Data Track Technology

Communications • Management • Solutions

White Paper:

Managing TCP/IP QoS with VPQ

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Quality of Service

Within a network of computers, QoS is the capability to provide better delivery service to specific application packet flows to achieve high performance levels without causing other application packet flows to fail to achieve minimum performance levels.

Voice over IP (VoIP) and video over IP are examples of applications whose packet flows need better delivery service than most applications. Organizations are moving their telephony and videoconferencing systems to TCP/IP networks to lower costs, deliver productivity enhancements, and engender the most efficient use of corporate resources such as network bandwidth and network infrastructure.

However, it is difficult to deploy these applications and difficult to maintain the expected performance. If the Quality of Experience (QoE) of a call does not meet user expectations, the lower costs and productivity gains from moving these applications to the TCP/IP network won't be realized. Voice and video are distributed applications that require functions and services across multiple devices in a network, and each of these devices may be simultaneously servicing multiple applications and sets of users throughout a large internetwork.

All of this complexity calls out for QoS to be implemented and then managed to provide a reliable framework for traffic flows in the network. Using QoS has a big impact not only on the quality of calls but also on the operating cost with research showing that using VoIP management tools can reduce voice operating costs by as much as 50 percent.

Data versus Voice and Video on a TCP/IP Network

On a TCP/IP network, the traffic created by most data applications has different needs and characteristics from the traffic created by voice and video applications. IP networks don't natively give real-time network traffic—like that generated by voice and video applications—the priority it needs in order to meet user expectations.

	Data	**Voice / Video**
Bandwidth needs	*Low to medium, "bursty"*	*Low to medium, continuous and fixed*
Recover from lost packets?	*Yes*	*No*
Tolerance for delay	*High*	*Very low*

Voice and video calls on an IP network require a relatively small—but assured—amount of bandwidth, low delay and jitter, and little packet loss. A data application like web browsing needs more bandwidth (in bursts), but can tolerate some delay and jitter, and can compensate for packet loss by retransmitting.

Therefore, in order to deploy applications that generate real-time network traffic and achieve optimal performance, QoS technologies must be deployed regardless of how much bandwidth is available. They minimize delay, reduce disparities in delay, and

manage packet loss for high-priority traffic without jeopardizing the performance of other applications.

Virtual LAN (VLAN) QoS

The simplest definition of a local area network (LAN) is a network whose Ethernet frames could collide. To further the definition, a LAN that uses LAN switches can be described as a set of devices where when one device sends a broadcast Ethernet frame, all the other devices receive a copy. That is called the broadcast domain. Therefore, a switched LAN is bounded by its broadcast domain, and can be defined as the set of network interfaces of all devices in the same broadcast domain.

Virtual LAN (VLAN) technology creates multiple broadcast domains within a LAN switch or set of LAN switches. All of the ports in one switch can be in one broadcast domain, or there can be multiple broadcast domains within one switch, and the ports divided up between them. When VLAN QoS is implemented on a switched LAN, one VLAN can be dedicated to voice or video traffic and that traffic will not be affected by the volume of other traffic. Once traffic reaches a router, VLAN technology flags the real-time traffic to the router so it can apply a high-priority DiffServ value to that traffic as it moves through the router, and then out of the router onto another LAN.

Differentiated Services (DiffServ) QoS

A basic definition of a wide area network (WAN) is a network that connects other networks—and the devices on them—together. Since Ethernet frames do not traverse a router, a router is a gateway between two or more Ethernet LANs, a k a broadcast domains. WANs, therefore, are a set of routers networked together.

DiffServ is a set of end-to-end QoS capabilities defined by the Internet Engineering Task Force (IETF), and implemented in the routers of a TCP/IP network. The routers use DiffServ to classify, mark, shape, and police traffic, and to perform intelligent queuing. It has become the dominant QoS technology in routers being used to carry real-time traffic.

A simple analogy of DiffServ is a methodology for moving vehicles across a gateway between two sides of a river. A router would be a six lane tunnel under the river. The primary goal of the river authority is to facilitate the movement of as many workers from one side of the river to the other as quickly as possible. The secondary goal is to get as many supplies from one side of the river to the other as quickly as possible.

To achieve these goals, the tunnel manager designates two dedicated lanes through the tunnel as bus-only lanes and another lane as a truck-only lane. The remaining three lanes are designated for automobiles. Traffic now flows with a profile that suits the needs of the river authority. The flows are continuously monitored for utilization and performance in case the profile needs to change.

Data Track's VPQ Solution

Design

When it comes to managing QoS on an IP network, most of the solutions in the market rely on a network analysis methodology that takes a ***bottom-up*** approach. They capture detailed information from every packet of data moving through a network, may create synthetic packet flows, and then use induction to understand the nature of many of the packet flows on the network.

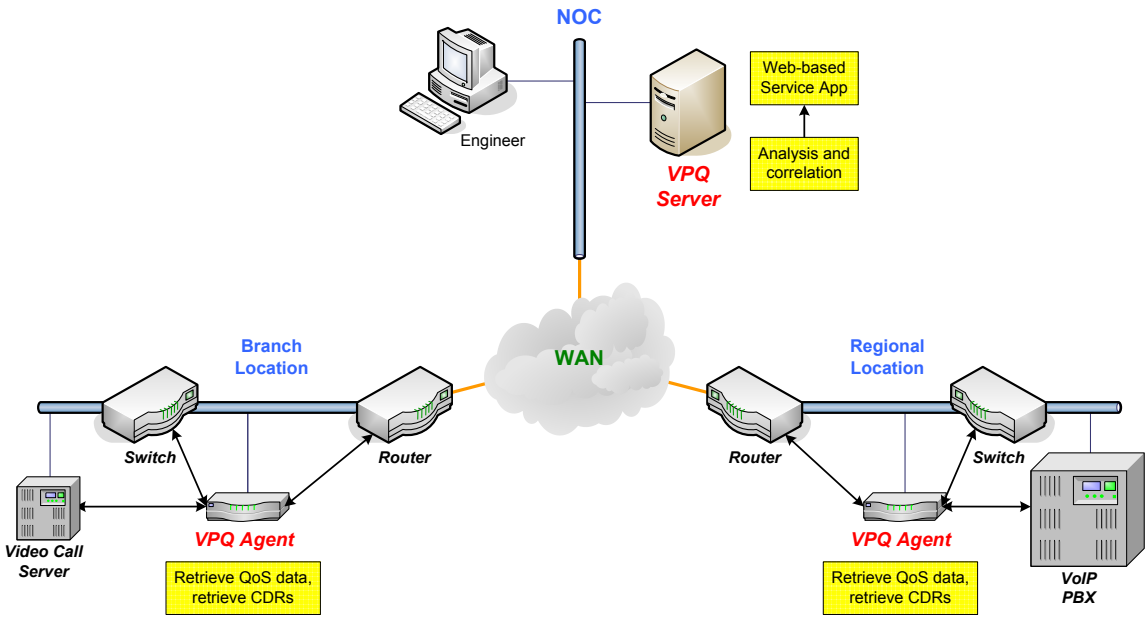
Continuing with the analogy of the router as tunnel between two sides of a river, products with a bottom-up approach position themselves outside of the tunnel on one or both sides of the river but with little knowledge of the configuration and performance of the lanes in the tunnel. They keep counts and take photographs of vehicles entering and/or exiting the tunnel, and record the source, destination, occupant's employer, vehicle color and manufacturer, etc. of all the vehicles. Although those data items are available and accessible, without a lot of inference analysis they don't much help the river authority achieve its goals. After the analysis, the operations team will still have to examine the raw configuration and performance data within devices to determine and to resolve the root cause of a QoS issue.

VPQ takes a ***top-down***, non-intrusive approach to managing QoS on an IP network. It constantly examines QoS configuration, utilization, and performance data from the network devices that are moving the data through a network. VPQ analyzes the network devices and how well they implement specific QoS schemes, and then uses deduction to isolate the root cause of problems in specific packet flows that require real-time performance.

So, within our tunnel analogy, VPQ with a top-down approach is the tunnel manager with a view inside the tunnel. It keeps track of the configuration, utilization, and performance of all of the lanes in the tunnel, but is most interested in the bus lanes, then the truck lane, and, finally, the car lanes. Focusing on the QoS technology implementation and service delivery within the network devices rather than the makeup and behavior of the packets that enter and exit the devices means a faster Mean Time to Repair (MTTR) since the problems of packet behavior are directly related to the configuration and performance of the network devices.

Features

VPQ is an automated solution that gives service providers and enterprises one system to cover the entire life cycle of real-time TCP/IP applications like voice and video conferencing. VPQ uses remote agents distributed throughout a network that is supporting real-time applications. It can be purchased as either enterprise software or as a hosted service.



VPQ Topology Map

VPQ enables network operations teams to:

- **Assess** router QoS by constantly modelling and analyzing a network's implementation of QoS to determine its readiness for real-time traffic from VoIP or video conferencing, showing the latest results and historical trending.
- **Monitor** QoS across all critical devices in the network to identify configuration and performance problems before call quality is adversely affected.
- **Troubleshoot** QoS-related voice and videoconferencing problems, determine their root causes, and resolve them quickly.
- **Report** on QoS configuration, utilization, performance, and SLA compliance from the latest sampling and from historical trending in a presentation-ready form.

VPQ tightly integrates with HP's OpenView network management platform to provide a comprehensive view of:

- How the network is configured for voice and videoconferencing
- How well the network is supporting voice and videoconferencing
- Resource utilization of high priority network resources
- Configuration and performance history

Benefits

- ***Better user experience:*** VPQ gives operations teams the tools to meet users' expectations for quality and reliability by ensuring excellent initial QoS implementations. The team can continuously resolve performance problems before they affect users.
- ***Faster MTTR:*** VPQ provides clear information to quickly identify root causes of QoS issues from a single console. It displays trend analysis to detect network weaknesses to be corrected before quality degrades.

- ***Improved IT Productivity:*** VPQ saves time required to manually gather, correlate, and report QoS performance and configuration. It uses built-in technical expertise about networking, in general, and QoS, in particular, to augment the knowledge base of network operations teams.

About Data Track Technology

Since 1979, Data Track Technology has been developing voice and data communications management solutions for service providers and enterprises. Solutions include:

- QoS management of TCP/IP networks
- Secure administrative access
- Call management and accounting services
- PBX alarm management
- Professional services for secure access and QoS
- Training programs in communications management

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