Rethinking the Building Blocks of Your Network

By Kevin Tolly and Charles Bruno

Rethinking the "Food Chain"

It's not often that you hear about significant changes in the food chain. You've got your herbivores and your carnivores and everyone pretty much knows their place.

It's highly unlikely that CNN will begin reporting anytime soon that tigers and lions have turned to green leafy vegetables or nuts and berries, like an Atkins fanatic who's had his or her fill of the high-protein burger and bacon meals.

There is, though, an evolution occurring in the food chain for IT equipment. Converged networking is the driver.

Plenty of Bandwidth

IP broadband networking, and the bounty of bandwidth it delivers, is driving network convergence in enterprise networks. Broadband is enabling new applications and ensuring that strategic business applications get the bandwidth and the response times they so desperately need to thrive.

IP broadband is laying the foundation for voice, data, and video feeds to coexist, peacefully, in a unified architecture. But getting there is no cakewalk. To ensure convergence success, it takes shrewd planning and a keen understanding of the principles at work.

Across the board, IT management is facing tough challenges resulting from rapid and continuous change in the business environment. These challenges include increasing end-user and staff productivity; reducing total cost of ownership (TCO); protecting data as connectivity proliferates; and most of all paving the way for true convergence. Creating the integrated system environment that will drive the convergence benefits means thinking very differently about the individual elements of the network, whether that's the LAN, WAN, or mobile infrastructure. More than ever, it is what's inside the network components such as controllers and processors—that is vitally important to ensure the interoperability and smooth integration central to leveraging broadband connectivity and enabling convergence.

IT's New Food Chain

In the recent past, through the 1990s, IT buyers focused their purchase decisions largely on brand name vendors. Companies like IBM, Cisco Systems, Compaq, Dell, Hewlett-Packard, and others were the preeminent brands, and continue as recognizable brands today. The brand name on the outside of the box was a valid indicator of what was inside.

Buyers familiar with the logo on the box, and what the vendors stood for, didn't need to go under the hood, because most of the internals were proprietary ASICs—except for, perhaps, the most elemental subsystems such as a serial interface or an RMON software stack. The so-called "secret sauce" was the custom ASIC designed and built by the systems vendor itself. "Outside" chips were rare, and usually basic — a LAN chipset, or perhaps some standard software code (e.g., a basic TCP/IP stack). If companies did outsource software elements, it was for an RMON network management stack or an IP routing stack. The singular exception to this approach was a product that was marketed

from another vendor on an OEM basis and sold under a more recognizable brand. In other words, a vendor takes a complete, finished product of another vendor and replaces only its branding on the physical box and the configuration screens.

Enter Integrated Silicon Vendors

Now, reputable vendors like Broadcom, Intel, and others are performing sophisticated integration of silicon solutions and other hardware/software elements into their systems. What is occurring is an evolution in which systems vendors are importing best-of-breed functionality, such as security processing, and integrating those functions into their own products rather than building them from scratch.

While the custom building approach made sense to brand name vendors 10 years ago, even five years ago, today certain conditions have made such a model ineffective.

Currently there are two key concerns for many vendors: product differentiation and time to market. Integrated silicon helps with both issues.

Differentiation is all about focusing one's efforts on those elements that can create value for the potential customer and, conversely, not wasting time "reinventing the wheel"—that is, creating a custom version of industry standard elements (i.e., standards defined by the IEEE and IETF) that, in any case, ***must*** comply with the standard. (A "custom" version of systems that must comply with standards is often a pointless exercise. An exception might be when the interfaces are "standard" but the internal processing, say, can be optimized.)

It stands to reason, as well, that when one uses custom components one's time to market lengthens (sometimes to infinity!). Thus, the availability of hardware and software subsystems providing core functions that can be embedded or integrated into a product can have a dramatically beneficial impact on a vendor's time to market.

These truths, combined with a very demanding "what have you done for me lately" stock market, provide very compelling reasons for a design revolution. Only now, adoption of discrete elements yielded to integrated silicon adoption—systems vendors now are integrating network processors and other highly specialized chipsets.

(For all the benefits of an integrated silicon-based approach, many vendors are reluctant to acknowledge the debt owed to said semiconductors. Vendors would do well to boast about how their use of advanced silicon solutions allows them to focus on the "value add" that makes their product "the best" for a given customer environment.)

Model for Today, and Tomorrow

Today, custom ASICs and OEM deals are overshadowed by a new model that enables vendors to respond more quickly to market conditions and has a better impact on profitability. In many cases, as noted above, it is not practical or profitable/desirable to build a product entirely from scratch. What we've seen is a dramatic change in how products are built, with a heavy emphasis being shifted onto the shoulders of hardware/software subsystem suppliers. These companies deliver everything from basic hardware to complete subsystems for security, for TCP/IP processing, for wireless, etc.

These integrated silicon solution vendors are hardware and software developers whose target market is not end users, but rather the traditional systems vendor building products for end users.

On the hardware side, examples would be companies like Agere Systems, Broadcom Corp., Intel Corp., IBM, and others that are creating multifunction network processors that serve as the core processing engines of access routers, wireless LAN gear, and a host of other emerging products.

From the software side, there is a veritable bumper crop of suppliers delivering everything from 802.11 wireless stacks to Layer 2/Layer 3 switching and routing functionality to the systems vendors. Companies like ARM, WIDCOMM, Wind River Systems, Instant802 Networks, Jungo Software Technologies, Kadak Products, Unicoi Systems, and Ashley Laurent are becoming common strategic partners with systems vendors. Many of these companies are even partnering with chip vendors and software suppliers, such as network processor makers, to offer comprehensive integrated suites of network services and functionality tailored for a specific network processor platform. This is relieving the systems suppliers from having to source every basic building block—and allowing them to focus on their unique "value add." In essence, it takes the integration out of the hands of the systems suppliers, enabling them to respond to evolving market conditions more rapidly than if the vendors built it all from scratch.

Some leading systems developers deliver these software stacks in software drivers that accompany the silicon that help define its overall functionality. Some of these subsystem vendors offer security capabilities that snap into an IP framework, while others focus solely on improving the quality of service (QoS) that systems vendors may offer to end users.

The upshot here is that these vendors are delivering ever-more sophisticated chipsets and subsystems that have power and sophistication, and are becoming a key indicator of the finished product. Moreover, these suppliers have quietly evolved into critical suppliers. They deliver building block software elements that get layered on top of the network processor or wireless silicon to bring it closer to a finished offering.

For systems vendors, the upside of relying on vendors is tantalizing. third party vendors rapidly reduce time to market for systems suppliers, and they do so by reducing development risk (projects stay on track and on time) and usually at less cost than in-house development.

In essence, the hardware/software offered by the third-party suppliers ultimately becomes the key building blocks of any user's enterprise network. What that means is that the full extent of the capabilities and limitations of the third party vendors utilized by systems suppliers becomes the full extent of the capabilities and limitations of the user's network. And that is reason enough for users to be paying close attention to how these suppliers contribute to the system-level offering buyers eventually purchase.

Impact of the Integrated Silicon Rush

The confusing part of this evolutionary shift is how vendors changed the way they source the semiconductor solutions of their products. Now, support for various standards helps system vendors integrate these premium subsystems more easily into the overall design of a product.

The support for standards also changes the playing field for systems makers to rethink design wins. For example, a particular company may get a design win for a network processor to be the heart of a broadband access device. In the past, the

chipmaker that won the original bid likely would also supply the chipsets for companion models in the product line.

That's not true with today's architectural model. In the current market, IT buyers can go out a few months after purchasing broadband routers and find that the newest model may instead sport a Broadcom network processor at the core that is faster, offers more functionality, or both compared to the original chipset in the older model.

What this says is that permanent vendor/supplier allegiances have gone out the window. Because there is such an innate focus on standards and on embedded systems that can plug and play easily, a given chip maker's design win ***does not*** mean forever. While users may look at a Model 200 as a natural extension of a Model 100, vendors look at each one as a separate design win.

Price and functionality are driving the shift. Integrated silicon solution vendors have stepped up their marketing to demonstrate to systems vendors that their chipset are less expensive, offer greater functionality, and can help vendors drive products to market faster with improved overall functionality.

What's the trickle-down effect on users? Although buyers still may be focused on the top brands in a given market segment, they have to invest some time and resources in investigating and understanding the underlying infrastructure and what it can, or cannot, offer. Unfortunately, looking over the product specs won't always provide the answers. Brand vendors don't exactly advertise who their major chip and subsystem suppliers are. However, there are a number of factors users can probe to gain a greater understanding of the role that chip vendors play in an IT supplier's product line.

Despite the rapid change in the systems market and the advent of the chip and other third-party vendors, there are still several elements that influence the success of enterprise LANs. Users should pay attention to these factors as they study the relationships between semiconductor suppliers, software specialists and their systems vendor partners.

Architecture Matters

Systems-level suppliers may well architect their own products, but as they embrace chip-level products and software, the architectural blueprint of the systems supplier takes on many of the design attributes of the chip subsystems.

Silicon solution providers, for instance, work to integrate layered technology into a product and test it as a subsystem. They may partner with third-party vendors to embed middleware that offers vastly more software capability than past silicon solutions.

Essentially, the message is that architectural elements of the component suppliers will find their way into the enterprise network, and organizations want to make sure they complement their own architectural goals.

Therefore, the security or QoS attributes supported by the third-party supplier ultimately may dictate what a user can/cannot do from a security or bandwidth-sharing perspective. In essence, users need to evaluate the product's architecture on an end-to-end basis, paying close attention to the silicon solutions in the mix and how they contribute to the architectural functionality. Some silicon solution providers, like Broadcom and Intel, provide silicon building blocks designed to work together. Other chipsets, including some imports, may not be designed to work cohesively across a network, and therefore may limit the overall systems functionality.

Building Block Integration

The trend to componentization means that users need to be aware of integration. Essentially, that means that the building block approach common to today's market lends itself very well to chip vendors/software partners working collectively to offer integrated suites, or even integrated systems.

Buyers need to look at the integration of third-party embedded subsystems (such as wireless functionality or TCP/IP services) and understand what impact that has on overall functionality offered on the device. Integration can be done via a building block approach, much akin to Broadcom and Intel, or it can be done to provide limited functionality.

It would not be uncommon for switch or router vendors to offer integrated firewall or virtual private network (VPN) functionality. And other vendors that previously may have offered a purpose-specific device now may be more apt to market a multifunctional offering to reap larger revenue streams.

The key here, though, for end users, is that they need to understand the depth of the offering. While a multifunctional device may sound good, some of those products may offer only basic capabilities and fall well short of the full function offered by a purpose-specific device. Again, users need to be more aware of the capabilities offered at the chip/subsystem level.

Chipsets and Subsystems

Historically, IT products like modems eventually became silicon commodities. In much the same way, it is likely that some of the chipset or embedded subsystem functions in today's products likely will become commodities, too.

What does that mean for the average end user? A lot. It means users should care about the differentiation of common elements like Ethernet network interface cards (NICs) and low-port density switches. Many enterprise shops have had to learn the hard way that all Ethernet NICs are not created equal. While some may be dirt cheap, others offer wake-on-LAN and other capabilities integral to enterprise LANs. Just because a product offers Ethernet NIC functionality does not mean that it is enterprise-class in nature.

The point here is that there is a wide range of price/performance for commodity-level functionality and users should be aware what commodity chips/subsystems round out the equipment they deploy in their network and what impact that may have on services offered.

Trust but Specify

The evolution of the IT food chain within the vendor ranks means that buyers need to be aware of the new ABCs—architecture, building block integration, and chipsets in the form of specialized silicon solutions. With that awareness comes a newfound requirement to trust but *specify*.

Certainly, buyers should continue to trust the vendors with whom they've anchored their network for years past. But the trend to chip vendors/software partners means that the onus now is on buyers to specify up front what functionality is required so

systems makers can make the right choices about what embedded technologies are best to incorporate into their products.

Working up front with suppliers to help specify technology requirements is a good start to getting what users need from a product. Ultimately, though, the burden is on someone —the buyer — to verify that the product can deliver the features and functions listed on the data sheet, and that those features and functions meet the architectural and enterprise service requirements of the network into which they are deployed.

How can users/buyers verify promised functionality? The first rule of thumb is that generic feature descriptions are insufficient. Vendors should offer actual performance data to justify claims.

Beyond performance, there is a wide range of features and functions that can now come into play in converged networks. Voice toll quality, QoS, security, and numerous other capabilities are all vital to network success. Yet it is important to remember that just as there is a wide range of feature/functions, there also is a wide range of implementations for those capabilities, which ultimately translates into performance.

Take QoS as an example. There is a vast difference between a system that offers QoS with support of two priority queues and a system that offers support for eight priority queues. Yet both systems rightfully can claim support for QoS. Moreover, is QoS supported at Layer 2, Layer 3, or both? As they say, the devil is in the details and this is the type of functionality diligence users now need to perform to truly understand if the relationship between the systems supplier, the chip vendors and the software partners likely will yield the types of services and the level of performance required for an enterprise's network.

The Best Crystal Ball

In summary, the change in the IT food chain has a direct impact on the enterprise network, like it or not.

That change means organizations must now pay close attention to the relationships that key systems suppliers have with chip vendors and software partners. The key to understanding those relationships is to leverage the new ABCs—architecture, building block integration, and chipsets.

In addition to keeping tabs on chip vendor relationships, buyers need to employ a trust-but-verify strategy. Vendor claims sound good, but in today's market, the claims need to be validated to ensure the level of performance and functionality expected. Understanding product fundamentals is the best crystal ball and will enable enterprises to harness broadband networking to support a converged set of network services.

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