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The Effect of Double Buffer Management in Packet Analysis of Adhoc Networks

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Abstract

Managing the buffer effectively leads to increase in data transmission which in turn paves the way for network efficiency. Even fraction of a second plays vital role in network performance involving read and writes operations. The network traffic analysis could be used for various data and protocol performance including the buffer capacity. The packet flow with respect to user request applications are noted and analyzed. Initially, the packet movement in the network was monitored with only hypertext transfers using HTTP. The same movement was analyzed with respect to other file transfer applications. The number of file downloads between the HTTP server and clients are also varied to follow the behavior of data. The buffer usage was found to be exhaustive leaving no free space for the newly incoming byte. We propose double buffering management system using incremental movements capable of dual operations simultaneously. This was analyzed and the comparative results shows that the time increase in filling the buffer capacity leads to the conclusion that more operations are done at a faster rate leaving more packets to accommodate.

Keywords: buffer, traffic analysis, packet, HTTP, server, clients, byte, double buffer.

INTRODUCTION

A network can be tracked based on the packet flow throughout the network. The available and achievable throughput differs due to various performances related issues. The network performance characteristics like delay, throughput were measured and studied. The Local Area Network in networking lab of Bahir Dar University was chosen for this case study and data readings were noted at the server by varying the time. The delay D of a network is minimum either if the volume of data has to be decreased or increase the throughput (Prathap et al; 2005). Trans-port Control Protocol (TCP) is a reliable, end-to-end, transport, protocol that is widely used to support applications like telnet, ftp, and http (Stevens W. R, 1994). Though TCP/IP had gained much importance, the standard TCP does not perform well in high bandwidth delay environments (Kelly T, 2003). Kelly's Scalable TCP on real networks with a set of systematic tests using different network were already tested (Li Yee-Ting et al; 2004). The throughput of such wireless networks scales with the number of nodes, n, in the network (M. Grossglauser and D. Tse; 2001). This paper also considers the node as specified. A throughput $\lambda > 0$ is said to be feasible/achievable if every node can send at a rate of λ bits per second to its chosen destination (Abbas El Gamal et al; 2004). When the network is idle, the number of users is kept as zero and when the network is functioning with maximum numbers of users, it is taken as one.

Adhoc Networks

An ad-hoc network is a local area network or small network, especially one with temporary plug-in connections, in which some of the network devices are part of the network only for the duration of a communications session. It has been applied to future

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office or home networks in which new devices can be quickly added. Each user has a unique network address that is immediately recognized as part of the network. The technology would also include remote users and hybrid wireless or wire connections. In Mobile Ad hoc Networks (MANETs), each node serves as a host as well as a router and uses consequently its own energy to route packets intended for other nodes. In fact, it is crucial to design techniques to reduce the energy consumption by the wireless hosts and to guarantee a certain level of quality of service (QoS). Also, in the IEEE 802.11 standard which is widely used for Wireless LANs today, a single queue is used in best-effort manner and it has no capability to support quality of service, such as bandwidth guarantee, delay and loss rate (Brahma, M et al; 2006). This paper concentrates on the buffer management for HTTP applications. Initially the behavior of buffer usage with respect to http noted and its performance are tracked by varying the user request.

MATERIAL AND METHODS

The configurations of the network server supporting 930 clients inclusive of two campuses are specified in table 1.

Server Description	Configuration
Processor	Sunblade 2000, V880
Operating system 2	Sun solaris 10
OS bit size	32 bit Operating system
Proxy details	Linux Squid 2.7
Switch capacity Access	10/100/1000 (44 numbers)

Table 1. Configuration of server

The Client configurations used are shown in table 2.

Description	Configuration
Processor	Intel (R)Pentium(R) Dual CPU T 2330 @ 1.60 GHz
Operating system	Windows Vista Home Basic
OS bit size	32 bit Operating system
Temporary memory	1 GB of RAM
NIC	PCI – E Fast Ethernet Controller

Table 2. Configuration of client

Network Interface Card Properties were set as per the below mentioned table 3

Properties	Settings
Flow control	Tx & Rx Enabled
Max.IRQ/sec	5000
Receiving bytes	256
Transmission bytes	256

Table 3. Changed properties of NIC

Packet Analysis

Packet analysis could be done by capturing and analyzing traffic passing by the machine where the tool is installed with results displayed. It also decodes all major and frequently used protocols including TCP/IP, UDP, HTTP, etc. It comprises user friendly interfaces to display technical information. It is possible to filter the network traffic to focus on the specified needed information. It is flexible and allows powerful filters during or after capture to isolate traffic by specific node, protocol, and packet content.

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Initial Buffer Behavior

Network performance and security prevent network problems, conduct effective troubleshooting and take actions quickly to solve possible problems. The network bandwidth and other resources are used for accounting, auditing or for network planning purposes and analysis of the packets passing through the network. Network Packet Analyzer CAPSA is an advanced network traffic monitoring, analysis and reporting tool, based on Windows operating systems. It captures and analyzes all traffic transport over both Ethernet and WLAN networks and decodes all major TCP/IP and application protocols. Its advanced application analysis modules allows to view and log key communication applications such as emails, http traffic, instant messages and DNS queries. The comprehensive reports and graphic views enable to understand network performance and bandwidth usage quickly, to check network health (Colasoft capsa, 2008). Initial HTTP readings were noted by varying the requests as shown in fig 4. Hypertext transfer protocol was designed to be quick, simple, and non instructive. The connection between a server and a client program is temporary and must be reestablished for every data transfer. A URL is always a single, unbroken line of text with no spaces. Web browser generally displays the URL of the Web page currently being viewed near the top of the windows.

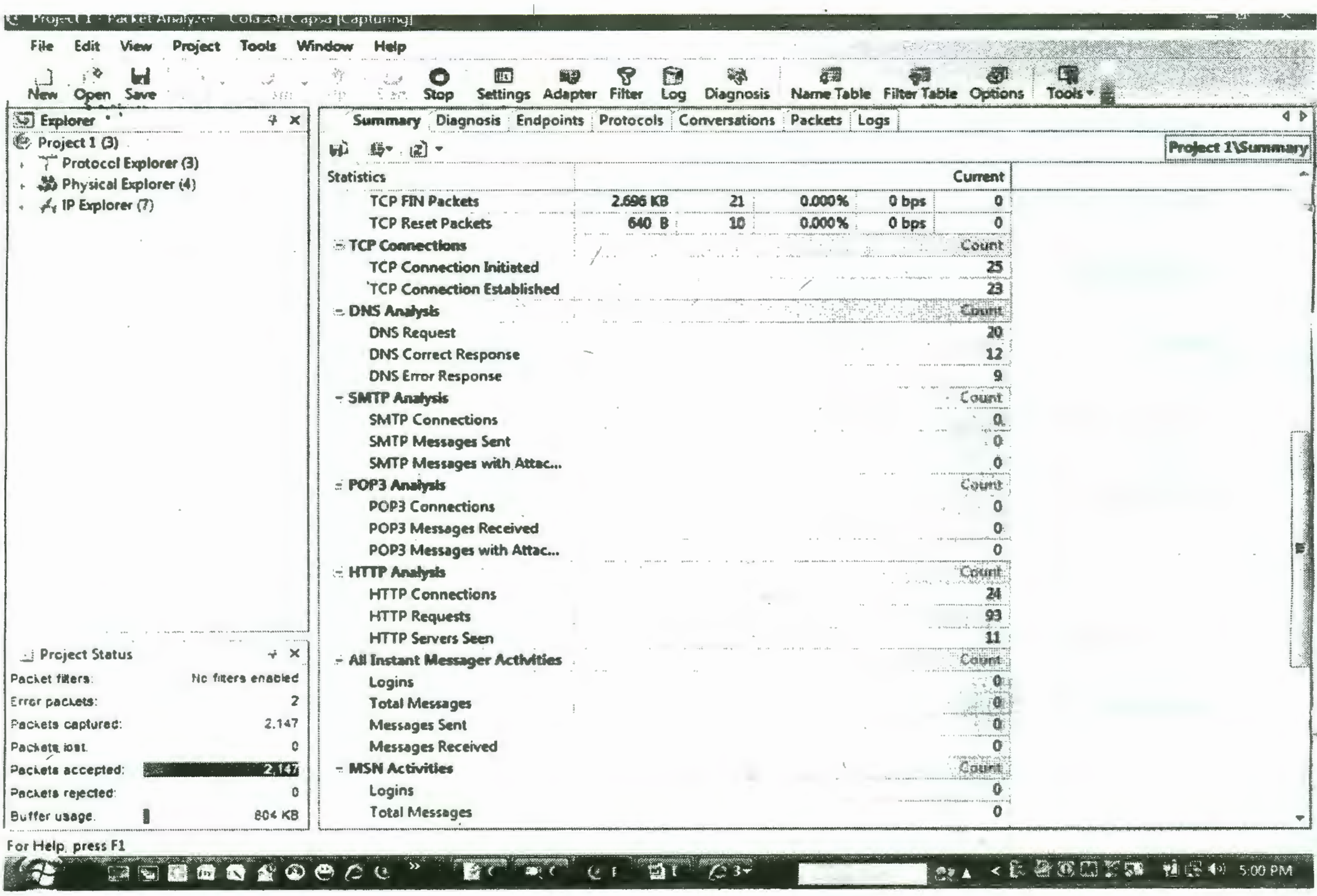

Fig 1 Initial analysis of HTTP at the start

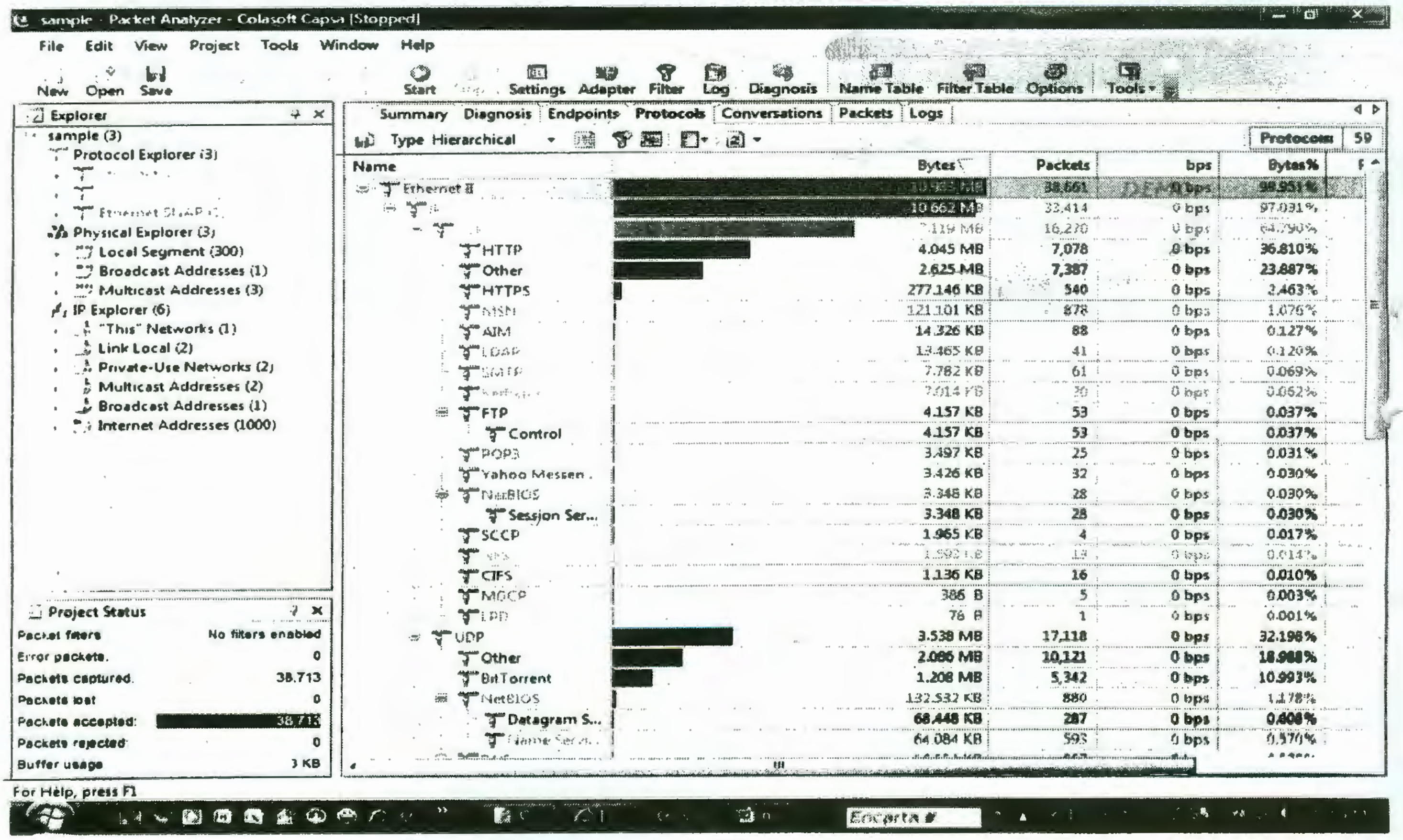

Fig 2 Packets utilized by respective protocols

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The packets used were noted and the readings for corresponding protocols are shown in fig 2 and the initial HTTP requests were shown in fig 3.

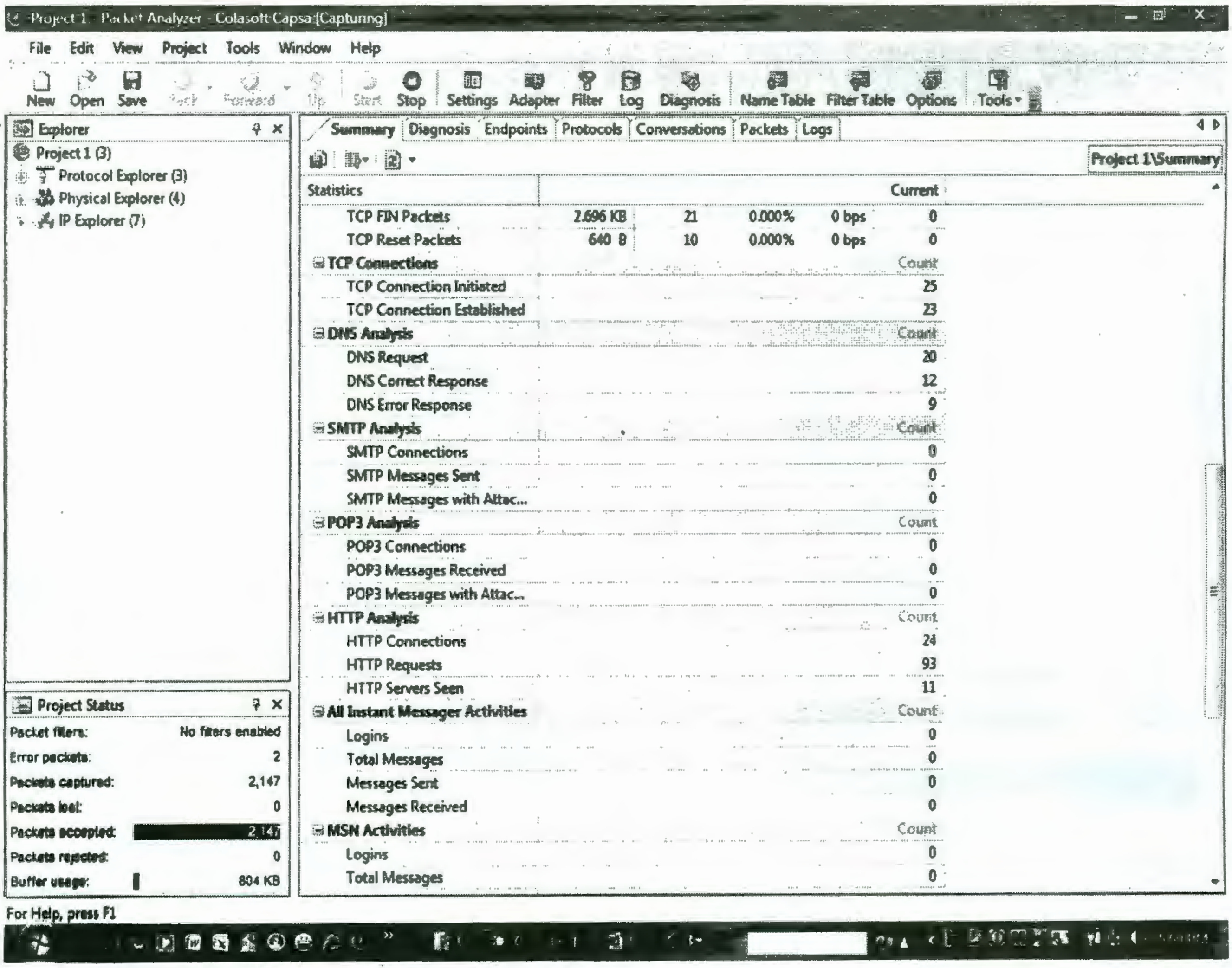

Fig 3 Buffer usage after the HTTP requests made without download

The two sites of same URL were requested and the same file of same size was downloaded. Now in order to invoke downloads of same size file single HTTP were noted and two HTTP requests were done for the same URL. The readings were noted for the same file of same size but as different requests as shown in fig 4. From the figure we can view that the buffer usage is almost nearing its capacity indicated in red. This is due to the fact that when more hypertext transfers are made the allocated buffer usage increases.

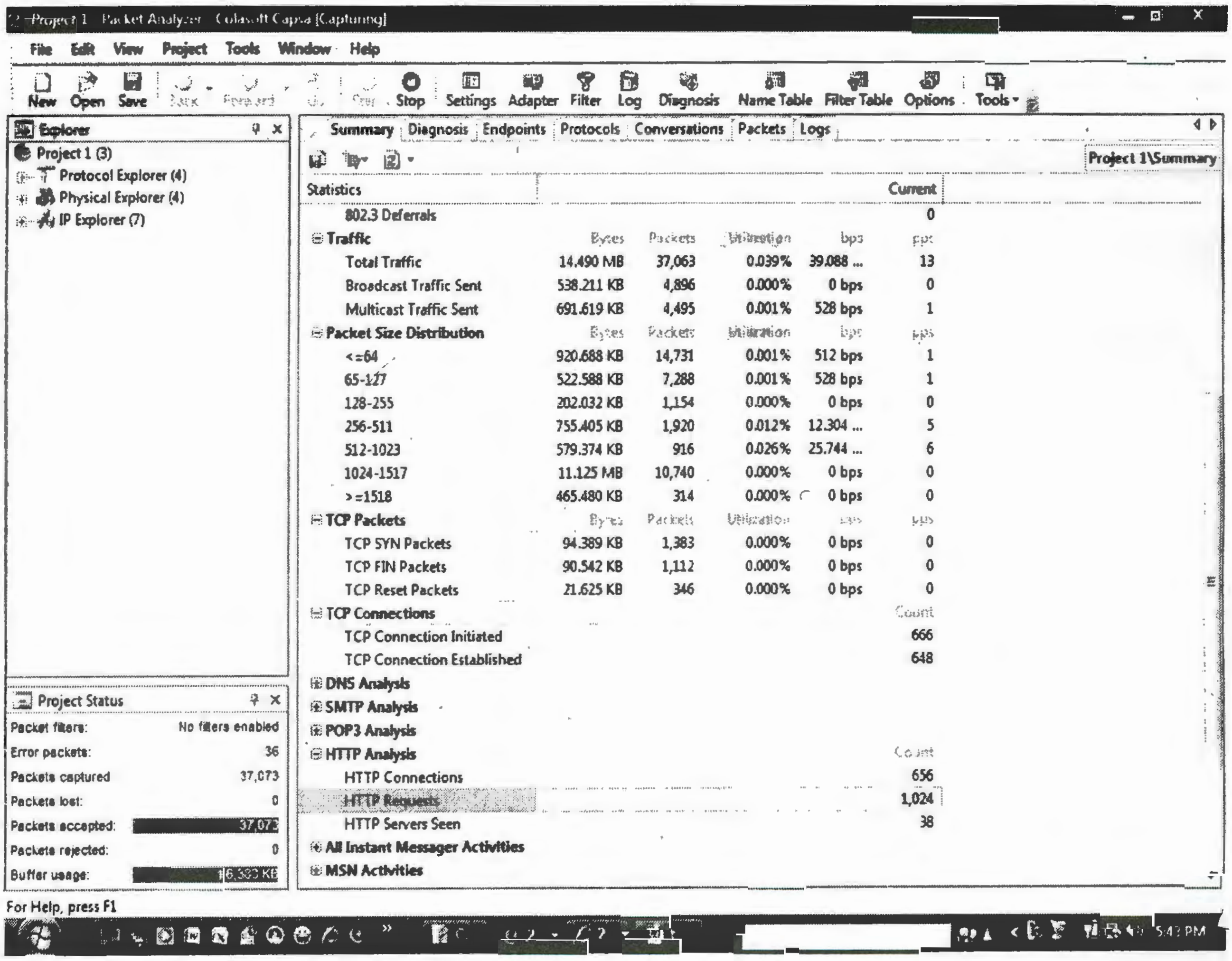

Fig 4 Buffer usage of HTTP with two downloads

RESULTS AND DISCUSSION

Results of double buffering

A buffer is basically an area of memory a hardware device or software program uses when it needs a constant, uninterrupted flow of information. Files, data, music and video are all transported across the Internet in small, discreet data packets. These packets arrive independently and have to be recombined and reordered to recreate the original data stream without interruption. If a data packet is missing, video playback will "jump" to the next packet in line. To avoid this, a few seconds worth of the stream is stored in the buffer, then as playback begins, the buffer stays just ahead of the display, "paving the way" for smooth sailing. We propose the algorithm used for double buffer management.

```
name previous buffer as b1, next incoming buffer as b2
Repeat
  load b1 and b2 with octet of bit
  set pointer to b1.
   Repeat
      send pointed bit of b1
      move pointer to next bit
   until last bit of b1.
 If last bit sent is equal to 8 set pointer to bit 9 of b2
   Repeat
      send pointed bit of b2
      move pointer to next bit
   until last bit of b2.
 If last bit sent is equal to 2 times of 8 set pointer to bit 1 of b1
Until the buffer queue is empty.
```

Fig 5 Algorithm used for double buffer managment

In order to manage the buffer efficiently and reduce the time for reading the bits, this buffering concept could be implemented. Figure 6 shows the situation after the buffers are created. These buffers are named as b1 and b2. After the second block has been read, the pointer P is set to the first record in buffer b1. The pointed bit positions are sent and the pointer is incremented till the end of the buffer. After sending the last bit then the pointer is moved to the first bit of buffer b2. This process is repeated until the last bit is sent. During sending process of the buffer b2 the buffer b1 is loaded. Hence, while the buffer b2 is sending, b1 is receiving bits both at the same time. Also after b2 is loaded b1

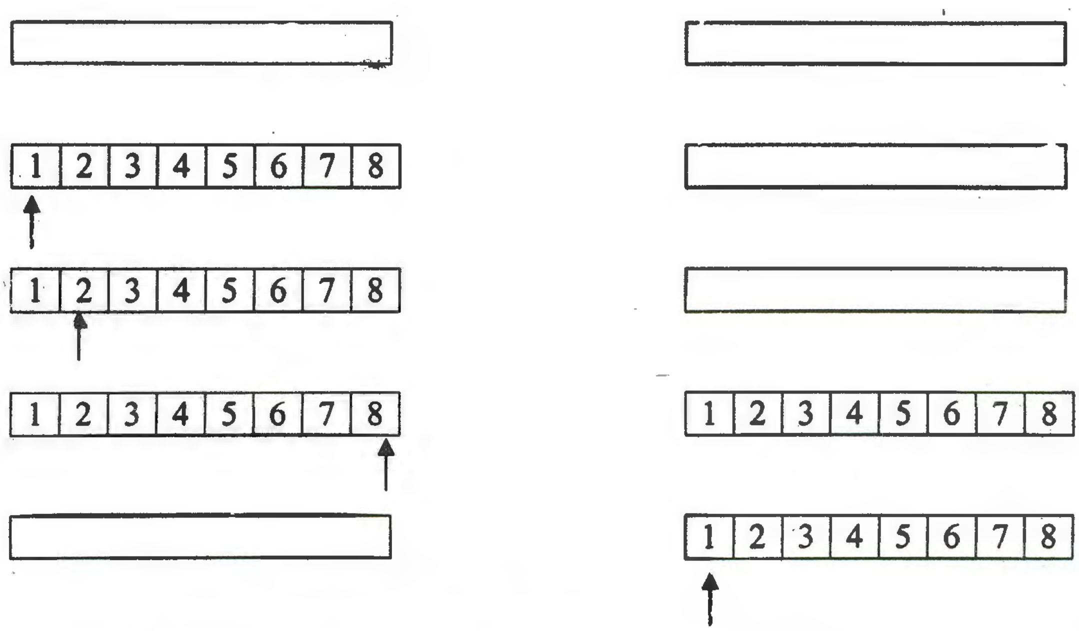

Figure 6. Buffer b1 and b2 with pointer

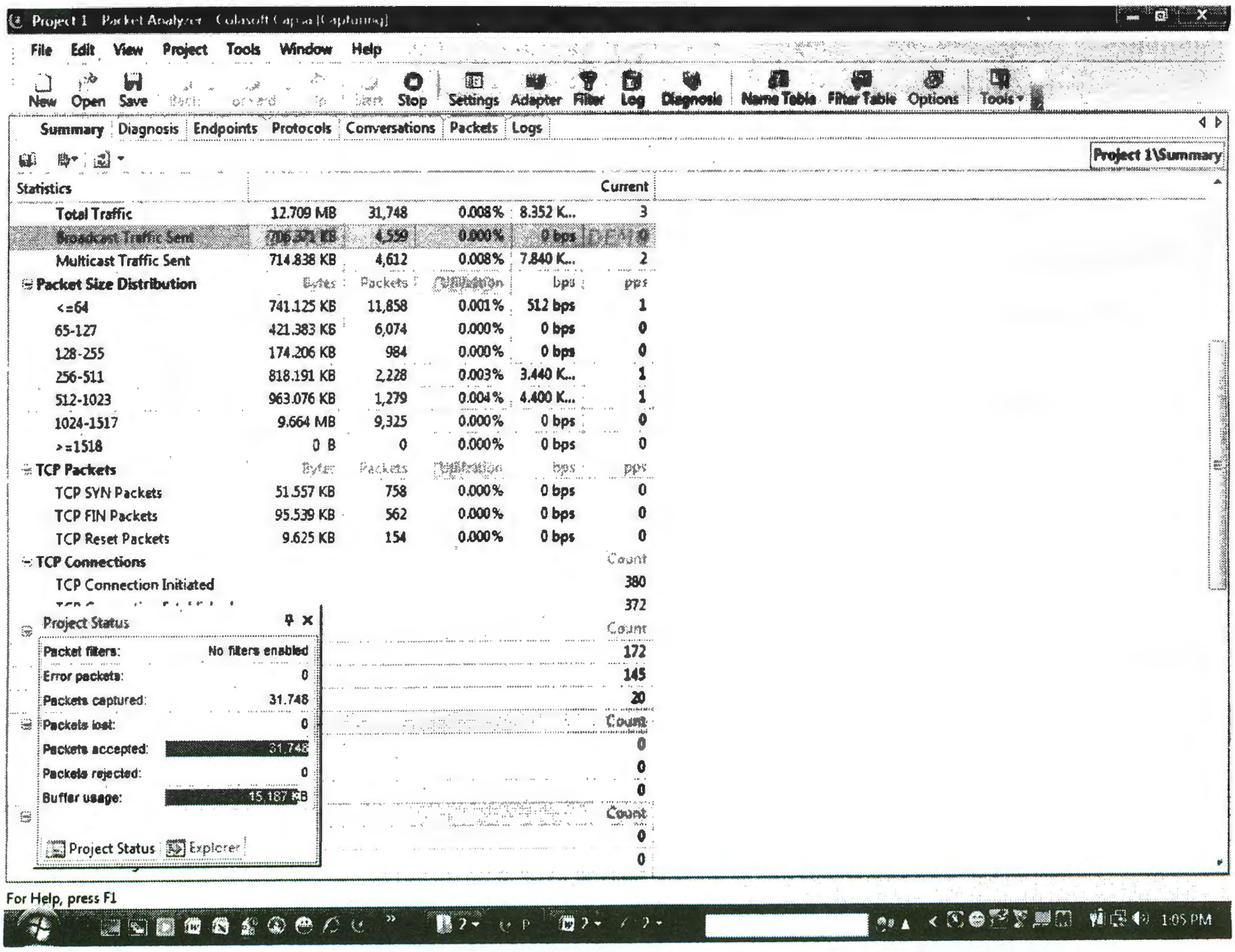

Figure 7. Result of double buffer and performance

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becomes empty and they interchange their functions. When the queue is empty, all the buffers and pointers are deleted. This helps in efficient time and memory management.

CONCLUSION

The throughput and its relation to packet performance were studied and analyzed. The contents of the packet should be stored in the buffer. However, the buffer size differs depending on the sending and receiving entity and their allocated sources. Real-time packet capture and analysis had been done using packet analysis technique. The tool had been tested under various HTTP requests and the increased requests are shown in table 4.

Name	Bytes	Packets
Ethernet II	10983 MB	38661
IP	10662 MB	33414
TCP	7119 MB	16270
HTTP	4045 MB	7078
Others	2625 MB	7387
HTTPs	277146 KB	540
FTP	4157 KB	53

Table 4 showing the packets utilized by respective protocols derived from Fig 2

Moreover, the analysis was done with variable number of downloads. The results obtained showed the buffer utilization is done whereas the buffer usage is in critical state. This implies that if the buffer is nearing to its full capacity then it loses its efficiency by not allowing the newly arriving packet contents. However this is the challenge whereas the same buffer size was used for both reading and writing operations. We propose a double buffering management system whereas both the reading and writing are done simultaneously. The buffer usage was monitored and the usage are shown in fig 7 which shows that time increases in nearing its capacity compared to that of the previous results. The comparative usage of buffer is shown in fig 8.

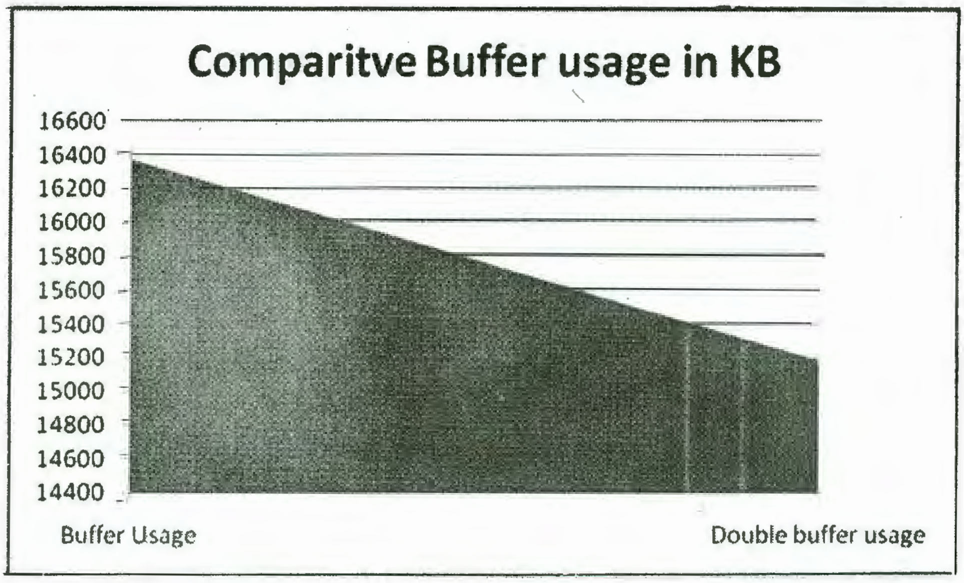

Figure 8. Comparative analysis of both buffer usage.

This clearly shows that the scheme is advantage since the time increase in filling the buffer capacity leads to the conclusion that more operations are done at a faster rate leaving more packets to accommodate.

Limitations

Since the system has two buffers b1 and b2, it can display buffer b2 while collecting new data into buffer b1. When it is done rendering into buffer b1, the system needs to wait until buffer b2 is in the monitor's vertical blank period before swapping buffers. This waiting period could be several milliseconds during which neither buffer can be touched. At 60 frames per second, there are only 16.67 milliseconds in which to draw the frame, so this delay could waste valuable frame time. When the monitor is in vertical blank it can either swap buffers b1 and b2.

Future Work

If the system has three buffers b1, b2 and b3, it does not have to wait to swap buffers. It can display buffer b2 while rendering into buffer b1. When done rendering into buffer b1, it can start rendering into buffer b3 immediately. When the monitor is in vertical blank, it can display buffer b1 and make buffer b2 available for reuse. In the two buffers, the cleaning was completely done before starting the drawing on the unused buffer, which would waste time and hence three buffers could be effective.

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REFERENCES

[1] Abbas El Gamal, James Mammen, Balaji Prabhakar, Devavrat Shah "Throughput-Delay Trade-off in Wireless Networks" IEEE INFOCOM, 2004.

[2] Brahma, M.; Kim, K.W.; Hachimi, M.E.; Abouaissa, A.; Lorenz, P. "A Buffer and Energy Based Scheduling in Mobile Ad hoc Networks over Link Layer" Telecommunications, 2006. AICT-ICIW apos; 06. International 19-25 Feb. 2006 Page(s): 69 - 69

[3] M. Grossglauser and D. Tse, "Mobility Increases the Capacity of Ad-hoc Wireless Networks", IEEE INFOCOM, Anchorage, Alaska, pp.1360-1369, 2001.

[4] M. Prathap Sri.V. Chakravarthi and Aemro Bizuneh (2005) "Performance Analysis of Throughput at BDU LAN" at ICECE 2005, Ethiopia.

[5] Network packet analyzer: professional network analyzer colasoft capsa (version 6.9);http://www.colasoft.com/download/

[6] Kelly T. (2003). "Scalable TCP: Improving Performance in High Speed Wide Area Networks. First International Workshop on Protocols for Fast Long-Distance Networks" Geneva, Switzerland.

[7] Stevens W. R. (1994). "TCP/IP Illustrated" *Volume* 1, Addison Wesley.

[8] Li Yee-Ting, Stephen Dallison, Richard Hughes-Jones, Peter Clarke (2004) "A Systematic Analysis of High Throughput TCP in Real Network Environments". Second International Workshop on Protocols for Fast Long-Distance Networks, Argonne National Laboratory, Argonne, Illinois USA.