Advanced Mezzanine Card (AdvancedMC) update

By Mark Summers

and Lawson Guthrie

PICMG's Advanced Mezzanine Card (AdvancedMC) specification is the next generation mezzanine standard optimized for (but not limited to) Advanced Telecom Computing Architecture (AdvancedTCA) platforms and high-speed Low Voltage Differential Signaling (LVDS) interconnects. Important changes have occurred in the AdvancedMC specification since the previous series of AdvancedMC articles appeared in CompactPCI Systems. *AdvancedMC.0 is now nearing D1.0 status. Mark and Lawson provide an update on these changes and examples of AdvancedMC general purpose and network processing applications.*

AMC recap

AdvancedMC.0 is designed to meet the reliability, availability, and serviceability requirements of the telecom industry. The AdvancedMC feature set includes support for multi-width modules (single-width and double-width) in addition to multi-height modules (full-height and half-height). Figure 1 shows full-height and half-height AdvancedMC modules from Artesyn. AdvancedMC also supports single-layer and stacked modules, hot-swap capability, greater throughput (21 duplexed LVDS pairs, each capable of 12.5 Gbps speeds), power (up to 60W per connector), size (25mm deeper than today's chassis management controller standard), and Intelligent Platform Management Interface (IPMI) based system management. These advanced capabilities make AdvancedMC the ideal choice for increasing the density and flexibility of AdvancedTCA and proprietary carrier board designs.

Figure 1

AdvancedMC.0 nears completion

PICMG AdvancedMC base and subsidiary specifications are expected to be completed and available by the end of this summer. The AMC.0 base specification defines mechanicals, thermal and power, interconnects, IPMI system management, and data transport. AdvancedMC.x subsidiary specifications define the usage requirements for each interface implementation including:

- PCI Express.
- Advanced Switching, Gigabit Ethernet.
- 10 gigabit attachment unit interface.
- Various storage interfaces including Serial Attached SCSI (SAS) and Serial AdvancedTA (SATA).

As shown in Figure 2, D0.9 of the AMC.0 specification was posted in May and is now undergoing PICMG's standard review processes including the Negative Ballot Review (NBR) and Intellectual Property Review (IPR). The NBR process enables PICMG members to submit any issues with the specification. IPR provides companies with the opportunity to disclose intellectual property conflicts and satisfy any outstanding licensing requirements.

The first AdvancedMC *plugfest* was held, and multiple telecom equipment manufacturers are incorporating AdvancedMC into their product plans. Figure 2 shows PICMG AdvancedMC.0 milestones.

Feature updates

AdvancedMC helps simplify designs through system modularity and enables higher system density by maximizing component layout for AdvancedMC modules and carrier boards. Feature updates to the AMC.0 specification include:

- Support for non-LVDS interfaces: AdvancedMC was designed and optimized to support high-speed LVDS interfaces. However, because of the high level of interest, support for non-LVDS interfaces (such as SPI-3 and UTOPIA Level II) is now possible and was recently added to the specification. Subsidiary specifications will be required to define support for specific interfaces.
- Connectors: To meet the anticipated demand for AdvancedMC designs, vendors have begun development of AdvancedMC connectors, including tooling the connector and piece parts. Early samples are expected this summer. Connector reliability was specified to comply with operational requirements for environmental exposure for shipboard, vehicular, and shore applications subject to vibration, shock, and temperature variations. Connector system quality requirements are equivalent to those required for large systems and life/endurance verification tests over a simulated 25-year lifespan.
- Mechanicals: Documentation of AdvancedMC mechanical requirements represents the biggest single advancement in AdvancedMC over

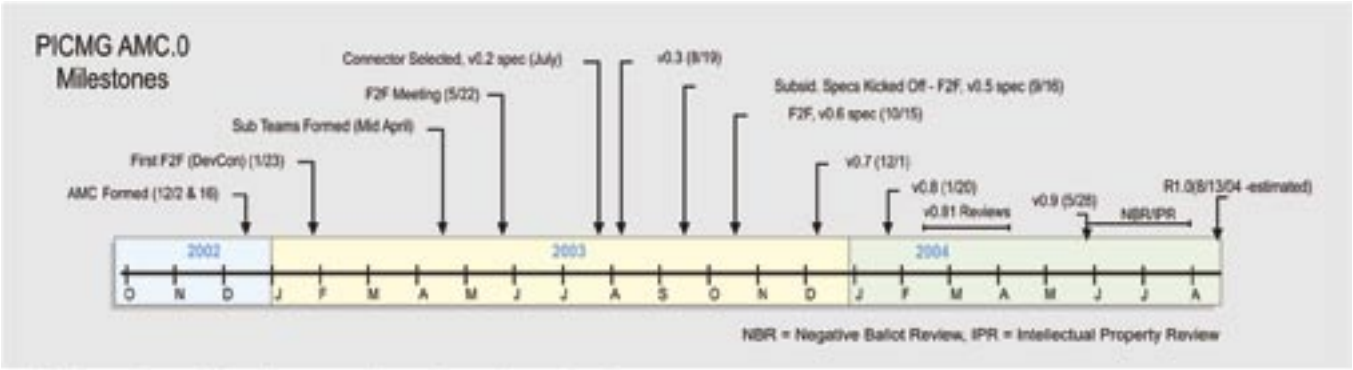

Figure 2

the last six months. Originally developed as 3-D mechanical drawings tracked by the mechanical sub-team, the AdvancedMC mechanical definition has now been fully documented and reviewed by industry experts. Mechanical definition includes specifications and requirements for:

- The carrier board.
- Single- and double-width modules.
- Half- and full-height modules.
- Component envelopes.
- Module guide rails.
- LEDs.
- Warp and creepage tolerances.
- The new latching mechanism.

Third-party vendors are now tooling complementary components including guide rails and faceplates.

Figure 3 illustrates the AdvancedMC stacked carrier board with full-height and half-height AdvancedMC modules.

- Module management: While the 60-page management section has gone through several industry reviews, the greatest advancements have been in the area of Electronic-Keying (E-Keying) and power management. AdvancedMC E-Keying is used in place of mechanical keying to ensure correct matching between AdvancedMC carriers and modules. Power management enables AdvancedMC module power requirements to be treated independently from the carrier. AdvancedMC supports IPMI manageability, which is used to enable these capabilities between an AdvancedMC module and carrier.
- Hot swap and non-hot swap: One of AdvancedMC's design goals was to ensure support for hot-swap capabilities. The principal focus is to enable front loadable hot-swap modules, with non-hot swap as an optional implementation. While AdvancedMC hot-swap requirements have been fulfilled, additional discussions have centered on how to further support and prevent non-hot swap. It is expected that the non-hot swap definition will be completed following the AdvancedMC D1.0 release.
- Thermal and power: Although AdvancedMC defines thermal design requirements, overall thermal constraints must be defined at the system level due to the wide range of possible carrier form factors, AdvancedMC module types, airflow resistance, and varying power levels. A single AdvancedMC connector was designed to accommodate up to 60W of power. It is generally expected that a single-width module will only utilize 30W to 35W of power, although a double-width module could utilize the full 60W through this single connector.
- Port mapping: The AdvancedMC port mapping strategy has been completed and now defines three primary regions as shown in Figure 4. These include common options, Fabric I/O, and extended options including rear transition module support. Any subsidiary specifications with non-conflicting port assignments can be combined, allowing a high degree of flexibility and interoperability.

Subsidiary specifications

AdvancedMC subsidiary specifications are being created to define the transport layers for multiple bus fabrics, following the Port Mapping strategy shown in Figure 4.

- AdvancedMC.1 defines port usage for PCI Express and Advanced Switching environments. This specification includes standard implementation guidelines for a single port of x1, x2, x4, and x8 links. Although the subcommittee did not define x12 and x16 links, AdvancedMC is capable of such support. AdvancedMC.1 is currently at D0.9 status and pending formal adoption following PICMG's standard review processes.
- AdvancedMC.2 defines port usage for GigE environments. Two one-GigE ports are being defined in the Common Options Region and four one-GigE ports are being defined in the fabric I/O region. Formed in May, this subcommittee is moving toward completion. It is expected that AdvancedMC.2 will be at D0.9 by August 2004, when it will undergo the standard PICMG process for formal adoption.

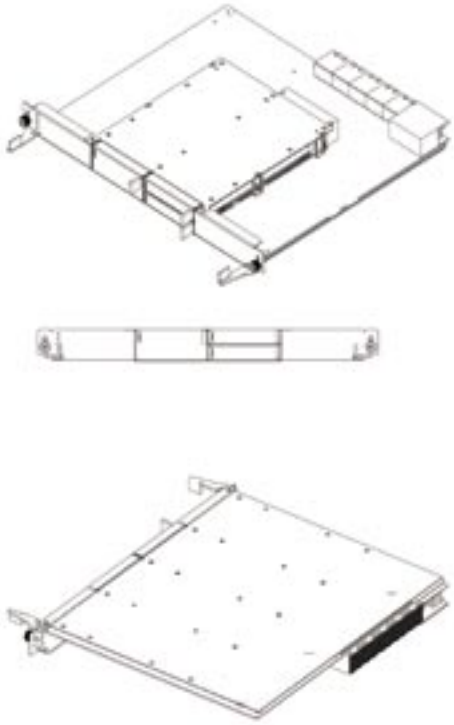

Figure 3

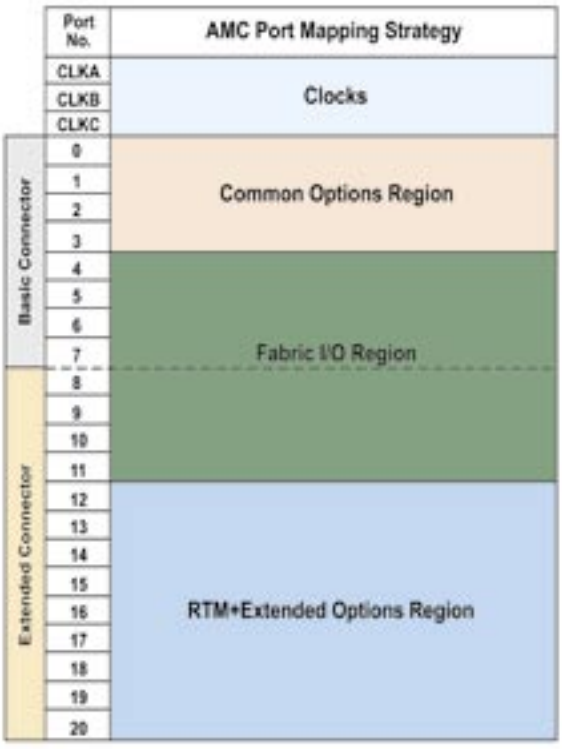

Figure 4

- AdvancedMC.3 defines port usage for the following storage interfaces: SATA (two ports), SAS (four ports), and Fibre Channel (two ports). This subcommittee, now in its early phases, may decide to limit the first revision to defining SATA only and then come back at a later date for the remaining interfaces. Completion of the D0.9 specification is expected by late summer.

Processor AMC (PrAMC) usage model examples

AdvancedMC.0 is a flexible enabler for an extensive list of usage models. In the January 2004 *CompactPCI Systems*, we provided a usage model summary. Now we will take a closer look at an example PrAMC mezzanine design.

Figure 5 shows a PrAMC module for use as a general purpose processing application. The AdvancedMC module includes a low-power processor, chipset, and either Ethernet or PCI Express controllers. Functional categories for this usage model include control processors, network service and application processors, adjunct processors, server microblades, and chassis/shelf-management controllers.

Conclusion

AdvancedMC plays an important role within the modular communications platform architecture. In addition to providing hot-swap capability and IPMI management required for high availability systems, AdvancedMC exploits the higher bandwidth of serial buses and takes advantage of the greater potential of power and size of an AdvancedTCA blade.

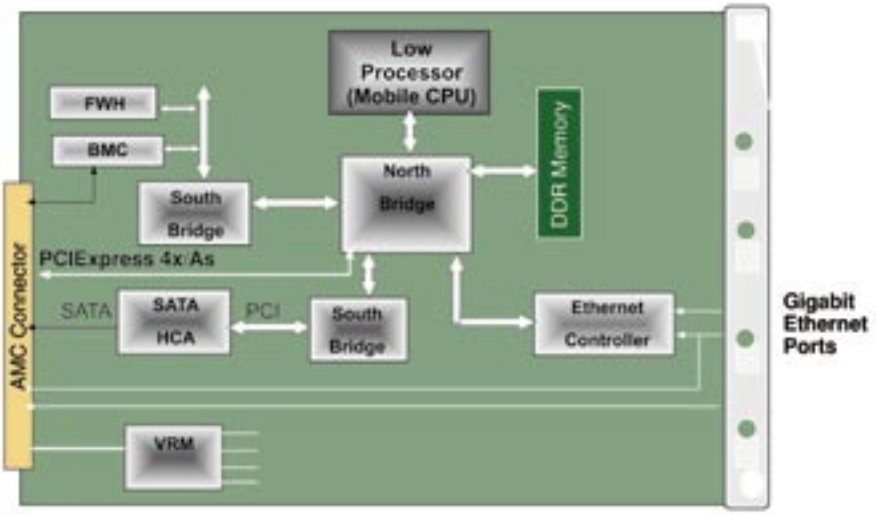

Figure 5

Now that the AdvancedMC.0 specification is almost finalized, telecom equipment manufacturers should take a look at the value of AdvancedMC in next generation designs. Visit www.picmg.org for further information and to download the AdvancedMC.0 short form specification.

Lawson Guthrie *is a strategic initiatives manager in Intel's Communications Infrastructure Group. He currently serves as secretary of the AdvancedMC.0 base specification and AdvancedMC.2 (GigE) subsidiary specification, as well as chair of the AdvancedMC.1 (PCI Express and Advanced Switching) subsidiary specification. Lawson has held various positions in strategic marketing over his 17-year career, focused on technology definition for network operating systems, desktop management, and telecommunications.*

Mark Summers *is a technical marketing engineer in the Intel Embedded Architecture Division developing new markets for Intel products and technologies. As chairman of the PICMG AMC.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 U.S. Patents and has authored numerous technical journals.*

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