



Overview of Management Structure and Methods in CHREC



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Outline

- **General structure**
- **Research mission and model**
- **University sites**
- **Industry and government partners**
- **Internal structure and interactions**
- **External structure and interactions**
- **Research impact**
- **General conclusions**



What is CHREC?



- NSF Center for High-Performance Reconfigurable Computing
 - Unique US national research center, operational since January 2007
 - Leading ECE/CS research groups @ four major universities
 - University of Florida (lead)
 - Brigham Young University
 - Virginia Tech
 - George Washington University
- Under auspices of I/UCRC Program at NSF
 - Industry/University Cooperative Research Center
 - CHREC is supported by CISE Directorate @ NSF
 - CHREC is both National Research Center and Consortium
 - University groups serve as research base (faculty, students, staff)
 - Industry & government organizations are research partners, sponsors, collaborators, advisory board, & technology-transfer recipients
 - Cited by NSF as one of its top national R&D centers

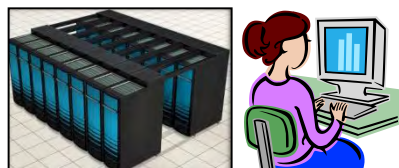
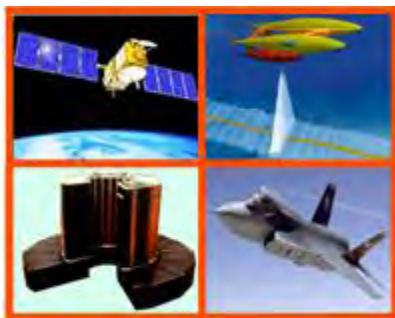
Note: a 5th university recently proposed to NSF and CHREC as a new site



CHREC Mission



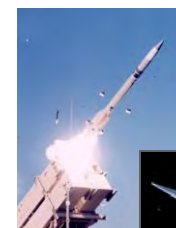
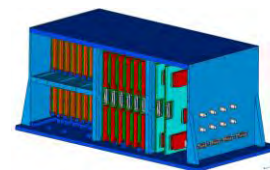
Reconfigurable Computing



High-Performance Computing



High-Performance Embedded Computing



Mission

Basic and applied R&D to advance S&T in advanced computing in these 3 increasingly overlapping domains.

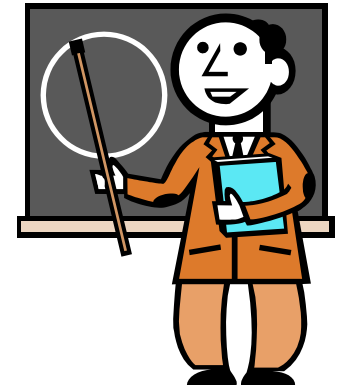
Many common challenges, technologies, & benefits, in terms of performance, power, adaptivity, productivity, cost, size, etc.

From architectures to applications to design concepts and tools.

From satellites to supercomputers!

CHREC

CHREC Faculty (16)



■ University of Florida (lead)

- **Dr. Alan D. George**, Professor of ECE – *Founder & Director*
- **Dr. Herman Lam**, Associate Professor of ECE – *Associate Director*
- **Dr. Ann Gordon-Ross**, Associate Professor of ECE
- **Dr. Greg Stitt**, Associate Professor of ECE
- **Dr. Jose Principe**, Professor of ECE
- **Dr. Janise McNair**, Associate Professor of ECE
- **Dr. Tuba Yavuz**, Assistant Professor of ECE

■ Brigham Young University

- **Dr. Michael J. Wirthlin**, Professor of ECE – *Co-Director*
- **Dr. Brent E. Nelson**, Professor of ECE
- **Dr. Brad L. Hutchings**, Professor of ECE
- **Dr. Doran Wilde**, Associate Professor of ECE

■ Virginia Tech

- **Dr. Peter Athanas**, Professor of ECE – *Co-Director*
- **Dr. Wu-Chun Feng**, Professor of CS and ECE
- **Dr. Krzysztof Kepa**, Postdoctoral Research Associate in ECE

■ George Washington University

- **Dr. Tarek El-Ghazawi**, Professor of ECE – *Co-Director*
- **Dr. Vikram Narayana**, Assistant Research Professor

Most importantly,
CHREC features an
exceptional team of ~70
students spanning our
four university sites



2014

CHREC Members



Honeywell



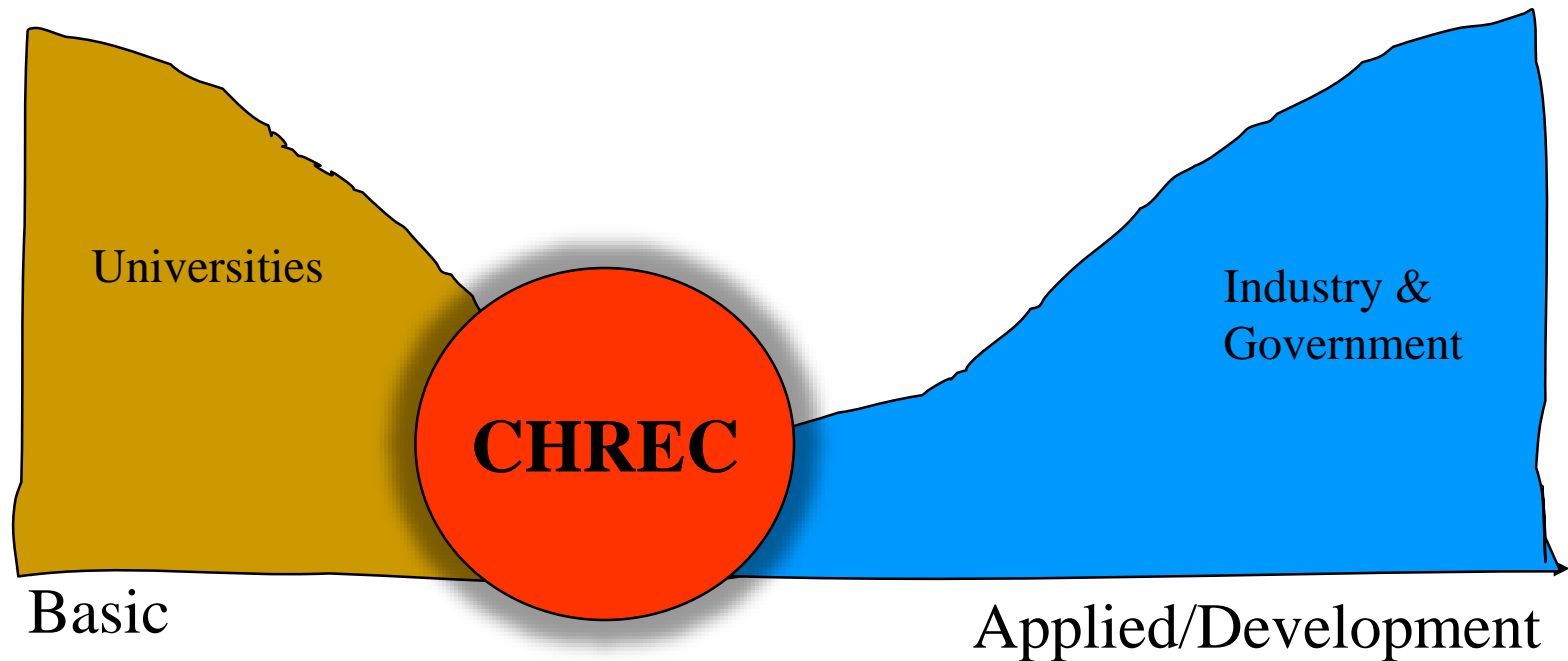
National Science Foundation
WHERE DISCOVERIES BEGIN



1. AFRL Munitions Directorate
2. AFRL Sensors Directorate
3. AFRL Space Vehicles Directorate
4. Altera
5. AMD
6. Arctic Region Supercomputing Center
7. BAE Systems
8. Convey Computer
9. Draper Laboratory
10. GiDEL
11. Harris
12. Honeywell
13. IBM
14. L-3 Cincinnati Electronics
15. Lockheed Martin Space Systems Co.
16. Los Alamos National Laboratory
17. MIT Lincoln Laboratory
18. NASA Ames Research Center
19. NASA Goddard Space Flight Center
20. NASA Johnson Space Center
21. NASA Kennedy Space Center
22. NASA Langley Research Center
23. National Instruments
24. National Reconnaissance Office
25. National Security Agency
26. Office of Naval Research
27. Sandia National Laboratories
28. SecurBoration
29. Space Micro
30. Texas Instruments
31. Xilinx

NSF Model for I/UCRC Centers

Research Interaction



Internal Structure and Interactions

- Multi-university center structure
 - Federation (union of partially self-governing sites)
 - Each school responsible for its members, projects, students, etc.
- Research structure
 - Hierarchical mentoring (faculty, PhD, MS, BS)
 - Project groups, each with multiple projects
 - 6 groups at UF in 2014, each with 3 projects on average
 - Each group led by 1 faculty and 1 or 2 doctoral students
- Internal interactions (at UF)
 - Twice-weekly group meetings (one w/ faculty, one w/o)
 - Weekly All-Hands meetings (groups take turns to present)
 - Variety of informal meetings as needed each week
 - Student rooms (5) organized to keep collaborators close



External Structure and Interactions

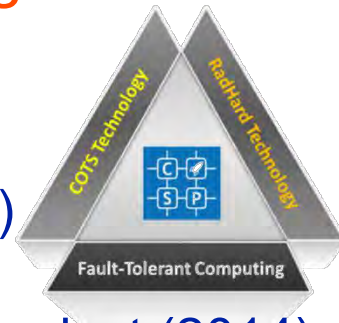
- Formal semiannual research workshops
 - June (midyear, 1.5 days) and December (annual, 2 days)
 - All members, students, and faculty assembled
 - Presentations, posters, & video on secure web site
- Progress reports
 - One-pager per group distributed monthly
 - Additional info distributed as needed by project
- Recurring and ad-hoc telecons by project
 - Some involve one site and member, others multiple
 - Some are regularly scheduled, and others on as-needed basis
- Student, faculty, and member travel
 - Center-arranged custom internships for students (many)
 - Meetings at member and school sites and conferences



Research Impact



- Foremost advantage of I/UCRC structure
 - 1) Attract industry and government leaders in your field
 - 2) Work closely with them to define research agenda
 - 3) Achieve success on that research agenda
 - 4) Members adopt your ideas, methods, technologies
 - 5) Thus, university research reaps major impact
- Example: CHREC Space Processor
 - Explored new research concepts and methods (2011-12)
 - Developed, evaluated, and optimized prototype (2013)
 - Adopted by NASA for future missions, and member as product (2014)
- Other advantages of this management structure
 - Critical mass → less stress on students and faculty
 - Flexible and stable source of research funding for worthy projects
 - Scalable approach → supports growth in all aspects



General Conclusions



- CHREC features I/UCRC structure c/o NSF
 - Beneficial for scalable research management
 - As we grow in members, sites, projects, students, and faculty
 - Beneficial for critical mass in research
 - Key players (industry, academia, government) and stable funding
 - Beneficial for research impact and IP
 - Agencies and companies adopting ideas, methods, technologies
- Strong support staff is vital
 - Center coordinator; System/network/security administrator
- Internal structure and interactions
 - To keep students and faculty productive (and happy)
- External structure and interactions
 - So members reap maximum ROI and return for more