Micro (and Pico) TCA: Setting The Standard For Less Expensive Carrier Gear

Michael Weingarten and Bart Stuck

Two new component standards could bring drastically lower costs for infrastructure deployed at the edge of networks.

If you weren't part of the Personal Industrial Computer Manufacturers Group (PICMG, www.picmg.org/) standards process over the last year, you may have missed an important development in the network equipment world: The formal approval of the MicroTCA standard on July 6, 2006, which followed the approval of the Advanced Telecommunications Computer Architecture (ATCA) set of standards on Feb. 22, 2005.

What is MicroTCA and what does it mean for the telecom world? The answer is that MicroTCA could be a very big deal, particularly at the edge of the public network and in a variety of enterprise applications.

As we've noted in a previous *BCR* article ("The Impact of ATCA on Telecom Economics," December 2005), ATCA, or Advanced Telecommunications Computing Architecture, is an effort by the PICMG to standardize card, chassis, backplane, power supply and mechanical specifications, in a manner analogous to what PICMG accomplished with personal computers. ATCA's approach will permit multiple vendors to build cards and boards for transmission and switching equipment and allow these cards and boards to be used in multiple applications and in multiple vendor product lines. This will improve product reliability (allowing for industry standard hot swappable hardware and software, including power supplies and fans) and will drive down prices—thanks to greater economies of scale in manufacturing and less time spent on details that will be standardized by ATCA (e.g., power, cooling, mechanical spacing and connectors issues). If ATCA takes hold, standardized ATCA-compliant components will reduce street prices substantially.

ATCA has a great deal of support from many major telecom vendors. Particular leaders during the standards process included Ericsson, Motorola, Intel, Lucent, Sun and HP. Huawei is said to be the world's largest vendor of ATCA platforms. The main players who are not supporting ATCA include Cisco, Juniper and to some extent IBM; these companies continue to emphasize proprietary solutions that would be affected adversely if ATCA takes off.

The market for this new standardized technology looks to be huge. By substituting for proprietary equipment in a $100 billion-plus telecom market, even low single-digit substitution means that this market will be in the billions of dollars annually. Most industry analysts predict that by mid-2007, there will be creation of development systems along with initial customer trials, with volume production in late 2007/early 2008. (For some recent forecasts, check out the links in the accompanying box: "Representative Forecasts").

Representative ATCA/MicroTCA Market Forecasts

- www.idc.com/getdoc.jsp?containerId=prUS20165806
- www.lightreading.com/document.asp?doc_id=95544&site=globalcomm
- www.crystalcubeconsulting.com/Page2.html
- www.electronicstalk.com/news/ven/ven126.html
- www.reed-electronics.com/electronicnews/index.asp?layout=article&articleid=CA6334859
- www.compactpci-systems.com/PDFs/Motorola.Jun06.pdf

Specification Details

Besides much higher availability than computer industry enterprise products—which typically lack redundancy, and hence have multiple single points of failure—the ATCA backplane switch fabric has been specified and agreed upon as part of the standards process: processor protocols include PCI-X, PCI-Express and Infiniband; storage protocols include Serial ATA; network protocols include Gigabit Ethernet, 10-Gigabit Ethernet, Serial Rapid IO and integrated time division multiplexing (ITDM). These protocols permit connectivity between control processors, disk

Michael Weingarten (mikew@signallake.com) and Bart Stuck (barts@signallake.com) are managing directors of Signal Lake, an early-stage telecom venture capital fund (Boston MA and Westport CT). Signal Lake is an investor in CorEdge Networks, a leading ATCA/MicroTCA startup.

storage and line cards/basic components in many types of transmission and switching gear.

So what's the difference between ATCA and MicroTCA, and where is each going to be deployed? ATCA chassis are "big iron" solutions that are designed for telco central offices with high density needs: i.e., switching systems and transmission cross connects. These chassis are too massive for remote/enterprise applications. Ditto for ATCA blades, which are the size of pizza boxes.

That's where MicroTCA comes in. As a big-iron solution designed for COs, ATCA was not useful for edge applications like cellular base stations and wireline fiber pedestals—the areas with greatest telco industry deployment.

In response, the members of PICMG came up with a mini-sized version of ATCA called MicroTCA (since the Greek symbol for Micro is 'μ,' the acronym for MicroTCA is sometimes shown as μTCA, otherwise MTCA). In MicroTCA, one uses so-called AdvancedMC (AMC) cards, which are smaller daughter cards, up to four of which can interconnect on a single ATCA blade or carrier card. These populate the big-iron ATCA chassis.

AMC cards can be used as an alternative to the large blades in the big-iron ATCA chassis; the same cards can also be used in MicroTCA implementations. With MicroTCA, rather than mounting the AMCs on large carrier cards, each AMC attaches directly onto a MicroTCA backplane that can interconnect as many as 12 AMCs. Connections among these AMCs are handled by a special AMC-sized card called a MicroTCA Carrier Hub (MCH), which also contains IPMI software for managing key chassis functions, as well as clocking daughter cards for different applications. There also is a special power module that fits in the same form factor as an AMC.

Compared to an ATCA chassis, MicroTCA chassis are much smaller—roughly similar in size to a Cisco 48XX/65XX. With respect to applications at the edge, MicroTCA clearly is a step in the right direction, although with each AMC having 10 Gbps capacity, the overall chassis' 120 Gbps capacity is still too large for many applications.

PicoTCA—Even Smaller

This continuing overcapacity level was quickly understood by key players in the PICMG effort. In response, PICMG extended the MicroTCA standard to an even-smaller form factor called PicoTCA. PicoTCA is a variant of MicroTCA in which a much smaller chassis and backplane is used to connect as few as 2-3 AMCs. Given the smaller number of AMCs, there is a corresponding ability to reduce the capability and hence the cost of the MCH and power module function; a starter system price that could be in the $500–$1,000 per shelf range, with volume purchase.

Compared to MicroTCA, a PicoTCA chassis is downright petite. The unit is laptop-sized, meaning that it is extremely portable. If you need more than three slots, the units are stackable. At this size, PicoTCA is an ideal solution for remote applications like 3G cell towers and WiMAX transmitters, as well as vertical markets like medical and the military.

As a result, we see a future in which ***X***TCA-compliant products will begin to substitute for proprietary telco equipment. The particular product used will be based on the particular application. We know of at least one case where a leading Tier 1 telecom equipment provider is adopting ***X***TCA for its next-generation IMS Triple Play architecture, with ATCA for central offices and MicroTCA/PicoTCA for the edges. In this architecture, the same AMCs will be used throughout the system.

By the way, this substitution will go beyond physical-layer equipment. At the software layer, a parallel effort is being led by another standards body, SAF (Software Applications Forum), which is developing a standard called HPI (Hardware Platform Interface) that will standardize how Layer 4–7 applications will map onto ***X***TCA equipment (more on this in a future article.)

In ATCA and MicroTCA, there is a software management hierarchy, with IPMI management on each AMC, each shelf of AMCs managed by a MicroTCA Hub Carrier or Shelf Manager, each Chassis Manager handling each Shelf Manager, and each Node Manager handling each Chassis Manager.

Conclusion

If you are a vendor of telecom equipment, you need to think about ***X***TCA, either as a new sales opportunity or as a threat. If you are a user of telecom equipment, i.e., at a carrier organization, you need to think about opportunities to substantially reduce your equipment cost. And if you are an enterprise that buys service from the carriers, you may be able to look forward to a new generation of services whose costs are contained by falling telco equipment prices.

Net-net, you may not have heard of ATCA, MicroTCA or PicoTCA until now. That's about to change□

PicoTCA is ideal for 3G cell towers, as well as vertical enterprise segments like medical and the military

Companies Mentioned In This Article

Cisco (www.cisco.com)
Ericsson (www.ericsson.com)
HP (www.hp.com)
Huawei (www.huawei.com)
IBM (www.ibm.com)
Intel (www.intel.com)
Juniper (www.juniper.net)
Lucent (www.lucent.com)
Motorola (www.motorola.com)
Sun (www.sun.com)