



Web Smart Switches

The Value-Oriented Alternative for Managed Switching



Solution Brief

September 2005

Abstract

This brief provides a short introduction to Web Smart switches and their importance in a local area network (LAN). It explains the basic concepts behind web-based switch technology, provides an overview of the product benefits, and details the network applications for web-based switches.

Introduction to Web-based Smart Switches

IT managers and staff face many challenges associated with today's local area network (LAN), which has become a vital business resource in today's competitive marketplace. The traffic of a LAN requires constant monitoring and management. However, with today's networks carrying more and more business-critical traffic such as VoIP, CRM, and video, and with many different types of applications sharing the same data links, organizations need to ensure that business-critical applications are not crowded-out by other high-bandwidth applications. When business traffic is left unmanaged, the performance of important, interactive or delay-sensitive applications can dramatically degrade, resulting in lost productivity and revenues as well as employee and customer frustration. And business growth, while generally desirable, imposes burdens that can diminish network performance. Performance-robbing burdens include rapid growth in the number of network users or clients, higher traffic volume generated by each client, increasing application complexity and larger file sizes.

Because of these growing network demands, IT managers face the challenges of having to boost bandwidth and uptime while keeping within tight budget constraints. Cost and downtime considerations often rule out massive upgrades to network infrastructure. Such upgrades may be overkill depending on the order-of-magnitude of increase capacity involved. At the same time, doing nothing may not be an option either, since existing infrastructure may not scale to meet bandwidth requirements. Because of greater network demands, more companies require sophisticated traffic-management features in their high-speed switches.

In today's world, technology managers are asking for more out of high-speed switches than just speed and switching. The growing demands of a sophisticated business IT environment, with complex, high traffic, database-driven networks, require that high-speed switches also offer network management. As demands have increased, vendors have responded with switches that offer a host of switch management features and capabilities. In addition to the "unmanaged" and "managed" switch categories in the market, a third switch category type has emerged and grown in popularity in recent years—Web-based Smart Switches.

A web smart switch or web-based switch is a network switch that can be managed through a web-based interface (or GUI) and provides many of the benefits of a managed switch, but without the complexity or cost of a fully managed switch. A web smart switch has more capability than an unmanaged switch, but not all that of a fully managed switch. They typically offer important switch features such as VLANs (virtual LAN), Quality of Service (QoS), link aggregation (port trunking), and port mirroring. Adding management capabilities like these to a network switch optimizes configuration and performance, and can help diagnose problems. Web smart switches do not typically include features such as IP Multicasting, Access Control Lists, RMON, 802.1x, SSH, SSL, TACACS, rate limiting, and others found in a fully managed switch. The benefits provided in a typical web-based switch include traffic prioritization, network segmentation, redundant network links, network monitoring, and remote management.

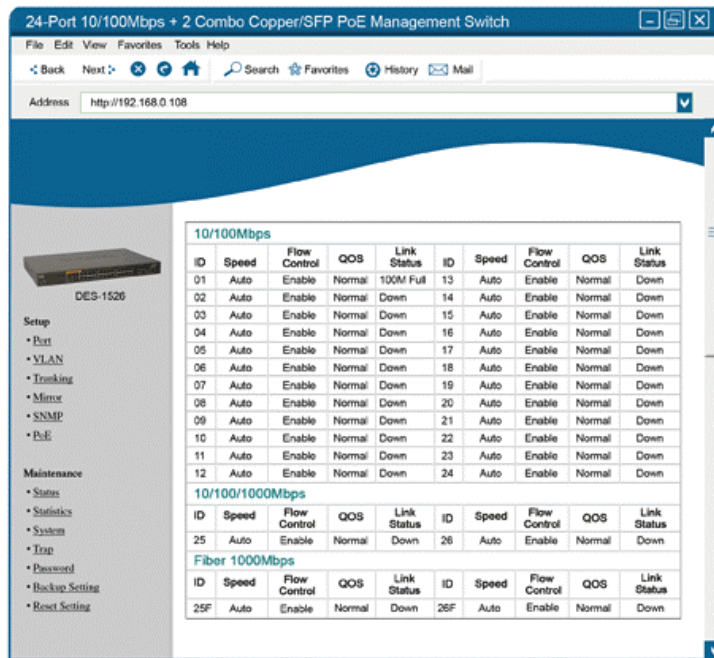


Figure 1. Intuitive, user-friendly web-based (HTML) interface.

All software functions of web-based smart switches can be managed, configured, and monitored using the embedded web-based (HTML) interface, and can be managed from remote stations anywhere on the network through a standard browser (such as Netscape Navigator/Communicator or Microsoft Internet Explorer). The browser acts as a universal access tool and can communicate directly with the switch using the HTTP protocol

Why are web-based smart switches becoming so important to Ethernet networks? The benefits of web smart switches are numerous from both a network efficiency and cost standpoint. Any organization, regardless of size, can enjoy the benefits of integrating web smart switches into their network.

Benefits of Web Smart Switches

Web-based Smart switches offer a number of benefits:

➤ Cost-Effective Managed Switch Solution

When compared to a fully managed switch in the market, web-based smart switches have several cost advantages. A web-based smart switch provides many of the same advanced features of a fully managed switch, but offers a price that is closer to that of an unmanaged switch. With widespread deployment of many units over several locations, the cost savings increases dramatically.

Web-based smart switches also save businesses money through a lower total cost of ownership (TCO) and faster return on investment (ROI). Because web-based switches are easier to configure and operate than managed switches, the cost of

training staff and deployment time is dramatically reduced, saving a company a significant amount costs.

Additionally, as a company grows and requires the network to scale, key switch features supported by web-based smart switches help to protect and future-proof a company's network investment. A web-based smart switch can operate as an unmanaged switch out of the box. But key features such as link aggregation, QoS, and network monitoring supported by web smart switches enable a company to scale and grow without having replace their switches or perform a “forklift” upgrade.

➤ **Easy Switch Management Through a Web-based Interface**

Tightened budgets in small and medium-sized businesses sometimes leave the responsibility of network administration to untrained personnel. In many cases the owner or untrained staff end up having to manage the local network themselves. Having a web-based interface makes configuring and deploying web-based smart switches simple and easy. Instead of a command prompt, where configuration requires memorization of switch commands, all software functions of web-based smart switches can be managed, configured, and monitored using the embedded web-based (HTML) interface. In addition, management can be performed from remote stations anywhere through a standard browser.

| 10/100 Mbps | | | | | | | | | |
|-------------|-------|--------------|--------|-------------|----|-------|--------------|--------|-------------|
| ID | Speed | Flow Control | QoS | Link Status | ID | Speed | Flow Control | QoS | Link Status |
| 01 | Auto | Enable | Normal | Down | 13 | Auto | Enable | Normal | Down |
| 02 | Auto | Enable | Normal | Down | 14 | Auto | Enable | Normal | 100M Half |
| 03 | Auto | Enable | Normal | Down | 15 | Auto | Enable | Normal | Down |
| 04 | Auto | Enable | Normal | Down | 16 | Auto | Enable | Normal | Down |
| 05 | Auto | Enable | Normal | Down | 17 | Auto | Enable | Normal | Down |
| 06 | Auto | Enable | Normal | Down | 18 | Auto | Enable | Normal | Down |
| 07 | Auto | Enable | Normal | Down | 19 | Auto | Enable | Normal | Down |
| 08 | Auto | Enable | Normal | Down | 20 | Auto | Enable | Normal | Down |
| 09 | Auto | Enable | Normal | Down | 21 | Auto | Enable | Normal | Down |
| 10 | Auto | Enable | Normal | Down | 22 | Auto | Enable | Normal | Down |
| 11 | Auto | Enable | Normal | Down | 23 | Auto | Enable | Normal | Down |
| 12 | Auto | Enable | Normal | Down | 24 | Auto | Enable | Normal | Down |

| 10/100/1000 Mbps | | | | | | | | | |
|------------------|-------|--------------|--------|-------------|----|-------|--------------|--------|-------------|
| ID | Speed | Flow Control | QoS | Link Status | ID | Speed | Flow Control | QoS | Link Status |
| 25 | Auto | Enable | Normal | Down | 26 | Auto | Enable | Normal | Down |

| Fiber 1000 Mbps | | | | | | | | | |
|-----------------|-------|--------------|--------|-------------|-----|-------|--------------|--------|-------------|
| ID | Speed | Flow Control | QoS | Link Status | ID | Speed | Flow Control | QoS | Link Status |
| 25E | Auto | Enable | Normal | Down | 26F | Auto | Enable | Normal | Down |

Figure 2. Sample port settings interface of a web smart switch.

➤ **Simple Point and Click Troubleshooting**

Management features in a web-based switch isolate and track problems in the network. Packet errors, faulty transmissions, port status, and traffic congestion can affect all users. Support for a Web Management Utility means these switches can alert an administrator of trouble, to either local or remote locations. Web-based Smart switches help keep small problems from becoming larger ones.

➤ **Network Segmentation For Improved Network Performance and Security**

Web Smart switches support VLANs. Implementing VLANs can provide network segmentation to improve network performance. VLANs can be configured for a single switch, or for multiple switches. VLANs can be used to control traffic flow and ease the administration of moves, adds, and changes on the network, by eliminating the need to change physical cabling.

End nodes that frequently communicate with each other are assigned to the same VLAN, regardless of their physical location on the network. Logically, a VLAN can be equated to a broadcast domain, because broadcast packets are forwarded to only members of the VLAN on which the broadcast was initiated. The primary utility of using VLANs is to reduce latency, using faster switching instead.

Security: Security is also improved with the reduction of opportunity in eavesdropping on a broadcast network because data will be switched to only those confidential users within the VLAN.

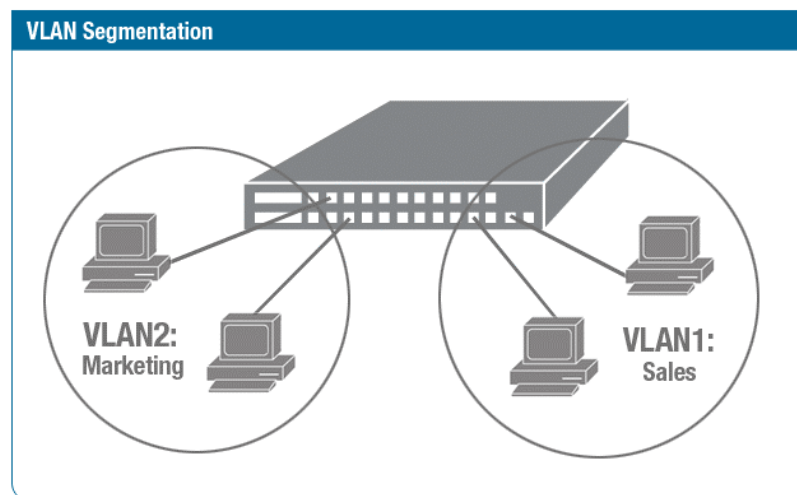


Figure 3. Security is enhanced because no traffic can be passed or accessed between ports not belonging to the same VLAN group.

Cost Reduction: A VLAN can be used to create multiple broadcast domains, thus eliminating the need of expensive routers.

802.1Q VLAN: The VLAN tagging option is a standard set by the IEEE to facilitate the spanning of VLANs across multiple switches. (Reference: IEEE Std 802.1Q-1998 Virtual Bridged Local Area Networks.) Standards-based support of 802.1Q VLANs means that a switch will interoperate with other vendor's switches in a multi-vendor environment.

Prioritize Delay-Sensitive Network Traffic

Network problems may cause loss, delay, or misdirection of traffic. Quality of Service (QoS) is a key component for today's networks and web smart switches can provide it to any size business. QoS mechanisms help administrators solve the problems inherent in unpredictable network traffic by classifying and prioritizing incoming and outgoing packets. Using web smart switching hardware that facilitates QoS, IT administrators can help maximize their switch implementations, relieve network congestion, and better meet guaranteed minimum delays.

QoS allows managers to set priorities and decide, for example, that network traffic involving voice or video should be given bandwidth ahead of Internet traffic. It allows managers to make value judgments about the importance of specific applications and the network traffic they generate.

Given today's high-end, wire-speed non-blocking managed switches, prioritizing traffic may no longer seem necessary. But converged voice and data service—which requires guaranteed minimum delays and assured bandwidth—increases network congestion even further. By implementing QoS, administrators can manage network congestion more effectively. Many companies are reluctant to invest in expensive managed switch equipment, but now with the availability of web smart switches, IT administrators and managers have a cost-effective alternative for network switching with QoS.

➤ **Higher Capacity Links for Higher Additional Bandwidth**

What do you do when you are faced with having to boost bandwidth and uptime while keeping within tight budget constraints? Cost and downtime considerations often rule out massive upgrades to network infrastructure. At the same time, doing nothing may not be a good option either, since existing infrastructure may not scale to meet bandwidth requirements. Link aggregation (or port trunking) helps address these challenges for additional bandwidth.

Link aggregation allows the network's backbone speed to incrementally grow as demands on the network increase, without having to replace everything and buy all-new, more expensive hardware. Link aggregation combines the datastream multiple Ethernet ports into a single high-speed virtual link. Link aggregation is most commonly used to link a bandwidth intensive network device or devices, such as a server or another switch, to the backbone of a network.

The link aggregation also provides inherent, automatic redundancy on point-to-point links. Should one of the multiple ports used in a link fail, network traffic is dynamically redirected to flow across the remaining good ports in the link. The redirection is fast and triggered when a switch learns that a media access control address has been automatically reassigned from one link port to another in the same link. The switch then sends the data to the new port location, and the network continues to operate with virtually no interruption in service.

➤ **Monitor Network Traffic with Port Mirroring**

Port Mirroring is a method of monitoring network traffic that forwards a copy of each incoming and/or outgoing packet from one port of a network switch to another port where the packet can be studied. It enables the manager to keep close track of switch performance and alter it if necessary. You can attach a monitoring device to the mirrored port, such as a sniffer, to view details about the packets passing through the first port. This is useful for network monitoring and troubleshooting purposes.

Deploying Network Smart Switches

Web Smart switches have grown significantly in popularity and deployment in recent years because of the many clear benefits they offer. They are cost-effective alternatives to higher priced, fully managed switches and are ideal for deployment in small business networks, branch offices, or wiring closets. Following are some applications that benefit most from the use of web smart switches.

Voice over IP (VoIP) Deployments

When adding VoIP to IP networks, more predictable and guaranteed IP service is required. Given the sensitivity of voice traffic to latency and loss, it is very desirable to give voice traffic priority over data traffic. VoIP requires advanced bandwidth management for prioritizing other traffic and guaranteeing bit rate for voice connections.

A typical network environment carries a broad mix of data traffic. This includes bursty data applications, such as e-mail and the web, with streaming real-time applications such as voice. VoIP demands consistent bandwidth allocation and minimal delays while data applications have variable and unpredictable bandwidth requirements.

Thus, a QoS system that enables VoIP optimization is needed.

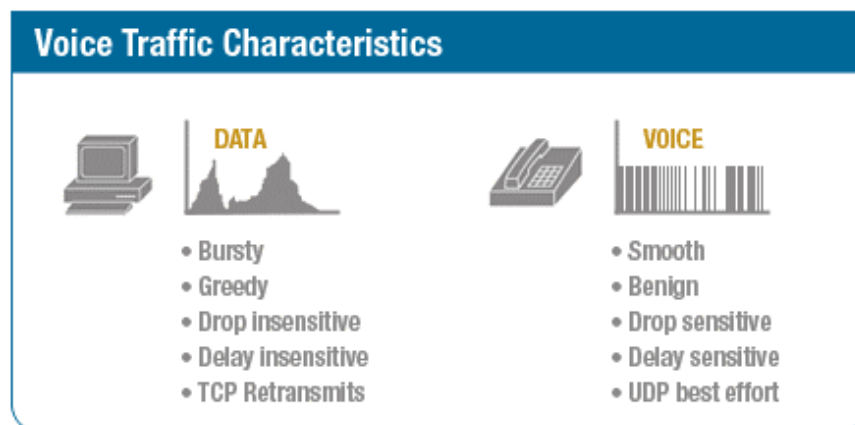


Figure 4. Voice traffic is highly sensitive to latency and packet loss

Web Smart switches that support 802.1p QoS can help to ensure that VoIP packets are handled with higher priority than data. Consider the example in the diagram below. In

this scenario, voice traffic travels over the same network as data traffic, with the latter consuming the majority of bandwidth. The lack of prioritization for voice traffic can result in degraded or unusable telephony service for endpoints such as IP phones. Implementing 802.1p QoS prioritization by using web-based smart switches addresses the problem of traffic latency and loss, giving higher priority to delay-sensitive voice traffic.

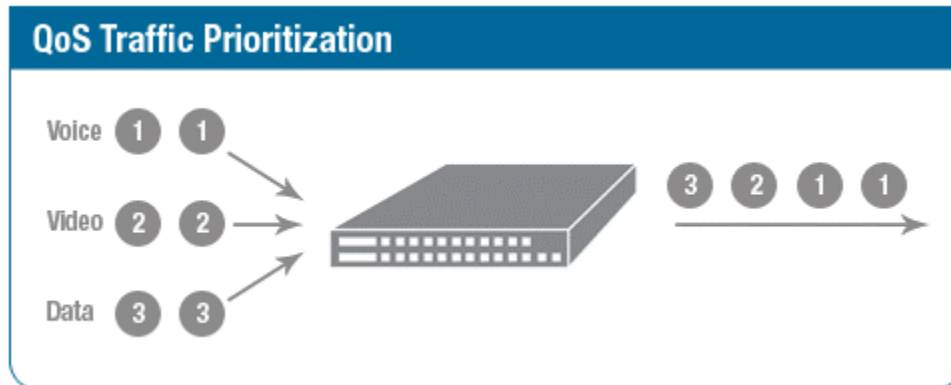


Figure 5. Prioritization of delay sensitive traffic using 802.1p.

Why not implement a fully managed switch instead of a web smart switch? In many network applications, implementing a fully managed switch—with support for additional features such as IP multicasting, Access Control List, 802.1x, SSH, SSL, TACACS, and other features—may not be cost-effective and may actually be an overkill. After assessing budgetary and network design requirements, a web smart switch may be more than sufficient for a particular network application.

Higher Bandwidth Server Applications

Company networks typically connect large numbers of users with one another and with server farms over a backbone such as Gigabit Ethernet. As the company grows, two things become increasingly likely. As the number of users grows, so too does the likelihood of backbone saturation. A tenfold increase in backbone capacity would provide more than enough bandwidth, but also would require the replacement of some equipment. In many cases, simply doubling backbone capacity would provide sufficient capacity, and allow the use of current hardware.

Link aggregation is an inexpensive way to set up a high-speed network backbone that transfers much more data than any one single port or device can utilize. By aggregating two links between each of the switches in the core of the network, we can double network capacity with no additional hardware.

Link aggregation is not just for the core switching equipment. Network interface cards (NICs) can also sometimes be trunked together to form network links, beyond the speed of any one single NIC. For example, this allows a central, high-end server to establish a 2-gigabit connection using two 1-gigabit NICs trunked together. High-end servers today can saturate a single Gigabit Ethernet link, but are not quite up to 2-Gbit/s rates. The low-cost addition of a second Gigabit Ethernet NIC, along with link aggregation support in

the NIC driver, provides twice the bandwidth as well as redundancy. If one NIC fails or a cable is cut, traffic automatically moves across to the remaining active link(s).

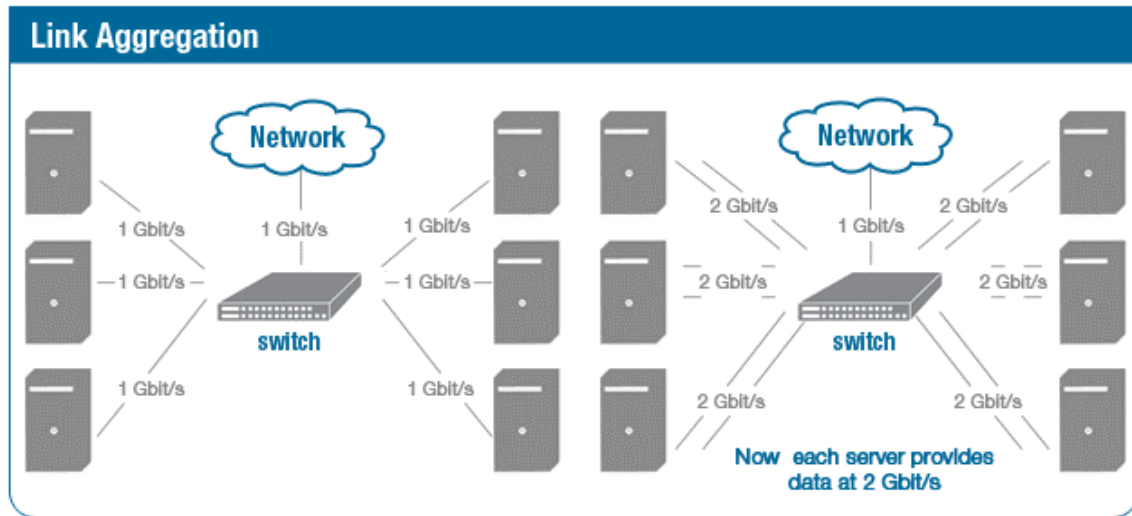


Figure 6. Before: Link Aggregation is not implemented. After: Link Aggregation is used to increase link capacity to servers.

Again, for this particular network server application, implementing a higher priced, fully managed switch may be cost prohibitive and excessive. Implementing a web smart switch may be more than enough.

Remote Management of Web Smart Switches

Web smart switches provide a built-in browser interface that lets you configure and manage them remotely using a standard Web browser such as Microsoft Internet Explorer or Netscape Navigator. The web interface also allows for system monitoring of the switch. Some web smart switches also support a Web Management Utility, which can alert an administrator of trouble, to either local or remote locations.



D-Link Web Smart Switch Solutions



DES-1526

Web Smart 24-Port PoE 10/100 + 2 Combo Gigabit Copper/SFP ports Switch



DES-1316

Web Smart 16-Port 10/100 with 8 PoE 802.3af ports Switch



DES-1226G

Web Smart 24-Port 10/100 + 2 gig Switch



DES-1250G

Web Smart 48-Port 10/100 + 2 Gig Switch



DGS-1216T

Web Smart 16-Port 10/100/1000+2 combo SFP Switch



DGS-1224T

Web Smart 24-Port 10/100/1000 + 2 combo SFP Switch



DGS-1248T

Web Smart 48-Port 10/100/1000 + 4 combo SFP Switch