TEST REPORT

Tolly.

#225114

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Commissioned by
New H3C Technologies Co., Ltd.

H3C S9825 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 S9825 series switches are a new generation of high-performance, high-density 400GE/200GE Ethernet switches launched by H3C for data centers. Provides high-density 400GE ports; supports redundant pluggable power supplies and fans. The S9825 can be used in the core and aggregation networking of the new generation data center. Tolly engineers evaluated H3C S9825 series data center switches' performance and validated their features.

H3C S9825 Series Data Center Switches

H3C S9825-64D
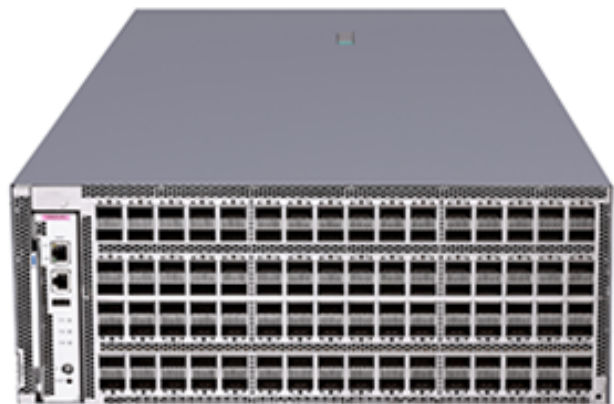
H3C S9825-128B

Source: Tolly, October 2024   Figure 1

Report link: https://www.tolly.com/publications/detail/225114

Test Results

Tolly engineers tested functions and performance of the H3C S9825 series data center switch (hereinafter referred to as the S9825). Unless specified, test results apply to all S9825 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 4 on Page 6 and Page 7. Test results are as follows.

Performance

Throughput

Tolly engineers evaluated throughput of the S9825-64D switch model with 64*400GE ports using the RFC2544 test in Spirent TestCenter. It supports 100% Layer 2 line-rate for frame sizes of 284-byte and above. 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 S9825-64D switch model demonstrated 25,600Gbps maximum throughput. The ATIS weighted power of the S9825-64D switch is 704.1W. So the TEER of the S9825-64D switch is 36.36Gbps/Watt. Please see Table 2 on Page 3 for detailed results.

M-LAG

H3C S9825 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. It provides high availability for traditional VLAN and new VXLAN overlay networks.

New H3C Technologies Co., Ltd.

S9825 Series Data Center Switch

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Tested October 2024

Link Aggregation

LAG with Load Balancing

H3C S9825 supports static L2/L3 link aggregation group (LAG) or dynamic L2/L3 LAG. The LAG supports load balancing between member links for unicast, multicast and broadcast traffic.

H3C S9825 Series Switch Throughput (Percentage of Line-rate)
Snake topology, 64*400GE ports
(as reported by Spirent TestCenter)

Frame Size	284-Byte	512-Byte	1024-Byte	1280-Byte	1518-Byte	2048-Byte	4096-Byte	9416-Byte
Layer 2 Throughput	100%	100%	100%	100%	100%	100%	100%	100%

Note: The S9825-64D model was used in the test. Throughput was tested with bidirectional traffic using all 400GE ports in a snake topology. All test results had 0 frame loss. 100% line-rate means 25.6Tbps throughput.

Source: Tolly, October 2024

Table 1

VXLAN

Basic VXLAN Functions

H3C S9825 supports the VXLAN overlay network which is widely used to build modern campus networks and data center networks.

Tolly engineers verified that H3C S9825 can provide Layer 2 and Layer 3 endpoint connectivity over the VXLAN overlay network. It can provide IPv6 endpoint connectivity over the IPv4 VXLAN overlay network. It can also provide endpoint connectivity between VXLAN and traditional VLAN (non-VXLAN) networks.

EVPN VXLAN with Distributed Gateways

VXLAN with the BGP-EVPN control plane and distributed gateways is the most popular VXLAN implementation with many advantages including high scalability and easy deployment. H3C S9825 supports EVPN VXLAN with distributed gateways.

S9825 also supports centralized L3 gateway for traditional VXLAN deployment.

VXLAN DCI

H3C S9825 supports VXLAN Data Center Interconnect (DCI) to provide L2 connectivity between data centers.

VXLAN Capacity

H3C S9825 supports 2,042 IPv4 VXLAN tunnels.

Routing

Routing Protocols

H3C S9825 supports OSPF, IS-IS and BGP IPv4 routing protocols.

H3C S9825 supports OSPFv3, IS-IS for IPv6, and BGP4+ IPv6 routing protocols.

H3C S9825 also supports IPv4 and IPv6 dual-stack network with routing protocols.

Graceful Restart (GR)

H3C S9825 supports graceful restart for OSPF.

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

DLB ECMP

H3C S9825 supports Equal-Cost Multi-Path Routing (ECMP) load balancing for high availability and efficient use of available bandwidth.

Traffic-matrix

H3C S9825 supports traffic-matrix. It can forward traffic according to the configured traffic matrix on the ECMP paths.

LBN and LBN Enhanced

H3C S9825 supports default ECMP HASH mode and ECMP enhanced mode. In the default ECMP HASH mode, when a ECMP path is down, the switch recalculates to load balance all traffic flows. This may cause sudden high latency for all traffic. In the ECMP enhanced mode, it only recalculates paths for traffic flows previously on the down link.

SprayLink

H3C S9825 supports SprayLink which uses flow-based load sharing for protocol packets and spray per-packet load sharing for service packets in the network, enhancing bandwidth usage for network-wide links.

H3C S9825 Series Switch Power Consumption (TEER)
(as reported by one AC clamp meter)

	0% utilization power	30% utilization power	100% utilization power	ATIS weighted power	Maximum demonstrated throughput	TEER
S9825-64D	609.4W	709.2W	758.3W	704.1W	25,600Gbps	36.36Gbps/Watt

Note: TEER = (maximum demonstrated throughput) / (ATIS weighted power) = 25,600Gbps / 704.1W = 36.36Gbps/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 six 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, October 2024   Table 2

The SprayLink solution effectively solves the issues of uneven load sharing and low bandwidth usage in RoCE networks.

BFD

H3C S9825 supports bidirectional forwarding detection (BFD) with 100ms minimum sending interval in echo or control mode.

MCE

MCE-VRF

Multi-VPN-Instance Customer Edge (MCE) enables a switch to function as the CE of multiple VRF VPN instances to reduce equipment investment. H3C S9825 supports MCE-VRF.

VPN Routing Protocols

When the H3C S9825 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 S9825 switch acts as the MCE, the IP address in one VPN can overlap with IP addresses in other VPNs to save IP resources.

O&M

Telemetry

H3C S9825 supports real-time and high performance gRPC-based dial-in and dial-out Telemetry for network monitoring (e.g. device hardware and traffic statistics.)

INT

H3C S9825 supports working as Inband Network Telemetry (INT) transit role.

Telemetry Stream

H3C S9825 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 S9825 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.

Ansible

H3C S9825 can be configured by Ansible for automation.

NETCONF

H3C S9825 can be controlled by a controller via NETCONF.

SNMP

H3C S9825 can be managed by a network management system via SNMP v1, v2c and v3.

OpenFlow

H3C S9825 supports OpenFlow to forward traffic according to the flow table.

ZTP

H3C S9825 supports Zero Touch Provisioning (ZTP) with the DHCP option and a TFTP server.

ERSPAN

H3C S9825 supports Encapsulated Remote Switch Port Analyzer (ERSPAN) to mirror traffic on a port to a remote port using a GRE tunnel.

RSPAN

H3C S9825 supports Remote Switch Port Analyzer (RSPAN) to mirror traffic on a port to a remote port on another device.

NetStream

H3C S9825 supports NetStream to monitor traffic flow statistics on the device and send it to a NetStream server.

Capacity

MAC Table

H3C S9825 supports up to 131,072 MAC addresses in the MAC table.

MAC Learning Rate

H3C S9825 supports learning up to 13,100 MAC addresses per second to the MAC table.

ARP Table

H3C S9825 supports up to 16,000 ARP entries in the ARP table with different MAC addresses.

H3C S9825 supports up to 163,000 ARP entries in the ARP table with the same MAC address.

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

ND Table

H3C S9825 supports 16,000 ND entries in the ND table with different MAC addresses.

H3C S9825 supports 81,000 ND entries in the ND table with the same MAC address.

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

FIBv4

H3C S9825 supports up to 980,000 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

H3C S9825 supports learning up to 34,300 IPv4 routes per second to the FIB.

FIBv6

H3C S9825 supports up to 980,000 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

H3C S9825 supports learning up to 27,400 IPv6 routes per second to the FIB.

Features

PFC Deadlock Prevention

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

H3C S9825 supports deadlock prevention. It can automatically recover from deadlock.

Mice Elephant Flow QoS

H3C S9825 supports the EM mode for the mice elephant flow scenario. In some data centers, a few elephant flows occupies a large portion of bandwidth and may cause packet loss for lots of mice flows. H3C S9825

can automatically detects the elephant flows and forward mice flows with higher priority.

DCBX and PFC

H3C S9825 supports Data Center Bridging Exchange (DCBX) and Priority-based Flow Control (PFC) for a lossless data center network.

ECN

H3C S9825 supports Explicit Congestion Notification (ECN) for a lossless data center network.

RoCE Lossless Ethernet

H3C S9825 supports RoCE lossless Ethernet with AI ECN and one-click PFC.

Microsegment

H3C S9825 supports microsegment. Administrators can use microsegments to create QoS policies.

Component Redundancy

Fan Redundancy

H3C S9825 supports fan module redundancy. When one fan module was unplugged, there was no packet loss.

Power Redundancy

H3C S9825 supports power module redundancy. When one power module was unplugged, there was no packet loss.

H3C S9825 Series Data Center Switch
Tolly Verified Features - Part 1 of 2

M-LAG		Routing	
✔	Multi-chassis Link Aggregation Group (M-LAG)	✔	IPv4 routing protocols: OSPF, IS-IS, BGP
Link Aggregation		✔	IPv6 routing protocols: OSPFv3, IS-IS for IPv6, BGP4+
✔	L2/L3 Static Link Aggregation Group (LAG)	✔	Dual-stack OSPF and OSPFv3; IS-IS and IS-IS for IPv6; BGP and BGP4+
✔	L2/L3 Dynamic Link Aggregation Group (LAG) with LACP	✔	Graceful Restart (GR) OSPF
✔	Load Balancing for unicast, multicast and broadcast traffic with either the static LAG or dynamic LAG	✔	DLB ECMP Dynamic Loa-balance Equal-cost Multi-path
VXLAN		✔	Traffic-matrix Forward traffic according to the configured traffic matrix on the ECMP paths
✔	Layer 2 connectivity over the VXLAN overlay network with the same VXLAN Network Identifier (VNI)	✔	LBN (ECMP HASH)
✔	Layer 3 connectivity over the VXLAN overlay network with different VNIs	✔	LBN Enhanced (ECMP Enhanced mode)
✔	IPv6 connectivity over IPv4 VXLAN overlay network	✔	SprayLink SprayLink uses flow-based ECMP load sharing for protocol packets and spray per-packet load sharing for service packets
✔	Connectivity between VXLAN and non-VXLAN (VLAN only) networks	**BFD**	
✔	Distributed VXLAN L3 gateway with an IPv4 or IPv6 underlay network	✔	Minimum BFD sending interval: 100ms in control mode or echo mode
✔	Centralized VXLAN L3 gateway with an IPv4 or IPv6 underlay network	**MCE**	
✔	EVPN VXLAN Widely used modern network architecture. VXLAN with the BGP EVPN control plane	✔	MCE-VRF Multi-VPN-Instance Customer Edge (MCE) enables a switch to function as the CE of multiple VPN instances to reduce equipment investment
✔	VXLAN Data Center Interconnect (DCI)	✔	VPN routing protocol support for MCE-VRF RIP/OSPF/IS-IS/BGP
✔	VXLAN tunnel capacity: 2,042 IPv4 VXLAN tunnels	✔	IP overlap in different VPNs

Source: Tolly, October 2024   Table 3

H3C S9825 Series Data Center Switch
Tolly Verified Features - Part 2 of 2

O&M		Capacity	
✔	Telemetry Real-time and high performance gRPC-based dial-in and dial-out Telemetry for network monitoring (e.g. device hardware and traffic statistics)	✔	MAC table: 131,072 MAC addresses
✔	INT (Only works as the transit role)	✔	MAC learning rate: 13,100 MAC addresses/sec
✔	Telemetry Stream	✔	ARP table: 16,000 ARP entries (with different MAC addresses) 163,000 ARP entries (with the same MAC address)
✔	Mirror on Drop (MoD)	✔	ND table: 16,000 ND entries (with different MAC addresses) 81,000 ND entries (with the same MAC address)
✔	Ansible	✔	IPv4 FIB: 980,000 routes
✔	NETCONF	✔	IPv4 FIB learning rate: 34,300 routes/sec
✔	SNMP v1, v2c and v3	✔	IPv6 FIB: 980,000 routes
✔	OpenFlow Forwarding traffic according to the flow table	✔	IPv6 FIB learning rate: 27,400 routes/sec
✔	Zero Touch Provisioning (ZTP)	**Features**	
✔	ERSPAN	✔	PFC deadlock prevention
✔	RSPAN	✔	Mice Elephant Flow QoS
✔	NetStream	✔	DCBX and PFC Data Center Bridging Exchange (DCBX), Priority-based Flow Control (PFC)
		✔	ECN Explicit Congestion Notification
		✔	RoCE Lossless Ethernet (AI ECN + One-click PFC)
		✔	Microsegment
		Component Redundancy	
		✔	Fan Redundancy
		✔	Power Redundancy

Source: Tolly, October 2024   Table 4

About Tolly

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