Semiconductor Research Corporation

PIONEERS IN COLLABORATIVE RESEARCH®

SRC/SRF/NSF Forum on Integrated Sensors for Cybersystems – FISC 2030

Session VI: FISC Perspectives: Research Needs and Potential Responses

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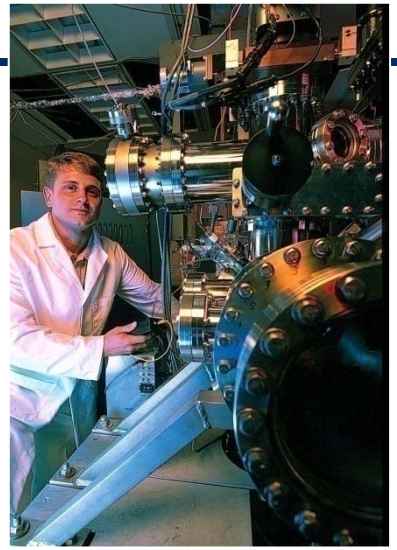
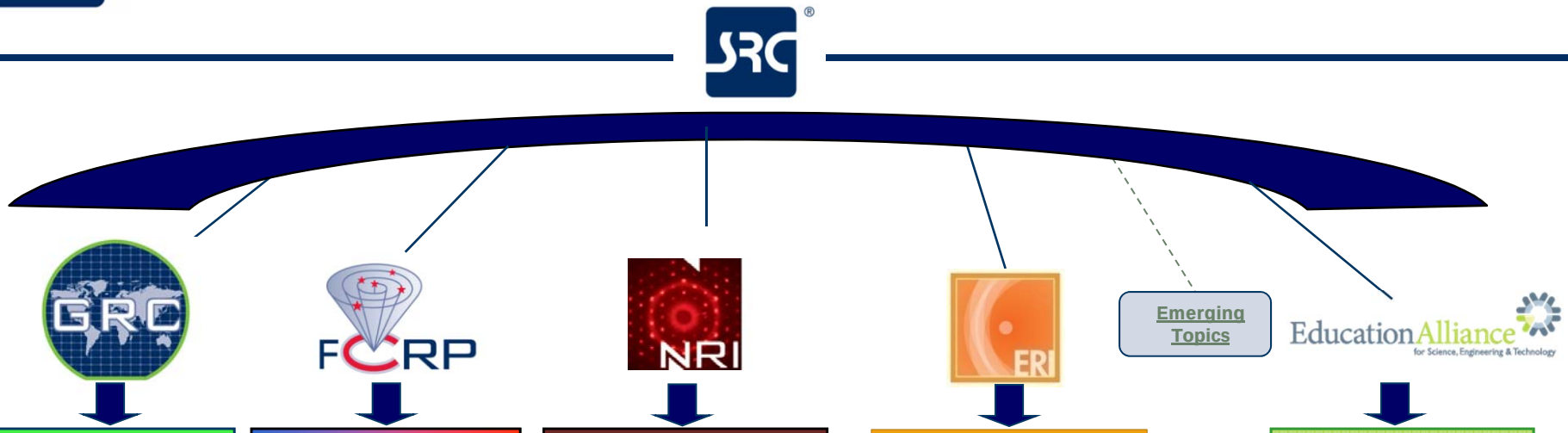
March 23, 2012

What We Do …



- Define industry research needs
- Coordinate research across the research ecosystem
- Provide early and easy access to university research results
- Facilitate interactions with faculty and students
- Provide access to students who are seeking jobs
- Leverage research investment

Semiconductor Research Corporation:
A Family of Distinct, Related Program Entities



Global Research Collaboration

Ensuring vitality of current industry

AMD
AMAT
ATIC
Freescale
GLOBAL-FOUNDRIES
IBM
Intel
Mentor Graphics
Novellus
Research Triangle Institute
TEL
TI

Gov't Participants
State of Arizona
State of Georgia
State of Texas
State of NY
NIST
NSF

Other Participants
SEMATECH
UK Eng & Phy Sci
SEMI
SIA

Focus Center Research Program

Breaking down barriers to extend CMOS to its limits

AMAT
GLOBALFOUNDRIES
IBM
Intel
MICRON
Novellus
Raytheon
TI
United Technologies

Government Participant
DARPA

Nanoelectronics Research Initiative

Beyond CMOS – identifying next information element

GLOBAL-FOUNDRIES
IBM
Intel
MICRON
TI

Gov't Participants
NIST
NSF
State of CA
State of Indiana
State of NY
State of Texas
State of Virginia
South Bend, Indiana

Energy Research Initiative

Emphasis on efficient/clean energy generation, storage and distribution

ABB
AMAT
Bosch
First Solar
Hydro One Networks, Inc,.
IBM
NEC
Nexans
ON Semiconductor
TEL

Education Alliance

Attracting and educating the next generation of innovators and technology leaders

Updated Feb 7, 2012

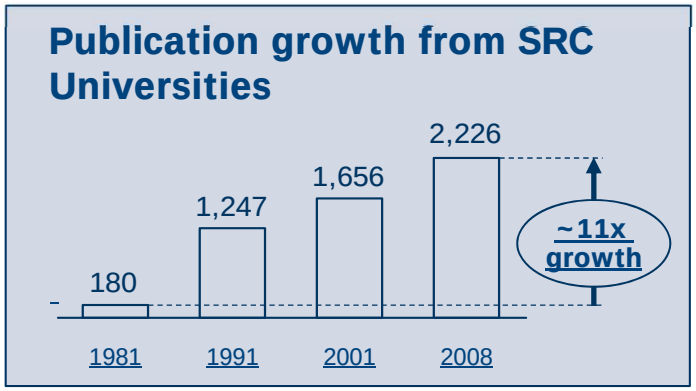
SRC Numbers

SRC Research Programs

- $1.747B invested by SRC Members
- 3,225 contracts
- 9,195 students
- 2,025 faculty members
- 261 universities

Deliverables*

- 43,070 technical documents
- 377 patents granted
- 908 patent applications
- 944 inventor awards
- 677 software tools
- 2,944 research tasks/themes



Inception through 2Q 2011 (updated 7/5/2011)

FISC Challenge:

Defining pre-competitive research that is:

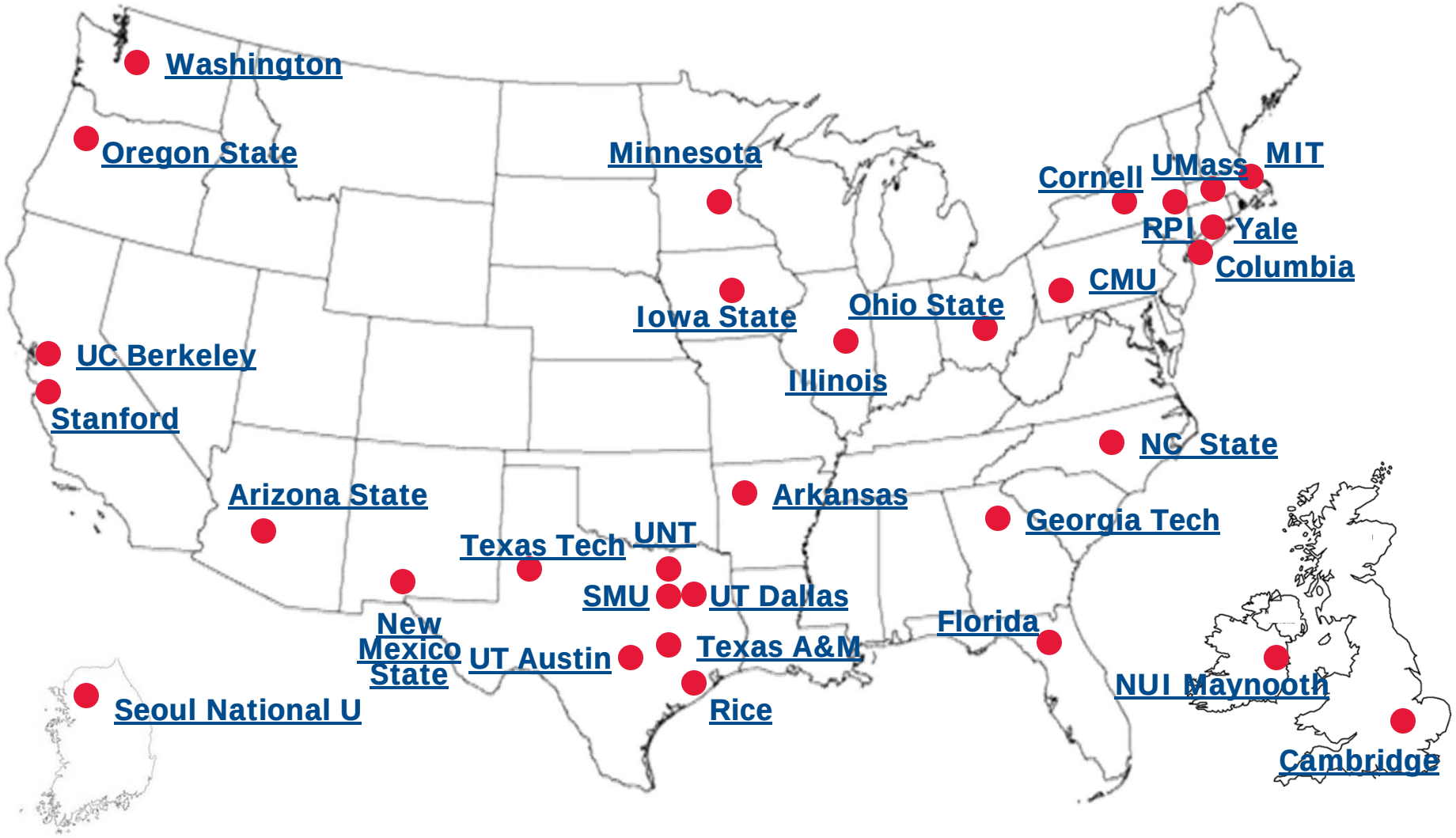
- Critical to industry needs
- Adequately focused
- Has a significant leverage research potential
- Maximizes synergies
- Minimizes conflicts of interest
- Generates appropriately trained students

Example of an SRC center

TxACE
Texas Analog Center of Excellence

- Primary focus on design with UT-Dallas in a lead role
- Other faculty/universities participated in and out of Texas
- Startup funds from state, university, TI.

TxACE supported universities



Some Potential Research Topics (1/4)

- New devices, tools, and techniques for power reduction
  - lightweight/small form factor power provision, and energy harvesting.
- Models for information extraction from multi-sensoric data
  - Need efficient frameworks for extracting information from data
  - Understand such frameworks from the perspective of low-power platforms
- Self-test for sensors
- New architectures and algorithms to meet security, throughput, and latency requirements of sensor networks (both the sensor itself and any network to which it connects).
- Given different/alternate sensor platform media, such as paper, new architectures and optimization for such

Some Potential Research Topics (2/4)

- Ambient Intelligence architectures
  - Standardized interfaces for ubiquitous sensors
  - Data management
- Networks for ubiquitous sensors
- NEMS scaling
  - Read-out schemes to minimize mismatch
  - Noise minimization
- Bio-sensors for (semi) permanent monitoring
  - Need breakthrough understanding of surface science, novel materials, etc. A multi-scale challenge
- nm-scale for gates for Si pore structures
- CAD for multi-scale sensor design
- Wafer-scale design/packaging technologies

Some Potential Research Topics (3/4)

- How to make long-term reliable (unattended) implanted biosensors that work for many years in harsh environments
- How to make good pumps and valves on chip (borrow ideas from nature)
  - Photo switchable materials – light activated valves
  - Electrostatic pumps
- Better modeling for all aspects of sensors, both physical and electronic, from nano-element level to system level
- Research in advanced functional materials – how to better functionalize various sensors
- How to deal with not only noise but element variability, selectivity, and “signal to interference”

Some Potential Research Topics (4/4)

- Information 'taming'; context-aware, real-time automated data management, to autonomically transform data into information, and subsequently, into knowledge.
- Standardization of design, fabrication processes, and materials utilized in sensor manufacturing to replicate the success of having a shared platform such as CMOS technology.
- Better integration of multiscale device simulation and design tools, sensor development tools 'from atoms to systems'.

Possible Center Definition

A vision...

- Ambient Intelligence Technology – from sensors to dynamic swarms to mobile devices to cloud

Built from critical elements...

- Sensor self-testing
- CAD tools for sensor design
- Materials for sensors
- Energy efficient devices
- Secure and reliable operation
- Swarm OS
- .....