DATA COMMUNICATIONS MANAGEMENT

# SMART CONTROL FOR FRAME RELAY NETWORKS: PERFORMANCE MONITORING AND TRAFFIC SHAPING

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INSIDE



## ARE BUSINESSES GETTING THE MOST FROM THEIR FRAME RELAY NETWORKS?

Companies of all sizes depend on their communication network for mission-critical business transactions. Despite the emergence of newer technologies, Frame Relay remains the primary Wide Area Network (WAN) technology utilized. According to the Vertical Systems Group, a Massachusetts-based research firm, there were nearly 35,000 U.S. enterprises using Frame Relay service in 2000. In comparison, there were less than 1,700 using other packet-based services. Despite the emergence of newer technologies, such as ATM or VPN, Frame Relay still has a stronghold in enterprise communication networks.

For companies using Frame Relay, gaining the best performance from their networks is of utmost importance and downtime is unacceptable. With the ever-increasing demands on networks, companies need to get the most out of the bandwidth they have allocated. The wide availability of network resources accessible to employees has added complexity to

**PAYOFF IDEA**

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the issue of network utilization and has made the job of an IT manager even more difficult.

Companies need to be able to ensure that business-critical transactions have top priority over non-essential applications. Does the company need additional bandwidth, or is the available bandwidth being misused? In most cases, the bandwidth is simply being misused; so acquiring more bandwidth is not always the best solution. It is just a matter of effectively managing available bandwidth. Purchasing additional bandwidth results in higher recurring costs; it does not address the real problem: the need to control the network.

The biggest question for network managers is how to control the ebb and flow of these Frame Relay networks. The answer lies in performance monitoring and traffic shaping.

## THE NEED FOR PERFORMANCE MONITORING

For Frame Relay networks, the need for performance monitoring is essential. This is due to growth in the number of branch office users, the proliferation of the Internet, and the widespread use of Web-based gaming and video applications. Performance monitoring takes the guesswork out of effective networking. It enables network managers to view network traffic, identify applications running on the network, and monitor bandwidth usage. Some performance monitoring devices on the market automatically discover all the applications running on the network, providing managers with a window into the WAN. In essence, this allows them to determine if bandwidth is being used by business-critical applications or if Web surfing, online gaming, or other less-critical, but bandwidth intensive, applications are consuming it.

To more effectively utilize bandwidth on Frame Relay networks, performance monitoring is fundamental. Performance monitoring keeps track of network capacity and Service Level Agreement (SLA) compliance. It reassures companies that they are getting the bandwidth for which they are paying. It may even save companies thousands of dollars every month. They may not need more capacity, just more control.

With the proper tools, IT managers can also define service level metrics to examine areas such as availability, PVC delay, throughput, end-to-end application response time, network delay, and server transaction time. Evaluating these metrics helps discover if bottlenecks exist within the network and, if so, where. Without performance monitoring, the IT manager is not able to control network activity.

## CONSIDERATIONS FOR PERFORMANCE MONITORING DEVICES

It is crucial to select a performance monitoring device that provides a window into the Physical, Frame Relay, and Application Layers. This allows monitoring on a per-port basis as well as a per-PVC basis. It also extends this functionality to the Application Layer to provide application performance monitoring. Automatic discovery of network applications, coupled with visibility into each layer of the

network, helps IT managers determine exactly where problems are taking place, as well as the cause of those problems.

In addition to discovering and classifying applications, some devices on the market can also identify applications running within other applications, such as streaming audio running over a Web browser. This extensive application data, along with the Frame Relay and Physical Layer information, provides a complete view of WAN bandwidth.

## NOW THAT COMPANIES SEE THE PROBLEMS, HOW CAN THEY FIX THOSE PROBLEMS?

### Traffic Shaping

Smart decisions come easy once network managers know how their bandwidth is being utilized. Viewing network traffic and identifying potential bottlenecks are not enough. Companies need control. *Traffic shaping* empowers managers to allocate bandwidth and guarantee capacity for business-critical applications.

Traffic shaping provides information to help managers analyze traffic patterns and adjust bandwidth allocation during peak times. Through real-time monitoring of the Frame Relay circuit, network managers are able to pinpoint specific traffic demands and problems, improve voice quality for delay-sensitive applications such as Voice-over-IP or Voice-over-Frame Relay, and shape traffic. With a device that allows real-time measurement of the Frame Relay circuit, changes can be made on-the-fly and with the ease of a keystroke.

### WAN Shaping

The most effective point to integrate an intelligent Frame Relay traffic management solution into a network is on the wide area side. Devices that shape traffic on the WAN provide more information on network bottlenecks by viewing both Local Area Network (LAN) and WAN metrics.

Some traffic shaping products are installed between the router and the switch or hub on the LAN side of the network. This setup is not as reliable as WAN shaping because many Frame Relay metrics are only available by viewing the WAN.

WAN shapers provide insight into top-talkers and bandwidth abusers, and give particulars into metrics such as PVC round-trip delay, congestion, and dropped packets. Oftentimes, bottlenecks occur because of the differences in LAN port speed and bandwidth available for access to the WAN. To effectively utilize the bandwidth companies are paying for, shaping traffic on the WAN side is the most economical way to ensure access to the outside world.

For example, a network user calls to report a slow response time. With a true seven-layer device, a network administrator can quickly see all layers of the network and more effectively troubleshoot the problem. Starting at layer 1 (or the Physical Layer), the administrator can see metrics such as errored seconds and unavailable time, and can also detect any physical errors to determine if a problem exists. Satisfied that the problem is not at Layer 1, the administrator can look at Layer 2 and the Frame Relay information provided, such as PVC delay, conges-

tion, lost packets, and other metrics, to determine if a Frame Relay problem exists. Moving further up the stack to Layer 7, the administrator can look at response times for specific applications, utilization by application, and retransmissions for applications to isolate the problem.

## TCP RATE CONTROL OR QUEUING: WHAT METHOD SHOULD BE USED FOR TRAFFIC SHAPING?

Within Internet Protocol (IP), two broad classes of traffic exist: Traffic Control Protocol (TCP) and User Datagram Protocol (UDP). To further complicate the issue, some protocols, such as Real-Audio and voice applications, have components that are both TCP and UDP based.

TCP connections are reliable, which means the sender always has confirmation that the data sent to the receiver was completely received and intact. If any problems occur, there are mechanisms in place to re-send the data before the transmitting device sends any additional data. Two parameters are used in this determination: the Acknowledgment (ACK) Message and the TCP Receive Window (RWIN) Size. The ACK is an indication from the receiver to the server that all data has been received and is valid. The receiver acknowledges a group of packets, and the size of this group of packets is known as the TCP RWIN Size.

Once a connection has been established, the receiver sends a message to the sender telling the sender when to expect an acknowledgment of the data. After a group of packets equal to the RWIN size is sent to the receiver, the receiver then sends an Acknowledgment — a record of receipt of valid data — back to the sender. At this point, the sender knows it is safe to send the next group of data.

In contrast to TCP applications, UDP applications are based on unreliable connections between two endpoints. This is called a "connectionless" exchange because the sender streams data to the receiver without regard to whether the data was received intact or even if it was received at all. UDP applications are typically not used in mission-critical settings because of the lack of reliability of the connection between the server and client.

## RELIABLE TCP RATE CONTROL

TCP Rate Control is a superior technology to queue-based algorithms or other methods of marking packets. TCP Rate Control is used to determine how and when the Acknowledgments are sent back to the sender, and makes modifications to the receiver's stated RWIN.

The use of TCP Rate Control allows traffic shaping devices to modify the traffic flow based on Frame Relay congestion information, dropped packets at the Frame Relay layer, as well as guarantee bandwidth to mission-critical applications.

Traffic shaping devices combine this information together with policies the IT manager has implemented to instruct the sender of the data (the server) to stop sending traffic altogether or send the data at a reduced rate until the network problem is resolved. The benefit of TCP Rate Control is its ability to stop traffic at the source.

In contrast, queuing algorithms buffer data. Once buffers are full, a device that supports queuing will drop data before it reaches the WAN, causing the sender of the data (the server) to retransmit the data. Because the congestion or other network problem has not been resolved, the server continues to flow data to the router, which queues the data and eventually drops the data again. This snowball effect adds to the problem and does not control the sender of the data.

Most routers use this approach for both TCP and UDP traffic control. Additionally, this approach is used by most traffic-management platforms on the market today. When selecting a Frame Relay traffic management solution, it is important for network managers to consider a product that supports TCP Rate Control for reliable connection-oriented protocols. This is crucial because a majority of the traffic on corporate networks is TCP IP traffic. The advantage of TCP Rate Control is its ability to stop traffic, allowing network congestion to clear.

TCP Rate Control and other methods of marking packets with DiffServ priorities or Type of Service (TOS) are more effective than queuing. TCP Rate Control, as the name implies, only works with reliable connection-oriented protocols. Therefore, all vendors must employ some queue-based strategies to shape UDP traffic because it does not provide visibility into the receiver of the traffic.

## FEATURES TO LOOK FOR IN A PERFORMANCE MONITORING AND TRAFFIC SHAPING DEVICE

The measurement of application metrics, in addition to real-time monitoring of the Frame Relay circuit, is crucial for pinpointing specific traffic demands and problem sources in the network. These metrics are used to analyze traffic patterns and for general maintenance and troubleshooting. With traffic shaping, the ability to allocate bandwidth per application guarantees the necessary bandwidth for business-critical applications and allows less important applications to utilize the remaining bandwidth.

In addition to TCP Rate Control and the ability to shape traffic on the WAN, look for the following features when selecting a traffic management solution:

- *Modularity.* Performance monitoring and traffic shaping devices that feature a modular network interface enable the user to easily upgrade an existing product to higher bandwidth applications without having to replace the entire unit. A modular network interface and the ability to upgrade firmware remotely over the network make the overall product cost significantly less than fixed-interface products. Additionally, modular products offer flexibility, letting users upgrade to higher bandwidth services as their network needs grow and change.
- *Nonintrusive monitoring.* Nonintrusive monitoring is an important feature because it allows network managers to identify applications running on the network without interrupting traffic flow. This feature provides a view into the WAN without affecting network performance. The benefit of nonintrusive monitoring is uninterrupted flow of data.

- *Inband management.* Inband management can save the user a significant amount in operating costs by eliminating the need for a dedicated PVC. With inband management, data traffic and management traffic share the same PVC.
- *Disaster recovery.* For many companies, a dial backup solution is essential because network downtime is not an option. If the primary network fails, the device needs the ability to initiate a dial backup call based on Physical Layer failure, loss of LMI from the network Frame Relay switch, or a PVC failure. This dial backup ability provides key advantages over router-based dial backup solutions, which do not have the ability to monitor for PVC failures.
- *Remote configuration.* Devices with remote configuration capability let the IT manager configure the device and obtain diagnostic information over the Frame Relay network without sending someone on-site.
- *Frame relay spoofing.* Frame Relay spoofing permits a traffic shaping device to be configurable, independent of the router. This permits turn-up of the network even before routers are configured, which is beneficial for troubleshooting initial installs.
- *Network management.* A Web-based network management tool allows remote configuration, stores performance information, and provides long-term trend analysis.

## GET THE MOST OUT OF THE AVAILABLE BANDWIDTH

Most companies are choosing Frame Relay as their network solution. Without the proper tools, network managers are not able to control network activity. A WAN-based performance monitoring and traffic shaping device is the tool that allows network managers to get the most out of their available bandwidth.

With a powerful traffic management solution, businesses can save money every month. How? Instead of adding additional capacity, companies can choose to control their networks with a flexible traffic management solution.

A product that can identify multiple traffic classifications, and view the Physical Layer, Frame Relay, and Application Layer statistics, provides users with the answers to existing network problems and gives them new information about their circuit's performance. Frame Relay customers want all the financial advantages that Frame Relay offers. By selecting a product that includes the features discussed in this article, companies are empowered to make the most of their existing bandwidth through the ability to identify, prioritize, and control their networks.

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