



NetSecOPEN Certification

Network Security Product Performance Testing

Trend Micro's TippingPoint Threat Protection System 5500TX

Testing Information

Vendor: Trend Micro INC.

Product name and Model: Trend Micro's TippingPoint Threat Protection System 5500TX

Product version: Firmware version 5.4.1.1649, Controller Firmware version 5.4.0.204385

Test Lab: University of New Hampshire Interoperability Lab

Test equipment: Ixia PerfectStorm One

Test equipment version:

Firmware: 9.10.2000.24,

Software: BreakingPoint QuickTest NetSecOPEN LITE (9.10.104.22)

BreakingPoint application (9.10.110.81) – This application was used to execute “Concurrent TCP/HTTP Connection Capacity” and “Concurrent TCP/HTTPS Connection Capacity” test cases only.

Test equipment for CVE tests: Spirent Cyberflood (SPT-C100-S3)

Test equipment version for CVE tests: version 5.18.0309 and security effectiveness application version 21.1.4286

Test Date and Location: July 13, 2021 Durham, NH

Tested based on draft-ietf-bmwg-ngfw-performance-08 (<https://tools.ietf.org/html/draft-ietf-bmwg-ngfw-performance-08>)

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. 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 TippingPoint 5500TX provided by University of New Hampshire InterOperability Lab. These results have been found to meet the NetSecOPEN certification requirements. Detailed results are provided in section Detailed Test Results below.

NetSecOPEN Certification is awarded to Trend Micro’s TippingPoint Threat Protection System 5500TX (version 5.4.1.1649). This certification is product and version specific.

Note: It was observed that the device under test would go into Intrinsic HA Fallback mode during the TCP/HTTPS Connections Per Second test case (Section 7.6); therefore, hardware acceleration was disabled on the device under test for all test cases to prevent it from going into fallback mode.

Results Summary

The tables 1 & 2 below highlight the measured values for the Key Performance indicators (KPIs). The values for individual object sizes and test scenarios are described in the section “Detailed Test Results”

HTTP Traffic Performance

Key Performance Indicator	Values
Connections Per Second (CPS)	137,962 CPS @ 1 KByte and 16,444 CPS @ 64 KByte object sizes
Throughput	9.97 Gbit/s @ 256 KByte and 5.47 Gbit/s @ 1 KByte object sizes
Transactions Per Second (TPS)	467,570 TPS @ 1 KByte and 4,535 TPS @ 256 KByte object sizes
Time to First Byte (TTFB)	0.15 ms average TTFB @ 1 KByte and 0.76 ms average TTFB @ 64 KByte object sizes ¹ 0.14 ms average TTFB @ 1 KByte and 0.26 ms average TTFB @ 64 KByte object sizes ²
Time to Last Byte (TTLB)	0.15 ms average TTLB @ 1 KByte and 1.68 ms average TTLB @ 64 KByte object sizes ¹ 0.15 ms average TTLB @ 1 KByte and 1.12 ms average TTLB @ 64 KByte object sizes ²
Concurrent connection	14,000,000 average concurrent connection

Table 1: Results summary for HTTP tests

¹ Tested with 50% of max. throughput that the TippingPoint 5500TX supported.

² Tested with 50% of max. CPS that the TippingPoint 5500TX supported.

HTTPS Traffic Performance

Key Performance Indicator	Values
Connections Per Second (CPS)	2,383 CPS @ 1 KByte and 2,355 CPS @ 64 KByte object sizes
Throughput	6.68 Gbit/s @ 256 KByte and 0.27 Gbit/s @ 1 KByte object sizes
Transactions Per Second (TPS)	19,538 TPS @ 1 KByte and 3,052 TPS @ 256 KByte object sizes
Time to First Byte (TTFB)	0.99 ms average TTFB @ 1 KByte and 2.68 ms average TTFB @ 64 KByte object sizes ¹ 1.43 ms average TTFB @ 1 KByte and 1.93 ms average TTFB @ 64 KByte object sizes ²
Time to Last Byte (TTLB)	0.98 ms average TTLB @ 1 KByte and 4.57 ms average TTLB @ 64 KByte object sizes ¹ 1.58 ms average TTLB @ 1 KByte and 3.58 ms average TTLB @ 64 KByte object sizes ²
Concurrent connection	79,800 average concurrent connection

Table 2: Results summary for HTTPS tests

Test setup and configurations

All the tests were performed with test setup (option 2) defined in the draft in [section 4.1](#). Four 10GbE interfaces of the TippingPoint 5500TX were directly connected with the test equipment.

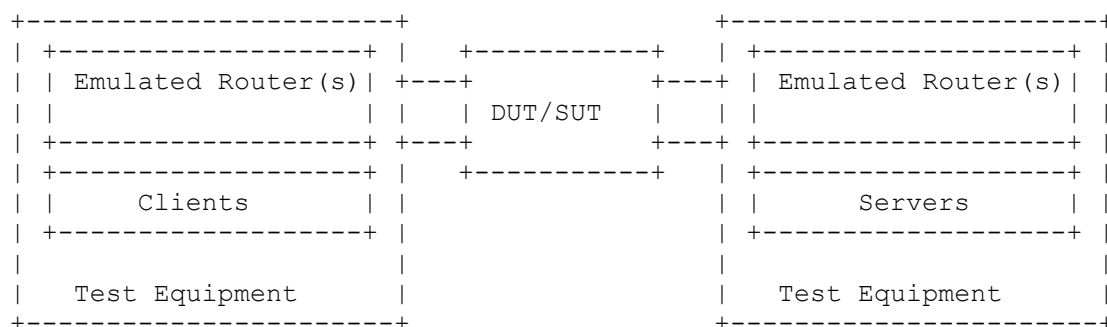


Figure 1: Testbed Setup

The table below shows the list of recommended Next Generation Intrusion Prevention Systems (NGIPS) features described in the draft that were enabled/disabled on the security device under test.

Features	Security device Status
SSL Inspection	Enabled
Anti-Malware	Enabled
Anti-Spyware	Enabled
Anti-Botnet	Enabled
Logging and Reporting	Enabled
Application Identification	Enabled
Deep Packet Inspection	Enabled
Anti-Evasion	Enabled

Table 3: NGFW security features

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 TippingPoint 5500TX security device. The TippingPoint 5500TX 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 the HTTPS performance tests.

Detailed Test Results

TCP/HTTP Connections Per Second

Object Size [KByte]	Avg. TCP/HTTP Connections Per Second
1	137,962
2	127,671
4	118,987
16	55,030
64	16,444

Table 4: TCP/HTTP Connections per Second

HTTP Throughput and Transactions per Second

Object Size [KByte]	Avg. HTTP Throughput [Gbit/s]	Avg. HTTP Transaction Per Second
1	5.47	467,570
16	8.64	61,865
64	9.83	17,933
256	9.97	4,535
Mixed objects	9.75	21,614

Table 5: HTTP Throughput

TCP/HTTP Transaction Latency

The test was performed with two traffic load profile as defined in the draft. Table 6 below describes the latency results measured with 50% of the maximum connection per second supported by 5500TX.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	< 0.00005	0.14	20	< 0.00005	0.15	20
16	< 0.00005	0.20	20	< 0.00005	0.41	23
64	< 0.00005	0.26	19	< 0.00005	1.12	27

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 5500TX.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	< 0.00005	0.15	26	< 0.00005	0.15	26
16	< 0.00005	0.25	22	< 0.00005	0.45	24
64	< 0.00005	0.76	22	< 0.00005	1.68	24

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

Figures 2-4 illustrate the distribution of maximum latency (TTFB and TTLB) values measured in approximately 600 measurement samples.

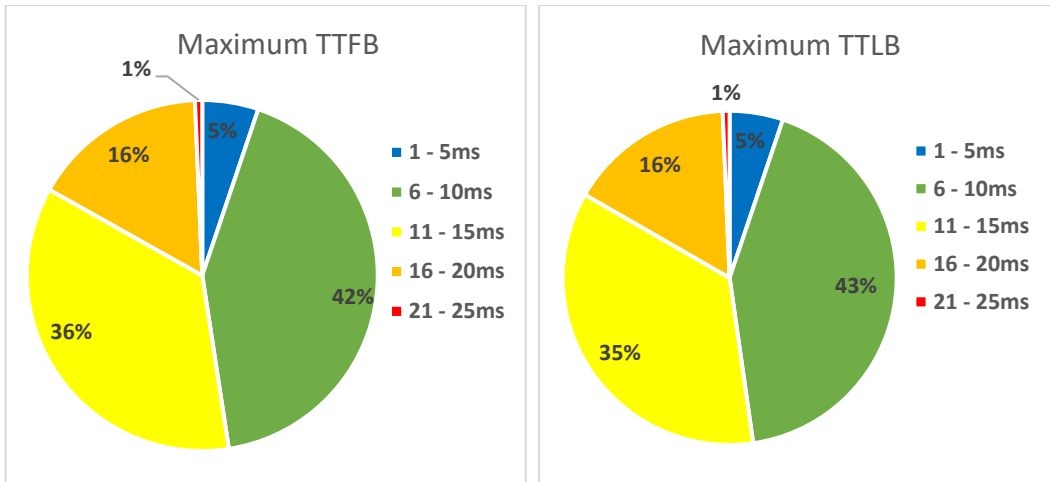


Figure 2: Latency distribution measured with 1KByte object size in Throughput test scenario

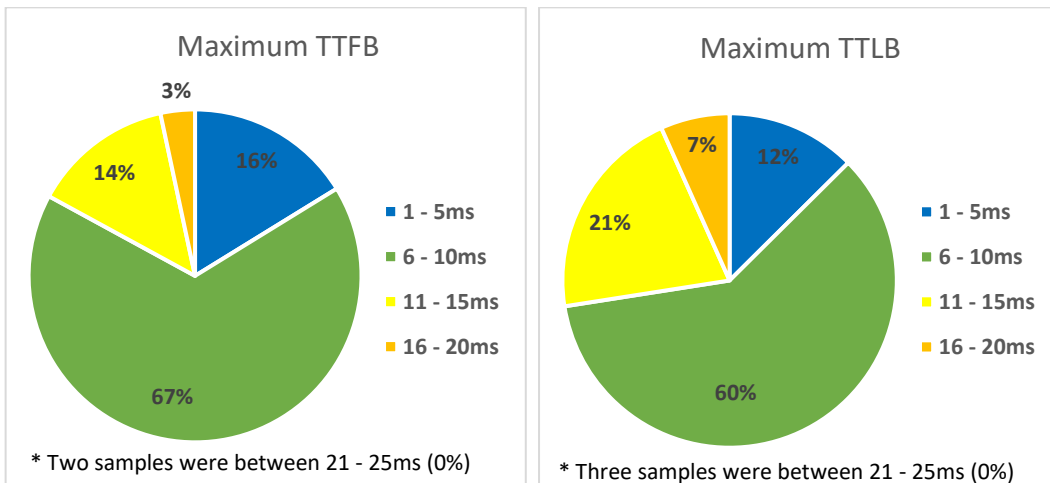


Figure 3: Latency distribution measured with 16KByte object size in Throughput test scenario

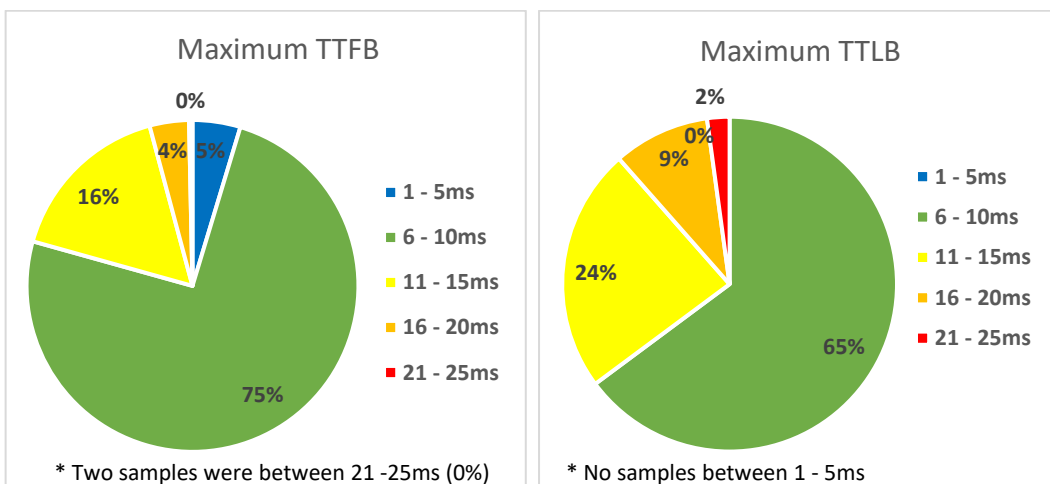


Figure 4: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTP Connection Capacity

The TippingPoint 5500TX supported 14,000,000 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 743 Mbit/s.

TCP/HTTPS Connections per second

Object Size [KByte]	Avg. TCP/HTTPS Connections Per Second
1	2,383
2	2,371
4	2,355
16	2,259
64	2,018

Table 8: TCP/HTTPS Connections per Second

HTTPS Throughput

Object Size [KByte]	Avg. HTTPS Throughput [Gbit/s]	Avg. HTTPS Transaction Per Second
1	0.27	19,538
16	2.09	14,704
64	4.53	8,176
256	6.68	3,052
Mixed objects	4.32	9,516

Table 9: HTTPS Throughput

HTTPS Transaction Latency

The test was performed with two traffic load profile as defined in the draft. Table 10 below describes the latency results measured with 50% of the maximum connection per second supported by 5500TX.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	< 0.00005	1.43	30	< 0.00005	1.58	30
16	< 0.00005	1.85	32	< 0.00005	2.11	33
64	< 0.00005	1.93	38	< 0.00005	3.58	46

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 5500TX.

Object Size [KByte]	Time to First Byte [ms]			Time to Last Byte [ms]		
	Min	avg	Max	Min	avg	Max
1	< 0.00005	0.99	29	< 0.00005	0.98	29
16	< 0.00005	1.88	30	< 0.00005	2.03	31
64	< 0.00005	2.68	31	< 0.00005	4.57	36

Table11: TCP/HTTP TTFB and TTLB @ 50% of the maximum Throughput

Figures 5 -7 illustrate the distribution of maximum latency (TTFB and TTLB) values measured in approximately 600 measurement samples.

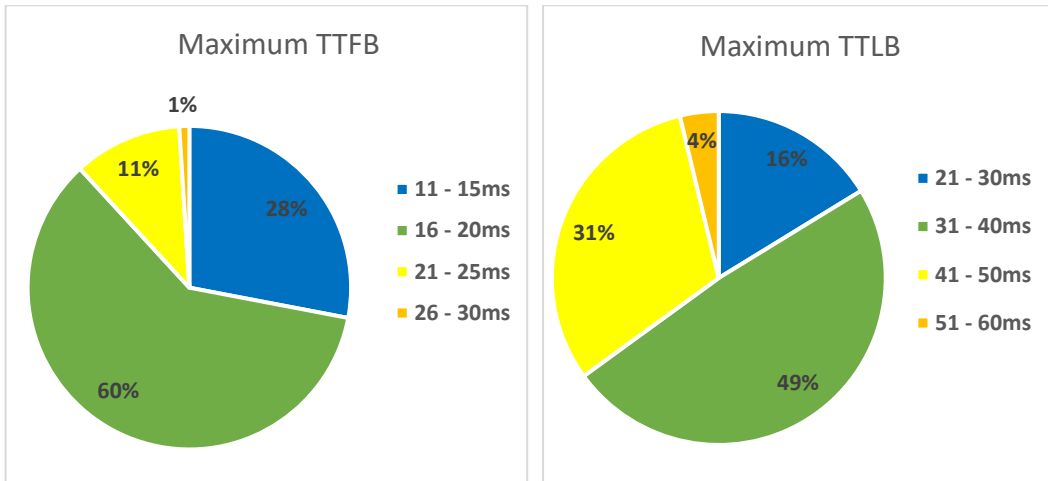


Figure 5: Latency distribution measured with 1KByte object size in Throughput test scenario

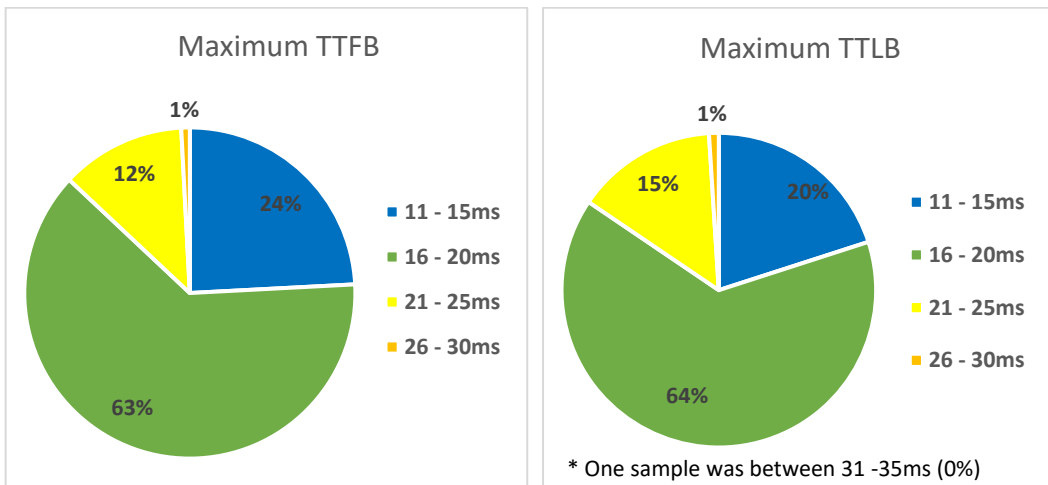


Figure 6: Latency distribution measured with 16KByte object size in Throughput test scenario

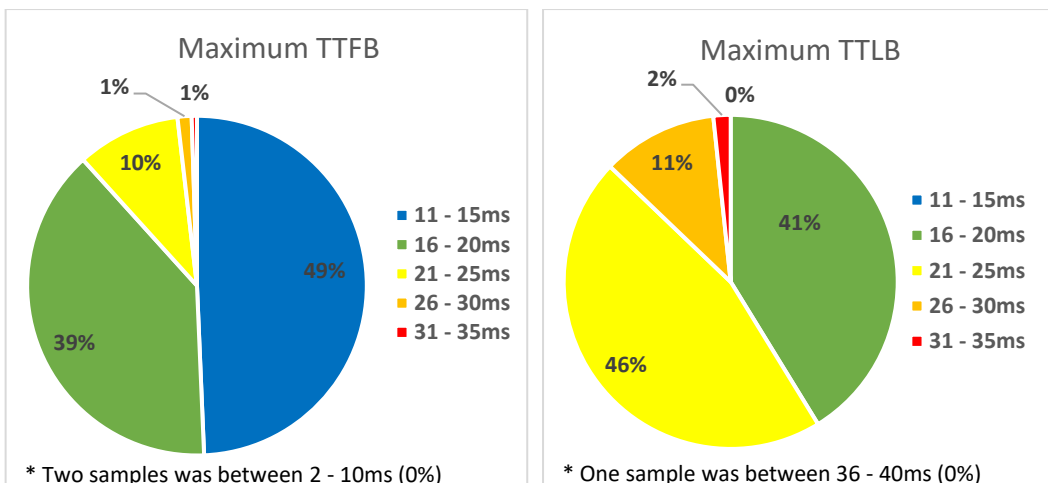


Figure 7: Latency distribution measured with 64KByte object size in Throughput test scenario

Concurrent TCP/HTTPS Connection Capacity

The TippingPoint 5500TX supported 79,800 concurrent TCP/HTTPS connection in average. 1 KByte object size was used as HTTPS GET request for each established TCP connection, which resulted an average throughput of 14 Mbit/s.