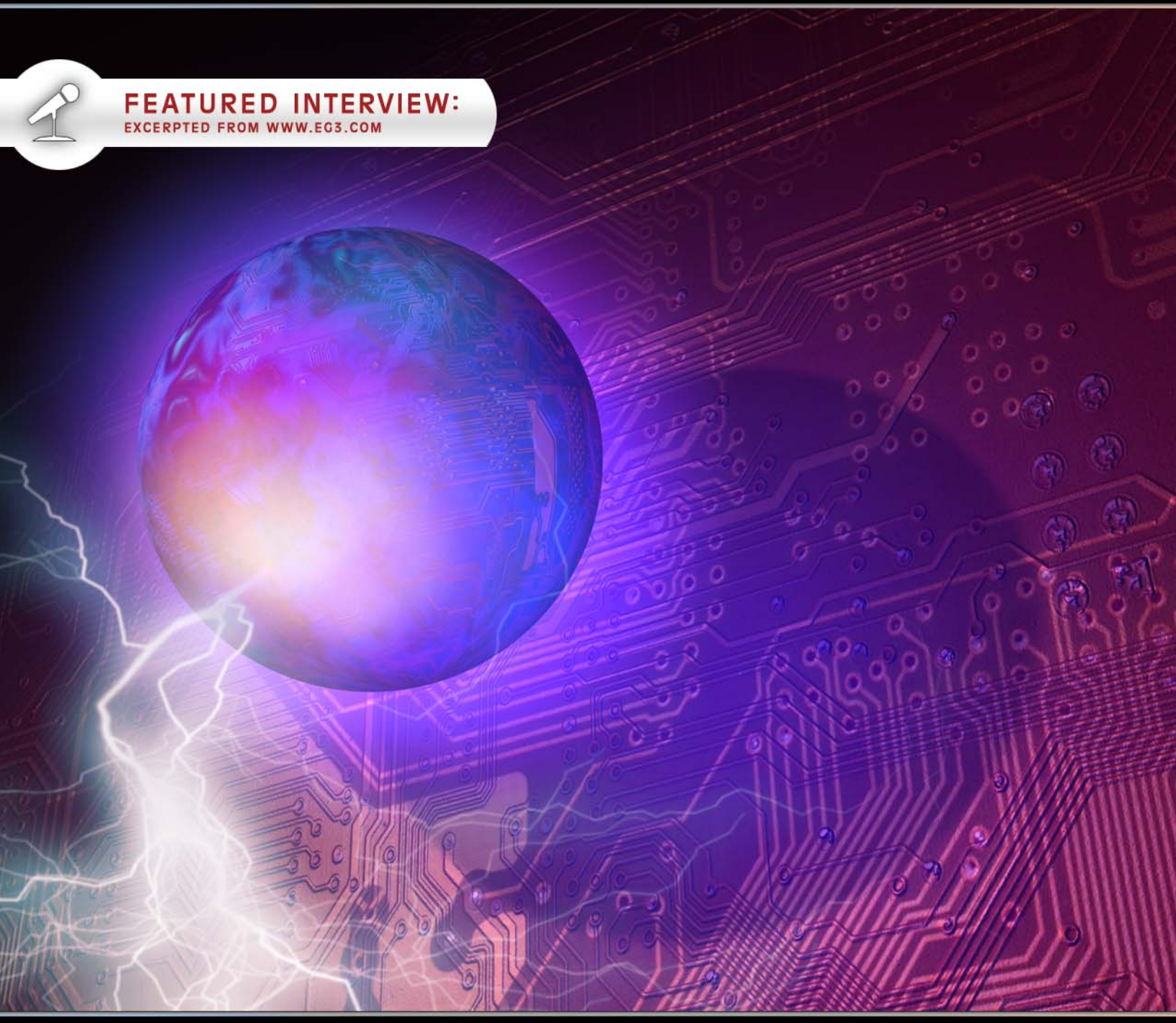
INSIDERS' GUIDE:

FPGAs, TOOLS, AND BOARDS



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EXCERPTED FROM WWW.EG3.COM

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BDTI: FPGAS FOR DSP, AN ANALYTIC APPROACH

10 October 2008: FPGAs for DSP, An Analytic Approach

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Q. **First of all, tell us a little bit about yourself and BDTI's publications and services.**

A. BDTI is—and always has been—a consulting company focused on helping its customers build and use signal processing technology. Signal processing is a fundamental technology that makes nearly all electronic systems today possible. This technology is an enabler of energy-efficient refrigerators and washing machines (through motor control), the equipment that supports our communications systems (including everything from central office switches and mobile wireless basestations to cellphones), and so forth.

BDTI serves primarily two classes of customers: the creators of technology—the companies that produce the processing devices and solutions that power these electronic systems; and, the users of technology—the companies that build the equipment that comprise the systems.

BDTI is perhaps best known for its benchmarks and published reports. However, this really is a very small part of our overall business. The benchmarks are a means for creators of technology to objectively evaluate their work and for the users of technology to reliably assess their suppliers' products. Our work has been disseminated through published reports, but much less so in the past few years as the place of print is taken by on-line—like eg3.com.

Q. **BDTI is known as an "expert" first and foremost in DSP technology. What are the most important connections you see between DSP / Signal Processing and FPGAs? What fact-finding advice would you give someone looking at FPGAs that also has DSP issues in his design?**

A. First, let's make a distinction between digital signal processing and digital signal processors. Digital signal processing is a key element of nearly all electronic systems today, and a wide variety of processing solutions are used to provide digital signal processing capabilities, including—not surprisingly—digital signal processors. But, CPUs, ASICs, microprocessors (increasingly), and FPGAs are also used as processing engines for digital signal processing applications.

In fact, FPGAs are an extremely powerful platform for digital signal processing. Someone who is seeking good cost-performance in a design may well consider the use of an FPGA.

Q. **Can you give us a brief summary of your report, *FPGAs for DSP*? What readership does it target? What does it overview? How much does it cost, and what are its publication dates?**

A. *FPGAs for DSP* is in its second edition. BDTI set out to test the conventional wisdom that FPGAs are prohibitively expensive for digital signal processing applications. As you know, FPGAs have been used as a prototyping platform for designs that migrate into ASICs for volume production. However, BDTI discovered that, when the workload is taken into account, an FPGA can be an inexpensive platform for digital signal processing applications. Take a telecom

application for example. Traditionally, equipment racks were filled with boards stuffed with DSP processors, each processing a small number of channels. A single FPGA is capable of processing orders of magnitude more channels.

The second edition of the report, published in 2007, provides qualitative and quantitative analysis. Qualitatively, it describes technologies for digital signal processing applications: the structure of an FPGA; the range of technologies available for digital signal processing, including DSP processors, general-purpose processors, ASICs, application-specific processors, and FPGAs; the FPGA design flow; and, the Altera Stratix II and Xilinx Virtex 4 families of FPGAs. Quantitatively, it describes the benchmarking of FPGAs and DSP processors on BDTI's Communications Benchmark (OFDM)™.

The report is approximately 100 pages and sells for $2,495.

Q. **Both Altera and Xilinx have special micro websites that focus on DSP, clearly indicative that they see DSP as a potentially big area for FPGAs. Could you help out our readership by identifying a few potential "gotchas" or "points of comparison" as they try to compare and contrast the FPGA technology for DSP of Altera and Xilinx?**

A. Both Altera and Xilinx have done an excellent job in the past few years in developing tools and IP for implementing digital signal processing applications. Since implementation of systems on FPGAs is primarily a matter of hardware design, systems designers would do well to consider the design ecosystem provided by a vendor and how it fits their particular needs. By this we mean the IP blocks available, the efficiency of systems design tools, and the technical support offered by the vendor and third-party network.

Q. **Many FPGA users are purchasing not simply FPGAs but FPGA-based boards, IP for FPGAs, even FPGA design tools as well as, of course, the "free" design tools from vendors like Xilinx. Does BDTI have any offerings that are relevant for boards, software, and/or IP?**

A. Although BDTI is not an FPGA design house per se, we have considerable expertise in programmable, instruction-set processors. This includes the "soft processors" that are offered by FPGA vendors these days.

BDTI can also help a company that is considering migrating an application from a programmable instruction-set architecture to an FPGA, to evaluate its options.

Q. **BDTI is known for your "benchmarks." Can you explain, briefly, what benchmarks you offer that are relevant for FPGAs?**

A. Fundamentally, benchmarks serve as a proxy for the workload of a real-world application. In an ideal world, a systems designer would implement his or her application on every candidate processing platform. Of course, this is prohibitively time-consuming and costly. What processing platform vendors, like FPGA vendors, want to do then, is to demonstrate the performance of their products on workloads that are relevant to those of their customers.

BDTI designed its BDTI Communications Benchmark (OFDM) to serve as a proxy for the types of workloads found in today's broadband communications applications where DSP processors and FPGAs compete for sockets. BDTI's 2007 report included detailed benchmark results for high-end TI and Freescale DSP processors as well as FPGAs. Recently, vendors of massively parallel multicore processors, such as picoChip and Tilera, have published results on this benchmark.

The BDTI Communications Benchmark (OFDM) is what we call an application component benchmark. That is, it implements a critical, core component of the functionality of an application. BDTI also offers other application component benchmarks, such as the BDTI Video Encoder and Decoder Benchmarks.

Q. **Beyond the reports that you publish and sell, tell us a little bit about BDTI's consulting services. Who would engage with you on a consulting basis? What value proposition does your consulting services bring to someone evaluating FPGAs for DSP?**

A. BDTI's mission is to serve the embedded processing industry as an independent technology analyst and provider of world-class, specialized engineering services. As an analyst, BDTI focuses on benchmarking and performance analysis. In its engineering services practice, BDTI's emphasis is on design consulting and software optimization.

BDTI's value for a company that is evaluating the use of an FPGA for a digital signal processing application is in independent analysis. For example, our report, *FPGAs for DSP*, is a valuable asset for a company that is weighing the use of FPGAs to implement a system that has heretofore used DSP or general-purpose processors.

But even a company that is a heavy user of FPGAs can find value in BDTI services. In a recent engagement, BDTI was asked to evaluate and compare the strengths and weaknesses of a number of design methodologies for a large defense contractor. The company wanted an independent assessment of the range of options available for implementing real-time embedded processing systems. BDTI's task was to recommend best practices for the design of systems that meet the demands of real-time processing, and to identify suitable tools and implementation technologies. BDTI evaluated the requirements of the applications and made several important recommendations, including ones for impacting the use of FPGAs in the customer's designs. By implementing the recommendations, the customer will gain greater efficiency in its design process.

FPGAs are a valuable technology for implementing digital signal processing systems. BDTI can help companies grappling with the decision as to when and how to use an FPGA for its application, resulting in savings in time and cost, with lowered risk.

Q. **Thank you for this interview.**