Industry Partnerships;

Inter-Company Collaboration, Public Private Partnerships, Member Specific Research, and

SRC support for all of the above.

Gilroy Vandentop
Dir. Intel Corporate University Research, SRC STARnet

CCC Symposium on Computing and Society
Partnerships Session, May 2016

Outline

- Intel partnerships and programs with universities
- SRC programs
- Intersection of Intel and SRC
- Benefits of SRC collaborations
- Summary

INTEL LABS TOP COLLABORATIVE PROJECTS

Focused collaborations on highest-priority needs for each Intel BU

IOTG
REDEFINING "I" IN IOT

NDG
SECURITY
AUTHENTICATION

DCG
BIG DATA AND
DEEP LEARNING

SSG
HIGH PERFORMANCE
SCRIPTING

intel
LABS

5G

PEG
5G+
NEXT-GEN ARCHITECTURE

CCG
HOLOGRAPHIC DISPLAY

TMG
ZERO POWER SYSTEMS
ENERGY HARVESTING

ISECG
MACHINE LEARNING FOR
THREAT DETECTION

CORPORATE UNIVERSITY RESEARCH

Very Large Centers – Solving Industry Scale Problems

Semiconductor Research Corp STARnet, NRI

Large Centers – Intel Labs' Innovation Pipeline

Intel Science and Technology Centers (ISTCs) and Collaborative Research Institutes (ICRIs), Intel-NSF partnership

Small & Midsized Grants – Focused Problem-Solving

- Intel Strategic Research Alliances (ISRAs)
- CRC Strategic Research Sectors
- Global Research Collaboration – Manage by SRC

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

SRC

Global Research Collaboration

Ensuring vitality of current industry

Analog Devices
AMD
ARM, Inc.
Freescale
GLOBAL-FOUNDRIES
IBM
Intel
Mentor Graphics
Microsoft
Mubadala Tech
Research Triangle Institute
TI
Qualcomm

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

Other Participants
SEMI
SIA
MOSIS

Targeted Research Areas

- SemiSynBio (SSB)
- Trustworthy and Secure Semiconductors and Systems (T3S)
- Efficiency and Performance for Connectivity Constrained Computing (EP3C)
- Innovative and Intelligent Internet of Things (I3T)

MARCO

STARnet

Focus Center Research Program Phase VI

STARnet

Early research engagement of key long horizon semiconductor challenges

GLOBALFOUNDRIES
IBM
Intel
MICRON
Raytheon
TI
United Technologies

Government Participant
DARPA

Other Partipants
US Air Force Lab
SIA

NERC

NRI

Nanoelectronics Research Initiative

Beyond CMOS – the next switch and associated architectures

IBM
Intel
MICRON
TI

Gov't Participants
NIST
NSF
State of Nebraska
State of NY
State of Texas

Other Participants
SIA

Education Alliance

for Science, Engineering & Technology

Education Alliance

Attracting and educating the next generation of innovators and technology leaders

Updated September 2015

SRC Research Programs

Contracting Entity Research Programs	SRC Global Research Collaboration (GRC)	MARCO Semiconductor Technology Advanced Research Network (STARnet)	NERC Nanoelectronics Research Initiative (NRI)
Nature of Research	Narrowing options	Creating options	Discover next logic switch
Main Sponsorship	Industry (Global)	Industry + DARPA (U.S. only)	Industry + NSF + NIST (U.S. only)
Operational Model	Individual researchers and centers, 3 year contracts	Multi-university collaborative centers, 5 year contracts	Individual researchers (at NSF centers) and multi-university centers, 5 year contracts
Technology Spectrum	CMOS and beyond – 10+ yrs. horizon	Radically new solutions to broad spectrum of information and communication technologies – 20+ yrs. horizon	Next logic switch beyond CMOS – 20+ yrs. horizon
Industry Involvement	Strategic direction (BoD) and execution (TABs)	Strategic direction (GC) and arms-length technical guidance (SAB)	Guidance from TPG and on-site industry assignees
Government Involvement	Limited direct funding; leveraged contribution	Significant funding (~40%) and program direction from DARPA	Major funding from state and federal (NSF and NIST)
University Autonomy	Independent researchers guided by industry	Autonomous centers with high collaboration among and within	Collaborative researchers guided by industry members and assignees
Technology Transfer	Industry-driven processes (industrial liaisons, annual reviews, and e-workshops)	Primarily faculty-driven processes (associates, annual reviews, and e-seminars, etc.)	Combination of industry & faculty-driven processes (e.g., industrial assignees, reviews, e-workshops, etc.)

Intersection of Intel and SRC

- Large collaborative centers are enabled by SRC
- Optimal IP terms are enabled by SRC
  - Most important for process and hardware research
- Software and security research
  - Historically mostly handled in house

CORPORATE UNIVERSITY RESEARCH

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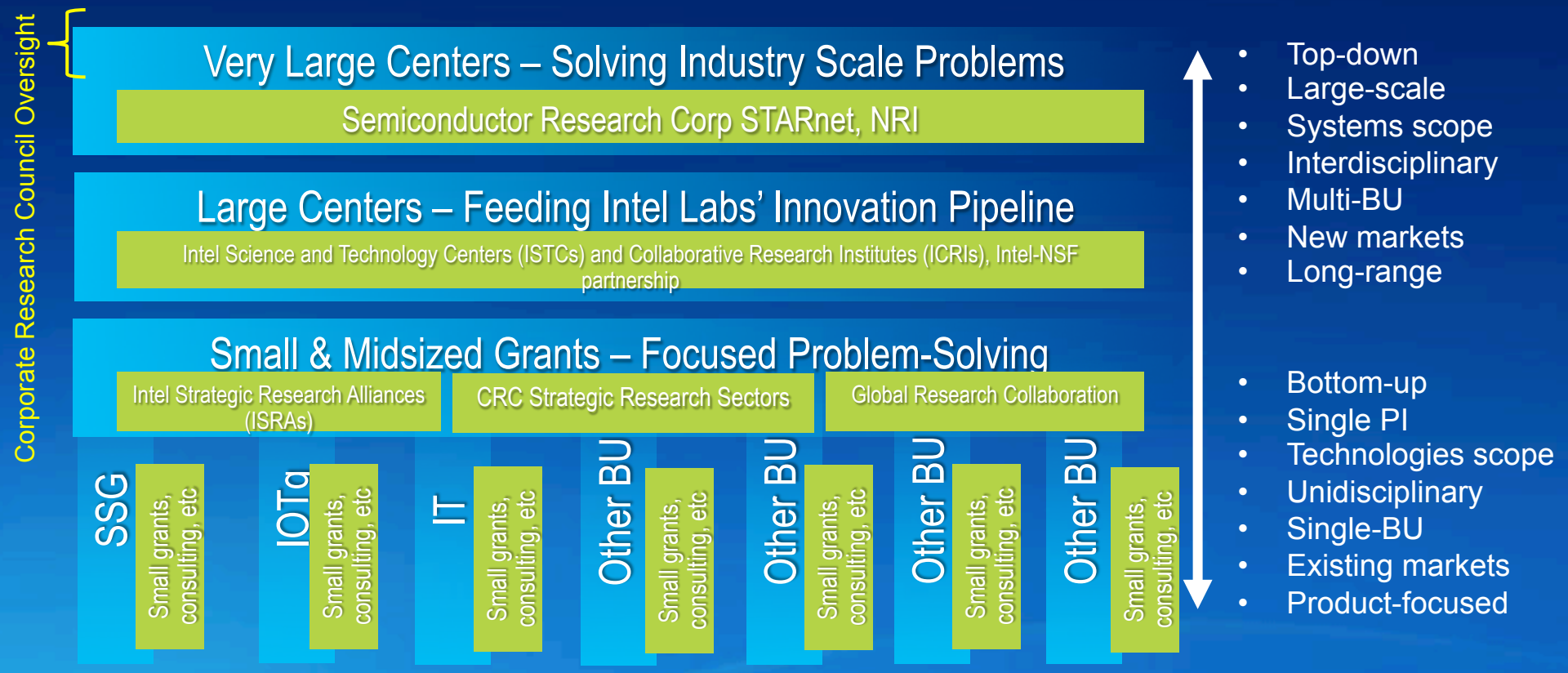
Benefits of SRC model

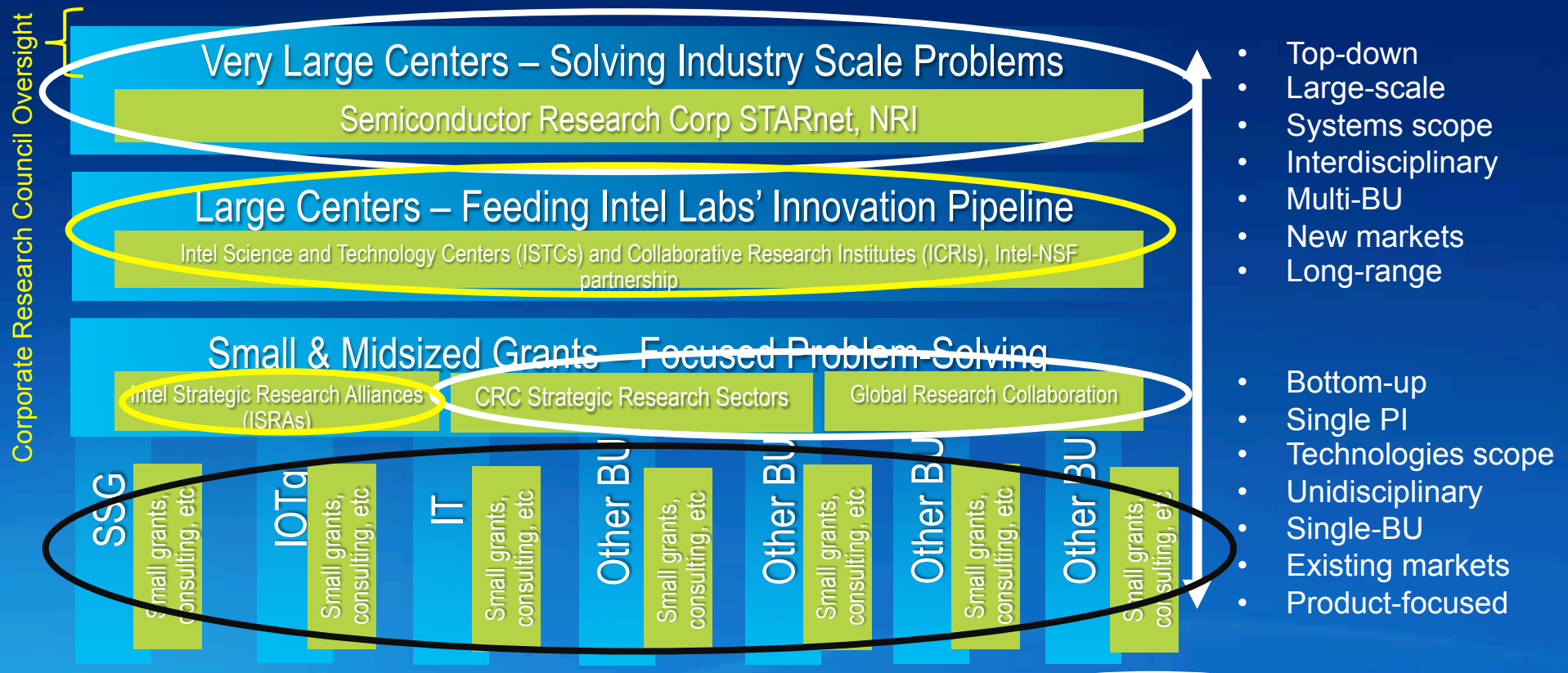
- Intangible benefits of collaboration
  - Senior technologists as fellow travelers
  - Neutral '3rd' party trusted environment
- Student programs and visibility
- Attractive IP terms and growing portfolio
- Funding leverage
- Public Private Partnership expertise
- Cost effective university program support

Intel's university research spectrum

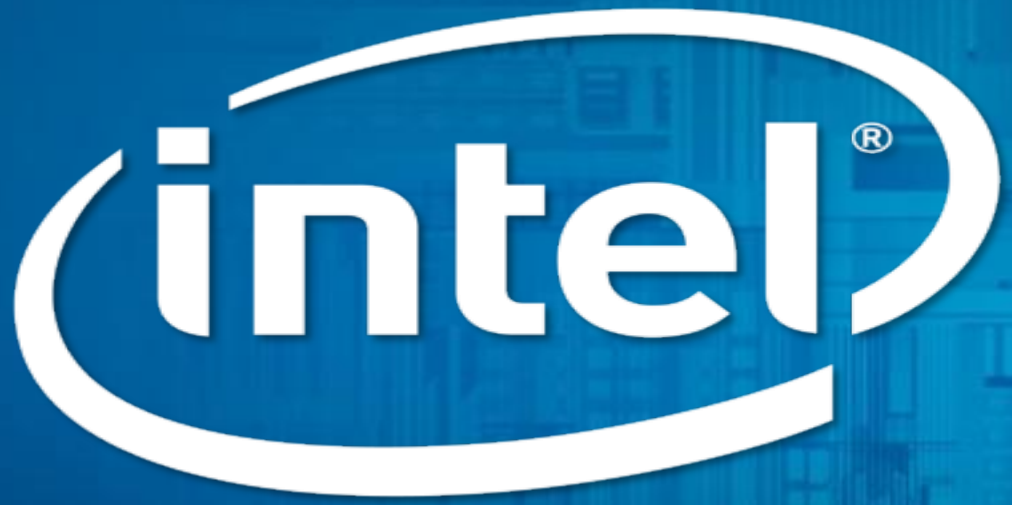


~$60M/year in academic research investments with broad reach

How do I engage with Intel's university research needs?



- Work with SRC to respond to calls for proposals =
- Foster individual relationships with Intel engineers =
- Do great research and be invited to compete =


intel

Risk Factors

- The above statements and any others in this document that refer to plans and expectations for the fourth quarter, the year and the future are forward-looking statements that involve a number of risks and uncertainties. Words such as “anticipates,” “expects,” “intends,” “plans,” “believes,” “seeks,” “estimates,” “may,” “will,” “should” and their variations identify forward-looking statements. Statements that refer to or are based on projections, uncertain events or assumptions also identify forward-looking statements. Many factors could affect Intel’s actual results, and variances from Intel’s current expectations regarding such factors could cause actual results to differ materially from those expressed in these forward-looking statements. Intel presently considers the following to be the important factors that could cause actual results to differ materially from the company’s expectations. Demand could be different from Intel's expectations due to factors including changes in business and economic conditions; customer acceptance of Intel’s and competitors’ products; supply constraints and other disruptions affecting customers; changes in customer order patterns including order cancellations; and changes in the level of inventory at customers. Uncertainty in global economic and financial conditions poses a risk that consumers and businesses may defer purchases in response to negative financial events, which could negatively affect product demand and other related matters. Intel’s results, including revenue, gross margin, expenses and interest and other, would likely be adversely affected in the event of widespread financial and business disruption on account of a default by the U.S. on U.S. government obligations and/or a prolonged failure to maintain significant U.S. government operations. Intel operates in intensely competitive industries that are characterized by a high percentage of costs that are fixed or difficult to reduce in the short term and product demand that is highly variable and difficult to forecast. Revenue and the gross margin percentage are affected by the timing of Intel product introductions and the demand for and market acceptance of Intel's products; actions taken by Intel's competitors, including product offerings and introductions, marketing programs and pricing pressures and Intel’s response to such actions; and Intel’s ability to respond quickly to technological developments and to incorporate new features into its products. The gross margin percentage could vary significantly from expectations based on capacity utilization; variations in inventory valuation, including variations related to the timing of qualifying products for sale; changes in revenue levels; segment product mix; the timing and execution of the manufacturing ramp and associated costs; start-up costs; excess or obsolete inventory; changes in unit costs; defects or disruptions in the supply of materials or resources; product manufacturing quality/yields; and impairments of long-lived assets, including manufacturing, assembly/test and intangible assets. Intel's results could be affected by adverse economic, social, political and physical/infrastructure conditions in countries where Intel, its customers or its suppliers operate, including military conflict and other security risks, natural disasters, infrastructure disruptions, health concerns and fluctuations in currency exchange rates. Expenses, particularly certain marketing and compensation expenses, as well as restructuring and asset impairment charges, vary depending on the level of demand for Intel's products and the level of revenue and profits. Intel’s results could be affected by the timing of closing of acquisitions and divestitures. Intel's results could be affected by adverse effects associated with product defects and errata (deviations from published specifications), and by litigation or regulatory matters involving intellectual property, stockholder, consumer, antitrust, disclosure and other issues, such as the litigation and regulatory matters described in Intel's SEC reports. An unfavorable ruling could include monetary damages or an injunction prohibiting Intel from manufacturing or selling one or more products, precluding particular business practices, impacting Intel’s ability to design its products, or requiring other remedies such as compulsory licensing of intellectual property. A detailed discussion of these and other factors that could affect Intel’s results is included in Intel’s SEC filings, including the company’s most recent reports on Form 10-Q, Form 10-K and earnings release.