TEST REPORT

Tolly.

#217117

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Commissioned by
D-Link Systems, Inc.

D-Link DXS-3400-24TC 10GbE Stackable Managed Switch

Performance Comparison Versus NETGEAR M4300-24X

EXECUTIVE SUMMARY

Stackable 10GbE managed switches provide scalability and flexibility in a compact form factor. 10GbE ports provide high-bandwidth connections for server or stacking connections. High-availability (HA) features also play an important role.

D-Link Systems commissioned Tolly to evaluate its DXS-3400-24TC 10GbE switch and compare that to a NETGEAR M4300-24X. Both switches offer 24 ports of 10 Gigabit Ethernet. Performance tests measured L2 throughput, latency and MAC address collision avoidance.

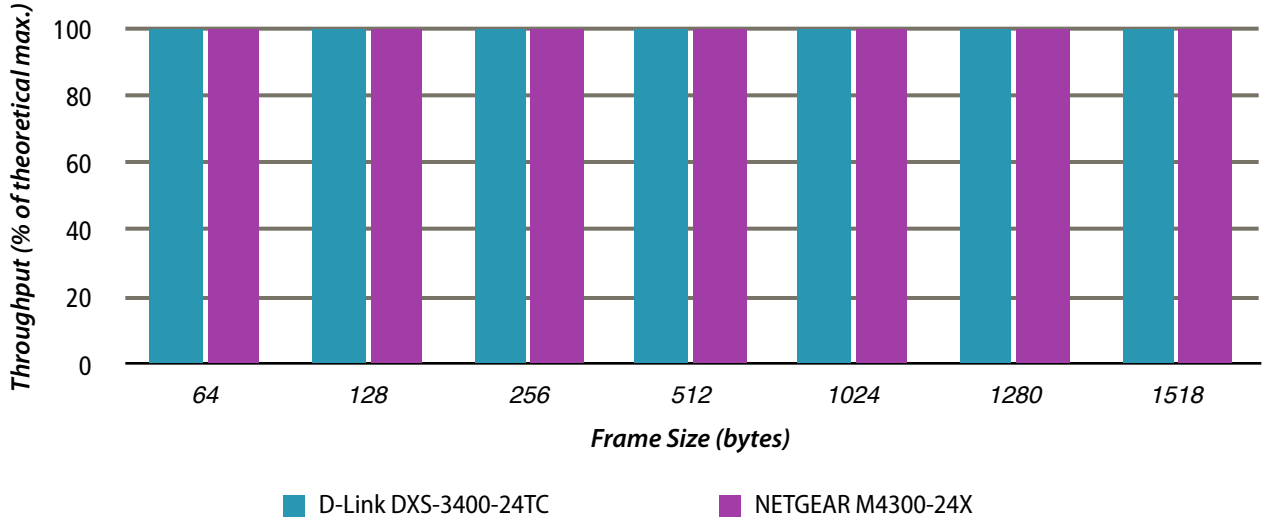
The D-Link Systems switch matched the throughput and latency of the NETGEAR switch. Furthermore, the D-Link switch offers HA features such as dual-modular power supply units (PSU) and modular fans. ...<continued on next page>

THE BOTTOM LINE

The D-Link DXS-3400-24TC delivers:

1. Line-rate L2 throughput across all 10GbE ports – equivalent to the competing switch
2. Latency that is identical to the competing switch
3. Dramatically lower MAC collision rates than the competing switch
4. HA features such as dual, redundant PSUs and modular, hot-swappable fans

Layer 2 10 Gigabit Ethernet Switch Throughput
Across 24 10GbE Ports in Snake Topology
(as reported by Ixia IxNetwork v8.20)



Source: Tolly, March 2017

Figure 1

The D-Link and NETGEAR switches provide 24 10GBASE-T connections and 4 10GbE combo ports that can be used in place of four 10GBASE-T ports. Both switches offer 240Gbps of total switch throughput.

See the Test Methodology section for additional details about the systems under test and the specifics of the tests.

L2 Throughput and Latency

Industry-standard RFC 2544 Throughput tests of multiple frame sizes, from 64-bytes to 1518-bytes, proved that the D-Link DXS-3400 switch delivers the same line-rate L2 throughput for each port as the competing switch. See Figure 1.

Latency tests showed that the D-Link switch results matched those of the NETGEAR switch. See Figure 2.

MAC Address Collision

In order to function properly, switches need to learn the stations addresses, known as MAC addresses, of all the devices communicating across the switch. It is important that switches do not overwrite active addresses and "lose" the address. This could occur if the MAC address storage is not large enough or possibly if the hashing algorithm used for storing addresses causes a new address to overwrite an old one.

The NETGEAR switch specification states a MAC table size of 16K addresses and it was tested at that level. The D-Link switch specification states a MAC table size of 48K and it was tested with 32K addresses.

The switches were tested first using MAC addresses that were incremented and then tested again with randomly generated MAC addresses.

D-Link Systems, Inc.

DXS-3400-24TC

Performance & Power Consumption

Tolly. Certified

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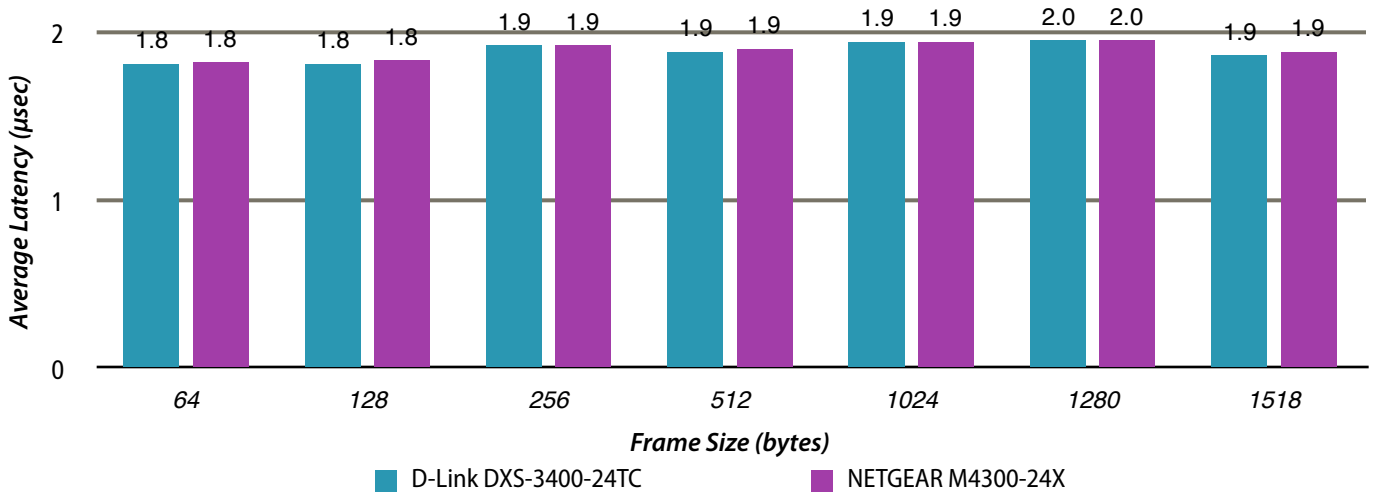
In the incremental MAC test, the D-Link switch did not miss any addresses. This compared with 1,671 missed for NETGEAR.

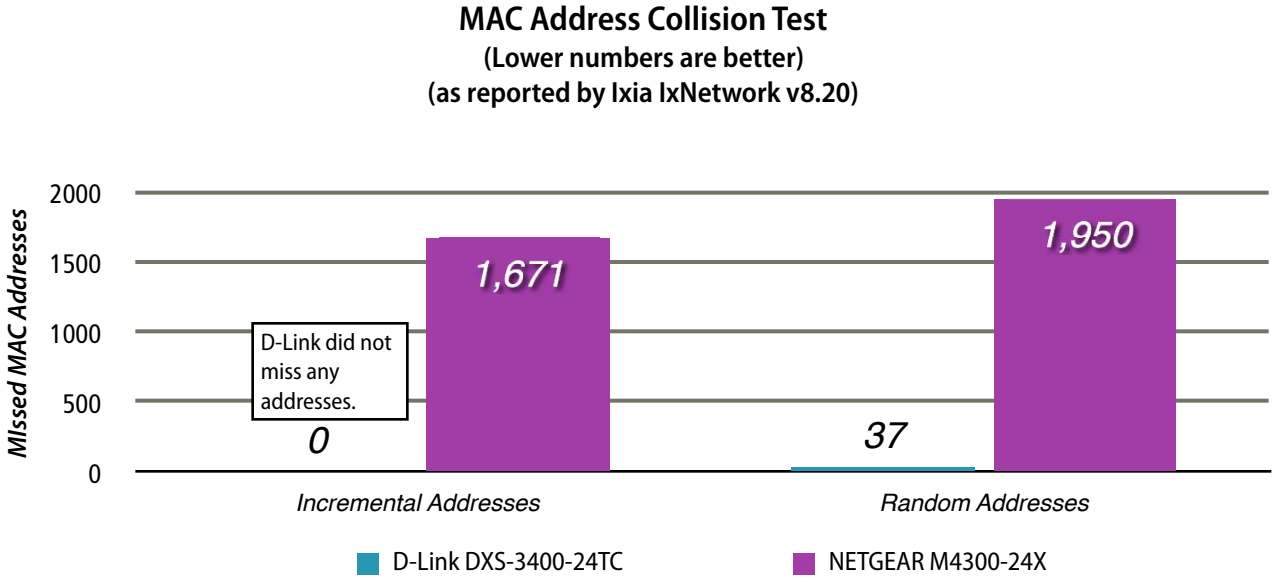
With the random test, the D-Link switch missed 37 addresses. NETGEAR missed 1,950 addresses. See Figure 3.

Layer 2 10 Gigabit Ethernet Switch LIFO Latency (µsec)
10GbE Port-to-Port Configuration
(Lower numbers are better)
(as reported by Ixia IxNetwork v8.20)



Note: Result is average of port 23 to port 24 and port 24 to port 23 across two SFP+ ports. Results do not include time required to store each frame.

Source: Tolly, March 2017 Figure 2



Note: D-Link specifies support for 48K MAC addresses, 32768 were sent in each test.
NETGEAR specifies support for 16K MAC addresses, 16,000 were sent in each test.

Source: Tolly, March 2017

Figure 3

ATIS Weighted Power

Finally, Tolly engineers evaluated the power consumption of the switches. The ATIS approach dictates that the power consumption of the switch be measured at different levels of activity. A lower ATIS value is a better result indicating lower power consumption.

The ATIS value for the D-Link switch was 114.52Watts while the ATIS value for the NETGEAR switch was 104.64Watts.

TEER

The Telecommunications Energy Efficiency Ratio - or TEER - looks at power consumption as it compares to throughput. With TEER, a higher number is better as it indicates more throughput for energy consumed.

The D-Link switch delivered a TEER value of 2.10Gbps/Watt while the TEER value for the NETGEAR switch was 2.29Gbps/Watt.

Test Setup & Methodology

Switches under test were managed 10GbE switches and provided 24 ports of 10Gigabit Ethernet connectivity. See Table 2.

All performance testing used all available 10GbE ports. Default device configurations were used as the basis for all tests.

Performance

Tests were run using an Ixia FlexAP10GE16S module installed in an optixia XM2 chassis running Ix0S version 8.2. Throughput tests were run using "snake" topology where traffic from one Ixia port entered an SFP+ port and than transited all 10GBASE-T ports in a port-to-port fashion before existing the switch via a second SFP+ port. IxNetwork V8.20 was used for all tests. Latency tests used two ports on the switch under test as port to port.

L2 Throughput & Latency Tests

The RFC 2544 templates were used for all throughput and latency tests. All tests were run using the following frame sizes: 64-, 128-, 256-, 512-, 1024-, 1280-, and 1518-bytes of layer 2 traffic. All tests were run three times for a duration of one minute each. The average of the three runs was reported.

For the throughput test, the constant loading traffic profile was used with a loss tolerance of zero frame loss.

For the latency test, the constant loading traffic profile was used and the rate was set to 100%. LIFO (last-in, first-out) latency was measured using two 10GbE ports. The LIFO measurements do not include the time required to store the frame.

10 Gigabit Ethernet Switch Power Consumption

Solution	Power Consumption (W) at ATIS Traffic Loads (lower is better)			ATIS Weighted Average Power (W_{ATIS}) (lower is better)	TEER (Gbps/Watt)
	Idle	10%	100%		
D-Link DXS-3400-24TC	114.4	114.4	115.6	114.52	2.10
NETGEAR M4300-24X	103.3	104.1	110.3	104.64	2.29

Note: Systems tested with single power supply. ATIS weighted power is calculated by as 80% of the 10% load value plus 10% each of the idle and 100% load values. For idle, ports are active (green LED) but no traffic is running. For TEER, higher numbers are better as it indicates greater throughput per Watt.

Source: Tolly, March 2017

Table 1

MAC Collision Tests

These tests were designed to illustrate whether the device could accommodate large numbers of MAC (station) addresses in its internal tables. The test had two parts. Incremental: 16K/32K MAC addresses with incremental values were transmitted into the switch; Random: 16K/32K randomly-generated MAC addresses were transmitted into the switch. At the end of each test, engineers reviewed the MAC address table to determine how many addresses were stored. Ixia IxNetwork was used to generate random MAC addresses.

Power Consumption

ATIS

Tolly engineers benchmarked the power consumption of each solution using all available ports and one power supply.

Testing was conducted in accordance with ATIS document ATIS-0600015.03.2009 - *Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting for Router and Ethernet Switch Products.* In the ATIS weighted energy consumption, a lower value is better.

The iMIX profile in Ixia: (framesize:weight) as 64:7, 570:4, 1518:1

Power was measured using a WattsUp Pro power meter.

TEER

Telecommunications Energy Efficiency Ratio (TEER) is defined as a ratio of maximum demonstrated throughput (Td) to ATIS weighted power (energy consumption rate) Pw. TEER = Td / Pw. For example, the D-Link DXS-3400-24TC demonstrated 240Gbps maximum throughput. So Td = 240Gbps. The ATIS weighted power consumption was 114.52Watts. So Pw = 114.52. As a result, the D-Link DXS-3400-24TC switch's TEER is 240 / 114.52 = 2.0957 Gbps/Watt.

10 Gigabit Ethernet Stackable, Managed Switches Under Test

Vendor	Product	Vendor SKU	10GbE Ports	Rack Size	High-Availability: Power Supply Unit (PSU) Options	High-Availability: Fan Options	Firmware	10GbE Connection Notes
D-Link Systems	D-Link DXS-3400-24TC	DXS-3400-24TC	24	Full-size	Two modular PSUs (tested with one)	Hot-swappable modular fans	2.00.0009	24-port 10GBASE-T copper 4-port shared 10GBASE-X SFP
NETGEAR	NETGEAR M4300-24X	XSM4324CS-100NES	24	Half-size	One modular PSU	Embedded fixed fan	12.0.2.10	24-port 10GBASE-T copper 4-port shared 10GBASE-X SFP

Note: Switches tested with one power supply.

Source: Tolly, March 2017

Table 2

Test Equipment Summary

The Tolly Group gratefully acknowledges the providers of test equipment/software used in this project.

Vendor	Product	Web
Ixia	**Ixia XM2 chassis** **IxOS 8.20.1300.2** **FlexAP10GE16S module (10GbE)** **IxNetwork Version: 8.20.1063.32 EA-Patch1**	www.ixiacom.com
Siemon	**Cable Infrastructure**	http://www.siemon.com

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

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Interaction with Competitor

In accordance with Tolly's Fair Testing Charter, Tolly personnel invited NETGEAR to participate in the testing. NETGEAR responded and was provided with test plans and reviewed their results. NETGEAR did not have any comments on their results.

For more information on the Tolly Fair Testing Charter, visit:

http://www.tolly.com/FTC.aspx

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