#### **DEPLOYING IPV6 IN A CAMPUS NETWORK**

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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## APPROVAL

This Project/internship titled "Deploying Ipv6 in a Campus Network", submitted by Abdullah Al Noman, ID No: 161-15-7427 and Arafat Chowdhury, ID No: 161-15-7522 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on December 2019.

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We hereby declare that, this project has been done by us under the supervision of Narayan Ranjan Chakraborty, Assistant professor, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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### ABSTRACT

With the rapid development of computer network, the construction of campus network is the inevitable choice of the development of information network. The campus network system is a very large and complicated system. It is not only for modern teaching, integrated information management and office automation series of applications to provide basic operating platform, but also to provide a variety of application services, so that information can be timely and accurate delivery. The campus network construction in the application of network technology is the important branch of LAN technology to build and management. This report shows the deployment of ipv6 in a campus network with network technology, network equipment selection and so on, and gives the concrete network topology diagram and implementation of the secure campus area network.

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### **CHAPTER 1**

#### INTRODUCTION

## **1.1 Introduction**

The Internet has experienced a phenomenal increase of devices accessing the Internet. Because of this increase, IPv4 addresses are running out. So, we want to deploy IPv6 in a campus network to accommodate this increased demand by providing a much larger address space, along with improved traffic routing and better security. We are currently on Internet Protocol version 4, or IPv4, but IPv6 will be the next generation protocol for Internet communication.

## **1.2 Motivation**

We are moving toward the IPv6 gradually. So, we need to learn how it will be implemented in campus network. This project will help us to do that. This project will also be the standard guideline for those who wants to deploy IPv6 in their network in near future.

## **1.3 Objectives**

- Study: Structure and Components of campus network.
- ✤ Case analysis.
- Case design.
- Sketch the design of our campus network.
- Create the network diagram in Packet Tracer and GNS3 with needed appliances.
- ✤ Ip planning for the designed campus network.
- Protocols choose.
- Implement the planned Ip addresses and protocols in campus network diagram.
- Test the network.

## **1.4 Expected Outcome**

After completing the project, the campus network will be enabled. All devices will up and can share their information to each other. Data packets will be sent from one to another. Admin can create domain from DNS server. Hosts can browse via http server, can send Email via Email server, can create, save, download, read, write, edit or delete any file from Ftp server.

### **1.5 Report Layout**

In this report, we will write about background, requirement specification, design specification, implementation with testing and conclusion with future scope. In background study, we will discuss about the related works like our project, scope of the problem and challenges for our project. In requirement specification, we will discuss about the requirement collection and analysis that where actually we learn about our project requirement to implement and design requirements. In design specification, we will discuss about front-end, back-end design for our project and requirements for implementing the project. In implementation and testing, we will discuss about how we implement ip, protocols in our project, will discuss the testing after implementation and will also discuss about the test result. After all of that we will discuss about our project future scope.

#### **CHAPTER 2**

#### BACKGROUND

#### **2.1 Introduction**

Web innovation started to spread in the grounds, the Internet and our grounds life has been firmly connected together. As a ground to develop the gifts of the century, to accomplish organize the executives, instructing is significant. So, the campus network is a very interactive and professional LAN. Multimedia teaching software development platform, multimedia presentation classrooms, teacher preparation system, library access system, test database, etc., can work through the network. If a university includes a number of professional disciplines, we can also form a number of local area networks, and through wired connection.

#### 2.2 Related Works

As far as our study about deployment on ipv6 in a campus network, there is no such project done in campus network by using ipv6 address before but there are lots of studies, journals and research happens about it. What is to learn, how to plan for designing, what protocols should be used are discussed on those research and study [1-6].

#### **Feasibility Study**

The feasibility study of any system is mainly intended to study and analyzed the proposed system and to decide whether the system under consideration will viable or not after implementation. That is, it determines the usability of the project after deployment. Ipv4 ip addresses have shorter address space which is already running out. Nearly, incoming years we must switch to ipv6 ip address. So, we think this is an important project we choose which will impact the campus network future. Some question is being answered about the efficiency of our project. The questions came to our mind when we thought about our project was:

- Why choosing a campus network?
- What resources are available for the proposed system? Is it worth solving the problem?
- What will be the impact after completing the project? i.e. will it be fitted for the campus network?

Thus, since the practicability study could result in commitment of enormous resources, it becomes necessary that it ought to be conducted ably and no elementary errors of judgment square measure created.

## 2.3 Scope of the problem

Internet Protocol Version 4 (IPv4) ip addresses are being used everywhere but the biggest problem is its shorter ip addresses (32 bits only) are already running out. To find out the solution, Ipv6 ip addresses was invented but not yet implemented widely. So, we think it is a great scope to switch ipv6 and deploy the new address in campus area network.

## 2.4 Challenges

There are so many challenges for completing the project [7] [8]. The challenges are given below:

- Designing the campus network.
- Planning and implementing the correct ipv6 addresses for the campus.
- ✤ Connectivity of the network.
- Security of the campus.

# CHAPTER 3 REQUIREMENT SPECIFICATION

## **3.1 Introduction**

Requirement of a project is mainly the resources that is going to need for doing the project. If we want to make a project then after studying about the project sides we must need to look after the project requirements that is going to need for completing the project.

## **3.2 Requirement Collection and Analysis**

To know about the requirements that our project going to need, we talked with Daffodil International University's IT control admin and visited the IT rooms. We gathered the knowledge we need from there and watched physically about the network device's placement and they worked. We are also studying CCNA (Cisco Certified Network Association) under an organization which almost completed. So, we gathered the basic knowledge and needy requirements from there first. For our campus network we need so many devices that's are router, switch, pc, laptop, printer, server and so many. So, it is important that how the devices act, need to configure and work. We learned about those devices that requires for our campus network and we have that confident to do that properly [9].

### **3.3 Design Requirements**

For the design of our project, we use Cisco Packet Tracer and GNS3 where both are a simulator. We'll make a prototype by using those simulators. We need to download those simulators from their specific websites. Cisco Packet Tracer is an environment created by Cisco where all cisco appliances we can use and for free where GNS3 is also an environment that allows the combination of virtual and real devices, used to simulate complex network. But, in GNS3 not all Cisco appliances for free and those are not free

are expensive enough that we can't afford. So, most of our work will be shown in Packet Tracer [10] [11].



Figure 3.1: Cisco Packet Tracer Simulator

The figure 3.1 is the outlook of cisco packet tracer where we're going to make our campus network prototype.



Figure 3.2: GNS3 Simulator

The figure 3.2 is the outlook of GNS3 simulator. We also make our campus network prototype besides cisco packet tracer.

# CHAPTER 4 DESIGN SPECIFICATION

## **4.1 Introduction**

In our campus network design, there is one Server building, one Administrative building, three Faculty Buildings (FSIT, FBE and FHSS), three Study buildings (CSE, BBA and English) department basis, one Library building, one Canteen Building and one Dormitory building. Total of five Cisco routers are connected between the buildings to establish the network inside the campus network. We use layer 2 switch in every building that's are connected with the router and the hosts of the buildings. We design serval server for our campus network which will provide http, https, dns, ftp, email service inside the campus. All devices are connected with different type of wires. We use serial interfaces from router to router, gigabit ethernet and fast ethernet interfaces from router to other devices. After configuring the network, the packet will pass from the source to destination via interfaces.

All buildings are in a single area network and internal network. We design an external network which is bounded with firewall for security from external attack and that is the internet or ISP.

## 4.2 Front-end Design

After studying and learning about ipv6, we design a small campus network diagram for our project with proper Ipv6 address plan.



#### Figure 4.1: Sketch Design

The figure 4.1 is the sketch design of our campus network. This is the complete design of our campus where we're trying to show all the necessary components with proper ipv6 address plan.

We use router, switch, server, pc, laptop, camera, firewall and internet to design the campus network into simulator. The appliances are shown in the figure 4.2 below:



Figure 4.2: Appliances for Design



Figure 4.3: Campus Network Design in Packet Tracer

The figure 4.3 is the final and complete design of our campus network which we designed into packet tracer with needed components and ipv6 address.



Figure 4.4: Campus Network Design in GNS3

The figure 4.4 is the final and complete design of our campus network which we designed into GNS3 simulator.

## 4.3 Back-end Design

Back-end design is the design where we will configure our commands and protocol. Next few figures will show the back-end design of different devices we use.

GLOBAL Settings			Global S	Settings		
Algorithm Settings ROUTING Static RIP SWITCHING VLAN Database INTERFACE GigabitEthernet0/0 GigabitEthernet0/1		Display Name Hostname NVRAM Startup Config Running Config	Router Router Erase Load Export	Save Export Merge	]	
quivalent IOS Comman Mould you like to n Press RETURN to g	ds o ent	er the initia. tarted!	I conrigurat:	ion dialog?	[yes/no]:	~

#### Figure 4.5: Back-end of a Router and Switch

The figure 4.5 is the back-end design of a router and switch. Here we can configure our router manually by giving commands.



Figure 4.6: Cisco IOS Command Hierarchy [12]

The figure 4.6 is the figure of cisco ios command hierarchy. When we use command line in our router there are some mode of the command line we need to know.

PC User			—		$\times$
Physical Config Democrace Fast	Programming	Attributes			^
	Static				
IP Address					
Subnet Mask					
Default Gateway					
DNS Server					
IPv6 Configuration					
	Config 🔘 Static				
IPv6 Address			1		
Link Local Address					
IPv6 Gateway					
IPv6 DNS Server					
802.1X					
Use 802.1X Security					
Authentication	MD5			~	
Username					
Password					~

Figure 4.7: Pcs and Laptops Back-end

The figure 4.7 is the back-end design of pcs and laptops. Here we can configure the pcs and laptops by giving there ip address, gateway address and dns server address.

Physical Config A	Attributes	Physical Config	Attributes
GLOBAL Settings INTERFACE FastEthernet0	Global Settings         Display Name         Printer.         Gateway/DNS IPv4         DHCP         Static         Gateway         DNS Server         Gateway/DNS IPv6         O HCP         Auto Config         Static         IPv6 Gateway         IPv6 DNS Server	GLOBAL Settings INTERFACE FastEthernet0	FastEthernet0         Port Status         Bandwidth         100 Mbps         Duplex         Half Duplex         Full Duplex         PConfiguration         DHCP         Static         IPAddress         Subnet Mask         IP46 Configuration         DHCP         Auto Config         Static         IP46 Address         Link Local Address:

Figure 4.8: Printers Back-end

The figure 4.8 shows the back-end design of printers. Here we can configure our printer in the campus network by giving their ip address.

Physical	Config	Servio	es	Desktop	Prog	gramming	Attribut	es	
SERVI	ICES	$\sim$				HTTP			
НТТ	ГР			-					
DHC	CP		нп	P			HIPS		
DHCF	Pv6		$\bigcirc$	On (	🖲 Off		🔿 On		Off
TET	r <b>P</b>								
DN	s		ile N	lanager					
SYSL	.OG			File Name	e	Ed	it		Delete
AA	Α		1 cc	pyrights.htm	nl 👘	(ed	t)		(delete)
NT	Р		-	17.5		<b>x</b>	·/		,,
EMA	IL		2 cs	coptlogo177	x1				(delete)
FT	Р								
Io	г		3 he	elloworld.htm		(ed	t)		(delete)
VM Mana	gement		4 in	nage.html		(ed	t)		(delete)
Radius	EAP		-	3		<b>x</b>	· ·		
			5 in	dex.html		(ed	t)		(delete)
		$\sim$					New File	•	Import

Figure 4.9: Servers Back-end

The figure 4.8 shows the back-end design of a server. Here we can configure the ip addresses and services of different servers.



Figure 4.10: Features of Back-end

The figure 4.10 is the back-end of packet tracer all features that we can use for our project.

# **4.4 Implementation Requirements**

To implement the design, we also use packet tracer and gns3. We need to configure the ipv6 addresses, give the commands and use protocols for implementing.

# CHAPTER 5 IMPLEMENTATION AND TESTING

## **5.1 Introduction**

Implementation and testing are one of the most important part of our project. We have to configure all of the ipv6 addresses, protocols carefully and we need to verify and troubleshoot those after inserting. And after configuring, we have to test the whole campus network. If any error occurs then we must debug to solve the problem.

# 5.2 Implementation of Front-end Design



Figure 5.1: Enable password and banner to all routers

In figure 5.1, we configure the basic router settings. Set the router hostname, enable password for unauthorized access and set banner for a warning message.

🖗 Gateway Router		-		$\times$
Physical Config <u>CLI</u> Attributes				
IOS Command	Line Interfac	e		
Gatewayish ipv Gatewayish ipv6 int Gatewayish ipv6 interface br Gatewayish ipv6 interface brief GigabitEthernet0/0 [up/u FE80::220:B0FF:FE4E:3201 2001:DB8:1:A1::1 GigabitEthernet0/1 [admi unassigned Serial0/0/0 [up/u FE80::1 2001:DB8:1:B1::1 Serial0/0/1 [up/u FE80::1 2001:DB8:1:C1::1	p] .nistrativ p] p]	rely down/do	own]	~
Serial0/1/0 [up/u FE80:1 2001:DB8:1:D1::1 Serial0/1/1 [up/u FE80:1	ସ ସ			
2001:DB8:1:E1::1 Serial0/2/0 [admi unassigned	nistrativ	vely down/do	own]	
Serial0/2/1 [admi unassigned Serial0/3/0 [admi	nistrativ nistrativ	vely down/do	own]	
unassigned Serial0/3/1 [admi	nistrativ	rely down/do	own]	
Vlanl [admi unassigned Gateway#	nistrativ.	rely down/do	own]	~
Ctrl+F6 to exit CLI focus		Сору	Past	e

Figure 5.2: Ipv6 address to Gateway router

In figure 5.2, we already assigned the ipv6 address into all of the interfaces gateway router has and verifying the addresses with interfaces by using show ipv6 interface command.

Physical Config <u>CLI</u> Attribu	ites Command Line Interface			
IOS	Command Line Interface			
Department#sh ipv6 int br				~
GigabitEthernet0/0	[up/up]			
FE80::204:9AFF:FEA6:A0	01			
2001:DB8:2:AB::1				
GigabitEthernet0/1	[up/up]			
FE80::204:9AFF:FEA6:A0	02			
2001:DB8:2:BC::1				
Serial0/0/0	[administratively	down/down]		
unassigned				
Serial0/0/1	[administratively	down/down]		
unassigned				
Serial0/1/0	[up/up]			
FE80::4				
2001:DB8:1:D1::2				
Serial0/1/1	[administratively	down/down]		
unassigned				
Serial0/2/0	[administratively	down/down]		
unassigned				
Serial0/2/1	[administratively	down/down]		
unassigned				$\sim$
Cani a 10 / 2 / 0	fednini et en trimel et			-
Ctrl+F6 to exit CLI focus		Сору	Paste	

Figure 5.3: Ipv6 address to Study Building router

In figure 5.3, we already assigned the ipv6 address into all of the interfaces department router has and verifying the addresses with interfaces by using show ipv6 interface command

Physical Config CLL A	ttributes		
	linduces		
	IOS Command Line Interface		
LCD#sh ipv6 int br			^
GigabitEthernet0/0	[up/up]		
FE80::2D0:FFFF:FEDA	:4501		
2001:CAFE:2:AB::1			
GigabitEthernet0/1	[up/up]		
FE80::2D0:FFFF:FEDA	:4502		
2001:CAFE:2:BC::1			
Serial0/0/0	[administratively down,	/down]	
unassigned			
Serial0/0/1	[administratively down,	/down]	
unassigned			
Serial0/1/0	[administratively down,	/down]	
unassigned	f		
Serial0/1/1	[up/up]		
2001.DB8.1.F12			
Serial0/2/0	[administrative]v down	/down1	
unassigned	[administratively down,	aoniij	
Serial0/2/1	[administrativelv down	/down1	
unassigned			~



In figure 5.4, we already assigned the ipv6 address into all of the interfaces LCD router has and verifying the addresses with interfaces by using show ipv6 interface command

Faculty Router		—		Х
Physical Config CLI Att	ributes			
	IOS Command Line Interface			
Faculty#sh ipv6 int bris	f			^
GigabitEthernet0/0 unassigned	[up/up]			
GigabitEthernet0/0.10 FE80::205:5EFF:FE33	[up/up] :5401			
2001:CAFE:1:AB::1				
GigabitEthernet0/0.20	[up/up]			
FE80::205:5EFF:FE33:	:5401			
2001:CAFE:1:BC::1				
GigabitEthernet0/0.30	[up/up]			
FE80::205:5EFF:FE33:	:5401			
2001:CAFE:1:CA::1				
GigabitEthernet0/1 unassigned	[administratively dow	m/down]		
Serial0/0/0 unassigned	[administratively dow	n/down]		
Serial0/0/1 FF803	[up/up]			
2001:DB8:1:C1::2				
Serial0/1/0	[administratively dow	wn/down]		$\checkmark$
Ctrl+F6 to exit CLI focus		Сору	Paste	)

Figure 5.5: Ipv6 address to Faculty router with inter-vlan

In figure 5.5, we already assigned the ipv6 address into all of the interfaces faculty router has and verifying the addresses with interfaces by using show ipv6 interface command.

	IOS Command Line	Interface	
Switch#			,
Switch#			
Switch#			
Switch#			
Switch#sh vlan br			
/LAN Name	Status	Ports	
default	active	Fa0/13, Fa0/14, Fa0/15, Fa0/16	
		Fa0/17, Fa0/18, Fa0/19, Fa0/20	
		Fa0/21, Fa0/22, Fa0/23, Fa0/24	
		Gig0/2	
LO FSIT	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4	
20 FBE	active	Fa0/8, Fa0/9, Fa0/10, Fa0/11	
0 FHSS	active	Fa0/5, Fa0/6, Fa0/7, Fa0/12	
1002 fddi-default	active		
1003 token-ring-derault	active		
1004 Iddinet-default	active		
Switch#	active		
WICCH#			_
		Come Doots	

Figure 5.6: Create VLAN on Faculty Building switch

In figure 5.6, the vlan we created for inter-vlan routing and set the vlan into specific interfaces is shown.

Physical C	Config	Attributes				
		100 0				
		103 Command Em	emilenace			
Switch#						^
Switch#						
Switch#						
Switch#						
Switch#						
Switch#						
Switch#						
Switch#						
Switch#						
Switch#						
Switch#sh	int tr					
Switch#sh	int trunk					
Port	Mode	Encapsulation	Status	Native	vlan	
Gig0/1	on	802.lq	trunking	1		
Port	Vlans allo	wed on trunk				
Gig0/1	10,20,30					
Port	Vlans allo	wed and active in	management	domain		
Gig0/1	10,20,30					
Port	Vlans in s	panning tree forw	arding state	and not p	runed	
Gig0/l	10,20,30					
Switch						

Figure 5.7: Trunk on Faculty Building VLAN switch

In figure 5.7, after activating the trunking mode we're verifying by using show interface trunk command.



Figure 5.8: Access VLAN to Faculty Building VLAN switch

The figure 5.8 shows that the separate vlans are assigned into specific interfaces.

Gateway Router	-		$\times$
Physical Config <u>CLI</u> Attributes			
IOS Command Line Interfa	ice		
Gateway#			^
Gateway#			
Gateway#			
Gateway#			
Gateway#sh ipv			
Gateway#sh ipv6 pro			
Gateway#sh ipv6 protocols			
IPv6 Routing Protocol is "connected"			
IPv6 Routing Protocol is "ND"			
IPv6 Routing Protocol is "ospf 1"			
Interfaces (Area 0)			
GigabitEthernet0/0			
Serial0/0/0			
Serial0/1/0			
Serial0/1/1			
Serial0/0/1			
Redistribution:			
None			
Gateway#			$\sim$
Ctrl+F6 to exit CLI focus	Сору	Past	е

Figure 5.9: OSPF in Gateway router

In figure 5.9, we create OSPF in every router with OSPF ip 1 and considering the full campus area as area 0.

Physical Config	CLI	Attribute	s				
			Ю	OS Command Line I	nterface		
Gateway#							
Gateway#							
Gateway#							
Gateway#							
Gateway <b>#</b>							
Gateway#							
Gateway <b>#</b>							
Gateway#							
Gateway#							
Gateway#							
Gateway#							
Gateway#							
Gateway#sh ip	v6 ospf	neighbo	r				
Neighbor ID	Pri	State		Dead Time	Interface ID	Interface	
5.5.5.5	0	FULL/	-	00:00:31	6	Serial0/1/1	
	0	FULL/	-	00:00:31	3	Serial0/0/0	
2.2.2.2	0	FULL/	-	00:00:32	5	Serial0/1/0	
2.2.2.2 4.4.4.4	· · ·			00.00.00	4	Saria10/0/1	
2.2.2.2 4.4.4.4 3.3.3.3	ő	FULL/	-	00:00:32	1	Jerrar0/0/1	

Figure 5.10: OSPF neighbors in Gateway router

By giving show ipv6 OSPF neighbor we can see the full neighbors which is configured manually by us in the router which is shown in figure 5.10.

Physical Config	Desktop	Programming	Attributes					
P Configuration						Х		
nterface Fas	tEthernet0					•		
	St	atic						
IP Address								
Subnet Mask								
Default Gateway	0.0.0	0						
DNS Server	IS Server 0.0.0.0							
IPv6 Configuration								
	Auto Config	) 🔘 Static						
IPv6 Address	20	01:CAFE:2:AB::3	}	1	64			
Link Local Address	FE	80::200:CFF:FE	35:1352					
IPv6 Gateway	20	01:CAFE:2:AB::1	I					
IPv6 DNS Server	20	01:DB8:1:A1::3						
802.1X								
Use 802.1X Secu	ırity							
Authentication	MD5					-		
Username	user							
Bacoword	123/	56						

Figure 5.11: Ipv6 address to PC

In figure 5.11, this is the most likely configuration of all pcs and laptops. Here we need to assign the ipv6 address, gateway address and the DNS address. DNS server ip will be the same in every device. We also activate the MD5 authentication for security purpose.

		GLOBAL	_ ^ _		Global Settings
CLOBAL     Part Status       Settings     Part Status       INTERFACE     Bandwidth       2astEthernet0     PC Configuration       D (D+CP)     Status       Status     IP-6 Configuration       D (D+CP)     Address       Status     IP-6 Address       Inth Local Address     Z011.DBI	ithermet0         O           100 Mbps         10 Mbps         Auto           100 July         10 Mbps         Auto           0004 9A67 6659         Auto           81 A1:2         (64           4 9AFF FE67 6659         Auto	Settings Algorithm Settings INTERFACE FastEthernet0		Display Name [ Gateway/DNS O DHCP	IPv4 IPv6 Ig [2001.DB6.1:A1::1 evr [2001.DB6.1:A1::3

Figure 5.12: Ipv6 address to server

In figure 5.12, this is the most likely configuration of all servers. Here we need to assign the ipv6 address, gateway address and the DNS address. DNS server ip will be the same in every device.

Web Server Physical Config	enices Desktop Programming Attributes	-		
SERVICES HTTP DHCP DHCPv6	HTTP HTTP On Of Of On	Off		
TETP	File Manager			
DIN5	File Name Edit	Delete		
	d annuichte blant	(1-1-4-)		
NTP	1 copyrights.ntmi (edit)	(delete)		
EMAIL	2 cscoptlogo177x111.jpg	(delete)		
FTP	D bellowedd blad	(delete)		
IoT	3 nellowond.ntml (edit)	(delete)		
VM Management	4 image.html (edit)	(delete)		
Radius EAP	5 index.html (edit)	(delete)		
~		New File	Import	

Figure 5.13: Web server setup

In figure 5.13, it is the figure of Web server where we need to turn on the http and https so that a host can tcp to web server. The files inside web server are html files. We can edit or delete those files when we need.

SERVICES	~		DNC	
НТТР			DNS	
DHCP	DNS Se	ervice	On	○ of
DHCPv6	Resource	ce Records		
TETP	Name	diu edu l	bd	Type A Record
DNS				.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
SYSLOG	Address	s 2001:DB8:1:A1::2		
AAA		Add	Save	Remove
EMAN			-	
ETP	No.	Name	lype	Detail
IoT	0	diu.edu.bd	ARecord	2001:DB8:1:A1::2
M Management	1	ftodiu com	ARecord	2001-DB8-1-A14
Radius EAP	1.1.	npala.com	711100010	2001.000.1311.4

Figure 5.14: DNS server setup

In figure 5.14, it is the figure of DNS server where we need to turn on the DNS service. Here we can create a domain by giving the server address. All devices DNS address must be the same. Host can browse by using domain name instead of ip address.

Email Server		_		$\times$
Physical Config	Services Desktop Programming Attributes			
SERVICES HTTP DHCP	SMTP Service POP3 Service OFF			
TFTP DNS SYSLOG	Domain Name: diu.edu.bd		Set	
AAA NTP	User Setup User admin Password admin			
EMAIL FTP IoT	admin user		+	
VM Management Radius EAP		C	- Change	
	v	P	assword	

Figure 5.15: EMAIL server setup

In figure 5.14, it is the figure of Email server where we can set a domain and create user and password. User can easily maul each other by config the user id.

💐 PCO	-		×	
Physical Config Desktop Programming Attributes				Physical Config Desktop Programming Attributes
Configure Mail		Х	] ^	User Information
User Information				Your Name: user
Your Name: admin				Email Address user@diu.edu.bd
Email Address admin@diu.edu.bd				Server Information
Server Information				Incoming Mail Server 2001:db8:1:a1::3
Incoming Mail Server 2001:DB8:1:A1::3				Outgoing Mail Server 2001:db8:1:a1::3
Outgoing Mail Server 2001:DB8:1:A1::3				Logon Information
Logon Information				User Name: user
User Name: admin				Password:
Password:				Save Clear Reset
Save		Reset		
			~	

Figure 5.16: Configure EMAIL server in two hosts

This is the figure where admin building host pc0 and Study building host pc5 configuring mail address by using diu.edu.bd domain and user and password which are set into Email server previously. After configuring mail successfully both hosts can send mail to each other.

FTP Server						—		$\times$
Physical Config	Ser	vices	Desktop	Programm	ing	Attributes	5	
SERVICES	$\sim$				FTP			
HTTP								
DHCP		Serv	ice	C	) On		0	Off
DHCPv6			or Sotup					
TFTP		US	er Setup		_			
DNS		Us	sername		Pas	ssword		
SYSLOG			Write	Read 🗌 D	)elete	Rena	ime 🗌 List	
AAA			Lleornamo	Bacoword	Dor	minoion		
NTP			Osemame	Password	Pen	mission	Add	
EMAIL		1	admin	123456	RW	DNL	-	
FTP				102455			Save	
IoT		2	user	123450	ĸ		-	
VM Management							Remove	
Radius EAP								
						File		^
		1	asa842-k8.b	in				
		2	asa923-k8.b	in				
		3	boo.txt					$\sim$
	$\sim$						Remove	e de la

Figure 5.17: FTP server setup

This is the figure of Ftp server where we need to turn on the FTP then, create username and password and give access where the user can write, read, delete, rename, access or list the FTP files.

SERVICES	^							
HTTP					NTP			
DHCP	Service			(	On			0
DHCPv6	Authentie	cation						
TETP	O Enal	ble 🔘 Dis	able					
DNS	Key				Password			
SYSLOG	reey.				1 40011010			
AAA			No	vember 2	019		•	01:19:08AN
NTP	~							
EMAIL	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
FTP								
IoT	27	20	20	20	24		2	
VM Management	21	20	29	30	31	1	× .	
Radius EAP								
	3	4	6	6	7	8	9	
	10	11	12	13	14	15	16	
	17	18	19	20	21	22	23	
	24	25	26	27	28	29	30	

Figure 5.18: NTP server setup

The figure 5.18 is a NTP server. First we need enable it and then the other setup.

🔻 Firewall	—		$\times$
Physical Config CLI Attributes			
IOS Command Line Interfa	ace		
<pre>interface Ethernet0/3 ! interface Ethernet0/4 ! interface Ethernet0/5 ! interface Ethernet0/6 ! interface Ethernet0/7 ! interface Vlan1 nameif inside security-level 100 ip address 192.168.1.1 255.255.255.0 ipv6 address 2001:ABCD:1:A1::2/64 ! interface Vlan2 nameif outside security-level 0 ip address dhcp ipv6 address 2001:ABCD:2:A1::1/64 !</pre>			<
Ctrl+F6 to exit CLI focus	Сору	Paste	÷

#### Figure 5.18.1: Firewall setup

The figure 5.19 is showing the configuration of cisco ASA firewall Firewall protects the inside network from any kind of attack or unauthorized access which can come from the outside network or the internet. For the inside network that is campus network, security level is 100 and we don't need to secure the outside network so its security level is 0.

# **5.3 Testing Implementation**

#### Testing connectivity from one source host to another destination host

For testing the connectivity, we use ping and tracert.

Ping is test method of checking the computer is connected. It also determines the latency and or delay between two hosts. If the ping between two hosts are successful then we can easily understand that packet or data can transfer [13].

Ping command: ping 2001:db8:1:a1::1[destination host ip address]

Traceroute is also a method for testing the connectivity between two hosts. It shows several details about the path that a packet takes from the device we are on to whatever destination we specify [14].



Traceroute command: tracert 2001:db8:1:a1::1[destination host ip address]

Figure 5.19: Ping test 1

This figure shows that this is a ping test from admin building host to other networks.

```
PC5
                                                                                                                  \times
                 Config Desktop Programming Attributes
  Physical
  Command Prompt
                                                                                                                            Х
                                                                                                                             ~
    C:\>ping 2001:cafe:l:ab::6
    Pinging 2001:cafe:1:ab::6 with 32 bytes of data:
    Reply from 2001:CAFE:1:AB::6: bytes=32 time=34ms TTL=125
    Reply from 2001:CAFE:1:AB::6: bytes=32 time=11ms TTL=125
Reply from 2001:CAFE:1:AB::6: bytes=32 time=10ms TTL=125
Reply from 2001:CAFE:1:AB::6: bytes=32 time=11ms TTL=125
    Ping statistics for 2001:CAFE:1:AB::6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 34ms, Average = 16ms
    C:\>ping 2001:db8:1:c1::2
    Pinging 2001:db8:1:cl::2 with 32 bytes of data:
    Reply from 2001:DB8:1:Cl::2: bytes=32 time=3ms TTL=253
     Reply from 2001:DB8:1:C1::2: bytes=32 time=3ms TTL=253
Reply from 2001:DB8:1:C1::2: bytes=32 time=13ms TTL=253
Reply from 2001:DB8:1:C1::2: bytes=32 time=2ms TTL=253
     Ping statistics for 2001:DB8:1:C1::2:
         Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
roximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 13ms, Average = 5ms
    C:\>ping 2001:cafe:2:ab::3
    Pinging 2001:cafe:2:ab::3 with 32 bytes of data:
    Reply from 2001:CAFE:2:AB::3: bytes=32 time=10ms TTL=125
Reply from 2001:CAFE:2:AB::3: bytes=32 time=5ms TTL=125
Reply from 2001:CAFE:2:AB::3: bytes=32 time=10ms TTL=125
Reply from 2001:CAFE:2:AB::3: bytes=32 time=11ms TTL=125
    Ping statistics for 2001:CAFE:2:AB::3:
          Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
oximate round trip times in milli-seconds:
          Minimum = 5ms, Maximum = 11ms, Average = 9ms
    C:\>tracert 2001:db8:1:al::3
    Tracing route to 2001:db8:1:al::3 over a maximum of 30 hops:
                                                             2001:DB8:2:BC::1
2001:DB8:1:D1::1
             0 ms
             0 ms
0 ms
                             1 ms
1 ms
                                              0 ms
                                                              2001:DB8:1:A1::3
     frace complete.
```

Figure 5.20: Ping test 2

This figure shows that this is a ping test from study building host to other networks.

#### PC7 🔍

```
- 🗆 X
```

Physical Config Desktop Programming Attributes Command Prompt Х  $\overline{}$ Reply from 2001:DB8:1:B1::2: bytes=32 time=4ms TTL=253 Reply from 2001:DB8:1:B1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:B1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:B1::2: bytes=32 time=2ms TTL=253 Ping statistics for 2001:DB8:1:B1::2: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 4ms, Average = 2ms C:\>ping 2001:db8:1:c1::2 Pinging 2001:db8:1:cl::2 with 32 bytes of data: Reply from 2001:DB8:1:C1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:C1::2: bytes=32 time=13ms TTL=253 Reply from 2001:DB8:1:C1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:C1::2: bytes=32 time=3ms TTL=253 Ping statistics for 2001:DB8:1:Cl::2: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 13ms, Average = 5ms C:\>ping 2001:db8:1:d1::2 Pinging 2001:db8:1:dl::2 with 32 bytes of data: Reply from 2001:DB8:1:D1::2: bytes=32 time=3ms TTL=253 Reply from 2001:DB8:1:D1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:D1::2: bytes=32 time=2ms TTL=253 Reply from 2001:DB8:1:D1::2: bytes=32 time=2ms TTL=253 Ping statistics for 2001:DB8:1:D1::2: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), roximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 3ms, Average = 2ms C:\>ping 2001:db8:1:e1::2 Pinging 2001:db8:1:e1::2 with 32 bytes of data: eply from 2001:DB8:1:E1::2: bytes=32 time<lms TTL=255 eply from 2001:DB8:1:E1::2: bytes=32 time<lms TTL=255 eply from 2001:DB8:1:E1::2: bytes=32 time=lms TTL=255 eply from 2001:DB8:1:E1::2: bytes=32 time<lms TTL=255 Ping statistics for 2001:DB8:1:E1::2: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), coximate round trip times in milli-seconds: Minimum = Oms, Maximum = 1ms, Average = Oms ::\>

#### Figure 5.21: Ping test 3

This figure shows that this is a ping test from Dormitory building host to other networks.

```
PC9 👰
                                                                                           _
                                                                                                        \times
  Physical
                   Config
                               Desktop Programming
                                                                         Attributes
   Command Prompt
                                                                                                                    Х
                                                                                                                     ~
    C:\>ping 2001:db8:1:a1::3
    Pinging 2001:db8:1:al::3 with 32 bytes of data:
       eply from 2001:DB8:1:A1::3: bytes=32 time=2ms TTL=126
        ply from 2001:DB8:1:A1::3: bytes=32 time=2ms TTL=126
ply from 2001:DB8:1:A1::3: bytes=32 time=1ms TTL=126
ply from 2001:DB8:1:A1::3: bytes=32 time=1ms TTL=126
     Ping statistics for 2001:DB8:1:Al::3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
           coximate round trip times in milli-seconds:
Minimum = lms, Maximum = 2ms, Average = lms
     C:\>ping 2001:cafe:l:ab::5
     Pinging 2001:cafe:1:ab::5 with 32 bytes of data:
     Reply from 2001:CAFE:1:AB::5: bytes=32 time=14ms TTL=125
Reply from 2001:CAFE:1:AB::5: bytes=32 time=2ms TTL=125
Reply from 2001:CAFE:1:AB::5: bytes=32 time=10ms TTL=125
Reply from 2001:CAFE:1:AB::5: bytes=32 time=2ms TTL=125
      ing statistics for 2001:CAFE:1:AB::5:
          Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
roximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 14ms, Average = 7ms
     C:\>ping 2001:cafe:1:ca::5
     Pinging 2001:cafe:1:ca::5 with 32 bytes of data:
      eply from 2001:CAFE:1:CA::5: bytes=32 time=5ms TTL=125
eply from 2001:CAFE:1:CA::5: bytes=32 time=11ms TTL=125
eply from 2001:CAFE:1:CA::5: bytes=32 time=26ms TTL=125
eply from 2001:CAFE:1:CA::5: bytes=32 time=3ms TTL=125
     Ping statistics for 2001:CAFE:1:CA::5:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 26ms, Average = 11ms
     C:\>ping 2001:db8:2:ab::4
    Pinging 2001:db8:2:ab::4 with 32 bytes of data:
       eply from 2001:DB8:2:AB::4: bytes=32 time=12ms TTL=125
        ply from 2001:DB8:2:AB::4: bytes=32 time=10ms TTL=125
ply from 2001:DB8:2:AB::4: bytes=32 time=11ms TTL=125
ply from 2001:DB8:2:AB::4: bytes=32 time=11ms TTL=125
      ing statistics for 2001:DB8:2:AB::4:
            Packets: Sent
                                                                         Lost = 0 (0% loss),
```

#### Figure 5.22: Ping test 4

This figure shows that this is a ping test from Library building host to other networks.

```
PDNS Server
                                                                                                                                                                   Х
                                                                                                                                                     _
   Physical Config Services Desktop Programming Attributes
    Command Prompt
                                                                                                                                                                                 Х
                                                                                                                                                                                  \overline{}
     Pinging 2001:db8:1:ab::4 with 32 bytes of data:
     Reply from 2001:DB8:1:AB::4: bytes=32 time=14ms TTL=126
Reply from 2001:DB8:1:AB::4: bytes=32 time=11ms TTL=126
Reply from 2001:DB8:1:AB::4: bytes=32 time=1ms TTL=126
Reply from 2001:DB8:1:AB::4: bytes=32 time=2ms TTL=126
      Ping statistics for 2001:DB8:1:AB::4:
            Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
roximate round trip times in milli-seconds:
Minimum = lms, Maximum = 14ms, Average = 7ms
      C:\>ping 2001:cafe:l:ca::4
      Pinging 2001:cafe:1:ca::4 with 32 bytes of data:
      Reply from 2001:CAFE:1:CA::4: bytes=32 time=1ms TTL=126
     Ping statistics for 2001:CAFE:1:CA::4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
            Minimum = 1ms, Maximum = 1ms, Average = 1ms
      C:\>ping 2001:db8:2:ab::4
     Pinging 2001:db8:2:ab::4 with 32 bytes of data:
      Reply from 2001:DB8:2:AB::4: bytes=32 time=15ms TTL=126
Reply from 2001:DB8:2:AB::4: bytes=32 time=1ms TTL=126
Reply from 2001:DB8:2:AB::4: bytes=32 time=2ms TTL=126
Reply from 2001:DB8:2:AB::4: bytes=32 time=1ms TTL=126
      Ping statistics for 2001:DB8:2:AB::4:
      Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = lms, Maximum = 15ms, Average = 4ms
      C:\>ping 2001:cafe:2:ab::3
     Pinging 2001:cafe:2:ab::3 with 32 bytes of data:
      Reply from 2001:CAFE:2:AB::3: bytes=32 time=2ms TTL=126
Reply from 2001:CAFE:2:AB::3: bytes=32 time=1ms TTL=126
Reply from 2001:CAFE:2:AB::3: bytes=32 time=1ms TTL=126
Reply from 2001:CAFE:2:AB::3: bytes=32 time=1ms TTL=126
        ing statistics for 2001:CAFE:2:AB::3:
             Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
coximate round trip times in milli-seconds:
```

Figure 5.23: Ping test 5

This figure shows that this is a ping test from admin building host to other networks.



#### Figure 5.24: Inter-vlan ping test

This figure shows that this is an inter-vlan routing ping test to faculty building hosts network. First picture shows ping from vlan 10 to 20 and second picture shows ping from vlan 20 to vlan 30.

🖗 РСЗ

₹ РСЗ					—	$\times$
Physical	Config	Desktop	Programming	Attributes		
Command	Prompt					х
C:\>tra	cert 200	)1:db8:1:a1	L::3			^
Tracing	route t	:o 2001:db8	3:1:al::3 o	ver a maximum of 30 hops:		
1 0	ms	0 ms	0 ms	2001:CAFE:1:BC::1		
2 1 3 0	ms ms	0 ms 1 ms	l ms O ms	2001:DB8:1:C1::1 2001:DB8:1:A1::3		
Trace c	omplete.					
C:\>200 Invalid	l:db8:1: Command	ab::2				
C:\>tra	cert 200	l:db8:l:ak	o::2			
Tracing	route t	:o 2001:db8	3:1:ab::2 o	ver a maximum of 30 hops:		
1 0	ms	0 m.s	0 ms	2001:CAFE:1:BC::1		
2 0	ms	0 ms	0 ms	2001:DB8:1:C1::1		
3 1 4 0	ms ms	l ms l ms	0 ms 0 ms	2001:DB8:1:B1::2 2001:DB8:1:AB::2		
Trace c	omplete.					
C:\>tra	cert 200	)1:cafe:2:k	bc::2			
Tracing	route t	:o 2001:caf	fe:2:bc::2	over a maximum of 30 hops:		
1 0	ms	0 ms	0 ms	2001:CAFE:1:BC::1		
2 0	ms	0 ms	l ms	2001:DB8:1:C1::1		
3 2	ms	1 ms	2 ms	2001:DB8:1:E1::2		
4 1	ms	3 ms	0 ms	2001:CAFE:2:BC::2		
Trace c	omplete.					
C:\>tra	cert 200	1:db8:2:bo	:::4			
Tracing	route t	:o 2001:db8	8:2:bc::4 o	ver a maximum of 30 hops:		
1 0	ms	0 ms	0 ms	2001:CAFE:1:BC::1		
2 0	ms	l ms	0 ms	2001:DB8:1:C1::1		
3 2 4 0	ms	1 ms 0 ms	2 ms 1 ms	2001:DB8:2:BC::4		
Trace c	omplete.					
C:\>tra	cert 200	)l:cafe:l:c	ca::4			
Tracing	route t	:0 2001:caf	fe:1:ca::4	over a maximum of 30 hops:		
1 1	ms	0 ms	0 ms	2001:CAFE:1:BC::1		
2 0	ms	0 ms	0 ms	2001:CAFE:1:CA::4		
Trace c	omplete.					$\sim$

Figure 5.25: Traceroute test

This figure shows that traceroute test from faculty building host to other networks.

R PC4	_		Х
Physical Config Desktop Programming Attributes			
Web Browser			Х
< > URL http://2001:db8:1:a1::2	Go	Stop	
Daffodil International University			^
Welcome to Daffodil International University.			-
Quick Links:			
A small page			
Copyrights			
Image page			
Image			

#### Figure 5.26: Web server test from host

The figure 5.26 shows that CSE building host pc4 can http to web server by entering the web server ipv6 address. Different hosts from different building can http to web server like this host does.



#### Figure 5.27: DNS server test from host

The figure 5.27 shows that CSE building host pc4 can http to web server by entering the domain name instead of web server ipv6 address. Different hosts from different building can http to web server by using the domain which is created by the DNS server.



#### Figure 5.28: FTP server 1

In figure 5.28, logging to ftp server by using ftp server username and password which is created before in ftp server. Then create a text file from desktop text option.



#### Figure 5.29: FTP server 2

In figure 5.29, the new created text file is in the c drive so, by using put command let's put the file on ftp server.



#### Figure 5.30: FTP server 3

In figure 5.30, after using put command the created text file is in the FTP server



Figure 5.31: FTP server 4

In figure 5.31, logging to FTP server using another host and check the directory file that the New.txt file is there. Now use get command to download the FTP file.

PC0					_		PC5					-		$\times$
Physical	Config	Desktop	Programming	Attributes			Physica Co	Config npose	Desktop Reply	Programming Receive	Attributes Delete	Conf	igure Mail	^
Reply Mail						Х	1	From admin@di	u.ed This	Subje is a Hello mail	ct	Wed Oct 01:56:33	2 2019	
Cand	To:	user@diu.ed	iu.bd											
Sena	Subject:	This is a Hel	lo mail				<						>	
Hello User	! How are	you today?					This is admin@ Sent : \ Hello U Sending subject : Server: 2	a Hello mail gdiu.edu.bd Ved Oct 2 2 serl How are mail to adm RE: This is 001.db8:1:a	019 01:56:33 you today? - in@diu.edu.t a Hello mail 11::3	bd , with Mail	C. Send	ancel Receive		-

Figure 5.32: Sending mail from one host to another

The figure 5.32 shows that host PC0 sends a mail to another host pc5 and after sending the mail host pc5 has received the mail from pc0. Both hosts configured the mail before.

R PCO	- 0	×	PC0		- 🗆 X
Physical Config Desktop Programming Attributes			Physical Config Desktop	Programming Attributes	
MAIL BROWSER	X	^	MAIL BROWSER		X
Mails			Mails		
Compose Reply Receive	Delete Configure Mail		Compose	eply Receive Delete	Configure Mail
From Subject	Received		From	Subject	Received
1 user@diu.edu.bd RE: This is a Hello mail	Wed Oct 2 2019 01:59:29		1 user@diu.edu.bd	RE: This is a Hello mail	Wed Oct 2 2019 01:59:29
5			K		>
RE:This is a Hello mail user@diu.edu.bd Sent : Wed Oct 2 2019 01:59:29 I am fine. thank you	^	~	RE: This is a Hello mail user@diu.edu.bd Sent : Wed Oct 2 2019 01:59:2 I am fine. thank you		

Figure 5.33: Replying mail from one host to another

The figure shows 5.33 that host PC5 reply the mail which it gets from host pc0. Host PC0 gets the reply mail from hosts pc5.

## **5.3 Test Results**

After pinging and tracerouting from one host to another successfully and using the servers from hosts successfully we can say that, we are successfully deploy the ipv6 address in our campus network.

# CHAPTER 6 CONCLUSION AND FUTURE SCOPE

#### **6.1 Discussion and Conclusion**

With the appearance of the web age, the impact of our education is new, and it additionally provides a fast leap for education opportunities, education ought to be destined towards modernization, facing the globe, facing the longer term, we tend to should 1st facing the network. Education will solely create a mixture with network so as to stay up with progress and development of times. The premise of network education is that the construction of the network, and because the construction of the field network isn't solely the development of the network exhausting setting, however additionally should embody the field network maintenance and security, field network resources and also the make love effective application of the field network and alternative 3 Link. solely the complete and make love effective application of the field network so as to create the whole teaching model and also the academic conception of an entire modification so as to use the new century to cultivate high-quality inventive and complicated skills wants for the field network construction, not applicable to any or all university program, even for a university, it's not possible to possess the simplest program, solely the higher program.

### 6.2 Scope for Further Development

Ipv6 is more secure than Ipv4 but the invention of Ipv6 was not so ago. Still it is working for better security and protocols. Though it is a new protocol so, there are lots of security issues happens and the newly attack possibility increases day by day. All protocols can be used in IPV4 still not come to IPV6. When it will come then we will use those protocols for making the campus more efficient and secure.

- ✤ Will Increase the campus area.
- ✤ Will add more protocols.
- ✤ Will increase more security.

#### REFERENCES

Deploying IPv6 in a Campus Networks, available at << <u>https://www.cisco.com/</u>>>, last accessed on
 22-09-2019 at 11:30 PM.

[2] IPv6 Deployment Guide, available at<< <u>https://www.6diss.org/</u>>>, last accessed on 24-09-2019 at
 12:00 PM.

[3] Tomas Podermanski, Matej Gregr, Miroslav Sveda, "DEPLOYING IPV6 – PRACTICAL PROBLEMS FROM THE CAMPUS PERSPECTIVE," Brno University of Technology, Bozetechova ½,612 66 Brno, Czech Republic, pp. 1-7, 2012.

[4] Huichao Ma, Guoliang Lv, Chunyu Wu, "Campus Network Planning and Design," School of Computer Information, Hefei University of Technology, Anhui, China, pp. 1-7, 2018.

[5] Homer Carlisle, Bliss Bailey, "Enabling IPv6 within a campus network," Auburn, Alabama, pp. 454-457, March 28, 2008.

[6] IPv6 deployment, available at<< <u>https://en.wikipedia.org/</u>>>, last accessed on 27-10-2019 at 1:20PM.

[7] Top 5 Concerns of Network Admins About Migration to IPv6 in 2019, available at<<</p>
<u>https://www.6connect.com/</u>>>, last accessed on 27-10-2019 at 2:15 PM.

[8] IPv4 to IPv6: Challenges, solutions, and lessons, available at<< <u>https://www.sciencedirect.com/</u>>>, last accesses on 28-10-2019 at 1:00 AM.

[9] CCNA Routing and Switching, available at << <u>https://www.cisco.com/</u> >>, last accessed on 26-10-2019 at 11:00 AM.

[10] Cisco Packet Tracer, available at<< <u>https://www.netacad.com/</u>>>, last accessed on 02-11-2019 at
 5:00 PM.

[11] GNS3, available at<< https://www.gns3.com/>>>, last accessed on 02-11-2019 at 5:30 PM.

[12] Cisco IOS Command Hierarchy, available at << <u>https://www.cisco.com/</u> >>, last accessed on 28-09-2019 at 10:30 PM.

[13] What is Ping Test, available at << <u>https://www.websitepulse.com/</u>>>, last accessed on 27-10-2019 on 8:00 PM.

[14] Tracert Command, available at << <u>https://www.lifewire.com/</u>

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