OpenSystems Publishing

HOST MEDIA PROCESSING…THE LAST SUPERCOMM…VOIP

CompactPCI® and AdvancedTCA® Systems

The Magazine for Developers of Open Communication, Industrial, and Rugged Systems
www.CompactPCI-Systems.com • www.AdvancedTCA-Systems.com

AUGUST 2005 • VOLUME 9 NUMBER 6

VoIP Media Gateways

Terminals 1 2 3 5

Leveraging AdvancedTCA

PICTURED
SBS TECHNOLOGIES' BROAD RANGE OF ADVANCEDMC MODULES.

Back Door Engineering

More CompactPCI Rear I/O Options

The SMA Pentium M CPU7.2 gives you more choices than any other 3U CompactPCI CPU, including a variety of rear I/O options. Five different rear I/O modules provide the interfaces you need and let you move your wiring off the front panel. Choose from the Celeron M or Pentium M, 600 MHz to 1.8 GHz, and all the popular operating systems. Additional CPU's, I/O modules, enclosures, backplanes, and power supplies, plus custom designed boards and systems are available.

For all your 3U CompactPCI needs, choose one partner. Choose SMA.

www.SMAcomputers.com

SMA Computers
9550 Warner Ave. #250
Fountain Valley, CA 92708
Phone +1 714.593.2338
www.SMAcomputers.com

SMA Technologie AG
Hannoversche Strasse 1–5
34266 Niestetal, Germany
Phone +49 561 95 22-0
www.SMA.de

RSC# 2 @www.compactpci-systems.com/rsc

CompactPCI® and AdvancedTCA® Systems

The Magazine for Developers of Open Communication, Industrial, and Rugged Systems

www.compactpci-systems.com
www.advancedtca-systems.com

VOLUME 9 • NUMBER 6
AUGUST 2005

COLUMNS

EVENTS

ESC
September 13-14, 2005
Boston, MA
www.esconline.com

Autotestcon
September 26-29, 2005
Orlando, FL
www.autotestcon.com

E-LETTER

August: www.compactpci-systems.com/eletter
Legacy telecom hits the 21st century: TDM circuits on AdvancedTCA switch fabrics
By R. Brough Turner

COVER
Faced with the challenge of keeping infrastructure costs low while minimizing time-to-market for new applications, VoIP carriers are looking to AdvancedTCA.

Advanced Mezzanine Card (AMC) boards photo courtesy of SBS Technologies, Inc.

Published by: OpenSystems Publishing™

FEATURES

WEB RESOURCES

Subscribe to the magazine or E-letter at:
www.opensystems-publishing.com/subscriptions

Industry news:
Read: www.compactpci-systems.com/news
Submit: www.opensystems-publishing.com/news/submit

Submit new products at:
www.opensystems-publishing.com/vendors/submissions/np

GE Fanuc Automation

The solutions you need. The speed you demand.

In the high-speed, higher-demand world of telecommunications, there are two certainties: you need it all, and you need it now. Fortunately, there's only one name you need to know – GE Fanuc Embedded Systems.

GE Fanuc Embedded Systems supplies the market's leading array of ultra high-speed networking, single board computers and switches – delivered as a fully customized solution that will keep you ahead of the game for years to come.

Learn more at www.gefanuc.com/embedded

VMICPCI-7806
Intel® Pentium M® CompactPCI Single Board Computer
- PICMG® 2.16 compliant
- Processor speeds up to 1.8 GHz
- Up to 1 GB DDR SDRAM
- 64-bit/66 MHz PCI-X PMC site
- 32-bit/33MHz PMC site
- Dual 10/100/1000 Ethernet interface
  - Software selectable (front or rear)
- Dual 16550-compatible serial ports
- Dual USB 2.0 ports
- Serial ATA interface
- Up to 1 GB Compact Flash
- PICMG® 2.9 Rev 1.5 IPMI compliant
- PICMG® 2.1 Rev 2.0 hot swap compliant

CP721
IBM® 440GX PowerPC® CompactPCI Server Blade
- PICMG® 2.16 compliant
- Processor speeds up to 800 MHz
- Up to 1 GB DDR memory
- 8 MB bootable flash
- Dual 64-bit/133MHz PCI-X PMC sites
- Dual 10/100/1000 Ethernet interface
  - Software selectable (front or rear)
  - Copper or Fiber front panel options
- Dual RS232 serial ports
- Up to 1 GB Compact Flash
- PICMG® 2.9 Rev 1.5 IPMI compliant
- PICMG® 2.1 Rev 2.0 hot swap compliant

CP920
CompactPCI Managed Gigabit Ethernet Switch
- PICMG® 2.16 compliant
- Layer 2/3/4 switching
- Twenty-four 10/100/1000 Ethernet ports
- PICMG® 2.9 Rev 1.5 IPMI compliant
- PICMG® 2.1 Rev 2.0 hot swap compliant
- 802.1p, 802.1Q VLAN, deep packet filtering, link aggregation, Rapid Spanning Tree (802.1w, 802.1d), broadcast storm control, port mirroring
- Conduction cooled model available
  - Twelve 10/100/1000 Ethernet ports

PMC696
Intelligent Dual Gigabit Ethernet PCI Mezzanine Card
- On-board high performance RISC processor
  - Up to 128 Mbytes of ECC DDR SDRAM
  - Dedicated TCP off-load engine
  - Built-in Ethernet failover capability
- 64 bit/66MHz PCI-X internal high speed bus
- Dual Gigabit Ethernet options
  - Fiber, 1000BaseFX
  - Copper, 10/100/1000BaseTX
- Trunking capabilities

FANUC

Embedded Systems

VMIC | RAMiX | Computer DYNAMICS

CompactPCI® and AdvancedTCA® Systems

AN OPENSYSTEMS PUBLICATION

Communications Group

- CompactPCI and AdvancedTCA Systems
- CompactPCI and AdvancedTCA Resource Guide
- CompactPCI and AdvancedTCA E-letter

Editorial Director Joe Pavlat
jpavlat@opensystems-publishing.com

Associate Editor Anne Fisher
afisher@opensystems-publishing.com

Senior Editor (columns) Terri Thorson
tthorson@opensystems-publishing.com

Technology Editor Curt Schwaderer
cschwaderer@opensystems-publishing.com

European Representative Hermann Strass
hstrass@opensystems-publishing.com

Art Director Steph Sweet

Senior Web Developer Konrad Witte

Graphic Specialist David Diomede

Circulation/Office Manager Phyllis Thompson
subscriptions@opensystems-publishing.com

OpenSystems Publishing

Editorial/Production office:
Fountain Oasis, Ste 203, 16872 E. Ave of the Fountains
Fountain Hills, AZ 85268
Tel: 480-967-5581 ■ Fax: 480-837-6466
Website: www.opensystems-publishing.com

Publishers John Black, Michael Hopper, Wayne Kristoff

Vice President Editorial Rosemary Kristoff

Embedded and Test & Analysis Group

Editorial Director Jerry Gipper
Editorial Director Don Dingee
Senior Technical Editor Mark David Barrera
Technical Editor Chad Lumsden
Special Projects Editor Bob Stasonis
European Representative Hermann Strass

Military & Aerospace Group

Group Editorial Director Chris Ciufo
Managing Editor Bonnie Crutcher
Assistant Editor Eli Shapiro
Senior Editor (columns) Terri Thorson
European Representative Hermann Strass
European Bureau Chief Stefan Baginski

ISSN #1098-7622 ONLINE ISSN #1550-0381
Publication Agreement Number: 40048627
Canada return address: WDS, Station A, PO Box 54, Windsor, ON N9A 615

CompactPCI and AdvancedTCA Systems is published nine times a year by OpenSystems Publishing LLC., 30233 Jefferson Ave., St. Clair Shores, MI 48082. Subscriptions are free, upon request in writing, to persons dealing with or considering *CompactPCI and AdvancedTCA Systems*. For others inside the US and Canada, subscriptions are $45/year. For 1st class delivery outside the US and Canada, subscriptions are $90/year (advance payment in US funds required).

POSTMASTER: Send address changes to *CompactPCI and AdvancedTCA Systems* Fountain Oasis, Ste 203, 16872 E. Ave of the Fountains, Fountain Hills, AZ 85268

AdvancedTCA at SUPERCOMM 2005

By Joe Pavlat
Editorial Director

CompactPCI & AdvancedTCA

Building upon last year's successful display and demonstration of AdvancedTCA equipment, PICMG members returned this year for a bigger and better presence in another PCI Industrial Computer Manufacturers Group (PICMG) sponsored booth at SUPERCOMM. Thirty-six PICMG member companies displayed a wide range of component, board, shelf, management, and software products compliant to the AdvancedTCA standard. A sophisticated set of demonstrations highlighted key platform features, including clustered computing, centralized management of multiple interconnected systems, scalability, interoperability, and raw computing power.

Last year the booth was packed with visitors who wanted their first glimpse at the then new platform, and they ranged from the merely curious to potential adopters wanting to judge the level of maturity of the standard. This year many serious and senior representatives from major telecom companies from around the world were asking difficult questions and interviewing vendors. The general consensus of vendors and potential adopters was that AdvancedTCA has arrived in a big way, is ready to move to full scale deployment, and will be very successful. Among notable announcements was Nortel's commitment to deploy production AdvancedTCA systems in 2006 across wide geographic areas. This adds to the number of major telecom equipment providers committing to the standard, a list that includes Alcatel, NEC, Siemens, and Huawei. Jay Gilbert, Intel Corporation, took the photo of PICMG's booth at SUPERCOMM 2005. (Figure 1).

Figure 1

Figure 2

AdvancedTCA equipment was not just being demonstrated in the PICMG booth, but seemed to be everywhere. Intel devoted its large booth mainly to AdvancedTCA, displaying dozens of fully functional systems and boards from a wide range of suppliers. The sheer number of people in the booth often made it difficult to get close to the exhibits, and everyone was very busy. Motorola's booth and its AdvancedTCA gear generated great interest, as did other booths showing compliant products including Diversified Technology, Continuous Computing, Performance Technologies, Kontron, RadiSys, Telco Systems, Carlo Gavazzi Computing Solutions, Rittal, AudioCodes, SBS Technologies, Elma Electronic, and Artesyn.

Show attendees got their first real look at products compliant with the new Advanced Mezzanine Card (AMC) standard, with SBS Technologies, alone announcing eight new products available immediately. Many more AMC modules were seen in AdvancedTCA shelves scattered throughout the show.

Two other significant PICMG-related events occurred at SUPERCOMM. One, members of the PICMG committee developing the MicroTCA specification gave an impressive first demonstration of prototype MicroTCA systems. Many PICMG MicroTCA Committee participants collaborated to bring these prototypes to life in the PICMG booth, garnering a high level of interest. MicroTCA is a specification under development that defines the use of AMC modules plugged directly into a backplane to create small, inexpensive but very powerful managed, fabric-based systems (see the May 2005 *CompactPCI and AdvancedTCA Systems,* Technology Update column). Figure 2, courtesy of Kim Anderberg, Artesyn, shows a MicroTCA prototype.

Another important event was the announcement of the formal launch of the Mountain View Alliance (MVA). MVA's charter is to coordinate the activities of key consortia and standards bodies to coordinate and integrate major open standards in the hardware, middleware, and operating system worlds. MVA will focus initially on the communications market. Its main objective is to ensure important open standards are harmonized and that gaps and overlaps are identified and eliminated. The goal is for customers to be able to obtain highly integrated platforms that are application ready, eliminating as much low-level integration as possible. The first three members are PICMG (www.picmg.org), the Network Processing Forum (www.npforum.org), and the Service Availability Forum (www.saforum.org). Other organizations are expected to join the Alliance in the near future.

Joe Pavlat
Editorial Director

By Rosemary Kristoff
Vice President Editorial
CompactPCI & AdvancedTCA

The last SUPERCOMM

The AdvancedTCA community should be excited and energized by the activities that took place during SUPERCOMM 2005. The mood was definitely "adoption" rather than "education" this year. Here is a quick look at some of the event's note-worthy happenings. (See the Editor's Foreword in this issue for more SUPERCOMM highlights.) Figure 1 shows the PCI Industrial Computer Manufacturers Group (PICMG) banner at SUPERCOMM. Among the show's many attendees were (Figure 2) Elma's Jennifer Li.

For those examining AdvancedTCA, SUPERCOMM 2005 provided plenty of visibility. In-Stat and PICMG produced a full-day AdvancedTCA Forum. Rob Davidson, PICMG VP of Marketing, hosted the luncheon keynote speeches. Anthony Ambrose, GM of the Marketing and Platform Programs at Intel, quoted major customers, among them Alcatel and Nortel, as embracing the concept of industry standard modular platforms such as AdvancedTCA. Philip McKinney, VP and CTO for the Communication, Media & Entertainment sector of HP, compared what the AdvancedTCA community promised at SUPERCOMM 2004 to what was delivered. Slides for both keynotes and the presentations by other sponsors are available on the In-Stat website (www.instat.com/events/atca).

A media event sponsored by the International Engineering Consortium further drove home the message that customers are demanding open systems. Matt Bross, the CTO of British Telecom (BT) ardently related BT's plans for transforming their current myriad of networks to a next generation converged communication network. This new network is expected to save BT approximately 1.5 billion EURO (1.8 billion dollars) per year. Tagged the 21st Century Network (21CN) program, BT has named eight preferred suppliers to complete this $20 million transformation, working with BT in five strategic domains:

- Linking BT's existing access network with 21CN
- Routing and signaling for 21CN voice, data, and video services
- Connecting metro nodes
- i-node: Providing the intelligence that controls the domain
- Supplying the optical electronics to convert the signals carried over cables connecting the metro and node cores

Figure 1

In narrowing the group of partners to eight, BT looked carefully at whether the supplier was willing to embrace open standards.

TelecomNEXT and GLOBALCOMM

2005 marks the last year for the Telecommunications Industry Association (TIA) and the United States Telecom Association (USTA) to jointly sponsor SUPERCOMM. Starting in 2006 USTA will sponsor a new show, TelecomNEXT, moving to the Mandalay Bay Resort and Convention Center in Las Vegas, NV. The USTA membership represents service providers and suppliers from the wireline, wireless, and cable markets. USTA's members spend over $30 billion a year in capital equipment.

TIA's members are the Information and Communications Technology (ICT) suppliers. As a leading trade organization with more than 600 members, TIA focuses on industry-backed standards development as well as the advocacy of domestic and international public policy such as network security, reliability, and interoperability. In addition, TIA conducts market reviews and analysis for the ICT industry. They will sponsor the new show GLOBALCOMM in 2006, which will be located in the same Chicago venue, and in the same June timeframe as SUPERCOMM.

Although I'll miss SUPERCOMM, I look forward to attending the new events and observing the continuing momentum that AdvancedTCA is enjoying.

Rosemary Kristoff

Rosemary Kristoff
Vice President Editorial

Figure 2

3U CompactPCI Board based on Intel® Pentium® M Processor with 855GME Chipset

TThe cPCI-3840 is a 3U CompactPCI 1.6GHz Pentium® M processor board. Combined with embedded chipsets 855GME and 6300ESB, the cPCI-3840 offers up to 2GB DDR 333 memory with XVGA and flat panel graphics, dual Gigabit Ethernet ports and several I/O features. It delivers higher computing power but at low-power consumption. The cPCI-3840 is specially designed for industrial automation and control system applications.

For more info, go to:
www.adlinktech.com/products

6U CompactPCI Highly Integrated Pentium® M Processor PCI-X Universal Blade

The cPCI-6840 is a 6U cPCI Pentium® M/Celeron® M SBC with 855GME and 6300ESB long-life embedded chipset. It complies with PICMG 2.16, 2.9, and 2.1 hot-swappable specifications. It supports up to 2GB DDR and its rich I/O features include three GbE ports, AGP graphics, four USB 2.0, two UART, two IDE, two Serial ATA ports, and a watchdog timer. The local PCI-X bus is optimized for maximum bandwidth and includes two 64-bit/66MHz PMC sites, dual GbE ports for 2.16, and PCI-X on a universal cPCI bus. Working with the cPCI-R6840 rear I/O module, the cPCI-6840 provides CompactFlash storage, S-ATA, optional SCSI over PMC rear I/O, and optional LVDS graphics.

For more info, go to:
www.adlinktech.com/products

2U Rackmount Chassis with 1U ATX Power Supply

The cPCIS-6230R/64 is a 2U-height three-slot CompactPCI chassis. It is equipped with a PICMG 2.1 hot-swap compliant 64-bit 6U CompactPCI backplane with P3 and P5 rear I/O. It supports one dual-slot system board and two peripheral slots. The cPCIS-6230R/64 also features a built-in 300W AC-input power supply, slim type EIDE CD-ROM, floppy drive, and internal space for drive bays for one 2.5" HDD and one 3.5" HDD.

For more info, go to:
www.adlinktech.com/products

2-CH 65MS/s 14-Bit Digitizer with SDRAM

ADLINK's PXI-9820 is a 65 MS/s, high-resolution PXI digitizer with 512MB SODIMM SDRAM memory. It features flexible input configurations including programmable input ranges and user selectable input impedance. With lots of on-board acquisition memory, the PXI-9820 can record waveforms for a long period of time. The PXI-9820 is ideal for high-swaveform capturing, software radio applications, and signal digitizing applications which requirpeed e ample memory.

For more info, go to:
www.adlinktech.com/products

Single or Dual Xeon® Processors up to 3.67GHz

The ATCA-6890's other extensive features include:

- One or Two Xeon® and next generation Xeon® processors, up to 3.67GHz
- Intel® E7520 and 6300ESB ICH Chipsets, 800MHz FSB
- Four DDR II-400 240-pin DIMMs, 16GB memory max.
- Two PMC slots with PCI-X bus and one supports Jn4/Pn4 to RTM
- 6 Gigabit Ethernet Data Ports: 4 Fabric Interface and 2 Base Interface
- One 10/100/1000Mbit management port (front panel)
- ATI RageXL Video

Contact us toll-free at 1-866-4-ADLINK or Email info@adlinktech.com

Intel® Communications Alliance Associate Member SILVER

PICMG

ADLINK TECHNOLOGY INC.

www.adlinktech.com

Flying without turbulence

By Hermann Strass

CompactPCI & AdvancedTCA

CompactPCI powers weather research advances

Pod is a term that describes round, long things. An example is a container hanging under the wings of an airplane, housing a jet engine. A helipod is similar in shape but hangs underneath a helicopter and houses scientific instruments, electronic control equipment, and a computer system. The helipod was developed by the Institute for Air and Space Systems (ILR) at the Technical University (TU) Carolo-Wilhelmina of Braunschweig, Germany, which has a long history of scientific aerospace research.

The helipod is an autonomous system with its own battery power supply, navigation system (Global Positioning System), computer system (CompactPCI), and storage. Used for novel ways of weather research, the helipod has produced some new and interesting results.

The helipod is the most advanced airborne system to measure atmospheric turbulence. It has been used in the Arctic waters, in California, Germany, and other places. Turbulence measurements can be done on the ground or onboard aircraft. This area is of great importance to weather development in the Northern Hemisphere. This airborne method is very expensive and it falsifies the measurement by introducing its own turbulence into the measured values. The helipod is 5 m (approximately 16 feet) long, 60 cm (about 2 feet) in diameter and weighs 250 kg (about 550 pounds), and is carried by a helicopter using a rope approximately 15 m (50 feet) long. At a speed of more than 40 meters per second (144 kilometers per hour, about 90 mph), the helipod is outside the downwash area of the helicopter rotor blades. The helipod's position enables it to measure the natural air turbulence. When used with two measurement systems, coarse and fine, along with some sophisticated algorithms, helipod measurements are more accurate than those using any other method. Table 1 shows some accuracy parameters. In Figure 1 a helipod heads off for turbulence, temperature, moisture, and CO2 measurements over the Arctic Sea. Figure 2 shows the rope being let out of the way of the rotor blades. (Photos courtesy TU Braunschweig.)

Parameter	Absolute	Relative (metric)	Relative (US approximate)
Temperature	0.2 K	0.01 K	0.018 °F
Humidity	1%	0.01 g/kg	0.00016 oz/lb.
Air velocity	0.3 ms^{-1}	0.01 … 0.1 ms^{-1}	0.003 … 0.03 ft/s
Height	0.7 m	0.3 m (radar) 0.01 m (barometric)	12 in. (radar) 4 in. (barometric)
CO2	2 x 10^{-6}	0.5 x 10^{-6}	0.5 PPM

Table 1

Figure 1

Figure 2

Measurements are taken as close as every 8 cm (about every 3 inches) and on different height levels for a high-definition three-dimensional profile.

Surprising results

The high degree of heterogenity of the air up to high altitudes above ground proved surprising. So far scientists have assumed that at heights greater than 300 meters to 500 meters (approximately 950 feet to 1,590 feet) the air above different ground areas (such as forest, lake, ice, and grassland) should be completely mixed. The helipod measurements revealed that the air above discrete ground environments also differs even at much higher altitudes. Computer models for local weather forecast computations had to be changed considerably.

The helipod does not need approval by the authorities, (Federal Aviation Administration) because it is passive. It can be easily disassembled for transport, reassembled onboard a ship or at some other location, and then lifted by a helicopter for immediate measurement activities. The first versions were flown in 1994, which means the team at the ILR has more than ten years' of experience in high-precision atmospheric turbulence, temperature, and humidity measurements.

The operation of the helipod is controlled by two CompactPCI cards, six M-Modules from MEN (Germany), and one ARINC M-Module from AcQ (The Netherlands). Important criteria included a wide operating temperature range from -40 °C (arctic) to +85 °C (desert), and low power consumption of 8 W using a PowerPC processor (MPC8245) on a 6U CompactPCI board. The M-Modules were:

- One M66 (32 DIOs)
- Four M36 (32 differential channels of 16-bit A/D)
- One M34 (16 SE channels of 12-bit A/D)
- One ARINC M-Module

The M-Modules were mounted on the D03 CPU board and on the D301 carrier board, both 6U CompactPCI boards from MEN.

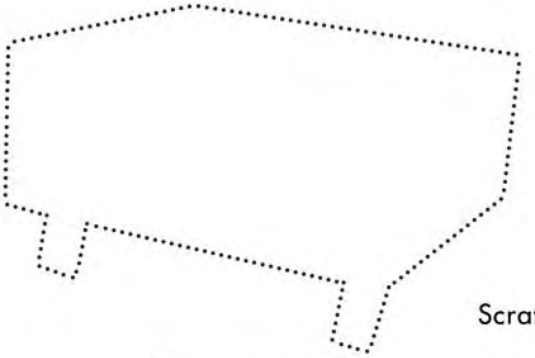
The ILR chose the real-time Linux operating system ELINOS from Sysgo (Germany) supplied by MEN. A few modifications were required for this highly specialized application. Adapting the real-time operating system was no problem since ELINOS is an open source Linux system.

With only two CompactPCI cards, the ILR was able to build and operate a highly complex and accurate measurement system from standardized, cost-effective components, which is usable in harsh environments.

European events

Hannover Fair held in Germany chose Russia as the partner country. Russian industry presented itself in Hall 13 at the fairground. The Russian economy indicated a healthy growth rate of 7.1 percent in 2004. Multibillion-EURO European contracts were inked at the Hannover Fair, which was opened by German Chancellor Gerhard Schroeder and Russian President Vladimir Putin. For more information on Hannover Fair 2005, see the June 2005 issue of *VMEbus Systems*, VMEbus Technology in Europe column (available online at www.vmebus-systems.com.

Voxbit (Germany) organized the RapidIO Developer Summit at the Siemens Conference Center in Munich, Germany on May 31, 2005. Hosted by the RapidIO Trade Association, the Developer Summit



Scratch

Standard Elma
Type 32 Enclosure

Customized Elma
Type 32 Enclosure

You don't need to start from scratch

Why start from square one when you can customize your enclosure from Elma's standard line of modular platforms? Use Elma's 40 years of expertise to build your exact configuration quicker, better, and more cost-effectively.

Elma has the largest inventory of standard parts and components in the U.S. And a knowledgeable technical support specialist will help you pick out exactly what you need.

So if you're looking for attractive quality enclosures but have a tight deadline, come to Elma. Our standard - or semi-custom -- enclosures are right at your fingertips. No waiting! No tool-up! No kidding!

ELMA
Your Solution Partner

Phone: 510.656.0606 Fax: 510.656.8008 E-Mail: sales@elma.com Web: www.elma.com

RSC# 14 @www.compactpci-systems.com/rsc

Handles

- Industry's largest selection of handle styles
- Classic, ergonomic, telco and long-telco styles
- Strongest latching button
- Patented alignment pin

Panels

- Blue LEDs meet IEEE 1101.10 hot-swap specifications
- Surface mount LEDs designed for IEEE front panels
- Switches and test jacks designed for IEEE front panels

took place as a one day seminar similar to events in the USA. A big emphasis was given to High Availability (HA) issues as defined by the Service Availability Forum (SA Forum). AdvancedTCA and ideas for the SA Forum started at Siemens in response to their requirement for carrier grade, open standard telecom products and systems. Werner Kammerer, formerly at Siemens and now CEO of Voxbit, and Iain Scott, Executive Director of the RapidIO Trade Association, opened the conference, which included application, technology, product, and vendor presentations. RapidIO is an international standard (ISO/IEC 18372).

European products

ESO Technologies (France) offers HA computing platform design integration services for OEMs as defined by the SA Forum. AdvancedTCA hardware from partners and Carrier Grade Linux (CGL) are offered as integrated solutions (preconfigured HA systems) according to customer requirements. ESO Technologies also offers an automated AdvancedTCA testing software suite called AdvancedTCA-Tester.

Fastwel (Russia) is ISO9001 certified by TUV Rheinland. They offer 3U and 6U CompactPCI CPU cards, optionally for extended temperature range (-40 °C to +85 °C) with 1.6 GHz Pentium. Fastwel is a contract manufacturer, system integrator (for example, industrial automation and space applications), and they do custom design.

Fujitsu Siemens Computers (FSC) (Germany) signed a worldwide agreement with IBM, allowing IBM the use of the SAFE4CS software infrastructure from FSC for telecom services. Both companies will now work together to offer server and middleware solutions to Telecom Equipment Manufacturers (TEMs). IBM integrates SAFE4CS from FSC into their Integrated Platform-Telecom (IP-T), including Blade CenterT, to make it into a turnkey system offering for their telecom customers and service providers. FSC demonstrated SAFE4CS at SUPERCOMM 2005 held in Chicago.

PICMG Europe news

The PCI Industrial Computer Manufacturers Group (PICMG) released new protocol encapsulation specifications for AdvancedTCA systems. Specifications SFP.0 and SFP.1 enable legacy protocols on PICMG 3.1 Ethernet and other transports over AdvancedTCA backplanes.

The PICMG executive membership approved two new protocol specifications that will allow applications that use legacy transport protocols to be easily ported to AdvancedTCA systems. By encapsulating these protocols on AdvancedTCA interconnects, they appear to be running over a direct connection.

SFP.0 is a protocol specification for low-overhead, high-speed generic encapsulation targeted at PICMG 3.1 Ethernet-based modular systems, but also applies to other PICMG 3.x and 2.16 fabric-based systems and all kinds of packet- and cell-based traffic, for example, TDM and ATM for transport on a switched fabric.

SFP.1, also known as Internal TDM (I-TDM), is a companion protocol specification to SFP.0 that is optimized for TDM traffic over high-speed fabrics such as 1 and 10 Gigabit Ethernet (PICMG 3.1), Advanced Switching (PICMG 3.4), and InfiniBand (PICMG 3.2).

SFP.1 and SFP.0 together provide a complete encapsulation for TDM over Ethernet. This provides a functional replacement to the hardware-based H.110 and H.100 buses that existed in older telephony systems.

For more information, contact Hermann at hstrass@opensystems-publishing.com.

Websites of interest:

- www.acq.nl
- www.eso-tech.com
- www.fastwel.com
- www.fujitsu-siemens.de
- www.helipod.de
- www.menmicro.com
- www.picmg.org
- www.rapidio.org
- www.saforum.org

Hewlett-Packard launches open platform, software, and services program

By Curt Schwaderer

The AdvancedTCA and Service Availability Forum (SA Forum) high availability middleware specifications are shaping up as a powerful one-two punch towards providing open architecture carrier grade solutions for service provider deployment. In-Stat/MDR estimates that approximately $15.7 billion worth of AdvancedTCA equipment will ship in 2008. All the top tier network equipment manufacturers are now behind AdvancedTCA as the standard that will enable open systems to dominate network equipment in the coming year. Hewlett-Packard (HP) is an IT company with a significant influence in shaping the future of communications platforms and services with more than 25 years of experience in voice and data networks. Also, HP has been an active member of the SA Forum for more than a year. Last fall, HP announced a program to deliver complete, integrated AdvancedTCA-based platforms to network and service providers. Recently, I had the opportunity to speak with Tim Leigh, leader of the Advanced Open Telecom Platform (AOTP) initiative, and Joy King, director of industry marketing, to discuss HP's AOTP strategy, development, and differentiation.

Network manufacturers face common issues

HP has been working with top tier network equipment manufacturers and service providers worldwide in order to develop its strategy. The most common issues raised are:

Cost of goods
Network systems have traditionally been big iron, proprietary systems. As a result, network manufacturers must carry in-house core competency in every aspect of the product, from the chips, boards, and software to mechanical engineering for chassis, power supplies, and other aspects of these systems. This results in systems that are longer in development and more expensive to buy. In many cases, these problems also hamper development of new services, which is the true revenue generator for these systems.

Operational expense
Network service providers build networks with multiple proprietary systems from multiple companies. This makes the operating expense of these systems prohibitive. Buying and storing spares and competency to understand the provisioning, management, and maintenance of these systems within a given network is expensive. It also makes it difficult to hire and keep the number of people it takes to properly operate and maintain these multiple pieces of equipment.

Life-cycle management
Availability of components, management, and maintenance of software releases and upgrades put High Availability (HA) at risk and cost network providers time and money to manage parts availability and upgrades of their systems. Many components in proprietary systems are low volume and as a result, at risk to become obsolete by the manufacturer with no compatible second source. This causes network equipment manufacturers and service providers alike to carry larger than needed inventories. In some cases, a redesign is required to eliminate the obsolete component.

HP's stated strategy is to leverage modular, standards-based technologies, enhance them to meet the stringent requirements of telecom operating environments, and build them into the heart of voice, data, and media networks. The goal is to meld standards-based platforms and middleware with HP network management and control plane software products and wrap the solution with a variety of compliance, service, and maintenance services to provide a solution that significantly reduces cost of goods, lowers operational expense, and offloads life-cycle management responsibility for network and service providers.

The AOTP program is more than an AdvancedTCA and middleware strategy. It addresses the platform, software, application, and services. Tim Leigh describes today's networking requirements shown in Figure 1. The left side of the figure

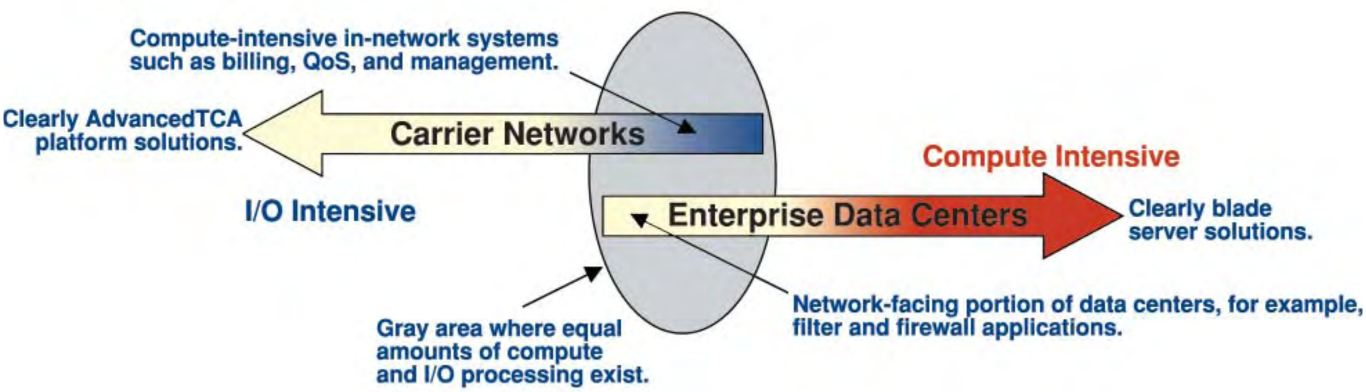


Figure 1

What can you say about Convergence in a Box?

How about Wow.

Features

- Scalable from 4 to 256 Low Speed Links
- Supports SS7 HSL and ATM T1/E1
- Hardware configurations from 1U simplex to 4U High Availability
- High density and redundancy from a single point code
- SIGTRAN support M2PA, M2UA, M3UA and SUA and SS7 InterWorking
- Common hardware platform with easy management software
- Gateways upgradable without having to change the application

Adax Signaling Gateway

Adax, the company you've come to trust to deliver high-performance signaling solutions across broadband, narrowband, and IP networks, now offers even greater choice. The Adax Signaling Gateway supports SS7/IP switching, routing, tunneling, and backhaul. Fully redundant options with no single point of failure are available today. These products enable a simple and straightforward migration of existing SS7 nodes to IP transport, saving the costs associated with leasing or provisioning dedicated long haul SS7 circuits. The same solution meets the new demands for IP signaling and SS7/IP interworking in converging IP, circuit, and wireless networks.

Building Blocks — Integrated Blades — Complete Gateways

You decide.™

adax inc 510-548-7047 sales@adax.com www.adax.com
adax europe ltd +44 (0) 118 952 2800 sales@adax.co.uk

adax

represents the purely I/O and packet processing end of carrier networks. The right side of the figure represents the application processing end of the enterprise network. In today's business and commercial network environment, these two once-disparate entities are combining into a continuum of customer applications and the networks that deliver these services.

Of course the packet processing part of the carrier networks is the primary target for AdvancedTCA systems, although the AdvancedTCA architecture is such that it allows for some number of application blades in the system. In addition to web services, commercial and business application software at the heart of the data center are the main target for blade server solutions with high powered compute processors and plenty of fast storage.

However, Tim describes a gray area between the two, where carrier network services such as billing, quality of service, and call control applications require a significant amount of compute power in a packet I/O-centric environment. Likewise, the data center interface to the external network is a place where network facing applications such as filtering, firewalling, and encryption require high amounts of packet I/O capability. HP has responded to this topology with a ubiquitous set of software across AdvancedTCA and blade server platforms. This approach enables AdvancedTCA systems to venture seamlessly into the compute space and the HP ProLiant blade server products to move into the packet processing space, depending on network requirements.

The HP AOTP architecture

The HP AOTP architecture addresses processors, platforms, and a unified software environment. Figure 2 shows the HP AOTP architecture.

As Figure 2 illustrates, the bottom two rows of the architecture focus on the hardware aspects of the platform – processors and rack-mount boxes and blades, with the architecture's top three rows providing the software solution. The overall architecture enables one software foundation to run seamlessly across both carrier and blade server platforms.

The main Intel architecture AdvancedTCA blades Tim mentioned were the Xeon 32-bit and Itanium 64-bit blades, which are also available for the ProLiant blade server platforms. However, when asked about network processor blades for more complex packet processing operations, Tim said this was an important part of the strategy and they would be making use of third party and internally developed Network Processor Unit (NPU) blades, especially in the AdvancedTCA systems.

The lowest layer of the software in the AOTP architecture is the operating system. The architecture uses Carrier Grade Linux (CGL) as the base operating system for AOTP. Red Hat, SuSe, and Debian Linux will all be available for the AOTP platform.

The next highest layer above the operating system consists of three blocks that include HA middleware, common services, and telecom protocols. Third-party partners supply the HA middleware component. HP will integrate the HA middleware into the AOTP architecture and is actively participating in the standardization efforts of the SA Forum for the HA middleware components. The company believes that as long as the standardization process is successful, integrating third-party capabilities here makes sense.

The common services and telecom protocols blocks include the full portfolio of the HP OpenCall network software, which includes SS7, SIGTRAN, and SIP signaling protocols. Additionally, the HP Digital Media Platform enables a variety of media delivery services. HP states that they have a 60 percent market share in SS7. In addition, 70 percent of the world's Short Message Service traffic is processed by HP OpenCall. HP's billing engine also benchmarks at 319,000 invoices per hour – one of the fastest billing engines around.

Network management includes the HP OpenView network and service management suite. HP will tailor the comprehensive network management solution to take advantage of SA Forum HA services as they become available. The hardware platform management capabilities use Intelligent Platform Management Interface platform management services, a familiar part of CompactPCI and AdvancedTCA carrier grade equipment.

The AOTP program wraps services and support around the architecture. Available services include:

- Product life cycle and supply chain management
- Consulting and integration services
- Worldwide support
- Maintenance capabilities

HP supports some impressive numbers when it comes to consulting, integration services, and customer support. HP has a specific telecommunications consulting practice qualified to participate at any stage of the development cycle. HP is the largest IT customer support organization in the world. Together, the consulting and support organizations span 160 countries with 24x7 access to 65,000 HP service professionals and 70,000 partners. The only company that can rival HP's numbers in the services and support area is IBM. But to this point, IBM's focus appears to be on the enterprise and blade server platforms.

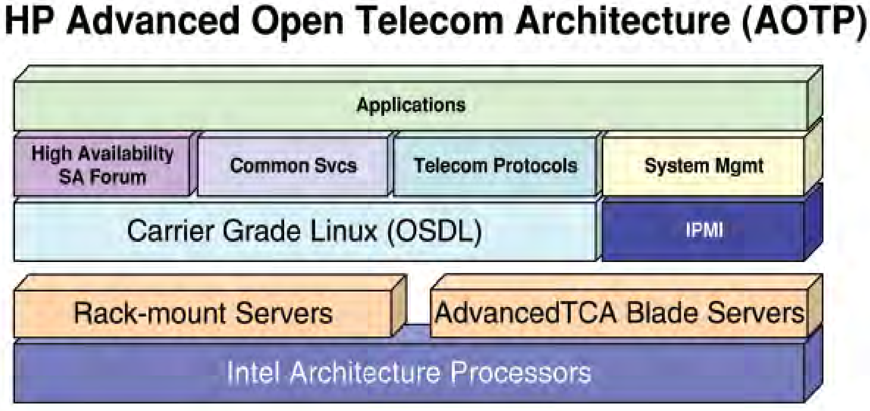


Figure 2

The gray area

One of the interesting development challenges is the offered solution set for the gray area capabilities identified in Figure 1. The *gray area* encompasses a unique mix of high speed packet I/O, yet requires flexible support for complex packet processing capabilities that vary over time and between customers. So, how does HP use the AOTP platform and its services organization to provide this gray area *missing link* for each customer?

Network processors are a great solution for the gray area problem, and network processor based blades are one likely option to address this area. But how can AOTP provide customer-specific customization for the gray area functionality quickly and flexibly? The NPU blade needs to have a *one-size-fits-all* body of data plane processing microcode that can be easily customized. Since microcode lives in a highly parallel environment (multiple compute engines, multiple threads), it is a high risk item to change and update often without risking the validated reliability of the system.

One interesting solution is IP Fabrics' Packet Processing Language (see January 2005 *CompactPCI and AdvancedTCA Systems,* Software Corner column). The IP Fabrics Packet Processing Language (PPL) Virtual Machine (VM) seems like a good fit for this type of application. Incorporating a packet processing VM into an AOTP NPU blade provides the one-size-fits-all data plane processing block that maintains the validation of the software at the data plane. HP services could then write high-level programs that control the VM for a variety of applications, allowing AOTP to flexibly adapt to gray area requirements on a customer-by-customer basis.

The implications may even go beyond the flexible gray area functions. An AOTP NPU blade may also have synergy with HP OpenView and OpenCall. The PPL VM gives control and management plane software insight into the data plane that has not existed before. Gathering statistics and reporting failures inside the data plane itself could be a compelling and significant next step capability for HP OpenView. The OpenCall software could potentially interface directly into PPL programs and provide more detailed quality of service capabilities along with the call control protocols currently available.

Important standards, components, and partners

Over the past few years, HP has embraced many of the open systems industry and corporate standardization activities relating to carrier grade equipment. Among these standards are AdvancedTCA, SA Forum, and the Intel Communications Alliance.

The AdvancedTCA standard provides the hardware form factor foundation for the HP open platform environment. HP believes the combination of AdvancedTCA's open architecture coupled with the ProLiant blade server platforms will provide a robust end-to-end system solution for HA multimedia network and application servers.

HP is an active member of the SA Forum, doing much of the pioneering work for development of the services and Application Programming Interfaces

(APIs) in the organization. Not only is HP helping drive these standards, but also plans to integrate the APIs with HP signaling and network management software products. If HP does find an innovative way for the OpenCall and OpenView environments to take advantage of the HA middleware initiatives of the SA Forum, it will lend significant credibility to the SA Forum's work.

> If HP does find an innovative way for the OpenCall and OpenView environments to take advantage of the HA middleware initiatives of the SA Forum, it will lend significant credibility to the SA Forum's work.

Intel is a very important partner for HP at a variety of levels. Intel Xeon and Itanium processors are one key ingredient to HP blades in the AOTP platform solution. HP is also a premier member of the Intel Communications Alliance. HP and Intel also have jointly operated *solution centers*. These solution centers work with customers to develop advanced service solutions and/or adapt existing solutions to meet specific customer requirements based on Intel and HP technologies.

Among other HP partners for AOTP are Linux providers Red Hat, SuSe, Debian, and Linux. GoAhead, Clovis, and Fujitsu/Siemens are also listed by HP among important partnerships for AOTP.

Product and deployment timeline

The AOTP concept originated about two years ago as network equipment manufacturers began to make the shift to hardware platforms in AdvancedTCA and off-the-shelf components. Tim thinks the momentum behind AdvancedTCA open system solutions is accelerating, and deployments will continue to increase through 2006 and achieve a critical mass of deployed, operational systems in 2007.

Proprietary HA and middleware components are more difficult to transfer over to open systems. It is typically a key interface for network equipment providers. Moving to a more standards-based approach requires updating/modularization and sifting through code for where the right APIs belong and how to incorporate the standards-based middleware underneath. But in the long run, manufacturers are anxious to move to this software paradigm as quickly as possible in order to increase reliability and the availability of *reliability-conscious applications.*

The base AOTP product is scheduled for the first quarter of 2006 with enhanced middleware, increased number of available blades, and higher levels of integration throughout the year.

Summary

HP's end-to-end AOTP network architecture targets the entire spectrum of products such as New Equipment Building Systems/Network Equipment Building Standards (NEBS), compliant Radio Network Controller (RNC) platforms, and software and Home Location Register (HLR) applications on the carrier side to ProLiant blade servers for business critical applications using Xeon and Itanium processor blades. HP's AOTP architecture investment positions the company to gain significant market share in an overall network and service provider platform, software, services, and applications industry worth about $225 billion.

For further information, contact Curt by e-mail at cschwaderer@opensystems-publishing.com.

For more information on the HP AOTP program, visit:

http://h20223.www2.hp.com/NonStopComputing/cache/11661-0-0-225-121.aspx

http://h71028.www7.hp.com/enterprise/downloads/5983-0979EN_rev_NEPS_Carrier-Grade%20Systems%2002-15-05.pdf

http://h20208.www2.hp.com/opencall/news/press/ocpr_1004_01.jsp

http://h71028.www7.hp.com/enterprise/html/4447-0-0-0-121.html

HMP delivers more options for AdvancedTCA and CompactPCI

By Ian Colville

Having read the title of this column you may well be asking, "What is HMP?" A brief search on the Internet might find such items as "Her Majesty's Prisons," "host monitoring protocol," the "Haughton-Mars Project," or even "head mounted projector." But more interestingly, you will find Host Media Processing (HMP), which will be discussed here. We will define what it is and address some of the relevant trends and issues, covering the who, why, when, where, and how surrounding the use and deployment of HMP in the Computer Telephony (CT) industry. A case study is included.

So what is HMP?

HMP describes software media processing resource functions that are identical to the more familiar term of Digital Signal Processing (DSP) resources. These are ubiquitously playback, record, Dual Tone Multi-Frequency (DTMF) tone detection, and others, the essential media processing operations required for applications such as Interactive Voice Response (IVR) and media server platforms.

A key difference lies in where these resources run, namely on a server's host processor rather than on DSPs on dedicated CT cards. So HMP resources are designed to perform the same tasks as DSP-based resources, but on Standard High Volume Processors (SHVP) alongside the application, instead of on specialized DSP hardware.

HMP has become viable due to recent availability of PCs with the processing capability to deal with resource functions previously only executable on specialized boards packed with DSPs. The rapid increase in processing power now means the host processor in a PC chassis can do the telephony work such as playing prompts or announcements, or recording messages.

A further distinction is that HMP is designed to operate in an all-IP environment. No dedicated telephony hardware is required to connect to the telecommunications network. Developers use the host Network Interface Card (NIC) to connect to the LAN. As more voice traffic travels over Session Initiation Protocol (SIP)-based IP networks this approach seems entirely appropriate. It makes sense, especially when one considers that a key desire for purveyors of existing applications is readily repositioning their products onto an alternative, IP-based platform, and leveraging those successful applications into new markets.

Where and when is HMP used, and by whom?

A variety of competitive offerings enrich the host media processing market, with HMP available as a core technology building block to developers who create their own applications and product solutions.

Initially, developers saw HMP as an ideal means of targeting the Small-to-Medium Enterprises (SME) market, where price sensitivity has always been a key issue and often a barrier to the adoption of new technology applications. With the increase in the use of broadband technologies such as Digital Subscriber Line and cable enabling an IP telephony alternative to analog lines or fractional ISDN services, SMEs could take advantage of applications that were previously designed for minimum E1/T1 scale channel counts. The relatively low number of IP media sessions that a host processor could support matched the scale needed by a small business. Also, the fact that HMP is software based, requiring no dedicated telephony boards, enabled the right price points.

As HMP has become more mature and processor power continues to rise, the number of media sessions a host can practically run, while also handling the co-existent application, has increased. This has led to higher headline *channel counts* being offered.

Therefore, HMP is now being proposed for use in both small and large enterprise applications. Figure 1 depicts an auto-attendant example. IVR, auto attendant, voice mail, unified messaging, speech, or conferencing services can be provided within an IP PBX or in an enterprise IP media server. Additionally, an HMP-based media server can implement IVR, announcements, voice mail/messaging, speech, or conferencing applications in service provider platforms.

For telco environments, solutions based on HMP can be offered on rack-mount

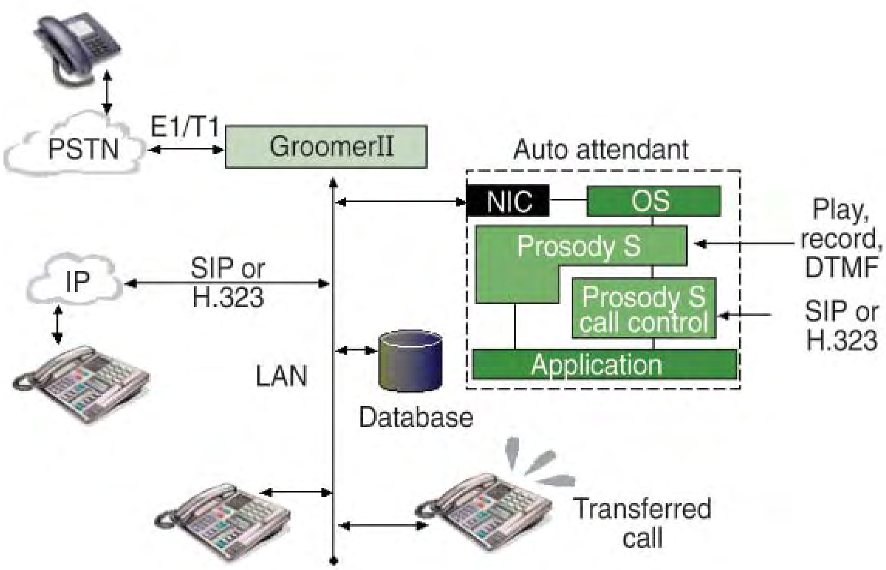


Figure 1

servers that are NEBS compliant and SBC-based, or on blade server configurations with multiple blades. These systems are typically scaled from one to four processors and are designed to replace DSP resource boards normally used for media processing.

Systems integrators should certainly consider this model for developing cost effective, tailored voice application platforms using HMP.

Why HMP software: The benefits for developers of CT solutions

Since HMP is a software only product, it can be installed and upgraded as easily as any other software. It is typically offered under a software license using an industry standard method involving either a hardware dongle or MAC address to lock the software to a particular computer. In this case HMP is licensed in bundles, that is, combinations of selected media functions and a number of licensed media channels.

For early product modeling the necessary investment in DSP hardware is often a barrier to many *would be* application developers. With HMP no such investment is required – a general purpose PC platform with a NIC is all that is needed to get started. Beyond that of course, the basic premise of HMP, in that it is a lower cost alternative, takes over when solutions are sold and successfully implemented.

Furthermore, new entrants will be pleased to find that they no longer require extensive telephony hardware expertise. Therefore another barrier to market entry for new developers is lowered.

New products can be easily scaled and offered at value for money price points due to the availability of software bundles based on numbers of channels or media sessions. Additionally, operational costs are likely to be considerably lower with a software only product that can be readily scaled and upgraded.

How is HMP implemented and what are the issues?

Anyone considering HMP as an alternative should properly weigh the options for each individual solution they choose to deploy. Let's look at some key aspects of an HMP implementation.

The choice of host processor is an important one. Processing power (and available memory) will obviously impact how many channels or media sessions can be handled. The CPU needs to do all the media processing work such as speech compression, recording, and tone detection, as well as run the application.

The challenge here is that the host processor may have some other jobs in addition to its telephony and speech processing work. Is it acceptable to have high density, mission critical speech applications handled by the same processor that has to oversee mouse movements and power management for peripherals? If the answer is no, then using DSP hardware may be the better option as they are totally deterministic. You can be sure of the performance they will yield under a given set of conditions.

On the other hand, why pay for DSP technology when an SHVP will easily look after the number of channels needed for a midsize enterprise IVR system? A rule of thumb here, and one that developers must test for their own configuration, is that there should be at least 50 percent of CPU usage remaining, on average, to run their application. As some processes are obviously peaky, it may be necessary to accept less than 100 percent channel capacity on occasion. This is not always an issue as IVR systems are often optimized to serve a larger number of users than channels available.

If an application uses resource hungry software such as Automatic Speech Recognition (ASR) or Text-To-Speech (TTS), it may be asking too much of the processor to perform the telephony and the ASR/TTS simultaneously. Large deployments of speech technologies such as ASR and TTS are often implemented in multiple servers in a client-server environment. Hence, this may not be an issue with HMP installed only in a client machine, for example.

Coders, decoders (CODECs), which are used to compress and reconstitute speech, are prime users of processing power. Compression means less bandwidth is taken up on the IP link, but it can also consume significant processing power.

G.711 is plain uncompressed speech (A-law or μ-law at 64 kbps) and, as such, does not take up a lot of resources, whereas a CODEC like G.729 gives great compression (down to 8 kbps) but does consume some of that all important processing power. There are differing emphases placed on CODEC selection and use.

Although processor speeds tend to get quoted frequently, they are not always instantly comparable. A Pentium processor may have a clock speed of 3.0 GHz but take a number of clock cycles to perform a single instruction. A given DSP may have a clock speed of 400 MHz but be able to perform multiple functions during one clock cycle such as multiply and accumulate.

Essentially, the measurement should be: how much a given processor does of what you want, when you want it done. This sounds less than scientific, but indicates that there is no substitute for running suitable load tests on your target system.

It is also worth noting that HMP offerings are not necessarily as universally applicable as one might think. For example, some appear to only work on Intel processors and even then only on certain motherboard chipsets. Other vendors' products work on both Intel and AMD processors.

There are other things to be considered such as licensing. The licensing process is more or less complicated depending upon the distribution method. Some vendors seem to complicate things unnecessarily with layers of options to wade through, and there are the added difficulties of dealing only via a distribution partner. Others, such as Aculab, deal direct and enable designers to choose how many channels are needed with all functionality, and support, included in the price. Developers should be sure to completely understand the cost of ownership before making a purchase decision.

A word of caution, having already suggested that HMP lends itself to easily scaling systems, there is more to think about. With telephony boards, one can simply buy another card and add it to the system. With HMP, although upgrading the number of channels is straightforward, system capacity is limited, as we have seen, by CPU capability. It may be possible to buy another processor to expand the capacity of an HMP system (remembering, of course, to buy more HMP licenses too) but this may not always be practical for a number of reasons.

HMP and AdvancedTCA

Some believe that technologies such as HMP eliminate the need for CompactPCI or AdvancedTCA because they perform the same functions on an inexpensive PC or server. This is certainly not the case.

HMP is indeed form factor agnostic; it will run equally well on PCI, CompactPCI, CompactTCA, or AdvancedTCA platforms and is not concerned with the interconnection fabric. As it is software designed to run on a host processor, it doesn't matter what form the host takes. And we have already seen that products based on HMP are being offered on rack-mount, SBC-based servers, or blade servers.

A primary reason for this, of course, is that inexpensive PCs are not acceptable platforms on which to deploy mission-critical applications in a telco or service provider environment. Hence, we have high-specification chassis or servers being used, and they are more likely to be CompactPCI or AdvancedTCA when deployed as a core network resource.

An AdvancedTCA blade with multiple processors can run HMP with the appropriate number of channels licensed per processor. By the same token, an AdvancedTCA carrier card with a number of mezzanine modules, each fitted with several processors, could be used to run HMP. However, once we get into these realms, the licensing costs may rise to such an extent as to dispel the notion that a hardware DSP-based solution is more expensive.

We are then back to *the choice is yours my friend* scenario. All things being (relatively) equal, an AdvancedTCA telephony board fitted with DSPs designed to run media processing features better suits media processing tasks than an AdvancedTCA processor board fitted with SHVPs. Some jobs, notably conferencing and echo cancellation, are best done by DSP hardware simply because of the type of operations required.

The *your choice* situation also applies to blade servers used for HMP-based products. Adding another server blade to increase the capacity of a system using HMP is the same as adding another telephony board to increase the number of DSPs. It may come down to cost, or cost effectiveness, in the end. After all, at approximately $11,500, the price of an IBM HS40 blade with four-way 3 GHz SMP capability is not that far away from a telephony board with similar media processing capacity when one adds the (one license per processor) HMP licensing costs.

Moore's Law – again!

An HMP related point, which some vendors tend to labor, is that SHVPs are subject to Moore's Law, and thus their capabilities are constantly increasing, becoming faster and more powerful. What they fail to realize, or perhaps wish to disguise, is that Moore's Law applies just the same to successive generations of DSPs. So I would suggest that it is unlikely that SHVPs will ever fully replace DSPs. They may be a viable alternative because they have evolved to offer more than adequate processing power for basic media processing functions. But let us not forget that SHVPs are, by design, generic enough to cope with many differing requirements. However, DSPs are purpose built for the task of signal processing, and that is what is needed in a substantial number of telephony applications.

HMP is eminently suited to all IP environments, if only the world were that simple! I read in a recent report that, despite the overwhelming rush to IP telephony and next-generation networks, TDM connectivity needs will remain for decades to come. This means a market for telephony boards, especially those that combine support for rich media processing resources, IP telephony, and optional E1/T1 digital network access functions for some considerable time to come.

Conclusion

This all means that whether you use DSP hardware or HMP software, and on whatever form factor platform, it will be a matter of choice.

Rather than adopt a strategy that dictates one kind of deployment over another, it is far better to consider each individual application scenario and then to decide whether HMP or a hardware-based solution is best.

As HMP gathers pace, with live implementations (refer to case study sidebar on page 27) evidencing acceptance of this software only alternative to DSP hardware, developers at all levels in the communications food chain now have a choice. From hors d'oeuvres to main course, applications can be cooked up to tickle anyone's taste buds.

***Ian Colville** is a product manager at Aculab. He has broad industry knowledge gained during a number of years employed in a variety of management roles by a major telecommunications manufacturer. Ian's industry experience spans marketing, sales, customer service, and project management.*

For further information, contact Ian at:

Aculab
Lakeside, Bramley Road
Milton Keynes MK1 1PT UK
Tel: 44-0-1908-27-3923
Fax: 44-0-1908-27-3801
E-mail: ian.colville@aculab.com
Website: www.aculab.com

AdvancedTCA®

CompactPCI®

WWW.CONEC.COM

ADVANCEDTCA CONNECTORS

This newly developed architecture and system layout allows manufacturers of telecom equipment a new standard for designing systems. ATCA stands for ***Advanced Telecommunications Computing Architecture***.

The basic structure is utilizing a modular concept. Application of this new structured approach allows various module designs that are compatible in layout and mechanical installation.

The PICMG Group created the PICMG 3.0 Standard. This Standard specifies the mechanical details with regards to input/output, voltage, current and connection parameters. Control, backplane layout and system architecture are part of the standard.

CONEC developed unique socket press fit contacts for this series of connectors. The socket contact utilizes high reliability screw machine components combined with stamped and formed press fit zone. CONEC has developed a new family of connector products that adhere to this new Standard. Products such as plugs and sockets, high power and signal contacts, have been developed.

This new connector series ia available with press fit and through hole contact types.

PRODUCT FEATURES:
- Rugged construction
- Special variations on request
- Polarizing system
- Screwdown hardware
- Premating contacts
- Press fit contacts
- Selective loading of contact positions

COMPACTPCI CONNECTORS

Compact PCI, this new bus architecture has been developed and adapted as the new standard by many computer system manufacturers. A group of companies formed the PICMG Consortium. PCI as it is known today, stands for ***Peripheral Components Interconnect***.

Telecom, datacom, computer, medical, instrumentation and industrial control manufacturers are implementing the CompactPCI Bus structure. This standardization brings many advantages to the designer of electronic systems.

CONEC is a member of the PICMG Group and has developed the 47 positions power connector types, adhering to the specifications outlined in PICMG 2.11 R1.0. Plug and socket types with various connection and contact styles have been developed. Press fit type, through hole type and high power contacts are available. Connectors can be selectively loaded to meet specific layout configurations.

PRODUCT FEATURES:
- Premating contacts in selective positions
- Polarizing, coding, system
- Mounting screws for PCB are available
- High reliability and longevity
- Selective loading, mixed layout contact configurations

AMERICAN CONEC®

PCI INDUSTRIAL COMPUTERS PICMG

RSC# 26 @www.compactpci-systems.com/rsc

SIDEBAR

AN HMP-BASED SOLUTION

This example of a solution based on HMP is from Finland. Staff and students at the Haaga Institute Polytechnic in Helsinki now have the ability to retrieve their voice mail using a Finnish language system, thanks to the NextInfo platform from Capricode, and HMP technology from Aculab.

The Haaga Institute was looking to upgrade its old style PBX telephone system to the IP-based Cisco CallManager. Using IP would help reduce their call costs, which is a key criterion for the system. With most of the staff and students speaking Finnish, they wanted a new voice mail system to better service the staff and students by offering them a native language system.

Cisco and Cygate (Cisco's reseller partner in Finland) approached *Connected with Aculab* partner Capricode with this requirement.

Capricode developed a solution for Cisco, based on its NextInfo toolkit and Prosody S host-based media processing software from Aculab. They chose to base the system on Prosody S as there is no hardware involved, meaning easier and cheaper integration for the end user, enabling costs of the system to be kept down. It has been configured for English, Swedish, and Finnish and is user selectable. Moreover, it can work with any supported language, enabling Cisco to roll out the system elsewhere in the world.

The solution offers several additional unified messaging features such as the ability to retrieve voice mail from a PC and have unlimited numbers of voice mail messages stored. It is also flexible, making it easy to add new value-add features, tailoring the solution for individual customers.

Staff and students are now enjoying enhanced voice messaging services in their native language following the successful installation of the system.

This development shows how HMP – in this case Prosody S – is proven in interworking with the Cisco CallManager. And with IP, as there are no telecom regulatory barriers, the formula can be repeated worldwide.

SIDEBAR

AdvancedTCA and Fibre Channel fabric interface

By Christopher Murray

AdvancedTCA is gaining in popularity as the standard for next generation telecommunications equipment. Included in the standard are specifications for the fabric interface in the AdvancedTCA shelf, which is responsible for sending high volumes of data between node blades. This article will provide an overview of the AdvancedTCA shelf and explain how Fibre Channel enables the swift, reliable transmission of data between blades within the shelf.

AdvancedTCA shelf

The AdvancedTCA shelf is made up of hardware and software components that provide high availability. Equipped with redundant Intelligent Shelf Management Buses, the shelf manager can monitor and control the proper operation of all node blades, sensors, and fans. The shelf manager manages the power, cooling, event reporting, and failure notifications and queries the Switch and Control Modules (SCMs) and node blades to determine compatibility at *power on.* The shelf manager also implements electronic keying. Each node in the shelf has electronic key information, which is gathered by the shelf manager, ensuring the port is compatible with other ports that share the same backplane connection. The key information also gives permission to the node to facilitate backplane ports. Additionally, a connection between the node and SCM will be allowed if they are compatible. The shelf manager also controls the enabling of the base and fabric interfaces and the boot order of the node blades. The nodes in each slot may communicate by a dual star topology.

Dual star topology

In dual star topology there are two SCMs in the shelf used for redundancy that provide base and fabric interface switching. Any node in the shelf can communicate with another node through the SCM and each node has a link to each of the SCMs. The advantage to the dual star topology is that the number of routed traces is low, and the fabric connectivity requirement on each blade is minimized. In Figure 1, the SCMs are in slots 7 and 8 in a 14-slot shelf.

The AdvancedTCA shelf also has node blades, which may be Compute Modules (CPMs), Disk Store Modules (DSMs), or signaling blades. The SCMs allow the node blades to communicate with other node blades through the fabric interface, while nodes in the AdvancedTCA shelf will communicate using the Fibre Channel protocol across the fabric interface. Each SCM has a Fibre Channel switch that routes the Fibre Channel data between the nodes.

Fibre Channel

Fibre Channel is a full duplex block-oriented serial network protocol designed to let computers and peripherals communicate. Fibre Channel enables the transmission of large volumes of data between CPMs and DSMs as in Storage Area Networks (SANs), via three communication methods:

- Point-to-point: Two nodes with a dedicated connection
- Arbitrated loop: Can connect 127 nodes in a loop
- Switched fabric: Nodes communicate via the requested switched fabric

Nodes communicate by sending ordered sets and frames of 4-byte transmission words, which always begin with K28.5. K28.5 is a command character for obtaining bit and word synchronization. The receiver knows it is receiving an ordered set on the reception of the K28.5 character in one of four ordered sets:

- Primitive signals
- Primitive sequences
- Start of Frame (SOF)
- End of Frame (EOF)

Primitive signals indicate an action. Two primitive signals are IDLE and Receiver Ready (R_RDY). An IDLE is transmitted on the link to indicate the port is ready for transmission and reception. The R_RDY signal indicates the receiver has available

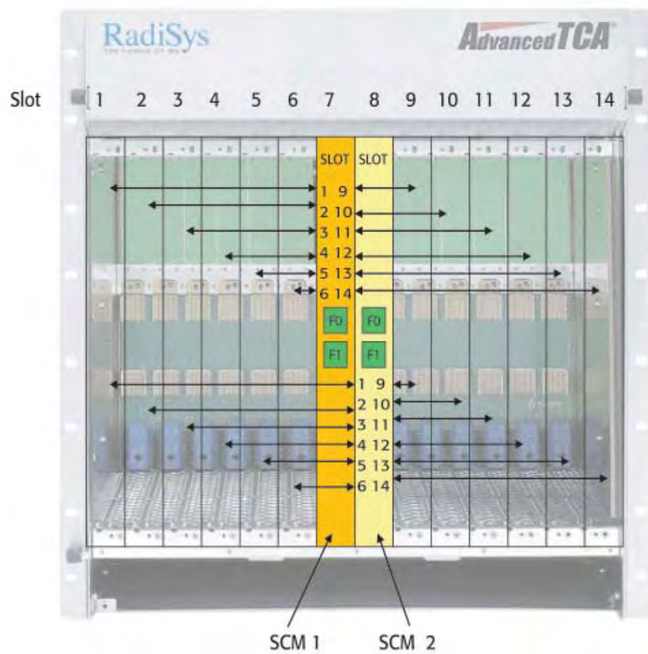


Figure 1

buffers and can receive more frames. This provides a flow control mechanism between the transmitter and receiver. Arbitrated loop expands the set of primitive signals supporting the primitive signals ARB, OPN, and CLS. The ARB allows a node to arbitrate access to the loop, while OPN and CLS allow a port to begin and end communications with another port.

Primitive sequences are ordered sets that indicate or initiate a state change. Those supported are Not Operational (NOS), Offline (OLS), Link Reset (LR), and Link Reset Response (LRR). These sequences are transmitted and repeated continuously to indicate specific conditions within a port. A primitive sequence is not recognized until at least three instances of the ordered set have been received. Once this happens, another primitive sequence or IDLE will be sent in response.

Arbitrated loop supports more primitive sequences, including Loop Initialization Primitives (LIP), Loop Port Enable (LPE), and Loop Port Bypass (LPB). LIPs are sent when a port is inserted into the loop or is removed from the loop. LPE is sent to allow a port to enter the loop, whereas LPB is sent to bypass a port on the loop.

The final two ordered sets are SOF and EOF. Each frame begins with a 4-byte SOF and ends with an EOF.

The Fibre Channel frame consists of a SOF, a frame header, a payload, a cyclic redundancy checksum, and EOF sequence (Figure 2). The frame header contains the control information for each frame, protocol, addressing, and frame sequence.

Figure 2

The 24-byte frame header contains the destination address (D_ID). The S_ID is the source address. In arbitrated loop, the Arbitrated Loop Physical Address (ALPA) is mapped to the lowest byte in the 24-bit address. Each port will look at the D_ID and compare it with its ALPA and determine if the frame should be received or forwarded.

When two ports communicate the data block being sent is put into frames. The maximum frame size is 2112 bytes, meaning if one port is sending a 1-megabyte file to another port, many frames will be sent to complete the transaction. A sequence is a series of one or more related frames transmitted from one port to another in one direction. Frames sent within the same sequence have the same SEQ_ID and each individual frame will have a unique SEQ_CNT. Each frame sent will have the SEQ_CNT incremented by 1, which allows two ports to communicate and lets the receiver verify that all frames were received in order and that no frames were dropped.

A Fibre Channel exchange is a series of sequences between two ports. The originator of the exchange assigns the OX_ID field while the responder assigns the RX_ID field. The OX_ID and RX_ID fields are unique between the originator and the responder. The originator and responder may be communicating with multiple nodes at one time. The nodes use these values to match the sequences with the proper exchange.

The next field in the Fibre Channel frame is the data frame. The data frame contains the data to be transferred between the source port and the destination port. The next field is the 4-byte Cyclic Redundancy Check (CRC) that is used to detect transmission errors in the data. The frame ends with an EOF ordered set.

Fibre Channel architecture

The Fibre Channel stack consists of five layers numbered FC-0 to FC-4 (FC-AL is in the stack to illustrate how the arbitrated loop functions work). This stack is similar to the OSI layer modeled stack with each layer performing unique functions (Figure 3).

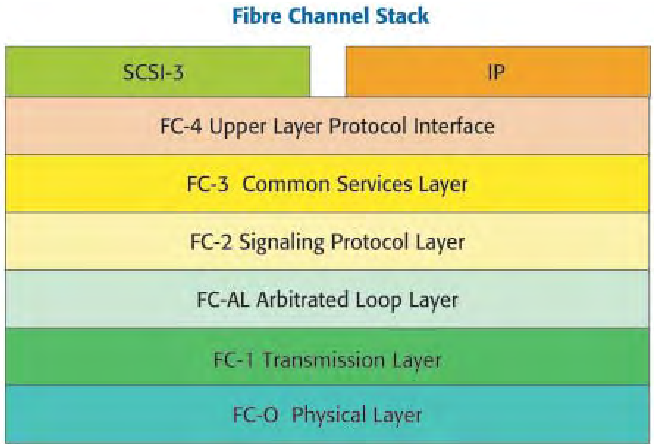


Figure 3

Layer responsibility

FC-0 is the physical layer and identifies the type of media that is used. The front Fibre Channel interface has two Small Form-factor Pluggable (SFP) connectors that provide two optical interfaces:

- FC-0 defines the data transfer rates of 1.0625 Gbps, 2.25 Gbps, 4.25 Gbps, and 8.5 Gbps.
- FC-1 defines the encoding and decoding process for transmitting and receiving characters. Each 8 bits is converted into a 10-bit transmission character providing a positive or negative disparity where each character has a maximum of six 0s and four 1s or a maximum of 4 0s and six 1s. It generates the K28.5 character to provide frame alignment.
- FC-AL defines the arbitrated loop functionality. This layer also defines the arbitrated loop specific primitives sequences and primitive signals and performs the arbitrated loop management, inserting, and bypassing ports.
- FC-2 serves as the Fibre Channel transport mechanism. This layer specifies the frame, sequence, exchange, and protocol and is responsible for segmenting the data into the maximum of 2,112 byte frames for transmission and reassembling the frames into data blocks at reception. It provides the sequence numbers and exchange identifiers and allows frames to be retransmitted if received out of sequence. FC-2 is responsible for link layer error recovery.
- FC-3 layer provides common services for higher layers, including facilities for data encryption and compression.
- FC-4 provides mapping to upper layer protocols like SCSI or IP and defines how upper layer protocols can operate over the Fibre Channel infrastructure.

Fibre Channel loop initialization

The Fibre Channel loop can have any combination of computers and peripherals and a maximum of 127 nodes. When a node is inserted into the arbitrated loop, which may be private or public, it issues 12 LIPs to start loop initialization. As each node on the loop receives the LIPs they then enter the open-init state. Nodes on public loop ports attempt to login to communicate with other nodes. If the login is successful, an address will be assigned by the switch and will be in the upper two bytes of the S_ID. If the login fails, the upper two bytes will remain as 0. All private loop nodes will have a S_ID with the upper two bytes as 0.

Each node now starts to send Loop Initialization Select Master (LISM) frames. The LISM frame contains the 64-bit World Wide Name (WWN) for the node. When it receives a LISM frame it will compare its WWN with the WWN in the frame. The node will continue to transmit the lowest value WWN that has the highest priority. When a node receives its own WWN it knows that it is the temporary loop master and will transmit ARB (F0) to notify others it is the temporary loop master.

The loop master sends a sequence of four frames to let each node choose its ALPA. Each frame sent is a 128-bit frame with each bit representing 0x00 to 0xef. All bits are 0 initially. Each node will set a bit for its ALPA. The first frame is the Loop Initialization Fabric Address (LIFA), which allows any public loop node that had a previously assigned ALPA to select the bit in the frame for this ALPA.

The master will send a Loop Initialization Previous Address (LIPA), allowing any private node to reselect its ALPA. The third frame issued is the Loop Initialization Hard Address (LIHA) that allows any nodes that have jumpered addresses or dip switches to choose their ALPA. The fourth frame sent is the Loop Initialization Soft Address (LISA). Any node that does not have an ALPA assigned may choose one, or any node whose ALPA was already taken may select a new one.

Once the ALPAs have been chosen, the loop master sends a frame allowing each node to report its ALPA in position to the loop. The Loop Initialization Report Position (LIRP) frame contains 127 bytes. The master inserts its own ALPA in the first byte position and increments the offset by one. Each node receives the LIRP and inserts its own ALPA in the next position, giving the position of all loop nodes.

The master sends a Loop Initialization Loop Position (LILP), which is a complete map of the ALPAs and their positions. The nodes are now ready to enter into monitoring state and communicate.

Figure 4 shows the arbitrated loop after the initialization sequence. In arbitrated loop, when the CPM in slot 13 wants to send data to the DSM in slot 4, the data flows through port 11 on the switch to port 10 and then to port 6 and out to the DSM. This is the function of the arbitrated loop. Each port checks the D_ID and if it is not the destination, the data is passed to the next node. Each node connected to the fabric switch is called an NL_Port. NL_Port is a loop-attached port to a fabric, which supports the arbitrated loop protocol. In this case the CPMs/DSMs are loop-attached ports. All are attached to an FL_Port on the fabric on the SCM. An FL_Port is a point at which frames originated by the NL_Port enter the fabric. Frames destined for an NL_Port exit the fabric at an FL_Port.

Switch mode allows two ports to communicate directly, speeding up the communication. When the switch fabric operates in switch mode the preceding initialization will still occur for this particular switch. Now when the CPM in slot 13 wants to send data to the DSM in slot 4 the switch from the FL_Port 11 to FL_Port 6 establishes a direct connection. The switch mode allows multiple connections between ports at the same time, increasing the bandwidth that is available with arbitrated loop (Figure 4).

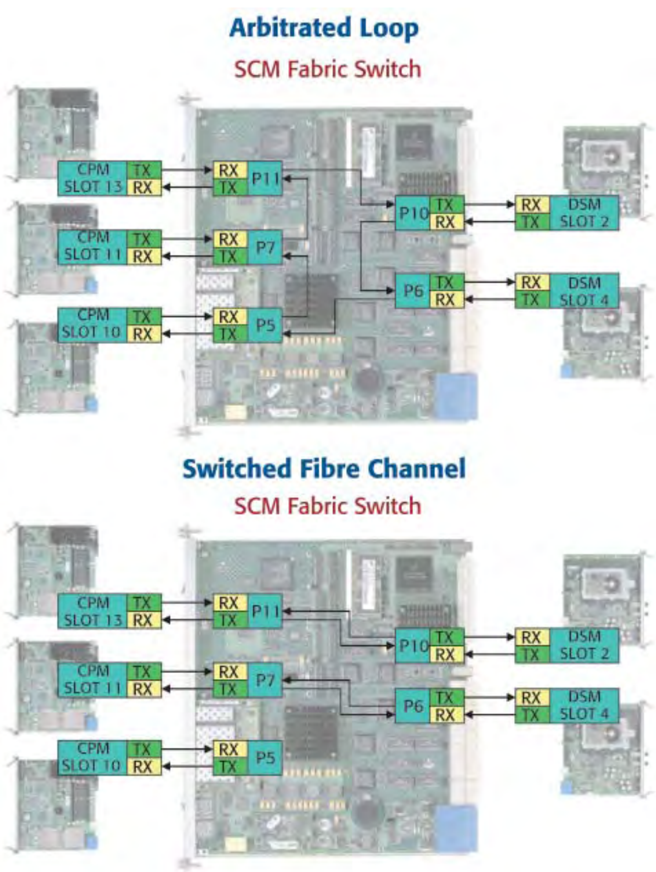


Figure 4

Fibre Channel zones

A significant benefit of Fibre Channel is that it provides zoning, a security feature that allows nodes to be segregated and can only be provided by a Fibre Channel switch. Zoning can be implemented by port or WWN and is similar to Virtual LANs in the Internet Protocol. Zoning in combination with LIP isolation avoids LIP interruptions from other segments. With LIP isolation, the LIP sequence is isolated to nodes in a certain zone.

Zoning implemented by port is called hard zoning. The switch controls this. The physical port or FL_Port of each node is used to define zones. Ports within a certain zone may communicate with each other, but may not communicate with other ports. When a frame enters the switch, the destination address will be read and compared to the port table for that zone. If the destination port is in the same zone, the frame will be delivered, otherwise the frame will be dropped and an alarm will be generated.

In Figure 5, there are two zones, 1 and 2. The CPMs in slots 13 and 11 and the DSM in slot 2 are in zone 1. The CPM in slot 10 and the DSM in slot 4 are in zone 2. The CPMs in slot 11 and 13 may only write to the DSM in slot 4. If the CPM in slot 10 tries to write to the DSM in slot 2 a zoning error will be generated.

Some fabric switches implement overlapping zoning as seen in Figure 5. This is also controlled in the hardware. In overlapping zoning, a physical port may be defined in more than one zone.

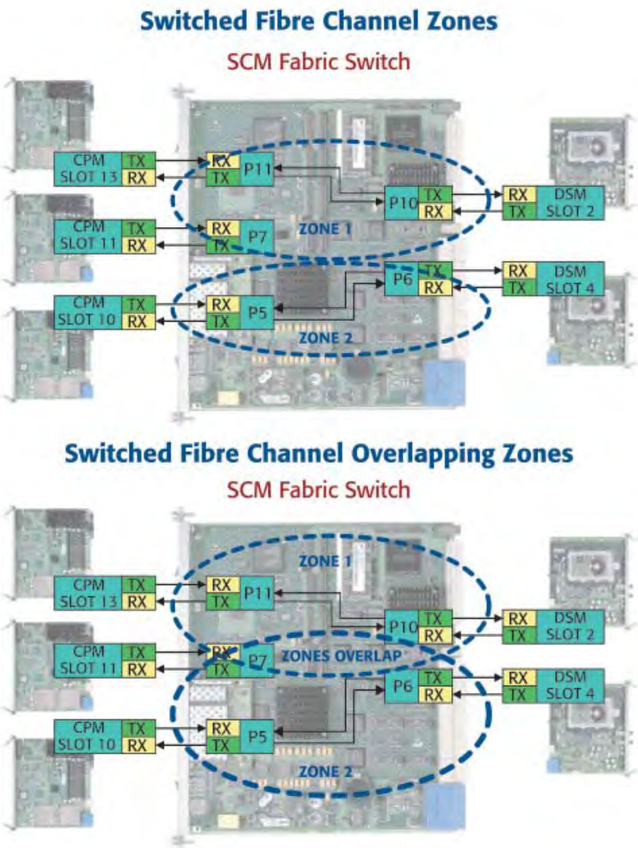


Figure 5

The CPM in slot 11 is in zone 1 and zone 2, allowing the CPM to write data to the DSM in slot 2 and the DSM in slot 4. Overlapping zoning only exists when the fabric switch is configured as a switch and cannot work as an arbitrated loop.

Cascading shelves

Cascading accommodates highly available systems by distributing redundant pairs over multiple shelves and can be used to increase port capacity. Here, the SCM provides two front panel Fibre Channel ports that can be used to cascade nodes between shelves.

Figure 6 is a hypothetical example to demonstrate cascading. There are 12 potential nodes in the arbitrated loop in each shelf. By cascading the front channel Fibre Channel ports, another 12 nodes have been added to the loop for a total of 24. Notice that one of the front panel ports on each SCM is used to provide the

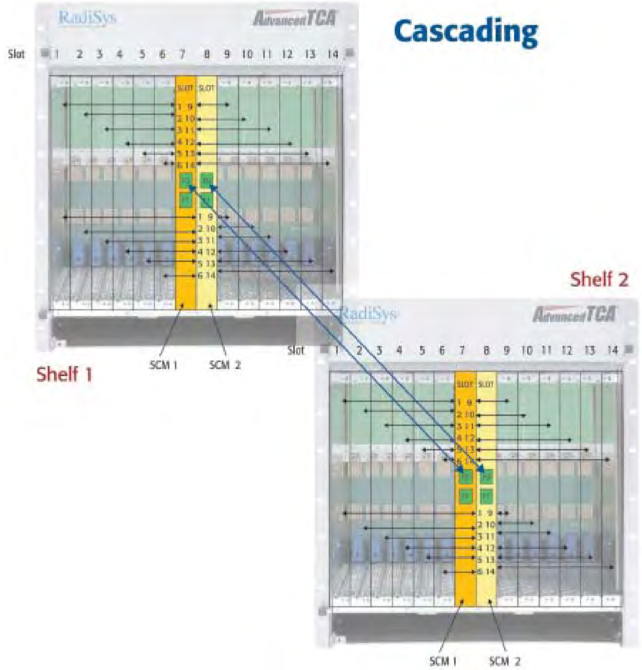


Figure 6

cascade for redundancy. If the active SCM fails, the standby SCM becomes active.

A mirrored Redundant Array of Independent Disk (RAID array) could be distributed over multiple shelves, which reduces the fault domain and increases reliability.

Conclusion

The AdvancedTCA standards have specified the fabric interface in the AdvancedTCA shelf for sending high volumes of data between node blades. The AdvancedTCA shelf provides a reliable and redundant method for accurately, securely, efficiently, and cost effectively managing huge amounts of data in high availability systems.

Christopher Murray *is a senior staff software engineer at RadiSys Corporation. Murray has worked on communications protocols and network device drivers for the last 15 years. He holds a Master of Science in Computer Science from the University of Houston, Clear Lake.*

References

The Fibre Channel Industry Association
www.fibrechannel.org

Technical Committee T1
www.t11.org/index.htm

PCI Industrial Computer Manufacturers Group (PICMG), PICMG 3.0 "Advanced Telecommunications Computing Architecture (ATCA)," December 18, 2002.Version D1.0

Clark, Tom. *Designing Storage Area Networks: A Practical Reference for Implementing Fibre Channel and IP SANs.* Addison-Wesley, 2003.

For further information, contact Christopher at:

RadiSys Corporation
5445 NE Dawson Ck Dr.
Hillsboro, OR 97124
Tel: 503-615-1188 • Fax: 503-615-1116
E-mail: christopher.murray@radisys.com
Website: www.radisys.com

Leveraging the AdvancedTCA platform for VoIP media gateways and media servers

By Alan Percy

The hosts of new VoIP carriers coming to market face the uphill challenge of building a new customer base while creating useful enhanced applications that will encourage new customers to stay for the long term. Many of these new carriers are considering open standard hardware platforms as a way to balance the cost of infrastructure versus the time-to-market for new applications. The recently approved AdvancedTCA is rapidly gaining favor with designers as AdvancedTCA offers a significant competitive edge: serving more customers and more new services in less space while improving reliability.

Background

Standard hardware platforms have been the backbone of carrier enhanced applications for the last 10 years. From the founding of the PCI Industrial Computer Manufacturers Group (PICMG) in 1994, through the CompactPCI 1.0 specification in 1998, PICMG has maintained a dedication to continual improvement in hardware platforms. While the PICMG hardware and computing platforms have been targeted for use in a wide range of industrial and commercial applications, no industry has been more affected by the platform evolution than the telecommunications industry. As a result of significant participation and guidance by the telecommunications industry, a new hardware platform specification has been crafted in PICMG 3.0, commonly known as AdvancedTCA. The underlying driver for the development of AdvancedTCA was the hope that a new platform could solve a wide range of physical, mechanical, and electrical limitations found in past PCI and CompactPCI platforms. Figure 1 shows an AdvancedTCA form factor card.

Figure 1

The key advantage of the AdvancedTCA specification is that it helps manufacturers lower equipment development costs by permitting the use of off-the-shelf components, avoiding expensive custom hardware development. The AdvancedTCA form factor also increases flexibility and functionality by providing a large board area – 8U high and 280 mm deep – with a 200 W power budget. AdvancedTCA is designed to meet today's demand for new processor-intense and high-speed data services that enable expanded carrier IT services.

Increased competition fuels need for advanced applications

As the number of new VoIP carriers continues to grow and the field becomes more crowded, new carriers need to find a differentiator to separate them from the competition. In many cases, these new carriers offer their services for little or no up-front cost, with very affordable monthly charges. Most carriers recognize, however, that over the long run, they need a better solution to keep customers and avoid *churn*. The development of advanced applications (or *sticky* applications) surrounding the service creates customer loyalty and a perception of value that discourages customers from changing carriers.

Most current broadband VoIP carriers are in the early phase of customer acquisition, pulling in new customers through extensive advertising and offers of lower or *all you can use* long distance packages. Over the next few years a shift is likely to occur, with carriers emphasizing applications rather than just monthly cost.

Scaling: Part of the business plan

Building a VoIP carrier business requires a unique balancing act, in that the applications and services must be deployed concurrently with building the subscriber base. If the application or service is successful, more subscribers will be added, and additional hardware will be needed to support the new users. No business savvy carrier wants to buy and install all the equipment they will potentially need before signing up the first customer. Scaling is therefore crucial to the carrier's business plan.

AdvancedTCA equipment addresses the need for scaling exceptionally well by providing a blade-based hardware environment that allows expansion on the fly. AdvancedTCA's packet-based network infrastructure within the chassis permits developers to add new capacity to the platform by installing additional or replacement higher-density blades during operation. This is a vast improvement over older PCI and CompactPCI systems that typically required a system shutdown and restart cycle to recognize the new hardware. Now new capacity can be achieved without disrupting customer service and without the increased cost of upgrades associated with the shutdown.

The flexibility of card insertion also offers carriers the ability to *pay-as-you-grow.* Most new VoIP carriers build their revenue on

subscriber headcount, and the ability to start small and grow as the customer base grows provides a significant asset. AdvancedTCA allows a carrier to start small, bring on the first trial customers, build momentum in the market, and add capacity as customer traffic and revenue build. This sets up two possible scenarios:

Single card solutions

The large physical form factor and modular Advanced Mezzanine Card (AMC) resources available with AdvancedTCA allow complete advanced applications to be built on one card. CPU modules, media processing resources, TDM network interfaces, and VoIP resources can be combined into one blade. Some carriers prefer this all-in-one-card approach as it supports their pay-as-you-grow strategy.

Mix-n-match solutions

In this situation, different blades are used for each function, with a *mix-n-match* combination of various functions. Best-of-breed CPU, media processing, TDM network interfaces, and VoIP resources are combined at the chassis level. This allows N+1 redundancy to be leveraged on high-risk or critical resources without requiring redundancy where it would not add value.

Getting more from less

One significant recurring cost of operation for carriers is the monthly cost of environmentally managed facilities used to house the equipment needed to operate the service. Because the managed facilities are in high demand and costly to operate, every inch of shelf space allocated is quite valuable, creating a need to maximize the number of customers each system can support.

The AdvancedTCA form factor offers greater space efficiency than either PCI or CompactPCI form factors. With AdvancedTCA, each blade is longer and wider, offering up to 140 square inches versus 57 square inches for CompactPCI and 51 square inches for PCI. Figure 2 shows blades in the AdvancedTCA, CompactPCI, and PCI form factors. AdvancedTCA also offers more continuous space per blade, which allows more circuitry on each blade with less room wasted by connectors and mounting brackets. In addition to the larger and denser platform, AdvancedTCA also specifies a 200 W power budget per blade and improved cooling resources with better airflow over the blade, so faster and hotter processors can be squeezed onto each blade.

Reducing the cost of connecting

In addition to the cost of physical space, carrier applications experience costs associated with connecting equipment to other elements in the network. As the density of the interconnection circuit increases, the cost per individual circuit or user drops. For example, one optical OC-3 circuit with 2,016 voice channels typically will cost less per channel than 84 individual T1 circuits. High-density circuit savings surpass the actual circuit costs and include the cost of equipment to terminate and cable the circuit.

The large AdvancedTCA form factor cards and array of physical interfaces available help carriers leverage high-density circuit savings because they allow high-density OC-3 and even OC-12 circuits to terminate directly on individual cards. Carriers can then build solutions to reduce the cost of each channel and avoid the costs of multiplexing equipment and associated cabling.

Enhanced reliability

With the increasing density of platforms, each component carries a greater number of customers. This increases the risk that a single failure could cause significant outages and negatively impact customer satisfaction and associated revenue. Carrier solution designers carefully review reliability and features like High Availability (HA) with hot standby cards as a way to mitigate this risk and achieve 99.999% uptime.

Reliability enhancements are a hallmark of the AdvancedTCA platform over PCI or CompactPCI platforms. HA builds full redundancy of all the elements in the system into the standard. For example, distributed power conversion on each blade makes the system tolerant to a failure on any board. In addition, the high bandwidth fabric interface in the AdvancedTCA platform can be used in various redundancy schemes. Developers can also use AdvancedTCA's fabric interface to efficiently connect any line card to any processing resource to create pooled resources and

Figure 2

Unique
Probe Card

Simulation/
Characterization

Various Backplane
Configurations

AdvancedTCA performance.
We have the evidence!

Not all ATCA backplane designs are created equal. With multi-gigabit fabric signals across the backplanes, you need proof of performance. Elma Bustronic's Signal Integrity Initiative (SII) provides just that. Our unique ATCA probe card lets us characterize the backplane quickly and accurately, assuring the backplane we provide you has been designed and fabricated for superior results.

Elma Bustronic's pre-design HSPICE simulation and model extraction service assures that our backplane is optimized with your integrated ATCA system. Simulating interconnect paths from line cards to the backplane to system managers, our service assures you of superior performance throughout your system before it is ever built. Come to Elma Bustronic, the proven leader in ATCA backplanes.

Visit www.elmabustronic.com to learn more about our published and upcoming ATCA SII studies.

ELMA BUSTRONIC

Tel: 510.490.7388 Fax: 510.490.1853 info@elmabustronic.com

ELMA
Your Solution Partner

RSC# 36 @www.compactpci-systems.com/rsc

cost-effective N+1 redundancy of expensive media processing resources.

Reducing development costs

The use of a standards-based platform frees telephony equipment manufacturers from the time and expense of designing their own platforms. This allows them to focus on software applications and system integration that maximize their competitive advantages. The AdvancedTCA specification provides exceptional freedom for manufacturers and carriers to expand their resources, offer better services, and maintain control of inventory and maintenance costs.

Summary

It may take some time for all participating vendors to optimize AdvancedTCA offerings, but with several early AdvancedTCA platforms already available on the market and more introduced every month, market momentum appears to be building.

AdvancedTCA will not be the final word on hardware platforms for telecommunications solutions, but for now, the high density, scalable solutions that can be built based on AdvancedTCA platforms fit a wide range of telecommunications needs, especially for solutions that leverage VoIP. The larger packages, improved power and cooling capabilities, greater interface options, and modular approach appear to solve numerous challenges and offer tremendous promise for better customer service and better profitability for the telecommunications industry.

Further reading

AdvancedTCA Specification: www.picmg.org

Breaking the scaling barrier: How packet-based CompactPCI systems enable large-scale solutions: www.compactpci-systems.com/articles/id?301

AudioCodes AdvancedTCA Platforms: www.audiocodes.com/Content.aspx?voip=25

Alan Percy *is director of business development at AudioCodes, a leading provider of Voice over IP telephony enabling technology and systems components. Alan joined AudioCodes in July 2001, bringing over 15 years of experience in the telecommunications, networking, and wireless equipment industries. He holds a BA in Computer Science from the University of Buffalo, has had a number of papers published in various telecommunications technical journals, and is a frequent speaker at industry conferences.*

For further information, contact Alan at:

AudioCodes, Inc.
257 Turnpike Road, Suite 320
Southborough, MA 01772
Tel: 716-662-2769
Fax: 408-577-0492
E-mail: alan.percy@audiocodes.com
Website: www.audiocodes.com

The telecommunications application ready platform

By Dr. Asif Naseem

Historically Telecom Equipment Manufacturers (TEMs) have relied on in-house resources to develop carrier grade systems for hosting telecom applications. Developing such a system consisted of a complete vertically integrated system comprising hardware, operating system, middleware, and the carrier applications, with most, if not all, implemented as proprietary components. As the computer industry matured in the 1990s, TEMs started to replace the proprietary platforms with commercial hardware running proprietary operating systems. Even though this unburdened the TEMS from investing in developing proprietary hardware, the middleware and the applications remained proprietary in-house developments.

In the current decade, with fewer resources, mounting cost pressures, and shrinking time to revenue intervals, such proprietary approaches are becoming less and less viable. And TEMs – large and small – are looking to acquire Commercial Off-The-Shelf (COTS) components to put together highly reliable platforms that are application ready. With the increasing adoption of standards such as AdvancedTCA, Carrier Grade Linux, Hardware Platform Interface Specification (HPI), and Application Interface Specification (AIS) from Service Availability Forum (SA Forum), creating such a system using COTS components is quickly becoming a viable and cost effective option. Dr. Naseem describes an approach to building a highly reliable application ready platform using standards-based, pretested COTS elements. Also addressed is how this approach effectively reduces the project costs, schedule risks, and time to market/revenue.

The telecommunications industry appears to be emerging from the slump – sometimes referred to as the "nuclear winter" – of the last several years. Even though a far cry from the spending and expansion of the 1990s, some recent reports indicate that telecom spending has started to see an upward tick and that this trend is likely to continue for the near future. One of the more optimistic reports comes from the Telecommunications Industry Association (TIA), which projects a year over year average growth of 9.5 percent for the next three years. Other reports are not as optimistic, placing the spending for the foreseeable future at flat to declining. Without quibbling with the specific numbers, a closer look reveals that both points of view are probably correct. The optimistic growth expectations come from players addressing the emerging and possibly most promising market sectors such as VoIP, wireless, broadband access, and converged services. The growth prospects for the more traditional telecom players are likely to languish while they transition from legacy telephony services to new and converged services. Such transition presents significant challenges for Service Providers (SPs) and TEMs alike. Yet the growth prospects for anyone (new entrants, SPs, and TEMs) aggressively pursuing converged services and the like are not a given. Several challenges must be addressed head on to ensure success in the market.

TEMs' revenues are directly related to SPs' spending on telecom gear. SPs' requirements are putting enormous pressure on TEMs to produce new functionality, reduce cost, and shorten time to market. Adding to the challenges is the need for TEMs to evaluate, and possibly adapt to, new emerging technologies necessary to meet such requirements. Mix into that equation fewer precious resources now at their disposal, and you have TEMs that are faced with unprecedented challenges to meet customer expectations and their own profitability goals.

Key challenges

Let us examine some of the key challenges faced by the players in the telecommunication market.

Price erosion

According to most accounts, the wireless equipment market is at best flat, if not declining. To protect profitability and return on investment, the service providers continue to focus on reducing their capital expenditures. Furthermore, consolidation is resulting in fewer service providers with increased buying leverage over TEMs, their suppliers. As a result TEMs are faced with mounting price pressures. For example, a network element that fetched an average selling price of $60K two years ago is drawing less than half that price in 2005. This trend is not likely to slow down. Service providers are demanding ever-increasing functionality and performance at decreasing prices.

Some of the fastest growth in wireless adoption is happening in the emerging markets, most notably in India and China. As a matter of fact in 2004 wireless subscribers in both countries surpassed wireline subscribers. The penetration in both regions is still pretty low – less than 10 percent teledensity in India – presenting good growth opportunities for equipment providers, including for US TEMs that sell telecom gear to the local SPs. The continued subscriber growth is due to the fact that the Revenue Per Minute (RPM) in these countries is among the lowest, if not the lowest – approximately $.04 per minute. Prepaid service is also keeping the tariffs low. The resulting Average Revenue Per User (ARPU) is $11 and $10 in India and China, respectively. This compares to an ARPU of $57 in the US, and $40 in Europe.

TEMS must adjust their cost structures to meet such aggressive price pressures.

New sources of revenue

Ever-increasing competition among wireline, wireless, and more recently cable operators has rendered voice and best-effort data services as commodity. Such services generate cash, but not profits.

Thus there is a strong need for service providers to find new sources of revenue. Such services must contribute to a significant increase in service provider ARPU. Bundling voice, data, and video – the so called "triple play" – offers a compelling set of services that holds the promise to increase service provider ARPU by 50-100 percent. This is expected to enable the long talked about IP TV, online gaming, distance learning, and a whole set of new applications. Even though the triple play presents compelling opportunities for service providers and TEMs, the reality is that telecom service providers have little experience delivering content as compared with the cable or satellite providers who have been in the business of delivering multimedia content for a long time. However, there is a window of opportunity, perhaps short, in which service providers must successfully deploy technologies to deliver such services before consumers and businesses make their purchase decisions to go with cable and satellite providers. The encouraging news for telecom service providers, however, is that commercially viable technology is available today to deliver triple play services over the carrier infrastructure. Any player who can successfully provide triple play combined with mobility as a bundled service to the end user stands to significantly benefit from it. The challenge for service providers and TEMs is timely execution.

New platforms and technologies

In order to transition from commodity services to new revenue generating services, network operators must upgrade their legacy networks to equipment that can effectively deliver such services. TEMs must respond to operator needs at unprecedented speed and cost. This requires adapting to new and emerging technologies and standards, as well as pursuing development strategies that minimize the risk of missing crucial market windows, yet deliver these new services. The telecom world is slowly, but surely, moving away from proprietary systems to systems based on standards that allow TEMs to build telecom systems using commercially available standard components. The challenge for TEMs is to decide where their core value-add is, and where they can rely on partners and suppliers to deliver components that will allow them to quickly build systems that address their customers' service, cost, and time-to-market requirements.

This is not a short term or temporary situation. These challenges will continue to define the telecom environment for the foreseeable future.

Emerging trends

Service providers generate revenue from applications and services running on systems generally provided by the TEMs. Conceptually (Figure 1) such a system can be viewed as consisting of four different layers:

- Hardware
- Operating system
- Middleware
- Application(s)

The bottom three layers typically represent a platform that must be acquired or developed before end user applications and services can be developed and deployed.

Implementing platforms using proprietary hardware and middleware often involves investment of enormous effort and resources. These proprietary implementations frequently require significant rework each time TEMs introduce a change in any of the layers, rendering the reuse of most of the functionality layers very costly, time consuming, and often prohibitive. Historically TEMs had to build such proprietary platforms in-house due to the lack of standards-based sophisticated, pretested, and pre-integrated COTS components that met their requirements. Such projects have invariably faced many challenges:

- Long development and integration cycles involved with building proprietary functionality and integration of third-party, and sometimes legacy, components
- Product commercialization cycles that are measured in years rather than months
- Missed deadlines due to underestimated development and integration effort
- Lost revenue and/or market share due to being late to the market

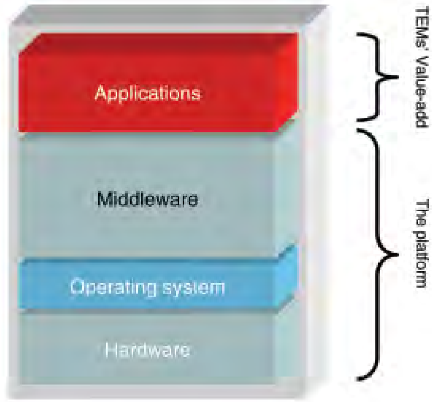


Figure 1

In the last few years, however, a few market realities have been causing systems developers to rethink their strategies. First, tight budgets, aggressive time-to-market requirements, increasing cost pressures, and fewer precious resources are causing telecom equipment manufacturers to look for alternatives such as acquiring hardware and middleware from third parties. TEMS are also focusing their resources on their core competencies, developing revenue-generating applications. Second, several emerging standards are providing designers the flexibility to build systems by combining a set of interoperable COTS building blocks such as hardware platform, operating system, and middleware from a variety of competing vendors. Let us look at the trends and opportunities in each of these layers.

The hardware

Arguably one of the most important factors driving the standardization of the hardware layer is the advent of the AdvancedTCA standard. A natural evolution of the PCI Industrial Computer Manufacturers Group (PICMG) specifications, AdvancedTCA is the first open standard targeted primarily at developers of telecommunication systems. It provides specifications for creating carrier grade hardware architecture that specifically addresses the reliability, performance, and scalability required for telecommunication applications. AdvancedTCA is fast gaining industry traction and most major TEMs have already announced their plans to provide network elements based on this standard. Although revenue estimates vary widely – 2007 revenue of \$4B to \$20B by RHK, and CCC/Metz International, respectively – there is no argument about the significant traction this standard is gaining with the OEMs. According to a report by In-Stat/MDR[1], by 2008 15 percent of the total chassis capital expenditure planned by the TEMs will be spent on chassis based on industry standards.

Another important development that holds additional promise for helping to drive this layer to standardization is the hardware abstraction specification called Hardware Platform Interface (HPI) specification from the SA Forum. HPI specifies services which, when implemented by the hardware OEM, provide ease of integration with third-party middleware that is compliant with the HPI specification. Commercial implementations of HPI are currently shipping from different hardware vendors. Middleware products that make use of HPI services are also commercially available.

Standards-based hardware promises to provide significant cost savings to the TEMs, savings that can be passed on to their customers, the service providers. A key implication of standardizing this layer is that it shifts the TEMs' value-add upwards into the software layers where it rightly belongs.

The operating system

Carrier Grade Linux (CGL) is fast gaining significant traction with TEMs developing a variety of new elements for the network core as well the edge. An impressive number of TEMs are already delivering systems based on CGL. On the operating systems and tools front, Wind River has recently joined MontaVista and Red Hat in announcing support for CGL.

Helping things along is the Open Source Development Lab (OSDL), an industry body dedicated to accelerating the adoption of Linux for enterprise computing and carrier applications. The CGL Working Group of OSDL is defining feature road maps and specifications for use in telecommunications architectures.

The middleware

Middleware is the natural next step in moving up the standardization chain. Ideally if this layer can provide abstraction from the layers below as well as the layer above it, the benefits to TEMS are potentially enormous. They can focus on their primary value add – the telecommunication services – without having to worry about the underlying middleware. Such standardization, though in its infancy, has already begun. SA Forum is leading the effort to create sets of standard specifications that facilitate middleware vendors to write their software such that they conform to standard APIs at the hardware as well as the application layer. In addition to HPI, it is evolving another specification called the Application Interface Specification (AIS), which establishes an interface between middleware components and the application layer. These specifications are intended to facilitate portability of middleware and applications across multiple platforms, thus reducing the startup cost and the integration effort. Several middleware vendors have announced support for AIS. Such vendors include those developing and marketing middleware that addresses areas such as high availability, systems management, and databases.

Several large players have been promoting standards-based modular platform architectures that provide for integration with COTS pretested middleware components. HP's Advanced Open Telecom Platform (AOTP), Intel's Modular Communications Platform, and IBM's BladeCenterT are some of the recent examples promoting the COTS-based ecosystem that such standardization makes possible.

The application

This is the layer of most value to the service providers in that applications are what generate service revenues for the service providers. The bottom three layers shown in Figure 1 can be viewed as the enabling technologies that support the applications and resulting services provided by the application layer. This is where the TEMs have the most opportunity to competitively differentiate themselves by offering compelling services that meet or exceed their customers' requirements.

It follows that the TEMs are best served if they can minimize their cost and effort in the lower layers by acquiring COTS components to put together an *application ready platform* rather than developing one in-house using proprietary technologies. This approach lets them focus their precious resources on developing the layer that provides them the most value and the most competitive differentiation, the application layer. This is where their core value-add is and should be.

Putting it all together

As some of the key standards, such as AdvancedTCA, CGL, and SA Forum specifications gain increased traction, the COTS ecosystem will continue to mature with more and more players providing pretested, pre-integrated components that can be used by the TEMs to quickly and cost effectively build application ready platforms. The transition from all-proprietary systems to COTS-based systems is expected to accelerate (Figure 2).

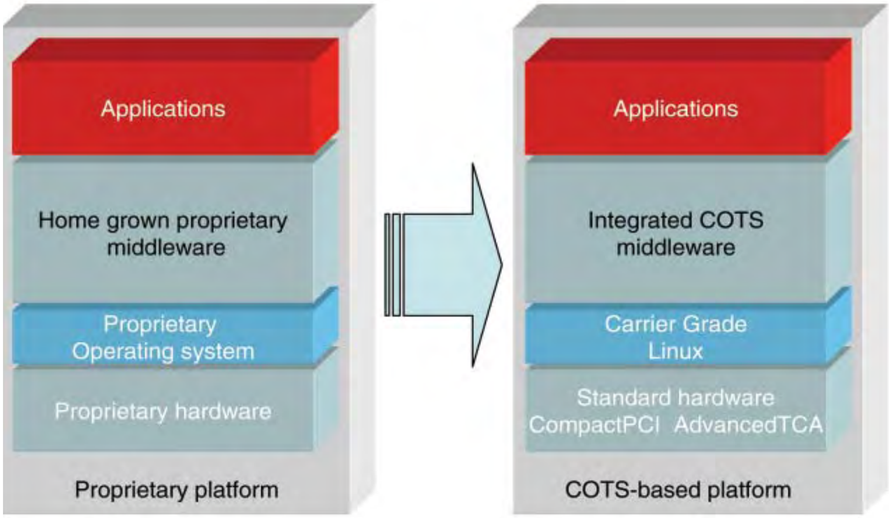


Figure 2

Figure 3 shows the *application ready platform* from GoAhead. SelfReliant, workhorse of this platform, provides comprehensive functionality that includes:

- Ability to model the entire system at the node as well as at the network level
- Stateful failure recovery
- Fast distributed messaging
- Standard interfaces for external systems management

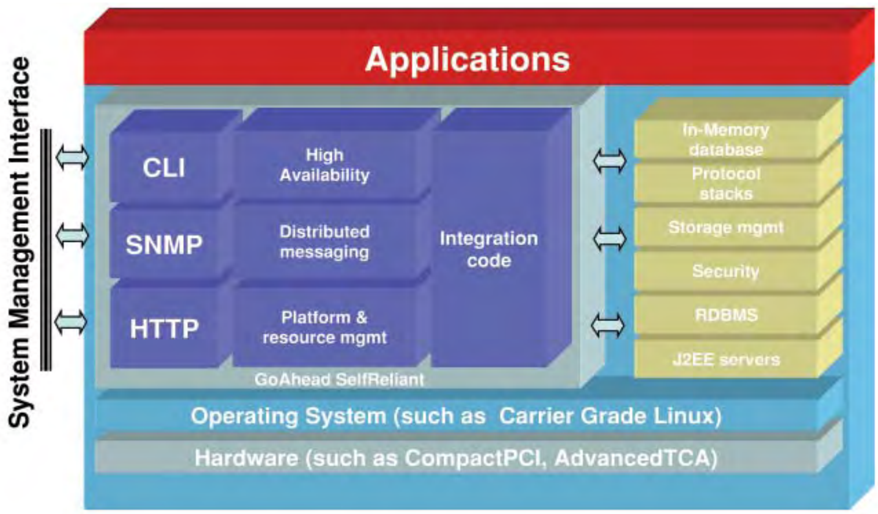


Figure 3

SelfReliant provides integration with relevant third party products from the COTS ecosystem, including widely used middleware components such as in-memory databases, relevant protocol stacks, and storage management systems. SelfReliant also provides seamless integration with standards-based hardware systems, such as CompactPCI and AdvancedTCA, from a variety of hardware vendors. SelfReliant provides such integration through HPI A or HPI B capabilities. By conforming to standards and providing abstraction layers, SelfReliant is platform independent.

SelfReliant has been field tested and proven through four major releases and more than 4000 deployments worldwide.

The final word

Mounting cost pressures, shrinking market opportunity windows, fewer development resources, and demand for new services from service providers are making TEMs rethink their system development strategies. They must develop telecom network elements quickly and cost effectively. The emergence of a set of key standards is enabling an ecosystem that offers an unprecedented opportunity for TEMs to build carrier grade systems from COTS components quickly and cost effectively. The transition from proprietary to standards-based systems is shifting the TEMs' value proposition up the stack into software, which creates the most value for them and their customers, the service providers.

Dr. Asif Naseem *is senior vice president and CTO for GoAhead Software, Inc. in Seattle, WA. He has more than 18 years of experience in the computer and communications industry. He has served as the general manager and director, ICSD, EMEA of Motorola, Inc. where he established and ran a new mobile applications business. He is a veteran speaker having presented at national and international events such as ITU Telecom Geneva, GSM World Congress, CTIA, and numerous other events. He has an M.S. in Electrical Engineering and a Ph.D. in Computer Engineering from Michigan State University.*

References

[1] "Standardized Chassis Help Thaw The Capex Ice Age," In-stat/MDR, 2004

For further information, contact Dr. Naseem at:

GoAhead Software
10900 NE 8th Street #750
Bellvue, WA 98004
Tel: 310-258-9801
Fax: 240-536-6546
E-mail: anaseem@goahead.com
Website: www.goahead.com

It's a Smooth Landing in ATCA™

with AudioCodes on Board

With more than a decade of expertise in VoIP, AudioCodes has deployed its feature-rich products in networks of leading customers around the world. Offering a wide variety of field-proven products, AudioCodes complies with the rapidly evolving international market standards and requirements. When selecting the right building blocks for your ATCA™ system, you can rely on AudioCodes for interoperability, scalability, responsiveness and reliability.

Leveraging on our sound track record, AudioCodes introduces the **TP-12610 ATCA™ VoIP Media Gateway Board**. Designed for high density applications, the TP-12610 supports up to 4,000 LBR channels and an array of PSTN and networking interfaces, all on a single blade.

For more information call +1-408-577-0488 or email VoIPsolutions@audiocodes.com

AdvancedTCA®

AudioCodes
www.audiocodes.com

RSC# 43 @www.compactpci-systems.com/rsc

Advanced Mezzanine Cards: More important than you think

By Rubin Dhillon

If you think the new Advanced Mezzanine Card (AMC) standard is "just another mezzanine card" or if you think it's just a subset of the AdvancedTCA specification and it will arrive sometime in the future, then you may have completely missed the boat.

AMC boards and chassis are here today. They are being adopted in platforms ranging from custom designs and blade servers to AdvancedTCA products and beyond. They are being considered by companies in the military and commercial markets as well as those in the enterprise and telecommunications space. Why? Because AMC modules bring a truly modular approach to systems design that no other mezzanine form factor has offered.

The PCI Industrial Computer Manufacturers Group (PICMG) consortium of more than 450 companies published the AMC base specification, AMC.0, in January of this year.

Since then, there have been a number of product pre-announcements and a small number of real product announcements that suggest the ecosystem for AMC modules is in the early stages of development. However, the market demand for this technology is now, and customers are anxious to build platforms using the scalability and modularity of AMCs today.

It seems that there has been a gap between what the market wants and what the ecosystem is ready to provide. Why is this? Most telecommunication equipment companies have been focused on developing AdvancedTCA components (mostly dual-Xeon processors) and positioning themselves as the *integrator of choice* for major Telecom Equipment Manufacturers (TEMs). Some companies have chosen to sit back and wait, positioning their existing PCI Mezzanine Cards (PMCs) for AdvancedTCA. As a subset of the overall AdvancedTCA specification, AMC has taken a back seat to AdvancedTCA for some time. Plus – what's all the excitement – AMC is just another mezzanine card isn't it?

What is an AMC?

In many ways AMC is to AdvancedTCA what PMC is to CompactPCI. The original goal was to define a mezzanine card for the AdvancedTCA platform that would allow modularity and scalability. Therefore the AMC standard is designed with telecom applications in mind. Some highlights:

Form factor, power, and thermals

The AMC form factor has been designed to be as flexible as possible for a wide range of computing and I/O applications. The AMC specification supports a range of single-wide, double-wide, half-height, and full-height configurations. One advantage of the AMC form factor is its larger surface area, approximately 14 percent larger than the PMC form factor, resulting in more room for components (Figure 1).

The AMC specification supports up to 60 W of power in all configurations, however it is unlikely that a system will

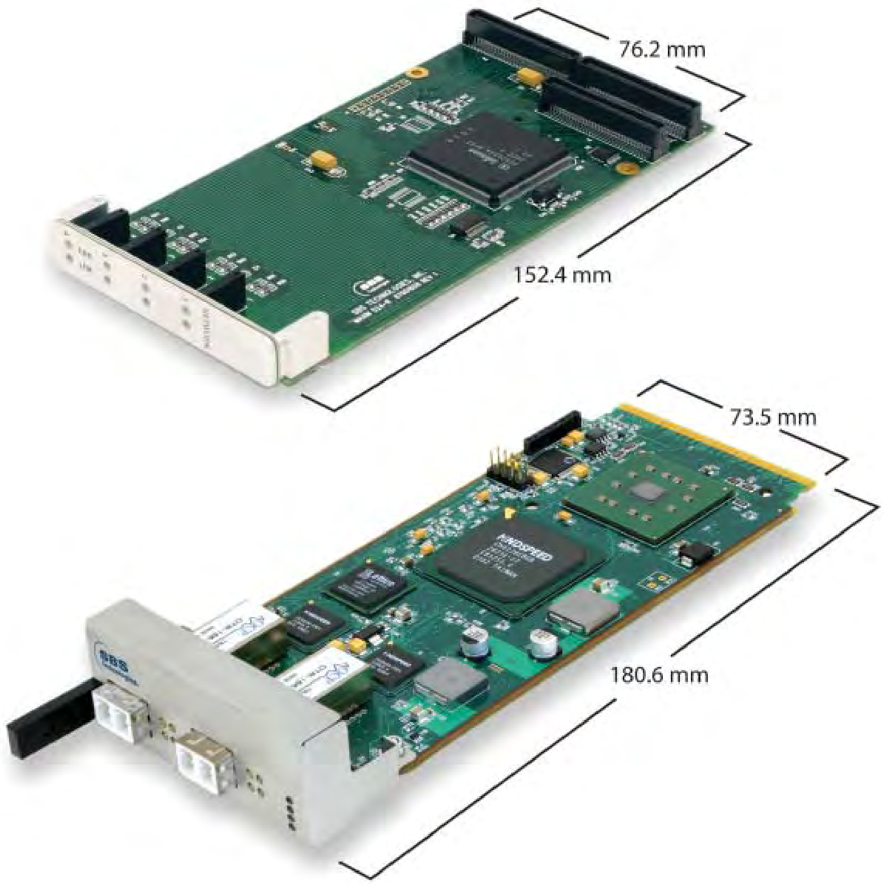


Figure 1

be capable of cooling a single-wide, half-height module running at 60 W (especially if there is another 60 W module in the adjacent half-height slot). Table 1 lists the recommended power requirements for the various form factors.

Description	Length	Width	Height	Recommended power
Single-wide, half-height	181.5 mm	73.5 mm	8.18 mm comp.	20 W
Single-wide, full-height	181.5 mm	73.5 mm	13.88 mm I/O	40 W
Double-wide, half-height	181.5 mm	148.5 mm		60 W
Double-wide, full-height	181.5 mm	148.5 mm		60 W

Table 1

Designed for high-speed applications – the serial interconnect

With telecom networks moving towards IP, 10 Gigabit Ethernet, and talk of 40 Gigabit interfaces, older parallel or PCI-based solutions such as PMC cannot keep up. The PCI PICMG standards committees have addressed this by adopting a serial interconnect strategy for the AMC that supports up to 12.5 Gbps. AMC has been designed with flexibility in mind and is capable of supporting a range of protocols including PCI Express and Advanced Switching (AMC.1), Gigabit Ethernet (AMC.2), and Serial RapidIO (AMC.4). Others have been proposed (such as InfiniBand). At the time this is being written, AMC.1 and AMC.2 seem to have the most interest, with AMC.4 gaining attention in DSP-centric applications.

Hot swap capability

The hot swap capability of AMC modules gives this mezzanine card format its true modularity. Unlike its PMC predecessor, the AMC module is front-loadable, sliding into a chassis, rather than being installed piggyback style in the internals of a carrier. The module is field-replaceable and upgradeable and does not require the entire system or blade to be removed. In this fashion, an AdvancedTCA blade consisting of multiple AMCs is flexible, scalable, and highly available.

Manageability

The AMC specification supports the Intelligent Platform Management Interface (IPMI) as standard and Electronic Keying (E-Keying). This allows dynamic configuration of AMCs as well as giving them a monitoring and alerting subsystem.

The characteristics just noted are a clear indication of how designers created the AMC architecture to address the telecom applications of today and tomorrow. Sure, first generation AdvancedTCA systems have been deployed using the PMC mezzanine architecture, but this is temporary, since PMCs cannot deliver the performance and modularity that today's system designers demand.

Winds of change in the market

We all know what happened to the telecommunications market several years back, and many companies are still recovering from that pain. The challenges are not behind us. The tremendous amount of activity in the market includes continued cost reductions and downsizing as well as consolidations at all levels including traditional board and chip vendors, TEMs, and end users. The move to all-IP networks has picked up momentum. What's more, new services and companies are delivering those services. Cable companies have gotten into the voice business, and telecom companies are looking at the video business.

The current telecommunications environment is driving the industry to adopt an open standard modular computing architecture to build scalable platforms. The TEMs are seeing less and less value in hardware and are looking more like software companies. Because of their lack of hardware resources, TEMs are focusing more of their energy and corporate resources into their core competencies in software applications such as softswitches and leaving the building of telecommunication hardware-to-hardware companies.

Competition is stiff, time to market is key, and cost to market is getting even more emphasis all across the telecom board. All of these factors are affecting the traditional embedded equipment companies that provide the boards and software that go into telecommunications systems.

The whole idea behind the modular computing architecture concept is to encourage a rich ecosystem of suppliers all competing to supply innovative products at the best price possible. Companies building modular systems want to have multiple suppliers for each component in their systems (second and third sourcing as much as possible) so they can take advantage of market efficiencies.

Supply chain issues such as lead times, inventories, quality, and yearly cost reduction commitments are becoming more prominent factors in the buying decisions TEMs are making. The whole environment is starting to look more like the IT industry than the traditional embedded industry.

This is not as strange as it sounds, though. There are companies that supply major IT systems that are very good with supply chain issues, companies such as IBM, HP, and Sun Microsystems, Inc. All three companies have announced strategies to compete effectively in the telecommunications market. Major TEMs see this as a welcome sign.

AMC steps out of the AdvancedTCA shadow

We are still in the early days of market development for AMC, however. Initial market data projects AMC sales as a small percentage of AdvancedTCA sales. It has become very clear that the opportunity of marketing AMC products extends way beyond its use in AdvancedTCA systems. Some TEMs are not moving aggressively in the AdvancedTCA direction because they have invested way too much in their own proprietary platforms.

These companies have recognized the advantages of the open standard modular computing concept, and are adapting their platforms to support AMC modules. This adaption essentially gives them the best of both worlds, which is leveraging a rich ecosystem of open standard modular AMCs and extending the life of their investment in proprietary equipment. For example, IBM has announced a joint partnership with SBS Technologies to develop

AMC support for its eServer BladeCenter platform, thereby enabling another (potentially large) channel for AMCs. Figure 2 shows a prototype of an AMC carrier blade for an IBM BladeCenter eServer system.

Figure 2

MicroTCA: AMC gets its own system platform

If you consider the architecture of the AMC standard – hot swappable, serial interconnect, and manageability – it lends itself nicely to a standalone system. This is exactly what many companies are working towards.

The MicroTCA system architecture consists of AMC modules, all connected together by a common backplane. AMC microblades can provide I/O and processing power to a standalone MicroTCA system without needing a carrier card, just as AdvancedTCA blades provide those same features to an AdvancedTCA system. The concept of a standalone AMC-based system will strengthen the acceptance of this architecture in application areas outside of the telecommunication market.

There is a lot of excitement around the MicroTCA specification as it has the potential of addressing applications not particularly suited for AdvancedTCA, but requiring a similar level of system performance and features. For example, while the AdvancedTCA architecture is aimed at core telecommunication network operations, the MicroTCA architecture is better suited for lower-cost network edge and enterprise applications.

The first MicroTCA demonstration systems were on display at SUPERCOMM in June of this year and the MicroTCA Committee projects final specification is to be ratified by the PICMG Committee sometime in early 2006.

What does MicroTCA look like so far?

At the time of this article the PICMG Committee is still working through the details of MicroTCA. The goal is to build a platform specification that has the cost, size, and modularity to meet applications not addressed by AdvancedTCA. These applications could vary widely, including telecommunications network applications, enterprise network applications, or even consumer applications.

Some MicroTCA specifications

Mechanicals, size, and power

The size and configuration of a chassis of AMCs connected by a serial interconnect fabric could vary from a small box of two single-height, single-wide AMCs, to a large, standalone chassis with multiple-sized AMC micro-blades. Of the many possible types of chassis configurations possible, there are at least two configurations the MicroTCA Committee is considering. Figure 3 shows a proposed MicroTCA chassis (top) and an SBS AMC chassis (bottom), each populated with AMC modules. Figure 3 shows a possible 4U 19" rack-mount chassis, which can support up to 10 full-height AMC modules and could also support a mixture of the other form factor AMCs and a possible 8" cube chassis configuration that could hold up to 12 half-height AMCs.

A MicroTCA system might also support either 48 V nominal or AC main power allowing it to support applications beyond central office telecom networks (AdvancedTCA specification provides for 48 V only).

Virtual Carrier Manager (VCM)

The VCM is the heart of a MicroTCA chassis and probably will be present in most MicroTCA configurations, as well as high-end systems. The VCM will most likely be the size of a full-height, double-wide AMC module and responsible for powering, managing, and connecting up to 12 AMC cards in the MicroTCA chassis.

The VCM will provide IPMI system management and a fabric switch with

Figure 3

up to 60 lanes of connectivity with various configurations supporting Ethernet, PCI Express, and other protocols. It is expected that there will be two virtual carriers to provide redundancy in a high availability configuration.

Interconnect fabric

The MicroTCA specification will be as flexible as AdvancedTCA, supporting a range of possible protocols across a serial backplane. The first systems on display at SUPERCOMM 2005 supported a Gigabit Ethernet backplane. Future systems are projected to support PCI Express and Advanced Switching, Serial RapidIO, and 10 Gigabit Ethernet.

Cost

Cost is an important part of any specification and will be pivotal for MicroTCA architecture gaining acceptance in many of the applications it targets. The current target cost for a low-end bare bones MicroTCA system, including chassis, backplane, and virtual carrier is $500. At this early point in the market development, $500 seems like a very challenging number to achieve, however, MicroTCA proponents point to potential volumes of both AMCs and MicroTCA systems driving the cost down.

As mentioned, MicroTCA is aimed at those applications not currently addressed by AdvancedTCA. AdvancedTCA is positioned very well for core network applications where the size and cost of the architecture is acceptable. For telecom and datacom applications such as wireless base stations, router/gateways, Multiservice Provisioning Platforms (MSPPs), and other applications requiring a smaller form factor and lower cost, MicroTCA is much better suited.

The concept of a standalone AMC-based system will strengthen the acceptance of this architecture in application areas outside of the telecommunication market.

Perhaps the most surprising aspect of MicroTCA is the interest the architecture is receiving beyond the traditional telecom applications. There is interest in using the platform to address data center and IT applications, therefore bringing MicroTCA and AMC to the enterprise market.

Also, there has been some discussion with companies building military systems where the concept of a *ruggedized* architecture is being explored. A ruggedized, conduction-cooled, bullet-proof military communications system using low-cost, high-volume MicroTCA components could soon be explored by companies, such as SBS Technologies, which build military systems using Commercial Off-The-Shelf (COTS) components. This is a significant challenge, but if realized, could open up a rich ecosystem of high-performance, low-cost building blocks unlike anything the military system integrators have seen in the past.

The MicroTCA architecture still has some way to go before the specification is finalized. There are challenges creating rugged, low-cost backplane connectors. There is still work to be done to address the reliability, availability, cooling, and cost aspects of the overall MicroTCA specification.

However, the enthusiasm behind the proposed specification, particularly from those vendors looking to get the most out of their AMC investments, looks to keep it on the fast track toward early deployment.

Conclusion

Developing the underlying technology for AMC modules is daunting. Everything from designing for a challenging thermal environment to getting the correct tools to implement complex high-speed interconnect fabrics, all while keeping costs as low as possible, is a significant challenge to those companies looking to supply AMC products.

The development of standards such as AMC and MicroTCA is changing the technology and market dynamics of the telecommunications industry in exciting and challenging ways. Over the next few years we will see AMC modules deployed in a variety of architectures and various markets. We will see a few major system integrators emerge as the suppliers to the world's leading TEM and enterprise companies. The face of the embedded industry will change dramatically. These are indeed challenging, but exciting times.

***Rubin Dhillon** is the general manager for the Communications Group of SBS Technologies, Inc., headquartered in Mansfield, MA. He has more than 10 years' experience in the embedded communications technology industry. He received a Bachelor of Business degree from Victoria University, Victoria, Australia.*

For further information, contact Rubin at:

SBS Technologies, Inc.
7401 Snaproll NE
Albuquerque, NM 87109
Tel: 505-875-0600 • Fax: 505-875-0400
E-mail: rdhillon@sbs.com
Website: www.sbs.com

Non-telecom AdvancedTCA applications

By Justin Moll

AdvancedTCA is gaining popularity in systems outside of the telecom Central Office (CO). Several potential customers in enterprise, scientific, and high-performance computing applications have shown a great deal of interest in AdvancedTCA. Even military communications systems vendors have shown interest. Although AdvancedTCA is geared for the CO, customers in these other market segments love the bandwidth, open standard format, form factor, reliability, and proven interoperability of the specification.

Non-telecom customers often have slightly different needs than conventional AdvancedTCA customers. For one, shelf management can be overkill for their application. The redundant nature and inherent reliability of AdvancedTCA is often ample for their less demanding needs. Some are willing to sacrifice the extra reliability and serviceability of shelf management to save the costs (and perhaps save more shelf space). Many in the non-telecom arena also do not need the full redundancy of AdvancedTCA. A modular and flexible design allows versions to be with or without key elements, providing customers with more choices based on their needs.

The incorporation of A/C power is another requirement of many in the non-telecom community. Although the PICMG 3.0 specification utilizes 48 VDC for power, some vendors have incorporated AC power supply options in their 2U, 3U, and 5U AdvancedTCA chassis. As these units can be plugged into conventional wall outlets, they suit tasks such as prototyping or tradeshow demos. An A/C power sup-

	Application	Challenge/Needs	Solution
Enterprise (2U)	This non-telecom user needed to use a smaller stackable chassis for scalability. The chassis had to be able to plug into A/C outlets.	• As small a form factor as possible • A/C power	A 2U A/C AdvancedTCA chassis met the need for a small form factor, with its room above the card cage for ultra-thin power supplies. (See Figure 1.)
Enterprise (13U)	This application needed a high end computing solution with full redundancy and maximum performance.	• Load sharing or N+1 redundant power • Minimize customization and NRE charges to standard 13U design	The user chose a 13U AdvancedTCA chassis with three power supplies. Elma Electronic performed thermal simulation to confirm that cooling was more than adequate. (See Figure 2.)
High-performance computing	This application required high-performance computing for general applications in a small portable size.	• Two front boards • Two RTMs • Redundant and pluggable fan trays and filters • 250 W power supply • PEM • Shelf manager	By choosing a 2U A/C chassis, with a design that allows space for both the power supply and shelf manager above the card cage, the user met the portability demands of this application. The chassis' removable fan tray and filter with side-to-side airflow enable increased serviceability.
Communications	In this case the customer needed a chassis that could address various communication applications and have full redundancy.	• Four slots • Shelf manager (included on the customer's fabric card)	The customer chose a 3U A/C chassis to accommodate the need for four slots. Elma Electronic increased the depth of the chassis below the RTM to make room for the dual power supplies and PEMs.
Storage	This application needed high processing power, A/C pluggability, and very high reliability.	• Dual shelf managers • A/C power	A 5U A/C chassis that included a shelf manager met this user's needs. Elma Bustronic's backplane characterization studies confirmed excellent performance at 3.125 and 6.250 Gbps data rates.

Table 1

ply option also lends flexibility to non-telecom AdvancedTCA users. Many of the non-telecom applications use widely available AC power. Table 1 shows some of the specific applications we've seen for non-telecom AdvancedTCA designs.

The non-telecom AdvancedTCA applications are becoming more common and interesting everyday. With a modular design platform and creative engineering, AdvancedTCA vendors will be able to provide solutions to meet the new challenges.

Figure 1

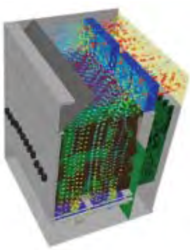
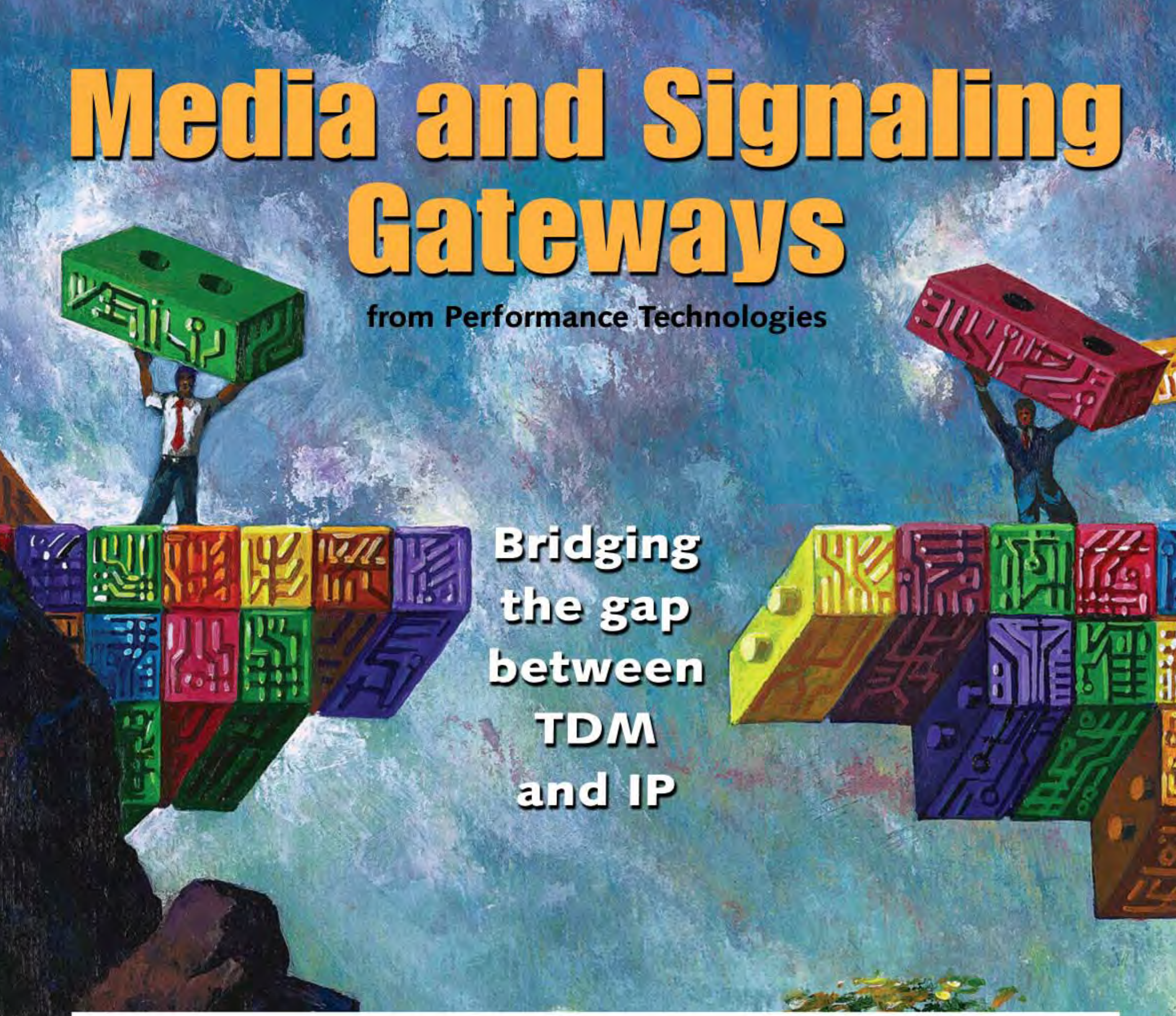


Figure 2

Justin Moll has more than 10 years of high-tech marketing and sales experience and has been with Elma Bustronic and Elma Electronic Inc. since 2000. As the Director of Marketing for Elma Bustronic and Manager of PR for Elma Electronic, he has been a key figure in the strategic marketing for both companies. Justin is active in VITA and PICMG and has been the VP of Marketing for the StarFabric Trade Association since 2003. His previous positions include Marketing Services Manager for E21 Corporation and Account Manager for Elcon Products International, now a Tyco Electronics company. Justin received his Bachelor of Science degree in Business Administration from the University of California, Riverside.

For further information, contact Justin at:

Elma Bustronic/Elma Electronic Inc.
44350 Grimmer Blvd
Fremont, CA 94538
Tel: 510-656-3400
Fax: 510-656-3783
E-mail: jmoll@elmabustronic.com
Website: www.elma.com


Media and Signaling Gateways
from Performance Technologies
Bridging the gap between TDM and IP

Open interoperability key to VoIP gateway designs

By Alan Baldus

Voice over Internet Protocol (VoIP) first emerged in the early 1990s as a way to conduct voice conversations over the Internet without incurring telephone charges. Today, the capacity, speed, and reach of data networks are expanding much faster than traditional circuit-switched voice networks. Voice over packet solutions (such as VoIP) leverage those data network resources and contemporary packet-switching technologies to generate new revenue opportunities and cost savings for both startup voice service providers such as Vonage) and existing telecom carriers. The result is that telecom companies are frantically investing in VoIP infrastructure equipment more than any other technology. And while proprietary VoIP systems initially helped establish the market, the trend is clearly toward open and interoperable VoIP platforms that easily permit equipment makers and carrier customers to add differentiating value.

On the customer side, growth in the VoIP market is being driven by the unabated adoption of broadband in the home. In addition, the quality and functionality of VoIP continues to improve with technology advances in both hardware and software. With the data networking bandwidth in place on the Internet infrastructure side, and voice processing technology in place on the telephone user side, enormous efficiencies are realized from converging voice and data onto the same physical transport medium. The advantages of leveraging networking protocols running on multichannel gateway devices include better bandwidth utilization, consolidated management systems, and greater sharing of hardware resources like switches and routers.

VoIP transports digitized speech traffic over an IP-based network instead of over a traditional telephone network. The majority of today's installed base of telephone handsets are still analog Plain Old Telephone System (POTS) units. These POTS-based phones create the greatest potential need for gateway-enabled VoIP calls. The conventional Public Switched Telephone Network (PSTN) uses Time Division Multiplex Access (TDMA) technology that must be converted to IP packets for IP-based networks, digitized by any of a large number of standard or proprietary voice coding schemes. This facility is the primary function of a VoIP gateway, the keystone device of a converged voice/data network.

Gateways and protocols

In general, a gateway is a device that connects one type of network to another. A PSTN-to-IP gateway transforms standard telephone sounds (such as touch-tones, dial tone, and voice) into a format that is suitable for the digital IP network. Generally, VoIP gateway software supports two major functions: voice media processing algorithms and software voice switching and control. The functions of a gateway include analog-to-digital and digital-to-analog data conversion of conventional phone signals (vocoding), voice and fax COmpression/DECompression (CODEC), packetization of digitized audio, call routing, and control signaling (for example, on-hook and off-hook functions). Additional gateway functions include interfaces to external controllers like open system softswitches that perform call control functions such as:

- Protocol conversion
- Authorization
- Accounting and administrative operations
- Billing systems
- Network management systems

The most widely deployed of IP-based call control protocols, H.323, is a vertically integrated suite of protocols that supports signaling, registration, admission control, security, inter-domain data exchange, and transport. One of its primary features is a fast-start procedure that rectified the long call setup delays previously experienced by IP telephony users. H.323's architecture borrowed heavily from legacy circuit switch protocols.

The most well-known packet format and transport protocol for transmitting real-time data on IP networks is the Real-Time Protocol (RTP). RTP is used to encapsulate voice or other real-time data and provide information about that data such as timestamp, sequencing, and payload format. RTP can also be used for any one of a number of vocoder formats including G.711 packetized Pulse Code Modulation (PCM), which is the native vocoder format of the PSTN. RTP is a transport layer protocol and is further encapsulated in User Datagram Protocol (UDP) and IP packets. Other sophisticated vocoders like G.723.1 and G.729 are complex algorithms that include:

- Stochastic codebook search
- Pitch prediction
- Parameter estimation
- Vector quantization

Such algorithms pose a challenging mix of control code and a substantial amount of mathematical calculations.

Another signaling protocol, the Session Initiation Protocol (SIP), borrows most of its concepts from the Web-browsing and e-mail protocols HTTP and SMTP. It focuses on *multimedia session control*, managing and coordinating multiple sessions and multiple users in multiple media (audio, video, and collaborative applications). Thus SIP ensures session-level interoperability between different teleconferencing implementations. Given its roots in standard Internet protocols, SIP has quickly gained popularity with service providers.

Design approaches

With the VoIP market exploding, pressure is mounting to drive gateway costs down while still ensuring optimal quality and performance. Vocoding, network and telephony signaling, the PSTN interface, and an Ethernet interface are the minimum functions required (see Figure 1).

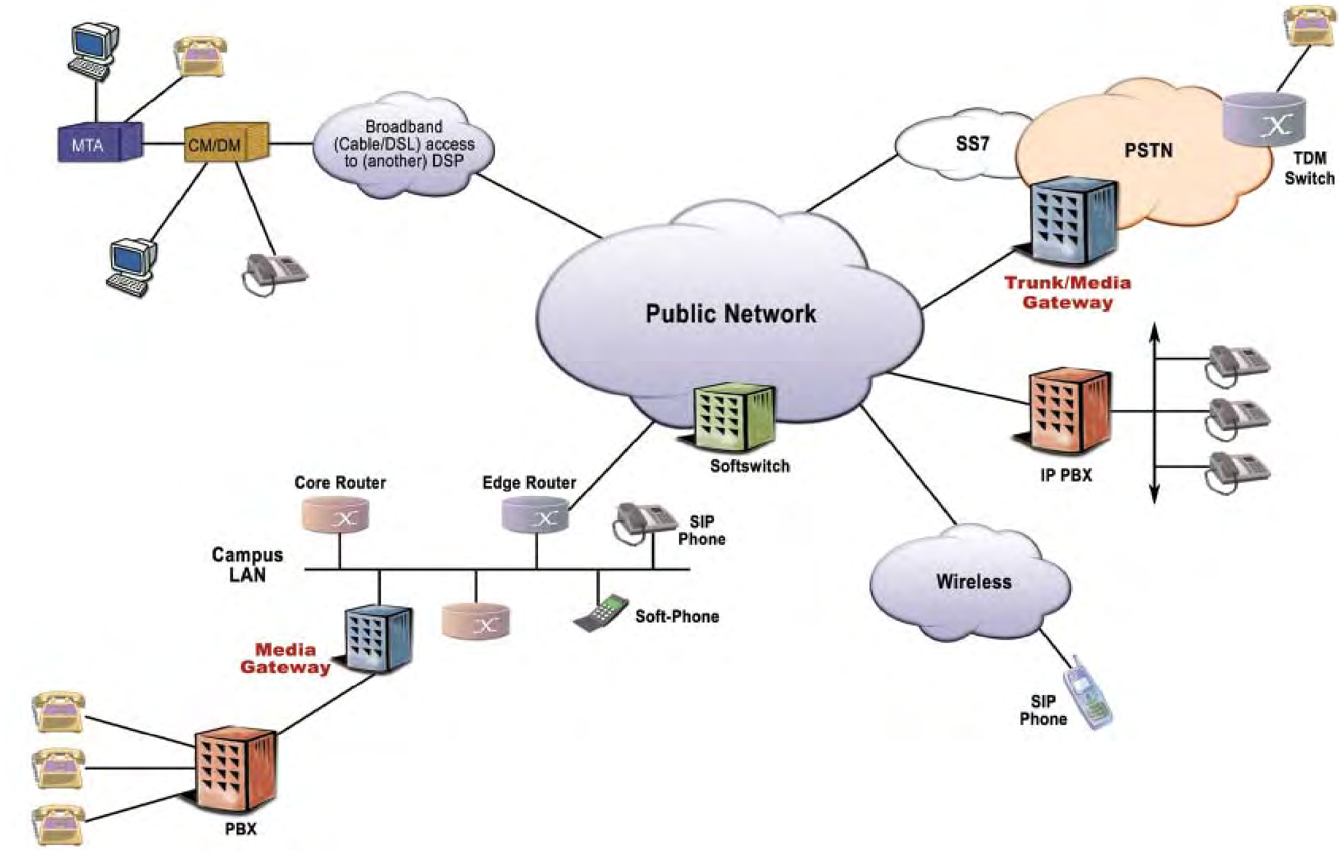


Figure 1

Gateway makers are adopting various methods of driving down costs to meet market demands. However, cost advances often come at the expense of adherence to standards. Some service providers give users devices that implement standards such as Media Gateway Controller (MEGACO) or Media Gateway Controller Protocol (MGCP) as well as the H.323 or SIP logic needed to properly switch and terminate VoIP calls. But other point-to-point VoIP vendors such as Skype have adopted nonstandard end-to-end protocols without compromising their own business success. Ultimately, however, the widespread and long-term success of VoIP rests upon open standards and on interoperable equipment residing at both ends of any VoIP call connection. This inevitability is pushing gateway developers to explore various open platform options for their designs. These include standard core-based ASICs and System-on-Chip (SoC) devices, Host Media Processing (HMP), and Digital Signal Processing (DSP) architectures in an off-the-shelf module approach.

Hardware choices for supporting the tough processing requirements of this functionality understandably point to DSP architectures, and some developers have turned to SoC designs that combine a DSP core with integrated peripherals and accelerators for specialized functions. Other gateway vendors opt for even more highly integrated ASIC solutions that indeed provide lower materials costs, but typically introduce radically high development costs, multivendor complexities, and barriers to supporting evolving or new standards.

HMP stages VoIP gateway functionality on a commercial host server computer. HMP software provides basic media services that developers can use to build modular network elements for voice and data services hosted on popular computing platforms such as Pentium servers. HMP software moves media processing solutions from the domain of custom software and specially designed boards to an open software model for standard high volume computing platforms.

Open standard platforms for VoIP gateways (or any system, for that matter) provide lower inventory and startup costs, as well as lower development, deployment, and maintenance costs. These characteristics all apply to standard platform based gateway designs that leverage off-the-shelf hardware configurations and high performance software.

Off-the-shelf platforms

With off-the-shelf hardware and software, VoIP gateway developers can focus on competitive differentiation through enhanced functionality like configuration, management, and billing. For infrastructure grade systems, developers are widely adopting CompactPCI and AdvancedTCA technologies for these purposes. Ultimately, vendors get reduced time-to-market and development risk, and carriers get lower total-cost-of-ownership.

As a key industry driver today, PCI Mezzanine Cards (PMCs) enable OEMs to develop turnkey carrier class VoIP gateways. PMC daughter cards reside on integrated bare board platforms that provide the processing muscle for the gateway functionality.

Advanced Mezzanine Cards (AMCs), designed specifically for packet-based, high availability applications are poised to become a significant platform for applications like VoIP gateways. Designed primarily for AdvancedTCA platforms, AMC provide high throughput, multiprotocol support, high power capability, hot swappability, and integrated system management, all key for telecom systems.

AdvancedMC modules extend the benefits of the AdvancedTCA fabric to individual modules, enabling VoIP gateway designers to customize, scale, upgrade, and service systems with a finer degree of granularity. Together, gateway developers can leverage AdvancedTCA and AMC to greatly reduce time and costs.

Modular VoIP "blades" based around standard, interoperable modules like PMC and AMC also reduce costs by limiting the number of unique blades that telecom OEMs and carriers have to purchase and stock. With the blade and module card approach, carriers can stock a single generic carrier blade that spans multiple needs, along with the modules needed to configure that blade for specific applications. (See Figure 2.)

SIDEBAR

CHOOSING A DSP VENDOR FOR GATEWAY DESIGNS

By Jeff Brower

SBE and Signalogic are collaborating to develop VoIP products featuring Texas Instrument's programmable Digital Signal Processors (DSPs) with Telogy Software and Wintegra's WinPath network processor to enable integration of voice, data, and fax. Jeff Brower, President & CEO, Signalogic, discusses criteria for matching a DSP-based approach to VoIP gateway design requirements.

Of the three architectural approaches for VoIP gateway design – ASIC, HMP, or DSP – DSP offers the best solution for high-channel-count equipment. Today, the criteria for choosing an ideal DSP device for VoIP applications is governed as much by access to development knowledge as by specific device features and empirical performance metrics. The blog-level chatter from the world's many thousands of DSP developers constitutes a sort of industry referendum on various DSP chips. Collective experience and interactive dialogue provide field-validated information on device performance as well as critical issues of development tools, support, and the "bugginess" of various DSPs. The following are some general guidelines for defining the appropriate DSP-based gateway approach for your needs:

- Which chip vendor has more online users, is gaining more online users, and freely discusses project development at meaningful, low-level detail?
- Which vendor provides more application notes, more source code, is honest and forthright about device errata, and makes this information easily accessible online?
- Which vendor ensures its own engineers and support personnel are consistently available in online chat groups to answer questions and address false assertions that might appear in these forums?
- Which vendor provides extremely low-cost entry points for development tools? Since collaborative, online development is, by definition, shared worldwide, the cost of development tools has become a major issue. Vendors whose toolsets are prohibitively expensive are beyond access to many of the economies that serve as today's centers for high-tech development.
- Which vendor has the best supporting service-stack software available for their DSP devices?

In the case of our design team, these five guidelines led us directly to Texas Instruments. TI made this choice easy with excellent support from field applications engineering staff, an extremely prolific user-group network, and easily affordable development tools. And because TI's (Telogy) vocoder protocols have been accepted as the default service-stack in the VoIP network, our team was assured that our TI-based gateway design would have no trouble meeting compatibility and compliance issues in the field.

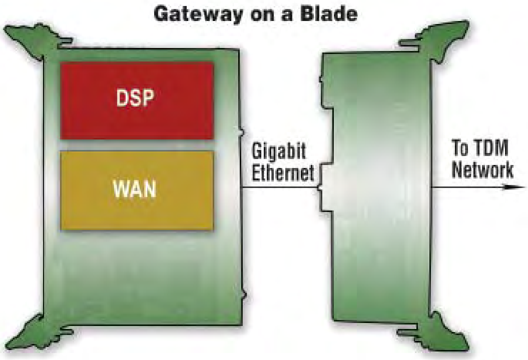


Figure 2

In a VoIP gateway equipped with transcoding modules, for example, the system could be deployed in a minimal configuration and scaled up later without replacing the whole blade and without taking it offline.

Many VoIP gateway vendors are moving in this direction, opting to differentiate through software hosted on VoIP optimized hardware platforms. Signalogic and SBE, Inc., for example, have developed a high density VoIP gateway platform using Texas Instruments' DSPs with Telogy Software and Wintegra's WinPath network processor to enable integration of voice, data, and fax. These products are scalable from daughterboard modules to complex gateway blades and provide telecom carriers and service providers with a selection of programmable voice platforms featuring SBE's line of network interface cards.

Building VoIP gateways in the context of required interoperability and standards ultimately minimizes network infrastructure costs by facilitating seamless, multivendor environments for both media gateways and softswitch/media gateway controllers. This translates directly to a carrier's ability to generate more revenue per customer by interoperating with leading softswitch, PBX, and IP PBX vendors, supporting diverse call control protocols, and offering transport-layer-agnostic solutions.

Physical media independence gives a VoIP gateway functional independence from the physical network over which IP packets are transported. Meanwhile, a programmable solution in an open platform context ensures support for multiple signaling and control protocols as well as evolving and emerging standards. Finally, open standard platforms allow seamless support for third-party software applications and services, a fundamental driver for VoIP market growth.

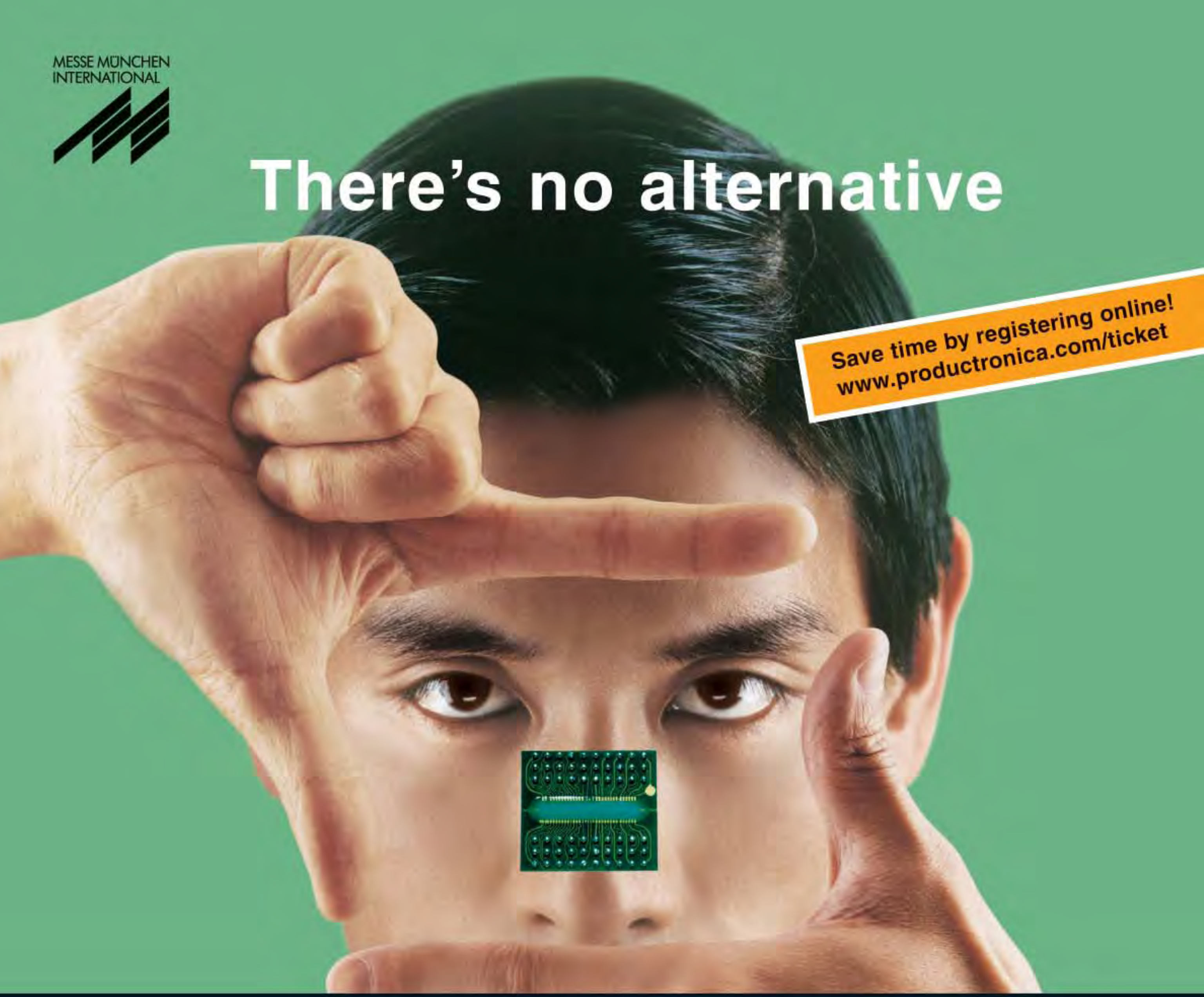
Alan Baldus *is the director of the Field Application Engineering (FAE) team at SBE. Alan has been working in the embedded networking industry for more than ten years. He has been active in the PICMG organization and chaired the PICMG 2.15 PTMC specification. Prior to joining SBE, Alan directed the FAE team at SBS Technologies and covered the West Coast as an FAE for Performance Technologies. Alan holds a BS in Electrical Engineering from San Diego State University.*

For further information, contact Alan at:

SBE, Inc.
2305 Camino Ramon
San Ramon, CA 94583
Tel: 800-214-4723
Fax: 925-355-2020
E-mail: alanb@sbei.com
Website: www.sbei.com

Company name/ Model number	AdvancedTCA	AMC	CompactPCI	DSPs	PICMG 2.16	PTMC	SIGTRAN	Software	T1/E1/J1	VoIP
Aculab www.aculab.com										
Prosody CompactPCI			•	•					•	
Adax www.adax.com										
Adax Signaling Extender			•						•	
Adax Signaling Gateway			•							
Adax Signaling Router			•						•	
Adax Tunneling Gateway			•						•	
SG Plus – HA							•		•	
Universal Signaling Gateway							•			
Artesyn www.artesyn.com										
Katana PPB	•						•			
Katana QP	•					•				
SpiderWareSG					•		•		•	
AudioCodes www.audiocodes.com										
IPmedia 2000			•							
IPmedia 3000			•							
IPmedia 5000										•
IPmedia 8000										•
Mediant 1000									•	•
Mediant 2000			•							
Mediant 5000			•							
Mediant 8000			•							
MediaPack 112/114/118										•
SB-1610			•		•		•			
Stretto 2000							•			
TP-12610	•						•			•
TP-12610 SDK	•							•	•	•
TP-260									•	•
TP-260/SIP									•	
TP-2810					•		•			•
TP-6310					•		•			
TPM-6300										•
TPM-1100										•
Brooktrout Technology www.brooktrout.com										
TR1500			•		•				•	
Continuous Computing www.ccpu.com										
FlexCore ATCA-FM30	•	•								•
FlexDSP ATCA-TI320	•			•		•				
FlexIO ATCA-PMC40	•					•				•
CoSystems www.cosystems.com										
EdgeBlade-A	•	•				•				•
EdgeBlade-C			•			•				•
General Micro Systems www.gms4vme.com										
C161 Aurora			•		•					
GNP www.gnp.com										
Signaling Gateway			•							

Company name/ Model number	AdvancedTCA	AMC	CompactPCI	DSPs	PICMG 2.16	PTMC	SIGTRAN	Software	T1/E1/J1	VoIP
Inova Computers www.inova-computers.com										
ICP-MMEDIA			•							
Intel www.intel.com										
NetStructure IXB28504xGbEFS	•									
Interphase www.interphase.com										
iNAV 9200									•	
Kontron www.kontron.com										
CP6011			•		•					•
CP6000			•		•					
Lantronix www.lantronix.com										
EMTalk				•				•		•
Motorola www.motorola.com/computing										
ATCA-6101	•									
WTRB500			•		•					
Performance Technologies www.pt.com										
MG6000					•				•	•
MTN4200			•			•				•
MTN4300						•				•
NexusWare MG								•		
SEGway 4200							•			
SEGway 4300							•			•
SG5600			•		•		•			•
Pinnacle Data Systems www.pinnacle.com										
TS2100	•									
TS2150			•							
Radvision www.radvision.com										
L2W-323										•
Redwood Technologies www.redwoodtech.com										
DNX/INX							•		•	
SBE www.sbei.net										
HW400c/2					•	•				
SBS www.sbs.com										
ARIES 720			•							
Telum 624/628-TEJ	•	•							•	
Syndeo Corporation www.syndeocorp.com										
Syion 426										•
Telesoft Technologies www.telesoft-technologies.com										
MPAC 5600 CESoPSN			•		•				•	
Versatel Networks www.versatelnetworks.com										
IQ1500		•							•	•
Voiceboard www.voiceboard.com										
PTMC41			•	•		•				•
Single Blade Gateway			•						•	•
Zarlink Semiconductor www.zarlink.com										
ZL50031			•							


MESSE MÜNCHEN
INTERNATIONAL
There's no alternative
Save time by registering online!
www.productronica.com/ticket

NEW PRODUCTS

By Chad Lumsden

www.compactpci-systems.com/products

CompactPCI & AdvancedTCA

BACKPLANE: FULL MESH

Omni Device

Website: www.omnidevice.com
Model: USPB-3000: ATCA **RSC No:** 21285
AdvancedTCA compliant backplane • 14 slots • Dual star • Full mesh

CARRIER BOARD: M-MODULE

AcQ InduCom

Website: www.acq.nl
Model: i3100 M-module Carrier **RSC No:** 21579
PCI9050 Controller by PLX (PCI 2.1 compliant) • M-module interface runs asynchronously to the PCI clock • Bi-directional FIFO for zero waitstate burst operation • Supports Big/Little Endian Byte conversion • 4x M-module interface (A08/A24, D16/D32) • Peripheral I/O connections up front

RSC 21579

For further information, enter the product's RSC# at www.compactpci-systems.com/rsc

CARRIER BOARD: PMC

Kontron

Website: www.kontron.com
Model: CP690HS **RSC No:** 21785
INT A, B, C, D support • Hot swap version • Rear I/O support for PMC modules • 64-bit/66 MHz PCI bus access • Holds two PMC modules on 4HP

CHIPS & CORES: FPGA

Sundance Multiprocessor Technology Ltd.

Website: www.sundance.com
Model: SMT351 **RSC No:** 20184
Embedded reconfigurable computing modules based on Xilinx Virtex-II Pro field programmable gate arrays (FPGA) • 1 GB of storage in DDR SDRAM (Samsung K4H511638B-GC/LB3 or Micron MT46V32M16FN -6) • Up to 400 MBps throughput rate • 32-bit data width • Single width module • Two Sundance High-Speed Bus (HSB) connectors with 60 I/O pins each • Eight Sundance Rocket Serial Links • Six 20 MBps communication ports • Xilinx Virtex-II Pro VP7 (optional VP20 or VP30) FPGAs • User defined pins for external connections (clock, trigger) • Compatible with a wide range of Sundance modules • TIM standard compatible • Weight: approximately 58 g

DATA ACQUISITION

Sundance Multiprocessor Technology Ltd.

Website: www.sundance.com
Model: SMT361 **RSC No:** 16954
A platform for telecom, image processing, medical, and industrial systems • Single-width module • 8 MB Flash ROM for configuration/booting • 400 MHz TI 'C6416 fixed-point DSP • 4000 MIPS peak performance • UTOPIA connectors • Xilinx II FPGA XC2V1000 • Two 200-MBps SDB interface ports, serial port connectors, JTAG diagnostics port, four COM ports • 32 MB high-speed SDRAM operating at 150 MHz • TIM standard compatible • TIM global connector • Supports PCI, CompactPCI, VME, and PXI platforms • Extensive multi-DSP software support with 3L Diamond and Pegasus applications

DSP RESOURCE BOARDS: COMPACTPCI

Sheldon Instruments

Website: www.sheldoninst.com
Model: SI-C33DSP-cPCI **RSC No:** 21382
Real time software accelerator board for LabVIEW based on Texas Instruments' TMS320VC33 family of floating point DSPs • TMS320VC33, 32-bit floating point DSP • 150 MHz clock speed • 128K x 32 words of one wait state Dual Access SRAM memory, expandable to 1M x 32 words • Full bi-directional CompactPCI/PXI initiated bus mastering, with 132 MBps peak transfer rate • Windows 9x/NT/2000/XP and Linux drivers • Expansion connectors for prototyping, analog, and digital I/O daughter cards • JTAG port for in system development and debugging

DSP RESOURCE BOARDS: TIM

Sundance Multiprocessor Technology Ltd.

Website: www.sundance.com
Model: SMT395Q **RSC No:** 21772
Four TMS320C6416T DSPs at 1 GHz • One VirtexII-Pro XC2VP70FF1704, two SHB interfaces, 14 RSL, and Global Bus • Supported by the TI Code Composer Studio • Supported by 3L Diamond RTOS to enable full MultiDSP systems with minimum programming effort • Six COM ports up to 20 MBps each for InterDSP communications/configuration • 8 MB Flash ROM for configuration/booting • Fully supported by TI CCS through JTAG • Virtex FPGA preprocessing can be done on-the-fly before the DSP gets the data • JTAG diagnostics port

ENCLOSURE + CARD RACK

Hybricon Corp.

Website: www.hybricon.com
Model: HRME 4U & 6U Encl. **RSC No:** 21352
High quality ruggedized construction • NEBS compliant • AC and DC line inputs available • CompactPCI, VME64x, and VME backplanes available • IEEE 1101.10/11 compliant card cage • Custom configurations and integration services available

RSC 21352

ENCLOSURE + CARD RACK + POWER SUPPLY

Vector Electronics & Technology, Inc.

Website: www.vectorelect.com
Model: cPCI Chassis/Enclosures **RSC No:** 21565
1U to 9U • PICMG 2.0, REV.3 or 2.16 • Up to 8 horizontal or vertical slots • Dual redundant hot swappable 200 W power supply option • 250 W, 450 W, 750 W, or 1,000 W embedded power supply options

RSC 21565

NEW PRODUCTS

FABRICS: PICMG 2.16 ETHERNET

Omni Device

Website: www.omnidevice.com
Model: PICMG 2.16 Switch Fabric **RSC No:** 21279
PICMG 2.16 compliant switch fabric • 24 FE and 2 Gigabit Ethernet ports L2/L3 • Web based Management SNMP

HOT SWAP/LIVE INSERTION

ON Semiconductor

Website: www.onsemi.com
Model: NIS5102 **RSC No:** 21335
Integrated power device • 18 V continuous operation • 10 A continuous operation • Thermal limit protection • Adjustable current limit • No external current shunt required • Power good signal • Undervoltage and overvoltage lockouts

I/O: ANALOG

KineticSystems Company, LLC

Website: www.kscorp.com
Model: CP266 **RSC No:** 21632
32 or 64 independent analog output channels • 16-bit resolution • ±10 V full-scale output • Low drift • Single gain and offset adjustments • 2-pole, Bessel output filter on each channel • Power-on reset to zero volts

INTEGRATED DEVELOPMENT ENVIRONMENT

QNX Software Systems Ltd.

Website: www.qnx.com
Model: Development Suite **RSC No:** 21946
Highly integrated development suite for building applications based on QNX Neutrino RTOS • Time-saving wizards help create new projects, launch remote debug sessions, and optimize target images • Performance optimization tools for system profiling, application profiling, and memory analysis • Code coverage fully integrated with IDE • Multi-language, multithreaded, multiprocessor debugging • Code-generating application builder for building graphical user interfaces • Driver development kits for audio, character, disk, graphics, input, networking, parallel, printer, serial, and USB devices • Libraries and compilers include ANSI, Dinkum C++, Embedded C++, GCC, and Intel C++ • Hundreds of POSIX, UNIX, and QNX utilities • Supported targets include ARM, MIPS, PowerPC, SH-4, XScale, and x86 • Support for Windows, Linux, Solaris, and QNX Neutrino development hosts

MEMORY: GENERAL PURPOSE

Dataram Corporation

Website: www.dataram.com
Model: DTM63321A **RSC No:** 21828
512 MB • DDR2-667 • UNB • ECC • LP • Single rack • 1.18"

Virtium Technology

Website: www.virtium.com
Model: DDR ECC **RSC No:** 21609
Designed to maximize density per socket • Densities up to 4 GB • Speed: PC2100/PC2700 • Available in commercial and extended temperature ranges • Leaded and lead-free available

MEZZANINE: PC•MIP

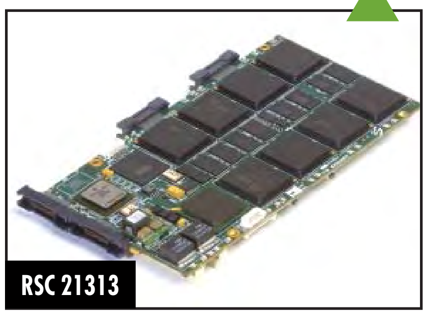
MEN Micro Elektronik GmbH

Website: www.menmicro.com
Model: P18/P518 Controllers **RSC No:** 21763
Graphics controllers on a PC•MIP or PMC mezzanine card • Flexibility of configuring application-specific capabilities in a field programmable gate array • Operates over the entire industrial temperature range, -40 °C to +85 °C • Can be deployed in systems based on a variety of buses including VMEbus, CompactPCI, or PXI, or in standalone compute platforms • Both cards feature 16 MB of frame buffer connected to the FPGA via a 133 MHz, 16 or 32-bit data bus • Analog and DVI digital video outputs are provided as well as a Low Voltage Differential Signaling (LVDS) interface • FPGA acts as 32-bit PCI targets for either 33 or 66 MHz PCI buses • Graphics clock is supplied by a 48 MHz oscillator • Application-specific graphics functionality can be integrated into the FPGA onboard • Byte-swapping logic on both the P18 and P518 allow both modules to support either PowerPC or Intel architectures

MEZZANINE: PTMC

Surf Communication Solutions

Website: www.surf-com.com
Model: SurfRider-812 **RSC No:** 21313
Enhanced media processing PTMC DSP farm for voice/video/data (fax/modem) provides simultaneous Triple-Play media-processing capabilities for developers of voice and video gateways, CTI applications, and media servers • Utilizes eight TI C6412 DSPs • Integrated with PCI, CompactPCI, and AdvancedTCA carriers • Available in three different configurations for optimized price/performance • Support for all standard interfaces: PCI 32-bit/33 MHz, RMII, CT Bus, GMII (proprietary) • Supports Windows, Linux, and VxWorks • Can be used in a variety of products, including voice and video gateway applications connecting mobile, broadband IP, wireless (Wi-Fi/WiMAX), and PSTN networks; CTI applications, such as voice, video, and fax mail, Interactive Voice/Video Response (IVR) servers, announcement servers, unified messaging servers, and call recording servers for voice, video, and fax; Inter-Working Function (IWF); and standalone termination applications, such as RAS, conferencing servers, voice quality monitoring, and nonintrusive interception and security applications



Power Sources Unlimited Inc.

Website: www.psui.com
Model: DPCI254-1022 **RSC No:** 21714
Standard PCI output voltages with variable current • Hot swap, N+1 redundant • DC input voltage 36-72 VDC • Current sharing on 5.0 V, 3.3 V, and +12.0 V outputs • Standard 47-pin connector configuration • 2-year warranty • PICMG compliant

PROCESSOR BLADES

Motorola

Website: www.motorola.com/computers/
Model: ATCA-6101 **RSC No:** 21618
High performance computing blade for the Centellis 3000 series of Motorola Application-Enabling Platforms • Dual PowerPC 970FX

NEW PRODUCTS

processors with up to 8.0 GB SDRAM • PICMG 3.0 Gigabit Ethernet base interface • PICMG 3.1, Option 2 GIgabit Ethernet fabric interface • Two SCSI interfaces for external storage connectivity • PMC site for I/O or coprocessing module • IPMC support for PICMG 3.0 standard intelligent platform management • Carrier Grade Linux distribution for telecom environments • Pre-integrated and validated hardware and operating environment • Ideal for compute-intensive control plane and multimedia applications within next generation wireless and wireline network elements

PROCESSOR: POWERPC

MEN Micro Elektronik GmbH

Website: www.menmicro.com
Model: 3U SBC **RSC No:** 22026
32-bit/33 MHz CompactPCI system slot, 4 HP • MPC5200/384 MHz • Up to 256 MB onboard DDR SDRAM • Up to 2 MB NVRAM, NAND Flash • Up to 2 MB SRAM, 16 MB graphics memory • Dual Fast Ethernet, COM, USB (front) • Dual CAN controller • FPGA for user-defined I/O functions • MENMON BIOS for PowerPC cards

Radstone Embedded Computing

Website: www.radstone.com
Model: ICS IMP1A-571 **RSC No:** 21247
Single board computer in 3U CompactPCI form factor, based on the PowerPC 7410 processor • IMP1A uses a Marvell Discovery integrated system controller, combining high-performance system control with multiple communication peripherals including high-speed serial and Ethernet ports • Provides wide bandwidth ADC and DAC capabilities at software radio frequencies • Four million gate Xilinx Virtex-II FPGA provides the platform for application-specific software development • 64-bit/66 MHz PCI interface supports high-speed data transfers to and from the IMP1A SBC

RSC 21247

SCSI CONTROLLER

Astek Corporation

Website: www.astekcorp.com
Model: A3803-cPCI **RSC No:** 21270
8 Gb CompactPCI SAS host board adapter

SERVERS

Alliance Systems

Website: www.alliancesystems.com
Model: A-4000 **RSC No:** 21328
Small AdvancedTCA system, 4U form factor • Five-slot dual-dual or star full mesh backplane • 70 mm rear transition module support • Dual DC input with redundant removable PEMs, circuit breaker protection, and optional dual AC input PEMs • Supports two Intel shelf managers and three node slots for single or dual Intel Xeon 2.8 GHz CPU or other AdvancedTCA boards • Optimized airflow for efficient cooling from the serial parallel fan arrangement and supports 200 W per board of power • MontaVista Carrier Grade Edition 3.0 and Windows 2003 Server • Covered by two-year warranty with optional extended warranties and technical support upgrade plans

Diversified Technology, Inc.

Website: www.dtims.com
Model: PlexSys-8 **RSC No:** 21656
8U industrial strength, rack-mount computer system • Multiple processor board options to choose from that may be customized to your application requirements • PICMG 2.16 compliant backplane • (16) 6U slots: two switched fabric, two system, and 12 64-bit/66 MHz node slots • 2 PCI Bus segments supporting H.110 computer telephony bus • Physical dimensions: 14" (H) x 17.2" (W) x 14.5" (D)

SHELF & MECHANICAL COMPONENTS

Asis-Pro

Website: www.asis-pro.com
Model: AdvancedTCA 10U Shelf **RSC No:** 21291
10U height in a stackable mode or 12U in a standalone mode • 19" rackmount enclosure • Easily removed from the front hot-swappable • 5 fan trays, each one with 2 serial fans for redundancy • Integral AC power input: two redundant power supplies, cooled independently, 1200 W each • Efficient front to back cooling up to 200 W per slot, with minimum of 40 cfm per front slot and 5 cfm per RTM • Easily front accessed, field removable, and replaceable air filter tray, fan trays, and shelf management board • 14-slots, fully passive, AdvancedTCA-compliant backplane with dual star routing topology by default, handle up to 5 Gbps per differential pair • Redundant field replaceable chassis data modules store shelf serial numbers and keep backplane passive • Rear access for serial and LAN connection • Redundant "no tools" field replaceable Power Entry Modules (PEMs) Comprehensive power filtering and over-current protection eliminate need for rack-level Power Distributed Units (PDUs) • Dedicated slots for two Asis Management Carrier Modules • Front connectors include serial ports, LAN ports, and Telco alarm ports • 10 fans for cooling the high-density/high-performance computing environment

SOFTWARE: OPERATING SYSTEM

Green Hills Software, Inc.

Website: www.ghs.com
Model: velOSity microkernel **RSC No:** 22113
Small, fast, and royalty-free, making it suitable for cost-sensitive, high-volume, and resource-constrained embedded applications • Rich set of kernel services, device drivers, board support packages (BSPs), and middleware, including IPv4, IPv6, IPsec, SSL, SSH, Web server, CORBA, and graphics • Software developed for the velOSity microkernel is 100 percent upwards compatible with the INTEGRITY RTOS • State-of-the-art architecture never disables interrupts in systems calls for the absolute minimum interrupt latency • Fast boot option provides embedded devices with an instant-on capability, an essential requirement for automotive electronics (as fast as 15 milliseconds) • EventAnalyzer system visualization tool • Dynamic loader allows multiple independent programs to be loaded and run on non-MMU systems without requiring symbolic information stored on the target, reducing memory use while maximizing performance • For custom hardware systems, can run without a BSP or other hardware-dependent code, significantly easing BSP development and allowing application testing on real hardware to begin much sooner in the development cycle

TELECOM: T1/E1/J1

SBS Technologies, Inc.

Website: www.sbs.com
Model: TELUM 624/628-TEJ **RSC No:** 21688
4 ports T1/E1/J1, AMC.0 compliant extended height • 128 DSO channels • AMC hot swap compliant • I-TDM to IP converter • Onboard CSU/DSU • Carrier Grade Linux, VxWorks

TURNKEY SYSTEM

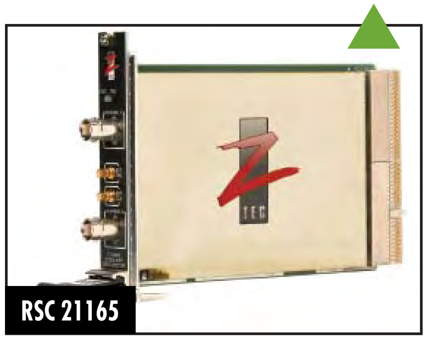
Arrow Electronics

Website: www.arrow.com
Model: AdvancedTCA Starter Kit **RSC No:** 21883
5U, 5-slot full mesh backplane that supports AdvancedTCA PICMG 3.0, 3.1, 3.2, 3.3, and 3.4 specification • AdvancedTCA compliant shelf management system • 19" bench top/rack-mount horizontal lead enclosure • ZNYX Networks Ethernet switch provides single-chip, Intel media switch 16-port Gb device capable of switching up to 24 million packs per second • Open Architect provides a complete Linux Ethernet networking environment that facilitates custom application development • Dual low-voltage Intel XEON processors for demanding wireless and telecom infrastructure applications • Integrated 512 KB L2 cache • Supports 4-plus GB DDR-266 ECC registered DRAM via four DIMM sockets

WAVEFORM DIGITIZERS/ DIGITAL OSCILLOSCOPES

ZTEC Instruments, Inc.

Website: www.ztec-inc.com
Model: ZT450 **RSC No:** 21165
Series of high-speed, low-power modular Digital Storage Oscilloscopes (DSO) for PCI, CompactPCI/PXI, and VXI • Built on data conversion technology with deep waveform memory • DSO performance in a modular instrumentation form factor • Extensive benchtop DSO capabilities • Advanced trigging • Average and envelope acquisition modes • Onboard signal processing • Benchtop instrument in a module features for PCI, CompactPCI/PXI, and VXI • Two (PCI, PXI) or four (VXI) channels • 8-bit resolution • 1 GSps dual-channel simulations or 2 GSps single-channel interleaved • 500 MHz analog bandwidth • Up to 32 MS per channel • Low power • Programmable signal conditioning • Real-time signal processing • Powerful triggering and multiple waveform capture



RSC 21165

CompactPCI® and AdvancedTCA® Systems

ADVERTISER INFORMATION

OpenSystems Publishing

Advertising/Business office:
30233 Jefferson Avenue
St. Clair Shores, MI 48082
Tel: 586-415-6500 ■ Fax: 586-415-4882

Vice President Marketing & Sales
Patrick Hopper
phopper@opensystems-publishing.com

Senior Account Manager
Dennis Doyle
ddoyle@opensystems-publishing.com

Account Manager
Tom Varcie
tvarcie@opensystems-publishing.com

Print and Online Marketing Specialist
Christine Long
clong@opensystems-publishing.com

Advertising/Marketing Coordinator
Andrea Stabile
astabile@opensystems-publishing.com

European Bureau Chief
Stefan Baginski
sbaginski@opensystems-publishing.com

Account Manager
Doug Cordier
dcordier@opensystems-publishing.com

Business Manager
Karen Layman

For reprints call the sales office: 586-415-6500