By Joe Pavlat

*Mil*TCA? Not yet

CompactPCI and AdvancedTCA Systems has published a number of articles about MicroTCA (December 2004; June 2005; June 2006; October 2006), introducing the readers to this powerful and physically small platform architecture. Originally designed for telecom applications, MicroTCA has attracted interest in unanticipated markets. Among these are military land, mobile, and airborne systems.

The MicroTCA architecture is very flexible. Simplex systems with single resources can be built quite inexpensively for applications where low cost is critical and occasional failures can be tolerated. MicroTCA duplex systems with redundant cards and high availability software are more complex and expensive, but can offer availability at the 5-nines level. Military electronic systems designers are rapidly warming to the concept of availability, borrowed from the telecom world where systems are often expected to operate continuously for 30 years or longer.

Simple Mean Time Between Failure calculations, which are often little more than an estimate of how often systems might fail, are increasingly viewed as inadequate for critical jobs. To achieve availability, the system encompasses redundant hardware with software management such that no single element can be a single point of failure for the entire system. In a highly available system, single elements – payload cards, power supplies, and the like – can fail and the system will continue to operate. Failed cards can be replaced at a convenient time, often with the system continuing to operate. Because MicroTCA is a switched fabric architecture and not a parallel data bus, systems can be designed to avoid a single card failure bringing the entire system down. The hardware management structure of MicroTCA is largely borrowed from the well wrung out AdvancedTCA management architecture. Industry standard high availability middleware, like that defined by the Service Availability Forum, can be used.

Is MicroTCA robust enough for the military? Not yet. While it is ruggedized to telecom standards for shock, vibration, temperature, earthquake, and other extremes, it is not yet ready for the harsher requirements of the mobile military environment. At the same time, a number of PICMG member companies are working on developing packaging concepts to make MicroTCA more suitable for these environments. Among the concepts:

- *Cocooning* a MicroTCA chassis inside an ATR box with shock mounting and conduction cooling
- Metal clamshells that encase AdvancedMC cards and are then rigidly mounted in a special chassis and are directly conduction cooled

It is expected that this work will move into PICMG and become a formal specification development activity in early 2007.

The AdvancedTCA Summit

This year's Summit, held in Santa Clara October 17-18, was the second year for this highly successful and focused event. More than 800 people attended and 54 companies exhibited, an increase of 30 percent over last year. A great number of operational AdvancedTCA systems, as well as quite a bit of MicroTCA, was on display. It was clear to anyone who toured the exhibits or listened to any of the very good presentations that AdvancedTCA has reached critical mass. This form factor has departed the laboratory and is being deployed in ever-larger numbers in the field. Interestingly, a recurring theme heard from many was that AdvancedTCA is now often a requirement from the telecom industry's customers – the carriers – as they seek to reduce capital and operational expense for the next generation of networks and services. The words *triple play* and *quadruple play* were on everyone's lips. Presentations from the Summit can be downloaded from www.atcasummit.com. Next year, AdvancedTCA Summits will be held in Europe in September, Santa Clara in October, and a new MicroTCA Summit is scheduled for June in the Washington D.C. area.

One very interesting talk, given by Tom Palkert of Xilinx and Bob Nosewirthy and Kristin Harris of the University of New Hampshire's well respected Interoperability Lab, introduced the much anticipated IEEE Draft Standard for 10 Gigabit Ethernet over backplanes, IEEE 802.3ap. In its simplest implementation, 10GBASE-KX4, four pairs running at 3.125 Gbps per pair are used. This matches exactly the already adopted PICMG 3.1 Ethernet on AdvancedTCA specification. Of great interest is the version of the standard that handles 10 Gbps per pair, 10GBASE-KR. This represents a quad speed increase over existing backplane standards. For AdvancedTCA, it means that dual star backplane configurations could handle over 500 Gbps of data and full mesh systems over 10 terabits per second. Will the existing connectors used in AdvancedTCA be up to the task? It's too early to tell, as it will at least require improved SERDES devices, although I am aware of one system being finalized that already runs 10 Gbps per pair over a standard AdvancedTCA backplane made of low loss material using already available high-performance SERDES devices. The MicroTCA connector system already supports speeds in excess of 12 Gbps, so it might be able to support 10GBASE-KR systems as soon as silicon is widely available. Stay tuned.

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