



Go, Jets!

"You have to go through six electronic steps to change a radio station. I am not going to go through six electronic steps to get the Jets. Working a mouse and screen while speeding down the highway in a BMW isn't an activity encouraged by highway-safety engineers."

—Jerry Flint, on BMW's iDrive technology, which controls 700 in-car functions, in *Forbes*, July 5, 2004

Mezzanine module boosts processing power

By Warren Webb

PENTEK RECENTLY RELEASED a high-performance, software-radio front end with two 105-MHz, 14-bit A/D converters and two user-configurable Virtex-II Pro FPGAs. The model 6256 VIM (Velocity-interface-mezzanine) module targets

computation-intensive engines in real-time-wideband-processing, radar, and wireless-system applications. You can mount one or two model 6256 modules on Pentek's VIM-compatible VME baseboard and maintain a single-slot configuration. For large applications, such as multi-channel beam forming, as many as 80 6256 modules, totaling 320 A/D channels, can share common synchronization signals for simultaneous capture and signal processing.

The mezzanine module includes factory-installed FPGA functions for data formatting, channel selection, timing, and

triggering with ample room for custom configurations or off-the-shelf algorithms. Model 6256 FPGAs come with 64 Mbytes of SDRAM connected with separate address and data buses, allowing independent access from each FPGA. This SDRAM supports digital delay and transient-data-capture functions, which are critical for many real-time applications, such as signal intelligence tracking receivers. In addition, 16 Mbytes of flash memory attach to each FPGA to handle boot and program code for the internal PowerPC processors.

Third-party and Pentek



Pentek's new model 6256 VIM module features two 105-MHz, 14-bit A/D converters and two user-configurable FPGAs.

software-development tools are available for a variety of platforms, including Windows, Linux, and Solaris. Prices for the model 6256 start at \$7195, and delivery time is eight to 10 weeks.

► **Pentek Inc.**, 1-201-818-5900, www.pentek.com.

Gate-drive optocoupler meets full military specs

OPTOCOUPLEDERS SOLVE many design problems in motor-control and power-supply designs, but finding them with full military specifications for defense and aerospace applications is a challenge. Agilent Technologies meets that need with the HCPL-5121 and HCPL-5151 gate-drive optocouplers in Class H and commercial versions, produced on a military-certified line and on the DSCC-qualified manufacturers list.

These hermetically sealed 5121 and 5151 units have 2 and 0.5A-drive capability, respectively; operate with V_{CC} of 15 to 30V; and have 500-nsec maximum propa-

gation delay. You can use them to drive the gates of IGBTs (insulated-gate bipolar transistors) with ratings of 1200V/100A for the 5121 or 1200V/50A for the 5151. Common-mode rejection is 10 kV/ μ sec at 1000V common-mode voltage, and operating temperature range is -55 to $+125^{\circ}\text{C}$. The eight-pin DIP, Class H devices sell for \$75 to \$115, depending on volume, and the commercial-grade units sell for \$65 to \$100 each.

—by Bill Schweber

► **Agilent Technologies Inc.**, 1-650-752-5000, www.agilent.com.

Nanovoltmeter combats offsets, drift, and noise

RELIABLY MEASURING billionths of a volt is essential to producing high-quality, state-of-the-art semiconductor devices. But getting repeatable, credible results has always presented

great challenges. The quantities you want to measure are usually small fractions of the offset voltage, and simply reversing the test leads and averaging the measurements usually don't do the trick; the offsets remain constant for too short a time, and they vary and drift.

With its 2182A nanovoltmeter, Keithley appears to have solved the problem. The instrument, in effect, not only automatically performs the lead reversal, but also tracks

the variations in the offset voltage and subtracts the correct amount. The result, according to Keithley, is the quantity you were trying to measure, error-free to a greater extent than is possible with other off-the-shelf instruments or custom-built setups.

The company simultaneously announced what it claims is the first precision ac/dc current source, the Model 6221, and a companion instrument, the 6220,

which lacks the ac-source capability. Keithley designed the 2182A to work in tandem with either the 6220 or the 6221 to create easy-to-assemble setups for making improved delta- and pulse-mode measurements of resistance—especially low resistance, measuring differential conductance, and gathering data for plotting the I-V characteristics of semiconductor materials and devices.

The 6221 not only sources dc currents of 100 fA to 100 mA and ac currents of 1 pA to 100 mA at frequencies of 1 mHz to 100 kHz, but also includes standard and arbitrary-waveform generators, as well as IEEE-488 and Ethernet interfaces and can emulate Keithley's earlier Model 220 dc current source. Keithley specs the unit's rms current noise at 80 fA. The otherwise-similar but dc-only 6220 lacks the Ethernet capability. Instrument-control software is available for both Windows PCs and for the Macintosh. The 2182A, 6220, and 6221 sell for \$2803, \$2995, and \$3995, respectively.

—by Dan Strassberg

► **Keithley Instruments Inc**, 1-888-534-8453, 1-440-248-0400, www.keithley.com.



According to the manufacturer, the 2182A nanovoltmeter solves the most vexing problems associated with measuring billionths of a volt.

DILBERT By Scott Adams



► According to Gartner research, more than 9.4 million US adults online were victimized by identity-theft fraud in the year ending April 2004.

BOOK EXPLORES HOW WIRELESS NETWORKS CAN PEACEFULLY COEXIST

So many wireless users and standards, so little spectrum, and, they're not making more of it, either. *Wireless Network Coexistence* by Robert Morrow, PhD, explains the various wireless standards of the crowded band, which includes Zigbee, Bluetooth, Wi-Fi, and cellular. It covers regulatory issues, the challenges of deploying multiple networks in one area, physical and system-level techniques for reducing interference, and more.

The \$59.95, 350-pg book targets reasonably knowledgeable design engineers and explains modulation techniques, protocols, formats, bit-error rates, SNR, and more, using equations but not to excess. It also has 50 useful and illuminating figures. The book (ISBN: 0071399151) examines other spectra that fall outside conventional communications but still are of concern, such as GPS, ultra-wideband, microwave ovens, and low-end cordless phones. Both as an introduction to communication standards and as a guide to assessing and dealing with the interference situation, this book will help.

—by Bill Schweber

► **McGraw-Hill**, www.books.mcgraw-hill.com.

Green chips control white light

TWO NEW ICs from International Rectifier simplify lighting-control designs and increase lamp efficiency. The IR2520D forms the core of a

robust, adaptive lighting-ballast design for CFLs (compact fluorescent lamps). The chip reduces a ballast's component count by 20%, increases its reliability over traditional electronic-ballast designs, and compensates for lamp characteristics that vary due to temperature and aging.

The 2520 operates on rectified line voltage and provides gate drive for a 600V half-bridge, which powers the lamp through a simple resonant LC network. The ballast-control IC is self-starting and guards against open-filament and lamp-strike failures that can destroy components in traditional electronic-ballast designs. An on-chip crest-

factor-measurement circuit monitors the half-bridge output current using the low-side switch's on-resistance as the sense resistor. Excessive current over a measurement interval causes the chip to lock out the gate-drive outputs until a user cycles the power to the chip.

IR's adaptive ballast IC requires 20% fewer parts than conventional electronic CFL ballasts. The 2520 needs neither a transformer nor a PTC thermistor, resulting in a smaller ballast design that dissipates less heat than those based on many competing controllers. The 57-cent

(100,000) IR2520D is available in DIP-8 and SO-8 packages.

For halogen lamps, International Rectifier's IR2161 adapts to variations in operating frequency, supply-voltage, and lamp conditions. It protects against overloads, short circuits, and excessive operating temperature and maintains compatibility with standard triac dimmers.

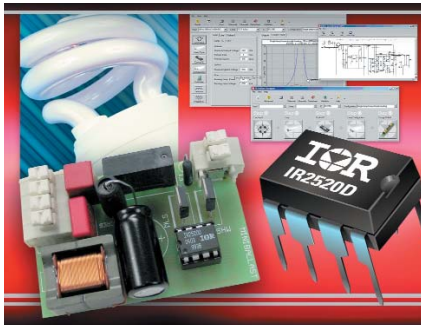
Like the 2520, the 2161

forms the center of a lamp-control circuit with 20% fewer external components than conventional designs. It trades the commonly used bipolar half-bridge output for a MOSFET pair and eliminates the need for matched output devices. Prices for the controller in DIP-8 or SO-8 packages start at 73 cents (100,000).

To jump-start your lighting-control design, International Rectifier also offers reference designs, demo boards, white papers, and design software, which runs on PC platforms. The program generates schematics, bills of material, and layouts for selected lamp types and input voltage ranges.

—by Joshua Israelsohn

► **International Rectifier**, www.irf.com.

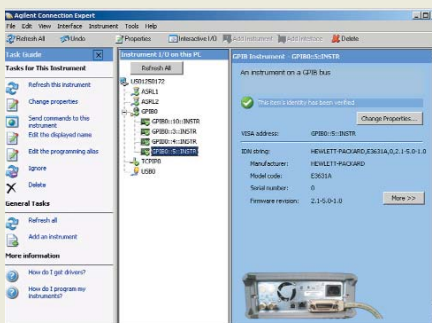


The IR2520D IC requires neither a transformer nor a PTC thermistor.

I/O tools simplify and speed test-application development

AGILENT HAS ANNOUNCED Version 2.0 of its T&M tool kit with test automation. The product provides what the company calls the industry's fastest method of sequencing measurements and analyzing results. A company spokesperson terms the product significantly easier to use than off-the-shelf test-executive software and explains that the new capabilities easily automate instrument control and measurement sequencing for design validation and prototype testing without the use of complex and often expensive test executives.

The company also introduced an enhanced I/O-library suite that simplifies and accelerates connecting test instruments to a PC to develop test systems. The E2094N I/O Libraries Suite Version 14.0 features updated I/O libraries and new automated connection tools that detect instruments connected to a PC, configure the interfaces, and verify connection, even in test systems that mix



The Connection Expert in the I/O Libraries Suite 14.0 automatically discovers multiple instrument types, configures the interfaces, and verifies connection—even in test systems that mix Ethernet/LAN-, IEEE 488-, RS-232-, USB-, and VXI-interfaced instruments from multiple vendors.

Ethernet/LAN-, IEEE 488-, RS-232-, USB-, and VXI-interfaced instruments from multiple vendors. The I/O Libraries Suite multivendor test software allows engineers to establish error-free connections in less than 15 minutes and create test programs in the development language of their choice.

Prices for the T&M tool kit 2.0 begin at \$1495. This price includes a full development license and one debugging and runtime license for test automation. Additional test-automation debugging and runtime licenses cost \$495. Engineers developing test systems that include at least one Agilent product—for example, instruments, I/O hardware, VEE, or the tool kit—will receive the I/O Libraries Suite free

with the purchase of the products for use in the application. Alternatively, \$395 buys the software as a stand-alone item.

—by Dan Strassberg

► **Agilent Technologies**, 1-800-829-4444, www.agilent.com.

1U modular power-supply system adds capabilities

AGILENT HAS ADDED new modules and paralleling capabilities to its MPS (modular power system), extending the system's output range to 100V or 80A. The low-profile, 1U-high, multiple-

output, programmable dc N6700 MPS gives test-system integrators the flexibility to match performance, power, and price to test needs. The N6700 adds three basic programmable power-supply modules, extending the single-module output range to 100V and 20A. For example, the 5V, 20A module provides high current at low voltage for applications including digital-device testing and burn-in. The 100V, 1A module provides high voltage at low current for applications including FET voltage-breakdown testing.

Virtual-channel capabilities simplify operating modules in parallel and improve performance during parallel op-

eration. A virtual channel allows you to set up the MPS to treat as many as four modules as a single, synchronized channel providing as much as 80A. Agilent calls the paralleling capability the industry's first to support all power-supply functions, including measurements, sourcing, triggering, protection, and status monitoring—without the need to write even one line of code to manage the interaction and synchronization of the paralleled supplies.

The system also provides programmable voltage slew rate. Thanks to this capability, one programming command generates a 0V to full-scale voltage change whose dura-



The N6700 fast-responding, programmable, 1U-high, modular power-supply system now provides as much as 100V and 80A.

tion you can control from 100 μ sec to 10 sec. The MPS also offers built-in digital multimeters, a choice of 50 and 100W output-power levels, various voltage and current combinations, and three performance levels in a 1U-high package. According to Agilent, processing speeds are 10 to 50 times those of other programmable supplies.

The system-ready MPS test instrument provides USB 2.0,

10/100BaseT Ethernet, and IEEE 488 interfaces, allowing quick connection to a PC or a network. You can also remotely operate the system from any browser by connecting to the system's built-in Web page to control and monitor power-supply operations. Prices start at \$1000 per output.—by Dan Strassberg

► **Agilent Technologies**, 1-800-829-4444, www.agilent.com.

Tool provides chip-to-board approach to FPGA and pc-board design

THE INCREASING CAPACITY of FPGA devices complicates the problem of integrating them on a pc board. In addition, many designs must operate at high frequency, further complicating integration. To address these problems, Mentor has introduced I/O Designer, a tool that provides for concurrent design of the FPGA and the pc board by combining these design environments and automating the processes necessary to implement high-pin-count, high-speed FPGAs on complex pc boards.

I/O Designer allows engineers to specify the contents of the FPGA using a hardware-description language. It derives the schematic symbol from the description and provides the board designer with the schematic symbol that

represents the FPGA on the board. The tool graphically assigns signals to designated pins, constrains pin-mapping presynthesis to achieve optimal FPGA and pc-board interconnections, and communicates allowable pin swapping to the design environment.

Using the tool, designers can also synchronize pin-out assignments between the FPGA and the pc board, exchange constraints between them, and use the FPGA-I/O assignments to lay out the pc board. The price for I/O Designer starts at \$10,000.—by Gabe Moretti

► **Mentor Graphics Corp**, 1-503-685-8000, www.mentor.com.

► **Between July 5 and July 9, 2004, more than 20 IT vendors, most of them software makers, announced that they had missed their second-quarter 2004 financial targets or would lower their estimates for 2004. The largest software vendors include BMC Software, Computer Associates International, FileNet, PeopleSoft, Siebel Systems, Veritas, and webMethods.**

USB drives test and measurement, sensor smarts get their role

THE USB INTERCONNECT, which was originally intended for simplifying keyboard, mouse, and printer connections to the PC, continues its expansion as the low-cost, easy-to-use interface. A new product in this market is National Instruments' SCXI-1600 DAQ module, which you can

use to convert the SCXI chassis into a USB-enabled system that supports all 40 National Instruments SCXI signal-conditioning and -switching modules. The \$995, 200k-sample/sec USB 2.0 DAQ module offers 16-bit resolution across 352 channels.

Designed to handle temperature, strain, high-voltage, and other real-world signals, the system lets you build a plug-and-play, complete signal chain for data acquisition

from a sensor through capture and analysis software. National Instruments' LabView general-purpose application software fully supports IEEE 1451.4, a standard for smart sensors. Under this standard, sensors carry information corresponding to the transducer electronic data sheet, which tells the system everything about the sensor, including calibration, nonlinearities, and range.

To extend the USB line, NI

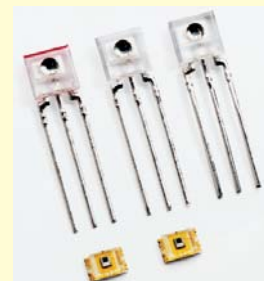
has also introduced the 16-channel, 16-bit DAQPad-6016 and DAQPad-6015 analog input modules operating at 200k samples/sec. The 6015 and 6016 devices have two analog outputs, two counter/timers, and 32 or eight digital-I/O ports, respectively. The new four-channel, 16-bit USB-9215 simultaneously sampling analog-input module for $\pm 10V$ range takes 20k samples/sec, and the four-channel, 24-bit USB-9211 analog input for thermocouples has an 80-mV range and takes as many as 14 samples/sec. The 6016, 6015, and 9215 include screw terminals for input-lead connection. Prices begin at \$395.

—by Bill Schweber

► **National Instruments**, 1-512-794-0100, www.ni.com.

LIGHT-TO-VOLTAGE CONVERTER OFFERS DESIGN TRADE-OFFS

A trio of integrated devices lets you select the sensitivity and rise time you need in light-to-voltage sensing and conversion. The TSL12, TSL13, and TSL14 from Texas Advanced Optoelectronic Solutions each use a single die with photodiode, transimpedance amplifier, and gain-setting resistors and



Make light work of transforming impinging photons into an analog voltage with the TSL12, TSL13, and TSL14 low-cost, integrated devices with various responsivity and rise-time pairings.

produce an analog output voltage proportional to impinging light intensity. The vendor claims that this integrated version is cost-competitive with discrete approaches for applications such as lighting and ballast control, signage control, and paper-edge detectors in printers.

The parts offer responsivity of 246, 63, and 12 mV and rise-time-parameters of 64, 12, and 4 μ sec, respectively. Operating voltage is 2.7 to 5.5V, and typical supply current is 1.1 mA. The converters are available in three-pin, side-looker packages and will soon be available in four-pin, surface-mount housings. Prices begin at 59 cents (1000).

—by Bill Schweber

► **Texas Advanced Optoelectronic Solutions**, 1-972-673-0759, www.taosinc.com.

Power supply lets you escape wimpy, single-digit outputs



Use this module from V-Infinity LLC to take your low-voltage dc supply to as much as 2000V dc, a requirement for many specialized applications.

IC SUPPLY-RAIL VOLTAGES may be dropping toward 1V, but many designs need supplies in the hundreds or even thousands of volts due to the physics of the application. To meet this need, four series of high-voltage dc/dc converters from V-Infinity provide resistor-adjustable output to 2000V dc, with MBTF of 400,000 hours. These modular units take a 5 or 12V supply and provide a high-voltage output at power levels of 0.5 to 3.5W with regulation as tight as 0.01%. Prices for these supplies, which operate from -10 to $+60^{\circ}\text{C}$, start at \$70 (single units).

—by Bill Schweber

► **V-Infinity LLC**, 1-503-372-1297, www.v-infinity.com.

► **On July 15, 2004, US President George W Bush signed into law the Identity Theft Penalty Enhancement Act, which adds two years to prison sentences for criminals convicted of using stolen credit-card numbers and other personal data to commit crimes (five years for those who exploit identity theft in the commission of "terrorist offenses").**

EMC Conference considers revised directive

IS EMC ABOUT TO become a hot topic again? When the EU (European Union) first issued directives controlling emissions and susceptibility of equipment to RF interference, a series of events—exhibitions, conferences, and seminars—supported the necessary ramp-up in design skills. Then, as design-for-EMC became part of mainstream design, those specialist events became less frequent. Now, with a new round of regulations pending, a UK-based conference organiser has launched a new event to update the design community on EMC issues and skills.

The EU is about to publish a new version of the EMC di-

rectives, for implementation in 2007, that both revises existing regulations and adds to their scope. The 2004 EMC Conference will offer sessions on these regulations as well as recent technology developments that you can apply to achieving compliance.

Two topics in particular reflect current concerns: public exposure to electromagnetic fields and powerline communications. Exposure to electromagnetic fields has come to prominence largely due to the proliferation of cellular base stations. Papers will cover safety and health issues and will also describe the experience in Australia, one of the first countries to formalise

legislation on the subject. Researchers and, in some cases, vendors have many times proposed data communication over the electricity-supply network, and opinion on the subject remains sharply divided between those who believe it will inevitably lead to EMC problems and those who think that the availability of a pervasive network makes the effort to overcome EMC issues worthwhile. Presenters will offer both viewpoints.

EMC UK 2004 takes place on October 12 and 13 in Newbury, UK, 45 minutes from London's Heathrow airport.

—by Graham Prophet

►EMC UK 2004, +44 1208 851530, www.emcuk.info.

Networking benchmarks score Freescale and IBM chips

EEMBC (EMBEDDED MICROPROCESSOR Benchmark Consortium)—the benchmarking organisation first founded by *EDN* and now an independent operation—has published its first scores for its Networking 2.0 tests. As with other EEMBC benchmarks, vendors can run “out-of-the-box” code, as created by and agreed on among all of EEMBC’s members, or they can optimise to tune the code for their own processor. However, they must declare all optimisations as part of the published results. Networking tests include code to evaluate QOS (quality of service), IP (Internet Protocol)-packet checking, IP reassembly, NAT (network-address translation), and TCP handling. A weighted average of the first three tests leads to the “IP Mark,” and three independent tests to stress different aspects of TCP handling lead to the “TCP mark.” The code was developed in association with Juniper Networks and other companies active in the field.

EEMBC has published scores for a Freescale MPC

7447A at 1.4 GHz and an IBM 750GX at 1 GHz. According to EEMBC founder Markus Levy, the results show the effects of processor speed, bus speed, and L2 cache size on different aspects of the benchmarks. For example, some tasks run within the L2 caches (512 kbytes on the Freescale part, 1024 kbytes on the IBM), and some larger tasks show system-level effects. As a result, the processors match closely in some areas, with one or other ahead on other parts of the code suite. Higher clock-speed scores in TCP handling and the IBM’s larger L2 cache wins out with IP tasks. You can see the results at EEMBC’s Web site. The organisation is also moving forward with benchmarks that evaluate power and energy efficiency and with further code for automotive and industrial tasks that will for the first time include a reference-hardware board.

—by Graham Prophet

►EEMBC, +1 530 672 9113, www.eembc.org.

Up-rated logic analyser probes improve fidelity

WITH JUST TWO VENDORS (Agilent and Tektronix) now dominating the market for high-performance logic analysers, it takes only for both of them to adopt an approach for it to become an “industry standard.” Such is now the case

with high-performance multichannel probing: If you lay down the defined pattern on your pc board, bringing signal lines out to an array of pads, you can use probe connectors from either company to make the connection.

Tektronix, in launching a new series of high-performance probes, is keen to position itself as the technology leader in this niche; however, interchangeability is likely of more interest to the user. The P6960 (single-ended) and P6980 (differential) probes both offer 34 channels in a 34×4.7-mm footprint, which the company claims is 61% denser than previous-generation technology. The device terminates the probe head in a set of

contact pads; clamping an interstitial contact pad between the probe head and the pads on your pc board completes the connection. Previously, Tek used an elastomeric contact pad for this function,

which proved less successful than the company hoped.

The new generation employs a connector interface using microminiature spring contacts. The interface strip is a consumable, with a finite life. Using this structure, the probe achieves a loading of 0.5 pF and 20 kΩ to ground, with an analogue bandwidth of 2 GHz from capture point to output connector. Tek claims these values are the best currently available in minimal loading on signal lines and in minimal added skew to the observed waveforms. The device acquires data single-ended or differentially, but clock capture is always differential. Probe leads measure 1.8m.

You place tie-down bars at each end of the contact pad array on your pc board, and the probe assembly latches onto them to pull the contacts into alignment. You can produce a development version of your pc board with the pad arrays included, then delete them for a production version, or

you can leave the pads in place. If you leave them in place, you might add the tie-downs only for development boards, because they require a through-hole soldering operation. Price for the basic probe set is \$2750 for the single-ended version and \$5250 for the differential.

—by Graham Prophet

► Tektronix, +44 1344 392000, www.tektronix.com.



The latest probe design from Tektronix still offers 34 signal lines, but in a reduced footprint and with just 0.5-pF loading.

Extending formal methods to embedded software

THE APPEAL of a more rigorous development path for software design has long been obvious: As the software content and complexity of the average project grow, software verification and testing consumes more of the project's budget. Formal methods—a precise definition of the software's function and assurance that it fulfils that specification—offer an attractive approach and have long been the subject of academic research. However, as new design consultancy Verum puts it, this academic work has been “inaccessible” to real-world designs. Verum's chief executive officer, Robert Howe, adds that formal methods have often been uneconomic, requiring a complete system model when design teams typically work with modules and components.

Howe and Verum chief technical officer, Guy Broadfoot, claim to have bridged the world of commercial- and embedded-software design with a strand of formal methods from Oxford University. They based the technique on an algebraic description of the software's behaviour, which

generates a set of assertions; if the software satisfies the assertions, then you can mathematically verify it as meeting the specification. Improved predictability is the key outcome, not only in the code's functions, but also in its cost and development time. The method can ensure design safety by showing that the software does only “allowed” behaviour. It can also check “liveness,” which verifies that, of all the allowed behaviours, the system actually does what its designers intend. The method allows a comprehensive check of all possible states that the system can enter.

Verum says that you can apply the method to any engineering system that you can describe as a state machine. It keeps the mathematics of formal methods in the background; instead, you see a method of describing the system in a particular style. Verum intends to operate in consultancy mode. The company will add its method to a software-design flow to dynamically model and formally verify a design for completeness and correctness. Once you apply the technique

at the specification stage, Verum's tools will check the specification for self-consistency, find any “holes” in it, and provide a behavioural description of the resulting code—if you implement it as Verum describes. Verum itself does not do the implementation, which remains the domain of its customers.

As with all such introductions, Verum's technique requires a particular specification-writing and coding style. How much does this requirement constrain designers? It doesn't restrain them at all, according to Howe, who describes the style as “straightforward, perhaps cleaner, but not radically different” from typical software practice. The method forces you to confront more design decisions earlier in the project and, Howe asserts, effectively catches defects early, before they propagate downstream in the product's life cycle and become written into the fabric of the project. It is also effective, he says, at finding defects that testing doesn't find—the troublesome “corner cases” that manifest themselves much later, when the

product is in the field.

You can apply the technique to new projects as well as existing code in maintenance or upgrade phases. Howe concludes that it is “not an alternative to any existing flow or design technique, but a new tool that will greatly reduce the time spent in verification and testing, improve the quality of the product, and cut the costs of development and maintenance.”

Verum offers consultancy in software design, re-engineering of problem software, and product-liability support in which you can use formal verification to certify the correctness of software modules. The company, which refers to its expertise generically as ASD (analytical-software design), believes that consultancy is the correct business model, because its client companies don't need an ongoing ASD skill base, which is specialised and expensive to maintain. You would typically apply ASD over only 10 to 20% of the project's development cycle.

—by Graham Prophet
► **Verum**, +31 40 2359090,
www.verum.com.

Not a simulator, an accelerator, or an emulator

WITH THE addition of VHDL to its language coverage (building on Verilog and C), Carbon Design Systems is expanding its geographical coverage to Europe. Carbon is in the business of speeding up block and system verification, aiming for the Holy Grail of simulation: the ability to run early code on not-yet-implemented hardware. The problem with that objective has always been getting the hardware simulation to run fast enough that you can run a useful amount of embryonic code on it in a reasonable amount of (real) time—in other words, to achieve true concurrent design of hardware and software. You can get the HDL code to run faster if you move

up in levels of abstraction, but you risk discarding detail that will compromise the accuracy of the result.

Carbon claims a new approach. Rather than trying to speed a simulator's actions, the technique focuses on the computational task of running the simulation, and it compiles your HDL model, which it handles as one item, to a computationally efficient yet cycle- and register-accurate runtime engine. The computational object gives you visibility of all nodes in the design but runs a claimed 10 to 50 times faster than native simulation. There is no event-based core to the "engine"; rather, the technology focuses on timing and expends the bulk of the software

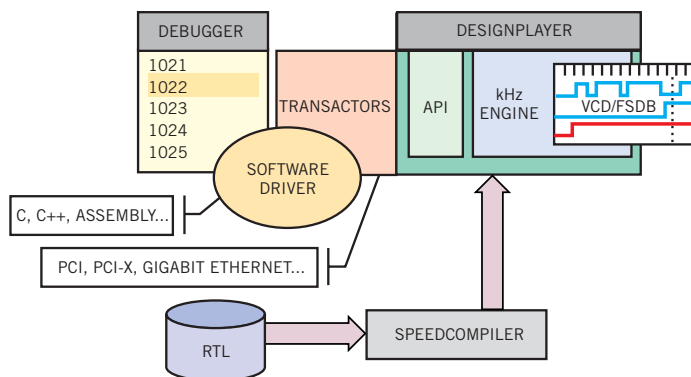
effort in the compilation phase. A high-performance API to the engine completes the offering. Software runs as on "real" hardware, and you can debug it using the API.

Carbon presents the product line as the compiler, SpeedCompiler, and the DesignPlayer runtime support environment. You can run the compiled object stand-alone or link it into an external environment, hardware, or another simulation. It can interface directly to driver code and compiles 6 million gates on a capable PC or workstation in less than an hour. Linking to a SystemC environment is also possible.

A design team typically has one copy of the compiler (\$200,000 and up), with multiple "player" packages (\$10,000 each). IP (intellectual-property) users can employ a "distribution" version of the DesignPlayer package that sells for \$2000 in volume to securely distribute cycle-accurate models of their hardware for evaluation and development. It offers far more detail than an instruction-set simulation, Carbon says.

—by Graham Prophet

► Carbon Design Systems,
+1 781 890 1500, www.
carbondesignsystems.com.



Carbon's SpeedCompiler offers a new dimension to the system-verification flow.