

**LAPORAN AKHIR FINAL PROJECT**  
**MAGANG & STUDI INDEPENDEN BERSERTIFIKAT**  
**Desain dan Implementasi jaringan skala kecil (Small  
Network) yang menerapkan Network  
Programmability**

**Di Balitbang SDM Kementerian Kominfo**

Diajukan untuk memenuhi persyaratan kelulusan  
Program MSIB MBKM

oleh :

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Kelas D TSA Network Programmability



**S1 PENDIDIKAN TEKNIK INFORMATIKA**  
**UNIVERSITAS NEGERI MALANG**  
**2022**

## **PENDAHULUAN**

### **A. Latar Belakang**

Manajemen konfigurasi perangkat jaringan menjadi hal yang sangat krusial di masa serba digital seperti saat ini. Dengan pesatnya perkembangan teknologi informasi, maintain perangkat jaringan perlu diperhatikan. Karena sebagian besar konfigurasi perangkat jaringan masih dilakukan secara manual. Terlebih lagi konfigurasi perangkat jaringan melibatkan banyak perangkat dan proses yang dinamis. Dengan demikian perlu adanya network automation untuk mengelola, mengonfigurasi, dan maintain perangkat jaringan secara otomatis.

Berdasarkan latar belakang tersebut, maka dibuatlah Desain dan Implementasi jaringan skala kecil (Small Network) yang menerapkan Network Programmability sebagai fitur network automation yang memungkinkan kita untuk maintain, manajemen, dan monitoring konfigurasi perangkat jaringan.

## METODE PELAKSANAAN

### A. Deskripsi Final Project

Desain dan Implementasi jaringan skala kecil (Small Network) yang menerapkan Network Programmability. Pada sebuah gedung terdapat 2 lantai dimana lantai 1 terdapat 2 ruang, dimana pada ruang 1 terdapat 3 PC dan pada ruang 2 terdapat 2 PC. Lantai 2 terdapat 1 PC, 1 Server, dan 1 Network Controller. Masing-masing ruang dihubungkan oleh switch dan masing-masing lantai dihubungkan oleh router. Lantai 1 dan 2, dihubungkan 1 router core. Desain jaringan menerapkan skema pengalamatan Variable Length Subnet Mask (VLSM) dan menerapkan Virtual Local Area Network (VLAN) serta menggunakan routing protocol.

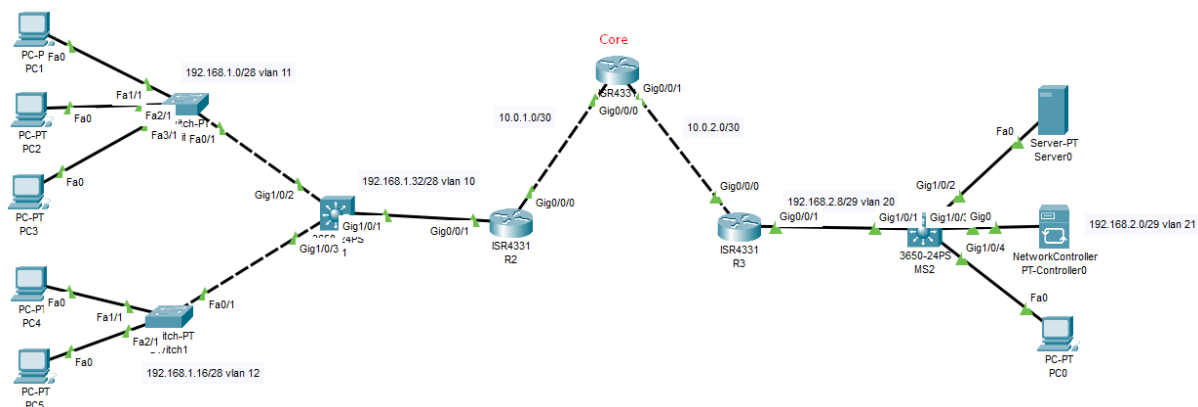
### B. Tahap Requirement

Network Simulation Tools yang digunakan Cisco Packet Tracer dengan fitur:

- Desain memuat minimal 3 (tiga) unit Cisco 4331 routers, 2 (dua) unit Cisco 3650 Switches, 6 (enam) unit PC client, 1 (satu) Server dan wajib menggunakan 1 (satu) Network Controller.
- Desain jaringan menerapkan skema pengalamatan Variable Length Subnet Mask (VLSM) dan menerapkan Virtual Local Area Network (VLAN) serta menggunakan routing protocol.
- Konfigurasi dasar pengamanan perangkat jaringan meliputi menerapkan password privilege, console dan remote access hanya melalui Secure Shell (SSH).
- Kode program yang dibuat mengimplementasikan fitur REST-API dari Network Controller.

Kode program Python yang dibuat wajib menerapkan Software Version Control sehingga disimpan pada Git Local Repository dan diintegrasikan dengan GitHub.

Topologi Jaringan.



Addressing Table

Device	Interface	IP Address
R1	G0/0/0	10.0.1.1/30
	G0/0/1	10.0.2.1/30
R2	G0/0/0	10.0.1.2/30
	G0/0/1.10	192.168.33.1/28
	G0/0/1.11	192.168.1.1/28
	G0/0/1.12	192.168.1.17/28
R3	G0/0/0	10.0.2.2/30
	G0/0/1.20	192.168.2.9/29
	G0/0/1.21	192.168.2.1/29
MS1	VLAN 10	192.168.1.34/28
MS2	VLAN 20	192.168.2.10/29
PC0	NIC	DHCP Client VLAN 21
PC1	NIC	DHCP Client VLAN 11
PC2	NIC	DHCP Client VLAN 11
PC3	NIC	DHCP Client VLAN 11
PC4	NIC	DHCP Client VLAN 12
PC5	NIC	DHCP Client VLAN 12
Server0	NIC	192.168.2.3/29
PT-Controller0	NIC	192.168.2.4/29

### C. Tahap Implementasi

Berikut merupakan konfigurasi yang diterapkan pada setiap perangkat jaringan.

Note: All; domain : admin.com, enable secret password : adminenpass, console password : adminconpass, ssh : admin, admin1pass

#### a) R1

R1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
R1#sh running-config
Building configuration...

Current configuration : 1351 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
security passwords min-length 10
!
hostname R1
!
!
!
enable secret 5 $1$mERr$WWNkcIXfYuLGqs6oFAPyN1
!
!
!
!
!
ip cef
no ipv6 cef
!
!
!
username admin secret 5 $1$mERr$ILrAmVhMGbrCFnj8QqS3T.
!
!
!
!
```

Ctrl+F6 to exit CLI focus

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☐ Top

R1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
no ip domain-lookup
ip domain-name admin.com
ip name-server 192.168.2.3
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0/0
description connect to R2
ip address 10.0.1.1 255.255.255.252
duplex auto
speed auto
!
interface GigabitEthernet0/0/1
ip address 10.0.2.1 255.255.255.252
duplex auto
speed auto
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Vlan1
no ip address
shutdown
!
ip classless
ip route 192.168.1.0 255.255.255.240 10.0.1.2
```

Ctrl+F6 to exit CLI focus

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R1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
ip classless
ip route 192.168.1.0 255.255.255.240 10.0.1.2
ip route 192.168.1.16 255.255.255.240 10.0.1.2
ip route 192.168.1.32 255.255.255.240 10.0.1.2
ip route 192.168.2.0 255.255.255.248 10.0.2.2
ip route 192.168.2.8 255.255.255.248 10.0.2.2
!
ip flow-export version 9
!
!
banner motd ^CUnauthorized Access is Prohibited!^C
!
!
!
!
logging 192.168.2.3
line con 0
 password 7 08204843001706181C1B0D1739
 login
!
line aux 0
!
line vty 0 4
 login local
 transport input ssh
line vty 5 15
 login local
 transport input ssh
!
!
ntp server 192.168.2.3
!
end
```

Ctrl+F6 to exit CLI focus

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☐ Top

b) R2

R2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
R2#sh running-config
Building configuration...

Current configuration : 1879 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
security passwords min-length 10
!
hostname R2
!
!
!
enable secret 5 $1$mERr$WWNkcIXfYyLGqs6oFAPyN1
!
!
!
ip dhcp pool vlan11
 network 192.168.1.0 255.255.255.240
 default-router 192.168.1.1
 dns-server 192.168.2.3
 domain-name admin.com
ip dhcp pool vlan12
 network 192.168.1.16 255.255.255.240
 default-router 192.168.1.17
 dns-server 192.168.2.3
 domain-name admin.com
!
!
!
ip cef
no ipv6 cef
!
```

Ctrl+F6 to exit CLI focus

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☐ Top

R2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
username admin secret 5 $!$mERr$ILrAmVhMGbrCFnj8QqS3T.
!
!
!
!
!
!
!
!
no ip domain-lookup
ip domain-name admin.com
ip name-server 192.168.2.3
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0/0
description connect to R1
ip address 10.0.1.2 255.255.255.252
duplex auto
speed auto
!
interface GigabitEthernet0/0/1
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0/1.10
description vlan10 management interface
encapsulation dot1Q 10
```

Ctrl+F6 to exit CLI focus

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☐ Top

R2

Physical Config **CLI** Attributes


IOS Command Line Interface

```
interface GigabitEthernet0/0/1.10
description vlan10 management interface
encapsulation dot1Q 10
ip address 192.168.1.33 255.255.255.240
!
interface GigabitEthernet0/0/1.11
description vlan11
encapsulation dot1Q 11
ip address 192.168.1.1 255.255.255.240
!
interface GigabitEthernet0/0/1.12
description vlan12
encapsulation dot1Q 12
ip address 192.168.1.17 255.255.255.240
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Vlan1
no ip address
shutdown
!
ip classless
ip route 10.0.2.0 255.255.255.252 10.0.1.1
ip route 192.168.2.0 255.255.255.248 10.0.1.1
ip route 192.168.2.8 255.255.255.248 10.0.1.1
!
ip flow-export version 9
!
!
!
banner motd ^CUnauthorized Access is Prohibited!^C
```

Ctrl+F6 to exit CLI focus

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Physical Config CLI Attributes

IOS Command Line Interface

```
!
!
!
banner motd ^CUnauthorized Access is Prohibited!^C
!
!
!
!
!
!
logging 192.168.2.3
line con 0
  password 7 08204843001706181C1B0D1739
  login
!
line aux 0
!
line vty 0 4
  login local
  transport input ssh
line vty 5 15
  login local
  transport input ssh
!
!
ntp server 192.168.2.3
!
end
```

c) R3



— □ ×

Physical Config CLI Attributes

IOS Command Line Interface

```
R3#sh run
Building configuration...

Current configuration : 1672 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
security passwords min-length 10
!
hostname R3
!
!
!
enable secret 5 $1$mERr$WWNkcIXfYuLGqs6oFAPyN1
!
!
!
ip dhcp pool vlan21
  network 192.168.2.0 255.255.255.248
  default-router 192.168.2.1
  dns-server 192.168.2.3
  domain-name admin.com
!
!
!
ip cef
no ipv6 cef
!
!
!
username admin secret 5 $1$mERr$ILrAmVhMGbrCFnj8QqS3T.
!
!
```

Ctrl+F6 to exit CLI focus

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☐ Top



R3

Physical Config **CLI** Attributes

IOS Command Line Interface

```
!  
no ip domain-lookup  
ip domain-name admin.com  
ip name-server 192.168.2.3  
!  
!  
spanning-tree mode pvst  
!  
!  
!  
!  
!  
interface GigabitEthernet0/0/0  
description connect to R1  
ip address 10.0.2.2 255.255.255.252  
duplex auto  
speed auto  
!  
interface GigabitEthernet0/0/1  
no ip address  
duplex auto  
speed auto  
!  
interface GigabitEthernet0/0/1.20  
description vlan20 management interface  
encapsulation dot1Q 20  
ip address 192.168.2.9 255.255.255.248  
!  
interface GigabitEthernet0/0/1.21  
description vlan21  
encapsulation dot1Q 21  
ip address 192.168.2.1 255.255.255.248  
!  
interface GigabitEthernet0/0/2
```

Ctrl+F6 to exit CLI focus

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☐ Top

R3

Physical Config **CLI** Attributes

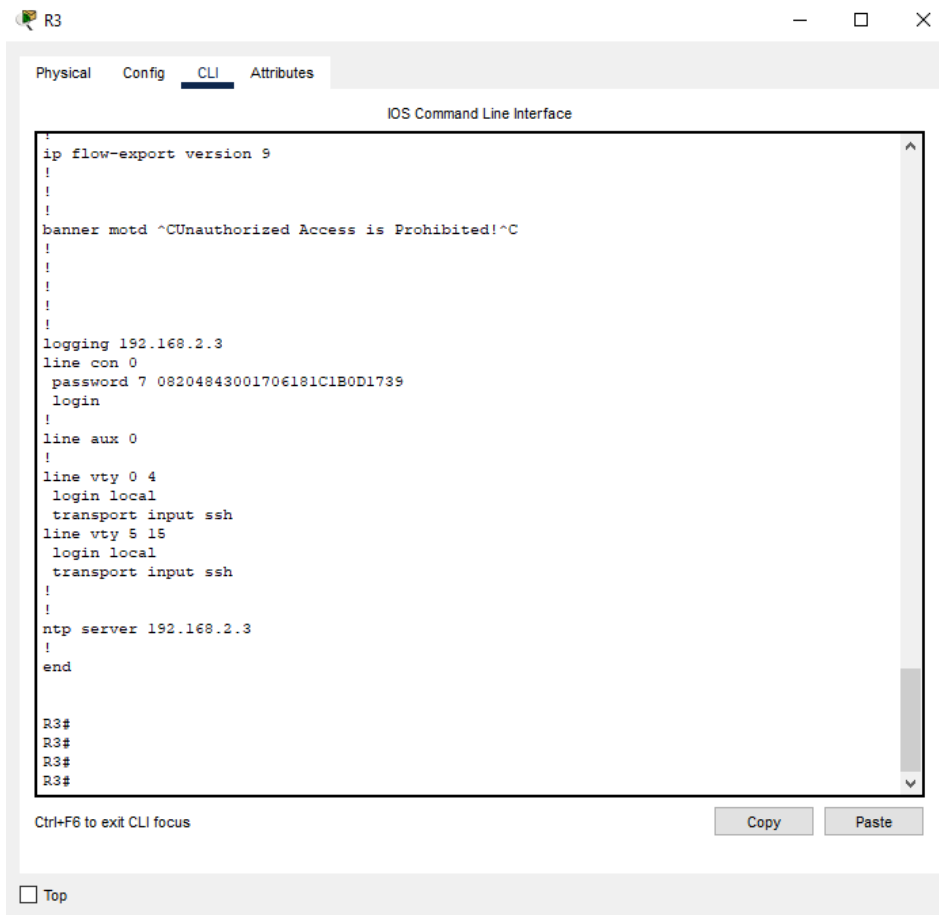
IOS Command Line Interface

```
!  
interface GigabitEthernet0/0/2  
no ip address  
duplex auto  
speed auto  
shutdown  
!  
interface Vlan1  
no ip address  
shutdown  
!  
ip classless  
ip route 10.0.1.0 255.255.255.252 10.0.2.1  
ip route 192.168.1.0 255.255.255.240 10.0.2.1  
ip route 192.168.1.16 255.255.255.240 10.0.2.1  
ip route 192.168.1.32 255.255.255.240 10.0.2.1  
!  
ip flow-export version 9  
!  
!  
banner motd ^CUnauthorized Access is Prohibited!^C  
!  
!  
!  
!  
logging 192.168.2.3  
line con 0  
password 7 08204843001706181C1B0D1739  
login  
!  
line aux 0  
!  
line vty 0 4
```

Ctrl+F6 to exit CLI focus

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☐ Top



d) MS1



MS1

Physical Config CLI Attributes

IOS Command Line Interface

```
!  
no ip domain-lookup  
ip domain-name admin.com  
ip name-server 192.168.2.3  
!  
!  
spanning-tree mode pvst  
!  
!  
!  
!  
!  
interface GigabitEthernet1/0/1  
  switchport mode trunk  
!  
interface GigabitEthernet1/0/2  
  switchport access vlan 11  
  switchport mode access  
  switchport nonegotiate  
!  
interface GigabitEthernet1/0/3  
  switchport access vlan 12  
  switchport mode access  
  switchport nonegotiate  
!  
interface GigabitEthernet1/0/4  
  shutdown  
!  
interface GigabitEthernet1/0/5  
  shutdown  
!  
interface GigabitEthernet1/0/6  
  shutdown  
!
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

MS1

Physical Config CLI Attributes

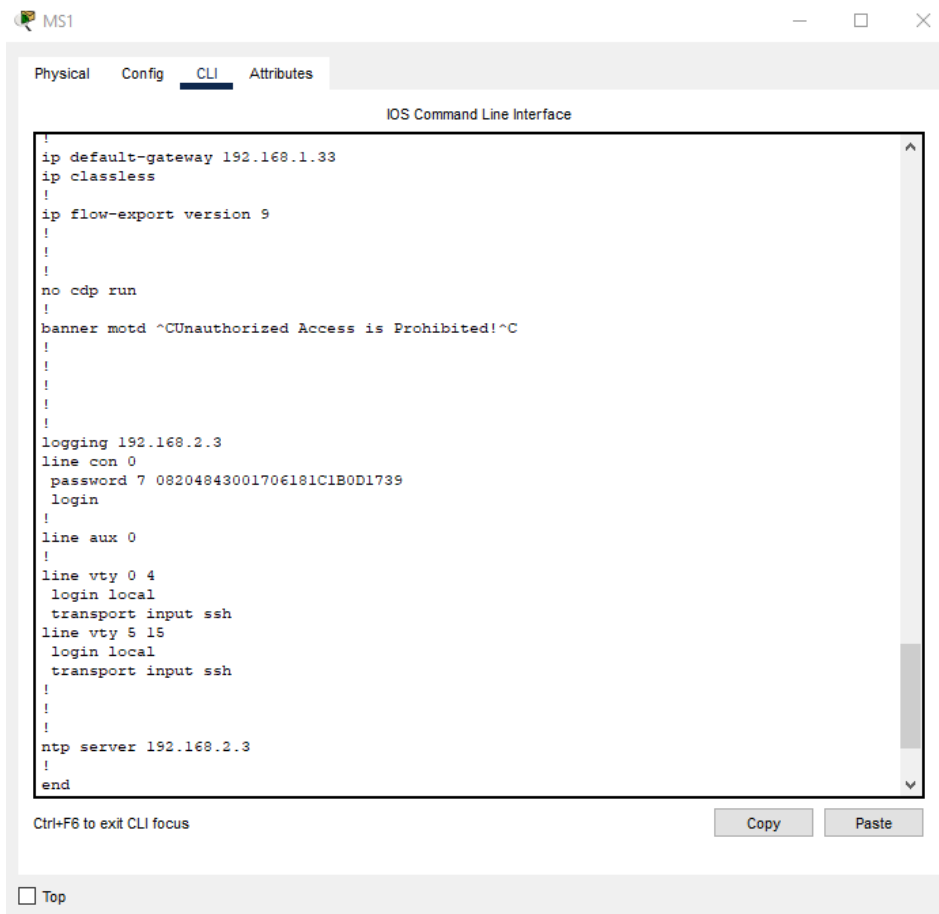
IOS Command Line Interface

```
interface GigabitEthernet1/1/4  
  shutdown  
!  
interface Vlan1  
  no ip address  
  shutdown  
!  
interface Vlan10  
  description vlan10 management interface  
  mac-address 0005.5e39.6301  
  ip address 192.168.1.34 255.255.255.240  
!  
ip default-gateway 192.168.1.33  
ip classless  
!  
ip flow-export version 9  
!  
!  
no cdp run  
!  
banner motd ^CUnauthorized Access is Prohibited!^C  
!  
!  
!  
!  
logging 192.168.2.3  
line con 0  
  password 7 08204843001706181C1B0D1739  
  login  
!  
line aux 0  
!  
line vty 0 4
```

Ctrl+F6 to exit CLI focus

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☐ Top



e) MS2



MS2

Physical Config CLI Attributes

IOS Command Line Interface

```
!  
no ip domain-lookup  
ip domain-name admin.com  
ip name-server 192.168.2.3  
!  
!  
spanning-tree mode pvst  
!  
!  
!  
!  
!  
interface GigabitEthernet1/0/1  
  switchport mode trunk  
!  
interface GigabitEthernet1/0/2  
  switchport access vlan 21  
  switchport mode access  
  switchport nonegotiate  
!  
interface GigabitEthernet1/0/3  
  switchport access vlan 21  
  switchport mode access  
  switchport nonegotiate  
!  
interface GigabitEthernet1/0/4  
  switchport access vlan 21  
  switchport mode access  
  switchport nonegotiate  
!  
interface GigabitEthernet1/0/5  
  shutdown  
!  
interface GigabitEthernet1/0/6
```

Ctrl+F6 to exit CLI focus

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☐ Top

MS2

Physical Config CLI Attributes

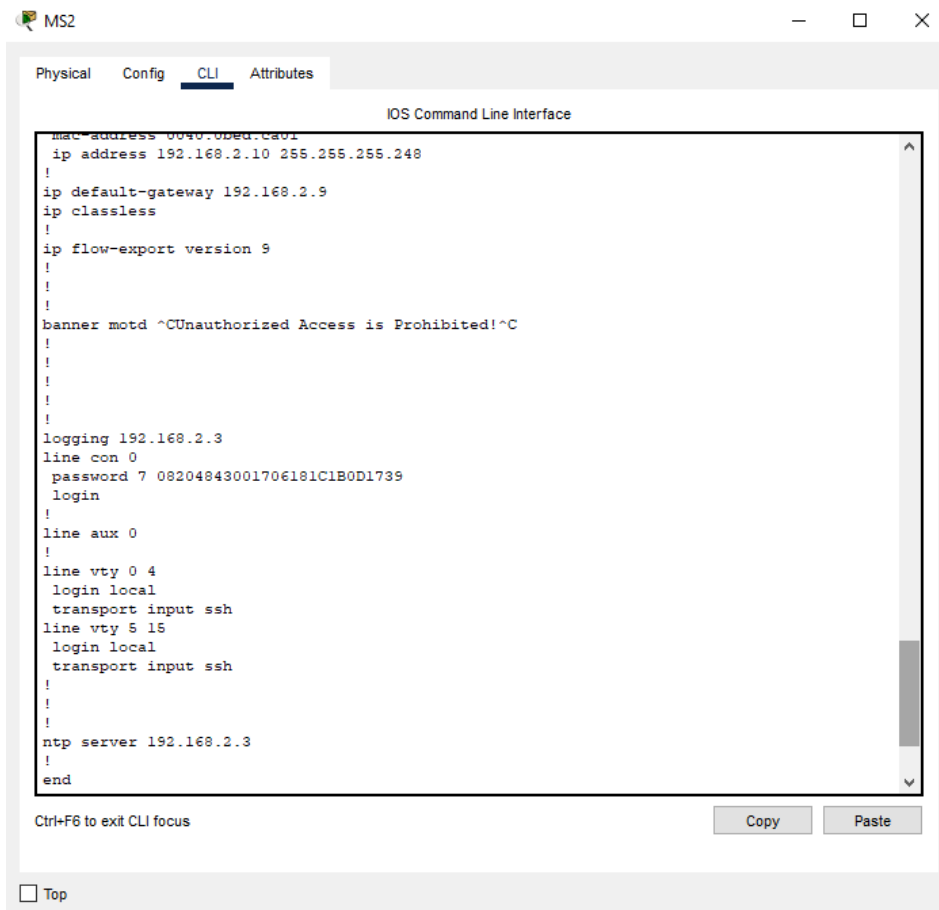
IOS Command Line Interface

```
interface GigabitEthernet1/1/4  
  shutdown  
!  
interface Vlan1  
  no ip address  
  shutdown  
!  
interface Vlan20  
  description vlan20 management interface  
  mac-address 0040.0bed.ca01  
  ip address 192.168.2.10 255.255.255.248  
!  
ip default-gateway 192.168.2.9  
ip classless  
!  
ip flow-export version 9  
!  
!  
banner motd ^CUnauthorized Access is Prohibited!^C  
!  
!  
!  
logging 192.168.2.3  
line con 0  
  password 7 08204843001706181C1B0D1739  
  login  
!  
line aux 0  
!  
line vty 0 4  
  login local  
  transport input ssh
```

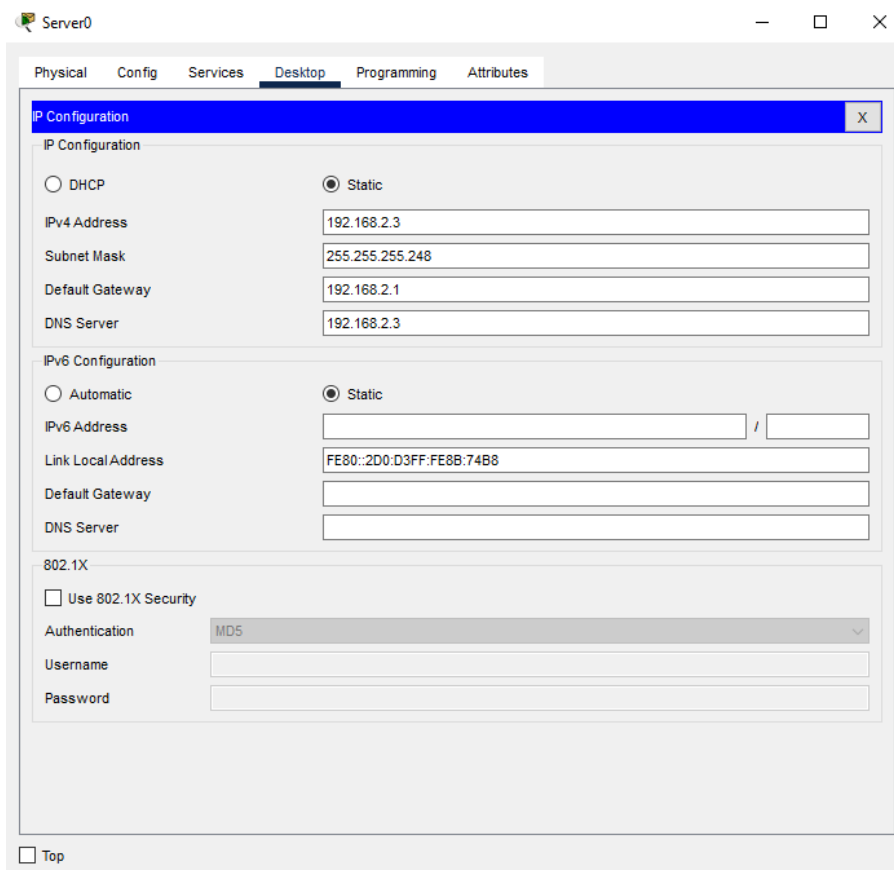
Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top



## f) Server0



Server0

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

HTTP

HTTP

☒ On☐ Off

HTTPS

☒ On☐ Off

File Manager

	File Name	Edit	Delete
1	copyrights.html	(edit)	(delete)
2	cscoptlogo177x111.jpg		(delete)
3	helloworld.html	(edit)	(delete)
4	image.html	(edit)	(delete)
5	index.html	(edit)	(delete)

New File

Import

☐ Top

Server0

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DNS

DNS Service

☒ On☐ Off

Resource Records

Name

Type

A Record

Address

Add

Save

Remove

No.	Name	Type	Detail
0	admin.com	A Record	192.168.2.3

DNS Cache

☐ Top

Server0

Physical Config **Services** Desktop Programming Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

**SYSLOG**

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

Syslog

Service ☒ On ☐ Off

	Time	HostName	Message
1	-	192.168.1.34	%CDP-4....
2	-	192.168.1.34	%CDP-4....
3	-	10.0.1.2	%DHCPD-4-PING_CONFLICT: DHCP address conflict: ...
4	-	192.168.2.1	%DHCPD-4-PING_CONFLICT: DHCP address conflict: ...
5	-	10.0.1.2	%DHCPD-4-PING_CONFLICT: DHCP address conflict: ...
6	-	192.168.1.34	%CDP-4....
7	-	192.168.1.34	%CDP-4....
8	-	192.168.1.34	%CDP-4....
9	-	192.168.1.34	%CDP-4....
10	-	192.168.1.34	%CDP-4....
11	-	192.168.1.34	%CDP-4....
12	-	192.168.1.34	%CDP-4....
13	-	192.168.1.34	%CDP-4....

Clear Log

☐ Top

Server0

Physical Config **Services** Desktop Programming Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

**NTP**

EMAIL

FTP

IoT

VM Management

Radius EAP

NTP

Service ☒ On ☐ Off

Authentication

☐ Enable ☒ Disable

Key: Password:

Jul 2022

04:17:26PM

Min	Sen	Sel	Rab	Kam	Jum	Sab
26	27	28	29	30	1	2
3	4	5	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
31	1	2	3	4	5	6

☐ Top



## g) PT-Controller0

PT-Controller0

Physical Config Attributes

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

GigabitEthernet0

GigabitEthernet1

**REAL WORLD**

Controller

Global Settings

Display Name: PT-Controller0

Interfaces: GigabitEthernet0

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway: 192.168.2.1

DNS Server: 192.168.2.3

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway:

DNS Server:

Ntp

Current Time: Min Jul 3 16:18:38 2022

Server Ip:

Authentication

☐ Enable ☒ Disable

Top

PT-Controller0

Physical Config Attributes

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

GigabitEthernet0

GigabitEthernet1

**REAL WORLD**

Controller

GigabitEthernet0

Port Status: ☒ On

Bandwidth: ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address: 00D0.FF85.E301

IP Configuration

☐ DHCP

☒ Static

IPv4 Address: 192.168.2.4

Subnet Mask: 255.255.255.248

IPv6 Configuration

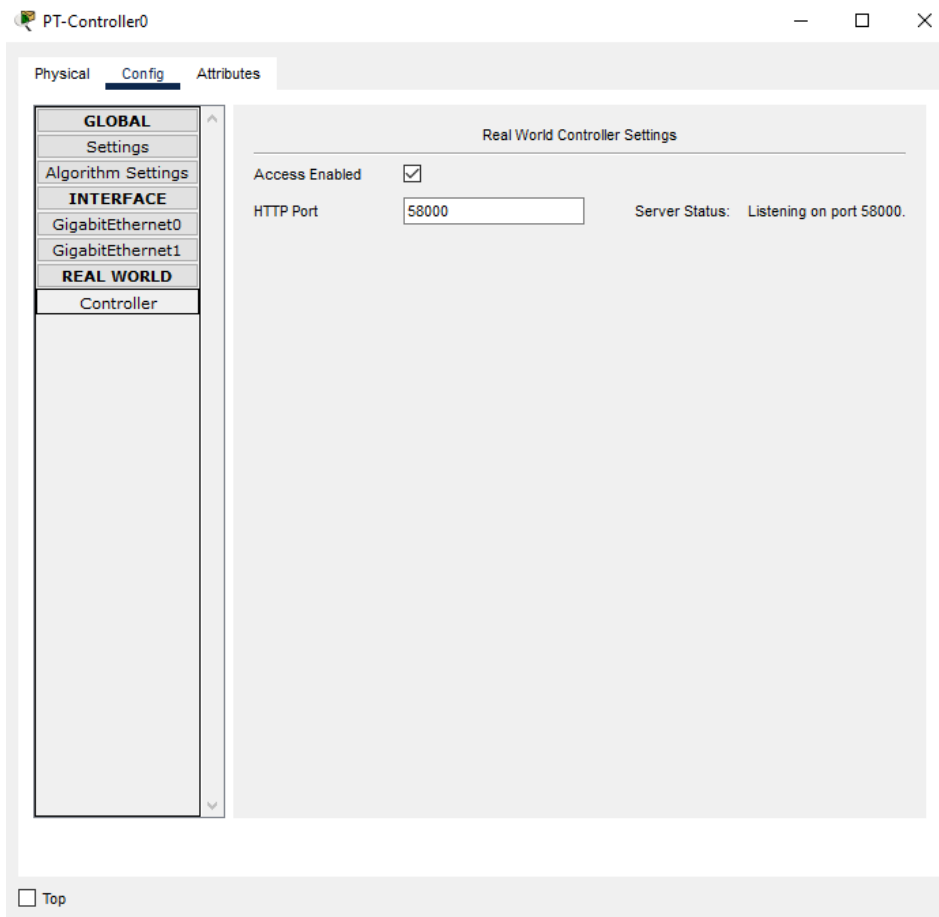
☐ Automatic

☒ Static

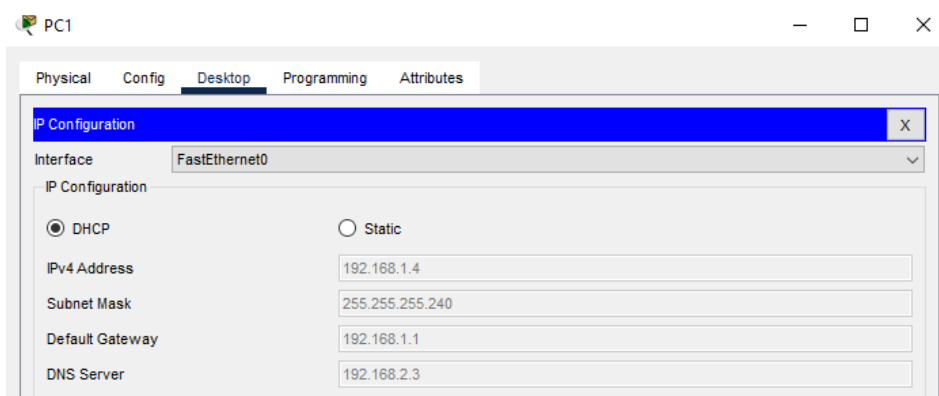
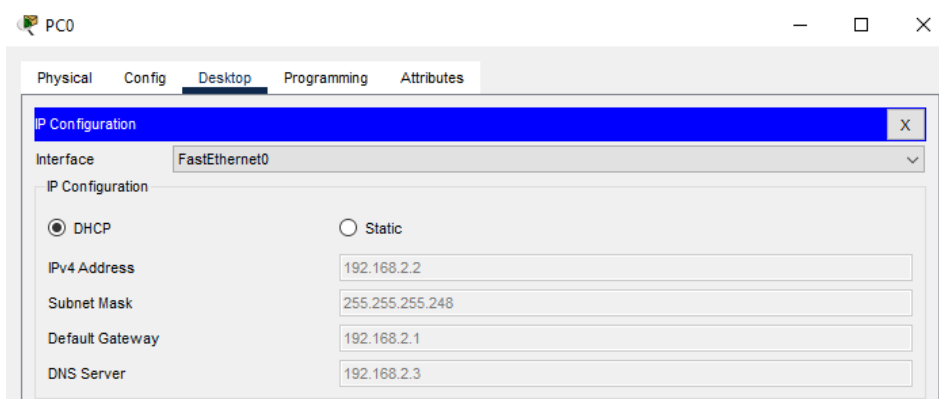
IPv6 Address:

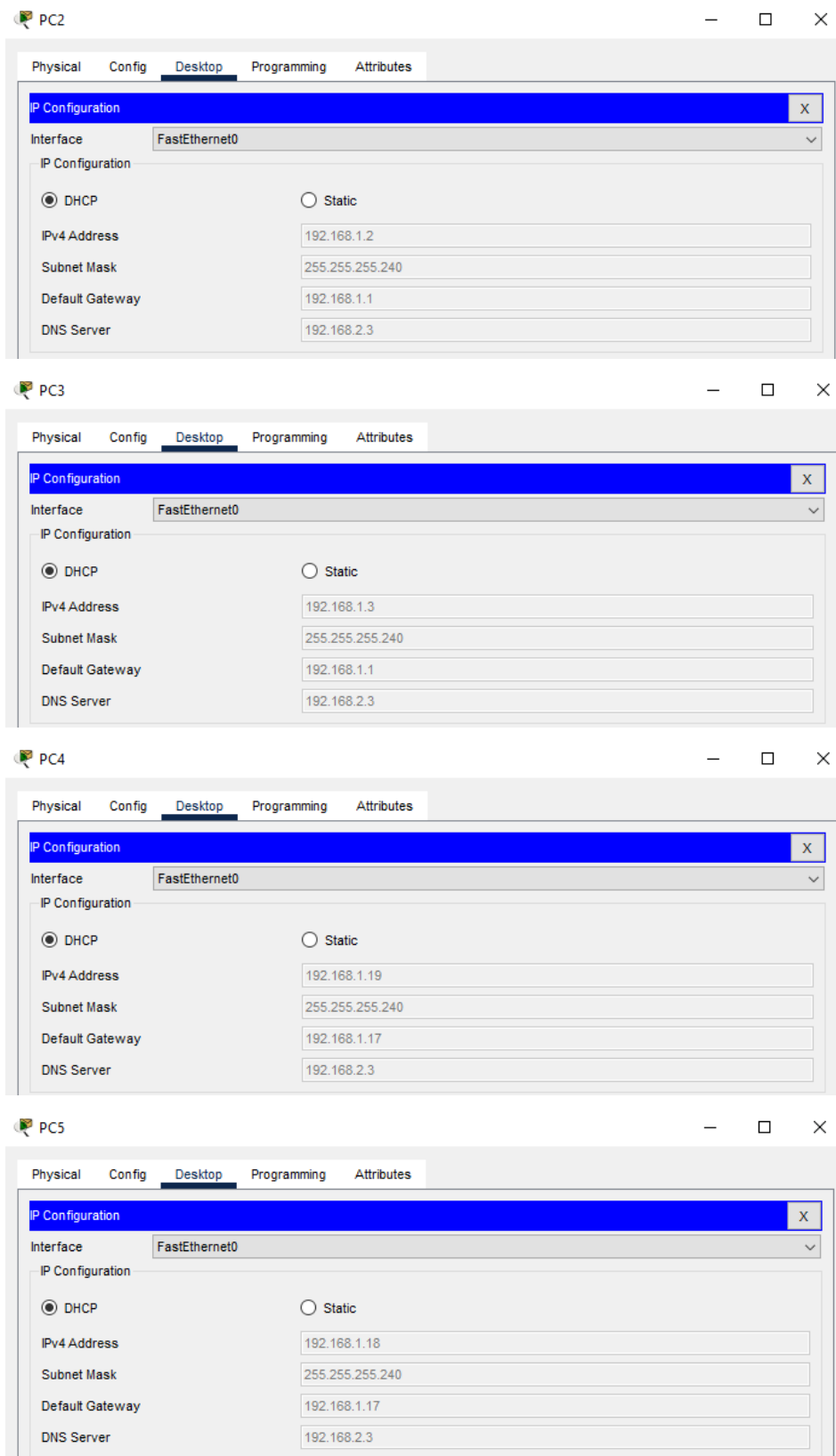
Link Local Address: FE80::2D0:FFFF:FE85:E301

Top



h) PC





i) Kode Python REST APIs

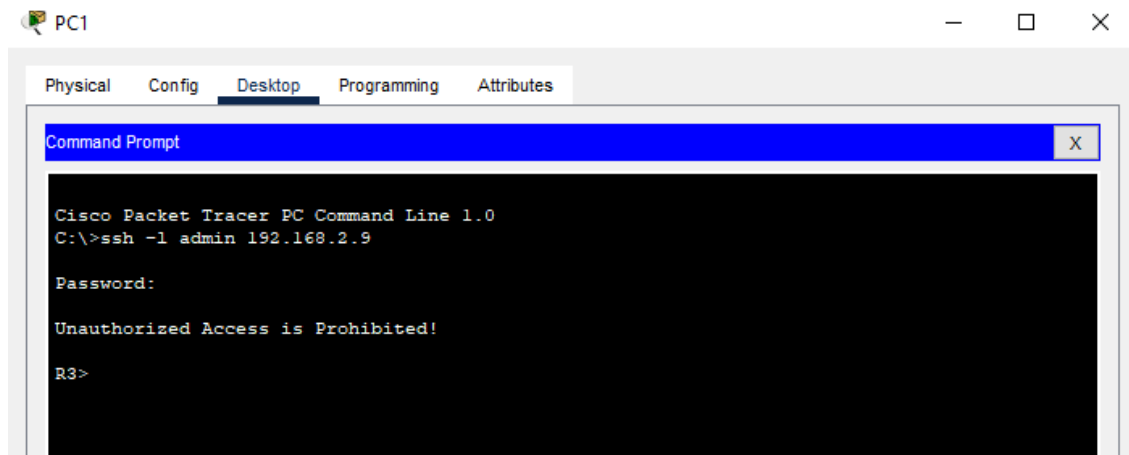
```
01_get-ticket.py X 02_get-network-device.py 03_get-host.py
01_get-ticket.py
1 import json
2 import requests
3 api_url = "http://localhost:58000/api/v1/ticket"
4
5 headers = {
6     "content-type": "application/json"
7 }
8
9 body_json = {
10     "username": "risqi2",
11     "password": "risqi2"
12 }
13
14 resp = requests.post(api_url, json.dumps(body_json), headers=headers, verify=False)
15
16 print("Ticket request status: ", resp.status_code)
17 response_json = resp.json()
18
19 serviceTicket = response_json["response"]["serviceTicket"]
20 print("The service ticket number is: ", serviceTicket)
21
```

```
01_get-ticket.py 02_get-network-device.py X 03_get-host.py
02_get-network-device.py
1 import json
2 import requests
3 api_url = "http://localhost:58000/api/v1/network-device"
4
5 headers={"X-Auth-Token": "NC-6-968f2ba2a9bb4838989d-nbi"}
6
7 resp = requests.get(api_url, headers=headers, verify=False)
8
9 print("Request status: ", resp.status_code)
10
11 response_json = resp.json()
12 networkDevices = response_json["response"]
13
14 for networkDevice in networkDevices:
15     print(networkDevice["hostname"], "\t", networkDevice["platformId"], "\t", networkDevice["managementIpAddress"])
16
17
```

```
01_get-ticket.py 02_get-network-device.py 03_get-host.py X
03_get-host.py
1 import json
2 import requests
3 api_url = "http://localhost:58000/api/v1/host"
4
5 headers={"X-Auth-Token": "NC-6-968f2ba2a9bb4838989d-nbi"}
6
7 resp = requests.get(api_url, headers=headers, verify=False)
8
9 print("Request status: ", resp.status_code)
10
11 response_json = resp.json()
12 hosts = response_json["response"]
13
14 for host in hosts:
15     print(host["hostName"], "\t", host["hostIp"], "\t", host["hostMac"], "\t", host["connectedInterfaceName"])
16
```

## HASIL DAN PEMBAHASAN

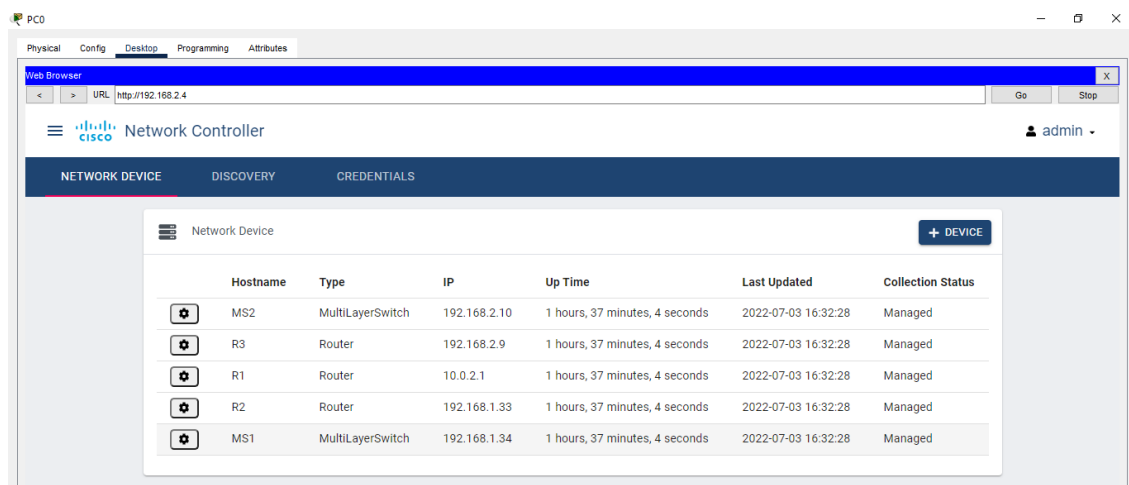
### Remote Access Secure Shell (SSH)

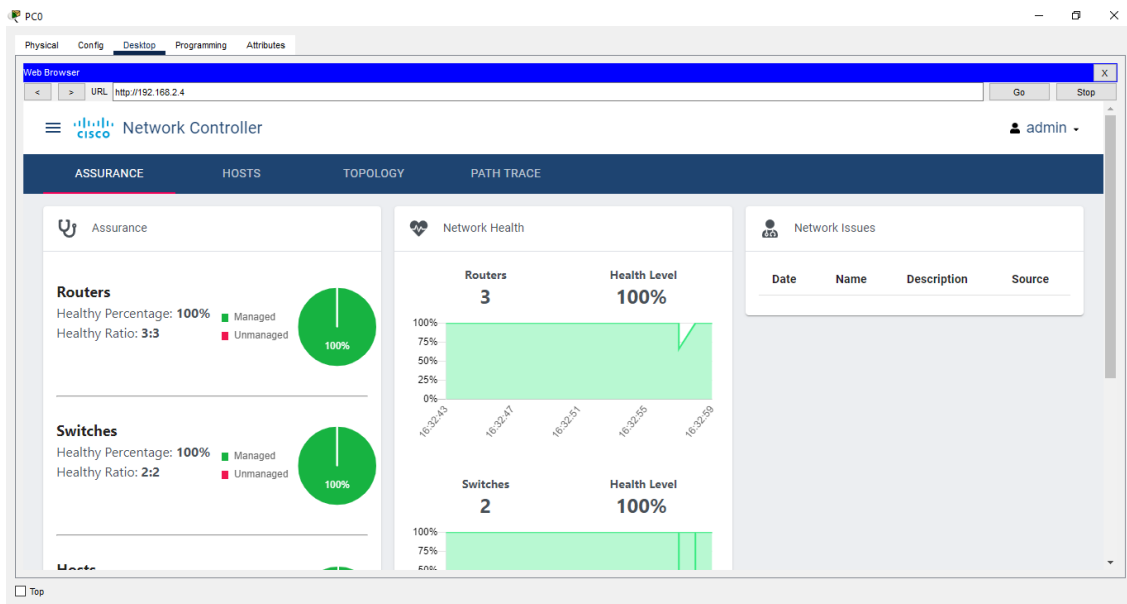


### Test Ping Koneksi

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC5	MS2	ICMP		0.000	N	0	(edit)

### Network Controller





PC0

Physical Config Desktop Programming Attributes

Web Browser

URL: http://192.168.2.4

Go Stop

Network Controller

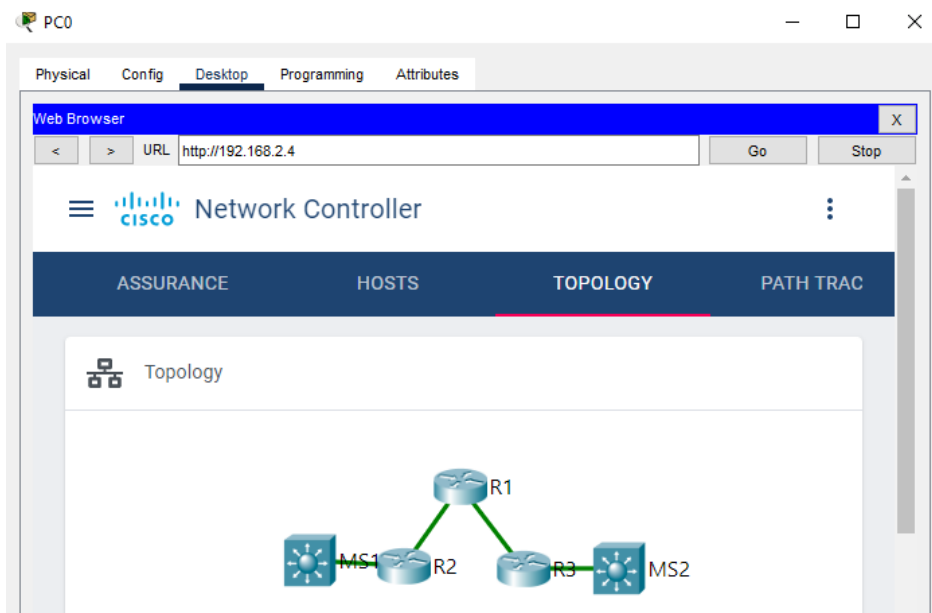
admin

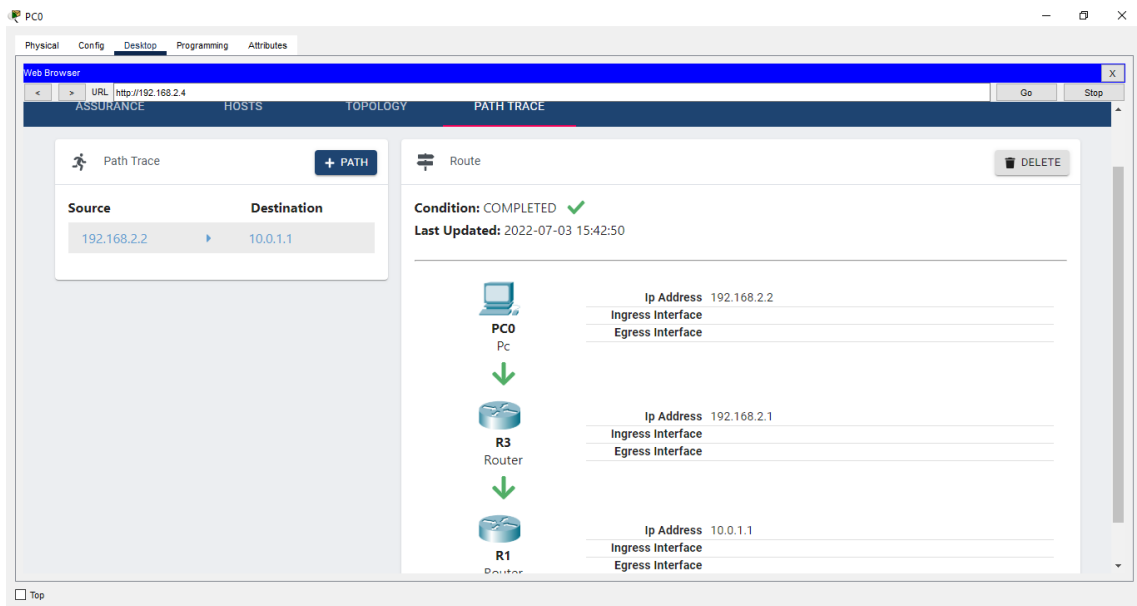
ASSURANCE HOSTS TOPOLOGY PATH TRACE

Host

Host Device					Connected Network Device		
	MAC	IP	Hostname	Type	IP	Hostname	Port
⚙	00D0.D38B.74B8	192.168.2.3	Server0	Server	192.168.2.10	MS2	GigabitEthernet1/0/2
⚙	0000.0C59.9154	192.168.1.4	PC1	Pc	192.168.2.10	Switch	FastEthernet1/1
⚙	0090.2B5B.98DA	192.168.1.2	PC2	Pc		Switch	FastEthernet2/1
⚙	0006.2A24.6D84	192.168.1.18	PC5	Pc		Switch	FastEthernet2/1
⚙	00D0.FFB7.AA2B	192.168.1.19	PC4	Pc		Switch	FastEthernet1/1
⚙	0010.1159.13A7	192.168.1.3	PC3	Pc		Switch	FastEthernet3/1
⚙	0010.1159.13A7	192.168.1.4	PC3	Pc		Switch	FastEthernet3/1
⚙	0002.17EA.B0CD	192.168.2.2	PC0	Pc	192.168.2.10	MS2	GigabitEthernet1/0/4

Top



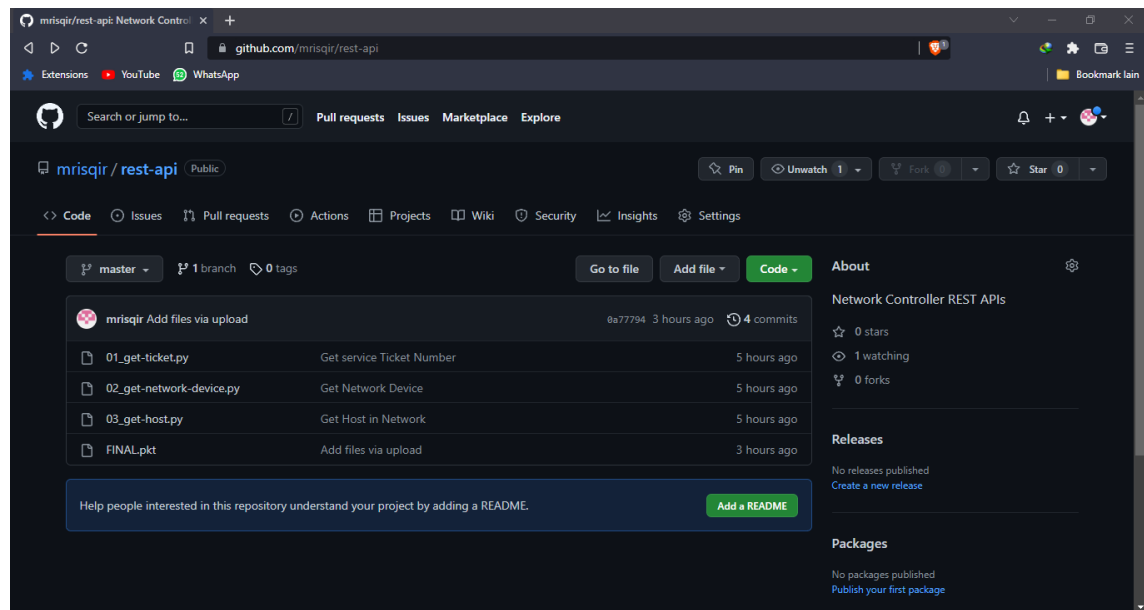


## REST APIs

```
devasc@labvm: ~/Downloads/Final
File Edit View Search Terminal Help
devasc@labvm:~/Downloads/Final$ python3 01_get-ticket.py
Ticket request status: 201
The service ticket number is: NC-5-e29c8c845d9d4016a1dc-nbi
devasc@labvm:~/Downloads/Final$ python3 02_get-network-device.py
Request status: 200
MS2      3650      192.168.2.10
R3       ISR4300      192.168.2.9
R1       ISR4300      10.0.2.1
R2       ISR4300      192.168.1.33
MS1      3650      192.168.1.34
Traceback (most recent call last):
  File "02_get-network-device.py", line 15, in <module>
    print(networkDevice["hostname"], "\t", networkDevice["platformId"], "\t", ne
networkDevice["managementIpAddress"])
KeyError: 'hostname'
devasc@labvm:~/Downloads/Final$ python3 02_get-network-device.py
```

```
devasc@labvm: ~/Downloads/Final
File Edit View Search Terminal Help
The service ticket number is: NC-5-e29c8c845d9d4016a1dc-nbi
devasc@labvm:~/Downloads/Final$ python3 02_get-network-device.py
Request status: 200
MS2      3650      192.168.2.10
R3       ISR4300      192.168.2.9
R1       ISR4300      10.0.2.1
R2       ISR4300      192.168.1.33
MS1      3650      192.168.1.34
Traceback (most recent call last):
  File "02_get-network-device.py", line 15, in <module>
    print(networkDevice["hostname"], "\t", networkDevice["platformId"], "\t", ne
networkDevice["managementIpAddress"])
KeyError: 'hostname'
devasc@labvm:~/Downloads/Final$ python3 03_get-host.py
Request status: 200
PC0      192.168.2.2      0002.17EA.B0CD      GigabitEthernet1/0/4
PC0      192.168.2.2      0002.17EA.B0CD      GigabitEthernet1/0/4
PC3      192.168.1.4      0010.1159.13A7      FastEthernet3/1
PC5      192.168.1.18     0006.2A24.6D84      FastEthernet2/1
PC4      192.168.1.19     00D0.FFB7.AA2B      FastEthernet1/1
PC2      192.168.1.3      0090.2B5B.98DA      FastEthernet2/1
PC3      192.168.1.4      0010.1159.13A7      FastEthernet3/1
Server0  192.168.2.3      00D0.D38B.74B8      GigabitEthernet1/0/2
devasc@labvm:~/Downloads/Final$
```

## Software Version Control



Untuk tahapan penyelesaian project mulai dari desain dan implementasinya, dan demo final project ada pada link berikut <https://youtu.be/eQmVoUy5CG4> dan untuk resource github terdapat pada link berikut <https://github.com/mrisqir/rest-api>.



## **PENUTUP**

### **A. Kesimpulan**

Final project ini diajukan untuk memenuhi persyaratan kelulusan Program MSIB di Balitbang SDM Kementerian Kominfo, Talent Scouting Academy dengan tema Network Programmability. Final project yang topik “Desain dan Implementasi jaringan skala kecil (Small Network) yang menerapkan Network Programmability” ini bertujuan untuk memudahkan kita dalam memahami dan menggunakan network automation yang memungkinkan kita untuk maintain, manajemen, dan monitoring konfigurasi perangkat jaringan.

Akhir kata, saya berharap laporan ini dapat memberikan informasi atau pembelajaran bagi kita semua, dan jika ada kesalahan dalam penulisan ataupun perkataan mohon dimaafkan. Oleh karena itu kritik dan saran yang membangun sangat diharapkan dari para pembaca sebagai bahan evaluasi untuk kedepannya