



## *2010 State of the VME Technology Industry*



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# State of the VME Technology Industry September 2010

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*This report provides the reader with updates on the state of the VME Technology industry in particular and 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 entire series of reports can be found at [www.vita.com/mktoverview](http://www.vita.com/mktoverview).*

## Business Conditions

Business conditions for the first two quarters of 2010 lived-up to my predictions in the February 2010 report: slow and full of uncertainty. Federal Reserve Chairman, Ben Bernanke, has similar concerns and stated that the US economy was exhibiting “unusual uncertainty” in testimony to Congress in July.<sup>1</sup> The first quarter was slower than anticipated for our industry: very few RFQs came out and sales activity was depressed. But we did see an increase in RFQs and sales activity in early to mid second quarter. While conditions improved slightly in the US in the first half, they deteriorated in Europe.

In the US, the banking and financial crisis stabilized in the first half of 2010, but credit remains very restricted. Money is tight across our industry as customers continue to pay slowly, creating cash crunches for many of the VITA members. The dollar has risen against the Euro and other currencies making US exports more expensive (and imports cheaper). In the US, 48 out of the 50 states are showing budget deficits for 2010 with the largest gaps on record.<sup>2</sup> California and Illinois are in the worst shape, and could cause another debt crisis in the US if they default on their bonds. Bailing-out the insolvent states that spent irresponsibly on entitlements and state employee benefits will cause tremendous political tension in the US, especially after the US taxpayers saved GM, Chrysler, AIG, and all the major banks. Unemployment remains high at +9% (with a real unemployment rate at 17%) in the US, with no sign of abatement over the next few years. 1Q10 GDP came in at 3.7% growth while 2Q10 slowed to 1.6%, so we are anticipating some slow-down in growth in the US for the remainder of 2010.

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<sup>1</sup> “Despite Positive Earnings, Ben Bernanke Spooks Market With Talk Of “Unusual Uncertainty””, Daily Markets, July 22, 2010, URL: [www.dailymarkets.com/options/2010/07/21/despite-positive-earnings-ben-bernanke-spooks-market-with-talk-of-unusual-uncertainty/](http://www.dailymarkets.com/options/2010/07/21/despite-positive-earnings-ben-bernanke-spooks-market-with-talk-of-unusual-uncertainty/)

<sup>2</sup> Elizabeth McNichol, Phil Oliff and Nicholas Johnson, “Recession Continues to Batter State Budgets; State Responses Could Slow Recovery”, Center on Budget and Policy Priorities, July 15, 2010, URL: [www.cbpp.org/cms/?fa=view&id=711](http://www.cbpp.org/cms/?fa=view&id=711)

In Q1 and Q2, the EU experienced a sovereign debt crisis in Greece, Spain, Portugal, and the UK taking their banks into a liquidity crisis similar to what we saw in the US in 2009. The US banking crisis was caused by the collapse of mortgage-backed securities and housing prices, not the potential default on bonds as seen in Europe. After a lot of political angst, the EU agreed to a bail-out plan for certain member countries near default. This action has created political disharmony in the EU as members are all paying for it with a devalued Euro. Fear of default caused a significant drop in the value of the Euro (from a high of \$1.41 to a low of \$1.18) in the first half. The Euro has risen into the \$1.27 range now, but the sovereign debt crisis is not over. Economic analysts are saying that the Euro fair value is between \$1.15 and \$1.20 USD. The unemployment rate in the EU rose to about 10% (from about 9.9% in 2009). Further, the EU revised their GDP forecast upward in May, to 1% growth in 2010 versus a previous zero growth forecast. The EU bank stress test results, announced on July 23rd, reported that only a few of their banks would have problems in a severe economic downturn. That's encouraging news, especially when you consider how much money the US Federal Reserve put into the US banks in 2008 and 2009 to avoid banking failures.

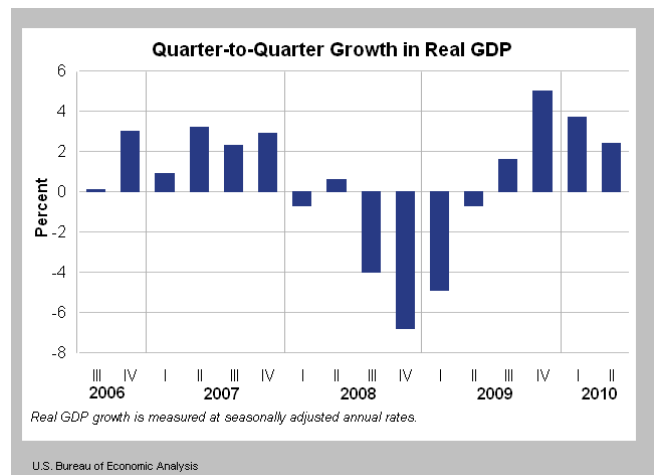
*“The general economic uncertainty will prevail into the second half of 2010.”*

From a macro-economic level, the general economic uncertainty will prevail into the second half of 2010, with a slight improvement in GDP for the EU, and lower GDP in the US. However, both regions are taking diametrically opposed actions to deal with their unique and specific problems.

About 67% of all US economic activity is consumer spending. US government spending, as a percentage of GDP, was about 22% (including state, county, city and federal spending) prior to this recession. Best predictions suggest that we are now at 50% or more, and rising. Obviously, the present administration's plan is to raise taxes (which reduces consumer spending) and increase government spending (which adds to our sovereign debt). While the debt to GDP ratio in the US is about 50%, all the European countries nearing default on their bonds are close to, or over, 100%.<sup>3</sup> In the US, the present administration's plan to replace consumer spending with government spending has set the stage for major political changes in Congress. Furthermore, this plan promises to increase the number of government employees (needed to administer all the new government spending programs like healthcare), which would possibly reduce our unemployment numbers, but would require even more government spending to pay for those people.

In the EU, government spending is at least 50% of GDP in most countries, and much higher in many others.<sup>4</sup> Obviously, consumer spending, in those countries where government spending is 50-70% of GDP, is very low compared to the US. The EU plan is to reduce government spending (especially on entitlements and benefits to their citizens) and thereby reduce their outstanding sovereign debt obligations (e.g., recently announced austerity plans for EU countries). The European plan to reduce government spending as a percentage of GDP, with their already high tax rates, doesn't seem to depend on increased consumer spending to make up the difference in GDP. Additionally, reduced government spending would also reduce the number of government employees needed, which would add to their already-high unemployment rolls.

I'm no economist, but the net result of both plans seems to reduce the overall GDP, going forward, for all the countries involved. The primary focus of both seem to be the avoidance of either inflation or deflation. Legislated reductions in consumer spending in the US (the largest GDP segment), and legislated reductions in government spending in the EU (the largest GDP segment again) would certainly create problems with overall GDP growth in both instances. Forgive



US Growth in Real GDP

<sup>3</sup> List of countries by public debt, Wikipedia, URL: [en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_public\\_debt](http://en.wikipedia.org/wiki/List_of_countries_by_public_debt)

<sup>4</sup> "Government spending as a percentage of GDP by country", The Audacious Epigone, March 12, 2008, URL: [anepigone.blogspot.com/2008/03/government-spending-as-percentage-of.html](http://anepigone.blogspot.com/2008/03/government-spending-as-percentage-of.html)

me for questioning these brilliant people, but I am having difficulty believing that either the US or EU government officials can implement these social and economic changes without adding more uncertainty to our future.

We can't affect the macro-level environment thrust upon us (except through the ballot box, and that takes time). We can, however, affect our micro-level environment. So, that's where we must concentrate for the remainder of 2010 and beyond. We must all think "small" in several ways.

## Transitions

Signs of two new transitions have surfaced in the MIL/Aero markets in the past months; 1) the transition to small form factor systems, and 2) the transition to optical interconnections. Both moves have been anticipated for a number of reasons.

At the VITA Standards Organization (VSO) meetings in the first half of 2010, three companies proposed small form factor standards and were each granted working group status. PCI-Systems, Themis Computer, and Curtiss-Wright made proposals for small form factor (SFF) computer systems, with each concept using small "cube-like" packaging to house small boards of different sizes (about 2x3 inches or slightly larger). These new proposals go far beyond the capabilities of the present 100+ SFF specifications in the market today by tolerating severe shock and vibration, resisting contaminants (the cubes can be hermetically sealed), tolerating broader temperature ranges, incorporating more advanced cooling techniques, minimizing the cabling and discrete wires used in present SFF implementations, providing PCB-based routing of the external I/O signals to the daughtercard connectors on the backplane, and adapting to different power supply voltages (i.e., 12-18VDC, 24-28VDC, 120VAC, 48VDC, etc.). These new implementations are aimed at unmanned aerial and ground vehicles.

While new platform requirements are the primary driver of this transition to military-grade SFFs, there are two other lines of reasoning at work here. First, we all know that >10 Gig signals on copper can run for a only few inches reliably. These SFF cubes allow the use of >10 Gig signals on very small copper backplanes and can avoid the signal integrity problems associated with longer backplane-based systems. Secondly, many control-oriented applications previously built with centralized or backplane computing architectures (i.e., a backplane with numerous boards plugged-in) are now changing to distributed computing architectures. Cost and ease of 2-level maintenance are key drivers in those cases.

In the first half of 2010, a number of new VPX system designs emerged using optical interconnections (discrete optical fibers) through the backplane and to the daughtercard (the VITA 66 VPX: Fiber Optic Interconnect specification). There are MIL/Aero applications that must continue to use centralized computing architectures and a large backplane (SIGINT, Radar, Sonar, Comm, etc.). As the I/O bandwidth increases, those connections to the chassis and boards are being accomplished with optical fiber. In addition, new systems designed with RF connections to the backplane (VITA 67 VPX: Coaxial Interconnect) are showing up in some design wins.

The incredible increases in bandwidth (10 Gig and beyond), possible with the new generation of switch fabric enabled processors, are driving systems to smaller boards and cube-like packaging. The next trend will be to connect those small cubes with optical interconnections. Inside the small cubes, the 10G+ signals can run on copper for the length of a few inches. For the larger backplane-based centralized systems though, we still need to explore and implement reflective optical waveguides in the backplane PCB laminate.<sup>5</sup>

<sup>5</sup> "A terabit capacity passive polymer optical backplane based on a novel meshed waveguide architecture", Springer-Verlag, February 13, 2009, URL: [www.springerlink.com/content/3871227217103847/fulltext.pdf](http://www.springerlink.com/content/3871227217103847/fulltext.pdf)

### Manufacturing Insourcing Picks Up Steam

During the boom times, it could be argued that it was a good business decision to move manufacturing offshore, especially to Asia. The cost of labor was such that the cons of moving could be overlooked by the cost saving of labor.

Now that picture has changed. Labor costs in Asia and India are growing at high rates and when you look at the whole labor cost picture, it doesn't add up. Labor intensive, high unit volume products can still benefit from the labor costs savings. But the VME Technology industry is not high unit volume and the products are for the most part assembled with robotics.

The cost of quality, inventory, shipping, protection of intellectual property, and customer responsiveness all make inhouse manufacturing a vital part of the business strategy for VITA members.

Many VITA members kept their manufacturing inhouse or used small local manufacturers. These companies are now enjoying the benefits and are better able to manage costs during this economic slowdown.

## Markets

### MIL/Aero

The first quarter of 2010 was very slow for MIL/Aero suppliers. Fewer RFQs and lower activity prevailed. However, some smaller vendors claimed they had a good quarter of shipments. This may indicate that new DoD activity in 1Q10 was depressed because of the DoD Acquisition Reform efforts and the CPR (Capability Portfolio Review) requirements. Activity did pick-up in early 2Q10: more RFQs were sent out, and overall activity increased. With major DoD programs delayed (like portions of FCS), I suspect most of the activity occurred on refresh programs and upgrades. That says the RFQs coming out in 2Q10 were for smaller volumes of focused products. Comments from VITA members indicate that most of the upgrade and refresh RFQs appear to be requesting VME64 boards. That is not surprising: most vendors tell me that VME is still close to 80% of their total MIL/Aero business. Regardless of the political and bureaucratic obstacles this administration has plagued our industry with, MIL/Aero is still the best place to invest for the coming years, both from a sales opportunity and margin standpoint.

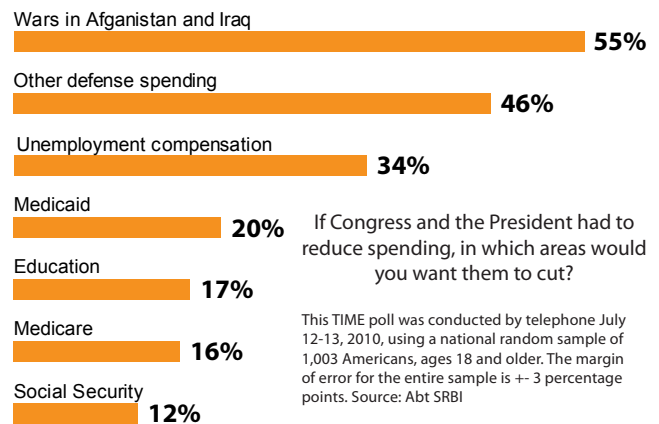


BAE Systems JLTV entrant

One of my primary concerns is the recent reduction in the NASA budget for future space missions.<sup>6</sup> Returning to the moon, and planning a manned mission to Mars, are now off the table. Another concern is the termination of the FCS ground vehicle program. The HUMVEE has proven to be vulnerable to Improvised Explosive Devices (IEDs) and needs to be replaced with the new Army JLTV (Joint Light Tactical Vehicle) or the new Marine CTV (Combat Tactical Vehicle).<sup>7</sup> The MRAP (Mine Resistant Ambush Protected) vehicle has performed poorly on the primitive roads and narrow mountain passes in Afghanistan and Iraq.

Some VITA members have related that several MIL prime contractors are insourcing (bringing previously outsourced work back inside) as the issuance of program contracts has slowed, in an effort to keep their people working and avoid layoffs. However, VDC Research, in their recent market report, states that most primes are increasing their outsourcing of certain products/tasks to MIL/Aero board and systems vendors.<sup>8</sup> Both perspectives probably have some truth to them. Primes most affected by the slowdown in DoD contract issuance and those experiencing delays on major platforms, are probably insourcing more. Primes on programs with issued contracts and fixed delivery/cost schedules are probably outsourcing more.

More uncertainty appeared in early August when Defense Secretary Gates proposed closing the Joint Forces Command (JFCOM) in Norfolk, VA as part of his budgetary goals to reduce military spending by \$100 billion over the next five years.<sup>9</sup> This uncertainty could negatively impact some of the programs being chased by VITA members.



6 Joel Achenbach, "Obama budget proposal scraps NASA's back-to-the-moon program", The Washington Post, February 2, 2010, URL: [www.washingtonpost.com/wp-dyn/content/article/2010/02/01/AR2010020102145.html](http://www.washingtonpost.com/wp-dyn/content/article/2010/02/01/AR2010020102145.html)

7 Benjamin Hunting, "US Army Tests HUMVEE Replacement Pickups", Tundra Headquarters, June 7, 2010, URL: [www.tundraheadquarters.com/blog/2010/06/07/army-humvee-replacement-truck/](http://www.tundraheadquarters.com/blog/2010/06/07/army-humvee-replacement-truck/)

8 Eric Heikkila, "Move to Outsourcing in the Embedded Mil/Aero Market Driven by Commercial Pressures", VDC Research, July 23, 2010, URL: [blog.vdcresearch.com/embedded\\_hw/2010/07/move-to-outsourcing-in-the-embedded-milaero-market-driven-by-commercial-pressures.html?utm\\_source=practice\\_update&utm\\_medium=email&utm\\_campaign=ehw\\_july10](http://blog.vdcresearch.com/embedded_hw/2010/07/move-to-outsourcing-in-the-embedded-milaero-market-driven-by-commercial-pressures.html?utm_source=practice_update&utm_medium=email&utm_campaign=ehw_july10)

9 Dana Hedgpeth and William Arkin, "Will Gates' proposed Pentagon spending cuts really save money?", The Washington Post, August 10, 2010, URL: [voices.washingtonpost.com/top-secret-america/2010/08/why\\_in\\_a\\_jiffy\\_is\\_often\\_an\\_emp.html](http://voices.washingtonpost.com/top-secret-america/2010/08/why_in_a_jiffy_is_often_an_emp.html)

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On the bright side, demand for high-reliability components has been good during this recession. Driven by space, military, medical, and oil exploration needs, this is another good sign that the MIL/Aero segments will fare well in the future.<sup>10</sup>

At AUVSI's Unmanned Systems conference held in Denver in August, it was painfully obvious that there are a large number of board suppliers chasing a small number of UAVs capable of utilizing the larger form factors. Small is definitely going to open more opportunities and suppliers need to be sure to look for platforms other than aerial platforms. The Army's 2010 report on unmanned aircraft systems<sup>11</sup> gives you a pretty good idea of what the U.S. Army expects the UAV landscape to look like.

## NextGen Air Traffic Control System Project

In February, I reported that orders for about 250 chassis, backplanes, and power supplies had been issued for the NextGen Air Traffic Control System (ATCS) testing hardware. In June, the FAA issued contracts to companies kicking-off the engineering, development of flight procedures, and evaluation of the resulting concepts.<sup>12</sup> These contracts run through 2020, so it doesn't look like the overhaul of the ATCS is going to generate a lot of board and system business in the short term.

## Smart Grids

The government has issued contracts and funded development of SmartGrid concepts, as reported previously. In July, the government contracted with Virginia Tech to create the SGIC website (Smart Grid Information Clearinghouse).<sup>13</sup> The objective is to design, populate, manage and maintain a public portal for Smart Grid initiatives. Contents in the SGIC portal will include demonstration projects, use cases, standards, legislation, policy and regulation, lessons learned and best practices, and advanced topics dealing with research and development. This project seems to be futuristic and bogged-down by politics, policies, and confusion. The standards process is a mess, there doesn't seem to be any central management, and there don't seem to be any guiding principles to pull the entire initiative together.<sup>14</sup>

*“This (Smart Grid) project seems to be futuristic and bogged-down by politics, policies, and confusion.”*

## Industrial Controls

After a tough 2009, demand for industrial control boards declined further in 1H10, especially in Europe. This condition was precipitated by the financial uncertainty in the EU associated with their sovereign debt crisis and the drop in value of the Euro. Several companies have reported reducing or closing some of their European sales operations in response to the slow conditions there. US corporations (excluding financial institutions) are holding \$1.8 trillion (USD) in cash these days, and are reticent to invest in new facilities, expansion, new products, or hiring because of the present governmental policies and high-risk environment.<sup>15</sup> European companies may also be hoarding cash

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10 Rob Spiegel, “High-reliability components market shows strength during downturn and after”, EDN, Canon Communication, August 3, 2010, URL: [www.edn.com/article/510008-High\\_reliability\\_components\\_market\\_shows\\_strength\\_during\\_downturn\\_and\\_after.php](http://www.edn.com/article/510008-High_reliability_components_market_shows_strength_during_downturn_and_after.php)

11 “U.S. Army Unmanned Aircraft Systems Roadmap 2010-2035”, Rucker, URL: [www-rucker.army.mil/usaace/uas/US%20Army%20UAS%20RoadMap%202010%202035.pdf](http://www-rucker.army.mil/usaace/uas/US%20Army%20UAS%20RoadMap%202010%202035.pdf)

12 Press Release, “FAA Awards Final Set of Major NextGen Engineering Contracts”, Federal Aviation Administration, June 29, 2010, URL: [www.faa.gov/news/press\\_releases/news\\_story.cfm?newsId=11561](http://www.faa.gov/news/press_releases/news_story.cfm?newsId=11561)

13 Suzanne Deffree, “Smart-grid online information portal launched by Virginia Tech”, EDN, Canon Communications, July 7, 2010, URL: [www.edn.com/article/509708-Smart\\_grid\\_online\\_information\\_portal\\_launched\\_by\\_Virginia\\_Tech.php](http://www.edn.com/article/509708-Smart_grid_online_information_portal_launched_by_Virginia_Tech.php)

14 Tam Harbert, “The not-so-smart grid. What exactly are the standards for the next-generation utility grid? In many cases, nobody knows”, EDN, Canon Communications, May 25, 2010, URL: [www.edn.com/article/509094-The\\_not\\_so\\_smart\\_grid.php](http://www.edn.com/article/509094-The_not_so_smart_grid.php)

15 Jia Lynn Yang, “Companies Piling Up Cash But Not Adding Jobs”, CBS News.com, July 15, 2010, URL: [www.cbsnews.com/stories/2010/07/15/politics/washingtonpost/main6680641.shtml](http://www.cbsnews.com/stories/2010/07/15/politics/washingtonpost/main6680641.shtml)

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and postponing investment and hiring. Consumer demand is still tepid in both the US and in Europe. Any increased government spending in both regions seems focused on maintaining social entitlement programs, not infrastructure or job-creation.

A large portion of the industrial board business has come from the Small Form Factor (SFF) technologies for several years now. But those markets are hopelessly fragmented with more than 100 different form factors and pin-outs. The products commonly use commodity PC technology and the margins are razor-thin.

## Healthcare

Healthcare and medical technology businesses were not immune to the widespread volatility produced by the economic downturn.<sup>16</sup> A recent report published by Ernst and Young, "*Pulse of the Industry: Medical Technology Report 2009*" gives some interesting insight into medical technology trends.<sup>17</sup> Demand for high-end medical equipment (MRI, CAT, PET) is still depressed as medical facilities decode and interpret the new healthcare laws signed by the US president in March. Even though some of the provisions do not take effect for several years, uncertainty is still prevalent. Since medical equipment typically operates in climate-controlled buildings, with no shock, vibration, or harsh environment requirements, the boards used are typically commodity commercial motherboards. As this industry segment recovers and demand returns, it will exhibit the same low gross profit margin characteristics of the present telecom board markets.

Ernst & Young's recent report "*Pulse of the Industry: Medical Technology Report 2009*", released last October, noted that the medical technology industry has weathered the downturn fairly well and its fundamental growth factors remain strong despite continuing challenges.

There are also new trends occurring in the medical equipment markets worth noting. The MRI/CAT/PET scanners are like mainframe computers: expensive, temperamental, large stationary machines. Hospitals move the patients to the machines, not the machines to the patients. That centralized system puts critical patients under severe stress and pain when jostled through the hallways and elevators while being transported to the machine (which is traditionally in the basement of the hospital for radiation-emission reasons). As microprocessor performance has increased substantially and the size of the electronics has decreased, machines can be made smaller and hospitals can now move these smaller diagnostic machines directly to the patient. This is apparent with new ultrasound and X-ray machines in use today.

In previous reports, I have mentioned the opportunities in the HoMedics (home-based consumer medical equipment). In August, Intel and General Electric (GE) announced the formation of a new company to supply the technology and equipment for this new market segment.<sup>18</sup>

The medical segment is not without its controversy. GE and others want access to the 2.36 GHz to 2.40 GHz range of the electromagnetic spectrum for remote monitoring medical equipment.<sup>19</sup> This happens to be the same spectrum that Boeing uses to test the safety of planes. Boeing is urging the FCC not to allow new uses of this spectrum. This could give a whole new meaning to "turn off your electronic devices" when flying.

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16 Ilya Leybovich, "Pulse of the Med Tech Industry", IMT, ThomasNet News, November 24, 2009, URL: [news.thomasnet.com/IMT/archives/2009/11/pulse-of-the-med-tech-industry.html](http://news.thomasnet.com/IMT/archives/2009/11/pulse-of-the-med-tech-industry.html)

17 Ernst and Young, October 2009, URL: [www.ey.com/Publication/vwLUAssets/Pulse\\_of\\_the\\_industry\\_2009:\\_medtech\\_review/\\$FILE/Pulse\\_Final.pdf](http://www.ey.com/Publication/vwLUAssets/Pulse_of_the_industry_2009:_medtech_review/$FILE/Pulse_Final.pdf)

18 Suzanne Deffree, "Intel, GE contribute assets to form healthcare joint venture", EDN, Canon Communications, August 3, 2010, URL: [www.edn.com/article/510015-Intel\\_GE\\_contribute\\_assets\\_to\\_form\\_healthcare\\_joint\\_venture.php](http://www.edn.com/article/510015-Intel_GE_contribute_assets_to_form_healthcare_joint_venture.php)

19 Sophia Yan and Christopher Flavelle, "Boeing Blocks GE, Philips Wireless Spectrum for Patient Monitoring Device", Bloomberg, July 21, 2010, URL: [www.bloomberg.com/news/2010-07-22/boeing-blocks-ge-philips-wireless-spectrum-for-patient-monitoring-device.html](http://www.bloomberg.com/news/2010-07-22/boeing-blocks-ge-philips-wireless-spectrum-for-patient-monitoring-device.html)

## Telecom

There have been a few new product announcements in the telecom segment at the board and system level in the past months. In July, Emerson released their 40G AdvancedTCA systems to support the 4G wireless trend.<sup>20</sup> There is some business out there, but it seems spotty and weak. At the macro-level, we have seen some M&A. Motorola sold-off their network equipment division to Nokia Siemens Networks in July.<sup>21</sup> Nokia's cellphone profits dropped 40% in 2Q10 even though sales of phones increased.<sup>22</sup> The cellphone market is forecast to be at saturation by 2013, and competition is fierce between Nokia, Apple and Google with their 3G and 4G offerings. At the wireless service provider level, both AT&T and Verizon expect to conduct more layoffs in 2010.<sup>23</sup> So, conditions remain very depressed and unstable in this segment.

The rollout of LTE 4G continues to drive new orders in this segment. Verizon claims to be on track to cover one-third of the US by the end of 2010, and twice that within fifteen months. They invested over \$18 billion in network improvements in 2009 and that is continuing into 2010. The explosive growth in smartphones, driven by the iPhone and numerous Android models, is creating a huge demand for bandwidth. The operators keep pushing customers to the smartphones to help stabilize their income but they need to have plenty of bandwidth to keep those customers happy. The cell phone market in the US has definitely matured as almost everyone that would ever want a phone has one.

Verizon also revealed for the first time that it serves 7.3 million non-phone devices like vehicle trackers and industrial sensors. That's an area that's expected to grow quickly, and one where AT&T competes as well. All of the operators are very aggressive about launching the next "killer app" that will drive more revenue. There is already a lot of talk of the Android operating system being used in a wide variety of small embedded devices that are connected through the existing 3G and future 4G networks as ways to grow the number of users in the future.

In spite of all this good news, some board companies are still coughing-up the telecom hair-ball that nearly killed this entire industry. Never again should we believe the hype in the media, or from the market researchers, on any technology or market segment potential.

## Mergers & Acquisitions

Three companies in our industry were bought in the first half of 2010. Parker Aerospace bought SprayCool in March, Kontron bought AP Labs in May, and Curtiss-Wright bought Hybricon in June. These acquisitions fit into the 5x GPM valuation model I have been using (considering certain acquisition conditions in both instances), and the companies were bought for greater than 1x sales. It's clear that Kontron needed the backplane and packaging design expertise of AP Labs, and that Curtiss-Wright's purchase of Hybricon is a vertical integration move (i.e., bringing backplane and packaging design in-house). Both acquisitions acquired MIL/Aero- focused backplane/packaging product lines. This

<sup>20</sup> Ken Cheung, "Emerson Network Power ATCA-F140 40G AdvancedTCA Switch Blade", Embedded Star, July 14, 2010, URL: [www.embeddedstar.com/weblog/2010/07/14/atcaf140-telecom/](http://www.embeddedstar.com/weblog/2010/07/14/atcaf140-telecom/)

<sup>21</sup> Press release, "Nokia Siemens Networks to Acquire Certain Wireless Network Infrastructure Assets of Motorola for US \$1.2 Billion", Motorola, July 19, 2010, URL: [mediacenter.motorola.com/content/detail.aspx?ReleaseID=13055&NewsAreald=2](http://mediacenter.motorola.com/content/detail.aspx?ReleaseID=13055&NewsAreald=2)

<sup>22</sup> Andrew Berg, "Nokia Profits Drop 40 Percent Year-Over-Year", Wireless Week, July 22, 2010, URL: [www.wirelessweek.com/News/2010/07/Nokia-Profits-Drop-40-Percent-Year-Over-Year-Business/](http://www.wirelessweek.com/News/2010/07/Nokia-Profits-Drop-40-Percent-Year-Over-Year-Business/)

<sup>23</sup> The Associated Press, "Verizon signals more layoffs coming; wireless sales slow", Localtechwire, April 22, 2010, URL: [localtechwire.com/business/local\\_tech\\_wire/news/blogpost/7468176/](http://localtechwire.com/business/local_tech_wire/news/blogpost/7468176/)

## CERN Shuts Down Accelerators in 2012<sup>1</sup>

In September, the CERN Council announced that they will not operate any of their accelerators in 2012. This in on top of the earlier decision not to operate the LHC in 2012 for technical reasons. The latest decision is to support cost-saving measures that the council had requested.

The new operating plan allows for continuing R&D on the compact linear collider study, CLIC, and high-intensity proton sources, but at a slower pace than originally foreseen.

This is a good news/bad news story for our industry. The good news is that the window for design wins has been extended, but the bad news is that not much equipment is likely to be purchased and installed in the coming months.

The length of the slowdown is certainly going to be dictated by the current economic conditions as the funding nations struggle to get back on stable financial ground.

<sup>1</sup> "CERN Council approves the Laboratory's Medium Term Plan", September 17, 2010, URL: [press.web.cern.ch/press/PressReleases/Releases2010/PR18.10E.html](http://press.web.cern.ch/press/PressReleases/Releases2010/PR18.10E.html)



is another clear sign that the MIL/Aero vendors continue to move toward becoming systems vendors, and away from being just board makers.

In the February 2010 report, I discussed the challenges that backplane and packaging vendors are facing in today's market as board vendors become systems vendors. In addition, many new systems, especially in UAVs and ground vehicles, are adopting a distributed architecture approach with "cubes" (small containers housing small form factor boards being defined in new VSO working groups) and LRU's (line replaceable units defined by the VITA 58 "Line Replaceable Integrated Electronics Chassis" standard). Both the Kontron and Curtiss-Wright acquisitions were wise and timely. The remaining backplane/packaging companies are too large and too diversified (into commodity market segments like telecom) to be acquired by other MIL/Aero vendors. Additionally, the remaining packaging/backplane companies have large exposure to the economically-challenged European markets and the declining Euro.

At this stage, I believe that industry M&A activity will continue to be depressed through 2011. The exception to this prediction would be smaller board companies who decide to sell-out, or larger companies who decide to leave this industry and sell-off certain divisions. If the MIL/Aero market continues to take budget hits from the DoD, some of the major MIL-focused companies will be looking to acquire.

At the commodity telecom and industrial level, larger companies could be interested in buying-up financially-crippled companies at bargain prices. In either situation, I would expect to see commodity product makers (industrial, telecom, motherboards, small form factor, etc.) to sell for about 0.5 to 0.6 times sales (depending on GPM), and specialty board makers (in MIL/Aero) to sell for 1.5 to 2.0 times sales (depending on GPM and existing DoD contracts).

I believe we will see more consolidation in this industry in the future. But, present economic conditions preclude any significant M&A activity until the financial environment improves significantly.

Parent	Target	Market Focus	Date
Kontron	Thales Computer	MIL/Aero	January 2008
Curtiss-Wright	Pentland Systems	MIL/Aero	February 2008
Adlink Technology	Ampro Computer	Industrial control	March 2008
Interconnect Systems Inc.	Nallatech	MIL/Aero	May 2008
Finmechanica	DRS	MIL/Aero	May 2008
Curtiss-Wright	VMETRO	MIL/Aero	August 2008
Kontron	Intel rack mount server group	Telecom	October 2008
Elma	ACT/Technico	System integration	January 2009
SIE	Carlo Gavazzi-Mupac	Packaging	April 2009
IDT	Tundra Semiconductor	RapidIO chipsets	April 2009
Intel	Wind River Systems	Embedded	July 2009
Mentor Graphics	Embedded Alley	Linux	July 2009
Cavium Networks	MontaVista Software	Linux	November 2009
Curtiss-Wright	Skyquest Systems	MIL/Aero	December 2009
Parker Hannifin (Aerospace)	SprayCool	Technology	March 2010
Kontron	AP Labs	System integration	May 2010
Curtiss-Wright	Hybricon	Packaging	June 2010

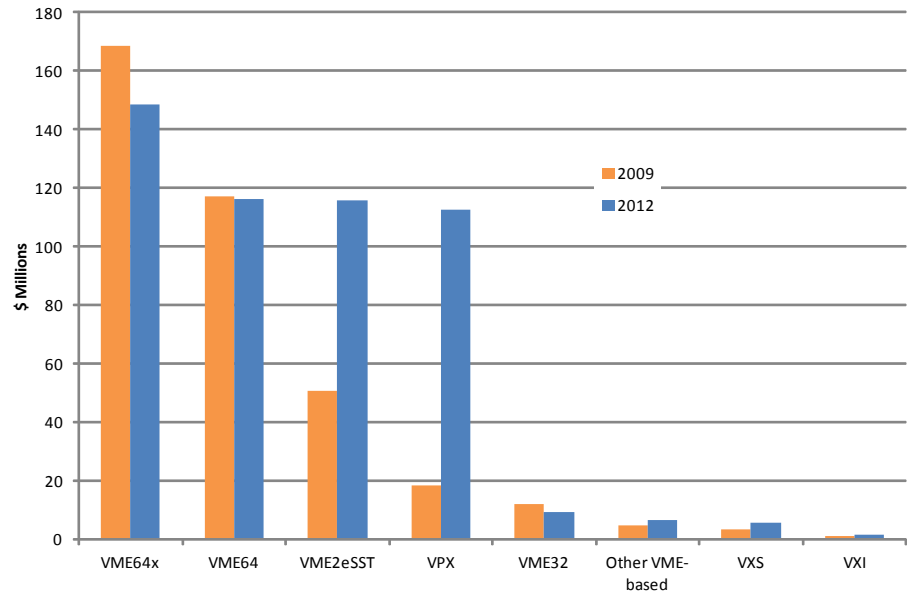
## Market Estimates

When we look at the demographics of our board and systems business, we can see the state of the industry in a different way. According to the best information I can find:

- *The top 10 companies in our industry produced about \$2.9 billion in sales in 2009. If the Pareto Principal (the 80:20 rule) is applicable here, the world-wide board market is about \$3.6 billion (\$2.9 billion/0.8).*
- *The top two companies had sales over \$500 million each last year. Both are non-US companies, and both have the largest percentage of their sales in commodity motherboards and SFF products. Between these two companies,*

they have sales of about \$115 million in the MIL/Aero market segment.

- The next four companies have sales over \$250 million each. These companies are US-based and are diversified across several form factors. One of these companies is the market leader in MIL/Aero sales while the others are diversified over different market segments. These four companies shipped over 50% of all MIL/Aero sales (\$500 million together) in 2009.



VME Single Board Computers, Segmented by VME Architecture, 2009 & 2012 (Dollar Volume Shipments)

- The last four companies range from about \$200 million to less than \$50 million in sales. Three of these companies shipped a total of about \$250 million to the Mil/Aero market. The other company is focused on commodity motherboards and SFF products.

- Of the top ten companies, only four have a footprint in the telecom board market today. Six of the top ten have significant footprints in the MIL/Aero segment. Those six companies shipped more than \$800 million to MIL/Aero applications. Again, if the Pareto Principle is appropriate here, the MIL/Aero board market is \$1.0 billion (\$800M/0.8).

- Three of the top ten board companies today are divisions of large multi-national multi-billion-dollar companies (GE, Curtiss-Wright, and Emerson). When VMEbus was introduced in 1981, five large multinational companies had board divisions (Motorola, Philips-Signetics, Thompson, Mostek, and Intel). At the start of our industry, semiconductor companies created board divisions. Today, all large companies with board divisions are applications-oriented, not semiconductor-oriented.

- More than 60% of total market share is held by just ten companies. In the MIL/Aero segment, six companies probably control more than 60% of that market. Both numbers indicate a move toward market maturity. At the midpoint of our industry's history (in the early 90's), Motorola was the largest supplier, but held only 22% of the total market (with their processor card product line). At that point, 80% of the market was controlled by about 80% of the other suppliers, a sign of immaturity in the board market.

- Based on my numbers, the top board vendor today holds less than 18% market share of the total board market. The top MIL/Aero supplier holds about 41% market share in that specific segment. According to the New Lanchester Strategy<sup>24</sup>, you must have 26.1% market share to be a serious player. You must have at least 41.7% market share to be the market leader. As you can see, we have one serious player in the MIL/Aero segment, and no well-defined leader in the overall board market. Under the present economic conditions, only an M&A strategy can get one of the top-ten companies to 26.1% or 41.7% market share, and become a serious player or a leader.

- During the telecom market surge of the 1990's, Motorola achieved about \$750 million in sales (and an increase in market share). No other company has ever reached that size in the history of the industry. The two top companies today are around \$650 million and \$550 million. Intel, in their heyday with Multibus I and II in the 1980's, achieved only about \$500 million in sales. No company has ever gained more than about 25-30% market share (of the total board market), and none has ever held that position for very long. According to my research, Motorola did achieve

24 Shinichi Yano, The New Lanchester Strategy, Vol 1, Chapter 3, Page 72 , URL: www.lanchester.com

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over 41.7% of the VME 68K processor card market segment, took the leadership position, and drove the other players to DSPs, Intel processors, i860/i960, National Semiconductor 32000 processors, and other microprocessors. But they never achieved 26.1% market share of the total board market to become a serious player.

- Since 1996 (14 years), this industry has seen an average of 6 companies per year bought by other board companies in our industry. That equates to about 84 board suppliers being consolidated through M&A during this period. As the top ten companies strive for the 26.1% and 41.7% positions, or for \$1 billion in sales, we will see continuous and significant M&A in the future. For now, uncertainty at the macro-economic level has dampened acquisition activity.

The VDC Research Group has just released its **Embedded Hardware & Systems: 2010 Market Intelligence Service** that provides analysis for the major embedded board platforms / architectures and embedded integrated computing systems markets. They estimate that the 2009 market for VME Single Board Computers was \$376.5 million and project it to grow to \$515.7 million in 2012. Most of that growth will be with VME 2eSST, the highest performance traditional VMEbus and with VPX, the newest technology to be announce by VITA members.

## Ex Ante Update

In May of 2010, the EU/DG-Comp (the equivalent of the USDOJ antitrust division) released their new antitrust guidelines and the proposed new rules for handling patents and intellectual property in standards developing organizations (SDOs).<sup>25</sup> A European law firm has evaluated and analyzed these new guidelines and proposed rules for those who are interested.<sup>26</sup> These new anti-trust rules follow VITA's ex ante mandatory patent disclosure policies, which were reviewed by the USDOJ, approved by ANSI, and adopted by the VSO four years ago. No other US-based standards developer has yet adopted ex ante policies similar to VITA's. However, the IEEE did submit "voluntary disclosure rules" to the USDOJ, received a positive BRL (Business Revue Letter) from the DOJ, and implemented those policies three years ago.

Earlier this year, VITA was contacted by several attorneys in the US who requested information about our experiences and problems with our ex ante implementation. The VSO has received six patent disclosures since we implemented our policies. There were a few small interpretation issues that surfaced, but our experience with ex ante rules has been overwhelmingly positive. One of these attorneys was compiling a complete analysis of ex ante policies and procedures for one of the largest standards developers in the US (name of the organization is withheld for privacy and legal reasons). This organization has observed the EU efforts to adopt ex ante, and this large US-based SDO feels that they must adopt similar policies, once the EU puts their new antitrust rules in place.

*"No other US-based standards developer has yet adopted ex ante policies similar to VITA's."*

In the second quarter, Nellie Kroes, Directorate General-Competition of the EU, in her speech about the proposed antitrust rules and guidelines, said that all European SDO's must evaluate these new guidelines and develop processes and procedures that reflect the spirit of these new antitrust policies.<sup>27</sup> After VITA's ex ante policies were reviewed by USDOJ, and we received the BRL, we were contacted by the attorneys from the EU/DG-Comp. VITA submitted our policies to them with a recommendation that they consider adoption of similar antitrust rules for standards developers in Europe. It only took four years, but it looks like ex ante mandatory disclosure policies are coming to the EU, and to the rest of the US standards developers in the near future.

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<sup>25</sup> "Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements", European Commission, July 22, 2010, URL: [ec.europa.eu/competition/consultations/2010\\_horizontals/guidelines\\_en.pdf](http://ec.europa.eu/competition/consultations/2010_horizontals/guidelines_en.pdf)

<sup>26</sup> "European Commission Consultation Focuses on Standards and FRAND Licensing of IPR", Allen & Overy, May 10, 2010, URL: [elink.allenoverly.com/getFile.aspx?ItemType=eAlert&id=ecf05d45-6e84-4b01-b7c0-dcdf0ec9ccee](http://elink.allenoverly.com/getFile.aspx?ItemType=eAlert&id=ecf05d45-6e84-4b01-b7c0-dcdf0ec9ccee)

<sup>27</sup> "Nellie Kroes Address at Open Forum Europe 2010 Summit: 'Openness at the heart of the EU Digital Agenda' Brussels", Zuropa, June 10, 2010, URL: [europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/10/300&format=HTML&aged=0&language=EN&guiLanguage=en](http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/10/300&format=HTML&aged=0&language=EN&guiLanguage=en)

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## Summary

Our macro-environment remains uncertain and unclear. The world financial situation will remain confusing for some time to come. The GDP in developed nations will continue to be volatile over the short term. Stability will be elusive in all market segments.

Political disharmony in the US, and financial uncertainty in the EU, are negatively affecting investment and hiring. We have survived a series of “bubbles” (the Dot-Com Bubble, the Telecom Bubble, the Savings and Loan Bubble, the Housing Bubble, the Banking Bubble, the Credit Bubble, the Stock Market Bubble, the Sovereign Debt Bubble, the Commodities Bubble, the Commercial Real Estate Bubble, and the Employment/Unemployment Bubble). Some of these old bubbles may come back to us, and we could see some new ones occur in the future.

There’s nothing we can do at the macro-level (except visit the ballot box). So, we should concentrate on our opportunities at the micro-level.

Warren Buffett, famous billionaire investor and Oracle of Omaha, once said: “Growth forges its own anchor”. What he meant was that industry segments or companies have great difficulty finding organic growth as they get larger, even in good times (i.e., The Law of Large Numbers). As our industry has grown and matured, we have seen significant M&A activity, evidence that large companies could not grow organically.

*“As our industry has grown and matured, we have seen significant M&A activity, evidence that large companies could not grow organically.”*

Even Intel sees the processor chip heat problems and the copper data-rate limitations. They are beginning to spend more time, energy, and money on interconnect silicon with optical connections (LightPeak optical links to replace SATA, USB, and Firewire; and their 50G Optical connection development for connecting processors and I/O in servers). There are serious architectural flaws and performance limitations in PCI Express. With optical connections, we should be able to eliminate many of the flaws and limitations. There are a number of smaller companies working on optical silicon and architectures, and these developments will drive out industry to the next level.

Our industry has experienced tremendous growth in the thirty-plus years of my career. Processor technology curves have driven most of our growth (68K, i860/i960, PowerPC, Intel processors, DSPs, FPGA’s, etc). We have reached a heat dissipation/computing performance limitation on this curve now, and that is hampering organic growth opportunities. New developments in interconnect technology (a series of even more capable buses, followed by a series of ever faster serial fabrics) have also been additional growth drivers for us. As we go to 10G+ connections for high-speed I/O and interprocessor communications in multiprocessor systems, we encounter signal integrity limitations with copper traces and wires. To get around these two limitations, we must think “small”.

## Thinking Small

There are a several ways we can all “think small” and prosper in these volatile times:

- **Small Form factor:** *It’s clear that certain platforms in the MIL/Aero segment (UAVs, other aviation vehicles, ground vehicles) see significant benefits from using SFF boards and small “cubes” in distributed processing systems. Also, if you expect to run 10G+ signals on copper traces, you will do it on the short backplanes in the SFF cubes, not on big long backplanes in centralized systems. We have seen a lot of activity focused on 3U VPX systems, another way to think small. These 3U systems have higher computing density and more cooling options. These smaller systems and subsystems must be connected with high-speed data connections, and that says “optical” to me.*

*Larger backplane-based centralized systems must move to optical connections to run at 10G and higher, and there is still a significant market for those systems. We are the first generation in the history of technology to have the opportunity to define and establish the first optical computing architectures, both in the board-to-board and the box-to-box markets. We must take advantage of that opportunity.*

- **Niche Markets:** *It is clear in these times of economic uncertainty that there will be fewer large orders in the market. Secondly, commodity-oriented buyers will place large orders to get a lower price, but they will not take the units in the contract. Third, these customers will pay their suppliers very slowly. Chasing large orders is going*

to be frustrating for the remainder of 2010 and probably into 2011. So we must explore new, dynamic, and more profitable niche markets (like SFF and optical).

Additionally, MIL/Aero vendors can find good success in the upgrade/refresh cycles that are using mostly VME64 boards in legacy systems. The orders are smaller (50-200 boards), but they are very profitable, the customers don't order the unit volumes needed to drive prices down, and the customers will pay you earlier. The large MIL/Aero platforms and programs have been delayed, with some small volume going to field testing now. Gates' DoD cost-reduction initiatives will haunt us for at least another year or two before the significant volumes materialize. We must find and exploit product and application niches to grow.

- **Focus on the Bottom Line:** *It is going to be very difficult to set and meet top-line goals (sales numbers) for the next year or so in this environment of uncertainty. This gives every company an opportunity to focus on the bottom line. Since we are a variable cost driven industry, even if sales are flat or down, we can increase profitability. That is the beauty of this industry and its business model, and companies should take advantage of that characteristic in the present economic circumstances. Drop money losing product lines, customers, and technologies. Drop product lines made to specifications that never lived-up to their media hype. Those products (and specification) will never be able to keep-up with the dynamics of this market. Stop propping-up your loser products and customers and your clarity and profitability will improve dramatically. If you are doing less than 40% GPM, you are vulnerable to the events at the macro-level.*
- **M&A Involving Smaller Niche Companies:** *Focus and concentration are the handmaidens of clarity in uncertain times. Smaller market-focused companies are the most attractive targets for acquisition. Larger companies are diversified and unfocused, which leads to confusion and obscurity in the market. In the first half of 2010, smaller companies fared much better than larger companies. Focus and concentrate on specific technologies, applications, and viable customers for the remainder of 2010 and all of 2011.*
- **Energy and Passion:** *It is a small thing, but it is important. I do not see much energy or passion in the telecom board segments, not like years past. I do not see much energy or passion in the industrial or medical segments either. When certain market segments become commoditized, produce low margins, or become hyper-competitive, energy and passion seem to disappear. I do see energy and passion in the MIL/Aero segments, even in these uncertain times, primarily because of the focused attention on certain technologies and applications. If you focus and concentrate, and implement some of these suggestions, you will see an increase in the energy and passion from the people in your company. Diversification and obscurity are the natural enemies of energy and passion.*

We cannot influence or control what happens at the macro-economic level. We can only react to it, at the micro-economic level, with new ideas, focus and concentration, and energy and passion. That is the only way we will find clarity in these uncertain times. Do not let the gravity of the macro-level situation pull you down over the next year. If you do the right things at the micro-level, and think small, you can pretty-much ignore what is going on at the macro-level.

### **Small Form Factors Emerging Through VITA Standards Organization.**

Three distinct small form factor working groups have been formed within the VITA Standards Organization (VSO).

VITA 73, VITA 74, and VITA 75 have been proposed since May 2010. They each have a common objective of developing a standard for small form factor modules to support serial fabrics in a rugged environment.

These efforts reflect the market demand for smaller modules that can operate in demanding and rugged operating environments.

From all of the activity in the market, these proposals will not be the last we will see of innovative small form factor boards.

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