



Intel® Network Processors Drive New Communications Capabilities for Rockwell Automation

New control products capitalize on embedded communications features in the new Intel® IXP465 network processor

Summary

What do commercial networking and communications have to do with industrial automation? More than you might think. Both industries must deliver increasingly higher performance into ever-shrinking devices. Interface standards are becoming an issue as networking and communications features are being added to every sort of platform. High-performance, reliable networks are needed to connect once-isolated environments to enable data sharing and real-time decision making. And everyone faces the same pressure: make it better-faster-cheaper.

Rockwell Automation is likely the first industrial leader to boldly cross the boundary of these once-disparate industries. By tapping the Intel® network processor architecture for its future automation solutions, the company plans to leverage the growth curve of the commercial processing world into the once-proprietary industrial segment.

Intel and Rockwell Automation are working closely together to ensure success. The new Intel® IXP465 network processor includes “hardened” features that serve the unique requirements of the industrial segment. Meanwhile, Rockwell Automation is developing leading-edge control products for a wide variety of industries that rely on the high performance/low power capabilities of the new Intel® IXP46X product line.

Both companies are eagerly working on solutions that bring together the best of both worlds. Read on to learn more.

The Nature of Industrial Automation

The industrial setting is not at all friendly to traditional computing equipment. Fast-moving machinery and products move about in organized chaos. Heavy equipment and constant movement create near-continuous vibration. Dust, dirt and other airborne debris, as well as fluctuations in temperature and humidity are common maladies. It is not the sort of place that you typically would choose to deploy commercial grade computing and communications equipment.

But automation requires deployment of computing infrastructure within this unfriendly environment, and these devices are expected to perform precisely—without failure—24x7 for years on end. Inconsistent performance can't be tolerated in the middle of a high-speed packaging operation or while pouring a ladle of molten steel into a die cast mold.

This is why the controllers, communication interfaces, sensors, motors and other devices that automate the industrial environment are designed specifically for the rigors of the factory floor. Engineered to exacting performance, these workhorse computing systems are critical to the success of the factory. The failure of a single device can cause hundreds of thousands of dollars in lost productivity.

Although rugged, these systems are by no means primitive. Rockwell Automation delivers highly sophisticated control and information processing solutions. In addition to regulating and controlling the incredibly complex environments on the factory floor, these systems have the capability to deliver valuable production information to other parts of a corporation's business systems—information that can be used to make real-time decisions that improve quality, productivity, flexibility and profitability. Rockwell Automation delivers thousands upon thousands of these finely tuned automation solutions for a wide range of industrial settings—not only factories, but also commercial buildings, water/wastewater facilities, airports, hospitals, amusement parks, Broadway shows and more.

Worldwide demand for Rockwell Automation's expertise is great, and so is the customer's need for cost-effective solutions. Expanding automation into new settings, customers want platforms that can be mixed and matched from a choice of vendors for optimum customization. What's more, Rockwell Automation says its customers require ever-increasing precision in the new solutions that must be delivered better-faster-cheaper.

Sound Familiar?

Much of the design criteria that fuels development in industrial automation is the same as that facing commercial networking and communications engineers. Increasingly smaller devices require more efficient power consumption, even though users insist on greater performance and more features. What's more, customers demand more flexibility and choice in their platforms.

There is enough commonality, in fact, that Rockwell Automation began looking to the computing and communications industries for strategies to improve performance, cut costs, and speed time-to-market. The company reasoned that some of the valuable technologies developed by these once-disparate industries could be leveraged into the industrial world—especially standards-based networking technologies like Ethernet (in manufacturing, EtherNet/IP*) and USB.

What Rockwell Automation Likes About Intel

A Complete Product Line

With a single architecture and integrated design, the entire Intel® IXP4XX product line of network processors delivers scalable performance, reduced power, and lower cost in packages optimized for a variety of applications, including communications-based embedded products and industrial automation and control devices. The highly efficient architecture offers high performance with low power consumption—two of the most essential ingredients in any tightly integrated device. The IXP4XX product line offers a choice of scalable data, voice, and security packages built on a common hardware and software architecture with a common development platform to accelerate time-to-market while minimizing training and support costs.

Intel's Newest NPUs

The Intel® IXP465 and Intel® IXP460 network processors are the latest additions to the Intel IXP4XX product line, extending Intel network processing technology into a broad range of applications that require communications functionality. Software and hardware architecture consistency among all products in the Intel IXP4XX product line speeds development and uses design resources across an entire standards-based product portfolio.

The highly integrated, single-chip design of the IXP465 network processor provides a unique combination of performance, reliability and flexibility. Intel XScale® technology combines with a variety of built-in communications features to support requirements for modular routers, security appliances, telecom line cards, industrial controls, interactive clients, test and instrumentation, RFID, and networked print imaging applications. The high performance Intel XScale core provides processing headroom to flexibly support a broad range of OEM applications while minimizing power consumption. Integration of multiple LAN and WAN interfaces, built-in hardware acceleration for features such as cryptography and time synchronization, and data integrity features such as ECC memory reduce overall system cost and simplify development.

The Intel IXP465 network processor is supported by a robust application development environment for the Intel IXP4XX product line including pre-integrated and pre-validated development infrastructures and operating systems, development platforms, software components, and debug tools from Intel and members of the Intel® Communications Alliance and other third party providers.

Intel XScale® Technology

Rockwell Automation's decision to standardize on Intel network processor architecture is due in large part to the performance, low power consumption features and support by the major embedded OS vendors. The high performance of the Intel XScale core gives Rockwell the necessary headroom for today's products as well as those planned for the future.

Time to Standardize

These observations led Rockwell Automation to make two important decisions:

- 1) Reduce development time and reduce dependence on proprietary solutions by taking advantage of open, industry-standard technologies, including Ethernet, the TCP/IP Suite, USB, and IEEE 1588 (an emerging standard for synchronizing time-critical functions).
- 2) Standardize product development on a single processing platform.

Both moves allow Rockwell Automation to reap the benefits of new technologies and performance that are rapidly outpacing those available through custom channels. “It used to be the other way around,” explains Brian Oulton, Rockwell Automation Marketing Manager. “In the past, we were forced into designing custom ASICs because commercial technology couldn’t perform to industrial specifications. Today’s commercial technology—like that available from Intel—is much more advanced than what we can get through proprietary means because the pool of resources working on development is so much greater.”

The development advantages for Rockwell Automation are significant. “It allows us to focus our time and energy to where we add value—the development of tightly integrated, highly flexible industrial automation systems,” explains Scot Tutkovics, Rockwell Automation Software Engineering Manager. “Before we adopted the standardized approach, we needed specially trained engineers on staff to develop our ASICs, develop and maintain our operating systems, make sure that the TCP/IP stack is current and updated with the latest features, and maintain the various different platforms on which our products were built. That is not our expertise. We build automation solutions. By going the standardized route, we can go to the industry experts for those things and redirect our internal resources to focus on our value add. All of that helps us get to market more quickly and more cost-effectively. Furthermore, our customers benefit from more products, all conforming to industry standards such as Ethernet and the TCP/IP Suite, with easier integration in their factories and applications.”

Choosing One Architecture

Once Rockwell Automation decided to standardize on a single processing architecture, the job remained to select the one platform that could meet exacting criteria for all the products

the company makes today, as well as those solutions planned for the future. And let’s not forget the rugged environment in which these chips need to run. Such conditions require high performance with very low power consumption (no more than 2 watts), along with a high degree of reliability, real-time synchronization (via IEEE 1588), speed, predictability and latency.

Add to that recent customer demands for increased information sharing capabilities and the emergence of industrial versions of networking standards like Ethernet within the automated environment. “We also wanted the flexibility to run any of the three most popular operating systems today: VxWorks*, Windows* CE, and embedded Linux*,” says Tutkovics. “This provides us with greater opportunities to best provide a wide range of products with just one processing platform.”

In sum: a single architecture must bring the price-performance benefits of the commercial processing world to the industrial automation environment in a package that effectively meets the needs of hundreds of applications.

The Solution: Intel® Network Processor Architecture

Rockwell Automation found the ideal architecture at Intel. As a product line, Intel network processors meet the company’s demanding design requirements, including processing performance, low power consumption and networking capabilities. With a standards-based design and support for all three of the most popular OS packages, the Intel NPUs give Rockwell Automation tremendous flexibility for their extensive product line.

The deciding factor? “We were impressed especially with the built-in Network Processing Engines (NPEs). We will take heavy advantage of them to gain a very high degree of re-use in all of our products going forward. The NPEs allow us to leverage the work we put into our software for one product into many other designs,” says Tutkovics. Design re-use is a huge benefit to both Rockwell Automation and their customers, enabling the company to significantly speed time-to-market in bringing out entire product families as well as feature additions to current families.

Rockwell Automation will soon launch its first new products based on one of the latest Intel NPUs: the Intel® IXP465 network processor. Intel and Rockwell Automation worked very closely during development of the new processor to ensure that it met all of the needs of the industrial environment.

The result: Intel will continue to include hardened, industrial features in future network processors. "As we move forward in our product roadmap, we're going to continue the trend we started with the Intel IXP465 network processor, taking our base commercial enterprise NPUs and finding ways to specialize and harden them for the industrial automation market segment," confirms Ken Caviasca, Silicon Engineering Manager, Intel.

Meanwhile, Rockwell Automation engineers are excited about the level of compatibility between Intel's network processors and Rockwell Automation's design strategy. "Intel brings all of the price-performance benefits of their leadership position in the commercial processing world to our industrial world, which means we can really improve our time-to-market and cost basis," explains Oulton.

The first Rockwell Automation product to use the IXP465 network processor will be an EtherNet/IP communication module for the company's Logix* family of controllers. EtherNet/IP is the leading industrial version of the Ethernet networking standard. The performance and capacity of this new module is expected to significantly outperform the currently shipping versions and will add a USB port for easy walk-up connectivity to the system. Use of the built-in Ethernet and USB ports are expected to reduce Rockwell Automation's development time significantly. The new module will also provide full support for the IEEE 1588 standard for precise time synchronization across distributed applications.

Even more significant, perhaps, is that Rockwell Automation will continue using the unique features of the Intel network processor architecture to implement a variety of industrial

network products. "It's our intention to use the Intel IXP465 network processor—and other Intel network processors—in many of other Rockwell Automation solutions going forward," says Oulton.

Conclusion

According to Rockwell Automation, the Intel network processor architecture will form the platform for an entire new generation of industrial automation solutions that include more powerful networking capabilities. It's a strategic decision that benefits everyone:

- Rockwell Automation customers get an effective price-performance along with the cutting-edge features and technology needed to stay competitive
- Rockwell Automation speeds time-to-market and reduces costs for better customer satisfaction and a stronger leadership position
- Intel gains from Rockwell Automation's expertise in the industrial segment, enabling the development of new features and technology that will benefit the entire industry

This move forecasts the eventual fusion of the industrial automation world with the commercial networking and communications segments. As Rockwell Automation and Intel work closely together to ensure that the demands of one group can be met by the solutions of the other, it is becoming clear that these once-disparate industries will converge. According to Rockwell Automation, the Intel network processor architecture is an amazing proof point.

For More Information:

Rockwell Automation, Inc.

http://www.rockwellautomation.com/about_us/overview.html

Intel® Network Processor Architecture

www.intel.com/go/networkprocessors

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