MicroTCA opens up a new world for AdvancedMCs

Next milestone in the standardization of platforms for carrier-grade telecom equipment.

Completion of the MicroTCA standard will revolutionize the Telecom COTS market.

By Claudia Bestler, Irene Hahner, Rudie Popma

Kontron, a global leader in embedded computer technology manufacturing, has been successfully employing an AMCeverywhere strategy for its AdvancedTCA products since publication of the AMC specification (see text box). The expected ratification of the MicroTCA specification in the coming weeks will bestow on Kontron further growth potential. MicroTCA is the new PICMG standard for purely AdvancedMC-based COTS (commercial off-the-shelf) products, many of which will be used in carrier-grade telecom infrastructures.

MicroTCA (= µTCA) is the new soon-to-be-officially-published telecom-oriented standard of the PICMG (PCI Industrial Computer Manufacturers Group). This standard uses the AdvancedMCs already developed and available for AdvancedTCA with an individual, small chassis concept, whereby the AdvancedMCs are plugged into the backplane directly, i.e., without a carrier board. With hot-swap support and autonomous system management – like AdvancedTCA – as well as switched fabric functionality, it is ideally adapted for carrier-grade telecom equipment. In addition, it is also suitable for many other industries with high switching, routing, and throughput requirements.

New International Markets (Emerging Markets)

Communication is an elementary factor for the successful economic growth of entire nations. For the development of the infrastructures for network coverage, unified standards such as AdvancedTCA and MicroTCA offer the possibility of implementing them as quickly as possibly, reacting flexibly to changes in the market, and minimizing overall costs. In terms of technology, for cell phones, this again clearly means packet-switched networks. Additionally, they are increasingly replacing the previously dominant fixed networks even in already existing regions and markets. With AdvancedTCA, an official PICMG standard for carrier-grade core and edge applications already exists. Now, with MicroTCA, a hardware platform for applications in the access area will be defined so that TEMs can develop specific solutions based on a global family of standards. Thanks to the open access to the PICMG standards, each decision-maker is free to purchase the technology completely, develop products internally within the company, or employ combinations of internally developed and COTS components, which can additionally strengthen the business location.

Due to the robustness and minimum size of the modular form factor (dimensions of a single-width module are only 73.5 x 183.5 mm, or 2.9 x 7.2 in), MicroTCA is essentially targeting applications in the access area of telecom, hence establishing the connection between subscribers and the networks of the telecom service providers. Typical applications for these tasks are, for example

- BTS (Base Transceiver Station)/Node B in the cell phone infrastructure, directly assuming the control and communications tasks “behind” every cellular network antenna,
- VoIP gateways for low-cost cell phone telecommunications over IP from the Base Transceiver Station,
- IEEE 802.16-compliant WiMAX solutions, which no longer require a dedicated line of sight for wireless communications but rather offer wireless access in a range of up to 3 km (1.8 miles) in urban areas,

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- IP-PBX (IP-based Private Branch Exchange) telecommunications systems, providing physical IP WAN dial-up connections to subscribers connected in a star configuration,
- MTU NGDLCs (Multi-Tenant Unit Next-Generation Digital Loop Carriers), enabling new telecom applications to be transferred via existing copper lines, and
- DSLAMs (Digital Subscriber Line Access Multiplexers), which concentrate several dedicated xDSL dial-in connections to optimize the network load and lie on the interface between the access layer and the aggregation layer,

to name just a few.

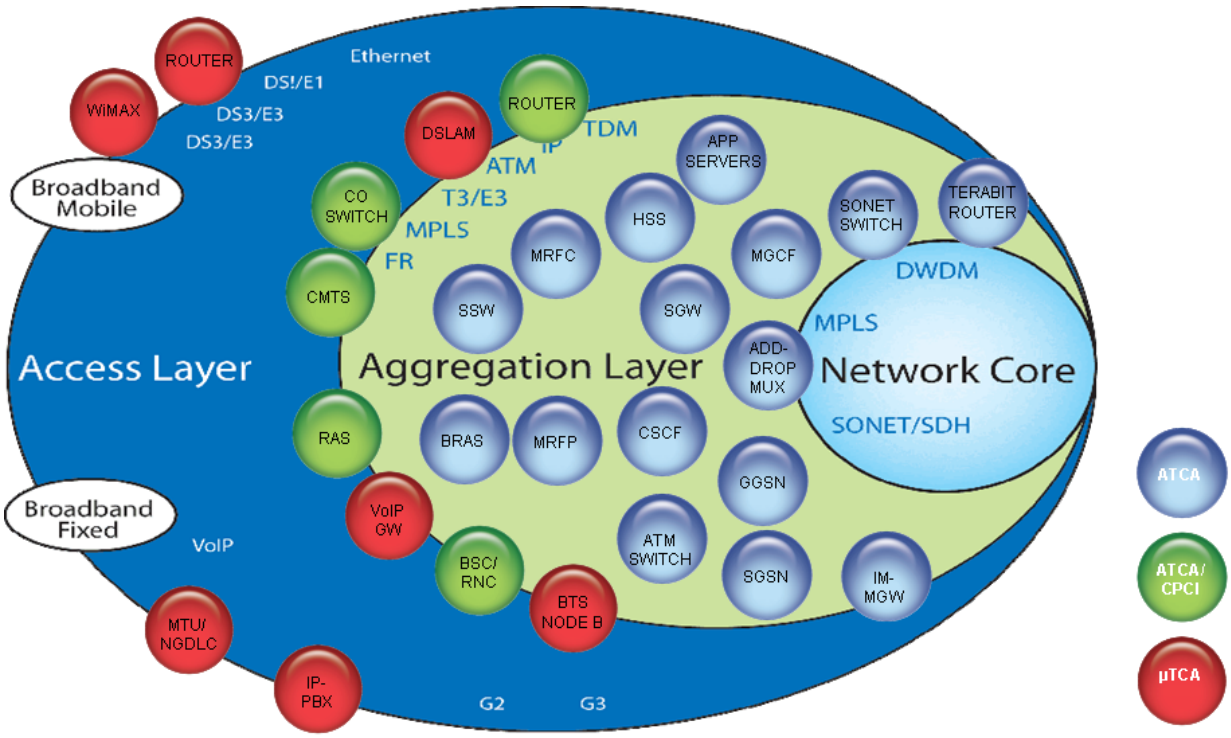

Figure: applications in various areas. MicroTCA (red) essentially targets applications in the access area, whereas AdvancedTCA focuses on edge and core applications.]

With this far-reaching application focus, the MicroTCA application range is expected to be considerably more quantity-capable than AdvancedTCA can be on an application-specific basis. Thus, MicroTCA is suitable not only for various access solutions in carrier-class networks but also for the commercial telecom and datacom markets. In all applications, MicroTCA is convincing due to:

1. High system availability of 99.999% (5 x 9) and higher
2. Inexpensive COTS prices thanks to high quantities
3. Upgrading capabilities on the modular component level
4. Requirements-based scaling of performance and expansion
5. Latest sustainable serial PC technology
6. Independent system management isolated from other functions and hence secure (IPMI = Intelligent Peripheral Management Interface)

In order to gain a foothold in price-sensitive, high-volume segments, design of MicroTCA housings is done with cost in mind. One goal, for example, is to be able to offer simple carrier boards for 6 AdvancedMCs for significantly less than 1,000 euros, according to the visions of some manufacturers. The current prerequisite for such attractive prices, however, is contract volumes of at least 50,000 units in the same

configuration, as can be achieved relatively easy in concentrating on the development of, e.g., cellular networks. According to current market forecasts, emerging markets (China, India, and South America) will intensively extend or develop their infrastructures for cellular services and also actually reach the quantities required for an "economy of scale" to take effect. In these price regions, MicroTCA will in the future also be suitable for high-end segments in the medical, enterprise & data communications, defense, industrial automation, and image processing sectors.

Form Factors

There are currently 2 basic form factors. Differentiation is made between single and double width (single width = 73.5 mm, or 2.9 in/double width = ca. 149 mm, or ca. 5.9 in). For both formats, different dimensions for the front plate (plug-in unit widths in MicroTCA systems) are additionally permitted. The consequence of this is the availability of several housing and backplane variants. This can range from pico systems with 2-4 AdvancedMC cards all the way to shelves with up to 192 AdvancedMC cards (VCS – Virtual Carrier Shelves). This broad scalability of the system architecture is an accelerator for the technology, as scaling and cascading possibilities are nearly limitless and can be financed for every special case in terms of backplane and housing with the corresponding lot sizes.

An additional factor for the design of the systems is specification of the desired interconnect technology for the AdvancedMC cards. At the moment PICMG foresees 4 variants: PCI Express and Advanced Switching (AMC.1), Gigabit Ethernet (AMC.2), Fiber Channel for Storage (AMC.3), and Serial RapidIO (AMC.4). All of these technologies are based on use of differential signal pairs, enabling the backplanes to be designed largely independent of the actual transmitted signals. However, for every technology, there might not yet be the corresponding functions available on AdvancedMCs.

MicroTCA Carrier Hub

The MicroTCA Carrier Hub (MCH) performs the switching and system management tasks and must support the appropriate infrastructures according to the corresponding relevant AMC substandards. The MicroTCA Carrier Hub (MCH) is hence the heart of every MicroTCA system. The specification requires support of 12 GbE ports (AMC.2) as well as IPMI system management for up to 12 AdvancedMCs as a minimum solution. A maximum of 60 fabric channels are possible. Additionally, the MCH provides an uplink-capable fabric channel, a clock distribution system, support of up to 4 power supplies, and optional shelf management. Several MCHes can be located on a module carrier and in this way form "virtual" systems. With the MCH, the granularity within complex MicroTCA systems is also simultaneously defined with a step width of 12: i.e., for 12, 24, 48, and 60 AdvancedMC cards. In a redundant design, 2 identical sets of 6 AdvancedMC cards are managed by 1 MCH each and are additionally equipped with redundant power supplies and fans. Synchronization occurs via 3 different clock signals. The complete MicroTCA system therefore consists of an MCH and AdvancedMCs in an appropriate housing. The dedicated function is thereby determined by the AdvancedMCs, the development and marketing of which Kontron is specialized in.

"AMCeverywhere" In Its Full Extent

Kontron is always at the forefront in the standardization of carrier-grade computing platforms: first for AdvancedTCA, then for AdvancedMC, and now for MicroTCA. For Kontron, a key strategy is thereby to demonstrate the advantages of its "AMCeverywhere" approach: AdvancedMC cards as the smallest field-replaceable units offer extension of the granularity of the system architecture and are ideally suited to scaling, standardization, and customization due to the modular approach. They are employed on AdvancedTCA boards, as modules on customer-specific boards, and now in independent MicroTCA systems. Through this, AdvancedMC cards have great sales potential and can thus make full use of the advantages of an "economy of scale" from the cost side.

MicroTCA From One Source

Soon after the PICMG specifications for MicroTCA is completed, Kontron will present the first MicroTCA system at GLOBALCOMM in June 2006 in Chicago, Illinois.

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First Kontron system
The draft of the MT4000 targets applications in the access area with limited space and offers up to 12 slots for full-height single-width AdvancedMC.

It will be able to manage up to 12 AMCs and can be designed redundant if necessary. TEMs will be able to choose from a wide variety of products for system solutions: MCHes and processors, communications, and memory cards. The following AdvancedMC cards, which are required as basic configurations in many access systems, are already available now:

- Kontron AM4001 – AdvancedMC module with Intel® Pentium® M processor
- Kontron AM4300 – Full-height single-width 4 x GbE AdvancedMC
- Kontron AM4500 – SATA storage AdvancedMC

Additional dedicated I/O modules for specific telecom applications, e.g., for BTS/Node B with suitable DSPs or solutions for other applications listed above, will be developed by Kontron or implemented by the company as third-party products in the overall system if necessary. The advantage for TEMs thereby is that there is only one contact partner for the entire system, which is of great importance both in concrete application development and in the case of servicing. For this, Kontron draws on a great deal of experience with completely certified modular VME- or CompactPCI-based systems including application-specific I/O boards. As a global player in embedded computer technology, Kontron additionally provides the assurance that the systems have long-term availability in the same configuration.

ATCA is moving toward actual implementation in 2006.

A new Light Reading report states that ATCA-based telecom and networking equipment will start enjoying a significant market in 2006. The report, "Components Insider Report: ATCA, AMCs, and MicroTCA 2006 Market Outlook" (Dec. 2005), surveyed 230 people with 100 equipment manufacturers. Almost 60% of them say they are now developing ATCA-based systems, and a majority of those say they will ship their first system within a year. Many are using ATCA systems developed by integrators rather than in-house. The main applications are VoIP gateways and media servers.
Source: atcanewsletter.com (Dec. 2005 to Jan. 2006)

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About Kontron

Kontron AG is a worldwide leading manufacturer of embedded computer technology and robust solutions for mobile use. It supplies leading OEMs, system integrators, and application providers in a wide variety of market segments such as data and telecommunications, automation, measurement and control technology, traffic engineering, medical and military technology, as well as aviation and energy. Kontron's goal is to enable customers to significantly reduce their time to market and to create clear competitive advantages through products such as high-performance open computer platforms and systems, single board computers, HMIs, and mobile computers. Kontron employs over 2,500 people worldwide with production facilities in Europe, North America, and the Asia-Pacific region. The company is listed on the German TecDAX 30 with the company symbol "KBC". Kontron is the only company based in Europe which has premier status in the Intel® Communications Alliance and, thus, has early access to leading Intel technologies and preferred engineering support. For more information about Kontron, visit the company's website: www.kontron.de.

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