Is it safe to start building your next product with MicroTCA?

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VDC research makes it clear that MicroTCA has great near-term potential in telecommunications, military and aerospace applications, plus potential in medical and industrial applications down the road. This article provides points to consider in design evaluations.

Figure 1. Front and rear view of single rack space MicroTCA platform with front-to-back cooling

■ Developing an entirely new product line based on an emerging technology can be daunting and involves more than just engineering design. There are numerous issues that need to be addressed such as determining the best technology that meets your customers' needs, the available ecosystem, your product pricing and margins, estimating product lifecycles, sales projections, manufacturing schedules, achieving market penetration, and the eventual end-of-life product planning.

For communication technology providers, whose livelihoods depend on selecting the right technologies, knowing which emerging platform provides the optimum performance to advance next generation product release is paramount. A wrong selection could potentially make the product obsolete the day it hits the market, while the correct infusion of an emerging platform can successfully position products and companies as a market leader – gaining the company accolades as visionary, improving sales and performance, and ultimately gaining more customers.

Questions abound for any new form factor introduction in your product development: Where does this new technology fit with current and future product roadmaps? If in the early adaptor phase, will the risks of time and resources be successfully recouped from the sales of the new products to warrant the development costs? Will the introduction of this new technology enable a company to move more aggressively in product development to reap the financial rewards that come with superior products and/or being the first to market? Is there sufficient traction in the market place with an established ecosystem that will ensure that the new technology will be supported over time? Are you partnering with the right vendor with the proven staying power to not only support current initiatives, but also stick around when you need follow-up support or enhanced features? Can the technology supplier provide all the right building blocks, both hardware and software, and provide the technical expertise to help integrate their products into the application? How quickly can you integrate these new platforms into existing product plans?

All embedded platforms at one point in their lifecycle experience this dilemma of successfully transitioning from promising concept to established and secure technology. VME, CompactPCI, and AdvancedTCA, are all viable, proven platforms with many successful and well-referenced deployments over the years. Yet it is not uncommon for speculation about the supposed demise of a particular form factor and the hype surrounding a new, untried technology to create uncertainty in product planning. Many products, not just embedded form factors, experience much longer shelf lives than their original estimated product lifecycle. The emergence of MicroTCA is no exception to market speculation and hype. While it is too early to say that MicroTCA has crossed the proverbial canyon as described in the book, Crossing the Chasm by Geoffrey Moore, research indicates that the MicroTCA computing architecture is a viable embedded computing and communications option today. This follows the official ratification of the MTCA.0 PICMG standard in July 2006, a wide range of cost-effective commercially available offerings, and a growing body of pilot project evidence that MTCA-based embedded platforms are meeting both technical and commercial requirements of equipment OEMs and their customers.

The value propositions of MicroTCA – a compact form factor, hot swap capability, NEBS compliance, cost efficiency, scalability, time to market savings, and open standard architecture – were initially developed to satisfy a host of requirements in the telecommunications market. Today, however, MTCA looks increasingly attractive to a host of vertical markets that utilize embedded communications computing systems. It is becoming clearer that MicroTCA may have a much larger available market than its seminal positioning as a complementary platform to ATCA for use in telecommunications applications where the ATCA architecture

Figure 2. Interior view of MTC5070 with built-in MCH and shelf management, and enterprise class, removable power supply

is overly robust, overpriced, and simply overkill. Rather, it has become clear that MicroTCA has the potential to be adopted across a broad range of vertical markets such as medical, industrial, military/aerospace/homeland security, transportation, and instrumentation.

To be clear, MTCA is not making these markets on its own. A number of trends in these markets – standards, processing capacity, connectivity, and others – are combining to bring requirements into a closer fit with MTCA capabilities. The MicroTCA value propositions are the key to unlocking the full potential of MicroTCA. The architecture offers many advantages over other solutions, the key is understanding which of them is most important to each market segment and to each customer. This enables suppliers to align their product portfolios, feature sets, and demand generation activities with the market, which will allow them to drive the market. Using data VDC collected from between 20 and 30 OEMs from each of four key vertical markets, about the importance of each value proposition the interviewed OEMs rated on a scale of 1 to 5, VDC has put together a value proposition analysis framework that can be used to segment the market and each vertical market. This framework is presented in Exhibit I.

Exhibit I
Value Proposition Framework Analysis
(Research Courtesy of VDC Corp.)

Value Propositions	Telecommunications	Military/Aerospace	Industrial	Medical	TOTAL SCORE
Built-in H/W Platform Management	4.2	4.2	3.1	2.9	14.4
Carrier Grade Quality/High Availability	4.4	3.2	4.4	1.9	13.9
Ease of Integration	4.3	3.3	4.1	4.5	16.2
Economies of Scale/Cost Savings	4.7	3.4	5.0	4.9	18.0
Interoperability	4.2	3.5	3.4	4.5	15.6
Multi-Sourcing/Robust Ecosystem	4.2	4.1	3.5	4.5	16.3
Open Standards	4.0	4.2	2.5	3.5	14.2
Product Life Cycle	4.5	4.8	4.5	3.7	17.5
Reliability	4.5	4.9	5.0	4.0	18.4
Scalability	3.6	3.8	3.4	4.5	15.3
Small Size of Form Factor	3.0	4.1	4.3	4.0	15.4
Time-to-Market Savings	4.8	4.8	4.5	4.4	18.5
Total Score	**50.4**	**48.3**	**47.7**	**47.3**	

From the rankings it is evident that telecommunications and then military/aerospace close behind have the greatest perceived demand for the advantages/value propositions offered by MicroTCA. These two vertical markets have been identified by VDC as those with the greatest potential for MicroTCA time and again in their MicroTCA research efforts. However, an interesting point is that telecommunications and mil/aero do not have a much greater number of highly rated MicroTCA value propositions than industrial and medical, but the former two markets consistently rated all the value propositions with comparatively high scores. Medical, for instance, had the greatest number of value propositions rated over 4.5, but scored the lowest overall for MicroTCA because this vertical rated some of the value propositions extremely low. This shows that MicroTCA should be successful in telecommunications and mil/aero because it provides a value proposition and feature set that is thoroughly and consistently in line with the needs of those markets. While in the medical market MicroTCA satisfies some of the important needs, it also provides extra features (such as hot swap and carrier-grade capability) that medical customers do not need, care about, or want to pay for.

The rankings also show that the total score across the four verticals for six of the value propositions were above the average total score. These six value propositions represent the most valuable selling points for MicroTCA and provide a way to forget about vertical markets and segment the market by value proposition. In other words, if suppliers take these six most important value propositions and structure their MicroTCA product portfolios, support, and demand generation (marketing) around them, it should help create demand for MicroTCA.

VDC research surrounding MicroTCA makes it clear that MicroTCA has great near-term potential in telecommunications and military/aerospace applications in addition to potential in medical and industrial applications down the road. If you are considering building in MicroTCA for the next product, here are some points to consider in your design evaluations. Choosing AMC modules: Once you have defined the architecture of the product, it's time to take the concept into reality. One of the first steps is to determine what AMC modules are needed and how many. How can the AMC ecosystem help? There are numerous AMC modules from multiple vendors to choose from, and the standards group, PICMG, hosts routine Interoperability workshops where more than 19 companies participate, to ensure compatibility. What AMC boards exist that can be utilized in the platform? What boards need to be designed? To maximize innovation, yet minimize costs, it is important to choose the AMC modules carefully based on performance, where it is needed, or cost-optimized versions. There are several dependencies between AMC modules and the MicroTCA platform. These are detailed as follows.

The platform: Once the AMC boards are determined, it is time to choose the MicroTCA platform. Platforms range from the maximum of 12 slots down to 2 slots. To minimize costs, select a platform that has the minimum number of slots the application requires, but consider leaving one or two slots available for expansion. Buying a platform with too many slots is not only costly from the connectors, power supply, and sheet metal standpoints, but also from the MCH (MicroTCA carrier hub) that is supporting all the fabric and management functions to the empty slots. Secondly, consider the environment in which the platform will be deployed. Telecom deployments require NEBS level requirements. Military deployments could vary from telecom-level requirements to a full ruggedization with extended temperature capability. Platforms that are highly integrated can help to cut costs on dramatically. For example, Performance Technologies MTC5070 platform integrates the MCH functions into a motherboard and utilizes a very reliable high-volume/low-cost enterprise class power supply.

AMC form factors: One criterion to pay close attention to during the AMC module selection process is the form factor. The AMC specification allows for mid or full, and single or double. Make sure that the platform can accommodate the AMC modules properly, especially if they are different sizes.

The AMC market is ripe with a number of module offerings that can support not only different variations of capacity, size, and performance, but also of processor type. This allows engineers to be more selective in designing their end product to match their preferences in processor technology, such as x86 or PowerPC. Once selected, another consideration is the pre-integration of the modules with a leading OS, such as Linux or other OS, to enable faster and tighter integration with the products.

The fabric interconnects: What fabric switching is needed between the AMC modules and do the AMC modules support those interconnects? The two most common fabrics are Ethernet and PCI Express. How much bandwidth is needed for the fabric? What IO is needed to the outside world from the AMC modules? And do the bandwidth requirements from the AMC modules match the bandwidth capabilities in the platform? Do the boards communicate appropriately to each other?

Power budget: The AMC specification provides guidelines for maximum power consumption to each type of AMC form factor. For example, the mid-size single module is 40W. Make sure that the platform can deliver adequate power to each board. Otherwise, the platform management controller may not allow an AMC module to boot up.

Cooling: Very closely tied to power are thermals. First consider the airflow path of the chassis. Many deployments require front to back airflow, such as telecom deployments in central offices. If the platform is configured with numerous boards that require maximum power, it is important to consider the configuration of each AMC module and how to maximize cooling to each module. In a platform that supports multiple tiers, one AMC module receives ambient air, and the one(s) behind it will receive preheated air from its predecessors. Consider placing the AMC modules with the most power consumption in the back-end of this stack. However, it is also important to look at the height of the components of each module and determine if the thermal shadow of one module will excessively restrict air to the subsequent AMC.

System management: What level of system management is required? The IPMI specification allows for a great deal of flexibility. There are many levels of monitoring and control. As a starting point, refer to the MicroTCA platform technical manual (like PTI MTC5070 MicroTCA platform with integrated platform management) or the MCH (MicroTCA carrier hub) technical manual. It will list the management commands it supports. Typically these manuals also refer to the IPMI specification, which can be found at http://www.intel.com/design/servers/ipmi/spec.htm. The IPMI specification provides complete detail, but in generic terms. To fully understand how IPMI is implemented in MicroTCA and AMC modules, go to the www.picmg.org website and purchase the MicroTCA and AMC specifications. ■