

The Inconvenient Balance

We live in a world of wanting more. More performance. More Security. More Mobility. But at the same time we need to reduce our carbon footprint & energy consumption. Can a balance really exist between business and sustainability? Crossbeam has the answer. Read on.

TABLE OF CONTENTS

Situation Room	2
The Appliance Farm	2
The Crossbeam Approach	3
Lowering The Energy Bill	3
The Crossbeam Virtual Infrastructure Effect	4
Summary	4
References & Resources	5

SITUATION ROOM

Enterprise IT organizations are mercilessly put under the spotlight to save the day and provide the business with both bottom line cost improvements and top line company competitiveness, all with the same budget and head count. Enter the global energy crisis and the overwhelming pressure to take action on reducing the corporate carbon footprint and you end up with a melting pot of problems for the twenty first century CIO.

Not surprisingly, the data center is at the heart of most discussions when it comes to balancing corporate needs, energy demand and the environment. Electricity intensity in a typical data center (in watts/ft²) is twenty times that of a standard office building hence investors, shareholders and governments want to see a "Green IT" action plan rolled out for all industries.

The fundamental predicament is rooted in the necessity for the enterprise to keep pace with IT innovation and remain competitive and efficient. This translates into adding more servers, larger data storage, increased security, faster connectivity and mobility improvements that all have a direct impact on the data center and more importantly its energy consumed. IT services are simply outstripping energy supply and consequently placing an added burden on the environment. Gartner forecasts that 50% of data centers will have insufficient power and cooling to meet the business demands this year. This was confirmed in a recent study indicating that 63% of enterprises have already run out of space, power and cooling capacity without warning.

Aside from the socially responsible behavior of reducing energy consumption inside the data center, the IT organization is primarily concerned with:

- The capital cost to build additional data centers due to current power/cooling shortfalls
- Restricted growth due to the fact no more power is available at the current data center
- Ever rising electricity costs hitting the bottom line

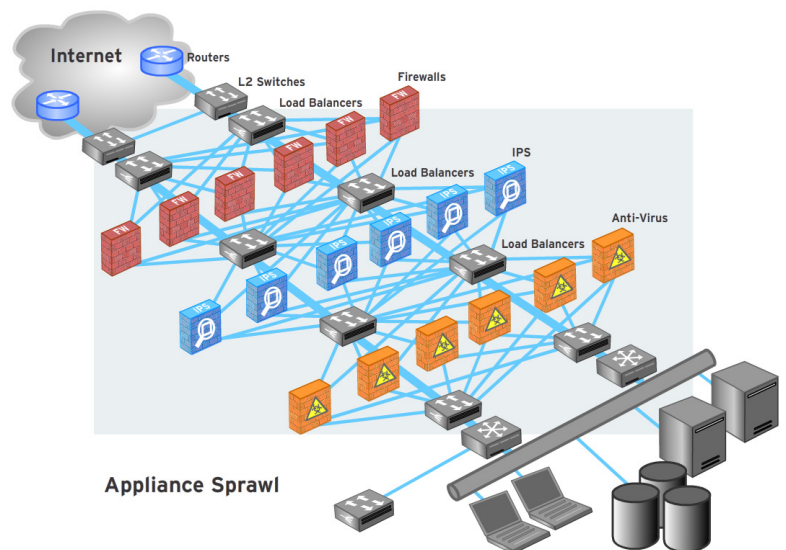
With Green IT becoming a hot topic in the eyes of shareholders, the CIO is in a perfect position to create a showcase environment and raise the green consciousness of the company, enhancing its image and consequently brand reputation. The question becomes what are the best technologies to lower consumption without compromising functionality or incurring additional capital and operational costs.

THE APPLIANCE FARM

The mandates on businesses to provide continuous IT operation, protect the corporate brand from web hackers and comply with governmental compliance regulations are just some of the reasons why data centers have seen an explosion of security equipment and appliance sprawl. (See Figure 1) The net effect does not help the energy crisis and in fact increases operational spending for electricity for the following three critical reasons:

1. **Power Conversion:** A significant portion of the power and energy that goes into every box is either wasted in the power supply conversion or diverted to non-computing loads such as internal fans for rejecting heat; the more appliances - the more waste
2. **Processing Inefficiency:** Traditional dedicated one-box appliances inevitably lead to over-provisioning and under utilization of processing assets but the larger problem is that the same traffic that flows through one appliance invariably needs to be routed to other appliances to check for different security threats. Additional energy is used to take the same information and perform almost the same compute functions over and over again.
3. **Network Connectivity:** Every appliance has its own set of connectivity ports that in the past drew very little power. That has all changed. The power/performance ratio is no longer in balance 1Gbps takes six times the power per port, while 10Gbps Ethernet takes a staggering 6-10W per port. Bottom line is that appliances have grown to be a huge energy drain over the past 10 years, from 100W to an amazing 400W today.

Figure 1



THE CROSSBEAM APPROACH

AT CROSSBEAM, WE BELIEVE IN CREATING A TRULY GREEN APPROACH TO NETWORK SECURITY. AN APPROACH THAT DOESN'T MEAN YOU HAVE TO COMPROMISE ON PERFORMANCE, SECURITY OR RELIABILITY. HOW DO WE DO IT? WE FOLLOW THREE SIMPLE RULES: REDUCE, REUSE AND RECYCLE.

REDUCE

The secret to the X-Series platform is that it's actually a Virtual Infrastructure or "network-in-a-box" that provides a responsive system that is change-ready to your application and performance needs. Our Virtual Infrastructure provides exceptional performance by leveraging every ounce of processing resource and maximizing system life. The net effect is that we can consolidate 50:1 devices in the network. That means fewer devices to manage a smaller footprint and drastically lower energy.

We didn't stop there either. Since so much energy is wasted in the power conversion stage from AC to DC, Crossbeam purposely chose to use of military grade power supplies, providing conversion efficiencies of ~90%. This means that only 10% of the energy is wasted as heat.

REUSE

The ability to adapt to the increasing trends of security threats, vulnerabilities and compliance regulations is what sets Crossbeam apart. We believe once a security application becomes out of date, the hardware should live on and be reused. That's why Crossbeam spent the last 10 years perfecting our X-Series Operating System (XOS) to ensure our platform can be adaptable to whatever business problems come its way. XOS allows multiple best-of-breed applications to live on the same platform. Applications can be moved, added or changed using the same hardware and without fear of downtime.

RECYCLE

Crossbeam is proud to comply with both WEEE (Waste Electrical Equipment) and ROHS (Restriction of Hazardous Substances) directives around the globe. To add to this, we have also made our packaging 100% recyclable and significantly reduced the printed materials that get shipped

LOWERING THE ENERGY BILL

Network security consolidation can have a compelling and dramatic effect of the total cost of ownership, lowering both long-term capital cost and operational expense. Although the power and cooling expenses are a smaller part of the overall operational expense budget, the additional effect of alleviating the power burden on data centers and preventing or delaying the need for a new data center is huge. Not to mention the lower output of greenhouse emitting gases.

ENERGY COST SAVINGS CALCULATION

The power consumed by security appliances and associated equipment can be calculated by adding up the power ratings of each device in the data center. Because this number represents the maximum power used, it should be de-rated to achieve steady-state power consumption. To de-rate simply means to lower the rated capability of an electric apparatus. The steady-state constant was determined empirically. According to the American Power Conversion Corporation the maximum power rating of most IT devices is well in excess of the actual running load by a factor of 33%.

To calculate the annual savings, use the following equation:

$$Savings = TP_s [(\beta\lambda\Phi\delta) - (B\lambda\Phi\delta)]$$

Table 1

Input	Description	Default Value	Source
β	Max Power of appliances / devices to be consolidated	Before	Available from manufactures website / data sheets
B	Max Power of the Crossbeam solution	After	See Table 3
δ	British Thermal Unit (BTU) to kWh	0.00029	The Carbon Trust ³
λ	Steady-state constant	0.67	American Power Conversion ⁴
Φ	kW to BTU	3.412	
P\$	Price per hour of 1kW of electricity	\$0.0946c	Energy Information Administration ⁵
T	Hours per year of operation	8760	(24 hour operation, 365 days per year)

COOLING COST SAVINGS CALCULATION

All data center electrical equipment produces heat. In fact heat dissipation is more expensive than power so the layout of data centers becomes critical.

For simplicity, the equation to calculate cooling cost savings will focus solely on the security appliances and associated devices.

Three variables need to be taken into account:

1. Energy conversion Ratio: According to HP laboratories, 0.8W of power is consumed by the cooling equipment for every 1W of heat dissipation in the data center.
2. Airflow Redundancy: Even with an optimized layout, as much as 25% airflow redundancy is required
3. De-Rating: Generally 80% of the cooling capacity can be used for cooling. The rest goes to humidification and normal losses in inefficiency. Humidification is required to reduce the potential damage of static discharge. Most AC units however induce humidity loss that is caused by the air-cooling function. To maintain an acceptable humidity level, supplemental humidification is required which creates additional load on computer room AC units.

To calculate the annual cooling savings, use the following equation :

$$Savings = \omega(TP_s [(\beta\lambda\Phi\delta L) - (B\lambda\Phi\delta L)])$$

Table 2

Input	Description	Default Value	Source
β	Max Power of appliances / devices to be consolidated	Before	Available from manufactures website / data sheets
B	Max Power of the Crossbeam solution	After	See Table 3
L	Energy conversion Ratio	0.8	HP Laboratories ⁶
ρ	Airflow redundancy Factor	1.25	Search Data Center ⁷
ω	Inefficiency / De-Rating	1.25 (reciprocal of 80%)	Search Data Center ⁷
λ	Steady-state constant	0.67	American Power Conversion
Φ	kW to BTU	3.412	
P\$	Price per hour of 1kW of electricity	\$0.0946c	Energy Information Administration
T	Hours per year of operation	8760	(24 hour operation, 365 days per year)

Table 3

Crossbeam	Watts (Peak)
Application Processor Module 8650 (APM)	280W
Network Processor Module 8650 (NPM)	130W
Control Processor Module 8600 (CPM)	220W
X-Series Chassis	170W

THE CROSSBEAM VIRTUAL INFRASTRUCTURE EFFECT

To demonstrate the effectiveness, three examples are shown in Table 4 that provide details of annual energy and cooling operational savings together with green IT metrics.

Scenario 1:

A typical large enterprise is consolidating 4 high-performance Firewall appliances and 4 IPS appliances into one X80 Chassis using Check Point R70 and Sourcefire 3D IPS

The performance of each appliance in this scenario is equivalent to one Crossbeam APM 8650 blade

Scenario 2:

A typical large enterprise is consolidating 20 medium-performance Firewall appliances into one X80 Chassis using Check Point R70

The performance of each appliance in this scenario is equivalent to 4 of a Crossbeam APM 8650 blade.

Scenario 3:

A typical regional government is consolidating 400 branch office Firewall appliances into one X80 Chassis using Check Point VSX.

The combined performance capacity of 400 branch office firewalls is equivalent to 10 Crossbeam APM 8650 blades in one X80 chassis.

Table 4

	Scenario 1 Consolidated Configuration X80 (4-8-2) Check Point R70 & Sourcefire 3D IPS	Scenario 2 Consolidated Configuration X80 (2-10-2) Check Point R70	Scenario 3 Consolidated Configuration X80 (2-10-2) Check Point VSX
Power Saving %	31%	77%	91%
3yr Total Cost Savings	\$5,658	\$46,647	\$136,118
Annual CO2 Emission Savings (kg) ⁸	4,634	38,206	111,487
Annual CO2 Emission Savings (lbs) ⁸	10,216	84,228	245,783

SUMMARY

Technologies meet business demands for performance, continuity and compliance, simultaneously help the data center reduce energy consumption and reduce cost should be added to the IT roadmap for investigation. These are the technologies that will help bring balance to the data center and provide the business with the tools it needs to continue to grow and operate.

Naturally, while the data center is a critical component, CIOs must consider the energy and carbon footprint of the whole organization and make recommendations on where technology can enable the most impactful savings. Technologies such as network security consolidation can significant impact energy usage as demonstrated in this white paper, but further simple changes in behavior can have staggering benefits.

For Crossbeam, being part of the green IT solution is about being able to help transform the security eco-system of the data center and in doing so empower businesses with a platform to adapt for whatever lies ahead.

REFERENCES & RESOURCES

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Crossbeam Systems®, Inc. offers a proven approach to deploying network security that meets the extreme performance, scalability and reliability demands of large enterprises, service providers and government agencies. Its leading X-Series security platform offers an open, high-performance architecture that easily provisions and scales multiple best-in-class security applications to meet the ever-changing threat landscape. Companies rely on Crossbeam to intelligently manage risk, accelerate and maintain compliance, and protect their businesses from evolving threats. Crossbeam is headquartered in Boxborough, Mass., and has offices in Europe, Latin America and Asia Pacific. More information is available at www.crossbeam.com.