WHITE PAPER

Taking control of your bandwidth budget

Introduction

In the midst of changing economic times, corporations are taking long, hard views as to what corporate budgets are buying, and where to save money. Corporate networks, however, are often overlooked as a corporate resource that needs financial oversight. Many companies upgraded their internal network infrastructures during the middle and late nineties. The result is that many companies have as much as 100 mbps switched to the desktop, leading to the erroneous belief that bandwidth—for both LANs and WANs—is somehow "free."

Within a campus environment, the idea of free bandwidth may not be too far from the truth—at least until video and audio over a LAN become more widely used. Once a network extends beyond the confines of a local campus and becomes *a wide* area network, however, bandwidth most certainly is *not* free. In fact, WAN bandwidth is very expensive. To make matters worse, many companies have little information from which to justify and manage their WAN bandwidth "budget." In tight economic times, watching the monthly charges for WAN bandwidth add up can quickly induce a company to manage these costs more closely. Knowing how, when and why WAN bandwidth is being used is vital to WAN management.

Once companies understand the need to manage their WAN bandwidth, the next problem is finding the best tools to identify and measure WAN usage. The most useful tool will not simply measure how much is being used, but will also identify who's using the bandwidth, when they're using it and what they're using it for. Only then, with a complete picture of WAN utilization, can companies make precise, educated and informed WAN utilization decisions that will add true business value—and save money at the same time.

Finding the true cost of WANs

Like many capital expenditures, once a LAN infrastructure is paid for, it becomes a reasonably inexpensive commodity. A LAN is similar to a durable good in that it can be used extensively for a long time. An operating expense such as a WAN, on the other hand, is more like a consumable in that a company must pay for bandwidth month after month, year after year. Further, the cost of a WAN is in direct proportion to the amount of bandwidth allocated by a carrier. To cut costs and remain efficient, it becomes the job of a prudent IT department to make sure that the correct traffic is using the WAN and to allocate the right amount of WAN bandwidth for necessary business use, enough to carry business-critical traffic without providing excessive, wasted bandwidth.

Ultimately, WAN bandwidth must be treated as any other budgeted commodity; spending WAN bandwidth on traffic not directly related to business goals is wasteful and can cost a company a significant amount of money. Just as a company's accountants would rightfully question a department's practice of purchasing two computers every time only one was needed, so should a network team question any use of the WAN that can't be linked directly to a business need.

Further, responsible financial management requires more than simply knowing how much money was spent in a fiscal quarter or year-expenditures must relate to specific line items. Similarly, network teams need to know not just how much bandwidth was used during any given period, but more importantly, which applications were using the most bandwidth, and at what times.

It's relatively easy to find out how much aggregate bandwidth is being consumed on a link, but this information is not enough to make an intelligent business decision as to the link's use. For instance, if a link is being used at 85 percent capacity, it may need to be upgraded to provide enough headroom for heavy application use. It is entirely possible, however, that this same link may not need upgrading if it is carrying unnecessary traffic—or carrying necessary traffic at unnecessary times.

For a network team to determine what action needs to be taken with a link, it's important to know how the link's bandwidth is being used. Information that would be very useful to a network team would include knowledge of what specific applications are consuming bandwidth, where the applications are originating from, and when they are consuming bandwidth. If an improperly scheduled backup is consuming the link's bandwidth, it can be rescheduled to off-hours, freeing prime-time bandwidth for time-sensitive business transactions. But a network team can't reschedule a backup if they don't know that it has been mis-scheduled. Knowing that bandwidth is being consumed by a backup, as well as when and what servers are initiating the backup, allows a network team to make informed networking decisions. Without this information, a decision to upgrade the link would have possibly fixed the problem, but it would have been unnecessary—and costly.

It's also important for network teams to determine if bandwidth is being eaten up with non-business traffic. Having poor application performance across a WAN due to employees playing network games is generally an inappropriate use of corporate bandwidth. Although there may always be some non-business traffic on a corporate WAN, finding heavy abusers is key to keeping bandwidth free for the applications that really count. Without the right tool, however, getting this type of specific information about WAN bandwidth consumption can be a daunting task. There are many tools available to help manage networks, but finding one that is appropriate for managing WAN bandwidth is imperative.

Tools for WAN accountability

Networking tools have typically fallen into one of three groups: media-, device- and packet-focused tools.

Media-focused tools

Media-focused tools are important for analyzing the physical infrastructure of a LAN/WAN; they're generally used to discover physical problems with a link. These tools find problems such as breaks in a wire, signal loss from bad connections and other issues that could be affecting the media itself. These tools are invaluable at troubleshooting the "wire" (or the fiber-optic cable for that matter), but media-focused tools do not address the performance of applications over a WAN.

Device-focused tools

Device-focused tools are designed to assist a network team in day-to-day maintenance of a network infrastructure. Typically using SNMP, these tools keep track of routers, switches and nodes on a network, and warn if these items are "unhealthy." Health status is sent to a central console where a symbolic map of the enterprise is displayed. If there is a problem with a node or network device, a warning is displayed on that part of the enterprise map. Device-focused tools are valuable in that they warn of network infrastructure problems quickly; they can often pinpoint which device is broken. By giving a network team instant notification of problems and pinpointing faulty network devices, device-focused tools allow a certain amount of network troubleshooting to occur quickly. Device-focused tools are also valuable as a central location to collect data from various sources and keep track of how devices are operating. Because they are focused on managing equipment and protocols instead of applications, however, device-focused tools fall short of truly solving the problem of managing application usage of the WAN.

While it's necessary to know what is happening with the cabling and equipment that make up an enterprise infrastructure, the task of managing bandwidth usage requires more than an understanding of the network itself. More importantly, it requires an understanding of the applications running on the network. What network teams need is a tool to complement the media- and device-focused tools—a tool that delivers application-level information to augment the equipment status information that these tools are already gathering.

Packet-focused tools

Packet-focused tools capture data packets as they flow across a link. Commonly called packet analyzers, protocol analyzers or packet capture utilities, these tools are among the most commonly used by network teams. Not surprisingly, packet-focused tools are excellent at finding problems in lower-level network protocols. For instance, if there is a malfunctioning network card placing noise on a segment, a packet-focused tool can help find the card.

The ability of packet-capture tools to collect entire packets of data from a network makes them excellent at troubleshooting protocol issues. The amount of data collected by these tools, however, is immense, making them generally unsuitable for 24x7 analysis. Because of their packet focus, these tools also don't track application flows easily; they're of little help to network teams analyzing application history on a given WAN segment.

The application-focused tool

To manage the "bandwidth budget" accurately and effectively, network teams need a tool focused at a higher, application level. An application-focused tool is significantly different from tools traditionally used to analyze a corporate WAN. Instead of providing analysis of media, infrastructure or protocol, application-focused tools are designed to analyze the flow of applications over a link.

Application-focused tools deal directly with the concept of WAN bandwidth budget analysis. A good application-focused tool gathers historical data from the WAN and analyzes the "who, what, where and when" of applications on the WAN, and helps IT departments determine the "why" of WAN bandwidth utilization. Ideally, an application-focused tool shows all of the applications that flowed over a WAN, when they traversed the WAN and which users were accessing these applications. By showing this type of data, a network team can ascertain if a WAN link is being used for business or non-business purposes, and who's using it.

A good application-focused tool can also help manage WAN budgets. For example, frame-relay circuits are commonly used by businesses for key application traffic. These circuits are paid for based on a Committed Information Rate, or CIR. A CIR is the maximum guaranteed level of bandwidth available for use on the WAN circuit. If the CIR is exceeded, then all packets entering the WAN that consume bandwidth in excess of the CIR are marked "discard eligible." These packets are often transferred through the WAN with no problems, but can be dropped at any time. It's common to get wildly varied performance from applications running on a WAN when the WAN link has exceeded CIR; applications can run normally one minute, and then take ten times longer to execute or even time out. This type of intermittent problem is very difficult to diagnose, especially as some applications run differently than others when this type of problem is encountered. An application-focused tool that can "watch" traffic for long periods, and then graph that data against the CIR for a link, provides very valuable data to network teams on when and how often CIR is exceeded.

The ability to graph either single applications or aggregate applications against the same CIR is also useful in an application-focused tool, in that it quickly shows network teams which applications are consuming bandwidth. With this type of analysis, a network team can know not only that CIR is being exceeded, but also which applications are causing the problem. This knowledge helps network teams decide intelligently whether to eliminate, reschedule or tune some applications in order to push their WAN use to more efficient levels.

If CIR on a link is consistently exceeded and the applications that are using the bandwidth are necessary for business, then the CIR may need to be increased—but doing so without knowing the pertinent application information could lead to a wasteful expense. The information needed to make this type of important bandwidth decision is available only from an application-focused tool.

Powerful knowledge: NetworkVantage

Of all the WAN networking tools available today, Compuware Corporation's NetworkVantage is unique in its ability to deliver comprehensive WAN usage information. NetworkVantage uses a passive collection technology that allows it to collect application data 24x7. NetworkVantage analyzes collected data on a daily basis and stores collected data on an MS-SQL database for long-term, multi-month trending.

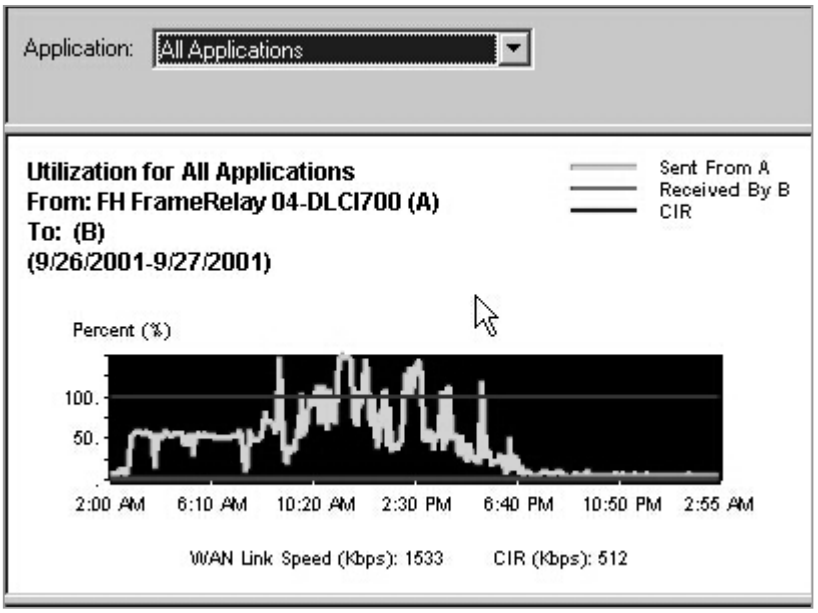

Figure 1.

With its focus on applications instead of raw traffic, NetworkVantage allows a user to display the applications on a WAN link. NetworkVantage discovers more than 2,000 applications plus any number of user-defined applications. Figure 1 shows a NetworkVantage screen shot of WAN traffic over a 24-hour period for one circuit in a frame-relay.

The screen shows a large amount of time where the traffic exceeds the CIR for this circuit. This leads to the possibility of poor performance for applications running during those periods the CIR is exceeded. This link either needs to have its CIR increased (an expensive proposition) or have its traffic reduced. To make an intelligent decision on how to handle this link's usage concerns, a network team needs detailed application data. NetworkVantage helps network managers make those decisions by identifying the total amount of network traffic, which applications are flowing on the link, which servers are being accessed by which applications and when these servers are being utilized.

In Figure 2, NetworkVantage shows that the vast majority of traffic for this link is either from HTTP (web) or AcmeApps, a custom ERP application written for this enterprise. Because of the large amount of HTTP traffic running alongside the mission-critical AcmeApps application, it would be reasonable for a network team to evaluate the business legitimacy of the HTTP traffic. To determine whether the HTTP traffic is legitimate business traffic, however, more analysis needs to be done to determine what web sites were accessed over this link. NetworkVantage allows this drill-down with a few clicks.

Figure 3 shows the web sites and clients that are accessing or being accessed by HTTP for the link in question. On the left is a list of servers running the HTTP application. Clicking on any server shows all of the clients accessing that server using HTTP. Notice that the top server utilized is a business-oriented server for this enterprise. Lower in the list are several servers that are less likely to be business servers. Clicking on any of these servers would show all of the clients that accessed the server. To further examine the traffic, it might be useful to see when a particular server was accessed. For example, in the list of servers is a fantasy football site that may be interesting.

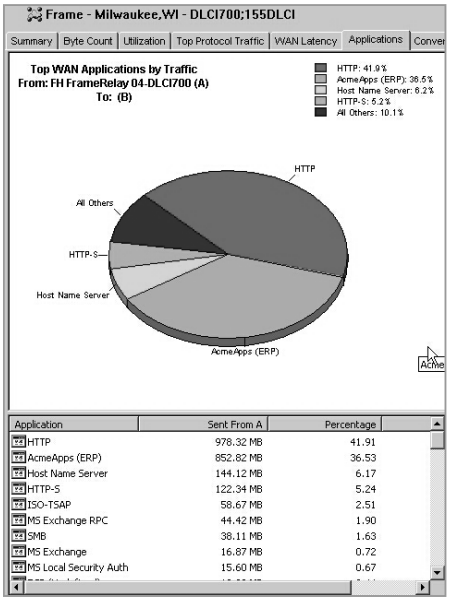

Figure 2.

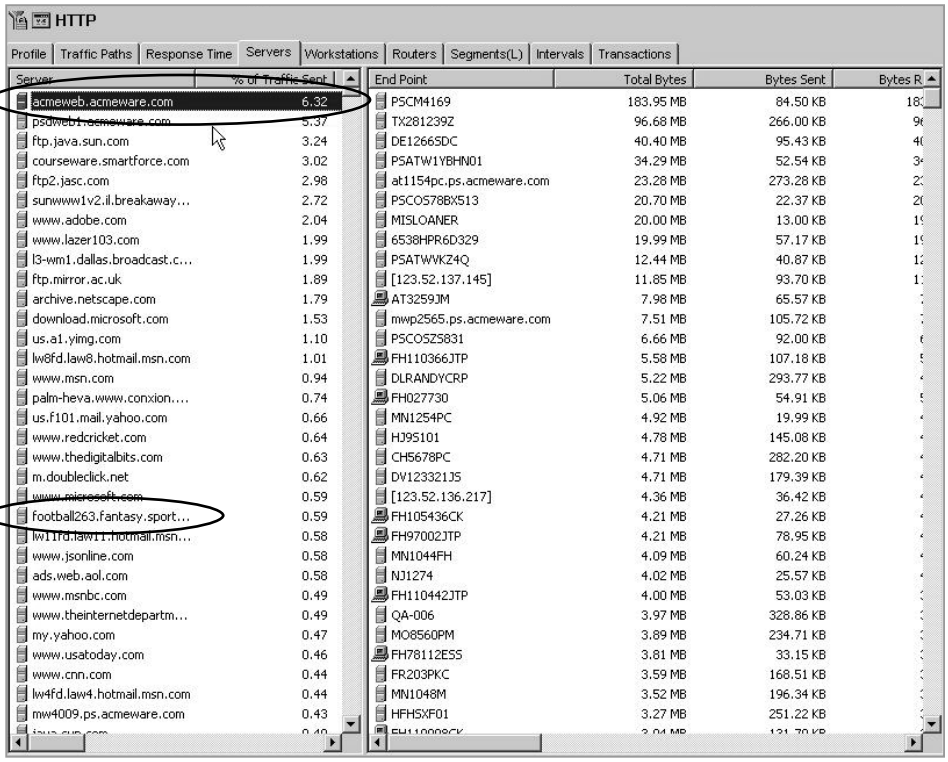

Figure 3.

In Figure 4, a few clicks have enabled the user to show when the fantasy football site was accessed. It appears that most of the traffic was during lunch. It would be up to management to decide if this was acceptable use of a company resource. The point here is not whether fantasy football is business-oriented, but rather that the ability to get to this granularity of data with an application focus is necessary in order to make proper decisions on the business use of a WAN.

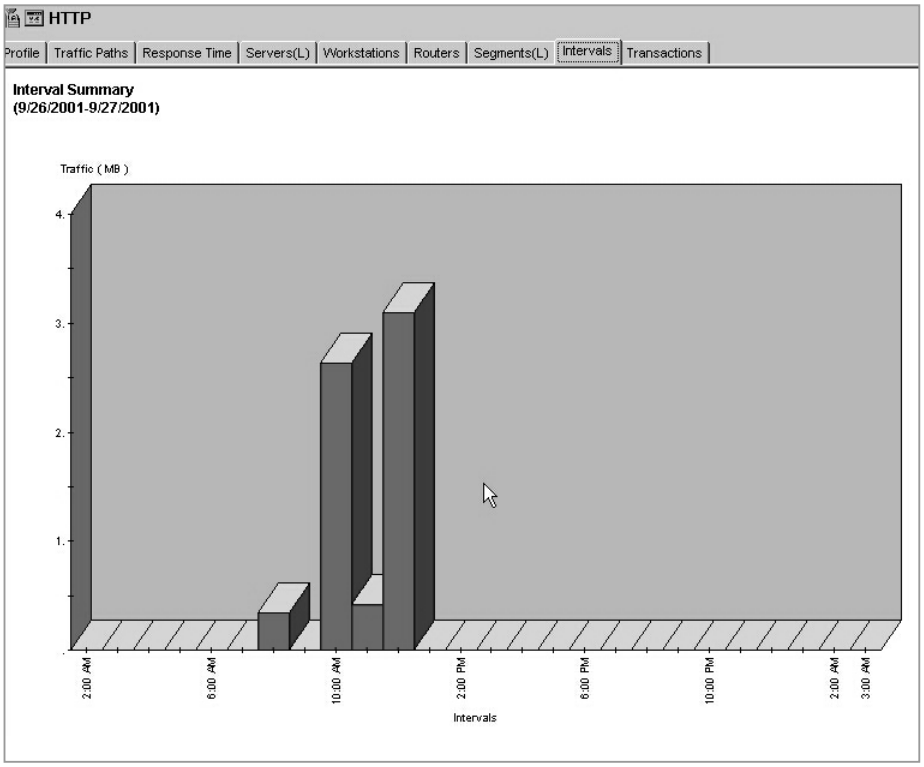

Figure 4.

Further analysis of the link shows that the AcmeApps application has the vast majority of its traffic originating from a single server. NetworkVantage allows the user to see exactly what applications were served from which servers.

Figure 5 shows that the server generating the majority of this application traffic is communicating primarily with four different boxes, including one other server. The server-to-server traffic may be replication or other batch traffic that can be scheduled to a different time. Another solution would be to co-locate other top users with the server. Either move would lower the amount of traffic on the WAN link and could possibly prevent a costly WAN upgrade. Without the information that NetworkVantage provides, finding any solution other than an expensive bandwidth upgrade becomes difficult, if not impossible.

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For more information, please visit http://www.compuware.com/products/vantage/networkvantage/

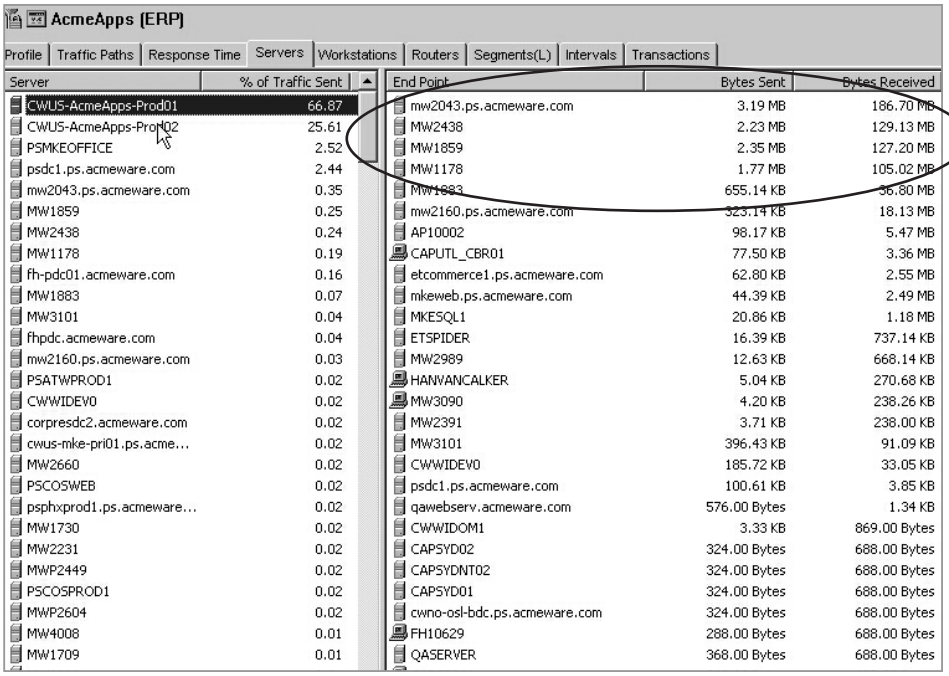

Figure 5.

Because NetworkVantage can display this level of application information over a long period of time, it's possible to determine whether the bandwidth being consumed is a long-term or short-term problem. NetworkVantage also allows network teams to track what part of the month produces the most traffic and where that traffic flows. Information of this type can be used to reschedule processes or relocate servers to eliminate the need to upgrade a link. Without NetworkVantage's application-focused information, a company could make some serious miscalculations concerning WAN usage.

Conclusion

Managing the WAN as a business resource requires the right tools. While important for day-to-day troubleshooting, the traditional packet and framework tools most commonly found in corporate enterprises simply cannot give the right data to make important decisions about how to spend money for the limited "bandwidth budget" available on a corporate WAN. To make wise business decisions requires data centered on the part of a WAN that affects business: the applications. Corporations should strongly consider employing a different type of tool than they are perhaps used to in their WAN environment. A true application-focused tool, like NetworkVantage, allows the WAN to be accounted for and provisioned like any other business resource.

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