

Today, OEM's are under increasing pressure to reduce time to market and reduce development costs for their products. Deregulation of the telecommunications industry and global competition have increased this pressure, and the rapid rate of technological change and consumer expectations have significantly reduced the market window for many telecom and telephony products.

One characteristic of today's environment is the move to "open" standards and specifications. Open standards have many advantages in the eyes of the customer, including:

- Interoperability between vendors
- A large number of suppliers
- Lower prices
- Increased competition
- Multiple sources
- Customers can focus on features, as opposed to the platform

Once largely developed by individual companies and then opened up to the world, we see an increasing trend toward independent specifications bodies comprised of industry experts that develop open specifications as a team and release them to the industry. The Enterprise Computer Telephony Forum (ECTF) and the PCI Industrial Computer Manufacturers Group (PICMG) are two such independent organizations who are currently working together to bring open, interoperable specifications for computer telephony to the market. ECTF's specifications (S.100, H.100, and H.110) will be released shortly, as will PICMG's corresponding PICMG 2.5 Computer Telephony Specification.

ECTF

The Enterprise Computer Telephony Forum was formed in 1995 by telephony equipment and software suppliers to improve the interoperability of various vendors' CT solutions. Until ECTF was formed, the telephony industry was an alphabet soup of competing software and hardware platforms. ECTF has sought to improve this situation, and to enhance the "scaleability" of CT standards so that telephony systems serving the needs of small businesses as well as large, multinational corporations can be built using the same technology.

Early members included...

- Brooktrout
- Dialogic
- DEC
- Ericsson
- Hewlett-Packard
- Lucent
- Mitel
- Motorola
- Natural Microsystems
- Nortel

...and the organization continues to grow.

The first major pieces of work to come out of ECTF are the H.100 hardware CT Bus specification and a standard set of software interfaces known as S.100. ECTF and PICMG have many common members, and in early 1997 a PICMG subcommittee dedicated to developing a CompactPCI version of the H.100 CT Bus was formed. Working closely with ECTF, this subcommittee has 17 active members and is chaired by Steve Hall of Lucent Technologies. PICMG is about to release a complete systems-level hardware specification (PICMG 2.5 Computer Telephony Specification) in conjunction with ECTF's CompactPCI version of the CT Bus, called H.110.

This article will focus on the hardware aspects of the CT bus and how the PICMG 2.5 Computer Telephony Specification uses the H.110 spec.

Goals

The Computer Telephony Subcommittee's goals include:

- Intrasystem isochronous Time Division Multiplexed (TDM) media transport
- A common telephony I/O definition
- Reliable hot swap of CT cards
- Agency-aware safety recommendations
- Definition of the H.110 Bus (CompactPCI version of ECTF's H.100 Bus)

Features

The H.100 CT Bus is defined for a 68-pin ribbon cable that plugs onto the top of a PC form factor PCI telephony card. This flat cable is then daisy-chained along a number of cards plugged into adjacent backplane slots. Historically, telephony buses have used ribbon cables to transport the serial data streams because standard PC backplanes (either passive or active) could be used. This low-cost solution still leaves a lot to be desired when it comes to repairing a system. To replace a bad board, the ribbon cable must be removed from every board, the faulty board replaced, and then the ribbon cable must be re-installed. Sometimes, the ribbon cable itself is damaged in the process and must be replaced. Also, the small area for I/O on the rear of a PC form factor card limits the number of phone lines that can practically be attached to a single card.

The CompactPCI community sought to improve this situation by utilizing the bountiful rear I/O capabilities built into 6U CompactPCI. 6U boards have a large number of pins available that can be used to route the telephony sub-bus between cards and also provide for ample telephone line interconnects. The recent incorporation of the IEEE 1101.11 Rear Panel Transition Module specification into CompactPCI provides a robust method for bringing phone lines into the back of a chassis on a semi-permanent basis (see Figure 1). Lightning and surge protection circuitry can easily be added to these rear-panel interconnect boards. Also, telephony boards tend to be "DSP intensive" – and hence, heat intensive. CompactPCI's Eurocard form factor with its vertical

CompactPCI & computer telephony

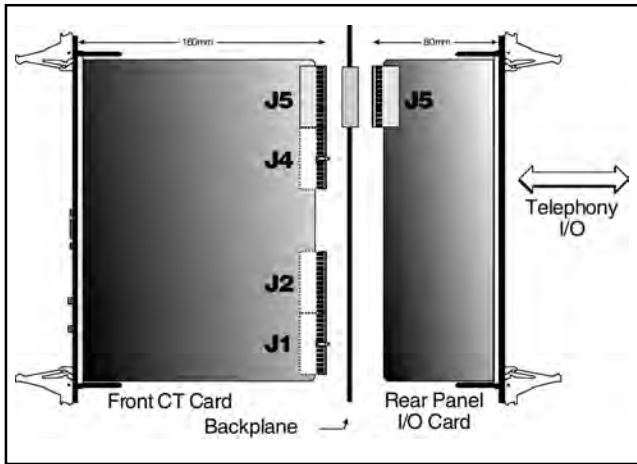


Figure 1

rear backplane provides more effective cooling than the PC form factor with its bottom backplane and horizontal airflow.

The H.100/H.110 bus has many advantages over the predecessors, including:

- PCI interface
- 8 Mbit/sec data rate
- Redundant clocking for increased fault tolerance
- 4096 bi-directional time slots (allowing up to 2048 full duplex calls)
- Backwards compatibility with the SC Bus, MVIP Bus, and HMVIP Bus

The bus provides the following signals (all 65 ohm impedance):

- Dual 8.192 MHz data clocks
- Dual 8 KHz frame clocks
- Dual Telecom network timing clocks
- 2 Mbps message channel
- 8 Mbps data streams
- Frame and data clocks
- "Card-in-Place" signal
- Reset signal

The CompactPCI Computer Telephony Specification takes advantage of several of the enhancements recently added to the core CompactPCI 2.1 specification. In addition to the rear panel transition module capability, the new CompactPCI spec provides three useful features. First, a 5 bit "geographic address" was added that allows a telephony card to read its slot number. Hence, by implication, it knows the phone lines to which it is connected. Secondly, the mandatory use of IEEE 1101.10 mechanics provides robust grounding and shielding. Thirdly, the new 1101.10 mechanics also provide a keying mechanism that is being used to mate particular CT cards with their corresponding slots in the chassis. For example, this prevents an "analog" CT card from being plugged into a "digital" CT slot and vice versa.

The Computer Telephony specification is not a part of the core CompactPCI spec, but is rather an adjunct to it. It specifies how CompactPCI systems using the H.110 bus should

be built by defining:

- Analog and digital signaling (32 tip-ring pairs per slot) pin assignments
- Bussed telecom power distribution
- Bussed ringing voltage distribution
- The H.110 CT Bus using the P4 (110 pin) backplane connector
- Four front panel keys for the following environments:
 - TNV3 "wet" circuits subject to over-voltages
 - TNV2 "wet" circuits non subject to over-voltages
 - TNV1 "dry" circuits subject to over-voltages
 - SELV "dry" circuits non subject to over-voltages
- Geographic slot address (5 bits - within a rack)
- Shelf enumeration (5 bits - between racks)
- Frame grounding (separate DC and Chassis Ground terminals)

The specification defines how four of the five connector areas on a 6U card are used (see Figure 2):

- J1-J2: 32/64-bit CompactPCI Bus (CT cards may optionally use or not use)
- J3: Not Used
- J4: H.110 CT Bus
- J5: Telephony I/O (If rear panel transition modules are used)

The Computer Telephony Specification further defines how IEEE 1101.11 compliant rear panel transition modules are used. Until 1101.11 came along, equipment suppliers who wanted to bring I/O into the rear of a chassis were pretty much on their own as to how to do that, and implementations varied. The 1101.11 specification provides an industry standard method for connecting rear I/O, and the CompactPCI community is standardizing on 80 mm deep cards. These cards "mirror" front panel cards and connect to them through the J5 through-backplane connector as defined in the Computer Telephony spec. Figure 1 shows a side view.

One exciting feature of this specification is that each plug-in CT card can connect to as many as 32 signal pairs. This means that up to 16 T1/E1 lines can be brought onto a single card. This expansion allows for very high density systems to be built, with a 20-slot chassis importing 320 T1/E1 lines - at least in theory.

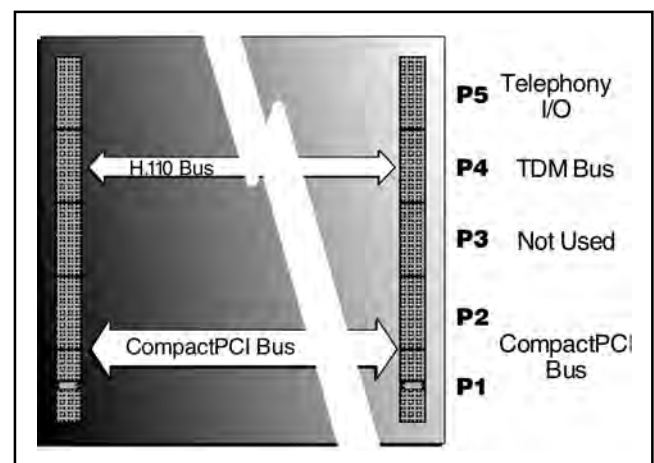


Figure 2

Status

The PICMG 2.5 Computer Telephony Specification has passed draft ballot. As of press time, PICMG is awaiting the final release of H.100 and H.110 from ECTF, after which the PICMG spec will be put to Executive ballot and released. The spec incorporates the latest work performed by the Hot Swap Subcommittee and will hopefully undergo few or no changes as the Hot Swap Specification (another story altogether!) is finalized.

Conclusions

Thanks to a lot of hard work and a lot of cooperation between ECTF and PICMG, computer telephony suppliers will shortly have a new platform that combines the advantages of the CompactPCI form factor with a high performance, open telephony architecture. These suppliers will enjoy a standard architecture embraced by the industry, and be able to choose from a host of suppliers for their cards and software. I/O can be connected to the front or rear, as desired. Customers will see higher performance and higher density CT systems. These systems will have a lower MTTR, better cooling, and a more rugged mechanical design than is currently available.

And just think - **NO FLAT CABLES!**

For more information visit the following websites:

■ <http://www.ectf.org>

■ <http://www.picmg.org>



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More Information on PICMG

You can learn more about CompactPCI and PICMG's activities by visiting our website at www.picmg.org. You can also email Joe Pavlat directly at pavlat@picmg.com. If you want to join PICMG, visit the website for more information. You can also contact the PICMG administrative office by calling 781-224-1100.