



*July Addendum to the
2008 State of the VME Technology Industry
Whitepaper*



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2008 State of the VME Technology Industry July Addendum

by: Ray Alderman, executive director, VITA

This is an addendum to the “2008 State of the VME Technology Industry” whitepaper released in February of this year. It reflects recent changes in the industry. The original whitepaper and this addendum provide the reader with strategic updates on the state of the VME Technology industry, in particular, and a view of the board industry in general, from the perspective of Ray Alderman, the executive director of VITA. VITA is the trade association dedicated to fostering American National Standards Institute (ANSI) accredited, open system architectures in critical embedded system applications. The original whitepaper and addendums can be found at www.vita.com/mktoverview.html

Markets

Each of the major markets using VME Technology for Critical Embedded Systems is influencing business decisions for suppliers in different ways. The updates here address many of those influences and give suppliers some insight into what is happening and what to expect in the near future.

MIL/COTS

Requests For Quotations (RFQs) for board products destined for defense programs started out slow in early 2008. But, the volume of RFQs in the second quarter has increased dramatically, according to reports from VITA members. The unsteady flow of RFQs illustrate the “chunkiness” of demand in the MIL/COTS board segment and the synchronous nature between budgets and program deployment decisions. A number of these new RFQs came from non-US programs as other countries are refreshing their military systems. Many of these RFQs were for legacy VME cards and some 3U CompactPCI products.

In the second quarter we did see one of the first large orders for VPX boards and systems placed with Curtiss-Wright.¹ This new order signals the start of the design-in and growth phase for VPX based boards and systems. VPX technologies have matured enough to be qualified for upcoming programs. It certainly indicates that defense programs are adopting next-generation interconnects and processors for more advanced and highly sophisticated platforms. Future design-in and deployment activity should begin to increase significantly in the coming months.

¹ Curtiss Wright. “Curtiss-Wright Awarded \$8 Million Contract”. [Online] May 13, 2008. ir.curtisswright.com/releasedetail.cfm?ReleaseID=310188.

Contents

Markets	1
MIL/COTS	1
Industrial	3
Telecommunications	3
Impact of Semiconductor Industry	5
Size Matters	7
Mergers and Acquisitions	8
Critical Embedded Systems MediaFest 2008	9
Summary	11

In addition to the deployment of VPX products in the MIL/COTS segment, I am seeing high levels of interest in liquid-cooled electronics. I anticipate similar orders for new VPX REDI (Ruggedized Enhanced Design Implementation) based liquid-cooled technologies by year's end. We are now entering the qualification and design-in phase of the REDI compliant products in many MIL applications.

There is a great deal of speculation that the November election will bring new priorities to the White House and Congress in 2009 and that defense budgets and purchases may shrink. There are many contracts already placed and I believe that defense spending will perpetuate for quite some time as we refresh older systems and replace damaged and destroyed equipment from the Iraq and Afghanistan conflicts. The military will need to develop, test, and field many new systems designed to thwart future terrorist techniques. A lot has been learned from the experiences in Iraq and Afghanistan and that knowledge is feeding into a number of new systems and platforms the military will need in the future.

We have seen recent developments involving the KC-X tanker contracts. The Government Accountability Office (GAO) sustained the Boeing Company's protest of the Department of the Air Force's award of a contract to the partnership of Northrop Grumman Systems Corporation and European Aeronautic Defence and Space, the parent of Airbus, for KC-X aerial refueling tankers.² The Pentagon recently said that it will rebid the program, essentially starting from scratch on a years-delayed deal to replace the service's aging aircraft.³ The old KC-135 tankers are over 50 years old and to maintain military readiness around the world, will certainly need to be replaced.

Consumer electronics continues to have an amazing impact on high performance computing. The recent announcement from IBM about the world's fastest computer using 12,240 IBM PowerXCell 8i Cell Broadband Engine™ processors⁴ – derived from chips that power today's most popular video game consoles – highlights just how much processing power is sitting in our own homes. I speculate that the performance capabilities of game consoles may initiate some companies to try, yet again, to create some kind of environmental packaging (i.e., a womb) to surround consumer products for military applications. This has been attempted many times in the past. But, even if consumer products are so packaged, there are still serious quality and reliability issues associated with consumer electronics, especially RoHS. If they could, our military fighter-planes would have used Xboxes for their cockpit electronics over the past five years.

The developing trend, based on knowledge gained in the Middle East, is to replace soldiers with technology. A large number of UAV's (Unmanned Aerial Vehicles), UGV's (Unmanned Ground Vehicles), and UUV's (Unmanned Underwater Vehicles) are in design and are being deployed. These platforms will continue in some number, no matter who gains the White House or which party controls Congress in 2009. Advanced communications, sensor-based systems, and signal intelligence systems development and deployment will continue well into the next administration and beyond. If a new administration does restrict the US military role in the Middle East, there will still be a need for continuous intelligence monitoring there in the future. In this case, the military budgets will shift from active systems (weapons platforms) to intelligence and communications systems (passive platforms).

2 **United States Government Accountability Office.** "GAO Sustains Boeing Bid Protest". [Online] June 18, 2008. www.gao.gov/press/press-boeing2008jun18_3.pdf.

3 **The Washington Post.** "Pentagon to Rebid \$40 Billion Air Force Contract". [Online] July 9, 2008. www.washingtonpost.com/wp-dyn/content/article/2008/07/09/AR2008070901767.html.

4 **IBM.** "IBM-Built Supercomputer at NNSA's Los Alamos National Lab No.1 in TOP500". [Online] June 18, 2008. www-03.ibm.com/press/us/en/pressrelease/24480.wss.

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The transition from soldier-based platforms in the military to autonomous platforms is clear. This is particularly interesting because we have seen much of the Land Warrior program unfunded, while unmanned vehicles of all kinds are being funded and deployed. This is probably the biggest change in the whole concept of the Future Combat Systems program and will continue into the future. That is good news for our members and for the board business as VITA member's products will play a significant role in these prolific autonomous platforms, with VPX and REDI-based products at the center.

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Industrial

Energy management and connectivity are the major trends for the industrial market.⁵ Energy management has been a priority for the industrial markets for some time now but with the rapidly rising cost of fuel, with no apparent end in sight, the priority has become even more urgent. Designers of embedded systems for industrial applications are even more concerned with minimizing power consumption.

Many new projects and capital investments are on hold now as demand has started to decline and economic uncertainty continues. US exports are relatively cheap at the current exchange rates holding some hope for exporters of US goods. There is even talk in some circles about rebuilding certain US manufacturing capability after years of outsourcing to Asia and India.

Connectivity is a major initiative for industrial markets as they continue to improve efficiencies by interconnecting equipment using traditional Ethernet or ZigBee, Wi-Fi, LTE (Long Term Evolution) and other emerging wireless technologies.

There is a proliferation of board form factors targeted at the industrial markets. This is being driven by a very cost sensitive market with a need to reduce size, weight and power (SWaP) in the electronics used in many pieces of equipment. Numerous small form factor (SFF) motherboards are emerging to meet the needs. In many cases there is very little differentiation between the various form factors and different factions are fielding slightly different versions of the same technology as suppliers struggle to differentiate themselves. There does not appear to be a strong and unified effort to come to common terms in many cases, creating an opportunity for VITA members to participate in the setting of form factor standards through efforts like VITA 59, Rugged System-On-Module Express.

Because of these transitions and the protectionist behaviors in the industrial markets, this segment seems to be the most unstable of all. It will remain unstable until homogenization occurs and many smaller vendors are driven from the market by the larger vendors with predatory pricing strategies. There's an old African proverb that explains this market's situation best: "When the elephants fight, it's the ants that take a beating."

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Telecommunications

In the past six months there has been further retrenchment by telecommunication equipment suppliers. Siemens Enterprise Communications announced layoffs and closures in their Corporate Telecom Equipment Business in late February.⁶ Siemens is

5 **Industrial Embedded Systems.** Open Systems Publishing. "Industrial market trends: Changes shaping the industry for 2008". [Online] December 2007. www.industrial-embedded.com/articles/id/?2395.

6 **Siemens AG.** "SEN undergoes extensive reorientation to meet changing customer needs". [Online] February 26, 2008. w1.siemens.com/press/en/pressrelease/2008/corporate_communication/axx20080237-e.htm.

changing the focus of this particular business from hardware centric to software centric. At the same time they are trying to sell that business, but no buyers have stepped forward. Motorola Embedded Computing and Communications announced AdvancedTCA deals with Siemens in mid 2006.⁷ This was probably an early premonition that Siemens was shifting away from hardware. To further the blow, Siemens announced recently that 16,750 jobs would be cut through cost reductions and restructuring.⁸

Verizon bought Alltel,⁹ and must now divest certain rural assets by order of the FCC. Those assets will most likely be bought by the smaller rural service providers. The rural providers are under no pressure to offer advanced services or do any network build-out meaning that less network equipment will be purchased. Of the larger service providers, both Sprint-Nextel and Qwest continue to show weakness and financial difficulty. These circumstances will have a dampening effect on telecom board sales both now and in the near future.

Most disturbing is the state of wireless in the US. Cellphone subscriber growth dropped to 7.9% this year.¹⁰ About 83% of all Americans have at least one cellphone now. That number increases to 89% in 2010, creating market saturation. The wireless service providers have two options going forward: (1) steal customers from each other with lower-priced service packages (i.e., price erosion), or (2) offer new data services. Consumers have been reluctant to pay the high rates for data services with gas north of \$4 a gallon, food costs rising rapidly, and the increase in mortgage defaults. Consequently, the prospects for additional US telecom system build-out continues to degrade. This set of circumstances will have a dampening effect on telecom board sales, both now and in the near future.

Telecom and internet service providers are increasingly exploring new ways to generate additional revenue from services. AT&T is looking at charging heavy internet users extra fees.¹¹ Cellphone providers are pushing video and text services whereby they can charge per transaction or data usage. Users are demanding more and more rich media and the service providers are hesitant to add additional bandwidth. There are two trains heading for a train wreck as one side wants more and the other is struggling with how to finance the needed bandwidth.

At the macro-level, Chinese telecom service providers have been consolidating in the first half of 2008.¹² The moves are part of China's long-awaited plan to restructure its telecom industry, in which six operators will be merged into three full-service

Commodification

From References.com¹

In the business world, commodification is a process that transforms the market for a unique, branded product into a market based on undifferentiated price competition. While in economic terms, commodification is closely related to and often follows from the stage when a market changes from one of monopolistic competition to one of perfect competition, a product essentially becomes a commodity when the repeated changes- because of competition-outplay themselves. It is essentially called a performance oversupply- which means that the market is performance saturated and any differentiation, even when being offered, is more than what the market demands. Commodification can be the desired outcome of an entity in the market, or it can be an unintentional outcome that no party actively sought to achieve.

Consumers usually benefit from commodification, since perfect competition usually leads to lower prices. Branded producers often suffer under commodification, since the value of the brand (and ability to command price premiums) can be weakened.

1 **References.com.** [Online] www.reference.com/browse/wiki/Commodification.

7 **Motorola.** "Motorola Embedded Communications Computing Selected by Siemens as a Preferred Supplier for ATCA-based Open Communications Servers". [Online] June 6, 2006. www.motorola.com/mediacenter/news/detail.jsp?globalObjectId=6828_6783_23.

8 **Siemens AG.** "Siemens to reduce SG&A costs - 12,600 jobs to be cut worldwide, 4,150 additional job cutbacks due to restructuring - Sale of SIMS planned". [Online] July 8, 2008. w1.siemens.com/press/en/pressrelease/2008/corporate_communication/axx20080765.htm.

9 **Verizon.** "Verizon Wireless To Acquire Alltel; Will Expand Nation's Most Reliable Wireless Network". [Online] June 5, 2008. newscenter.verizon.com/press-releases/verizon/2008/verizon-wireless-to-acquire.html.

10 **USA Today.** "Slower cellphone growth in USA could bring good deals". [Online] May 30, 2008. www.usatoday.com/tech/wireless/phones/2008-05-29-cellphone-slow-growth_N.htm?csp=34.

11 **USA Today.** "AT&T looking at charging heavy Internet users extra". [Online] June 12, 2008. www.usatoday.com/tech/products/services/2008-06-12-att-internet-charge_N.htm.

12 **China Daily.** "Telecom mergers afoot". [Online] June 3, 2008. www.chinadaily.com.cn/cndy/2008-06/03/content_6729957.htm.

carriers. The government hopes the restructuring will help create a more competitive telecommunications industry and break the de facto monopoly of China Mobile, the country's largest cell phone operator.

Intel has also been stepping up the action in China. Intel Capital, Intel Corporation's global investment organization, recently announced its second China investment fund, the Intel Capital China Technology Fund II.¹³ The new US\$500 million fund will be used for Intel Capital investments in wireless broadband technology, media, telecommunications and "clean tech" that complement Intel's corporate initiatives and help expand technology market segments in China. At the board products level, Intel has moved much of their support for US-based telecom board vendors to Chinese telecom board vendors. I predict that ultimately most telecom equipment is going to be built by ZTE and Hua Wei (they are both expanding in the US rapidly, opening offices here and there).

While this will eliminate a number of potential customers for telecom boards, the silver lining here may be an increase in the unit volumes purchased by the few remaining service providers leading to larger orders for the surviving suppliers.

These changing market conditions have inspired some telecom board vendors to diversify into the MIL/COTS board markets in search of business to help defray their large sunk-investments in communications boards. The long design-in cycles, and even longer deployment cycles for MIL programs, will conspire to delay recognition of orders for telecom board vendors for 2-4 years. Additionally, the number of boards shipped to MIL programs is very low relative to telecom programs and will not resolve the sales and growth problems of these telecom-focused companies even if they are successful. These contributing factors may cause some companies to depart the telecom market or initiate more M&A transactions to enable growth in the sector in the coming months.

All this consolidation in the telecom market is only making it more competitive and thus difficult to get design wins. Fewer buyers means more challenges for the suppliers. Smaller niche suppliers will be especially impacted. The larger suppliers certainly have their work cut out for them.

Impact of Semiconductor Industry

The merchant board industry is an extension of the semiconductor industry and is vulnerable to any significant shifts in semiconductor supply and new chip directions. This was painfully evident when PA Semi recently announced that they had sold-out to Apple.¹⁴ This move created serious concern from MIL/COTS board and systems suppliers because several new DoD programs had chosen the PA Semi PWRficient family of 64-bit multicore processors for their designs.¹⁵ In addition, lead times for some popular Power Architecture processors, used in many DoD programs, have moved out to 36 weeks according to some reports from VITA members. These developments involving the Power Architecture processors have shaken the confidence of end-users and board suppliers.

¹³ Intel. "Intel Capital Announces New US\$500 Million China Technology Fund II; Marks 10 Years Of Chinese Investments". [Online] April 8, 2008. www.intel.com/capital/news/releases/080408.htm.

¹⁴ EETimes. "Apple enters IC market, buys PA Semi". [Online] April 23, 2008. www.eetimes.com/news/latest/showArticle.jhtml?articleID=207401495.

¹⁵ EETimes. "DoD reviewing Apple's bid for PA Semi". [Online] May 20, 2008. www.eetimes.com/showArticle.jhtml;jsessionid=IRMDV4KEULTMUQSNLRSKH0CJUNN2JVN?articleID=207801405.

At a board level Intel has moved their support from US-based telecom board vendors to Chinese telecom board vendors and that ultimately all telecom equipment is going to be built by ZTE and Hua Wei

All this consolidation in the telecom market is only making it more competitive and thus difficult to get design wins.

Steve Jobs Claims PA Semi Will Make iPhone, iPod Chips

Some have converted product lines to Intel Architecture processors, but that is a tough choice for many as it is very difficult to differentiate products and distance ones self from the competition when everyone is using the same foundation technology.

The PA Semi/Apple deal and extended lead times for Power Architecture processors are minor compared to the present chaos in the semiconductor industry. According to research by the Semiconductor Industry Association, in 2006, for the first time in technology history, over 50% of all world-wide semiconductor shipments went into “consumer devices” (which includes cell phones). That percentage increased in 2007 and will again in 2008. This mega-trend has caused serious concerns in the industrial and MIL/COTS board segments, as the chips used in those segments may go End of Life (EOL) faster than ever before.

At the May Critical Embedded Systems MediaFest I noticed a major reaction to this semiconductor instability: virtually all board vendors exhibiting there were showing their FPIO (Field Programmable Input Output) products. To reduce the exposure to semiconductor suppliers ending production and eliminating various I/O chipsets, vendors have moved to FPGAs (Field Programmable Gate Arrays) for their new products. Other vendors, especially in the DSP segment, have been developing and announcing FPCA (Field Programmable Computing Array) products for several years to eliminate traditional CPU vendors from their supply chain. This gives these board vendors more stability and better product life cycle management control.

There are major potential disruptions coming in the semiconductor industry. The semiconductor industry is sure to consolidate rapidly over the next few years. One particular scenario claims that only 50 semiconductor companies will exist in a few years, down from the present 450+ semiconductor companies today.¹⁶ Single-digit growth in the semiconductor IP (intellectual property) market, will encourage further consolidation, according to Gartner Inc.¹⁷ This prediction is particularly unnerving when the merchant board vendors have inextricably hitched their wagons to the semiconductor industry's directions and roadmaps. Ann Steffora Mutschler, Senior Editor for EDN's Electronic Business reports “In the end, there is no way to know how 2008 will wrap up for the semiconductor industry until a clear picture of consumer demand can be had – since that segment drives so much of the industry's activities. One thing is for sure, the industry is in for a bumpy ride until then, with conditions likely to get worse before eventually improving.”¹⁸

In Europe, there are proposals being considered to merge Infineon, STMicro, and NPX Semiconductor into one company, what I call “Euro-Semi Corporation”.¹⁹ Other rumors are that NPX and Freescale Semiconductor should merge, making them large enough to survive the coming massive consolidation in the semiconductor industry.

The semiconductor supplier consolidation is particularly unnerving when the merchant board vendors have inextricably hitched their wagons to the semiconductor industry's directions and roadmaps.

16 EETimes. “NXP's Claasen: 50 IC companies are still too many”. [Online] May 10, 2008. www.eetimes.com/showArticle.jhtml?jsessionid=IRMDV4KEULTMUQSNDLRKSH0CJUNN2JVN?articleID=207601928.

17 EDN. “Single-digit growth in semiconductor IP market pushes consolidation”. [Online] June 23, 2008. www.edn.com/article/CA6572360.html?nid=3351&rid=2058715598.

18 EDN. “Semiconductor industry dynamics will get worse before getting better.” [Online] June 23, 2008. www.edn.com/article/CA6572685.html?nid=3351&rid=2058715598.

19 EDN. “ST, NXP begin detailing wireless joint venture”. [Online] June 26, 2008. www.edn.com/article/CA6573543.html?nid=3351&rid=2058715598.

Consequently, the biggest problem facing the merchant board business in the near future will be the consolidation of the semiconductor supply base. This will require our industry to innovate in totally different ways and to decouple ourselves from as many semiconductor suppliers as possible.

Size Matters

The industrial and telecom market segments are both in advanced stages of commodification, a market based on undifferentiated price competition, due to what I believe is the extensive use of common PC technology. I have often talked about this impact of PC technology on our markets. It is producing a market of undifferentiated products at lower prices and low gross profit margins. Consequently, the suppliers in these markets must find customers who use high unit volumes of boards before they can realize a return on development investment.

This has been particularly true for large telecom-oriented boards and also applies to the larger embedded motherboard products. We all know that the GPM on systems is much lower than the GPM on boards. With large telecom boards and fairly large embedded motherboards, those products begin to take-on the same characteristics of systems. Since they are both PC technology based and the board contains all the elements of a PC system (give or take some small unique I/O interfaces), they are systems. Consequently, the margins on those boards approach the lower margins seen on systems. Examples of large form factors include Multibus II, AdvancedTCA, and blades of several varieties from suppliers such as Sun Microsystems, IBM and HP.

This leads to my first postulate:

- *The larger the form factor, the lower the Gross Profit Margin (GPM) of the products.*

I would not say that the inverse of this rule is always true (i.e., the smaller the form factor, the higher the GPM on the products), but it is true in many cases. The GPM on small unique mezzanine cards is much higher because they still are differentiated from the PC technology based products.

As suppliers struggle for market share and profitability, they will seek additional high-volume users with lower pricing tactics. That, in turn, will drive many of the smaller suppliers from the market. Since there is a limited number of these high unit volume customers, there is also a smaller number of board suppliers. This is based on my observation that most suppliers only have one or two major customers right now. This leads to my second postulate:

- *The larger the form factor, the fewer are the number of suppliers of those products in the marketplace.*

This principle is evident in the telecom board segment and it will probably prevail in the industrial segment, especially when homogenization occurs. This observation is the basis for suggesting that we will see a lot of M&A activity in this segment in the near future. Again, I would not say that the inverse of this rule is always true. But, it is true in many instances. There are more suppliers of the smaller mezzanine-type cards than for large telecom boards and industrial motherboards.

The larger the form factor, the lower the Gross Profit Margin (GPM) of the products.

The larger the form factor, the fewer are the number of suppliers of those products in the marketplace.

PC technology is especially prevalent in the base of suppliers that produce embedded motherboards of various form factors, but the small form factor board suppliers seem to have learned from the lessons taught by the telecom board segment's woes. Smaller companies thrive on a market that is heterogeneous and fragmented. This is why we have seen so many slightly different variations on the same form factors. With this approach, the large companies, especially the Taiwanese board vendors, can't play in all the SFF product lines. They simply cannot support the large number of part numbers required to cover all the form factor options.

Common standard form factor boards were the catalyst pushing many of the single board computer products to commodification in the telecom market. The SFF suppliers do not want to suffer the same consequences in the industrial markets. But, this market fragmentation may not offer protection for very long against the larger players. The single element that will homogenize this market will be price and the larger players will certainly use pricing to their advantage. Additionally, with all these SFF products using PC technology, the barriers to switching vendors and board sizes are very low.

As certain SFF's specifications gain market share and prevail, we can expect to see vigorous M&A activity as the smaller companies, in their pseudo-protected SFF segments, experience growth and margin problems. There are some traditional board vendors, many from Asia, who will drive the industrial market segment to commodification over the next few years.

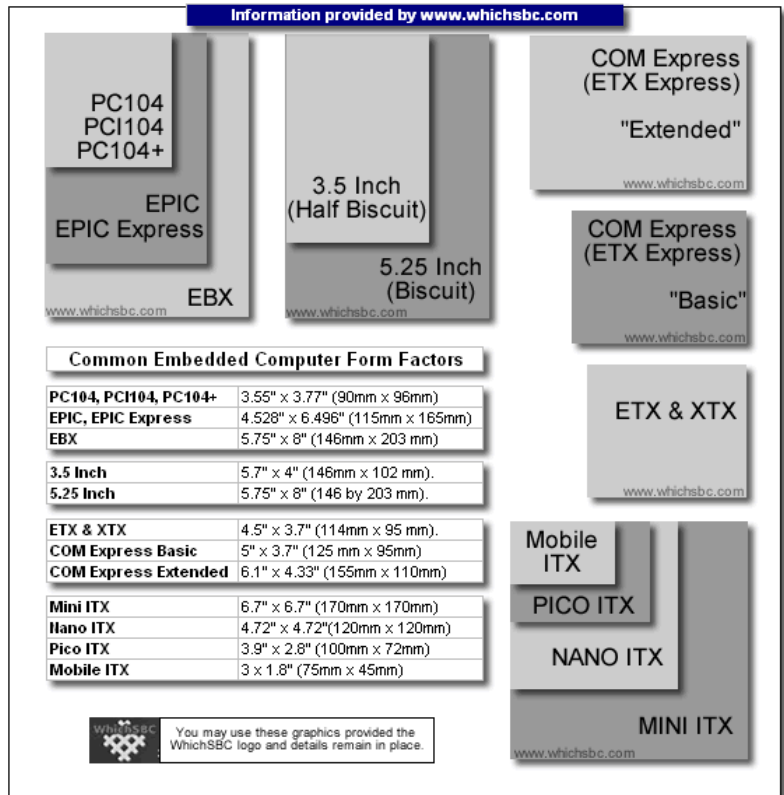
VITA members are working vigorously to develop standards that support the small form factor needs of these markets while still allowing the suppliers to remain differentiated. Efforts like the FPGA Mezzanine Cards and Rugged System-On-Module Express are first steps in helping the small form factor suppliers to thrive in these markets.

I have written more on this subject and it can be found in the August issue of Opensystems Publishing's *VME and Critical Embedded Systems* at www.vmecritical.com.

Mergers and Acquisitions

In the first 6 months of 2008 (through early June), we saw six acquisitions in our industry. According to my records (covering 16 years of M&A in this industry), the highest number of acquisitions in one year was nine in 2004. If this level of M&A continues, we may break that record in 2008 since we have already seen six in the first half.

MIL/COTS companies are still prime property in the M&A activity. When you buy industrial or telecom board companies, you are buying a chance at the next order from their commodity-buying customers. When you buy a MIL/COTS company, you are buying

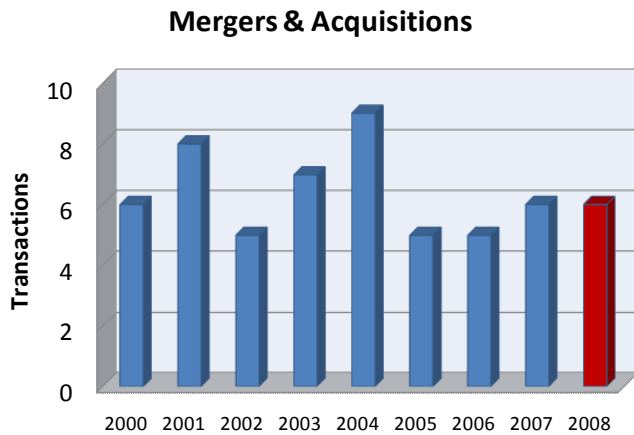


an annuity. Orders to MIL/COTS companies are rarely put out for rebid once awarded. That is another reason that MIL/COTS companies sell for much larger multiples, when compared to industrial or telecom board companies.

As you could expect, the valuation of the MIL/COTS companies is higher than those of industrial companies as the MIL/COTS companies benefit from higher average selling prices and higher Gross Profit Margin (GPM). The industrial and telecom markets continue the commodification process with little product differentiation and aggressive prices.

Interesting is the acquisition of a US-based MIL/COTS board vendor by a European concern. The purchase of DRS by an Italian company seems to reflect the increased value of US-based MIL/COTS suppliers when bought by European companies with Euros. A number of US companies are being sold to European based firms because of the devalued US dollar. The strong Euro gives European buyers a large discount when buying US-based MIL/COTS

companies. This European acquisition activity, involving US-based MIL/COTS companies, may perpetuate if the currency imbalance continues and other market segments (i.e., telecom and industrial) remain unstable and unpredictable.



First Half 2008 M&A Transactions

January 2008: Kontron bought Thales Computers (US and France) (MIL/COTS)

February 2008: Curtiss-Wright bought Pentland Systems (Scotland) (MIL/COTS)

March 2008: Adlink bought Ampro (small form factor and PC104 boards) (Industrial)

March 2008: SMART Modular Technologies bought Adtron Corporation

May 2008: Interconnect Systems Inc (ISI) bought Nallatech (Scotland) (MIL/COTS)

May 2008: Finmeccanica (Italy) bought DRS Technologies (MIL/COTS)

Critical Embedded Systems MediaFest 2008

VITA hosted a media conference, Critical Embedded Systems MediaFest, in early May in Scottsdale, AZ.²⁰ This conference replaced the Bus&Board Conference that was started in 2000. The conference was hosted by 24 companies that supply VME Technology. Sixteen members of the electronics press were also in attendance to meet with the sponsors. Sponsors talked to the audience about topics that ranged from standards updates to key trends in various industries developing critical embedded systems.

At the conference I introduced a new initiative for VITA members: IOTSO (Innovate Outside Traditional Semiconductor Offerings). There are numerous areas where VITA members can innovate while avoiding the inevitable and painful consolidation of the semiconductor suppliers and the extensive EOL of traditional semiconductor components. FPGA devices offer companies the ability to



²⁰ VITA. Critical Embedded Systems MediaFest. [Online] May 4-6, 2008. www.critical-embedded-systems.com/mediafest.html.

remove many traditional semiconductor suppliers from their supply chain and gain stability (as we have seen already with the FPIO products coming to market). FPCA (Field Programmable Computing Arrays) processing architectures are still restricted to lower-performance applications using processor cores embedded in FPGA devices. But, many critical applications can benefit from using 4, 8, 16, or 32 processor cores in those FPGA's and eliminating traditional processor suppliers. Members can focus and concentrate on extended environmental operating conditions for their boards using the REDI (Ruggedized Enhanced Design Implementation) specification.

VITA is developing many standards that meet the IOTSO objectives and we expect to see several new proposals coming to committee in the future that also support the IOTSO concept. New VITA Standards Organization (VSO) working groups are active or will be created in the near future to begin specifications for:

- *Space and high-altitude environmental requirements*
- *New mezzanine to better accommodate SDR (software defined radios), SSDs (solid state disks), FPGA-based I/O (FPIO) and processor implementations (FPCA), optical and RF signal connections to mezzanine cards*
- *Advanced cooling techniques (liquid flow-through and conduction-cooled/liquid-cooled hybrids, as in the REDI specification)*
- *Methods to transfer digitized signal data and metadata important to RF applications such as Software Defined Radio.*
- *Rack-insertable power supplies (with liquid cooling capabilities)*
- *New LRU (line replaceable units) mechanical specifications with new mechanical packaging standards to enhance two-level maintenance*

Through specifications and standards, VITA can create options that allow members to consolidate their supply chains, gain stability and profitability, eliminate a great deal of obsolescence and eliminate many of the business problems that the semiconductor industry will inflict upon us over the next few years. Continuing to be driven by "traditional

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semiconductor offerings” in the future will result in commodification of products in many market segments and those “consumer-oriented devices” will never be able to meet the environmental and reliability requirements of many critical embedded system applications that our members serve well.

Summary

We have seen some amazing developments in our markets over the past year or so. Some are frightening, some are positive, and some are confusing. The major shifts I see happening in our industry now are:

- **MIL/COTS:** A shift from people to autonomous platforms. A potential shift from weapons systems to intelligence and communications systems could occur in the near future, depending on political outcomes. M&A activity and valuations (2.0 to 3.0 times sales) of MIL/COTS companies will remain high, but this market segment will be the most stable.
- **Industrial:** A shift from a slow-growth stodgy market to a growth-oriented unstable market is occurring. This is being created by all the new form factors being fielded and will cause user system redesigns across this industry segment. Commodification will dramatically increase M&A activity and valuations of companies will decline (0.5 to 1.0 times sales)
- **Telecom:** At the macro-level, a shift from subscriber-revenue growth to an emphasis on new service-revenue growth is occurring. But, consumers have not been willing to pay for these new services in today’s uncertain economy. At the board-level, there is little motivation for much M&A activity in this segment and company valuations will remain low (0.5-0.8 times sales). Any M&A activity will probably be at “fire sale” prices as companies leave this market segment to pursue other markets.
- **Semiconductor:** At the macro-level, the fundamental shift from broad-line semiconductor product makers to a focus on low-margin consumer-oriented semiconductor devices continues unabated. This is destabilizing the semiconductor industry and will cause rapid and rampant consolidation of the chip makers. At the board-level, the macro-trends will increase the number of chipset EOL’s and affect lead times for common components.
- **The Board Industry:** The macro-situations above are suggesting that there are only two possible strategies in the future for board-level companies: (1) be a semiconductor-driven commodity supplier to commodity market segments or (2) be a specialized custom hardware supplier to non-commodity segments by using FPGA’s and cores. The major trend we see occurring now is the shift from traditional chip-based I/O products to FPGA-based I/O products (FPIO) using the new VITA-57 FMC (FPGA Mezzanine Card) specification. Over the past few years, we have already seen the shift from DSP’s to FPGA-based processing (FPCA). The trend toward more FPGA-based processing elements, using processor cores, will expand out of the DSP segment and into the mainstream. Board vendors in this segment will need to develop new skills and capabilities, and eliminate as many semiconductor suppliers as they can from their supply chain. This initiative is called IOTSO (Innovate Outside Traditional Semiconductor Offerings).

As you can see, we have some interesting and serious market transitions to consider. I believe that there are great opportunities in both the commodity-oriented markets (telecom, industrial) and in the value-oriented markets (MIL/COTS), depending on company size, a company’s expertise, and a company’s ability to adapt to these conditions.