



Lab Testing Summary Report

January 2010

Report 100102

Product Category:

Power Efficient Ethernet Switches

Vendor Tested:



Products Tested:

H3C S12508 Data Center Switch



Key findings and conclusions:

- 10 Gigabit Ethernet modules consume half the power compared to competitive products
- New ASIC technology has low power consumption while providing a rich advanced feature set
- Intelligent Management Center (IMC) provides complete network management of all devices
- Redundant, scalable, 90% efficient power supplies (up to 6) deliver high reliability in the data center

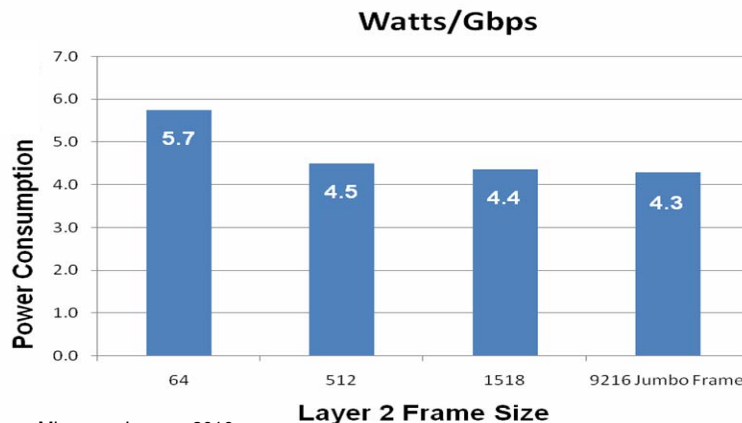
H3C engaged Miercom to evaluate the S12508 Data Center Switch under the Certified Green Test Program for power consumption and efficiency. We analyzed the overall environmental impact and green features that the H3C S12508 switch offers the data center environment.

The S12508 demonstrated during hands-on testing and by an independent audit that it is a highly flexible, manageable and energy efficient switching solution due to its modular design and use of superior ASIC technology. Using advanced ASICs as well as a unified Comware platform, it also provides leading class remote management and features and helps customers reduce power consumption and related energy costs.

The S12508 is a high density 22 rack unit chassis designed specifically for the data center. It offers exceptional redundancy with six internal power supplies. Only three are required to power a fully-populated chassis and still have 1:1 redundancy. High Availability is provided by two redundant management modules. Two fan trays containing 12 fans each draw cool air from the front, and return warm air trough the rear for hot aisle/cold aisle configurations. The overall noise is reduced due to the efficient design and the variable fan speed. *(continued on page 3)*

Figure 1: Power Consumption Relative to Throughput

Measured with (8) interface modules, each with 8x10GbE ports, (2) management modules, (9) fabric modules, and (3) 2000W power supplies



Source: Miercom, January 2010

The H3C S12508 Data Center Switch tested consistently low for power consumption relative to throughput for all Gigabit Ethernet (GbE) frame sizes at full line rate.

Test Bed Equipment

IP Load Generators



Ixia 1600T and XM2
Multifunction Chassis



H3C S12508 Data Center Switch



Environmental Testing Tools



Dranetz
Encore 61000
Power
Analyzer



Miercom
Industry Average
Green Calculator



Fluke Scope
Meter Portable
Heat and
Power Analyzer

How We Did It

The H3C S12508 Data Center Switch was evaluated for environmental impact by looking at the individual components as well as features and capabilities. Testing focused on the power consumption and efficiency of the product. A full audit was conducted to analyze the overall product-specific environmental impact.

Lab testing was conducted for power consumption under load as well as measurements and audit results verified with site survey assessments.

Measuring Power Consumption: The power consumption of the S12508 was measured at varying frame sizes and link loads that the switch would typically experience in a real world deployment. Power consumption was measured using a Dranetz Encore 61000 Power Analyzer from Dranetz-BMI (www.dranetz-bmi.com). The SUT was loaded with traffic at various rates and packet sizes in accordance with RFC 2544 Benchmarking Methodology for Network Interconnect Development. The SUT was configured with (8) interface modules, each with 8x10GbE ports, (2) management modules, (9) fabric modules, and (3) 2000W power supply modules. The 64 10GbE ports were a combination of XFPs consisting of 3 types: SXP3101SV-02 and SXP3101LX-H2-H3C (both 1310nm), and H8511D3-H3C (850nm). The power consumption was measured as a function of throughput at standard and jumbo frame sizes with 100% link utilization.

Power consumption measurements were taken during system boot-up, idle, and with 70% and 100% load. Power usage was measured, while running Layer 2 and 3 traffic using XM2 and 1600T traffic generators from Ixia (www.ixiacom.com). Traffic was applied to each of the 10 Gbps ports while stressing the product with the features it supports. All power measurements were taken at 220 volts and 50 Hz frequency.

Miercom utilizes Ixia equipment to conduct 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 2-3 routing and switching traffic and IxLoad for layer 4-7 application traffic.

Environmental Analysis: Miercom's environmental review of the H3C S12508 Data Center Switch also entailed an examination of the company-wide and product-specific environmental impact reduction efforts. We interviewed 3Com customers and 3Com's Green Team regarding the environmental-related features of the equipment and applications.

(continued from page 1) The relative power consumption as a function of throughput at different frame sizes is shown in *Figure 1*. For Layer 2 forwarding, with 100% link utilization at 64 byte frames, power efficiency was measured at 5.7 watts/Gbps. Transmitting using jumbo frames improved efficiency by 24%, to 4.3 watts/Gbps.

Power Efficiency

Figure 2 illustrates the power profile of the H3C S12508 switch. Testing was performed and power consumption was measured with the switch in various operational states—first an empty chassis, then with individual modules installed, with fully loaded chassis at idle, connected with active links and with typical and maximum link generated traffic.

The variable speed fan trays are controlled by the management module and allow for most efficient dynamic cooling “as required”. Power consumption is 24% lower when the management module is installed since the fans are throttled down from their default maximum speed. The consumption figure for the 8 port 10GbE line module includes the usage for a single management module since this module is a prerequisite for running the line module. Consumption for the 8-port line card alone was 232 watts, *see figure 2*.

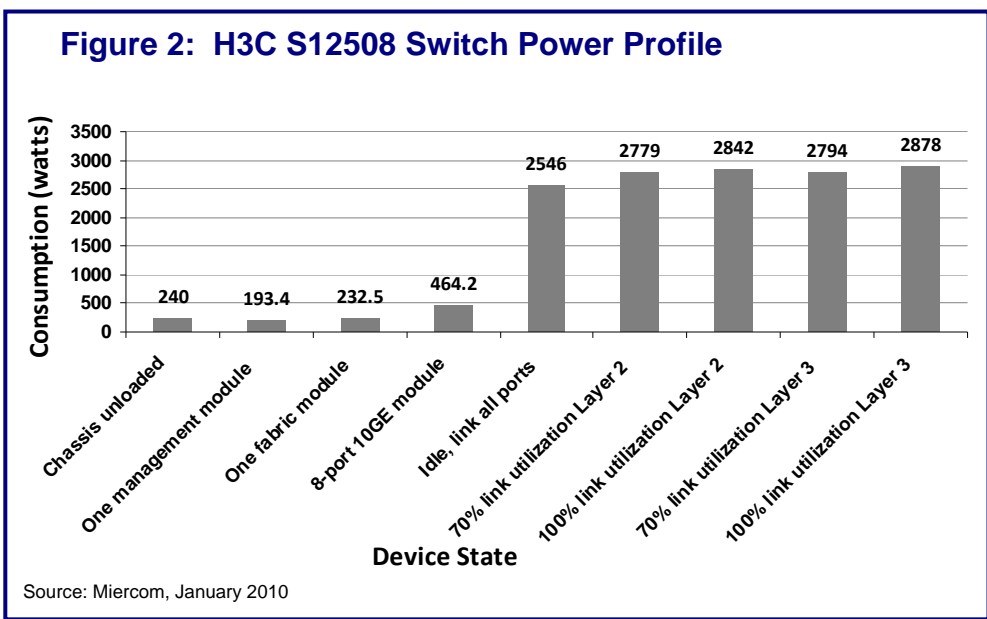
The measurements taken with traffic loads were performed using a chassis configuration

consisting of two management modules, eight 10GbE Base-R/W-XFP line cards, each providing 8 ports of 10GbE connectivity, for a total of 64 10GbE interfaces. Nine fabric modules and three 48Volt 2000W power supply modules rounded out the as-tested configuration.

At idle with links up on all ports, the S12508 consumed 2,546 watts. At a typical 70% link utilization load using 64 byte Layer 2 frames, power consumption increased 8% to 2,779 watts. At maximum traffic load, usage was 10% higher than idle, with 2,842 watts recorded. With Layer 3 traffic, using the same rates, consumption was 6% higher –2,794 watts at 70% load; 10% higher –2,878 watts at maximum load.

The H3C S12508 utilizes the latest ASIC technology to deliver reduced power consumption. Currently, 65nm silicon technology is used, and 3Com is planning future incorporation of 45nm silicon to further reduce power consumption while providing the latest advanced features demanded by customers.

Results of testing showed that the 10GbE modules in our test bed used about half the stated power of comparable modules from other published datasheets. The S12508 used only 5.7 watts/Gbps during testing with 64 byte frames, which decreased to 4.4 watts/Gbps for 1518 byte frames. The S12508 also supports jumbo frames of 9216 bytes. When transmitting using jumbo frames, the switch drew only 4.3 watts/Gbps.



H3C S12508 Switch Power Profile illustrates the power usage with various modules engaged while tested idle thru 100% traffic load.

The power consumption reported for the 8 x 10GbE line modules includes the fabric module usage.

For the link utilization test, a total of 64 10GbE interfaces were used. Traffic consisted of 64 byte frames. Packet inspection of the Layer 3 traffic causes power draw to be slightly higher than for Layer 2 traffic.

Product Efficiency

The H3C S12500 is intended for data center placement. It is designed to be flexible, scalable and future-proof. The system architecture delivers 2.2 billion packets-per-second of forwarding performance and aggregates large numbers of Gig Ethernet ports, providing up to 864 line-speed GigE ports, 128 wire-speed 10GbE ports, or 512 non-wire speed 10GbE ports. With a 256 MB buffer for each 10GbE port, the S12500 can support a burst size of data in 200ms to meet the high burst size requirements in large data centers, and support emerging high bandwidth application like video.

The modular architecture enables administrators to reconfigure and upgrade to meet ever-changing data center needs, and new technologies. The switch is compatible with 40-Gigabit Ethernet, 100-Gigabit Ethernet, and Fibre Channel over Ethernet (FCoE).

The H3C S12508 comes with a fully distributed architecture separating the forwarding and control planes. This architecture provides 1:1 redundancy for the control plane, and N+1 redundancy for the forwarding plane. The passive backplane design has load sharing fabrics, management modules, and redundant power supplies and fan trays.

All of these core elements are hot-swappable, minimizing the impact of single component failure.

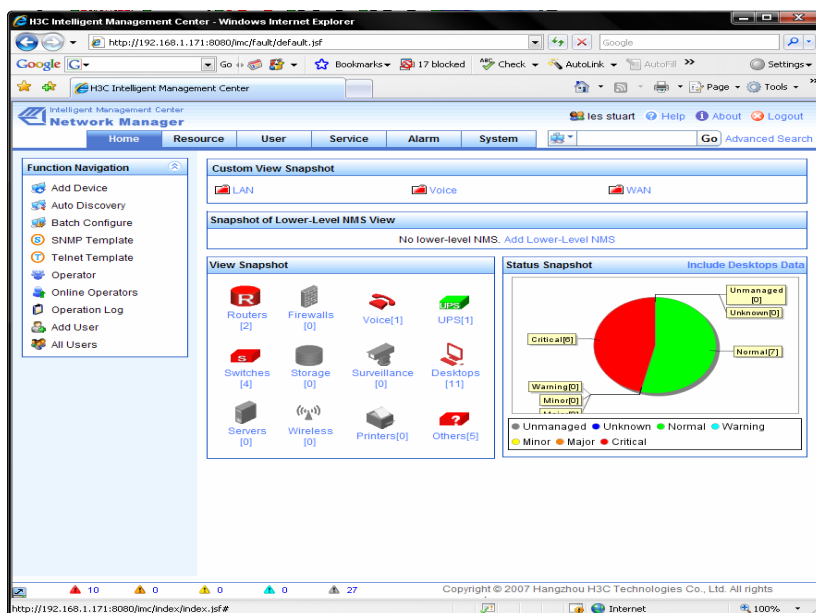
Multiple Spanning Tree Protocol, Rapid Spanning Tree Protocol, OSPF Equal Cost Multi Path, and Virtual Router Redundancy Protocol support delivers rapid recovery from device or link failures in the network, minimizing disruptions for business applications. In addition, “always on” high availability is critical.

The H3C S12508 shares its unified Comware platform operating system with all other H3C switches to provide commonality and consistency of features and operation, which helps to reduce operational costs by providing more efficient network administration. Intelligent Management Center (IMC) is a next generation enterprise management solution. Designed to support the Information Technology Infrastructure Library (ITIL) operational center of excellence best practices model, IMC provides management of not just routers and switches but all networked devices, delivering end-to-end administration through a single interface.

Business Processes

IMC provides network management and administration through a single console interface. This enables end-to-end business administration by combining traditionally separate management tools, policy management, and 3rd party device management for more effective and efficient network administration.

Figure 3: Intelligent Management Center



Source: Miercom, January 2010

The H3C Intelligent Management Center (IMC) allows for effective remote administration and multi-site management.

IMC provides a single-pane control to control the entire enterprise network topology, not just routers and switches.

The H3C S12500 family of switches is designed to reduce power consumption without impacting performance or features. Advanced ASIC design and a common unified Comware platform operating system allow 3Com to take advantage of the latest technological innovations known today to reduce power consumption.

Green Innovation

3Com's approach of using the most advanced ASIC technology provides the freedom to design switch products using the latest advances in silicon technology to deliver critical data center features and performance, while providing reductions in power usage. For example, distributed temperature management is included on each I/O module to trigger and drive the speed of the cooling fans.

Use of a common unified Comware platform operating system across all models, means that enhancements can be rolled out easily and in a consistent fashion. H3C switches use Intelligent Resilient Framework (IRF), a 3Com-developed technology to provide distributed high availability and resiliency by extending the control plane of multiple active switches in different geographic locations. IRF eliminates the need for complex redundancy technologies, such as Spanning Tree Protocol (STP) or Virtual Router Redundancy Protocol (VRRP). Enterprises can collapse their network architecture from 3 tiers to 2 tiers, eliminating the additional network layers, the associated power and costs associated with them, and reducing network latency while improving performance.

Affiliations and Standards

3Com is a participating member of The Green Grid, and contributes to the leadership of the IEEE 802.3 Ethernet Working Group, the parent body of the IEEE P802.3az an Energy-efficient Ethernet project. This project will provide an interoperability standard which will save power during idle periods on an Ethernet link, and enable some energy savings on attached devices with a Sleep and Wake signal indicating the entry and exit from long idle periods, allowing the devices to enter a low power mode.

3Com is a partner in EnergyStar as well as a stakeholder in reviewing the EnergyStar Requirements for Networking Equipment. They are also an endorser of the EU Data Center Code of Conduct, part of the EU Standby Initiative to

improve the energy efficiency of electrical equipment while either Off or in Stand-by. 3Com has also been certified ISO 14001 compliant.

Business Case

The S12500 employs the latest ASIC technologies and other advanced techniques to deliver industry-leading throughput performance addressing the requirements of the largest data centers in the world. The H3C S12500 Data Center Switch is designed with an 80% derating on internal components including the Printed Circuit Board (PCB). This criteria, which is over and above the components manufacturer limits, ensures the longevity of the internal components. Management modules, power supply modules and fan tray modules are all hot-swappable and redundant to provide "always on" high-availability to meet the strict requirements of the data center. The S12508 is compatible with new 40-, 100-Gigabit Ethernet technology, and FCoE. Modular design allows for future upgrades and protects IT investment.

The S12500 using Comware v5, OS running on H3C product line, provides a comprehensive list of features to help manage fault, configuration, accounting, provisioning locally and remotely. Logs, traces, reports, alarms, traps use protocols and features like SNMPv3, Telnet/SSHv2, FTP/SFTP. It is also supported by 3Com's Intelligent Management Center (IMC) providing single pane console control of the network infrastructure.

Certified Green

Miercom conducts environmental analysis on products by taking a holistic view of the product life cycle. We consider power efficiency of the product, manufacturing and overall business practices in this analysis. Power consumption and power efficiency are important metrics for comparing products and this data does provide a key component to green analysis, but not the only relevant component.

Miercom believes that a comprehensive environmental analysis such as that conducted for H3C is the only credible and relevant approach to evaluating green technologies. This type of study reveals a business case justification for the environmental benefits the products have to offer by virtue of the sustainable benefits in cost savings in power as well as product efficiencies.

Miercom Certified Green

The energy-saving attributes of the H3C S12508 Data Center Switch were evaluated by Miercom in accordance with the Certified Green Testing Methodology. The product has been awarded Miercom Certified Green based on the observations and audit analysis.

Based on our hands-on testing and the verified representations made by 3Com, Miercom confirms that the H3C S12500 family of Data Center Switches is designed to provide enterprise customers superior performance, critical redundancy and availability, and environmentally sound datacenter solutions.



**H3C S12508
Data Center Switch**


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