Who needs CompactPCI?

By Chuck Hill

The landscape is changing for equipment providers in many high technology industries. In the past, equipment was produced vertically from conception to obsolescence. To succeed in today's competitive marketplace, equipment providers are being forced to speed time to market. 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. CompactPCI 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

The PCI bus, which is the foundation for CompactPCI, offers a good general purpose, industry standard interconnect. This simple, memory mapped, low protocol interconnect is useful for many applications such as industrial control. The features of the PCI bus 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 PICMG (PCI Industrial Computer Manufacturers Group) 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 range in their ability to reduce this downtime from hours of system unavailability per year to less than five minutes per year

(99.999% or 5NINES). *The CompactPCI Hot Swap Specification* (PICMG 2.1 R2.0) has recently been updated to include better protocols for system interaction and hot swap in higher bus rate systems. The new specification provides solutions for holes in the PCI protocol that do not work well in hot swap environments.

PICMG 2.12 offers a standard software interface for managing devices in a hot swap environment. By providing a standard set of "services" across multiple operating system environments, applications can be made more portable. The recent revision of the *Hot Swap Specification* added resources that 2.12 leverages for a more robust software interface.

The physical layer of the CompactPCI bus is augmented by PICMG 2.14. PICMG 2.14 (soon to be completed) offers a communication layer to allow heterogeneous software environments to coexist. Providing a common software and hardware messaging mechanism greatly eases system integration.

Another specification, PICMG 2.9, extends the CompactPCI bus for system management. It leverages the work of the Intelligent Platform Management Interface (IPMI) community. IPMI offers capabilities not available in PCI. For example, with IPMI, the system can gather vendor product data from devices and perform a number of management tasks like power and thermal management.

More than just PCI

Some applications require performance that is not suited to the CompactPCI bus. Medical imaging, for example, requires the transfer of large blocks of

data from board to board. The bandwidth required per transfer is not high, but the aggregate use of a bus overloads the capacity of the CompactPCI bus. Telecom applications also typically involve moving larger quantities of data. The data often has quality of service needs that the PCI bus protocol cannot provide.

The PICMG family of specifications include several extensions to CompactPCI to increase the system's capabilities for much more demanding applications. The specifications are designed to allow system implementers to choose the specification appropriate for their application. The designer can mix and match the specifications to form an open architecture system, 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 data (TDM). 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.

Another specification in progress is PICMG 2.16 *CompactPCI Packet Switching Backplane Specification.* PICMG 2.16 adds Ethernet interconnect capability to the CompactPCI platform, as well as up to 2 Gbits/sec of routed connectivity to each CompactPCI slot.

Figure 1 shows how the two specifications, 2.5 and 2.16, can be combined in a single platform.

Motorola Computer Group offers a platform with a high speed switching fabric capable of more than 100 Gbits/sec
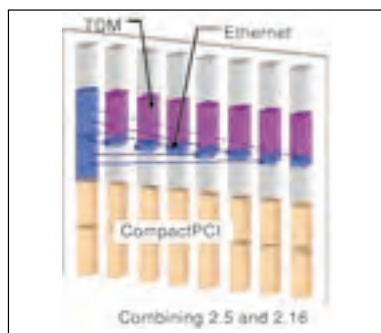
Figure 1

capacity. This PXP Series of Intelligent Packet Transport Platforms provide a highly integrated configurable platform using a packet transport backplane and integrated media switch. This is an example of how CompactPCI can be utilized with its industry standard advantages but still extended for applications beyond those covered by today's standards.

Why CompactPCI?

Industries such as the telecom equipment business are facing an evolution in the way equipment is produced. As technology evolves, some of the "magic" becomes more commonplace. It is easier for competitors to purchase open standard technology and produce solutions. Traditional, vertically integrated equipment producers are forced to outsource more than just the manufacturing of equipment.

To leverage an open architecture platform, the 80/20 rule applies. Using an off-the-shelf approach, a product can achieve 80% of its goals with 20% 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 – 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 like firmware upgrade. CompactPCI, however, is more than just a PCI bus in a rugged form factor. With the extensions available, it is possible to build a CompactPCI system without a PCI bus. What CompactPCI offers the system provider is a range of options – including standard processors, chassis, and communications hardware – 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:

■ Without the need to train on proprietary architectures, engineering staffing becomes easier due to an increased knowledge pool.
■ Open standards promote vendor competition, ultimately speeding innovation and reducing prices.
■ Competition also ensures upgrade paths to the latest chipsets and technologies.
■ Single sourcing issues are made easier, as products may be purchased from a range of suppliers.

What's next?

Look for the evolution to continue. The PICMG community is growing and new applications are finding their way into PICMG standards. With advancements in technology, it is possible to utilize the CompactPCI form factor where a proprietary form factor was required just a few short 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 the need for CompactPCI.

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