Pumping up the WAN

WAN optimization and acceleration products reduce cost and bandwidth requirements while speeding throughput.

Today's data center managers are looking for improvement in their operations. In particular, they want to reduce energy costs, make more efficient use of data center space and cut administration loads. These objectives make data center consolidation a continuing trend.

After years of moving toward distributed data architecture, many companies are now seeking ways to bring users back to the centralized infrastructure. Until recently, placing storage, applications, servers and other resources in branch offices was reasonable given the high cost and latency problems of WAN connections.

But as the amount of data and resources grows, many IT departments are becoming overwhelmed having to support far-flung satellite data centers. They also find that they are losing the economies of scale as well as the reliability, scalability and availability of a central computing resource.

Since the sticking point is often the WAN, it's becoming apparent to many organizations that they could profit from optimizing and accelerating the network. This would allow users throughout the organization to connect directly to the main office or central data center.

Fortunately, a solution is at hand. WAN optimization and acceleration devices accelerate a broad range of applications accessed by distributed networks. They accomplish this by eradicating redundant transmissions, staging data in local caches, compressing and prioritizing data, and streamlining chatty protocols.

Boost Network Performance

WAN optimization application delivery to end users, reduces network traffic and improves network management capabilities. It can also result in increased intrusion prevention and a more secure network plus easier compliance with business and industry regulations.

The solutions are typically implemented via a hardware appliance or software on the network that classifies traffic to help data flow more freely – thereby speeding operations. (Note: New host-based and virtual WAN optimization technologies are also available and gaining in popularity.)

These solutions allow businesses to consolidate resources such as storage while improving backup and recovery. They also reduce support costs by eliminating travel to branch offices and possibly even limit the number of licenses needed for some software packages and operating systems.

While WAN optimization architecture does require an investment in both remote and central data center appliances, it typically results in significant cost savings. Leading WAN optimization solution providers include Blue Coat Systems, Cisco, Radware and Riverbed Technology.

WAN Optimization Architecture

When comprised of dedicated appliances, a secure WAN optimization system includes devices at each end of a WAN connection. Its primary function is to provide WAN reliability and improve bandwidth utilization.

Cisco's Wide Area Application Services (WAAS), or WAAS, the company's WAN optimization and acceleration product set, offers the option of a blade form factor for its integrated services routers. According to the firm, keeping WAN optimization in the router eliminates the need to deploy acceleration appliances throughout the infrastructure.

Companies also offer WAN optimization through software clients that reside on the desktop. Mark Weiner, director of marketing for Data Center Solutions at Cisco, says WAN optimization companies and products "seek to provide the acceleration technology that addresses all popular enterprise applications on the greatest number of form factors to meet the needs of different organizations and users."

In the most common configuration, one large WAN optimization appliance is installed in the central data center. Then each branch office installs a smaller appliance between its LAN and the WAN connections.

In a completely centralized structure, the LAN in the branch office merely acts as a conduit, collecting data from end users and transmitting it to the WAN acceleration appliance. It, in turn, sends the data on via the WAN to the central data center.

In the reverse trip, data travels over the WAN, arrives at the branch office WAN acceleration appliance and is then handed off to the LAN. From there, a server distributes it to end users.

In some configurations, however, servers on the LAN support some local services such as print services. Some WAN optimization appliances, such as Cisco's Windows Server on WAAS, combine WAN acceleration and server functionality on the same device.

Users who are working offsite can take advantage of client-based WAN acceleration software. Working with a subset of the features provided in the appliance versions of accelerators, PC-based systems provide much faster throughput to enterprise applications such as Customer Relationship Management (CRM) or HR systems than they would get without acceleration.

Keep in mind, when remote users go to a branch office where a WAN acceleration appliance is active, the mobile software version detects it and defers acceleration to the more effective hardware version.

Multifunctional

The most common purpose of WAN acceleration and optimization is to speed the connection between users and the data center. Still, it can also be used for accelerating data transfer to backup systems, centralized storage and disaster recovery data centers.

All of these transfers require transmitting a massive volume of data, sometimes over hundreds of miles. Without WAN optimization, many companies that do such large batch data transfer operations have to figure out the least impactful way to do so.

That might mean purchasing and dedicating extra bandwidth to the operation or performing the operation during off-peak hours. It can also require tolerating network performance degradation during the operation and, most commonly, restricting the number of backups to the minimal level they deem acceptable.

With WAN optimization, many of those compromises become unnecessary. "We've seen organizations that perform only one or two backups a week," says Cisco's Weiner. "That's all they felt they could do given their bandwidth."

After installing a WAN accelerator, "They moved to a routine of multiple backups a day without increasing bandwidth resources."

How Acceleration Works

WAN acceleration is not a single technology. Rather, it is a set of technologies all aimed at increasing the effective WAN bandwidth and improving remote users' experience with applications that run over the WAN.

Some of the technologies – such as data compression – are not new. Still, the two-appliance (pitcher/catcher) architecture makes processes such as the compression/expansion operation much more robust.

Another aspect of WAN optimization is application-specific acceleration. This feature is particularly helpful for applications that use protocols optimized for LANs as opposed to WANs. Many such applications would not even benefit from adding bandwidth.

"You can increase the size of the connection all you want," Weiner says. "But if the application is not made to run over the WAN connection, you're still going to have serious problems."

In a process called "protocol spoofing" or "protocol optimization," the sending appliance replaces the native application protocol with a more network-friendly protocol. The receiving WAN appliance reverses the process, returning the file to the native protocol.

One common example is Microsoft file and folder browsing, which uses Common Internet File Services or CIFS. While fine for LANs or for use in a single PC, CIFS can run slowly over a WAN.

"When sent over long distances, network latency combined with CIFS chattiness results in poor file transfer performance," says Mark Urban, senior director of product marketing at Blue Coat Systems. He points out that to transfer a single CIFS file from point A to point B requires hundreds or even thousands of transmissions.

"On a LAN, the data transfer happens so quickly, people rarely notice any problems," he says. But on a WAN, "It often appears to users as the difference between talking to someone in the same room and talking to someone on the moon; they experience annoying delays."

WAN acceleration vendors are working with software makers to certify that their appliances support the applications and participate in protocol licensing programs to assure compatible engineering. And many generic applications, such as some sales or inventory databases, use Hypertext Transfer Protocol (HTTP), which many WAN acceleration appliances support.

Eliminating Redundancy

WAN optimization appliances also reduce network traffic by eliminating redundancy. They can look inside files and note when the same or similar data was recently sent.

When the appliance identifies redundant data, instead of transmitting, it instructs the receiving appliance to access a cached version of the file. This is especially helpful if the same file is being sent to multiple users.

"If 10 people are receiving the same PowerPoint presentation, but you only have to send it one time, you've reduced your bandwidth requirements for that transmission by about 90 percent," says Apurva Davé, Riverbed's vice president of product marketing.

WAN optimization appliances can also recognize small changes in files and transmit only the alterations. They then notify the receiving appliance to reassemble the document, adding the changes to the cached version.

"If someone substitutes one or two slides in a PowerPoint file, it would be very inefficient to resend the entire file over the WAN," Davé says. "Transmitting only the new slides greatly reduces network traffic related to the file."

Because it recognizes data at the byte level, WAN optimization appliances can usually recognize redundant transmissions even if they are sent in a different application than in the original transmission. This could help if someone sends, for example, a Microsoft Word file that contains the same text or tables that were previously sent on a PowerPoint slide or Excel worksheet.

WAN optimization appliances also have other tricks to reduce redundancy. For example, branch office WAN optimization appliances can limit the amount of video that users download from headquarters by receiving and broadcasting a single live stream to multiple users simultaneously.

Network Usage: Taking Control

Another way to reduce bandwidth requirements is to restrict the non-business data that users are allowed to transmit. For example, some companies use WAN optimization appliances to limit the amount of video traffic or music downloads.

"The impact of recreational traffic is the biggest unknown at many organizations," Urban says. "The ability to control that activity can reduce the overall required bandwidth and also allow IT to make reasonable predictions about bandwidth, storage and processor requirements."

WAN optimization appliances have other features which can improve network performance. For example, they can prioritize traffic based on a wide number of parameters including history of data usage. The appliance can also limit the amount of data any department, any individual user or any type of user can send or receive in a given period of time.

Return on Investment
The controls provided by the features in WAN optimization products translate into real cost savings. So while one aspect of the WAN optimization ROI equation is reduction in IT capital expenditures, the streamlined processes and procedures, enabled by the technology, always represent a large portion of the cost savings pie.

For example, centralized control reduces or eliminates the need to provide expensive support to branch offices. WAN accelerators can also eliminate peaks and valleys of performance that may sour users to a centralized architecture.

The more users buy into the architecture, the more they will be willing to move their distributed resources to it and the more cost effective the centralized data center. And restricting recreational usage of the WAN may make users more productive in general.

Other ROI issues include cost savings from moving from direct-attached storage at each branch office to a centralized Storage Area Network (SAN). The reduction in need for branch office servers – and resulting real estate, heating and cooling requirements – also saves money.

Add to this the reduced danger of privacy breaches and the resulting legal and public relations costs. This is because data at one location can be more readily controlled.

When the tech research firm Forrester considered only savings related to branch-server hardware, including maintenance contracts, administration costs, and refresh and upgrade costs, it estimated an ROI in about 10 to 11 months.

Load Balancing
While WAN optimization and acceleration products allow businesses to make more efficient use of their bandwidth, there are times when companies simply have to dig into their budgets and lease an additional WAN connection.

Radware's LinkProof allows organizations to utilize a WAN connection they may already have but rarely use. "Many companies lease a backup WAN connection," says Eitan Bremler, Radware product marketing manager. "But what they're mostly paying for is insurance, not infrastructure."

Leasing a backup connection does make sense. Bremler points out that on average, companies experience eight to nine hours of WAN outage a year. But if the backup connection is sitting idle for the rest of the time, the bang for the buck is very muted.

LinkProof provides load balancing among multiple WAN connections. This allows organizations to use their entire WAN infrastructure. However, if one of the connections goes down, the appliance automatically moves the traffic from the offline WAN to the remaining WANs.

Obviously, to do this effectively, organizations will have to lease enough bandwidth to maintain essential services even if one connection goes down. But LinkProof does allow the organization to prioritize usage – for example, by user, by department or by application of the WAN during an outage.

WAN Optimization Benefits

The improvements resulting from WAN optimization are appreciated by IT managers and end users alike. These include:

- Faster File Accessibility- Caching capabilities allow someone that utilizes the same files repeatedly to be able to access them more quickly.

- Increased Speed Between Multiple Office Locations- WAN solutions boost network speed between remote locations, accelerating file transfers and network-based communications such as e-mail.

- Better Performance of "Non-Affected" Applications- Because bandwidth use is maximized, apps that are not directly affected by optimization solutions appear to run faster.

- Faster Data Recovery- The ability to increase network response time capabilities enable users to rapidly regain access to critical applications, thereby boosting productivity.

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