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Performance Analysis Of Http And Ftp Based On Opnet

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Abstract – In this paper the performance of HTTP protocol and FTP Protocol is analyzed by using OPNET-based simulation. Firstly, related scenarios are modeled with OPNET Simulator. Furthermore, two case studies are conducted by choosing average queuing delay and TCP delay as performance indices respectively. In the case of HTTP protocol's performance, the changing trend with the increase of the number of clients is reported. Additionally, in the case of comparison analysis, TCP delays of HTTP and FTP protocols are studied with the connection of 5 clients. On the basis of this work, performances of related network system with multiple traffics can be conducted.

Keywords—HTTP; FTP; OPNET

I. INTRODUCTION

The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. This is the foundation for data communication for the World Wide Web (i.e. internet) since 1990. HTTP is a generic and stateless protocol which can be used for other purposes as well using extensions of its request methods, error codes, and headers. This tutorial is based on RFC-2616 specification, which defines the protocol referred to as HTTP/1.1. HTTP/1.1 is a revision of the original HTTP (HTTP/1.0). A major difference between HTTP/1.0 and HTTP/1.1 is that HTTP/1.0 uses a new connection for each request/response exchange, whereas HTTP/1.1 connection may be used for one or more request/response exchanges.

II. BASIC FEATURE

There are three basic features that make HTTP a simple but powerful protocol:

A. HTTP is connectionless

The HTTP client, i.e., a browser initiates an HTTP request and after a request is made, the client disconnects from the server and waits for a response. The server processes the request and reestablishes the connection with the client to send a response back.

B. HTTP is media independent

It means, any type of data can be sent by HTTP as long as both the client and the server know how to handle the data content. It is required for the client as well as the server to specify the content type using appropriate MIME-type.

C. HTTP is stateless

As mentioned above, HTTP is connectionless and it is a direct result of HTTP being a stateless protocol. The server and client are aware of each other only during a current request. Afterwards, both of them forget about each other. Due to this nature of the protocol, neither the client nor the browser can retain information between different requests across the web pages.

HTTP/1.0 uses a new connection for each request/response exchange, whereas HTTP/1.1

connection may be used for one or more request/response exchanges.

D. Client

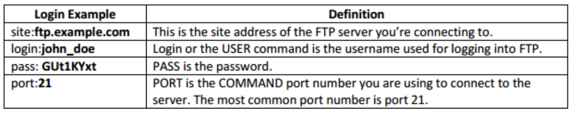
The HTTP client sends a request to the server in the form of a request method, URI, and protocol version, followed by a MIME-like message containing request modifiers, client information, and possible body content over a TCP/IP connection.

E. Server

The HTTP server responds with a status line, including the message's protocol version and a success or error code, followed by a MIME-like message containing server information, entity meta-information, and possible entity-body content.

F: FUNCTIONS AND TERMS OF FTP

To use FTP, you will need FTP client software and an FTP server. You also need to know the server address, the username, and a password and port number. The basic information you need in order to log in successfully follows:



Login Example	Definition
site:**ftp.example.com**	This is the site address of the FTP server you're connecting to.
login:**john_doe**	Login or the USER command is the username used for logging into FTP.
pass: **GUt1KYxt**	PASS is the password.
port:**21**	PORT is the COMMAND port number you are using to connect to the server. The most common port number is port 21.

Table 1 Function and terms of FTP

G. CONNECTION MODES – ASCII AND BINARY

FTP transfers files between systems by using one of these two modes – ASCII and binary. The mode is determined at the initial stage of all FTP transactions by the server. The FTP client will automatically switch to the mode. ASCII mode is used exclusively to transfer text and HTML. Binary mode transfers zip files, images or executable files in binary form. Binary files cannot be sent via ASCII mode and vice versa as corruptions will occur. Syncback always transfers files in binary mode. This ensures that the files contents are not changed by the FTP server and that the size of the file is always the same.

H. TRANSFER MODES – PASSIVE AND ACTIVE

In passive mode connections, the FTP client initiates the connections to the command port and data port to the host server. This is the preferred mode in most FTP clients as well as the default FTP setting in SyncBackPro as the client's firewall will allow outgoing connections to the server.

The FTP client first establishes the connection by opening a port (random port, X>1023) locally and connecting to Port 21 of the server. The client then opens another port X+1 and sends out the PASV command to notify the server it is in passive mode. The server will respond by opening a port (predefined random port, Y>1023) and acknowledges the client by sending out P to it. Then the client initiates the connection from port X+1 to the server's port Y for data transferring.

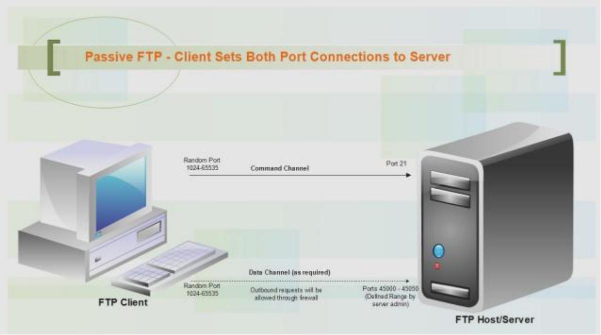

Passive FTP - Client Sets Both Port Connections to Server
Random Port 1024-65535
Command Channel
Port 21
Data Channel (as required)
Random Port 1024-65535
Outbound requests will be allowed through firewall
Ports 45000 - 45050 (Defined Range by server admin)
FTP Client
FTP Host/Server

Fig1 FTP Architecture

In active mode, the FTP client (random port, X>1023) initiates the connection by connecting to the server's command port (Port 21). The client then opens a listening data port and sends the command PORT to the server. The server, using Port 20, will initiate the connection to the specified data port on the FTP client.

III. APPLICATION PERFORMANCE BASED ON TCP AND UDP

TCP (Transport Control Protocol) and UDP (User Datagram Protocol) are two most important transport protocols in TCP/IP network architecture, which guarantee the transmission of network layer data TCP is a reliable connection-oriented transport layer protocol. This means that prior to the transmission of data, the two sides should establish a connection to send and receive the data before the completion of the transmission and then disconnect the connection. UDP is an connectionless transport layer protocol, regardless of the state of the other side, you can send data directly. In different network environments, different transport protocols have different effects on application performance, and we can choose different transport protocols according to different requirements.

OPNET(Network Engineering Tools Optimal) is a kind of network simulation software, which provides three levels of model: process model, node model and network model. Users can use Modeler OPNET to realize the network simulation, such as network performance analysis, network planning and communication network analysis based on the simulation model. OPNET becomes the most popular network simulation software with its facilitate of operation of the graphical interface and a large number of model library and provides a great convenience for us to study the network

a. TCP

TCP is a connection-oriented protocol provides reliable data transmission. TCP packet format is shown in Fig. The term connection-oriented means the two applications using TCP must establish a TCP connection with each other before they can exchange data While it must follow the principle of Three-way Handshaking to establish a connection and terminate a connection by Four-way Handshaking.

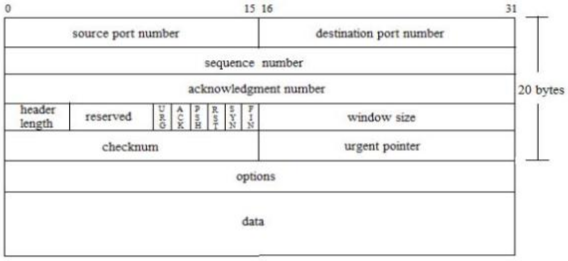


Fig 2 CP Datagram Format

b. UDP

UCP packet format is shown in Fig.2 and we can see that compared with TCP, UDP is a simple communication protocol and it provides connectionless unreliable transport services. Between the sending and receiving ends, UDP doesn’t provide a point-to-point connection and it can transmit data immediately. UDP is a packet-oriented, and the length of the datagram will remain unchanged. UDP does not provide a guaranteed transmission, flow control mechanism, congestion control mechanism and error control mechanism and other functions but forwards the data of IP layer without ensuring that they reach the destination successfully .UDP is a good choice for applications that can tolerate data errors.

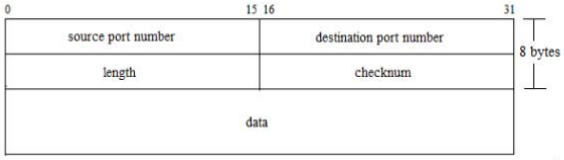


Fig 3 UDP Datagram Format

IV. PERFORMANCE ANALYSIS OF FTP AND HTTP

HTTP Protocol: OPNET tool can simulate HTTP application as the browsing activities of Internet, i.e. one of the client nodes periodically contact Web server to retrieve web pages. In OPNET, each page is modeled as a text (a basic HTML file) and a few inline objects (such as images and data files referenced objects) of a combination. HTTP uses

TCP as the transport protocol, the running process is as follows: the client sends a HTTP request to a Web page; the server receives the request, and the corresponding page will be replied to the client. In this analysis process, if the Web page contains several inline objects, the client node will request for the follow-up objects from the Server. In OPNET, HTTP Configuration Table (HTTP configuration table) mainly includes four key attributes of describing HTTP application: HTTP Specification defines the configuration of Web browser; Page Inter-arrival Time (seconds) specifies the time between page requests in a row; Page Properties describes an OPNET said of a typical Web page; Server Selection decides the retrieving path by parsing an embedded Web link index page.

The number of client nodes and the network bandwidth is different in each scene. We set the packet loss rate of the Internet cloud in each scenario be 1%. Also all through the traffic on the introduction of an additional delay is set to be 200ms. Set the web browser of every scene running on top of HTTP1.1, and configure each client node requests a new page every 10s. Set the size of each web page to 100 bytes, which is consist of a single text object and 7 large images. The Web application configuration is shown as table. as follows, and the network topology details table of these nine scenes is shown as table.

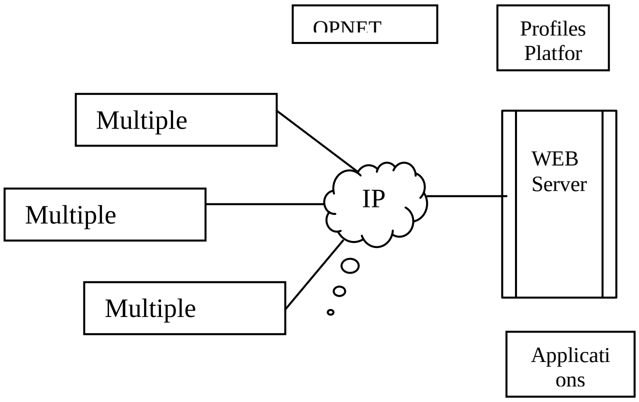


Fig 4 Network Topology

FTP Protocol: OPNET standard application for FTP models the basic operations. OPNET simplify the multiple FTP applications and simulate the two main data transmission of FTP operation: get and put. FTP put operations are used to upload a file to FTP server and FTP get operation are used to download a file from the FTP server to the client nodes. In OPNET, the FTP application models the process of transferring files at a time. By default, FTP is running on top of the TCP. When using the default transport protocol, it opens a separate TCP connection for each file. Unlike in real networks, during the procedure of one file's transferring operations, the FTP model uses the same TCP connection to send control messages and data modeling. OPNET FTP is described in three key properties: Command Mix (Get/Total) specifies the ratio between the get operands and the total number of FTP operations; Inter-Request Time (seconds) to specify the amount of time between consecutive FTP operation; File Size (bytes) specifies that you want to transfer the file size in bytes.

The simulation model contains two scenes in this group, in the first scene the Web application is the HTTP protocol, the second one is FTP protocol, the network topology of the two scenes are observed as Fig, These two scenes of network topology group scene are much the same with group_1, the only difference is that the link object is set to ppp_DS1. The Web application configuration of HTTP scene is shown as table. and the Web application configuration of FTP scene is shown as table.

OPNET provides various kinds of simulation and statistics, as well as the ability to configure the collection mode, but a simulation in OPNET does not automatically select which statistics to collect. In order to validate different types of network bandwidth and request the client node number effects on the performance of HTTP protocol, we need to manually configure the simulation in each scene to collect the following statistic: all Client HTTP node statistics, all point-to-point link statistics. And then repeatedly perform the simulation in the results browser view and collect the results. We collect the queuing delay in the link from client_1 to the Internet in every scene, and then export the result to an excel file. From these useful data, we calculate the average Queuing delay in every scene.

With the increasing of link bandwidth, the end-to-end queuing delay of the client node to the server decreases. When the number of the clients is increased from ten to 20, the end-to-end queuing delay increased by a big margin, as the number of the clients is increased from 20 to 30, the end-to-end queuing delay increased relatively less. Thus we get the following results: client node number of HTTP requests made more big effect on end-to-end queuing delay in the link, HTTP protocol properties relatively made smaller effect. The larger the link bandwidth are, the smaller the end-to-end queuing delay will be, and the performance of HTTP protocol will be better accordingly.

V. EXPERIMENT RESULTS ANALYSIS

A. HTTP Protocol Performance Analysis

OPNET provides various kinds of simulation and statistics, as well as the ability to configure the collection mode, but a simulation in OPNET does not automatically select which statistics to collect. In order to validate different types of network bandwidth and request the client node number effects on the performance of HTTP protocol, we need to manually configure the simulation in each scene to collect the following statistic: all Client HTTP node statistics, all point-to-point link statistics. And then repeatedly perform the simulation in the results browser view and collect the results. We collect the queuing delay in the link from client_1 to the Internet in every scene, and then export the result to an excel file. From these useful data, we calculate the average Queuing delay in every scene.

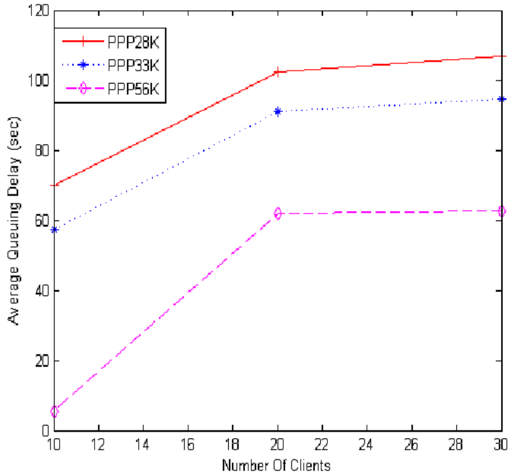


Fig 5 HTTP Performance comparison chart

B. Performance Results analysis of HTTP and FTP

In order to verify the performance of HTTP and FTP protocol in the same network environment, we configure the set of simulation to collect statistics for two scenarios: all nodes from the class node of the statistics for TCP. After you run the simulation, collecting and comparing results.

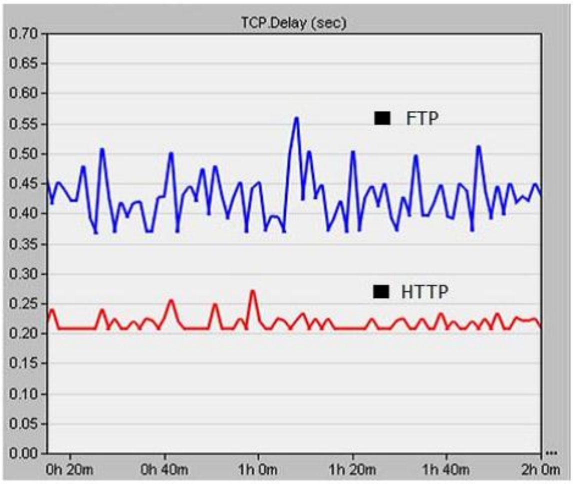


Fig 6 TCP Delay of HTTP and FTP

VI. CONCLUSION

This is based on OPNET, and completes a simulation of HTTP protocol and FTP protocol, By comparing the queuing delay in different scenarios based on HTTP protocol, we find what do the link bandwidth and client node number effect on the performance of HTTP; through comparing the TCP Delay in HTTP protocol and FTP protocol scene, we learned the performance of FTP protocol and HTTP protocol on Web application under the same network environment. All the analysis are based on simulation. On the basis of this study, performances of related network system with multiple traffics can be conducted.

REFERENCES

1. J. Evangelista. Netto, E. Hernane. Paulicena, R. Amorim. Silva, A. Anzaloni. "Analysis of Energy Consumption Using HTTP and FTP Protocols Over IEEE 802.11," IEEE Journals & Magazines, 2014, 12(4): 668-674
2. L.D.Circiumarescu,G.Predusca, N.Angelescu, D.Puchianu. "Comparative Analysis of Protocol RIP, OSPF, RIGRP and IGRP for Service Video Conferencing, E-mail, FTP, HTTP," IEEE Conference Publications, 2015:584-589.
3. Andrew.S.Tanenbaum, David.J.Wetherall. "COMPUTER NETWORKS," Tsing University Press, 2013.
4. Adarshpal.S.Sethi, Vasil.Y.Hnatyshin. "The Practical OPNET User Guide for Computer Network Simulation," CHINA MACHINE PRESS, 2014, 1.
5. R. Fielding, UC Irvine. "RFC 2616: Hypertext Transfer Protocol HTTP/1.1," IETF, June 1999.
6. J. Postel, J. Reynolds. "RFC 959: FILE TRANSFER PROTOCOL (FTP), ISI, October 1985.
7. M. Allman, V. Paxson. "RFC 5681: TCP Congestion Control," ICSI, September 2009.
8. Manju Sharma, Manoj Kumar, Ajay.K. Sharma. "Http And Ftp Statistics For Wireless And Wire-Line Network With And Without Load Balance Based On Opnet," Institute for Scientific Computing and Information, international journal of information and systems sciences Volume 5, Number 1, Pages 112-125©2009
9. Manju Sharma, Manoj Kumar. "Comparative investigation on Media Access Delay and Client Object response Time for a Switched and Routed Wireless LAN based on OPNET," (2008)
10. IT Guru Academic Edition OPNET Technoligies, http://www.opnet.com/University program/it guru academic edition,(2007)
11. W.R Stevens. TCP/IP Illustrated Volume1 the Protocols [M]. Post and Telecom Press, 2010, pp. 223-227.
12. M. Jeanna. Computer Networking Internet Protocols in Action[M]. POST&TELECOM PRESS, 2006, pp.75,83.
13. R. Adolfo, G. John. TCP/IP Tutorial and Technical Overview 7th Edition[M]. Tsing University Press, 2002, pp. 023-025.
14. Adarshpal S.Sethi, Vasil Y.Hnatyshin. The Practical OPNET User Guide for Computer Network Simulation[M]. CHINA MACHINE PRESS, 2014, PP. 1.
15. J. Shi, L. J. Zhong. Study of OPNET Network Simulation Mechanism and Modeling Method[J]. Science and Technology Information, 2009