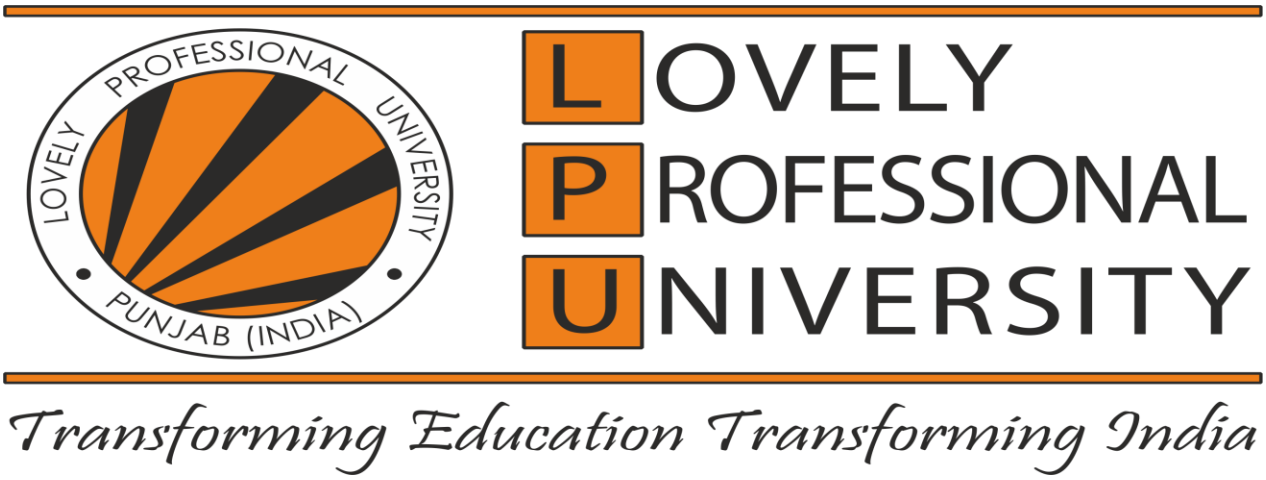

SIX WEEKS SUMMER TRAINING REPORT

On

Mastering Network Fundamentals (CCNA)

Submitted by

Deepak Dhull
11709831

Networks Fundamentals

Under the Guidance of

Assistant Prof Deepak Prashar

School of Computer Science & Engineering
Lovely Professional University, Phagwara

(May-June 2019)

DECLARATION

I hereby declare that I have completed my four weeks summer training at LPU from 25/05/2019 to 25/06/2019 under the guidance of Deepak Prashar. I have declared that I have worked with full dedication during these four weeks of training and my learning outcomes fulfill the requirements of training for the award of the degree of Introduction of Game Development, Lovely Professional University, Phagwara.

(Signature of the student)

Deepak Dhull

11709831

Date: 26 July 2019

Acknowledgment

Apart from the efforts of myself, the success of any project depends largely on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. I would like to show my greatest appreciation to Prof Deepak Prashar. I can’t say thank you enough for his tremendous support and help. I feel motivated and encouraged every time I attend his meeting. Without his encouragement and guidance, this project would not have materialized. I am grateful for their constant support and help.

Summer Training certificate

CENTRE FOR PROFESSIONAL ENHANCEMENT

[Under the Aegis of Lovely Professional University, Jalandhar-Delhi G.T. Road, Phagwara (Punjab)]

Certificate No. 169514

Certificate of Participation

This is to certify that Mr./Ms. **Deepak Dhull** S/O,D/O,W/O **Mr. Rishi Pal**

student of **School of Computer Science and Engineering**

Registration No. **11709831** pursuing **BTECH-CSE**

participated in the event **Mastering Network Fundamental (CCNA)**

held from **25-05-2019** to **25-06-2019** organized by **Center for Professional Enhancement**

Lovely Professional University (Punjab).

Date of Issue : 16-07-2019
Place of Issue: Phagwara (India)

Prepared by
(Administrative Officer-Records)

Organizing Secretary

Head of School

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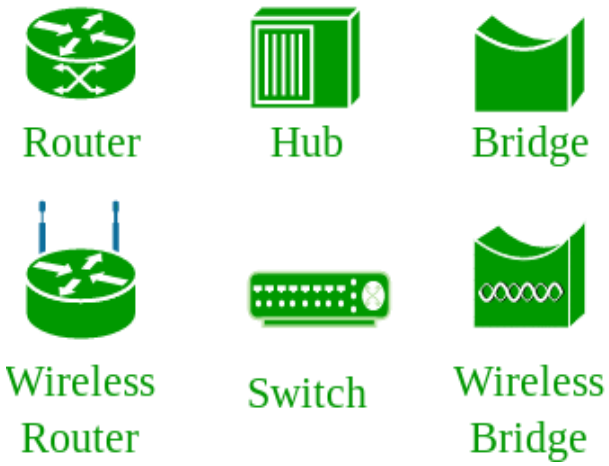
1. Introduction to Computer Networks

It is the interconnection of multiple devices, generally termed as Hosts connected using multiple paths for the purpose of sending/receiving data or media.

There are also multiple devices or mediums which helps in the communication between two different devices which are known as **Network devices**. Ex: Router, Switch, Hub, Bridge.



CCNA

CCNA is a popular certification among computer network engineers. Full Form of CCNA is Cisco Certified Network Associate. It is a certification program valid for all type of engineers. It includes entry-level network engineers, Network Administrators, Network Support Engineers and Network Specialists.

It is estimated that more than 1 million CCNA certificates have been awarded since it was first launched in 1998.

The CCNA certificate covers a broad range of networking concepts. It helps candidates to prepare for the latest network technologies they are likely to work on.

Some of the common topics covered under CCNA certification include:

- OSI models
- IP addressing
- WLAN and VLAN
- Network security and management (ACL included)
- Routers / routing protocols (EIGRP, OSPF, and RIP)
- IP Routing
- Network Device Security
- Troubleshooting

Why to acquire a CCNA certification?

- The certificate validates a professional's ability to understand, operate, configure and troubleshoot medium-level switched and routed networks. It also includes the verification and implementation of connections via remote sites using WAN.
- It teaches the candidate how to create point-to-point network
- It teaches about how to meet users requirement by determining the network topology
- It imparts on how to route protocols in order to connect networks
- It explains about how to construct network addresses
- It explains on how to establish a connection with remote networks.
- The certificate holder can install, configure and operate LAN and WAN services for small networks
- CCNA certificate is a pre-requisite for many other Cisco certification like CCNA Security, CCNA Wireless, CCNA Voice, etc.
- Easy to follow study material available.

OSI :

OSI stands for **Open Systems Interconnection**. It is a reference model that specifies standards for communications protocols and also the functionalities of each layer.

Protocol :

A protocol is the set of rules or algorithms which define the way how two entities can communicate across the network and there exists different protocol defined at each layer of the OSI model. Few of such protocols are TCP, IP, UDP, ARP, DHCP, FTP.

One of the earliest examples of a computer network was a network of communicating computers that functioned as part of the U.S. military's Semi-Automatic Ground Environment (SAGE) radar system. In 1969, the University of California at Los Angeles, the Stanford Research Institute, the University of California at Santa Barbara and the University of Utah were connected as part of the Advanced Research Projects Agency Network (ARPANET) project. It is this network that evolved to become what we now call the internet.

Networks are used to:

- Facilitate communication via email, video conferencing, instant messaging, etc.
- Enable multiple users to share a single hardware device like a printer or scanner
- Enable file sharing across the network
- Allow for the sharing of software or operating programs on remote systems
- Make information easier to access and maintain among network users

There are many types of networks, including:

- Local Area Networks (LAN)
- Personal Area Networks (PAN)
- Home Area Networks (HAN)
- Wide Area Networks (WAN)
- Campus Networks
- Metropolitan Area Networks (MAN)

- Enterprise Private Networks
- Internetworks
- Backbone Networks (BBN)
- Global Area Networks (GAN)
- The Internet

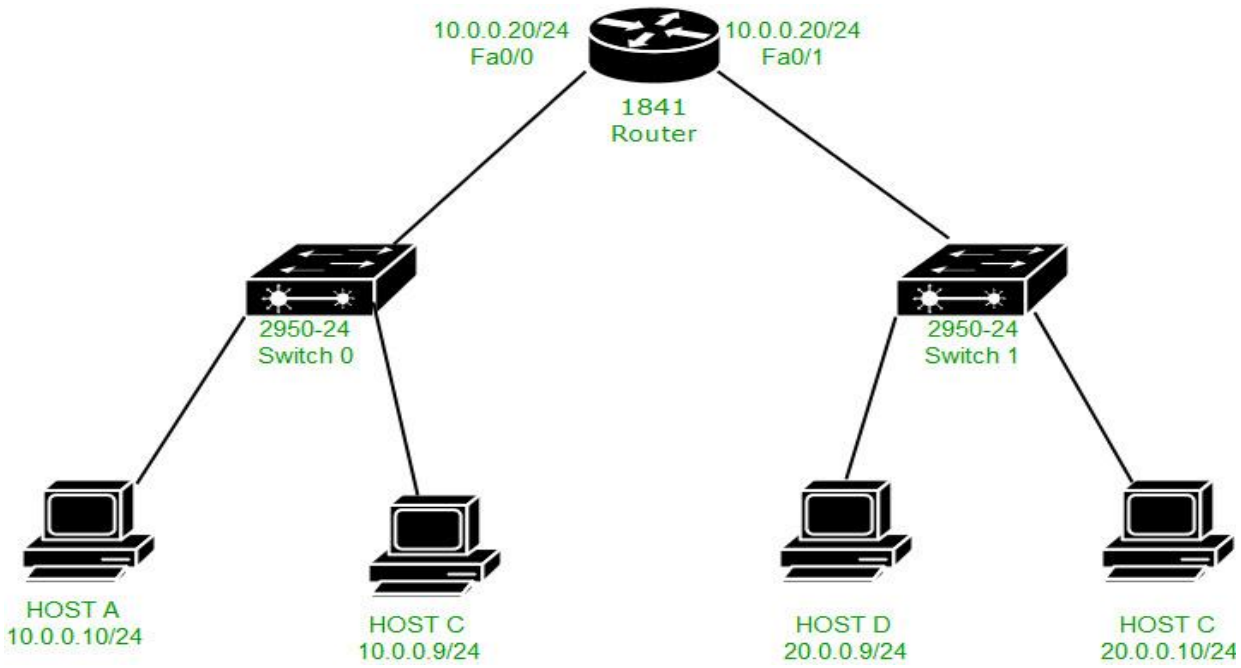
Router

A router is a Layer 3 network gateway device, meaning that it connects two or more networks and that the router operates at the network layer of the OSI model.

Routers contain a processor (CPU), several kinds of digital memory, and input-output (I/O) interfaces. They function as special-purpose computers, one that does not require a keyboard or display.

The router's memory stores an embedded operating system (O/S). Compared to general-purpose OS products like Microsoft Windows or Apple Mac OS, router operating systems limit what kind of applications can be run on them and also need much smaller amounts of storage space. Examples of popular router operating systems include *Cisco Internetwork Operating System (IOS)* and DD-WRT. These operating systems are manufactured into a binary firmware image and are commonly called *router firmware*.

By maintaining configuration information in a part of memory called the routing table, routers also can filter both incoming or outgoing traffic based on the addresses of senders and receivers.

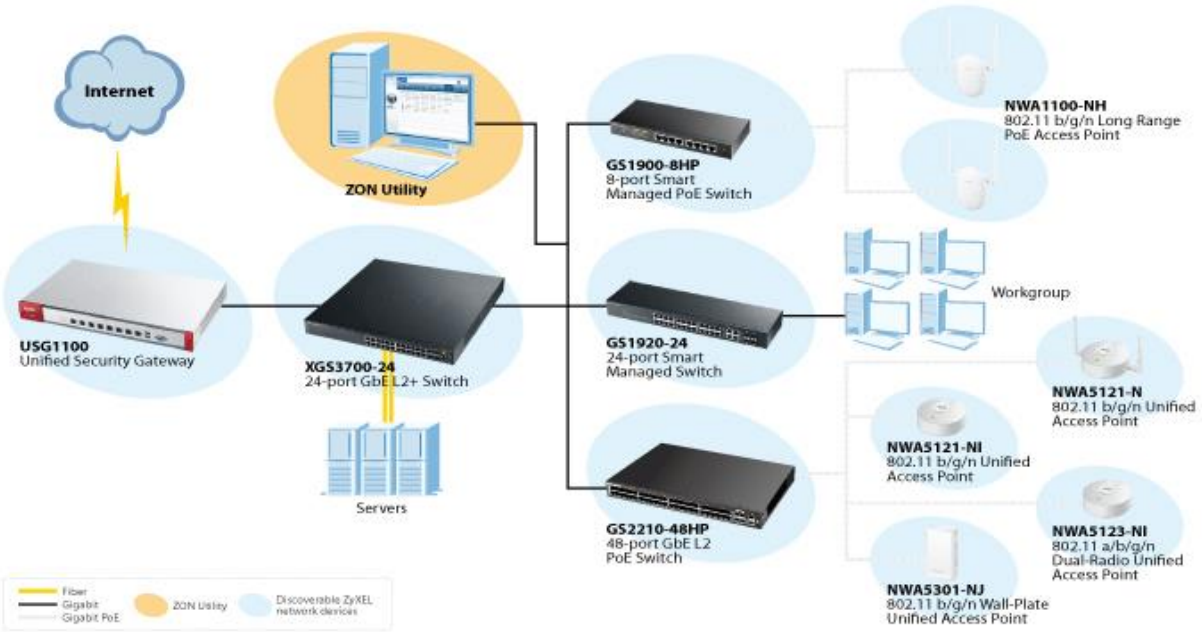

10.0.0.20/24
Fa0/0
10.0.0.20/24
Fa0/1
1841
Router
2950-24
Switch 0
2950-24
Switch 1
HOST A
10.0.0.10/24
HOST C
10.0.0.9/24
HOST D
20.0.0.9/24
HOST C
20.0.0.10/24


LINKSYS
LINKSYS

Switch :

A switch is a device in a computer network that connects other devices together. Multiple data cables are plugged into a switch to enable communication between different networked devices. Switches manage the flow of data across a network by transmitting a received network packet only to the one or more devices for which the packet is intended. Each networked device connected to a switch can be identified by its network address, allowing the switch to direct the flow of traffic maximizing the security and efficiency of the network.

A switch is more intelligent than an Ethernet hub, which simply retransmits packets out of every port of the hub except the port on which the packet was received, unable to distinguish different recipients, and achieving an overall lower network efficiency.



Switch

Cables :

Networking cables are networking hardware used to connect one network device to other network devices or to connect two or more computers to share printers, scanners etc. Different types of network cables, such as coaxial cable, optical fiber cable, and twisted pair cables, are used depending on the network's physical layer, topology, and size. The devices can be separated by a few meters e.g. Ethernet or nearly unlimited distances e.g. The interconnections of the Internet .

There are several technologies used for network connections. Patch cables are used for short distances in offices and wiring closets. Electrical connections using twisted pair or coaxial cable are used within a building. Optical fiber cable is used for long distances or for applications requiring high bandwidth or electrical isolation. Many installations use structured cabling practices to improve reliability and maintainability. In some home and industrial applications power lines are used as network cabling.

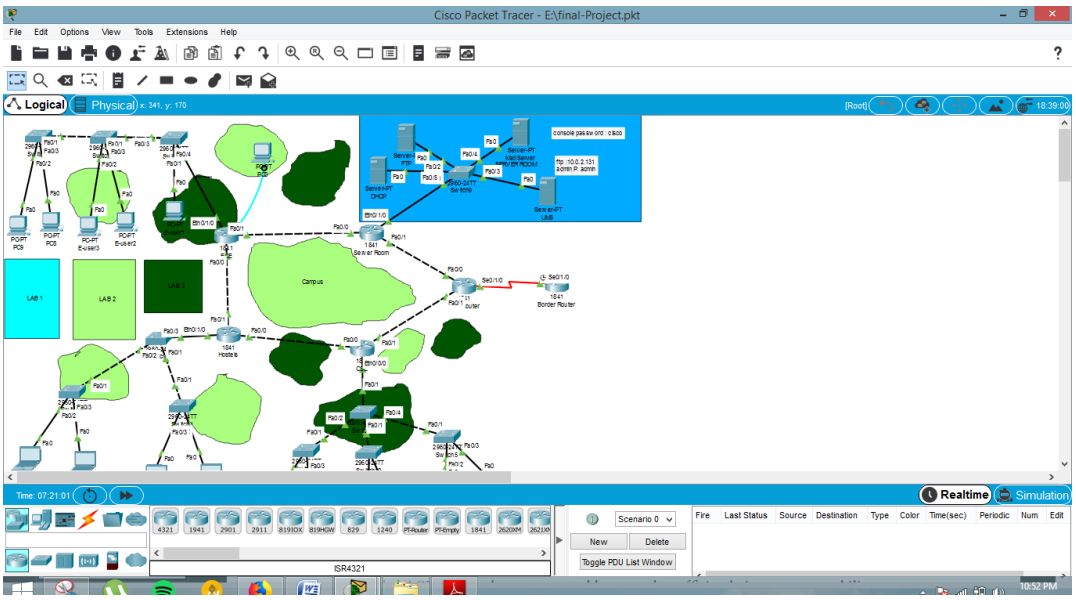
2. Technology Learnt

CISCO Packet Tracer Simulator

Packet Tracer is a powerful network simulator that can be utilized in training for Network certifications by allowing students to create networks with an almost unlimited number of devices and to experience troubleshooting without having to buy real Cisco routers or switches. The tool is created by Cisco Systems. The purpose of Packet Tracer is to offer students a tool to learn the principles of networking as well as develop Cisco technology specific skills. However, it is not be used as a replacement for Routers or Switches.

As Cisco says, the best way to learn about networking is to do it. Hands-on equipment gets students started, but is limited to the number of devices in the lab. Furthermore, Educators use Packet Tracer to demonstrate complex technical concepts and networking systems. Students use Packet Tracer to complete assignments, working on their own or in teams.

As a network engineer, I used to simulate complex scenarios first on packet tracer and then deploy them on the real equipments.



Packet Tracer complements the Networking Academy curricula, allowing instructors to easily teach and demonstrate complex technical concepts and networking systems design. With Packet Tracer, instructors can customize individual or multiuser activities, providing hands-on lessons for students that offer value and relevance in their classrooms. Students can build, configure, and troubleshoot networks using virtual equipment and simulated connections, alone or in collaboration with other students. Most importantly, Packet Tracer helps students and instructors create their own virtual "network worlds" for exploration, experimentation, and explanation of networking concepts and technologies.

Features Cisco Packet Tracer includes the following features:

• Makes teaching easier by providing a free, multiuser environment for instructors to easily teach complex technical concepts

• Makes learning easier by providing a realistic network simulation and visualization environment

• Provides authoring of learning activities, tasks, labs, and complex assessments

• Supports lectures, group and individual labs, homework, assessments, case studies, games, and competitions

• Supplements real equipment and enables extended learning opportunities beyond physical classroom limitations

• Simulates continuous real-time updates of underlying network logic and activities

• Empowers students to explore concepts, conduct experiments, and test their understanding

• Promotes social learning through a network-capable (peer-to-peer) application with opportunities for multi-user competition, remote instructor-student interactions, social networking, and gaming

• Supports the majority of protocols and technologies taught in the following Networking Academy curricula: Cisco CCNA Discovery, CCNA Exploration, and CCNA Security, and can also be used to teach concepts from IT Essentials and Cisco CCNP courses.

How Cisco Packet Tracer Works :

building a small network inside Packet Tracer
I will need a router
so in my device choices. I 've got router chosen
I will choose a 1941 model router
I need ultimately two switches I'm going to choose a 2960 switch
and ultimately I will need two PCs
and I can choose it that way, I can keep coming down and picking up
if I choose something I don't want like I just accidentally added two
I can delete them using the delete tool
I can also do a select via control click and drag
to rapidly populate a topology using devices are already added to it
control-click and right makes a copy just as it does in the Microsoft Word
now to rename the display name I can click
under the device as call that "S1"
or I can click on the device
go to the "Config" tab and change the display name here
now in here it's worth pointing out that the host name does not get changed
is still switch and so I could do that here
but it's working in the "Config" tab show me the commands down below
and I can save the config in the "Config" tab as well
but I prefer working in the command line
because I need the extra practice
I need to practice
"copy run start", there we go

let's do it on the router, R1
that does not change the hostname but we will do all the routers all at once
a PC configuring we don't configure PC in the command line can use the Config tab
and typing the Gateway
which would be "1.1"
192.168.1.1 this is in the global settings on the PC
but the IP address assigned to the net is
on the interface so 192.168.1.2
we will use the default mask
I prefer on the PCs using the desktop tool for configuring IP addresses
because then I don't have to switch tabs
192.168.2.2 will be this PC
because it will be on a different network default mask, there we go
PCs are configured the switches
we are only going to configure those hostnames, now and I need to connect the devices
connect the devices so I choose my connection
choose a copper straight through, I will go for the PC0
Fast Ethernet to switch one, first available port
and notice as soon as I click on the switch
it no longer is making cables
and I need to come back but if I need to make several cables like I do in this case
I can control click and then
from Gigabit 1 to Gigabit 0
from Gigabit 1 to Gigabit 2, notice I don't have to go back
to the toolbar to be able to pick up the tool
now I'll keep drag the cable cable because is no place to put this one
so let me just turn of the tool. let's go into the router
go to the command line

>enable,
#config t

(config)#hostname R1,

(config)#interface g0/0

(config)#ip address 192.168.1.1 255.255.255.0

and just like the real equipment it needs

to have the no shutdown command to bring the interface up

if you do forget what

for you connected to you can hover over the cable and see the other interfaces

gigabit one

still in config mode

click up arrow,just like in the real equipment it works just fine

cope arrow again to save us some typing time

and

no shut

and copy run start

to confirm its working

I will fast forward the time to speed up the spanning tree

I will go into the PC, go the "Desktop"

go to the command line prompt and

ping 192.168.2.2

the other PC no surprise the first PC

ping fail because resolve the ARP, but here we go

try one more time, and we have complete connectivity.

3. Reason for choosing Networking

When we talk about building a career in IT, the first thing that pops up in our mind is software. But the truth is that today hardware and networking jobs are among the topmost career fields that young professionals are looking at. And when the word ‘networking’ is on your mind, then it is none other than Cisco networks. Taking up the CCNA certification and training course assures a high level of knowledge in computer systems. More importantly, a CCNA course proves that we are well-skilled and trained under Cisco Systems, which is a worldwide leader in the IT domain.

Doing a CCNA course not only provides knowledge and skills but also offers a ticket to success. It means that the moment our resume has a CCNA certification course by an authorized Cisco learning center, the best multinational companies would be glad to have you onboard. As a CCNA candidate, we would get a job faster than any other individual. Those who specialize in the various courses offered by CCNA have better job opportunities.
The industry requirement for CCNA certified people has increased. Today, recruiters are looking for competent individuals who have an edge over others. They seek those certified networking professionals who have an advanced knowledge of protocols. Once we receive this high-grade recognition, you will get the confidence to opt for better career prospects. In fact, we will observe that with the right efforts and dedication, it would be able to excel in your field.

Career Opportunities :

- **Network Support Engineer:** This is the initial position which you will get after you are certified. This can be considered as L1 or L2 support position. In this position, you will not get direct access to routers and switches. This is a kind of support role job in which you have to provide support to the higher engineers who have access to routers and switches.

- **Network Administrator/System Admin:-** Both this profile has kind of very similar job responsibilities, so I am not mentioning them individually. This role basically involves installing and managing various hardware devices like PCs, routers, and switches. To get this role you need to have good knowledge of hardware parts.

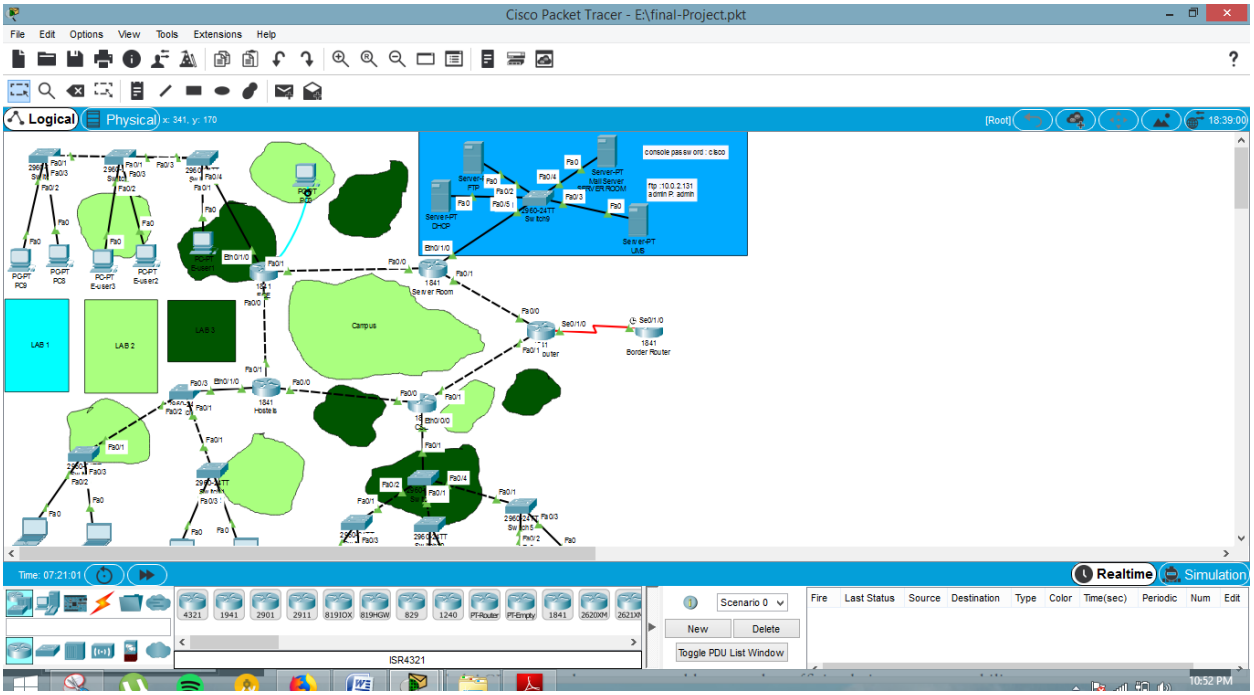
- **Network Engineers:-** This role is also a kind of It support role but involves more responsibilities compared to the Network support engineer. In this role, you will be designing, maintaining, implementing and supporting the organization's network environment

- **Network Security Associate:-** This the best job profile for you if you want to dive into network security. The responsibilities of this job profile are very complex and risky as you will have to perform security to identify and then remove the security threats. But please note if you want to go into security you will have to do both CCNA Security and CCNA Routing and Switching.

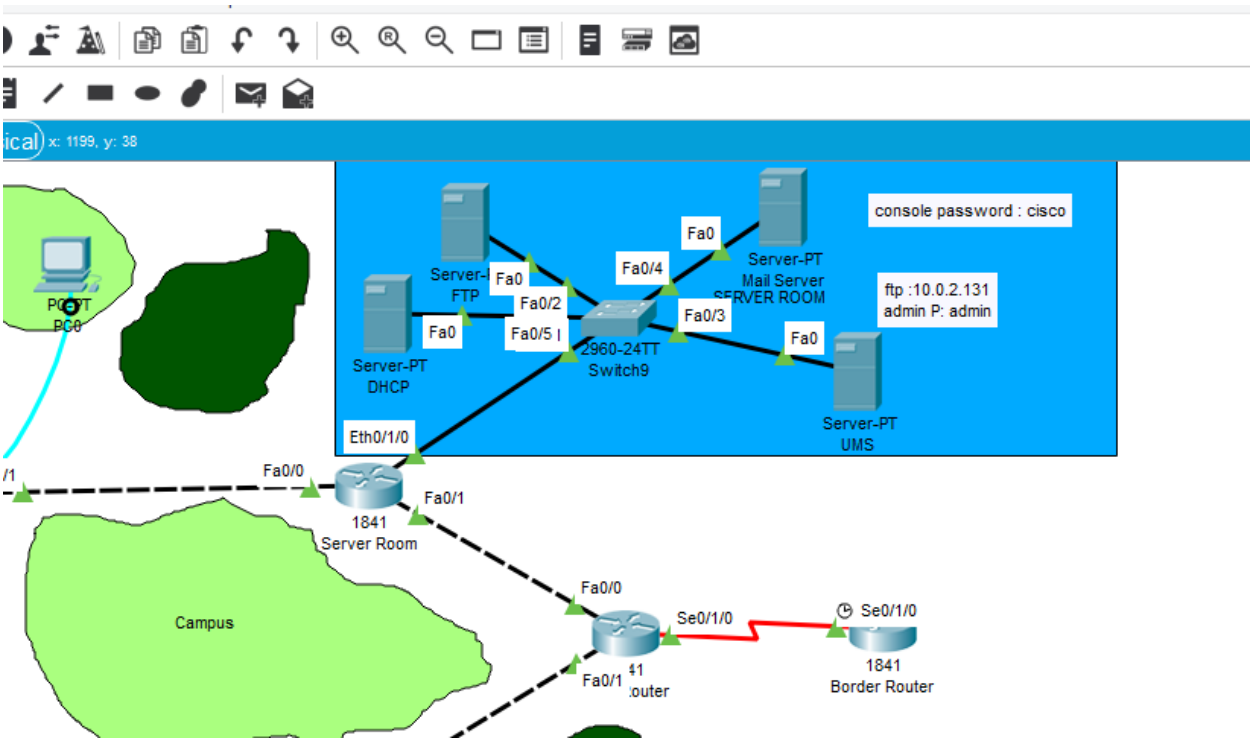
4. Learning Outcomes

- The basic networking processes used to communicate across Local Area Networks, Wide Area Networks and the Internet.
- Operate basic networking devices and services used to support communications across an Internetwork.
- The layers of communications in data networks using the 7-Layer OSI and the 4-LayerTCP/IP models.
- The role of protocols in data networks.
- The importance of addressing and naming schemes at the following OSI Data Link, Network and Application layers.
- The protocols and services provided by the Application layer in the OSI and TCP/IP models.
- Use Cisco CLI commands to configure and verify basic router and switch operation.
- Analyze the operations and features of common Application layer protocols such as HTTP, DNS, DHCP, SMTP, Telnet, and FTP.
- NAT-Network Address Translation
- Port-Security, provide port some security from anonymous user to access router or switch.
- Vlan Virtual Lan – Basically it is used to divide into networks.

5. Project –University Network using all CCNA concept



University network



Server Room

In this complete network used private ip 10.0.0.0 and VLSM Subneting .

It consist of 10 networks :-

CSE has 230 hosts,

Hostel has 250 hosts,

ECE and Server room need only 127 hosts.

6 interconnect networks

Router:

Password on primary console or privilege mode is either cisco or 123.

Routing :-

OSPF(open shortest path first) routing is done in this network.

For security , ACL is used by creating access-list to give particular user a access particular services.

In server room, port-security is done. There particular port dynamically assigned specific MAC-address of device because no one else never to connect there device on port-security port.

Dynamic NAT is used in this network ,NAT become a necessary part of any network. It helps to convert public to private ip and vice versa.

Services:

DHCP

HTTP: www.abc.in or 10.0.2.133

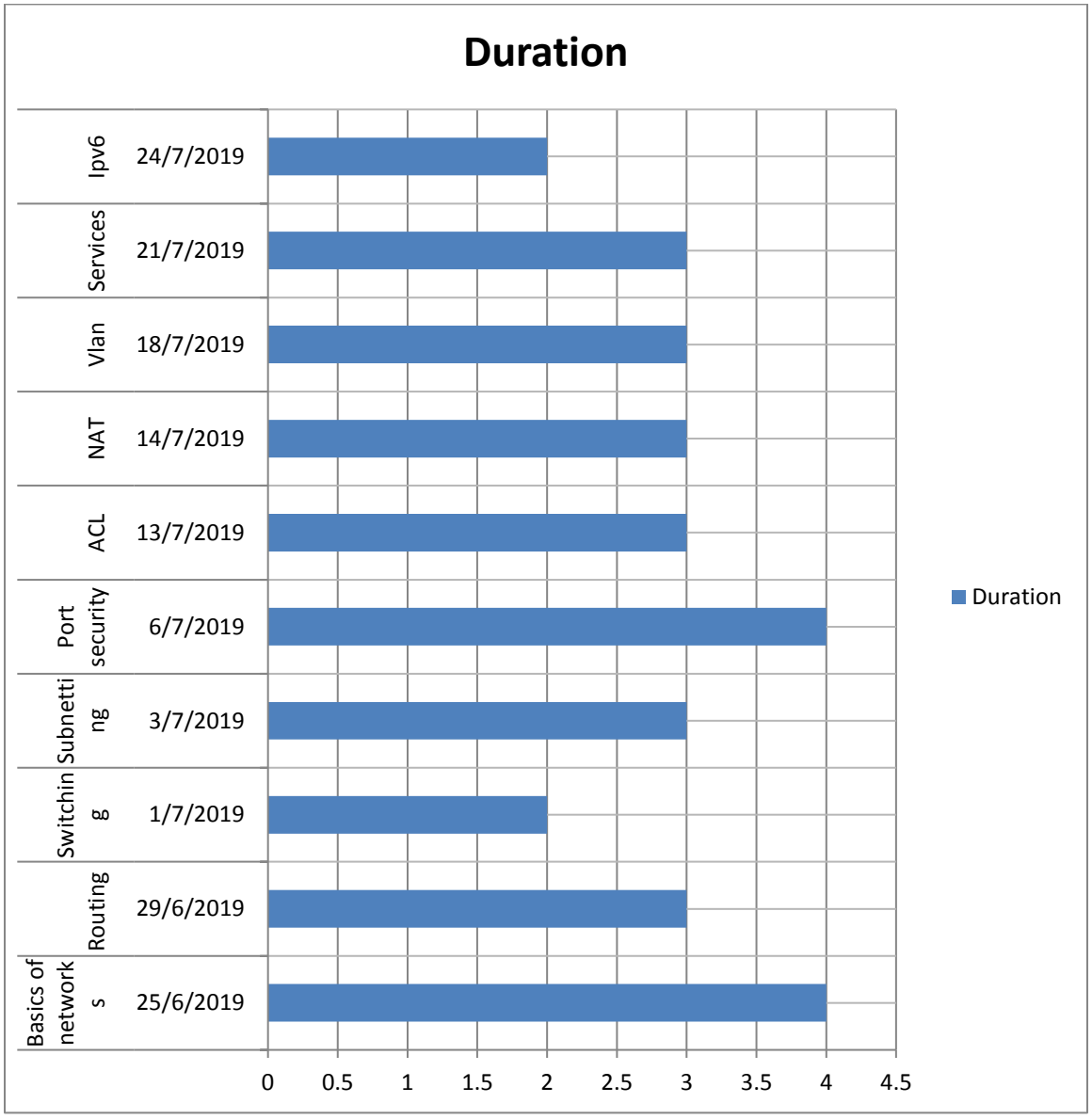
FTP: 10.0.2.131 username :admin password :admin

DNS: 10.0.2.133

Mail :10.0.2.132

Telnet: password : cisco

6. GANTT CHART



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