Cisco Bandwidth Quality Manager 4.0

General

Q. What is Cisco® Bandwidth Quality Manager (BQM) 4.0?

A. Cisco BQM 4.0 is a next-generation network performance management product that helps enable customers to monitor and provision their network for controlled levels of latency and loss performance. Cisco BQM 4.0 implements a broad set of patented and patent-pending traffic measurement and network analysis technologies that give the user unprecedented visibility and understanding of how to optimize the network for maximum application performance.

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.

Q. What makes Cisco BQM different from other performance monitoring solutions?

A. The BQM difference can be summed up by the phrase “microvisibility with macrocontrol.” Network application performance degradation can occur at timescales of milliseconds or less. With microvisibility, Cisco BQM gives users full visibility into the microsecond behavior of the application traffic on the network. It then uses powerful analytics to turn this microsecond view into provisioning information that can be directly applied to the routers and switches to control the network for the required application performance.

Q. What are the primary capabilities of Cisco BQM?

A. Its primary capabilities are:

- End-to-end latency and loss measurement: Precisely measures the end-to-end latency, jitter, and loss of network traffic across a data center or across the WAN
- Troubleshooting network application congestion: Allows the user to quickly identify the root cause of application congestion and associated intermittent performance problems
- Provisioning to deliver required latency and loss target: Determines how much bandwidth is required to achieve user-specified quality of service (QoS) targets across all classes and provides specific QoS action recommendations

Q. What are the primary business benefits of Cisco BQM?

A. The principle benefits of the Cisco BQM solution are:

- Unprecedented visibility of network events that affect application latency and loss increases confidence in the network’s ability to handle latency-sensitive applications.

  Cisco BQM microvisibility is the ability to detect, measure, and analyze latency, jitter, and loss affecting traffic events down to microsecond levels of granularity with per packet resolution. This helps enable Cisco BQM to detect and determine the impact of traffic events on network latency, jitter, and loss
- Rapid troubleshooting of network congestion issues reduces the time, effort, and uncertainty involved in resolving issues.

Cisco BQM detects network quality performance (congestion) violations against user-specified thresholds in real time on all interfaces. Simultaneously Cisco BQM operates a background rolling packet capture. Whenever a threshold violation or other potential performance degradation event occurs, it triggers BQM to store the packet capture to disk for later analysis. This allows the user to examine in full detail both the application traffic that was affected by performance degradation ("the victims") and the traffic that caused the performance degradation ("the culprits"). This victim/culprit analysis is vital to understanding what is really happening during performance outages and determining what needs to be done about it.

- Understand how to provision a network for the desired level of latency and loss and cut the cost and time to support latency-sensitive applications on the network.

  Cisco BQM monitors per packet network performance against user-specified quality targets for delay and loss to provide definitive early indication of network performance degradation. Cisco BQM is then able to provide detailed bandwidth and QoS policy provisioning recommendations, which the user can directly apply to achieve desired network performance.

Q. What are the functional areas of Cisco BQM?

A. Cisco BQM has the following main functional areas:

- **Network Service Quality:** Cisco BQM measures the end-to-end latency, jitter, and loss of application traffic between pairs of appliances using Passive Network Quality Monitoring (PNQM) technology. In addition, proprietary algorithms compute the expected queuing in local and remote routers. The Network Service Quality view in Cisco BQM gives summarized and detailed views of the end-to-end and expected queuing performance of the network.
- **Event Analysis:** When Cisco BQM detects events such as excess end-to-end latency or loss, or microbursts above expected levels, it stores packet-level information in an Event Trace that can later be used to perform a detailed analysis of culprits and victims of network events. This helps enable rapidly pinpointing of the culprit during a period where service objectives are being violated.
- **Bandwidth sizing:** Cisco BQM uses Corvil Bandwidth to perform QoS-aware bandwidth requirement measurements.
- **Traffic Insight:** Cisco BQM measures all packets with nanosecond time-stamp resolution. This information is used to provide microburst detection and Layer 7 application autodiscovery and to report on top talkers, listeners, and conversations.
- **LiveView:** Cisco BQM LiveView displays the key monitoring statistics for a link (mean, microburst, latency, loss, and so on) with 1-second updates and a scrolling 5-minute history.
- **Quality Alarms:** Cisco BQM has user-programmable thresholds for generating triggered event traces and alerting the network manager for performance degradation before it affects the application users. Alarms support e-mail notifications and syslog messages.

Q. What is the core technology within Cisco BQM?

A. Cisco BQM keeps track of all the traffic at a micro level using its patent-pending Rapid Traffic Sequencing (RTS) technology. RTS provides a framework for processing high volumes of traffic at very fine time resolution and generates bandwidth and QoS analysis results in real time. It helps enable:

- High-speed packet measurement: A high-speed packet and data processing engine that uses hardware acceleration. This engine can process gigabit rates and provides compact packet descriptors with nanosecond resolution to the subsequent analysis modules.
- One-way latency and loss measurement: Patent-pending PNQM technology resolves the per packet latency and loss of every packet flowing between pairs of BQM appliances.
- High-speed data classification: Matches packets against the network model and identifies applications and hosts.
- Microburst detection: Detects periods of microburst activity with an adjustable duration of 1 millisecond to 10 seconds.
- Expected queuing (delay and loss): Estimates queuing delay, jitter, and loss experienced by packets in local and remote routers. Supports multiclass configurations in Cisco routers.
- Corvil Bandwidth: Estimates bandwidth requirement for the traffic as a function of the desired QoS.
- Event traces: Provides a compact format of packet timelines when events were detected.

Technology

Q. What is the Passive Network Quality Monitoring feature?

A. PNQM measures the end-to-end latency, jitter, and loss of network traffic between pairs of Cisco BQM appliances. It is passive in the sense that it does not inject instrumented packets into the network; instead it watches the flow of traffic at both ends and returns time stamps to one end to allow the latency and loss to be calculated. The latency and loss of each and every packet between two points can be measured, not just a small set of "probe" packets. Results are reported for each direction independently.

Q. What is the difference between PNQM and Internet Control Message Protocol (ICMP) ping?

A. PNQM differs from ICMP ping in several important respects:

- ICMP ping is an active measurement technique wherein instrumented traffic is generated and measured.
- Latency and loss are resolved in each direction independently.
- PNQM reports the latencies experienced by all network traffic instead of just the small fraction represented by ICMP ping packets; in other words, PNQM will detect if even a single packet is lost or excessively delayed.
- In a multiclass network, PNQM can report the different latency and loss characteristics of each class of traffic independently, whereas ICMP traffic will only probe one class.

  The addition of PNQM provides a spectrum of measurement techniques from active (freely available Cisco IOS® Software-based ICMP ping) through passive (high-fidelity PNQM).

Q. Does PNQM require GPS synchronization of the Cisco BQM appliances?

A. GPS is supported but is not required. GPS hardware can be useful when the propagation delay (that is, the minimum delay) between two sites is asymmetric. Without GPS, PNQM assumes equal propagation delay in each direction. Measurement of the end-to-end loss and variation in latency (jitter) is virtually unaffected by the presence of GPS synchronization.

Q. What is the network impact of PNQM measurement?

A. PNQM batches time-stamp reports together, and the overhead is approximately 12 bytes per measured packet. For a typical mixture of packet sizes (IMIX), this translates into a network overhead of about 4 percent if measuring all packets. PNQM can be configured to measure less than 100 percent of packets, generating controllable and arbitrarily small network overheads.

Q. What is the microburst detection feature?

A. Microburst detection uses a unique algorithm to calculate the microburst traffic activity with an adjustable duration of 1 millisecond to 1 second. This algorithm measures every packet to report microbursts on links and classes.

Q. What is Expected Queuing?

A. Expected Queuing estimates the router queuing delay and loss for every packet and takes account of the sharing of bandwidth between classes in a multiclass network. This technology can be used to estimate the queuing delay and loss incurred at the service provider router connected to the remote site. By comparing the Expected expected Queuing queuing to the end-to-end measurements by PNQM, potential troublepoints along the network path can be pinpointed accurately.

Q. What is Corvil Bandwidth?

A. Corvil Bandwidth is the amount of bandwidth needed for a given interface or class to achieve a user-defined QoS target. It is calculated by measuring the traffic on the interface or class.

Q. What is the Network Service Index?

A. The Network Service Index (NSI) is a highly summarized measure of the service level being achieved for each interface in the system. The Network Service Index helps enable network managers to rank links according to congestion status. The Index gives a relative figure of merit for the service level experienced on a link or class. If the NSI is less than 1 then the QoS objectives are met.

Q. What is event tracing?

A. Cisco BQM allows the user to set network service level objectives such as end-to-end latency thresholds and microburst bandwidth thresholds. When any violation of these thresholds is detected, a trace is recorded for postprocessing that contains 10 seconds of traffic preceding the event, the full duration of the event, and several seconds of traffic following the resolution of the event. The user can later analyze the event down to the level of packet granularity. Event tracing gives visibility into quality and congestion-related events—what traffic caused the problem, what traffic suffered as a result.

Installation and Usage

Q. What if my Cisco BQM device fails?

A. Because Cisco BQM is not in the data path, traffic will continue to flow if Cisco BQM fails. Only monitoring and analysis of the network will stop.

Q. Does Cisco BQM require any client configuration?

A. No, there is no client configuration required; Cisco BQM is completely transparent to end users.

Q. Do I need to configure client software for my network management system?

A. No, there is no configuration required; Cisco BQM is accessible through a standard Web browser and does not require client configuration.

Q. How long are event traces kept?

A. Event traces are recorded for up to 60 days.

Q. Does Cisco BQM use simulated traffic?

A. No. It monitors all the packets, not just a sample of packets.

Q. Don't lots of products have analysis algorithms? How is this different?

A. The Cisco BQM starting point is very different. It provides microvisibility at gigabit-per-second rates. This is the level at which microbursts and congestion events are visible on LAN and WAN boundaries. RTS can be programmed with network-configuration parameters to uniquely compute, in real time, the expected QoS levels and bandwidth requirements for application traffic. The latter is compatible with Cisco router QoS mechanisms.

Q. Will Cisco BQM slow down my network and applications?

A. The Cisco BQM algorithms can process a full gigabit of network traffic. In addition, because Cisco BQM is not in the data path, it does not affect the network or applications.

Q. Does Cisco BQM capture packets?

A. Cisco BQM has an optional license to provide full packet capture and export in standard format (PCAP) for analysis in external tools. Packet captures can be triggered or manually started and stopped.

Q. Is Cisco BQM difficult to use?

A. No, Cisco BQM is a next-generation network management system designed for low operational overhead. It delivers the following benefits:

- **Easy to use:** Cisco BQM includes a Web-based user interface and dashboards for easy access to relevant information. Instant PDF reports with up to 60-day histories allow network managers to easily share information with other departments and management.
- **Simple Network Management Protocol (SNMP)** traps for quality alarms integrate with existing network management and operations systems.
- **Easy to deploy:** Provides remote site monitoring from a single appliance in the data center. It supports up to four ports to help enable easy connectivity in redundant router configurations. It provides the same command-line interface (CLI) and modular QoS CLI (MQC) structure that network managers use in their Cisco routers.

Q. What interface types and speeds can Cisco BQM monitor?

A. Cisco BQM supports Ethernet connectivity from 10/100/1000 Base-T, and both 1 and 10 Gbps optical.

Q. Does Cisco BQM monitor traffic on an IP/Multiprotocol Label Switching (MPLS) network or VLAN?

A. Yes, it can model IP/MPLS and VLAN sites.

Q. Does Cisco BQM monitor traffic encapsulated with GRE?

A. Yes. GRE-encapsulated traffic may be monitored either at the top IP/GRE layer or at the encapsulated (GRE payload) layer.

Q. Does Cisco BQM monitor custom applications?

A. Yes, it supports definition of custom applications based on IP addressing information, generic class-maps mechanisms, and URLs.

Q. How much data does Cisco BQM store?

A. Cisco BQM is available in several hardware configurations, with storage ranging from 250 GB to 900 GB. Each hardware configuration stores up to 60 days of monitoring data; the larger configurations can hold up to seven billion event-trace packet records.

Q. What is LiveView?

A. LiveView is a capability of Cisco BQM 4.0 wherein microbursts are displayed immediately for real-time troubleshooting. The LiveView option provides network operators with the ability to observe traffic patterns in their network and take remedial actions, if needed. LiveView complements the Cisco BQM event tracing and analysis capabilities, which provide for detailed analysis of traffic after a congestion event has occurred.

Q. Who manufactures Cisco BQM?

A. Cisco BQM is a Cisco product built on OEM technology licensed from Corvil.

Product

Q. What is the difference between Cisco BQM 4.0 and 3.x?

A. Cisco BQM 4.0 builds upon the technology of BQM 3.x by providing for passive measurement using PNQM. The new release also features LiveView, which provides for real-time troubleshooting. The user interface of Cisco BQM 4.0 has also been enhanced with innovative "Sparklines" that are color coded based on the compliance of the service objectives. The release also features a customizable dashboard.

Cisco BQM 4.0 also adds support for two new hardware platforms based on the Cisco Application Deployment Engine (ADE), the ADE 2130 and ADE 2140 Series. The ADE 2130 Series is a replacement to the Cisco BQM 1180 engine. The products have similar specifications and performance but are being standardized under the Cisco ADE banner. The Cisco ADE 2140 Series is the 10 Gigabit Ethernet offering for large-size data centers.

Q. What are the upgrade options from 3.x to 4.0?

A. For existing customers of Cisco BQM 3.x releases on the BQM 1180 Engine, ADE 2120, and ADE 1010, the part number in Table 1 upgrades the software. All previous entitlements of the software are covered by this single part number.

Table 1. Part Number to Upgrade from Cisco BQM 3.x to Cisco BQM 4.0

Part Number	Description
CBQM-4.0-UPG-LC=	Cisco BQM 4.0 upgrade Option from 3.x releases; maintains all previous 3.x entitlements – supports 1180 and ADE Series

Q. How do I try out Cisco BQM 4.0?

A. Cisco BQM 4.0 is an offering that requires either the Cisco ADE series or the BQM 1180 engine platforms. These platforms have been verified for achieving the performance expected of the Cisco BQM software. Consequently, evaluations require delivery of an appliance to a location. Please contact your local Cisco sales representative for further details, or send an email to bqm-product-info@external.cisco.com.

Q. How do I plan for the future; do I have to buy licenses for software for the complete planned deployment, or can I pay-as-I-grow?

A. The Cisco BQM product can be ordered in increments of bandwidth licenses as highlighted in the next section. The Cisco ADE series platforms are also available to address a range of sites. You can buy a higher performance hardware platform and buy incremental bandwidth licenses as your deployment matures.

Q. What are the support options provided for hardware and software?

A. Cisco BQM offers technical support services based on SMARTnet® for hardware and Software Application Support (SAS) for software.

Q. Are there reference customers for Cisco BQM, and how do I contact them?

A. Yes, there are reference customers who will be happy to share their experience on Cisco BQM with you. Please contact your local Cisco sales representative for further details or send an email to bqm-product-info@external.cisco.com.

Ordering Information

Q. What Cisco BQM products are available?

A. Cisco BQM is available as an appliance. Cisco BQM Engine 4.0 is supported on the Cisco ADE 2140, Cisco ADE 2130, Cisco ADE 2120, and Cisco ADE 1010 hardware and has a base software product offering, additional licensing options, and configurable electrical or optical interfaces. Cisco BQM 4.0 is also supported on the Cisco 1180 engine. The hardware configuration includes an acceleration network interface card (NIC) with optical dual 10 Gigabit or four copper or optical Gigabit Ethernet ports for network connectivity. The host hardware has one copper Gigabit Ethernet port for management. Cisco BQM base software provides access to all features with support for up to 10 sites and 100 Mbps of monitored bandwidth. Additional license packs are available in increments of 10 and 100 sites and 100 Mbps and 1 Gbps monitored bandwidth.

Q. What part numbers do I need to order Cisco BQM?

A. Table 2 lists the key part numbers that you would need to purchase Cisco BQM.

Table 2. Part Numbers for Cisco BQM

Part Number	Description
Software	
CBQM-4.0-SW-K9	Cisco BQM Software licensed for up to 10 Mbps of monitored bandwidth – Up to 10 remote sites
CBQM-4.0-100BW-LC	Cisco BQM 100 Mbps Bandwidth Processing License
CBQM-4.0-1GBW-LC	Cisco BQM 1 Gbps Bandwidth Processing License
CBQM-4.0-100AC-LC	Cisco BQM 100 Mbps Accelerated Bandwidth Processing License (requires Accelerator card)
CBQM-4.0-1GAC-LC	Cisco BQM 1 Gbps Accelerated Bandwidth Processing License (requires Accelerator card)
CBQM-4.0-10GAC-LC	Cisco BQM 10 Gbps Accelerated Bandwidth Processing License (requires Accelerator Card)
CBQM-4.0-10ST-LC	Cisco BQM License – for additional 10 sites
CBQM-4.0-100ST-LC	Cisco BQM License – for additional 100 sites
CBQM-4.0-UPG-LC=	Cisco BQM 4.0 Upgrade Option from 3.x releases; maintains all previous 3.x entitlements – supports 1180 and ADE Series
Hardware	
CADE-2140-K9	Cisco Application Deployment Engine – 2140 (Includes 2 GB RAM + 147 GB hard disk drive)
CADE-2130-K9	Cisco Application Deployment Engine – 2130 (Includes 2G RAM + 147 GB hard disk drive)
CADE-2120-K9	Cisco Application Deployment Engine – 2120 (Includes 1 GB RAM + 250 GB hard disk drive)

CADE-1010-K9	Cisco Application Deployment Engine – 1010 (Includes 1 GB RAM + 250 GB hard disk drive)
CADE-RAM-15EU	Cisco Application Deployment Engine – 1 GB RAM (for 2120)
CADE-RAM-25EF	Cisco Application Deployment Engine – 2 GB RAM (for 2130/2140)
CADE-HDD-T3720250	Cisco Application Deployment Engine – 250 GB SATA hard disk drive (for 1010/2120)
CADE-HDD-A2100147	Cisco Application Deployment Engine – 147 GB SAS hard disk drive (for 2130/2140)
CADE-EXP-NXN4FR	Cisco BQM Accelerator card – PCI card with 4 port (RJ-45) 10/100/1000 Mbps
CADE-EXP-NXN4FM	Cisco BQM Accelerator card – Modular PCI card requires SFPs purchase
CADE-EXP-NXN2FM	Cisco BQM Accelerator card – PCI card with 2 active ports 10/100/1000 Mbps; 2 SFPs can be added
CADE-EXP-NXN2FG	Cisco BQM Accelerator card – 10 Gbps – requires XFP and Memory
CADE-XO-NX10GSLR1	Cisco BQM XFP – Long Reach (required for the 10 Gigabit Ethernet card)
CADE-XO-NX10GMSR1	Cisco BQM XFP – Short Reach (required for the 10 Gigabit Ethernet card)
CADE-XO-NRDR22GB1	Cisco BQM – 2 GB Onboard Memory for 10 Gigabit Ethernet card
GLC-LH-SM=	Gigabit Ethernet SFP, LC connector LX/LH transceiver (Spares)
GLC-SX-MM=	Gigabit Ethernet SFP, LC connector SX transceiver (Spares)
GLC-T=	Gigabit Ethernet SFP, 1000BASE-T (Spares)

For full details on ordering options, consult your local Cisco sales representative or visit http://www.cisco.com/go/bqm.

Q. What are the hardware options for the Cisco ADE series platforms for Cisco BQM?

A. The Cisco ADE series platforms are designed to support multiple network management products on a common hardware. Each network management product contains a specific configuration. Cisco BQM is one of the first products to be released on the Cisco ADE series. To see a complete list of network management products available on Cisco ADE, please visit http://www.cisco.com/go/ade.

Table 3 lists the configurations for Cisco ADE platforms as applicable to Cisco BQM. The ordering tool on Cisco.com automatically selects the appropriate configuration by adding additional RAM and hard disk drive capacity as required:

Table 3. Cisco ADE Configurations

Product offering	Configuration
ADE 1010	1 GB RAM and 250 GB hard disk drive
ADE 2120	4 GB RAM and 500 GB hard disk drive
ADE 2130	8 GB RAM and 600 GB hard disk drive
ADE 2140	16 GB RAM and 900 GB hard disk drive

Q. What combinations of Cisco BQM hardware appliance and accelerator cards are available?

A. The appliances and accelerator cards are available in the combinations given in Table 4.

Table 4. Accelerator Cards: Only one accelerator card is supported per ADE platform

Appliance	2 x 10/100/1000	4 x 10/100/1000	4 x 1 Gbps	2 x 10 Gbps
Cisco ADE 1010	Not supported	Not supported	Not supported	Not supported
Cisco ADE 2120	Optional	Optional	Optional	Not supported
Cisco ADE 2130	Not supported	Standard	Standard	Not supported
Cisco ADE 2140	Not supported	Not supported	Not supported	Standard

The available accelerator cards and their part numbers are listed in Table 5.

Table 5. Part Numbers for Accelerator Cards

Accelerator	Part Number	Available Media	Notes
2 x 10 / 100 / 1000	CADE-EXP-NXN2FM	Copper SFP – electrical SFP – SC connector with LX or SX transceiver	PCI card with 2 active ports 10/100/1000 Mbps, 2 SFPs can be added
4 x 10 / 100 / 1000	CADE-EXP-NXN4FR	Copper	Fixed PCI card with 4 port 10/100/1000 Mbps
4 x 1 Gig	CADE-EXP-NXN4FM	SFP – electrical SFP – SC connector with LX or SX transceiver	Modular PCI card with 4 ports (requires optical/electrical SFPs: GLC-LH-SM=, GLC-SX-MM=, GLC-T=)
2 x 10 Gig	CADE-EXP-NXN2FG	10 Gbps – requires XFP and Memory	Modular PCI card with 2 x 10G ports (requires SFPs: CADE-XO-NX10GSLR1 or CADE-XO-NX10GMSR1, and memory: CADE-XO-NX10GMSR1)

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