***Lab 1: Physical Layer and Ethernet Overview***

CNIT34400-007  
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Submitted To: Waleed Nasr  
Date Submitted: 09/22/22  
Date Due: 09/22/22  
PROCEDURES

The Procedure section covers how to configure Cisco switches to enable network connections from three computers using CAT 5e/6 patch cables and Cisco 3750 switches. These switches need to be configured via terminal and how to interpret output information such as MAC address tables. It also contains information on how to configure SPAN sessions through the Cisco switches and how to use various methods of exchanging data between two computers on the same network. The procedure section also includes how to change duplex speeds and how to interpret the data.

The formatting key of the following section will obey rules below: buttons are **bold**; options are *italicized*; text entered into the computer is in Courier New style; menu and folder navigation are shown with the pipe symbol and are *italicized*: *Start | Programs | MS Office | Word*.

**Phase 1**

**GENERAL NETWORK CONFIGURATION**

To allow the three lab computers to connect to the internet without using the direct domain cable, it was necessary to connect the computers into the switches via the patch panels in the datacenter. Rack ‘XCO2’ that is referenced is the rack that contains the patch panel from the lab computers.

**Physical Configuration of XC02-PC03**

1. Connected a Cat 5e/6 cable from XC02 Rack 7 Patch Panel 02 Port 18 to XC02 Bench 11 Yellow Port 3.
2. Connected a Cat 5e/6 cable from Rack 7 Patch panel 02 port 18 to the console port on the back of the Cisco 3750 switch.
3. Connected a Cat 5e/6 cable from XC02 patch panel 02 port 17 to XC02 Bench 11 red port 3.
4. Connected a Cat 5e/6 cable from Rack 7 Patch panel 02 port 17 to the bottom Cisco 3750 switch.

**Physical Configuration of XC02-PC02**

1. Connected a Cat 5e/6 cable from XC02 Rack 7 Patch Panel 02 Port 16 to XC02 Bench 11 Red Port 2.
2. Connected a Cat 5e/6 cable from Rack 7 Patch panel 02 port 16 to the console port on the front of the Cisco 3750 switch.

**Physical Configuration of XC02-PC03**

1. Connected a Cat 5e/6 cable from XC02 Rack 7 Patch Panel 02 Port 15 to XC02 Bench 11 Red Port 1.
2. Connected a Cat 5e/6 cable from Rack 7 Patch panel 02 port 15 to the console port on the front of the Cisco 3750 switch.

**Reset Cisco Switch**

In order to provide network connectivity to our lab station, the Cisco 3750 switch assigned to our PCs required a manual reset. To do this, the “Mode” button on the physical switch was held down for approximately 30 seconds. Afterwards, the switch automatically rebooted and we proceeded with the next task of configuring each PC’s TCP/IP network settings.

**Network Configuration for PC 1 and PC 3 (Windows machines)**

After a physical connection was made between the lab computer and the switches in the datacenter, there needed to be configurations with the software to allow the hardware to function correctly. In this case, this was mostly done through the Windows settings.

1. Logged into the CIT domain by plugging the blue cat 5e/6 cable into the blue port on Bench 11 XC02-PC01/3.
2. Unplugged the Cat 5e/6 cable from the blue domain port after the login process completed and plugged it into the red ports on XC02-PC01/3.
3. Opened *Control Panel* | *Network Sharing Center* | *Network Adapters* | *Ethernet0* | *Properties* | *IPv4* and changed the network configuration settings as follows:  
   IP Address: 10.25.11.100 (10.25.11.101 for PC01).  
   Gateway: 10.25.11.1  
   Subnet mask: 255.255.255.0  
   DNS Servers: 10.2.1.11 and 10.2.1.12
4. Opened a command prompt by typing cmd in the Windows search bar and pinged the Purdue DNS by entering ping 10.2.1.11 to confirm the network connection.

**Network Configuration for PC02 (Linux)**

After a physical connection was made between the Linux lab computer and the switch in the datacenter, there needed to be configurations made to the switches to allow the hardware to work as intended. This was done through the Linux settings.

1. Plugged in Cat 5e/6 cable to the XC02-PC02 blue port and logged into the CIT domain
2. Unplugged the Cat 5e/6 cable from the blue port and plugged it into the red port.
3. Opened network settings by clicking on the network icon in the top right of the desktop.
4. Opened ‘Wired Connection’ and deleted the network profile.
5. Created a new network profile and set the IP configuration as follows:  
   IPv4: 10.25.11.102  
   Gateway: 10.25.11.1  
   Subnet Mask: 255.255.255.0  
   DNS: 10.2.1.11,10.2.1.12
6. Opened a terminal via the Linux search menu and pinged the Purdue DNS servers by typing ‘ping 10.2.1.11’.

**Set Up File Sharing Between PC 1 and PC 3**

File sharing can be an important task to be able to carry out in an enterprise environment. To configure file sharing, it is necessary to enable the file sharing feature on both computers as well as create a connection between the two PCs through their IP settings.

1. Opened Control Panel
2. Navigated to *Network and Internet | View network status and tasks | Change advanced sharing settings*
3. Clicked on **Turn on network discovery** and **Turn on file and printer sharing**
4. Opened *File Explorer | Network*
5. Searched *\\computername* in the search bar (substituted computername with desired PC name, which was labeled on the front of each PC)
6. Selected the user account of the desired user’s files to view and share files between PCs

**Printer Connectivity**

1. Opened a command prompt by searching cmd in the Windows search bar
2. Entered ping 10.3.1.206 in the command prompt to determine a connection to the lab printer

**Switch Console Access**

To be able to remotely log into the Cisco switch via the lab PCs, rollover cables needed to be connected between the switch and the desired PC, and terminal software was required for login. Physical rollover cable specifications can be found in the “Physical Configuration of XC02-PC03” on page 2.

1. Opened PuTTY
2. Selected *Serial* as connection type
3. Confirmed Serial line number is correct by opening Device Manager and expanding Ports (COM & LPT)
4. Selected *Open* to open a new serial connection with the switch

The contents of the switch MAC address table and start-up/running configuration can be found in Appendix B and C respectively. Explanations for the purpose of the MAC table can be found in Appendix A.

**Phase 2**

**PACKET ANALYSES**

**Creating a Notepad File with 600-1000 Words**

1. Created a notepad file on PC03 by right-clicking the desktop and selecting *New | Text Document.*
2. Copied random words into the text file until it contained 855 words.

**Sharing the Notepad File Across Machines**

File sharing can be enabled in the Windows Control Panel settings when right-clicking a file. This is necessary to allow both parties access to read the file as well as write to the file and share it back and forth.

1. Right-clicked the file on PC03 and selected *Share | Specific people.*
2. Added PC01 to the share folder.
3. Opened Wireshark on PC03 and used LAN Ethernet 2 as the network to capture on.
4. Entered the Wireshark capture filter ip addr == 10.25.11.101
5. Opened the file on PC01 that was shared from PC03.
6. Right-clicked the Frame corresponding to the file being opened on PC01 and selected *Follow | TCP Stream*

All explanations and question answers pertaining to sharing the notepad file can be found in Appendix A.

**SPAN**

Using the notation of port mirroring or Switched Port Analyzer (SPAN), a device connected to a switch can receive copies of network data to and from the switch. The device receiving copies of the data will be in “listening” mode and will be unable to receive or send any packets of its own.

1. Connected to the switch from PC03 using PuTTY.
2. Entered en to enter privileged executive mode, sh interfaces status to show the interface, and conf t to start configuring the switch.
3. Entered monitor session 1 source interface gigabitethernet 1/0/47 to set the source for the port mirroring.
4. Entered monitor session 1 destination interface gigabitethernet 1/0/1 to set the destination for the port mirroring to complete the SPAN session.
5. Navigated to http://espn.com on PC01 and monitored the connection packets with PC03.
6. Entered no monitor session 1 **to** reset the SPAN monitor session.

An explanation of the results of PC01’s visit to http://espn.com can be found in Appendix A.

**Construction of Twisted-Pair Media**

Characteristics and classifications of the constructed cables and evaluations of each type of ISO/IEC 11801:2002 standards can be found in table 1 in Appendix D. All question answers can be found in Appendix A.

**Applications of Different Types of Cables**

Using a constructed crossover cable, two of our PCs could be physically connected to directly enable file sharing and other network capabilities between them.

1. Connected PC01 and PC03 to the yellow ports on Bench 11.
2. Connected XC02 Rack 7 Yellow Port 1 and Yellow port 3 with the crossover cable.
3. Set the IP on PC03 to 192.168.0.3 and PC01 to 192.168.0.2
4. Pinged 192.168.0.2 on PC03, and typed \\192.168.0.2 in File Explorer’s Network search bar to confirm a physical connection between the two PCs.

Explanations on the uses of different cable types and answers pertaining to the physical connection between PC01 and PC03 can be found in Appendix A.

**Analysis and Evaluation of Unknown Cable Construction**

During the construction of the various cables, many tests returned with the modular tester proved that some construction attempts yielded “broken” cables. Remedies for repairing broken cables and further explanations of cable abilities can be found in Appendix A.

**Phase 3**

**ESTABLISHING THE LABORATORY ARCHITECTURE**

**Adding the HP Switch and Another Cisco Switch to the Network Architecture**

In order to reset the HP Procurve switch to the factory defaults, perform the following:

1. Using pointed objects, simultaneously press both the Reset and Clear buttons on the front of the switch. The power and fault lights come on.
2. Continue to press the Clear button while releasing the Reset button.
3. When the Self Test LED begins to blink, release the Clear button.

The MAC broadcast domain will include all 3 switches and the 3 computers inside since they are all on the same VLAN. The contention domains will be between each switch, between switch 1 and the CNIT Network, and lastly between each respective switch and computer connection.

**ANALYSIS OF BIDIRECTIONAL COMMUNICATION & LINE SPEEDS**

**Line Speed/Duplex Configurations Between Two Computers**

To test the time required to send files between the two Windows PCs, line speed/duplex settings needed to be configured to throttle the network sharing speeds.

1. Navigated to *Control Panel | Network and Internet | Network and sharing center | Ethernet1 | Properties | Configure… | Advanced | Speed and Duplex*
2. Selected desired duplex settings and speed limits for transferring each type of file

Setting speed/duplex settings were configured on all PCs for analysis of sharing speeds between PC01 and PC03. The speed/duplex settings of one PC, PC03, were set when uploading each file type to the online file storing site OneDrive. The parameters set and results of each test can be found in Appendix A.

**Creating a File of a Certain Size**

1. Entered fsutil file createnew *filePath/*fileName.txt *numberOfBytes* (Replaced filePath with desired file location, fileName with the desired name of the file, and numberOfBytes with with the requested count of bytes for the two types of files described in the lab report).

**ESTABLISHING ETHERNET BASELINE PERFORMANCE**

**MAC Address Configuration**

1. Opened a Windows command prompt and typed in net config rdr to get the *Workstation Active On* network adapter data.
2. Opened Regedit via the Windows search bar and determined the folder that had a matching *Workstation Active On* data value.
3. Right-clicked the folder and added a new registry named NetworkAddress and set the parameters to 1122334455
4. Opened *Control Panel* and navigated to *Network and Internet | Ethernet0 | IPv4* and clicked *Disable* and then *Enable*.
5. Re-opened the Windows command prompt and typed ipconfig /all to verify the new MAC address change.

Explanations and question answers pertaining to reconfiguring a PC’s MAC address can be found in Appendix A.

**Copying a Large File Between Host A and Host B**

1. Entered fsutil file createnew *C:\Users|long325\Share\testfile.bin* 262144000 in a command prompt to create a new text file with a size greater than 250 MB.
2. Entered *\\k206b11pc03\Share* in the Network section of the Windows File Explorer on PC01 to access PC03.
3. Copied *testfile.bin* from PC03’s Share folder to PC01’s desktop and used Wireshark on PC03 to measure the frames.
4. Verified TCP retransmitted frames are counted to 296 Frames by entering the Wireshark retransmission filter tcp.analysis.retransmission and tcp.analysis.fast\_retransmission

The calculation for the number of frames estimated for the transfer, recorded time for the file transfer and number of retransmitted frames can be found in tables 2 and 3 in Appendix E. Explanations for the actual vs. estimated number of frames required and causes for errored/retransmitted frames can be found in Appendix A.

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APPENDIX A: LAB MANUAL QUESTIONS

**Phase 1**

**Switch Console Access**

**Explain the purpose of the MAC table.**

The purpose of the MAC address table is to store the associated MAC address of computers connected to the switch, for the purpose of switching packets between hosts on the same VLAN. The most direct way to save the configuration from the running-config to the startup-config is using the wr command.

**Explain the purpose of the start-up and running configurations.**

Any changes made to the switch’s configuration are placed in the running configuration. The purpose of the start-up configuration is to save all changes made to the switch in the running configuration, and apply such configuration changes after boot. There were 5 VLANs configured after a factory reset and they were assigned VLAN IDs of 1, and 1002-1005.

**Phase 2**

**Packet Analysis**

**What layers of the OSI model are involved in file sharing across the network?**

The OSI models that were involved with sharing a file over the network are all 7 layers, since in order to establish the connection we need to utilize the Application, Presentation and Session Layers. Then the Transport, Network, Data Link and Physical layers take over to get the data over the network from one pc to the other utilizing TCP/IP.

**What protocols were involved during the file sharing process in the LAN environment?**

The protocols used for the file share on the LAN network were SMB, NetBIOS, TCP, IP, ARP, and LLDP.

**Use one packet as an example to explain the how TCP/IP layered architecture and the encapsulation processed.**

Taking a single packet from the file transfer as an example to further explain the OSI model, when we initiate the file transfer the files data will be broken up into packets. Which will first be encapsulated by Microsoft's protocols for network file transfers (SMB and NetBIOS), followed by the Transmission Control Protocol in the transport layer, and IP will next be encapsulated to support the network layer of the data transfer, and the final protocols used before the data is put onto the wire are MAC and LLC. The packet is then sent over the wire, and switched to the destination computer to be encapsulated.

**If someone were only given the captured packets, are they able to reassemble the file transmitted? Use the captured packets to support your answer.**

If someone was ‘listening’ in on the file transfer, by receiving and copying all packets relating to the file transfer, then reading the data from the frame data is possible if it is done over unencrypted protocols and if the data itself is in paintext. After analyzing a packet from the words list file transfer, the specific words on the list can be identified. If all packets relating to the file transfer were captured, it would be possible to reconstruct the original file and data.

**SPAN**

**Explain the results from the SPAN session connecting to espn.com.**

When PC01 and PC03 were connected in a SPAN session with PC01 being the source, and PC03 being the destination for the session, Wireshark was run on PC03 to capture the packets from PC01 connecting to http://espn.com. The packets that were captured with the correct display filter to only show the packets from the SPAN session were only TCP and HTTPS packets. Going to the espn website in HTTP automatically rerouted it to HTTPS and Wireshark was able to capture those packets. This is able to be captured this way because the SPAN session was allowing PC01’s connectivity input/output of data to be mirrored to PC03, who could analyze it with Wireshark.

**Construction of Twisted-Pair Media**

**What are the physical layer characteristics of the cables you have constructed?**

The cables that were created have a number of characteristics depending on what kind of cable that was constructed. When electrical signals come through the straight-through cables, the 1’s and 0’s (or ‘on’ and ‘off’) should match from the source to destination. The signals should be identical on both ends of it, which can be tested via an RJ45 network cable testing device. Crossover cables, however, follow a different format in that the signals match to where the physical cable goes as opposed to being identical. For example, if the striped green wire is in the first slot, it may be somewhere else on the other end of the cable, but the signal should match from TIA-568B physical format to TIA-568A format.

**What is the correct term for each of the cables you constructed?**

Classifying either the straight-through or crossover cables as simply “ethernet” cables isn’t accurate to their different functions. Ethernet cables are simply the wires that comply with Ethernet protocols. The cables that follow the TIA-568B specifications are referred to as, as the lab manual states, straight through cables, or patch cables. The lab manual is also correct on the name of the cables following TIA-568A specification, that being crossover cables. The cables where each wire sticks out the end of the cable terminator are referred to as pass-through cables, while the cables where each wire is contained within the terminator are called traditional or non pass-through.

**Applications of different types of cable**

**What kinds of connections typically use straight-through cables, crossover cables, and rollover cables?**

The type of network connections that typically use straight through cables are connecting a host to a switch, or numerous switches together. Crossover cables are often used to connect two computers together without utilizing another network device (such as a switch). The final rollover cable connection type is used to connect a host to the console interface of a network device (switch, router, etc.).

**Use a crossover cable that you construct to directly connect two PCs and configure the lab computers such that files can be shared between computers. What IP addresses and network masks were used? Does a default gateway need to be configured?**

The IP addresses and network mask of the computers we connected using a crossover cable were 192.168.0.1/24 and 192.168.0.2/24. The default gateway needs to be set as the IP address of the opposite host. For example, the host with the IP address of 192.168.0.1 needs to have a default gateway of 192.168.0.2 same vice versa.

**Analysis and evaluation of unknown cable construction**

**Assuming these are cables constructed using the TIA-568B standard, what must be done to repair each of these cables?**

The cables need to be repaired by identifying where the break in the wire is, or if the connection has been punched down incorrectly. Then cut the wire where the mistake was made, punch down the twisted pairs in a new RJ45 connector according to the TIA-568B standard and test continuity to ensure functionality.

**Assuming these are cables constructed using the ISOC standard, what must be done to repair each of these cables?**

The cables need to be repaired by identifying where the break in the wire is, or if the connection has been punched down incorrectly. Then cut the wire where the mistake was made, punch down the twisted pairs in a new RJ45 connector according to the ISO 11801 standard and test continuity to ensure functionality.

**Why will a rollover cable not be sufficient for transmission of data over an Ethernet-based network?**

The rollover cable will not transfer packets over an Ethernet based network since the physical connection will be crossed and the NIC will not read the receiving/ transmitting data on the correct pins. This will result in no network connectivity.

**Phase 3**

**Analysis of bidirectional communication & line speeds in Ethernet**

**How does the calculated time compare to the actual time? Why?**

The calculated times for each of the file transfers were shorter than the actual time to transfer the files, this is often because of TCP retransmissions and packets being dropped.

**Compare and contrast the impact of link speed and duplex mode.**

The link speed often changed the time to transfer by a factor of 10 for the large file compared to the small file. The duplex mode often doubled or more the time to transfer the file, depending on the file size and transfer rate.

**Establishing Ethernet Baseline Performance**

**Explain the purpose and function of the MAC address table.**

The main purpose of the MAC address table on the switch is to maintain a record of all the connected devices so the switch can forward packets to the correct device recipient, this is how the switch accomplished its task to transfer packets to the correct end device according to the frames MAC header.

**Reconfigure the MAC address on one of the host computers to be 00:11:22:33:44:55. Explain the effect this has on the host and the switch.**

The host device will reflect this MAC address when retrieving information regarding the NIC, this will also result in the switch sending out another ARP request to the client to add the new MAC to the switches address table.  
**Why would it be necessary to reconfigure a host in this manner?**

A host might be reconfigured this way for nefarious means, this might spoof the MAC address of another device on the network to cause problems. This might also be accomplished for the means of deterring administrators from tracking network activity, but often changing the MAC address of a host is not enough to become completely anonymous on the network.

**Copy a large file (>250 MB) between Host A and Host B while recording the time elapsed. Calculate the number of Ethernet frames required to transfer of this file based on the standard payload size of Ethernet frames (assuming no errors occur in transmission).**

The number of Ethernet frames required to transfer a file with the size of 250MB between two hosts is calculated to be around 174,762 frames, this is calculated assuming the standard Ethernet maximum payload size of 1500 bytes and assuming no errors in transmission.

**Is this the actual number of frames that were transmitted? Explain.**

The actual number of frames transmitted was quite a less than expected (38062 Frames), we determined this was as a result of the switch having jumbo frames enabled. This allowed for packets to contain more information in the payload and reduced the number of frames needed. The time measured to transfer the file between hosts was 4.72 seconds.

**Track the number of errored/retransmitted frames that occurred during this transfer. Explain the potential cause(s).**

The large number of retransmitted frames that occurred during this transfer was as a result of packets being dropped on the network, and the transmission control protocol returned a request for the frames to be retransmitted.

APPENDIX B: SWITCH MAC ADDRESS TABLE

This section contains a copy of the MAC address table of the first switch, in the beginning of the lab

**Switch 1 MAC Address Table**

Switch#sh mac address-table

Mac Address Table

-------------------------------------------

Vlan Mac Address Type Ports

---- ----------- -------- -----

All 0100.0ccc.cccc STATIC CPU

All 0100.0ccc.cccd STATIC CPU

All 0180.c200.0000 STATIC CPU

All 0180.c200.0001 STATIC CPU

All 0180.c200.0002 STATIC CPU

All 0180.c200.0003 STATIC CPU

All 0180.c200.0004 STATIC CPU

All 0180.c200.0005 STATIC CPU

All 0180.c200.0006 STATIC CPU

All 0180.c200.0007 STATIC CPU

All 0180.c200.0008 STATIC CPU

All 0180.c200.0009 STATIC CPU

APPENDIX B: SWITCH MAC ADDRESS TABLE (CONTINUED)

All 0180.c200.000a STATIC CPU

All 0180.c200.000b STATIC CPU

All 0180.c200.000c STATIC CPU

All 0180.c200.000d STATIC CPU

All 0180.c200.000e STATIC CPU

All 0180.c200.000f STATIC CPU

All 0180.c200.0010 STATIC CPU

All ffff.ffff.ffff STATIC CPU

1 78da.6eca.b661 DYNAMIC Gi3/0/47

1 885a.9249.3c02 DYNAMIC Gi3/0/47

Total Mac Addresses for this criterion: 22

APPENDIX C: SWITCH CONFIGURATIONS

This section contains a full copy of all the final configuration changes made to the switches in this lab.

**Startup Configuration for Switches 1 – 3**

Switch 1 through 3 had similar configurations and therefore, only switch 1’s configuration is included.

Switch#sh startup-config

Using 2524 out of 524288 bytes

! Last configuration change at 01:55:00 UTC Wed Mar 30 2011

! NVRAM config last updated at 02:41:37 UTC Wed Mar 30 2011

version 15.0

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname Switch

boot-start-marker

boot-end-marker

no aaa new-model

switch 3 provision ws-c3750e-48pd

system mtu routing 1500

spanning-tree mode pvst

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

spanning-tree extend system-id

vlan internal allocation policy ascending

interface FastEthernet0

no ip address

interface GigabitEthernet3/0/1

interface GigabitEthernet3/0/2

interface GigabitEthernet3/0/3

interface GigabitEthernet3/0/4

interface GigabitEthernet3/0/5

interface GigabitEthernet3/0/6

interface GigabitEthernet3/0/7

interface GigabitEthernet3/0/8

interface GigabitEthernet3/0/9

interface GigabitEthernet3/0/10

interface GigabitEthernet3/0/11

interface GigabitEthernet3/0/12

interface GigabitEthernet3/0/13

interface GigabitEthernet3/0/14

interface GigabitEthernet3/0/15

interface GigabitEthernet3/0/16

interface GigabitEthernet3/0/17

interface GigabitEthernet3/0/18

interface GigabitEthernet3/0/19

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

interface GigabitEthernet3/0/20

interface GigabitEthernet3/0/21

interface GigabitEthernet3/0/22

interface GigabitEthernet3/0/23

interface GigabitEthernet3/0/24

interface GigabitEthernet3/0/25

interface GigabitEthernet3/0/26

interface GigabitEthernet3/0/27

interface GigabitEthernet3/0/28

interface GigabitEthernet3/0/29

interface GigabitEthernet3/0/30

interface GigabitEthernet3/0/31

interface GigabitEthernet3/0/32

interface GigabitEthernet3/0/33

interface GigabitEthernet3/0/34

interface GigabitEthernet3/0/35

interface GigabitEthernet3/0/36

interface GigabitEthernet3/0/37

interface GigabitEthernet3/0/38

interface GigabitEthernet3/0/39

interface GigabitEthernet3/0/40

interface GigabitEthernet3/0/41

interface GigabitEthernet3/0/42

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

interface GigabitEthernet3/0/43

interface GigabitEthernet3/0/44

interface GigabitEthernet3/0/45

interface GigabitEthernet3/0/46

interface GigabitEthernet3/0/47

interface GigabitEthernet3/0/48

interface GigabitEthernet3/0/49

interface GigabitEthernet3/0/50

interface GigabitEthernet3/0/51

interface GigabitEthernet3/0/52

interface TenGigabitEthernet3/0/1

interface TenGigabitEthernet3/0/2

interface Vlan1

no ip address

ip http server

ip http secure-server

line con 0

line vty 5 15

end

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

**Running Configuration for Switches 1 – 3**

Switch 1 through 3 had similar configurations and therefore, only switch 1’s configuration is included.

Switch#show running-config

Building configuration...

Current configuration : 2524 bytes

! Last configuration change at 01:55:00 UTC Wed Mar 30 2011

! NVRAM config last updated at 02:41:37 UTC Wed Mar 30 2011

version 15.0

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname Switch

boot-start-marker

boot-end-marker

no aaa new-model

switch 3 provision ws-c3750e-48pd

system mtu routing 1500

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

spanning-tree mode pvst

spanning-tree extend system-id

vlan internal allocation policy ascending

interface FastEthernet0

no ip address

interface GigabitEthernet3/0/1

interface GigabitEthernet3/0/2

interface GigabitEthernet3/0/3

interface GigabitEthernet3/0/4

interface GigabitEthernet3/0/5

interface GigabitEthernet3/0/6

interface GigabitEthernet3/0/7

interface GigabitEthernet3/0/8

interface GigabitEthernet3/0/9

interface GigabitEthernet3/0/10

interface GigabitEthernet3/0/11

interface GigabitEthernet3/0/12

interface GigabitEthernet3/0/13

interface GigabitEthernet3/0/14

interface GigabitEthernet3/0/15

interface GigabitEthernet3/0/16

interface GigabitEthernet3/0/17

interface GigabitEthernet3/0/18

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

interface GigabitEthernet3/0/19

interface GigabitEthernet3/0/20

interface GigabitEthernet3/0/21

interface GigabitEthernet3/0/22

interface GigabitEthernet3/0/23

interface GigabitEthernet3/0/24

interface GigabitEthernet3/0/25

interface GigabitEthernet3/0/26

interface GigabitEthernet3/0/27

interface GigabitEthernet3/0/28

interface GigabitEthernet3/0/29

interface GigabitEthernet3/0/30

interface GigabitEthernet3/0/31

interface GigabitEthernet3/0/32

interface GigabitEthernet3/0/33

interface GigabitEthernet3/0/34

interface GigabitEthernet3/0/35

interface GigabitEthernet3/0/36

interface GigabitEthernet3/0/37

interface GigabitEthernet3/0/38

interface GigabitEthernet3/0/39

interface GigabitEthernet3/0/40

interface GigabitEthernet3/0/41

APPENDIX C: SWITCH CONFIGURATIONS (CONTINUED)

interface GigabitEthernet3/0/42

interface GigabitEthernet3/0/43

interface GigabitEthernet3/0/44

interface GigabitEthernet3/0/45

interface GigabitEthernet3/0/46

interface GigabitEthernet3/0/47

interface GigabitEthernet3/0/48

interface GigabitEthernet3/0/49

interface GigabitEthernet3/0/50

interface GigabitEthernet3/0/51

interface GigabitEthernet3/0/52

interface TenGigabitEthernet3/0/1

interface TenGigabitEthernet3/0/2

interface Vlan1

no ip address

ip http server

ip http secure-server

line con 0

line vty 5 15

end

APPENDIX D: CHARACTERISTICS OF CABLE CATEGORIES

Table 1: Cable categories, their characteristics and resulting data rates.

| **Category** | **Data Rate** | **Bandwidth** | **Max Distance** |
| --- | --- | --- | --- |
| Cat 3 | 10 MB/s | 16 MHz | 100m |
| Cat 4 | 16 MB/s | 20 MHz | 100m |
| Cat 5 | 100 MB/s | 100 MHz | 100m |
| Cat 5e | 1 GB/s | 100 MHz | 100m |
| Cat 6 | 1 GB/s | 250 MHz | 100m |
| Cat 6a | 10 GB/s | 500 MHz | 100m |
| Cat 7 | 10 GB/s | 600 MHz | 100m |
| Cat 7a | 10 GB/s | 1000 MHz | 100m |
| Cat 8 | 25-40 GB/s | 2000 MHz | 30m |

Source: (tripplite.com, 2022).

APPENDIX E: SPEED/DUPLEX TEST RESULTS

Table 2: Line speed/duplex configurations and timings between computers

| **File Size** | **Speed** | **Duplex** | **Time Elapsed** |
| --- | --- | --- | --- |
| Small file (~1MB) | 10 Mb/s | Full Duplex | 1.03 seconds |
| Small file (~1MB) | 100 Mb/s | Full Duplex | 0.50 seconds |
| Small file (~1MB) | 10 Mb/s | Half Duplex | 3.30 seconds |
| Small file (~1MB) | 100 Mb/s | Half Duplex | 0.55 seconds |
| Large file (~100MB) | 10 Mb/s | Full Duplex | 83.00 seconds |
| Large file (~100MB) | 100 Mb/s | Full Duplex | 11.44 seconds |
| Large file (~100MB) | 10 Mb/s | Half Duplex | 99.93 seconds |
| Large file (~100MB) | 100 Mb/s | Half Duplex | 14.57 seconds |

Table 3: Line speed/duplex configurations between a computer and OneDrive

| **File Size** | **Speed** | **Duplex** | **Time Elapsed** |
| --- | --- | --- | --- |
| Small file (~1MB) | 10 Mb/s | Full Duplex | 3.29 seconds |
| Small file (~1MB) | 100 Mb/s | Full Duplex | 0.73 seconds |
| Small file (~1MB) | 10 Mb/s | Half Duplex | 1.96 seconds |
| Small file (~1MB) | 100 Mb/s | Half Duplex | 1.60 seconds |
| Large file (~100MB) | 10 Mb/s | Full Duplex | 90.33 seconds |
| Large file (~100MB) | 100 Mb/s | Full Duplex | 33.29 seconds |
| Large file (~100MB) | 10 Mb/s | Half Duplex | 107.27 seconds |
| Large file (~100MB) | 100 Mb/s | Half Duplex | 12.17 seconds |