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ICSI 516 – Computer Communication Networks I

Project 1 Report

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Project 1 – Report

Tables

Table for delay of File 1, File 2, File 3, and File 4.

Delay	File 1 (16KB)	File 2 (32 KB)	File 3 (48 KB)	File 4 (62 KB)
TCP (sec)	0.007616	0.007317	0.011519	0.012050
UDP (sec)	0.055467	0.121433	0.100874	0.178673

Table for throughput of File 1, File 2, File 3, and File 4.

Throughput	File 1 (16KB)	File 2 (32 KB)	File 3 (48 KB)	File 4 (62 KB)
TCP (bps)	16484243.7	33938499.4	31460369.8	40000663.9
UDP (bps)	2341284	2098342	3771676	2828676

Methodology

How did you process the Wireshark traces to calculate the above metrics? Did you use a program, or did you do it manually?

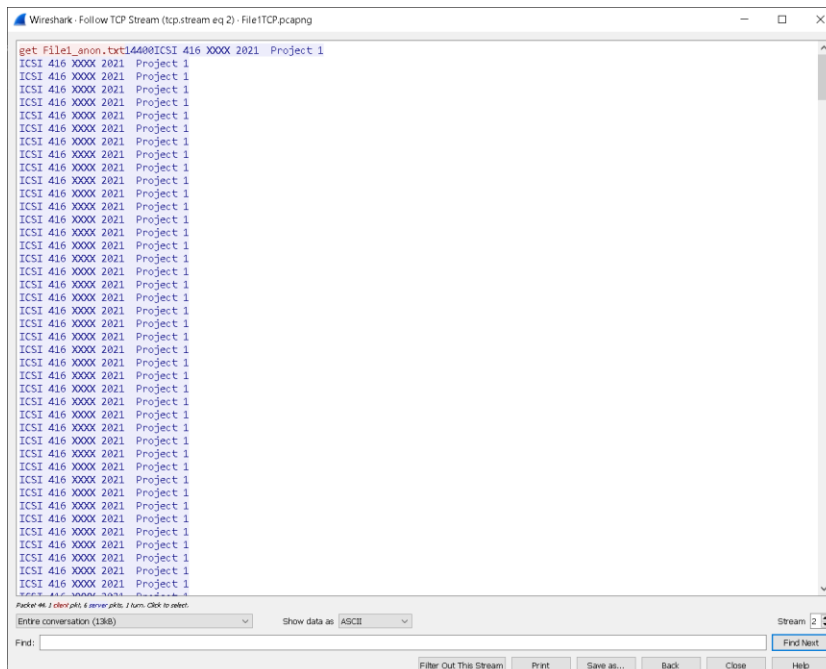
First of all, on Wireshark, I have filtered the packets with the IP address of the VM, “ip.addr == 169.226.22.20”.

I calculated the delay by right clicking on the first packet, then clicking “set/unset time reference”. After that, I looked at the last packet and it automatically calculates the difference between the first packet and the last packet.

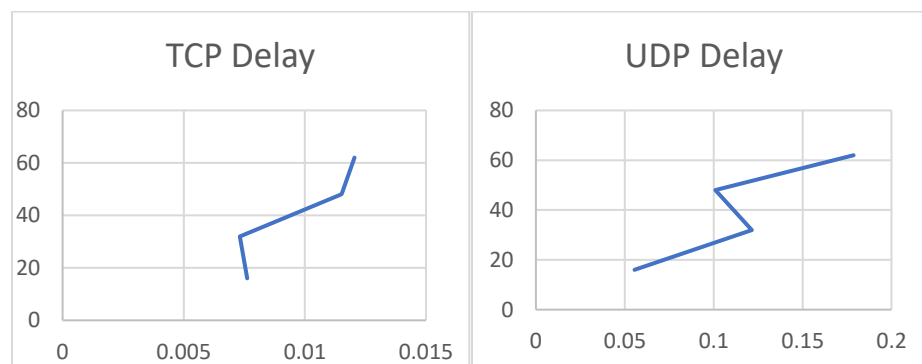
To calculate the throughput, on Wireshark, from “File”, I clicked “export packet dissections”, then chose CSV to save it in an CSV file. Then I opened the file on Excel, added all “Length” values of all packets, then divided it by the overall delay, and acquired the throughput.

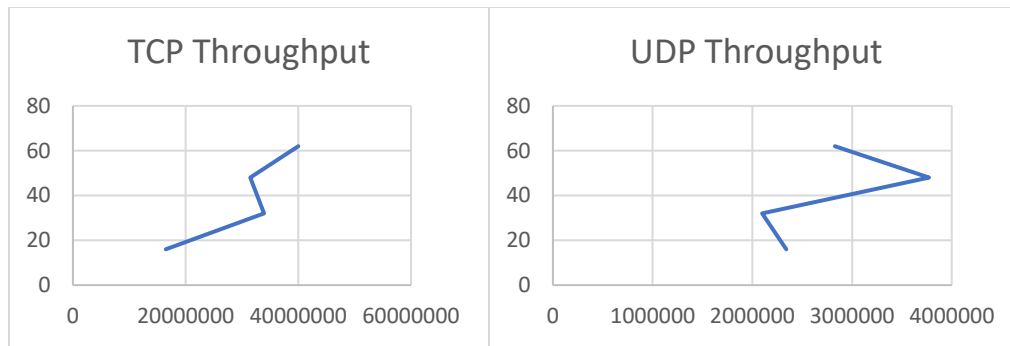
A description of the trends you see in your results along with a justification of these trends.

On the table of delay, we can see that for TCP and UDP, as file gets bigger the delay slightly increases, this is because the file size gets bigger, and more data packets are being transmitted, and on Wireshark, from statistics, and conversations, we can see the file data being transmitted in the data packets:



Plot graphs for delay and throughputs.





Some factors that cause increase in delay are packet losses and congestion control, in the below screenshot, we can see, for example for File1, there are packet losses, and this might be the reason of significant delays in the network:

File1TCP.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

ip.addr == 169.226.22.20

No.	Time	Source	Destination	Protocol	Length	Info
39	7.981936	169.226.232.77	169.226.22.20	TCP	84	57382 → 12000 [PSH, ACK] Seq=1 Ack=...
40	7.983669	169.226.22.20	169.226.232.77	SSH	126	Server: Encrypted packet (len=60)
41	7.983669	169.226.22.20	169.226.232.77	TCP	71	12000 → 57382 [PSH, ACK] Seq=1 Ack=...
42	7.983865	169.226.232.77	169.226.22.20	TCP	66	57384 → 22 [ACK] Seq=1 Ack=61 Win=5...
43	7.983870	169.226.232.77	169.226.22.20	TCP	66	57382 → 12000 [ACK] Seq=19 Ack=6 Wi...
44	7.985405	169.226.22.20	169.226.232.77	TCP	9066	12000 → 57382 [PSH, ACK] Seq=6 Ack=...
45	7.985829	169.226.232.77	169.226.22.20	TCP	66	57382 → 12000 [ACK] Seq=19 Ack=9006...
46	7.986045	169.226.22.20	169.226.232.77	TCP	2066	12000 → 57382 [PSH, ACK] Seq=9006 A...
47	7.986045	169.226.22.20	169.226.232.77	SSH	142	Server: Encrypted packet (len=76)
48	7.986175	169.226.232.77	169.226.22.20	TCP	66	57384 → 22 [ACK] Seq=1 Ack=137 Win=...
49	7.986234	169.226.232.77	169.226.22.20	TCP	66	57382 → 12000 [ACK] Seq=19 Ack=1100...
50	7.989121	169.226.22.20	169.226.232.77	TCP	1514	12000 → 57382 [ACK] Seq=11006 Ack=1...
51	7.989121	169.226.22.20	169.226.232.77	TCP	570	[TCP Previous segment not captured]...
52	7.989121	169.226.22.20	169.226.232.77	TCP	1514	[TCP Out-Of-Order] 12000 → 57382 [A...
53	7.989474	169.226.232.77	169.226.22.20	TCP	66	57382 → 12000 [ACK] Seq=19 Ack=1245...
54	7.989540	169.226.232.77	169.226.22.20	TCP	78	[TCP Dup ACK 53#1] 57382 → 12000 [A...
55	7.989552	169.226.232.77	169.226.22.20	TCP	66	57382 → 12000 [ACK] Seq=19 Ack=1440...

File1TCP.pcapng

Packets: 88 · Displayed: 17 (19.3%)

Profile: Default

As we can see above in the plot graphs, the delay is a bit more linear in a constant rate as the file size grows bigger, and as we can see below, we see a reliable file transfer with UDP, thanks to stop and wait.

File UDP.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

ip.addr == 169.226.232.20

No.	Time	Source	Destination	Protocol	Length	Info
155	9.801021	169.226.232.77	169.226.22.20	LLC	60	T, N(R)=16, N(S)=58; DSAP: 0x06 Group, SSAP: 0x0d Response
160	9.801283	169.226.22.20	169.226.232.77	SSH	126	Server: Encrypted packet (len=60)
163	9.803432	169.226.232.77	169.226.22.20	TCP	66	57358 → 22 [ACK] Seq=1 Ack=61 Win=501 Len=0 TSval=1520609542 TSecr=2204911377
165	9.822370	169.226.22.20	169.226.232.77	LLC	47	T, N(R)=24, N(S)=26; DSAP: 0x00 Group, SSAP: 150 Network Layer (unofficial) Command
166	9.822370	169.226.22.20	169.226.232.77	LLC	1042	U F, func=RD; DSAP: 0x48 Group, SSAP: Spanning Tree BPDU Response
167	9.822636	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
168	9.824153	169.226.22.20	169.226.232.77	LLC	1042	T, N(R)=16, N(S)=44; DSAP: 0x08 Individual, SSAP: 0x08 Command
169	9.824331	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
170	9.825703	169.226.22.20	169.226.232.77	LLC	1042	U, func=NAME; DSAP: 0x08 Individual, SSAP: 0x72 Command
171	9.825925	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
172	9.829082	169.226.22.20	169.226.232.77	LLC	1042	U F, func=RD; DSAP: 0x48 Group, SSAP: Spanning Tree BPDU Response
173	9.829183	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
174	9.830596	169.226.22.20	169.226.232.77	LLC	1042	T, N(R)=16, N(S)=44; DSAP: 0x08 Individual, SSAP: 0x08 Command
175	9.830816	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
176	9.832096	169.226.22.20	169.226.232.77	LLC	1042	U, func=NAME; DSAP: 0x08 Individual, SSAP: 0x72 Command
177	9.832256	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
178	9.833968	169.226.22.20	169.226.232.77	LLC	1042	U F, func=RD; DSAP: 0x48 Group, SSAP: Spanning Tree BPDU Response
179	9.834156	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
180	9.835226	169.226.22.20	169.226.232.77	LLC	1042	T, N(R)=16, N(S)=44; DSAP: 0x08 Individual, SSAP: 0x08 Command
181	9.836457	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
182	9.837929	169.226.22.20	169.226.232.77	LLC	1042	U, func=NAME; DSAP: 0x08 Individual, SSAP: 0x72 Command
183	9.838454	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
184	9.839875	169.226.22.20	169.226.232.77	LLC	1042	U F, func=RD; DSAP: 0x48 Group, SSAP: Spanning Tree BPDU Response
185	9.840851	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
186	9.843238	169.226.22.20	169.226.232.77	LLC	1042	T, N(R)=16, N(S)=44; DSAP: 0x08 Individual, SSAP: 0x08 Command
187	9.843433	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
188	9.844866	169.226.22.20	169.226.232.77	LLC	1042	U, func=NAME; DSAP: 0x08 Individual, SSAP: 0x72 Command
189	9.845044	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
190	9.846368	169.226.22.20	169.226.232.77	LLC	1042	U F, func=RD; DSAP: 0x48 Group, SSAP: Spanning Tree BPDU Response
191	9.846533	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
194	9.852241	169.226.22.20	169.226.232.77	LLC	1042	T, N(R)=16, N(S)=44; DSAP: 0x08 Individual, SSAP: 0x08 Command
195	9.852604	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
196	9.854056	169.226.22.20	169.226.232.77	LLC	442	U, func=NAME; DSAP: 0x08 Individual, SSAP: 0x72 Command
197	9.854389	169.226.232.77	169.226.22.20	LLC	45	U, func=Unknown; DSAP: 0x40 Group, SSAP: Spanning Tree BPDU Response
198	9.855007	169.226.232.77	169.226.22.20	LLC	45	[Malformed Packet]
199	9.856342	169.226.22.20	169.226.232.77	SSH	118	Server: Encrypted packet (len=52)
200	9.856468	169.226.232.77	169.226.22.20	SSH	66	23258 → 22 [ACK] Seq=1 Ack=61 Win=501 Len=0 TSval=1520609542 TSecr=2204911377

> Frame 155: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on Interface vDeviceNPF_{701898D0-CE25-4C62-B0AE-6A1916A22205}, Id 0

00 1c 73 00 00 99 d5 1d a1 f0 82 0a 08 00 45 00 ...s.....E-

File UDP.pcapng

Packets: 200 · Displayed: 37 (13.5%)

Profile: Default

Looking at graphs for throughput, comparing it with the delay, we can see it is kind of going in the opposite direction. So increase in delay means less throughput, and decrease in delay means more throughput. Similarly, lost packets mean reduced throughput. Observing higher throughput in TCP means that it has more successful message delivery over the machines.