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The Information Centre for Design Engineers

Simple ideas foster innovative designs

by by Chitra Giridhar, India Correspondent
ECN Asia

What makes a great design? A great design is built by going off conventional stereotypes and incorporating innovation, according to Dr. Niranjan, adjunct professor of ECE and BME, Manipal Institute of Technology. Anil Gupta, managing director, India operations, ARM Embedded Technologies Pvt Ltd, views great design as something that can be applied readily. "Create a design that fulfills a need," says Gupta. This also means that a great design speaks for itself, and that is never questioned of its purpose.

Expanding on the thought, Jailendar Singh of Solex Semiconductor India Pvt Ltd observes, "A great design should be able to anticipate end-user needs. Engineers should forecast and predict what is required, and how to provide it cost-effectively."

INNOVATION BY DESIGN

According to Gupta, design companies are aware that innovation is an important aspect of a great design. For instance, Thiruvananthapuram-based Ushus Technologies, the technology division of Accel Transmatic Ltd, engineered a high-speed data transfer solution for the Apple Mac environment that uses customized link aggregation techniques to boost throughput while transferring large files. The new design provides a cost-effective way to scale up infrastructure in an incremental fashion by aggregating links in lock-step with required data rates. Ushus Technologies' new design was created for an undisclosed Japanese startup that specializes in high-speed media converter solutions. Before turning to Ushus, the Japanese company discussed the idea with other designers in the Mac world, and was advised that the solution was largely infeasible.

"This success gives our company the confidence to look forward to the future, with data communications as one of the key focus areas," says an overjoyed Ram Mohan, manager, technology strategy for Accel.

Another company, GDA Technologies Ltd, with design centers in Chennai, Kochi and Bangalore, has worked on the CM5100, a mobile display digital interface (MDDI) compliant serial interface display controller with embedded memory for US-based California Micro Devices. Aside from providing backend

IC design, GDA Technologies also produces hardware and software validation routines, and reference platforms. Ravi Thummarukudy, vice president and general manager of GDA Technologies' IC Solutions Business Unit, said the company's optimized design methodologies for low-power designs enable them to complete designs quickly.

To bolster GDA Technologies' design capability, Thummarukudy cites the company's Home Cinema reference design, which forms a part of the popular AMD Live! Solution for entertainment applications. The Home Cinema reference design combines the ATI TV wonder digital cable tuner, a DVD burner, and a D2 audio digital amplifier. This all-in-one consumer electronics system with PC capability can function as a DVD player, DVR, and set-top box. This equates to fewer boxes and wires in the living room.

Meanwhile, NeST Technologies Corp. has recently worked on a special mobile handset targeted at Japanese students. The handset not only enables VoIP conversations over campus-wide Wi-Fi, but also provides information such as the location of the student. This Linux-based mobile phone incorporates an easy-to-use user identification system for built-in security.

LEADING EDGE CREATIONS

To provide affordable healthcare to rural areas, the government of India needed a sophisticated yet affordable telemedicine terminal. NeST was commissioned to develop a portable device that can be used to examine, monitor, and treat a patient. The design called for a device that can send patient reports via text, voice, images, and video, and enable video conferencing with a medical specialist.

Other features include multiple power source operation and a choice of broadband connectivity solutions – depending on site conditions at specific rural locations. NeST addresses these complex requirements through a design developed using MontaVista Linux and TI's DaVinci processor.

Bangalore-based iWavesystems Technologies Pvt Ltd specializes in the development of novel wireless products. The company's latest product is a rear-view system for automobiles. "We have developed an

FPGA-based solution for the rearview camera that replaces wired LAN in automobiles. The camera collects data, which is then compressed in the FPGA and transmitted over Wi-Fi to the receiver. There the information is decompressed by another FPGA and displayed on an LCD," explains Zafeer Feroz, in-charge of innovative solutions at iWavesystems. The company's solution simplifies the installation of rear-view systems in vehicles, improving driver safety and comfort.

LOW-END DEVICES

High-end products are not only the best samples of great designs, Microchip Technology's PIC18F85J90 8-bit microcontroller is used in many cost-sensitive embedded display applications, such as thermostats, utility meters and medical instrumentation. This cheap microcontroller was designed completely at Microchip Technology's India design center.

"It was a challenging design with aggressive goals for cost, power consumption, and a rich set of features. We had to release the design to production on a very tight schedule," recounts Rajesh Joshi, design manager, AMAD, Microchip Technology India. "LCD controller is a cost-sensitive market. We had to explore several options before arriving at the best possible floor plan that would give us the optimum die size.

To address the power consumption problem, we used a cell library with low leakage, redesigned some analog micros, and employed propriety architectural techniques," he added. The product has been commercially successful and has secured a large number of customer orders, according to Joshi.

The India Product Development Center (IPDC) of Analog Devices India Pvt Ltd is also working on contemporary and challenging technologies. "We have engineered three generations of ADI's SHARC digital signal processors from here – raising the performance from 40MHz to 400MHz, and improving the performance of architectural and micro-architectural innovations," said Dr. Reddy Penumalli, managing director, Analog Devices India. "We have also made improvements in the design methodology to reduce design cycle times and ensure higher quality silicon." To note, IPDC was responsible for the world's first 200 MFLOP SHARC. The center is currently working on enhancing the company's Blackfin processors.

REJUVENATING LEGACY TECHNOLOGIES

It is not just designing new technologies that occupy the time and efforts of Indian design engineers. Re-engineering legacy systems is also catching up. Electronic controllers, for instance, are key components of capital-intensive investments like power plants, process plants, aircraft, etc. While these plants and equipment have a lifespan of more than 25 years, the controllers that they use have become obsolete. Engineers maintaining these equipment are often faced with the challenge of finding replacements since the original suppliers of old controllers may no longer be producing them. One solution to the problem is to re-design the equipment.

Re-designing, however, is easier said than done. The propriety nature of the original equipment, nonavailability of original design data, and the need for the interoperability with other equipment, make reverse engineering design solution a challenging task. It requires significant hardware and firmware skills, indepth knowledge of past and present technologies, and well-equipped laboratories.

NeST has done re-engineering work in which the functionality of the old controller was analyzed, resulting in the development of a new equipment that complies with present day standards and interoperability requirements. The legacy design was re-engineered and improved using FPGAs and new generation microcontrollers.

FRUGAL ENGINEERING

Electronics design can be considered as the only industry where the cost of production goes down, while features continue to increase. "My organization is looking at designs from a cost angle," says DR. Narasimha Bhat, CEO of Manipal Dot Net Pvt Ltd.

"There are many instances in which a judicious choice of components and architecture can cut design costs by a factor or two. This reduction, in turn, can result in the wider use of the design and applications that depend on it."

One application of Bhat's frugal engineering concept is will be a hardware platform for Indian engineering students. "The platform will be a re-design of an existing platform available to US university students. However, the imported kit is way too expensive for India. Our goal is to re-design the platform in a way that it retains all the features — yet is cheaper by 75 to 80 percent," Bhat explains.

The platform that Manipal Dot Net is working on will be used by sophomore and junior year engineering students. It will allow them to learn the basics of digital design, microcontrollers, signal processing, and video and image processing through a set of graded laboratory examples that run on both software and hardware. The price of the US platform in India exceeds \$1,000 and is unaffordable to a vast majority of local students. Bhat is hoping to create a version that will sell for less than \$250.

Furthermore, the company is also working on custom projects for clients who want to popularize new technologies by "giving away" thousands of sample boards. "Since the goal is to have something useful which costs next-to-nothing, a clever choice of components and design architecture is a must," says Bhat.

TOWARD THE FUTURE

Pratul Shroff, CEO of eInfochips Inc., believes that a great design company needs four P's to achieve success: passion (for engineering), people (training them on hardware technologies as well as software skills), processes (for flawless execution), and persistence.

eInfochips Inc. was recently acknowledged as one of the top five developers worldwide by Texas Instruments. Shroff also emphasized that setting and managing customer expectations is important if a design services company wants to be successful. Meanwhile Dr. Bhat wants educators to foster a practical mindset among their students so that future Indian designers can conquer the promising low-cost, high-features design market.



ADI's Indis Product Development Center designed three generations of SHARC processors.



Novel wireless products from iWavesystems.



Telemedicine board designed by NeST Technologies.

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