Fault-Resilient PCs: Zippy's Mega-Update

Richard "Zippy" Grigonis - May 01, 1999

Conventional fault-resilient computers (ISA, EISA, PCI, VMEbus, etc.) are a mainstay of computer telephony. But the architecture of fault-resilience is suddenly at a crossroads. Compact PCI (cPCI) and related standards (S.100, H.110) promise big benefits, including hot-swappability, bus-based component sensing, and a purpose-segregated but physically-common bus for media content, commands, and other signaling. The result has been a sudden burst of creativity coupled with angst, as some makers start testing the waters with cPCI offerings, while others insist it's not yet ready for prime-time. Herewith, our state of the moment report on conventional and cPCI fault-resilient products and systems.

A fault-resilient computer is the computer in computer telephony. Fault-resilient computers are systems with redundant, hot swappable components such as power supplies, disk drives, and fans. They have sophisticated monitoring and alarming subsystems that can alert you over a LAN or call you on the phone at home if there is technical trouble brewing at the office.

Fault-resilient computers also tend to be high-density systems capable of handling many CT resource cards and ports. The cards aren't plugged into a conventional motherboard (although some systems do use ruggedized industrial motherboards). Instead, they use passive backplanes, a technology in which all of the active circuitry that is normally found on an active PC motherboard (such as the CPU) is moved onto a card (such as a single-board computer) which plugs into one of the expansion slots on the backplane.

The passive backplane has little on it other than slot connectors, which is why this technology is sometimes referred to as slot cards. The chance of a passive backplane failing is quite low (unless you plug in so many power-hungry voice and fax cards that the backplane melts!)

Because ISA/EISA cards are readily available, fault-resilient computers designed around these buses are still in demand. VMEbus, a proprietary development of the 1980s, is a perpetual dark horse competitor especially now that some companies are giving it the ability to run in an Intel software environment.

As elsewhere in the PC world, however, the Peripheral Component Interconnect (PCI) bus is currently King. The standard for PCI in passive backplanes is established by PICMG (PCI Industrial Computer Manufacturers Group). Since there are still many legacy ISA cards out there,
many boards rely on Concurrent PCI, an enhancement to the PCI bus architecture that allows both PCI and ISA buses to simultaneously transfer data.

The old 16-bit, 8MHz ISA bus had a theoretical data transfer limit of 16MBps, while the very first 32-bit wide PCI buses ran at either 30MHz or 33MHz and could handle 132MBps transfer rates.

As the PCI bus and its electrically-similar, though more rugged compactPCI brother, continue to evolve (towards, for example, 64-bit wide data paths, running at 33MHz, handling 264MBps), you'll see system bandwidth grow enormously. So much so, that it will accommodate broadcast-quality videoconferencing and high bandwidth data transfers to and from disk drives.

As for the single-board computers (SBCs) that plug into PCI slots on passive backplanes, we're now seeing an incredibly high level of integration. On most boards you'll find 10 or 100Base-T Ethernet, EIDE, SCSI, and video interfaces. You'll also find a few USB ports and the usual floppy, serial, parallel, mouse, and keyboard ports. Other board appurtenances may be application specific -- for example, equipment subject to vibration may incorporate onboard Flash disks, such as the DiskOnChip subsystem from M-Systems' (Newark, CA - (510-413-5950).

These built-in items stand in for separate function cards, freeing up backplane slots. They let you build denser systems (more ports) in a smaller footprint.

Further streamlining SBC operations is the advent of the Pentium Mobile Module, which contains a Pentium processor core, cache memory, and logic chip in one unit; enabling fast field replacement/upgrade. Boards using the Pentium Mobile Module also have lower power consumption compared to Slot 1 Pentium II solutions, and thus run at lower temperatures.

Alarming and notification is also getting more sophisticated. Alarming boards can monitor the status of system temperature, the rotational speed of fans, and a plethora of other system variables. When problems arise, they can warn you over a network or dial up your NOC, via modem.

SBCs with dual Pentium II or III processors are now abundant, and can handle just about any application you throw at them.

AND THEN CAME COMPACT PCI

CompactPCI kicks up a storm of controversy whenever we publish an article on it here at Computer Telephony. Many manufacturers have gone so far as to urge me to write that compactPCI isn't yet ready for Prime Time. Various peripheral cards haven't appeared and volume production has yet to take place, they say. They tell me that some potential buyers of fault-resilient equipment are waiting for deliverance when more compactPCI products are available.

Well, compactPCI is coming along just fine, thank you. Its market isn't exploding like a thermonuclear bomb - at least not yet - but it continues to grow, fueled by more and more diverse
products and customers who respect what the technology can do for them.

I expect the year 2000 to be the true "year of compactPCI." By then, the various hardware specs will be "set in stone," and this year's equipment orders will be filled. Meanwhile, our laboratory tests suggest cPCI performs very much as advertised. Last year, we demonstrated hot-swappability of Dialogic and Natural MicroSystems cPCI QuadSpans. In January, we achieved interoperability, by sticking the cards in one compactPCI chassis and making calls between them over the H.110 bus.

**cPCI EVOLUTION**

cPCI sprang up at the juncture of two movements: the charge towards ruggedized PCI development (led by PICMG), and promulgation of the H.100 CT bus standard (by the ECTF).

H.100 is the PCI implementation (and the first card-level definition) of a "neutral" telephony bus that works with existing SCbus- (Dialogic) and MVIP-90/H-MVIP- (NMS and others) compliant products. H.100-compliant PCI products will interoperate in the so-called CT Bus "core mode," and will work simultaneously with SCbus, MVIP-90 or H-MVIP (as well as ANSI VITA 6) cards in various "compatibility modes," even when these legacy cards are plugged into ISA / EISA slots. This helps system integrators and VARs manage smooth migration of systems from ISA SCbus or MVIP90, to mixed ISA/PCI, to 100% PCI, according to need, feature availability, and price.

H.100 supports up to 20 boards, all of which are connected with a ribbon cable that shouldn't exceed 20 inches; and supports up to 2,048 simultaneous calls. But it's neither "rugged" nor "hot-swappable." For truly mission critical telecom applications, some reformulation of the existing spec (to make it more fault-resilient) was considered necessary. This became compactPCI, which was initiated in late 1994 under the auspices of PICMG.

Right from its inception, most members of the compactPCI community believed computer telephony would be the first big market for compactPCI and that telephony suppliers would move quickly to it as soon as cPCI voice and fax cards were available.

The ECTF soon became involved and eventually announced the H.110 specification, which covers the CT Bus implementation on the compactPCI (cPCI) form factor. The H.110 specification is electrically identical to the PCI standard used on desktop PCs, is functionally identical to H.100 and even uses the same I/O driver specification. This lets semiconductor vendors implement chip designs that support both standards.

**cPCI FEATURES**

Unlike desktop PCI, however, compactPCI supports twice as many PCI slots - eight vs. four. PCI-t-PCI bridge devices permit further expansion, in groups of eight. Each bridge, however, add a clock cycle (33 ns) to a data block transfer -- impeding performance if data is moved in tiny chunks. This threat has induced companies like Texas Micro to develop more sophisticated methods of cPCI bus slot expansion.
CompactPCI cards are mechanically different from standard PCI --- they follow the rugged “Eurocard” form factor (originally popularized by the VME bus): a 3U (100 by 160 mm) or 6U (233 by 160 mm) board size with up to five, 2mm metric pin-and-socket connectors along one edge (6U), and faceplate and I/O connectors along the other. On a 6U cPCI card, only two of the five connectors are required for bus mechanics. The other three connectors provide up to 315 pins for user-specified I/O connections.

Power and signal pins on the cPCI connector are staged to support hot swapping, which, along with redundancy, lies at the heart of fault tolerant and fault-resilient systems.

Hot swap is now an official PICMG standard (a combination of hardware and software standards) that allows for insertion and extraction of compactPCI peripherals in a live system with a passive backplane. It's a superset of the PCI Hot Plug specification, which permits card removal after slot power-down -- implying an active backplane, unacceptable in many high density applications.

cPCI cards are normally arranged vertically in a cabinet, allowing vector cooling and easy access/removal via the front or back panel. Cards are firmly held in position by their connector, card guides, and faceplate screws.

So, in spite of the naysayers, I now figure that by the end of the year 2000, cPCI will have garnered about 15% of yearly sales in the telco / CT market. Others say that cPCI will be at least a $1 billion market in three years, which, although possible, sounds a bit optimistic.

**AAEON ELECTRONICS**

AAEON Electronics (Hazlet, NJ - 732-203-9300) has developed a “Little Board” form factor CPU card, the PCM-7890. Aside from a 450MHz Pentium II (440BX chipset), it has an onboard CRT/LCD controller and a 72MB DiskOnChip Flash memory disk in addition to the main 128MB block of SDRAM. You'll also find onboard a 100BaseTx Fast Ethernet interface, TV output and SoundBlaster compatible audio making possible sophisticated kiosks, gaming systems, telecom, Point of Sale (POS) systems, medical and educational products.

The PCM-7890 has four serial ports, three RS-232s, and one RS-232/422/485. A 2 x 2 header, onboard, supports dual USB ports. There's also a parallel port, a watchdog timer, and support for two IDE devices in Ultra DMA/33 mode. And to think that all of this fits in the space of a 5.25&quot floppy drive (5.75" x 8"). The PCM-7890 costs about $600 in low quantities.

**ADAstra SYSTEMS**

Adastra Systems Corporation’s (Hayward, CA - 510-732-6900) VNS-686 (VENUS) SBC now supports the Pentium MMX processor at speeds up to 233 MHz (256KB Level 2 cache) and up to 128M bytes of EDO DRAM or SDRAM.
There's on-board 256KB Level 2 cache. All major on-board peripherals are high performance PCI, including flat-panel compatible SVGA, drivers Fast Ethernet, and Fast and Wide SCSI. Additional on-board features include two local-bus EIDE ports, a floppy disk controller, two enhanced parallel ports, four FIFO serial ports (RS-232, with RS-485 and IrDA options), keyboard, PS/2 mouse, real-time clock, solid state disk memory, and a watchdog timer. The dimensions are an EBX-compatible 5.75\(\times\)8. Expansion is via a PCI mezzanine bus for high speed and a PC/104 embedded ISA bus for more traditional applications.

The SVGA subsystem, based on the latest in laptop chipsets and with 2M bytes of video memory, supports all flat panels on the market including the new high-resolution TFT and 3.3V displays. The SVGA system includes an interface for direct digital video input. Support is also onboard for 10Base-T or 100Base-T operation (with auto-negotiation) and an AUI port for other media. The SCSI interface is Fast and Wide (20MBps) with an optional Ultra SCSI mode (40MBps).

**ALLIANCE SYSTEMS**

I gave Alliance Systems (Plano, TX - 972-633-3400) a "Judges Pick" award at CTExpo Spring '99 (see our show coverage in this issue). Their new Alliant CTS 7000 20-slot 19" rackmount lets you deploy a CT server and a RAID subsystem all in one.

The box has two tiers, one for both the processor and cards and the other for drives, power supplies, and Alliance’s Intelligent Temperature Monitoring System (which monitors fan, power supply, and chassis temperature).

The system has individual shock mounts for six accessible 5.25" drives

and two internal 3.5" drives. Hot-swappable 400W AC power supplies (AC

and DC) are available with audible and visual alarming.

The CTS 7000 also has a Remote Monitoring System.

**ALTA TECHNOLOGY**

Alta Technology Corporation (Sandy, Utah - 801-562-1010) has coupled a 64-bit compactPCI rugged Eurocard architecture with Compaq's (previously DEC's) Alpha microprocessor. The result is the CPCI/SBC-A500, which uses a 500 MHz 21164 microprocessor in a 6U dual slot format.

This interesting Alta hybrid design has uses 64-bit, fully pipelined advanced RISC processor technology, support for up to 1 GB of ECC memory on DIMMs (there is a 256-bit pathway to memory), 2 MB of Level Three cache, and bridgeless I/O through a PCI Mezzanine Card (PMC) site.
In a compactPCI backplane, all seven slots (or more with bridge chips) can be 64-bit peripherals. Alta offers other cPCI cards to complement the system, such as the 6U Dual PMC carrier board for both 64-bit and 32-bit peripherals, 6U 64-bit Front Panel Data Port which allows data transfer rates of up to 160 MBps, 6U 3D Graphics Accelerator that uses 3Dlabs’ GLINT, and carries 40 MB EDO and 16 MB of VRAM, and the 64-bit Gigabit Ethernet PMC card that yields ten times the performance of Fast Ethernet!

As for software, you now have to settle for the 32-bit Alpha version of Windows NT - I hope that Windows 2000 should be able to run on the Alpha in a fully 64-bit environment. But remember that Linux is already fully 64-bit compliant, suggesting some interesting development opportunities.

Alta says that, with the release of even faster Alpha processors and new 64-bit peripheral chips, Alta is committed to new compactPCI and PMC products that will continue to adopt the latest 64-bit technologies.

**AMERICAN ADVANTECH**

American Advantech Corporation (Sunnyvale, CA - 408-245-6678) always has an interesting assortment of new products. Here are just a few:

The **IPC-623** is a 4U high rackmount IPC chassis which can hold a 20-slot ISA/PCI backplane and hot-swappable 300 Watt redundant power supply. The front-accessible disk drive bay can hold three half-height and one 3.5" floppy disk drive (another 3.5" HDD can be mounted inside the case). There's vibration and shock protection drive mountings for industrial applications.

The IPC-623 allows installation of multiple PC systems in a single chassis. A wide variety of multi-segment ISA or ISA/PCI backplane options are available, up to 20-slot ISA / PCI backplanes. Some of them come with a PCI bridge to support more PCI slots for different applications. Baby-AT, ATX motherboard versions are available also. A hold-down clamp protects plug-in cards from vibration.

The IPC-623 has fault detection with audible and visual alarms for power supply, fan failure, and overheating.

Advantech’s **IPC-644** is an ultra-compact four-slot mini node chassis for embedded applications. It can be wall mounted or desktop mounted. The IPC-644 can be equipped with four ISA or 1 ISA / 2 PCI / 1 NLX backplane to hold 4 half-size cards. It is also equipped with both the DC and the AC power inputs. The IPC-644 is so compact it can fit in environments such as boats, cars, and vehicles on the go. It is equally suitable for indoor operation.

The IPC-644 comes with two LED indicators for the power source and hard drives on the front panel to provide easy diagnostics and maintenance. It also has two controllers for the Power Reset and ON/OFF switch.

Disk drives include one 3.5" floppy disk and one hard drive. Other features include two 9- and 25-pin
I/O reserved ports, a built-in 80 Watt power supply, and a 40 CFM filtered cooling fan flow-in and a 19.42 CFM cooling fan flow-out with washable fan filters.

**American Predator**

American Predator Corporation (APC) (Morgan Hill, - 408-776-7896) **Hunter LPX** was developed specifically for industrial applications that need a powerful all-in-one low profile embedded controller. It has a standard LPX form factor (8.3\(\times\) 11\(\times\)).

The Hunter LPX offers a solution for applications such as: cash registers, retail POS, security systems, computer networks, CNC controllers, gaming industry, etc. The Hunter LPX design uses the Intel TX chipset.

The board holds up to 256MB of memory and 56KB of pipelined burst cache memory.

The Hunter LPX offers a built-in LCD/CRT display (Chips & Technology 65555) interface with an option for LVDS video link for monitoring devices. It also supports Ultra-DMA high bandwidth disk data transfer technology. The board operates with all CPU manufacturers in speeds ranging from 75MHz to 350MHz, including the Intel P55C (MMX).

**APPRO**

APPRO International (Milpitas, CA - 408-941-8100) bases its fault-resilient Communications Server Platform on their 5100 Series chassis. It’s meant for distributors and OEMs who build servers for internet telephony, voice mail, paging, email, fax, ACDs, IVR and other CT apps. For resellers using Altigen Quantum boards, the APPRO can be ordered with NT pre-loaded, so you only have to load the AltiWare and install the Quantum boards.

The Communications Server Platform can be configured through a Pentium SBC, with or without Ultra SCSI or with a Pentium Pro SBC. Both configurations include the standard ATI Mach 64 video with 2MB video memory, EIDE, FDD, 2 serial ports, a parallel port, and PS/2 mouse and keyboard ports. Available passive backplanes vary from 14 to 20 slot, PCI / ISA bus combinations.

**ARTESYN**

For you VMEbus enthusiasts, Artesyn Communication Products (Madison, WI - 608-831-5500) has a PowerPC 750-based VME CPU board, the **BajaPPC-750**, for applications such as SS7, wireless, network bridging, protocol processing, and data filtering. The PowerPC 750 processor runs at 366MHz with a 66MHz external bus, a 1MB Level 2 cache, up to 256 MB of SDRAM, 12MB of Flash memory, and a PCI-to-VME interface. This includes a VME64 master/slave functionality with DMA block transfers and 5-row DIN connectors.
The BajaPPC-750 has two 32-bit PCI Mezzanine Card (PMC) expansion slots for flexible I/O. They accept various Artesyn PMC modules, including T-1 or E-1 interfaces, high-speed serial interfaces, Fast Ethernet, SCSI, and VSB. Third party PMC modules are available for ATM, fibre channel, and FDDI or video and graphics.

The board includes 10/100Base-T Ethernet via an RJ-45 connector on the front panel, two serial ports, software support for Wind River's Tornado/VxWorks, and ISI's pSOS real-time operating systems. A configuration is available for I/O pin-compatibility with Motorola's MVME-712 transition module.

The BajaPPC-750 VME board has a single unit price of $3,995 (with 32MB of SDRAM).

AXIOM

AXIOM Technology (City of Industry, CA - 626-934-1199), designs rackmounts for CT platforms, computer-based PBX systems, voice mail systems, heavy duty network servers, and fax-on-demand systems.

Their **AX6180** is an 8U high, 19” wide rackmount chassis that houses a 20-slot ISA or ISA / PCI passive backplane for single, dual or quad systems. The system is flexible enough to support either a CPU card or an ATX mainboard. The AX6180 can hold either a PS/2 or ATX hot-swappable redundant power supply, along with four hot-swappable fans. The unit has alarm notification and front-panel LEDs to display the status of Power ON/OFF, hard drive, temperature, system fans, CPU cooling fans, and the power supply voltage. A flexible drive cage has one 3.5” and seven 5.25” disk drive bays.

The **AX6151 A/B** , 5U high, holds 14 to 20-slot backplanes, and one 3.5” and four 5.25” drive bays.

Axiom's **SBC8176** is an “all-in-one” PCI / ISA CPU card supporting up to two 450MHz Pentium IIs with the Intel 440BX PCI chipset. It holds up to 1GB of buffered or 512MB of unbuffered SDRAM, and 512KB standard L2 cache memory. It comes with 100MHz Slot 1 socket for the CPU. There's also a built-in socket for a DiskOnChip 72MB Flash memory disk.

The board integrates two RS-232 serial ports, one parallel port supporting EPP/ECP, and a high-bandwidth (Ultra DMA/33) interface for up to four EIDE drives. An FDD interface supports up to two floppy disk drives. There's also the usual PS/2 keyboard and PS/2 mouse interface. A DiskOnChip holds up to 72MB Flash memory.

The **SBC8177** is a Pentium II PCI / ISA CPU Card with SCSI and VGA interfaces. It holds up to a 450MHz processor (Intel 440BX chipset) and an ATI Rage XL AGP graphics chipset (4MB SDRAM display memory). The onboard Adaptec AIC 7890A Ultra II SCSI interface can connect to 15 SCSI devices at up to 80MB per second.

CRYSTAL GROUP
Crystal Group (Hiawatha, IA - 319-378-1636) recently released their **CS600**, a 2U high by 19” rackmount computer chassis. This chassis can contain a six-slot ISA or ISA/PCI compliant passive backplane with a butterfly backplane design. Cards mount horizontally in the chassis, with three to a side, including a removable card cage. Each unit can accommodate three 3.5” hard drive bays and two cooling fans. This unit's core-performance characteristics are the same as Crystal's CS500 computer in an equally space-saving form factor.

Speaking of the **CS500**, it remains one of Crystal's most popular computer designs. It holds a 5-slot standard ISA / PCI backplane that can be ordered in combinations of 2 ISA/ 2 PCI/ 1 CPU, or 4 ISA / 1 CPU, or 1 ISA / 3 PCI / 1 CPU, or 3 ISA / 1 PCI / 1 CPU. The whole shebang is powered by a SBC with either a 450MHz Pentium II or up to two 133MHz regular Pentiums. The box can hold one 3.5” floppy and two 3.5” internal device bay. 17 CFM and 25 CFM fan options keep the unit no more than 10 degrees C above ambient temperature.

**CSS LABS**

The NEBS-compliant **ProRACK 7220 and 8020 Series** rack mountable servers from CSS Laboratories (Irvine, CA - 714-852-8161) come with CSS' 20-slot QuietBus passive backplanes, available in one, two, or four segments. The ProRACK7220 can accept any CSS 20-slot passive backplane and can handle up to four independent SBCs. Dual 300W hot-swappable front-loading power supplies, 110/220 voltage selection, dedicated cooling fans, and hot swappable drives are also included. Five 5.25” hot-swap drives and two 3.5” drives are all accessible from the chassis' front.

ProRACK 8020 variations include 400W hot-swappable, rear-loading power supplies, with options of 500, 750 or 1,000W load-sharing power supplies. Up to nine 3.5” hot-swappable SCSI drives can be mounted.

Each segment is controlled by a separate power sequence switch. ISA and PCI configurations of up to 20 slots are possible. The 7220 server price starts at $2,500, the 8020 at $3,000.

**CUBIX**

Cubix Corporation (Carson City, NV - 775-888-1000) introduces the **Density Series**, supplying greater server density for NT services and thin-client projects. The Density Series can accommodate as many as four individual Pentium Pro two-way symmetric multiprocessing (SMP) servers. Another backplane option contains as many as eight Pentium servers with MMX technology, and a third option combines two dual-SMP and four uni-processing servers for maximum flexibility.

Cubix's **SP7300** and **SP7333** are Pentium II SBCs. Density Series systems can be configured with as many as four SP7xxx servers. The processors can be up to 333 MHz with a 512 KB Level 2 cache. Up to 1 GB of ECC 168 pin DIMMs of memory can be mounted. Flash BIOS is by AMI. Ultra Fast Wide SCSI is supported, as is auto-sensing 10/100Base-T. There are USB, serial, and parallel ports.
DIVERSIFIED TECHNOLOGY

Diversified Technology (Ridgeland, MS - 601-856-4121) recently debuted their new **LBC8716 SBC**. The LBC8716 PICMG is based on the Pentium III and 440GX chipset, and runs at 100MHz. This provides support for processor speeds up to 500MHz. There's 1GB of memory using 100MHz SDRAM, PCI 10/100 Base-T Ethernet, Ultra Wide SCSI, EIDE, and USB interfaces, along with a PCI based video controller with 2MB RAM and flat panel support.

DTI's **FTS906 Industrial Rackmount Fault-Tolerant Enclosure** is a 19" rackmountable computer chassis that combines a small enclosure, large power supply, fault tolerance/serviceability, diagnostic features, cooling, 20 slot backplane, and large storage capacity into one package. The front drive bay area will accept three standard half-height hard drives, one DAT drive, and one floppy drive. The FTS906 has front loading, dual, hot-swappable power supplies which operate in a load-sharing redundant mode with their own self contained airflow system.

Diversified has just introduced the new **CPT605 compactPCI Desktop Development System**. The CPT605 supports three 6U expansion slots along with a 6U processor slot and a power supply slot. The system's form factor is similar to a typical /AT minitower system in order to keep the footprint small, and is great if you don't have the space for a complete rackmount system.

The CPT605 accommodates one full height 5.25" drive bay and one 3.5" bay. All connections to the processor can be made at the rear of the system. The CPT605 includes a 150 Watt power supply (AC or DC input). The CPT605 can be used for development work, but is also suitable for low port field applications.

The CPT605 is available with either a Celeron Pentium II or a Mobile Pentium II processor board. The CPU board comes with many interfaces including Ultra Wide SCSI, SVGA, 100Mbs Ethernet, EIDE, floppy, serial, and parallel ports. This level of integration allows all three expansion slots to be used for telephony resource boards.

Diversified's new **LBC8725 SBC** is a dual CPU PICMG computer board based on Intel's Pentium III processor and 440GX chipset running at 100MHz, but it provides support for processor speeds up to 500MHz. The LBC8725 holds up to 1GB of memory using 100MHz SDRAM. Dual PCI 10/100 Base-T Ethernet, Ultra Wide SCSI, EIDE, and USB interfaces are provided along with a PCI based video controller with 2MB RAM and flat panel support. Other features of the LBC8725 include floppy, parallel, and serial ports as well as DTI's System Monitor.

ELMA ELECTRONIC

Just as we went to press, Elma Electronic (Fremont, CA - 510-656-3400) announced their Type 15 compactPCI family of enclosures for desktop or rackmount systems. Designed to IEEE 1101.10/10/.11 standards, Type 15C enclosures give electromagnetic shielding protection (meets the FCC and European CE mark) and can be configured by selecting the backplane, power supplies,
device modules, and the number of slots (four, six or eight slots, PICMG 2.0 R2.1 compliant). You can have the system configured for either front-to-rear or bottom-to-top airflow cooling.

Standard heights are 3U, 4U, 6U and 10U with custom sizes possible, and systems can be configured without rear I/O card cages.

FORCE COMPUTERS

Force Computers' (San Jose, CA - 408-369-6000) CO 16723 is their top-notch compactPCI fault-resilient platform for critical Central Office applications, built for Network Equipment Building System (NEBS) SR-3580 Level 3 criteria (GR-63-CORE and GR-1089-CORE). The CO 16723 got a Best of Show Award at CT Expo Spring '99.

The Centellis CO 16000 Series runs Windows NT in a carrier grade system chassis. Rather than just running a mere IVR system or voicemail repository, this kind of highly fault-resilient system lets you deploy mission-critical advanced Intelligent Network (IN) applications such as intelligent peripherals, service nodes, and adjunct processors for the central office environment.

The Centellis CO has an all-steel 112 pound rack-mountable chassis (with rails for either 19 or 23-inch rack mounting) housing redundant N+1 power supplies and redundant front-to-back, bottom-to-top filtered cooling for NEBS recommended airflow. It also houses a media bay having space for up to six hot swap 3.5-inch SCA SCSI drive modules (3U high), up to two 5.25” SCSI devices, and an optional hardware RAID 0, 1, 5 controller.

For servicing and upgrades, the unit has convenient front access to such hot swappable components as compactPCI I/O boards, power supplies, disk drive modules, and fan trays.

The processor board supports a 233 MHz Pentium MMX with 512 KB L2 Cache, Fast Ethernet, EIDE, two Fast / Wide SCSI channels, two PCMCIA, and two PMC expansion slots, in addition to factory-installed Windows NT 4.0. Force can do other processor options too.

The 16-slot 6U PICMG 2.0 R2.1-compliant compactPCI passive backplane supports the PICMG compactPCI 2.1 R1.0 Hot Swap Specification and the PICMG compactPCI 2.5 R1.0 Computer Telephony H.110 Bus.

An optional telecom alarm module is available for central office alarming applications.

The Centellis CO 16723 lists starting at $15,500.

The latest member of the Centellis product line is the Centellis 4730. An entry-level small-footprint, Windows NT compactPCI workstation (19 inches wide, 3U high) runs on a 266 MHz Pentium II (on a Mobile Module), with support for standard PC software and hardware.
The Centellis 4730's compact form factor means that customers looking to embed their industrial applications while enjoying the advantages of compactPCI can deploy the Centellis 4730 without changing their entire system. Similarly, telecommunications applications requiring minimal downtime can benefit from the

The Centellis 4730, though compact, has two 6U, two 3U compactPCI, and 2 PMC slots which will accept any of the increasing number of compactPCI I/O expansion boards now available from Force and third party vendors. You can order up to 384MB of memory, and five drive bays (for floppy, CD-ROM and hard drives).

The Centellis 4730 should be available by the time you read this.

**GENERAL MICRO**

General Micro Systems (Rancho Cucamonga, CA - 909-980-4863) offers one of the industry's fastest SBCs, the new **Dual Pentium compactPCI C2P2** (there's also a VME64 version called the V2P2).

The V2P2 and C2P2 provide two Pentium II Deschutes processors running at 450 MHz (or the next-generation Katmai up to 550MHz), and 1 GB of 100 MHz SDRAM main memory, and a megabyte of Level 2 cache. They also use Intel's 82443BX chipset and the 640 Advanced Graphics Processor (AGP). They are said to be the first CPU boards to provide a 100MHz implementation of Intel's Front Side Bus (FSB) (a high-performance local bus that connects Pentium II processors with cache and main memory) and the first to deploy the DEC 21554 Draw Bridge Chip on compactPCI to allow multiprocessing.

As GMS president Ben Sharfi modestly proclaims: "This is the fastest damn CPU board ever produced, and I'm not just talking industrial computing. This thing is faster than any workstation or server on the market, a virtual Silicon Graphics workstation on a single board. I wish I had one for my desktop." That makes two of

Also included are dual Ethernet interfaces (twisted pair) operating at either 10Mbps or 100M.