

The Best of Ethernet

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Table of Contents

Acknowledgements 2

Hypothesis 4

Review of Literature..... 5

Materials List..... 10

Procedure..... 11

Results 14

Graph..... 17

Conclusion..... 20

Works Cited..... 22

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Purpose

Which category Ethernet cable is the fastest on which browser?

Hypothesis

If CAT 5, CAT 5E and CAT 6 Ethernet cables are tested for internet speed on Google Chrome, Internet Explorer, Mozilla Firefox, I think the CAT6 on Google Chrome will win because CAT6 are the newest type of Ethernet cables and Google Chrome is a new browser that incorporates new and fast internet browsers.

Review of Literature

A network connects many computers together. It is used almost every second by the average 21st century human. Our cell phones, printers, and computers are always trying to communicate with each other, through a network. With a network failing, a whole company or the stock market might crash. Without a network, the 21st century might come to a stand-still (Webster, 2006).

A computer network is 2 or more computers connected through wireless or wired connection. There are two types of computer networks, LAN (local-area network) and WAN (wide-area network). WAN is not the same as WLAN, a wireless local-area network, a part of LAN. The LAN is usually found in an office environment where many computers need to network boot or share files between each other. A typical LAN might include two local data servers connected to a network server. A data server stores all the client's files. The network server manages all the computers and routes all the computers to whichever data server they need. The LAN might also be connected to a router to connect to the internet. A server for data and network will be used only if a network requires a network boot and has a lot of clients. An example use of a LAN: a client, which is a user of the LAN, will access the network server and requests to access the internet. The network server lets the client access the internet and routes him to the professional router. The router manages the rest of the requests of the internet. But most residential users do not have any servers and a normal router takes care of everything for them. The client's request would be sent to their internet service provider, who has special equipment that lets them connect to the internet ("Computer Network", 2003).

The second type of network is the WAN or wide-area network. A WAN may be used in a company to exchange data between multiple buildings in an area, through a special high-speed

cable laid for exclusively for them. An office five miles away might hold their servers and the exclusive cable would connect to the network server in the other office, giving a stable connection to the other server (“Computer Network”, 2003).

The internet is a WAN with many exclusive technologies. In order to access the internet, an eager user would require an internet service provider, or ISP. The ISP is a company that offers an internet connection. A residential house is connected through a cable, DSL, or telephone line. Some newer residential ISPs use cellular 3G or 4G LTE signals. Businesses usually get a high speed T1 cable wired to the building (Tyson, 2001).

The user now requires a router. Once a router is purchased and installed, the router usually contacts the ISP’s user server through the cable the ISP installed, and verifies if the user is paying and if he/she could use the connection. The ISP’s server now allocates the user’s router a unique public IP address and limits the speed that is given to router and network. An ISP could give a customer as much speed as the cables can sustain, but that would be unfair to other customers because they would have a really slow connection. If the ISP approves the subscription and gives the public IP address, the router will allow a subscriber to use the internet. After approval of connection, the router will also be given access to the ISP’s point of presence, or POP. The POP lets the subscriber access servers on the customer’s ISP’s network, faster (“How Browsers Work,” 2012).

A domain name server, or DNS, is another service an ISP provides to residential users. When a person tries to access a server through its uniform resource locator, or URL, this is not the actual address of the server; it is a human-readable address. This address is sent to the DNS, which looks up this address, finds the corresponding public IP address, internet protocol address, and sends the IP address to the computer. This IP is then sent to the ISP’s server locator, which

locates the server and asks the server for the corresponding file with the IP address. The server gives the requested file, which is sent back to the subscriber's server locator, which sends the file to the subscriber (Tyson, 2001).

A Network Access Point (NAP) is added to connect multiple POPs into one place. NAPs are usually found in very large ISPs. This is usually the end of an ISP internal network. The NAPs of the ISP then are put on the global network, which is connected with OC-3 or OC-48 cables. These cables are very fast and connect many ISPs together. Each NAP is connected with each other with these cables. Countries not bordering the United States have underwater cables connecting them to the US network's NAPs (Tyson, 2001).

A browser lets computer users access web pages on the internet. There are many browsers available in the market. A few to name are Google Chrome, Mozilla Firefox, and Microsoft's Internet Explorer. All browsers work on the same basis, but have differently designed code to render and display the pages. A web page is a simple text file with hypertext markup language, or HTML, tags that format the text for viewing. Web pages are made usually with very advanced web software such as Adobe Dreamweaver (Brain, 2000b). All browsers have a user interface. Common buttons are front, back, home, universal resource link (URL) bar, and settings. When a URL, such as google.com, is entered into the URL bar, the browser contacts the DNS server and asks to be forwarded. The DNS searches its list, finds the correspondent, and gives the task to the server locator, which takes care of everything else. The file that the browser receives is usually stored in RAM (Garsiel & Irish, 2011).

The browser's render engine now takes the file and renders the page and displays the page to the user. The render engine scans the text of the page and finds HTML tags. These tags then are applied to the text, to display the web author's desired viewing experience of the web

site or web page. A render engine is usually closed source and the code is not revealed to the public. Until this date, the fastest render engine is Google's custom designed render engine, made for Google Chrome. The World Wide Web Consortium (W3C) currently manages the world's internet standards and browser standards. They say that HTML 5 is the current HTML tag version required on a website. HTML 5 is a version of HTML tags. Currently, Internet Explorer and Google Chrome are the only browsers supporting HTML 5. According to a survey done by an unnamed college, Google Chrome is the number 1 browser in the world (Garsiel & Irish, 2011).

A computer can be connected to a network in many ways. The most common way a computer is connected to a network is through Ethernet cables. Ethernet was developed by Bob Metcalfe at the Xerox's Palo Alto Research Center over a span of two years. Ethernet cables are a very advanced form of normal telephone cables. Today's Ethernet cables are much faster than the first ones (Verducci, 2009). An Ethernet cable is a strand of 8 copper or silver cables, painted with a specific color, that emit data in the form of electrical signals (Spurgeon, 2000).

There are two standards of Ethernet cabling. There is 568A and 568B. The only difference is the wiring pattern inside the cable to the adapter. 568A's wiring pattern is: white-green, green, white-orange, blue, white-blue, yellow, white brown, and brown. 568A is used in homes and any residential use, except for AT&T's fiber residential service, which uses 568B for outbox to router. 568B's wiring pattern is white-yellow, yellow, white-green, blue, white-blue, green, white-brown, and brown. 568B is used in businesses and corporate data centers. There is also category of the cable. The categories are CAT 5, CAT 5E, and CAT 6. A higher number category means there is better quality wiring. Better quality wiring gives higher speeds. A CAT 5 usually speeds around 10 Megabits per second. CAT 5E can pull 100 Megabits per second. CAT

6 is Gigabit, which means it has a speed of 1 Gigabits per second. All cables are reverse-capable though, except CAT 5. A CAT 6 cable can be used in a CAT 5 required situation. The adapter, the part that connects to a computer, is called the RJ-45 connector (Spurgeon, 2000).

Ethernet cables can also be shielded. If Ethernet cables are shielded, they can have higher speeds due to less electrical interferences. There are 3 types of shielding: UTP, FTP, and S-FTP. UTP stands for unshielded twisted pair. This is basic and the plastic coat over the wires is the only protection. All cables are UTP or higher. Level 2 of shielding is FTP. FTP stands for foiled twisted pair. This has foil below the plastic coat. This type blocks about 25% of electrical interferences. S-FTP is the highest form of shielding for an Ethernet cable. This is only used in 568B Ethernet Cables because only commercial settings can have this much interferences (Webster, 2006).

Till now, Ethernet has brought a new age of technology and communication. The browser has become an everyday tool and almost 5 billion people use the internet. Internet and Ethernet are evolving by the minute. Ethernet is the backbone of the internet and many other things. Already Gigabit internet is becoming slow for some companies and a new hybrid technology is already under development (Garsiel & Irish, 2011). An average human's dependency on internet is growing and in the coming years, most people's jobs and lives might be dependent on internet. A network now holds a home's or a whole company's data and other computer necessities such as printers and scanners. Without a network and internet, most children would have hard time researching due to the revolution of e-resources and online research. Without a browser, internet, or Ethernet, many things that mankind has accomplished might not have been accomplished (Tyson, 2001).

Materials List

2 Cisco-Linksys UTP 510 10 ft. CAT5 cables

2 CablesToGo® 10 ft. CAT6 Molded Blue cables (Item Number: 27143)

2 CablestoGo® 3 ft. CAT5E Molded Grey cables (Item Number: 15177)

1 Samsung NP355E5C-A01US Laptop with pre-loaded Windows 8

1 AT&T 6 Mbps U-verse Internet Connection

1 AT&T 2WIRE 3801HGV Router

Procedure

1. Gather materials.
2. Make sure AT&T technician installed the network service and also setup the router.
3. Connect a Cisco-Linksys CAT5 cable to the router's Ethernet port 1.
4. Switch on the Samsung laptop.
5. Connect the other end of the CAT5 cable to the laptop.
6. Open Internet Explorer 11 browser.
7. In the address bar, type www.speedtest.net and hit enter.
8. Once the web page opens and loads, click on "Begin Test".
9. Wait for the test to complete.
10. Record the results.
11. Click on "Test Again".
12. Record the results once the test is complete.
13. Repeat steps 11 and 12 again.
14. Open this link in Internet Explorer:
<https://dl.google.com/tag/s/appguid%3D%7B8A69D345-D564-463C-AFF1-A69D9E530F96%7D%26iid%3D%7B5436CBCB-29F4-7110-18EE-B764AE0047EC%7D%26lang%3Den%26browser%3D4%26usagestats%3D0%26appname%3DGoogle%2520Chrome%26needsadmin%3Dtrue%26installdataindex%3Ddefaultbrowser/update2/installers/ChromeSetup.exe>
15. Let it download and run it with administrator privileges when download is complete.
16. Follow the installation procedures and only use recommended settings.
17. Open Google Chrome when installation is complete.

18. Repeat steps 7-13 in Google Chrome.
19. Open this link in Google Chrome:

<http://download.cdn.mozilla.net/pub/mozilla.org/firefox/releases/17.0.1/win32/en-US/Firefox%20Setup%202017.0.1.exe>
20. Let it download and run it with administrator privileges when download is complete.
21. Follow the installation procedures and only use recommended settings.
22. Open Mozilla Firefox when the installation is complete.
23. Repeat steps 7-13 in Mozilla Firefox.
24. Disconnect the Cisco-Linksys CAT5 cable from the computer and router.
25. Take the other Cisco-Linksys CAT5 cable and connect the cable to the laptop and router.
26. Repeat steps 6-13.
27. Repeat steps 7-13 in Google Chrome.
28. Repeat steps 7-13 in Mozilla Firefox.
29. Disconnect the Cisco-Linksys CAT5 cable from the computer and router.
30. Connect a CablesToGo[®] CAT5E cable to the router and laptop.
31. Repeat Steps 26-28.
32. Disconnect the CablesToGo[®] CAT5E cable from the router and laptop.
33. Connect another CablesToGo[®] CAT5E cable to the router and laptop.
34. Repeat steps 26-28.
35. Repeat step 32.
36. Connect a CablesToGo[®] CAT6 cable to the router and laptop.
37. Repeat step 34.
38. Disconnect the CablesToGo[®] CAT6 cable to the router and laptop.

39. Take another CablesToGo[®] CAT6 cable to the router and laptop.
40. Repeat step 34.
41. Repeat step 38.
42. Clean up testing area. Analyze results.

Results

Chrome CAT5	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.94	0.94
Cable 1 Trial 2	5.88	0.95
Cable 1 Trial 3	5.96	0.95
Cable 2 Trial 1	5.95	0.92
Cable 2 Trial 2	5.87	0.96
Cable 2 Trial 3	5.81	0.92

Chrome CAT5E	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.88	0.94
Cable 1 Trial 2	6.04	0.93
Cable 1 Trial 3	6	0.94
Cable 2 Trial 1	6.02	1
Cable 2 Trial 2	6	0.88
Cable 2 Trial 3	5.97	0.9

Chrome CAT6	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	6.05	1
Cable 1 Trial 2	6.15	0.97
Cable 1 Trial 3	6.11	0.94
Cable 2 Trial 1	6.1	0.96
Cable 2 Trial 2	6	0.95
Cable 2 Trial 3	6	0.94

Firefox CAT5	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.93	0.94
Cable 1 Trial 2	5.89	0.95
Cable 1 Trial 3	5.9	0.95
Cable 2 Trial 1	5.94	0.92
Cable 2 Trial 2	5.9	0.89
Cable 2 Trial 3	5.88	0.92

Firefox CAT5E	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.8	0.94
Cable 1 Trial 2	6	0.9
Cable 1 Trial 3	5.6	0.91
Cable 2 Trial 1	6	0.8
Cable 2 Trial 2	5.4	0.88
Cable 2 Trial 3	5.9	0.9

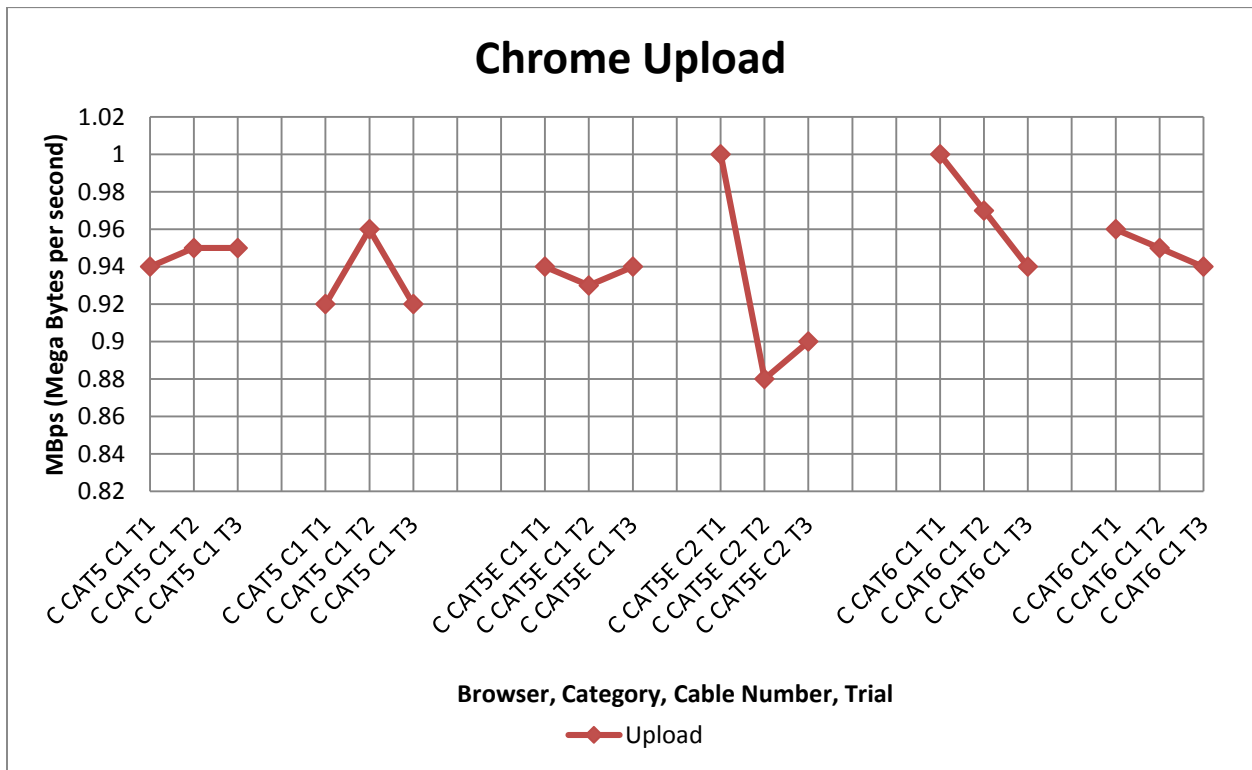
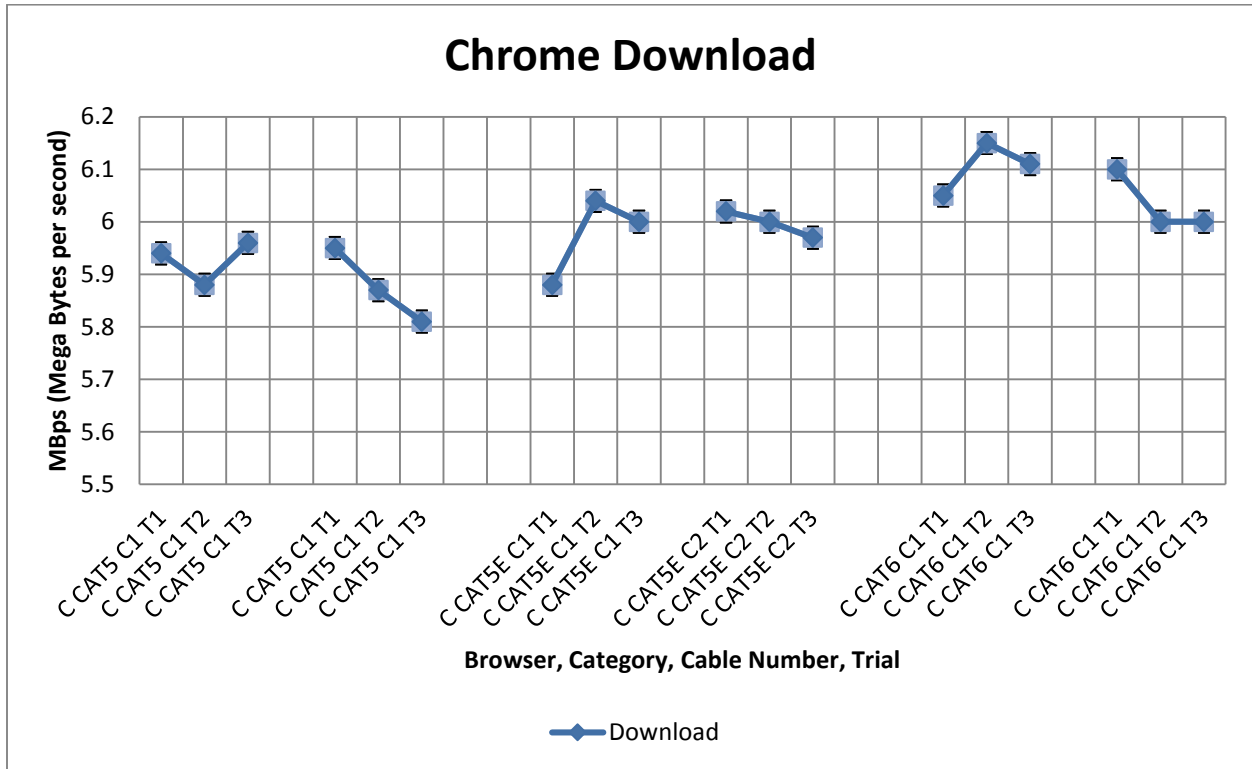
Firefox CAT6	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	6.05	0.89
Cable 1 Trial 2	6	0.92
Cable 1 Trial 3	6	0.94
Cable 2 Trial 1	6.1	0.96
Cable 2 Trial 2	6.2	0.95
Cable 2 Trial 3	5.4	0.9

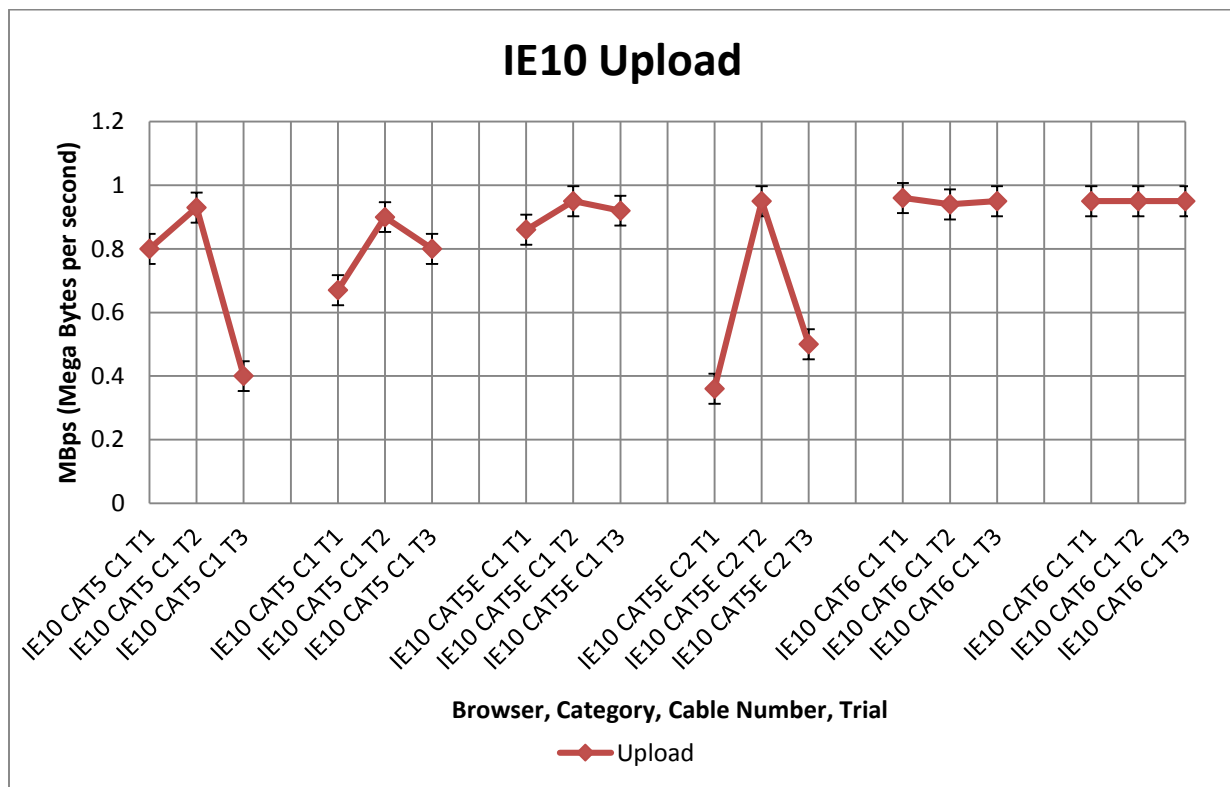
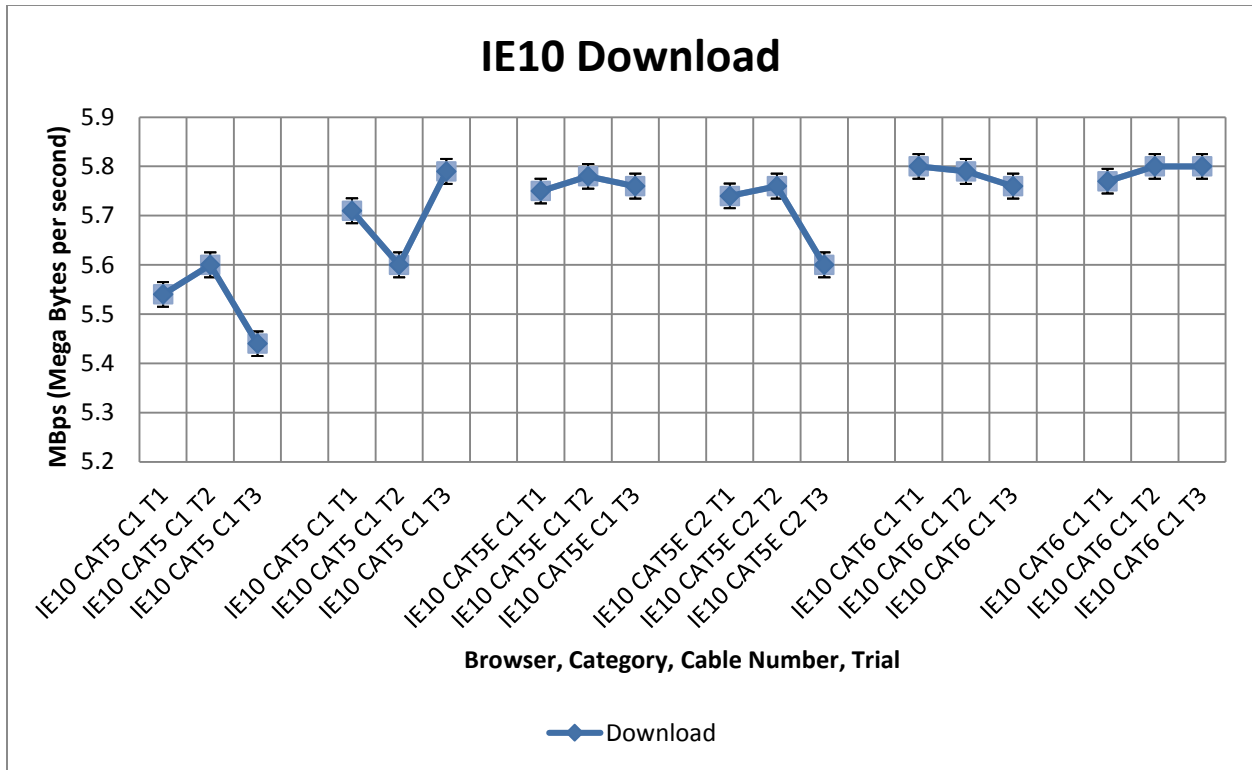
IE10 CAT5	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.54	0.8
Cable 1 Trial 2	5.6	0.93
Cable 1 Trial 3	5.44	0.4
Cable 2 Trial 1	5.71	0.67
Cable 2 Trial 2	5.6	0.9
Cable 2 Trial 3	5.79	0.8

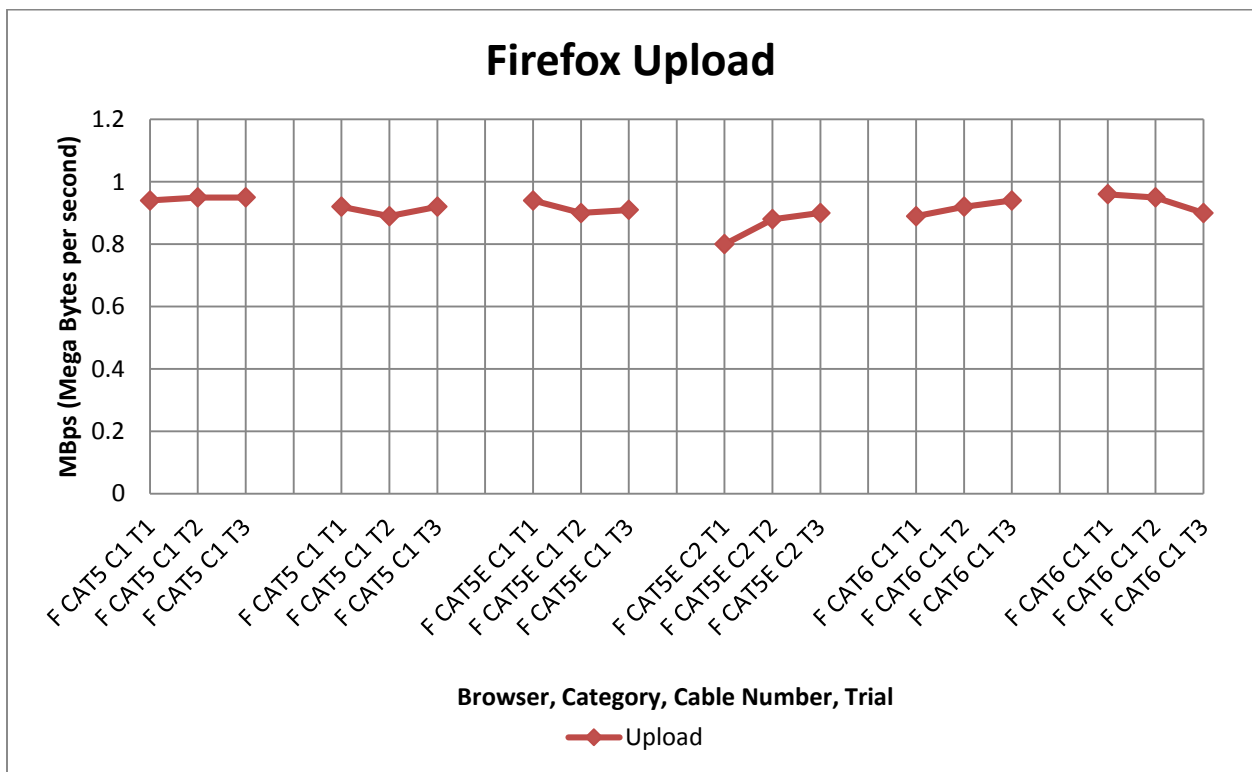
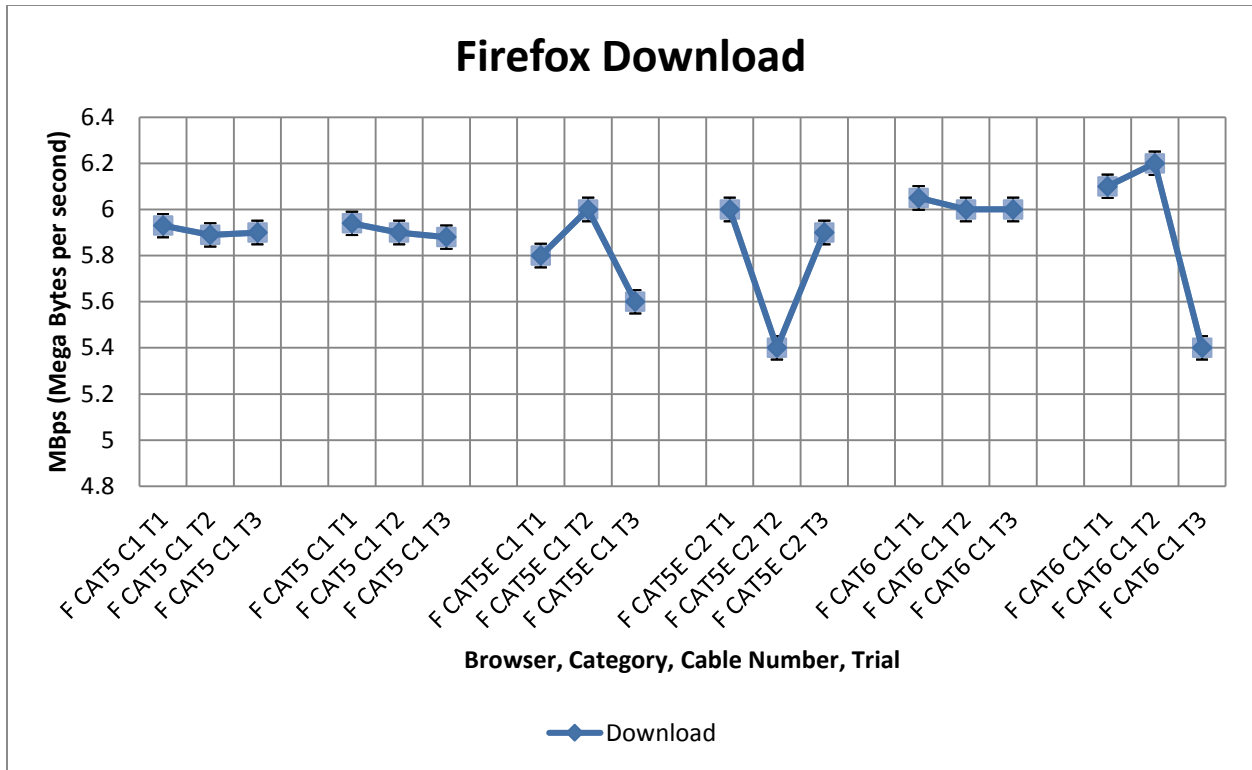
IE10 CAT5E	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.75	0.86
Cable 1 Trial 2	5.78	0.95
Cable 1 Trial 3	5.76	0.92
Cable 2 Trial 1	5.74	0.36
Cable 2 Trial 2	5.76	0.95
Cable 2 Trial 3	5.6	0.5

IE10 CAT6	Download (Mbps)	Upload (Mbps)
Cable 1 Trial 1	5.8	0.96
Cable 1 Trial 2	5.79	0.94
Cable 1 Trial 3	5.76	0.95
Cable 2 Trial 1	5.77	0.95
Cable 2 Trial 2	5.8	0.95
Cable 2 Trial 3	5.8	0.95

Graph







Conclusion

The purpose of this experiment was which category Ethernet cable is the fastest on which browser. The hypothesis for the experiment was if CAT 5, CAT 5e and CAT 6 Ethernet cables are tested for internet speed on Google Chrome, Internet Explorer, Mozilla Firefox, I think the CAT6 on Google Chrome will win because CAT6 are the newest type of Ethernet cables and Google Chrome is a new browser that incorporates new and fast internet browsers. The hypothesis was supported by the data.

The results of the experiment showed that CAT 5 with Chrome had average speeds of 5.9 MBPS, with a standard deviation of 2.59 MBPS. Internet Explorer 10 with CAT 5 had averaged 5.61 MBPS and a standard deviation of 2.54 MBPS. Mozilla Firefox with the CAT 5 had averaged 5.91 MBPS with a standard deviation of 2.6 MBPS. CAT 5E with Chrome had averaged 5.99 MBPS, with a standard deviation of 2.64 MBPS. Internet Explorer with CAT 5E handled an average of 5.73 MBPS with a standard deviation of 2.6 MBPS. Firefox and CAT 5E worked together for an average speed of 5.78 MBPS with a standard deviation of 2.56 MBPS. CAT 6 and Chrome topped all the results with a whopping average speed of 6.07 MBPS and a standard deviation of 2.67 MBPS. Internet Explorer with CAT 6 was able to handle an average speed of 5.79 MBPS with a standard deviation of 2.53 MBPS. Firefox and CAT 6 were cool with an average speed of 5.96 MBPS with a standard deviation of 2.63 MBPS.

The scientific explanation for the results is very clear. According to research, Google Chrome's Turbo Engine is the fastest render and page accelerator engine in the world. In the experiment, Chrome was able to pull the best speeds with the help of a Category 6 Ethernet cable (Garsiel & Irish, 2011).

Attempts to limit error in this experiment included not using Wi-Fi or other Ethernet ports during testing, doing testing over a period of time to not stress the Internet Service Provider, doing tests over the same internet connection, same and using the same router for each trial.

Some possible sources of error were using Wi-Fi during testing, cable not being connected properly and the system using internet connection for updates or background processes.

A limitation to this experiment was the usage on the community optic fiber trunk, which lowered my speeds a little.

From this experiment, the no discoveries were made. All scientific predictions were accurate.

In the future, this experiment could be improved by using a higher speed internet connection.

In the real world, this information can be useful to home internet users, businesses, and education-related buildings. A home-internet user's home cabling would determine his speed. A business with servers would see which cable could let their servers communicate faster. A college would like high-speed internet cabling for good internet around the campus.

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