ONPATH TECHNOLOGIES
ALWAYS ON

White Paper

GREENER NETWORKING: TRANSLATING TERABITS INTO WATTS!

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In traditional data center environments, performance and uptime were the key indicators for success. With the explosive growth of data centers today, the professionals who manage them are finding that creating an environmentally friendly data center is quickly becoming another major requisite.

This growth creates a need for innovative ways to reduce power consumption and cooling requirements within the data center.

This white paper focuses on technology that can be leveraged to enhance eco-efficiency and help organizations make better decisions regarding network infrastructure. It highlights physical layer switching (PLS) as one such technology that can be employed to drastically reduce power consumption.

WHY IS POWER CONSUMPTION IMPORTANT?

Upcoming legislation, yet to be passed, may forever change how we look at power consumption. In 2010, power quality issues (disruptions and power failures) ended up costing the economy in excess of several hundred billion dollars. Many firms have begun enacting mandates to do more with less by employing various environmentally-friendly “green” strategies, including recycling, reducing “carbon footprint” emissions, sustainable manufacturing practices, energy consumption, and many others. There are numerous reasons, both economic and otherwise, that businesses are going green. Be it social responsibility or other driving factors, when a company goes green, especially by reducing energy consumption, they increase business margin. This is undeniably good for the bottom line.

Power and cooling usage costs have become an increasing fraction of the total cost of ownership (TCO) for computer networks around the world. In a recent IDC survey on the most pressing issues they faced; businesses such as high frequency quantitative trading firms, financial information exchanges, military battlefield information systems, cyber security firms, media and news outlets, research networks, search engines, and cloud networking companies, that claim the network is their business, most often cited power and cooling among the top concerns.

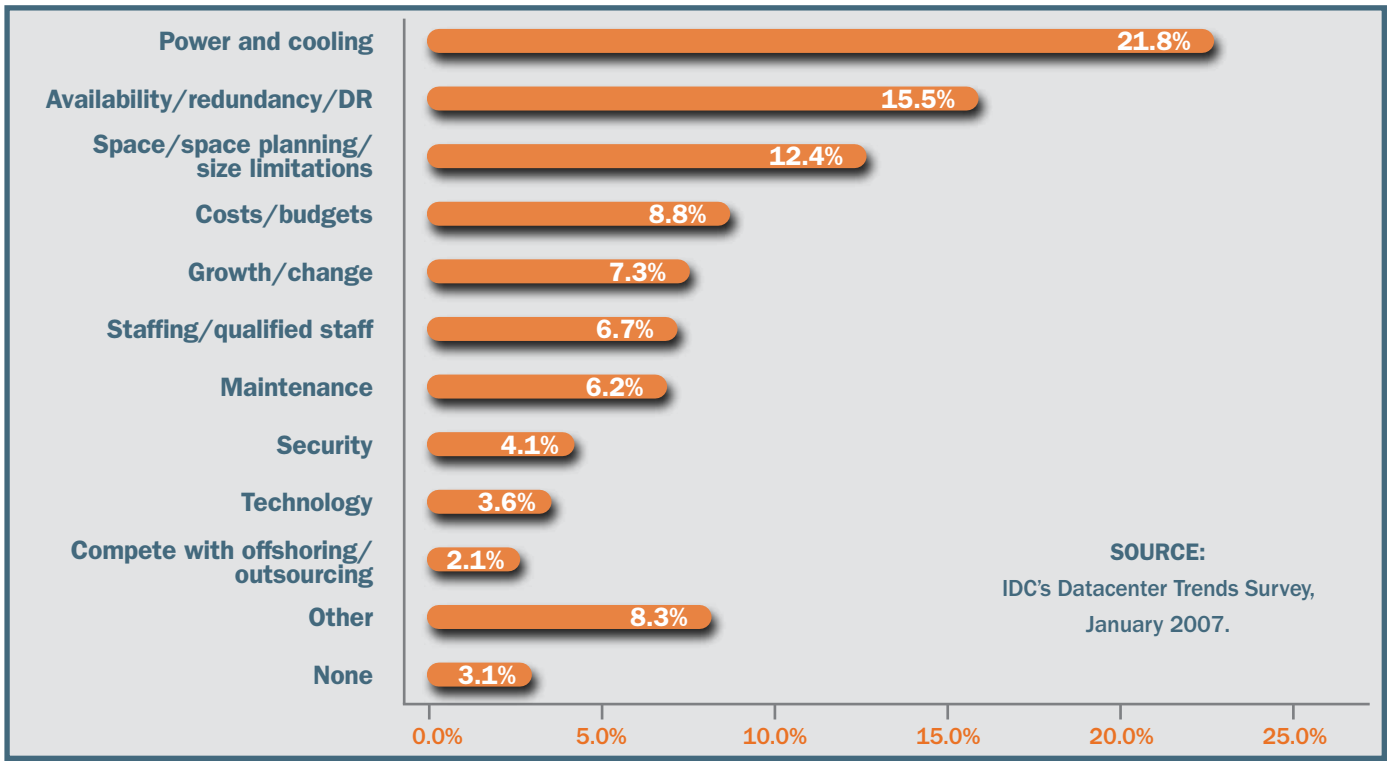

FIGURE 1. IDC Survey of the most pressing issues and trends in the data center

HOW DOES POWER CONSUMPTION DRIVE COOLING?

Network equipment, computer, and storage systems consume a large amount of power, while generating a considerable amount of heat in a relatively small area. This is because every watt of power used by a system is dissipated into the air as heat. The heat produced by electronic devices such as routers is usually expressed as the number of British Thermal Units (Btu) generated in an hour (Btu/hr). A Watt is another term used to express heat output and cooling. One watt is equal to 3.412 Btu/hr. For example, if you consume 100 Watts of power, you generate 341.2 Btu/hr. Large air conditioning systems are rated in tons. One ton of air conditioning is a unit of cooling equal to 12,000 Btu/hr or 3517 watts. The measurement includes aisles and areas where power distribution, ventilation, and other facility equipment is located. Some cabinets might require 10kW or more of power and cooling capacity, while large chassis switches in a rack may require 30kW or higher of capacity per rack. Architects for large scale systems generally refer to a rule of thumb: for every Watt (W) of power consumed by a piece of equipment, one half Watt of cooling is needed to remove that heat generated. As various computer systems, including network equipment, become more and more powerful, the insatiable thirst for greater power consumption increases.

HOW CAN PHYSICAL LAYER SWITCHING HELP?

There are two options traditionally accepted in the industry for network infrastructure interconnection or switching:

Manual Patch Panels - are cheap and easy to start small, and offer the least power consumption but offer no automation or intelligence.

Layer 2/3 Switches - are accepted for general networking, however they can add significant cost and consume the highest power.

When you need more functionality than a patch panel but less complexity than a Layer 2/3 switch, there is another option often overlooked – the Physical Layer Switch. Unlike a Layer 2/3 switch, which is burdened with high power consumption by having to process packets, a Physical Layer Switch (PLS) is an OSI Layer 1 switch in which all interfaces can transmit and receive simultaneously at the maximum line rate without dropping traffic or processing packets. PLS allows moves, adds, and changes to be executed precisely and in an automated fashion, with very high consistency across the network. In addition, Physical Layer Switching is also protocol-independent, so the performance is consistent across data rates and protocols.

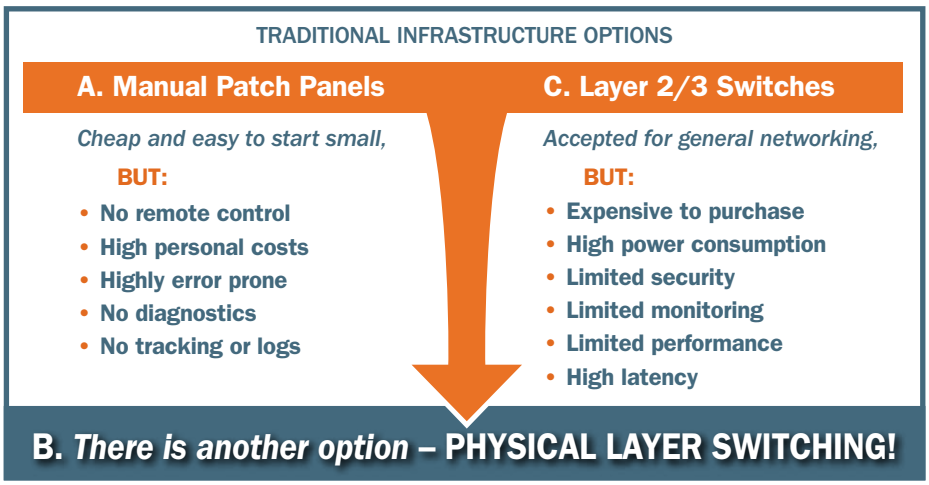

FIGURE 2. Traditional infrastructure options

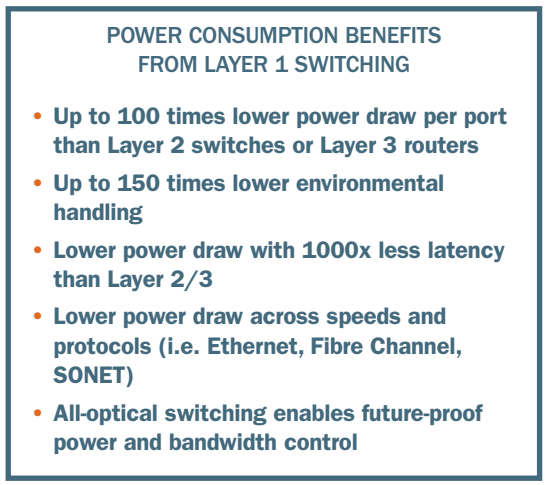

FIGURE 3. Power consumption benefits from layer 1 switching

Testing and monitoring of network traffic becomes seamless with Physical Layer Switching, since all ports can be multicast or tapped. Utilization of all equipment within test lab, data center, and cloud environments increases as well, which in turn saves money and increases productivity.

HOW CAN WE COMPARE NETWORK TECHNOLOGIES BY POWER CONSUMPTION?

"Greening" data applications is critical for many of today's business needs. The power consumption of a piece of networking equipment varies based on its configuration. A common way to evaluate the power consumption of a network device is to determine the maximum power draw of a fully loaded system with all identical port interfaces, and divide that number by the total number of ports. This number represents the per-port power consumption on that piece of networking equipment. Physical Layer Switching consumes extremely low-power, especially when compared to Layer 2/3 alternatives. An all-optical switch, for example, uses approximately 1 watt per port, regardless of the data rate running through it. The power benefit is over 100 times that of Layer 2/3 switching. This benefit remains consistent for future line speed upgrades required.

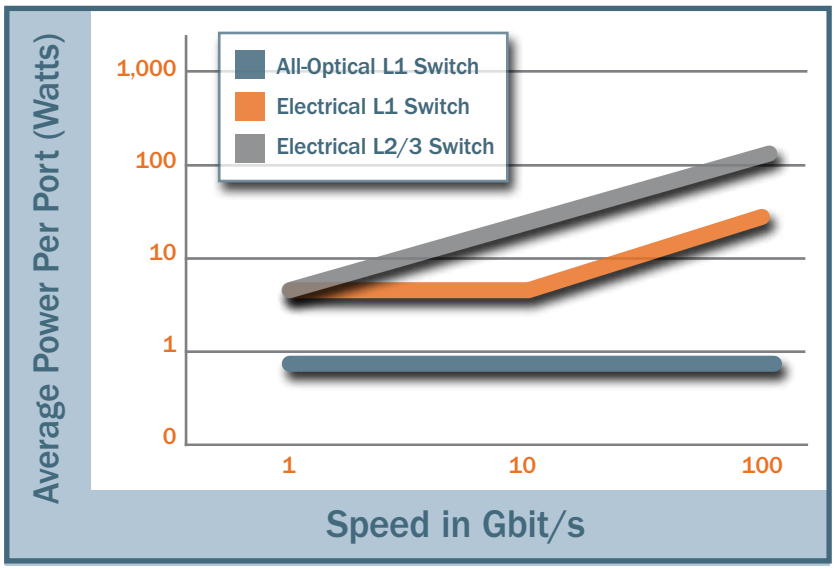

FIGURE 4. Average per port power consumption of network devices

When network architects or test lab managers look for obvious places to begin seeking lower power consumption and performance advantages, the access layer becomes an area of focus in identifying these measured gains. For every added network layer beyond the access layer, it is important to consider just how much power is consumed, in contrast to a flatter network design using PLS technology.

As discussed, Layer 2/3 switches and routers process packets, and hence contribute to increased power consumption. In addition, small scale switches require multiple network hops, which can further amplify consumption. Alternately, PLS technology does not involve packet processing, and can scale to thousands of high-speed ports without drawing additional power. As companies migrate to higher speed host interfaces, replacing some or all of the access-Layer 2/3 switching with a Physical Layer Switch could decrease power consumption by as much as 100 times.

CONCLUSION

Power continues to become more expensive, harder to get, harder to fit into existing spaces, and difficult to forecast from a cost standpoint. Businesses concerned with power consumption should consider designing high-performance networks using Physical Layer Switching.

Layer 1 switching offers an innovative solution for reducing power and cooling consumption by up to 100 times, while increasing performance.

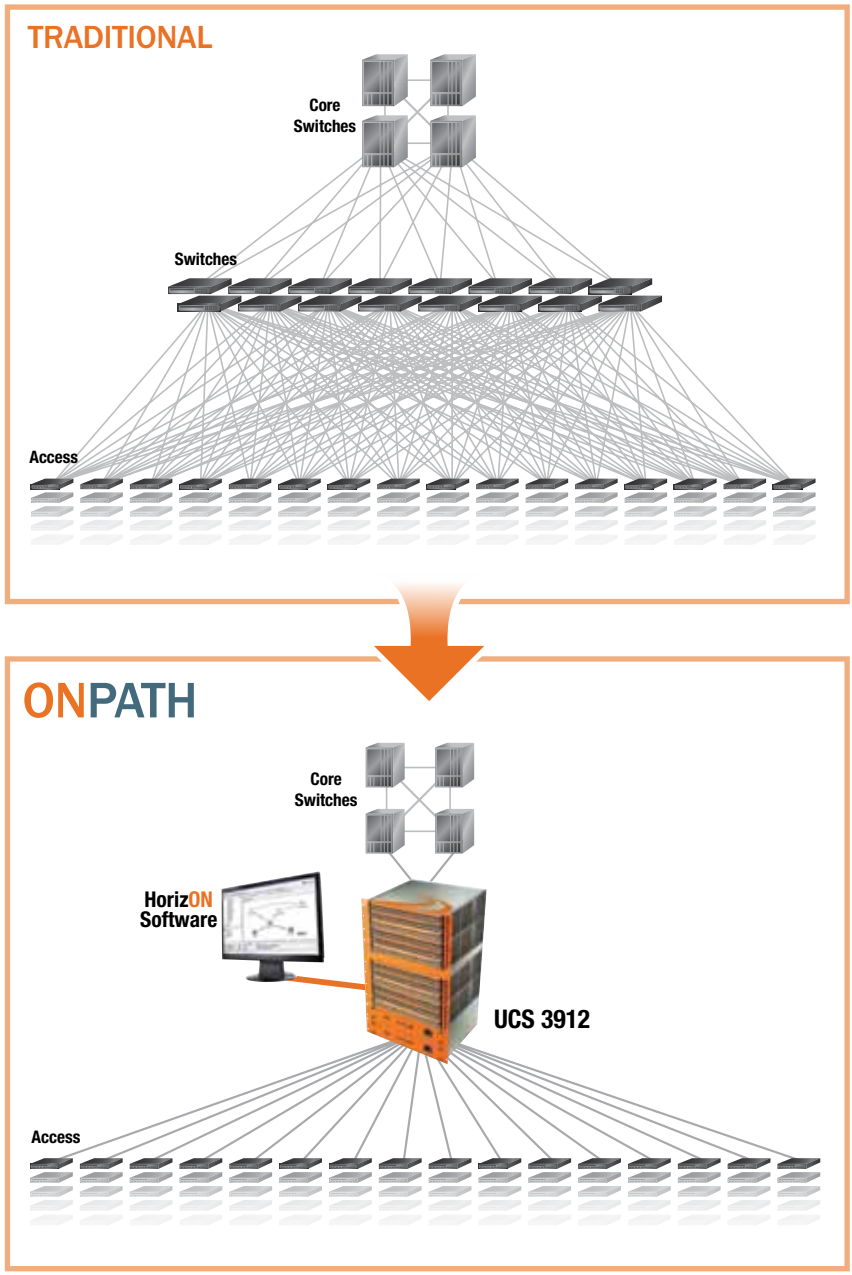

FIGURE 5. Using a physical layer switch to reduce power consumption up to 100x

ABOUT ONPATH TECHNOLOGIES

ONPATH Technologies is the leading provider of scalable connectivity and monitoring solutions for high-performance networks. With a history spanning over 25 years, ONPATH is a spin-out of Brocade Communications' physical layer switch business. ONPATH's Universal Connectivity System™ and HorizON™ Software deliver an advanced platform that automates and secures data center and test infrastructure to help network managers conserve time, increase utilization, and save money compared to manual patching or complex mesh switching architectures. Our patented switching technology and advanced software deliver the industry's most scalable, secure connectivity solution with the most in-depth view of your network. Scalable from 8 to 4,096 non-meshed ports, independent of your speed or protocol requirements, ONPATH delivers the flexibility and security required by today's data centers and the investment protection necessary for those of tomorrow. ONPATH currently has over one million installed ports throughout Fortune 1,000 and Government customers.

For more information on how ONPATH can help you with your initiatives, contact us today for an engineering application review or network consultation.

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