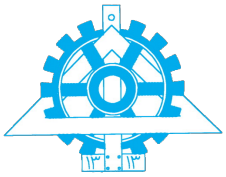
In the name of Allah

بسم الله‌الرحمن الرحیم

UDP and its Applications Laboratory Manual



University of Tehran
دانشگاه تهران

School of Electrical and Computer Engineering
دانشکده مهندسی برق و کامپیوتر

Computer Network Lab
آزمایشگاه شبکه‌های کامپیوتری

Dr. Ahmad Khonsari - احمد خونساری
a_khonsari@ut.ac.ir

Amir Haji Ali Khamseh'i - امیر حاجی علی خمسه‌ء
khamse@ut.ac.ir

Sina Kashi pazha - سینا کاشی پزها
sina_kashipazha@ut.ac.ir

Amirahmad Khordadi - امیر احمد خردادی
a.a.khordadi@ut.ac.ir

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1 Echo Service

Use the following commands in `h1` and `h2` to observe the basic operation of **socket**[1] and echo service.

h2> **/etc/init.d/xinetd restart**

h1> **socket -u *10.0.0.2* echo**

h1> type any text in socket and press enter

Report

Explain the operation of each command.

2 Socket Server

Use following command to run a server and send packet to serever.

h2> **socket -u -s 5555**

h1> **socket -u -i -n3 -w2048 *10.0.0.2* 5555**

Report

Explain the operation of each command.
Show packet in wireshark. What you see in transmitted packet?
What is different between packet in client and server?
What is different between generated packet and sended packet?

3 socket -h

Study various options associated with the **socket** program. A brief list of options can be displayed by typing **socket**.

Report

Explain 5 of them.

4 Segment size

While running **wireshark** on `h1`, execute the following command with different values of size (i.e., the size of the datagram).

h2> **socket -u -s 5555**

h1> **socket -u -i -n1 -w${size} *10.0.0.2* 5555**

The **-u** option is used to send UDP datagrams rather than TCP segments.
Increase *size* (i.e., the size of the datagram) until fragmentation occurs.
Use **netstat -in** to find out the MTU of the Ethernet interface.

[1] Basic command is sock use alternative socket (linked to sock)

Report

What is the maximum value of *size* for which the UDP datagram can be sent without IP fragmentation? Justify your answer with the **netstat** output.

5 Datagram size

Capture the data packets generated by the following command **wireshark** on `h1`.

h2> **socket -u -s 5555**

h1> **socket -u -i -n1 -w10000 *10.0.0.2* 5555**

Save the **wireshark** output for the lab report.

Report

Explain the **wireshark** output in terms of the IP header fields that are used in fragmentation.
When IP fragmentation occurs, only the first fragment has the UDP header. How do you verify this fact from the **wireshark** output?

6 TFTP and FTP

In order to compare the transfer rates of FTP and TFTP, we will retrieve a large file from a remote server using FTP and TFTP, respectively.
First run ftp and tftp service. Run **wireshark** on `h1` and see ftp and tftp packets.

h2> **/etc/init.d/xinetd restart** # start tftp server

h2> **ls /etc/xinetd.d/** # see services in xinetd

h2> **vsftpd &** # start ftp server

h2> create file in **/tftpboot/{small.dum, med.dum, larg.dum}**

h2> create file in **/home/mininet/{small.dum, med.dum, larg.dum}**

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h1> **tftp 10.0.0.2**

h1> tftp> **get {$filename}**

h1> tftp> **quit**

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h1> **ftp 10.0.0.2** # Enter user and password -> **mininet**

h1> tftp> **ls**

h1> tftp> **get ${filename}**

h1> tftp> **quit**

*Create **small.dum** with **10kB**, **med.dum** with **1MB** and **larg.dum** with **50MB***
Also, from the **ftp** window, record the transfer rate (time) displayed.
Restart the above **wireshark** session.

Report

For first **wireshark** session identify the starting and ending time of actual data transfer. Don't include the time spent establishing the TCP connection. Calculate the time spent for data transfer.
Compare the time with the value displayed in **ftp** window. Are they consistent? If there exists any significant difference, what might be the reason?
Now, from the second session, carefully determine the starting and ending time of data transfer for the **tftp** program.
Compare the time with the value displayed in **tftp** window. Are they consistent? If there exists any significant difference, what might be the reason?
By comparing the actual data transfer times of **ftp** and **tftp**, which of these two is faster, and why?

7 TFTP Analysis

Capture the packets that are exchanged during a **tftp** session for the `/tftpboot/small.dum` file between `h1` and `h2`, using **wireshark**
Observe the protocol in action. Analyze various types of TFTP messages.

Report

1. List all the different types of packets exchanged during the **tftp** session.
   Why does the server's port number change?
2. In most cases, **tftp** service is restricted.[2] Why is **tftp** service not generally available to users?
3. With **tftp**, which uses UDP, we transferred a file larger than the maximum UDP datagram size. How do you explain this?

8 FTP Small file

Repeat the above experiment, but use **ftp**. Capture a trace of the packets exchanged when downloading the `/home/mininet/small.dum` file using **ftp**.
Examine the port numbers used.

Report

1. How many well-known port numbers were used? Which machine used the well-known port numbers? What were the other machine's port numbers?
2. As can be seen from the **wireshark** output, FTP involves two different connections, `ftp-control` and `ftp-data`. Why are two different connections used, instead of one connection?

9 FTP Debug

Run **ftp** in `h1` using the debug mode: **ftp -d** *10.0.0.2*.
After logging into the remote host, type **dir** `/home/mininet/small.dum` in the **ftp** window.
Then type **quit** to terminate the **ftp** session, and save the **ftp** window output.

Report

Submit what you saved in this exercise, explaining each line of the output. Explain how the `PORT` command works. Which connection, the control connection or the data connection, did the server send the response (the `LIST` output) on?

[2] This is not the case in our lab, where we deliberately enabled the TFTP service and use it as a tool to study the UDP protocol.