

International Roadmap for Devices and Systems (IRDS) Industry Connections Activity Initiation Document (ICAID)

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IC16-006-01 Approved by the IEEE-SASB 24 April 2016

Instructions

- Instructions on how to fill out this form are shown in red. It is recommended to leave the instructions in the final document and simply add the requested information where indicated.
- **Shaded Text** indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE-SA) Industry Connections Committee (ICCom) Administrator at the following address: industryconnections@ieee.org.
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

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Affiliation: IEEE

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Employer: Georgia Institute of Technology

Affiliation: IEEE Computer Society

2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Individual based

3. Purpose

3.1. Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

The electronics industry has benefitted from identifying technical trends since Moore's Law was first published in 1965. Since then road mapping long-term trends has allowed industry to identify challenges and possible solutions early on that have guided the research of academia, consortia, industry, and national laboratories.

The continuous improvements in transistor density and performance had driven "bottom-up" the electronic industry until the end of the previous century. In the past 10 years, smart phones, data centers, tablets, and enhanced interconnectivity via the Internet (e.g., Internet of Everything), just to mention a few, have revolutionized the electronics industry and changed it to a "top driven" industry.

This Industry Connections activity will focus on an International Roadmap for Devices and Systems ("IRDS") via establishment of an interest group closely aligned with the new electronics industry ecosystem. Activity members will collaborate in the development of this roadmap, as well as engaging with other segments of the IEEE in complementary activities (e.g. conferences) that help assure alignment and consensus across a range of stakeholders.

The IRDS will identify key trends related to devices, systems, and all the related technologies by generating a roadmap with a 15 years horizon. The supporting participants shall cooperate to identify generic devices and systems needs without regard to particular products of individual companies.

The IRDS will identify challenges and include recommendations on possible solutions.

The IRDS will replace the current existing International Roadmap for Semiconductors, the "ITRS". Previous ITRS reports will become the property of the IRDS.

3.2. Related Work

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

The IEEE Rebooting Computing Initiative (RCI) and International Technology Roadmap for Semi-Conductors (ITRS) signed an MOU in 2015. Going forward, ITRS is moving up the chain to become IRDS (International Roadmap for Devices and Semiconductors). Since the IRDS efforts include "standards-related" activities which may lead to future standards proposals, there is a desire to operate the

IRDS under the auspices of the IEEE Standards Association with a technical connection to the IEEE societies involved in IRDS. (e.g. the IEEE Computer Society)

3.3. Previously Published Material

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

The International Technology Roadmap for Semiconductors (ITRS) is a well-established document. This effort will build upon that foundation, moving up a level with a systems/devices viewpoint.

International Technology Roadmap for Semiconductors 1999, 2000 Update, 2001, 2002 Update, 2003, 2004 Update, 2005, 2006 Update, 2007, 2008 Update, 2009, 2010 Update, 2011, 2012 Update, 2013, and 2015

Emerging Research Devices Workshop Reports on:

Beyond CMOS 2008

Emerging Logic Devices 2010, 2014

Emerging Memory Devices 2010, 2012, 2014

Emerging Information Processing Architectures 2008, 2012, 2014

3.4. Potential Markets Served

Indicate the main beneficiaries of this work, and what the potential impact might be.

Potential Market	Potential Impact
Computer Manufacturers	New components to accelerate information collection, analysis, and action.
Integrated Circuit Manufacturers Logic ASIC Memory	Higher performance lower power logic New logic architectures with higher information analysis and throughput Higher density lower cost memory
Semiconductor Process Equipment Manufacturers	New process equipment needed to support future logic and memory needs
Semiconductor Material Suppliers	New materials markets identified to support future logic and memory needs
Integrated Circuit CAD Vendors	New design CAD tools required to analyze and design new logic architectures. New design CAD tools required to analyze and design products with diverse integrated components
Process and Device Modeling Companies	New process and device models required to simulate and optimize new devices for

	emerging logic and memory
MEMs and NEMs Manufacturers	New sensors and transducers to support future applications
Photonics Components Manufacturers	Demand for more compact, integrated, lower power photonic circuits
IC & Device Test Equipment Suppliers	Demand for testing of novel architecture logic and memory components Demand for testing of products with integrated logic, memory, sensors and transducers
Integrated Circuit Packaging Companies	Identification of technology and manufacturing requirements for integrating diverse components into a single package.
Process and Device Researchers	Identification of high value research needed to enable devices to support new architectures
Architecture and Circuit Researchers	Identification of high value research to analyze performance of different implementations of new architectures to support emerging applications

4. Proposed Deliverables

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

The primary output of this IC activity is the development and delivery of a roadmap document outlining recommendations for the electronics industry, as described above in the scope.

5. Funding Requirements

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICom.

Industry Connections staff will provide standard support as made available to all IEEE_SA IC activities. Activity members will provide any needed support for hosted meetings, marketing activities that exceed basic IC support.

It is envisioned that IRDS will plan to hold 3 plenary meetings per year. The responsibility of supporting the cost of IRDS meetings will be shared by the supporters in an equitable manner. Other events and initiatives supporting IRDS will be addressed through collaboration with IEEE Societies and other IEEE means, depending on nature of the funding needs.

6. Management and Procedures

6.1. IEEE Sponsoring Committee

Indicate whether an IEEE sponsoring committee of some form (e.g., an IEEE Standards Sponsor) has agreed to oversee this activity and its procedures.

Sponsors of the IRDS ICAID are the current IEEE Societies and Councils participating in RCI* with the Computer Society as the Lead representative.

(* Presently These are the *Solid-State Circuits Society, Computer Society, Circuits & Systems Society, Council on Nanotechnology, Council on Superconductivity, Reliability Society, Electron Devices Society, Magnetics Society* and *Council on Electronic Design Automation*. Others may be added as they join the RCI)

Has an IEEE sponsoring committee agreed to oversee this activity?: Yes

If yes, indicate the sponsoring committee's name and its chair's contact information.

Sponsoring Committee Name: IEEE Computer Society

Chair's Name: Roger Fujii (2016 President, IEEE Computer Society)

Chair's Email Address: rogerfujii@cox.net

Chair's Phone: Please use point-of-contact individual (below)

Point-of-Contact: Dr. Thomas M. Conte (2015 President, IEEE Computer Society)

POC Email Address: conte@gatech.edu

POC Phone: 404-376-2267

6.2. Activity Management

If no IEEE sponsoring committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

The activity will be managed by an executive committee under the auspices of the IEEE Computer Society Standards Activities Board.

6.3. Procedures

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures*, (b) Sponsor policies and procedures accepted by the IEEE-SA Standards Board, or (c) Working Group policies and procedures accepted by the Working Group's Sponsor. If option (a) is

chosen, then ICCom review and approval of the P&P is required. If option (b) or (c) is chosen, then ICCom approval of the use of the P&P is required.

Will use the baseline Industry Connections Activity Policies and Procedures.

7. Participants

7.1. Stakeholder Communities

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

Industry associations:

Since 1998 researchers from Europe, Japan, Korea, Taiwan and the USA have participated in the ITRS and have expressed their intention to continue their participation in IRDS through organizations equal or similar to the ones listed below.

The European Semiconductor Association (ESIA)

Japan Electronics and Information Technology Industries Association (JEITA)

The Korea Semiconductor Industry Association (KSIA)

The Taiwan Semiconductor Industry Association (TSIA)

IEEE TAB Initiatives:

IEEE Rebooting Computing Initiative

IEEE Societies and Councils:

Solid-State Circuits Society

Computer Society [lead society]

Circuits & Systems Society

Council on Nanotechnology

Council on Superconductivity

Reliability Society

Electron Devices Society

Magnetics Society

Council on Electronic Design Automation

7.2. Expected Number of Participants

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

Typically over 1000 researchers contribute to the ITRS

See list of 2013 ITRS participants (attached)

7.3. **Initial Participants**

Provide a list of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

The International Roadmap Committee (IRC), 7 Focus Teams and 7 International Technology Working Groups (ITWG) are already active

For any additional information contact Tom Conte (tom@conte.us) and Paolo Gargini (Chair) (paologargini1@gmail.com)

7.4. **Initial Participants**

Provide a list of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

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