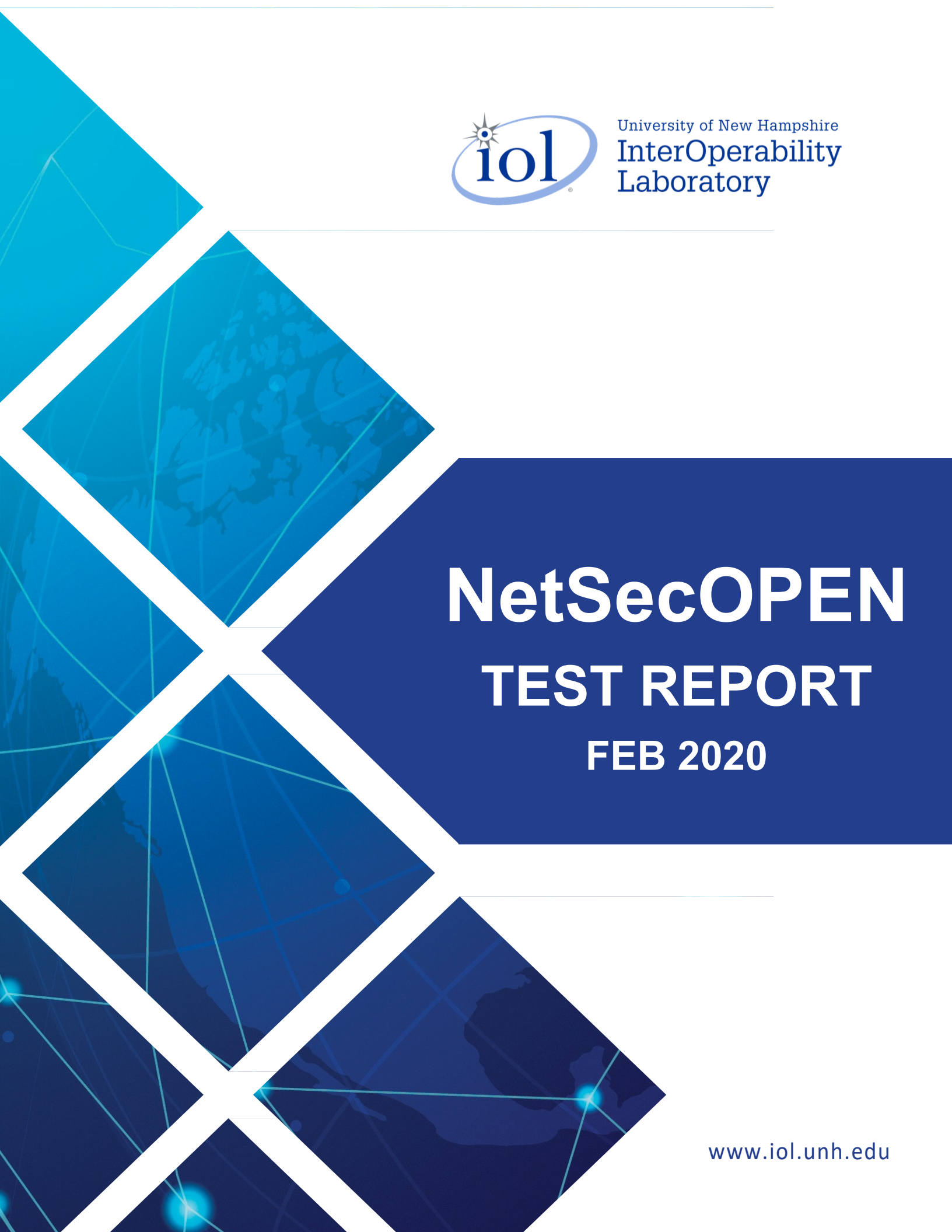

NetSecOPEN

TEST REPORT

FEB 2020

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ARIA ESLAMBOLCHIZADEH
SONICWALL
ARIAE@SONICWALL.COM

DEVICE AND TEST PLAN INFORMATION	
Device Under Test (DUT)	SonicWall NSA 4650
Test Specification/Suite	Benchmarking Methodology for Network Security Device Performance draft-ietf-bmwg-ngfw-performance-02
UNH-IOL Test Result ID	31356

CONTACT INFORMATION		
Testing Completed by	Chris Brown	cbrown@iol.unh.edu
Report Created by	Chris Brown	cbrown@iol.unh.edu
Report Reviewed by	Michayla Newcombe	mnewcombe@iol.unh.edu

Please use Adobe Acrobat to validate the authenticity of this document.

Michayla Newcombe
2020.02.11 09:07:20
-05'00'

TESTING NOTES

The following table contains any notes on the testing process or on general DUT behavior.

NOTES
Throughput performance with NetSecOPEN traffic mix portion of the methodology is currently still under development; therefore, not reported. Both public and private Common Vulnerabilities and Exposures (CVE) sets were tested against the device under test to confirm that the device exhibited the enabled security functionality. This portion of the methodology is currently still under development; therefore, the results are not officially reported for NetSecOPEN certification.

REVISION HISTORY

The following table contains a revision history for this report.

REVISION	DATE	AUTHOR	EXPLANATION
1.0	01/21/2020	Chris Brown	Initial version
2.0	01/24/2020	Chris Brown	Updated device information & added table in CVE results summary
3.0	01/29/2020	Chris Brown	Updated appendix
4.0	02/07/2020	Chris Brown	Removed results that are still under development by the methodology
5.0	02/10/2020	Chris Brown	Added language to second appendix that was requested by working group

DEVICE INFORMATION

COMPONENT	DESCRIPTION
Device Name	SonicWall NGFW Firewall
UNH-IOL Device Identification Number	FW-SONICW-0000026714
Device Model	NSA 4650
Device Firmware	SonicOS Enhanced 6.5.0.11-91n
Interfaces Tested	X24, X25
Interfaces Speed	10G
Controller Name	N/A
Controller Model	N/A
Controller Firmware	N/A
Virtual VNF	N/A
VM Cores Used	N/A
VM RAM Used	N/A
Pinning Information	N/A
Hypervisor Name	N/A
Hypervisor Version	N/A

DEVICE ENABLED FEATURES

FEATURE	STATUS	
	ENABLED	DISABLED
SSL Inspection	✓	
IDS/IPS	✓	
Web Filtering		✓
Antivirus	✓	
Anti-Spyware	✓	
Anti-Botnet	✓	
DLP		✓
DDoS		✓
Certificate Validation		✓
Logging and Reporting	✓	
Application Identification	✓	

DEVICE ACL RULES

RULE TYPE	ACTION	# OF RULES
Application Layer	Block	10
Transport Layer	Block	50
IP Layer	Block	50
Application Layer	Allow	10
Transport Layer	Allow	1
IP Layer	Allow	1

TEST TOOL AND ENVIRONMENT INFORMATION

COMPONENT	DESCRIPTION	
Performance Test Equipment Vendor	Spirent	
Performance Hardware Name	SPT-C100-S3	
Performance Hardware Firmware	5.03.0381	
Performance Hardware Interface Type	10G	
Performance Application Software Name	Cyberflood	
Performance Application Software Version	19.4.0.3105	
Efficiency Test Equipment Vendor	Spirent	
Efficiency Hardware Name	SPT-C100-S3	
Efficiency Hardware Firmware	5.03.0381	
Efficiency Hardware Interface Type	10G	
Efficiency Application Software Name	Cyberflood	
Efficiency Application Software Version	19.4.0.3105	
Client IP Subnet	10.1.0.0/21	
Server IP Subnet	10.2.0.0/21	
Traffic Distribution Ratio	**IPv4**	**IPv6**
	100%	0%

KPI RESULT SUMMARY

SECTION 7.1

TEST CASE	KPI	TRAFFIC MIX (SSL DISABLED)	TRAFFIC MIX (SSL ENABLED)
Throughput Performance with NetSecOPEN Traffic Mix	Throughput	N/A	N/A
	TPS	N/A	N/A
	TTFB	N/A	N/A
	TTLB	N/A	N/A

SECTION 7.2

TEST CASE	KPI	1K	2K	4K	16K	64K
TCP/HTTP Connections Per Second	CPS	27,950	25,677	21,943	13,570	5,357

SECTION 7.3

TEST CASE	KPI	1K	16K	64K	256K	MIX
HTTP Throughput	TPUT (Kbit/s)	1,106,805	2,903,242	3,456,854	3,530,882	3,360,272
	TPS	96,411	21,230	6,442	1,652	7,618

SECTION 7.4

TEST CASE	KPI	CPS 1K	CPS 16K	CPS 64K	TPUT 1K	TPUT 16K	TPUT 64K
TCP/HTTP Transaction Latency	TTFB Average (msec)	0.8	0.5	0.5	0.4	0.3	0.4
	TTFB Minimum (msec)	0.282	0.284	0.287	0.3	0.31	0.313
	TTFB Maximum (msec)	122.05	103.939	99.437	59.106	97.107	99.832
	TTLB Average (msec)	0.4	0.6	1.5	0.1	0.3	1.1
	TTLB Minimum (msec)	0	0	1	0	0	0
	TTLB Maximum (msec)	48	58	49	69	59	49

SECTION 7.5

TEST CASE	KPI	1K
Concurrent TCP/HTTP Connection Capacity	CC	252,000

SECTION 7.6

TEST CASE	KPI	1K	2K	4K	16K	64K
TCP/HTTPS Connections Per Second	CPS	420	418	417	402	359

SECTION 7.7

TEST CASE	KPI	1K	16K	64K	256K	MIX
HTTPS Throughput	TPUT (Kbit/s)	58,087	403,244	911,324	1,953,864	1,756,995
	TPS	3,875	2,875	1,677	102	539

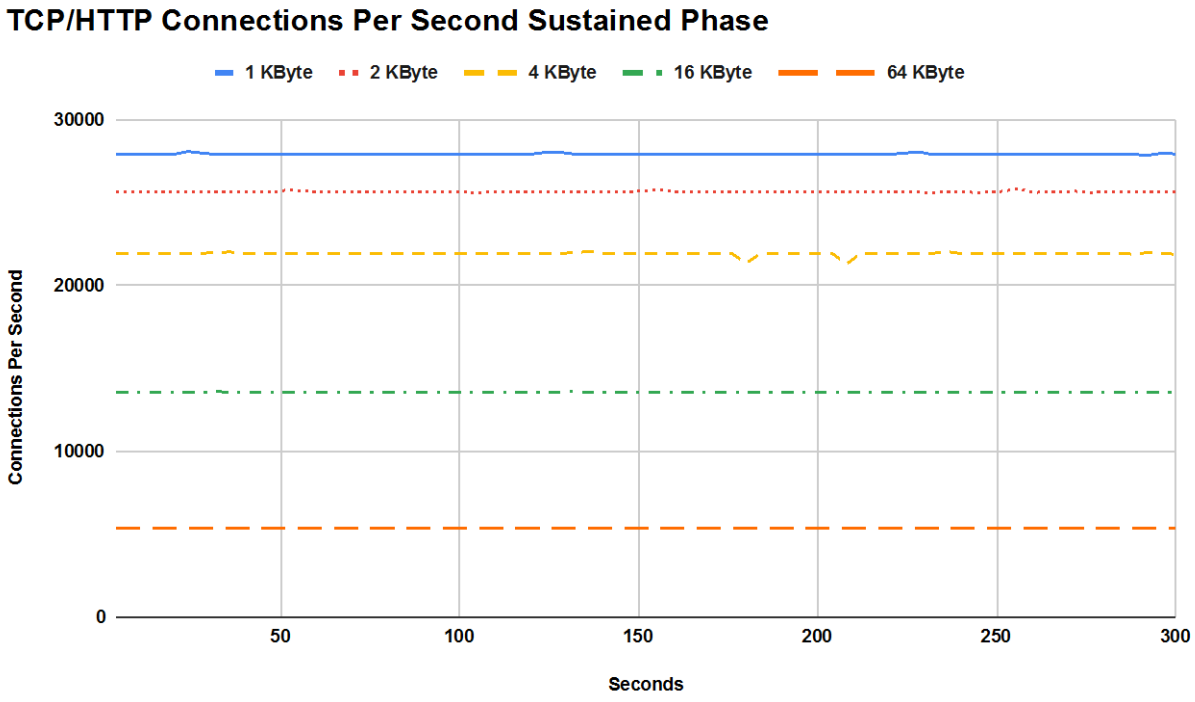
SECTION 7.8

TEST CASE	KPI	CPS 1K	CPS 16K	CPS 64K	TPUT 1K	TPUT 16K	TPUT 64K
TCP/HTTPS Transaction Latency	TTFB Average (msec)	19.6	19.7	20.9	445.1	329.2	195.5
	TTFB Minimum (msec)	18.49	18.537	18.617	19.462	19.349	19.146
	TTFB Maximum (msec)	194.612	127.226	209.59	2767.693	614.672	384.553
	TTLB Average (msec)	0.3	1.0	205	38.5	50.6	60
	TTLB Minimum (msec)	0	0	202	4	2	2
	TTLB Maximum (msec)	105	106	377	453	348	3021

SECTION 7.9

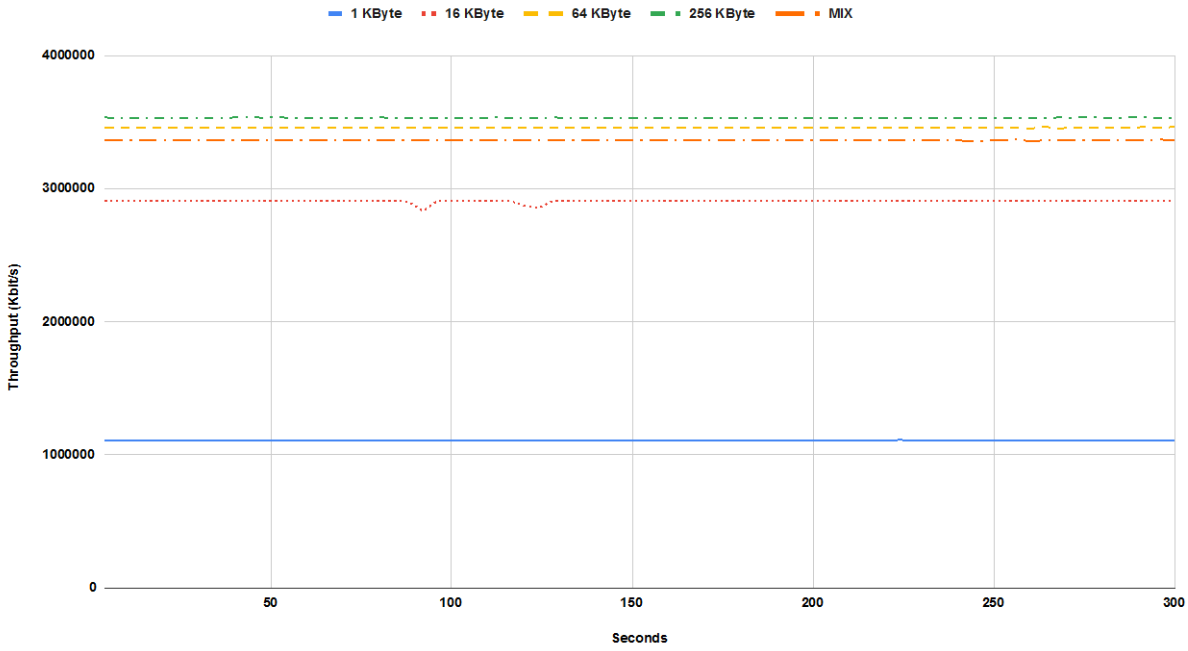
TEST CASE	KPI	1K
Concurrent TCP/HTTPS Connection Capacity	CC	13,500

GRAPHS

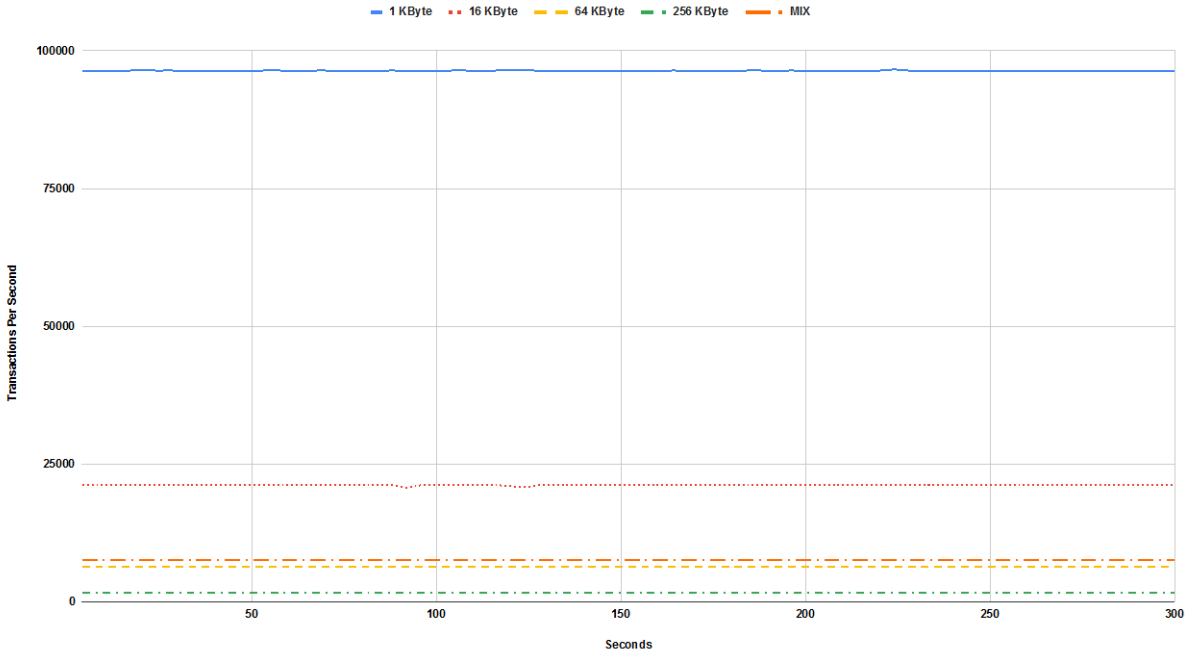


Maximum sustainable TCP/HTTP connection establishment rate supported by the DUT under different throughput load conditions.

HTTP Throughput Sustained Phase

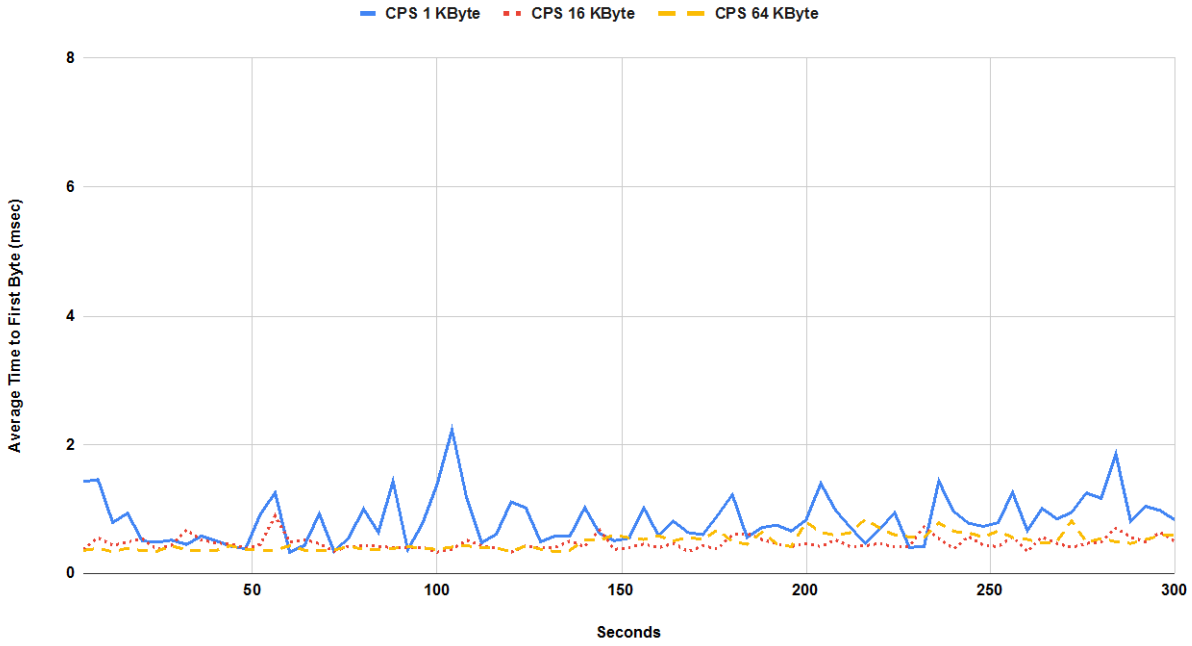


HTTP Transactions Per Second Sustained Phase

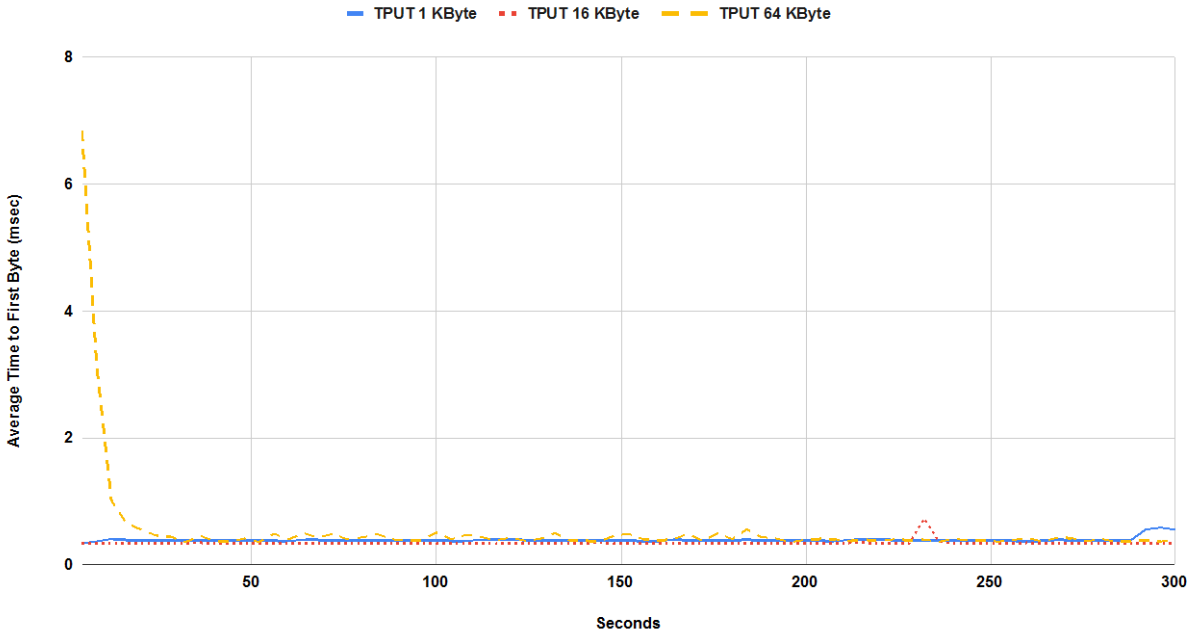


Maximum sustainable throughput for HTTP transactions varying the HTTP response object size.

TCP/HTTP Transaction Latency Connections Per Second Sustained Phase

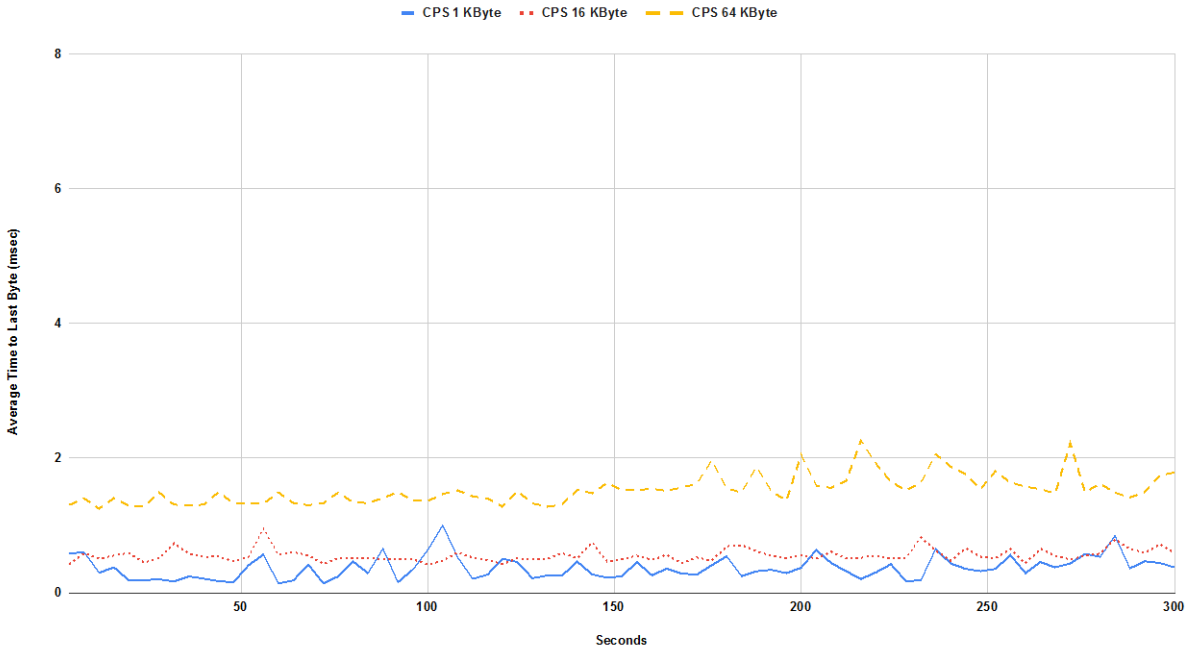


TCP/HTTP Transaction Latency Throughput Sustained Phase

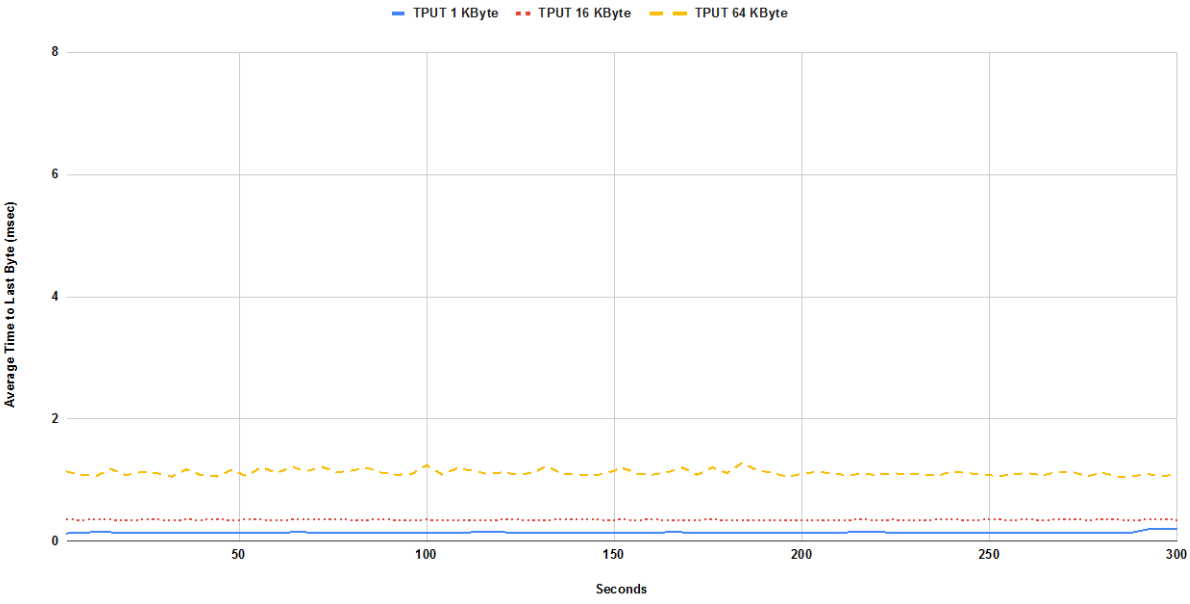


Average HTTP transaction latency time to first byte with sustainable HTTP transactions per second under different HTTP response object sizes. First scenario with a single transaction and the second scenario is with multiple transactions within a single TCP connection.

TCP/HTTP Transaction Latency Connections Per Second Sustained Phase

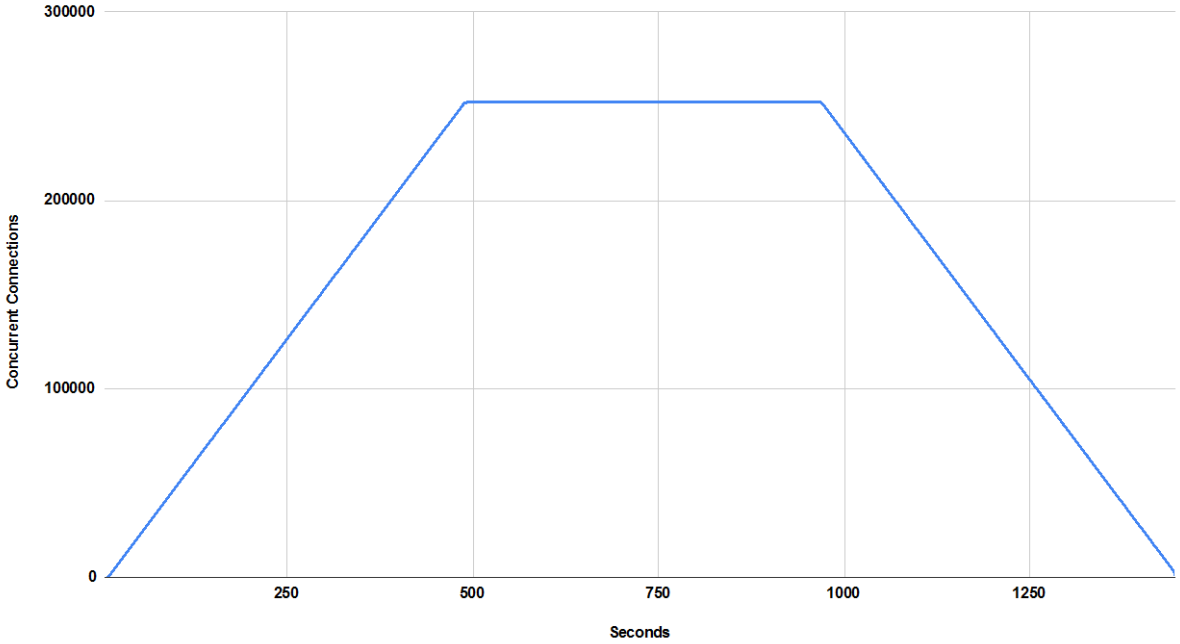


TCP/HTTP Transaction Latency Throughput Sustained Phase



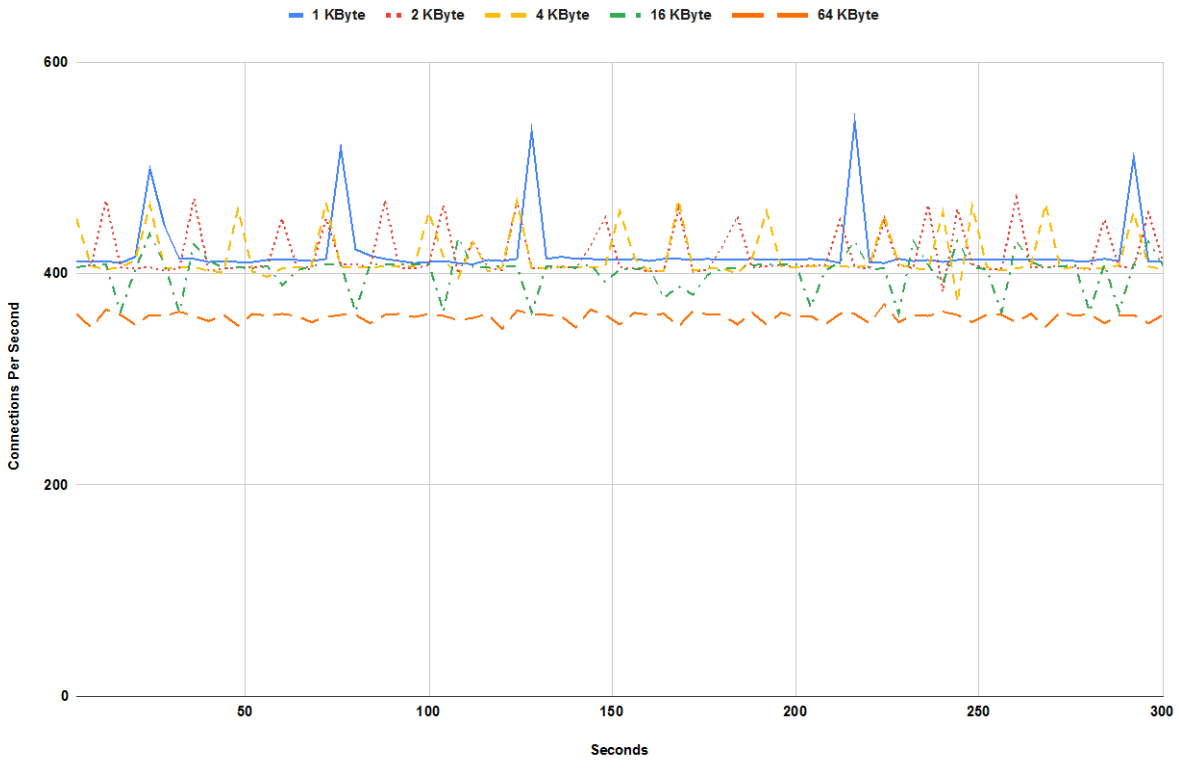
Average HTTP transaction latency time to last byte with sustainable HTTP transactions per second under different HTTP response object sizes. First scenario with a single transaction and the second scenario is with multiple transactions within a single TCP connection.

Concurrent TCP/HTTP Connection Capacity



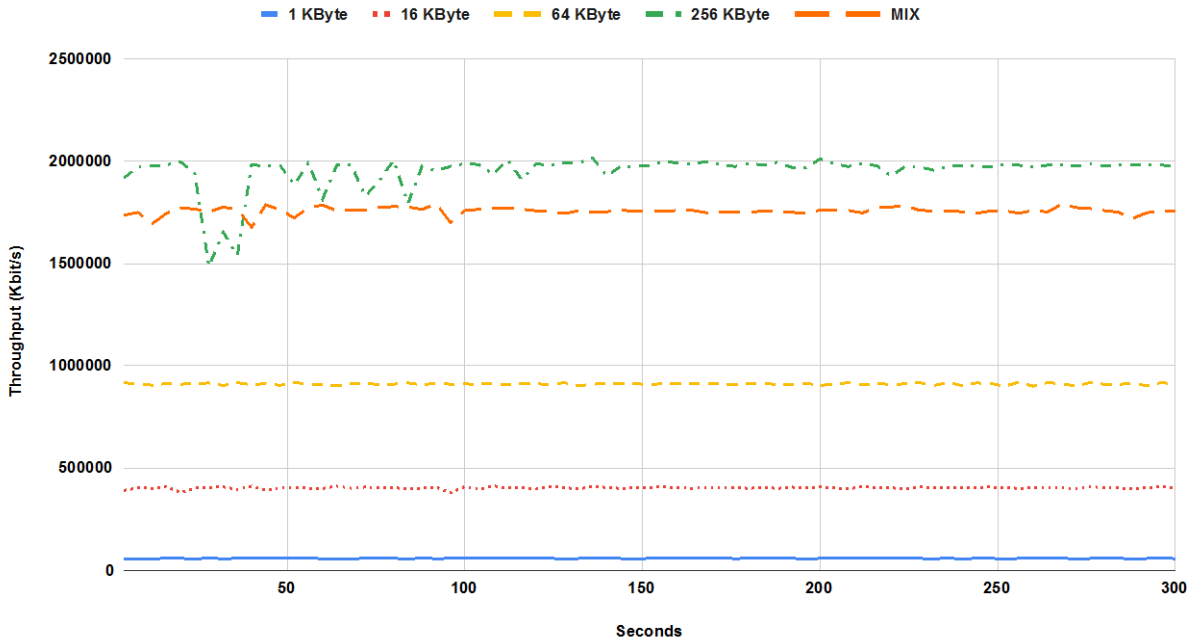
Maximum achievable HTTP connections per second with 1 KByte object size.

TCP/HTTPS Connections Per Second Sustained Phase

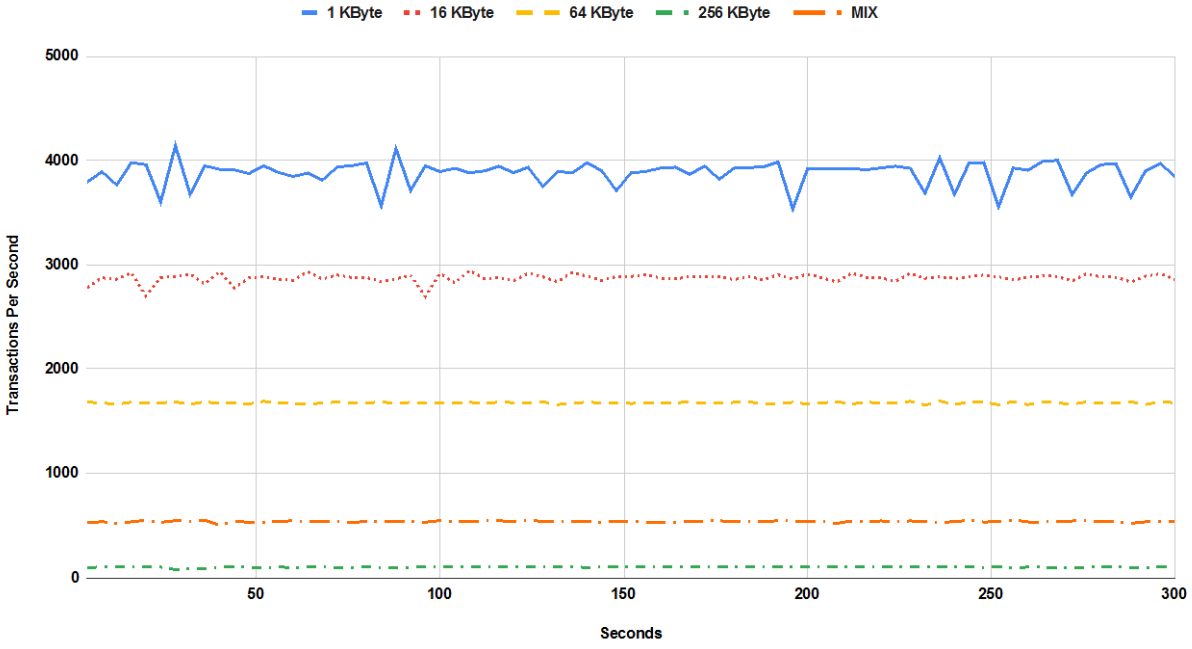


Maximum sustainable TCP/HTTPS connection establishment rate supported by the DUT under different throughput load conditions.

HTTPS Throughput Sustained Phase

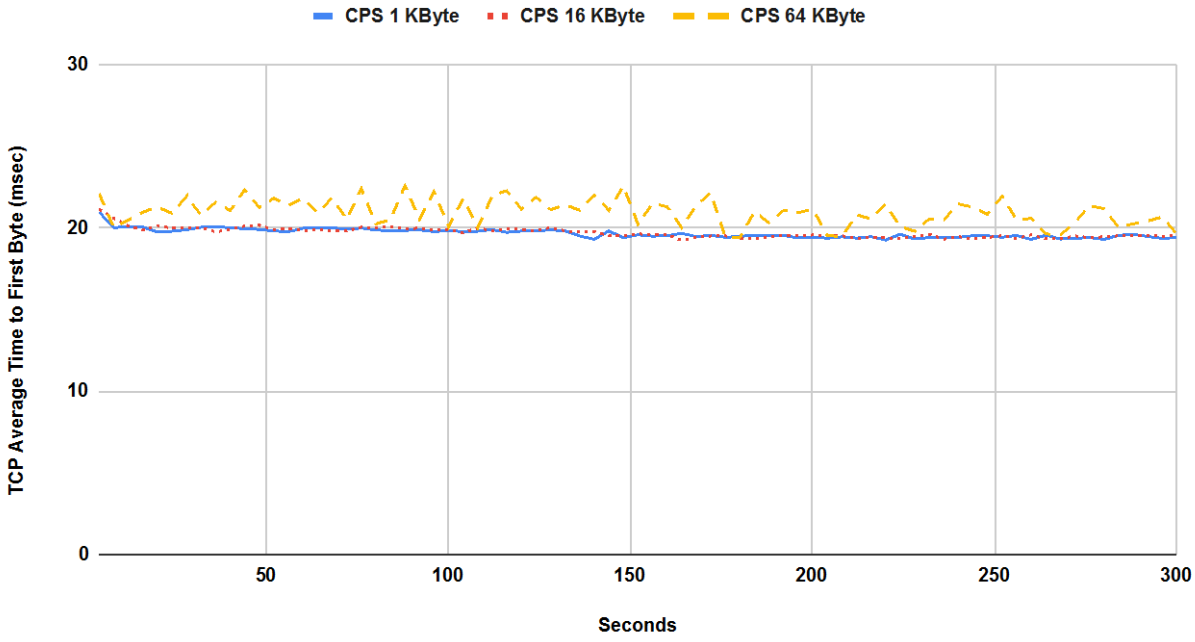


HTTPS Transactions Per Second Sustained Phase

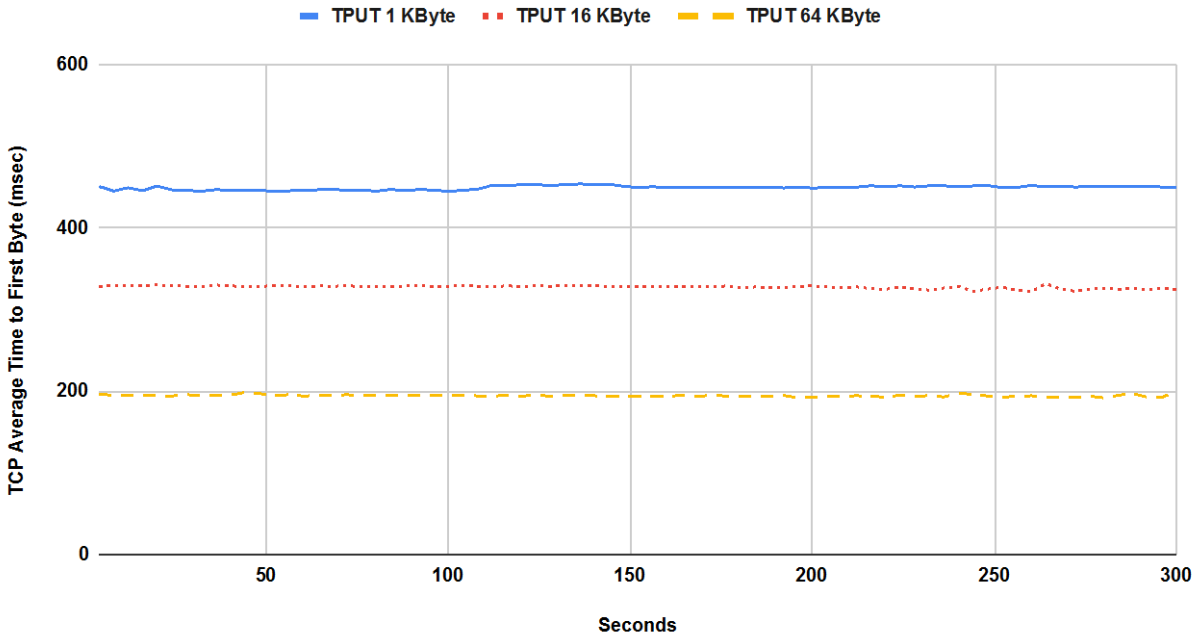


Maximum sustainable throughput for HTTPS transactions varying the HTTPS response object size.

TCP/HTTPS Transaction Latency Connections Per Second Sustained Phase

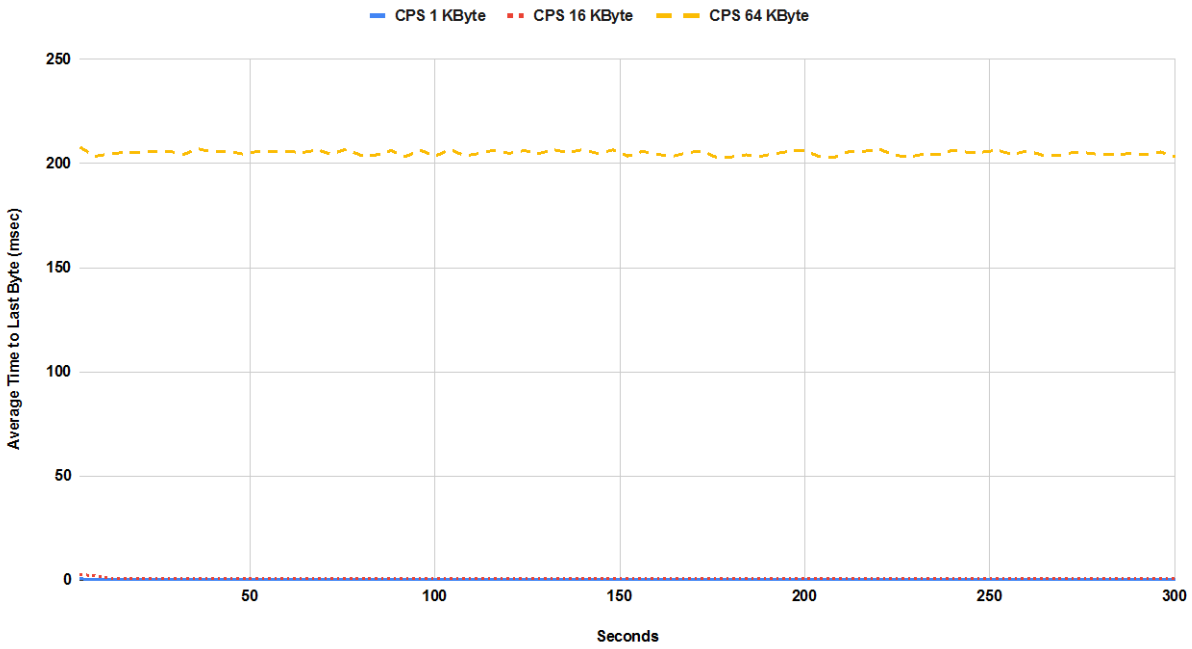


TCP/HTTPS Transaction Latency Throughput Sustained Phase

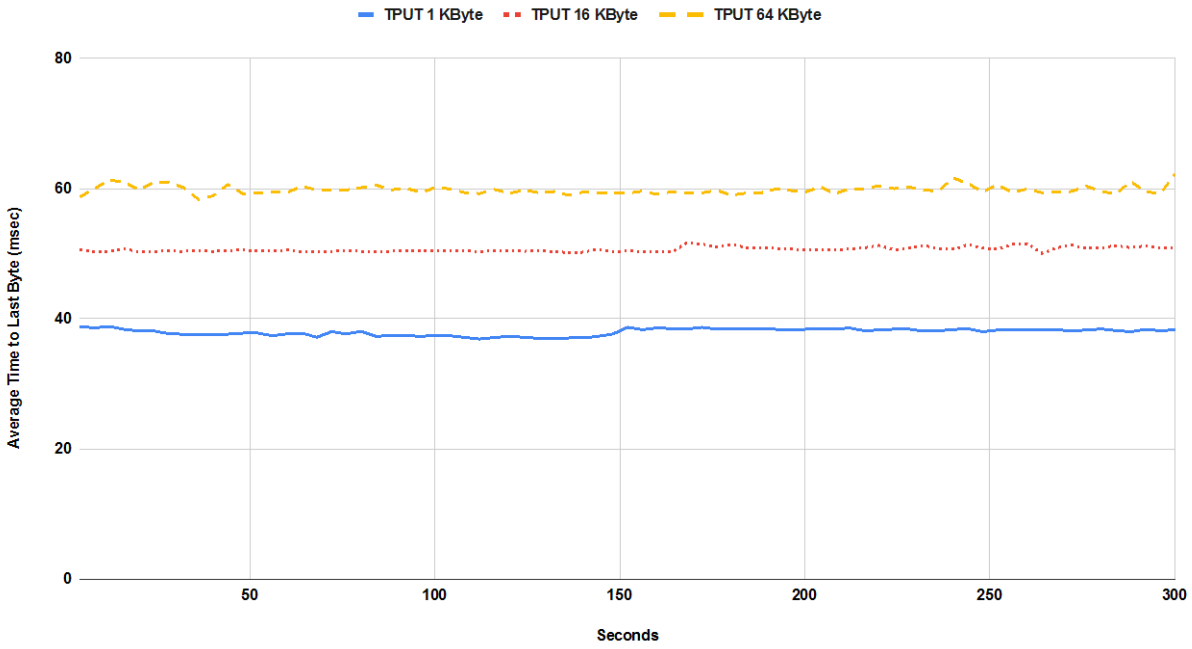


Average HTTPS transaction latency time to first byte with sustainable HTTPS transactions per second under different HTTPS response object sizes. First scenario with a single transaction and the second scenario is with multiple transactions within a single TCP connection.

TCP/HTTPS Transaction Latency Connections Per Second Sustained Phase

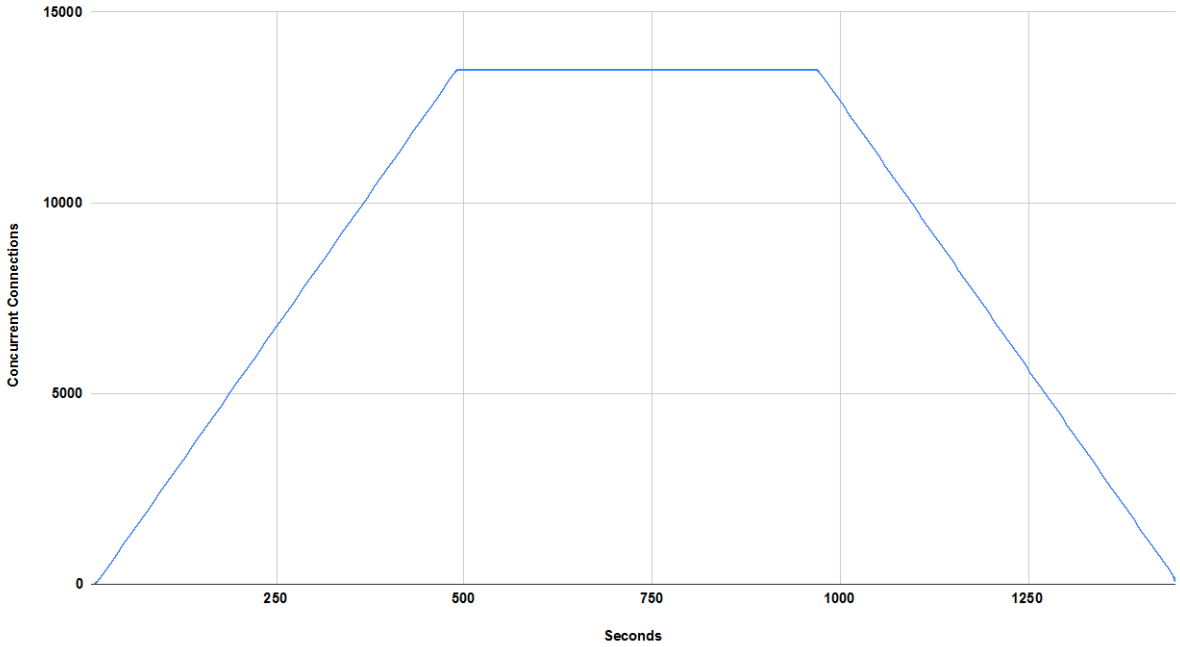


TCP/HTTPS Transaction Latency Throughput Sustained Phase



Average HTTPS transaction latency time to last byte with sustainable HTTPS transactions per second under different HTTPS response object sizes. First scenario with a single transaction and the second scenario is with multiple transactions within a single TCP connection.

Concurrent TCP/HTTPS Connection Capacity



Maximum achievable HTTPS connections per second with 1 KByte object size.

APPENDICES

APPENDIX 1: KPI KEY

The following table contains possible KPIs and their meanings.

KPI	MEANING	INTERPRETATION
CPS	TCP Connections Per Second	Measures the average established TCP connections per second in the sustaining period. For "TCP/HTTP(S) Connection Per Second" benchmarking test scenario, the KPI is measured average established and terminated TCP connections per second simultaneously.
TPUT	Throughput	Measures the average Layer 2 throughput within the sustaining period as well as average packets per seconds within the same period. The value of throughput is expressed in Kbit/s.
TPS	Application Transactions Per Second	Measures the average successfully completed application transactions per second in the sustaining period.
TTFB	Time to First Byte	Measure the minimum, maximum and average time to first byte. TTFB is the elapsed time between sending the SYN packet from the client and receiving the first byte of application date from the DUT/SUT. TTFB SHOULD be expressed in millisecond.
TTLB	Time to Last Byte	Measures the minimum, maximum and average per URL response time in the sustaining period. The latency is measured at Client and in this case would be the time duration between sending a GET request from Client and the receival of the complete response from the server.
CC	Concurrent TCP Connections	Measures the average concurrent open TCP connections in the sustaining period.
N/A	Not Applicable	This test does not apply to the device type or is not applicable to the testing program selected.

APPENDIX 2: CVE DETECTION RATES

As stated previously, we performed the CVE check to verify the security functionality of the DUT during performance test. Two vulnerability sets were used, one Public and one Private (The private set was not known to the DUT vendor in order to ensure the test was not being gamed). The public set contained approximately 435 CVEs and the private set contained approximately 30 CVEs.

As a preview to the security effectiveness test methodology under development, following are the respective private and public block rates used to verify security functionalities/modules are engaged.

The block rates for this test are:

PREVENT SCENARIO	SCENARIOS TOTAL	BLOCKED	NOT BLOCKED
Public CVE	435	430	5
Private CVE	33	33	0