NetSecOPEN Certification
Network Security Product Performance Testing
SonicWall NGFW Firewall NSA 4650

Testing Information

Vendor: SonicWall

Product name and Model: NSA 4650

Product version: SonicOS Enhanced 6.5.0.11-91n

Test Lab: University of New Hampshire InterOperability Lab

Test equipment: Spirent Cyberflood C100-S3

Test equipment version: 5.03.381

Test Date and Location: Jan. 21, 2020 Durham, NH

Tested based on draft-ietf-bmwg-ngfw-performance-02 (https://tools.ietf.org/html/draft-ietf-bmwg-ngfw-performance-02)

Executive Summary

Introduction

The goal of NetSecOPEN is to provide performance testing standards developed by the membership, implemented on approved test tools and used by accredited test labs. All of these goals are intended to promote transparency and reproducibility. To achieve these goals the accredited labs freely provide access to their test reports, Device under Test (DUT) vendors provide the configuration of the DUT as it was tested and the test tool vendors provide the default configuration, while the lab documents changes to the test tool in the report.

All of these are provided at no charge to interested parties. Anyone interested in having access to the configuration files please e-mail the NetSecOPEN Certification Body at netsecopen-cert-body@netsecopen.org.

Summary of Findings

The NetSecOPEN Certification Body has reviewed the test report of the NSA 4650 provided by University of New Hampshire InterOperability Lab. These results have been found to meet the NetSecOPEN certification requirements. Detailed results are provided below.

NetSecOPEN Certification is awarded to SonicWall's NSA 4650 (SonicOS Enhanced 6.5.0.11-91n).

Note: this certification is product and version specific.

Test setup and configurations

All the tests were performed with test setup (option 2) defined in the draft in section 4.1. Two 10GbE SFP+ interfaces of the NSA 4650 were directly connected with the test equipment.

The table below shows the recommended and optional Next Generation Firewall (NGFW) features described in the draft that were enabled/disabled on the security device.

Features		Security device Status
SSL Inspection	Recommended	Enabled
IDS/IPS	Recommended	Enabled
Antivirus	Recommended	Enabled
Anti Spyware	Recommended	Enabled
Anti Botnet	Recommended	Enabled
Logging and Reporting	Recommended	Enabled
Application Identification	Recommended	Enabled
Web Filtering	Optional	Disabled
DLP	Optional	Disabled
DDoS	Optional	Disabled
Certificate Validation	Optional	Disabled

Table 1: NGFW security features

As defined in the draft (section 4.2 table 1, DUT classification "S") 122 ACL rules were configured on the NSA 4650.

Before the performance tests were started, the Common Vulnerabilities and Exposures (CVE) tests were performed to ensure the security feature "Detection of Common Vulnerabilities and Exposures (CVE)" was enabled on the SonicWall security device. SonicWall's NSA 4650 successfully detected and blocked attack attempts during this test, indicating that inspection/blocking capability was enabled and functioning.

All tests were performed with IPv4 traffic only. The ECDHE-RSA-AES128-GCM-SHA256 with RSA 2048 cipher suite was used for all of the HTTPS performance tests. The latency values represent in the Table 2 and Table 3 measured with 50% of the maximum throughput supported by the NSA 4650.

Test Results

HTTP Traffic Performance

Object Size [KByte]	Avg. CPS	Avg. TP [Gbit/s]	Avg. TPS	Avg. CC	TTFB [ms]			TTLB [ms]		
					Min	Avg.	Max.	Min	Avg.	Max.
1	27,950	1.1	96,411	252,000	0.3	0.4	59.1	<0.0009	0.1	69
2	25,677	NA	NA	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
4	21,943	NA	NA	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
16	13,570	2.9	21,230	NA	0.3	0.3	97.1	<0.0009	0.3	59
32	NA	NA	NA	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
64	5,357	3.5	6,442	NA	0.3	0.4	99.8	<0.0009	1.1	49
128	NA	NA	NA	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
256	NA	3.5	1,652	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Mixed	NA	3.4	7,618	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table 2: TCP/HTTP Traffic Performance

CPS: Connection Per Second, TP: Throughput, TPS: Transactions Per Second, CC: Concurrent Connections, TTFB: Time To First Byte, TTLB: Time To Last Byte, NA: Not Applicable or Not tested

HTTPS Traffic Performance

Object Size [KByte]	Avg. CPS	Avg. TP [Gbit/s]	Avg. TPS	Avg. CC	TTFB [ms]			TTLB [ms]		
					Min	Avg.	Max.	Min	Avg.	Max.
1	420	0.06	3,875	13,500	19.5	445.1	2,767.7	4	38.5	453
2	418	*NA*	*NA*	*NA*	*NA*	*NA*	NA	*NA*	*NA*	*NA*
4	417	*NA*	*NA*	*NA*	*NA*	*NA*	NA	*NA*	*NA*	*NA*
16	402	0.4	2,875	*NA*	19.3	329.2	614.7	2	50.6	348
32	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	*NA*	*NA*	*NA*
64	359	0.9	1,677	*NA*	19.1	195.5	384.6	2	60	3,021
128	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	*NA*	*NA*	*NA*
256	*NA*	2.0	102	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Mixed	*NA*	1.8	539	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table 3: TCP/HTTPS Traffic Performance

CPS: Connection Per Second, TP: Throughput, TPS: Transactions Per Second, CC: Concurrent Connections, TTFB: Time To First Byte, TTLB: Time To Last Byte, NA: Not Applicable or Not tested

TCP/HTTP Connections Per Second

Object Size [KByte]	Avg. TCP/HTTP Connections Per Second
1	27,950
2	25,677
4	21,943
16	13,570
64	5,357

Table 4: TCP/HTTP Connections per Second

HTTP Throughput

Object Size [KByte]	Avg. HTTP Throughput [Gbit/s]	Avg. HTTP Transaction Per Second
1	1.1	96,411
16	2.9	21,230
64	3.5	6,442
256	3.5	1,652
Mixed objects	3.4	7,618

Table 5: HTTP Throughput

TCP/HTTP Transaction Latency

The test was performed with two traffic load profiles as defined in the draft. Table 6 below describes the latency results measured with 50% of the maximum connection per second supported by the NSA 4650.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.3	0.8	122	<0.0009	0.4	48
16	0.3	0.5	103.9	<0.0009	0.6	58
64	0.3	0.5	99.4	1	1.5	49

Table 6: TCP/HTTP TTFB and TTLB @ 50% of the maximum connection per second

Table 7 below describes latency results measured with 50% of the maximum throughput supported by the NSA 4650.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.3	0.4	59.1	<0.0009	0.1	69
16	0.3	0.3	97.1	<0.0009	0.3	59
64	0.3	0.4	99.8	<0.0009	1.1	49

Table 7: TCP/HTTP TTFB and TTLB @ 50% of the maximum Throughput

Figures 1-3 illustrate the distribution of maximum latency (TTFB and TTLB) values measured in approximately 75 measurement samples.

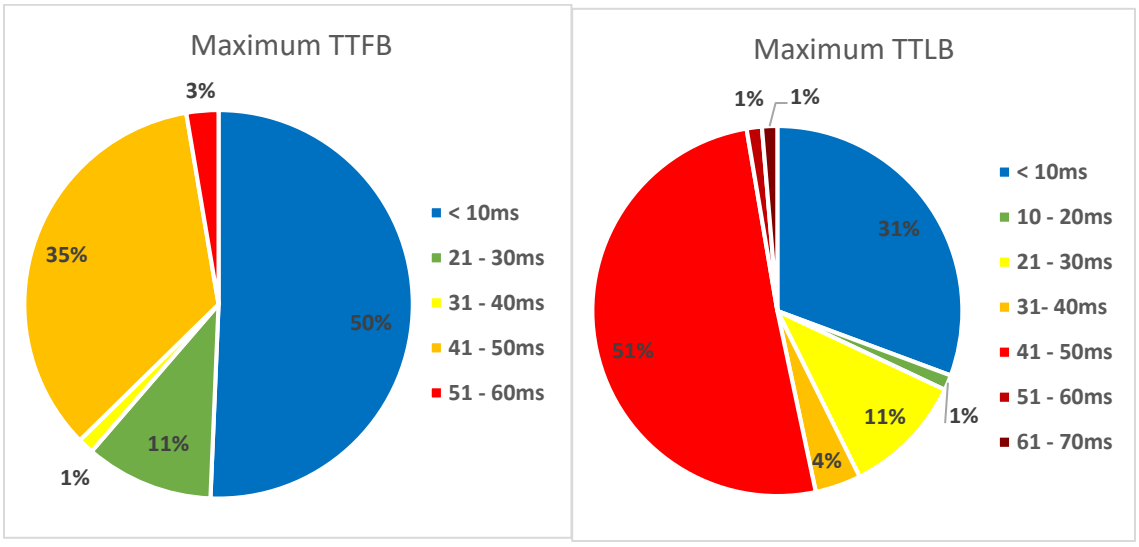

Figure 1:Latency distribution measured with 1KByte object size in Throughput test scenario

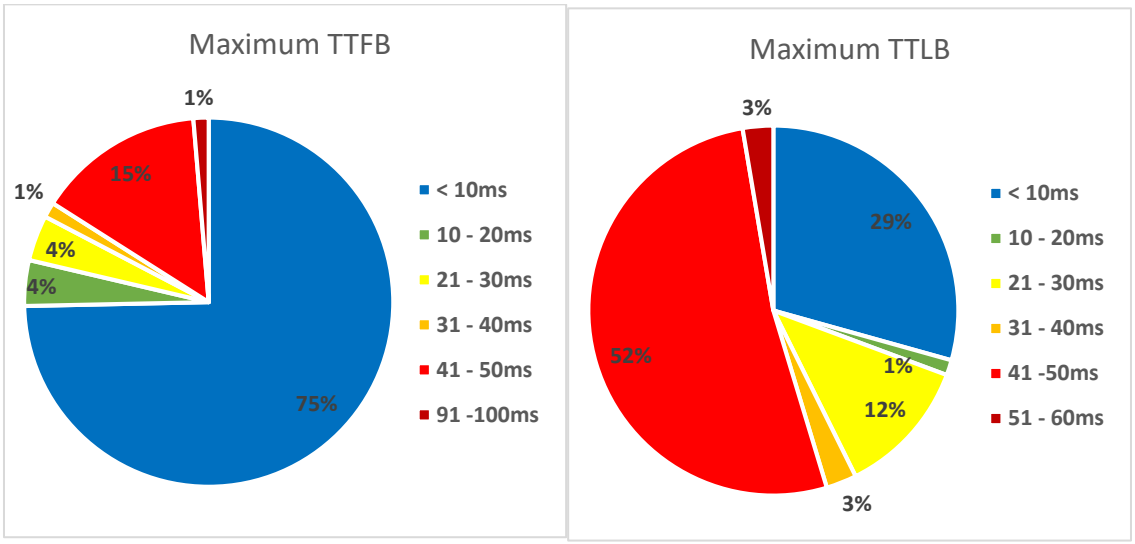

Figure 2: Latency distribution measured with 16KByte object size in Throughput test scenario

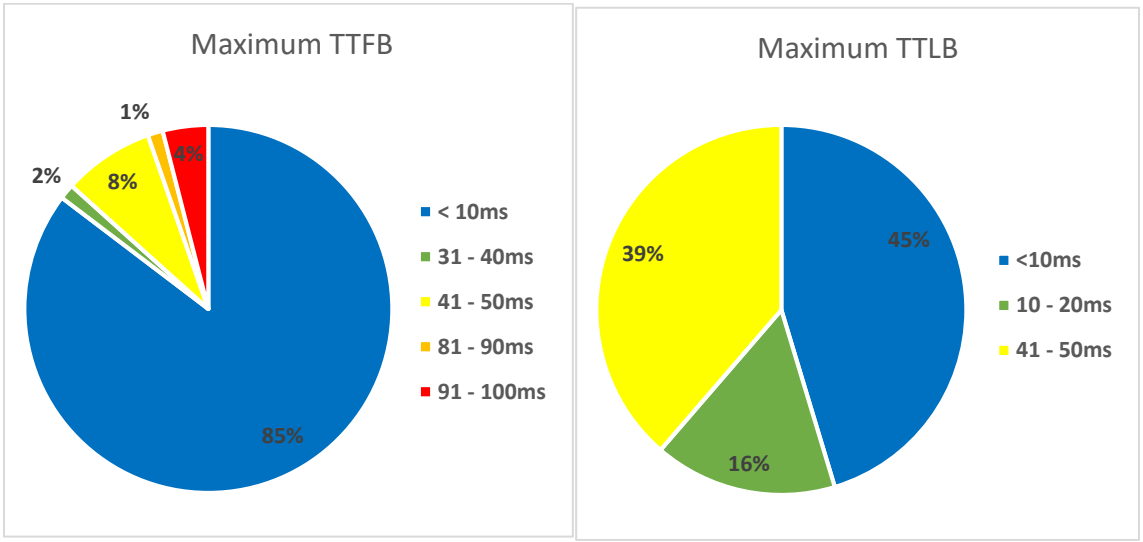

Figure 3:Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTP Connection Capacity

The SonicWall NSA 4650 supported 252,000 concurrent TCP/HTTP connection in average. 1 KByte object size was used as HTTP GET request for each established TCP connection, which resulted an average throughput of 30 Mbit/s.

TCP/HTTPS Connections per second

Object Size [KByte]	Avg. TCP/HTTPS Connections Per Second
1	420
2	418
4	417
16	402
64	359

Table 8: TCP/HTTPS Connections per Second

HTTPS Throughput

Object Size [KByte]	Avg. HTTPS Throughput [Gbit/s]	Avg. HTTPS Transaction Per Second
1	0.06	3,875
16	0.4	2,875
64	0.9	1,677
256	2.0	102
Mixed objects	1.8	539

Table 9: HTTPS Throughput

HTTPS Transaction Latency

The test was performed with two traffic load profiles as defined in the draft. Table 10 below describes the latency results measured with 50% of the maximum connection per second supported by the NSA 4650.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	18.5	19.6	194.6	<0.0009	0.3	105
16	18.5	19.7	127.2	<0.0009	0.1	106
64	18.6	20.9	209.6	202	205	377

Table 10: TCP/HTTPS TTFB and TTLB @ 50% of the maximum connection per second

Table 11 below describes latency results measured with 50% of the maximum throughput supported by the NSA 4650.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	19.5	445.1	2,767.7	4	38.5	453
16	19.3	329.2	614.7	2	50.6	348
64	19.1	195.5	384.6	2	60	3,021

Table 11: TCP/HTTP TTFB and TTLB @ 50% of the maximum Throughput

Figures 4 -6 illustrate the distribution of maximum latency (TTFB and TTLB) values measured in approximately 75 measurement samples.

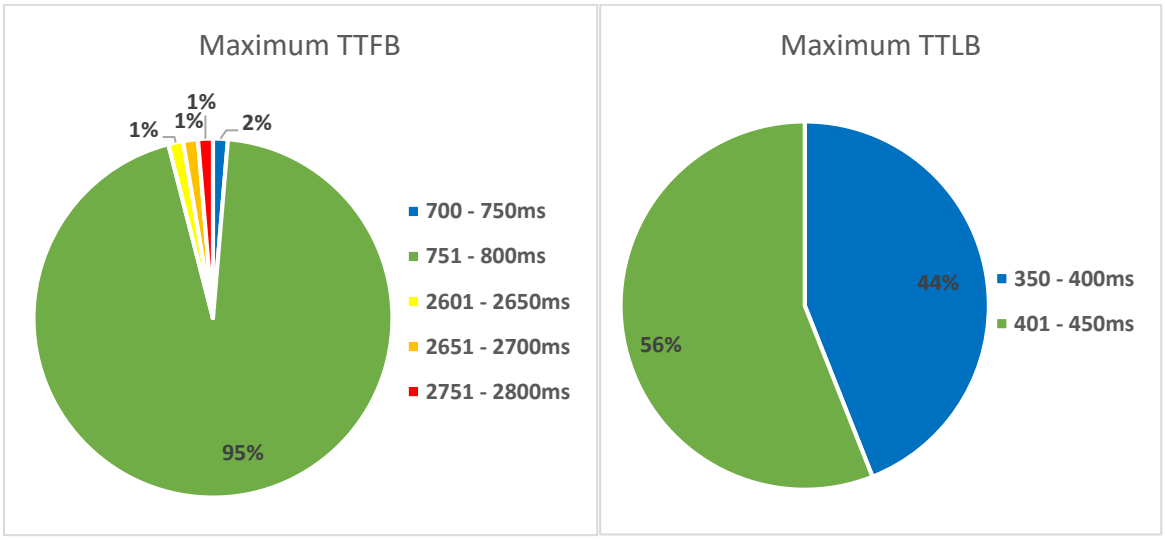

Figure 4:Latency distribution measured with 1KByte object size in Throughput test scenario

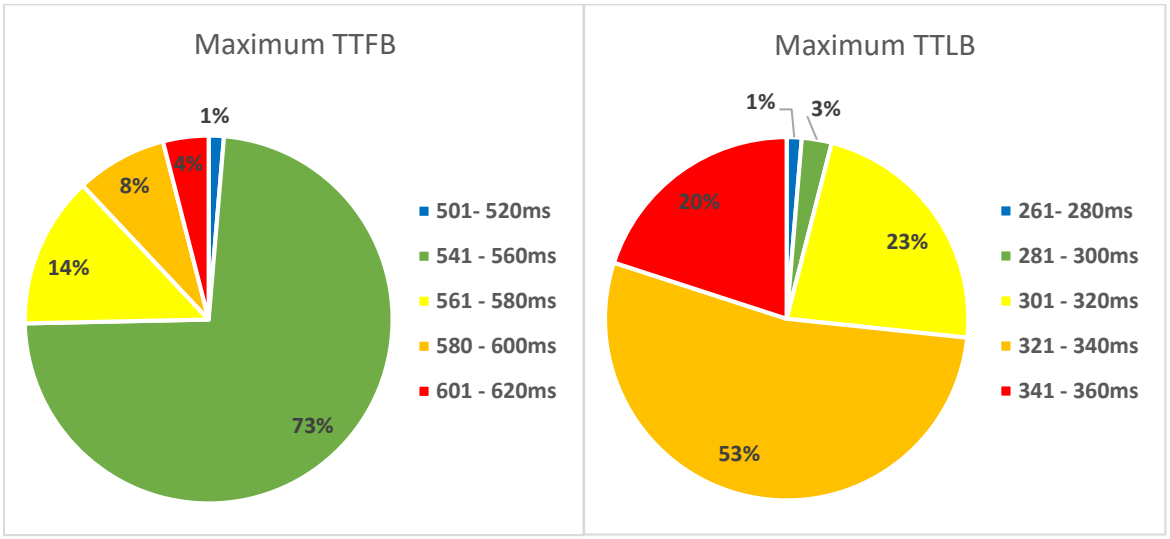

Figure 5: Latency distribution measured with 16KByte object size in Throughput test scenario

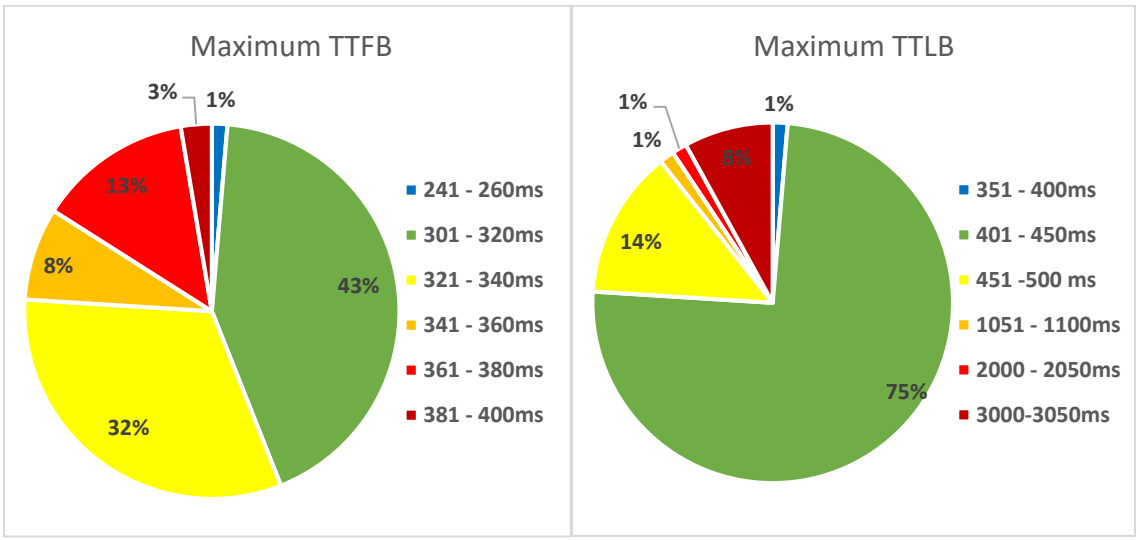

Figure 6:Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTPS Connection Capacity

The SonicWall NSA 4650 supported 13,500 concurrent TCP/HTTPS connections in average. 1 KByte object size was used as HTTPS GET request for each established TCP connection, which resulted an average throughput of 1 Mbit/s.