

University of Florida (lead)  
Brigham Young University  
George Washington University  
Virginia Tech



*Mission: Fundamental research and development in reconfigurable computing for a broad range of industry and government partners with compelling needs in high-speed data and embedded processing.*

**CHREC Directors**

**Dr. Alan D. George, Director**  
(352)392-5225, george@chrec.org

**Dr. Tarek El-Ghazawi, Co-Director**  
(202)994-2607, tarek@chrec.org

**Dr. Brent E. Nelson, Co-Director**  
(801)422-6455, brent\_nelson@chrec.org

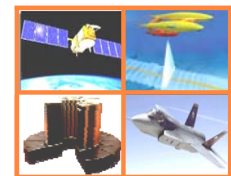
**Dr. Peter A. Athanas, Co-Director**  
(540)392-7250, athanas@chrec.org

*Under the auspices of the highly acclaimed Industry/University Cooperative Research Centers (I/UCRC) program of the National Science Foundation, a national research center was founded in 2007 in high-performance reconfigurable computing. Known as CHREC (pronounced "shreck"), this Center is devoted to scientific and engineering research in architectures, algorithms, programming, services, and systems for the advancement of multi-paradigm computing with reconfigurable and traditional parallel processing, spanning special- and general-purpose needs, for a broad range of applications. Each of the four university sites in CHREC contributes unique expertise and capabilities for research in this critical field.*



**Goals:** (1) Establish the nation's first multidisciplinary research center in high-performance reconfigurable computing as a basis for long-term partnership and collaboration amongst industry, academe, and government; (2) Directly support the research needs of our Center partners in a cost-effective manner with pooled, leveraged resources and maximized synergy; (3) Enhance the educational experience for a diverse set of top-quality graduate and undergraduate students; and (4) Advance the knowledge and technologies in this emerging field and ensure commercial relevance of the research with rapid and effective technology transfer.

**Research Scope:** Areas of primary research thrust are likely to vary and expand as this Center grows. Preliminary thrust areas include: device and core building blocks; reconfigurable systems and services; design automation and programming methods and tools; and reconfigurable and parallel algorithms and applications. Research projects in these areas are formulated in terms of key figures of merit such as performance, scalability, reliability, fault tolerance, resource utilization, power consumption, and device or system density, with a keen interest in new methods as well as key tradeoff analyses. High-performance reconfigurable systems and dual-paradigm computing hold tremendous promise in addressing the needs of a broad range of applications, in areas such as signal and image processing, bioinformatics, cryptology, communications processing, data and text mining, optimization, and complex system simulations, for a variety of platform types, from leading-edge machines on earth to mission-critical machines in space. Advantages from a reconfigurable approach can be realized in terms of performance, power, size, cooling, cost, versatility, scalability, and dependability to name a few, important facets where conventional computing infrastructure alone is proving unable to meet the needs of an increasing number of critical applications.



**Benefits of Center Membership:** Through participation in the Center, industry and government members (i.e. research partners) directly and substantially benefit in terms of research achievement and technology transfer with a leveraged and synergistic funding pool, collaboration and cooperation with other members,

and access to a strong cadre of faculty members, graduate students, and post-doctoral researchers. CHREC members have influence over and access to a broad range of cost-effective research activities at the leading edge of this important new field. They select the project topics that their resources support and review project progress and results on a semiannual formal basis and continual informal basis and thus benefit from research results in a timely fashion, before new developments lead to publications, with full access to all intellectual property emerging from the Center. Members leverage strong university research labs in several departments with world-class facilities. In addition to work conducted in the Center, many benefits arise *between* members from their memberships, such as new industrial partnerships, customers, and teaming opportunities on proposals for major government funding initiatives. Recruitment is also a major advantage of participation in CHREC, leveraging interactions with many bright and highly educated and skilled students.

**Personnel:** Research at the participating universities is undertaken by a team comprised of dozens of expert faculty, graduate students, and post-doctoral researchers from multiple disciplines such as computer engineering, electrical engineering, computer science, and aerospace engineering. In addition to university personnel, industry and government partners are welcome to have researchers in residence at any of the four sites of the Center or as temporary visitors to campus making use of its facilities.

**Management Structure:** The Center Director is Dr. Alan D. George, Professor of Electrical and Computer Engineering (ECE) at the University of Florida. Each Co-Director is lead faculty member at their respective partner institution, including Dr. Brent E. Nelson, Professor of ECE at Brigham Young University, Dr. Tarek El-Ghazawi, Professor of ECE at the George Washington University, and Dr. Peter Athanas, Professor of ECE at Virginia Tech. Each of the four CHREC sites features a strong cadre of faculty researchers, in reconfigurable, high-performance, and embedded computing and related areas, which lead research projects and tasks in the Center. The Industrial Advisory Board (IAB) serves a vital role in the management and success of CHREC. The IAB is comprised of representatives from approximately 30 industry and government members and responsible for oversight of Center activities, review of on-going and completed projects, as well as selection of new projects. Other key contributors for the success of CHREC include the NSF Center Evaluator for CHREC, Dr. Vida Scarpello, the CHREC Center Coordinator, Ms. Jena Slocum, and the site coordinators at the three partner institutions.



**Facilities:** Major facilities in the reconfigurable, high-performance, and embedded computing research labs at UF, BYU, GWU, and VT are being leveraged and significantly expanded in support of the CHREC Center. Facilities include cutting-edge technologies from system and board vendors such as Cray, DRC, GiDEL, Nallatech, SGI, SRC, and XtremeData, device vendors such as Altera and Xilinx, and tools and core vendors such as Altera, Xilinx, Aldec, Gedae, Impulse, Nallatech, Synopsis, and SRC. The suite of facilities available to CHREC members and researchers provides the most advanced and powerful experimental research testbeds of this type in the world, with hundreds of fixed and reconfigurable multicore devices supported by a potent assortment of high-performance communications and storage technologies.

**Funding:** Per NSF guidelines, industry and government contributions in the form of annual CHREC memberships (\$35K/year per regular membership), coupled with baseline funds from NSF and university matching funds, directly support the operations of the Center in terms of various costs for personnel, equipment, travel, and supplies. Memberships provide the requisite funds to support the Center's graduate students on a one-to-one basis, and thus the size of the annual membership fee is directly proportional to the cost of supporting one graduate student, while NSF and university funds support various other costs of operation. Multiple annual memberships may be contributed by any organization that wishes to support multiple sites, students and/or projects. The total budget for CHREC across the four sites is approximately \$3M/year, including NSF and universities contributions, in an academic environment that is extremely cost-effective. Thus, a single regular membership is an exceptional value. It represents less than 2% of the projected annual budget of the Center yet reaps the full benefit of all Center activities, a research program that could easily cost on the order of \$10M/year to operate in an industry or government facility.

CHREC organizers seek inquiries from industry and government groups interested in participating as members in our research consortium, and from top students seeking advanced engineering degrees in this exciting field of research and technology.