TEST REPORT

Tolly.

#220143

October 2020

Commissioned by NETGEAR, Inc.

NETGEAR M4300 Intelligent Edge Switch

Performance, Stacking & Power Consumption vs. Aruba & Cisco Systems

EXECUTIVE SUMMARY

Edge networks carry critical applications for businesses large and small. In these deployments resilience and reliability can be as important as performance. Increasingly, edge switches need to have the type of reliability usually associated with chassis-based switches. NETGEAR's M4300 Intelligent Edge Switch family combine high performance with non-stop forwarding (NSF) to provide enterprise-class reliability.

NETGEAR commissioned Tolly to benchmark the performance, stack failover and power consumption of the NETGEAR M4300-52G LAN switch and compare that to the Aruba 2930F-48G-4SFP+ and the Cisco Systems SG550X-48P switches. Testing was performed both on single switches and a stack of three switches from each vendor.

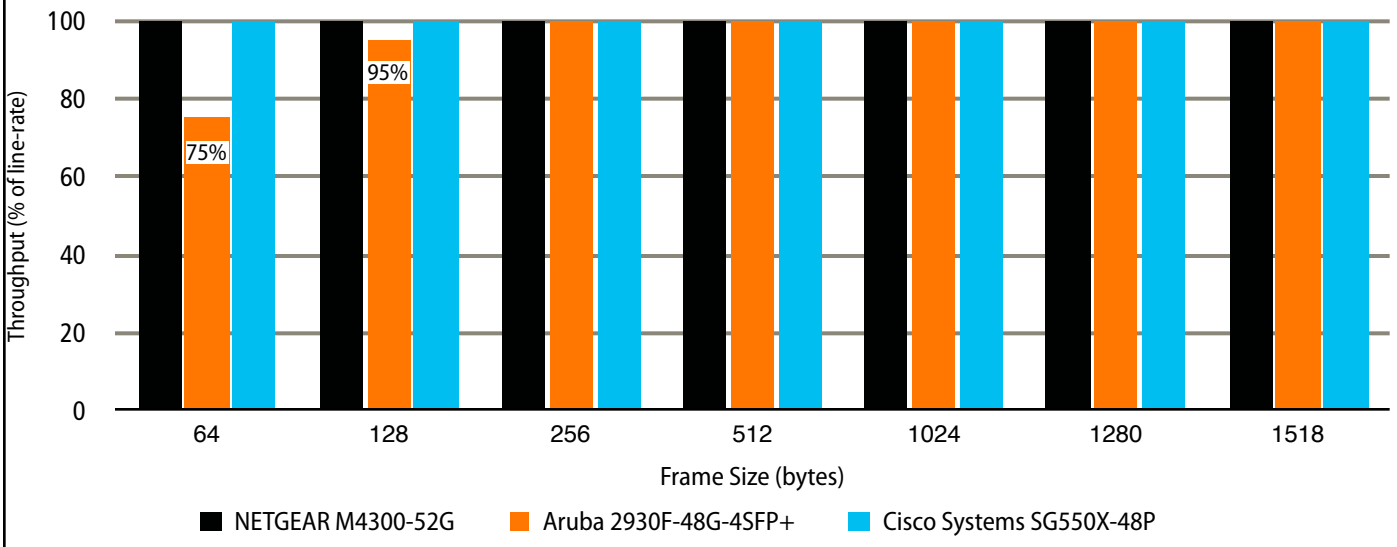
The NETGEAR M4300 switch demonstrated line rate performance at all frame sizes for both GbE and 10GbE ports. This performance was better than the Aruba 2930F and matched that of the Cisco SG550X (See Figure 1.)

THE BOTTOM LINE

NETGEAR'S M4300 switches deliver:

1. Line-rate L2 switch throughput across all 48 GbE ports
2. Line-rate L2 switch throughput across all four 10GbE ports
3. Non-Stop Forwarding (NSF) with zero failover loss when commander switch goes down
4. Rapid failover in switching stack (1.1s) when stack link goes down
5. TEER energy efficiency of 1.88 Gbps/Watt

NETGEAR M4300 RFC2544 LAN Throughput vs Aruba & Cisco Systems
48*GbE + 4*10GbE Layer 2 LAN Switch Ports
(as reported by Spirent TestCenter)



Note: Aggregate throughput of all GbE and 10GbE ports. Snake topology used for GbE and for 10GbE.

Source: Tolly, September 2020

Figure 1

All devices under test (DUTs) provided 48 GbE ports and four 10GbE ports. Tolly engineers evaluated the Gigabit Ethernet and 10 Gigabit Ethernet throughput and latency of each switch. Engineers also benchmarked the stack failover time of several failure scenarios using a three-member stack of switches from each member. Finally, the power consumption of a single-switch was measured under various specified loads and the Telecommunications Energy Efficiency Rating (TEER) was calculated.

Test Results

Layer 2 Throughput

Engineers ran standard RFC2544 throughput tests with frame sizes ranging from 64- to 1518-bytes.

NETGEAR's M4300 and Cisco's SG550X delivered line-rate throughput for all frame sizes across all 48 GbE ports and all four 10GbE ports.

Aruba's 2930F achieved 75% of line rate for 64-byte frames and 95% of line rate for 128-byte frames. At 256-byte frames and higher, Aruba also delivered line rate throughput. Results, as noted previously, are found in Figure 1.

Layer 2 Latency

Engineers ran standard RFC2544 throughput tests with frame sizes ranging from 64- to 1518-bytes. Tests were run separately on pairs of GbE (Copper) and 10GbE (SFP+) ports.

For GbE ports, the NETGEAR M4300 latency ranged from 4.9 to 5.8 microseconds (µs). Aruba 2930F latency ranged from 2.3 to 2.7 µs and Cisco SG550SX ranged from 3.0 to 3.7 µs. At 1518-byte frames, the delta between lowest and highest latency was 3.1 µs or 0.0031ms, a minuscule difference.

For 10GbE ports, the latency results were more tightly clustered. The NETGEAR M4300 latency was 1.3 µs for all frame sizes. Aruba 2930F latency ranged from 1.3 to 1.8

NETGEAR

M4300 Intelligent Edge Switch

GbE & 10 GbE L2 Switch Performance

Tolly. Certified

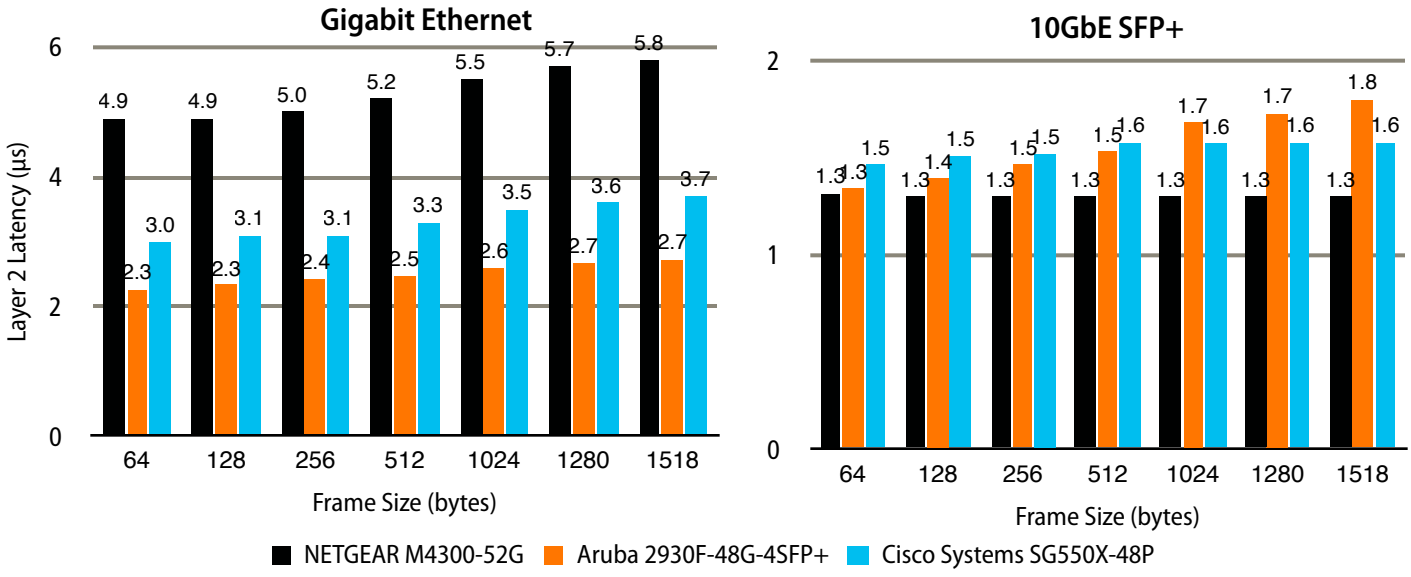
Tested September 2020

NETGEAR M4300 RFC2544 LAN Latency vs Aruba & Cisco Systems

GbE & 10GbE SFP+ Layer 2 LAN Switch Port Pairs

(as reported by Spirent TestCenter)

Lower Numbers are Better



Note: 1ms = 1,000 microseconds (µs). 10GbE ports were SFP+.

Source: Tolly, September 2020

Figure 2

µs and Cisco SG550SX ranged from 1.5 to 1.6 µs. At 1518-byte frames, the delta between lowest and highest latency was 0.5 µs or 0.0005 ms, again a minuscule difference. See Figure 2.

Stack Failover

Non-stop forwarding (NSF) is NETGEAR's virtual chassis architecture provides advanced High Availability (HA) with hitless failover across the stack.

Several stack failover test scenarios were run using a three-switch stack from each vendor. See Figure 3 for a logical diagram of both the switch-to-switch stack links and the traffic flow. For all tests, traffic was generated at 10,000 FPS. Failover time was calculated by measuring the number of frames dropped before the traffic flow was recovered. See Table 1 for all stack results.

Non-Stop Forwarding (Switch Down)

The first scenario benchmarked the failover (i.e. recovery) time when the active, "commander" switch failed with two different traffic flows.

In the first test, traffic was sent between two different switches when the third (master) switch was failed.

The NETGEAR M4300 stack provided hitless, zero second failover. That is, not a single frame was lost. The Aruba 2930F stack failed over in 0.002 seconds. The Cisco SG550X stack required 28.7 seconds to resume traffic flow.

In the second test, traffic was sent between two ports on the same switch when the master switch was failed.

The NETGEAR M4300 stack again provided hitless, zero second failover. Not a single

Switch Stack Failover Results
(as reported by Spirent TestCenter)
Lower Numbers are Better

Three-Member Ring Stack

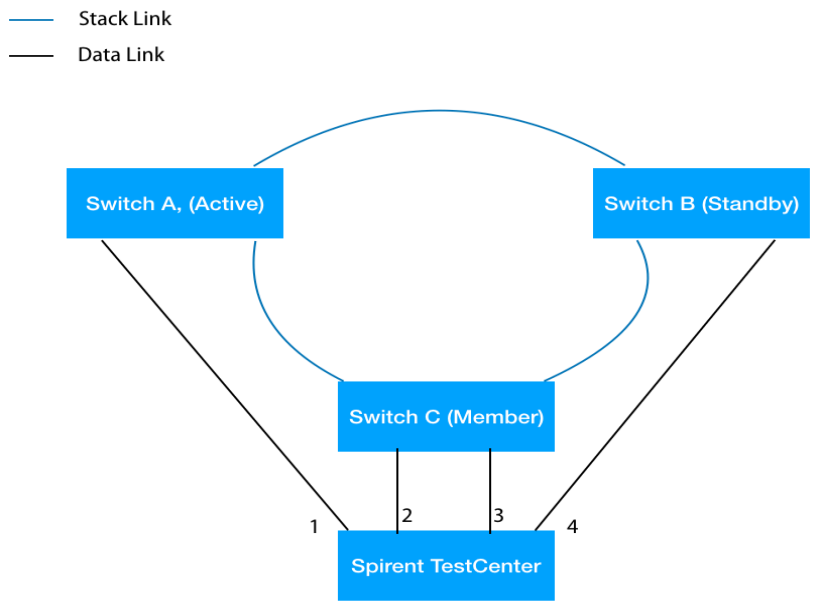
Test	Scenario	Solution Under Test	Traffic Failover Time (seconds)
Commander Switch Down (NETGEAR Non-Stop Forwarding (NSF))	L2 traffic across two physical switches (between Spirent port 2 and port 4)	NETGEAR M4300	0
		Aruba 2930F	0.002
		Cisco SG550X	28.7
	L2 traffic on the same physical switch (between Spirent port 2 and port 3)	NETGEAR M4300	0
		Aruba 2930F	0.002
		Cisco SG550X	8.2
Stack Link Down	L2 traffic across two physical switches (Spirent 1 <--> 2, 2 <--> 4, 1 <--> 4)	NETGEAR M4300	1.146
		Aruba 2930F	0.008
		Cisco SG550X	1.309

Note: See stack test traffic diagram for switch-to-switch data flow. "Zero" result indicates no measurable frame loss with the 10,000 FPS traffic rate.

Source: Tolly, September 2020

Table 1

Switch Stacking Tests: Logical Diagram



Source: Tolly, September 2020

Figure 3

frame was lost. The Aruba 2930F stack again failed over in 0.002 seconds. The Cisco SG550X stack required 8.2 seconds to resume traffic flow.

Stack Link Down

This scenario benchmarked the failover time when a stack link goes down. Traffic was flowing through an active link when that link was failed. As before, Tolly engineers measured frame loss before the traffic began flowing through an alternate path.

The NETGEAR M4300 stack failed over in 1. 146 seconds. The Aruba 2930F stack failed over in 0.008 seconds. The Cisco SG550X stack failed over in 1.309 seconds.

Power Consumption & Efficiency

Tolly engineers measured the power consumption of a single switch from each vendor and calculated power consumption and energy efficiency using the ATIS-TEER methodology.

The power consumption is calculated at different load levels to provide a weighted power consumption where lower is better. Then the power efficiency is calculated by using the aggregate measured system throughput to calculate TEER where higher is better.

In this test, all three systems had the same aggregate system throughput of 88Gbps. NETGEAR's ATIS power score of 46.88 was significantly better (lower) than Cisco's score of 64.2. Aruba's ATIS power was the lowest at 43.91.

Because system throughput was identical, the relative scores remained the same in the TEER calculation. NETGEAR's 1.88 was significantly better than Cisco's 1.37 but lower than Aruba's 2.00. See Table 2.

Test Setup & Methodology

Devices Under Test

In the throughput, latency and power consumption tests, Tolly engineers used one device of each device under test. In the stack failover test, Tolly engineers used three devices of each DUT. For NETGEAR and Aruba, at least one of the switches had Power over Ethernet (PoE+) capabilities, however that function was not tested. Power consumption tests were run on non-PoE switches. See Table 3 for the DUT information.

Layer 2 Throughput

Each DUT provides 48 x GbE ports and 4 x 10GbE ports. In the Layer 2 throughput test, all 48 x GbE ports are tested in a snake topology and all 4 x 10GbE ports are in a snake topology with concurrent bidirectional traffic passing through all

NETGEAR M4300 Power Consumption vs Aruba & Cisco Systems
48*GbE + 4*10GbE Switch Ports

Solution Under Test	Power Consumption (Watts) with IMIX Traffic			ATIS Weighted Power *(lower is better)*	Throughput (Gbps)	TEER (Gbps/Watt) *(higher is better)*
	0% Traffic	10% Traffic	100% Traffic			
NETGEAR M4300-52G	47.1	46.8	47.3	46.88	88	1.88
Aruba 2930F-48G-4SFP+	42.8	43.2	45.7	43.91	88	2.00
Cisco SG550X-48P	51.8	65.5	66.2	64.2	88	1.37

Source: Tolly, September 2020

Table 2

ports. Taking the 10GbE ports connections for example, 10GbE port 1 is connected to Spirent TestCenter; 10GbE port 2 is connected to 10GbE port 3; 10GbE port 4 is connected to Spirent TestCenter. 10GbE port 1 and 2 are in the same VLAN while 10GbE port 3 and 4 are in the same VLAN.

Layer 2 Latency

For each DUT, Tolly engineers tested the latency between two GbE copper ports and the latency between two 10GbE SFP+ ports with bidirectional 100% line-rate traffic.

Stack Failover

For each DUT, Tolly engineers used three switches to build a three-member ring stack and evaluated the failover time when the active commander switch failed. Please see Figure 3 for the test bed topology. The failover time of the following traffic flows were evaluated:

Spirent TestCenter port 2 <—> port 3;

Spirent TestCenter port 2 <—> port 4.

Scenarios tested both traffic flow within the same switch member and traffic across switch members.

Each traffic flow was sent using 10,000 FPS rate. Then, Tolly engineers unplugged the power cable Switch A (the active commander switch) and recorded the frame loss of the test traffic flows. The failover time of each flow = frame loss / 10,000 (seconds).

Power Consumption

Each DUT's power consumption was measured with 0% (X Watts), 10% (Y Watts), and 100% (Z Watts) iMIX traffic. The ATIS weighted power consumption for each device = 0.1 * X + 0.8 * Y + 0.1 * Z (Watts). Since all DUTs support 88Gbps throughput as the maximum, the Telecommunications Energy Efficiency Ratio TEER = 88 / ATIS weighted power consumption (Gbps/Watts).

Solutions Under Test

	Switch Details					
Vendor	Primary Switch Model	Description	Version	Secondary Switch Model	Description	Version
NETGEAR	M4300-52G (quantity 2)	48xGbE + 4 SFP+ 10GbE ports	12.0.9.3	M4300-52G-PoE+ (quantity 1)	Same as primary switch plus PoE+	12.0.9.3
Aruba, an HPE Company	2930F-48G-4 SFP+ JL254A (quantity 2)	48xGbE + 4 SFP+ 10GbE ports	WC. 16.07.0003	2930F-48G-PoE+-4SFP+ JL256A (quantity 1)	Same as primary switch plus PoE+	WC. 16.07.0003
Cisco Systems	SG550X-48P (quantity 3)	48xGbE + 4 SFP+ 10GbE ports	2.5.0.83	None	N/A	2.5.0.83

Note: PoE features not tested.

Source: Tolly, September 2020

Table 3

About Tolly

The Tolly Group companies have been delivering world-class IT services for more than30 years. Tolly is a leading global provider of third-party validation services for vendors of IT 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

Test Equipment Summary

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

Vendor	Product	Web
Spirent	TestCenter	spirent Promise. Assured. https://www.spirent.com

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