THE TOLLY GROUP

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# Extreme Networks Inc.

## BlackDiamond 8810 Core Switch

### "Green" Evaluation of Energy Consumption vs. Cisco Catalyst 6509 and Foundry BigIron RX-16

TOLLY Up to Spec CERTIFIED Test Summary

*Premise: High performance and a broad list of features/functionality are not enough today to make network switches appealing to buyers. Core and Data Center switches must exhibit low power consumption, since power saved over rival offerings translates into a lower total cost of ownership profile. In addition, these devices are preferred over other rival offerings that are less "energy conscious."*

Extreme Networks, Inc. commissioned The Tolly Group to evaluate the power consumption of its BlackDiamond 8810 series switch versus the power consumption of the comparable core switches from Cisco Systems, Inc. and Foundry Networks, Inc.

Tolly Group engineers measured the total watts consumed by the BlackDiamond 8810 switch, a Cisco Catalyst 6509 and a Foundry BigIron RX-16. Power consumption measurements were taken across more than a dozen traffic load scenarios, ranging from no load on the switch to a heavily taxed load of eight 10GbE ports and 96 Gigabit Ethernet (GbE) ports.

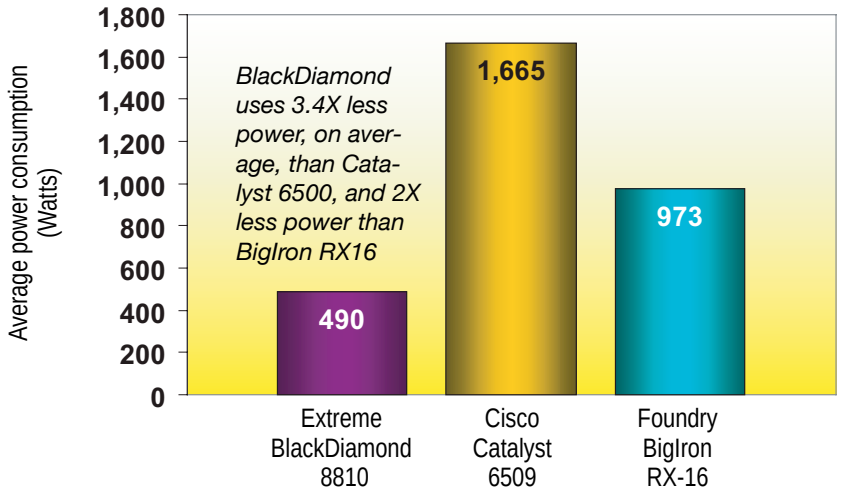
Tests were conducted in January 2008.

## Test Highlights

- Uses 3.3X to 1.7X less power than Cisco and Foundry switches when all line card modules and cables were connected
- Uses 535 Watts of power, or from 3.5X to 2.3X less than the Cisco and Foundry devices when maximum Layer 2 bidirectional traffic was introduced across eight 10 GbE ports plus 48 GbE ports
- Exhibits the "greenest" or most energy efficient chassis switch tested using from 3.4X to 2X less power than the Cisco and Foundry devices tested on average across all test scenarios

**Average Power Consumption (Watts) of Extreme Networks BlackDiamond 8810 vs. Cisco and Foundry Switches Across Various Test Scenarios**

**(Lower bars are better)**




Source: The Tolly Group, January 2008

*Figure 1*

# Executive Summary

**The Extreme Networks BlackDiamond 8810 consistently demonstrates more efficient power consumption than the Cisco and Foundry switches tested, both of which use from 2X to 3.5X more power.**

The emphasis in today's networks is on managing costs. With the ever escalating costs of energy, network personnel want "green" switches — devices that are frugal in the energy they consume.

These tests show that the Extreme Networks BlackDiamond 8810 uses significantly less energy than chassis-based switches from Cisco Systems and Foundry Networks. Both rival products use anywhere from 2X to 3.5X more Watts to power their devices and support traffic flowing across the switch in a number of scenarios tested.

What is also significant to note is that with line-rate 10GbE and GbE traffic flowing across the BlackDiamond 8810 chassis switch, there is very little increase in the power consumed. In fact, the BlackDiamond switch used just 6% more power to support line-rate Layer 2 bidirectional traffic flowing over eight 10GbE ports and 96 GbE ports compared to the power used when there was no traffic but all cables were connected to the switch.

Finally, the reduced power usage of the BlackDiamond 8810 directly translates into lower cooling usage. The dual benefits of lower power consumption and reduced cooling requirements translate into lower cost of ownership.

## Results

### Power Consumption without traffic

Every network manager faces the question of how much power a switch in a data center will consume on a daily basis. In today's environmentally conscious world, prolonged power consumption refers to how "green," or efficient the device is with regard to power consumption. Tolly Group engineers measured just that with the switches tested.

To begin, engineers tested the power consumption of the switch chassis (with management and switch fabric modules installed), with no line cards drawing power and no traffic transiting the device.

The BlackDiamond 8810 used 219 Watts versus 452 Watts for the Foundry BigIron RX-16 and 617 Watts for the Cisco Catalyst 6509. In essence, the Foundry and the Cisco devices used 2X and 2.8X more power, respectively, than the Extreme BlackDiamond 8810 in the base system configuration without traffic.

Next, engineers measured the power consumption with two 10GbE and two GbE line cards, and all cables plugged in, but no traffic passed.

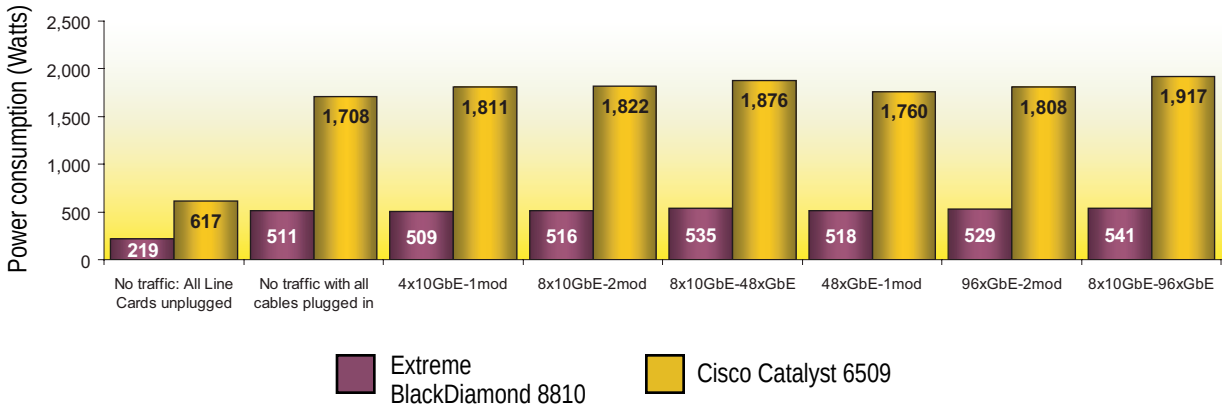
Here, the BlackDiamond 8810 used 511 Watts, versus 858 Watts for the BigIron RX-16 and 1,708 Watts for the Catalyst 6509. Again, the competitive devices tested used from 1.7X to 3.3X more power than the BlackDiamond switch.

### Power Draw when Supporting 10GbE traffic

Tolly Group engineers drove line-rate bidirectional Layer 2 traffic across four 10GbE ports and measured the power consumed.

The BlackDiamond 8810 used 509 Watts, while the BigIron RX-16 used twice as much power, at 1,053 Watts, while the Catalyst 6509 used more

**Power Consumption of Extreme BlackDiamond 8810 vs. Cisco Catalyst 6509 Across Various Traffic Load Scenarios**




Source: The Tolly Group, January 2008

*Figure 2*

than 3X the power, consuming 1,811 Watts. (See Figures 2 and 3.)

Next, Tolly Group engineers increased the number of 10GbE ports to eight ports across two modules — meaning traffic had to flow across the switch backplane.

The BlackDiamond 8810 used 516 Watts, or half as much power as the 1,096 Watts used by the Foundry switch, while the Catalyst 6509 used 3.5X more power than the BlackDiamond 8810 — 1,822 Watts versus 516 for Extreme.

## Power Draw when Supporting GbE traffic

Tolly Group engineers drove line-rate bidirectional Layer 2 traffic for 48 GbE ports across two modules and measured the Watts used.

The BlackDiamond 8810 used 519 Watts versus 1,083 Watts for the Foundry switch and 1,768 Watts for the Cisco switch. That means the rival products used from 2X to 3.4X more power to drive the same traffic loads. (See Figures 2 and 3.)

Engineers next tested the BlackDiamond 8810 and the Cisco Catalyst 6509 with 96 GbE ports across two modules. Here the BlackDiamond used 529 Watts versus 1,808 Watts for the Cisco switch. Again, the Cisco device consumed 3.4X more power than the Extreme BlackDiamond. (Engineers did not test the Foundry switch with 96 ports since the necessary configuration was unavailable at test time.)

## Power Draw when Supporting Mixed GbE and 10GbE traffic

Engineers measured the power draw when supporting line-rate bidirectional traffic across eight 10GbE ports and 48 GbE ports.

Here the BlackDiamond 8810 used 535 Watts, versus 1,223 Watts for the Foundry BigIron RX-16 and 1,876 Watts for the Cisco Catalyst 6509. Again, the Foundry and Cisco devices used 2.3X and 3.5X more power than the Extreme switch.

When supporting line-rate traffic across eight 10GbE ports and 96 GbE ports, the BlackDiamond used 541 watts versus 1,917 Watts for the Cisco Catalyst tested, meaning the Cisco switch used 3.5X more power.

## Test Setup & Methodology

The Tolly Group tested an Extreme BlackDiamond 8810 (Ver. 12.1.0.43) against a Cisco Catalyst 6509 (Ver. 12.2(18)SXD3) and a Foundry Networks BigIron RX-16 (Ver. 2.2.0aT143).

Extreme Networks, Inc.

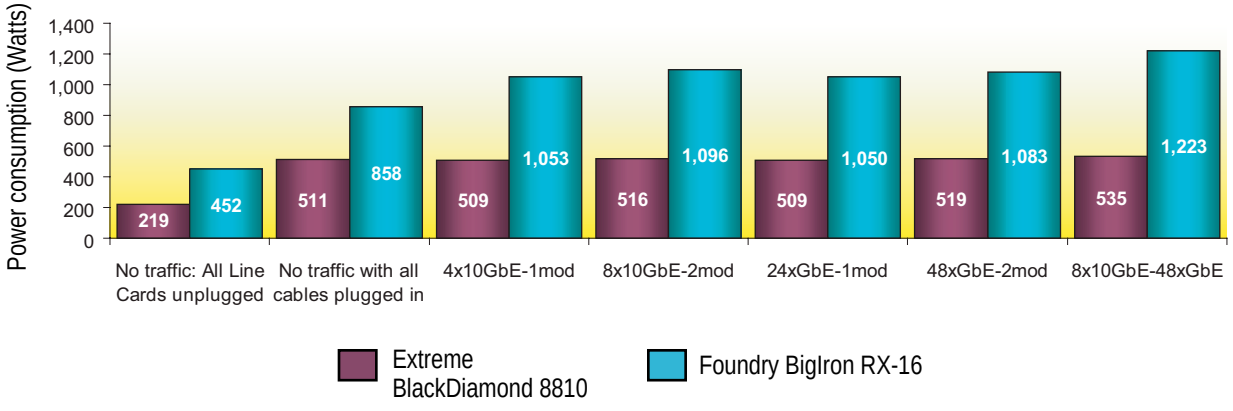
BlackDiamond 8810

Power Consumption

The BlackDiamond 8810 was configured with two MSM-48c management/switch fabric modules, two 10G4Xc line card modules (four 10GbE ports per module) and two G48Tc line- card modules (48 GbE ports per module) with one BD 700W/12000W AC power supply.

The Catalyst 6509 was configured with two WS-SUP720-BASE management/switch fabric modules, two WS-X6704-10GE line card modules (four 10GbE ports per module), two WS-X6748-GE-TX with WS-F6K-DFC line card modules (48 GbE ports per module) and one 1300/2500 Watt power supply. The BigIron RX16 was configured with two RX-BI-MR management modules, four RX-BI-SFM3 switch fabric modules, two BI-4XG line card modules (four 10GbE ports per module), two BI-BI-24C line card modules (24 GbE ports per module)

**Power Consumption of Extreme BlackDiamond 8810 vs. Foundry BigIron RX-16 Across Various Traffic Load Scenarios**




Source: The Tolly Group, January 2008

*Figure 3*

and two RX-ACPWR-F-SYS power supplies.

Engineers used a FLUKE 87 III and 110 multi-meter to measure current and voltage between the power source and devices under test (DUTs). Voltage and current were measured twice to obtain an accurate result and the results were averaged to determine the power consumed in Watts.

For each vendor, engineers started by calculating the power where only the management and switch fabric modules were connected to the chassis. Then engineers measured the power of all the line card modules and the cables connected without any traffic.

Engineers used Ixia Optixia XL10 with IxAutomate Ver 6.3 to generate bidirectional Layer 2 traffic to the DUTs in a full-mesh configuration within the same connection type. While the traffic flowing at the line rate, engineers measured the power values at various scenarios: four 10GbE ports of one module, eight 10GbE ports of two modules, 24 GbE ports of one module, 48 GbE ports of two modules, eight 10GbE plus 48 GbE ports of four modules, 48 GbE ports of one module, 96 GbE ports of two modules and eight 10GbE plus 96 GbE ports of four modules.



## Test Equipment Summary

| Vendor | Product | Web URL: |
|---|---|---|
| Fluke Corp. | Fluke 87 III Digital Multimeter | http://www.us.fluke.com |
| IXIA Communications | Optixia XL10, IxAutomate Ver. 6.30 | http://www.ixiacom.com |

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