

NC State team to develop energy efficient 3-D CPU

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Researchers from North Carolina State University are developing a three-dimensional (3D) central processing unit (CPU) – the brains of the computer – with the goal of boosting energy efficiency by 15 to 25 percent. The work is being done under a \$1.5 million grant from the Intel Corporation.

The computer industry has a great deal of interest in 3D integrated circuits, which are vertically integrated chips that are connected by vertical electronic connections – called "through silicon vias" – that pass through silicon wafers. These 3D circuits would represent an advance over conventional computer chips, which operate in only two dimensions.

"Under this grant, we are building a 3D CPU chip stack and will be solving some of the problems currently facing the development of 3D CPUs," says Dr. Paul Franzon, a professor of electrical and computer engineering at NC State and lead researcher on the project.

One problem the researchers plan to address is how to reconcile chips that are designed and manufactured in different places to different specifications so that they can work together in three dimensions. They will also address questions concerning heat dissipation, since the 3D nature of the design would otherwise lead to much higher temperatures within the machine.

"Our goal is to achieve at least a 15 percent improvement in

performance per unit of power, through architectural and circuit advances," Franzon says.

The researchers plan to have a complete prototype developed in 2014, and will also be addressing "test and yield" challenges – such as how manufacturers can test individual CPU components to ensure they are functional. These challenges are key to facilitating the manufacture of 3D CPUs.

In addition to Franzon, the research team includes Drs. Eric Rotenberg and Rhett Davis, a professor and associate professor, respectively, of electrical and [computer](#) engineering at NC State; and Dr. Krishnendu Chakrabarty of Duke University.

Provided by North Carolina State University

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