



NetSecOPEN Certification

Network Security Product Performance Testing

Fortinet FortiGate 500E

Testing Information

Vendor: Fortinet

Product name and Model: FortiGate 500E

Product version: 6.0.6, build0272, 190716 (GA)

Test Lab: EANTC AG

Test equipment: Spirent Cyberflood C100-S3

Test equipment version: 5.03.0389

Test Date and Location: Jan. 4, 2020 Berlin, Germany

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 FortiGate 500E provided by EANTC AG. These results have been found to meet the NetSecOPEN certification requirements. Detailed results are provided below.

NetSecOPEN Certification is awarded to Fortinet's FortiGate 500E (6.0.6, build0272, 190716 (GA)).

Note: this certification is product and version specific.

Test setup and configurations

All the performance tests were conducted with test setup (option 2) defined in the draft in [section 4.1](#). Two 10GbE SFP+ interfaces of the FortiGate 500E 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 FortiGate500E.

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 Fortinet security device. <Fortinet’s FortiGate 500E 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. ECDHE-RSA-AES128-GCM-SHA256 with RSA 2048 was used as cipher suite for all 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 FortiGate500E.

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	22,432	0.87	75,931	1,550,000	0.3	0.7	60	<0.0009	0.2	59
2	20,503	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	17,107	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	12,471	3.77	27,532	NA	0.5	0.8	48.8	<0.0009	0.5	48
32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
64	6,492	5.11	9,517	NA	0.5	0.9	48.2	<0.0009	20.3	1,648
128	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
256	NA	6.44	3,010	NA	NA	NA	NA	NA	NA	NA
Mixed	NA	5.31	12,017	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	3,103	0.28	19,511	745,000	2.5	3.2	56.9	<0.0009	0.3	50
2	3,002	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	3,002	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	2,802	1.95	14,014	NA	2.5	3.3	54.3	<0.0009	200.9	262
32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
64	2,353	4.34	8,016	NA	2.5	3.4	52.0	<0.0009	1.29	1002
128	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
256	NA	5.41	2,512	NA	NA	NA	NA	NA	NA	NA
Mixed	NA	3.80	8,512	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	22,432
2	20,503
4	17,107
16	12,471
64	6,492

Table 4: TCP/HTTP Connections per Second

HTTP Throughput

Object Size [KByte]	Avg. HTTP Throughput [Gbit/s]	Avg. HTTP Transaction Per Second
1	0.87	75,931
16	3.77	27,532
64	5.11	9,517
256	6.44	3,010
Mixed objects	5.31	12,017

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 FortiGate 500E.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.3	0.7	55.2	< 0.0009	0.3	49
16	0.4	0.8	51.1	< 0.0009	0.7	4,001
64	0.4	0.8	54.9	1	58.6	5,612

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 FortiGate 500E

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	0.3	0.7	60.0	< 0.0009	0.2	59
16	0.5	0.8	48.8	< 0.0009	0.5	48
64	0.5	0.9	48.2	< 0.0009	20.3	1,648

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 150 measurement samples.

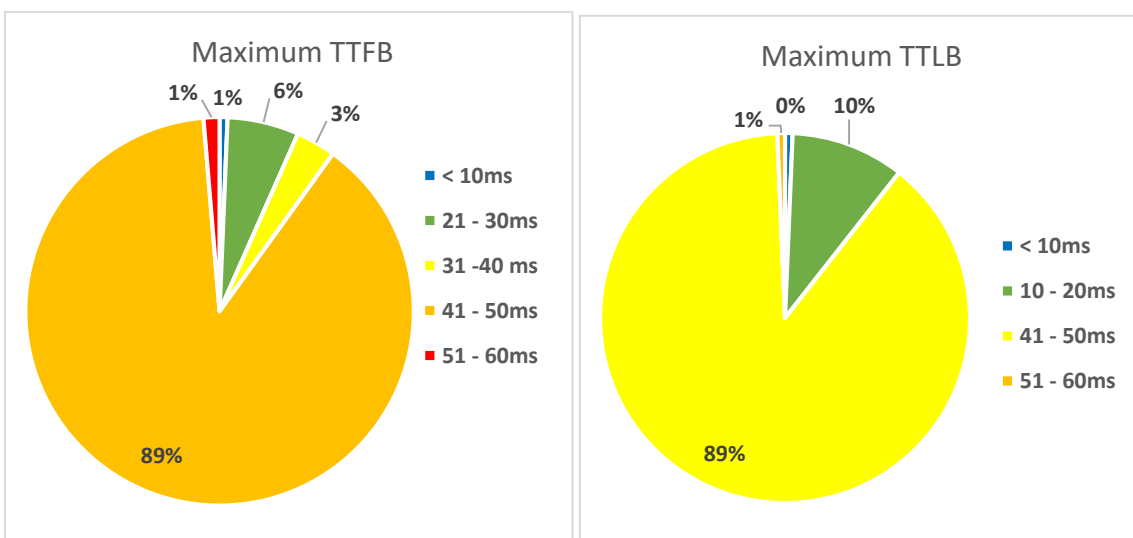


Figure 1: Latency distribution measured with 1KByte object size in Throughput test scenario

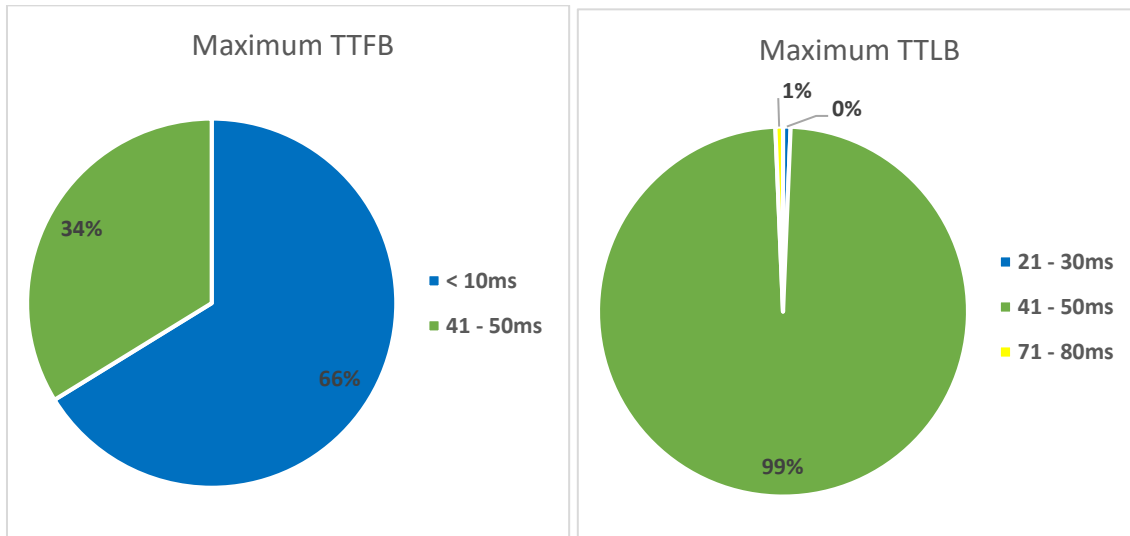


Figure 2: Latency distribution measured with 16KByte object size in Throughput test scenario

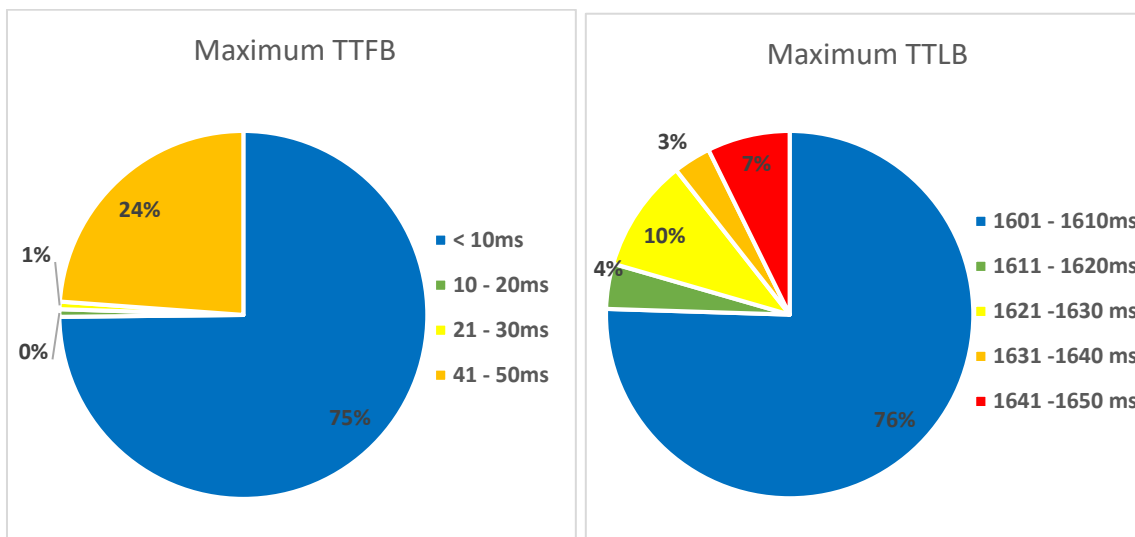


Figure 3: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTP Connection Capacity

The Fortinet FortiGate 500E supported 1,550,000 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 198.4 Mbit/s.

TCP/HTTPS Connections per second

Object Size [KByte]	Avg. TCP/HTTPS Connections Per Second
1	3,103
2	3,002
4	3,002
16	2,802
64	2,353

Table 8: TCP/HTTPS Connections per Second

HTTPS Throughput

Object Size [KByte]	Avg. HTTPS Throughput [Gbit/s]	Avg. HTTPS Transaction Per Second
1	0.28	19,511
16	1.95	14,014
64	4.34	8,016
256	5.41	2,512
Mixed objects	3.80	8,512

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 FortiGate 500E.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	2.5	3.8	63.5	< 0.0009	0.6	49
16	2.5	3.7	55.1	< 0.0009	201.2	250
64	2.5	3.6	62.9	< 0.0009	2.4	248

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 FortiGate 500E.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	2.5	3.2	56.9	<0.0009	0.3	50
16	2.5	3.3	54.3	<0.0009	200.9	262
64	2.5	3.4	52.0	<0.0009	1.29	1002

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 150 measurement samples.

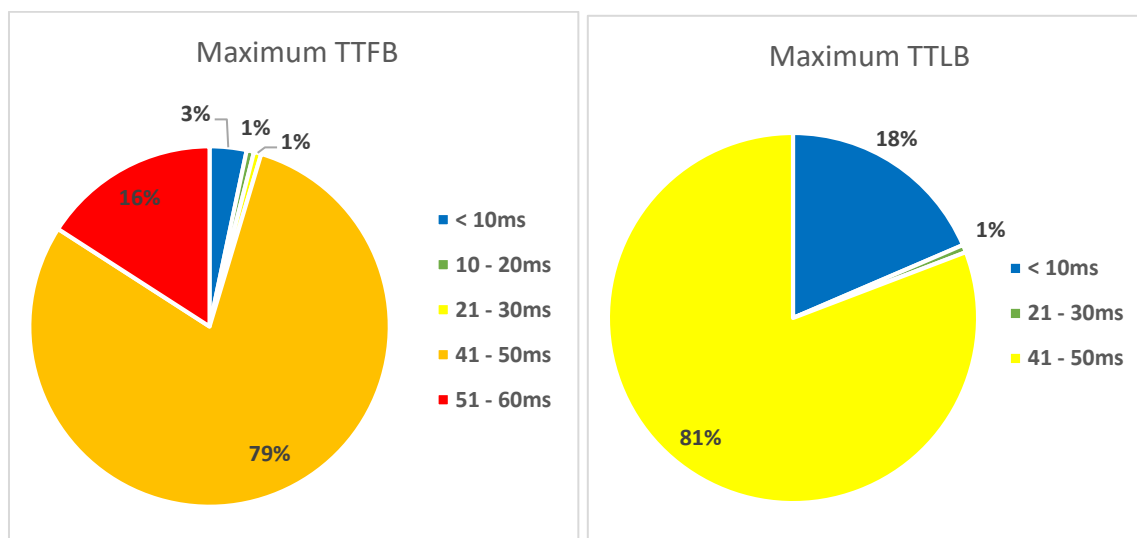


Figure 4: Latency distribution measured with 1KByte object size in Throughput test scenario

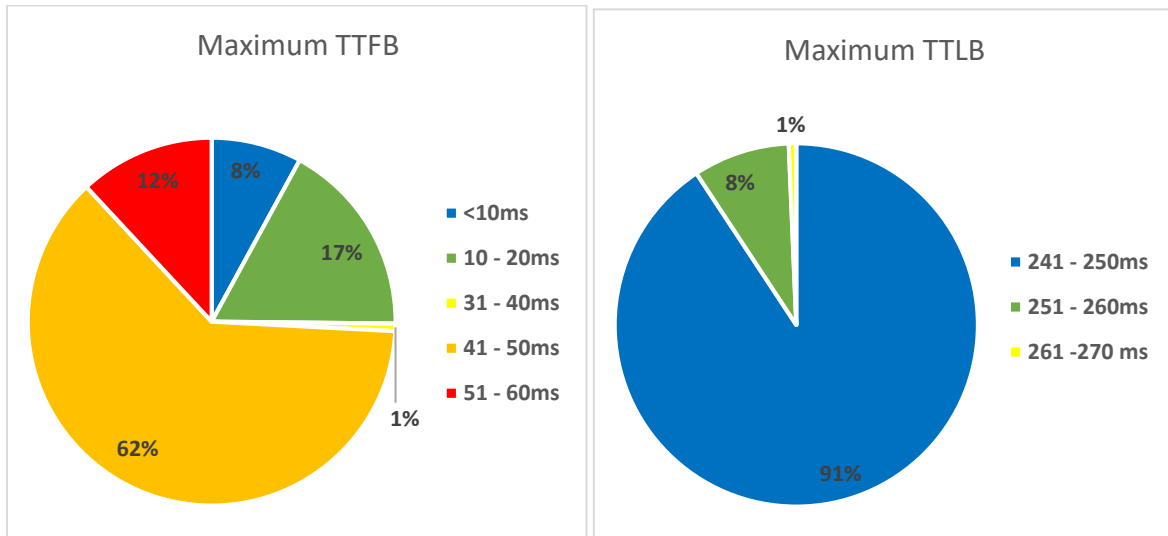


Figure 5: Latency distribution measured with 16KByte object size in Throughput test scenario

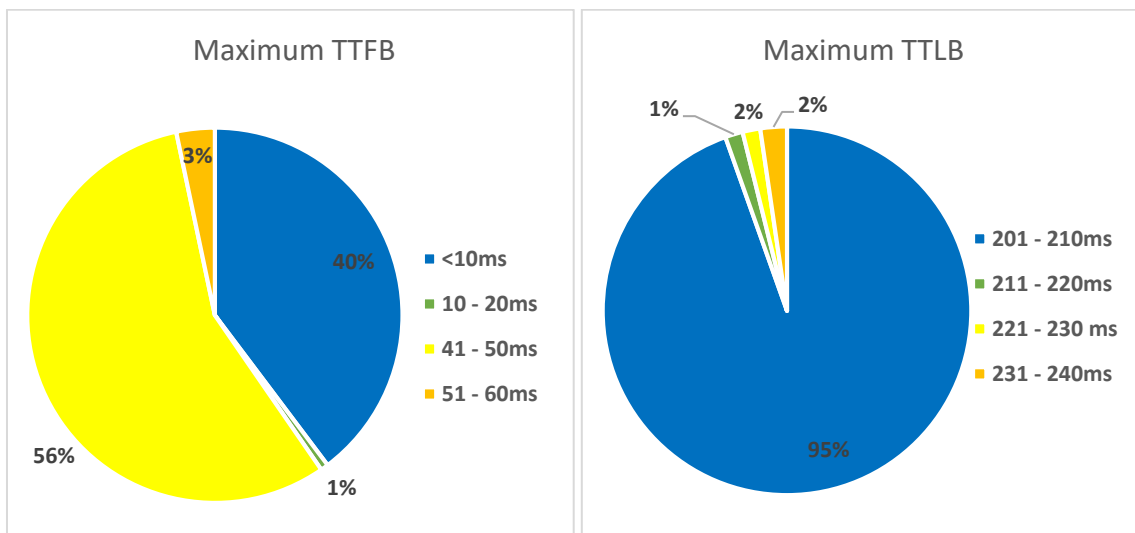


Figure 6: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTPS Connection Capacity

The Fortinet FortiGate 500E supported 745,000 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 103.1 Mbit/s.