

Convergence In The Closet

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As appliances combine more functions, you can save on power while streamlining your network.

Our project started out to be an effort in monitoring power consumption in my office network, and ended up being an extreme makeover of our communications closet. At the time, we weren't aiming for qualitative improvements, but just to knock down the monthly operating costs for power.

As in most businesses, our second-highest

usage of power is for network gear; our setup includes a network operations center (NOC) function to monitor our customer IP-PBXs and provide remote maintenance and services. Table 1 breaks down the power usage.

Sprint met with me several times to discuss our needs, and encouraged us to look at the Adtran Netvanta products, which integrate a CSU, router, managed power over Ethernet (PoE) switch and firewall into one box (Figure 1). There's a saying that, "You can lead a horse to water, but you can't make him drink." Well, I resisted, but my curiosity was piqued by the mention that Adtran doesn't charge for licensing. This seems to counter what other manufacturers do to earn a profit these days,

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TABLE 1 Power In The Closet

(Watts) Power Consumption	24 hours (x 24) = Watt Hours	/1,000 = kWh per Day	x Rate of MD Power .0782 per kWh = Daily Rate \$	x 365 = Annual Cost of Power \$
Old: 1,329	31,896	31.896	\$2.494	\$910.31
New: 425	10,200	10.200	\$0.798	\$291.27
Savings: 904	21,696	21.696	\$1.697	\$619.41

FIGURE 1 Convergence In The Closet

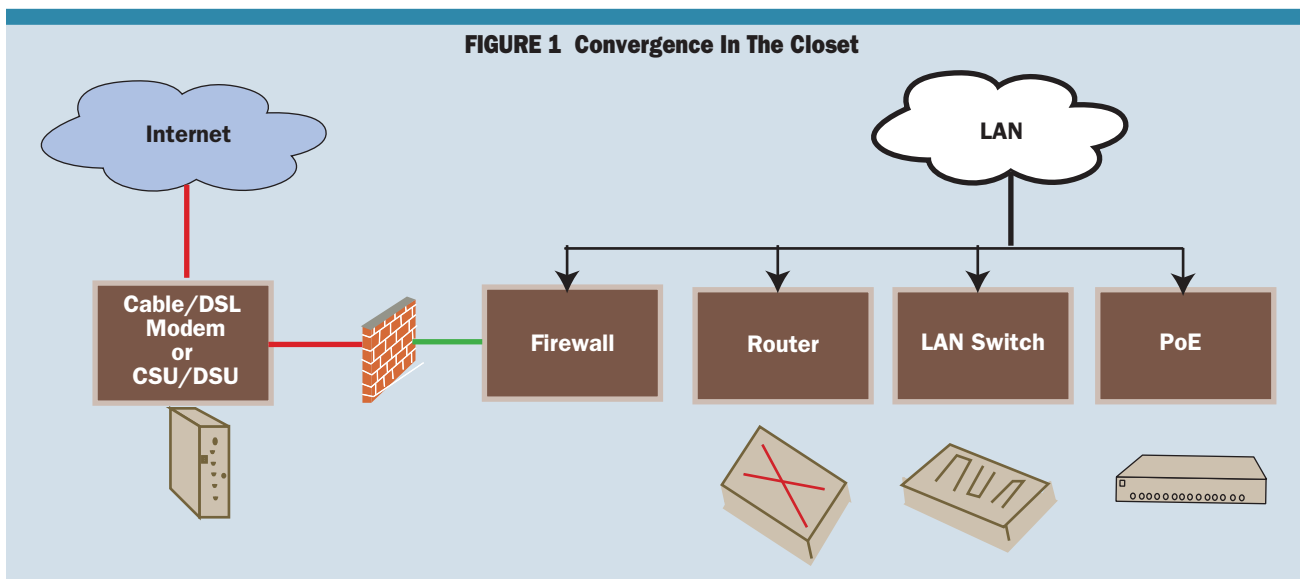


TABLE 2 Many vs. One

Multiple Appliances	Converged Appliance Value Adds
Management of many appliances	Simplified management of one
Firmware upgrades to many	Firmware upgrade to one
Multiple points of failure	Single point of failure
Multiple IP addresses	Single IP address
Maintenance of multiplicity of appliances and vendors	One vendor, one appliance, simplified maintenance

We've been testing SIP, and want gear to support that

and is a concern we hear from our customers.

Licensing costs add significantly to the total cost of ownership (TCO). The hidden cost of licensing is usually revealed when a customer needs to add just one or a few IP-telephones, but finds that he or she is forced to buy a block of licenses well beyond the number of end stations actually required.

So my reluctance to change waned, and since then we've been using the Adtran Netvanta 1224 STR PoE product for our own needs and implementing the Netvanta products into existing customer sites, attacking several issues, ranging from improving the user experience to simplifying the network (see "Solving Network Loops").

Networks Evolve

Most networks don't start out with managed LAN switches with onboard PoE, or even routers with enough switch ports to serve just a small LAN. Networks evolve, and so does the equipment on customer sites.

Customer sites vary in numbers and kinds of LAN switches, cable or DSL modems, routers and other gear. Most of this gear, if it fails, has the

potential to disrupt the entire network, a network segment or user operations. Arguably, if my new converged gear fails, it will disrupt the entire network, but putting all those eggs in one basket didn't concern me at all. The reasons why I'm not concerned are threefold.

■ One, we've had other gear from this vendor installed on the edge of networks for years, and it doesn't appear in our files as being returned for repair or warranty issues—it's solid. And does it really make sense to use six appliances when one will do the same job?

■ Secondly, our Symantec firewall appliance was on the list for replacement, since it did not support Session Initiation Protocol (SIP), and we have been testing SIP products for a very long time. The new converged unit supports SIP.

In addition to the SIP limitation on the Symantec appliance, we noted that when the closet exhaust fan would run for extended periods, usually during the winter, the air builds up a static charge (due to lack of humidity). In spite of our rack being grounded and bonded along with our other electrical safeguards, our Symantec firewall would lose programming and default. This situa-

Solving Network Loops

One of the problems we've been encountering in networks has been network loops. Network loops arise from mistakes in patching equipment, ports, the use of print servers and user errors. Frequently, the culprit was crossover cables.

The converged Adtran appliance detected this and automatically blocked the offending port. You can read about the details at www.voiploop.com/blogs/crossing-over-2.htm. We even let cross-over cables that created the network loops remain in our network for 24 hours. Only the offending ports were blocked by the appliance, without affecting the rest of the network, including our NOC operations.

The feature responsible for defeating the network loop uses Spanning Tree Protocol (STP) 802.1d and Rapid Spanning Tree Protocol (RSTP) 802.1w, which I believe is essential in any network running voice. Our former

managed switches had STP enabled, but the cross-over cable tests induced to the old switches knocked down the entire network.

The STP/RSTP-based preventive measures provide a good management tactic, since the gear will automatically detect and block users that incorrectly plug virtually any other appliance or misconfiguration of patch cables into the LAN switch or faceplates connected to the LAN switch. Sooner or later, users will call for support if they don't figure out what they've done.

Without STP and RSTP working properly within the LAN switches, those trouble calls that do come in are potentially expensive and time-consuming to identify. We've experienced this with customers making changes and implementing new servers that were improperly configured, along with some printers that had built-in print servers □

Our UPS can run the new gear for longer, and our closet stays cooler

TABLE 3 Original Equipment

QTY	Description
1	Managed LAN Switch 24 10-Mbps ports and 2 10/100-Mbps ports
1	Managed LAN Switch 12 10-Mbps ports and 2 10/100-Mbps ports
1	Firewall Appliance w/VPN
1	DSL Modem
1	Unmanaged LAN Switch 4 10/100-Mbps PoE 802.3af ports
1	Router

tion didn't occur frequently, but when it did it wasn't pleasant.

The other behavior of the legacy firewall, which has happened to other firewall appliances we've deployed, is the loss of Internet connectivity for 20–60 seconds, caused by the firewall rebooting to clear the security logs when they reached maximum storage. These reboots seemed like an eternity for some customers, and for most they are at least an annoyance.

■ Thirdly, a converged appliance lowers cost of ownership, as shown in Table 2.

Our previous configuration included gear shown in Table 3.

Additional Benefits

There are other benefits associated with our efforts to converge the gear in the closet. By using a single appliance, we more than doubled our run time, a factor that's critical to our NOC operations—which are revenue-producing for our business. Before the change, our uninterruptible power supply (UPS) could maintain all of our closet equipment for approximately 4.7 hours during a power outage. After we replaced the networking gear, we monitored our UPS load times and discovered that we now can continue operations for approximately 9.83 hours. These figures (both before and

after) do not include pre-programmed reserve time—10 minutes—that we block out so we don't run the batteries dry in the event of a prolonged outage.

In addition, the space savings was 8U through our consolidation to the appliance.

So now we have the legacy IP-PBX, which occupies 8U of rack

space, and the proprietary PoE, which uses 2U. Once we determine the SIP gateway we are going to deploy for our office telephones, we expect more savings in power consumption, additional rack space freed up, longer run times on the UPS, and other benefits such as less cooling and lower costs of licensing of our planned SIP telephones (Table 4).

Our equipment room is also air conditioned and uses a backup exhaust, which is zoned separately to cool and vent air once temperatures reach 74 degrees F. In the past, the fan ran most days, but it's been idle since we installed the converged appliance. Our room should now be less expensive to cool, since anything electrically powered generates heat. The noise in the room is buffered by reinforced doors that we installed when we renovated the building. Now, the noise levels are notably lower.

The converged appliance's Web admin tool provides access using one IP address, which is easier than managing multiple appliances. Our previous Layer 2 switches and firewall endured numerous firmware upgrades, and the router had a few. Upgrades always require more resources than customers will tolerate during business hours, and the new converged appliance reduces the amount of time to upgrade, and minimizes upgrade reach

TABLE 4 Summary Of Benefits

	Old Configuration	New Configuration	Savings/Benefit %
Cost of Power	\$910.31/yr	\$291.27/yr	-68%
UPS Runtime	4.7 hours	9.83 hours	+109%
Rack Space Used	23 U	15 U	-34.8%

TABLE 5 VLANs

VLAN	IP Address	Media Gateway	Use
1	192.168.2.0	192.168.2.1	Office LAN (PCs, MACs, printers, etc.)
2	192.168.3.0	192.168.3.1	SIP Telephony System
3	192.168.5.0	192.168.5.1	Belkin Pre-N Wireless
5	192.168.6.0	192.168.6.1	Guest Internet Access
6	192.168.4.0	192.168.4.1	Legacy 3Com IP Telephony System

to one appliance, unlike the many devices that were affected in our old configuration.

LAN switches vary in speed and credibility (meaning, Do the features work as advertised?). Performance does vary, and even when you think you have an ideal network configuration, you may find out that just a few more appliances or software upgrades to your appliances are in order, especially when you run voice over your network.

Change management is simplified by using a converged appliance, and through time I expect to see more convergences—or I should say displacements—of responsibilities. For example, antivirus, antispam, firewalling and virtual private networks (VPNs) don't necessarily belong on the server or user workstation. Instead, these functions belong either on an integrated appliance or on the carrier's end of the network pipe. I believe where the functionality lies contributes to the never-ending cycle of upgrading.

There's one area where I haven't completely converged, however. I still maintain separate cable drops for every end-user faceplate—one for voice and one for a data device. My new network gear gives me even better performance, greater resiliency, and by not daisy-chaining PCs and Macs to IP-telephones, I'm less likely to lose voice and data service. There may be a higher cost for having two ports or doubling your switching infrastructure, but you have to compare that with the costs of lost productivity in downtime.

VLANs

We set up VLANs for everything in our office, as shown in Table 5, and they worked without disturbance or disruption to other VLANs, and all gear worked concurrently. What's unique about our configuration is that we have two IP-telephony systems operating on the same LAN switch: The H.323 protocol used by the legacy 3Com NBX, and SIP by Aastra Technologies.

Both systems multicast traffic and use different multicast address schemes, including music or message-on-hold, conferencing, time and date and

keep-alive traffic. Each system worked without disruption from the other, unlike our previous managed switches with VLANs set up in the same manner.

In addition to both systems working on the same LAN simultaneously, we were able to integrate the two systems by interconnecting the 3Com "2500" analog gateway ports to the Aastra gateway. We are able to pass Caller-ID from the 3Com IP system to the Aastra on internal and external calling. There is no noticeable difference in audio quality, and disconnect between the two systems is almost instantaneous, with no hung lines or ports.

Getting the two systems to work on the same network helps us provide our customers with what we call "Shared Tenant Services." The customer gets a low-cost solution that utilizes their own IP-PBX and voice mail. In this type of arrangement, costs are always a factor, including added licensing costs, and the integration of the 3Com and Aastra gear is very low cost. It also provides separate voice mail zero-out destinations, since the Aastra Venture IP telephones have their own internal voice mail and the gateway acts as the automated attendant.

The converged Adtran appliance also functions as a DHCP server for our guests (onsite or wireless) and secures access to our network. It gives us control over all devices, including the others in the subnets listed in Table 5, by assigning multiple IP addresses to the media gateway within the router. We can go further and manage port security on a port-by-port basis, locking down ports by MAC address. This is particularly useful in environments where change control needs adherence.

Another useful tool is labeling of ports, physical interfaces and VLANs. When techs view the Ports or Summary of Ports in the system, they see the names or customization entered in. Documentation goes a long way in the field, especially after you haven't looked at something for a long time. Along with the labeling, the ports and interfaces have a statistics page revealing input and output

I still run two cables to each desktop, however

Test Information

Following are some test sites and tips that we've found useful:

Test Sites

- www.grc.com—Use Shields Up to test ports and security of PCs and firewalls
 - www.testyourvoip.com—Test the suitability of your WAN for VOIP and bandwidth*
 - www.bandwidth.com—Test your WAN suitability for VOIP and bandwidth*
- *Please note these tests are very subjective, since conditions to and from these sites including Internet congestion and your network conditions vary.

Test Materials

- Cross-over patch cable
- Laptop with packet EthReal sniffer (www.ethereal.com)□

We'll save the equivalent of 200 gallons of fuel per year

for packets, bytes, unicast, multicast, broadcast and errors. The continuous refresh feature constantly updates these counts and is very useful in tracking down a NIC or IP-telephone stuck in a multicast mode.

With this solution, I learned to establish the WAN connectivity first, set up QOS for the internal switch, then optimize the WAN using the wizard, test the stateful firewall for security (see www.grc.com SHIELDS UP), and then set up each layer of users or devices accordingly. At each step, a backup of the system configuration is performed. The included wizards do make implementation easier—in fact, it was so easy, I had to call technical support to verify that I didn't miss something.

Three Things I'd Add

Of course, Adtran isn't your only viable choice in this area of converged appliances. The competing Sonicwall firewalls include two key elements that make their product successful. First, the firewall is set up and managed by using the Web interface, not the command line interface (CLI). Second, Sonicwall offers converged platforms too—firewall, antivirus, antispam and VPN included in one appliance.

Sonicwall appliances include in plain view within the Web interface the existing system load. This is necessary and I think an important issue for customers willing to put more eggs (or all their eggs) into one basket. That utilization reporting provides immediate feedback and removes any doubt about the load on the appliance. Adtran shows utilization in the command line interface.

The third thing I'd like to see in any appliance is to provide documentation discussing the features, examples of configurations, deployments and other tools of the appliance.

To meet the needs of small business, the key points include the five-year warranty, unlimited tech support, no licensing costs and free firmware upgrades. These all minimize risk to customers, provide value and deliver benefits that pay off before and after the sales cycle has ended. Bottom line: Convergence in the closet makes sense.

Configuring corporate firewalls with the Netvanta stateful firewall running behind them is also an alternative for IP or SIP telephone deployments connecting to the appliance. It's a cost effective alternative to prevent internal users from accessing the IP or SIP telephony systems.

Conclusion

We are seeing market pressures and forces at work. IP telephony has continued the LAN/WAN corporate infrastructures' convergence of the desktops. The network carriers are converging, too, by offering voice, data, video and signaling on one pipe, and with Broadwing's announcement that it will provide security services, the pipe should be clean, free of spam and viruses. Then,

we can apply accelerators in various forms on the LAN or WAN to improve upon the user experiences, and manage our traffic better before it gets to the WAN, or LAN.

We also have convergence of personal appliances and tools requiring connectivity. What lies between the carrier and the customers are closets, and plenty of them. This is a very exciting opportunity, considering the reduction of power consumption for one year is 7,919.04 kWh. That's an equivalent of 4.6 barrels of crude oil—each U.S. barrel of crude is 42 gallons, so you're saving almost 200 gallons a year□

Companies Mentioned In This Article

3Com (www.3com.com)
Aastra (www.aastra.com)
Adtran (www.adtran.com)
Broadwing (www.broadwing.com)
Sonicwall (www.sonicwall.com)
Sprint (www.sprint.com)
Symantec (www.symantec.com)
Tolly Group (www.tolly.com)