

Why can't a transparent bridge be used as an embedded bridge or vice versa?

By Gerhard Mayr

CompactPCI technology offers a standardized, open and scalable platform for various applications. When CompactPCI was introduced, it was already clear that it was ideally suited for telecom applications, and that it would become the standard for that industry. However, the CompactPCI market today is missing elements that are necessary for mission-critical and scalable systems applications. PCI-to-PCI bridges (PPBs) are key elements in CompactPCI systems, but current PPBs cannot deliver all the features that are essential for telecom applications. The following article examines some of the possible applications for this bridge technology as it applies to the telecommunications industry.

Technical overview

Why can't a transparent bridge be used as an embedded bridge or vice versa? Each bridge is designed for its specific purpose and nothing else. The transparent bridge is designed for loading restriction reasons coming out of the PCI market and the embedded bridge is designed for multiprocessing purposes especially for the CompactPCI and embedded market.

The basic approach to overcome these restrictions is to combine the complete range of features of a transparent and an embedded bridge in one device. This approach includes the combination of two different register maps in one device and support of the functions of both bridges. A diagram of Sentinel, Force's

universal PCI-to-PCI bridge device, is shown in Figure 1. This solution offers the following features and benefits:

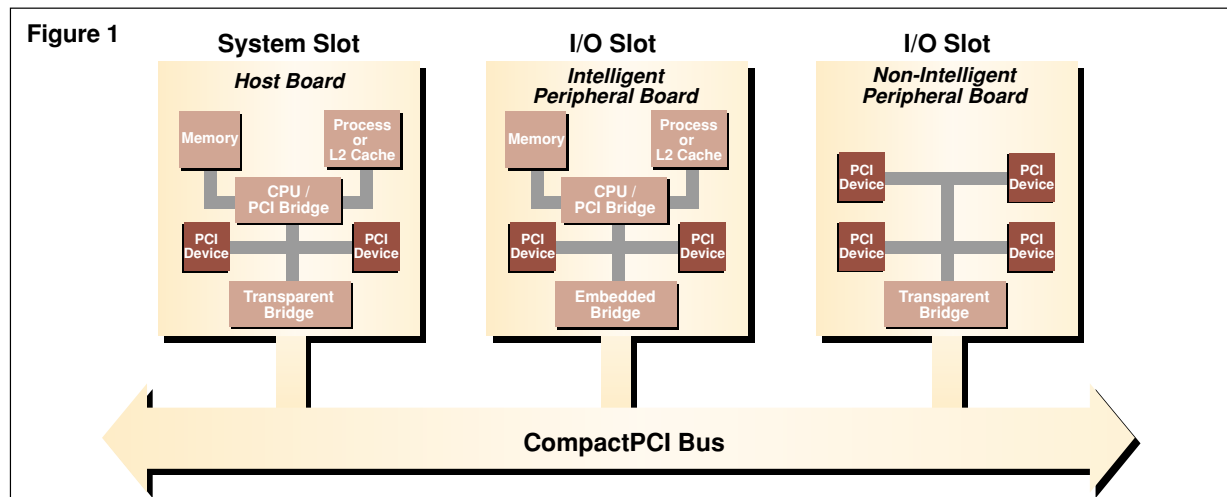
- One CompactPCI board that fits system slot and I/O slot
- Standardized communication features for multiprocessing via I₂O hardware features
- Speed up for time-critical real-time applications via standardized Message Signaled Interrupts (MSI)
- Improved I/O performance through advanced buffering architecture
- Hot Swap friendly silicon for all types of CompactPCI I/O boards
- Longevity supply guarantee and silicon roadmap for future enhancements

CompactPCI boards based on the Universal Sentinel Bridge can be designed to meet the needs of the full spectrum of applications based on the CompactPCI architecture.

Telecom applications

CompactPCI technology is widely used in the Telecommunications industry for target applications such as:

- Central office – central processor and intelligent peripheral applications
- Customer premise equipment – call center applications with large I/O demands



■ Mobile infrastructure – I/O-intensive base transceiver station applications

Systems for these applications require multiple CPUs or even different CPUs running more than one operating system to effectively meet application requirements. A multiple processor application example would involve using one CPU to run the user interface and networking functions, while other CPUs operate the I/O interfaces under real-time conditions. These systems need to be scalable especially for the I/O intensive applications. Being scalable in this context means that in an application such as a base station controller, the system must be able to support a certain number (e.g. 4) of T1/E1 lines with the option of upgrading to more T1/E1 lines (e.g. 16) to accommodate future demand. An ideal building block for scalable systems is the Force Computers' Sentinel-powered PowerCore CPCI-680, which specifically addresses the needs of telecom vendors requiring additional bandwidth.

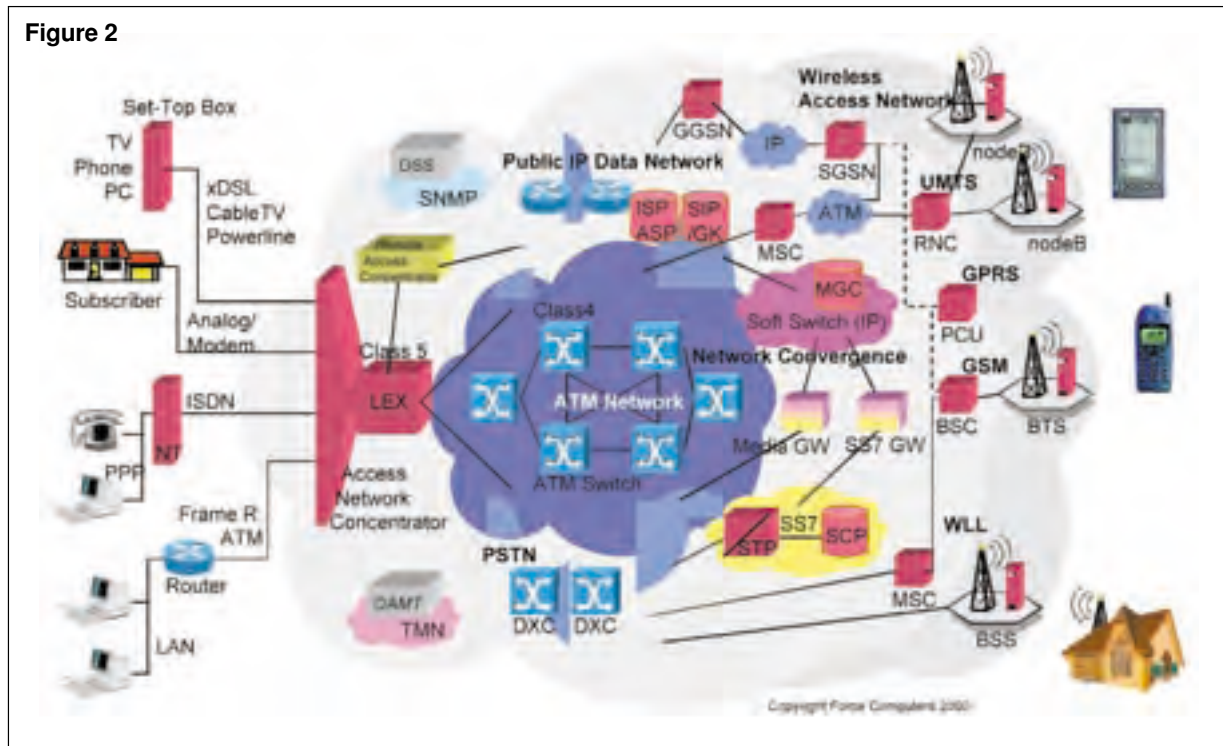
Other elements of the telecom cloud shown in Figure 2, however, require different features and have different operating system requirements. Examples of other applications are the Home Location Register (HLR) in the wireless infrastructure where typically, a UNIX-style operating system is needed in a scalable system platform. For such an application, Force Computers offers SPARC/Solaris-based platforms for the CompactPCI environment. The latest SPARC-based products CPCI-542 and CPCI-540 from Force incorporate Sentinel technology. This scalability allows for the use of more than one processor, and thus additional performance for the application, in a single CompactPCI system.

Currently, Force offers Intel-based, SPARC-based, and Power-

PC-based single board computers (SBC) with the Sentinel technology. These address real-time requirements within a wireless infrastructure such as a processing element in a SGSN (Serving GPRS Support Node) or in a PCU (Packet Control Unit) within a GPRS network (General Packet Radio Service), which have multiple E1 lines. All incoming data across the E1 needs to be processed, thus the need for a distributed multi-processing environment. One PowerCore CPCI-680 offers two slots for PMC modules and each slot can be equipped with Force's PMC/860 telecom Controller Module. Therefore, a single slot solution can offer up to four E1 links with a local processing capability.

One typical SGSN or PCU function extracts certain packet from one E1 line that is in, for example, Slot 2, and then passes it across another E1 line that is in for example Slot 4 in the CompactPCI rack. In such data exchanges across the CompactPCI bus, the Sentinel features such as Intelligent Input/Output (I₂O) and Messaged Signaled Interrupt (MSI) are essential to the accurate detection of interrupt request from all slots. Besides such data transfers, all of the activities within a CompactPCI system have to be coordinated by the system slot controller. Since it is possible to use the CPCI-680 in the system slot as well as the peripheral slot, the software development on an SGSN and PCU is simplified because the software team does not have to deal with two or several different board types. Even in systems with special I/O features integrated into the system slot controller, the CPCI-680 can be utilized for additional I/O functionality, such as on-board CompactFlash disk or a SCSI interface.

The flexibility of Sentinel in a mobile infrastructure application is addressed in several areas, including multiple I/O option, universal mode capability and the freedom to use the operating system of choice.



In conclusion

By combining the Sentinel bridge with a wide choice of operating systems and processor platforms, Force is able to offer a complete spectrum of technologies to telecom infrastructure vendors. In addition to this, Force also offers a complete portfolio of telecom controllers and suitable software stacks for a turnkey solution.



Gerhard Mayr is the Director of World Wide Business development for Force Computers' Board Business Unit, and holds a degree in communication engineering. He started his career as a software designer at an industrial automation company in 1988 where he designed protocol stacks for Ethernet such as SINEC-H1 and TCP/IP, followed by

designing application software for end customers. In 1991, he founded his own company that specialized in developing application software for industrial automation. In 1995, he joined Force Computers as a product manager of the 68K and PowerPC based product lines for VMEbus and CompactPCI. In 1997, he became responsible for Force's complete board level product line. Since 2000, he has managed Force's standard product portfolio developed in Munich, including single board computers, telecom controllers and system level platforms.

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