TEST REPORT

Tolly.

#225129

March 2025

Commissioned by

New H3C Technologies Co., Ltd.

# H3C S9820 Series Data Center Switches

## Performance Evaluation and Feature Validation

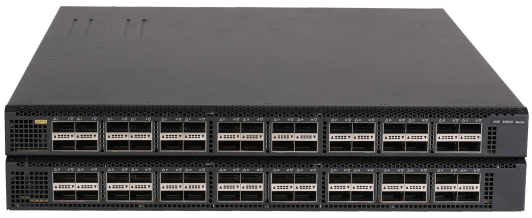
## Executive Summary

With the rapid development of new-generation technologies such as 5G, cloud computing, and AI, the accelerated integration of information technology and traditional industries, data centers, as the physical carrier for the operation of information systems in various industries, have become indispensable for economic and social operations.

H3C S9820 series switches are a new generation of high-performance, high-density 400GE/100GE Ethernet switches launched by H3C for data centers. The S9820 series includes S9820-8C (eight subplots, each card can provide up to 16*100GE ports or 4*400GE ports) and S9820-64H (64*100GE QSFP28 ports) models. Tolly engineers evaluated H3C S9820 series data center switches' performance and validated their features.

**H3C S9820 Series Data Center Switches**

S9820-8C



S9820-64H

Source: Tolly, May 2023

Figure 1

Report link: https://www.tolly.com/publications/detail/225129

# Test Results

Tolly engineers tested functions and performance of the H3C S9820 series data center switch (hereinafter referred to as the S9820). Unless specified, test results apply to both S9820 models. For a summary of the performance test cases, refer to Table 1. For a summary of the feature test cases, refer to Table 3 and Table 5 on Page 5 to Page 7. Test results are as follows.

# Performance

## Throughput

Tolly engineers evaluated throughput of the S9820-8C switch model with eight LSWM116H interface modules of total 128*100GE ports using the RFC2544 test in Spirent TestCenter. It supports 100% Layer 2 and Layer 3 line-rate for frame sizes of 183-byte to 214-byte, as well as 283-byte and above. The test result proves that the S9820-8C switch model supports 12,800Gbps (12.8Tbps) throughput. Please see Table 1 for detailed results.

## Energy Efficiency (TEER)

According to the ATIS Energy Efficiency for Telecommunication Equipment standard, TEER (Telecommunications Energy Efficiency Ratio) is defined as a ratio of maximum demonstrated throughput to weighted power.

The H3C S9820-8C switch model with eight LSWM116H interface modules demonstrated 12,800Gbps maximum throughput. The ATIS weighted power of the S9820-8C switch is 1,052.3W. So the TEER of the S9820-8C switch is 12.16Gbps/Watt. Please see Table 2 on Page 3 for detailed results.

# M-LAG

H3C S9820 supports multi-chassis link aggregation group (M-LAG). Two switches in an M-LAG system connects to the uplink or downlink device through links in an M-LAG to provide high availability.

**New H3C Technologies Co., Ltd.**

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*Tested May 2023*

## GIR

An S9820 M-LAG system supports Graceful Insertion and Removal (GIR) with no packet loss to upgrade M-LAG members' software. GIR upgrades M-LAG members in sequence. GIR maintenance mode automatically switch traffic on one member to the other member before upgrading it.

**H3C S9820 Series Switch Throughput (Percentage of Line-rate)**
**Dual-snake topology, 128*100GE ports**
**(as reported by Spirent TestCenter)**

| Frame Size | 183-byte to 214-byte | 283-Byte | 512-Byte | 1024-Byte | 1280-Byte | 1518-Byte | 9416-Byte |
|---|---|---|---|---|---|---|---|
| **Layer 2/Layer 3 Throughput** | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

Note: The S9820-8C model was used in the test. Throughput was tested with bidirectional traffic using all 100GE ports in a snake topology. All test results had 0 frame loss. 100% line-rate means 12.8Tbps throughput.

Source: Tolly, May 2023

Table 1

# Link Aggregation

## LAG with Load Balancing

H3C S9820 supports static link aggregation group (LAG) or dynamic LAG. The LAG supports load balancing between member links for unicast, multicast and broadcast traffic.

# Routing

## Routing Protocols

H3C S9820 supports OSPF, IS-IS and BGP IPv4 routing protocols.

H3C S9820 supports OSPFv3, IS-IS for IPv6, and BGP4+ IPv6 routing protocols.

H3C S9820 also supports IPv4 and IPv6 dual-stack network with routing protocols.

## Graceful Restart (GR)

H3C S9820 supports graceful restart for IPv4 routing protocols.

Tolly engineers verified that there was no packet loss when the routing protocol process was reset on the switch.

# BFD

H3C S9820 supports bidirectional forwarding detection (BFD) with 100ms minimum sending interval in control mode.

# MPLS

## MPLS L3VPN

H3C S9820 supports MPLS L3VPN.

## MPLS TE

H3C S9820 supports MPLS Traffic Engineering (MPLS TE).

## MPLS MCE

MPLS Multi-VPN-Instance Customer Edge (MPLS MCE) enables a switch to function as the CE of multiple VPN instances in a BGP/MPLS VPN network to reduce equipment investment. H3C S9820 supports MPLS MCE.

## VPN Routing Protocols

When the H3C S9820 switch acts as the MCE, it supports RIP, OSPF, IS-IS, and BGP routing protocols for the VPN instances (VRFs).

## IP Overlap in Different VPNs

When the H3C S9820 switch acts as the MCE, the IP address in one VPN can overlap with IP addresses in other VPNs to save IP resources.

# Ring Protection Protocols

## RRPP

H3C S9820 supports Rapid Ring Protection Protocol (RRPP) with less than 20ms failover time.

## ERPS

H3C S9820 supports Ethernet Ring Protection Switching (ERPS) with less than 40ms failover time.

# O&M

## Telemetry

H3C S9820 supports real-time and high performance gRPC-based Telemetry for network monitoring (e.g. device hardware and traffic statistics.)

### H3C S9820 Series Switch Power Consumption (TEER)

**(as reported by Chroma Programmable AC Source)**

| | 0% utilization power | 30% utilization power | 100% utilization power | ATIS weighted power | Maximum demonstrated throughput | TEER |
|---|---|---|---|---|---|---|
| **S9820-8C** | 969.9W | 1,023.7W | 1,363.8W | 1,052.3W | 12,800Gbps | 12.16Gbps/Watt |

Note: TEER = (maximum demonstrated throughput) / (ATIS weighted power) = 12,800Gbps / 1,052.3W = 12.16Gbps/Watt. Test used the same topology as the throughput test in Table 1. The Spirent TestCenter default iMIX profile was used. The switch was fully loaded with four AC power modules and five fan modules. According to the ATIS-0600015.03.2016 standard, ATIS weighted power = 0.1* (0% utilization power) + 0.8* (30% utilization power) + 0.1 * (100% utilization power).

Source: Tolly, May 2023 Table 2

### INT

H3C S9820 supports Inband Network Telemetry (INT) which collects data from the device and sends data to a collector in real time for performance and network monitoring.

### Telemetry Stream

H3C S9820 supports Telemetry Stream which collects data from the device and streams data to a collector in real time for performance and network monitoring. Telemetry stream is similar to INT, but is different in that it requires configuration only on the device to collect data from.

### MoD

H3C S9820 supports Mirror on Drop (MoD) to detect packet drops during the forwarding process on the device. It can send the packet drop reason and the characteristics of the dropped packet to the collector.

### PTP

H3C S9820 supports working as the Precision Time Protocol (PTP) server or client. It supports 1588v2, 802.1AS, and SMPTE 2059 standards.

### Ansible

H3C S9820 can be configured by Ansible for automation.

### Puppet

H3C S9820 can be configured by the Puppet open source configuration management tool for automation.

### NETCONF

H3C S9820 can be controlled by a controller via NETCONF.

### SNMP

H3C S9820 can be managed by a network management system via SNMP.

### ZTP

H3C S9820 supports Zero Touch Provisioning (ZTP) with the DHCP option and a TFTP server.

### ERSPAN

H3C S9820 supports Encapsulated Remote Switch Port Analyzer (ERSPAN) to mirror traffic on a port to a remote port using a GRE tunnel.

### RSPAN

H3C S9820 supports Remote Switch Port Analyzer (RSPAN) to mirror traffic on a port to a remote port on another device.

### NetStream

H3C S9820 supports NetStream to monitor traffic flow statistics on the device and send it to a NetStream server.

### iNQA

H3C S9820 supports Intelligent Network Quality Analyzer (iNQA) which measures the service packets directly to calculate packet loss results, thus reflecting the real network quality.

## Capacity

### MAC Table

The H3C S9820-8C model supports up to 8,000 MAC addresses in the MAC table.

### MAC Learning Rate

The H3C S9820-8C model supports learning up to 1,250 MAC addresses per second to the MAC table.

### ARP Table

The H3C S9820-8C model supports up to 32,000 ARP entries in the ARP table.

Tolly engineers verified that the switch forwarded traffic matching all entries in its ARP table, without any packet loss.

### ND Table

The H3C S9820-8C model supports 16,000 ND entries in the ND table.

Tolly engineers verified that the switch forwarded traffic matching all entries in its ND table, without any packet loss.

### FIBv4

The H3C S9820-8C model supports up to 931,000 IPv4 routes in the FIB.

Tolly engineers verified that the switch forwarded traffic matching all routing entries in the FIBv4 table, without any packet loss.

### FIBv4 Learning Rate

The H3C S9820-8C model supports learning up to 19,600 IPv4 routes per second to the FIB.

### FIBv6

The H3C S9820-8C model supports up to 466,500 IPv6 routes in the FIB.

Tolly engineers verified that the switch forwarded traffic matching all routing entries in the FIBv6 table, without any packet loss.

### FIBv6 Learning Rate

The H3C S9820-8C model supports learning up to 18,300 IPv6 routes per second to the FIB.

# Features

## DLB ECMP

H3C S9820 supports Equal-Cost Multi-Path Routing (ECMP) load balancing for high availability and efficient use of available bandwidth.

## TCB

H3C S9820 supports Transient Capture Buffer (TCB) to monitor packet drop events on a set of memory management unit (MMU) resources. When a packet is dropped on a queue, the system collects drop time, drop reason, packet metadata, and other information and reports them to a network management system through gRPC.

## PFC Deadlock Detection

PFC deadlock may happen in certain networks due to a loop or other causes to block forwarding on multiple devices.

H3C S9820 supports deadlock detection. So administrators can recover the network from PFC deadlock after receiving the alarm.

## DCBX and PFC

H3C S9820 supports Data Center Bridging Exchange (DCBX) and Priority-based Flow Control (PFC) for a lossless data center network.

## ECN

H3C S9820 supports Explicit Congestion Notification (ECN) for a lossless data center network.

## RoCE Lossless Ethernet

H3C S9820 supports RoCE lossless Ethernet with AI ECN and one-click PFC.

## OpenFlow

H3C S9820 supports OpenFlow to forward traffic according to the flow table.

## EVPN VXLAN Route Reflector (RR)

In a VXLAN overlay network using BGP EVPN as the control plane, the S9820 can work as the BGP RR.

# Component Redundancy

## Fan Redundancy

H3C S9820 supports fan module redundancy. When one fan module was unplugged, there was no packet loss.

## Power Redundancy

H3C S9820 supports power module redundancy. When one power module was unplugged, there was no packet loss.

## Mixed Power Supply Modules

H3C S9820 supports using the AC power module and the DC power module together on the same switch.

### H3C S9820 Series Data Center Switch
**Tolly Verified Features - Part 1 of 3**

| M-LAG | | Routing | |
|---|---|---|---|
| ✔ | Multi-chassis Link Aggregation Group (M-LAG) | ✔ | IPv4 routing protocols: OSPF, IS-IS, BGP |
| ✔ | Graceful Insertion and Removal (GIR)<br>No packet loss to upgrade M-LAG members' firmware. GIR upgrades M-LAG members in sequence. M-LAG maintenance mode automatically switch traffic on one member to the other member before upgrading it | ✔ | IPv6 routing protocols: OSPFv3, IS-IS for IPv6, BGP4+ |
| **Link Aggregation** | | ✔ | Dual-stack<br>OSPF and OSPFv3; IS-IS and IS-IS for IPv6; BGP and BGP4+ |
| ✔ | Static Link Aggregation Group (LAG) | ✔ | Graceful Restart (GR) |
| ✔ | Dynamic Link Aggregation Group (LAG)<br>with LACP | **BFD** | |
| ✔ | Load Balancing<br>for unicast, multicast and broadcast traffic with either the static LAG or dynamic LAG | ✔ | Minimum BFD sending interval: 100ms |

Source: Tolly, May 2023 Table 3

## H3C S9820 Series Data Center Switch
### Tolly Verified Features - Part 2 of 3

| | | | |
|---|---|---|---|
| **MPLS** | | ✔ | NETCONF |
| ✔ | MPLS L3VPN | ✔ | SNMP |
| ✔ | MPLS TE (Traffic Engineering) | ✔ | Zero Touch Provisioning (ZTP) |
| ✔ | MPLS MCE<br>MPLS Multi-VPN-Instance Customer Edge (MPLS MCE) enables a switch to function as the CE of multiple VPN instances in a BGP/ MPLS VPN network to reduce equipment investment | ✔ | ERSPAN |
| ✔ | VPN routing protocol support for MPLS MCE<br>RIP/OSPF/IS-IS/BGP | ✔ | RSPAN |
| ✔ | IP overlap in different VPNs | ✔ | NetStream |
| **Ring Protection Protocols** | | ✔ | iNQA |
| ✔ | Rapid Ring Protection Protocol (RRPP)<br>less than 20ms failover time | **Capacity - for the S9820-8C model** | |
| ✔ | Ethernet Ring Protection Switching (ERPS)<br>less than 40ms failover time | ✔ | MAC table: 8,000 MAC addresses |
| **O&M** | | ✔ | MAC learning rate: 1,250 MAC addresses/sec |
| ✔ | Telemetry<br>Real-time and high performance gRPC-based Telemetry for network monitoring (e.g. device hardware and traffic statistics) | ✔ | ARP table: 32,000 ARP entries |
| ✔ | INT | ✔ | ND table: 16,000 ND entries |
| ✔ | Telemetry Stream | ✔ | IPv4 FIB: 931,000 routes |
| ✔ | Mirror on Drop (MoD) | ✔ | IPv4 FIB learning rate: 19,600 routes/sec |
| ✔ | Precision Time Protocol (PTP) server and client<br>1588v2, 802.1AS, and SMPTE 2059 standards | ✔ | IPv6 FIB: 466,500 routes |
| ✔ | Ansible | ✔ | IPv6 FIB learning rate: 18,300 routes/sec |
| ✔ | Puppet | | |

Source: Tolly, May 2023

Table 4

## H3C S9820 Series Data Center Switch
### Tolly Verified Features - Part 3 of 3

| Features | |
|---|---|
| ✔ | ECMP Dynamic Load Balancing (DLB) |
| ✔ | TCB |
| ✔ | PFC deadlock detection |
| ✔ | DCBX and PFC<br>Data Center Bridging Exchange (DCBX), Priority-based Flow Control (PFC) |
| ✔ | ECN<br>Explicit Congestion Notification |
| ✔ | RoCE Lossless Ethernet (AI ECN + One-click PFC) |
| ✔ | OpenFlow<br>Forwarding traffic according to the flow table |
| ✔ | EVPN VXLAN Route Reflector (RR)<br>In a VXLAN overlay network using BGP EVPN as the control plane, the S9820 can work as the BGP RR |
| **Component Redundancy** | |
| ✔ | Fan Redundancy |
| ✔ | Power Redundancy |
| ✔ | Mixed power supply modules<br>Using the AC power module and the DC power module together on the same switch |

Source: Tolly, May 2023

Table 4

## About Tolly

The Tolly Group companies have been delivering world-class ICT services for over 35 years. Tolly is a leading global provider of third-party validation services for vendors of ICT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at: http://www.tolly.com

## Learn More About H3C

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