Real-Time QoS Performance Analysis for Multimedia Traffic in an Optical Network

P. Piruthiviraj, Preeta Sharan and R. Nagaraj

Abstract Different multimedia data transfer analysis through the optical network with a routing table is performed by using the conversion to a next-generation IPv6-based protocol. IPv4 suffers from some drawbacks that may be preventing the growth of the Internet. IPv6 is developed to solve the several issues of the IPv4 such as delay, jitter, error, latency, dropped packets, address depletion, security, research, and extensibility. Hence, by using it will also give an expansion of the capabilities of the Internet and provide a variety of valuable conditions, including end–end mobile applications. The ideas are implemented for the transfer of multimedia data on the connection-oriented network TCP (Transmission Control Protocol). Different multimedia data used are image, audio, and video which is downloaded and streamed to the client systems of the established optical network. The file size is taken for the experimental purpose of image, audio, and video is 20 Mb respectively. Hence, we have analyzed with the Wireshark tool at the client systems with the Ubuntu 14.04 version.

Keywords IPv4 · IPv6 · TCP

1 Introduction

Real-time streaming of multimedia is popular with a high demand in Internet and there are many applications yet to meet this demand. Multimedia communication allocates a large bandwidth through the server in live streaming from the source point of access [1]. Packet loss is an important issue to be considered in data

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A. Mishra et al. (eds.), *Silicon Photonics & High Performance Computing*,
Advances in Intelligent Systems and Computing 718,
https://doi.org/10.1007/978-981-10-7656-5_10

transmission in case of mobile applications with the vast developments in small-sized embedded processors. Based on the infrastructure needs for a huge number of addresses which is a highest priority while using several tools as Java programming support. IPv6 plays a vital role.

IPv6 enhances the reallocation of addresses from the IP-based network (3.40282E+38 addresses) [2] to the configured networks in multiple orders with respect to IPv4 (4294967296 addresses) [3]. As such the device requires more address lines from the microprocessor or because of the further resources of the temporary memory files such as flash memory, in order to support IPv6-based network [4]. The IPv4 and IPv6 configured clients are supported by the server system configured with the IPv6 which also act as a dual-stack system and supports both. In case of IPv4 and IPv6 configured clients but IPV4 server system is able to support only the IPv4 server client and it does not support the IPv6 client. The above mentioned characteristics of IPv6 support a lot for the IPv4 network-based communication [5, 6]. By using the "Network Codes" from our routing table, even the systems configured as IPv4 connects to the communication link similar to IPv6.

The QoS for an IP-based networks in multimedia data streaming is calculated using the following parameters such as delay, speed, and time of data streaming. Then supporting of multimedia services is complex for IP-based networks and thus QoS is quite Challenging task.

2 IPv4 Communication

In the present IPv4 addressing protocol used on the Internet, limited public IPv4 addresses are used and has no more IPv4 addresses due to wider usage of address. IPv4 addresses for new customers are allocated based on the current address utilized.

3 IPv6 Communication

IPv6 was developed around 1990 from the Internet Engineering Task Force (IETF) due to limited address available in IPv4 [7]. IPv6 and IPv4 will coexist, since IPv4 to IPv6 transition is to be done. IPv4 and IPv6 vary with address size and has 128 bits [8]. IPv6 and IPv4 are used in Application Layer Gateways with translation for end-to-end support.

4 Simulation Results and Analysis

Out of the four computers, two are configured as host computers and the other two are configured as routers using routing commands on Ubuntu-14.04 platform as shown in Fig. 1. A source host and a destination host are configured. From source

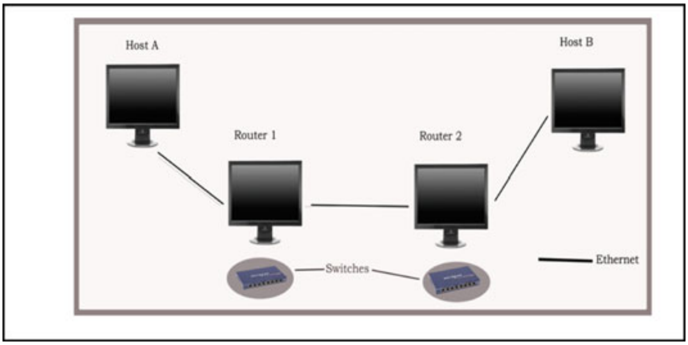

Fig. 1 Implementation diagram

hosts text, audio and bulk video data are sent and then links transfers the data with the router in Mbps. Routing tables are used for the purpose of converting the Ubuntu systems to function as routers. The optical fiber cable of different lengths results in attenuation when cable length varies. The results are verified with various optical components like couplers, attenuators, and multiplexers. Multiplexed data from Source Host 1 is transferred using a multiplexer through a bottleneck link and received at the destination host as a de-multiplexed output.

Wireshark is a tool available for Ubuntu systems, which is an open-source packet analyzer for network troubleshooting, software, and communications protocol development [9]. Wireshark analyses the structure of different networking protocols where the data can be analyzed in a network connection. Wireshark provides a GUI for the network data. Apache web server for secured authentication schemes is maintained by the server-side programming language support [10]. In Apache installation to many websites, Virtual Hosting is used.

First, the whole network is configured to be IPv4 multimedia traffic data like image, audio, and video are transmitted from server to client. The resulting analysis is as shown below with the image, audio, and video is downloaded and streamed to the client systems. So, the following figure gives the complete view of the IPv4 network from Figs. 2, 3, and 4.

Figure 2c gives the Wireshark output for the image file streamed at the client system. The graph is plotted by taking time along *X*-axis and number of packets on *Y*-axis with a unit of packet per tick. The Wireshark result analysis of the audio and video, respectively, for the client systems is shown in Fig. 3.

Second, the network was configured to be IPv6 with the same multimedia traffic data like image, audio, video are transmitted to the client systems from the server. Various multimedia analysis is shown below with the downloading stream is carried out at the client systems in the established IPv6 multimedia network. So the figures below from Figs. 5, 6, and 7 are analyzed with the time and bytes of the different data.

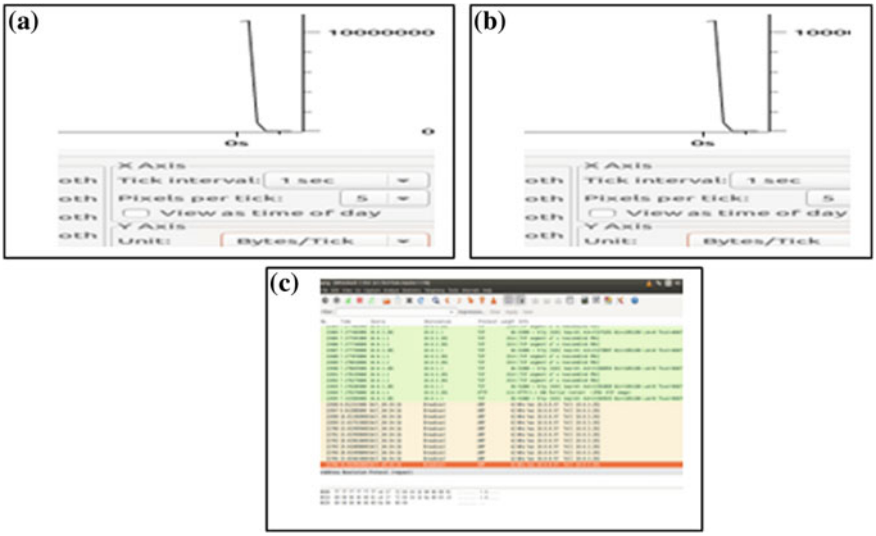

Fig. 2 IPv4 network method (image file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

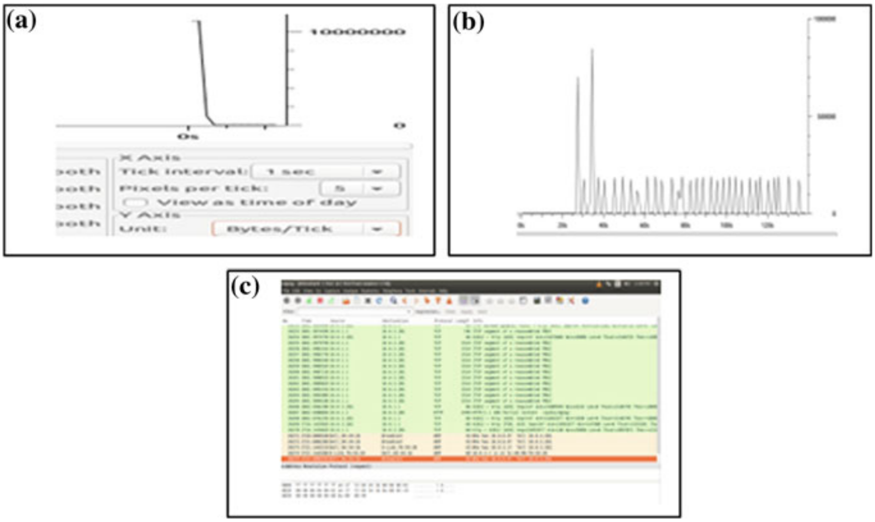

Fig. 3 IPv4 network method (audio file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

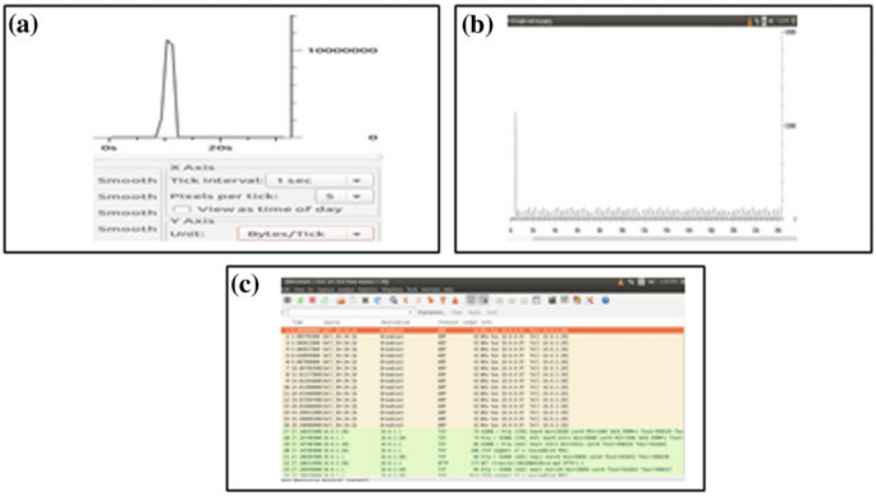

Fig. 4 IPv4 network method (video file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

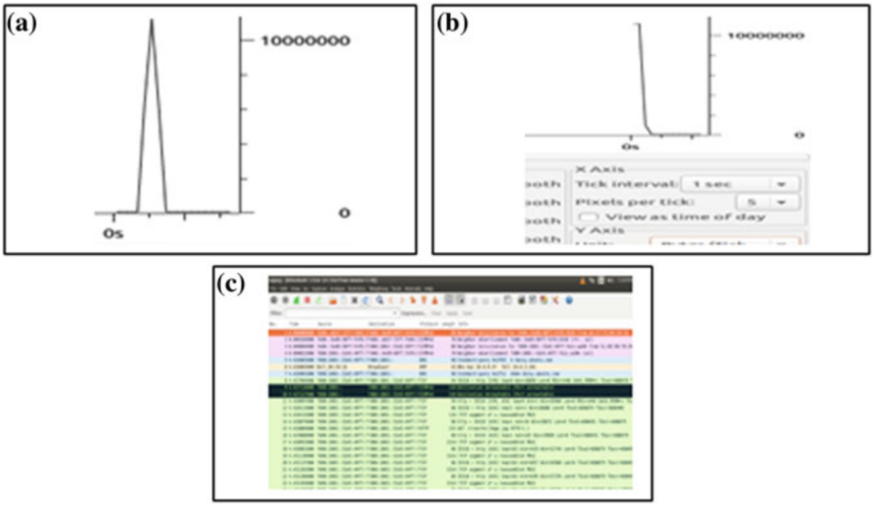

Fig. 5 IPv6 network method (image file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

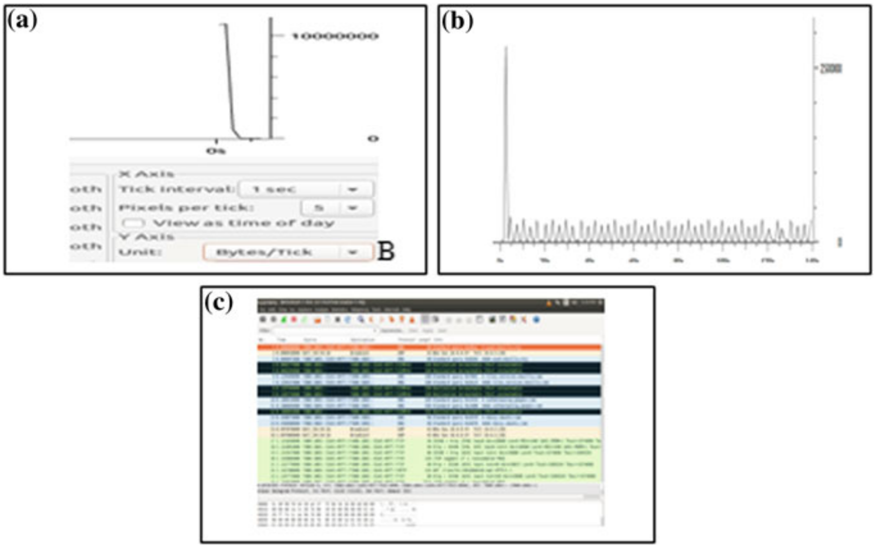

Fig. 6 IPv6 network method (audio file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

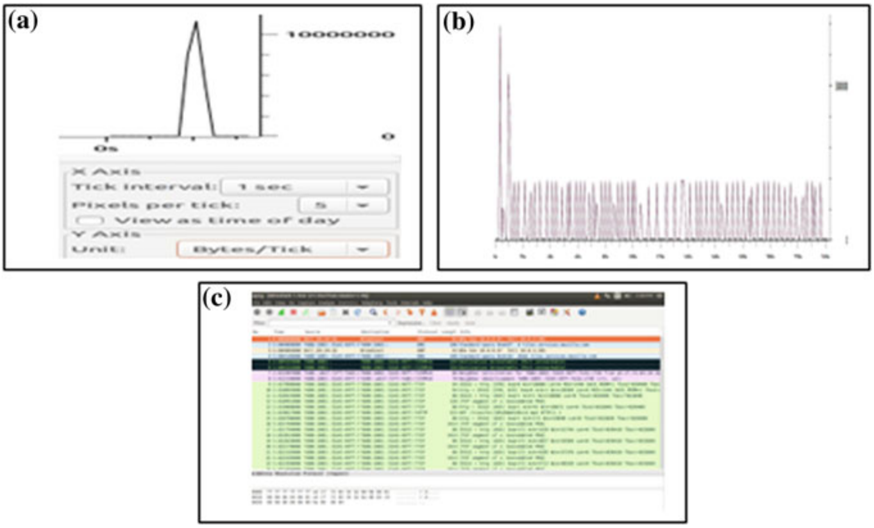

Fig. 7 IPv6 network method (video file). **a** Downloading operation. **b** Streaming operation. **c** Wireshark output

5 Conclusion

The systems are configured as routers for the analysis of IPv4–IPv6 transitions in the network to transfer multimedia data. Using the Apache server, for the various multimedia data analysis such as for image, audio, and video indicates about the downloading and streaming time in reference to the number of bytes. The multimedia data streaming is calculated as variation in the number of bytes during the different transfer of data and the downloading time. The values of the time at which it is streamed varies with image, audio, and video are 2, 3, and 12 s, respectively, for IPv4 and 2, 3, and 11 s for IPv6 respectively. The streaming of the same image, audio, and video of 20 Mb each has the value of 9, 140, and 240 s for IPv4 network and 7, 120, and 220 s for IPv6 network using Wireshark network analyzer.

Due to the nonavailability of IPv4 addresses, the system address transition to IPv6 helps not to replace the older systems. Hence, further work has been estimated to implement a tunneled IPv4–IPv6 network and a mixed network and also to obtain the results using optical cables. So the analysis of these results will help in getting a clear picture of various multimedia data over the IPv4–IPv6 communication network.

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