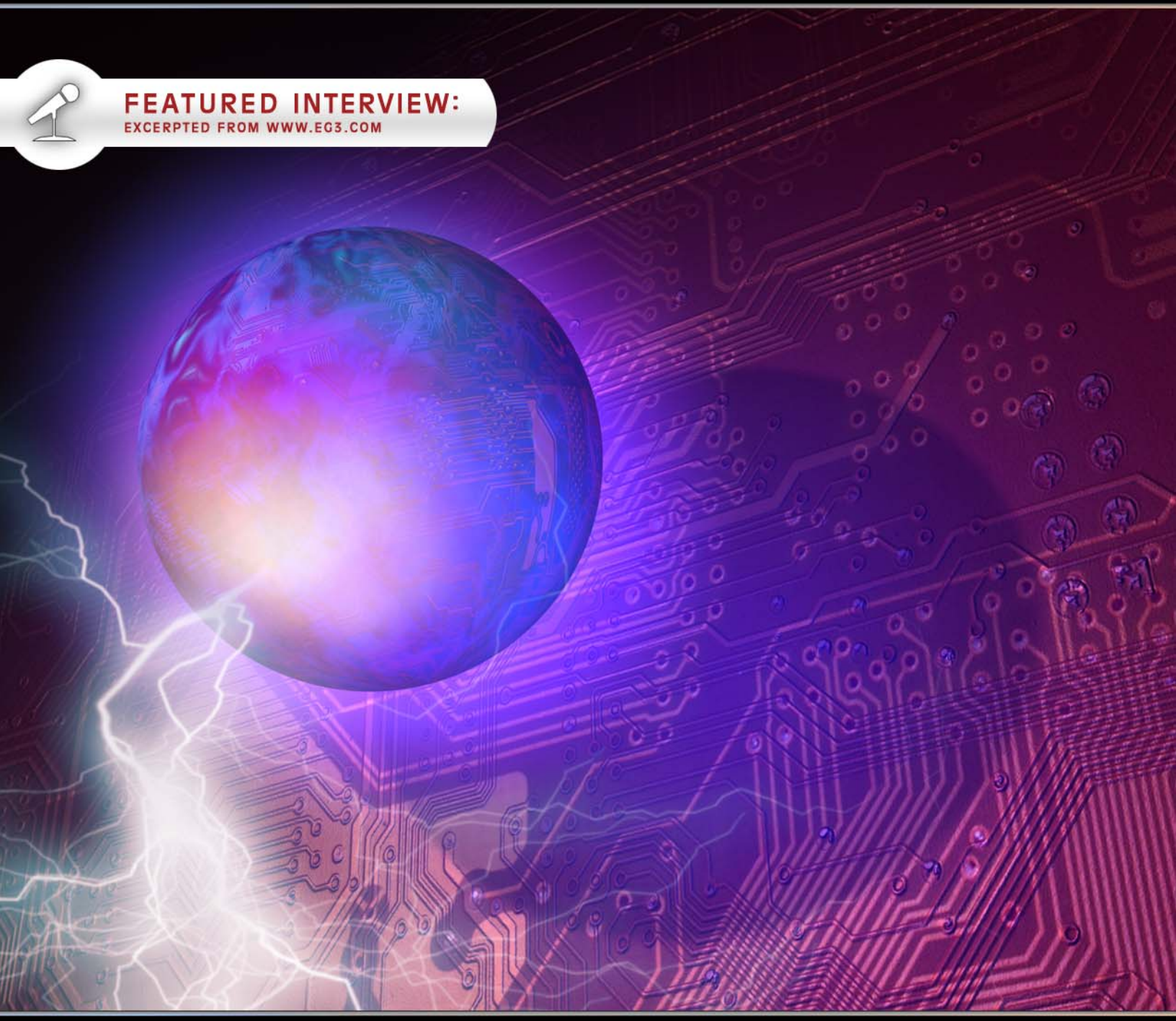
INSIDERS' GUIDE:

FPGAs, TOOLS, AND BOARDS



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COMMAGILITY: FPGA-BASED ADVANCEDMC BOARDS

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Q. **First of all, tell us a little bit about yourself and your responsibilities at CommAgility.**

A. I'm managing director of CommAgility, and one of four co-founders of the company. We had all worked together previously at Blue Wave Systems and Motorola Computer Group, and between us have more than 50 years' experience in the embedded signal processing industry. We started CommAgility in 2006, and I'm responsible for leading the team and our sales and marketing activities – although I'm originally an engineer by trade and still do some VHDL work when I can find the time!

Q. **What sorts of products does CommAgility provide? Would you please give us a very brief summary of the product offerings?**

A. CommAgility develops and manufactures signal processing Advanced Mezzanine Card (AMC) modules for a range of applications, primarily wireless baseband but also high end industrial, military and physics applications. They generally combine flexible high-speed high-bandwidth I/O such as copper or optical wireless/comms interfaces with CPRI, OBSAI, Serial RapidIO (SRIO) and Ethernet protocols. Processing comes from a mix of the latest Xilinx FPGAs and Texas Instruments DSPs according to the application space. Customers around the world use CommAgility products to develop high performance applications, and recent designs include test equipment, trial systems and base stations for a wide range of wireless standards especially WiMAX and LTE.

Q. **You mentioned earlier that you were very excited as a company about FPGA-based boards for wireless baseband applications. What do you see unique in this application area for FPGA-based boards? What sorts of special design challenges and opportunities do you hope to help companies address?**

A. Wireless baseband applications have tough requirements for processing performance and I/O bandwidth. Over the last few years, FPGA vendors, such as Altera and Xilinx, have substantially improved their chips and development tools for signal processing. The number one benefit offered by FPGAs is their efficiency in concurrent applications by using multiple parallel processing blocks. Coupled with their flexibility to allow the embedded systems designer to tailor the device to match their application's demands as closely as possible, FPGAs can achieve the highest possible throughput with low cost per channel.

Taking for example the processing of WiMAX Orthogonal Frequency Division Multiple Access (OFDMA) channels, a pure DSP solution cannot match an FPGA in the bandwidth and number of channels it can process. Consequently the DSP solution may have an

unacceptable cost and power per channel.

The FPGAs' flexibility has traditionally come with an additional cost in power due to the increased gate count and silicon area of non-optimized solutions in comparison to hard-wired architectures. However, 65-nm and 40-nm technologies and the use of equivalent ASIC devices for volume manufacture mean that FPGAs can be low power in the lab, and power-reduced further in volume.

DSPs still retain many advantages, including reduced development time for new and complex algorithms, and flexibility to run many different algorithms. We have found that the best solution for wireless baseband customers is often a heterogeneous system incorporating DSPs and an FPGA. For example, our AMC-3C87F board includes three Texas Instruments TCI6487 multi-core DSPs running at 1GHz and a Xilinx Virtex-5 SX95T FPGA. Using this for example as a WiMAX PHY, the FPGA is used to add flexibility to the front end radio interface, plus as a DSP co-processor for algorithms such as turbo-coding which is based heavily on bit manipulation and less suitable for the DSP.

This kind of system does pose design challenges to achieve a suitable high-performance, low latency I/O infrastructure. In wireless baseband, when supporting multiple-input multiple-output (MIMO) systems with channels encoded using spread-spectrum techniques such as CDMA, data from all radio antennas has to be available to all baseband-processing blocks. To achieve good performance, the key is an efficient low-latency interconnect such as Serial RapidIO (SRIO).

Q. **CommAgility seems to have hitched itself very closely to the PICMG AdvanceMC standard. What are your views about standards like AdvancedTCA, AdvancedMC, and MicroTCA? How do these help applications in which FPGAs play a significant role?**

A. One of the reasons for forming CommAgility was the recent emergence of the AdvancedTCA and MicroTCA standards, with AdvancedMC as our natural product choice as the sweet spot covering both of these standards.

We're certainly excited about these standards, and see them making a significant contribution to the development of scalable, high-performance signal processing applications. MicroTCA in particular is still very young and appears to be into first deployments and entering a phase of rapid growth, which we are right in the middle of, and we expect significant growth for CommAgility in the next few years as MicroTCA matures and our customers move from development into volume.

The key benefit to customers in using these standards is the ability to take advantage of a tried and tested infrastructure, available from a range of suppliers, with the up to date management, power and I/O bandwidth capabilities to cover many high-end application needs. This massively reduces system development and integration effort compared to a proprietary solution.

Q. **What sort of vertical applications do your products go into? When one hears AdvancedMC, one immediately thinks of telecommunications. Is that your primary vertical?**

A. Wireless telecoms are certainly our main vertical market, and this is where the DSP/FPGA combination is widely used. But for our more FPGA focused products, we've had additional interest from a wide variety of application areas, including semiconductor processing equipment, high-energy physics, wireline telecoms, and military software

defined radio and radar. This demonstrates the flexibility and performance of FPGAs in today's high-end applications.

Q. **As a small company, how do you stand out from your competition? Do you provide any design services or special value adds for customers?**

A. We have two key areas where we believe we stand out from our competition:

- Speed of response. With our highly experienced and focused development team, we can implement new designs very quickly and efficiently, and already consider ourselves the technology leaders in the market areas, which we serve.

- Flexibility. In contrast to larger companies in this space, we are set up to be agile and react to our customers' specific needs, and can respond quickly to support the particular requirements of their OEM project. We primarily work with OEM customers who we also support closely in order to ensure success of their product.

Q. Where will we see CommAgility going in the future?

A. On the one hand we will continue to provide a broad range of high performance AMC signal processing platforms, and are already working on plans to support the next generation TI DSPs and Xilinx FPGAs when they are available.

In addition to this we will be looking for and pursuing opportunities to take our products into more vertical-market focused solutions, working with partners where appropriate. This enables us to work with customers who don't have the expertise to develop all their own software and FPGA code. The first of these will be in wireless baseband – watch out for more details soon!

Q. Thank you for this interview.