Cooperative design shaves chip-making costs -- a boost for Europe's bottom line

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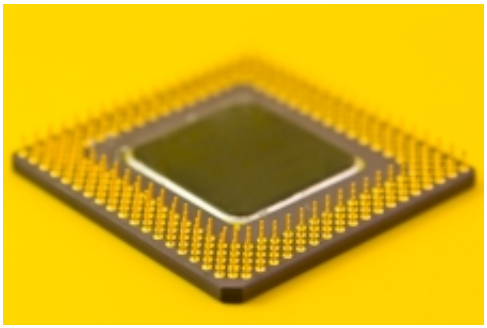

(PhysOrg.com) -- A European-sponsored programme that gives universities inexpensive access to state-of-the-art microchip design tools and fabrication techniques, and helps even small businesses fabricate novel microchips, is helping Europe remain competitive worldwide.

It is a simple idea that has turned out to be very powerful - fabricate multiple microelectronic or micromechanical systems on a single wafer to cut costs dramatically.

The European-funded consortium EUROPRACTICE started offering this cooperative, cost-saving multi-project wafer (MPW) service to universities and small and medium sized businesses 20 years ago. Today, nearly every university in Europe uses EUROPRACTICE, as do hundreds of smaller businesses every year. As a result, European

researchers and students have access to the latest microchip design tools and fabrication techniques, and European businesses bring hundreds of novel microelectronic and micromechanical applications to market every year.

“The best training is to give someone the chance to design a chip, make it, measure it, and verify it,” says Carl Das, project manager at IMEC in Belgium and project coordinator of EUROPRACTICE. “In addition, if smaller companies didn’t get this kind of access, their ability to innovate would be dead-ended.”

The consortium’s goal is to support research and development in nanoelectronics and nanotechnology that paves the way for industrial uses three to ten years in the future.

Space-sharing millimetre by millimetre

Packing multiple projects on a single wafer can cut the costs of designing, fabricating, testing, and producing a microchip by up to 90 percent.

The upfront costs of a chip can run from €50,000 to €200,000, according to Wayne McKinley of the Fraunhofer-Institut für Integrierte Schaltungen (IIS). However, when many projects share that high-rent real estate, costs fall dramatically.

“We didn’t invent the MPW, but we’ve made it as cheap as possible,” McKinley says. “If you share an MPW design, you can easily have it done for €5000 or less. It has become a very nice interface for people to use.”

Funding from the EU underwrites projects coming from European universities and researchers, while businesses and non-European

universities must pay their own way.

However, EUROPRACTICE has managed to keep costs low enough that every year hundreds of companies from more than 40 countries use EUROPRACTICE to produce new products.

In 2008, EUROPRACTICE produced 534 ASICs (application-specific integrated circuits), about two-thirds for European universities and research groups, the remainder for commercial customers worldwide.

As is true throughout the microelectronics world, the size of components continues to shrink. “Twenty years ago we were offering 2 micron technology, now it’s 90 nanometres, and there’s a good chance we’ll be offering 65 nanometres in the near future,” says Das. “We’re working hard to keep up with the advances in the industry.”

To make the process as simple and accessible as possible, EUROPRACTICE provides researchers with detailed start-to-finish support. This includes design rules and kits, software to simulate how a prototype circuit will behave, and state-of-the-art tools to generate the final layout.

The final layouts go to participating foundries which fabricate the actual chips.

“We do a lot of checking to make sure that the designs will function,” says Das. “Once we’ve transferred them to the foundry, in eight to twelve weeks we give our clients their chips back ready for them to measure and evaluate.”

Applications - outer to inner space

Over the years, EUROPRACTICE has produced thousands of ASICS,

some experimental but many highly practical. Recent applications span the scale from outer space to inner space - inside our bodies.

If all goes according to plan, some time in 2020 the Bepi/Colombo space probe will ease itself into orbit around Mercury. Onboard will be PICAM, the Planetary Ion CAMera developed through EUROPRACTICE. PICAM is a minute - 3200 x 3200 micron - mass spectrometer that will let scientists determine what kinds of chemicals circulate near Mercury.

The PICAM chip was produced at IMEC, in Leuven, one of EUROPRACTICE's three primary partners. The other two are Fraunhofer IIS in Erlangen, Germany, and the Rutherford Appleton Laboratory, in the UK.

Meanwhile, anyone who has experienced an endoscopy will appreciate the benefits of VECTOR, the Virtual Endoscopic Capsule for Gastrointestinal Tumor Recognition and Therapy, designed at the University of Barcelona and fabricated by EUROPRACTICE.

VECTOR incorporates advanced microelectronic and micromechanical features to power a "smart pill" that can not only focus on and take diagnostic pictures of suspicious features, but utilises two micromechanical electric motors to move around.

EUROPRACTICE has also helped develop permanent bio-electronic implants. One, an implant developed at Imperial College London and the University of Cyprus, uses a combination of micromechanical and microelectronic functions to restore normal balance to people suffering from certain kinds of inner ear dysfunction.

The system senses motion in three dimensions and transforms that information into meaningful neural signals.

Another implant may help restore sight to the blind. It is a 1600 pixel artificial retina with its own power supply and signal processing capability that may let blind people distinguish between different shapes. The device was developed by the University of Ulm, Germany, and Retina Implant AG, with the help of EUROPRACTICE.

“These products showcase what can be accomplished,” says Das. “We’re continually trying to offer new technologies - like the micromechanical systems - where new things can be done.”

More information: www.europractice.com/

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