Advances in microprocessors and extended specifications

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The VMEbus format continues to take advantage of the latest developments in microprocessor technology, and those advances, combined with the work on a switched fabric standard for the VMEbus format by the VITA Standards Organisation, will ensure the usefulness of the VMEbus format for quite some time.

Today, advances in microprocessors include higher performance low-voltage processors with manageable power consumption, increased integrated functions per chip set, and network connectivity in the gigabits-per-second (Gbps) range.

The most important developments in the merchant silicon market are being utilised in VME-based single board computers (SBCs), enabling SBCs to handle more demanding applications in avionics, mission control, visualisation, factory automation and networking.

Embedded processor roadmaps

Technology does not sit still for long in the PC world. New processors and chip sets appear on the market every six months for all the major market servers - segments workstations and notebooks. This fast-paced technology turnover does not apply in the embedded world where design life cycles typically range from three to five years or longer, not months.

Fortunately, silicon makers such as IBM, Intel Corporation and Freescale Semiconductor offer developers specific embedded roadmaps for processors and chipsets, PCI bridges and Ethernet components that will be available for at least five years. As might be expected, the latest processor roadmap for embedded designers includes processors that offer long-term availability and low voltage requirements - providing the embedded developer with numerous benefits, including:

Higher processing speeds, larger integrated caches, and faster buses, allowing faster program/application execution.

New hardware enhancements, such as changes within the internal pipeline structure or new hyper-threading technology, which also improves program/application execution.

Sophisticated on-chip power management functions that allow developers to shut-down and/or wake-up onchip functions within clock cycles, which reduces power consumption and lessens the need for heat dissipation.

Dynamic speed control of a processor, which allows developers to reduce or increase the speed of the processor within the clock cycles of a program, making power consumption and heat dissipation easier to manage.

For applications that communicate via broadband between boards within a system, or between systems chassis, a switched serial bus topology is often the best method of data transfer.

Bandwidth problems solved

Advances in suitable microprocessor technology for single board computers aren’t the only bright spots for the VMEbus architecture. After two decades on the market, the VMEbus has become a proven and reliable industry standard with many applications, and both users and manufacturers alike have embraced it. However, as a parallel bus technology, the VMEbus has its limitations, including the inability to perform high-speed synchronous data transfers. Another limitation is that it cannot transfer large data packets.

For applications that communicate via broadband between boards within a system, or between systems chassis, a switched serial bus topology is often the best method of data transfer.

Switched serial fabric technology has several advantages over parallel bus structures. Parallel buses typically use a synchronous single-ended signalling system, signals are difficult to switch quickly, and shared bus arbitration introduces data delay and latency. Parallel buses don’t scale well or support multiple traffic types or high availability.

Switched serial fabric technology, on the other hand, generally uses low voltage differential signalling (LVDS) with high speed point-to-point connections, increasing bandwidth into the Gbps range. Signals from each of a system’s devices are gathered at a central switch, instead of spread across a parallel bus, and are connected to the desired destination by the switching fabric, achieving multiple orders of magnitude bandwidth performance.

The new VMEbus switched serial standard (VXS) or VITA 41 specification defines the pin out and backplane requirements for an evolutionary path to switched fabric systems for VMEbus installations. Facilitating high-speed and large packet data transfers, the VITA 41 specification will extend the life of systems and facilitate an industry-wide...
migration path from parallel buses to switched serial fabrics. 

To help ease migration of existing VME architectures to switched fabric technology, the VITA 41 specification addresses backward compatibility with the VME/VME64 specifications. Since existing VMEbus connectors are parallel, new serial connectors have been developed to easily accommodate the new switched standards. For example, the new MultiGig RT P0 connector for VXS boards will support the high-speed switch fabric connectivity while the VXS board's P1 and P2 connectors will support parallel VME traffic.

Another important enhancement to the VMEbus standard is the addition of 2eSST, a new transfer protocol based on source synchronous transfer technology. Designed to enhance the performance of the VMEbus, the 2eSST protocol will double the theoretical bandwidth of the VMEbus to 320 Mbps and enable existing applications to increase performance with only minor system software changes. The 2eSST protocol also provides for broadcast data transfer, which will allow the master to send the same data to multiple slaves with a single transmission.

The technology advances of the VITA 41 specification coupled with the addition of 2eSST support should make the VMEbus specification eminently suitable for high bandwidth military and industrial applications for the foreseeable future. When combined with the latest processors, the VMEbus specification should be capable of addressing the needs of the market for many years to come.

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