

StarFabric: A look at 2003 and the year ahead



By Justin Moll

CompactPCI

It's hard to believe that 2003 is nearly over, so much has happened in such a short time. Since this will be the last *CompactPCI Systems* StarFabric Watch column for the year, it is a good time to review the successes, reflect on the trends, and take a forward look at the year ahead.

Several companies introduced new StarFabric products in late 2002 and early 2003. At the 2003 Bus & Board Conference, many of these products were seen in action for the first time. The StarFabric demo showed the live integration of the various vendors' boards, backplanes, chassis, and accessories. However, one of the key developments for StarFabric in 2003 was that the technology reached a level of maturity that caused growth-curve acceleration in volume, and did so in a challenging market. Many of the announcements and introductions of 2002 ramped into full production in 2003. At the same time, it became evident that the technology had indeed found its mark in the industry.

From the chip-level, switch and bridge component level, to the end-user system configuration, StarFabric has developed a complete solution. The embedded computing market has responded by embracing the concept of a high-performance, switch-based serial interconnect in a variety of applications.

Aside from the technology benefits, one of the most impressive achievements for the architecture is the wealth of products that support StarFabric. There are PCI Industrial Computer Manufacturers Group (PICMG) 2.17-compliant products in all levels of the system. There are StarFabric switch cards, node cards, single-board computers (SBCs), PMC modules, interface cards, backplanes/chassis, development systems, and adapter cards. StarFabric has also seen more activity in the military, with VME SBCs, PCI mezzanine cards (PMC), and other components.

While the communication equipment market has been hit strongly by the economic slowdown, other embedded equip-



Figure 1

ment markets have been steady if not strong through 2002-2003. The difficulties in the IT and communication industries in general have not had as severe an effect on some industrial, military, and specialized server companies. Since the level of new design activity was down, the interest in upgrading existing platforms has increased, and StarFabric's PCI compatibility features allowed these existing platforms to upgrade performance and capacity without a re-design from the ground up. In addition, some of the uncertainty in 2002 over which of the announced advanced interconnects would gain market traction has been settled. StarFabric is ending 2003 with a strong, positive momentum in design wins and parts shipped.

Standards

StarFabric has benefited from the initiatives of the leading standards bodies serving the embedded computing arena. In particular, PICMG has incorporated StarFabric into its family of electrical and mechanical specifications for industrial computers. PICMG 2.17 was completed and ratified in 2002, and this was followed in 2003 by the ratification of the PICMG 3.3 standard. As mentioned above, CompactPCI based systems are well supported by standards-based StarFabric cards, backplanes and chassis, etc.

There is a wealth of PICMG 2.17-compliant products on the market, especially backplane/chassis configurations, as Figure 1 from Bustronic illustrates.

For AdvancedTCA, there are quite a few backplanes and chassis on the market. Several companies have 12U or 13U vertical chassis, often with 14-slot Dual Star or even Mesh configurations. Also on the market are 4U horizontal AdvancedTCA chassis with 5-slot backplanes. Elma Electronic also recently announced a 5U AdvancedTCA Development chassis with A/C to 48 VDC conversions for easy adaptation to a conventional wall outlet. AdvancedTCA cards are still in the design phases. In the AdvancedTCA Interoperability Workshops, mechanical issues have already been worked out and focus is now on working towards getting cards developed by different vendors to interact with each other more efficiently. The goal is to have complete system functionality by 2004 Bus & Board Conference, which is scheduled January 18-20, 2004. In 2004, development of PICMG 3.3 switch and node cards will be seen more and more.

Figure 2 shows the DIGITAL-LOGIC AG PC/104-Plus module with a StarFabric



Figure 2

interface. StarFabric has also entered the PC/104 arena with the arrival of the PC/104-Plus SBC from DIGITAL-LOGIC AG. This promises to widen the customer base for StarFabric based solutions in the instrumentation, industrial control, mobile computing and other applications where its small form factor is a key design attribute.

In addition, StarGen is supporting the efforts of the International Test Consortium in developing standards for the Automated Test Equipment industry to base future generations of chip, board, and system testers on standardized modules designed to interconnect, expand, and upgrade based on a common architecture and interconnect.

StarFabric's features of performance, scalability, high availability, low cost, and compatibility with PCI software are proving to be an attractive combination to many system developers. Hardware vendors worldwide are providing StarFabric components that serve local and global markets. Unfortunately, one cannot specifically discuss many of the larger design wins. Understandably, many StarFabric customers want to keep an edge over their competition and keep their intentions close to the vest. Instead, talk about general applications that are particularly active areas for StarFabric designs will be discussed.

PCI extension

There has been a strong interest in extending present PCI-based equipment through the use of StarFabric. PCI has been the most pervasive interconnect standard in the history of computing, and over its history it has served as the backbone of many designs. Its performance and other limitations are hampering its use as the central system backbone, but PCI can be used along with its attached peripherals, storage devices, etc. as a sub-system with StarFabric replacing its function as the central interconnect. The increases in reliability and capacity of the system are extremely attractive, including the performance gains due to the higher bandwidth of the fabric. It is expected that this interest will continue to provide a large number of new designs as mature systems hit the limits imposed by bus-based technologies. The ability to re-use major components of present systems (including drivers and BIOS) provides major time to market and engineering cost savings.

Typical applications that are opting for PCI extension with StarFabric are in areas such as enterprise storage, automated test

equipment, avionics, medical imaging, and military command and control. Trenton Technology's StarFabric backplane is used in video server/content storage applications where network communications integrity is critical. The backplane supports a SBC and up to 14 64-bit/66 MHz PCI option cards (as shown in Figure 3). StarFabric enables key features of the design, including direct peer-to-peer communication between PCI cards.



Figure 3

Embedded control plane

The control plane is a critical aspect of any communication equipment design. As customers demand for high availability and reliability increases, the need to provide fault tolerance at the control plane level becomes clearer. Present control planes are widely based on PCI. Here the transition to a StarFabric control plane architecture is simple and can transform the control plane to a high-performance, redundant system based on the same PCI hardware and software. An alternative approach to control plane architecture is to base it on Ethernet. This works, but as performance increases, where each node is saddled with the burden of handling a TCP stack, this becomes expensive and problematic as performance is scaled. StarFabric designs have been integrated to overcome these problems in several programs, the result being much lower processor overhead and a more efficient, robust and lower-cost solution.

Voice access systems

The move toward multi-service access platforms to combine voice, data, and video is generating interest in StarFabric. Developers of such systems face a common problem of insufficient bandwidth to route the high volume of traffic across a traditional interconnect. StarFabric not only provides sufficient bandwidth, it also can be configured to provide much higher levels of reliability through redundancy in the switches, so that no single failure can bring down the system. Another problem faced by multi-service communication

platforms is that of guaranteeing quality of service for time critical processes and data streams. StarFabric provides a solution through separate classes of service with rules for guaranteeing bandwidth and priority in transmission across the fabric. As both the amount of data and the number of endpoints to be serviced is growing exponentially, StarFabric's point-to-point architecture provides the scalability, bandwidth, reliability, and quality of service features that break through the limitations of present day system buses. These advanced features are keys to the communications market that is expected to show marked improvement in 2004.

StarGen's Multi-Segment Expansion Board is the first multi-segment PICMG 2.17 board designed for H.110 and CompactPCI expansion using StarFabric. The board is capable of switching both control and voice data over StarFabric, allowing systems to scale to additional segments or chassis. The SG3010, TDM-to-StarFabric Bridge provides an H.110 interface, a local TDM bus interface, and a StarFabric interface. The SG2010 PCI-to-StarFabric Bridge and SG1010 6 Port Switch interface to the PCI bus and to the additional StarFabric cards in the system. The board can be used in any PICMG 2.17 compliant multi-segment backplane. Figure 4 is the PICMG 2.17 Multi-Segment Expansion Board designed for H.110 and CompactPCI Expansion (StarGen reference design).

2004 outlook

The market outlook for the next couple of years looks promising. Specifically in the communications market, companies are realizing that they can't keep up the minimal Band-Aid approaches much longer. At the same time, a forklift system upgrade can be too costly, require too many changes, and take too long. StarFabric is an excellent solution to preserve existing PCI investments, but provide vastly superior bandwidth, reliability, and service.

The StarFabric Trade Association and leading StarFabric architects collaborated with the Arapahoe Working Group to develop the PCI Express and Advanced Switching specification to deliver the same features of scalability, high availability, and quality of service that the market has come to expect from StarFabric. Starting in 2005, PCI Express and Advanced Switching products will introduce a complementary higher performance serial interconnect fab-



ric alternative for high-end applications. StarFabric will continue to grow, providing a low cost solution that will meet the needs of the broad part of the market.



Figure 4

Justin Moll has over nine years of high-tech marketing and sales experience, and has been the marketing manager for Bustronic since 2000. He was elected as vice president of marketing for the StarFabric Trade Association in 2002.

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