

ITS 413 : Internet Technologies and Applications

Assignment: Phase 2 Report

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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

1. To measure the throughput of the Wireless Ethernet in comparison to Wired internet
2. To find out the maximum throughput for both network types.
3. Practice using command line interface of Ubuntu Linux
4. To study how UDP sends data.
5. To study about data communication using radio frequency.

Network Diagram

Experiment 1 : Wired Ethernet



Experiment 2 : Wireless Ethernet



Equipment Specifications

Server :

Sony VAIO VPCEG18FH
CPU : Intel Core i5-2410M 2.30 GHz
Memory : 8 GB DDR3
HDD : OCZ-AGILITY3 120GB SSD
SATA3
WLAN Interface : Atheros AR9285 
LAN Interface : Atheros AR8151
OS: Ubuntu Linux 11.10 64-bits

Client :

Sony VAIO VPCEA16FH
CPU : Intel Core i5-520M 2.40 GHz
Memory : 4 GB DDR3
HDD : Hitachi HTS54505 SATA3
WLAN Interface : Intel Centrino Advanced-N 6200
LAN Interface : Marvell Yukon Optima 88E8059
OS: Ubuntu Linux 11.04 64-bits

Server's Network Interfaces Information

Wired Ethernet:

```
09:00.0 Ethernet controller: Atheros Communications AR8151 v2.0
Gigabit Ethernet (rev c0)
  Subsystem: Sony Corporation Device 908a
  Flags: bus master, fast devsel, latency 0, IRQ 43
  Memory at d4100000 (64-bit, non-prefetchable) [size=256K]
  I/O ports at 2000 [size=128]
  Capabilities: [40] Power Management version 3
  Capabilities: [48] MSI: Enable+ Count=1/1 Maskable- 64bit+
  Capabilities: [58] Express Endpoint, MSI 00
  Capabilities: [6c] Vital Product Data
  Capabilities: [100] Advanced Error Reporting
  Capabilities: [180] Device Serial Number ff-9a-92-39-78-84-
3c-ff
  Kernel driver in use: atl1c
  Kernel modules: atl1c
```

Wireless Ethernet:

```
02:00.0 Network controller: Atheros Communications Inc. AR9285
Wireless Network Adapter (PCI-Express) (rev 01)
  Subsystem: Foxconn International, Inc. Device e037
  Flags: bus master, fast devsel, latency 0, IRQ 16
  Memory at d5200000 (64-bit, non-prefetchable) [size=64K]
  Capabilities: [40] Power Management version 3
  Capabilities: [50] MSI: Enable- Count=1/1 Maskable- 64bit-
  Capabilities: [60] Express Legacy Endpoint, MSI 00
  Capabilities: [100] Advanced Error Reporting
  Capabilities: [140] Virtual Channel
  Capabilities: [160] Device Serial Number 00-15-17-ff-ff-24-
14-12
  Capabilities: [170] Power Budgeting <?>
  Kernel driver in use: ath9k
  Kernel modules: ath9k
```

Client's Network Interfaces Information

Wired Ethernet:

04:00.0 Ethernet controller: Marvell Technology Group Ltd. Yukon Optima 88E8059 [PCIe Gigabit Ethernet Controller with AVB] (rev 11)

Subsystem: Sony Corporation Device 9071

Flags: bus master, fast devsel, latency 0, IRQ 41

Memory at f2220000 (64-bit, non-prefetchable) [size=16K]

I/O ports at a000 [size=256]

Expansion ROM at f2200000 [disabled] [size=128K]

Capabilities: [48] Power Management version 3

Capabilities: [5c] MSI: Enable+ Count=1/1 Maskable- 64bit+

Capabilities: [c0] Express Legacy Endpoint, MSI 00

Capabilities: [100] Advanced Error Reporting

Capabilities: [130] Device Serial Number 34-db-08-ff-ff-49-

42-54

Kernel driver in use: sky2

Kernel modules: sky2

Wireless Ethernet:

02:00.0 Network controller: Intel Corporation Centrino Advanced-N 6200 (rev 35)

Subsystem: Intel Corporation Centrino Advanced-N 6200 2x2

AGN

Flags: bus master, fast devsel, latency 0, IRQ 44

Memory at f4a00000 (64-bit, non-prefetchable) [size=8K]

Capabilities: [c8] Power Management version 3

Capabilities: [d0] MSI: Enable+ Count=1/1 Maskable- 64bit+

Capabilities: [e0] Express Endpoint, MSI 00

Capabilities: [100] Advanced Error Reporting

Capabilities: [140] Device Serial Number 00-23-14-ff-ff-50-

71-08

Kernel driver in use: iwlnagn

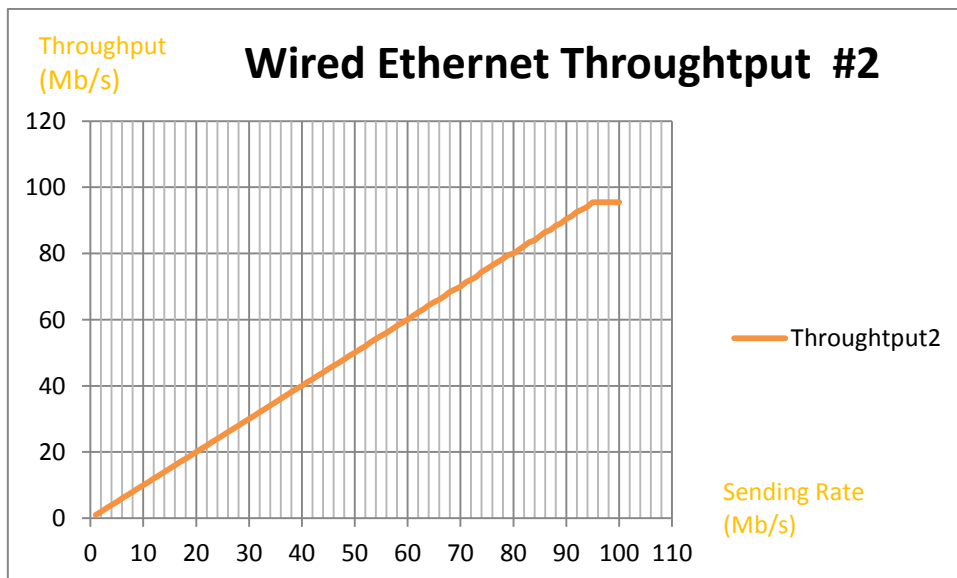
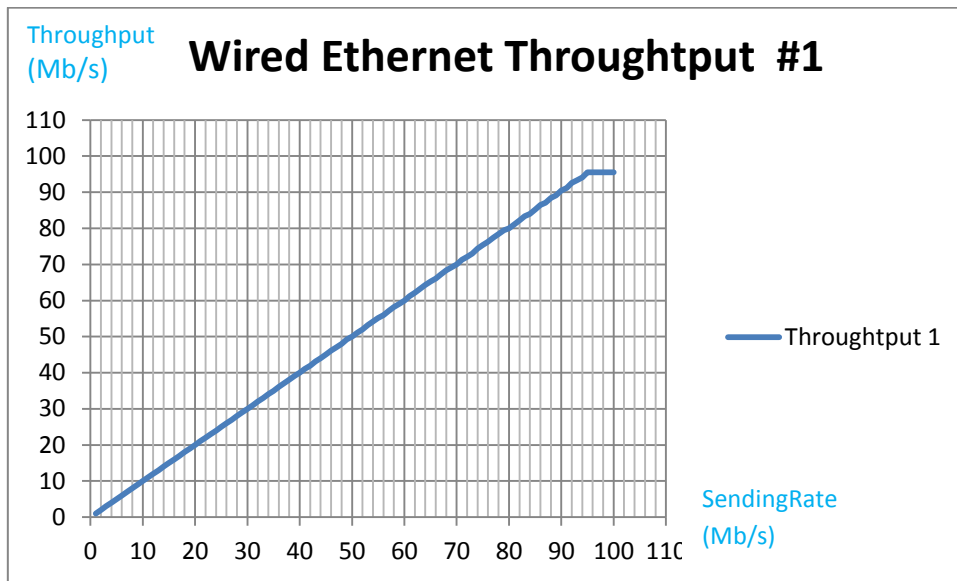
Kernel modules: iwlnagn

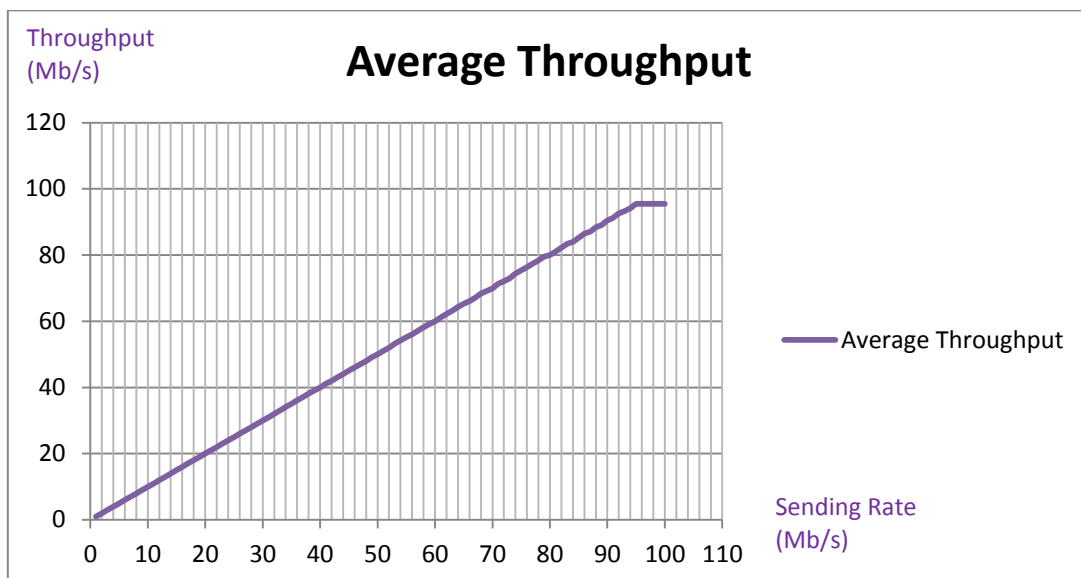
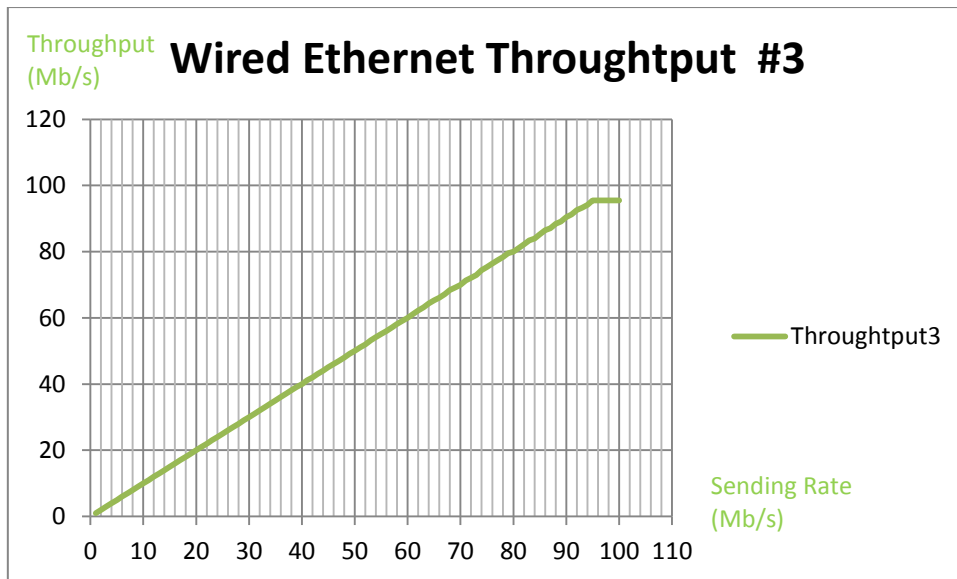


Experiments and Results

Experiment 1 – Wired Ethernet

In this experiment, we've tested the throughput of the Wired Ethernet Link by using iperf to send the UDP packets through the link and observe the result. This test has been conducted for three times consequently. For each iteration, there is only one parameter changed, the sending rate of UDP packets, starting from 1 Mb/s to 100 Mb/s.





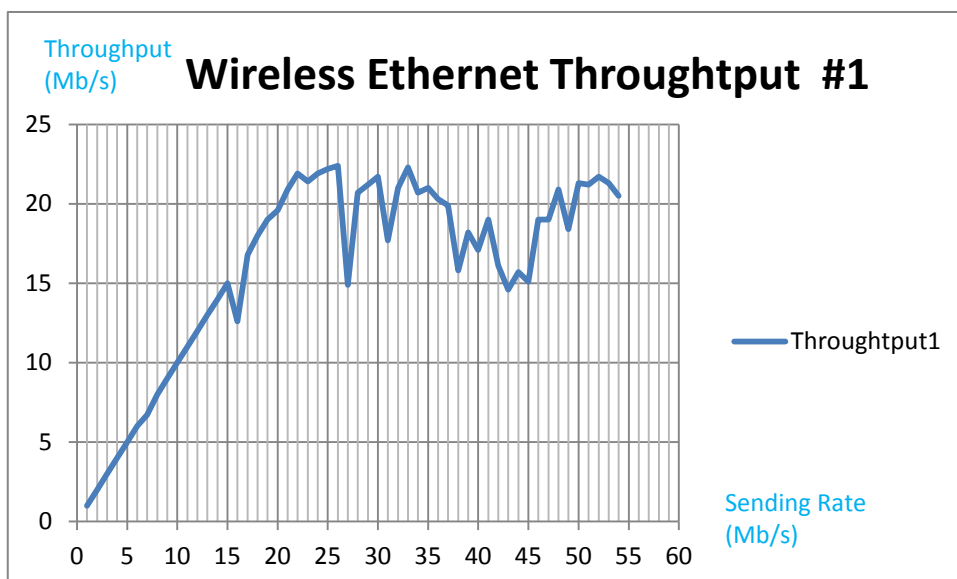
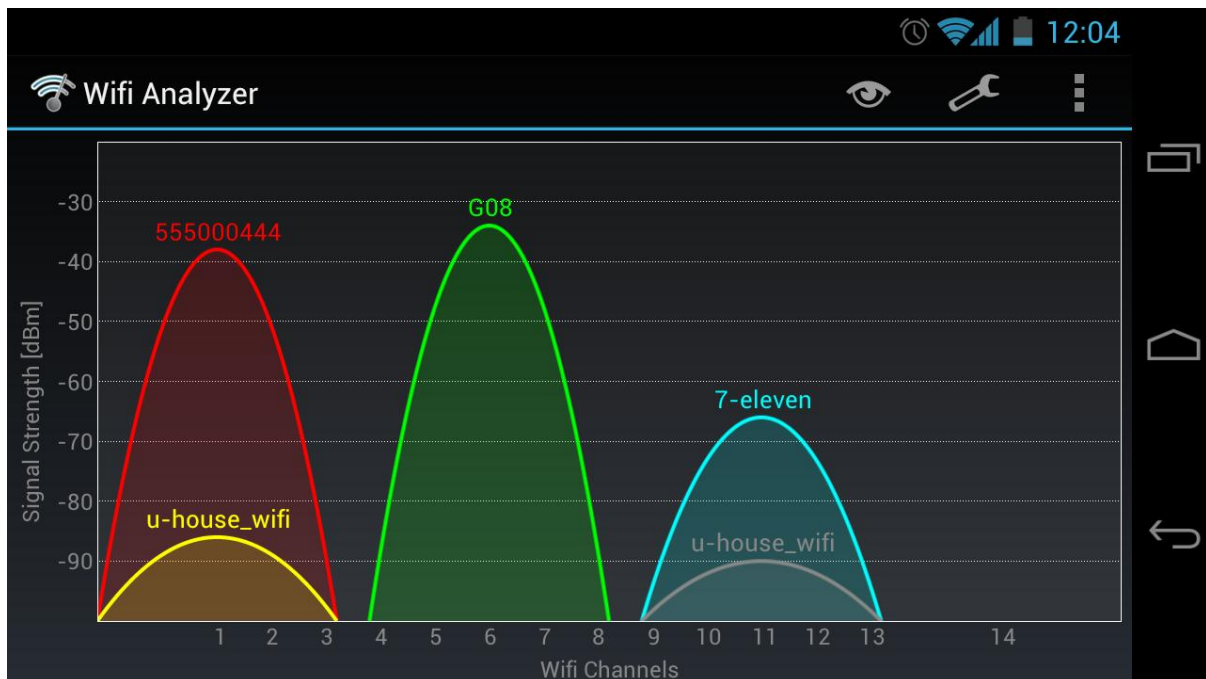


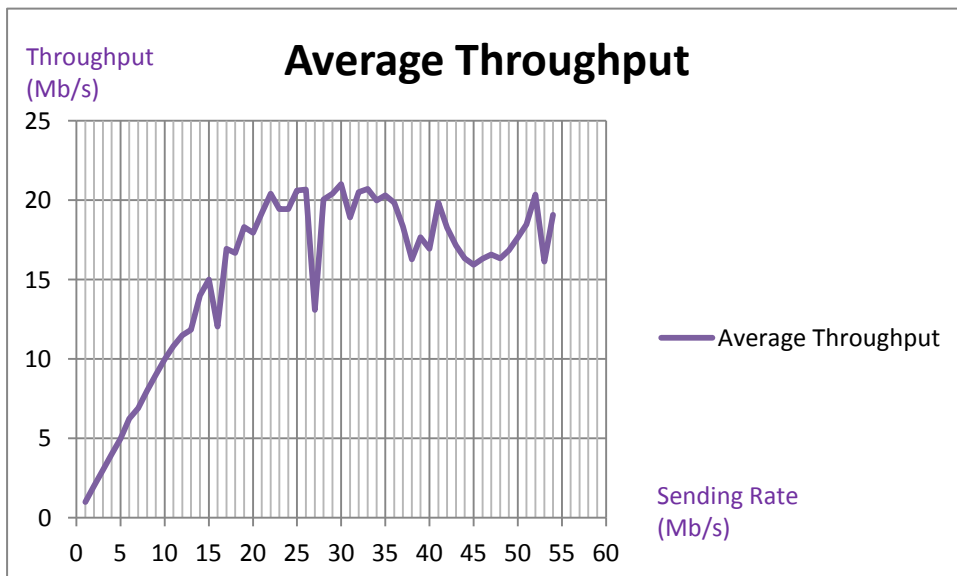
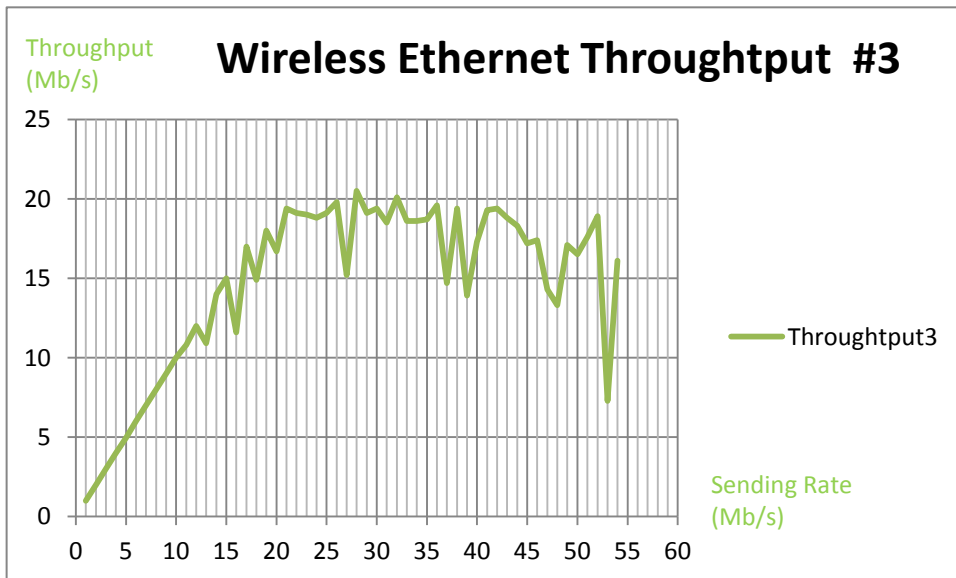
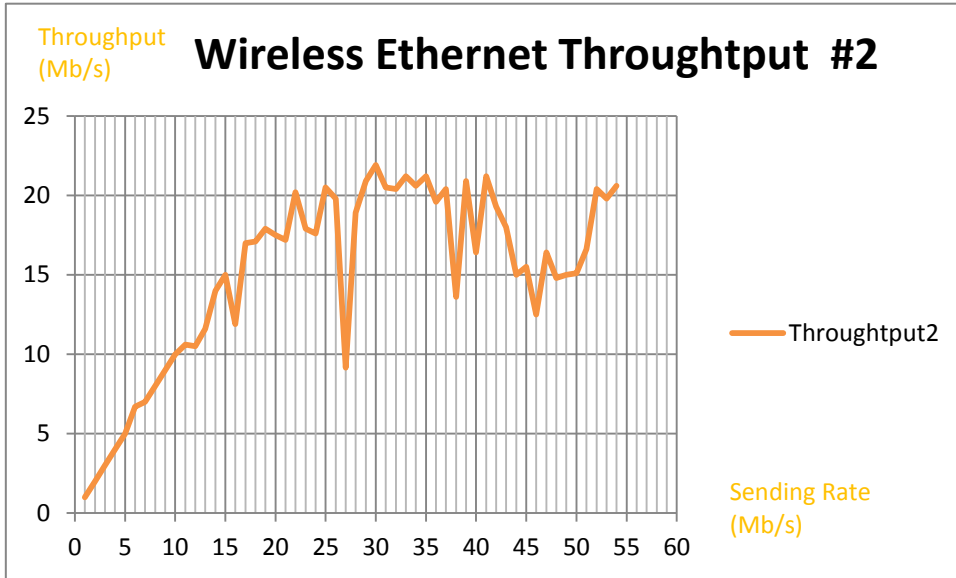
From the figures above, it is obvious that the wired Ethernet link is more stable. Three times of test resulted in very close throughput values. Therefore, the average throughput is very less different. The highest throughput achieved for the wired Ethernet in this experiment is 95.5 Mb/s at 96 Mb/s sending rate.




Experiment 2 – Wireless Ethernet


For this experiment, we attempted to find out the highest value of throughput that can be achieved on the wireless link that uses the 802.11G standard. The experiment method is similar to the previous one. Because of it is a wireless link, the maximum sending rate parameter of  iperf is decreased to 54 Mb/s instead of 100 Mb/s. Other parts are the same as the wired Ethernet experiment. In addition, we have to avoid collision as much as possible. This experiment is done on the wireless LAN channel 6 of the 2.4 MHz spectrum. 





As shown above, the result in each iteration has much difference, in comparison to another iteration of the same experiment. Furthermore, the result of each iteration is fluctuate and not linearly increases as wired Ethernet. Hence, we may judge the highest throughput of the wireless Ethernet by using the average values of all iteration that is 21 Mb/s at 30 Mb/s sending rate. 

Conclusion

In summary, both experiments reflect the stability and reliability of wired Ethernet compared with wireless Ethernet. The wired Ethernet throughput increases linearly until it reaches the limitation of the whole system and will remain constant while the wireless Ethernet oscillates. This is because of the characteristics of the signal sending via wired media has lower interference in comparison to wireless communication. Moreover, the wired media is not shared with other people; one LAN cable is used by only one station to the switch whereas wireless media has to share the radio frequency spectrum with many  users which mean wireless communication may suffer with more collision. Last but not least, wireless Ethernet is considered to be the half-duplex communication but wired Ethernet is full-duplex which can send and receive data at the same time.