

COMMUNICATING WITH SAM



Sam Johnston

Getting More With Less From QoS: Network Survival in Tough Economic Times

Question:

Over the past year, we have noticed significant degradation in response time associated with applications that run over our Wide Area Network. When investigating the issue, we had noted that during peak business periods, bandwidth utilization was maximized, especially at the aggregation point that services our main data center. Given that we have added several new applications to the data center that serviced remote clients, we were not surprised to see that we were saturating the network.

In order to improve response time, we had anticipated upgrading our network. Our current topology is Frame Relay, with most remote sites at relatively low speeds (128 kbps is the norm), while the data center aggregation point is serviced by a T1 (1.544 Mbps). We have currently standardized our router hardware platform on Cisco. Based on benchmark testing, we believe that our remote sites require a minimum of 512 kbps, and that multiple T1's are needed at the data center.

Based on these requirements, we compared the costs of upgrading our Frame Relay network versus moving to a new topology. It was apparent that newer network technologies provided better value on a cost-per-bit basis when higher speeds are needed, and consequently we made the decision to migrate to an MPLS network that would provide Ethernet LAN-type speeds over the wide area.

However, given the recent economic slowdown, our operating budgets have been frozen and we can no longer afford to migrate to MPLS, nor do we have the budget to perform a significant Frame Relay upgrade. This presents a real dilemma, as response time issues persist and they are impacting the business. Our goal is to ensure that mission critical transactions at a minimum are protected. Given our bandwidth deficiencies, is it possible to reach this goal, in whole or in part, through the use of QoS (Quality of Service) technology?

Answer:

It is incredible how times can change can so rapidly. It wasn't so long ago that huge increases in spending on IT were never questioned. However, rapidly the focus has change to doing more with less, and driving ROI. The simple answer to your question is yes, QoS can help you in essence ration bandwidth to ensure that the applications that deliver the most to your business get the bandwidth. While your challenges of increased application bandwidth needs are very real your current WAN topology will enable you to perform many levels of QoS to improve your situation and provide the required preference to your mission critical applications. One important concept to grasp with respect to QoS enablement in your network

infrastructure is that QoS will not provide you increased bandwidth, but it will offer you choice in how you use your bandwidth.

You have not gone into any significant detail regarding your applications, but I will assume you are like many other iSeries customers. You have 1 to 2 mission critical business applications that run on specific protocols within your network. Next you have 3-5 important business applications that while not mission critical are important and to some degree response time sensitive (what isn't these days). Aside from these applications it is safe to say that you have Internet traffic, file and print traffic and e-mail traffic.

At this point without delving into techno-detail of all the wonderful tools available currently for QoS engineering, I will provide a quick overview of the framework required for QoS before I begin to recommend some effective tools for your environment. Fundamentally, QoS includes, but is not limited to the following main categories (see **Figure 1**).

The key categories that you will need to consider in your case of implementation are classification, congestion management, congestion avoidance, traffic shaping and possible QoS signaling. Admission control will be used more likely if you have data you do not care about servicing and

are critically concerned with real time applications. Link efficiency mechanisms are primarily required when using timing sensitive applications such as voice where the small voice packets can get held up by larger TCP/IP packets traversing routers and WAN ('freeze-out'). QoS signaling is again more often deployed when requiring support for timing sensitive applications or end-to-end QoS requirements within the domain.

Classification of packets can occur at L2, L3 or L4 headers or even within the payload of the packet. One of the most basics form of classification is to use access-list to define your types of traffic based upon protocol type, packet size, source and destination address etc. This technique will be effective especially for defining non-TCP/IP traffic.



Figure 1

Congestion mechanisms commonly deployed in a Frame Relay environment are Weighted Fair Queuing (WFQ) or Custom Queuing. I'm betting on Custom queuing as it will enable a single PVC to carry multiple traffic types, such as TCP/IP and SNA. Depending on the actual detail all of these mechanisms, it could be effective in your environment. The following diagram (Figure 2) highlights the operation of CBWFQ:

Congestion avoidance techniques can be very effective, but really only in a TCP application environment. From a high level perspective the way these tools operate is that they attempt to predict the flow and when traffic begins to reach thresholds and queue depth begins to increase in an interface the mechanism will intelligently discard packets in order to throttle back the applications. This is effective in reducing windowing sizes in an FTP file transfer. Just think about what it would do to a SNA stream (I shudder to think!).

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packet to manage bandwidth availability within the Frame Relay network i.e., CIR, FECN, BECN, DE, or burst rate.

So back to the simple answer of yes, QoS should be able to help ensure you deliver bandwidth to the right applications. The deployment process, provided your routing infrastructure is QoS capable, will not be too complex if stick to the basics:

- ACLs for classification to ensure that the network can intelligently identify which traffic is important
- Custom Queuing for congestion management to ensure that priority is given to the key applications when bandwidth is scarce
- FRTS for Traffic Shaping and Policing to assist you in proactively managing the network to reduce or avoid bandwidth scarcity situations

Clearly without having intimate detail of your existing network applications I can only provide a guide to solutions to your problems. However, as complicated as these details may seem, the good news is that Frame Relay is a mature WAN protocol and has some of the most proven techniques associated with QoS traffic shaping. Frame Relay has historically been the standard protocol for Canadian wide area networks, enabling many companies to successfully implement cost effective networks with limited bandwidth to support the timing sensitive SNA protocol along with IPX, netbios and TCP/IP. This means that the tools and techniques are tried and proven, and the risk associated with this plan is relatively low.

Unfortunately economic down turns do happen, and they can interfere with our plans. Investments that were a must have only a few months ago are scrutinized for the value they will bring to the business, and money no longer simply thrown at problems. They key in these times is to stay focused on the true business needs relative to what your IT investments need to deliver, and to think creatively. When we do this, it is amazing how can survive and sometimes turn what we think is less into more. 

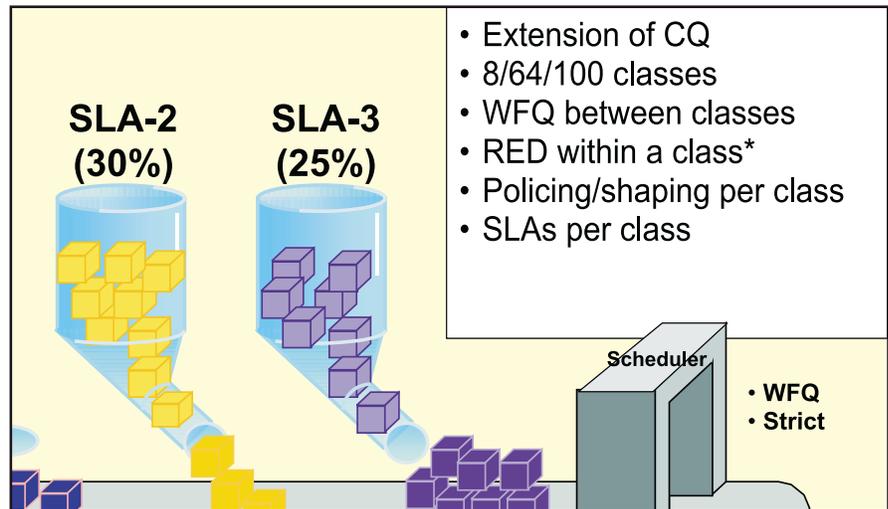


Figure 2

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Any TUG member wishing to submit a question to Sam can forward their typewritten material to the TUG office, or to Intesys. The deadline for our next issue is Friday February 8th, 2002.

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