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Less time on the charger

In the world of consumer electronics, **everything depends on your power supply**. And when you're talking about portable devices including laptops, cell phones, mp3 players and the like, that power supply is your **battery**.

Dr. Saraju Mohanty works with computer science students running simulations on the Quad-Core Xeon systems in UNT's Nanosystem Design Laboratory.

Depending on how much you use your devices, they may require recharging several times a day. Constant recharging not only uses a lot of electricity, but also reduces the life of your battery, which means more frequent battery replacement. Dependence on electricity for recharging uses natural resources – as does manufacturing replacement batteries.

But **what if your devices only needed recharging once or twice a week**? Imagine how much electricity and how many resources could be saved.

Dr. Saraju Mohanty, associate professor of computer science and engineering at UNT and director of UNT's Nanosystem Design Laboratory (NSDL), is working to make that imagined scenario a reality.

Modeling in the design phase

Mohanty uses a technique called **nanoscale device and system modeling** with computer aided design (CAD) tools to figure out how to reduce "power leakage," or loss of power, **while a device is still in the design phase** -- rather than learning during the manufacturing process how much power a device will lose during use.

"Modeling is a formula, or a table, that represents the behavior of the actual device or system," Mohanty explains. "A single transistor in a circuit has hundreds of parameters. A chip like an Intel i7 has 800 million transistors. To simulate an individual test of each parameter is an impossible task unless you reduce the time it takes for the simulation process. Modeling uses unbelievably fast, high-end equipment to run simulations to get results we can study and see where improvements can be made."

He's **earned about $1 million in grant money** – from the National Science Foundation (NSF) and from the Semiconductor Research Corporation (SRC) -- to support his research. Much of the funding supports students as research assistants, while also purchasing two Intel Quad-Core Xeons -- computer and high-end server systems with several terabytes of storage and hardware simulation tools capable of running the modeling simulations.

Student researchers

Mohanty and UNT's breakthrough equipment provide UNT students with a **unique opportunity** to learn how to run the kinds of simulations leading manufacturers need to improve consumer products.

"We have to prepare future generations of engineers and researchers who will be able to transfer technology to society and increase the workforce in the semiconductor industry," Mohanty says. "That's the role of the academy, to provide the supply to meet the demand. Student training is part of our progressive research activities. We train them with the tools we have so they can go out and perform the simulations and process the data. They are actually doing that work here."

Meeting of the minds

One of the advantages of Mohanty's research is that he gets a **sneak peek at upcoming technology**. He receives the parameters for devices still in development to run through the modeling process so manufacturers like **Intel, Dell and Apple** can produce more efficient, lower priced products.

But to really improve performance and efficiency, Mohanty says all the groups that play a part in designing device components need to work together.

That's why he's organizing – and UNT is sponsoring – the International Symposium on Electronic System Design 2010 in December in Bhubaneswar, India. The symposium will bring together representatives from organizations that develop the five main components of the cell phone -- one of the world's most widely adopted consumer electronic devices. Those components are:

- analog and mixed signal circuits, including radio frequency (RF) components
- digital circuits
- memory circuits
- power management systems, including the battery
- system and application software

An emerging industry hub, India is one of the **fastest-growing nations** in the world. Holding the symposium in India takes advantage of that growth while also growing UNT's appeal as a choice for Indian students in computer science, computer engineering, and electrical engineering programs.

India already sends most of its students to the U.S. A. to study, and Indian students are among the largest international student populations on campus. But, Mohanty says more of these students could benefit from knowing about UNT.

"We have many great programs and competitive stipends for students, but not enough people there know about us," he says. "I want to change that."

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Related sites

- Department of Computer Science and Engineering
- Nanosystem Design Laboratory
- International Symposium on Electronic System Design 2010

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