Cisco Bandwidth Quality Manager 3.1 for TelePresence

Product Overview

Cisco® TelePresence delivers true life-size images with ultra-high-definition video (both 720p and 1080p) and spatial audio, which creates a “room within a room” environment that makes users feel as if they are at the same table with people in remote locations.

Cisco TelePresence requires a high degree of quality of service (QoS) to preserve body language. Insufficient network resources can disrupt the user experience. The Cisco TelePresence QoS Network Management Solution includes Cisco Bandwidth Quality Manager (BQM), which is a network service quality management appliance that provides next-generation visibility and analysis of traffic, bandwidth, and QoS on IP networks.

Cisco BQM is part of the Cisco Network Application Performance Analysis Solution. This solution is a set of tools and services that help customers quickly isolate application performance problems and optimize their networks for current and future applications to help ensure that they meet their information technology performance and cost objectives. The solution helps maximize the value of applications and network assets in a number of ways:

- By validating the behavior and performance of an application before it is deployed over the network.
- By allowing the user to baseline the performance of the existing applications on the network, thereby helping to ensure that the newly deployed application will not adversely affect existing network performance.
- By continuous monitoring of both new and existing applications after deployment to help ensure that the required service levels are maintained. With its microsecond visibility and QOS-aware threshold setting, Cisco BQM will give early warning of approaching quality degradation.

Cisco BQM for TelePresence

The Cisco TelePresence solution has two primary product offerings—Cisco TelePresence 3000 and Cisco TelePresence 1000. Cisco TelePresence 3000 features three screens, while Cisco TelePresence 1000 is a single-screen solution. Depending upon the type of solution deployed and the amount of movement in the meeting room, TelePresence traffic can generate anything from a few megabits per second to 15 megabits per second average rate. This traffic is also inherently bursty in nature.

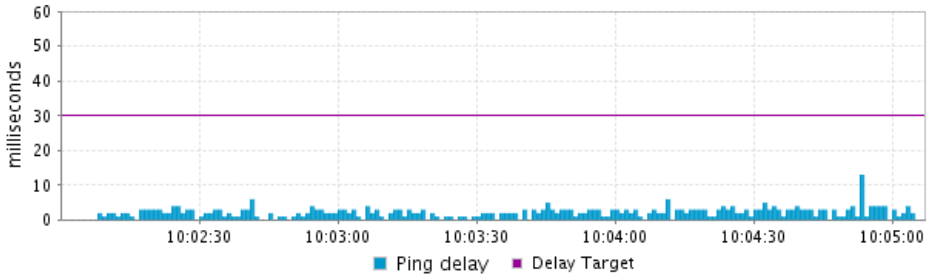
When this TelePresence traffic from the LAN reaches the WAN router, it is queued with other network traffic according to the local QoS policy. This can result in rapid queue buildup, both in the TelePresence class and in the other classes. These queuing events can introduce from tens to hundreds of milliseconds of delay or packet loss. The duration of these events is too short to be detected by traditional performance monitoring technology, but they can result in significant degradation for both TelePresence and other applications. To assure the reliable performance of both TelePresence and other applications, it is critical to monitor and manage this dynamic congestion phenomenon to within acceptable bounds.

Cisco BQM has features that are specifically designed to identify and manage this phenomenon. Cisco BQM monitors traffic with microsecond resolution and is capable of detecting short-lived congestion events and identifying the traffic responsible for the congestion. Cisco BQM can also be used before deployment of TelePresence to help ensure that the existing network resources are sufficient to deliver adequate QoS for TelePresence sessions without adversely affecting existing network traffic.

The level of acceptable dynamic congestion depends on the application. For optimal TelePresence performance, queuing delay should be less than 30 milliseconds, with no more than 0.05 percent of packets being dropped. The user experience is likely to be affected significantly if these targets are not met.

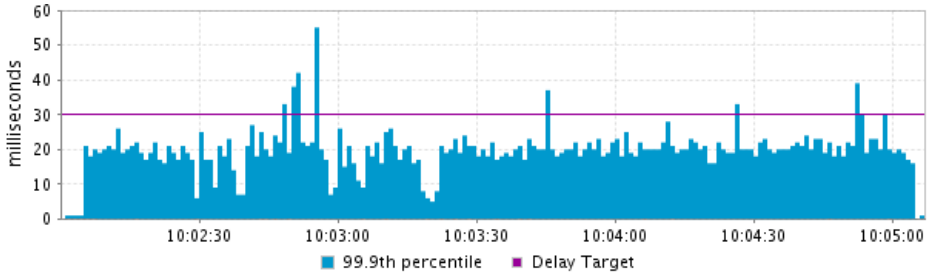
To illustrate dynamic congestion in TelePresence, Figure 1 shows the graph of the packet delay observed with 1-second Internet Control Message Protocol (ICMP) pings during a TelePresence call. According to this view, the largest observed delay is about 12 milliseconds, with typical observed delays of less than 5 milliseconds.

Figure 1. Dynamic Congestion—1-Second ICMP Ping View



However, the 1-second ping view is not enough to identify the loss and delay that the actual TelePresence traffic experiences. Using the Expected Service Level technology of Cisco BQM to analyze the same traffic under the same network conditions, you see the true range of delays that the TelePresence traffic will experience in the WAN queue[1] (Figure 2):

Figure 2. Dynamic Congestion—Millisecond View



With Cisco BQM you can see the expected queuing delay for every packet. With this resolution you see that TelePresence traffic is occasionally experiencing up to 55 milliseconds of queuing jitter—well outside the acceptable range. This traffic is experiencing dynamic congestion and will require more bandwidth to restore acceptable service quality.

[1] Both analyses were performed with a high-movement TelePresence trace in a FIFO queue with an 18-Mbps service rate.

Cisco BQM provides the microvisibility and real-time bandwidth/QoS analysis necessary for organizations to monitor and assure required TelePresence end-user experience over their existing packet network.

Use Case 1: Bandwidth and QoS Management

Cisco TelePresence uses the existing network infrastructure. This means that TelePresence traffic will coexist with traffic from other sources like voice over IP (VoIP), mission-critical applications (for example, SAP, Citrix, and so on), e-mail, and Web traffic. To facilitate appropriate service quality for all traffic, multiclass queuing using mechanisms like Low-Latency Queuing (LLQ) or Class-Based Weighted Fair Queuing (CBWFQ) are required.

Cisco BQM measurement and analysis help ensure that sufficient bandwidth is available and that the QoS mechanisms are configured to provide the required service quality both to TelePresence traffic and other network traffic. It does this in two phases:

1. Prior to TelePresence deployment, Cisco BQM can be used to assess the current QoS policy and the current network service levels being achieved. It can also be used to design a QoS policy that can deliver the required network service level for TelePresence traffic without degrading the operation of existing network applications.
2. Once TelePresence is up and running, Cisco BQM continuously monitors the service level achieved, both by TelePresence traffic and existing network traffic. Cisco BQM gives immediate notification or early warning of service degradation and gives clear analysis of the cause of detected congestion.

Use Case 2: Troubleshooting TelePresence Quality Problems

Organizations are constantly evolving, and new applications tend to change traffic patterns. After rolling out TelePresence, Cisco BQM continuously monitors the traffic and can give immediate feedback if a quality violation event is detected, as well as maintaining a 60-day history, revealing trends due to changing network conditions.

Cisco BQM retains event traces during congestion events when the service objectives are violated. Using these event traces, Cisco BQM provides congestion event analysis with per packet drilldown. The drilldown analysis quickly pinpoints the traffic culprit causing congestion and identifies the top talkers active during the congestion event. This ability is key as the traffic causing congestion may not show up on traditional, longer timescale top talker reports. Figure 3 shows a typical drilldown investigation into 500 milliseconds of traffic where packet loss occurred.

Figure 3. Cisco BQM per Packet Drilldown for Network Service Quality Troubleshooting

In Figure 3, the user “zooms in” to a period of time when loss occurred and identifies which conversations and applications were active at the time. This can help identify what behavior may have caused the problem, and also which users suffered degradation.

The historical storage of event traces is also a source that can be used by Cisco Support Teams to greatly reduce the time to troubleshoot network quality problems. These support services can greatly increase network uptime, while providing critical skill sets needed to complement customer support staff.

It is important to note that the event traces retained by Cisco BQM do not store potentially sensitive packet payload. This has the dual benefit of increased security and also greater efficiency in the storage and processing of event traces.

Product Description

Cisco BQM is a network service quality management appliance that provides unsurpassed visibility and analysis of traffic, bandwidth, and QoS on IP access networks. It is used to monitor, troubleshoot, and assure network performance objectives for TelePresence and converged application traffic:

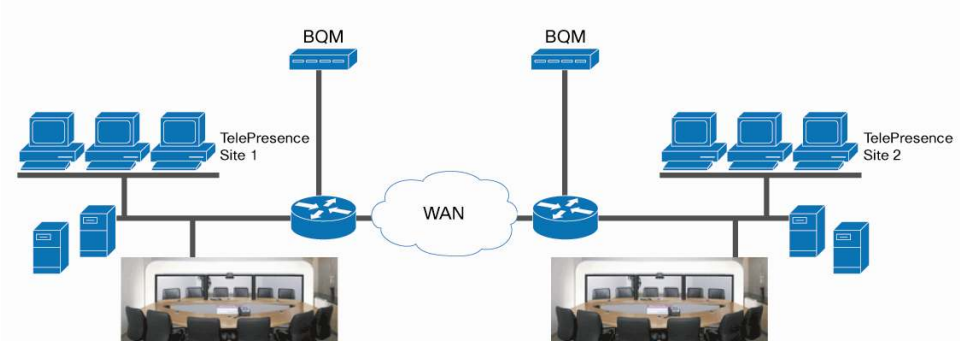
- Cisco BQM monitors and analyzes network traffic with microsecond granularity, identifying congestion causing TelePresence or other application quality degradation, and recommends corrective actions.
- Cisco BQM is an easy-to-use troubleshooting tool that facilitates root cause analysis for identified quality problems.
- Cisco BQM integrates with Cisco QoS mechanisms to minimize deployment and training.

Cisco BQM can be used in advance of a TelePresence rollout, to help ensure that local network resources and QoS policies are sufficient both to deliver the demanding quality of service required by TelePresence and to maintain quality for existing application traffic.

Following deployment, Cisco BQM provides continuous QoS-aware application monitoring and can diagnose whether or not the network traffic or QOS policy is responsible for service degradation and, if so, assists in identifying the solution.

Cisco BQM software runs on an appliance with two or four gigabit-speed traffic monitoring ports. It is typically deployed at each TelePresence site (as shown in Figure 4) and monitors every packet passively by spanning or tapping the Ethernet data links. All analysis and configuration functions are delivered through an advanced, user-friendly Web interface, with additional support for Secure Shell (SSH) Protocol and Telnet access to an intuitive command-line interface (CLI).

Figure 4. Cisco BQM TelePresence Deployment



Cisco BQM Functions

- Traffic insight: Cisco BQM traffic insight provides a detailed view and real-time analysis of what applications are active on the network and of how network resources are being used to support the network application environment. Cisco BQM traffic insight does the following:
  - Autodiscovers network applications with Layer 7 signatures
  - Identifies traffic microbursts of programmable duration from 5 milliseconds to 1 second
  - Identifies top applications, talkers, listeners, and conversations
  - Performs active measurement of end-to-end network latency and loss
  - Reports average link use, packet rate, and packet size distribution
- Congestion analysis: Cisco BQM computes the expected service level in terms of loss and delay for each packet and highlights traffic classes that are not meeting configured network performance objectives. The Cisco BQM congestion indicator condenses this information into a single number that reflects the performance of each interface and traffic class relative to the QoS objectives. Cisco BQM congestion analysis does the following:
  - Estimates expected queuing loss and latency at local and remote bottleneck points
  - Reports the baseline health of a network with respect to congestion, using the congestion indicator
  - Summarizes the information and provides a detailed view of all the congested periods, including time in congestion
  - Uses an easy-to-understand quality events timeline to highlight trouble periods
- Event analysis: Cisco BQM maintains an internal rolling real-time trace. Whenever a congestion event is detected, a 10-second section of the trace around the event is recorded

for later analysis. Cisco BQM provides analysis capabilities at the site, class, application, conversation, or even packet level. Cisco BQM event analysis does the following:

  - Analyzes quality event triggering from excessive delay or loss, traffic microbursts, and bandwidth use
  - Allows zooming into quality events down to packet-level resolution
  - Shows top applications, talkers, listeners, and conversations active during a quality event
  - Provides host, class, and application filtering for traffic root-cause analysis

- Bandwidth sizing: Cisco BQM recommendations give clear, plain-language guidelines on class and link bandwidth requirements, queue-limit sizing, and policy settings. Each recommendation takes into account the amount of dynamic congestion that applications or classes can tolerate. Cisco BQM bandwidth sizing does the following:
  - Allows user to specify queuing delay and loss targets and sizing policy—for example, queue 99.9 percent of packets in the busiest one-hour period for less than 500 milliseconds
  - Recommends changes if required to help each class meet its dynamic congestion requirements
  - Reports the bandwidth required for each traffic class to achieve the configured queuing targets
- Quality alarms: Cisco BQM detection and analysis of congestion is made available to external systems through fully configurable Simple Network Management Protocol (SNMP) traps, syslog streaming, and e-mail alerts.

Business Benefits

Cisco BQM 3.1 provides the following business benefits:

- Increases TelePresence uptime: Cisco BQM helps network managers ensure that network bandwidth is properly dimensioned and QoS mechanisms are properly configured to support the continuous high quality delivery of the TelePresence end-user experience. Cisco BQM continuously monitors, analyzes, and recommends corrective actions against events that affect network quality.
- Reduces risk of TelePresence rollout affecting existing business-critical network applications: Cisco BQM bandwidth and QoS analysis takes into consideration the network quality requirements of all applications. The BQM recommendations will protect not only the TelePresence traffic but will also make sure existing applications are not bandwidth starved.
- Reduces operating time and troubleshooting expense: Through its unique ability to monitor and analyze traffic with microsecond resolution, Cisco BQM diagnoses traffic-induced performance problems that many competing tools miss or misdiagnose.
- Mitigates risk of making expensive bandwidth upgrade decisions: Cisco BQM determines whether a bandwidth upgrade or QoS or traffic management policy is the preferred action based on its unique algorithms. These algorithms take into account whether an upgrade action may result in no improvement to network quality.
- Builds on investment made in Cisco QoS infrastructure: Cisco BQM models Cisco router QoS mechanisms, so that network managers can unleash the power of QoS without having to deploy yet another packet-processing appliance.

Key Features

Table 1 summarizes the primary features and benefits of Cisco BQM.

Table 1. Features and Benefits

Feature	Benefit
Cisco CLI compatibility	Allows network managers to use current knowledge and existing Cisco router configurations to deploy Cisco BQM
Congestion indicator	By providing a highly summarized view of congestion, allows network managers to rank links according to congestion status, quickly identifying underperforming applications
Corvil bandwidth	Provides the required bandwidth per class according to user-configured quality targets and sizing policy; presents bandwidth numbers clearly and in a familiar format to allow easy application of the results
Comprehensive congestion analysis	Provides views into events down to the single packet and provides time stamps with 10-nanosecond accuracy
End-to-end QoS	Uses ICMP testing to provide insight into end-to-end delay and loss; size of packets and frequency of testing are user configurable to minimize effects on application traffic
Expected service level	Analyzes the amount of delay and loss that traffic to the remote site is experiencing; Cisco BQM estimates the router queuing delay and loss for every packet and also takes into account bandwidth sharing between classes
Export packet capture (optional)	Captures traffic and exports it to other analysis tools without the need for an additional network probe; standard Packet Capture (PCAP) format provides compatibility
Microburst detection	Sees traffic bursts as they are being injected into the network; detects microbursts from 5 milliseconds to 1 second
Multiprotocol Label Switching (MPLS) and VLAN support	Provides visibility for any traffic flow of interest including MPLS and VLAN traffic
Multiclass support	Supports monitoring of advanced networks that use QoS mechanisms such as class-based weighted fair queuing and low-latency queuing to optimize network performance
Multiport appliances	Four 10/100/1000 Ethernet ports provide easy support for redundant router configurations
Network-monitoring dashboard	Quickly identifies interfaces and classes in the network that are not delivering the required QoS and troubleshoots quality problems and quantitatively determines whether the network is contributing to the problem
QoS alarms	Provides alarms to report network performance degradation in real time and integrates with existing SNMP network management systems to provide correlation with other alarms
QoS-sensitive capacity planning	Integrates application requirements of delay and loss, not just bandwidth, into the capacity planning cycle
Remote-site monitoring	Through its logical network model, allows detection of likely quality alerts, even in the service provider network
System alarms	Provides warning and alarming mechanisms for system problems related to hardware failures, disk capacity, and use
Top talkers, listeners, and conversations	Provides insight into network use by hosts without the need to configure hundreds of IP addresses or ports
Triggered event traces	Captures event traces according to programmed thresholds of bandwidth, microbursts, latency, and loss; event traces can be used to perform comprehensive congestion analysis and eliminate the need to store terabytes of packet captures
What-If analysis	Allows QoS policy changes and new application rollout to be tested and optimized prior to deployment

Hardware Requirements

Cisco BQM 3.1 is available on the Cisco 1180 platform with a specialized network interface card. Full details about availability and ordering of the required hardware platform are available from your Cisco sales representative.

Table 2 summarizes the hardware specifications for Cisco BQM.

Table 2. Hardware Specifications

Description	Specification
System	
Maximum throughput	500,000 pps
Maximum number of remote sites monitored	500
Maximum number of classes monitored	1000
Network interfaces	Copper: Four 10, 100, and 1000 Mbps ports Copper and fiber mix: Four 1000 Mbps ports
Management	
Management access	Web browser interface, SSH, Telnet, and console
SNMP	Version 2
Syslog	Yes
Out-of-band management	10/100/1000 baseT Ethernet (RJ-45)
Software upgrades	FTP and Trivial FTP (TFTP)
Deployment	
Deployment options	Switched Port Analyzer (SPAN) or mirror port Passive tap

Service and Support

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For More Information

For more information about Cisco Bandwidth Quality Manager, visit http://www.cisco.com/go/bqm, e-mail bqm-product-info@external.cisco.com, or contact your local Cisco sales representative.

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