

QoS Overview

The Cisco MDS 9000 NX-OS software offers traffic management features such as fabric-wide quality of service (QoS). These advanced capabilities are integrated into MDS 9000 Series switches to simplify deployment and to provide optimization of large-scale fabrics.

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QoS

QoS monitors the ability of a network to provide better service to selected network traffic over various underlying technologies including Frame Relay, Asynchronous Transfer Mode (ATM), Ethernet and 802.1 networks, SONET, and IP-routed networks. QoS features provide better and more predictable network service with these functions:

- Supporting dedicated bandwidth
- Improving loss characteristics
- Avoiding and managing network congestion
- Shaping network traffic
- Setting traffic priorities across the network

QoS-enabled switches provided traffic differentiation and prioritization, enabling latency-sensitive applications such as Online Transaction Processing (OLTP) to share common storage resources alongside throughput-intensive applications such as data warehousing.

QoS can be used alongside other traffic engineering features such as FCC and ingress port-rate limiting and can be configured to apply different policies at different times of day using the command scheduler built into Cisco MDS 9000 NX-OS software.

QoS in Differentiated Service

A service model, also called a level of service, describes a set of end-to-end QoS capabilities. End-to-end QoS is the ability of the network to deliver service required by specific network traffic from one end of the network to another.

The QoS implementation in the Cisco MDS 9000 Series switch follows the differentiated services (DiffServ) model.

Differentiated service is a multiple service model that can satisfy differing QoS requirements. However, unlike the integrated service model, an application using differentiated service does not explicitly signal the router before sending data.

For differentiated service, the network tries to deliver a particular kind of service based on the QoS specified by each packet. This specification can occur in different ways, for example, using the IP Precedence bit settings in IP packets or source and destination addresses. The network uses the QoS specification to classify, shape, and police traffic, and to perform intelligent queueing.

Applying QoS to Traffic

QoS provides service differentiation in the fabric by applying different service levels to different traffic. The service differentiation can perform the following operations:

- Provide relative bandwidth guarantees to application traffic
- Control latency experienced by application traffic
- Prioritize one application traffic over another

QoS is accomplished by combining traffic classification and Virtual Output Queuing (VOQ). Data traffic is classified at ingress ports as low, medium, or high priority. Classified frames are queued in the appropriate location based on the traffic type and QoS priority.

Traffic is processed based on how you classify it and the policies that you create and apply to traffic classes.

You can classify data traffic based on the following criterion:

- VSAN ID
- Source or destination N port WWN
- Fibre Channel ID (FCID)
- Zone

Four distinct QoS priority levels are available: three for Fibre Channel data traffic and one for Fibre Channel control traffic. Control traffic is assigned the highest QoS priority automatically to accelerate convergence of fabric-wide protocols such as Fabric Shortest Path First (FSPF), zone merges, and principal switch selection.

QoS requires FCC to be enabled in the fabric to provide the configured bandwidth guarantees.

QoS Configuration

QoS configuration should be consistent across multiple switches to help ensure that all switches are enforcing a common policy for traffic in both send and receive directions.

QoS is configured in an identical manner regardless of whether the switch has first generation, second generation, or third generation modules present. QoS can be deployed in any one of three ways depending on the complexity of the QoS policy desired:

- Virtual SAN (VSAN)-based QoS—VSAN-based QoS enables QoS priority to be assigned on a per-VSAN basis.
- Zone-based QoS—QoS priority can be assigned on a per-zone basis when a more granular QoS is required.
- Individual QoS policies matching individual devices—QoS policy can be defined on a per-device basis, with individual policies applied to different devices and VSANs when maximum flexibility is required.

QoS Licensing

QoS is a licensed feature and requires an Enterprise Package license installed on all switches where QoS is enabled. However, you do not need a license to provide QoS for internally generated control traffic. You can also explicitly enable QoS by using the **qos enable** command.

Port Tracking

The port tracking feature in the Cisco MDS NX-OS software provides a resilient SAN extension.

If a switch detects a WAN or metropolitan-area network (MAN) link failure, it brings down the associated disk-array link when port tracking is configured. The array can redirect a failed I/O operation to another link without waiting for an I/O timeout. Otherwise, disk arrays must wait seconds for an I/O timeout to recover from a network link failure.