

**Small Business Stackable Switch White Paper January 16, 2001**

Today's fast-paced global business arena, spurred by the Internet and World Wide Web (WWW), has changed the ground rules for small offices, requiring them to work faster, be more responsive to customers, and outpace a worldwide range of competitors. At the same time, the Internet and WWW have also provided new ways for small offices to not only survive ? but thrive ? in these market conditions.

To take advantage of today's unprecedented opportunities, small offices are deploying larger networks, higher-performance personal computers (PCs) and servers, and resource-hungry client/server applications that consume large amounts of bandwidth to support Internet- and/or intranet-based customer transactions or other business activities. At the same time, small offices are facing the growing challenge of providing users with sufficient bandwidth to perform day-to-day activities such as:

- Accessing e-mail, the Internet, and the company intranet
- Fetching image-enhanced documents
- Accessing graphics-intensive files
- Conducting unified voice/data messaging and Internet telephony activities

Stackable switch technology offers a solution for improving network performance, relieving bandwidth bottlenecks, while allowing small offices to preserve their investment in their current network infrastructure. Stackable switch technology also offers advantages in performance and provides the framework for utilizing evolving technologies, such as Gigabit Ethernet, as they become available.

This White Paper explains stackable switching technology, its origins, and its advantages. This Paper also identifies the features to look for in a stackable switch.

The History of Stackables

Historically, the stackable concept has been the preferred method of moving data between different nodes and devices on larger networks (more than 20 users). First introduced in network hubs, the stacking solution proved immediately successful for many reasons, particularly those of flexibility and price.

With the advent of the network switch, the stackable concept became popular once again. Unlike hubs, which are designed to share the available bandwidth through port bandwidth degradation, a stackable switch provides full bandwidth to each of the ports on the switch. For example, a heavy-traffic hub with 16 10/100 ports might forward as little as 6.25 Mbps per port, while a full-duplex switch can move close to 200 Mbps of data on each port.

What is a Stackable Switch?

Stackable switches are single-configuration switches that can be stacked and interconnected through proprietary ports. The concept of stacking, however, is more than just physically placing one switch on top of another or connecting some switches using a proprietary connection.

The essence of stacking starts with bandwidth. In a stacking arrangement, the connection between any two switches must provide future-proof bandwidth to prevent oversubscription as additional switches are added. For this reason, stackable switches that have a high-performance, high-availability uplink port can create a fat-pipe connection between cascaded switches that boosts the backbone bandwidth, eliminating backbone bottlenecks and network-looping issues.

A stackable solution should also free users from the yoke of having to choose between performance and price. Unlike chassis-based solutions, which require a significant initial investment of the physical chassis, truly stackable solutions should allow users to buy only the number of ports required at the time of purchase, with the ability to upgrade to additional ports at a later date. (This advantage was one of the key reasons contributing to the popularity of stackable network hubs.)

Additional benefits derived from a scalable stacking technology include:

- Seamless migration from 10 Mbps to 100 Mbps to 1000 Mbps (1 Gbps).
- Easy expansion to match an organization's future networking requirements. For example, you can readily expand network size (number of nodes), and performance (bandwidth) in incremental steps, maintaining interoperability throughout.
- The flexibility to redeploy network resources if and when the need arises. Scalable stacking technology also makes it easy to add switches to support more users, thereby providing greater bandwidth and protecting against network downtime. In this way, small office can respond to business changes while obtaining peak performance from existing infrastructure.

The Challenges of Network Growth

In assessing your own need for scalable solutions, consider the potential impact of the following industry-wide trends on your network.

Trend	Impact
Deploying high-performance PCs as clients and servers	Today's Pentium III-based clients and servers can place significant amounts of information on the network.
Increasing reliance on client/server solutions	More and more applications are being installed on servers rather than on desktop PCs, greatly increasing the amount of traffic on the network. At the same time, the applications themselves are requiring greater bandwidth. This trend will accelerate as small offices increase their reliance on resource-intensive applications such as distributed data bases, e-mail supporting multimedia attachments, CAD, audio and video transmissions, groupware and push technologies.
The avalanche of IP traffic	The increasing dependency on the Internet and intranets as business tools means that large files are uploaded and downloaded frequently over the network. In fact, the widespread popularity with the Internet and Web browser-based applications has made IP the primary protocol on the small-business intranet.
Dramatic rise in backbone traffic	In the past, data traffic flow within the workplace followed the "80/20 rule," which held that 80% of network traffic stayed within the workgroup and only 20% was traffic to and from the server. In a recent survey, Dataquest, a market-research firm in San Jose, CA, found that the deployment of applications on the server, coupled with the increasing use of intranets and the Internet, has inverted the 80/20 rule, with 80% of the network traffic making it to the server and only 20% remaining local.
Architectural shifts	The trend of deploying "thin clients" ? desktop devices equipped with a minimum of computing power ? places an additional strain on network capacities. Thin clients need to contact the server continuously, not only to download the initial applications, but also for applets that change fonts or create tables.
Consolidating networks	As older technologies are phased out within an organization and those legacy users migrate to Ethernet, the number of people sharing Ethernet bandwidth increases.

The Expense of Network Downtime and Lag Time

As a small business increases its dependency on the network, its employees ? and its customers ? become less tolerant of LAN downtime and sluggish response times. At a small business that sells musical CDs, for example, operators taking telephone orders typically interact with the corporate database and with the database of an outside credit-card company. When demand on the system is high (just after a radio advertisement is aired or following a catalog mailing, for instance), response time slows. A delay of a second or two is irritating, but a delay of 15 seconds or more means the small business risks losing the sale and the customer. This example illustrates how the network plays an integral role of how a small company conducts business. Not many companies can live without it.

In fact, a survey conducted by the International Data Corp., a market-research firm in Framingham, MA., found that nearly 75% of managers consider their networks to be critical to their company's operations. Moreover, network downtime can be exceedingly expensive. In fact, by some accounts, network downtime results in financial losses that cost companies hundreds or even thousands of dollars per hour.

Clearly, small offices have to provide more capacity and higher reliability to their networks. But because the networks have become critical to the company, managers can't just yank everything out and start over (much as they might like to). Hence, the window of opportunity for scalable stacking technology.

Features to Look for in a Stackable Switch

Stackable switches offer a variety of features that may affect their suitability in a small business environment. The following sections describe some of the key features to consider before making a switch purchase decision.

Backplane Speed

Traffic between switches travels along a high-speed backplane. Therefore, it is important to use stackable switches that employ fast backplane speeds to maintain the highest performance to the desktop ? especially as the network grows.

Load Balancing

Load balancing refers to a switch's ability to distribute network traffic evenly and intelligently across the backbone that exists between two switches. In this way, load balancing ensures that traffic is distributed efficiently and effectively across the stacking connections.

Fault Tolerance and Redundancy

Fault tolerance and redundancy are important switch functions. With these features, the failure of one link causes the switch to automatically reroute packets to one of the remaining operational links, usually without users noticing the exchange. In this way, fault tolerance and redundancy ensure network integrity and avoid network segregation if a link goes down. The switch you select should also support "intelligent" fault-recovery capabilities, which allow it to

start passing data through the failed port once that port becomes operational.

Reliability

Access to information is critical to any company's success. A switch's reliability, therefore, offers companies the security of network uptime along with the timely delivery of information.

Ease of Installation and Maintenance

Faced with the challenges of creating and maintaining a reliable, high-performance network infrastructure with limited personnel and budget, small offices require equipment that is easy to install, manage, and maintain; cost-effective; scalable; and dependable. Choosing a stackable switch that offers ease of use and set up, therefore, should allow any level IT personnel to install and configure the switch.

Seamless Integration

Another important feature to look for in a switch is its ability to integrate new technology seamlessly. A well-designed switch allows small offices to adapt easily as their computing needs change and new technologies emerge.

Conclusion

Implementing a stackable switching system can help small offices migrate from shared to switched networks while maintaining current performance, protecting existing infrastructure investments, and establishing a foundation ready for future network.

Stackable switches offer an attractive way to relieve bandwidth bottlenecks and provide faster response times for networked PC users. A quick and cost-effective solution, stackable switches are also easy to deploy in an existing or new network environment. Installation is simply a matter of plugging the switch in and attaching devices to its ports. Bandwidth problems are promptly resolved without wiring changes or any upgrading of individual desktop PCs. This ease of configuration is comparable to hubs, making stackable switches an appealing choice especially for companies with small LANs.

With new switches designed specifically for connecting devices and desktops, small offices no longer have to invest in expensive and inflexible switches engineered primarily for larger workgroup environments and backbone implementations. Instead, they can deploy scalable, affordable switches that increase the aggregate bandwidth of the network by boosting throughput to the workgroups that need it most.