



Open Modular Computing Specifications

There is something new on the horizon - microTCA

μ TCA™

Introduction

With over 30 years of computer bus technology, a new culmination is on the horizon called microTCA. This technology combines the diverse requirements from the telecommunication industry with the industrial automation market. And this combination makes it special in a broad sense, including:

1. Based on high speed serial communication channels, supporting hot swap and providing reliability till 99,999% uptime
2. Scalable infrastructure – from one processor systems to 100's
3. Small sized cards, suitable for a broad industry – from embedded to industrial control
4. Flexible systems by defining several packaging formats, suitable for different space requirements
5. System management functionality build in, providing the basis for remote diagnostics and maintenance
6. Ruggedized systems, yet low cost capabilities

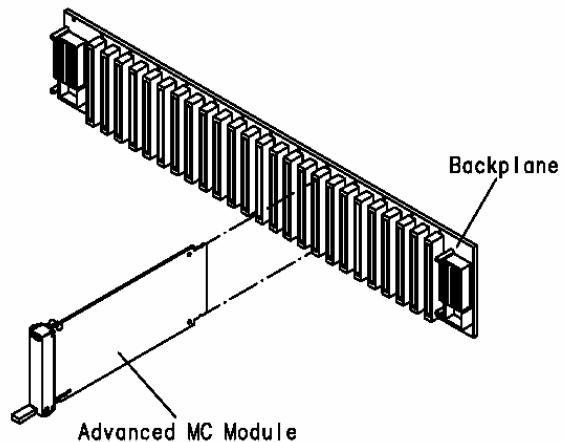
With this remarkable combination, microTCA provides a basis for flexible, extendable, low cost controller platforms with high availability and remote maintenance, important to the industrial world. However, it also provides low cost communication controllers build on existing technology (PICMG Advanced Mezzanine Cards, or AMCs) for the telecommunication industry, outside of the typical telecom equipment manufacturers, or TEMs.

The basis of microTCA

The organization PICMG developed an Advanced Telecommunication Computing Architecture, called AdvancedTCA or ATCA, in order to supports the high requirements from the high-end telecommunication industry, especially in the 99.999% system uptime.

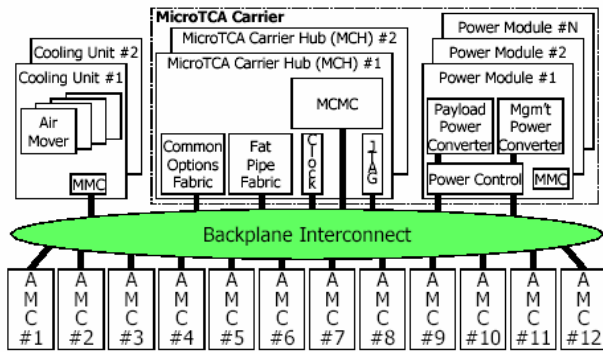
In order to provide extensions capabilities to the AdvancedTCA modules, PICMG defined the Advanced Mezzanine Cards, or AMCs. These had to support hot swap and management functionalities, in order to realize the high availability of the ATCA modules and systems.

The next step was to provide the AMC with a backplane of their own, creating the possibility to build systems with just AMC modules.



Single width AMC module/backplane combination

MicroTCA is designed to address cost sensitive and physically smaller applications with lower capacity, performance, and perhaps less stringent availability requirements. MicroTCA preserves many of the important philosophies of AdvancedTCA, including basic interconnect topologies and management structure.

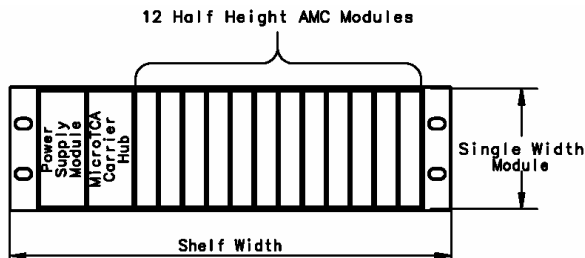


MicroTCA Block Diagram of a System

If we look to the system above, we see at the bottom 12 AMC's that are connected via the backplane. On top we see (from left to right):

- Up to two cooling units, with one or more fans each, and the MMC units (Module Management Controller, providing the basis for the system management function)
- A microTCA Carrier with up to two microTCA Carrier Hubs, MCH, providing the interface to the fabric, and one or more power modules, also with the MMC.

Overall, the basic specification, called microTCA.0, defines the general mechanical, electrical, thermal, and management properties of a microTCA shelf necessary to support AMC compliant modules. Accompanying standards like microTCA.1 – n define the different interconnect protocols in the backplane.



Example of a microTCA system

Interconnect Fabric Infrastructure

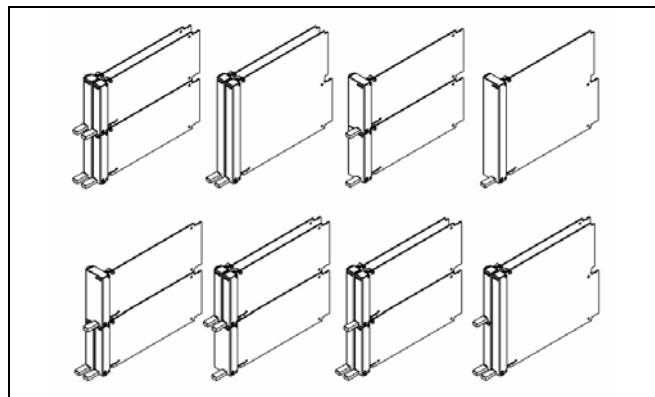
An interconnect fabric provides the main connectivity among the AMCs in a MicroTCA shelf. This interconnect consists of a central switch and a number of high speed serial lanes to each AMC position. Lanes on MicroTCA are differential high speed serial interconnects, with bandwidth capability of at least 3.125 Gb/s in each direction. Although some MicroTCA implementations will run these Lanes at 1 Gb/s, many MicroTCA shelves will permit these bit rates to increase to beyond 10 Gb/s per Lane.

The interconnect protocol used in MicroTCA depends upon the specific format expected by the AMCs and implemented on the fabric. All AMC subsidiary specification formats are supported in MicroTCA, including PCI Express/Advanced Switching (AMC.1), Ethernet (AMC.2), Storage Interfaces (AMC.3), and RapidIO (AMC.4). Future subsidiary specifications of AdvancedMCs, as well as proprietary Backplane protocols, are also possible.

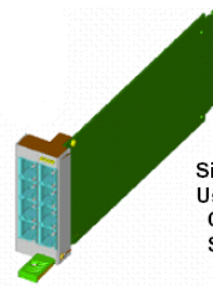
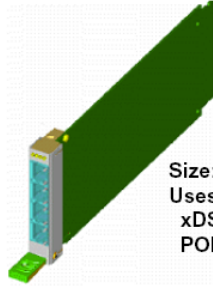
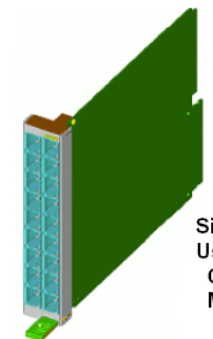
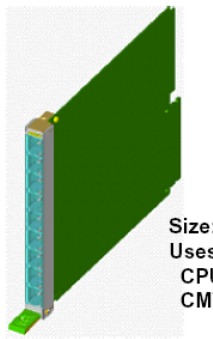
Flexibility in mechanical sizes

MicroTCA supports four different mechanical sizes of AdvancedMCs. The largest is the Full-Height, Double-Width AdvancedMC, which occupies a mechanical volume of 150 x 187.3 x 30.48 mm.

Be aware with AMCs that, as they originated as mezzanine modules, the width is the height of the board size, and the height deal with the width of the front panel if vertically mounted.



Double-Width, Full-Height Slot dividing examples

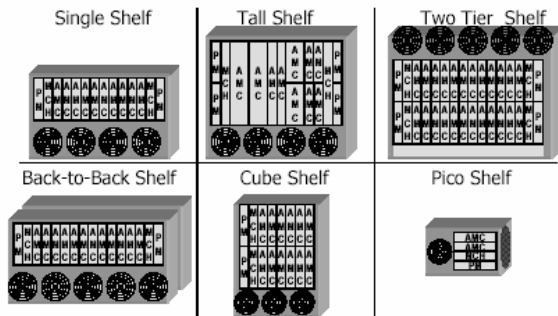
	Full-Height	Half-Height
Single-Width	 <p>Size: 73.8 x 28.95 x 181.5 mm Uses: I/O (up to 8 RJ-45s / SFPs), CPUs, DSPs, NPs, RF, optics, Small disk drives</p>	 <p>Size: 73.8 x 13.88 x 181.5 mm Uses: I/O (up to 4 RJ-45s / SFPs), xDSL, POTS, T1, DS3, OC-3/12, PON, Wi-Fi, Wi-Max, FPGAs</p>
Double-Width	 <p>Size: 148.8 x 28.95 x 181.5 mm Uses: I/O (up to 18 RJ-45s), CPUs, DSPs, NPs, RF, optics, Medium disk drives, DVDs</p>	 <p>Size: 148.8 x 13.88 x 181.5 mm Uses: I/O (up to 9 RJ-45s), xDSL, CPUs, DSPs, NPs, RF, optics, CMTS, bulk RAM, Flash, PoE</p>

AMC Module configuration examples

MicroTCA enclosure types

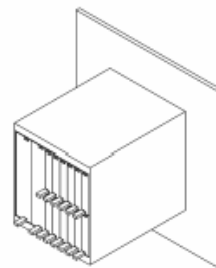
The standard microTCA elements can be assembled into many different types of systems that conform to the specification. Although the variability of these systems is large, it is believed that in the end there will be a few popular implementation types.

In order to provide more concrete illustrations of how to assemble the standard elements into actual systems, several possible solutions are presented hereunder. Be aware that there are more possibilities as shown here.

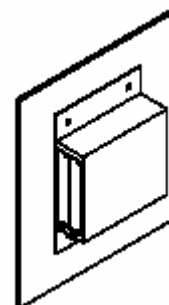


MicroTCA packaging

Or other form factors like this single cube on a mounting plate:



Or even smaller like pico on a panel



MicroTCA design goals

Overall, the PICMG MicroTCA specification was written with the following design goals in mind:

- Complementary to AdvancedTCA
- Full conformance with the AMC.0 Module definition
- Favorable cost, size, and modularity
- Target low start-up costs
- Scalable reliability and bandwidth
- Modular and serviceable
- Standardized Shelf management implementation compatible with AdvancedTCA
- Support 300 mm nominal equipment Depth and 19" nominal equipment width
- Cooling: 20–80 W/AdvancedMC
- Support for extended temperatures (–40 to +65 °C)
- 12 V Power to AdvancedMCs
- Life span: eight years
- Backplane bandwidth: SerDes @ 1–40 Gb/s
- Backplane topologies: Star, Dual Star, Mesh
- Scalable system reliability: from .999 to .99999
- Support any/all AdvancedMC-defined form factors
- Hot Swap/plug-and-play support, in conformance with AMC.0 and consistent with AdvancedTCA

Conclusion

MicroTCA provides a very flexible building block for cost sensitive application and/or with limited space requirements versus ATCA, CPCI or VME. Based on the constructs of all these busses, and building on the existing ATCA mezzanine card market (AMC), a bright future is foreseen for this new modular approach.

What is PICMG Europe?

PICMG Europe is the neutral promoter of the PICMG technologies in Europe. The definition of the technical specifications is managed by the parent organization in the United States. The European branch office, PICMG Europe, was established in 1997.

The writing of the specifications is one aspect. Marketing of the technology and products is the necessary next step. PICMG Europe is a dedicated, independent association for supporting this goal.

By marketing these technical specifications as a group, we are stronger than a number of individually operating companies. Moreover, users expect from open environments that products from different manufacturers are compatible on the same back panel.

PICMG Europe is supported by its members, as well as it supports its members. For instance, every member receives all specifications, updates and changes, free of charge. With this they are sure they are using the latest versions only. Membership levels include suppliers, users and system integrators. As such, PICMG Europe is an organization to join if you are active in these markets.

For more information please check www.picmgeu.org

There is a free-of-charge short-form specification on microTCA available on the website.

Also, an order form for the full specification is provided.



**Open Modular
Computing Specifications**