



NetSecOPEN Certification

Network Security Product Performance Testing

Palo Alto Networks PA-3250 NGFW

Testing Information

Vendor: Palo Alto Networks

Product name and Model: PA-3200 Series NGFW, PA-3250

Product version: 9.0.5

Test Lab: University of New Hampshire Interoperability Lab

Test equipment: Spirent Cyberflood C100-S3

Test equipment version: 5.03.0381

Test Date and Location: January 30, 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 PA-3250 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 Palo Alto Network's PA-3250 (version 9.0.5).

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 PA-3250 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	Enabled
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 PA-3250.

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 Palo Alto Networks security device. The Palo Alto Networks PA-3250 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 PA-3250.

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	14,352	0.22	19,341	1,971,000	0.8	0.9	90.5	<0.0009	0.6	89
2	12,745	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	10,955	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	6,252	0.98	7,168	NA	1.6	1.8	48.9	1	1.6	71
32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
64	2,686	1.55	2880	NA	1.6	2.3	58.8	3	4.7	78
128	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
256	NA	1.82	849	NA	NA	NA	NA	NA	NA	NA
Mixed	NA	1.50	3,400	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	997	0.09	6,348	246,600	1.8	202.7	434.9	1	55.9	349
2	985	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	966	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	862	0.44	3,192	NA	1.8	124.3	259.3	2	68.9	1,145
32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
64	647	0.8	1,476	NA	2.3	59.9	132.7	5	82.6	348
128	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
256	NA	1.07	501	NA	NA	NA	NA	NA	NA	NA
Mixed	NA	0.79	1,782	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	14,352
2	12,745
4	10,955
16	6,252
64	2,686

Table 4: TCP/HTTP Connections per Second

HTTP Throughput

Object Size [KByte]	Avg. HTTP Throughput [Gbit/s]	Avg. HTTP Transaction Per Second
1	0.22	19,341
16	0.98	7,168
64	1.55	2,880
256	1.82	849
Mixed objects	1.5	3,400

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 PA-3250.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.8	0.9	59.3	0	0.7	58
16	1.6	1.7	48.6	1	1.7	48
64	1.6	1.7	48.1	4	4.2	50

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 PA-3250.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.8	0.9	90.5	<0.0009	0.6	89
16	1.6	1.8	48.9	1	1.6	71
64	1.6	2.3	58.8	3	4.7	78

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.

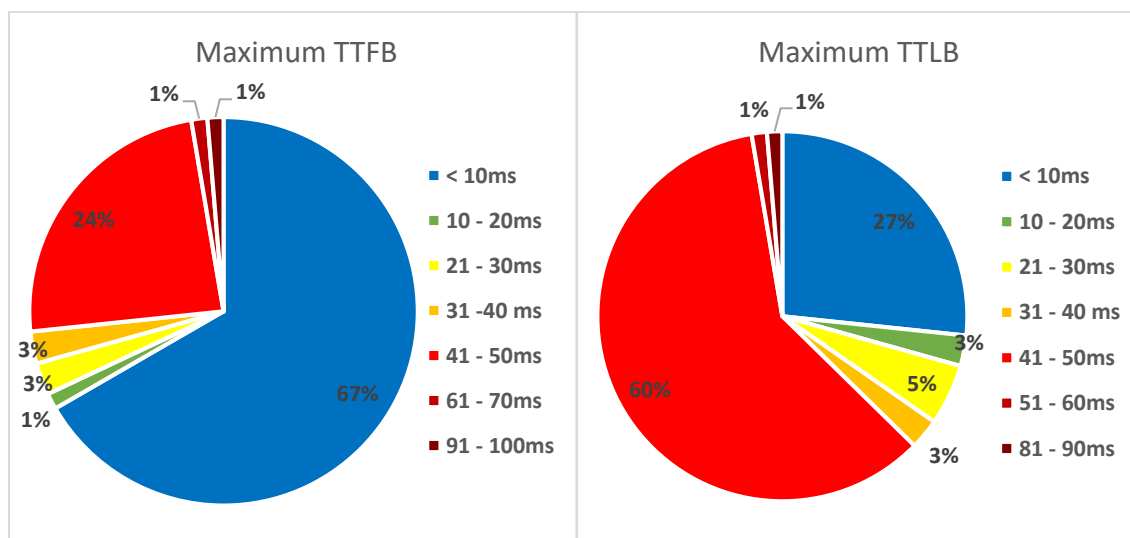


Figure 1: Latency distribution measured with 1KByte object size in Throughput test scenario

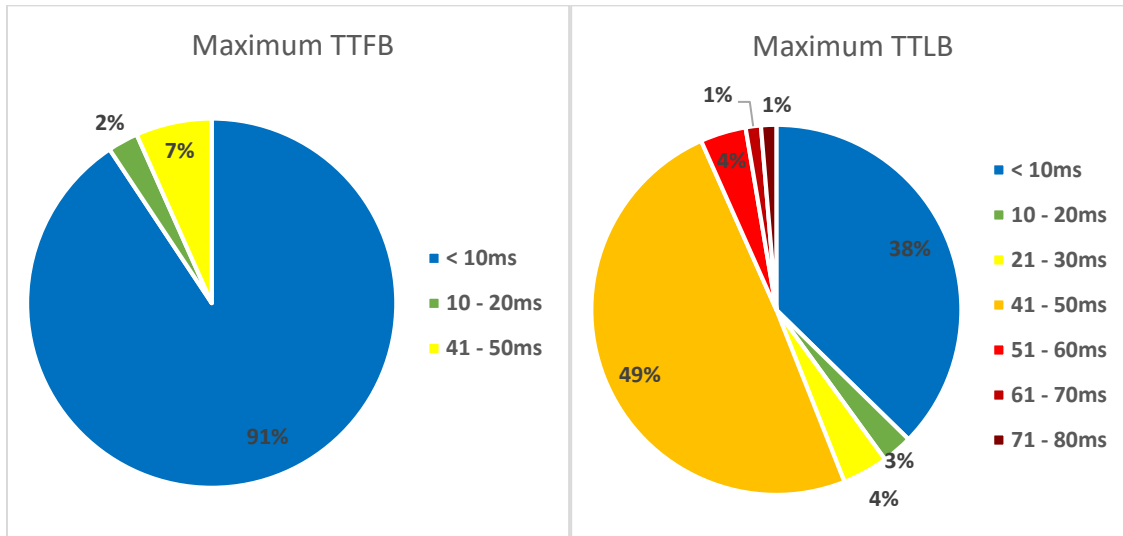


Figure 2: Latency distribution measured with 16KByte object size in Throughput test scenario

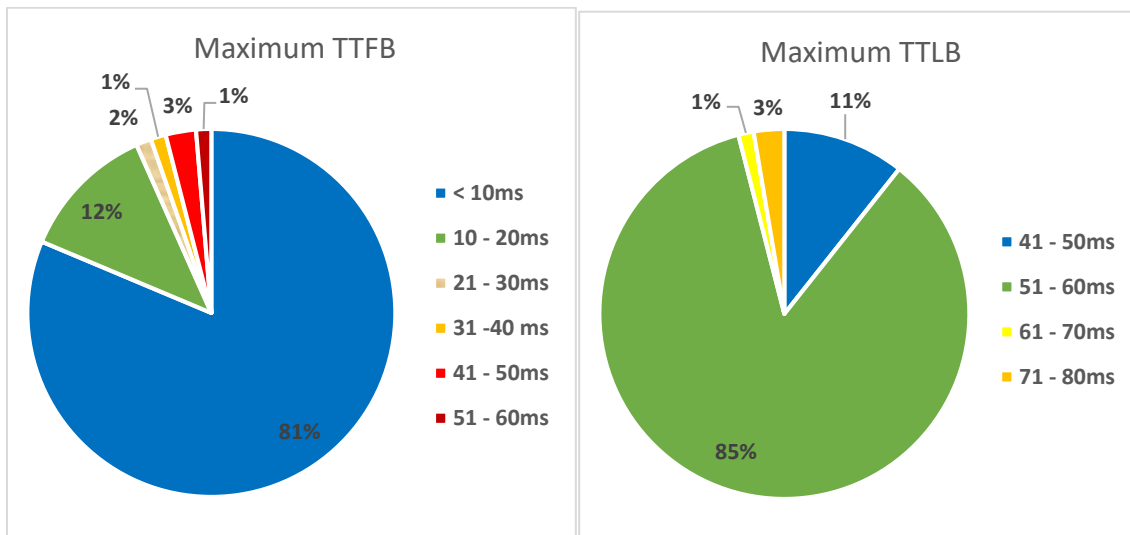


Figure 3: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTP Connection Capacity

The Palo Alto Networks PA-3250 supported 1,971,000 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 192 Mbit/s.

TCP/HTTPS Connections per second

Object Size [KByte]	Avg. TCP/HTTPS Connections Per Second
1	997
2	985
4	966
16	962
64	647

Table 8: TCP/HTTPS Connections per Second

HTTPS Throughput

Object Size [KByte]	Avg. HTTPS Throughput [Gbit/s]	Avg. HTTPS Transaction Per Second
1	0.089	6,348
16	0.44	3,192
64	0.8	1,476
256	1.07	501
Mixed objects	0.79	1,782

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 PA-3250.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	10.5	11.3	2,011.2	<0.0009	1.1	47
16	10.6	11.2	2,011.4	2	2.7	49
64	10.6	11.1	2,011	6	6.5	1,249

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 PA-3250.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	1.8	202.7	434.9	1	55.9	349
16	1.8	124.3	259.3	2	68.9	1,145
64	2.3	59.9	132.7	5	82.6	348

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.

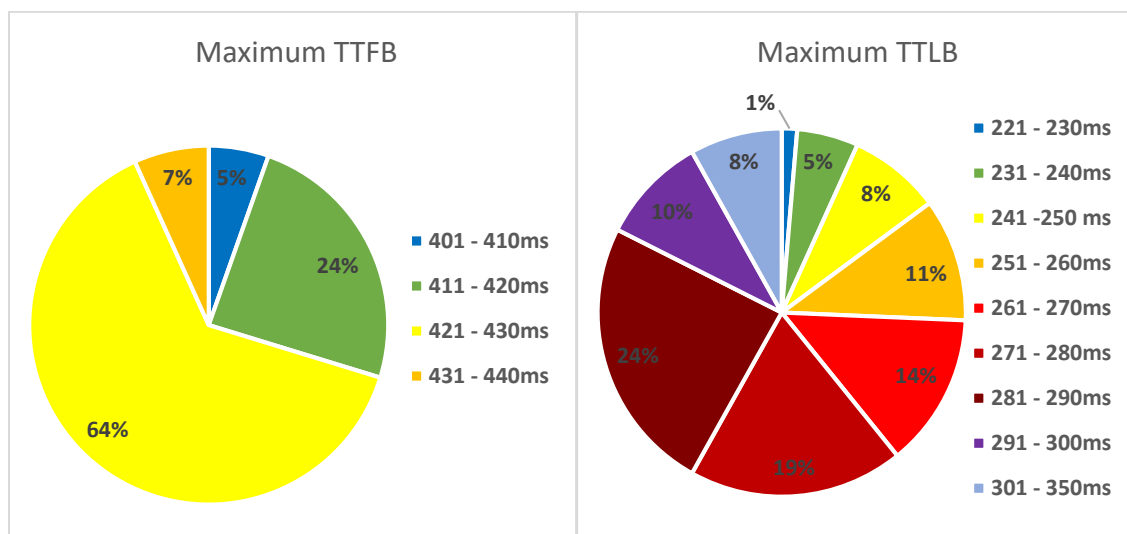


Figure 4: Latency distribution measured with 1KByte object size in Throughput test scenario

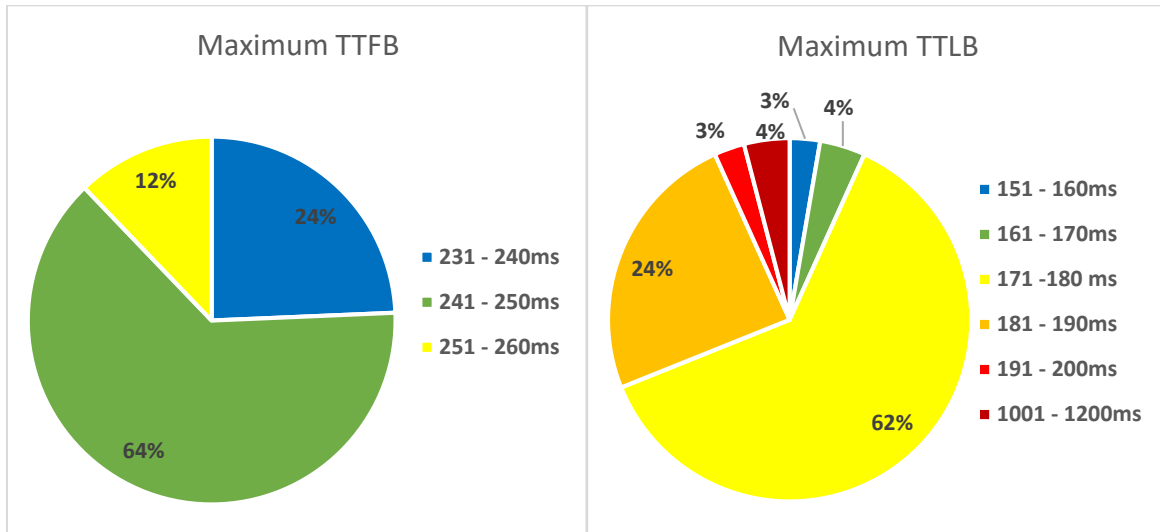


Figure 5: Latency distribution measured with 16KByte object size in Throughput test scenario

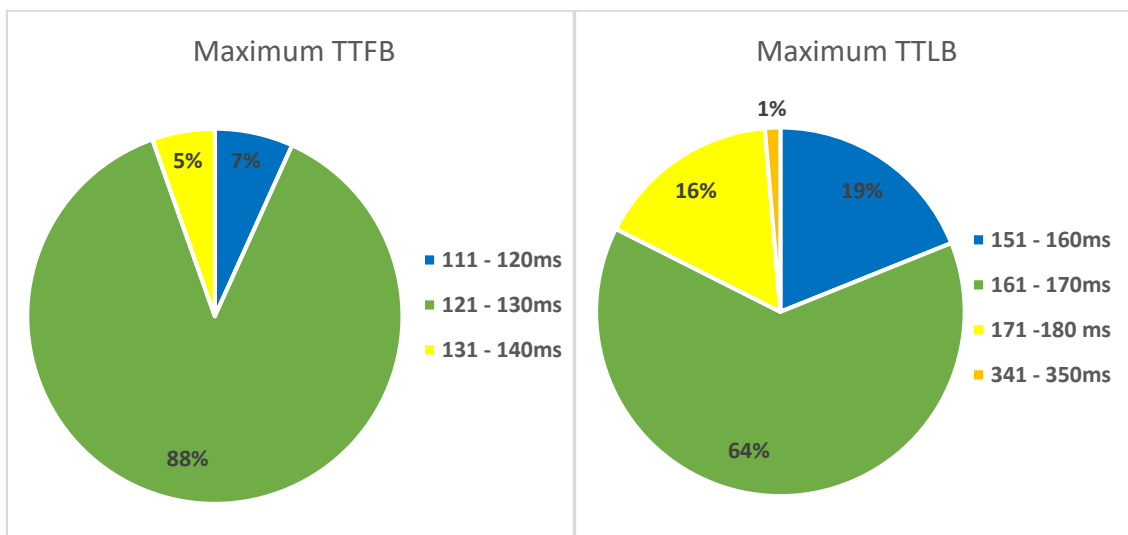


Figure 6: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTPS Connection Capacity

The Palo Alto Networks PA-3250 supported 246,600 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 31 Mbit/s.