PARPRO

Partners in Production and Design

5 Epic COTS Fails

Why You Can't Afford NOT to have Purpose Built Hardware

SOLUTION BRIEF

Introduction

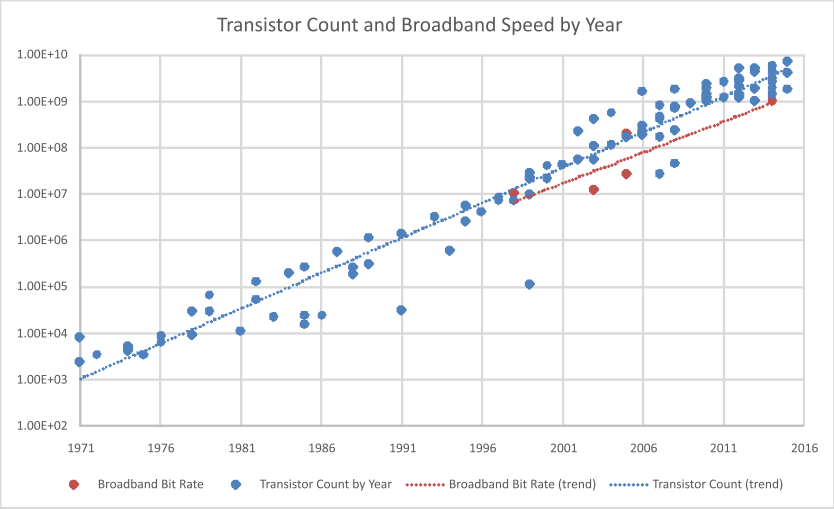
For decades, the conventional wisdom has been that, whenever possible, commercial off-the-shelf hardware (COTS) should be used and customized platforms should be avoided. And, in many cases that conventional wisdom is correct – lots of applications run on x86 servers; everything from accounting to wagering runs on commodity compute platforms. However, there is always an exception that tests the rule. In this solution brief, we'll look at 5 instances where a COTS platform couldn't get the job done but a purpose-built application-ready platform could.

Table of Contents

Performance Anxiety

Nielson's Law of Internet Bandwidth states that a high-end user's connection speed grows by 50% per year. While that is 10% slower than Moore's Law for computer speed, the need for ever deeper and more complex analysis of internet traffic is increasing rapidly in response to new technologies such as Network-Function Virtualization (NFV) and emerging threats.

In other words, our needs to inspect internet traffic is growing faster than our COTS compute capabilities are growing. Much has been written about measuring the performance of intrusion detection system (IDS) tools such as Snort®, and it is quite evident that such tools struggle at today's higher bandwidth interconnect rates 40G and 100G. For vendors of security solutions, traditional COTS server platforms simply can't get the job done.



Nielson's Law of Internet Bandwidth

For one such vendor, the solution to this problem comes in the form of the PARPRO O3E-110 PCIe card, which features a massively multi-core Cavium CN78xx-series CPU with up to 48 cores and 128GB of DDR3. This card, which is designed to fit into standard rack-mount server platforms, offers 80Gbps of I/O bandwidth and processing power to match, along with on-chip accelerators for crypto and search applications, including HFA engines capable of pattern-matching at up to 40Gbps. Furthermore, by using Cavium's CCPI technology and Avago MiniPODs on a custom derivative design, **these PCIe cards can function as a single 96-core compute complex.** When placed into a standard server (which provides control-plane support) which can hold two such cards, the combined platform can now process 160Gbps – far in excess of anything which could be done on the equivalent COTS platform alone.

"There's no such thing as a free lunch, and COTS integration is definitely never free. You will eliminate a lot of headaches, downtime and cost with a purpose built solution that's designed from the start to be compatible with your existing technology investments."

When All You Have is a Hammer...

The world of COTS products can be very attractive; there is a large catalog of components to select from which cover almost every conceivable permutation of products. Switches can be had in a variety of port configurations. Servers are available with a variety of CPU, memory, and storage configurations. And in a rack-mount environment, these components can be stacked together like interlocking bricks.

Of course, that benefit also has a cost: size and density. At a minimum, a server and switch stacked together will consume 2 rack-units (RU) of space, and maybe 3 or 4 RU depending on the server configuration. For many companies, including one metropolitan-area network vendor, rack space is a precious resource. So, when they needed a platform which could act as an SDN-enabled switch as well as a network boot host and VM host, they turned to the PARPRO CSW-1248 2U rack-mount server and switch integrated package. Featuring a mixture of Intel Xeon processing power, solid-state storage, and a Broadcom Trident II switch the CSW-1248 provides a **compact, dense, and powerful platform for next-generation applications**. The platform even has a PCIe expansion slot for future-proofing and is available branded with customer-specific logos and colors. With this platform, the customer recovers rack space, provides a high-value-add component, and gets all the features they want in 33-50% greater density.

"Standards-based solutions can be tricky to work with. You can waste a lot of time and resources getting your application to "work" on standardized servers or changing your processes to fit within a generic hardware package."

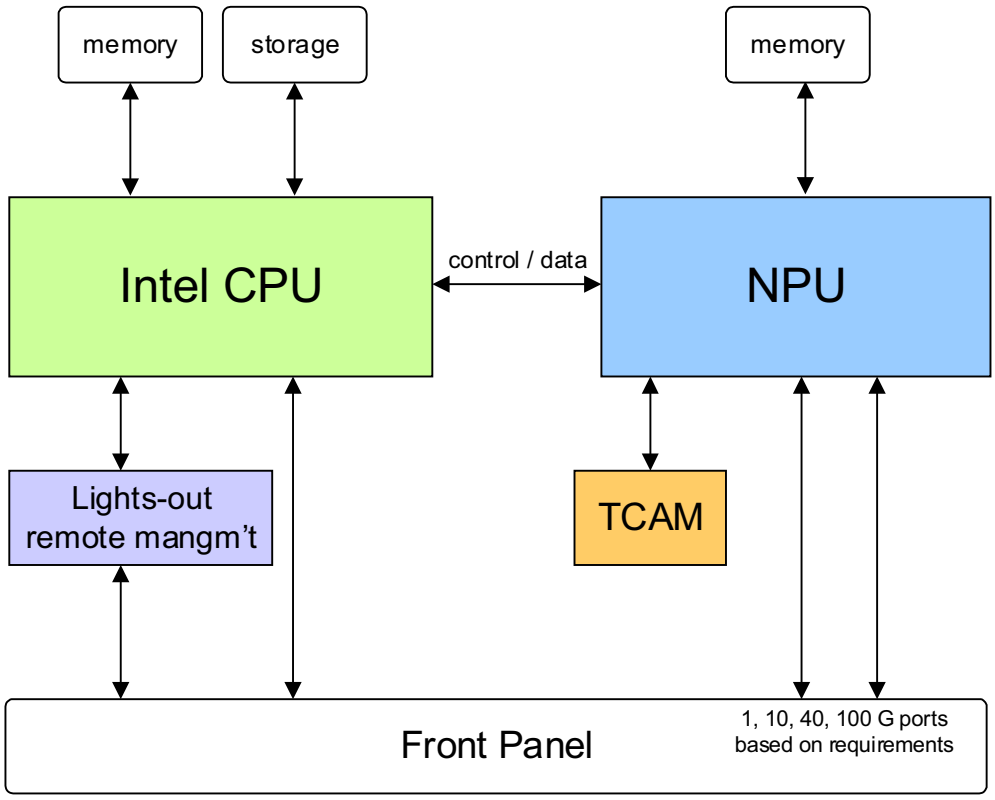
An Unconventional Marriage

Another wonderful benefit of COTS products is the wide availability of alternate vendors of similar products. Mainstream servers, workstations, and even "box PCs" are available from many sources. Switches come in a variety of port configurations, bandwidth levels, and management features with virtually identical products available from multiple vendors.

Even in the world of AdvancedTCA (ATCA) cards, dual-CPU x86 server blades are readily available. And, while that widespread availability is a benefit for sourcing, it also means that all of these products cater to the "middle" of the market and have only the "straightforward" features that are found on every other product in the same class.

While many COTS products share a common core feature set, sometimes the best features are found from the marriage of different technologies. Consider the case of an OpenFlow software vendor that had built their product around the NP-4 and NP-5 NPU products from EZchip. Starting with reference design platforms from the silicon vendor, they implement their OpenFlow application. But, when it came to deployment, the platform was lacking. To truly take their product to the next level and offer the next big thing in performance, they selected a customized variant of the PARPRO N5R-100 platform, incorporating not only the EZchip NPU and an Intel control-plane CPU, but also a Broadcom NL12K TCAM. The addition of the TCAM propelled their product to a best-in-class solution capable of storing over 1M flow entries and supporting over 12K flow mods per second.

This top-tier performance was only achievable through the combination of technologies from multiple silicon vendors in a way that simply doesn't normally occur in the homogeneous world of COTS products. A mixed-mode technology platform holds the promise for greater levels of control, innovation, and flexibility in the network.



Block Diagram of Generic Platform

“Do not go gentle into that good night....”

COTS products are continually undergoing periodic refresh cycles to upgrade to newer versions of technology (i.e. the latest x86 CPU). Vendors are constantly updating their ATX, ATCA, and COM Express portfolios as incremental improvements in technology are made, such as incorporating 10G Ethernet or updates to 6Gbps SATA II.

While this gives customers access to a reasonably current set of technology to draw from, it also has a dark side – the continuous pressure to EOL products. Especially for market segments with significant regulatory certification costs, such as medical, military, and even telecom, the end of life of any technology component in a system can cause months of effort to identify, qualify, and certify a replacement part. Sometimes, a replacement isn’t readily available and a full-custom solution must be commissioned – a component which will be expensive, because it often has to be done in a hurry and there are no other choices to drive down the price. This problem, of course, is one that fixes itself if turned on its head. Rather than do an expensive custom component project late in the life-cycle of the complete system, it is much more practical to do a proper design for long-lifecycle up-front, with a vendor who understands BOM-locking and proper handling of component-level EOL notices early enough to do a form, fit, and function identical replacement. PARPRO Embedded Systems products are designed for 7 to 10 years of availability, and are often available even longer, even for the simplest products – any component in your system can be a problem, not just the complex ones. Consider the case of a medical device vendor who integrated a PCIe Half-Mini Card into their product; the HMC card fit on a standard adaptor card.

While the HMC module itself was long-life, the adaptor card wasn't and availability could not be guaranteed beyond 2-3 years. PARPRO was able to design and build a cost-effective, long-life-guaranteed, fully certified alternative adaptor product, guaranteeing that this particular system component would be available for at least 10 years.

"How soon will you need to upgrade?

Most organizations develop new systems because of rapidly expanding technology needs. While an off-the-shelf solution is expandable to a degree, it may not be expandable in ways that best fit your requirements. A good system designer will help you forecast future needs and will integrate specific expandibility capabilities."

“A Penny Saved is a Penny Earned”

Perhaps the most common manta in the industry which pushes people towards COTS solutions is the idea that they are low-cost. Truth be told, they often are – very few organizations would try to compete with the likes of Dell, HP, or SuperMicro for standard x86 computer platforms with memory, storage, and basic networking features.

These vendors leverage the tremendous volume driven by the consumer and the datacenter markets into very aggressive pricing structures for embedded and industrial use. But, wander away from those types of products, into more custom applications and even standards-based form-factors such as ATCA, and the pricing suddenly looks much less beneficial. Especially for systems build on ATCA, AMC, or even VME or cPCI platforms, the overhead costs of chassis, power supplies, and management controllers can easily add thousands of dollars to the system cost. And that doesn’t include the relatively high cost of the payload boards, part of which is driven by the unique requirements of the platform (such a corresponding management elements, or highly specialized cooling solutions, or specialized power input requirements).

Consider the case of a system which needed to have 4 high-power NPUs, x86-based command and control, and over 280Gbps of I/O bandwidth and enough internal switching bandwidth to move data between the NPUs. The initial approach taken by the designers of this system was to use COTS – a series of ATCA boards in a 5U-tall ATCA chassis. With multiple NPU and switch cards, an x86 server card, chassis, power supply, management modules, and all the other bits required, the total system cost was over $120,000! PARPRO Embedded

Systems was able to take the key technologies required and create a 1U custom network appliance integrating switching, NPU, and CPU into a single platform, with a total cost under $30,000. That's a 75% reduction in system cost, with an 80% reduction in system size as a bonus. Applications optimized to run on off-the-shelf hardware are handicapped performance-wise and not much cheaper in the long run.

A solid hardware design foundation covers switch technology, processor requirements, I/O options, physical size, cooling requirements, custom features, private labeling, time to market, and regulatory certifications, along with forward-looking aspects, such as next generation offering, model variations and any other features that offer a competitive advantage.

"The purpose-built design approach allows for improved performance over off-the-shelf products. Customers requiring a unique architecture can now get the right combination of technology in the form factor required without compromising design, cost, schedule, or feature set."

Conclusion

Whether application-ready platforms are used to enhance existing COTS systems, provide integration that is otherwise unavailable, or simply replace one architecture with another, they form a valuable part of the hardware ecosystem. In many cases, they can even provide superior lifecycle management and total system cost. Regardless of what the "conventional wisdom" says, don't let your project get locked into a COTS platform that costs too much and doesn't perform to the highest levels. Read the PARPRO Technology Brief "Lodestar Series – High Performance Network Platforms for Tomorrow's Network Challenges" for more information on some of the products, platforms, and solutions that PARPRO offers to bring your project to fruition and avoid the common pitfalls of COTS platforms.

"The reality is COTS is neither easy, nor a silver bullet. COTS products are often driven by the mass market and not your specific system context. This is not just a technical issue; it has total life cycle impact and critical business and management implications."

PARPRO

Partners in Production and Design

About PARPRO

PARPRO is a full service design & manufacturing company with an emphasis on ODM solutions. We offer a comprehensive engineering-rich hardware solution with low-to-high volume manufacturing and integration/test capabilities, and pride ourselves on delivering simple to complex solutions making our manufacturing offerings competitive at virtually any volume and with any sourcing strategy.

We serve customers in the aerospace, gaming, telecommunications and industrial markets providing time savings and cost optimization by minimizing margin stacks throughout the value chain.

PARPRO Embedded Systems, a business unit of PARPRO, provides next-gen multi-core and switching platforms. We team with our customers and technology partners to deliver innovative embedded computer hardware in application-specific platforms. Whether you need a custom appliance, PCI Express, AMC, or ATCA, PARPRO can help you respond quickly to business opportunities.

Matthew Dharm
CTO, PARPRO
Embedded Systems

Author

Matthew Dharm is the Chief Technology Officer of PARPRO's Embedded Systems group. Matthew has worked in the embedded computer industry since 1998 and is an experience software and systems designer with special emphasis on single board computers across multiple platforms and architectures and high-performance mixed-solutions. His career has touched on such diverse markets as mobile communications, defense, medical, datacenter, and many others. Matthew graduated from Harvey Mudd College with a B.S with Distinction and was a founder of JumpGen Systems, which was later acquired by PARPRO to become their Embedded Systems group.

PARPRO

Partners in Production and Design

N. AMERICA HEADQUARTERS
PARPRO Embedded Systems (CA)
2141 Palomar Airport Road, #350
Carlsbad, CA 92011
Tel: +1 (760) 931.7800

NEVADA - US
PARPRO Nevada
7390 Eastgate Road, #160
Henderson, NV 89011
Tel: +1 (702) 331.2700

MEXICO
PARPRO Mexico
Periférico Sur No. 1 Col. Obrera
Tijuana, Baja California México
C.P. 22180
Tel: +1 (664) 637.5602

TAIWAN
PARPRO TAIWAN
67-1, Dongyuan Road
Chungli Industrial Park, Taoyuan
Taiwan 32063
Tel: +886 3 452.5535

For General inquires, please contact
1-844-PARPRO-1 or +1 (760) 931-7800
Email: sales@parpro.com