The Power behind the Power

But soft! what light through yonder window breaks?" OK, Romeo didn't exactly have the latest technology breakthroughs in software development tools or DSPs in mind when he issued his famous tribute to Juliet back in the late 16th century. Nor did he answer his own question with, "It is the DSP chip, and object orientation is the sun!" as he may have if he were living today.

But perhaps the poets among us can appreciate that metaphor applied to the dazzling software advances lighting up the DSP stage. For that matter, who is to say that the star-crossed lovers wouldn't appreciate them if they were around today?

Blazing chip speeds may impress, but software is right there on center stage as well, giving system developers the tools and standards needed to make sure that the chips deliver what they promise in performance and functionality. The latest tools don't stop there, however. As part 2 of our report on advances in software development tools for DSP-based embedded systems shows, today's tools are equipped to help users design multifunctional, multitasking, multiprocessing systems; integrate algorithms and real-time kernels; and compile listings for optimum speed or size.

For example, more and more developers are writing algorithms that comply with Texas Instruments' TMS320 DSP Algorithm Standard, part of its eXpressDSP real-time software technology. The standard's rules impose a level of excellence on third parties and assure the end user of consistency and compatibility, among other things.

Signals+Software is one company that was quick to recognize the benefits of complying with the standard. It's churned out over 35 eXpressDSP-compliant algorithms—tested by TI for adherence to the standard—and found that the rules are simple to follow and don't result in unwanted overhead. Read the contributed article inside for tips that help reduce conversion time and recommendations on how to prepare code for shipment to users.

The algorithm standard delivers another major benefit: it makes component-based programming for DSP algorithms a reality, as Spectrum Signal Processing describes in our next article. Spectrum Signal then shows how component-based programming is a significant answer to the burgeoning complexity of application algorithms and the big jumps in system software/hardware ratios.

A system-level framework is required to encapsulate the components into applications, however. A rich framework allows developers to move entire algorithms—or parts of an algorithm—from one task or processor to another and reuse algorithmic building blocks in different algorithms. Importantly, there's no need to modify—or even possess—the source code of the original algorithms or algorithmic building blocks, as there is with traditional programming techniques.

In the hardware arena, a backplane communication strategy to connect DSPs to workstations and hosts aids software development, debugging, and data transfer, in particular, for systems with multiple DSP boards—without using the ubiquitous emulator.

With an emulator, if all the DSPs are on a single board, the JTAG path slows down very slightly with each added processor, as the article from Pentek notes. For systems with multiple boards, all the boards must be daisy-chained externally, leading to extremely cumbersome cabling and possibly slowing performance further.

The backplane strategy, detailed in the article, exploits the open architectures of embedded systems, such as VMEbus or CompactPCI. Unlike the emulator, standard backplanes offer an ideal communication path between multiple DSP boards and between DSP boards and a workstation or a host.

Stan Runyon
testman2@earthlink.net

Speech, Related Software Move to C54x DSPs

Speech Technology Center (St. Petersburg, Russ www.speechpro.com) is porting high-quality, resource-conserving algorithms for speech recognition, speech enhancement, speech stretching, and noise and echo cancellation to the TMS320C54x DSP platform. The software will be eXpressDSP-compliant. Future versions will be developed for the C6000 processor.

DSP Packet Manager Prototypes Are Now Available

Tundra Semiconductor Corporation (Kanata, Ont.; www.tundra.com) is now shipping the Tundra Tsi920 DSP Packet Manager for prototyping. A fully functioning evaluation card is also available. The Tsi920 manages up to 32 DSPs, including Texas Instruments' C5000 platform, in a single board system. It increases system throughput and channel density by offloading the management of DSP traffic from a host processor.

Software Selected for In-flight Internet Access

Formation Inc. (Moorestown, N.J.; www.formation.com) has tapped Surf Communications Solutions Ltd. (Maynard, Mass.; www.surf-com.com) to supply multimodem software for Formation's in-flight digital communications and entertainment system. Among the software selected is Surf Multi-access Pool running V.90 high-speed modems to provide for Internet and e-mail services. The resulting modem cards are being built from reference designs using dual TMS320C6202 DSPs and Windows NT drivers.

BlueWave Board Picked for Network Security System

The Comstruct PCI/C6400 communications processing board from BlueWave Systems Inc. (Carrollton, Texas; www.bluews.com) has been selected by eNetSecure Inc. for its Model 2600 Telecommunications Intrusion Detection System (TIDS). The system detects unauthorized network access through computer-to-computer modems behind the network firewall by monitoring dial-up traffic. Optimized for high-density processing, the PCI/C6400 board carries up to four 200-MHz TMS320C6201 processors, with peak processing power pegged at 6,400 MIPS.

eXpressDSP Initiative Gains Support

Imagine Technology LLC (Lincoln, Neb.; www.imaginetechnology.net) has committed to developing telephony, encryption, audio, and modem algorithms based on the TMS320 DSP Algorithm Standard, an eXpressDSP initiative. Six algorithms developed by Imagine have already passed compliance tests and more are planned. The algorithms are optimized C and assembly functions for the C5000 and C6000 DSP platforms.

System OK'ed to Keep Network Healthy

PolicyPoint, a QoS traffic and multiservice access platform from Natural Microsystems Corp. (Framingham, Mass.; www.nmss.com), has been certified by Concord Communications for compatibility with Concord's Network Health system. Network Health lets service providers and enterprises view network performance across applications, network services, and the network infrastructure. Information gathered by PolicyPoint is reported to Network Health and used by Concord's network managers to achieve predictable, consistent service-level management of IP-based services and converged IP applications.

CCS Plug-ins Aid Debugging

SwiftNet Debug Manager and a Register Configuration Tool are seamless eXpressDSP-compliant plug-ins for Code Composer Studio. The debug manager lets Code Composer Studio communicate with a virtually unlimited number of DSP targets in multiple locations, allowing live debugging over the Internet. The register configuration tool configures hardware registers for Pentek models 4290, 4291, and 4292, all TMS320C6000-based boards. Available now, the tools are supplied free when Code Composer Studio is purchased through Pentek (Model 4977) for $2,995. ***Pentek, Inc.,*** Upper Saddle River, N.J.; 201-818-5900, www.pentek.com

Media Processor Harnesses Eight DSPs

The SPIRIT-6022 PCI-based high-density media processing platform delivers a dense, scalable architecture for applications like voice and fax over packet, CTI/IVR, speech recording and playback, and audio conferencing. Based on a high-performance architecture that builds on eight TMS320C6203 DSPs and a 200-MHz PowerQUICC II processor, the platform is complemented by a full suite of voice coders, telephony algorithms, and fax software, as well as speech recording and playback and other CTI/IVR APIs. The SPIRIT-6022 is available now. Prices start at $5,421 each in single quantities. ***RadiSys Corp.,*** Portland, Ore.; (800) 950-0044, www.radisys.com

PCI Board Forms Voice Compression Channels

Using 12 TMS320C54x processors, the PCI-based Voice Shuttle delivers up to 72 scalable, high-quality voice compression channels. The board generates Internet formats on telephony hardware, offering the option to select a preferred coding format, bit rate, and architecture. In this way, the Voice Shuttle optimizes voice quality at low bit rate while tailoring the output format to meet personal preferences. The Voice Shuttle sells for $200 to $300 per channel and is available now. ***VoiceAge Corp.,*** Montreal; (514) 737-4940; www.voiceage.com

CCS Plug-In Tests Software Components

The VectorCAST for Code Composer Studio plug-in lets designers test individual software components before testing at the system level. The software, which is eXpressDSP-compliant, allows designers to build complete test harnesses for each software component as well as construct test cases, execute code, view pass/fail test results, and get code coverage details for each test executed. Prices for VectorCAST, which is available now, start at $6,850. ***Vector Software, Inc.,*** North Kingstown, R.I.; (401) 295-5855, www.vectors.com

eXpressDSP Telephony Algorithms Save Memory

A complete set of eXpressDSP-compliant telephony software for the TMS320C54x serves applications—like point-of-sale systems, ATM terminals, and set-top boxes—requiring low-bandwidth transfers of data, voice, or both. A unified, robust design reduces the system memory requirements of the dozen algorithms, which include code for V.32bis/V.32, V.22bis/V.22, DTMF, Caller ID type I and II, G3 fax, and 2.4-kb/s vocoders. The price for the V.32bis/V.32 algorithm starts at $9,950. ***Spirit Corp.,*** Moscow; +7 095 912-7024, www.spiritcorp.com

Design Suites Achieve eXpressDSP Compliance

Two SystemView bundled design suites for the TMS320C5000 and C6000 platforms, the Real-Time DSP Architect and the Real-Time Communications Design Suite comply with the eXpressDSP specification for Code Composer Studio plug-ins. The SystemView portion of the suite promotes efficient design, simulation, and analysis. DSP Architect adds C code generation and a seamless interface to Code Composer Studio for rapid prototyping, real-time analysis, debugging, and hardware-in-the-loop simulation. The communications suite adds communications, RF, analog, and logic libraries. Both SystemView Real-Time DSP Architect and the SystemView Real-Time Communications Design Suite are available now and sell for $8,995 and $11,995, respectively. ***Elanix, Inc.,*** Westlake Village, Calif.; (800) 535-2649, www.elanix.com

Low-Power VC33 Module

A TMS320VC33-based, business-card-sized controller board, the D.Module.VC33 complements the DSP with microcontroller-like I/O peripherals optimized to minimize CPU load. The board provides up to 1 MB of additional SRAM, flash memory, a software-configurable external bus interface, high-speed UART, watchdog, in-system reconfigurable logic to accommodate application-specific interfaces, and BIOS. It's available now, starting at $290. ***D.SignT,*** Kerken, Germany; ++49 2833 570977, www.dsignt.de

Development Software Spans Network Protocols

A complete embedded-software tool suite, the DelCORE Universal Framework can serve as a building block for developing DSP-based wired and wireless network applications that work across multiple, disparate protocols of the developer's choice, both commercial and proprietary. Touting a simplified connection manager and upper-layer functionality, the framework accommodates a range of DSPs, including the TMS320C5x, C54x, and C6000. Prices for the DelCORE Universal Framework, which is available now, start at $25,000 plus royalties. ***Delphi Communications Systems,*** Maynard, Mass.; (978) 897-5650, www.delcomsys.com

eXpressDSP Components Focus on Communications

A large series of digital communications software components for the TMS320C6000 and C5000 platforms offers eXpressDSP compliance. Numbering 50 in all, the series includes G.723.1, FR-GSM, EFR-GSM, other telephony elements, and fax and modem components. Prices start at $7,000 each. The components are available now. ***Signals+Software Ltd.,*** London; +44 (0) 20 8872 9000, www.signalsandsoftware.com

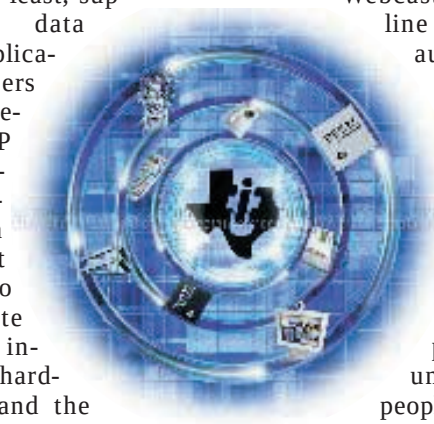
PCI-based DSP Board Targets Data Acquisition

The model AVR-32 is a PCI-based DSP and data acquisition board driven by a TMS320C32. The board's connector, which can tie directly to an IDE drive for fast data acquisition, consists of the inputs and outputs of 3-MHz 12-bit D/A and A/D converters. For flexibility, an onboard complex FPGA can be configured as a FIFO, dual-port RAM, digital filter, or other circuit. An assembler, debugger, Windows drivers, utility software, and sample programs are included. The model AVR-32 is available now and sells for $995 each in single quantities. A software development kit for the board costs $400. ***Dalanco Spry,*** Rochester, N.Y.; (713) 473-3610, www.dalanco.com

What Developers Need from Web Sites

By David Peterman

The Internet is changing the way designers develop their products, as well as the way vendors support designers and distribute the tools and the software they use. Designers now purchase development tools, software—even algorithms—on-line. Most vendors' Web sites, at the very least, supply manuals, data sheets, and application notes. Yet users need more, especially in the DSP embedded-systems world. Developers of such systems want vendors' sites to supply complete solutions, with information about hardware, software, and the links between them. Vendors face the challenge of creating the most useful, interactive, and information-rich on-line presence possible.



SEARCHING FOR ANSWERS

A series of focus groups conducted by Texas Instruments indicates that designers are most likely to use such sites in the early stages of product development, returning later for answers to specific questions. They would rather search a site than navigate through it to find those answers, and their chief complaint is the frustration they feel when trying to do so. Merely typing a question into a knowledge base and receiving the response would be heaven, but most designers don't expect to see it in their own lifetimes.

A truly helpful Web site for designers of DSP-based embedded systems would have at least three important features: interactive Webcasts, interactive on-line training, and the automatic notification of bug patches. Each is needed if designers are to work as efficiently as possible.

A single interactive Webcast on a specific design problem permits a virtually unlimited number of people to receive more information about it than they could by exchanging days' worth of e-mail: Watching a screen that shows code being written or a sensor moving on a diagram is a more immediate and comprehensible experience than reading application notes or listening to abstruse technical discussions. A tip or a solution from an interactive Webcast can reduce development time by weeks.

The second essential feature—interactive on-line training—makes it possible to train more designers in a single month than could be trained in 12 months of seminars in the physical world. Last year, more than 15,000 registrants participated in TI's on-line training courses, in which designers, proceeding at their own pace, take 12-hour classes at their desktops. For both Webcasts and on-line training courses, questions submitted by e-mail or telephone should be answered quickly.

Last, automatically notifying designers about bug patches would help alleviate the common complaint that engineers sometimes spend days or even weeks working on a bug problem before discovering that a fix was available. Although some vendors do post bug patches on the Web, automatic notification is now rare in the embedded systems industry, not only for patches, but also for software updates and other relevant information.

Of course, the danger of reliance on the Web is the loss of the personal touch. Vendors can minimize this problem by creating vital on-line communities that cater to designers and answer their need for information and support. Interactive chat rooms provide additional opportunities for dialogue among users.

Designers are moving to the Web as a one-stop shop for all their professional requirements, notably purchasing. Vendors must now rise to the challenge.

David Peterman is the manager of Worldwide Software Development Systems at Texas Instruments Inc., based in Houston.

xICE* Multi-Target Emulator

DSP/RISC Debugging

In the past emulators provided a physical and software link between a ***single*** scan chain target DSP/RISC and a host computer, running a Debugging Interface Program.

Until now, multi-processor systems have required that devices be daisy chained into the one scan path. The longer scan path does not allow full scan rates because of scan path delays through the respective processors (switching in and out of bypass) and PCB-processor interconnects.

xICE* Solution

The ***xICE**** Multi-Target Emulator is capable of emulating multiple DSPs/RISCs on separate scan paths **simultaneously**. This is particularly useful for parallel processing applications employing multiple DSPs and/or RISCs, such as image processing, radar/sonar systems, and processor arrays.

The ***xICE**** consists of one PCI host card and multiple pods, one for each of the separate scan paths. This enables a number of DSPs / RISCs, each on separate scan paths, to be debugged from one PCI slot, all at full scan rates upto 30MHz, all at the same time.

Softronics Emulators

- xICE* -> **PCI** Bus **Multi-Target** Emulator
- nICE -> **100baseT Ethernet** Emulator
- Dspice* -> **PCI** Bus Emulator
- Ice*Pack -> **ISA** (16 bit) Bus Emulator
- Mice*Pack -> **Parallel Port** Emulator

Softronics

inform@softronx.com
www.softronx.com

Ph+61 500 505059
Fx+61 500 505049

Processor Support

- TMS320C2xxx <> TMS320C3x <> TMS320C4x <> TMS320C5x
- TMS320C54xx <> TMS320C55xx
- TMS320C62xx <> TMS320C67xx <> TMS320C64xx
- ARM7 <> ARM9 <>TMS470 <> TMS320CAVxxx
- Flash Programming Support <> RTDX <>DSPBios

Software Support

- TI Code Composer Studio
- ARM Aspex
- Eonic Virtuoso

xICE*

Multi-target DSP/RISC

eXpressDSP Real-Time Software Technology from TI.

Simplicity, simplicity, simplicity, and simplicity, right at your fingertips.

DSP
TEXAS INSTRUMENTS TECHNOLOGY

With eXpressDSP™ Real-Time Software Technology from Texas Instruments, DSP programming can become simpler than ever before. Code Composer Studio™ integrated development tools give you powerful data visualization, real-time analysis, and code-optimization capabilities. The DSP/BIOS™ kernel provides a scalable, stable real-time foundation upon which you can build all of your DSP designs. Application-interoperability standards help ensure that your software components can be continually reused, without the hassle of redesign. And thanks to our global third-party software network, you have access to a library of modular, interoperable, off-the-shelf algorithms and plug-ins that let you spend more time designing and less time reprogramming. To put the power of simplified DSP programming at your fingertips, rely on eXpressDSP Real-Time Software Technology, only from Texas Instruments.

For an eXpressDSP developers info pack that includes free Code Composer Studio evaluation tools and information on eXpressDSP-compliant third-party products, go to **www.dspvillage.ti.com/simplicity**

THE WORLD LEADER IN DSP AND ANALOG

TEXAS INSTRUMENTS