ITS 413 Internet Technologies and Applications

Assignment: Phase 2: Determine peak throughput of Wireless LAN and Ethernet

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By submitting this report all members of the group listed above agree that each member has contributed approximately equal amounts to designing and performing experiments, as well as to preparing this report. All members agree that this report accurately reflects the experiments conducted by the group members, and is their own work (not works of other groups).

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Aims

The aim of this project is to find out the throughput of wireless and wired transmission by continuously increase the bandwidth use to transmit the data. In this experiment, the server will be connected to router through LAN wire, while client computer will send packets to server by wireless and through LAN cable on another experiment. Then we will determine the maximum throughput client able to use to send packets to the server.

Network Diagram

Draw a diagram(s) showing the network topology for your experiments. Label the devices (e.g. laptop1, router, LAN cable, and given specs for the computers/router in the next section)

Equipment Specifications

Server: Dell N5010 with windows 7 ultimate

Comment [s1]: Its ok to copy the specs, but make sure it includes all info that is needed. In particular it says nothing about the wired LAN interface...

Dell Inspiron N5010-560343TH (15R)	
CPU	Intel® Core™ i5-430M Processor (2.26GHz, Turbo Boost up to 2.53 GHz, 3M cache)
Chipset	Mobile Intel® 5 Series Express Chipset (HM57)
Ram	4GB (2 X 2 GB) DDR3 1066Mhz
Graphic Card	ATI Mobility Radeon™ HD 5470 - 1GB
Screen	15.6 Widescreen HD WLED Glossy Display with TrueLife™ (1366x768)
Harddisk	320 GB 5400RPM Hard Drive
CD DVD Drive	12.7" SATA Tray Load DVD+/-RW
Wireless	Dell Wireless 1501 802.11b/g/n Half Mini Card
Bluetooth	DellTM Wireless 365 Bluetooth® Internal (2.1+EDR) Mini-Card
Card Reader	7-in-1 Media Card Reader
USB	3 x USB 2.0 & 1 x Combo E-SATA/USB 2.0
Battery	6 cell 48 WHr Li-Ion Battery
OS	DOS Operating System
Other	SRS Premium SoundTM - 2 speakers @ 2W each, HDMI, Webcam 1.3Mpixels
Weight	2.6 Kg (including the supplied battery)

Client: Lenovo IdeaPad G470 with windows 7 home premium

Processor	
CPU	Intel Core i3-2310M (2.10 GHz, 3 MB L3 Cache)
Chipset	Mobile Intel HM65 Express Chipset
Graphic system	
Graphic Chip	AMD Radeon HD 6370M (1GB GDDR3)
Display	
Type	14.1 inch WXGA (1366x768) LED
Main Memory	
Memory	4 GB DDR3
Hard Disk Drive	
Hard Disk	640 GB 5400 RPM
Optical Disc Drive	
Drive	DVD Writer (Dual Layer Support + Removable)
Web Camera	
Details	2.0 Mpixel
Connection	
Wireless Lan	Lenovo 802.11 BGN
Bluetooth	Yes
LAN	Gigabit Ethernet
Modem	No

Router: Linksys WRT54GL Wireless Broadband Router 802.11b/g up to 54Mbps with version Backfire 10.03.1 with the Broadcom Linux 2.4 kernel

Wire connection

Wireless connection

Comment [s2]: Why didn't you complete this, and add more parameters? What was the distance? Wireless LAN data rate? WLAN parameters?

Parameters

Parameters	Values
Channel	3
Transmit Power	
Distance	
Lan Cable	CAT 5E
MTU	1500

Experiment 1: Basic performance measuring with Iperf

In this experiment, we try to find out the maximum possible throughput by continuously increase the bandwidth use in transmitting data packets to server. After 10 seconds interval of data transmitting, the server wills feedback with report of throughput of the session. This will then use to plot the graph and find the maximum throughput using the trend line created from the results.

Comment [s3]: It would give more accurate results if you repeated the experiments (especially with sending rate near throughput) multiple, say 3 or 5 or 10, times. Then take the average of those tests.

Result

Comment [s4]: Put the data in tables in an appendix, and only show the plots in the main body of the report.

Bandwidth (Mbits/sec)	Throughput (Mbits/sec)	Packets loss (%)
1	0.999	0
2	2	0
3	3	0.039
4	4	0
5	4.99	0.024
6	6	0
7	7	0
8	8.01	0.015
9	8.76	0.8
10	8.96	10
11	10.1	7.7
12	11.6	2.9
13	13	0.14
14	13	7.1
15	14.1	6.2
16	14.8	7
17	14	17
18	14.3	20
19	14.9	21
20	16.8	16
21	16.1	23
22	15.3	30
23	16	30
24	16.5	31
25	17.2	31

26	19.1	27
27	16	41
28	21	25
29	22.7	22
30	21.1	30
31	19.9	36
32	19.1	40
33	20.6	37
34	19.3	40
35	20.3	42
40	23.1	42
45	19.4	57
50	19	62
55	18.5	73

Comment [s5]: The plot below is good in that it plots the actual values (circles) while also interpolating. Unfortunately the interpolation is not quite correct. It suggest the throughput will keep increasing as the transmitting bandwidth keeps increasing. Do you think if the transmitting bandwidth is 1000Mb/s, the throughput will be 100Mb/s? Thats what the line looks like.

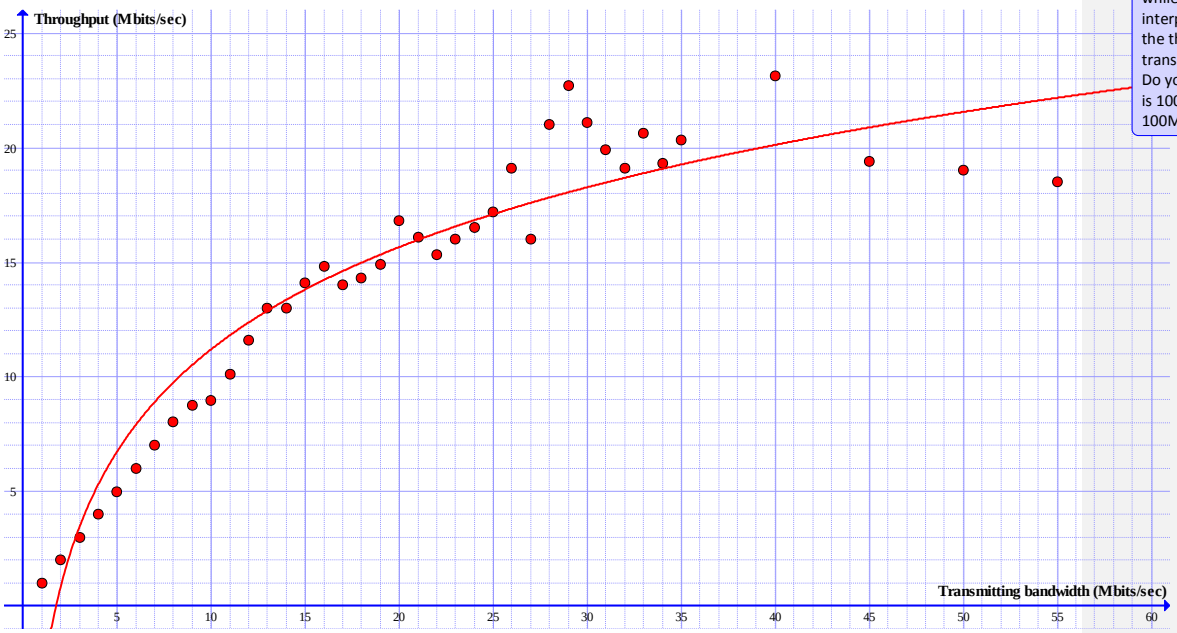

Figure 1: Throughput of wireless transmission

Figure 1:

From the collected data interpret into the form of graph; we can see that the throughput of wireless transmission with this model of router is roughly

around 20 Mbits per second. As the throughput reaches 20 Mbits per second, it began to stop increasing and stabilize. Even though we increase the sending bandwidth, the throughput stops increasing. This is because, more and more packets loss start to occur after we reach sending bandwidth of 17 Mbits per second, as you can see in the table. The packets loss reaches 17% and keeps increasing as we increase the bandwidth. Even though we send at a faster rate, most packets do not reach the destination and therefore create inefficiency. At transmitting bandwidth of 55 Mbits per second, the packets loss reaches up to 73%. This mean that anymore increase in bandwidth will only result in more packets loss. Therefore, it is suitable to finish our experiment at this point.

Comment [s6]: Why? What is the capacity?

Comment [s7]: But why are the packets lost?

Bandwidth (Mbits/sec)	Throughput (Mbits/sec)	Packets loss (%)
1	1	0
5	4.99	0
10	9.98	0.024
15	15	0
20	20	0.082
25	25	0.0094
30	30	0.0078
35	35.1	0
40	40	0.0059
45	45.1	0.0052
50	50	0.0024
55	55.2	0.017
60	60	0
65	65.2	0.0018
70	69.9	0
75	75.3	0.09
80	79.9	0.01
85	83.7	1.6
90	84.7	6.2
95	85.7	10
100	86	14
105	86.1	18
110	86.3	22
115	87.6	24
120	88.4	26
125	88.9	29

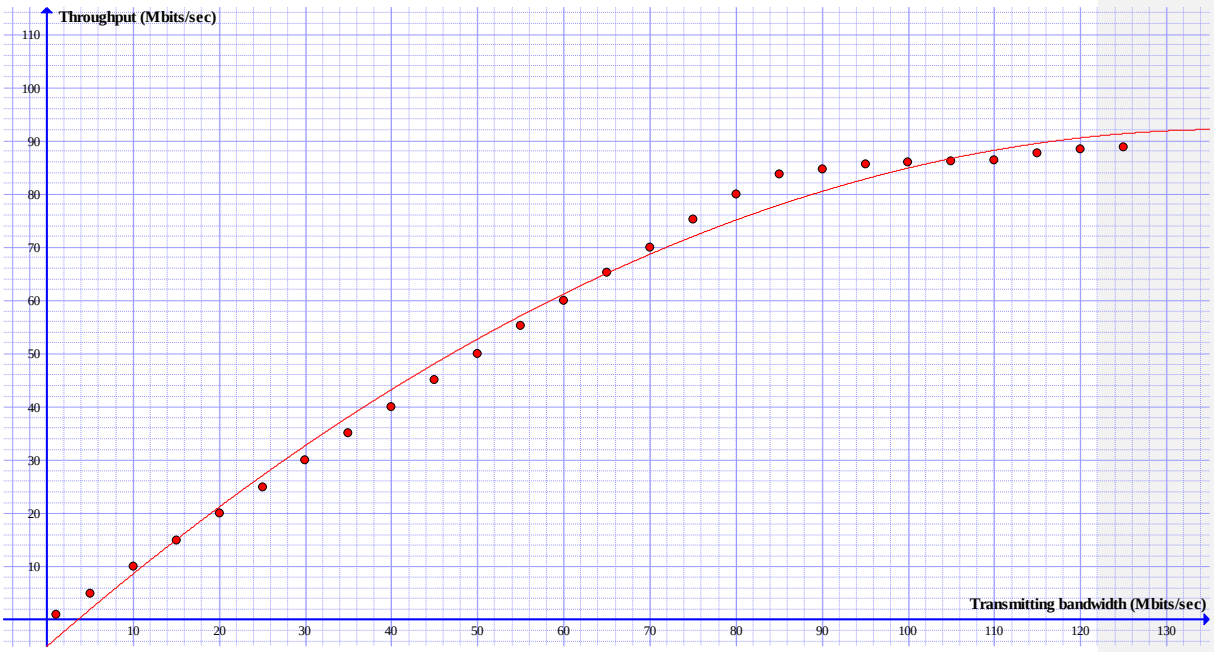

Figure 2: Throughput of wired transmission

Figure 2:

For wired transmission, if we compare to the wired and wireless transmission, the maximum throughput of wireless transmission can reach only about 20 Mbits/sec but for wired transmission can go up to almost 90 Mbits/sec. Therefore, wired transmissions has higher throughput rate than the wireless transmission. However, as we reach the limit of the medium (100 Mbits/sec), the same problem starts to show. This is the percentage of packets loss start to increase proportionally, therefore, no further increase in throughput. As you can see the table of result, the throughput did not reach the speed specified on the LAN cable (100Mbits/sec). The reason to this might be the header contained in packets being sent. Result in decrease in throughput.

Comment [s8]: Why?

Comment [s9]: Ok, thats a good start to the reason why for Ethernet. Then why for Wireless LAN can we not reach 54Mb/s?