



## Lab Testing Summary Report

May 2009

Report 090520

Product Category:

### Power Efficient Ethernet Switches

Vendor Tested:



# 3COM

Product Tested:

**3Com Switch  
7906E  
and  
H3C S7506E**



## Key findings and conclusions:

- 24% more efficient than comparable products based on Industry Average (Watts/Gbps)
- Enhanced redundant management features; provides traffic control and advanced security
- Hot swappable fan, power supplies and management modules; easily replaced or upgraded
- Multi-layer switch design provides 384 Gbps crossbar switching

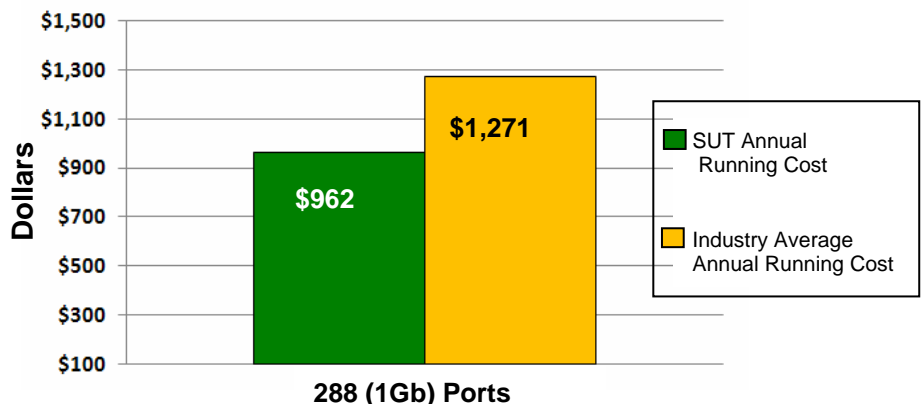
**3**Com Switch 7906E/H3C S7506E was evaluated by Miercom under the Certified Green Test Program for power consumption and efficiency. We evaluated the overall environmental impact and business enabling green benefits that the 3Com Switch 7906E provides to customers.

Switch 7906E proved in hands-on testing and by independent audit, to afford customers with an energy efficient switching solution. 3Com delivers a standards-based network solution, providing energy-efficient products that reduce costs and minimize the environmental impact.

3Com 7906E is a 12U chassis type switch, designed with a modular blade configuration. The chassis has eight slots, two dedicated for management modules, and six slots supporting 48-port modules providing up to 288 10/100/1000 Base-T ports. Dual external and/or internal power supplies and an external fan tray complete the chassis. Replaceable and upgradeable components include internal/external power supplies, fan tray module, and management modules, providing enhanced scalability and redundancy to enterprise switch networks.

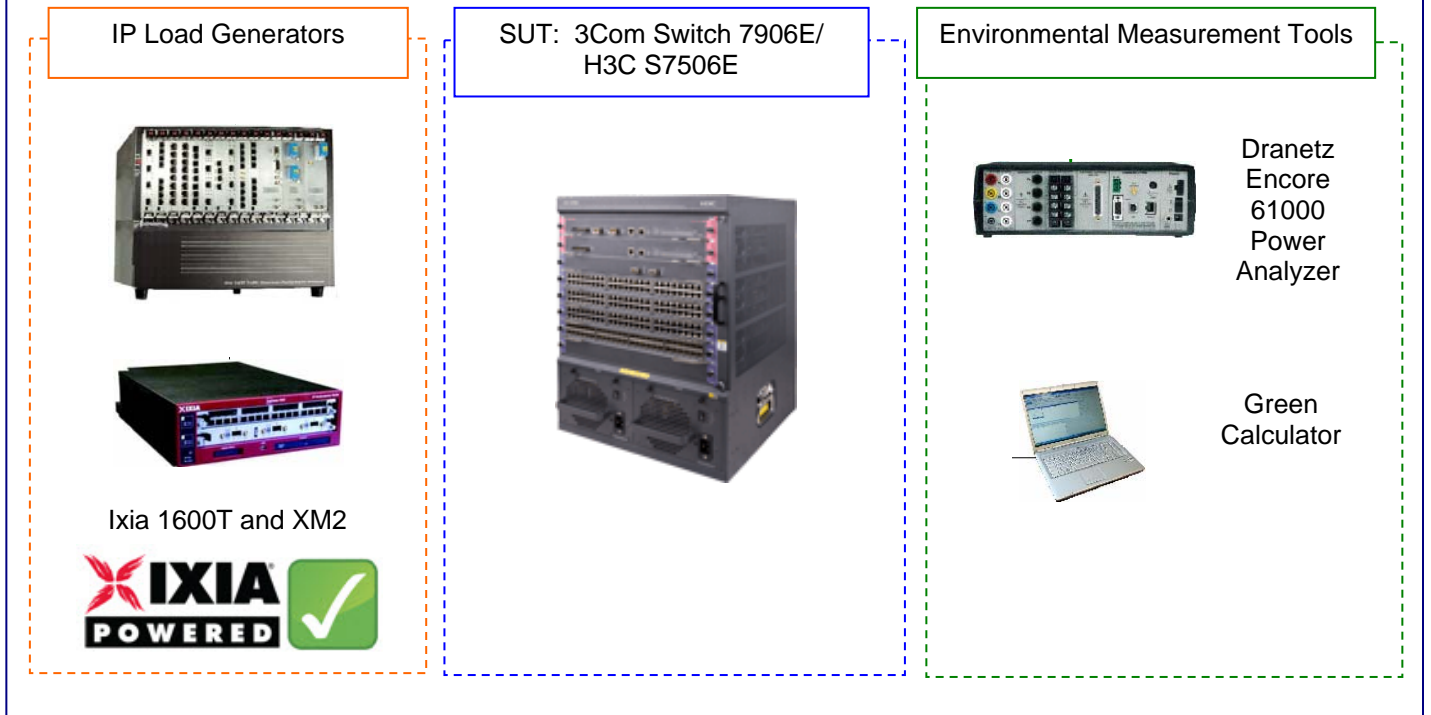
Switch 7906E provides 24% annual savings, as shown in [Figure 1](#). The annual cost of the Switch 7906E is \$962 vs. \$1,271 Industry Average. An explanation of the cost calculation is on page 7, under Business Case. 3Com Switch 7906E is designed with (*continued on page 3*)

**Figure 1: 3Com Switch 7906E Annual Cost**



Annual cost for the Switch 7906E is \$962. When compared to the Industry Average of \$1,271, there is an average savings of 24%, based on typical usage of 12.5 cents per Kw/hr. Chassis equipped with fully redundant power supplies. For more details, see the Business Case on page 7.

## Test Bed Diagram



## How We Did It

3Com Switch 7906E/H3C S7506E was evaluated for environmental impact by looking at the individual components as well as features and capabilities. Testing was performed at 3Com headquarters in Marlborough, MA and focused on the power consumption and efficiency of the product. A full audit was additionally conducted to analyze the overall product-specific environmental impact.

Lab testing of each feature was conducted for power consumption under load as well as verifying audit results with site survey assessments. The Switch 7906E was configured and tested with dual power supplies, each at 1400W AC, a hot-swappable nine fan tray module, two LSQ1SRPB0 management modules on slots one and two, and six LSQ1GV48SC0 modules with 48 10/100/1000 Base-T ports each, totaling 288 ports.

**Measuring Power Consumption:** The power consumption of Switch 7906E was measured by varying the traffic load and CPU utilization. Power consumption was measured with a Dranetz Encore 61000 Power Analyzer from Dranetz-BMI ([www.dranetz-bmi.com](http://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.

Power consumption measurements were taken during system boot-up, with two power supplies until it reached an idle state. Power consumption of the Switch 7906E chassis was measured, while running Layer 2 and Layer 3 traffic with an XM2 and 1600T traffic generators from Ixia ([www.ixiacom.com](http://www.ixiacom.com)), to obtain a full environmental reading spectrum with a mix of traffic at different processor utilization rates. Additional power supplies were incrementally added. Measurements were taken at both 110 and 220 volts. Frequency was also tested at 50Hz and 60Hz to test actual power provided in other countries. All measurements were taken under Normal conditions which signify a temperature of 24 degrees Celsius, atmospheric pressure in the range of 850 to 1070 mbar, and relative humidity from 30 to 75 percent.

Ixia is 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 2-3 routing and switching traffic and IxLoad for Layer 4-7 application traffic.

**Environmental Analysis:** Miercom's environmental review of the 3Com Switch 7906E also entailed an examination of the 3Com company-wide and product-specific environmental impact reduction efforts. Analysis includes comparisons to industry averages for competitive products that were also tested.

(continued from page 1) flexible, resilient architecture for deployment at the enterprise core, with distribution to edge applications.

Switch 7906E provides a total of eight slots, supporting 48 10/100/1000 Base-T ports, which are upgradeable to PoE. Up to 16 10G SFP ports can be supported, but without PoE. Two slots are dedicated for use by the redundant management modules. Four power supplies, two each of external and internal, are provided for redundancy.

3Com Switch 7906E has a 2.4 Tbps backplane, providing scalable and enhanced performance and for future expansion capability.

## Power Efficiency

Figure 2 below illustrates the power profile for 3Com Switch 7906E. Measurements of power consumption were monitored and recorded for the Switch 7906E while in various operational states – boot-up, idle, and with 70% and 100% loads. Both 110V and 220V were measured and as expected a 5 to 10 watt improvement resulted with 220V at 50Hz, compared to 110V at 60Hz. The total boot-up cycle took 5 minutes, 24 seconds. The chassis uses 28.3 watts with no activity and increases to 845.7 watts at idle. With 100% maximum load

applied, 889.7 watts was recorded.

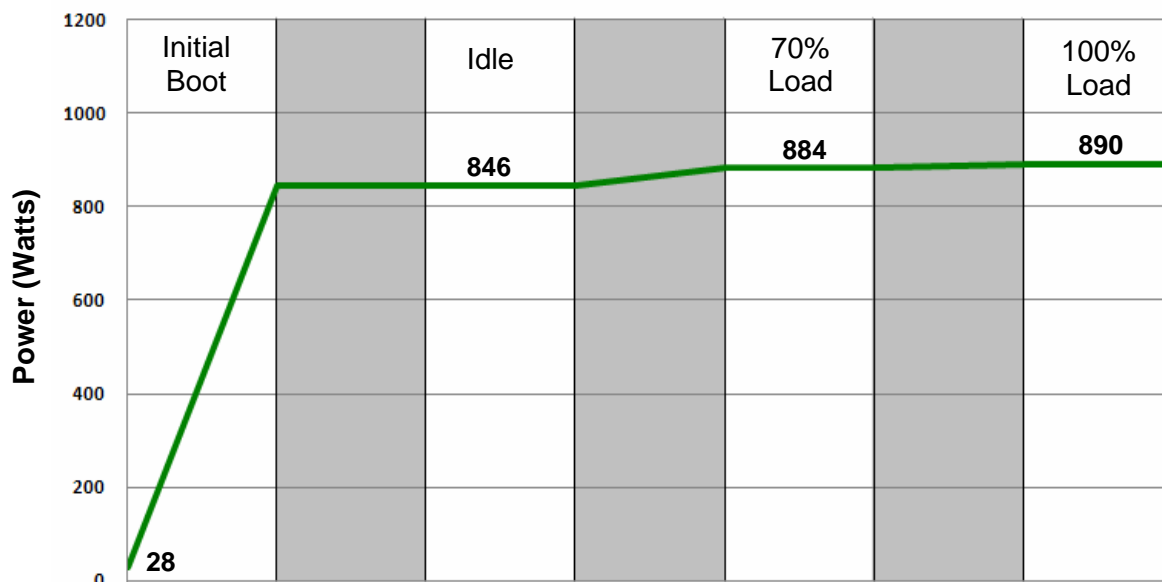
For continuous network operation, 3Com Switch 7906E is designed with redundant load sharing included in management modules, a hot swappable and redundant fan module, and four power supplies (DC or AC). There are nine variable-speed cooling fans on the switch, in a 3x3 configuration. If one fan fails, an alarm is displayed, and the remaining two fans will continue cooling on that row. In addition, when device utilization is minimal, Switch 7906E will automatically lower the fan speed thereby using less power.

Switch 7906E is configured with two internal power supplies, and also supports two external power supplies which provide redundant power to switch ports and PoE to limited external devices.

## Power Consumption

During the power profile test for the Switch 7906E, shown in Figure 2 below, we recorded the power measurements, with links connected. When both power supplies and all modules were turned off, 28.3 watts usage was recorded. Each power supply requires 14.1 watts while dormant. Once all modules were loaded on the

**Figure 2: 3Com Switch 7906E Power Profile**



*Power Profile shows the power draw as Switch 7906E is brought on line through maximum throughput, with uplink modules enabled. Results are based on 120V supply, between 70% and 100% loads.*

chassis, and both power supplies were turned on, the boot-up cycle took 5 minutes and 24 seconds to achieve idle state, without power spikes. Using 120V at 60Mhz, once idle state was reached, the power gradually increased to 845.7 watts and the maximum CPU utilization of 45% registered during boot-up cycle.

While using 220V at 60Hz, 838.7 watts was recorded during idle. When we used power equivalent to the European standards of 220V at 50Hz, power consumed increased to 839.8 watts.

Figure 3 below compares the energy used by Switch 7906E to the Industry Average (IA) when applying various levels of Layer 2 traffic. The Switch 7906E consistently used less power. With 100% load, 889.7 watts was used, compared to 1,140.7 watts for IA, a **23%** reduction. At 70% load 884.2 watts was recorded compared to an IA of 973.0 watts, equaling **10% less**. While at idle, a **10%** reduction was noted, with 845.7 watts for 3Com vs. 931.2 watts IA.

Figure 4 on page 5 shows the comparison of Watts/Gbps on different size frames. Switch 7906E uses 22% to 24% less Watts/Gbps when compared to the IA. Since small frames require more header activity, switching of small (64 Byte) frames requires more watts than the large (1519 Byte) frames.

## Product Efficiency

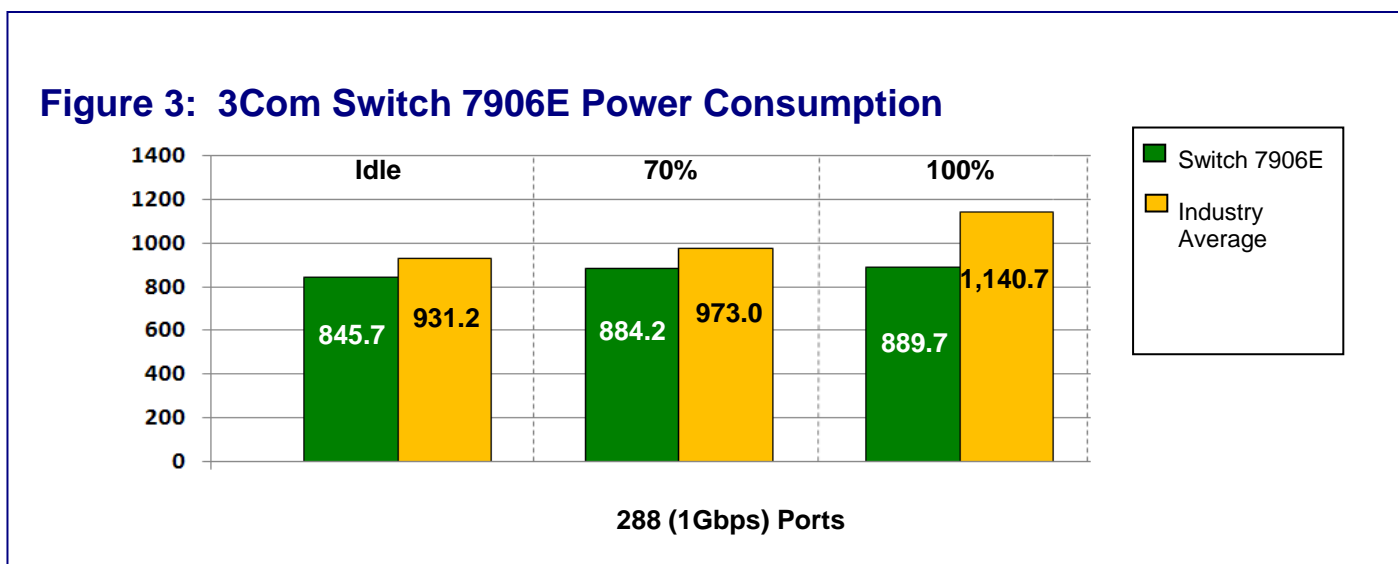
The 3Com Switch 7906E GUI interface provides remote administration of basic network switch

functions. Traffic port status, port configuration, firmware version, as well as, power and fan status can be monitored by the administrator. Figure 5 on page 6 shows a sample screen shot of the GUI. Tabs allow choice of views and filtering options to facilitate management of the network and underlying switches.

Management of devices is now consolidated and centralized with Intelligent Management Center (IMC) from 3Com. IMC Enterprise Edition supports up to 10,000 managed devices. While managing and monitoring traffic, IMC is capable of detecting network problems including CPU issues, memory, and bandwidth utilization. It can be configured to generate alarms based on customizable events and rules. Status reports are available for all 3Com network devices. Downloadable reports are available in many common formats, CSV pdf, Excel and others.

Administrators can deploy network configuration changes to multiple devices while using the bulk configuration function through IMC. Used in conjunction with bulk backup and restore feature, IMC offers enhanced control for firmware and configuration upgrade processes. Other features include Access Control List (ACL) management, which provides effective policy-base security, and QoS; and network traffic analysis which delivers a clear view of network usage including NetStream and SFlow data.

Encrypted management capability is included by SSH for Command Line Interface (CLI) access, HTTPS for web access, and SNMPv3 for secure



Power consumption was measured at idle, 70% and 100%, throughput with Layer 2 traffic. The results for 3Com are compared to the Industry Average on the graph. A decrease of 23% was recorded for 3Com Switch 7906E.

access to the IMC management application. Processor queuing mechanisms prevent denial of service (DoS) attacks, and ACL restricts users to authorized areas on the network.

Switch S7900E delivers advanced security including user and device authentication, policy-based Access Control Lists (ACLs), encrypted protocol headers and system management access. The switch supports IEEE 802.1X Network Login and RADIUS, allowing the administrator to control access to a single port, and manage VLAN and MAC address authentication for enhanced network security.

With its modern ASICs, Switch S7900E provides distributed switching technology for demanding applications. Using high-reliability technologies such as non-stop forwarding (NSF) and ring network protection, the Switch 7906E can improve productivity and ensure maximum uptime, thereby reducing total cost of ownership (TCO).

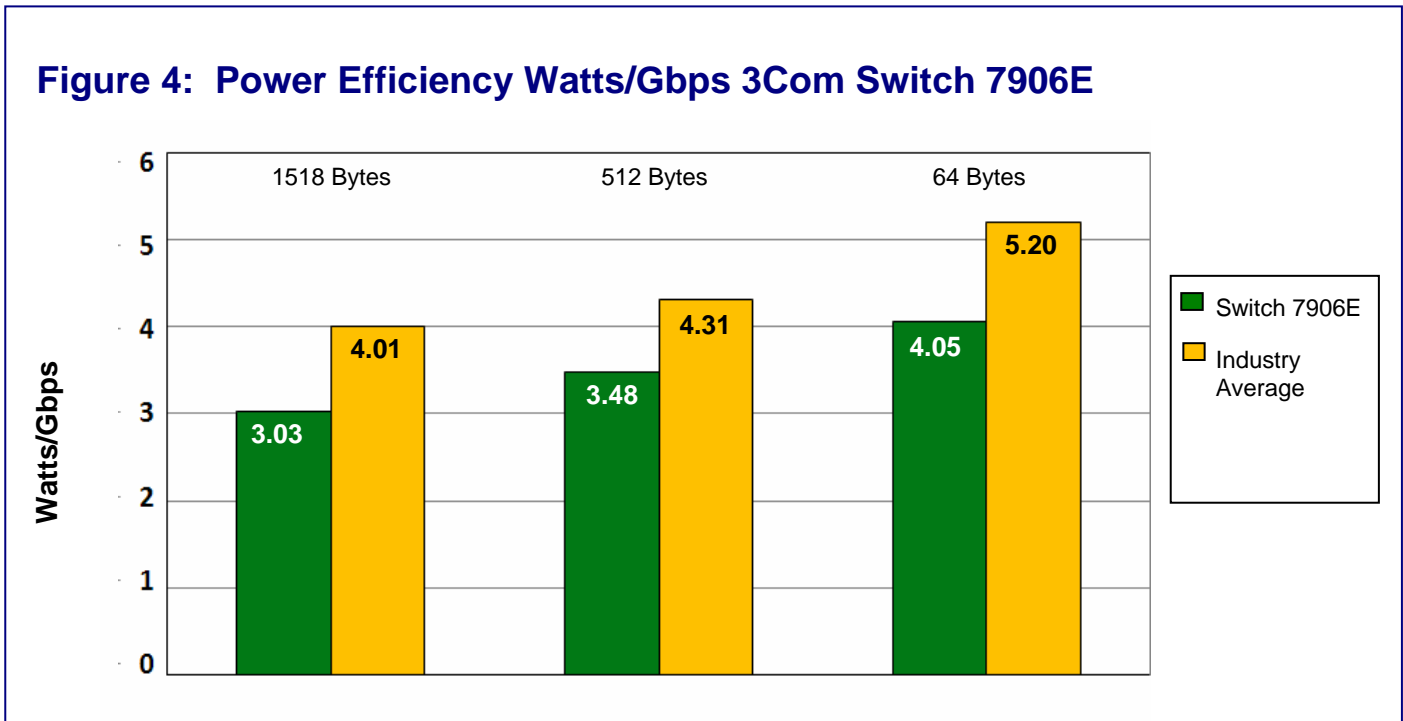
3Com Switch 7906E has a hot swappable fan module that spans the full height of the chassis, holds nine variable speed fans in a 3x3 configuration. Each row of fans has the ability to provide cooling to the respective section of the

chassis, as well as to provide cooling even with one fan out on a single row. This allows maximum redundancy, easy replacement and maintenance, minimizing costs.

The internal and external power supplies on the Switch 7906E are hot swappable and upgradeable and provide power redundancy; reducing operational costs and power consumption, while extending the service life of the equipment.

LEDs are located on the front of the internal power supply. Each power supply has LEDs which indicate input power, power status, and a display for Redundant Power Supply (RPS) status. Even when the power is set to “off”, power continues to be supplied to the Switch 7900E. Management module LEDs provide throughput traffic status on crossbar switching.

Each Management module also provides 384 Gbps crossbar switching. The secondary management module, in addition to providing redundancy, can double bandwidth and provide load balancing. We verified that the Switch 7906E can operate with a single management module, in the event the primary module fails.



*A comparison of Watts/Gbps on different size frames, 3Com Switch 7906E uses 22% to 24% less Watts/Gbps when compared to the Industry Average.*

## Manufacturing

All 3Com products are designed with the latest silicon technology. The Switch 7906E uses 90nm technology (90 billionths of a meter transistors), providing enhanced performance without increasing power usage. Innovations in reducing current leakage enable processors to support a 35% increase in speed that is counter-balanced by a 60% reduction in active power needs.

3Com uses texture mapping rather than printing, electroplating or bronzing, to reduce materials used. Recyclable materials are utilized whenever possible in component manufacturing. Additionally, sea rather than air transportation is 3Com's preferred choice for global distribution of products, which reduces overall impact on the environment.

3Com has a one year warranty, providing coverage for the complete unit including power supplies and fans during the warranty period.

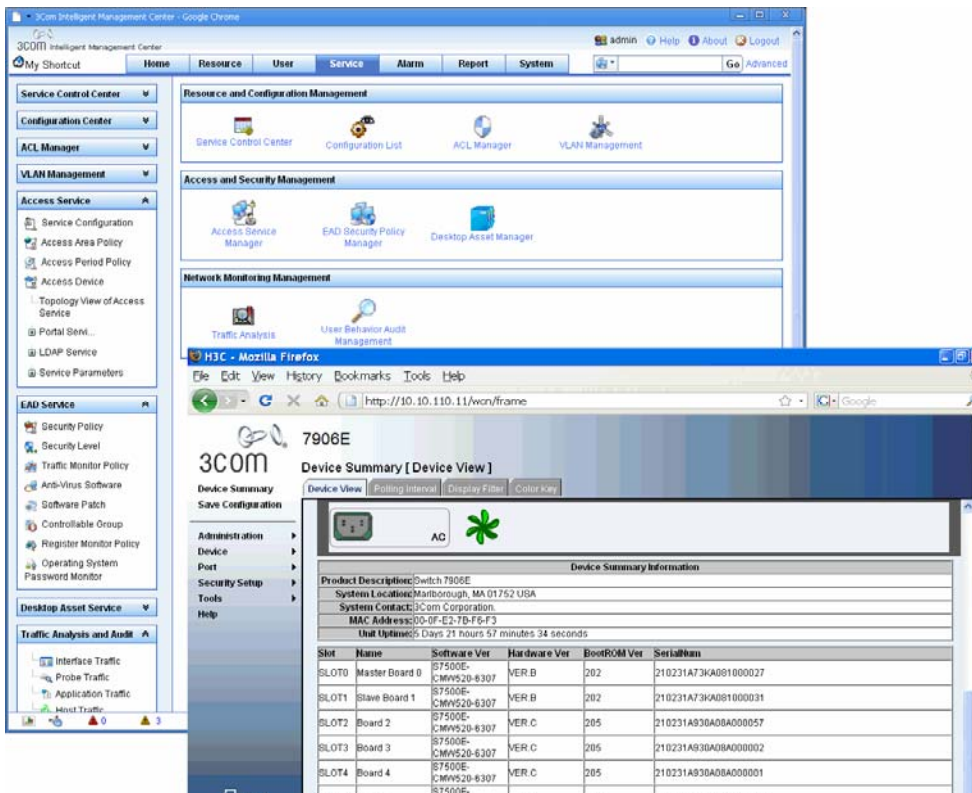
## Business Processes

3Com strives to reduce landfill waste, by reducing the physical dimensions of their products. Package simplification design, as well as paperless documentation is now available online, further reducing materials used and facilitating recycling activities.

3Com demonstrates their commitment to the environment when planning and designing 3Com facilities and operations. 3Com implements recycling and waste reduction programs, energy management systems for controlling light and heat, a global print-on-demand system for marketing and sales materials, eliminating and reducing waste. 3Com employs technologies that enable employees to work remotely, reducing travel and damaging emissions.

IMC, by controlling multiple devices remotely from a central location, allows the management

**Figure 5: 3Com GUI and Central Manager Interfaces**



IMC provides centralized management to multi-switch networks. The upper screen shot shows IMC service applications such as, ACL manager, VLAN management, User Behavior Audit management, EAD security policy manager and traffic analysis.

Lower screen shows status of power and fans. Other information on this tab includes specific product information such as up-time, hardware version, device and serial number physical location and MAC address.

and administration of all devices on the network. Remote backup, mass configuration deployment and other similar functions can all be performed without traveling to various locations. Carbon foot print is again being reduced.

## Green Innovation

3Com Switch 7906E/H3C S7506E complies with Restriction of Hazardous Substances (RoHS) directives that restrict the use of certain hazardous substances in electrical components such as cadmium, hexavalent chromium, lead, and others.

Furthermore, 3Com products that ship to China comply with the China Ministry of Information Industry Order #39, Administrative Measures on the Control of Pollution Caused by Electronic Information Products, referred to as China-RoHS.

3Com enforces guidelines for removing hazardous substances and comply with the Waste Electrical and Electronic Equipment (WEEE) initiative. WEEE ensures that manufacturers are responsible for the disposal and recycling of their products.

In addition to reducing power consumption, heat generation and cooling requirements, the built-in dual speed cooling fans run at a lower speed and reduce the amount of energy that fans consume. The switch is capable of supporting 104°F or 40°C. The dual speed fans operate at higher temperatures and the system detects when fans are needed at lower speeds, thereby reducing power usage.

## Affiliations and Standards

As a Contributing Member of the Green Grid, 3Com is involved in efforts to standardize methods for measuring energy efficiency. Through membership, 3Com is able to vote on initiatives that compliment participation in the IEEE 802.3 Ethernet working group's activities, especially IEEE P802.3az Energy-efficient Ethernet Task Force. As an ENERGY STAR partner, 3Com is part of a global effort to help customers save money and protect the environment through energy-efficient products and practices.

3Com products comply with both the European Union's RoHS and China-RoHS directives, which regulates and restricts the use of hazardous

materials in the manufacturing of electrical and electronic products.

## Business Case

Figure 1, shows a \$309 or 24% savings for when compared to the Industry Average of other vendor switches tested.

Data from Figure 2 is used to calculate the average cost, since idle, 70% and 100% loads use more watts as the load increases.

Switch 7906E chassis is deployed in high-end enterprises and data center environments. They are also used for data storage and back-up. The estimated use is about 28 hours with a 100% load, 112 hours with a 70% load and will be in an Idle/Ready State for 28 hours per week.

To calculate the annual cost, multiply the kilowatts by total yearly hours; and multiply this result by the annual cost factor of 12.5 cents kWh. Watts are obtained from Figure 2.

## Certified for Green

Miercom conducts environmental analysis on products using a holistic view, considering power efficiency and manufacturing. Power consumption and power efficiency are very important metrics for comparing products and are typically all that are discussed in other organizations' green reports. We believe a more comprehensive approach, which reveals true business case savings to customers for the other environmental benefits that a vendor's product may afford, is a better approach.

Competitive index with industry average is achieved by comparing measured results from products in a given class. The significance of this comparison is that it allows a single view of annual cost for power consumption of a product, and comparison information that will help the consumer understand if the evaluated product affords an overall advantage for power efficiency.

Vendors with similar products that are included in the Industry Average for this report include Extreme Networks, Hewlett-Packard, Foundry Networks, Juniper Networks, Cisco Systems and other manufacturers.

## Miercom Certified Green

The energy-saving attributes of the 3Com Switch 7906E/H3C S7506E was evaluated by Miercom in accordance with the Certified Green Testing Methodology. The product achieved sufficient scores in each of the rated criteria to achieve the Miercom Certified Green distinction Award.

Based on our hands-on testing and the verified representations made by 3Com, Miercom confirms that the 3Com Switch 7906E/H3C S7506E is designed to provide enterprise customers effective and environmentally sound networking and datacenter solutions.



**3Com Switch 7906E/  
H3C S7506E**



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## About Miercom's Product Testing Services

Hundreds of product-comparison analyses have been published over the years in such leading network trade periodicals as Network World, Business Communications Review - NoJitter, Communications News, xchange, Internet Telephony and other leading publications. Miercom's reputation as the leading, independent product test center is unquestioned.

Miercom's private test services include competitive product analyses, as well as individual product evaluations. Miercom features comprehensive certification and test programs including: [Certified Interoperable](#), [Certified Reliable](#), [Certified Secure](#) and [Certified Green](#). Products may also be evaluated under the [NetWORKS As Advertised](#) program, the industry's most thorough and trusted assessment for product usability and performance.



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