



## **Arizona State University and Raytheon Company receive Science Foundation Arizona grant to expand computer capabilities**

Tempe, Arizona (August 11, 2008) – Research that promises technological advances to greatly increase computer processing capabilities will be funded by a \$2 million Science Foundation Arizona grant to support work by scientists and engineers in Arizona State University’s Computer Science and Engineering Department and Raytheon Missile Systems.

The project will explore ways to maximize the computational power of multi-core processor systems. A multi-core processor is a single chip on which multiple processors (such as a Pentium microprocessor) are integrated.

“Five years ago, a desktop personal computer (PC) consisted of a single microprocessor, such as the Intel Pentium. In the next five years, the main chip on a desktop PC is expected to have upwards of 16 processors. In the not so distant future, desktop PCs will have hundreds of processors,” says Sarma Vrudhula, an ASU engineering professor and director of the ASU Consortium for Embedded Systems.

“This massive increase in processing capabilities will have a profound impact on every facet of human-machine interaction,” Vrudhula explains, “including medical instrumentation, robotics, transportation systems, smart-home environments, homeland security, aerospace and defense systems, and many other applications that are not yet on the drawing board.”

Vrudhula is on ASU’s team for the researcher project, along with fellow computer science and engineering faculty members Karam Chatha, Partha Dasgupta and Aviral Shrivastava. The Raytheon Missile System team will be led by Raytheon principal engineering fellow, Reagan Branstetter, who has 36 years of experience in development of high performance processor systems and embedded missile processors.

The promise of increased performance from massively parallel multi-core systems hinges upon the development of novel programming approaches and operating system policies that can effectively harness available computation resources, the researchers say.

In particular, both the programming techniques and operating system policies must deliver high performance while addressing the challenge posed by exponential increase in heat dissipation due to increased integration on a single chip. The project will focus upon the development of thermal aware parallel programming techniques and operating system policies for next-generation multi-core processor systems.

The Science Foundation Arizona funding “provides ASU researchers a valuable opportunity to collaborate with Raytheon to make significant progress on this technology,” says Rick Shangraw, vice president of ASU’s Office of Research and Economic Affairs.

The joint effort is a fortuitous match, Shangraw says. Raytheon engineers have the experience and understanding of specific computational skills required to address high performance defense systems issues that can be solved only by using multi-core processors. The urgent needs of Raytheon Missile Systems enable ASU researchers to have an immediate impact on state-of-the-art defense systems.

Moreover, the objective of this research is to have widespread impact on the design and deployment of multi-core processor systems in all domains, including commercial applications in the embedded semiconductor sector.

“Science Foundation Arizona is happy to support this program,” says Science Foundation Arizona CEO William C. Harris. “We believe that software for multi-chip systems and multi-core processors presents an important challenge for industry and an important opportunity for Arizona. We look forward to the exciting advances enabled by this partnership and we are proud to be partners with Raytheon and ASU.”

#### *About Science Foundation Arizona (SFAz)*

*With the mission of spurring new innovation in Arizona and developing a diversified, robust knowledge driven research and education infrastructure, SFAz, a 501(C)(3) public/private partnership, has to date awarded \$33.6 million in 59 innovation investments in information and communications technology, sustainable systems and biomedical research. In just one year, these investments have demonstrated clear strategic advantages to Arizona by attracting an additional \$43.8 million in outside research dollars, seeding the development of eight new companies, and fostering science, engineering and math skills in more than 10,800 students statewide. For more information, visit [www.sfaz.org](http://www.sfaz.org)*

#### *About Raytheon Company*

*Raytheon Company, with 2007 sales of \$21.3 billion, is a technology leader specializing in defense, homeland security and other government markets throughout the world. With a history of innovation spanning 86 years, Raytheon provides state-of-the-art electronics, mission systems integration and other capabilities in the areas of sensing; effects; and command, control, communications and intelligence systems, as well as a broad range of mission support services. With headquarters in Waltham, Mass., Raytheon employs 72,000 people worldwide. For more information, visit [www.raytheon.com](http://www.raytheon.com)*