

ITS 413 Internet Technologies and Applications

Assignment: Phase 2 Report

By: G03

Songklod Amornkul (5222792673)

Chawarat Tantivathanaphand (5222800633)

Chittra Roungroongsom (5222780488)

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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).

Sirindhorn International Institute of Technology

Thammasat University

Aims

Determine the maximum possible throughput of designated router (Linksys Wireless-G Broadband Router WRT54GL V1.1)

Comment [s1]: Actually, not the throughput of the router. The throughput of a wireless LAN link in general. In theory the throughput of a wireless LAN link between laptop and router should be independent of the type of device (in practice there may be some minor differences).

Network Diagram

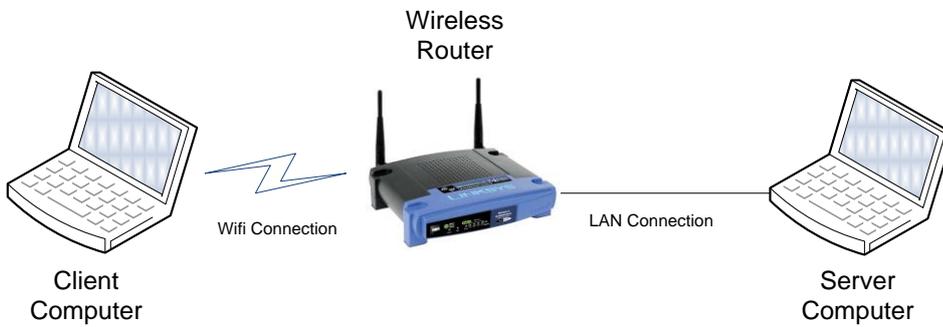


Figure 1

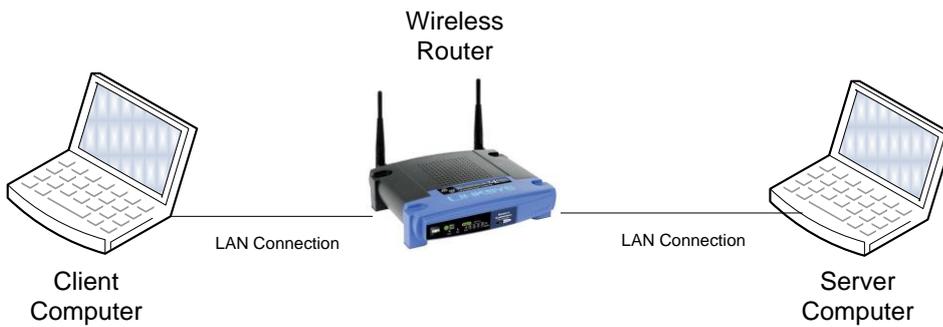


Figure 2

Equipment Specifications

Laptop #1 (Server Computer)

HP Pavilion dv3 2145tx

Processor: Intel Core 2 Duo 2.67GHZ

Graphic Card: NVIDIA GEFORCE 512 Mb

Ram: 4.00 GB (2.97 GB Usable)

Network Interface Card: Integrated 10/100Base-T Ethernet LAN (RJ-45 connector)

Wireless Connectivity: 802.11agn

OS: Ubuntu 10.04 (64bit)

Laptop #2 (Client Computer)

Toshiba Portege M800

Processor: Intel Core 2 Duo 2.1GHZ

Graphic Card: Onboard (Intel 965 express chipset family)

Ram: 2.00 GB

Network Interface Card: Marvell Yukon 88E8072 (10/100/1000Mbps Gigabit Ethernet)

Comment [s2]: Good.

Wireless Connectivity: 802.11agn

OS: Ubuntu 11.10

Router

Linksys Wireless-G Broadband Router WRT54GL V1.1

Device type: Wireless router - 4-port switch (integrated)

Data Link Protocol: Ethernet, Fast Ethernet, IEEE 802.11b, IEEE 802.11g

Data Transfer rate: 54 Mbps

Frequency band: 2.4 GHz

OS: OpenWrt (Backfire 10.03.1)

Parameters

The **important parameters** we use in this experiment are

- **Bandwidth** (Mbits/sec)
 - o 5, 10,15,20,25...100
- Time (Sec)
 - o 10 (default), 30

Comment [s3]: What about all the default values used? Wireless LAN data rate? RTS/CTS threshold? ...

Comment [s4]: That's ok – iperf calls it bandwidth. But you may find it easier if you refer to it as sending rate (to avoid confusion with bandwidth in Mhz and bandwidth as throughput).

Experiments and Results

Experiment 1 – Bandwidth Test (Wire/Wireless)

This first experiment is aim to **test** the possible throughput of wireless router (**Linksys WRT54GL**) by changing the increasing the Bandwidth (by multiple of 5 [5, 10, 15...100]). This is done using the model display in figure 1 from the “Network Diagram” section.

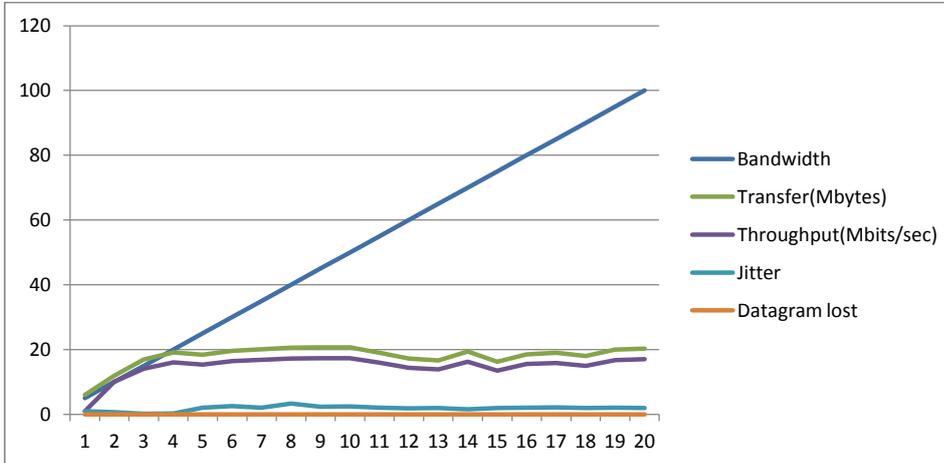
Comment [s5]: What iperf commands did you use for the tests?

Then we later test the possible throughput of the same router, but with the wire connection. This experiment is conduct to using the same parameter as the first experiment, which result will be used to compare with the previous experiment to see if the wire and wireless will cause different in any of the value. This experiment will be conduct using the figure 2 in “Network Diagram” section.

Wireless (Bandwidth)

Comment [s6]: Good to include the actual data, but I prefer you put it in an Appendix. Then the report is easier to read as I just see the summary plot.

Bandwidth	Time (sec)	Transfer (MBytes)	Throughput (Mbits/sec)	Jitter (ms)	Datagram Lost	Total datagram
5	10	5.96	5.00	0.355	0	4252
10	10	11.9	9.98	0.636	0	8504
15	10	16.9	14.1	0.172	0	12021
20	10	19.1	16.0	0.287	0	13645
25	10	18.4	15.4	2.071	0	13149
30	10	19.6	16.4	2.492	0	13987
35	10	20.1	16.8	2.035	0	14310
40	10	20.6	17.2	3.330	0	14717
45	10	20.7	17.3	2.333	0	14735
50	10	20.7	17.3	2.446	0	14765
55	10	19.0	15.9	1.993	0	13572
60	10	17.2	14.4	1.855	0	12272
65	10	16.6	13.9	1.918	0	11828
70	10	19.4	16.2	1.517	0	13818
75	10	16.2	13.5	1.948	0	11520
80	10	18.5	15.5	2.033	0	13171
85	10	19.0	15.8	2.161	0	13533
90	10	18.0	15.0	1.931	0	12819
95	10	20.0	16.7	2.031	0	14285
100	10	20.3	17.0	1.914	0	14471

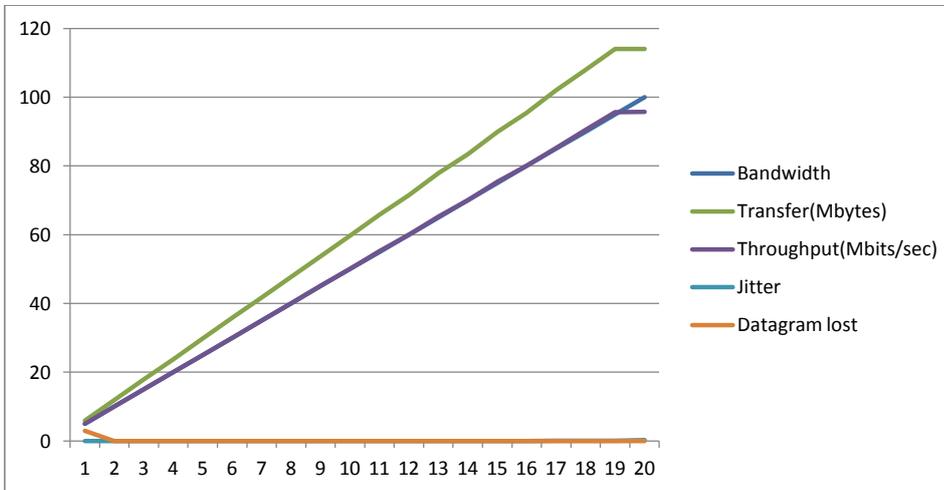


Wired (Bandwidth)

Bandwidth	Time (sec)	Transfer (MBytes)	Throughput (Mbits/sec)	Jitter (ms)	Datagram Lost	Total datagram
5	10	5.96	5.00	0.024	3 (0.071%)	4252
10	10	11.9	10.0	0.012	0	8504
15	10	17.9	15.0	0.009	0	12755
20	10	23.8	20.0	0.003	0	17007
25	10	29.8	25.0	0.012	0	21277
30	10	35.8	30.0	0.002	0	25510
35	10	41.7	35.0	0.002	0	29762
40	10	47.7	40.0	0.003	0	34014
45	10	53.7	45.1	0.002	0	38315
50	10	59.7	50.0	0.005	0	42553
55	10	65.8	55.2	0.008	0	46948
60	10	71.5	60.0	0.006	0	51020
65	10	77.9	65.3	0.007	0	55555
70	10	83.4	70.0	0.005	0	59524
75	10	89.9	75.4	0.026	0	64102
80	10	95.4	80.0	0.023	0	68027
85	10	102	85.2	0.037	0	72463
90	10	108	90.5	0.079	0	76923
95	10	114	95.6	0.066	0	81300
100	10	114	95.7	0.239	0	81414

Comment [s7]: On your plots you must label the axes. What does the x and y-axis represent and what units? This is especially a problem in your plot because you have data with different units: MB, Mb/s, s, number of packets

Comment [s8]: Separate the different performance metrics (throughput, jitter, etc.) into different plots.



For this experiment, we compare the transferring of data using wireless and wired while having bandwidth as the main parameter. Although the bandwidth keeps increasing, the result shows us that transferring of data and throughput of wireless method are accelerating at first and then become quite stable for the rest of the time. While for wired method the transfer of data and throughput are increased as the Bandwidth is larger. However, the wired method lost some datagram at the first try of this experiment. This might be because in the wired method some data is sent to find the route and are lost on the way. In addition, the wireless method has some jitter during the experiment while the wired method doesn't have any.

Comment [s9]: What is the maximum throughput? Your aim is to find the maximum throughput – but you haven't stated what it is? I.e. you haven't come up with conclusions that achieve your aim.

Comment [s10]: Why is it larger for wired vs wireless? Not just the absolute values, but also the percentage?

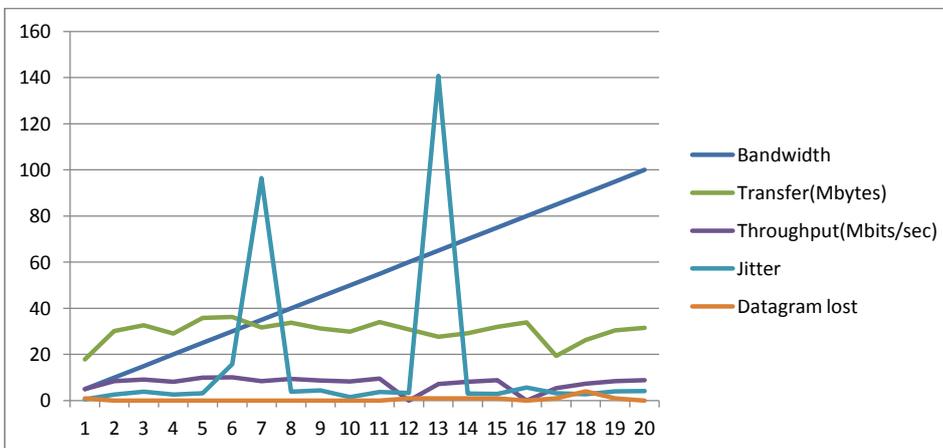
Experiment 2 - Time Test (wire/wireless)

This experiment is aim to test the change in other parameter, when amount of time use to transmit is change from default value (10 sec) to 30 second. This experiment will be conduct using figure 1 in "Network Diagram Section". Which we then will compare the data with the previously record data to determine the difference between the two experiment data.

Then this experiment will be conduct using wire connection (figure 2 in "Network Diagram Section"). Which we then will compare the data with the previously experiment we conduct using the wireless connection.

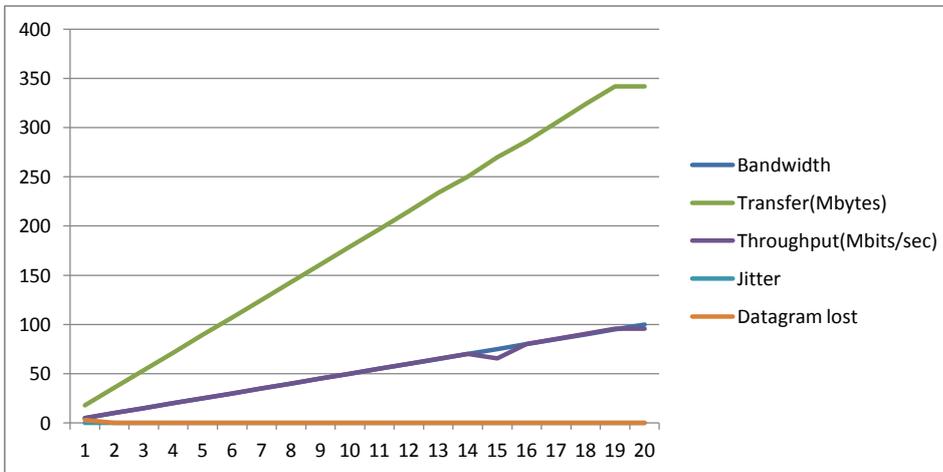
Wireless (Time)

Bandwidth	Time (sec)	Transfer (MBytes)	Throughput (Mbits/sec)	Jitter (ms)	Datagram Lost	Total datagram
5	30	17.9	5.00	0.512	1(0.0078%)	5001
10	30	30.2	8.39	2.621	0	21547
15	30	32.6	9.09	3.849	0	23220
20	30	29.0	8.09	2.552	0	20652
25	30	35.8	10.0	3.208	0	25541
30	30	36.3	10.1	15.787	0	25866
35	30	31.7	8.49	96.503	0	22611
40	30	33.7	9.41	3.844	0	24042
45	30	31.2	8.70	4.469	0	22255
50	30	29.9	8.34	1.562	0	21312
55	30	34.1	9.51	3.761	0	24310
60	30	30.9	8,63	3.246	1(0.0045%)	22063
65	30	27.7	7.22	140.763	1(0.0051%)	19742
70	30	29.2	8.15	2.980	1(0.0048%)	20828
75	30	31.9	8.90	2.877	1(0.0044%)	22723
80	30	33.9	9,43	5.636	0	24145
85	30	19.3	5.39	3.153	1(0.0073%)	13765
90	30	26.3	7.34	2.774	4(0.021%)	18780
95	30	30.5	8.49	4.071	1(0.0046%)	21725
100	30	31.5	8.81	4.105	0	22461



Wired (Time)

Bandwidth	Time (sec)	Transfer (MBytes)	Throughput (Mbits/sec)	Jitter (ms)	Datagram Lost	Total datagram
5	30	17.9	5.00	0.014	3(0.024%)	12755
10	30	35.8	10.0	0.007	0	25510
15	30	53.6	15.0	0.005	0	38266
20	30	71.5	20.0	0.003	0	51021
25	30	89.5	25.0	0.006	0	63830
30	30	107	30.0	0.002	0	76531
35	30	125	35.0	0.005	0	89286
40	30	143	40.0	0.001	0	102041
45	30	161	45.1	0.001	0	114932
50	30	179	50.0	0.004	0	127660
55	30	197	55.2	0.006	0	140845
60	30	215	60.0	0.001	0	153061
65	30	234	65.3	0.002	0	166667
70	30	250	70.0	0.002	0	178571
75	30	270	65.4	0.003	0	192307
80	30	286	80.0	0.008	0	204081
85	30	305	85.2	0.019	0	217391
90	30	324	90.5	0.026	0	230769
95	30	342	95.6	0.027	0	243902
100	30	342	95.7	0.076	0	244190



Next experiment that we did is that we compare the wired and wireless method again but use time as our main parameter this time. By looking at the graph it is clear that the wireless method have a lot of jitter. Moreover, the wireless method's throughput and data transfer are unstable, but are still in a steady pattern. And for the wired method, the result is similar to the previous experiment where we use bandwidth as our main parameter. Also there are some datagram lost at the start of the experiment again.

In conclusion, from these experiments, we learn that by extend the transferring time the different between wireless and wired method are shown clearer. The wireless method seems to be very unstable especially for it jitters, while the wired method has a very stable result which is also in a fixed pattern. Additionally, we also notice that at the start of the wired method, some data will be lost on its path.

Comment [s11]: Focussing only on throughput, what do you expect to change when you change the test time from 10s to 30s? What do you see in the results – does it match you expectation? I see in your results the wireless LAN throughput is around 5-6 Mb/s but with 10s it was about 17Mb/s. This seems strange to me???