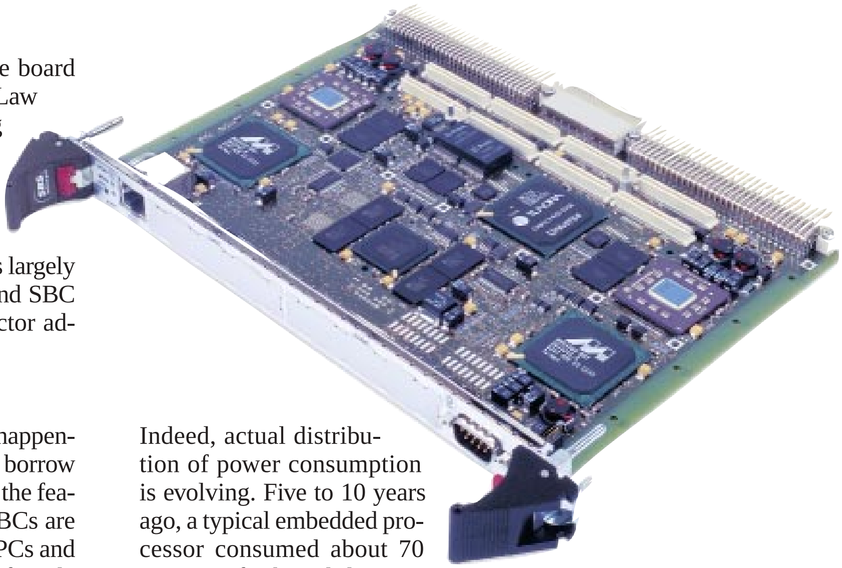
PC Silicon Advances Drive Embedded SBCs

By Juergen Eder



VMEbus systems continue to be centered on single board computers (SBCs) that faithfully follow Moore's Law to provide steadily increasing levels of processing and I/O performance for a wide variety of demanding embedded applications. VMEbus board makers are indeed an innovative bunch, but it remains true that innovations in the embedded SBC world depend heavily on advances in the merchant silicon market. Chip vendors largely design their device strategies for high-volume markets and SBC users continue to be direct beneficiaries of semiconductor advances aimed at PCs and other mass-market products.

Look for embedded silicon roadmaps

First, a caveat: There is indeed some very exciting stuff happening in the PC world and it is all too easy to be tempted to borrow some of the latest and greatest chips for use in advancing the features and performance of SBCs. However, embedded SBCs are designed into very different classes of applications than PCs and the PC technology churn is very short compared to the lifecycle of SBCs, introducing the possibility of parts shortages for long-term SBC installations. Thus, despite the attraction of merchant silicon, SBC suppliers must carefully select component suppliers that ensure long-term roadmaps for reliable, continuous supply of parts. Some silicon vendors offer embedded roadmaps and this is where SBC makers should focus their attention before salivating over the latest and greatest desktop processor.

Power hungry support

That said, let's take a look at some of the exciting innovations that can be readily borrowed from the PC world and applied to embedded computing. That power consumption is a big concern for embedded computing is nothing new and SBC purchases have often been a tradeoff between power consumption and performance. Today, the fast growth in mobile and portable device markets means that board vendors can take advantage of new processors such as the Intel Pentium processor, which has high performance, but a power level that can be managed.

In general, power demands steadily increase as SBC performance goes up. But standard form factors like VME or CompactPCI inherently have limits of power dissipation per slot. That is one reason why the PICMG standardization organization is working on the AdvancedTCA (ATCA) specification for the telecom market, which is a new approach that allows higher power consumption per slot and system. With ATCA, the industry is changing the physical form factor to allow more power consumption, including increasing slot spacing, new connectors, and others to go up to 200W per single-slot board specified limitation.

Indeed, actual distribution of power consumption is evolving. Five to 10 years ago, a typical embedded processor consumed about 70 percent of a board design's overall power budget. Today, that percentage has dropped to about 50 percent, and within five years, the processor will consume only about 30 percent of a board's power. Who is stealing the power? Integrated system support components like chipsets, graphics, and Ethernet that provide sophisticated, fast, and highly configured I/O are examples of SBC resources that consume more power than the processor itself.

PCB considerations

One trend that is a direct result of more highly integrated system-support chips is an increase in die size and pin count. Bigger packages restrict PCB design flexibility and there is a move to increase the average number of PCB layers. Where SBCs used to max out at eight layers, we are now seeing 16 layers with more challenging PCB design scenarios that introduce the need for better test equipment and sometimes bigger, more sophisticated design teams. Such boards can be a challenge to get to market, making engineering project management more crucial than ever for SBC manufacturers.

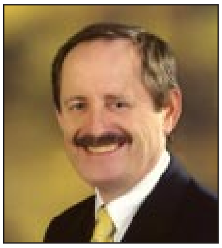
Performance is still king

From a technology perspective, everything is evolving to high speed with GHz processing speeds and network connectivity reaching gigabits-per-second. In general, technologies are evolving to higher-speed alternatives: parallel busses are giving way to high-speed serial buses like PCI Express, Parallel ATA (PATA) will soon be replaced by Serial (SATA) for disk drives, and SDRAMs will be replaced by Double Data Rate (DDR) SDRAMs. All this evolution is trickling down from PC advancements.

The embedded application industry is also moving toward more visualization, which drives performance and memory requirements. Some applications require 3D simulations and rendering, which borrow from PC computer games where real-time rendering capabilities are *de rigueur.*

Expect connectivity and networking advances to quickly flow from the PC world as well, allowing embedded computing devices to communicate with other computing devices. Wireless LAN technologies (such as the variants of 802.11), all driven by the PC industry, will begin to appear on SBCs within the next year or so. For example, onboard Wi-Fi chipsets will allow SBCs to drive things like automation equipment on the factory floor. Will parallel buses on the backplane survive? In all likelihood yes, but demanding high-bandwidth applications will start to use switched serial connects – VITA 41.x (switched fabric), together with the parallel VMEbus in the future.

VMEbus SBCs should continue to thrive on the aggressive technology strategies that inevitably bubble up from the PC industry. The success of SBC makers will pivot on strategic decisions and tradeoffs between taking advantage of these technologies early on versus mitigating risk by insisting on working with silicon partners who can and will commit to support a long-term embedded roadmap. Ω



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