Hybrid System

LAYS BRICK FOR NEXT-GEN CONTROLLERS

There are a lot of different hybrids out there these days. Hybrid cars are on the tip of tongues from Tokyo to Detroit as we plunge ever further into our pockets to cover oil costs. But any multitude of factors combined for a specific purpose warrant a hybrid classification. The two-faced term could refer to anything really: hybrid machine, hybrid coupling, hybrid security—in reference to finances—and even mythological hybrids like the griffin, centaur or mermaid.

The latest item bearing the hybrid label to hit the power transmission market is Delta Tau Data System's Power PMAC, a motion computer, which fuses a controller with a full-fledged, Linux operating system into a compact and powerful tool for most commercial, industrial or military applications.

"What really distinguishes the Power PMAC is that it's a hybrid beast," says Curt Wilson, vice president of engineering for Delta Tau Data Systems, Inc. "It can be used as a dedicated controller, but it also gives sophisticated programmers the access to a general purpose computer. Same processor. Same hardware. Same environment."

The Power PMAC provides advantages over both traditional dedicated controllers and general-purpose computing engines because it permits the user to choose for each aspect of an application which approach is more suitable.

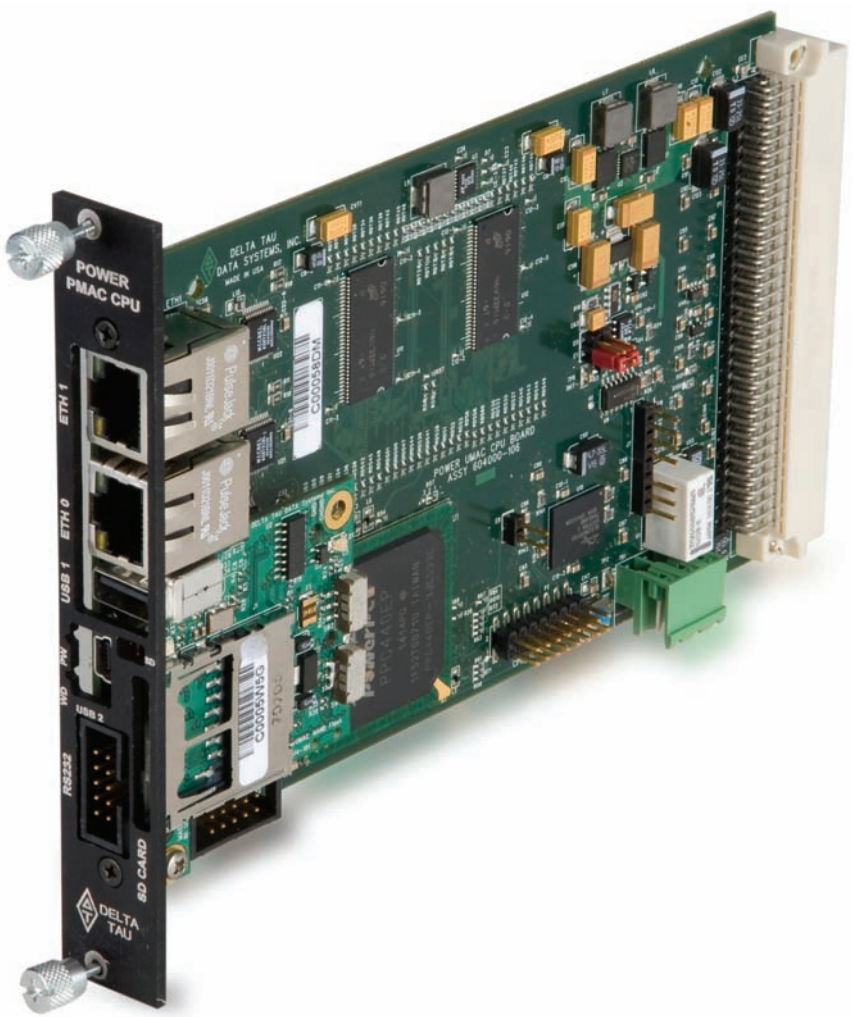
One of the most significant options designers have with the Power PMAC is to write programs using Delta Tau's script language or a popular programming language like C or C++. The main difference is "a script language is generally easier to use, but more limited in its functionality," Wilson says. "You don't have access to all of the powerful tools that you have in a language like C. C is very open, very powerful, but it's difficult for the novice and potentially dangerous for the unaware."

A designer could by accident write over critical memory, which is easy to do in C and would result in a crash. It's what computer hackers look to achieve, according to Wilson.

Delta Tau considered the pros and cons of these software writing tools when the Power PMAC was conceived four years ago and realized the benefits each has for users looking to fulfill varying needs. "With each generation of controller, we listen to what people tell us, both customers, and probably more importantly, the accounts we didn't get, and why didn't we get them," he says. "One of the important things we noticed was in accounts where there were very serious programmers who were used to all the tools of a language like C; these people were very hesitant to use a controller that they sensed was limited by the simplification of the script programming approach."

The script language simplifies some tasks in a way that compensates for issues a standard language may run into. Wilson cites two particular tasks as the most important ones the script language takes care of. "It's handling, under the hood and invisibly to you, what's called the type matching of variables. It converts them automatically as needed. [Secondly] it has what we call a sequencing engine that is automatically sequencing program execution move by move."

Another key feature is the embedded Power PC processor, which is about 10 times faster for floating point math calculations. "The floating point math is so fast and efficient in this processor; we can do things we couldn't

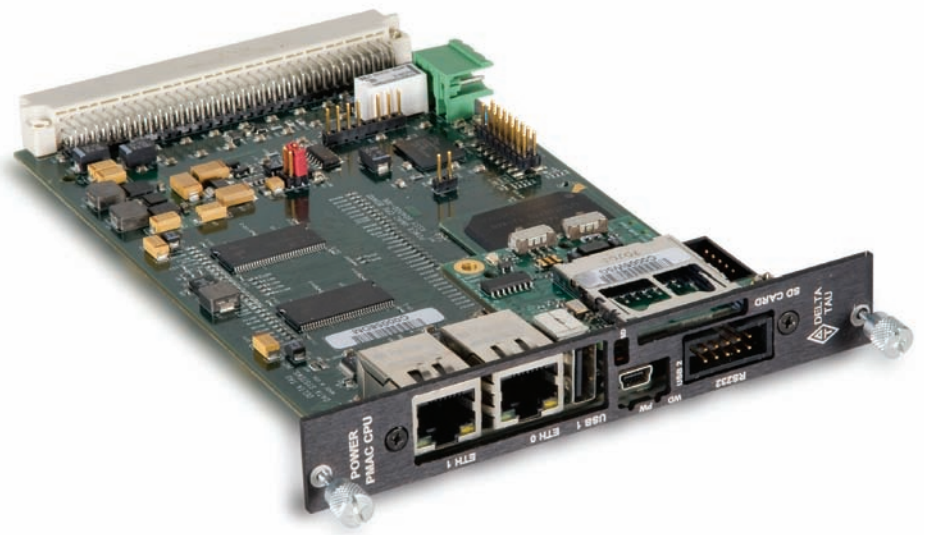


do in previous generations. We're talking about sophisticated floating-point algorithms," Wilson says.

This type of processer features low heat dissipation, so there is no fan required to prevent the chip from overheating. It also has built-in peripheral interfaces like Ethernet, USB and PCI, which add to the compact, efficiency factors while allowing the Power PMAC to be accessed from any computer in any location.

There are many other new features in the Power PMAC like a built-in web browser and a fully integrated development environment. Also, "as a full fledged computer, it has an organized file system like your PC," Wilson says. "It allows you to write software for what are called both real time tasks—things that must happen now—and what are called background tasks in C or C++. It supports up to 32 independent axes in a single coordinate system."

The Power PMAC is equipped with about 100 times more memory than traditional controllers. "The huge memory permits programs that run for days to be completely loaded into the memory and then run. With previous controllers, you had to sort of dribble it in as you were running, which is much more difficult. This makes it much easier. Just load the whole thing in and say 'run.'"



The Power PMAC is being officially released to the market come the New Year, but it has been pre-released for sampling purposes to selected customers, who have overall provided very positive feedback, Wilson says. One user is faced with a particularly difficult control program, which requires a custom servo algorithm that closes the feedback loop as efficiently as possible—10,000 times per second. Using the Power PMAC, this user is able to write the algorithm in C, and with the high-speed processor, it executes about 100 times faster than the previous controller would allow.

Delta Tau may have set the bar a little higher for motion control technology with the Power PMAC, and there are already visions for further developing the product in the future. "We will be building one that fits in your computer's PCI expansion slot," Wilson says. "We're also planning an enclosed controller/drive combination—both the brains and the power circuitry. By combining the controller and drive in a single package it dramatically reduces both size and cost to the users, and it reduces the complexity of wire because it's all internal."

In closing, Wilson alludes that the Power PMAC's introduction responds to current market trends, and motion system designers will find the product better equipped to fulfill their needs. "People continue to push the envelope on speed and accuracy and complexity of projects. As they get more and more complex, you've got to manage the complexity in more formal ways. That's what things like the integrated development environment [IDE, which provides for seamless C/C++ and script application development] do, and a lot of people like to work through an IDE as much as possible for these complex projects."

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Yaskawa

REDUCES PARTS IN COMPACT DRIVE

The J1000 AC drive from Yaskawa Electric America, Inc. claims to be the world's smallest compact drive with 70 percent less space required. With fewer parts used in the drive's construction, mean time between failure (MTBF) is increased to 28 years, and other component lifetimes are also extended, such as fans, capacitors and thermal optimization, according to the company's press release.

"The new J1000 was designed with three main principles in mind consisting of quality, reduced cost of ownership and maintainability," says Todd Ammerman, Yaskawa MicroDrive product manager. "All of these allow for the customer to get the most out of their products at a cost-effective price."

The goal to reduce cost of ownership is accomplished by compact design, side-by-side mounting and the capacity to run a larger motor with normal duty rating. An over-excitation braking feature allows the drive to limit stop times without external braking resistors.

The J1000 AC drive can store files for programming several drives quickly or backing-up the system, and it is equipped so hardware or software can function for this purpose. The drive is maintained by lifetime monitors, which constantly supervise how well the key components are working.

The J1000 drive is sized from 1/8 to 7.5 hp. Voltage classes are all 50/60 Hz; they are 200-240 V single-phase, 200-240 V three-phase and 380-480 V three-phase. Other standard features include an open loop V/f control with a 40:1 speed range, starting torque of 150 percent at 3 Hz, a 5-digit LED keypad, vibration resistance to 50 Hz and a swing PWM function to decrease motor noise.

Applications for the J1000 include industries such as material handling, food and beverage, fan and pump control, packaging, agricultural machines and industrial washers. The drive is RoHS compliant and has CE, UL and cUL global certification.

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OneGear Product Line

OFFERS MAXIMUM MOTOR USE

The Allen-Bradley OneGear product line from Rockwell Automation supplies a full range of motor and power control center options. The line includes the full voltage non-reversing controller, intelligent protection systems and 10 kV to 15 kV SMC Flex controllers.

Designed for next generation medium voltage control, the OneGear line of products can be used with full voltage and solid-state, reduced voltage applications and it supports operating voltages up to 15 kV. OneGear uses vacuum-contactor and circuit-breaker switching technology for flexible solutions. Each product is available with arc-resistant cabinets, and they provide remote monitoring, diagnostic capability and detailed motor protection, so the maximum motor utilization can be achieved without damage or downtime.

"OneGear is a complete line of medium voltage control products that have been

designed to meet global standards," says Ralph Paling, manager, integrated marketing communications at Rockwell Automation.

The inaugural products are only a start for the OneGear line. "Over the next three years, OneGear will expand and feature a complete line of motor control products which will include reversing, multi-speed and synchronous controllers, as well as main and tie breaker units," Paling says. "OneGear will offer a complete line of non-variable speed medium voltage control."

When asked how the product line may help to expand Rockwell Automation's customer base, Paling points out that, "OneGear allows Rockwell Automation to market these products globally, instead of just NEMA, which is restricted to North America alone."

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Redesigned Air Motors

MINIMIZE NEED FOR COMPRESSORS

A redesigned series of air motors from Huco Dynatork has reduced the need for air compressors in paint stirring applications. Plants in both the United States and the U.K. have switched from traditional vane motors to air motors. According to the company's press release, one automobile plant is saving over $150,000 annually on power and equipment costs.

Via an integral rotary valve, air up to 100 psi is supplied to each of the three pistons in turn. The free-floating pistons transmit torque on start-up that can be adjusted via a pressure regulator, resulting in high torque at variable low speed and low noise.

Because the Dynatork air motor traps the compressed air within the piston/cylinder, allowing for maximum energy conversion, the unit is easier to seal than a vane motor cylinder. The air motor consumes up to 80 percent less air than a vane motor, providing a significant cost savings even at maximum torque. It can be used in harsh and hazardous environments thanks to redesigned internal air passages that replace the external tube structure, and it can operate in constant start-stop applications under loads displaying similar characteristics to a stepper motor.

"The original purchasing criteria for the motors, given by the U.K. automaker, were greater reliability on 24/7 operation and freedom from lubrication to avoid the possibility of contamination," said David Lockett, joint managing director of Huco Dynatork. "However, by changing to the air motor, this manufacturer has gained considerably more. The company has now installed 42 Dynatork motors which have provided a capital saving of two 600 scfm compressors and an overall power saving of 152 kVA per year."

Available in aluminum, stainless steel for harsh environments and plastic for high-pressure washdown environments, the air motors can be supplied as fully submersible units for lubricated or non-lubricated operation.

The air motors are available with maximum torques up to 16 Nm or 550 Nm with gearbox. Huco has also introduced a new controller that holds the motor speed constant under variable load for paint and other liquid stirring applications where torque reduces as the paint or liquid levels fall.

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3D Production Systems

EMPLOY DISSOLVABLE WAX SUPPORT TECHNIQUE

The ProJet CP 3000 3D production system from 3D Systems Corporation produces high-speed, high-volume casting patterns from digital data for foundry prototyping and end-use parts applications such as medium- to large-sized mechanical parts for engines, pneumatics, aerospace, general manufacturing and other heavy equipment. The company also released the ProJet CPX 3000 system, which specializes in high-resolution production of extremely detailed wax patterns for medical instruments and devices, mechanical parts, replicas and other uses.

The ProJet CP 3000 and CPX 3000 use standard investment-casting materials and processes for investment casting of final parts that are produced with 3D Systems' VisiJet CP200 or CPX200 wax build, a new material, and Visijet S200 dissolvable wax support material, which together create wax patterns for casting. The 3D printers are capable of complex or highly-detailed geometric shapes, which traditional CNC or milling procedures cannot produce.

The dissolvable wax support system leaves smooth support-side surfaces while both build and support materials do not require special handling and are environmentally friendly. The process does not entail production patterns from photocurable materials, which may be subject to thermal expansion during casting, effectively limiting the part-size and geometries capable of being cast.

The CP 3000 production system

has a large x-y-z build volume (11.75 x 7.3 x 8 inches) and a single-pass printhead design, so it can build one large or several smaller patterns across the x-y build area without giving up build time. Longer unattended operation is possible with both production systems by optimum use of the z-direction build volume—in the CP 3000 case—facilitated by part stacking and nesting features for the patterns produced.

"We are very pleased to be able to deliver the new ProJet CP 3000 3D production system, the first high-volume wax pattern production system designed specifically for general foundry casting applications," says Buddy Byrum, senior director of 3D printing solutions for 3D Systems. "The ability of this new precision manufacturing tool to quickly produce easy-to-cast precision wax patterns directly from CAD should reduce our customers' cycle time and production costs, resulting in improved final part quality and functionality."

The ProJet CPX 3000 production system has two optional build modes. A high-definition, HD, mode creates small to large parts that have excellent surface finish. In the extreme high definition, XHD, mode, a 16 micron layer thickness is provided for parts with fragile, fine-feature detail common in micro-casting applications.

"We are delighted to deliver a true, fast, 100 percent wax-based investment casting solution, ideal for foundry and other industry segments that addresses all of the required professional casting requirements and is packed with real cost savings," Byrum says.

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Digital Module Range

INCREASES POWER OUTPUT, SUITS MEDICAL USES

A new range of digitally controlled output modules has been added to the NV-Power family of configurable AC-DC power supplies from TDK-Lambda Americas. The new range increases power output up to 1,450 W peak rating for 10 seconds. They suit the industry demand for low-profile configurable power solutions from 350 W to over 1,000 W for broadcast instrumentation, medical equipment, ATE, automation, routers, servers and security networks.

This trend for low-profile power solutions "is being driven by requirements for higher efficiency power supplies, smaller equipment, portable equipment and the increasing need for standard product easily adaptable to custom output voltages," says Dorrel Vernon, senior product manager at TDK-Lambda.

The modules' digital control is useful for customizing an application based on specific requirements. An integrated magnetic transformer makes the modules smaller and more efficient. The NV-Power uses an eight-bit microcontroller for integrating maintenance processes, which effectively replaces discrete components such as comparators and op amps. This feature reduces the parts count to 50 percent, making room for 40 percent more board space for power components while power densities are capable of up to 19 W/in^3.

The new range of output modules are components designed for use with the NV-350 and NV-700 series power supplies.

Up to 350 W of output power with <180 VAC mains is possible with the NV-350 series. It provides up to 660 W continuous with >180 VAC mains, and up to six outputs users choose can be achieved in a 1.6 x 3.75 x 10.8-inch package.

The NV-700 series supplies up to 700 W of output power with <180 VAC mains and up to 660 W continuous with >180 VAC mains. As many as eight user outputs can be provided in a 1.6 x 4.92 x 10.8-inch package.

continued

The modules include EMC-improving design features such as Lambda's patented Multi Resonant Topology (MRT). "[This] is an electronic design by which switching losses are dramatically reduced, and therefore enables higher efficiencies to be achieved—typically around 90 percent," Vernon says. "MRT also features soft switching, which minimizes the generation of switching spikes and harmonics, ensuring that the power supplies offer excellent EMC/EMI performance."

This new range of modules in particular appeals to medical equipment applications because the input to output isolation meets the 4 kVAC reinforced requirements for medical use. TDK-Lambda conforms to the international standard IEC601. A substantial category in this standard is reinforced insulation for medical applications.

"Reinforced or double insulated power supplies must withstand a dielectric test at 4 kV for medical applications, whereas the corresponding figure for industrial use is just 3 kV," Vernon says. "Any shortcoming in isolation would result in a higher risk of electric shock for a patient or system operator.

"Power supplies that are approved to less than 4 kV may be used in medical applications as part of a reinforced barrier, provided that the insulation provided by the power supply is regarded as a lesser 'basic' or 'supplementary' barrier," he says. "In this case additional isolation is required within the end equipment to achieve the requirements of a reinforced barrier between the mains supply and the user.

"The new digitally controlled module range was designed for full compliance to reinforced insulation specifications, eliminating the need for end users to design in additional isolation on the end equipment."

Suitable medical applications include MRI, ultrasound, optical lasers, x-ray equipment, blood/chemical analyzers, surgical equipment, chargers, hospital beds, incubators and patient monitors.

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Transformer Relays

REMOVE TRIPPING, MAGNETIZING INRUSH

Schweitzer Engineering Laboratories, Inc. introduces the SEL-787 and SEL-487E transformer protection relays, which employ simultaneous harmonic blocking and restraint to do away with tripping caused by external faults and magnetizing inrush states.

Both products feature Commissioning Assistant software that recognizes unsuitable CT configurations and produces compensating settings. They can combine with substation control systems using serial ports, dual failover Ethernet connections and various protocols.

The SEL-787 relay can replace most electromechanical relays to safeguard two-winding transformers in industrial plants, utilities and other mission-critical facilities. It connects to networks using Modbus, DeviceNet, DNP3 and IEC 61850 protocols, and it takes plug-in modules for AC voltage and neutral current, I/O, communications or RTD inputs.

The SEL-487E shields and monitors transformers with two to five windings. The relay can identify turn-to-turn faults that are 2 percent of the total winding. Internal error damage is reduced using a sub-cycle adaptive differential element, and the relay monitors and controls breakers and disconnect switches with front-panel LCD one-line diagrams.

"With transformer manufacturing lead-times exceeding two years and prices doubling in the past four years, no one can afford to be caught off guard losing a transformer," says Joe Mooney, SEL R&D manager. "We developed these advanced transformer relays to provide the best return on investment for every power transformer."

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