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## From Project to Product Engineering

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Outsourcing of chip design, system integration, testing and validation activities to India continued unabated over the past twelve months, with a number of new startups and captive facilities either commencing operations or increasing head counts. Design companies in India are continuing to participate in leading-edge technologies—and moving towards delivering product engineering solutions that span the entire product lifecycle.

Take, for instance, the work that is being done by TCS which is working on 45nm technology for a global leader in computing and peripherals. The project involves validating chip design (including core area optimization), and ensuring that critical parameters like low clock skew, IR drop and shielding are kept in check. The company is also working on a two-system design for a LTE base station emulator, and TDD development, for a major test equipment vendor. These projects involve FPGA, board, embedded software, protocols, algorithms, and DSP design. "The main challenge is that the [wireless] standard is not yet frozen. We are working with the latest version of the standards, and make changes when the specification evolves," explains Rampura Venkatachar Raman, Head - EIS Semiconductor and Consumer Electronics Vertical, Tata Consultancy Services.

### India Inside

An increasing number of consumer, entertainment and automotive systems are incorporating technologies and embedded software developed by Indian companies. Wipro Technologies has licensed its DVB-T and Common Interface (CI) software stacks to TiVo, the creator digital video recorders (DVRs), for its solutions targeted at Australian and European markets. TiVo has recently launched its HD DVR in Australia, and Wipro's solution enables support for free-to-air television networks' digital channels with most of TiVo's popular features. Wipro already has more than two dozen licensees for its Digital TV middleware stacks such as ATSC, OpenCable, DVB-T/C/S/CI, MHEG-5 and ISDB-T/S. These stacks are used in multiple product segments including HDTV, high-end hybrid set-top boxes, DVRs and in-car TVs. Wipro has also set up an engineering development center for Harman International Industries to design and develop audio and infotainment solutions across the automotive, consumer, and professional markets.

Analog and mixed-signal design is one area where Tata Elxsi has been seeing a lot of interest from overseas customers. "Early this year, one of our customers commissioned full-chip design and development of analog chipsets. Since, there were a large number of existing products (analog chipsets) in the market, we had to analyze their features and performance, before devising a new range of chipsets with more comprehensive functionality," says Nagaraj Keshava Murthy, Specialist- Marketing PDS at Tata Elxsi Ltd. The scope of the project involved circuit design to layout, device characterization and testing. The challenge was to simultaneously tape out multiple chipsets with lowest cost targets Murthy explains.

Infochips has developed a low-cost, small form-factor rapid prototyping board based on TI's TMS320DM6467 DaVinci technology. The DVPB-HD board simplifies prototyping of applications like video surveillance DVRs, video conferencing systems, and medical imaging. The kit includes a bundled with software package consisting of U-Boot bootloader, test utilities, and a demo application.

### Putting it Together

HCL Technologies is helping a telecom giant build a SoC for use in satellite phone applications. Acting as a system integrator, HCL is coordinating with multiple suppliers for analog and digital IPs, USB cores, processor cores, etc., and creating the physical design and packaging needed to deliver a complete customer solution. For another client, HCL integrated three fully verified devices (a memory controller, an EDAC device, and a PCI master/target controller) on a single ASIC. The company's design team created a conceptual FPGA design, modeled its behavior, and converted it to an ASIC, according to Abhishek Vanamali, Head of Marketing and Strategy, R&D services business at HCL Technologies Ltd. HCL has completed over 10 full chip designs, from architecture definition to physical design for various applications.

Companies like GDA are investing substantial resources in creating building blocks that can be used in ASIC, SoC and reference board designs. In addition, GDA has also developed a translation methodology for converting from Specman/VERA to System Verilog. "Recently, all of this came together in a project where we supported full chip development for wireless infrastructure. We used our existing building blocks (Serial RIO with AXI) and delivered a new System Verilog environment. Few companies could have delivered this in the short project time frame," claims a GDA spokesperson.

#### Cautious Optimism Rules

India's design industry is already in a mature state, and the presence of almost all major EDA and IP companies in the country means that a complete design ecosystem is available. According to the ISA-IDC Report 2008, the total design services market in India was estimated at \$7.37 billion, and the sector employs about 153,000 engineers. A lion's share of the industry revenue is accounted by embedded software (81 percent), with VLSI services at 13 percent. The sector's CAGR is about 21 percent, well above the global average of 6 percent.

However, thanks to ongoing financial turmoil in the United States, the industry's frenetic pace of growth could be moderated. "If the recession continues, then it would have a definite impact on the schedules of OEM/semiconductor vendors who are planning new launches—they may either delay making an outsourcing decision for a new chip design, or annul an existing contract. The course of action depends on how critical it is for the product to hit the market," observes Ganesh Ramamoorthy, analyst at Gartner Group.

Another fact that is worrying companies in the design services sector is that, on a worldwide basis, the total number of design starts is dropping. This is leading to a decline in outsourcing opportunities—and more cost pressures on service providers. "While I assume that most design service vendors are already covered for 2008, they will probably feel the pinch of the recession in Q1 of 2009," feels Ganesh. "But, when the markets bounce back, I expect companies will look at outsourcing before increasing internal headcount," predicts Poornima Shenoy, President of Indian Semiconductor Association (ISA). "But, a favorable IPR regime is helping position India as a region which fosters innovation. And with years of design expertise in VLSI and project management, India is in a strong position to drive cutting-edge, full-chip design" she adds.

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