

Why CompactPCI?

By Chuck Hill



The landscape has changed forever for many high technology equipment providers. In the past, the same company that used the equipment in an end product often produced equipment vertically from conception to obsolescence. To succeed in today's competitive marketplace, equipment providers are being forced to speed time to market and reduce development costs. Growing competition has led manufacturers to outsource as many parts of a complete system as possible. CompactPCI offers open architecture platforms that can shorten equipment design cycles, enabling equipment providers to respond quickly to market demands with applications that require more advanced capabilities, such as high levels of availability. The CompactPCI "family" offers a large number of specifications that allow equipment integrators to layer significant functionality on top of the basic system.

CompactPCI and the PCI bus

PCI bus, the foundation for CompactPCI, offers a good general-purpose, industry standard interconnect. This simple, memory mapped, low protocol interconnect serves many applications, and software to support it is widely available. PCI bus features allow the system integrator to dynamically allocate and manage system resources.

To reach the levels of availability and reliability required by many applications, especially those in the telecommunications equipment industry, CompactPCI and the PCI Industrial Computer Manufacturers Group (PICMG) have extended the capabilities of the basic PCI functionality with specifications such as Hot Swap. The ability to add and remove components from a live system, reducing system downtime, is fundamental for high availability. Systems with hot-swap capabilities vary in their ability to reduce downtime, with some systems experiencing hours of system unavailability per year and some keeping downtime to less than five minutes per year (99.999% or *five nines*). PICMG recently updated the CompactPCI Hot Swap Specification (PICMG 2.1 R2.0) to include better protocols for system interaction and hot swap in higher bus rate systems. The new specification mends holes in the PCI protocol that do not work well in hot-swap environments.

PICMG 2.12 offers a standard software interface for managing hot swappable devices. This interface makes applications more portable by standardizing a set of *services* across multiple operating system environments. The recent revision

of the Hot Swap Specification added resources that 2.12 leverages for a more robust software interface.

Another specification, PICMG 2.9, extends the CompactPCI bus to address system management needs. PICMG 2.9 capitalizes on the Intelligent Platform Management Interface (IPMI) standard. IPMI offers capabilities not available in PCI. With IPMI, the system can gather vendor product data from devices and perform a number of supervisory tasks, such as power and thermal management. High availability systems also demand system management capabilities.

More than just PCI

The CompactPCI bus does not match some applications' performance needs. Medical imaging, for example, involves the transfer of large data blocks from board to board. The bandwidth required per transfer is not substantial, but in the aggregate, such bus use would swamp CompactPCI bus capacity. Telecom applications also typically involve moving larger quantities of data. Telecom data often have quality of service needs that the PCI bus protocol cannot address.

The PICMG family of specifications includes several extensions to CompactPCI. These extensions increase the system's ability to serve applications that are much more demanding than those CompactPCI has traditionally handled. PICMG has designed the specifications so that system implementers can choose the specification appropriate for their applications. Designers can mix and match the specifications to form an open architecture sys-

tem, while still benefiting from the core strengths of the CompactPCI platform.

The CompactPCI Computer Telephony Specification (PICMG 2.5 R1.0) defines an auxiliary bus to transmit Time Domain Multiplexed (TDM) data. This TDM bus offers isochronous data transport, important in voice applications. The H.110 bus adds an additional 256 Mbits/sec of capacity to the system.

Also in progress is PICMG 2.16, the CompactPCI Packet Switching Backplane Specification. PICMG 2.16 adds Ethernet interconnectivity to the CompactPCI platform. PICMG 2.16 adds up to 2 Gbits/sec of routed connectivity to each CompactPCI slot. Figure 1 shows an example of a platform with these two specifications combined.

Motorola Computer Group offers a platform with a high-speed switching fabric capable of more than 100 Gbits/sec capacities. The MXP Series of Intelligent Packet Transport Platforms provides a highly integrated configurable platform using a packet transport backplane and integrated media switch. These platforms show how system implementers can leverage CompactPCI's industry standard advantages, yet extend CompactPCI to applications beyond those covered by today's standards.

Why use CompactPCI?

Vendors in industries such as the telecom equipment business are facing an evolution in the way they produce systems. As technology evolves, some of the *magic* becomes more commonplace. Competitors



Figure 1

find it easier to purchase open standard technology and produce solutions. Traditional, vertically integrated equipment producers are then forced to outsource more than just the manufacturing of equipment.

The 80/20 rule applies to leveraging an open architecture platform. Using an off-the-shelf approach, a product can achieve 80 percent of its goals with 20 percent of the effort. The trick is to be able to compromise on the product goals while keeping a competitive edge by quickly getting to market. Many *proprietary* solutions have 80/20 equivalents in CompactPCI implementations.

Which leads to the question, "Who cares about the PCI bus?" Some suppliers have speculated that a half-size PCI board that is not CompactPCI is all most applications need. The PCI portion of the CompactPCI offers significant functionality for board discovery and resource allocation. It is useful for diagnostics and system utilities such as firmware upgrades. CompactPCI however, is more than just a PCI bus in a

rugged form factor. Today's extensions make it possible to build a CompactPCI system without a PCI bus, as PICMG 2.16 platforms demonstrate. What CompactPCI offers the system provider is a range of options that include standard processors, chassis, and communications hardware. These options are for standard or *nearly standard* implementations that help to dramatically shorten equipment design cycles.

CompactPCI is now the open standard of choice for new telecommunications infrastructure designs. Resources previously deployed on hardware designs are now being focused on software value-add. In addition to speeding time to market, CompactPCI also provides the following benefits:

- When there is no need to train on proprietary architectures, engineering staffing becomes easier. Open standards promote vendor competition, ultimately speeding innovation and reducing prices.
- Competition also ensures upgrade paths to the latest chipsets and technologies.
- Sourcing issues are made easier, as products may be purchased from a range of suppliers.

What's next?

Look for the evolution to continue, both in CompactPCI and in very high performance platforms like AdvancedTCA. The PICMG community is growing, and new

applications are finding their way into PICMG standards. Technology advancements make it possible to utilize the CompactPCI form factor in applications that required a proprietary form factor just a few years ago. New specifications to add even higher performance to the system and other form factors may be on the horizon.

Conclusion

CompactPCI is more than just an extension to PCI. CompactPCI offers an open standard architecture for many applications based on its ruggedness, flexibility, and capability to support high availability. PICMG specifications exist for extensions to the basic CompactPCI bus for many advanced applications, and there are more to come as new specifications further broaden CompactPCI's strengths.

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