

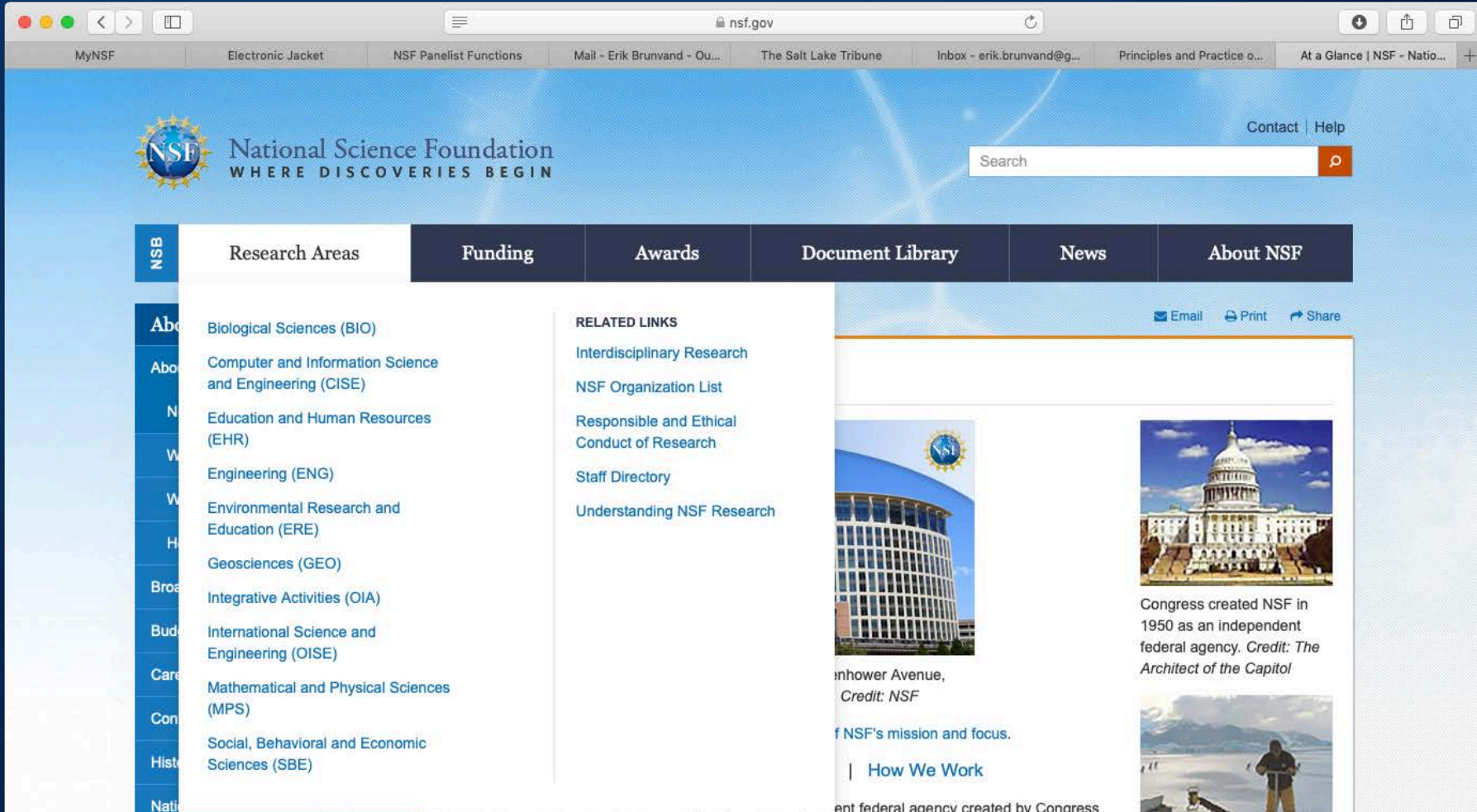
Overview of the Computer and Network Systems (CNS) Division at NSF



Erik Brunvand
CISE/CNS
May 6, 2020



The National Science Foundation



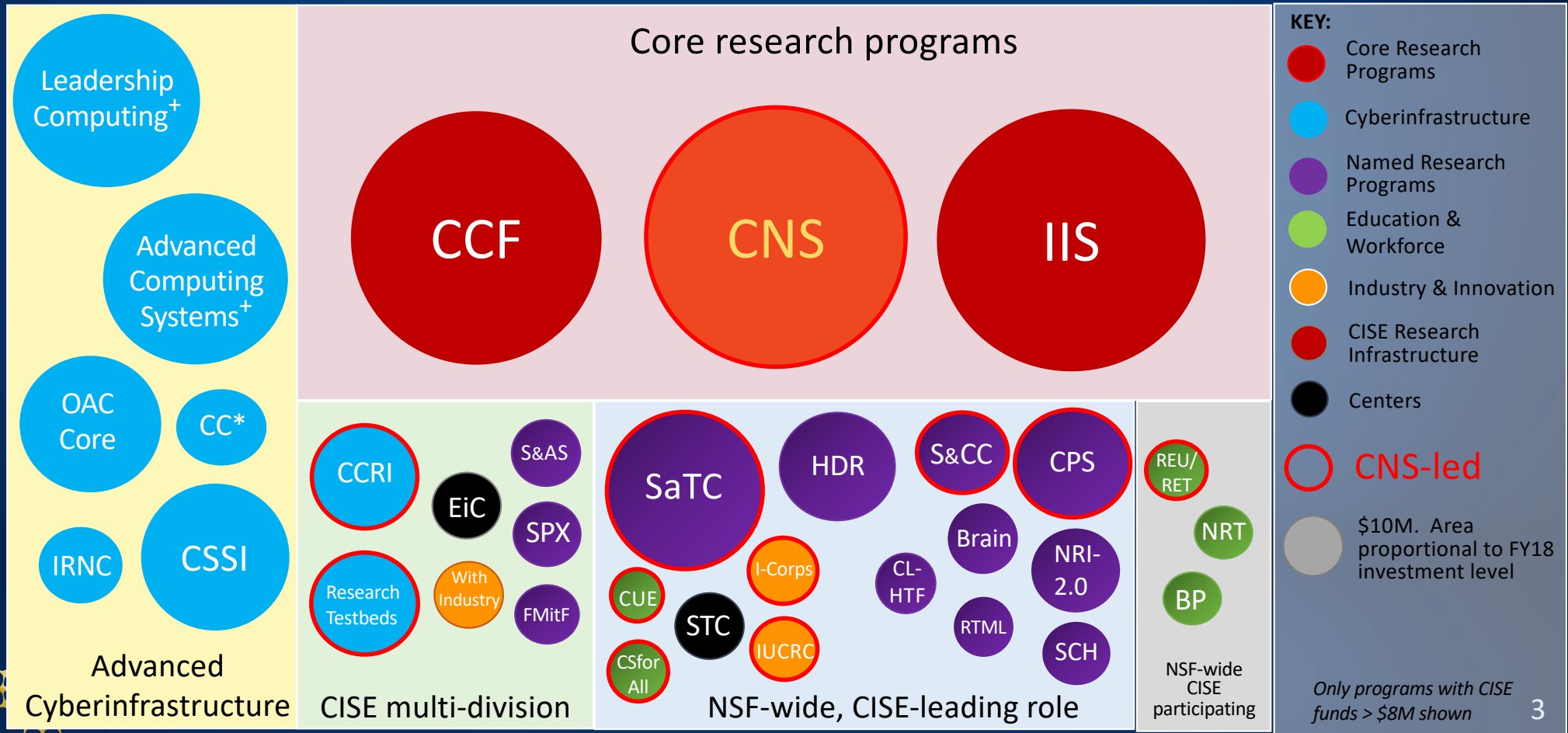
The screenshot shows the NSF website with the 'Research Areas' menu open. The menu lists the following categories:

- Biological Sciences (BIO)
- Computer and Information Science and Engineering (CISE)
- Education and Human Resources (EHR)
- Engineering (ENG)
- Environmental Research and Education (ERE)
- Geosciences (GEO)
- Integrative Activities (OIA)
- International Science and Engineering (OISE)
- Mathematical and Physical Sciences (MPS)
- Social, Behavioral and Economic Sciences (SBE)

Other visible elements include the NSF logo, the tagline 'WHERE DISCOVERIES BEGIN', a search bar, and a 'RELATED LINKS' section with items like 'Interdisciplinary Research', 'NSF Organization List', 'Responsible and Ethical Conduct of Research', 'Staff Directory', and 'Understanding NSF Research'. There are also images of NSF buildings and the US Capitol building.



CNS Programs in CISE Context



Ongoing Research Programs in CNS

CNS Core Programs

Computer
Systems
Research

Networking
Technology &
Systems

Education and Workforce

CS for All

Computing in
Undergraduate
Education

Multi-directorate Programs (CNS Lead)

Secure &
Trustworthy
Cyberspace
(SaTC)

Cyber-
Physical
Systems

Smart &
Connected
Communities

Programs Housed in CNS

CISE
[Community]
Research
Infrastructure

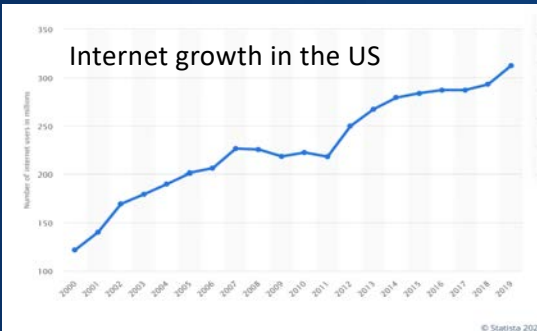
Industry-
University
Cooperative
Research
Centers (IUCRC)

REU Sites &
Supplements

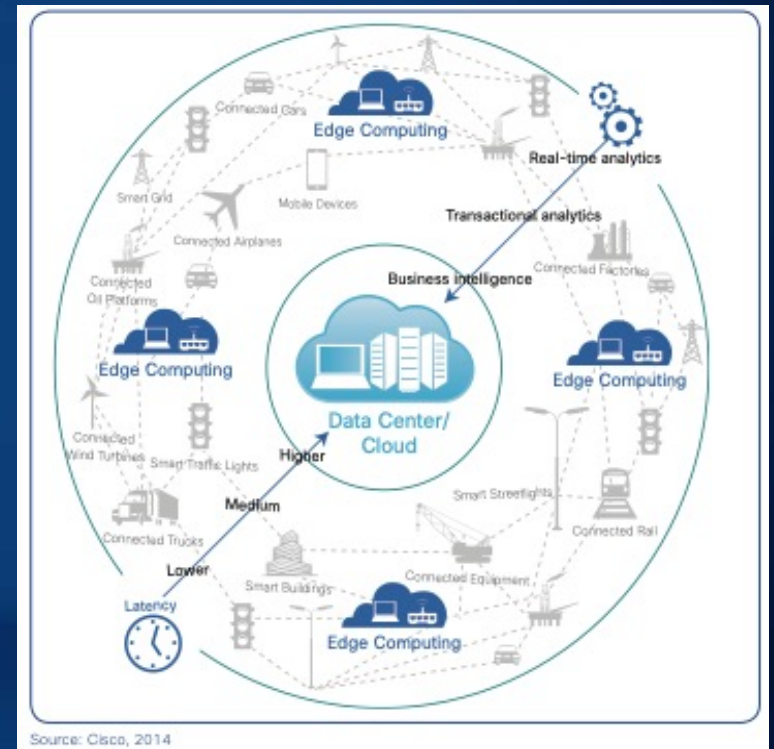
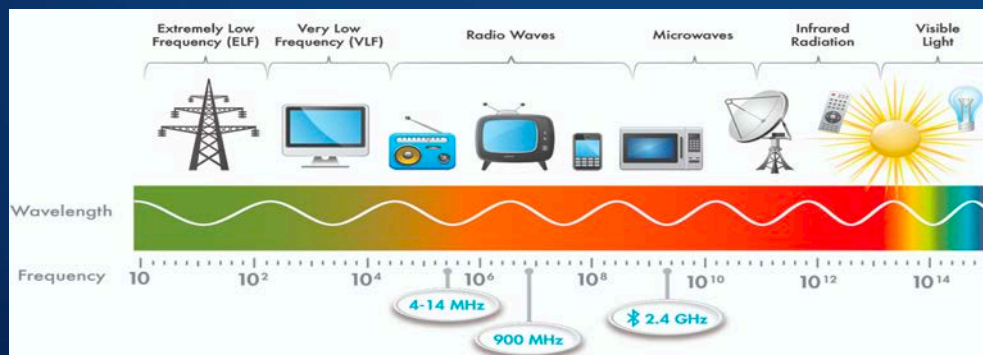
SpecEES



Networking Technology and Systems (NeTS)



NUMBER OF INTERNET USERS IN THE UNITED STATES	293m
NUMBER OF ISPs IN THE US	2678
INTERNET PENETRATION IN THE U.S.	87.27%



NSF's primary program for Network and future Internet architectures research



NeTS

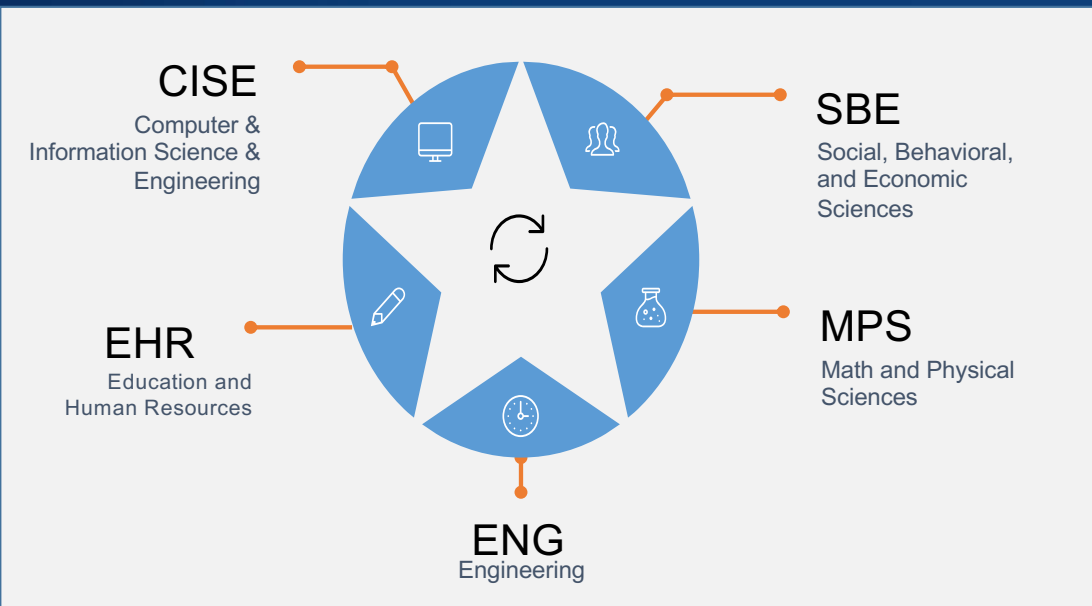
- NeTS seeks to advance fundamental scientific and technological advances leading to the development of future generation networks.
 - The program includes both 'wired' and 'wireless' network systems, from on-chip to Internet-scale, IoT and other network systems
 - The program seeks research that advances secure-by-design, high performance, robust and manageable networks. Example topics are:

- Application-aware networking (e.g. AR/VR)
- Future Internet architectures
- Data center networks
- In-network computing and storage
- AI/ML for networking
- Network resilience
- Network security
- Optical networks
- Programmable networks

- 5G and beyond wireless networks
- MIMO networks
- WAN, MAN, backhaul and access networks
- Networking for serverless computing
- Network management: monitoring, measurement, traffic engineering, etc
- Network performance (latency, QoS)
- Network verification
- Quantum Networking



Secure and Trustworthy Cyberspace (SaTC)



- NSF's flagship research program for **inter-disciplinary**, foundational research on security and privacy.
- SaTC views cybersecurity and privacy as a socio-technical problem.
- SaTC seeks new ways to design, build and operate cyber systems, protect existing infrastructure, and motivate and educate individuals about cybersecurity.
- SaTC currently manages 924 active awards.



SaTC Research Diversity

Authentication



Data Science

Intrusion
Detection



Social, Behavioral
Economic Sciences

Biometrics



Formal
Methods

Language-
Based
Security



Software

Cryptography

- Applied
- Theory



Hardware
Security
Architecture

Mathematics
& Statistics



Systems

Cyber -
Physical
Systems



Hardware
Security Design

Networking

- Wired
- Wireless



Transition to
Practice (TTP)

Cybersecurity
Education



Information
Authenticity

Privacy

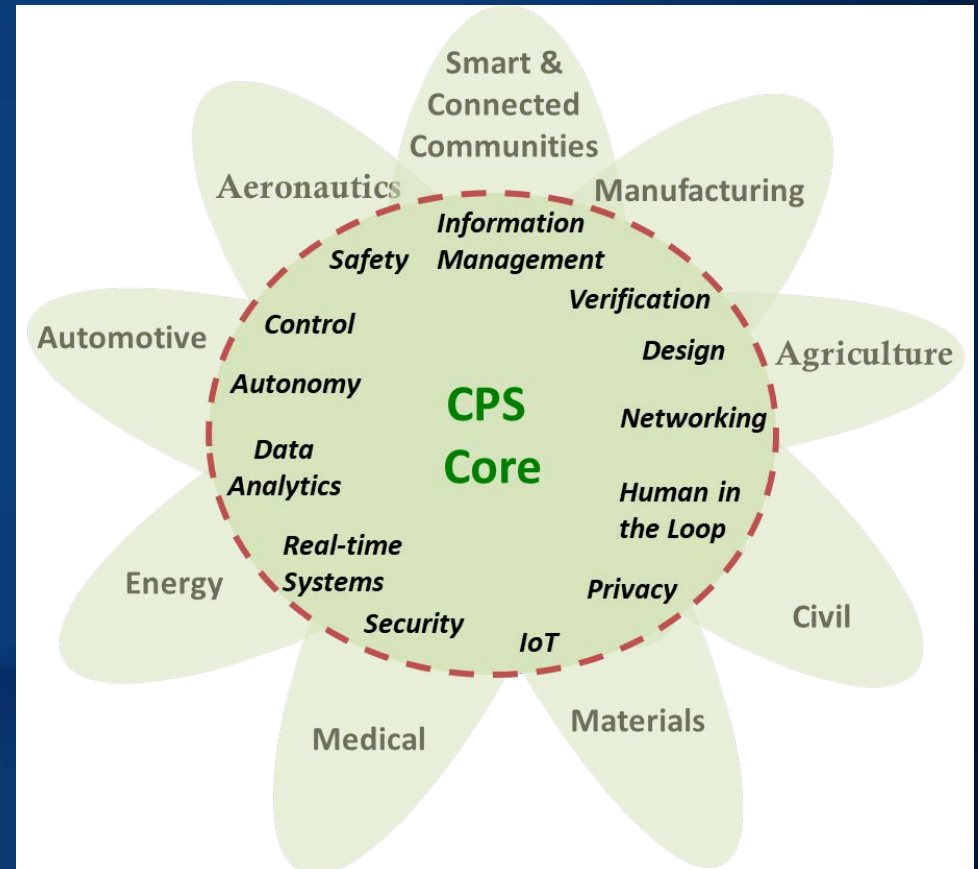
- Applied
- Theory



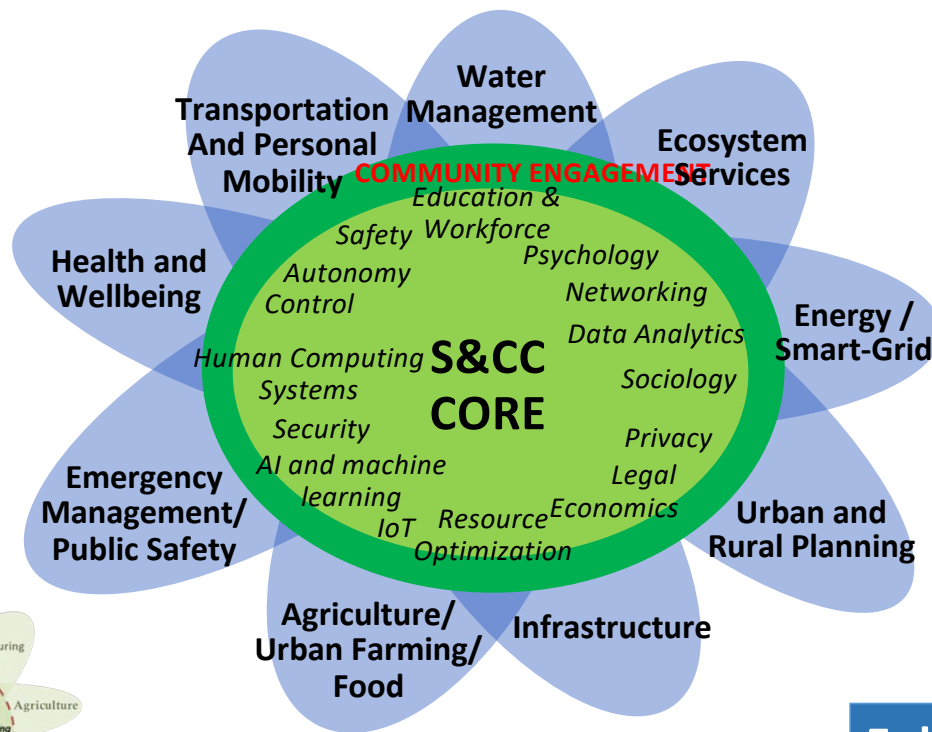
Usability and
Human
Interaction

Cyber Physical Systems (CPS)

- Core system science of complex cyber-physical systems and transitions the technologies into engineering practice.
- CPS program seeks to reveal cross-cutting, fundamental scientific and engineering principles that underpin the integration of cyber and physical elements across all application domains
- Approximately 400 active awards



Smart & Connected Communities (S&CC)

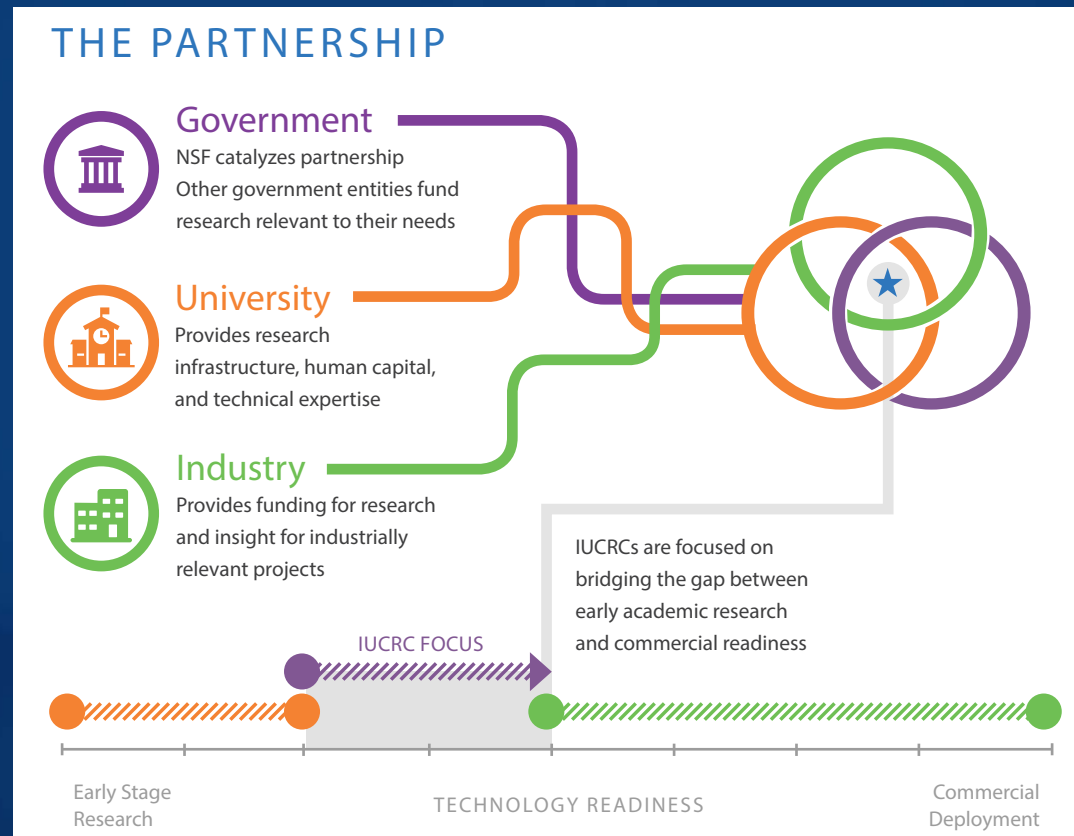


A fundamental understanding of the complex, dynamic interactions between technology and society is essential for unlocking the potential benefits of smart and connected communities.

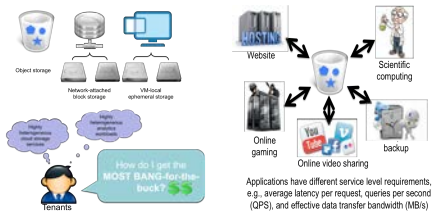
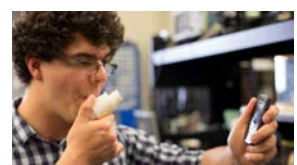
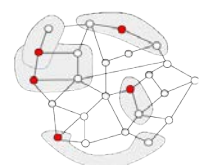
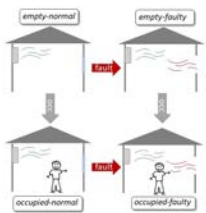
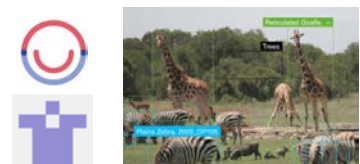
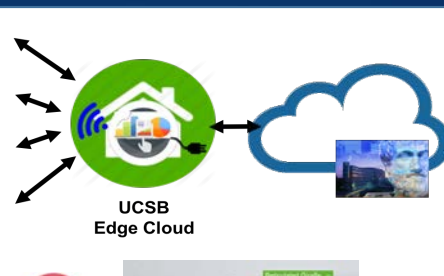
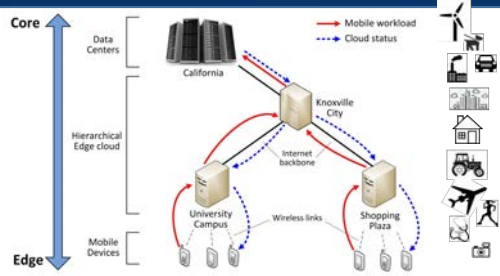
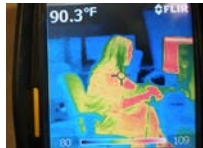
Enhances scientific and engineering knowledge in ways that improve the quality of life within communities.



Industry-University Cooperative Research Centers (IUCRC)



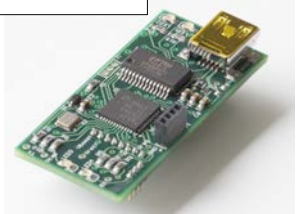
PACE
Stony Brook University



Applications have different service level requirements, e.g., average latency per request, queries per second (QPS), and effective data transfer bandwidth (MB/s)

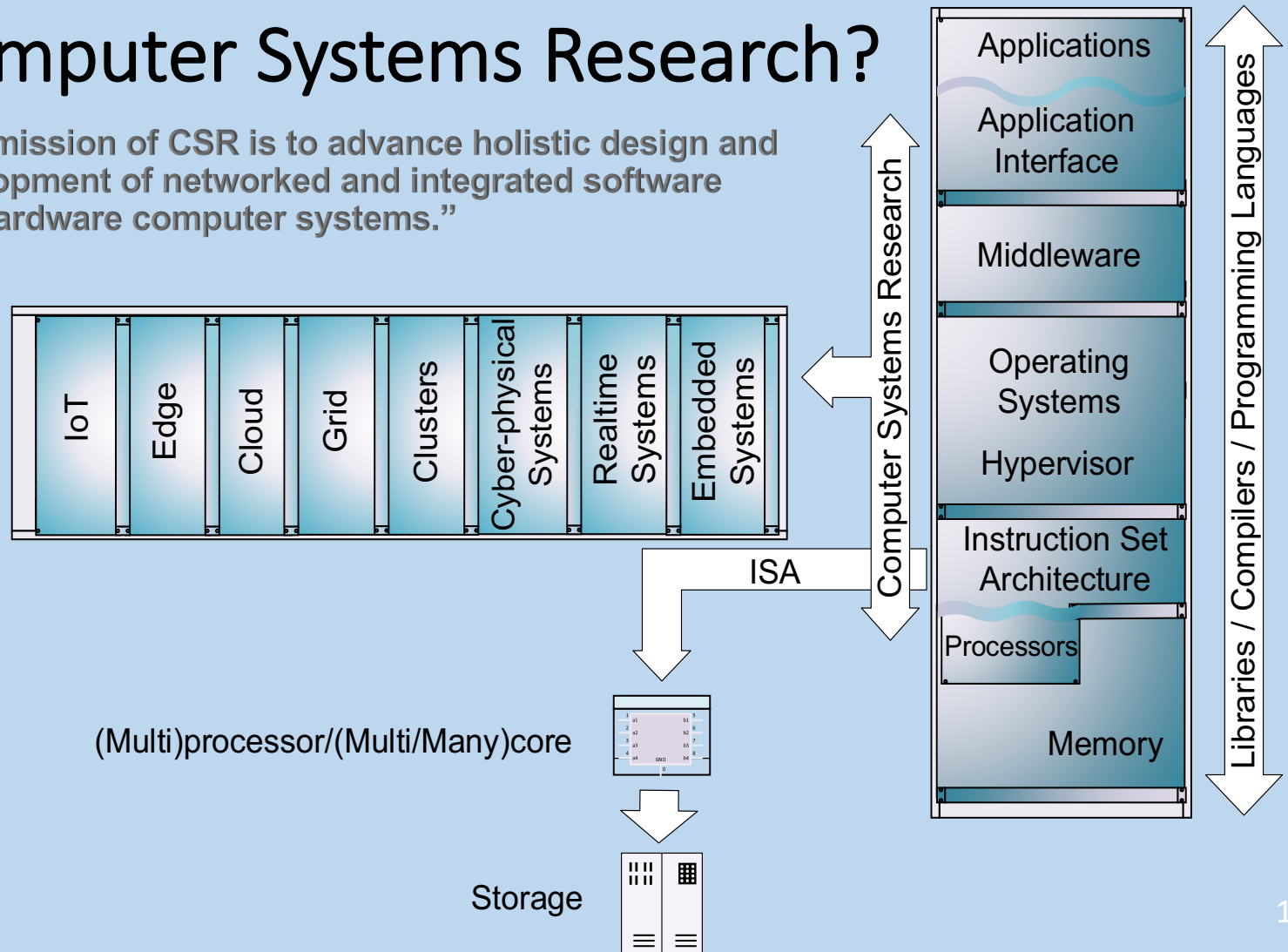
Galois
amulet

Computer Systems Research
NSF

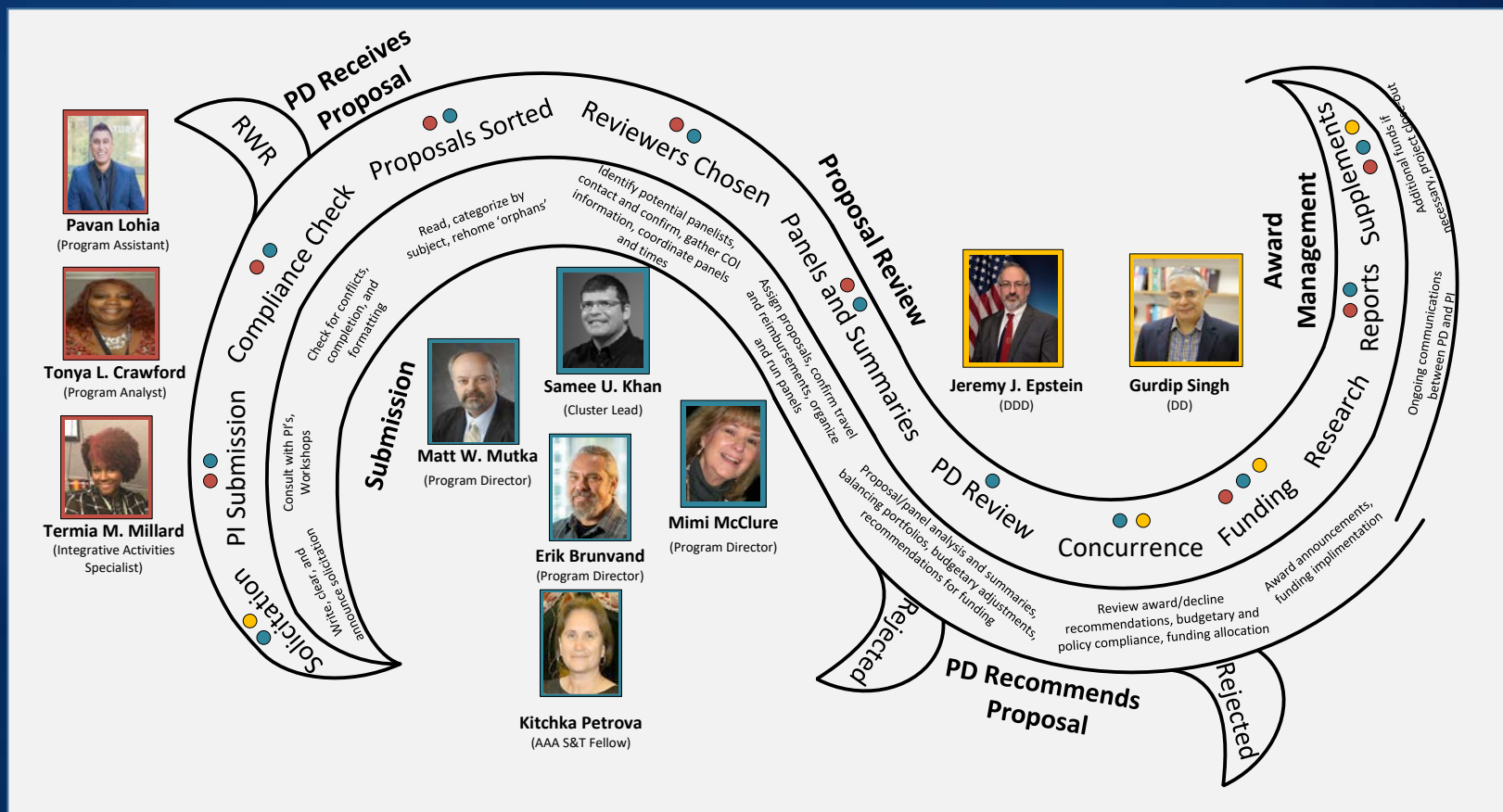


What is Computer Systems Research?

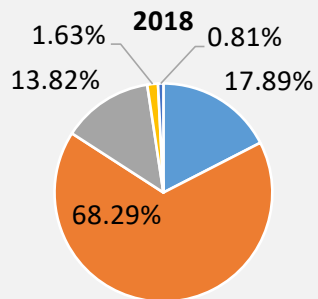
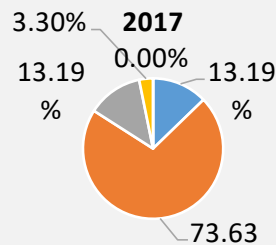
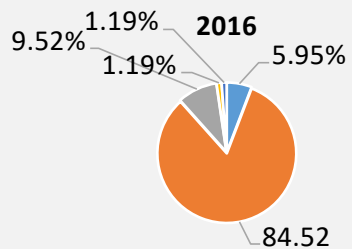
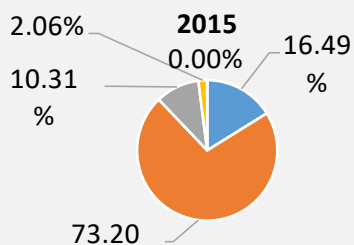
“The mission of CSR is to advance holistic design and development of networked and integrated software and hardware computer systems.”



Who is in CSR? How does it Operate?



CSR History and Demographics



■ Female ■ Male ■ Undeclared ■ Minority ■ Disabled

FIRST AWARD (2003):

NGS: Collaborative Research: Adapting Programming Code Continuously and Aggressively

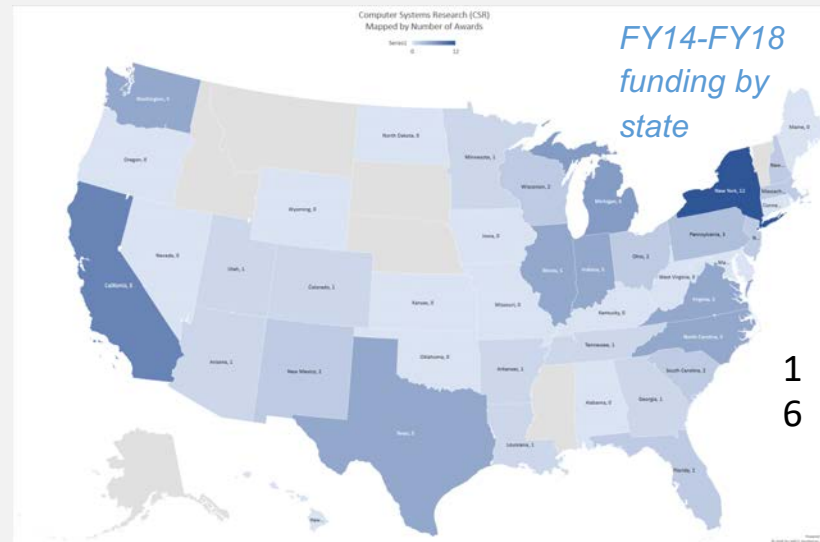
Mary L. Sofa (UVA)
Jack W. Davidson (UVA)
Bruce R. Childers (Pittsburgh)

Turing Awardees:

Barbara Liskov Amir Pnueli

PECASE Recipients:

Alexandre Bayen	Edward Kohler
Michael Freedman	Thomas Martin
Rahul Mangharam	Shwetak Patel
George Pappas	Matei Zaharia
Sanjit Seshia	



FPGA Awards in CNS



Search award for:

Export up to 3,000 Awards:

CSV | XML | Excel | Text

Export All Results

Sort By:

Results size:

Table List

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SaTC: CORE: Medium: Collaborative: Security of Reconfigurable Cloud Computing

Award Number:1901901; Principal Investigator:Jakub Szefer; Co-Principal Investigator:; Organization:Yale University;NSF Organization:CNS Start Date:07/01/2019; Award Amount:\$457,160.00; Relevance:43.05;

CAREER: Operating System Support for Ephemeral and Malleable Accelerators

Award Number:1846169; Principal Investigator:Christopher Rossbach; Co-Principal Investigator:; Organization:University of Texas at Austin;NSF Organization:CNS Start Date:06/01/2019; Award Amount:\$234,393.00; Relevance:43.05;

CAREER: Towards the Security of Heterogeneous CPU-FPGA Systems

Award Number:1912593; Principal Investigator:Sheng Wei; Co-Principal Investigator:; Organization:Rutgers University New Brunswick;NSF Organization:CNS Start Date:08/11/2018; Award Amount:\$246,965.00; Relevance:43.05;

SaTC: CORE: Medium: Collaborative: Security of Reconfigurable Cloud Computing

Award Number:1902532; Principal Investigator:Russell Tessier; Co-Principal Investigator:Daniel Holcomb; Organization:University of Massachusetts Amherst;NSF Organization:CNS Start Date:07/01/2019; Award Amount:\$690,839.00; Relevance:43.05;

CNS Core: Small: MintCloud: An Elastic Multitenant FPGA Cloud

Award Number:1908507; Principal Investigator:Sang-Woo Jun; Co-Principal Investigator:; Organization:University of California-Irvine;NSF Organization:CNS Start Date:10/01/2019; Award Amount:\$500,000.00; Relevance:43.05;

EAGER: Efficient Utilization of FPGAs in HPC Centers and the Cloud: A Software/Hardware Approach

Award Number:1821691; Principal Investigator:Lina Sawalha; Co-Principal Investigator:; Organization:Western Michigan University;NSF Organization:CNS Start Date:05/01/2018; Award Amount:\$191,435.00; Relevance:43.05;

II-EN: Collaborative Research: Large-Scale FPGA-Centric Cluster with Direct and Programmable Communication

Award Number:1405790; Principal Investigator:Herman Lam; Co-Principal Investigator:Herman Lam; Organization:University of Florida;NSF Organization:CNS Start Date:08/01/2014; Award Amount:\$687,333.00; Relevance:40.29;

CRI: II-New: Pebbles: A Modular, Composable Hardware and Software Platform for Pervasive Edge Sensing and Computing

Award Number:1730291; Principal Investigator:Fan Ye; Co-Principal Investigator:Yuanyuan Yang, Peter Milder; Organization:SUNY at Stony Brook;NSF Organization:CNS Start Date:07/01/2017; Award Amount:\$822,419.00; Relevance:38.89;

ICE-T: RC: Orchestration and Reconfiguration Control Architecture for Software Defined Radios

Award Number:1836901; Principal Investigator:Ivan Seskar; Co-Principal Investigator:Richard Martin; Organization:Rutgers University New Brunswick;NSF Organization:CNS Start Date:10/01/2018; Award Amount:\$316,000.00; Relevance:38.89;

CRI: CI-New: OpenPiton 2: Enabling Open Source Manycore Hardware Research

Award Number:1823222; Principal Investigator:David Wentzloff; Co-Principal Investigator:; Organization:Princeton University;NSF Organization:CNS Start Date:06/15/2018; Award Amount:\$500,000.00; Relevance:38.89;

CRI: II-NEW: CHRONOS : A Cloud based Hybrid RF-Optical Network Over Synchronous Links

Award Number:1823225; Principal Investigator:Dola Saha; Co-Principal Investigator:Hany Elgala, Aweek Dutta; Organization:SUNY at Albany;NSF Organization:CNS Start Date:10/01/2018; Award Amount:\$765,999.00; Relevance:38.88;

SaTC: CORE: Small: Collaborative: Techniques for Enhancing the Security and Trust of FPGAs-Based Systems

Award Number:1814804; Principal Investigator:Chintan Patel; Co-Principal Investigator:Ryan Robucci; Organization:University of Maryland Baltimore County;NSF Organization:CNS Start



Questions or Comments?

csr@nsf.gov

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in the body of the email, without the quotes.*

