ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 6, June 2015

Study of Traffic Generation Tools

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Abstract: To evaluate performance of different traffic generators, a comparison is required to find out most suitable traffic generator for particular application which could help researchers to evaluate a network in a better way. This paper presents a comprehensive survey of six most popular traffic generators. Traffic Generators are used to generate synthetic traffic to check network performance. Discussion on characteristics and capabilities of these tools help researchers to select particular tool for their application and also for developers to find new possibilities of development. Paper uses some prior experimental results to compare these tools on the basis of Throughput.

Keywords : Traffic Generation, Internet.

1. INTRODUCTION

The area of synthetic traffic generation is recently introduced with development of web and network. Traffic generation is very essential in the processes of testing and developing new network elements, such as equipments, protocols and applications regarding both the production and research area [7]. It is vital to predict the behavior of computer network and how it will run in real time scenario. Deploying networks without testing under appropriate traffic conditions, new systems run under risk of unpredictable behavior and unacceptable performance.

Traffic generation makes it possible to test and study the performances of network systems and their applications without incurring the substantial cost of the equipments and human efforts that would otherwise be required. Traffic Generators help researchers in understanding network dynamics and in designing suitable modifications and improvements in current protocols and equipment.

The rest of the paper is organized as follows; Section 2 introduces some traffic generators (TG) and discusses their features. Section 3 presents a comparative discussion of tools. Finally, remark of study is stated in Section 4.

2.STUDY OF TRAFFIC GENRATORS

2.1 . DITG [1]

D-ITG (Distributed Internet Traffic Generator) is a platform that can generate both IPv4 and IPv6 traffic. Traffic generation pattern is defined by Inter Departure Time (IDT) between packets and the Packet Size (PS). A rich variety of probability distributions is available: Constant, Uniform, Exponential, Pareto, Cauchy, Normal, Poisson and Gamma. It can be also used to measure the One Way Delay (OWD), Round Trip Time (RTT), Packet Loss, Jitter and Throughput. D-ITG is supported on Linux (Ubuntu, Debian, Fedora, Centos), Windows, OSX and FreeBSD. ITGSend generates the traffic and directs it towards the ITGRecv. Both ITGRecv and ITGSend can generate a log file for every sent and received packet. Multi flow mode is also supported by D-ITG.

2.2. PACKETH [2]

PackETH is a GUI and CLI based stateless traffic generation tool for Ethernet. It was developed and maintained for Linux, but some ports for Windows and MAC also provided It can craft and send any possible packet or sequence of packets on the Ethernet link and supports the protocols such as Ethernet II, Ethernet 802.3, 802.1q, QinQ, user defined Ethernet frame. It also supports ARP, IPv4, IPv6 network layer protocol and UDP, TCP, ICMP, ICMPv6, IGMP transport layer protocol. Parameters like IP, MAC addresses and UDP payloads can be varied while sending packets.

2.3. OSTINATO [3]

Ostinato is an user level traffic generation tool with a friendly GUI. It is supported by Window, Linux, BSD and Mac OS X. The common standard protocols supported by Ostinato are Ethernet/802.3/LLC SNAP; ARP, IPv4, IPv6, IP-in-IP, IP Tunneling (6over4, 4over6, 4over4, 6over6); TCP, UDP, ICMPv4, ICMPv6, IGMP, MLD and many text based protocols like HTTP, SIP, RTSP, NNTP etc. It also supports client server architecture. It can create and configure sequential and interleaved streams of different protocols at different rates. Flexibility to add any unimplemented protocol is also provided through a user defined script.

2.4 IPERF [4]

Iperf is used for the evaluation of parameters like bandwidth, delay, window size and packet loss for both TCP and UDP traffic. It has both command line as well as GUI based interface. Its graphical interface is written in JAVA called as Jperf. It can be installed on Linux/Unix and Windows system. Iperf client connects to Iperf server and the bandwidth utilization from client to server is measured. Iperf features are as follow

- TCP
  - Measure bandwidth
  - Report MSS/MTU size

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- Observe read sizes
- Support for TCP window size via socket buffers
- Support Multi-threaded Mode

◆ UDP

- Create UDP streams of specified bandwidth.
- Measure packet loss
- Measure delay jitter
- Multicast capable
- Support Multi-threaded Mode

◆ Specify appropriate options with K (kilo-) and M (mega-) suffices. So, 128K instead of 131072 bytes
◆ Can run for specified time, rather than a specified amount of data to transfer
◆ Choose best units for the size of data being reported.
◆ Allow Servers handle multiple connections, rather than quitting after a single test
◆ Print periodic, intermediate bandwidth, jitter and loss reports at specified intervals
◆ Can run server as a daemon
◆ Can run server as a Windows NT Service
◆ Use representative streams to test out how link layer compression affects bandwidth

2.5 NETPERF [5]

Netperf was developed by Hewlett-Packard. Netperf is a benchmark that can be used to measure performances of many different types of networks. It provides tests for both unidirectional Throughput and end-to-end latency. The environments currently measurable by Netperf include:

◆ TCP and UDP via BSD Sockets for both IPv4 & IPv6
◆ DLPI
◆ Unix Domain Sockets
◆ SCTP for both IPv4 and IPv6

2.6 IP Traffic [6]

IP-Traffic is commercial software developed by ZTI-Telecom. It is a data generation/monitoring/testing tool for IP networks which support TCP, UDP or ICMP protocols. It can use Microsoft Windows TCP/IP stack (Winsock2 interface) and is independent of any transmission link. IP-Traffic has graphic interface benchmark tool that run on Microsoft platforms such as Windows 98, Windows XP, Windows 2003 and Windows Vista.

3. COMPARISION OF TG

Author of [8] compared the four tools with packet size ranging from 128 bytes to 1408 bytes with TCP protocol only. Highest TCP Throughput is obtained at packet size 1408. Figure 1 show Throughput variation with packet size of TCP protocol. Remark of highest Throughput is stated in Table 1 with packet size 1408 bytes. Author of [10] also compared tools with packet size from 64 bytes to 8950 bytes for both UDP and TCP protocol.

Author[10] also compared the DITG and Iperf in multi threaded mode. Figure 2 and 3 show the Throughput graph for PackETH, DITG and Ostinato. Jumbo Frames are used for packet size more than 1500 bytes. Remark of Highest Throughput is stated in Table 2 for TCP and Table 3 for UDP with single thread performance. Table 4 and 5 state remark of multi threaded mode comparison of DITG and Iperf. For UDP Traffic, maximum bandwidth utilization is of 9.X by PackETH at payload size of 5120 bytes. For TCP Traffic, maximum bandwidth utilization is of 9 Gbps by Ostinato at payload size of 8950 bytes.

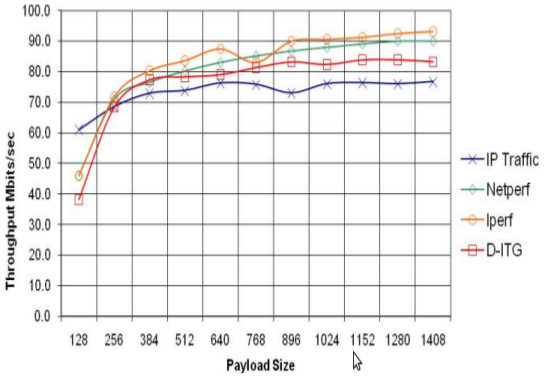

Figure 1. TCP Throughput Comparison [8]

Table 1. Highest TCP Throughput

Tool Name	Throughput (Mbps)
DITG	83.1
Iperf	**93.1**
Netperf	89.9
IP Traffic	76.6

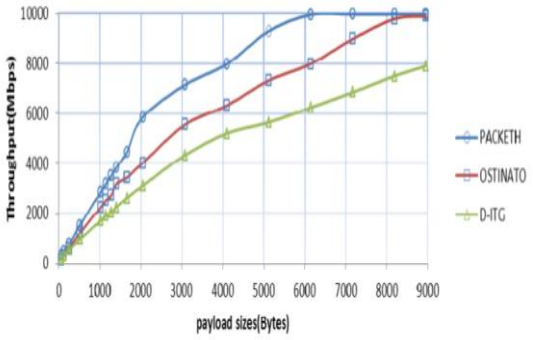

Figure 2. TCP Throughput [10]

Table 2. TCP Throughput

Tool Name	Packet Size (Bytes)	TCP Throughput (Gbps)
DITG	8950	6.2
PackETH	8950	7.8
Ostinato	**8950**	**9**

Table 3. UDP Throughput

Tool Name	Packet Size (Bytes)	UDP Throughput (Gbps)
DITG	8950	7.9
PackETH	**5120**	**9.3**
Ostinato	8192	9.79

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Table 4. TCP - Multi threaded Mode

Tool Name	Thread Count	TCP Throughput (Gbps)
DITG	**10**	**9.8**
Iperf	7	9.5

Table 5. UDP - Multi threaded Mode

Tool Name	Thread Count	UDP Throughput (Gbps)
DITG	**12**	**8.4**
Iperf	7	12 Mbps

When DITG is compared with Iperf in multi threaded mode, the number of thread is varied from 1 to 12 and payload size is kept constant at 1460 bytes. Figure 4 and 5 shows the Throughput variation with respect to thread count. For TCP, DITG achieved highest Throughput of 9.8 Gbps with 10 thread as shown in Table 4. For UDP also, DITG out performance Iperf and achieve Throughput os 8.4 Gbps as shown in table 5. Iperf basically used to measure the maximum bandwidth utilization for TCP. For UDP it creates stream of specified bandwidth and measure various UDP characteristics. Hence, achieved Throughput is very low. Various features and mode supported by these traffic generators are given in Table 6.

Table 6. Features Supported by Traffic Generators [1~6]

Traffic Generators	Supported Features				
	Operating System	Network Protocol	Transport Protocol	MTD	PD*
DITG	Linux, Windows	IPv6, IPv4	UDP,TCP,DCCP, SCTP	Yes	Yes
PackETH	Linux, Windows	IPv6, IPv4	UDP,TCP,ICMPv6, IGMP	No	No
Ostinato	Linux, Windows	IPv6, IPv4	UDP,TCP	No	No
Iperf	Linux, Windows	IPv6, IPv4	UDP,TCP,SCTP	Yes	No
Netperf	Linux, Windows	IPv6, IPv4	UDP,TCP,SCTP	No	No
IP Traffic	Windows	IPv6, IPv4	UDP,TCP	No	No

PD : Probability Distribution MD: Multi-threaded

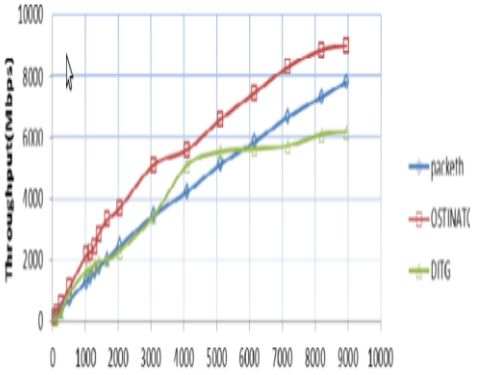

Figure 3. UDP Throughput [10]

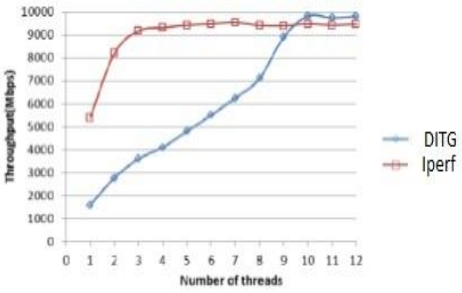

Figure 4. TCP - Multi-threaded Mode [10]

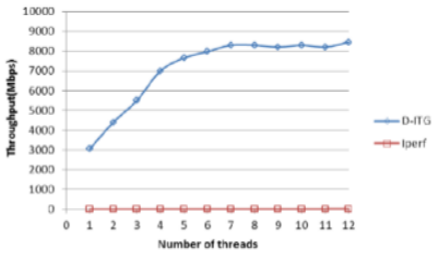

Figure 5. UDP Multi-threaded Mode [10]

4. REMARK

A single traffic generator is not applicable for all types of networks. Traffic Generators are designed for particular application depending upon the need and characteristics of application and network. Highest Throughput at lower packet size is what the need of the realistic traffic. It may also have mix traffic, where multiple protocols and packets with variable size flow in the network. Studying these pattern and designing a generator which can produce same traffic is of a great challenge. As IPv6 is replacing IPv4, demand for traffic generators which are capable of producing IPv6 traffic increases. A detailed experiment is needed to study the IPv6 traffic pattern in order to simulate a realistic one.

ACKNOWLEDGEMENT

We express our sincere thanks to all the authors whose papers related to this area are published in various conferences and journals. Their work has helped a lot in our research.

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ISSN (Print) 2319-5940

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REFERENCES

[1] D-ITG, http://traffic.comics.unina.it/software/ITG/
[2] PackETH, http://packeth.sourceforge.net/packeth/home
[3] Ostinato, https://code.google.com/p/ostinato/
[4] Iperf, http://das t.nlanr.net/Projects /Iperf
[5] Netperf , http://www.netperf.org/netperf/
[6] IP-Traffic,http://www.zti-telecom.com
[7] Raffaele Bolla, Roberto Bruschi and Marco Canini, "A High Performance IP Traffic Generation Tool Based on the Intel IXP2400 Network Processor" ,Published by Distributed Cooperative Laboratories: Networking,Instrumentation, and Measurements Signals and Communication Technology 2006, pp 127-142
[8] Shalvi Srivastava, Sweta Anmulwar and A.M.Sapkal, "Comparative Study of Various Traffic Generator Tools", Proceedings of RAECS UIET Panjab University Chandigarh, 06 – 08 March, 2014
[9] Stefano Avallone, Antonio Pescapè, Giorgio Ventre, "Analysis and Experimentation of Internet Traffic Generator", Distributed Computing Systems, 2004. FTDCS 2004 Proceedings. 10th IEEE International Workshop, pp 277– 283
[10] Samad S. Kolahi, Shaneel Narayan, Du. D. T. Nguyen and Yonathan Sunarto, "Performance Monitoring of Various Network Traffic Generators",UKSim 13th International Conference on Modelling and Simulation , 2011