



Cisco Catalyst 9500 Series
Performance Validation



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1.0 Executive Summary

High-density switches manage communications heavily reliant on aggregating and routing technology to ensure intelligent forwarding. The port density is ever increasing to meet enterprise campus needs, and performance in realistic deployment scenarios should be evaluated to validate data sheet specifications.

Cisco Systems, Inc. engaged Miercom to validate aggregate Gigabit Ethernet (GE) throughput capacity and latency of its Catalyst 9500 High Performance Series Switches – C9500-32C (100GE), C9500-32QC (40GE) and C9500-48Y4C (25GE). Using an Ixia IxNetwork test system, we simulated high-density traffic of different frame sizes, ranging from 192 to 9216 bytes. RFC 2544 and 2889 tests were conducted over Layer 2 and Layer 3, RFC 3918 was performed over Layer 3. The percentage of line rate and latency were recorded.

Key Findings for the Cisco Catalyst 9500 High Performance series

- **Offers up to 2 Bpps forwarding performance and 3.2 Tbps total switching throughput**
- **Each Catalyst 9500 High Performance Series Switch delivered full line-rate throughput on every port for all packet sizes of 192 bytes or larger, with zero packet loss, based on high-density RFC 2544 unicast and RFC 3918 multicast throughput testing.**
- **Latency for unicast and mesh throughput testing was as low as 3.02µs and 3.04 µs for multicast performance.**

Miercom has independently observed the performance of the Cisco Catalyst 9500 High Performance Series 100/40/25GE Switches and awards the ***Miercom Performance Verified*** certification in recognition of each product's proven performance in accordance with RFC 2544 and 3918.



Robert Smithers

CEO

Miercom

2.0 Product Tested

The Cisco Catalyst 9500 High Performance Series Switches are the industry's first purpose-built fixed 1-RU core and distribution layer switches based on Cisco UADP ASIC architecture, running on Cisco IOS XE operating system. These switches deliver exceptional table scales and buffering capabilities while also supporting all the foundational high-availability capabilities, including dual redundant power supplies and variable-speed highly efficient redundant fans. These switches operate at line rate and offer configurable system resources to optimize support for specific features. Below are the product highlights.

- 3.2-Tbps switching capacity with up to 2 Bpps of forwarding performance
- 212,000 routing entries (IPv4/IPv6)
- Quadcore 2.4-GHz x86 CPU, 16-GB DDR4 memory and 16-GB internal storage
- Unmatched MAC/route/ACL table scalability and buffering
- 100/40GE nonblocking Quad Small Form-Factor Pluggable (QSFP+, QSFP28)
- 25/10/1GE Small Form-Factor Pluggable Plus (SFP/SFP+/SFP28)
- Advanced routing and infrastructure services – Multiprotocol Label Switching (MPLS), Layer 2 & Layer 3 Virtual Private Network (VPN), Multicast VPN and Network Address Translation (NAT)
- Cisco Unified Access Data Plane (UADP) Application-Specific Integrated Circuit (ASIC)
- Cisco [Digital Network Architecture](#) (DNA) with Cisco Software-Defined Access (SDA) capabilities, such as host-tracking database, cross-domain connectivity and VPN Routing and Forwarding (VRF) aware Locator/ID Separation Protocol (LISP) to extend and simplify network fabric operations by automating IT tasks and security for minimized downtime and maintenance
- Network system virtualization with Cisco StackWise virtual technology for campus core
- High-availability capabilities such as patching, Graceful Insertion and Removal (GIR), [Cisco Nonstop Forwarding with Stateful Switchover](#) (NSF/SSO), redundant platinum-rated power supplies, and fans
- Cisco IOS XE Software – modern operating system for model-driven programmability, on-box Python scripting, streaming telemetry, container-based application hosting, patching and built-in defense against runtime attacks
- Cisco Plug and Play (PnP) enabled for simple, secure, unified and integrated method of branch or campus rollouts and updates for existing networks
- Encrypted Traffic Analytics (ETA) to identify and remediate threats or network anomalies within encrypted communications



Catalyst 9500-32C
32 x 100GE



Catalyst 9500-32QC
32 x 40GE



Catalyst 9500-48Y4C
48 x 25 GE + 4 x 100G Uplink

3.0 How We Did It

Using hands-on network testing tools, business environments are simulated and challenged with real-world traffic scenarios to provide an accurate assessment of product performance. Testing of the Cisco Catalyst 9500-32C/32QC/48Y4C switches employed multiple, centrally controlled Ixia XGS12 multi-slot chassis. Aggregated test systems yield bidirectional 100/40/25GE test ports, one for each corresponding port on the Device Under Test (DUT).

The following steps were taken prior to testing of each DUT:

1. Array of **Ixia XGS12** test systems were connected to the DUT
2. One Ixia system test port was connected to each 100/40/25GE port on the switch, depending on the model used (C9500-32C used 100GE; C9500-32QC used 40GE; C9500-48Y4C used 25GE)
3. Connectivity was confirmed on each port to avoid re-cabling for duration of testing

A battery of tests was applied to each switch to examine different aspects of the DUT. The procedures for testing Layer 2 and Layer 3 switches and routers have been standardized. Four of the standards used in this testing, incorporated in the Ixia test system, are publicly available as Internet Requests for Comments, or RFCs. The ones applicable to this assessment include RFCs 2544, 2889 and 3918 for throughput and latency.

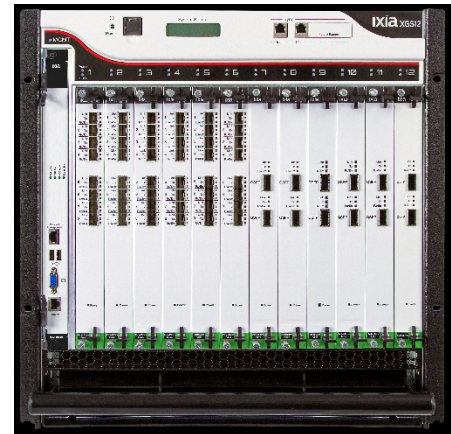
Traffic consisted of the following packet sizes:

- 192, 256, 512, 1024, 1518 and 9216 bytes
- IMIX – L2/IPv4: 64, 512 and 1518 bytes; IPv6: 86, 512 and 1518 bytes

3.1 Ixia Test System

The Ixia XGS12 is a versatile multi-slot test system which accepts various port modules and offers a special software load for running IEEE-specified performance tests. Such software includes IxNetwork, IxLoad and BreakingPoint test applications and automation APIs for massive-scale Layer 2-7 testing on high-density switches, such as those in data center deployments.

In this testing, multiple **Ixia XGS12** chassis were driven by the IxNetwork application, which features an extensive library of test methodologies and supported scenarios. This traffic generator delivered test network traffic through each DUT.

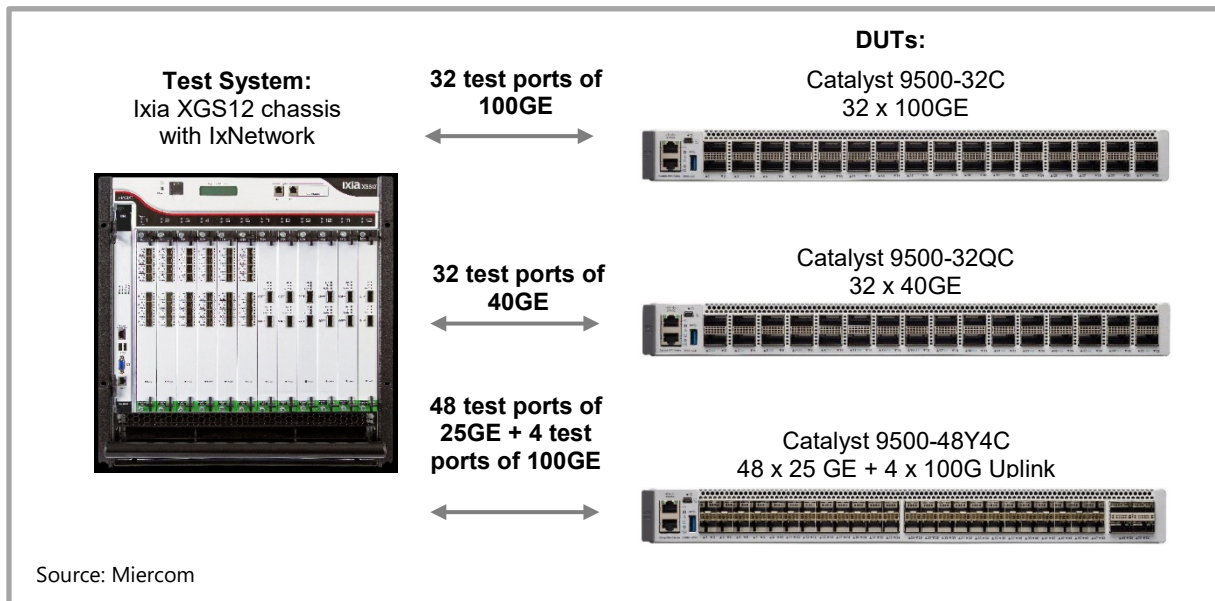


Source: Ixia

3.2 Equipment Used

	Hardware	Software Version
DUT	Catalyst 9500 High Performance SKU's	IOS XE 16.8.1
Test Equipment	Ixia XGS12 High Performance Chassis	IxOS 8.40.1400.5 EA IxNetwork 8.40.1124.8 EA
Cabling	QSFP-100G-AOC3M/5M QSFP-100G-SR4-S with MPO Ribbon Cable QSFP-H40G-AOC3M/5M QSFP-4SFP25G-CU5M	

Test Bed



Source: Miercom

Actual Test Site:

Shown left is one of the switches under test, connected via QSPF cabling to the Ixia test system.

4.0 RFC 2544 Performance

This standard was issued in 1999 to describe how to conduct basic benchmark tests for throughput and latency measurements. Bidirectional Layer 2 and Layer 3 traffic was applied on port pairs on the DUT, so that traffic was processed across the switch fabric.

This test determines the maximum rate at which the DUT receives and forwards traffic across all ports without frame loss. Frames are sent at a specified rate which increases until frame loss occurs. Once the maximum traffic rate, right before a single packet is lost, is established for a frame size, the minimum, average and maximum latency (in microseconds, μ s) was calculated as the difference in timestamps from packets sent and received by the Ixia system.

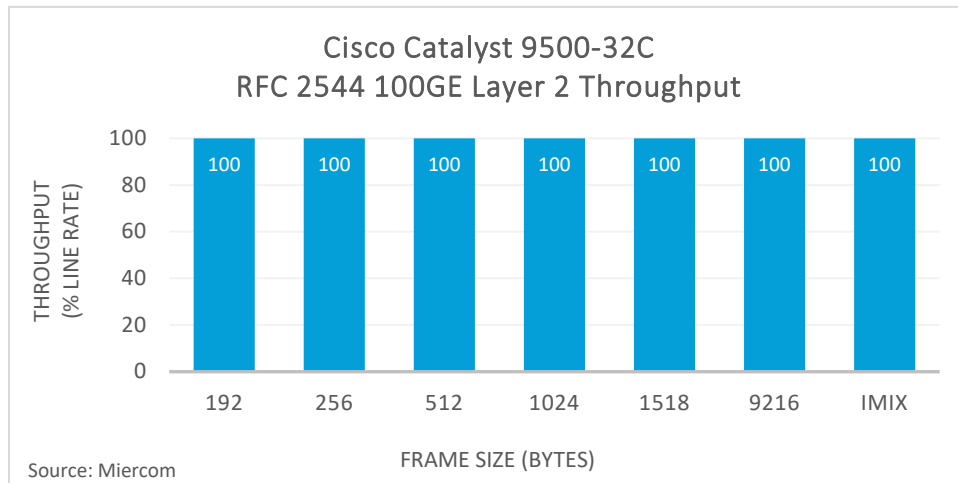
The Ixia system was configured with one-to-one traffic mapping and to forward and receive traffic to and from each directly connected port on the switch. Initially, frames were sent at the rated throughput of the port. When the DUT accepts and successfully processes all traffic at the theoretical rate based on the speed of the port, the switch is said to have performed at “wire speed” or “full line rate” for the packet size. If the maximum was not achieved, it was recorded as a percentage of the line rate throughput. The DUT was configured for Layer 2 and Layer 3 switching and endured a stress test of meshed traffic load distribution that traversed both the local line card and other line cards to force traffic across all the fabric modules, in accordance with RFC 2544. For latency measurements, tested was conducted using store and forward mode.

Throughput and latency was measured for the following models:

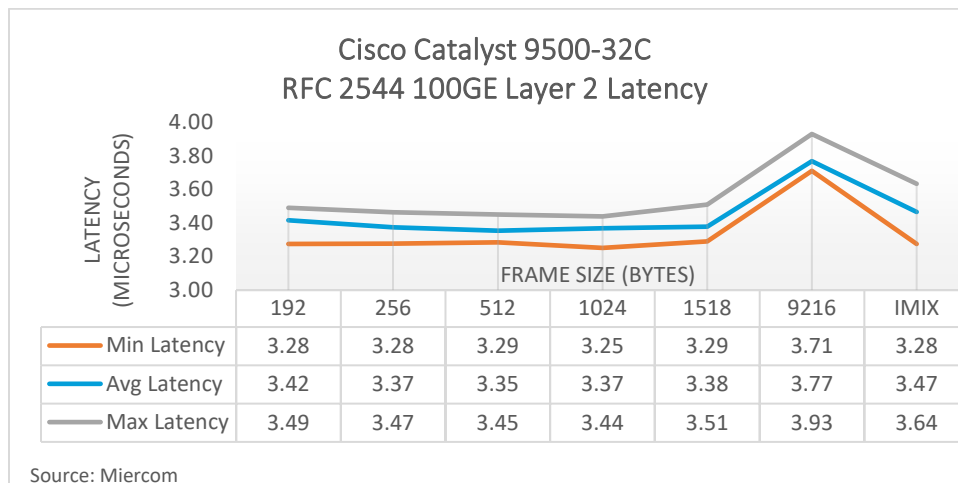
- Section 4.1 – Cisco Catalyst 9500-32C: 100GE
- Section 4.2 – Cisco Catalyst 9500-32QC: 40GE
- Section 4.3 – Cisco Catalyst 9500-48Y4C: 25GE

4.1 Cisco Catalyst 9500-32C

Layer 2: 100GE Throughput and Latency

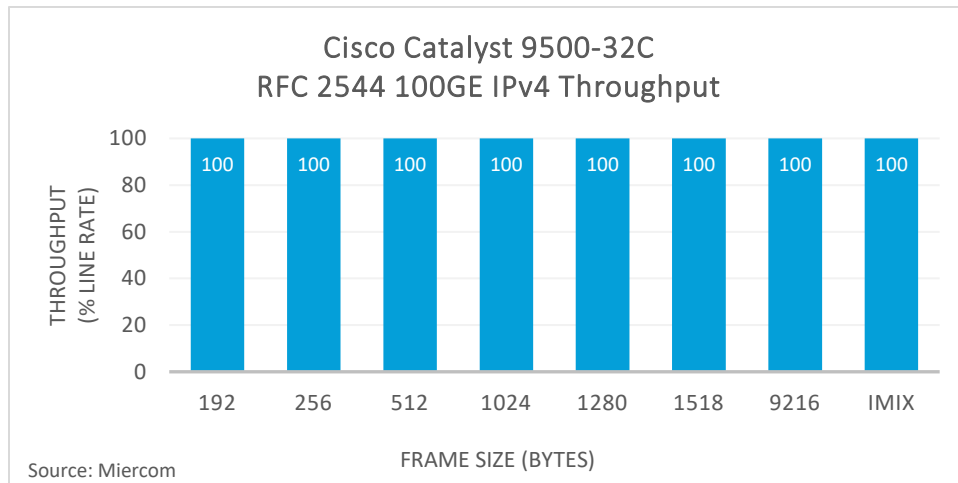


The Cisco Catalyst 9500-32C exhibited full line-rate forwarding performance for all frame sizes with all 100GE ports loaded. Test results shown are for the 100GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 2 unicast traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

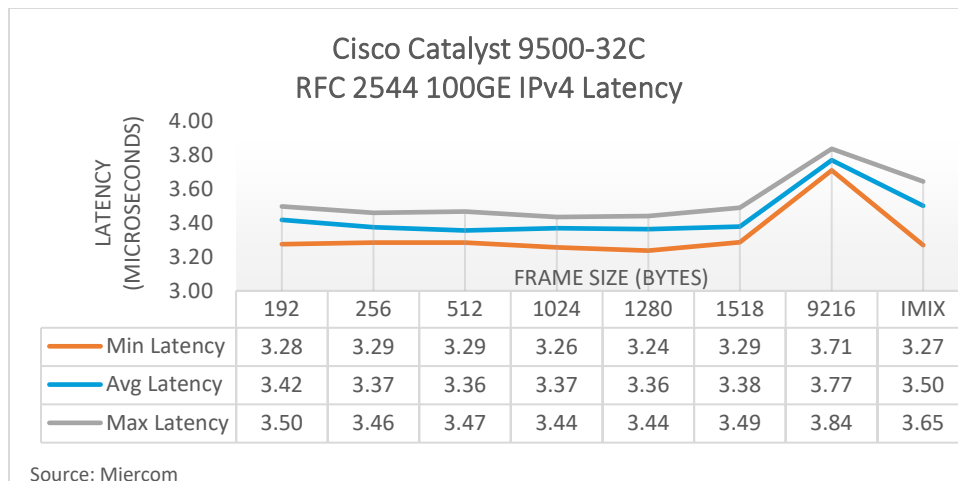


The Cisco Catalyst 9500-32C exhibited the latency results shown above during 100GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 2 unicast traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Average latency ranges from 3.35 to 3.77 microseconds. Tests were conducted in accordance with RFC 2544.

IPv4: 100GE Throughput and Latency

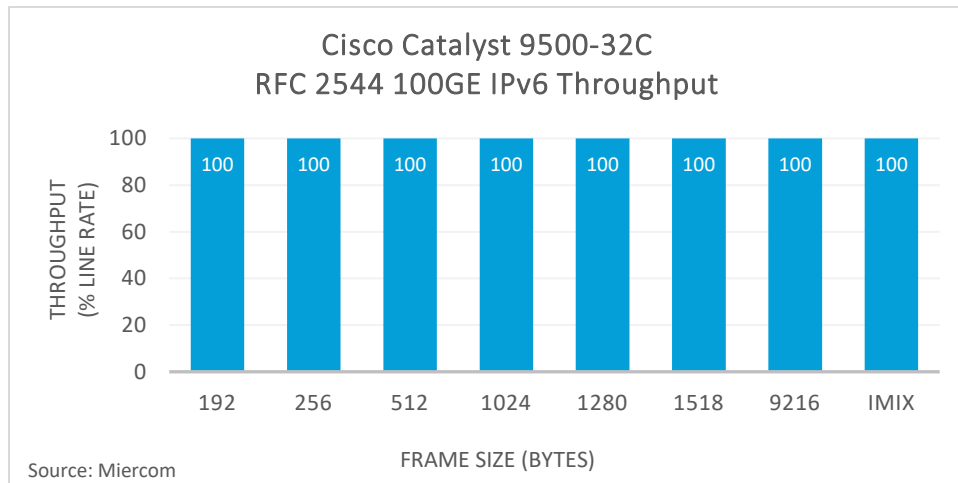


The Cisco Catalyst 9500-32C exhibited full line-rate forwarding performance for all frame sizes with all 100GE ports loaded. Test results shown are for the 100GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv4 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

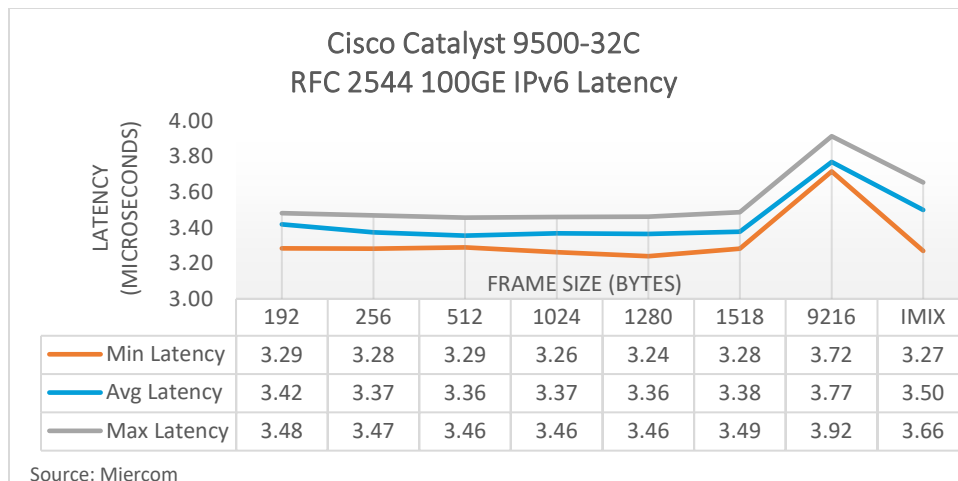


The Cisco Catalyst 9500-32C exhibited the latency results shown above during 100GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv4 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Average latency ranges from 3.36 to 3.77 microseconds. Tests were conducted in accordance with RFC 2544.

IPv6: 100GE Throughput and Latency



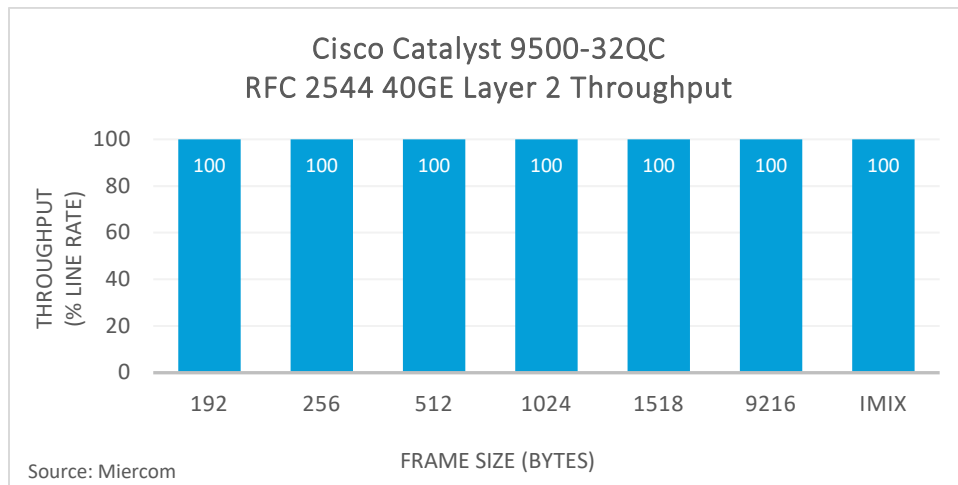
The Cisco Catalyst 9500-32C exhibited full line-rate forwarding performance for all frame sizes with all 100GE ports loaded. Test results shown are for the 100GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv6 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.



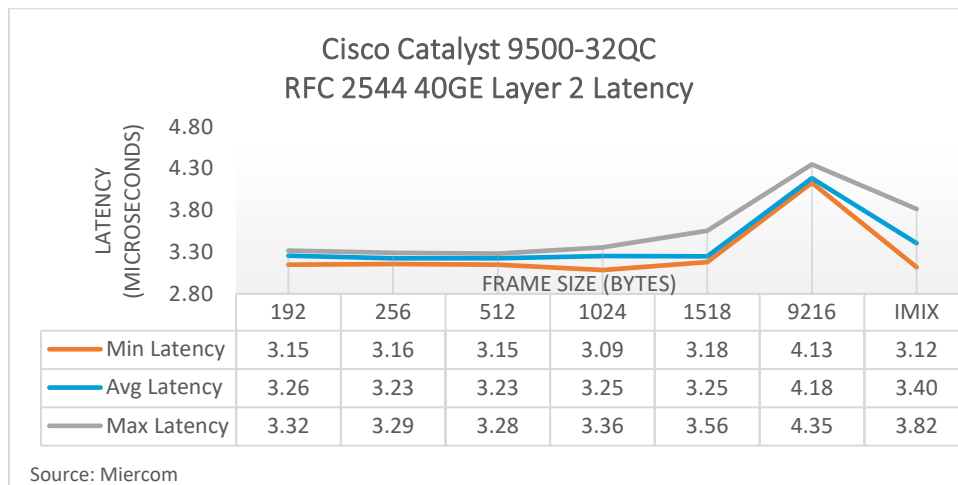
The Cisco Catalyst 9500-32C exhibited the latency results shown above during 100GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv6 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. The average latency ranges from 3.36 to 3.77 microseconds. Tests were conducted in accordance with RFC 2544.

4.2 Cisco Catalyst 9500-32QC

Layer 2: 40GE Throughput and Latency

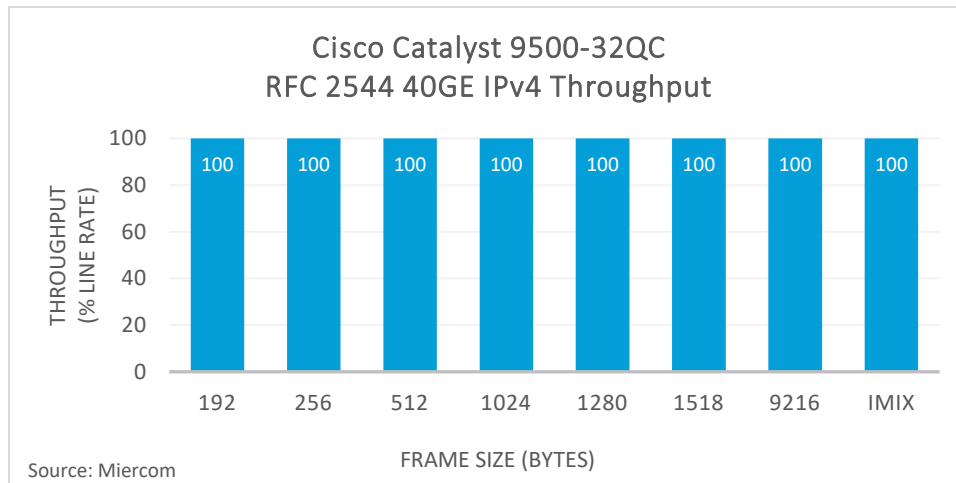


The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 2 unicast traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

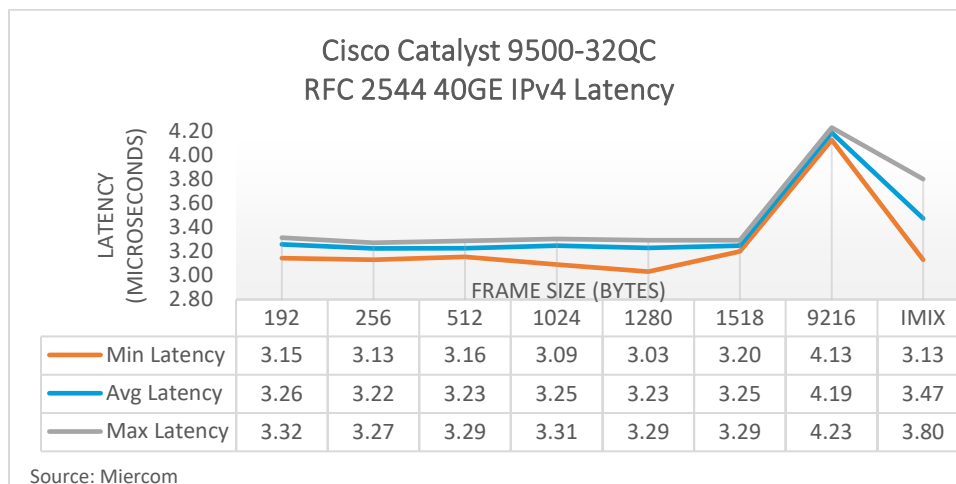


The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 2 unicast traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Average latency ranges from 3.23 to 4.18 microseconds. Tests were conducted in accordance with RFC 2544.

IPv4: 40GE Throughput and Latency

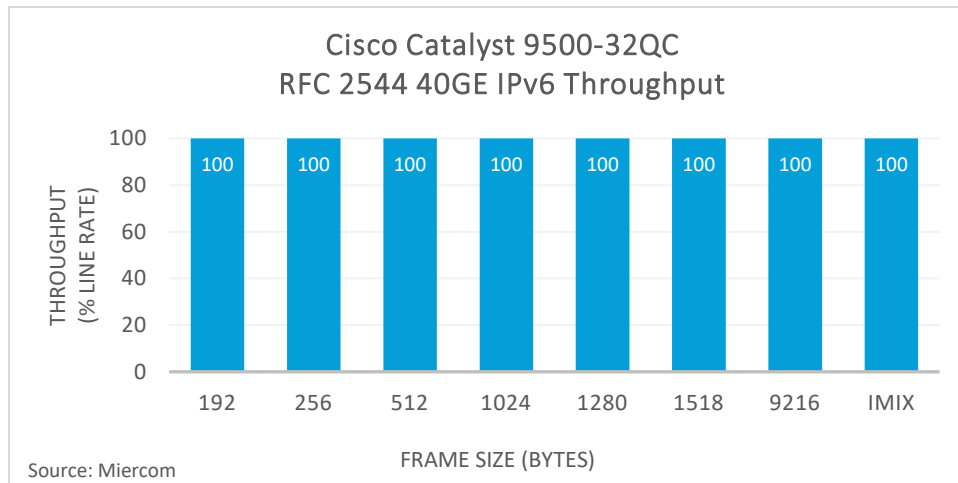


The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv4 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

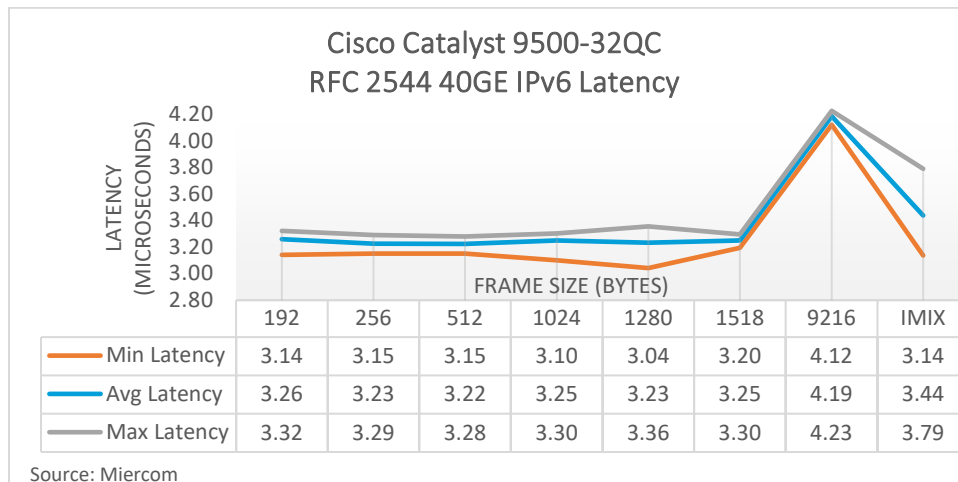


The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv4 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. The average latency ranges from 3.22 to 4.19 microseconds. Tests were conducted in accordance with RFC 2544.

IPv6: 40GE Throughput and Latency



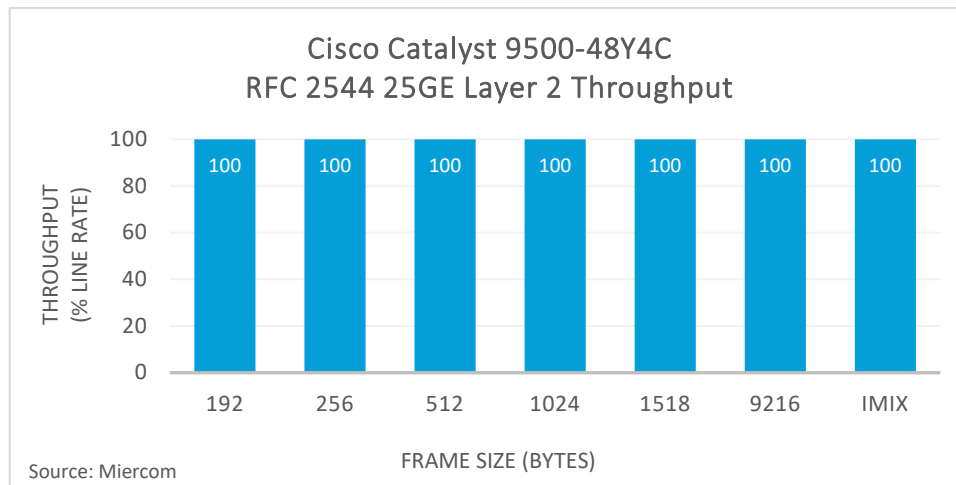
The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv6 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.



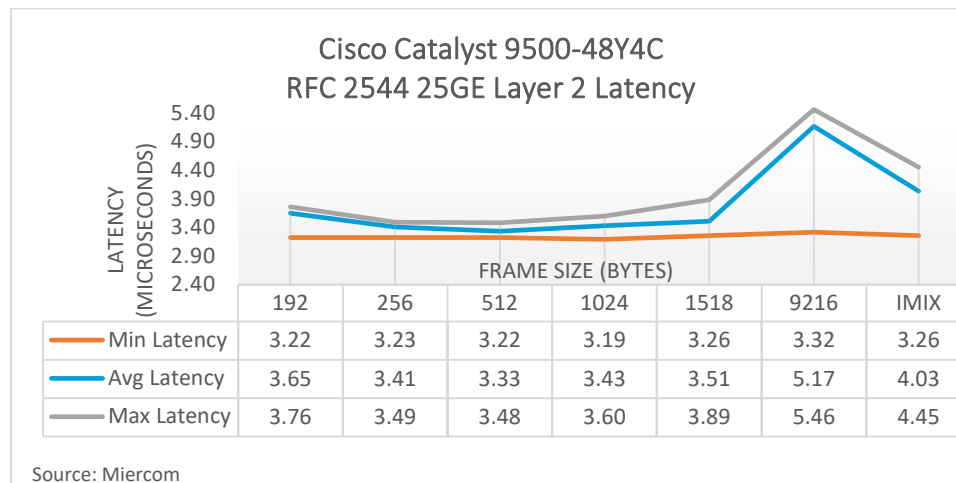
The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv6 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. The average latency ranges from 3.22 to 4.19 microseconds. Tests were conducted in accordance with RFC 2544.

4.3 Cisco Catalyst 9500-48Y4C

Layer 2: 25GE Throughput and Latency

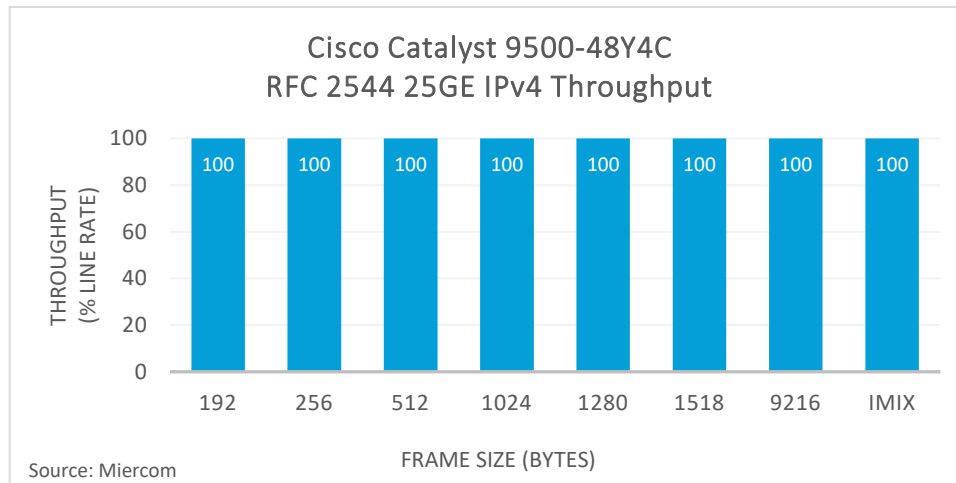


The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 2 unicast traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

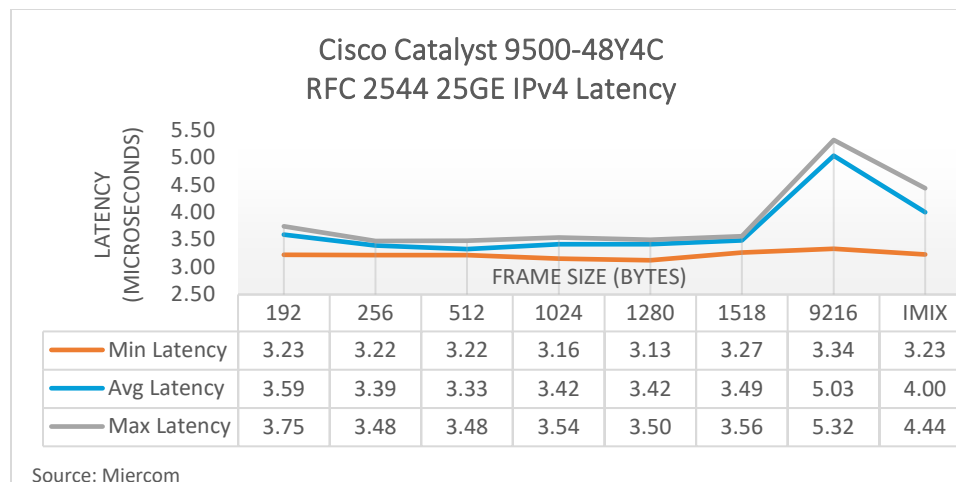


The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 2 unicast traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Average latency ranges from 3.33 to 5.17 microseconds. Tests were conducted in accordance with RFC 2544.

IPv4: 25GE Throughput and Latency

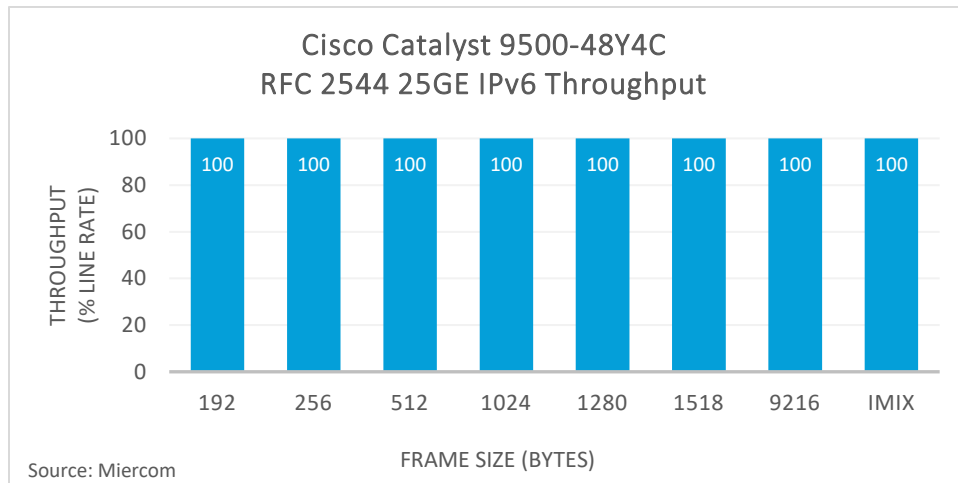


The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv4 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.

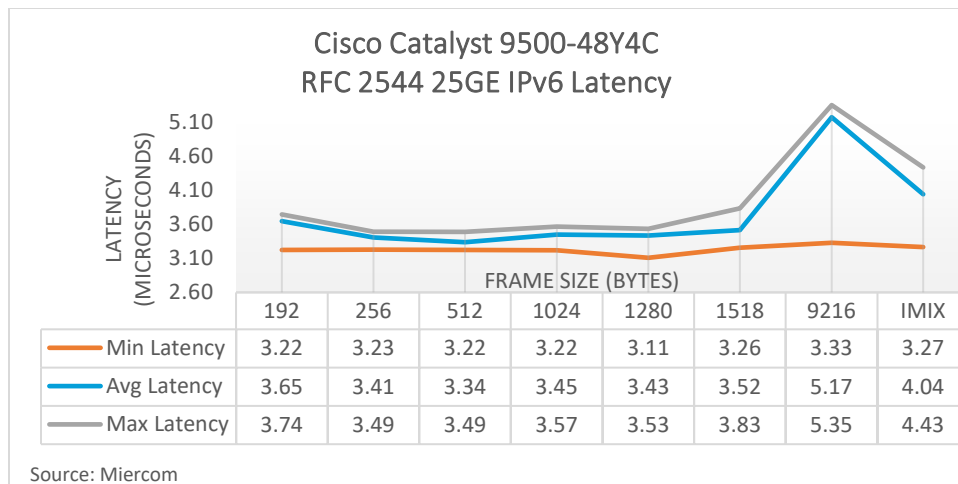


The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv4 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. The average latency ranges from 3.33 to 5.03 microseconds. Tests were conducted in accordance with RFC 2544.

IPv6: 25GE Throughput and Latency



The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for Layer 3 IPv6 traffic for frames sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. Testing was conducted in accordance with RFC 2544.



The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for Layer 3 IPv6 traffic for frame sizes ranging from 192 to 9216 bytes and an IMIX weighted mixture of frame sizes. The average latency ranges from 3.34 to 5.17 microseconds. Tests were conducted in accordance with RFC 2544.

5.0 RFC 2889 Performance

This standard was issued in 2000 as a reference for conducting more stressful mesh tests for throughput and latency measurement. The Ixia test system provides a meshed bidirectional traffic flow and fully stresses the switch fabric.

This meshed throughput performance test determines the number of frames the DUT can handle when receiving frames on all ports. The test results show the total number of frames transmitted and received. All ports of the Ixia tool were connected, and traffic flows of fixed packet sizes were sent in mesh-distribution fashion. Of the 32 ports, Port 1 was set as the source, and the remaining 31 ports were receivers. The DUT was configured for Layer 2 and Layer 3 switching and endured a stress test of meshed traffic load distribution that traversed both the local line card and other line cards to force traffic across all the fabric modules. The total number of frames obtained for each frame size for the fully populated switch was recorded. A bidirectional load was used for simultaneously sending and receiving traffic on all ports. Testing was conducted using store and forward mode.

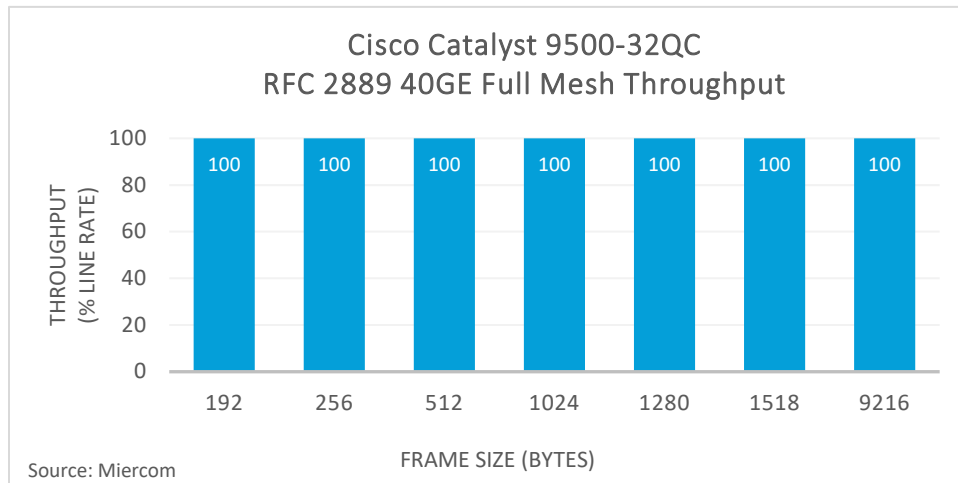
Throughput was measured in percent line rate and latency was measured in microseconds for the following models:

- Section 5.1 – Cisco Catalyst 9500-32QC: 40GE
- Section 5.2 – Cisco Catalyst 9500-48Y4C: 25GE

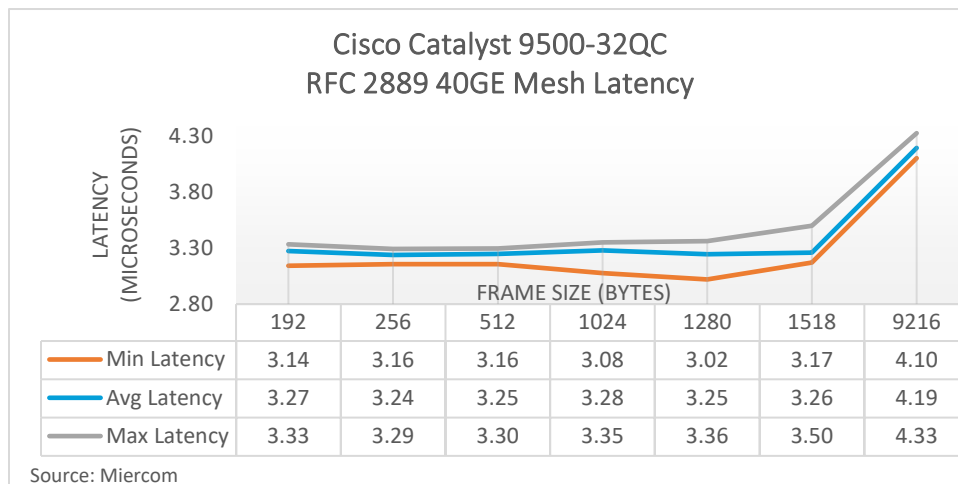
Throughput was calculated as the percent line rate throughput. Latency was calculated by the difference in timestamps from when frames were sent and received by the Ixia system. The test system records minimum, average and maximum latencies for each multicast group, in microseconds (μ s).

5.2 Cisco Catalyst 9500-32QC

Layer 2 Full Mesh: 40GE Throughput and Latency

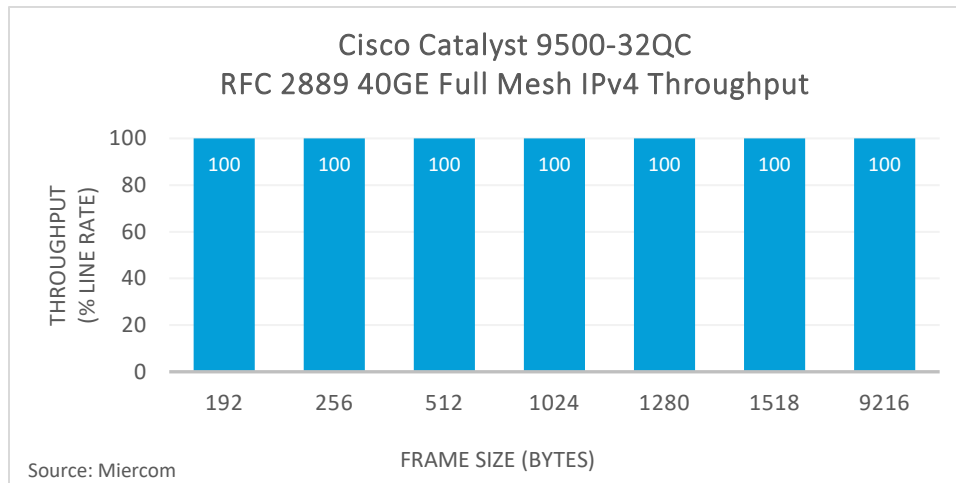


The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.

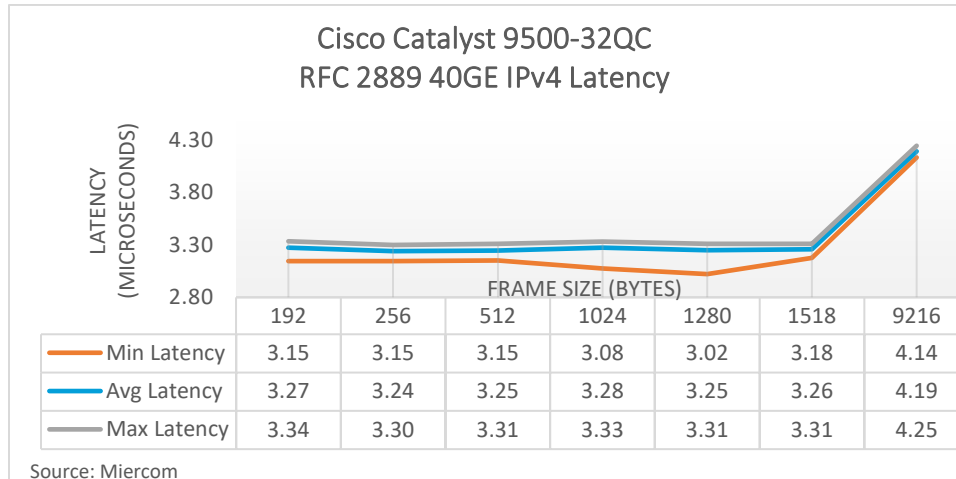


The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for full mesh traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.24 to 4.19 microseconds. Tests were conducted in accordance with RFC 2889.

IPv4: 40GE Throughput and Latency

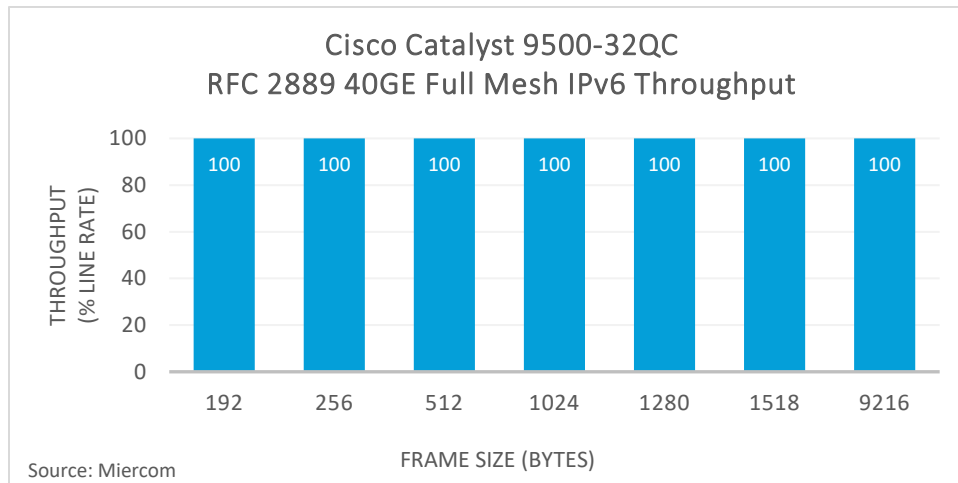


The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv4 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.

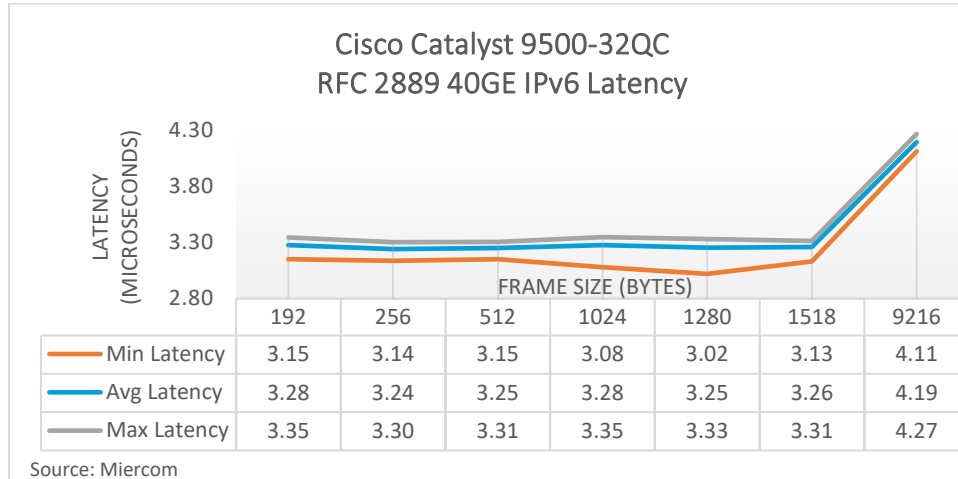


The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for full mesh IPv4 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.24 to 4.19 microseconds. Tests were conducted in accordance with RFC 2889.

IPv6: 40GE Throughput and Latency



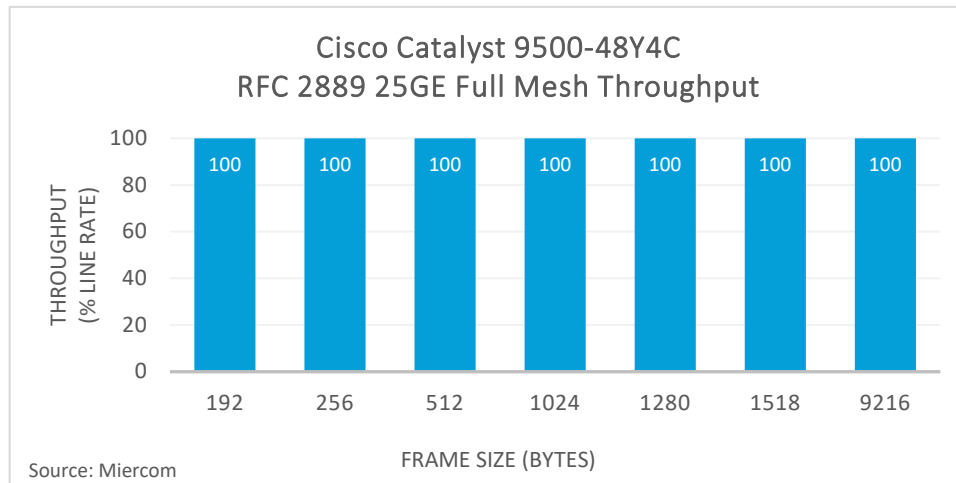
The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv6 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.



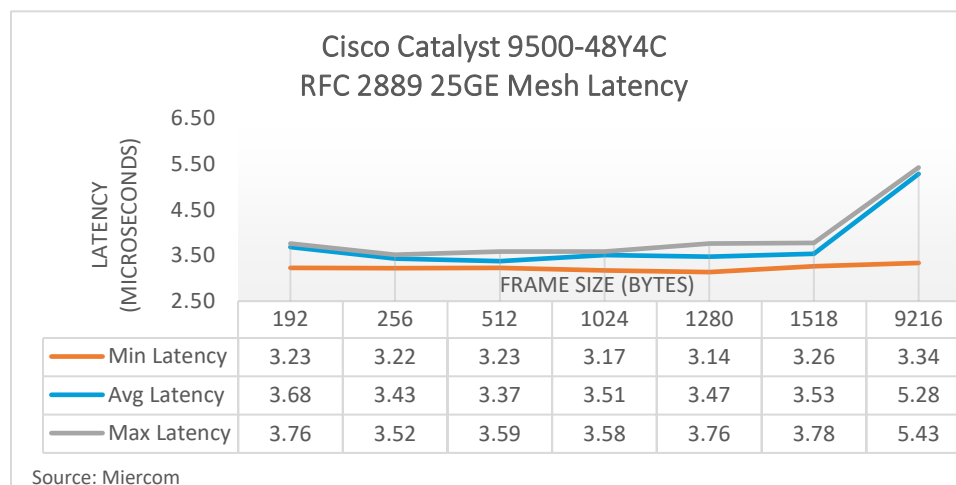
The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for full mesh IPv6 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.24 to 4.19 microseconds. Tests were conducted in accordance with RFC 2889.

5.3 Cisco Catalyst 9500-48Y4C

Layer 2 Full Mesh: 25GE Throughput and Latency

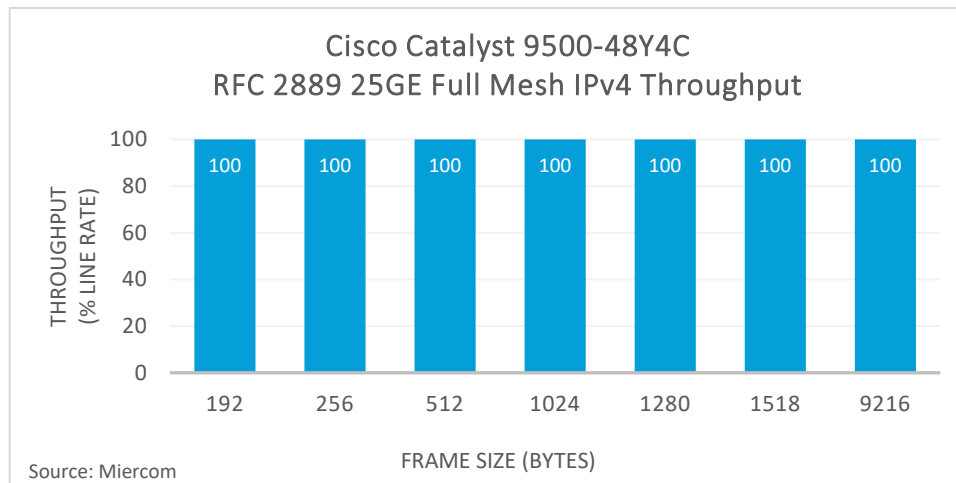


The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.

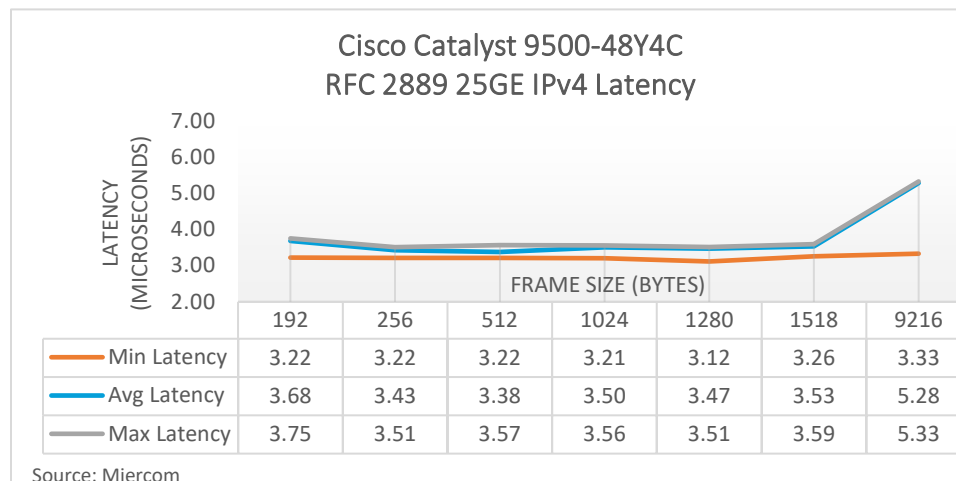


The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for full mesh traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.37 to 5.28 microseconds. Tests were conducted in accordance with RFC 2889.

IPv4: 25GE Throughput and Latency

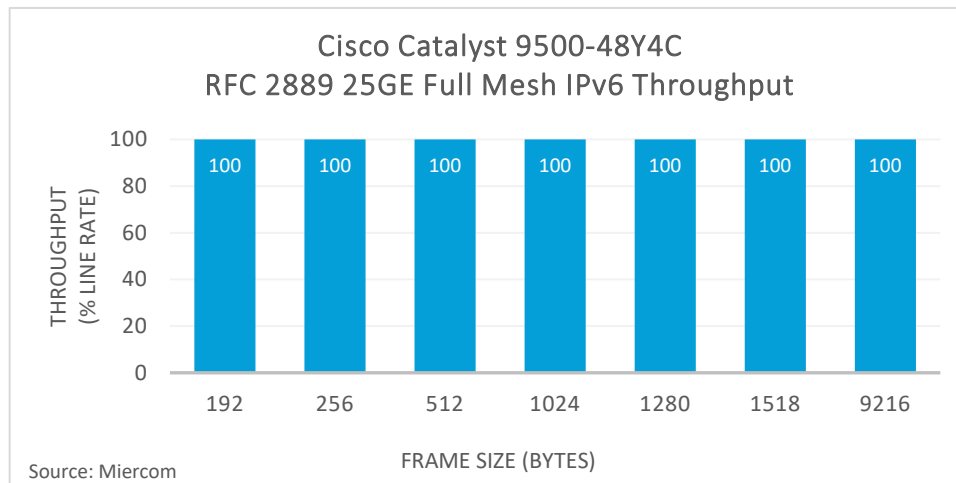


The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv4 traffic for frame sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.

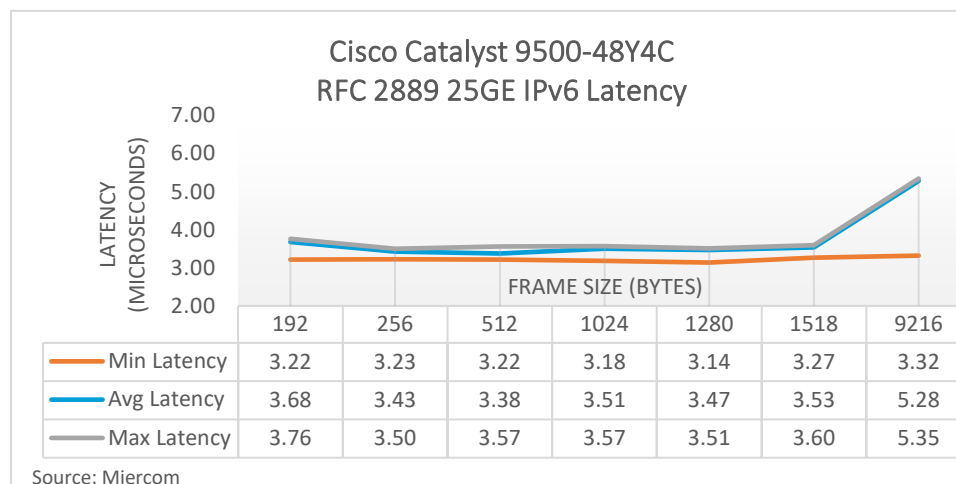


The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for full mesh IPv4 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.38 to 5.28 microseconds. Tests were conducted in accordance with RFC 2889.

IPv6: 25GE Throughput and Latency



The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv6 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 2889.



The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE data center switch testing. The switch was subjected to maximum sustainable load without loss for full mesh IPv6 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.38 to 5.28 microseconds. Tests were conducted in accordance with RFC 2889.

6.0 RFC 3918 Performance

IP multicast is a process and protocol for sending the same IP packet stream to a group of interested receivers. This efficient way to achieve one-to-many or many-to-many communication between IP devices is heavily used by financial trading applications, where performance is critical.

The RFC 3918 standard was established in 2004 to address throughput and latency measurements of IP multicast traffic. The Ixia system supports a combination of traffic profiles with an adjustable number of transmit and receive ports for multicast traffic flows. The multicast frames are sent to clients on multiple subnets (ports) which are also configured via the test and measurement system.

The test reveals the average processing overhead required by the DUT to forward multicast frames. In a typical scenario, the test defines the multicast protocol – in this case, IPv4 or IPv6 – and the number of multicast groups to be sent. Traffic streams are automatically built by the Ixia system. A combination of throughput, latency, group capacity, frame loss and delay can be calculated from the results.

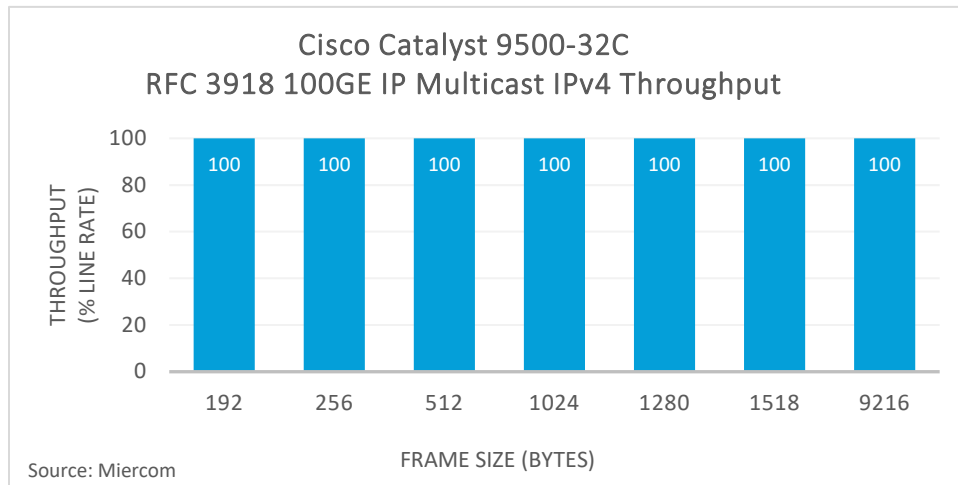
Throughput was measured in percent line rate and latency was measured in microseconds for the following models:

- Section 6.1 – Cisco Catalyst 9500-32C: 100GE
- Section 6.2 – Cisco Catalyst 9500-32QC: 40GE
- Section 6.3 – Cisco Catalyst 9500-48Y4C: 25GE

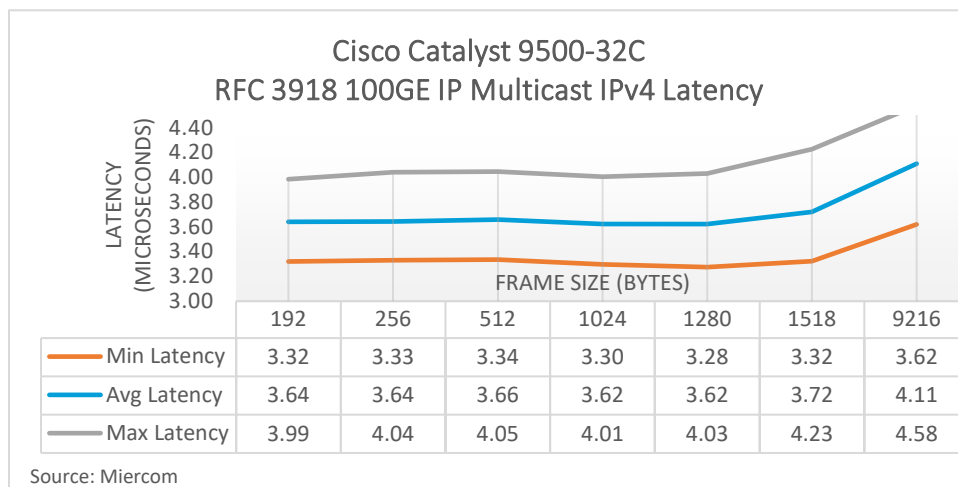
Throughput was calculated as the percent line rate throughput. Latency was calculated by the difference in timestamps from when frames were sent and received by the Ixia system. The test system records minimum, average and maximum latencies for each multicast group, in microseconds (μ s).

6.1 Cisco Catalyst 9500-32C

IPv4: 100GE Throughput and Latency

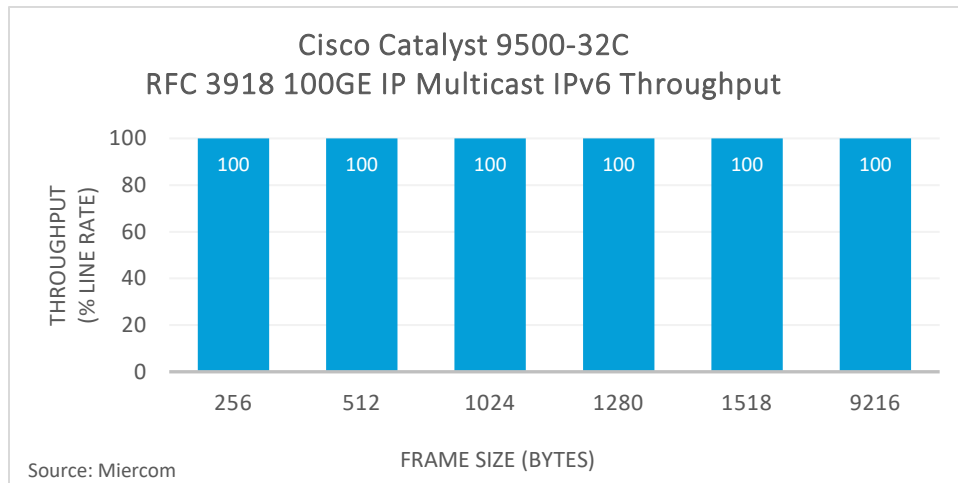


The Cisco Catalyst 9500-32C exhibited full line-rate forwarding performance for all frame sizes with all 100GE ports loaded. Test results shown are for the 100GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for multicast IPv4 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 3918.

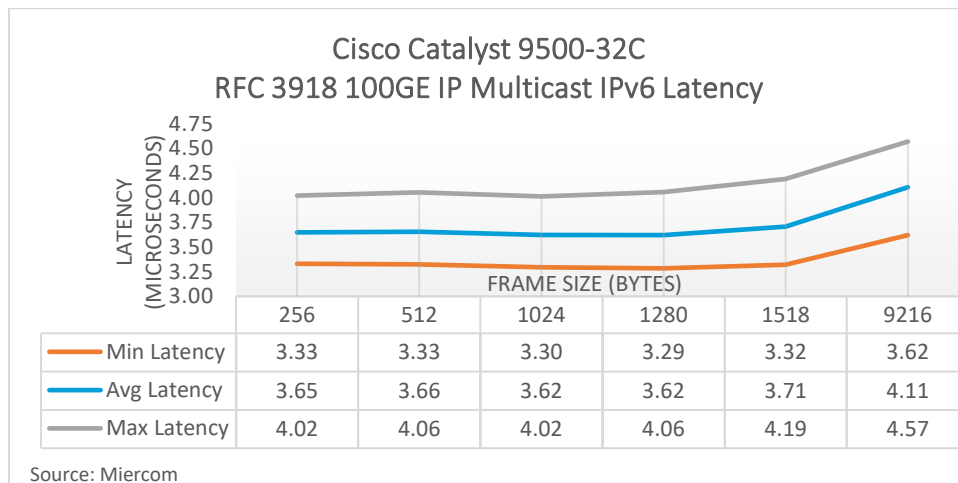


The Cisco Catalyst 9500-32C exhibited the latency results shown above during 100GE data center switch testing. The switch was subjected to maximum sustainable load without loss for multicast traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.62 to 4.11 microseconds. Tests were conducted in accordance with RFC 3918.

IPv6: 100GE Throughput and Latency



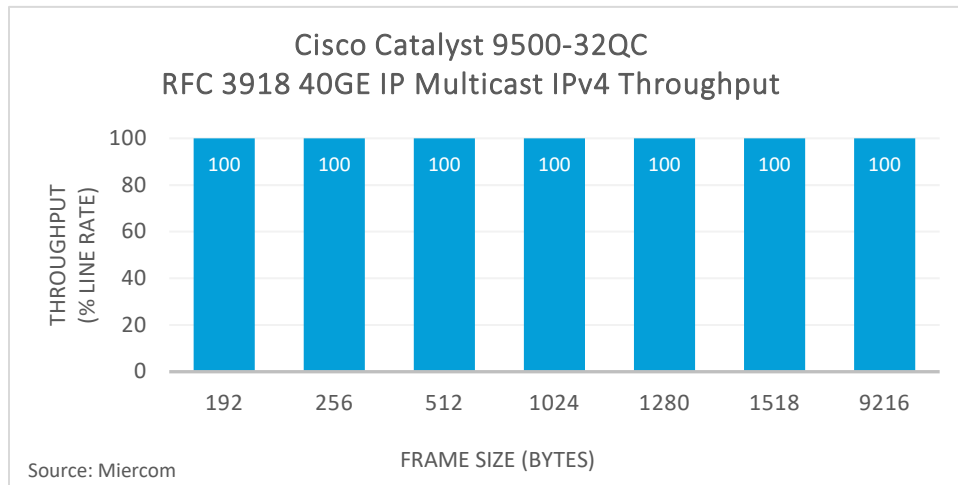
The Cisco Catalyst 9500-32C exhibited full line-rate forwarding performance for all frame sizes with all 100GE ports loaded. Test results shown are for the 100GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for multicast IPv6 traffic for frames sizes ranging from 256 to 9216 bytes. Testing was conducted in accordance with RFC 3918.



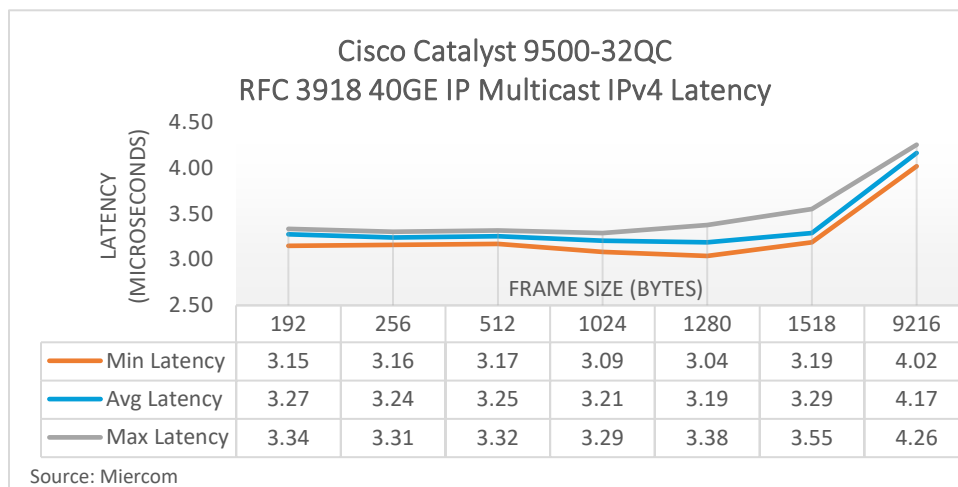
The Cisco Catalyst 9500-32C exhibited the latency results shown above during 100GE switch testing. The switch was subjected to maximum sustainable load without loss for multicast traffic for frame sizes ranging from 256 to 9216 bytes. The average latency ranges from 3.62 to 4.11 microseconds. Tests were conducted in accordance with RFC 3918.

6.2 Cisco Catalyst 9500-32QC

IPv4: 40GE Throughput and Latency

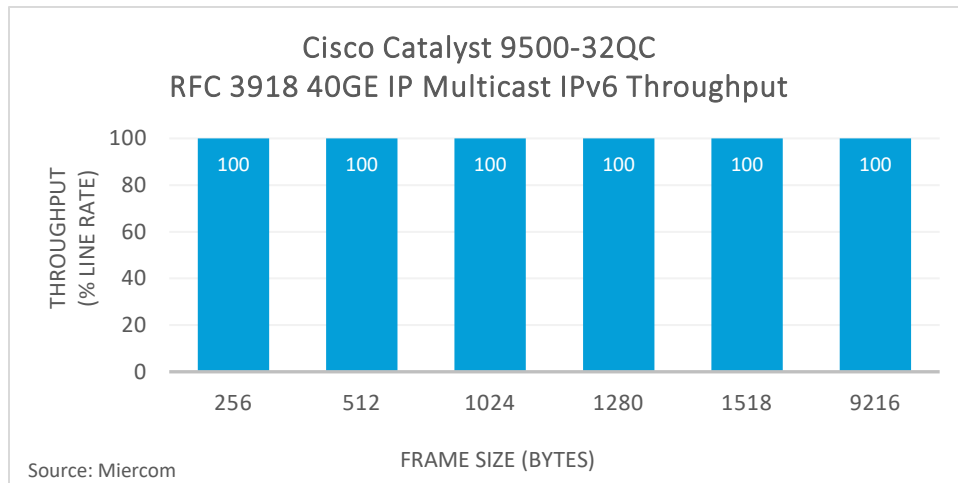


The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for multicast IPv4 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 3918.

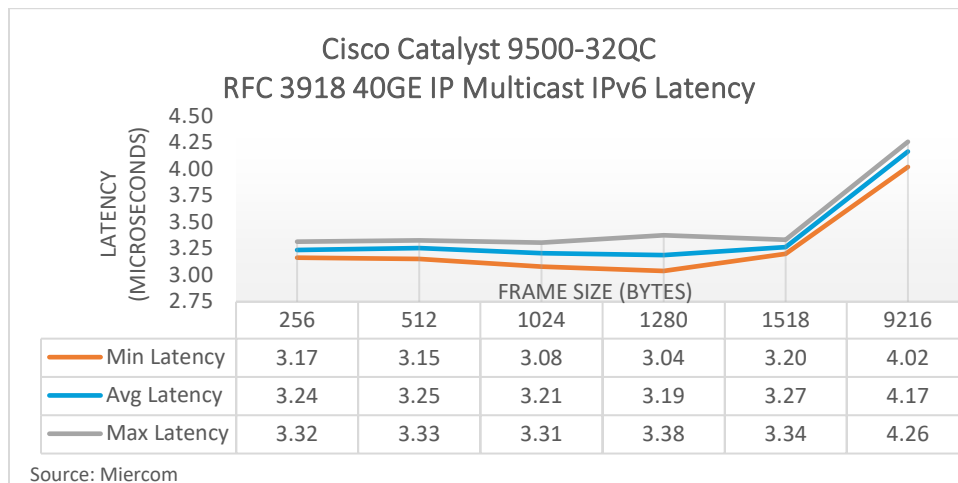


The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE data center switch testing. The switch was subjected to maximum sustainable load without loss for multicast IPv4 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.19 to 4.17 microseconds. Tests were conducted in accordance with RFC 3918.

IPv6: 40GE Throughput and Latency



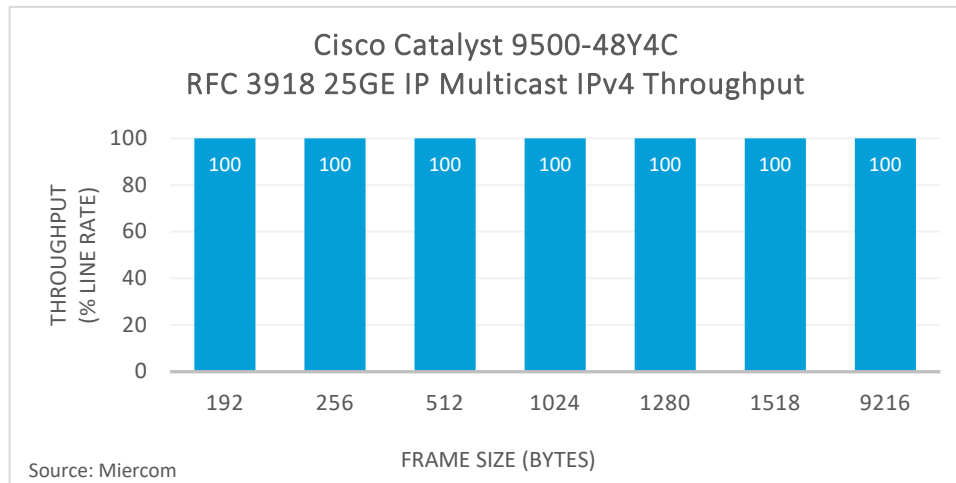
The Cisco Catalyst 9500-32QC exhibited full line-rate forwarding performance for all frame sizes with all 40GE ports loaded. Test results shown are for the 40GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for multicast IPv6 traffic for frames sizes ranging from 256 to 9216 bytes. Testing was conducted in accordance with RFC 3918.



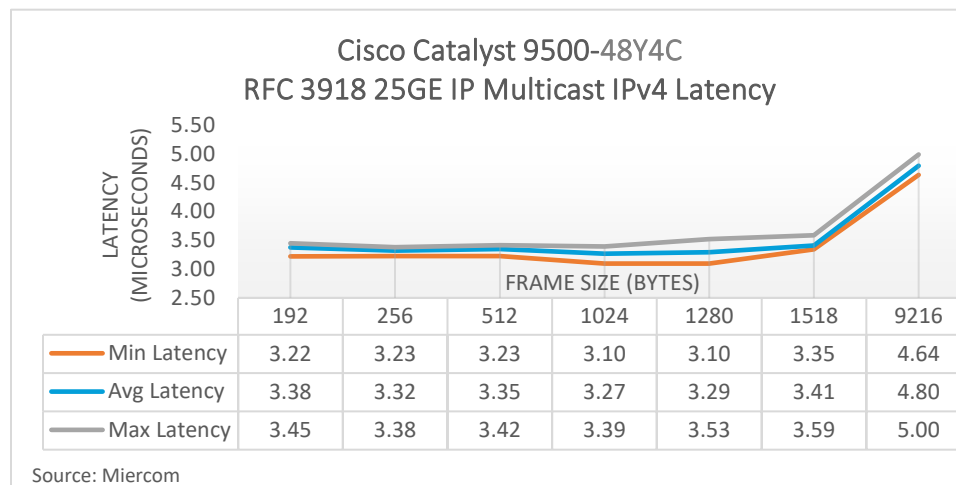
The Cisco Catalyst 9500-32QC exhibited the latency results shown above during 40GE switch testing. The switch was subjected to maximum sustainable load without loss for multicast IPv6 traffic for frame sizes ranging from 256 to 9216 bytes. The average latency ranges from 3.19 to 4.17 microseconds. Tests were conducted in accordance with RFC 3918.

6.3 Cisco Catalyst 9500-48Y4C

IPv4: 25GE Throughput and Latency

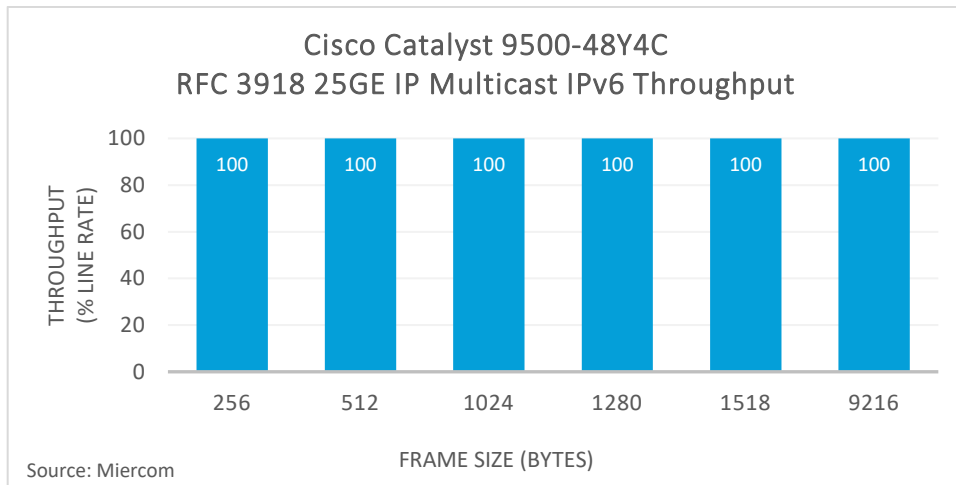


The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv6 traffic for frames sizes ranging from 192 to 9216 bytes. Testing was conducted in accordance with RFC 3918.

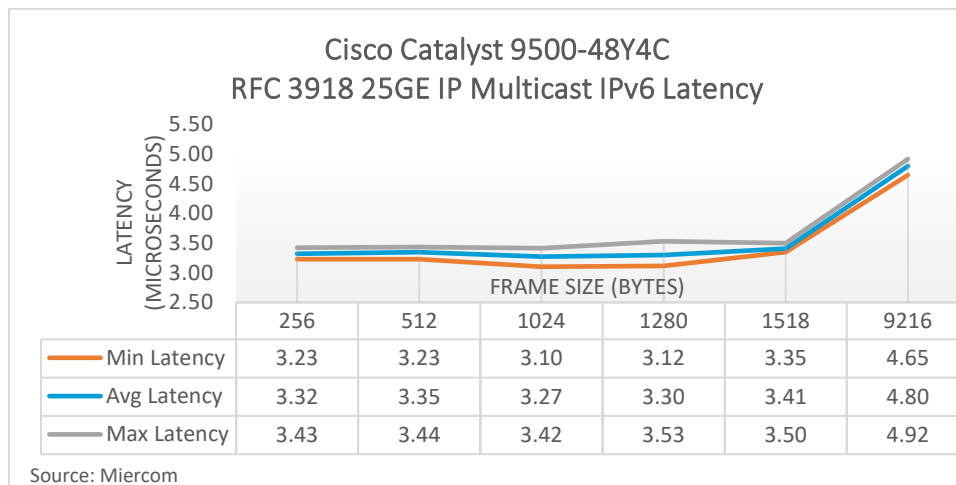


The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for multicast IPv4 traffic for frame sizes ranging from 192 to 9216 bytes. The average latency ranges from 3.27 to 4.80 microseconds. Tests were conducted in accordance with RFC 3918.

IPv6: 25GE Throughput and Latency



The Cisco Catalyst 9500-48Y4C exhibited full line-rate forwarding performance for all frame sizes with all 25GE ports loaded. Test results shown are for the 25GE port-pair testing configuration. The switch endured a maximum sustainable load without loss for full mesh IPv6 traffic for frames sizes ranging from 256 to 9216 bytes. Testing was conducted in accordance with RFC 3918.



The Cisco Catalyst 9500-48Y4C exhibited the latency results shown above during 25GE switch testing. The switch was subjected to maximum sustainable load without loss for multicast IPv6 traffic for frame sizes ranging from 256 to 9216 bytes. The average latency ranges from 3.27 to 4.80 microseconds. Tests were conducted in accordance with RFC 3918.

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