relevant national policy, strategy and R&D opportunities
- ▢ Strengthen knowledge exchange and transfer between academia and industries, by providing inputs to SRA, cooperating with 7FP related projects, and promoting knowledge valorization towards industry

Responsibilities and tasks of SCC (II)

- ▢ Provide strategic and technical guidance for upgrading of education systems and curricula in EU, based on the industrial and knowledge roadmaps
- ▢ Enhance the activity level of R&D eco-system in Europe for nanoelectronics:
 - Organize conferences, seminars, workshops
 - Promote networking and international contacts
 - Stimulate more students to study subjects related to nanoelectronics
 - Strengthen cooperation within Europe's scientific community
 - Intensify cooperation between academic and industrial partners of ENIAC
- ▢ Participation in 7FP and JTI project proposals

The present state

Executive

▣ Management Team

- Education: Daniel Donoval
- SRA: Mikael Oestling and Adrian Ionescu
- Ecosystem Design: Wolfgang Rosenstiel
- Ecosystem Technology: Clivia Sotomayor
- Programs: Francis Balestra
- Vice chair and Public Authorities: Enrico Sangiorgi
- Chair: Patrick Dewilde

▣ Secretariat: Pien Rijnink rijnink@dimes.tudelft.nl

all in place... now what?

Education (Donoval - ETCB: Maes)

- ▣ Inventory of educational efforts on nE in the EU
- ▣ 'Core' exemplar curricula
- ▣ Connecting with industrial needs/wishes
- ▣ Third cycle efforts, connecting with EU efforts



SRA: Baldi - Oestling & Ionescu

□ Update of ENIAC SRA just went to the printer!

□ New version next year

□ Interactions with Domain Teams:

(Oestling)

Beyond CMOS

More than Moore

Design Automation

(Ionescu)

More Moore

Heterogeneous Integration

Equipment and Materials

Ecosystems



Who invented the term in our context?

What it is not... avoidance of 'unnatural' processes...

What it is...

the close interaction of heterogeneous agents capable of producing a self-sustaining and evolving environment, through mutual satisfaction of needs and provision of supplies

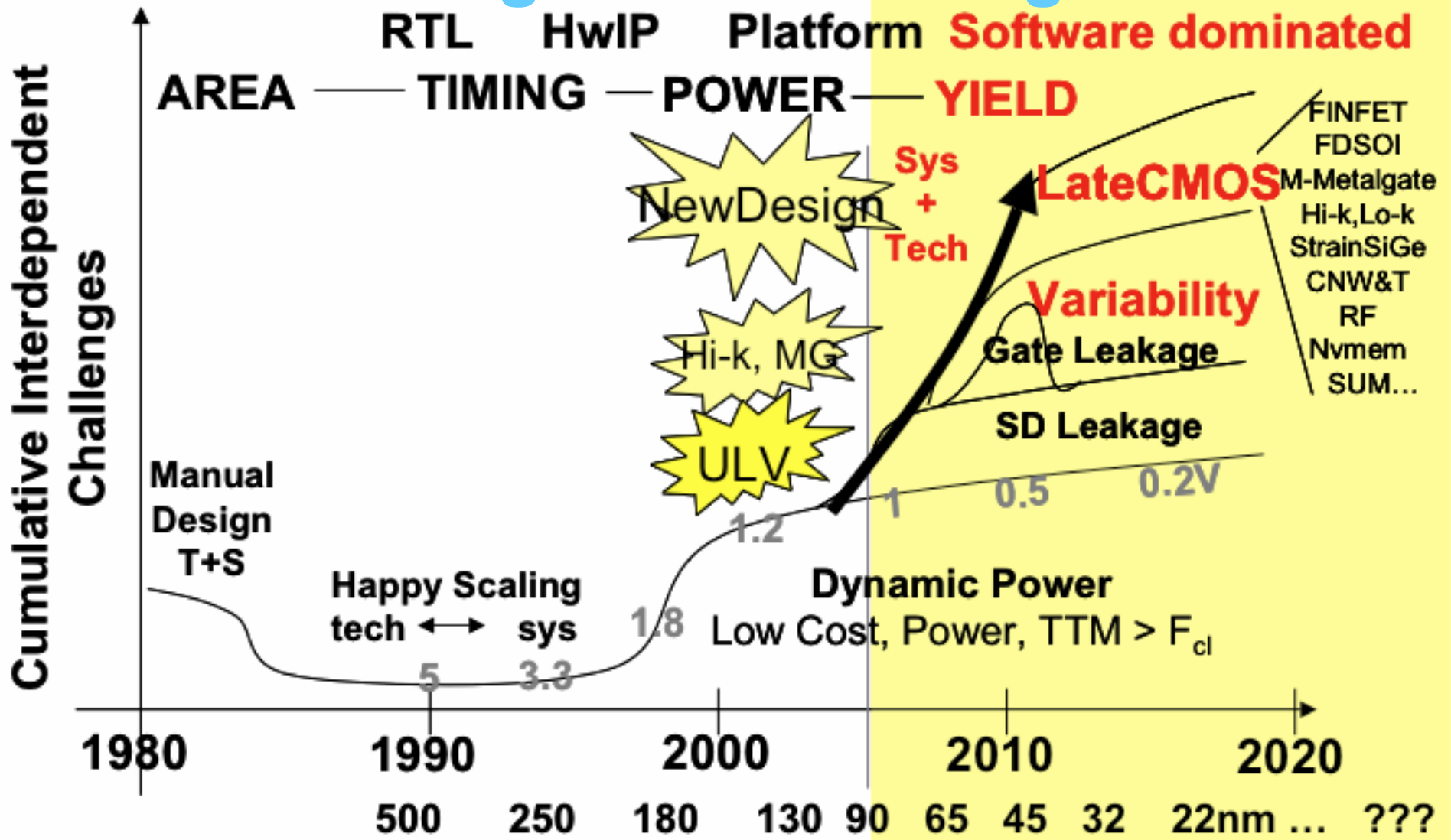
but there is more to it...

- ▣ the present world is characterized by globalization of markets, of science, (to a limited extent of people)
- ▣ the ecosystem cannot be a 'closed' system!
- ▣ it has to contain all the necessary ingredients to insure more than survival: thriving!
- ▣ only by growing and providing more to the outside than it uses will it remain healthy!

Europe's strengths and weaknesses...

- ❑ Largest microelectronic manufacturers are outside Europe
- but they need an inordinate amount of capital
- ❑ The most active technological scene, and the largest efforts are also outside Europe
- ❑ Major inventions, e.g. at the system level are European (GSM, WiFi, Bluetooth) - no lack of creativity!
- ❑ Europe provides a large market full of new opportunities: culture, health
- ❑ Europe can put its intellect to work (more?) effectively

Talking about challenges...



the eco-system as the place where culture meets business

	from	Universities	Industry
to		<ul style="list-style-type: none"> • scientific collaboration • exchange of people 	<ul style="list-style-type: none"> • technological know how • funds (mostly US?) • source of problems (inspiration)
Universities		<ul style="list-style-type: none"> • young people • connection to world's knowledge • innovative ideas • culture as product 	<ul style="list-style-type: none"> • the value chain (ecosystem) • the economic basis
Industry			



Putting tensions to work

- ▣ Concentration vs. dispersion (focused vs. broad)
- ▣ Complexity vs. deep understanding
 - role of the Institutes!
- ▣ Regional vs. global
 - bring the vast potential of Eastern Europe in!
 - collaborate with US and Far East
- ▣ Culture vs. economics
- ▣ Proprietary vs. open source

Ecosystem Design

Wolfgang Rosenstiel



Proposed actions

- ▣ **Special research cluster to bridge the gap from academia to industry**
 - Academia and industry will explore together new design possibilities
 - Prepare innovation for industrial designs in 5-10 years

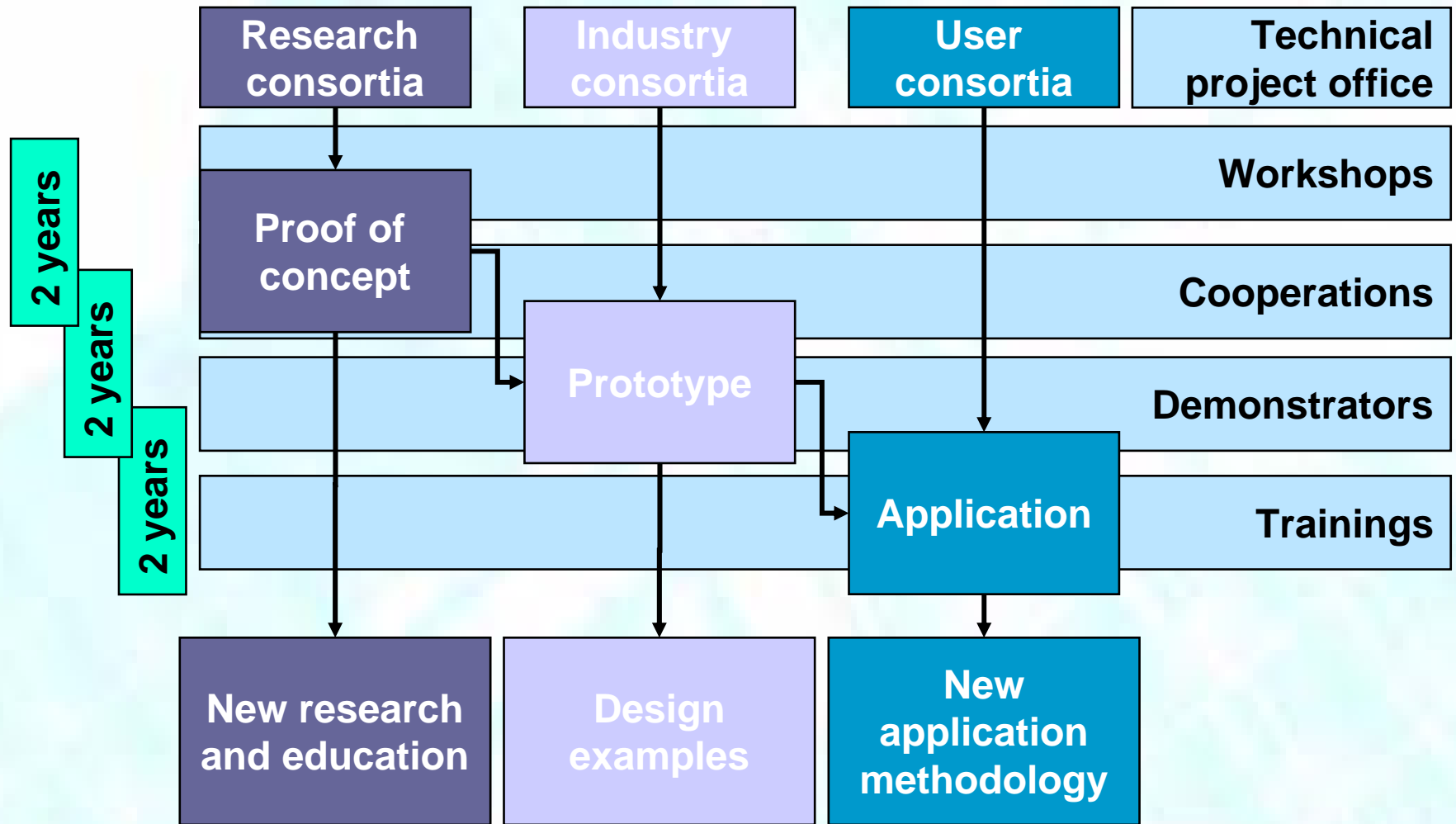
- ▣ **Electronic R&D market place to improve ENIAC knowledge exchange**
 - Web based information platform will collect R&D results
 - Competence profiles of research institutes, experts etc. presented
 - Technology, design and application will be served
 - Using Web 2.0 techniques

- ▣ **An „Innovation Camp“ during conferences and workshops to improve communication between academia and industry**
 - New information platforms will improve the communication during existing design events
 - Academia and industry will meet all experts of the nanoelectronic “IC food chain” from technology to application

Special research projects

- Special projects with 3 R&D phases
 - Phase 1: Development of a “proof of concept” in a research cluster in cooperation with industry via domain teams
 - Phase 2: Transformation of academic results into a “prototype environment”
 - Phase 3: Application of the prototypes for “industrial demonstrators” via the domain teams
- After each phase the project can be aligned
 - To application needs
 - To R&D results
- Technical project office coordinates the project
 - Coordinates the academic research cluster
 - Strengthen the cooperation in the project
 - Support the dissemination of the results of each partner
 - Keeps contact to other research teams

Project phases and networking within the project



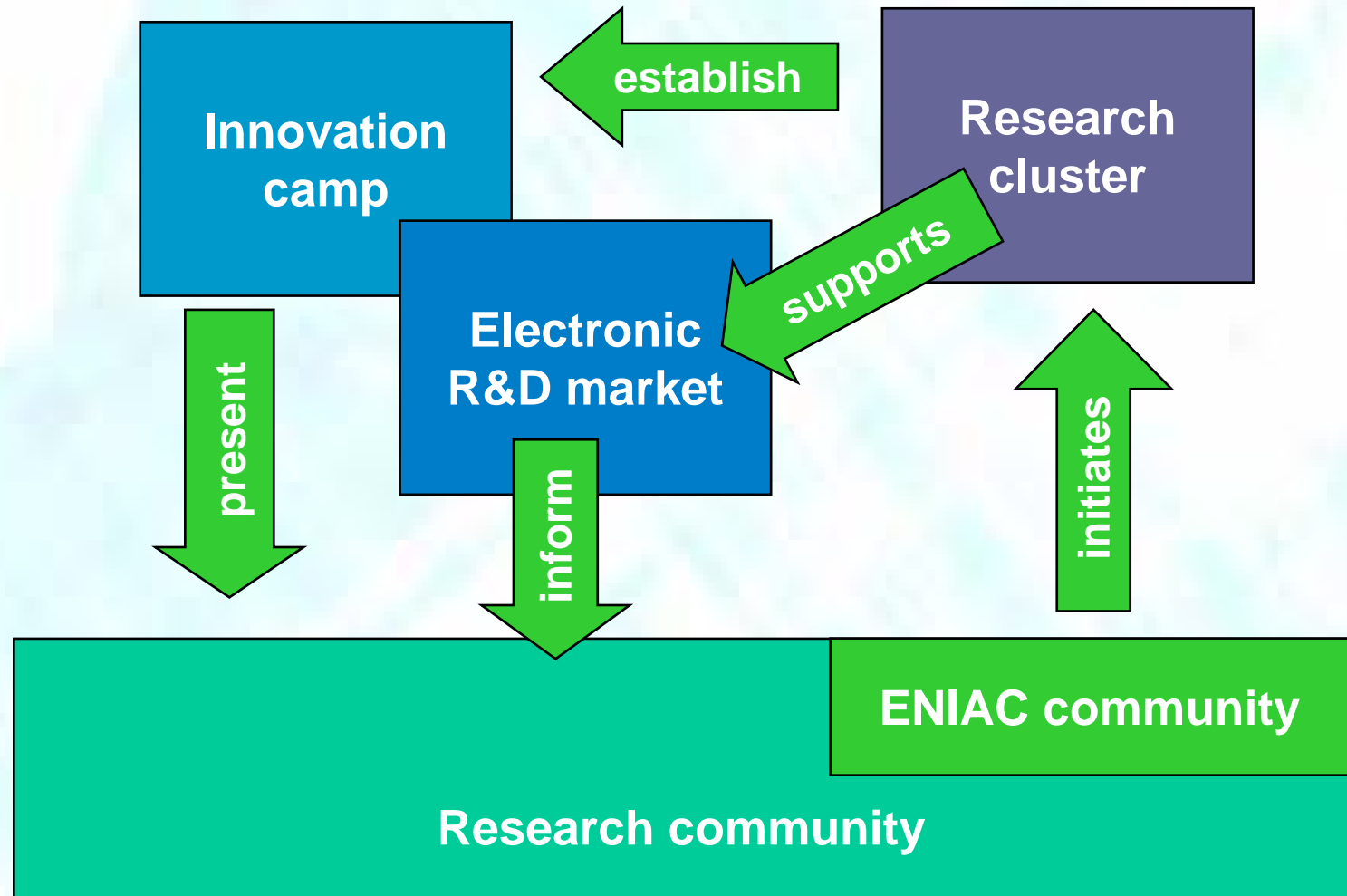
A central electronic R&D market place to improve ENIAC knowledge exchange

- ▢ An integrated platform will bridge the gap between technology, design and application
 - Expert groups will exchange their requirements and competences
- ▢ ENIAC community distributes their R&D excellence through a web based competence platform
 - Inform about news and trends
 - Guide the users to best practice
- ▢ R&D organizations and experts
 - Keep their R&D competence up-to-date
 - Offer new solutions
- ▢ Research projects
 - Present R&D results
 - Initiate new projects
- ▢ Exploring a new research platform by a joint initiative
 - The actual edaAtlas of the edacentrum can be explored to serve this competence platform (<http://edaatlas.org/>)

The research community of ENIAC will meet at “innovation camps” through the year

- ▣ New results from projects will be presented
 - Proof of concept by academia
 - Prototypes with innovative designs for industrial users
- ▣ Results of R&D projects and future needs of industry are discussed between academia and industry
 - Competence and cooperation between different projects will be stimulated
 - The “IC food chain”: Technology, design and application will meet and express their interfaces and requirements for future R&D
- ▣ New research partners can get in contact to
 - Academic research
 - Innovative SMEs and start-ups
 - Innovative application industry
- ▣ An “innovation camp” office will plan and coordinate these activities through the year
 - The technical project office will organize the project presentation at the “innovation camp”

Synergies and activities in the Ecosystem



ENIAC Scientific Community Council

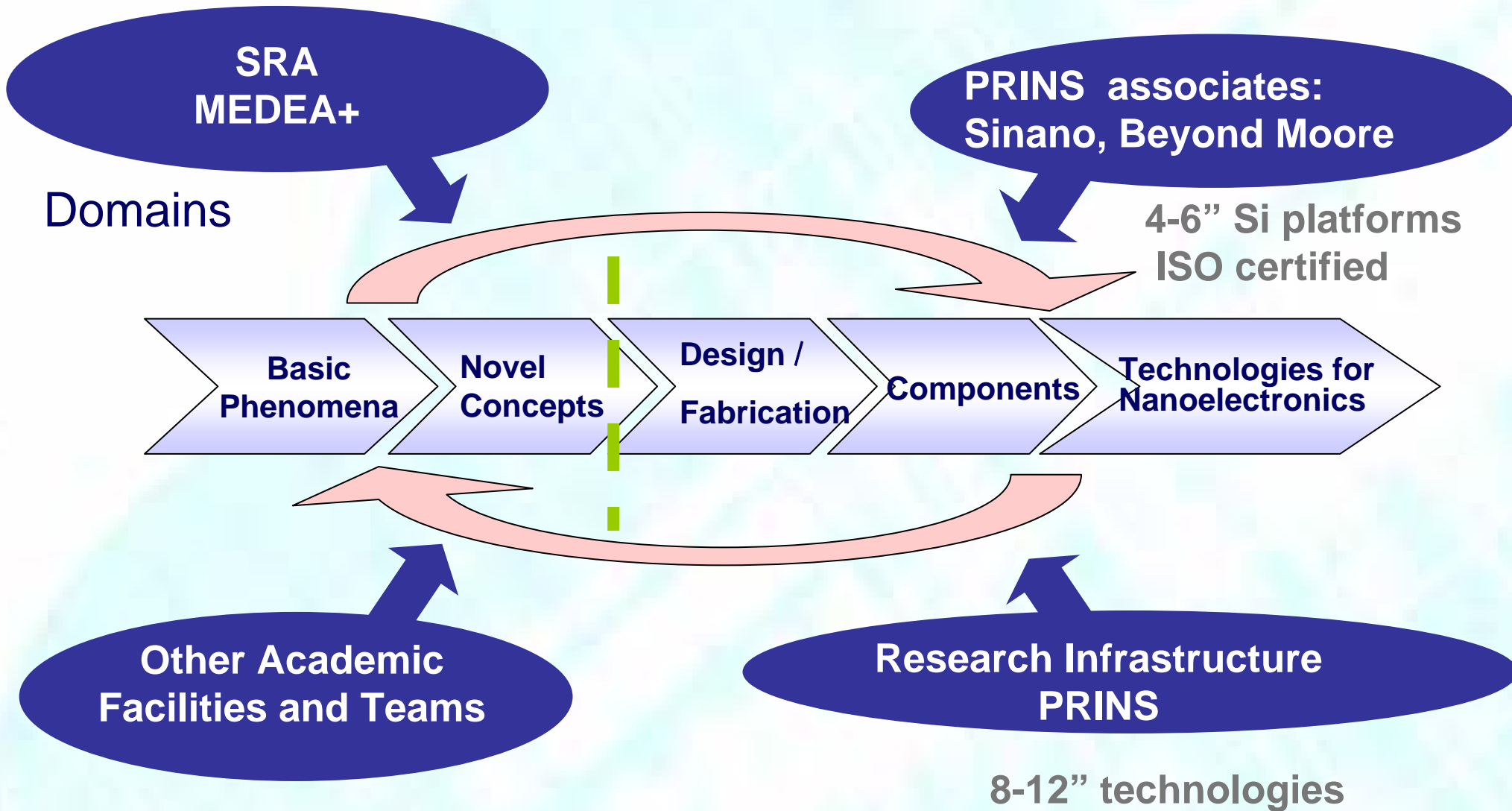
Portfolio: Ecosystem Technologies

Clivia M Sotomayor Torres

Tyndall National Institute
University College Cork
Cork
Ireland



Components of the Ecosystem Technology



Domains

4-6" Si platforms
ISO certified

Basic Phenomena

Novel Concepts

Design / Fabrication

Components

Technologies for Nanoelectronics

Other Academic Facilities and Teams

Research Infrastructure PRINS

8-12" technologies

Various degrees of specialisation

Proposed Activities

1. Access of Academia to Research Infrastructures via PRIS, Sinano, Beyond Moore ...
In planning.
2. Identify technology bottlenecks in current device-relevant academic research. Cross-check with MEDEA+
3. Map out strength and weakness for future academic research in Nanoelectronics in Europe relevant to ENIAC.
4. Set up research topic-oriented clusters driven by technological needs supported by web-based exchange of information.
5. Innovation Camp a la Ecosystem Design
6. Bottom-up contributions to the SRA.
7. Work with the future European Institute of Technology

Input from and participation of:

- Universities



With active research programmes in the ENIAC SRA areas.

- Research Centres



With a mission to carry out R&D in the areas of the SRA targeting JTI priorities. National Facilities.

- FP6 and FP7



Projects (IP-LSCP, CA, SSA, STREPS-SSCP) in the areas of the SRA. Eg: EUROSOL, PULLNANO, NANOCMOS, ...

Examples of Technological Challenges as seen by MEDEA+

- Introduction of new materials
- Introduction of new device architectures
- Moving to EUV litho or Nanoimprint lithography
- Increase in random devices and interconnects
- ...
- Conflict between static and dynamic power density

All expected to impact design processes up to system level

Explore forms of efficient collaborative work between Academia and Industry in the Ecosystem Technologies

- Research Clusters → Virtual Research Centres?
- A section/department of the European Institute of Technology?
- Poles de Competitivite?
- Revive the FET-NID community as a forum to discuss results and plan joint work?

Possible Research Clusters

FP7: ICT
FET
ERC

ERA-NET+
MNT and
Nanoscience

JTI

Other

For brain-storming purposes

- ▢ Sub-micrometer 3D integration.
- ▢ RF MEMS/NEMS
- ▢ State variable level (extended to photons, plasmons and phonon)
- ▢ ... A extensive list can be found in the MEDEA+

Research Infrastructure

European Research Infrastructures and Programs

Contact: Francis Balestra (balestra@enserg.fr), ENIAC SCC

Montreux, Sept. 21, 2006

Infrastructure (2)

Research Infrastructures - PRINS

Proposition of a strong European structuring with complementary platforms:

wide industrial and pre-industrial technological platforms dedicated to large wafers (300mm) for short and medium term applications

network of small-scale flexible platforms (100-200mm) for rapid prototyping, test and validation of very innovative device and material ideas for long term nanoelectronic applications:
⇒ Need of a strong support from the EC

Infrastructure (3)

Research Infrastructures and Programs

=> **In summary:**

- Work in close collaboration between NoE and IP/CP in a given field
- Complementary activities devoted to long term research and scientific approach of industrial issues using flexible platforms in NoEs, based on the competences of the scientific community, and short/medium term research in IPs/CPs
- The main results obtained in the NoEs (validation of new concepts, materials, architectures...) can be transferred to future CPs projects
- A coordination committee could meet regularly in order to strengthen these complementary researches and to propose transfer of technology, expertise and teams



The basic philosophy?

- ▣ facilitate through cooperation (platforms for design and technology)
- ▣ create excellence by mutual reinforcement (education)
- ▣ cater for links across the 'value chain'
- ▣ go after new applications using 'proven' technology (the 'stub' model)
- ▣ generate new technology and search for applications (new frontiers aplenty)