

## Advanced Mezzanine Card (AdvancedMC) design goals

CompactPCI &  
AdvancedTCA

*This is the latest in a series of articles describing Advanced Mezzanine Card, the industry's next generation mezzanine standard, by providing a preview of the PICMG AdvancedMC.0 specification. In this article Lawson and Mark describe why we need a new mezzanine standard.*

A mezzanine card, referred to as a module within the AdvancedMC specification, defines an add-on or child card that is intended to extend the functionality of a carrier board, providing system designers with the flexibility to enhance their solutions by adding modular building blocks. The benefits include the flexible implementation of unique functions to reach new and growing market segments, with important economies of scale that can help to reduce equipment costs.

As we have noted in previous articles in *CompactPCI and AdvancedTCA Systems*, mezzanine cards have evolved steadily with the ongoing development of modular bus standards. In the early 1990s, a base mezzanine standard was developed to support parallel interfaces and was optimized to support PCI and CompactPCI environments. The first of these mezzanine specifications was IEEE 1386, known as the Common Mezzanine Card (CMC) specification. Many subsidiary specifications to CMC have subsequently emerged, including PCI mezzanine card, PCI telecom mezzanine card, and VITA 32 processor PMC. Telecom and server equipment manufacturers have widely adopted these standards.

Mezzanines cover a broad range of functionality, but they typically include the following general usage models:

- Telecom connectivity (ATM/POS [OC-3/12/48], T1/E1, VoIP, Gigabit Ethernet)
- Processors (CPUs, Digital Signal Processors, and FPGAs)
- Network Processor Units (NPs)
- Network communications coprocessors (classification, security, or intrusion detection)
- Mass storage

### Limitations of existing mezzanines

The emergence of the AdvancedTCA specification and high-speed serial interconnect technologies have exposed some shortcomings of existing mezzanine standards, which are subject to bus throughput limitations and do not enable hot swap. The advent of highly dense, modular, scalable, and highly reliable network infrastructure equipment requires a new mezzanine standard designed from the outset to support hot swap capability, Intelligent Platform Management Interface (IPMI) based manageability, and scalable throughput for the next 10 to 15 years. It should be noted that in addition to supporting AdvancedTCA, AdvancedMC can also support other form factors, including proprietary designs.

Designed to meet telecom Reliability, Availability, and Serviceability (RAS) requirements, the AdvancedMC feature set as defined in the PICMG AdvancedMC.0 specification includes support for single-width and double-width modules in addition to full-height and half-height modules. Figure 1 shows four single-width AdvancedMC modules on an AdvancedTCA carrier board. AdvancedMC also provides flexible supports for single layer and stacked modules.

In addition to these multiple module configurations, some of the other notable improvements enabled by PICMG AdvancedMC.0 include:

- Support for hot swap capability
- Greater throughput (21 duplexed LVDS ports, each capable of 12.5 Gbps speeds)
- An enhanced power budget (up to 60 W per connector)
- Greater size (25 mm deeper than today's CMC standard)
- IPMI based system management

These enhancements make AdvancedMC a compelling mezzanine alternative for increasing the density and flexibility of AdvancedTCA and proprietary carrier board designs used in today's demanding telecom and high-density bladed server applications. Various configuration

options will be explained further in the next article in this series.

### Scope of the specification

The PICMG AdvancedMC.0 specification defines the baseline requirements for a wide spectrum of high-speed mezzanine cards. It includes the common mechanical aspects as well as hot swap, power, thermal, and interconnect system management elements required for each implementation. In addition PICMG AdvancedMC.0 covers regulatory guidelines.

The specification provides the definitions and requirements for face plates with ejectors, defined component spaces, complete mechanical dimensions, thermal definitions, mounting, guides, and a connector necessary to interface between the module and the carrier board.

The PICMG AdvancedMC.0 specification also defines the framework or base requirements for a family of anticipated subsidiary specifications that define the usage requirements for various interfaces, including PCI Express, Advanced Switching, Serial RapidIO, and Gigabit Ethernet. These and other interconnect definitions will be provided through AdvancedMC.x subsidiary specifications.

As shown in Figure 1, each AdvancedMC module lies parallel to the carrier board,

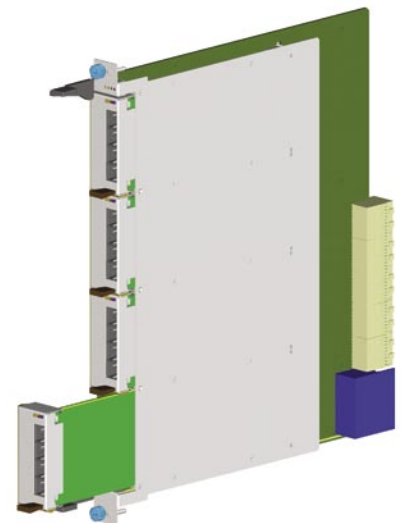


Figure 1

plugging into the carrier by means of an AdvancedMC connector. Carrier boards themselves range from passive boards with minimal *intelligence* to high-performance SBCs.

## Why we need a new mezzanine

Rather than providing another extension of the CMC standard, a new mezzanine standard was required to meet the design objectives of high-speed serial LVDS interface support and AdvancedTCA optimization. As such, AdvancedMC is not backward compatible with mezzanine standards based on the CMC specification. AdvancedMC is also adapted to the increased power budget and size enabled by AdvancedTCA.

## Design goals

This PICMG AdvancedMC.0 specification was written to help the telecom industry meet a series of important design goals:

- **PICMG 3.0 optimized:** All elements must work within the bounds of the PICMG 3.0 base specification and build upon its strengths of RAS. The AdvancedMC module should not be limited by other chassis standards.
- **System management:** System management should be an extension of the PICMG 3.0 shelf management Intelligent Platform Management Bus (IPMB) scheme.
- **Hot swap support:** Hot swap of AdvancedMC modules should be enabled to support availability and serviceability objectives. The focus is on front-loadable hot swap modules. The PICMG AdvancedMC.0 revision is hot swappable only. While *non-hot swap* will be an optional implementation, it is not addressed in this revision. *Non-hot swap*, which will be covered in the next revision of the specification, enables lower cost implementations.
- **LVDS interconnect:** AdvancedMC should be optimized for LVDS interconnects.
- **Low pin count:** The interconnect should be conservative in its total pin count, thereby reducing the amount of space required on both the module and the carrier board, yet provide sufficient real estate for intended interconnects and usage models.
- **Support for a rich mix of processors:** This includes CPUs, NPUs, DSPs, and I/O processors.


- **Reduced development time and costs:** The reduced total cost of ownership and shorter design cycles are supported by component standardization and economies of scale.
- **Communications and embedded industry focus:** Target usage models include support for edge, core, transport, data center, wireless, wire-line, and optical network design elements.
- **Modularity, flexibility, and configurability:** PICMG AdvancedMC.0 provides support for a minimum of four modules across a given AdvancedTCA carrier, and includes dual-width and stacked mezzanines.
- **Future advances in signal throughput:** Anticipates advances in interconnect technologies by supporting a minimum of 12.5 Gbps throughput per LVDS signal pair.

## Summary

AdvancedMC represents the industry's next generation mezzanine standard, designed to enable designers to take advantage of the performance, scalability, and cost benefits of AdvancedTCA. In addition to providing hot swap capability, intelligent platform management, greater potential power/size, and the other enhancements made possible by AdvancedTCA, AdvancedMC is intended to help designers take advantage of the performance enhancements of new, fast, wide-bandwidth serial buses, including PCI Express.

D0.97 of the PICMG AdvancedMC.0 specification is in the process of Negative Ballot Review and IP Review. The Technical Membership Review process provides PICMG members with the opportunity to submit issues with the specification. IP Review lets companies disclose any intellectual property conflicts and satisfy outstanding licensing requirements.

Telecom equipment manufacturers should take a close look at the value of AdvancedMC in their next generation designs. Visit [www.picmg.org](http://www.picmg.org) for further information and to download the PICMG AdvancedMC.0 short form specification.

In the next article in this series, we will continue our preview of the PICMG AdvancedMC.0 specification by examining the theory of operations of AdvancedMC modules. 



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AdvancedMC.0 subcommittee, Mark is focused on assuring a successful industry specification that will be readily adopted by industry. During his 19 years of technical experience (as employee of Motorola and Intel) spanning commercial, industrial, and military electronics markets he has been issued 20 US Patents and has authored numerous technical journals.

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