Case Study:
Tap the full potential of RTM slots

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SANBlaze
ARTM400
ARTM403

Can open RTM standards offer more design, architecture and system configuration options for ATCA based solutions?

Inside contents

Figure 1. SB-ARTM403 PCIe and SAS I/O RTM

Overview

Engineers are rethinking the roles for RTMs. This often untapped space can potentially become a mainstream "child" card in much the same way AMCs are treated.

This paper explores why OEMs and Telecommunication equipment manufacturers (TEMs) are considering standardization as means to foster a market of off-the-shelf RTMs that extend ATCA functionality. It then highlights two innovative RTM products, which provide I/O expansion solutions using PCIe, SAS and 10Gb Ethernet.

The Case for Standardization

The number of new and potentially profitable hardware architecture ideas almost always exceeds an organizations budget (money and people) to fund and execute them all. A standardization strategy means companies can consider hardware products developed outside their organizations. Perhaps more than anything, the AdvancedTCA initiative has created a standard environment, and has fostered a new "food-chain" for telecommunications hardware:

- It begins with Telco companies and their shift to recognize revenue earning competency in terms of applications and services rather than the explicit equipment they happen to run on.
- These companies now routinely outsource hardware development to Telecommunication equipment manufacturers (TEMs) who are experts at integrating technologies from multiple suppliers, and deliver application-platforms that meet strict quality and reliability metrics (99.999% uptime).
- Finally, the TEMs are turning to OEM and product specialists, like SANBlaze, that are vertically proficient in specific technologies such as networking or storage.

This new food-chain gives Telco's the opportunity to choose best-fit hardware, that is inherently price competitive because of the free-market environment created by open ATCA standards.

Proprietary Rear Transition Module (RTM)

Today, the RTM by itself is not part of the free-market definition. The PICMG (PCI Industrial Computer Manufacturers Group) has published a series of specifications that provide detailed infrastructure definitions for the AdvancedTCA ecosystem (http://www.picmg.org/v2internal/specifications.htm). Notably absent from the ATCA specification is a detailed definition for the RTM. Though there are some high-level descriptions for power and mechanical size, the specification states:"

"The specific implementation of an RTM may be a PCB, wiring harness, or other construction and is left to the user."

While this provides maximum implementation flexibility, the RTM becomes tightly coupled to the ATCA front board; this implies the RTM is single source, with limited reuse and interoperability opportunities. A proprietary interface virtually eliminates a free-market alternative for sourcing RTM variants.

RTM Standardization Efforts

SANBlaze Technology is participating in a new PCIMG subcommittee formed to deliberate a definition for AdvancedTCA RTM (ARTM). The subcommittee operates under the name ARTM.0, and intends to produce an implementation document that defines one or perhaps several RTM variants. Variants will share a common base definition for things like shelf management and keying, but individually define mechanical connections and signal overlays. When finished, adoption of the definition(s) is purely optional and companies are under no obligation to implement to this specification. However, companies that build products to these definitions should be able to interoperate with one another's RTM products.

Figure 2. www.picmg.org logo

ARTM.0 Key mechanical elements

As mentioned above, there may be several defined RTM variants. Presently, the industry has splintered over RTM zone-3 connector choice, with some ATCA vendors adopting a "4-row" connector (originally favored by Intel® carriers, now Radisys®), others adopted the "3-row" connector (favored by Sun Microsystems®) and still others using proprietary schemes. The options will likely include several mechanical types, as the committee members stratify on specific zone-3 and signal assignments. It is almost certain that one of the initial type definitions will include a 3-row connector with signal mappings that include LAN, console, PCIe, XAUI and storage (SAS/SATA).

ARTM.0 Key management elements

The ARTM.0 sub-committee intends to borrow significantly from the AMC infrastructure, which has resulted in a very quick definition for expected ARTM behavior. The implementation includes MMC (module management controller) with dual redundant IPMI, FRU info, e-keying, and environmental monitoring capabilities. There are many benefits to this approach. Designers can reuse schematic blocks and components developed for AMC modules. Manufacturing and field servicing can use the same software and utilities already developed for AMC modules. Moreover, FRU information fields are easily mapped to meet ARTM.0 needs. Architecturally, the ARTM can be managed as an additional expansion slot, offering functions similar to what could otherwise be delivered by AMC cards.

PCIe and SAS pass-through ARTM

The SB-ARTM403 (figure 1) is a standard product RTM that brings both SAS and PCIe I/O to the rear panel. The RTM can be used to quickly extend functionality of single blade computers (SBC) and add critical functions that physically didn't fit on the original design, or perhaps lacked enough market appeal to warrant inclusion on every unit. In figure 2, the SB-ARTM403 is paired with the SANBlaze ATCA1010 which provides PCIe path extension to serve compute resources located on the SBC. This in turn provides the CPU access to 4 new AMC slots that can be populated with any AMC.1 (PCIe compliant) peripheral module.

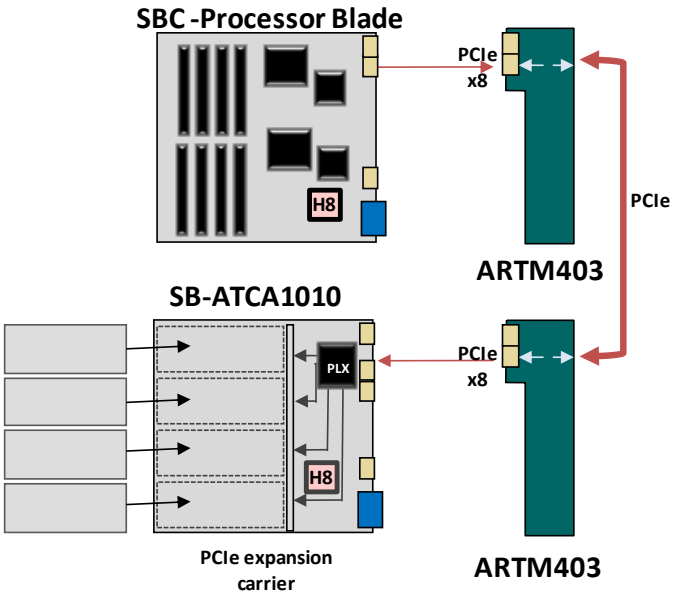

Figure 3. SB-ARTM403 using PCIe to expand SBC functionality

The SB-ARTM403 also includes SAS connections which support numerous disk I/O expansion configurations. Again, the original SBC may have lacked physical space for disks, or perhaps not every application needed direct access storage (DAS). The ARTM provides a way to connect the SBC to drives in adjacent ATCA slots, or to connect external equipment elsewhere in the rack, such as JBOD or RAID products. In figure 4, the SB-ARTM403 is shown paired with the SANBlaze ATCA1020 - an ATCA JBOD card capable of holding 4 disk AMC's. This configuration provides the CPU with up to 4 SAS or SATA disks, with additional support for solid state drives.

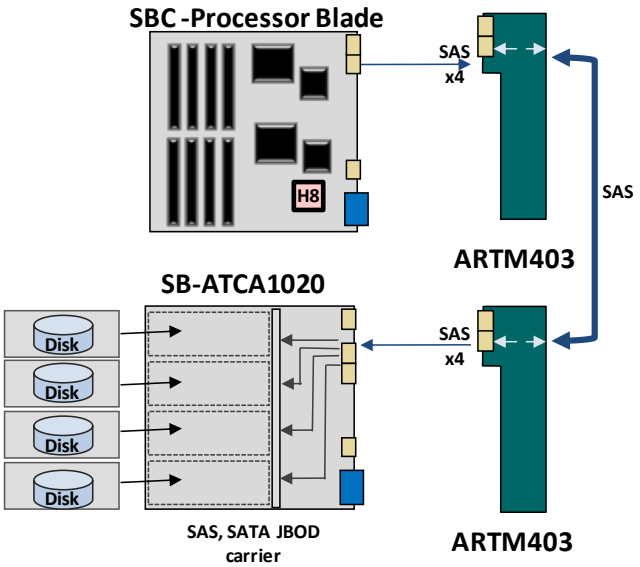

Figure 4. SB-ARTM403 using SAS to expand SBC functionality

Figure 5. SB-ARTM400 10Gb expansion RTM

10Gb RTM

The SB-RTM400 boasts four 10Gb ports, which appeal to many architects because of the ability to fit so many network intensive application variants. In cluster computing or hierarchical processing applications, the 10 Gb pipes provide high performance ingress/egress ports using standard 10Gb SFP+ connections which were tested with several 10Gb switch products at the UNH interoperability lab. The RTM's many advanced features include IP flow classification, thread affinity, and 24 independent DMA channels.

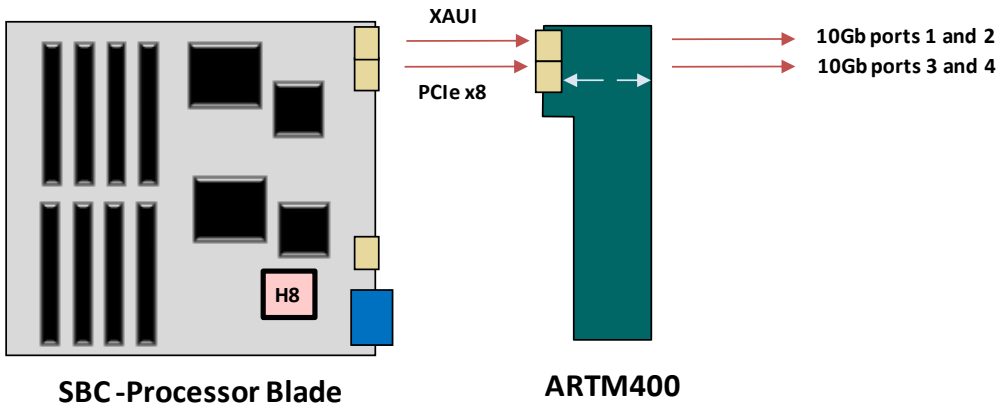

Figure 6. SB-ARTM400 provides 10Gb connections. SBC interface is PCIe or XAUI.

Choose XAUI or PCIe

By offering both XAUI and PCIe interfaces on the zone-3 connector, the RTM has the flexibility to support several SBC architectures that seek to segregate local compute traffic (zone-2) from the external network traffic. The RTM's high-speed ports allow an SBC to quickly classify packets, and decide whether hierarchical processing should be deferred to adjacent blades (zone-2 fabrics) or to adjacent chassis and racks(via zone 3). Ports 3 and 4 offer a powerful load balancing feature. If using a multi-core CPU, (x64, SPARC) incoming packets can be assigned to specific CPU threads or balanced across L1,L2, L3 and L4. This offers a high level of flexibility and granularity for assigning resources and can help avoid I/O bottlenecks.

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Summary

RTM standardization will not suit every ATCA design. Proprietary RTM designs will always be permitted by the ATCA specifications. However, for a group of products, like the group dedicated to SBC functions, companies and customers may find advantages if standardization resulted in more choices. At a minimum, organizations can attract more development partner interest if their products are standards based.

SANBlaze Technology is dedicated to providing innovative products to serve open markets. We have developed several complex RTM, AMC and ATCA products. We will watch and participate in this initial RTM standardization effort as well as any additional proposals that may be submitted later. In the future, we expect some of the more popular function combinations will be re-engineered to accommodate alternate RTM interface proposals.

For more information please visit the SANBlaze web site at: www.sanblaze.com or send email info@sanblaze.com

SANBlaze is a leading provider of storage solutions for embedded systems, delivering high performance enterprise storage technologies and functionality to the embedded computing market. Our AMC, PMC, ATCA and cPCI board level storage solutions provide maximum design flexibility, ease of integration and cost effectiveness.