Miercom

Lab Testing Summary Report

April 2013

Report 130310

Product Category:

Energy Efficient Switches

Vendor Tested:

Products Tested:

HP 5120-48G EI Switch

Key findings and conclusions:

- **HP 5120 switch has an annual savings of 16% when compared to the Industry Average**
- **By using 1.78 less Watts/Gbps, the HP 5120 is 57% more efficient than similar switches**
- **Higher temperature operation range of 32-113° F (0-45° C) requires less cooling capacity**
- **Variable, dual cooling fans on all switches**

Hewlett-Packard 5120 EI switch series was evaluated by Miercom under the Certified Green program for power consumption and energy efficiency. We analyzed the overall environmental impact and business-enabling green benefits that this switch offers.

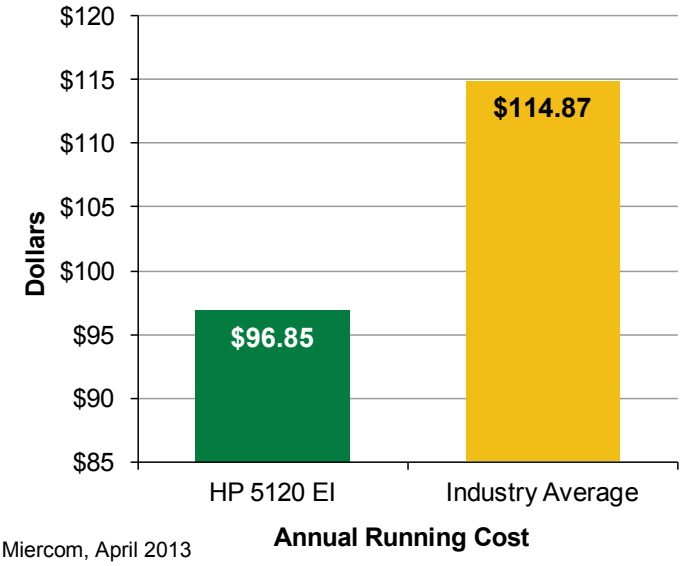
Testing was performed on the HP 5120-48G EI using 48 one GbE and four 10GbE ports. This model features 48-ports with additional uplinks. These modules support XFP, SFP+ or CX4 connections.

The 5120-48G EI switch has a 48-port configuration with four combo fiber 1GbE ports. Additionally, the switch has two upgradeable 10GbE module cards with two fiber ports (SFP+ or 10G BaseT) each.

HP 5120 series are GE switches that support Static Layer 3 routing. All models provide up to four 10GbE interfaces. The switches are designed as an edge switch, or to connect server clusters in data centers. Several switches can be managed as one device when Intelligent Resilient Framework (IRF) technology is deployed.

In hands-on testing and data analysis, the HP 5120 EI switch series has high availability and resilient capabilities. IRF simplifies management by providing a single IP address and common interfaces,

Figure 1: HP 5120 Switch Annual Running Cost



Source: Miercom, April 2013

Annual costs for the HP 5120-48G EI switch compared to the Industry Average. Cost is based on 12.9 cents per kWh.

and distributes high availability and resiliency by extending the control plane across multiple active switches.

QoS includes broadcast control, traffic policing, and priority queuing allowing for improved traffic flows. The switch supports jumbo packets and wire speed switching, up to 143 million pps for improved data transfer, especially when used in data center and recovery operations.

Management includes secure Web GUI, flash config files, SNMP v1, v2c and v3, RMON, Link Layer Discovery Protocol (LLDP), IPv6 and others.

Power Consumption

Power consumption of the HP 5120 EI switch was measured with various frame sizes and traffic loads. Energy usage was recorded while the switch was booting, and at idle with no link, idle with link, and with 10%, 30%, 70% and 100% traffic load. Power consumption for this switch was recorded using 64-, 128-, 256-, 512-, 1024-, 1280-, 1518-, 9198- (the largest packet size for Layer 3 testing), 9216-byte frames (the largest frame size for Layer 2) and IMIX traffic with tests repeated to ensure accurate results. Power consumption is shown in *Table 1* below and in *Figure 2* on *page 3*.

To consume less power and improve energy efficiency, the HP 5120 utilizes the latest advances in silicon development and employs variable-speed fans.

Product Performance

Product performance of the HP 5120-48G EI switch was compared to the Industry Average (IA) using Watts/Gbps at 100% load using a Layer 2 1518-byte frame size. The 5120-48G EI consumed 1.33 Watts/Gbps, whereas the Industry Average was 3.12 Watts/Gbps.

Switch Model	Efficiency Improvement
5120-48G EI	57%

Using 1518-byte frames with 100% load, the HP is 57% more efficient in Watts/Gbps comparison to the IA Average.

The HP switch uses less power to maintain throughput when in use. This equates to a 57% energy reduction for sending one Gbps, when compared to the current industry average of 3.12 Gbps. See *Figure 3* on *page 3*.

Product Efficiency

The HP 5120-48G EI power usage was very consistent under various lades when the load increased from 10% to 100% throughput. Wattage used increased from 3.1 to 3.8.

Being able to operate between 32° and 113° F (0° and 45° C) allows the switch to run with minimal fan usage. The switch also has variable speed fans. When the switches are idle or ports not in use, the fans automatically scale down operation to improve efficiencies as well as to reduce noise levels. With the latest advances in silicon development, unused ports can be shutdown until needed. Likewise, with PoE+, power consumption will be negotiated based on the end device. PoE priority allows the choice of ports to be dropped in case of power outages in overconsumption of energy.

The HP switch is fully manageable either through a secure Web browser interface, the CLI via serial console, Telnet or SSH session. The HP 5120-48G EI can be managed via HP Intelligent Management Center and easily integrate with other network management tool using industry standards such as SNMP, sFlow, RMON, etc.)

Remote monitoring (RMON) is accomplished by using standard SNMP to track essential network functions. Ingress and egress port monitoring facilitate network troubleshooting. Virtual cable tests show visibility into cable problems.

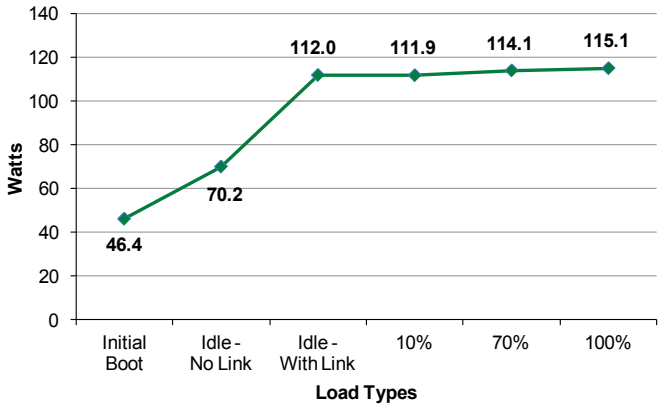
Table 1: Layer 2 Power Consumption of the HP 5120 Switch

Power Consumption in Watts of the HP 5120-48G EI Switch at Frame Size:					
	256-byte	512-byte	1518-byte	9216-byte	IMIX
Initial Boot	46.4				
Idle (No Link)	70.2				
Idle (with Link)	112				
10% Load	111.9	111.9	111.9	112	111.9
30% Load	114.7	114.5	113.7	113.7	113.7
70% load	114.6	114.3	114.1	114	114.5
100% load	115.7	115.4	115.1	115.1	115.7

Power consumption measurements with Layer 2 traffic using various frame sizes.

Source: Miercom, April 2013

Figure 2: HP 5120 Power Consumption Layer 2 Traffic with 1518-byte Frame Size, Specified Load



Source: Miercom, April 2013

Watts used by the HP 5120 switch under different loads utilizing Layer 2 traffic.

The switch has a 1U rack and is stackable with up to four switches. It has one internal power supply and two models support external power supplies.

To take advantage of new energy efficient technologies, HP 5120 can be reconfigured with software updates as part of the warranty. Optional interface modules can also be updated with technological advances using software updates.

Business Processes

HP networking products are shipped using processes that utilize recyclable packaging materials. To protect employees and customers, all HP networking products are in compliance with Restriction of Hazardous Substances (RoHS) directives which restrict the use of certain hazardous substances in electrical and electronic equipment. HP is also affiliated with the Waste Electrical and Electronic Equipment Directive (WEEE) for collection, recycling and recovery of all types of electrical goods in Europe.

HP networking products have factory trade-in programs for compliance with Hewlett-Packard Supply Chain Social and Environmental Responsibility Policy. Along with offering trade-ins, HP has programs to allow for switch returns for cash, as well as recycling or donating options for disposing of old equipment, which minimizes the environmental impact.

Business Case

The annual running cost is calculated based on the projected use of the switch in a business environment. The assumption is the switch will be in operation 12 hours daily during the work week. Of those 60 hours, 10 hours out of the week will be operating at 100% and the remaining 50 hours will be at 70%. For the other 108 hours, (48 hours weekend and 12 hours weekday) the switch will be considered idle. We are using a rate of 12.9 cents per kWh, currently considered as a national average. Your calculation may vary depending upon the rate in your area.

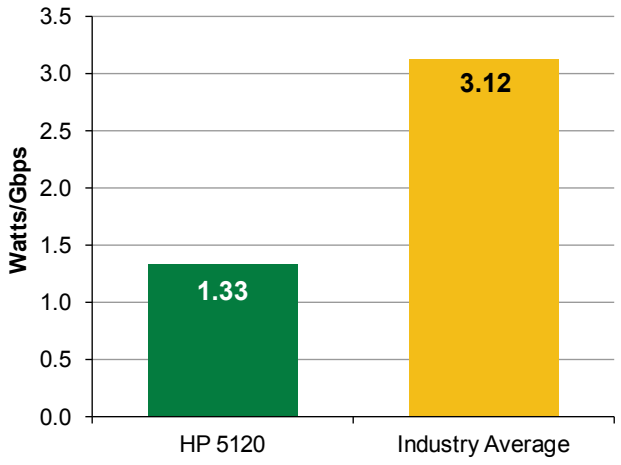
As shown in *Figure 1* on *page 1*, the HP 5120 switch has lower running costs. The dollar amount savings is approximately $18 yearly. On average the HP 5120-48G EI switch can save 16%.

Certified Green

Miercom conducts environmental analysis on products using a holistic view, considering power efficiency, manufacturing, and other factors which are part of the product and its lifecycle. Power consumption and power efficiency are important metrics when comparing products. Typically, other reports only address these metrics in their documents. Miercom, however, believes in a more comprehensive approach, which reveals the true business case savings including discussion of other environmental benefits that the product may afford.

Competitive indexing with industry average is achieved by comparing measured results from products in a similar class. This comparison allows a single view of the annual cost for power consumption of a product, and comparison information that will help the user understand if the evaluated product affords an overall advantage for power efficiency.

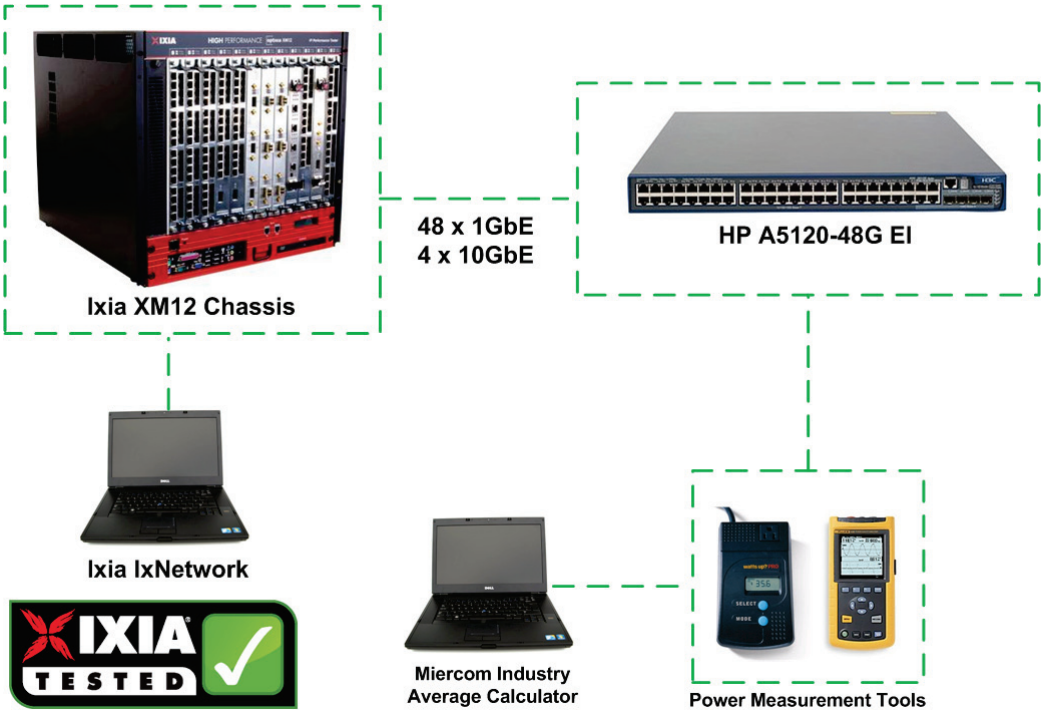
Figure 3: HP 5120 Power Efficiency
Watts/Gbps at 100% Load, 1518-byte Frame



Source: Miercom, April 2013

HP 5120 switch power consumption utilizing Layer 2 traffic using 1518-byte frame size at maximum load as a function of throughput compared to the IA. Lower values indicate higher power efficiency.

Test Bed Diagram



How We Did It

HP 5120-48G EI switch was evaluated for total environmental impact by testing the product's individual components, as well as evaluating the other features and capabilities. Testing was performed at Miercom lab and focused on power consumption and efficiency of the product. A full audit was additionally conducted to analyze the overall product-specific environmental impact.

Lab testing was conducted for power consumption under load. Measurements and audit results were verified with site survey assessments. HP 5120-48G EI was configured and was tested using 48 x 1GbE and 4 x 10GbE ports. We measured power consumption changes by transmitting various traffic loads while the switch had power saving features enabled and disabled. Specifically, we measured the power consumption at idle with no traffic, no links, partial load and full load under all standard frame sizes between 64-bytes to 9216-bytes. Power consumption of the HP switch was measured with varying network and link loads that a switch would typically experience in a real-world deployment. The SUT was loaded with traffic at various rates and packet sizes in accordance with RFC 2544 Benchmarking Methodology for Network Interconnect Development.

Power consumption was measured while running Layer 2 traffic from the Ixia XM12 traffic generator. Miercom recognizes Ixia (http://www.ixiacom.com/) as an industry leader in energy efficiency testing of networking equipment. Ixia's unique approach utilizes coordination of energy measurements with network traffic load – allowing energy consumption to be graphed against network traffic volume. Real-world traffic is generated by Ixia's test platform and test applications, principally IxNetwork for Layer 2 and 3 switching and routing traffic.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Current or prospective customers interested in repeating these results may contact reviews@miercom.com for details on the configurations applied to the Device Under Test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a product selection.

Miercom Certified Green

The HP 5120 EI switch series was evaluated by Miercom according to the Certified Green Program. Based on the observations and audit analysis, this family of switches has been proven to be energy efficient and is an environmentally sound network product.

HP 5120 EI series uses the latest technology advances to improve performance and management while reducing power consumption. Resilient with High Availability is one of the many energy efficient standards included in this switch series.

HP 5120-48G EI Switch

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