This document presents the solution for the final lab project for" CCNA: Introduction to Networks" course, including topology creation in GNS3, network device configuration, network settings and testing.

FINAL LAB

Course 420-EB6-AB – Cisco IV

CCNA: Introduction to Networks

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FINAL LAB

1. *General description*

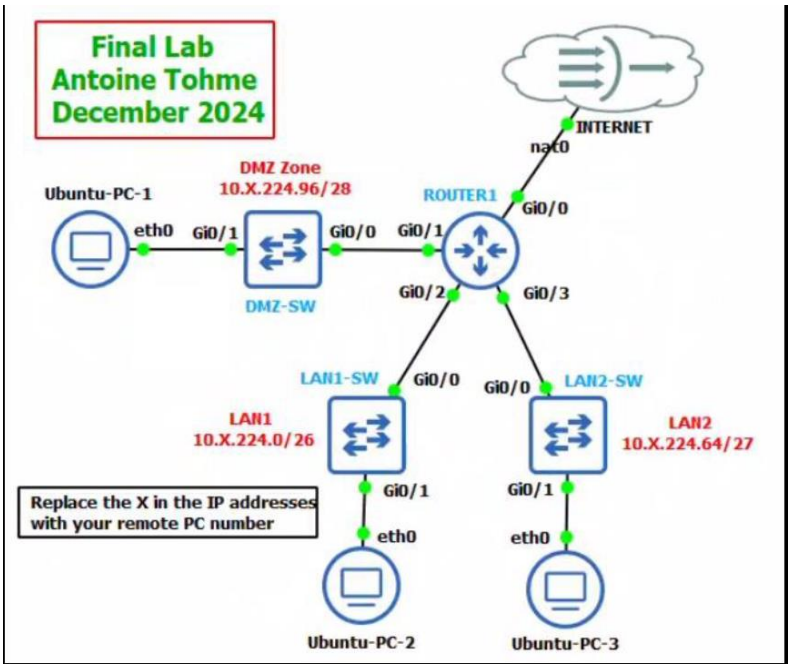
The following network design process is followed as defined below:

- GNS3 is used to recreate the logical topology as shown in the provided diagram.
- IPv4 Network addressing – Define the IPV4 addresses to be used in each subnet.
- Network Element Configuration:
  1) Set hostnames, secure passwords, banners and enable SSH access on all routers and switches.
  2) IPV4 Network Settings: Create an IP address table, configure router interfaces, interface descriptions, configure switch SVIs, and assign static IP addresses to PCs.
  3) Save configuration
- Testing: Test connectivity between PCs using ping, test SSH connectivity from Ubuntu-PC-1, and capture ICMPv4 and SSH traffic using Wireshark.

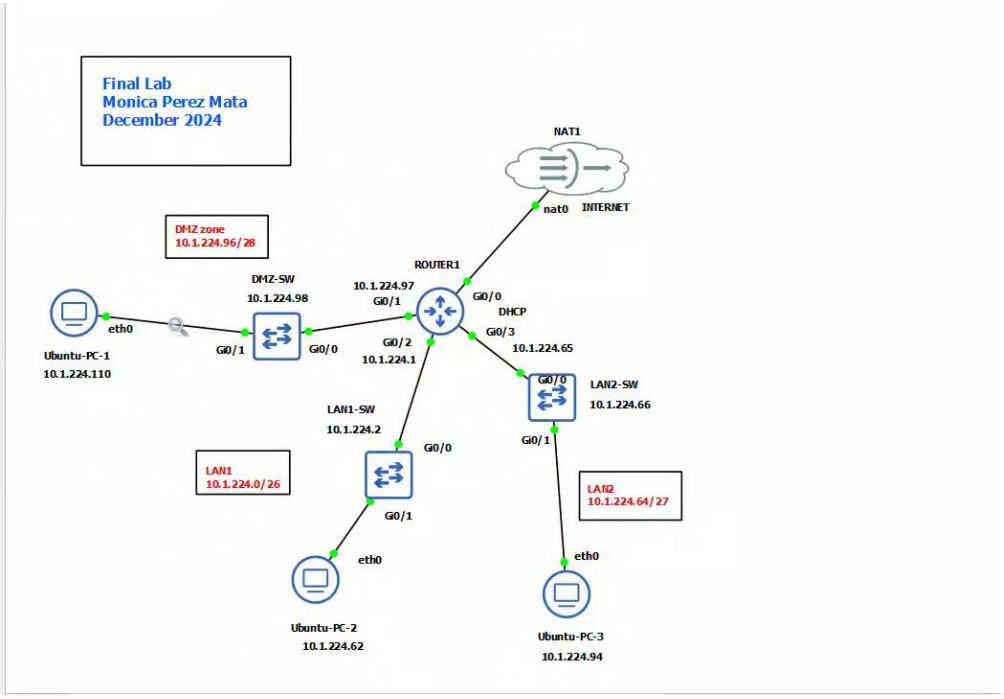
The next chapters present what was done to define the requested network.

2. Topology

The following GNS3 diagram shows a visual representation of the requested network topology.



GNS3 was used to create the logical topology for the solution, as shown in the next diagram



3. IPv4 Network addressing

Base on the requirements three networks are to be created. Since internet connection was requested a fourth subnetwork “Internet” is created with and Ip address provided by DHCP.

Subnet Table

Subnet Description	Number of Hosts	Network Address/CIDR	Subnet Mask	First Usable Host Address	Last Usable Host Address	Broadcast Address
DMZ zone	1	10.1.224.96/28	255.255.255.240	10.1.224.97	10.1.224.110	10.1.224.111
LAN1	1	10.1.224.0/26	255.255.255.192	10.1.224.1	10.1.224.62	10.1.224.63
LAN2	1	10.1.224.64/27	255.255.255.224	10.1.224.65	10.1.224.94	10.1.224.95
INTERNET		DHCP	--	-	-	-

Addressing Table

The following addressing table is to be used for configuration of network elements.

Device	Interface	Address	Subnet Mask	Default Gateway
Router 1	G0/0	DHCP	-	N/A
	G0/1	10.1.224.97	255.255.255.240	N/A
	G0/2	10.1.224.1	255.255.255.192	N/A
	G0/3	10.1.224.65	255.255.255.224	N/A
DMZ-SW	VLAN 1	10.1.224.98	255.255.255.240	10.1.224.97
LAN1-SW	VLAN1	10.1.224.2	255.255.255.192	10.1.224.1
LAN2-SW	VLAN1	10.1.224.66	255.255.255.224	10.1.224.65
Ubuntu-PC-1	Eth0	10.1.224.110	255.255.255.240	10.1.224.97
Ubuntu-PC-2	Eth0	10.1.224.62	255.255.255.192	10.1.224.1
Ubuntu-PC-3	Eth0	10.1.224.94	255.255.255.224	10.1.224.65

4. Network device configuration

For each one of the network elements, the script used to configure, the logs of the configuration process and the printouts to confirm the configuration is presented in the sub chapters below.

Router configuration

ROUTER1

Configuration Script

```
!!! ROUTER CONFIGURATION
enable
config t
hostname Router1
no ip domain-lookup
banner motd # Authorized access only! #
enable secret cisco
service password-encryption
ip domain-name itmt.ca
crypto key generate rsa general-keys modulus 1024
username monica secret cisco
line vty 0 15
 password cisco
 transport input ssh
 login local
exit
line console 0
 password cisco
 login
exit

!! ROUTER INTERFACE CONFIGURATION
interface g0/0
ip address dhcp
 description LINK to INTERNET DHCP
 no shutdown

interface g0/1
 description Link to DMZ Zone 10.1.224.96/28
 ip address 10.1.224.97 255.255.255.240
 no shutdown

interface g0/2
 description Link to LAN1 10.1.224.0/26
 ip address 10.1.224.1 255.255.255.192
 no shutdown

interface g0/3
 description Link to LAN2 10.1.224.64/27
 ip address 10.1.224.65 255.255.255.224
 no shutdown

exit
end
!!! CHECK CONFIGURATION
show ip interface brief
show running-config
!!!
copy running-config startup-config
```

Log

Configuration

```
Router#!!! ROUTER CONFIGURATION
Router#enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router1
Router1(config)#banner motd # Authorized access only! #
Router1(config)#enable secret cisco
Router1(config)#service password-encryption
Router1(config)#ip domain-name itmt.ca
Router1(config)#crypto key generate rsa general-keys modulus 1024
The name for the keys will be: Router1.itmt.ca

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 1 seconds)

Router1(config)#
*Dec  6 17:28:00.148: %SSH-5-ENABLED: SSH 1.99 has been enabled
Router1(config)#username monica secret cisco
Router1(config)#line vty 0 15
Router1(config-line)# password cisco
Router1(config-line)# transport input ssh
Router1(config-line)# login local
Router1(config-line)#exit
Router1(config)#line console 0
Router1(config-line)# password cisco
Router1(config-line)# login
Router1(config-line)#exit
Router1(config)#
Router1(config)#
Router1(config)#
Router1(config)#
```

```
Router1(config)#!! ROUTER INTERFACE CONFIGURATION
Router1(config)#interface g0/0
Router1(config-if)#ip address dhcp
Router1(config-if)# description LINK to INTERNET DHCP
Router1(config-if)# no shutdown
Router1(config-if)#
Router1(config-if)#interface g0/1
Router1(config-if)# description Link to DMZ Zone 10.1.224.96/28
Router1(config-if)# ip address 10.1.224.97 255.255.255.240
Router1(config-if)# no shutdown
Router1(config-if)#
Router1(config-if)#interface g0/2
Router1(config-if)# description Link to LAN1 10.1.224.0/26
Router1(config-if)# ip address 10.1.224.1 255.255.255.192
Router1(config-if)# no shutdown
Router1(config-if)#
Router1(config-if)#interface g0/3
Router1(config-if)# description Link to LAN2 10.1.224.64/27
Router1(config-if)# ip address 10.1.224.65 255.255.255.224
Router1(config-if)# no shutdown
Router1(config-if)#
Router1(config-if)#exit
Router1(config)#
*Dec  6 17:29:24.997: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to up
*Dec  6 17:29:25.328: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
*Dec  6 17:29:25.597: %LINK-3-UPDOWN: Interface GigabitEthernet0/2, changed state to up
*Dec  6 17:29:25.902: %LINK-3-UPDOWN: Interface GigabitEthernet0/3, changed state to up
*Dec  6 17:29:25.997: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router1(config)#
*Dec  6 17:29:26.328: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
*Dec  6 17:29:26.597: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
*Dec  6 17:29:26.902: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/3, changed state to up
Router1(config)#
```

Show overview of all interfaces on ROUTER1

```
Router1#
*Dec  6 17:30:36.282: %SYS-5-CONFIG_I: Configured from console by console
Router1#show ip interf
Router1#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         192.168.122.11  YES DHCP   up                    up
GigabitEthernet0/1         10.1.224.97     YES manual up                    up
GigabitEthernet0/2         10.1.224.1      YES manual up                    up
GigabitEthernet0/3         10.1.224.65     YES manual up                    up
Router1#
```

Display the current running configuration on ROUTER1

```
Router1#show running-config
Building configuration...


Current configuration : 3646 bytes
!
! Last configuration change at 17:30:36 UTC Fri Dec 6 2024
!
version 15.7
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname Router1
!
boot-start-marker
boot-end-marker
!
!
enable secret 5 $1$ddLA$CIkobUISbjutIzAWhYyjo1
!
no aaa new-model
!
!
!
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
!
!
!
!
no ip icmp rate-limit unreachable
!
!
!
!
!
!
!
!
!
!
no ip domain lookup
ip domain name itmt.ca
ip cef
no ipv6 cef
!
multilink bundle-name authenticated
!
!
!
!
username monica secret 5 $1$p17M$DTssVstoFjRAuNXPpsIXv0
!
redundancy
!
no cdp log mismatch duplex
!
ip tcp synwait-time 5
!
!
!
!
!
!
!
!
!
!
!
!
!
interface GigabitEthernet0/0
 description LINK to INTERNET DHCP
 ip address dhcp
 duplex auto
 speed auto
 media-type rj45
!
interface GigabitEthernet0/1
 description Link to DMZ Zone 10.1.224.96/28
 ip address 10.1.224.97 255.255.255.240
 duplex auto
 speed auto
 media-type rj45
!
interface GigabitEthernet0/2
 description Link to LAN1 10.1.224.0/26
 ip address 10.1.224.1 255.255.255.192
 duplex auto
 speed auto
 media-type rj45
!
interface GigabitEthernet0/3
 description Link to LAN2 10.1.224.64/27
 ip address 10.1.224.65 255.255.255.224
 duplex auto
 speed auto
 media-type rj45
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
!
ipv6 ioam timestamp
!
!
!
control-plane
!
banner exec ^C
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**************************************************************************^C
banner incoming ^C
**************************************************************************
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**************************************************************************^C
banner login ^C
**************************************************************************
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* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**************************************************************************^C
banner motd ^C Authorized access only! ^C
!
line con 0
 exec-timeout 0 0
 privilege level 15
 password 7 13061E010803
 logging synchronous
 login
line aux 0
 exec-timeout 0 0
 privilege level 15
 logging synchronous
line vty 0 4
 password 7 1511021F0725
 login local
 transport input ssh
line vty 5 15
 password 7 1511021F0725
 login local
 transport input ssh
!
no scheduler allocate
!
end

Router1#
```

Switch configuration

DMZ-SW

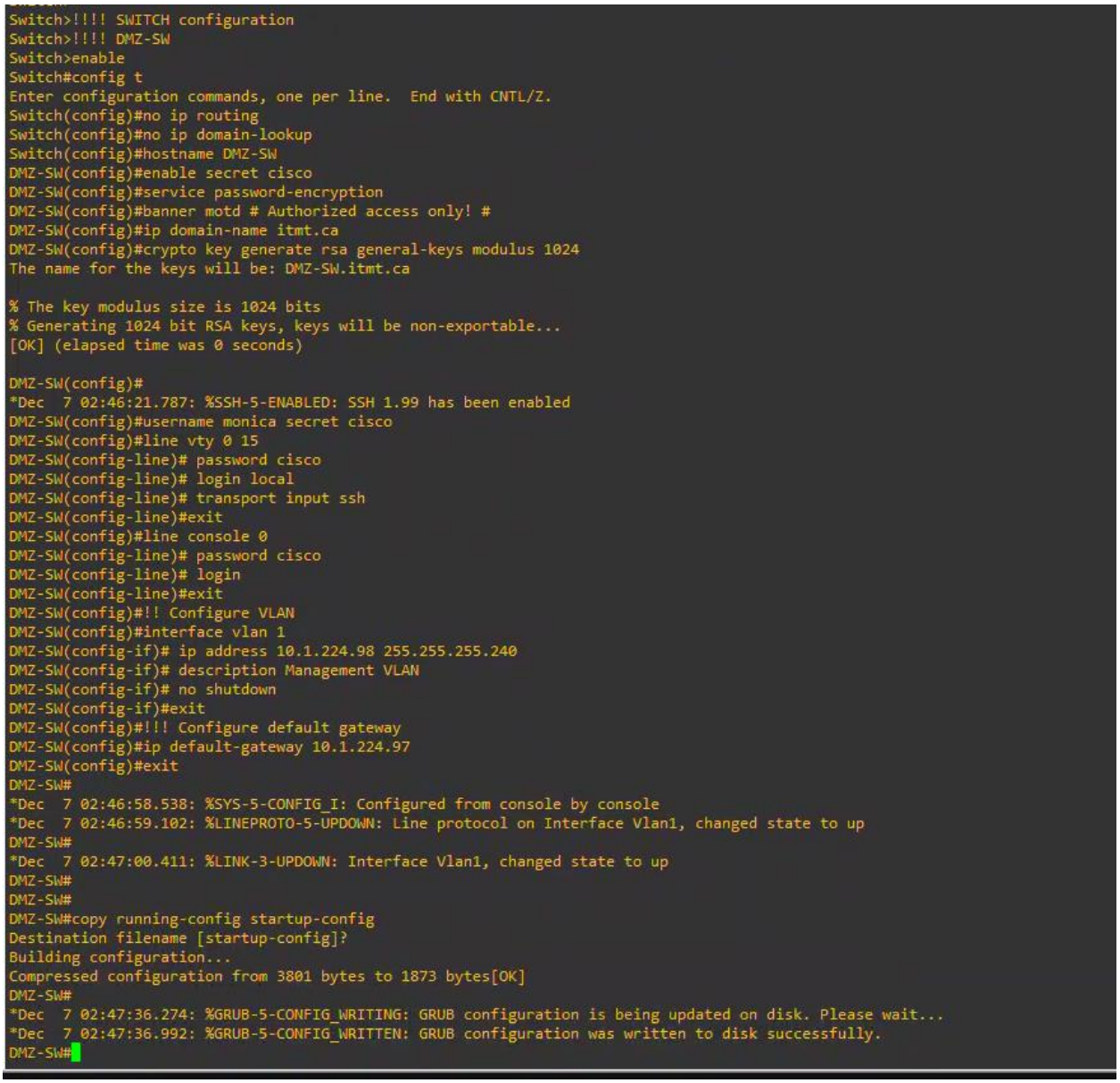
Configuration Script

```
!!!! SWITCH configuration
!!!! DMZ-SW
enable
config t
no ip routing
no ip domain-lookup

hostname DMZ-SW
enable secret cisco
service password-encryption
banner motd # Authorized access only! #
ip domain-name itmt.ca
crypto key generate rsa general-keys modulus 1024
username monica secret cisco
line vty 0 15
 password cisco
 login local
 transport input ssh
exit
line console 0
 password cisco
 login
exit
!! Configure VLAN
interface vlan 1
 ip address 10.1.224.98 255.255.255.240
 description Management VLAN
 no shutdown
exit
!!! Configure default gateway
ip default-gateway 10.1.224.97
exit
copy running-config startup-config
show ip interface brief
show interface vlan 1
show running-config
```

Log

Configuration



```
Switch>!!!! SWITCH configuration
Switch>!!!! DMZ-SW
Switch>enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ip routing
Switch(config)#no ip domain-lookup
Switch(config)#hostname DMZ-SW
DMZ-SW(config)#enable secret cisco
DMZ-SW(config)#service password-encryption
DMZ-SW(config)#banner motd # Authorized access only! #
DMZ-SW(config)#ip domain-name itmt.ca
DMZ-SW(config)#crypto key generate rsa general-keys modulus 1024
The name for the keys will be: DMZ-SW.itmt.ca

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

DMZ-SW(config)#
*Dec  7 02:46:21.787: %SSH-5-ENABLED: SSH 1.99 has been enabled
DMZ-SW(config)#username monica secret cisco
DMZ-SW(config)#line vty 0 15
DMZ-SW(config-line)# password cisco
DMZ-SW(config-line)# login local
DMZ-SW(config-line)# transport input ssh
DMZ-SW(config-line)#exit
DMZ-SW(config)#line console 0
DMZ-SW(config-line)# password cisco
DMZ-SW(config-line)# login
DMZ-SW(config-line)#exit
DMZ-SW(config)#!! Configure VLAN
DMZ-SW(config)#interface vlan 1
DMZ-SW(config-if)# ip address 10.1.224.98 255.255.255.240
DMZ-SW(config-if)# description Management VLAN
DMZ-SW(config-if)# no shutdown
DMZ-SW(config-if)#exit
DMZ-SW(config)#!!! Configure default gateway
DMZ-SW(config)#ip default-gateway 10.1.224.97
DMZ-SW(config)#exit
DMZ-SW#
*Dec  7 02:46:58.538: %SYS-5-CONFIG_I: Configured from console by console
*Dec  7 02:46:59.102: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
DMZ-SW#
*Dec  7 02:47:00.411: %LINK-3-UPDOWN: Interface Vlan1, changed state to up
DMZ-SW#
DMZ-SW#
DMZ-SW#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 3801 bytes to 1873 bytes[OK]
DMZ-SW#
*Dec  7 02:47:36.274: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Please wait...
*Dec  7 02:47:36.992: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfully.
DMZ-SW#
```

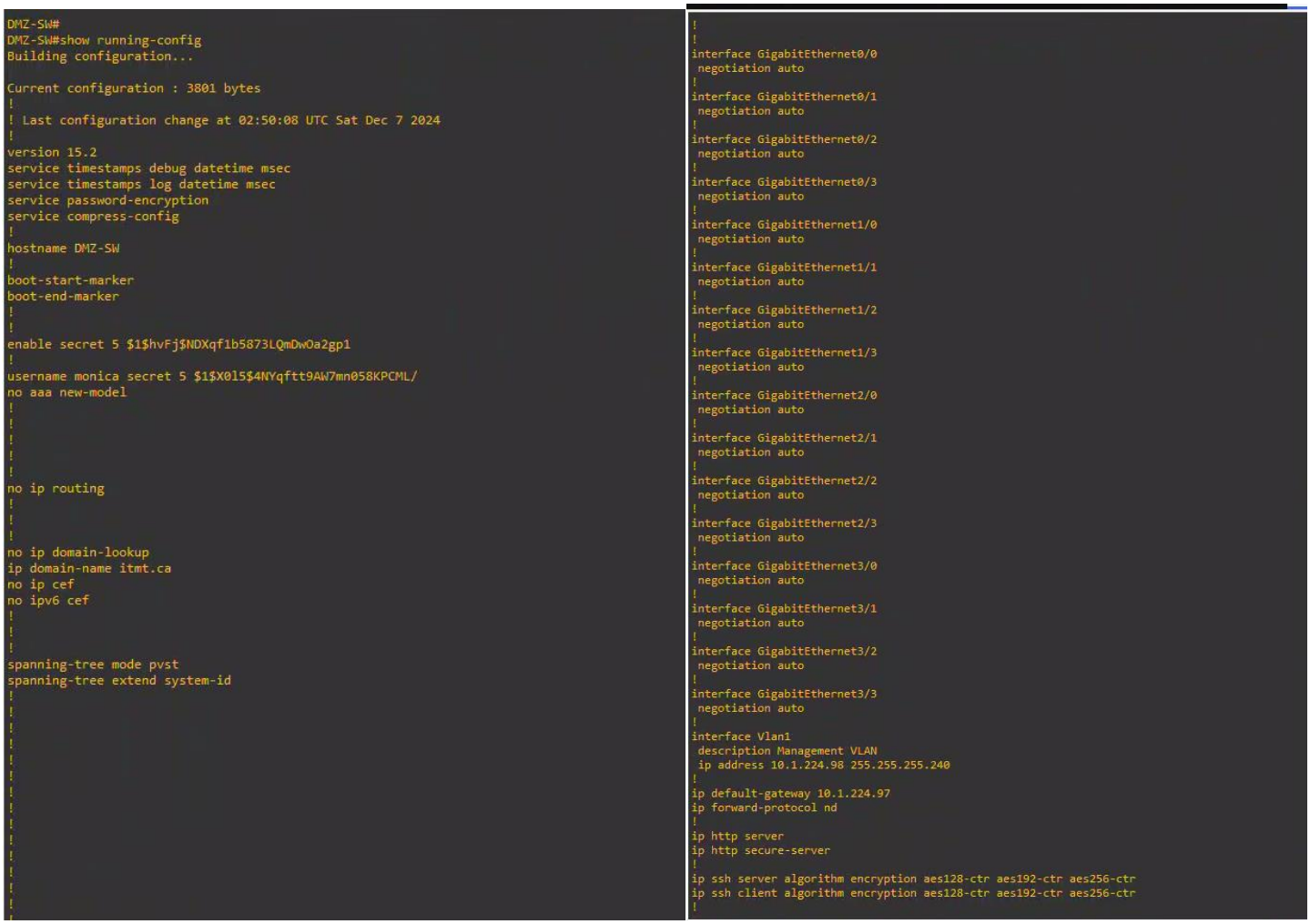
Show overview of all interfaces on DMZ-SW

```
DMZ-SW#
DMZ-SW#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/2     unassigned      YES unset  down                  down
GigabitEthernet0/3     unassigned      YES unset  down                  down
GigabitEthernet1/0     unassigned      YES unset  down                  down
GigabitEthernet1/1     unassigned      YES unset  down                  down
GigabitEthernet1/2     unassigned      YES unset  down                  down
GigabitEthernet1/3     unassigned      YES unset  down                  down
GigabitEthernet2/0     unassigned      YES unset  down                  down
GigabitEthernet2/1     unassigned      YES unset  down                  down
GigabitEthernet2/2     unassigned      YES unset  down                  down
GigabitEthernet2/3     unassigned      YES unset  down                  down
GigabitEthernet3/0     unassigned      YES unset  down                  down
GigabitEthernet3/1     unassigned      YES unset  down                  down
GigabitEthernet3/2     unassigned      YES unset  down                  down
GigabitEthernet3/3     unassigned      YES unset  down                  down
Vlan1                  10.1.224.98     YES manual up                    up
DMZ-SW#
DMZ-SW#
DMZ-SW#
```

Show interface vlan 1

```
DMZ-SW#
DMZ-SW#show interface vlan 1
Vlan1 is up, line protocol is up
  Hardware is Ethernet SVI, address is 0ccb.aff6.8001 (bia 0ccb.aff6.8001)
  Description: Management VLAN
  Internet address is 10.1.224.98/28
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     2 packets output, 120 bytes, 0 underruns
     0 output errors, 0 interface resets
     0 unknown protocol drops
     0 output buffer failures, 0 output buffers swapped out
DMZ-SW#
DMZ-SW#
DMZ-SW#
DMZ-SW#
```

Display the current running configuration on DMZ-SW



```
DMZ-SW#
DMZ-SW#show running-config
Building configuration...

Current configuration : 3801 bytes
!
! Last configuration change at 02:50:08 UTC Sat Dec 7 2024
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service compress-config
!
hostname DMZ-SW
!
boot-start-marker
boot-end-marker
!
!
enable secret 5 $1$hvFj$NDXqf1b5873LQmDwOa2gp1
!
username monica secret 5 $1$X015$4NYqftt9AW7mn058KPCML/
no aaa new-model
!
!
!
!
!
no ip routing
!
!
!
no ip domain-lookup
ip domain-name itmt.ca
no ip cef
no ipv6 cef
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
interface GigabitEthernet0/0
 negotiation auto
!
interface GigabitEthernet0/1
 negotiation auto
!
interface GigabitEthernet0/2
 negotiation auto
!
interface GigabitEthernet0/3
 negotiation auto
!
interface GigabitEthernet1/0
 negotiation auto
!
interface GigabitEthernet1/1
 negotiation auto
!
interface GigabitEthernet1/2
 negotiation auto
!
interface GigabitEthernet1/3
 negotiation auto
!
interface GigabitEthernet2/0
 negotiation auto
!
interface GigabitEthernet2/1
 negotiation auto
!
interface GigabitEthernet2/2
 negotiation auto
!
interface GigabitEthernet2/3
 negotiation auto
!
interface GigabitEthernet3/0
 negotiation auto
!
interface GigabitEthernet3/1
 negotiation auto
!
interface GigabitEthernet3/2
 negotiation auto
!
interface GigabitEthernet3/3
 negotiation auto
!
interface Vlan1
 description Management VLAN
 ip address 10.1.224.98 255.255.255.240
!
ip default-gateway 10.1.224.97
ip forward-protocol nd
!
ip http server
ip http secure-server
!
ip ssh server algorithm encryption aes128-ctr aes192-ctr aes256-ctr
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
!
```

```
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
!
!
!
!
!
!
control-plane
!
banner exec ^C
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**********************************************************************^C
banner incoming ^C
**********************************************************************
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**********************************************************************^C
banner login ^C
**********************************************************************
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* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************^C
banner motd ^C Authorized access only! ^C
!
line con 0
 password 7 045802150C2E
 login
line aux 0
line vty 0 4
 password 7 01100F175804
 login local
 transport input ssh
line vty 5 15
 password 7 01100F175804
 login local
 transport input ssh
!
!
end

DMZ-SW#
```

LAN1-SW

Configuration Script

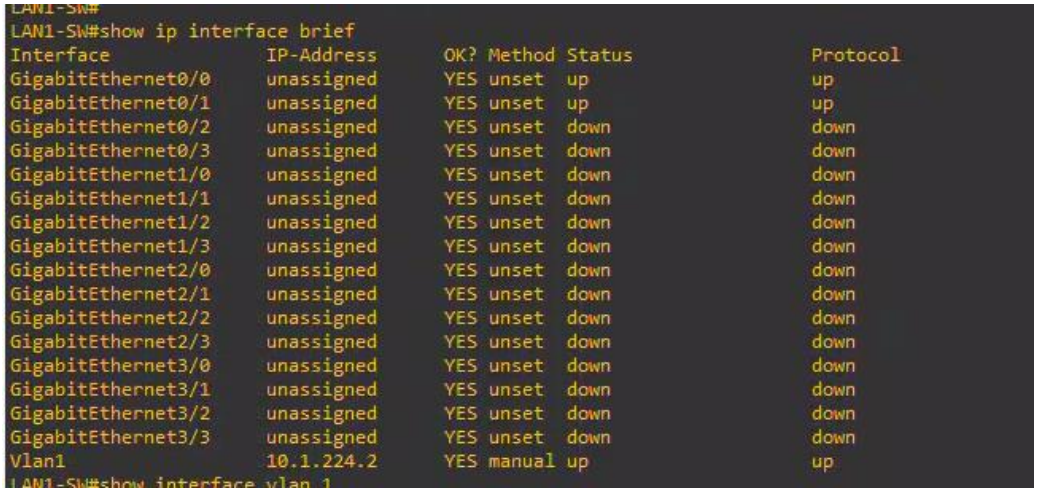
```
!!!! SWITCH configuration
!!!! LAN1-SW
enable
config t
no ip routing
hostname LAN1-SW
no ip domain-lookup
enable secret cisco
service password-encryption
banner motd # Authorized access only! #
ip domain-name itmt.ca
crypto key generate rsa general-keys modulus 1024
username monica secret cisco
line vty 0 15
 password cisco
 login local
 transport input ssh
exit
line console 0
 password cisco
 login
exit
!! Configure VLAN
interface vlan 1
 ip address 10.1.224.2 255.255.255.192
 description Management VLAN
 no shutdown
exit
!!! Configure default gateway
ip default-gateway 10.1.224.1
exit
copy running-config startup-config
show ip interface brief
show interface vlan 1
show running-config
```

Log

Configuration

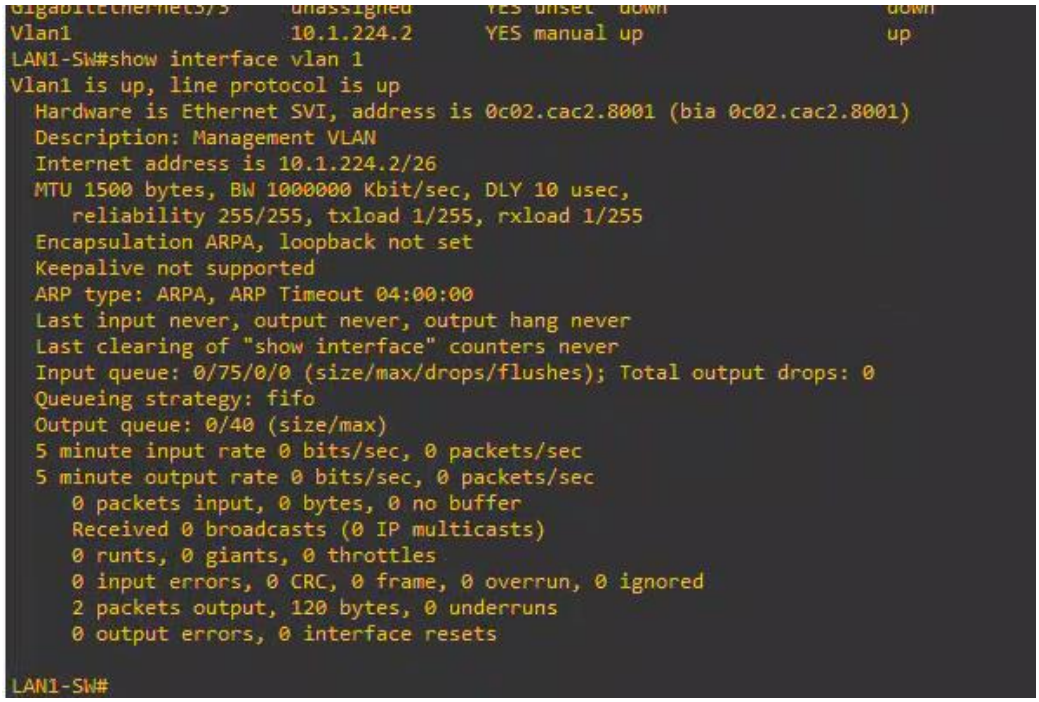
```
Switch>
Switch>!!!! SWITCH configuration
Switch>!!!! LAN1-SW
Switch>enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ip routing
Switch(config)#hostname LAN1-SW
LAN1-SW(config)#no ip domain-lookup
LAN1-SW(config)#enable secret cisco
LAN1-SW(config)#service password-encryption
LAN1-SW(config)#banner motd # Authorized access only! #
LAN1-SW(config)#ip domain-name itmt.ca
LAN1-SW(config)#crypto key generate rsa general-keys modulus 1024
The name for the keys will be: LAN1-SW.itmt.ca

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

LAN1-SW(config)#
*Dec  7 03:06:39.764: %SSH-5-ENABLED: SSH 1.99 has been enabled
LAN1-SW(config)#
LAN1-SW(config)#
LAN1-SW(config)#
LAN1-SW(config)#username monica secret cisco
LAN1-SW(config)#line vty 0 15
LAN1-SW(config-line)# password cisco
LAN1-SW(config-line)# login local
LAN1-SW(config-line)# transport input ssh
LAN1-SW(config-line)#exit
LAN1-SW(config)#line console 0
LAN1-SW(config-line)# password cisco
LAN1-SW(config-line)# login
LAN1-SW(config-line)#exit
LAN1-SW(config)#
LAN1-SW(config)#
LAN1-SW(config)#
LAN1-SW(config)#
!! Configure VLAN
LAN1-SW(config)#interface vlan 1
LAN1-SW(config-if)# ip address 10.1.224.2 255.255.255.192
LAN1-SW(config-if)# description Management VLAN
LAN1-SW(config-if)# no shutdown
LAN1-SW(config-if)#exit
LAN1-SW(config)#!!! Configure default gateway
LAN1-SW(config)#ip default-gateway 10.1.224.1
LAN1-SW(config)#exit
LAN1-SW#
*Dec  7 03:07:23.330: %PNP-6-PNP_DISCOVERY_STOPPED: PnP Discovery stopped (Config Wizard)
*Dec  7 03:07:24.791: %SYS-5-CONFIG_I: Configured from console by console
*Dec  7 03:07:25.345: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
*Dec  7 03:07:26.665: %LINK-3-UPDOWN: Interface Vlan1, changed state to up
LAN1-SW#
LAN1-SW#
```

Show overview of all interfaces on LAN1-SW



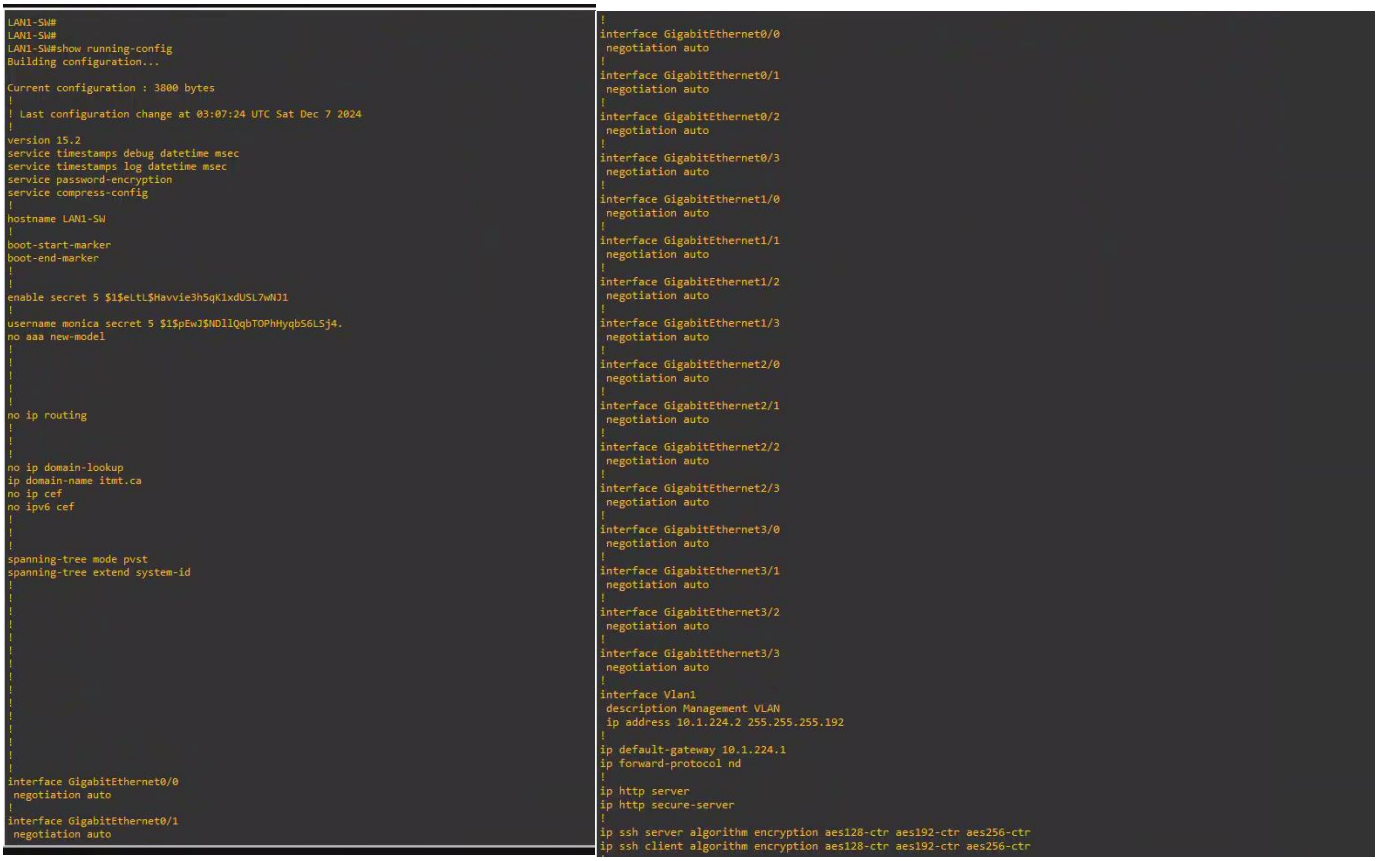
```
LAN1-SW#
LAN1-SW#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/2     unassigned      YES unset  down                  down
GigabitEthernet0/3     unassigned      YES unset  down                  down
GigabitEthernet1/0     unassigned      YES unset  down                  down
GigabitEthernet1/1     unassigned      YES unset  down                  down
GigabitEthernet1/2     unassigned      YES unset  down                  down
GigabitEthernet1/3     unassigned      YES unset  down                  down
GigabitEthernet2/0     unassigned      YES unset  down                  down
GigabitEthernet2/1     unassigned      YES unset  down                  down
GigabitEthernet2/2     unassigned      YES unset  down                  down
GigabitEthernet2/3     unassigned      YES unset  down                  down
GigabitEthernet3/0     unassigned      YES unset  down                  down
GigabitEthernet3/1     unassigned      YES unset  down                  down
GigabitEthernet3/2     unassigned      YES unset  down                  down
GigabitEthernet3/3     unassigned      YES unset  down                  down
Vlan1                  10.1.224.2      YES manual up                    up
LAN1-SW#show interface vlan 1
```

Show interface Vlan 1



```
GigabitEthernet3/3     unassigned      YES unset  down                  down
Vlan1                  10.1.224.2      YES manual up                    up
LAN1-SW#show interface vlan 1
Vlan1 is up, line protocol is up
  Hardware is Ethernet SVI, address is 0c02.cac2.8001 (bia 0c02.cac2.8001)
  Description: Management VLAN
  Internet address is 10.1.224.2/26
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     2 packets output, 120 bytes, 0 underruns
     0 output errors, 0 interface resets

LAN1-SW#
```

Display the current running configuration on LAN1-SW



```
LAN1-SW#
LAN1-SW#
LAN1-SW#show running-config
Building configuration...

Current configuration : 3800 bytes
!
! Last configuration change at 03:07:24 UTC Sat Dec 7 2024
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service compress-config
!
hostname LAN1-SW
!
boot-start-marker
boot-end-marker
!
!
enable secret 5 $1$eLtL$Havvie3h5qK1xdUSL7wNJ1
!
username monica secret 5 $1$pEwJ$NDllQqbTOPhHyqbS6LSj4.
no aaa new-model
!
!
!
!
!
no ip routing
!
!
!
no ip domain-lookup
ip domain-name itmt.ca
no ip cef
no ipv6 cef
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
interface GigabitEthernet0/0
 negotiation auto
!
interface GigabitEthernet0/1
 negotiation auto
!
interface GigabitEthernet0/2
 negotiation auto
!
interface GigabitEthernet0/3
 negotiation auto
!
interface GigabitEthernet1/0
 negotiation auto
!
interface GigabitEthernet1/1
 negotiation auto
!
interface GigabitEthernet1/2
 negotiation auto
!
interface GigabitEthernet1/3
 negotiation auto
!
interface GigabitEthernet2/0
 negotiation auto
!
interface GigabitEthernet2/1
 negotiation auto
!
interface GigabitEthernet2/2
 negotiation auto
!
interface GigabitEthernet2/3
 negotiation auto
!
interface GigabitEthernet3/0
 negotiation auto
!
interface GigabitEthernet3/1
 negotiation auto
!
interface GigabitEthernet3/2
 negotiation auto
!
interface GigabitEthernet3/3
 negotiation auto
!
interface Vlan1
 description Management VLAN
 ip address 10.1.224.2 255.255.255.192
!
ip default-gateway 10.1.224.1
ip forward-protocol nd
!
ip http server
ip http secure-server
!
ip ssh server algorithm encryption aes128-ctr aes192-ctr aes256-ctr
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
```

```
!
ip http server
ip http secure-server
!
ip ssh server algorithm encryption aes128-ctr aes192-ctr aes256-ctr
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
!
!
!
!
!
!
control-plane
!
banner exec ^C
**********************************************************************
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* education. IOSv is provided as-is and is not supported by Cisco's      *
* Technical Advisory Center. Any use or disclosure, in whole or in part, *
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* Cisco in writing.                                                      *
**********************************************************************^C
banner incoming ^C
**********************************************************************
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* Technical Advisory Center. Any use or disclosure, in whole or in part, *
* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************^C
banner login ^C
**********************************************************************
* IOSv is strictly limited to use for evaluation, demonstration and IOS  *
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* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************^C
banner motd ^C Authorized access only! ^C
!
line con 0
 password 7 110A1016141D
 login
line aux 0
line vty 0 4
 password 7 030752180500
 login local
 transport input ssh
line vty 5 15
 password 7 030752180500
 login local
 transport input ssh
!
!
end

LAN1-SW#
LAN1-SW#
LAN1-SW#
```

LAN2-SW

Configuration Script

```
!!!! SWITCH configuration
!!!! LAN2-SW
enable
config t
no ip routing
hostname LAN2-SW
no ip domain-lookup
enable secret cisco
service password-encryption
banner motd # Authorized access only! #
ip domain-name itmt.ca
crypto key generate rsa general-keys modulus 1024
username monica secret cisco
line vty 0 15
 password cisco
 login local
 transport input ssh
exit
line console 0
 password cisco
 login
exit
!! Configure VLAN
interface vlan 1
 ip address 10.1.224.66 255.255.255.224
 description Management VLAN
 no shutdown
exit
!!! Configure default gateway
ip default-gateway 10.1.224.65
exit
copy running-config startup-config
show ip interface brief
show interface vlan 1
show running-config
```

Log

Configuration

```
Switch>
Switch>
Switch>
Switch>!!!! SWITCH configuration
Switch>!!!! LAN2-SW
Switch>enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ip routing
Switch(config)#hostname LAN2-SW
LAN2-SW(config)#no ip domain-lookup
LAN2-SW(config)#enable secret cisco
LAN2-SW(config)#service password-encryption
LAN2-SW(config)#banner motd # Authorized access only! #
LAN2-SW(config)#ip domain-name itmt.ca
LAN2-SW(config)#crypto key generate rsa general-keys modulus 1024
The name for the keys will be: LAN2-SW.itmt.ca

% The key modulus size is 1024 bits
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

LAN2-SW(config)#
*Dec  7 03:28:18.811: %SSH-5-ENABLED: SSH 1.99 has been enabled
LAN2-SW(config)#username monica secret cisco
LAN2-SW(config)#line vty 0 15
LAN2-SW(config-line)# password cisco
LAN2-SW(config-line)# login local
LAN2-SW(config-line)# transport input ssh
LAN2-SW(config-line)#exit
LAN2-SW(config)#line console 0
LAN2-SW(config-line)# password cisco
LAN2-SW(config-line)# login
LAN2-SW(config-line)#exit
LAN2-SW(config)#
LAN2-SW(config)#!! Configure VLAN
LAN2-SW(config)#interface vlan 1
LAN2-SW(config-if)# ip address 10.1.224.66 255.255.255.224
LAN2-SW(config-if)# description Management VLAN
LAN2-SW(config-if)# no shutdown
LAN2-SW(config-if)#exit
LAN2-SW(config)#
LAN2-SW(config)#
*Dec  7 03:28:52.895: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
LAN2-SW(config)#
*Dec  7 03:28:54.248: %LINK-3-UPDOWN: Interface Vlan1, changed state to up
LAN2-SW(config)#!!! Configure default gateway
LAN2-SW(config)#ip default-gateway 10.1.224.65
LAN2-SW(config)#exit
LAN2-SW#copy running-config startup-config
Destination filename [startup-config]?
*Dec  7 03:29:16.283: %SYS-5-CONFIG_I: Configured from console by console
Building configuration...
Compressed configuration from 3802 bytes to 1877 bytes[OK]
LAN2-SW#
LAN2-SW#
*Dec  7 03:29:22.623: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Please wait...
*Dec  7 03:29:23.337: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfully.
LAN2-SW#
LAN2-SW#
```

Show ip interface brief

```
*Dec  7 03:29:22.623: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Pleas
*Dec  7 03:29:23.337: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfull
LAN2-SW#
LAN2-SW#
LAN2-SW#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/2     unassigned      YES unset  down                  down
GigabitEthernet0/3     unassigned      YES unset  down                  down
GigabitEthernet1/0     unassigned      YES unset  down                  down
GigabitEthernet1/1     unassigned      YES unset  down                  down
GigabitEthernet1/2     unassigned      YES unset  down                  down
GigabitEthernet1/3     unassigned      YES unset  down                  down
GigabitEthernet2/0     unassigned      YES unset  down                  down
GigabitEthernet2/1     unassigned      YES unset  down                  down
GigabitEthernet2/2     unassigned      YES unset  down                  down
GigabitEthernet2/3     unassigned      YES unset  down                  down
GigabitEthernet3/0     unassigned      YES unset  down                  down
GigabitEthernet3/1     unassigned      YES unset  down                  down
GigabitEthernet3/2     unassigned      YES unset  down                  down
GigabitEthernet3/3     unassigned      YES unset  down                  down
Vlan1                  10.1.224.66     YES manual up                    up
```

Show interface vlan 1

```
Vlan1                  10.1.224.66     YES manual up                    up
LAN2-SW#show interface vlan 1
Vlan1 is up, line protocol is up
  Hardware is Ethernet SVI, address is 0c50.4fc8.8001 (bia 0c50.4fc8.8001)
  Description: Management VLAN
  Internet address is 10.1.224.66/27
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:14, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     1 packets input, 77 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     2 packets output, 120 bytes, 0 underruns
     0 output errors, 0 interface resets
     0 unknown protocol drops
     0 output buffer failures, 0 output buffers swapped out
LAN2-SW#
*Dec  7 03:29:57.757: %PNP-6-PNP_DISCOVERY_STOPPED: PnP Discovery stopped (Config Wizard)
```

Display the current running configuration on LAN2-SW

```
LAN2-SW#show runn
LAN2-SW#show running-config
Building configuration...

Current configuration : 3802 bytes
!
! Last configuration change at 03:29:56 UTC Sat Dec 7 2024
!
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service compress-config
!
hostname LAN2-SW
!
boot-start-marker
boot-end-marker
!
!
enable secret 5 $1$DMUJ$PZ4kTMInCm3J0gbjb2ijB1
!
username monica secret 5 $1$xyLA$vmkLJy35E6UcuvZJV1CWH1
no aaa new-model
!
!
!
!
!
no ip routing
!
!
!
no ip domain-lookup
ip domain-name itmt.ca
no ip cef
no ipv6 cef
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
```

```
interface GigabitEthernet0/0
 negotiation auto
!
interface GigabitEthernet0/1
 negotiation auto
!
interface GigabitEthernet0/2
 negotiation auto
!
interface GigabitEthernet0/3
 negotiation auto
!
interface GigabitEthernet1/0
 negotiation auto
!
interface GigabitEthernet1/1
 negotiation auto
!
interface GigabitEthernet1/2
 negotiation auto
!
interface GigabitEthernet1/3
 negotiation auto
!
interface GigabitEthernet2/0
 negotiation auto
!
interface GigabitEthernet2/1
 negotiation auto
!
interface GigabitEthernet2/2
 negotiation auto
!
interface GigabitEthernet2/3
 negotiation auto
!
interface GigabitEthernet3/0
 negotiation auto
!
interface GigabitEthernet3/1
 negotiation auto
!
interface GigabitEthernet3/2
 negotiation auto
!
interface GigabitEthernet3/3
 negotiation auto
!
interface Vlan1
 description Management VLAN
 ip address 10.1.224.66 255.255.255.224
!
ip default-gateway 10.1.224.65
ip forward-protocol nd
!
ip http server
ip http secure-server
!
ip ssh server algorithm encryption aes128-ctr aes192-ctr aes256-ctr
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
!
!
!
```

```
ip ssh client algorithm encryption aes128-ctr aes192-ctr aes256-ctr
!
!
!
!
!
!
control-plane
!
banner exec ^C
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**********************************************************************^C
banner incoming ^C
**********************************************************************
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* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
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**********************************************************************^C
banner login ^C
**********************************************************************
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* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************^C
banner motd ^C Authorized access only! ^C
!
line con 0
 password 7 045802150C2E
 login
line aux 0
line vty 0 4
 password 7 1511021F0725
 login local
 transport input ssh
line vty 5 15
 password 7 1511021F0725
 login local
 transport input ssh
!
!
end

LAN2-SW#
LAN2-SW#
```
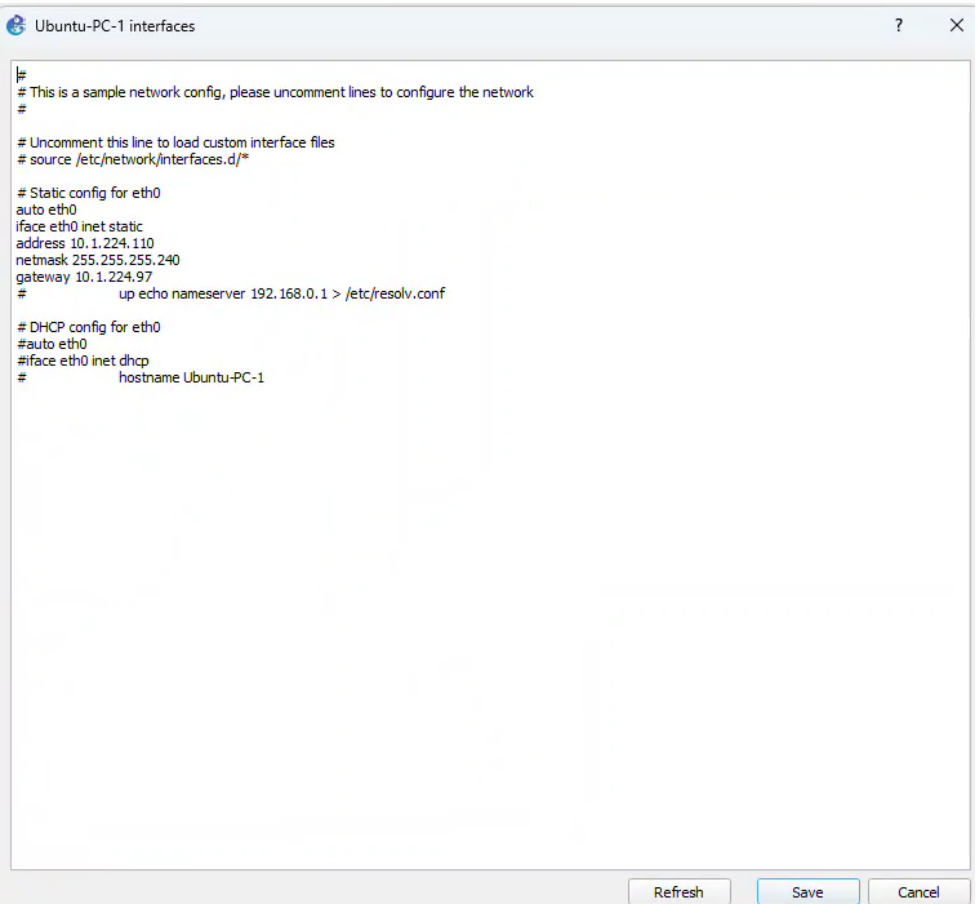

UBUNTU-PC configuration

UBUNTU PC-1

Configuration

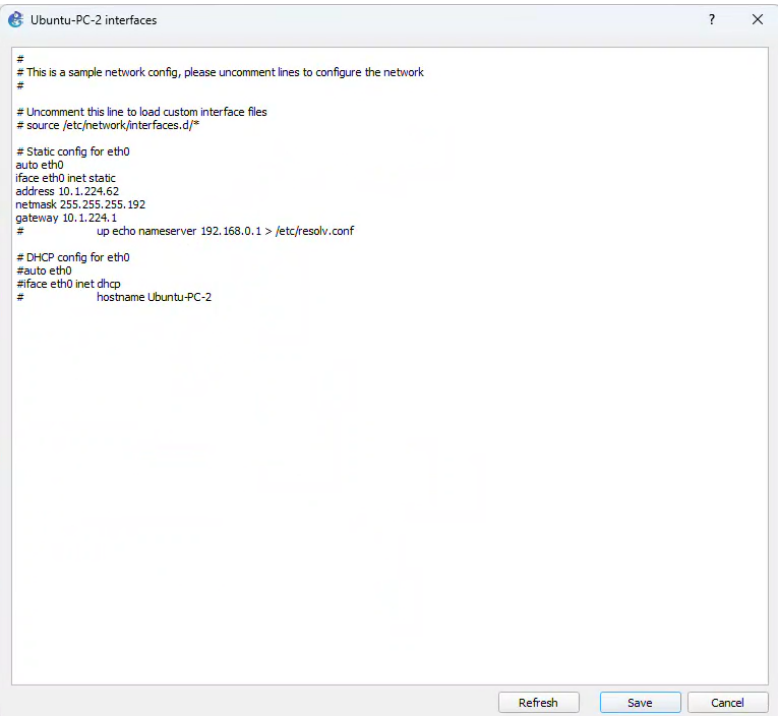


IFCONFIG

```
root@Ubuntu-PC-1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.1.224.110  netmask 255.255.255.240  broadcast 0.0.0.0
        inet6 fe80::42:a9ff:fe1d:1800  prefixlen 64  scopeid 0x20<link>
        ether 02:42:a9:1d:18:00  txqueuelen 1000  (Ethernet)
        RX packets 15465  bytes 1165530 (1.1 MB)
        RX errors 0  dropped 39  overruns 0  frame 0
        TX packets 170  bytes 17660 (17.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 8  bytes 672 (672.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 8  bytes 672 (672.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

UBUNTU PC-2

Configuration

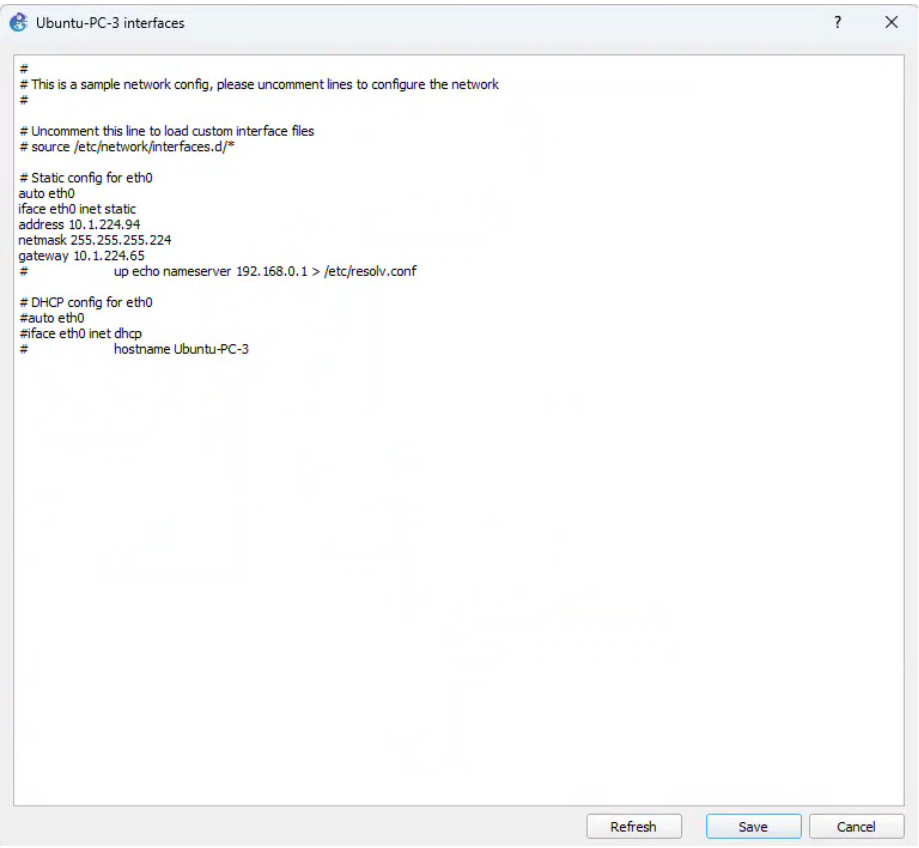


IFCONFIG

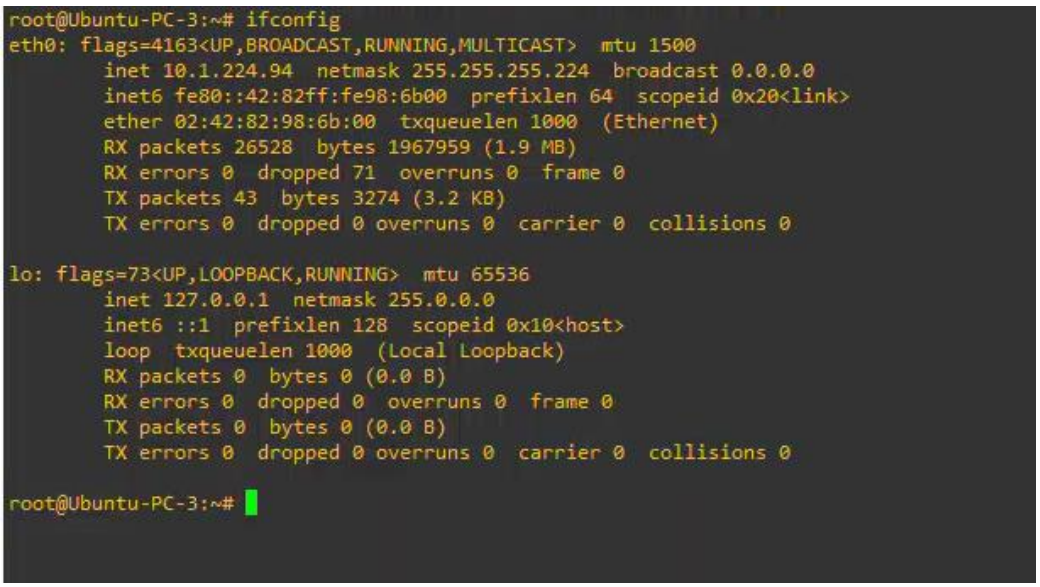
```
rtt min/avg/max/mdev = 3.635/8.147/17.056/6.299 ms
root@Ubuntu-PC-2:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.1.224.62  netmask 255.255.255.192  broadcast 0.0.0.0
        inet6 fe80::42:89ff:fe64:ef00  prefixlen 64  scopeid 0x20<link>
        ether 02:42:89:64:ef:00  txqueuelen 1000  (Ethernet)
        RX packets 69  bytes 5199 (5.1 KB)
        RX errors 0  dropped 1  overruns 0  frame 0
        TX packets 14  bytes 1132 (1.1 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

root@Ubuntu-PC-2:~#
```

UBUNTU PC-3

Configuration



IFCONFIG



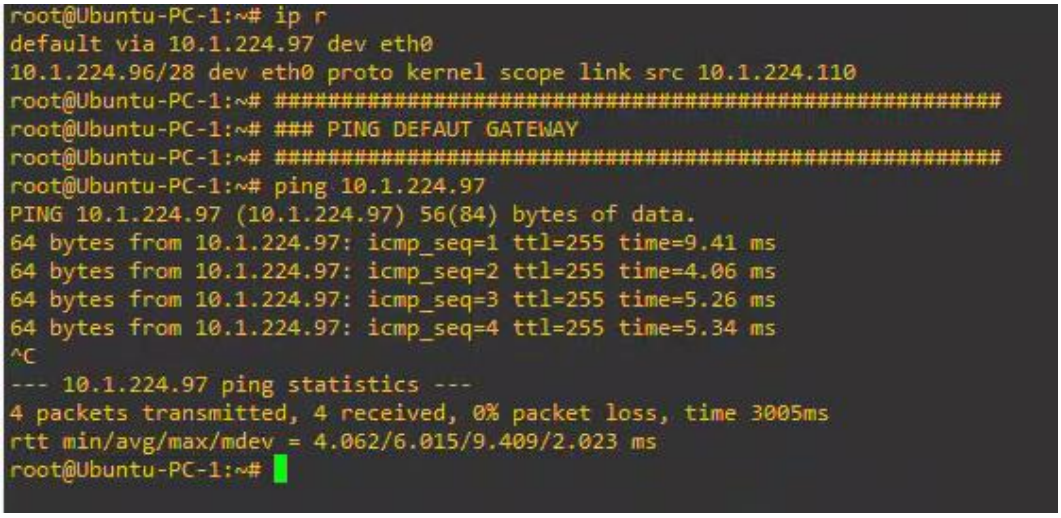
5. Testing

Ping testing

For each UBUNTU-PC's ping the other network elements

Ping testing from UBUNTU PC-1

Ping Default gateway



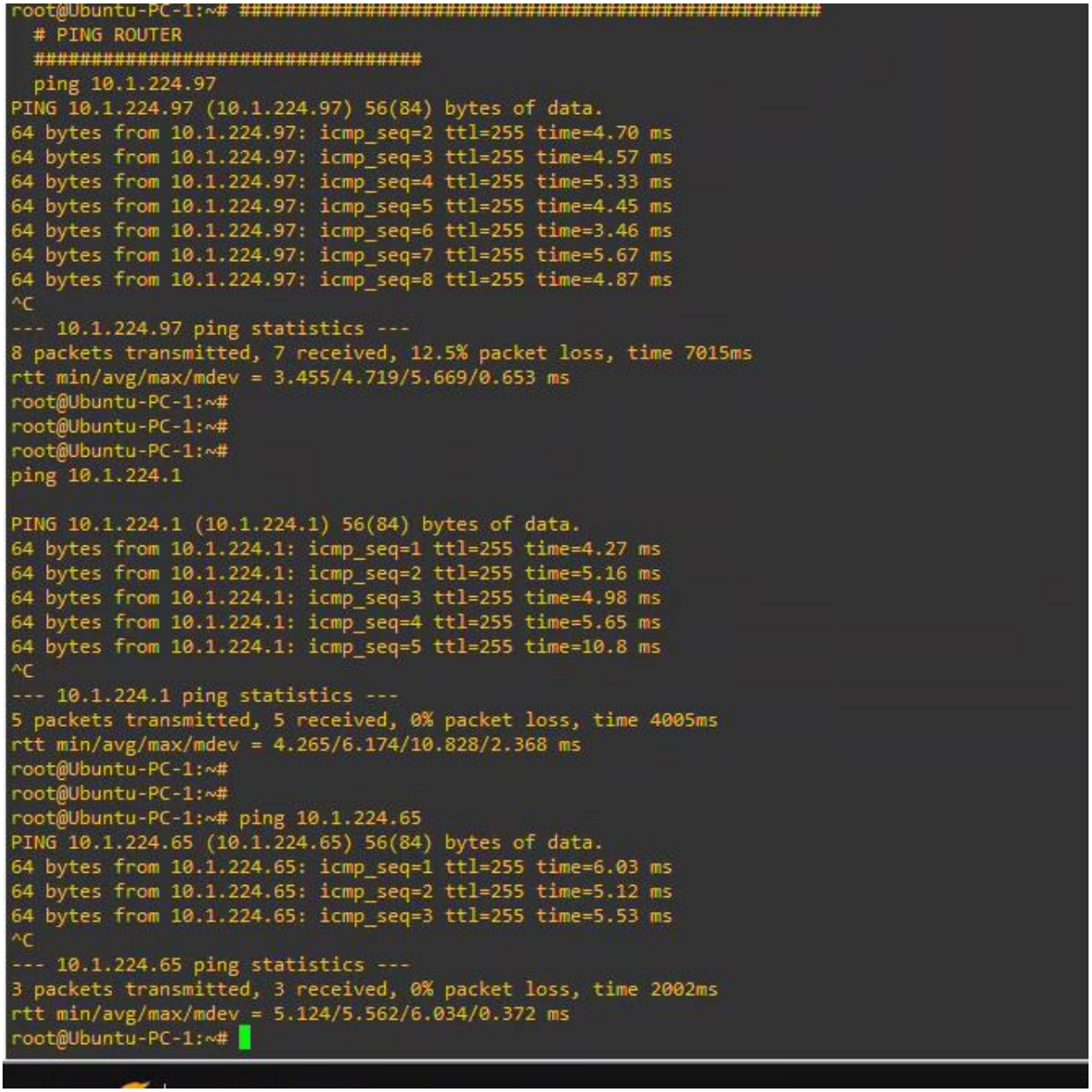
PING switches

```
bash: PING: command not found
root@Ubuntu-PC-1:~# # PING SWITCHES
root@Ubuntu-PC-1:~# ###############
root@Ubuntu-PC-1:~# ping 10.1.224.98
PING 10.1.224.98 (10.1.224.98) 56(84) bytes of data.
64 bytes from 10.1.224.98: icmp_seq=2 ttl=255 time=4.41 ms
64 bytes from 10.1.224.98: icmp_seq=3 ttl=255 time=14.6 ms
64 bytes from 10.1.224.98: icmp_seq=4 ttl=255 time=2.91 ms
64 bytes from 10.1.224.98: icmp_seq=5 ttl=255 time=3.46 ms
64 bytes from 10.1.224.98: icmp_seq=6 ttl=255 time=2.90 ms
64 bytes from 10.1.224.98: icmp_seq=7 ttl=255 time=3.00 ms
^C
--- 10.1.224.98 ping statistics ---
7 packets transmitted, 6 received, 14.2857% packet loss, time 6031ms
rtt min/avg/max/mdev = 2.904/5.217/14.622/4.238 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# ping 10.1.224.2
PING 10.1.224.2 (10.1.224.2) 56(84) bytes of data.
64 bytes from 10.1.224.2: icmp_seq=2 ttl=254 time=20.4 ms
64 bytes from 10.1.224.2: icmp_seq=3 ttl=254 time=8.71 ms
64 bytes from 10.1.224.2: icmp_seq=4 ttl=254 time=8.57 ms
64 bytes from 10.1.224.2: icmp_seq=5 ttl=254 time=7.91 ms
64 bytes from 10.1.224.2: icmp_seq=6 ttl=254 time=9.97 ms
64 bytes from 10.1.224.2: icmp_seq=7 ttl=254 time=9.51 ms
64 bytes from 10.1.224.2: icmp_seq=8 ttl=254 time=7.29 ms
^C
--- 10.1.224.2 ping statistics ---
8 packets transmitted, 7 received, 12.5% packet loss, time 7030ms
rtt min/avg/max/mdev = 7.289/10.335/20.394/4.190 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# ping 10.1.224.110
PING 10.1.224.110 (10.1.224.110) 56(84) bytes of data.
64 bytes from 10.1.224.110: icmp_seq=1 ttl=64 time=0.016 ms
64 bytes from 10.1.224.110: icmp_seq=2 ttl=64 time=0.026 ms
64 bytes from 10.1.224.110: icmp_seq=3 ttl=64 time=0.065 ms
64 bytes from 10.1.224.110: icmp_seq=4 ttl=64 time=0.031 ms
64 bytes from 10.1.224.110: icmp_seq=5 ttl=64 time=0.024 ms
64 bytes from 10.1.224.110: icmp_seq=6 ttl=64 time=0.026 ms
64 bytes from 10.1.224.110: icmp_seq=7 ttl=64 time=0.025 ms
64 bytes from 10.1.224.110: icmp_seq=8 ttl=64 time=0.041 ms
^C
--- 10.1.224.110 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7155ms
rtt min/avg/max/mdev = 0.016/0.031/0.065/0.014 ms
root@Ubuntu-PC-1:~# ##################################################
root@Ubuntu-PC-1:~#
```

Ping UBUNTU PC-2 and UBUNTU-PC3

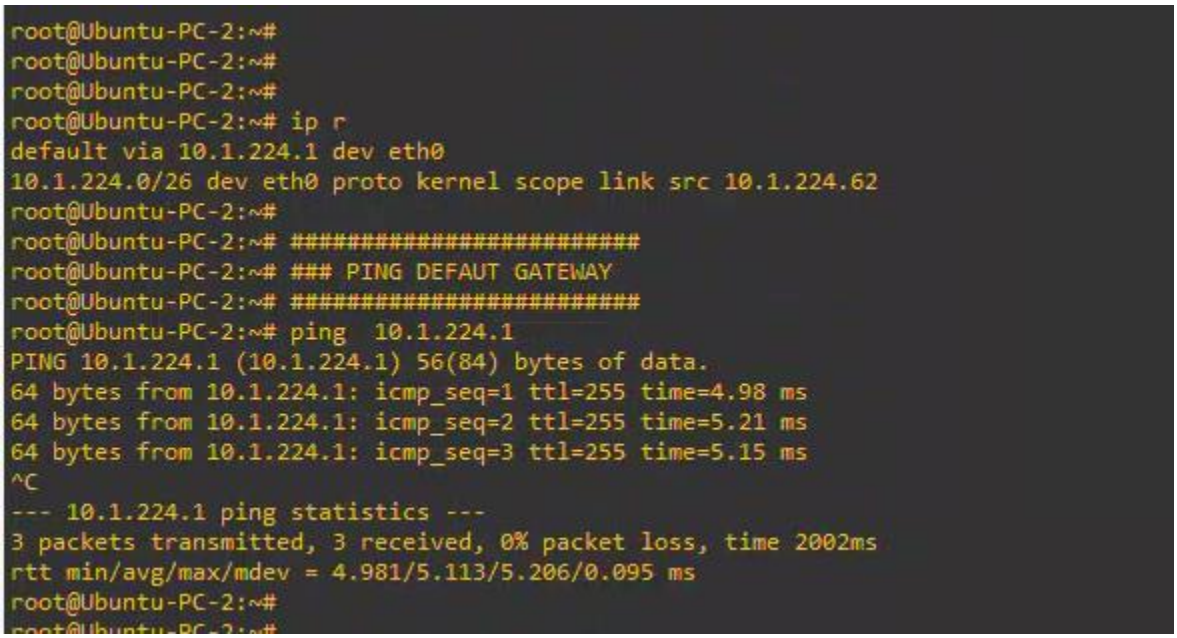
```
rtt min/avg/max/mdev = 0.016/0.031/0.065/0.014 ms
root@Ubuntu-PC-1:~# ######################################################
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# # PING UBUNTU PC
root@Ubuntu-PC-1:~# #################
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# # PING UBUNTU PC-2
root@Ubuntu-PC-1:~# ping 10.1.224.62
PING 10.1.224.62 (10.1.224.62) 56(84) bytes of data.
64 bytes from 10.1.224.62: icmp_seq=1 ttl=63 time=25.2 ms
64 bytes from 10.1.224.62: icmp_seq=2 ttl=63 time=9.09 ms
64 bytes from 10.1.224.62: icmp_seq=3 ttl=63 time=8.76 ms
64 bytes from 10.1.224.62: icmp_seq=4 ttl=63 time=8.15 ms
64 bytes from 10.1.224.62: icmp_seq=5 ttl=63 time=9.48 ms
64 bytes from 10.1.224.62: icmp_seq=6 ttl=63 time=7.88 ms
64 bytes from 10.1.224.62: icmp_seq=7 ttl=63 time=11.2 ms
^C
--- 10.1.224.62 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6009ms
rtt min/avg/max/mdev = 7.882/11.402/25.232/5.735 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# # PING UBUNTU PC-3
root@Ubuntu-PC-1:~# ping 10.1.224.94
PING 10.1.224.94 (10.1.224.94) 56(84) bytes of data.
64 bytes from 10.1.224.94: icmp_seq=1 ttl=63 time=18.5 ms
64 bytes from 10.1.224.94: icmp_seq=2 ttl=63 time=7.89 ms
64 bytes from 10.1.224.94: icmp_seq=3 ttl=63 time=8.04 ms
64 bytes from 10.1.224.94: icmp_seq=4 ttl=63 time=8.78 ms
64 bytes from 10.1.224.94: icmp_seq=5 ttl=63 time=8.20 ms
^C
--- 10.1.224.94 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4007ms
rtt min/avg/max/mdev = 7.885/10.276/18.478/4.112 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# ######################################################
root@Ubuntu-PC-1:~#
```

Ping router

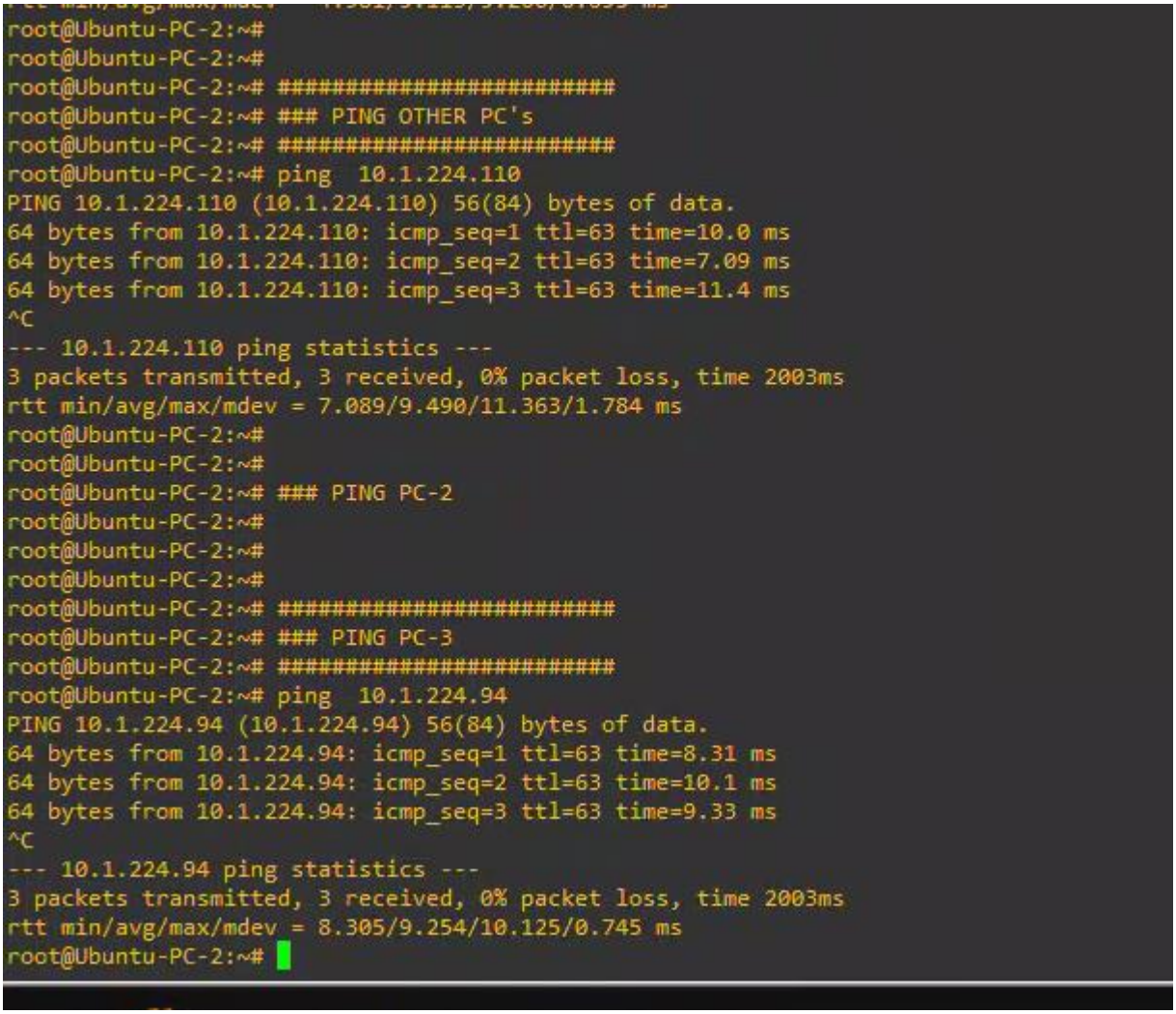

root@Ubuntu-PC-1:~# ##
PING ROUTER
##################################
ping 10.1.224.97
PING 10.1.224.97 (10.1.224.97) 56(84) bytes of data.
64 bytes from 10.1.224.97: icmp_seq=2 ttl=255 time=4.70 ms
64 bytes from 10.1.224.97: icmp_seq=3 ttl=255 time=4.57 ms
64 bytes from 10.1.224.97: icmp_seq=4 ttl=255 time=5.33 ms
64 bytes from 10.1.224.97: icmp_seq=5 ttl=255 time=4.45 ms
64 bytes from 10.1.224.97: icmp_seq=6 ttl=255 time=3.46 ms
64 bytes from 10.1.224.97: icmp_seq=7 ttl=255 time=5.67 ms
64 bytes from 10.1.224.97: icmp_seq=8 ttl=255 time=4.87 ms
^C
--- 10.1.224.97 ping statistics ---
8 packets transmitted, 7 received, 12.5% packet loss, time 7015ms
rtt min/avg/max/mdev = 3.455/4.719/5.669/0.653 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
ping 10.1.224.1
PING 10.1.224.1 (10.1.224.1) 56(84) bytes of data.
64 bytes from 10.1.224.1: icmp_seq=1 ttl=255 time=4.27 ms
64 bytes from 10.1.224.1: icmp_seq=2 ttl=255 time=5.16 ms
64 bytes from 10.1.224.1: icmp_seq=3 ttl=255 time=4.98 ms
64 bytes from 10.1.224.1: icmp_seq=4 ttl=255 time=5.65 ms
64 bytes from 10.1.224.1: icmp_seq=5 ttl=255 time=10.8 ms
^C
--- 10.1.224.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 4.265/6.174/10.828/2.368 ms
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~#
root@Ubuntu-PC-1:~# ping 10.1.224.65
PING 10.1.224.65 (10.1.224.65) 56(84) bytes of data.
64 bytes from 10.1.224.65: icmp_seq=1 ttl=255 time=6.03 ms
64 bytes from 10.1.224.65: icmp_seq=2 ttl=255 time=5.12 ms
64 bytes from 10.1.224.65: icmp_seq=3 ttl=255 time=5.53 ms
^C
--- 10.1.224.65 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 5.124/5.562/6.034/0.372 ms
root@Ubuntu-PC-1:~#

Ping testing from UBUNTU PC-2

Ping Default gateway

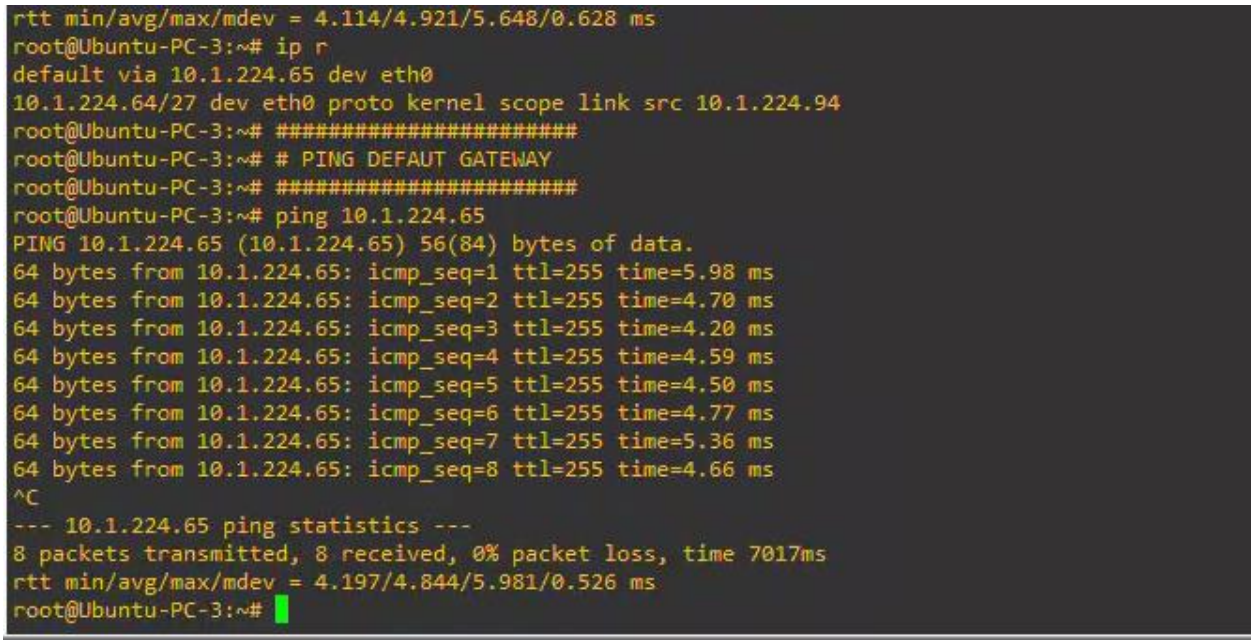


Ping UBUNTU-PC2 and UBUNTU-PC3



Ping testing from UBUNTU PC-3

Ping Default gateway



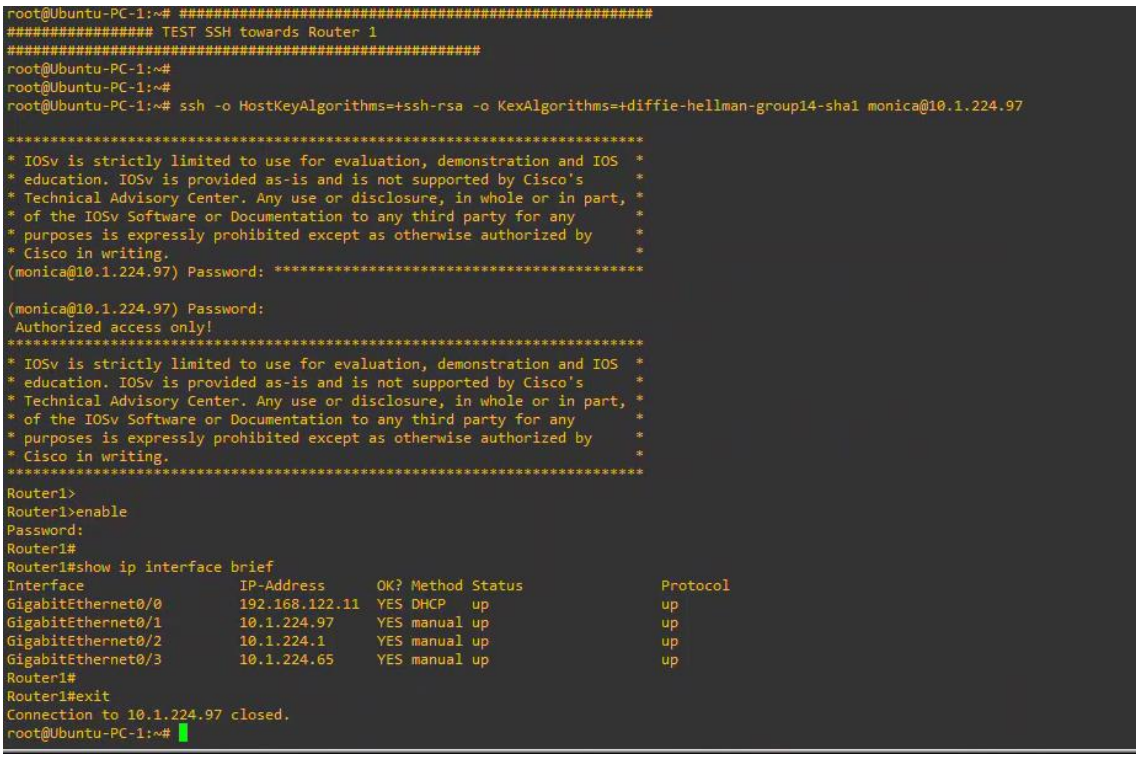
Ping UBUNTU PC-1 and UBUNTU-PC2

```
root@Ubuntu-PC-3:~# ######################
root@Ubuntu-PC-3:~# # PING PC-1
root@Ubuntu-PC-3:~# ######################
root@Ubuntu-PC-3:~# ping 10.1.224.110
PING 10.1.224.110 (10.1.224.110) 56(84) bytes of data.
64 bytes from 10.1.224.110: icmp_seq=1 ttl=63 time=9.72 ms
64 bytes from 10.1.224.110: icmp_seq=2 ttl=63 time=8.63 ms
64 bytes from 10.1.224.110: icmp_seq=3 ttl=63 time=9.45 ms
^C
--- 10.1.224.110 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 8.625/9.263/9.719/0.465 ms
root@Ubuntu-PC-3:~#
root@Ubuntu-PC-3:~#
root@Ubuntu-PC-3:~#
root@Ubuntu-PC-3:~# ######################
root@Ubuntu-PC-3:~# # PING PC-2
root@Ubuntu-PC-3:~# ######################
root@Ubuntu-PC-3:~# ping 10.1.224.62
PING 10.1.224.62 (10.1.224.62) 56(84) bytes of data.
64 bytes from 10.1.224.62: icmp_seq=1 ttl=63 time=10.6 ms
64 bytes from 10.1.224.62: icmp_seq=2 ttl=63 time=7.49 ms
64 bytes from 10.1.224.62: icmp_seq=3 ttl=63 time=9.23 ms
64 bytes from 10.1.224.62: icmp_seq=4 ttl=63 time=7.49 ms
64 bytes from 10.1.224.62: icmp_seq=5 ttl=63 time=9.67 ms
64 bytes from 10.1.224.62: icmp_seq=6 ttl=63 time=7.48 ms
64 bytes from 10.1.224.62: icmp_seq=7 ttl=63 time=9.30 ms
64 bytes from 10.1.224.62: icmp_seq=8 ttl=63 time=7.20 ms
64 bytes from 10.1.224.62: icmp_seq=9 ttl=63 time=8.31 ms
64 bytes from 10.1.224.62: icmp_seq=10 ttl=63 time=8.13 ms
64 bytes from 10.1.224.62: icmp_seq=11 ttl=63 time=4.69 ms
64 bytes from 10.1.224.62: icmp_seq=12 ttl=63 time=8.19 ms
64 bytes from 10.1.224.62: icmp_seq=13 ttl=63 time=6.35 ms
64 bytes from 10.1.224.62: icmp_seq=14 ttl=63 time=7.07 ms
64 bytes from 10.1.224.62: icmp_seq=15 ttl=63 time=8.12 ms
64 bytes from 10.1.224.62: icmp_seq=16 ttl=63 time=6.46 ms
64 bytes from 10.1.224.62: icmp_seq=17 ttl=63 time=5.95 ms
64 bytes from 10.1.224.62: icmp_seq=18 ttl=63 time=5.72 ms
64 bytes from 10.1.224.62: icmp_seq=19 ttl=63 time=6.30 ms
64 bytes from 10.1.224.62: icmp_seq=20 ttl=63 time=7.20 ms
64 bytes from 10.1.224.62: icmp_seq=21 ttl=63 time=7.32 ms
64 bytes from 10.1.224.62: icmp_seq=22 ttl=63 time=7.39 ms
64 bytes from 10.1.224.62: icmp_seq=23 ttl=63 time=7.51 ms
64 bytes from 10.1.224.62: icmp_seq=24 ttl=63 time=7.92 ms
64 bytes from 10.1.224.62: icmp_seq=25 ttl=63 time=8.03 ms
64 bytes from 10.1.224.62: icmp_seq=26 ttl=63 time=6.82 ms
^C
--- 10.1.224.62 ping statistics ---
26 packets transmitted, 26 received, 0% packet loss, time 25040ms
rtt min/avg/max/mdev = 4.686/7.533/10.578/1.254 ms
root@Ubuntu-PC-3:~#
```

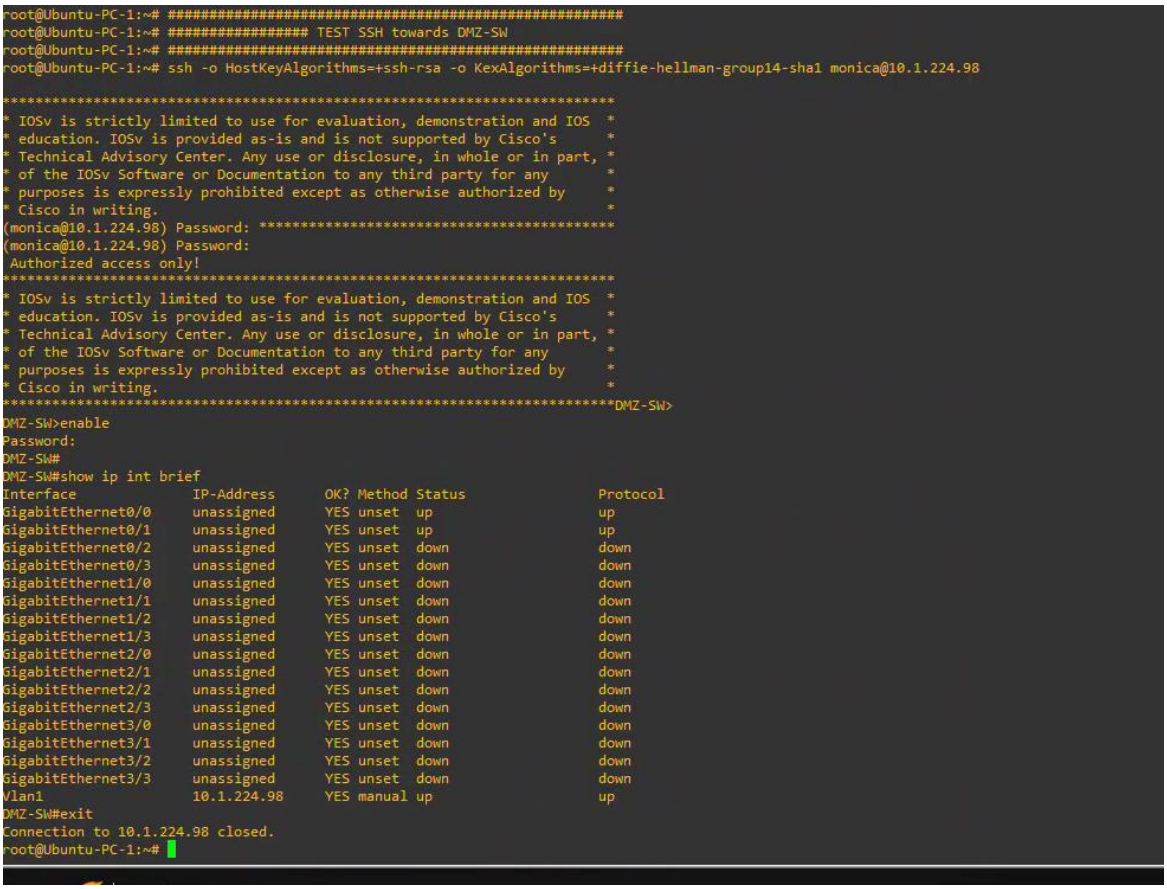
SSH testing

Test for SSH connection towards router and switches in the network is only done from Ubuntu-PC-1

Verify SSH From UBUNTU-PC1 towards ROUTER1



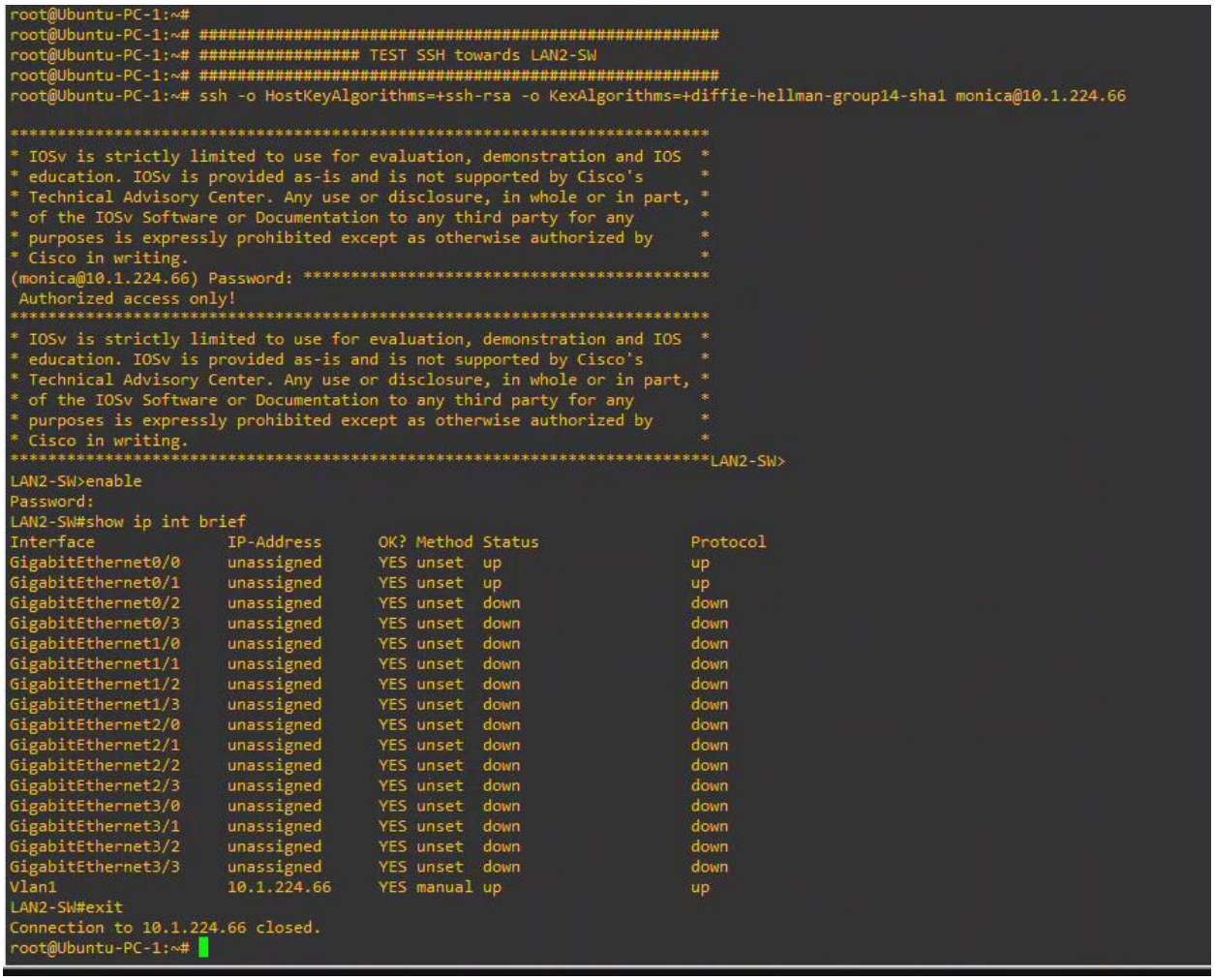
Verify SSH From UBUNTU-PC1 towards DMZ-SW



Verify SSH From UBUNTU-PC1 towards LAN1-SW

```
root@Ubuntu-PC-1:~# ##################################################
root@Ubuntu-PC-1:~# ################ TEST SSH towards LAN1-SW
root@Ubuntu-PC-1:~# ##################################################
root@Ubuntu-PC-1:~# ssh -o HostKeyAlgorithms=+ssh-rsa -o KexAlgorithms=+diffie-hellman-group14-sha1 monica@10.1.224.2

**********************************************************************
* IOSv is strictly limited to use for evaluation, demonstration and IOS  *
* education. IOSv is provided as-is and is not supported by Cisco's      *
* Technical Advisory Center. Any use or disclosure, in whole or in part, *
* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
(monica@10.1.224.2) Password: ****************************************
 Authorized access only!
**********************************************************************
* IOSv is strictly limited to use for evaluation, demonstration and IOS  *
* education. IOSv is provided as-is and is not supported by Cisco's      *
* Technical Advisory Center. Any use or disclosure, in whole or in part, *
* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************LAN1-SW>
LAN1-SW>enable
Password:
LAN1-SW#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/2     unassigned      YES unset  down                  down
GigabitEthernet0/3     unassigned      YES unset  down                  down
GigabitEthernet1/0     unassigned      YES unset  down                  down
GigabitEthernet1/1     unassigned      YES unset  down                  down
GigabitEthernet1/2     unassigned      YES unset  down                  down
GigabitEthernet1/3     unassigned      YES unset  down                  down
GigabitEthernet2/0     unassigned      YES unset  down                  down
GigabitEthernet2/1     unassigned      YES unset  down                  down
GigabitEthernet2/2     unassigned      YES unset  down                  down
GigabitEthernet2/3     unassigned      YES unset  down                  down
GigabitEthernet3/0     unassigned      YES unset  down                  down
GigabitEthernet3/1     unassigned      YES unset  down                  down
GigabitEthernet3/2     unassigned      YES unset  down                  down
GigabitEthernet3/3     unassigned      YES unset  down                  down
Vlan1                  10.1.224.2      YES manual up                    up
LAN1-SW#exit
Connection to 10.1.224.2 closed.
root@Ubuntu-PC-1:~#
```

Verify SSH From UBUNTU-PC1 towards LAN2-SW



Wireshark testing

For Wireshark tracing the incoming and outgoing traffic in Ubuntu-PC1 eth0 port is being captured.

Ping is issued from Ubuntu-PC1 towards default gateway, followed by SSH connection from Ubuntu-PC1 towards DMZ-SW

Filters are then used to select ICMP traffic and SSH traffic.

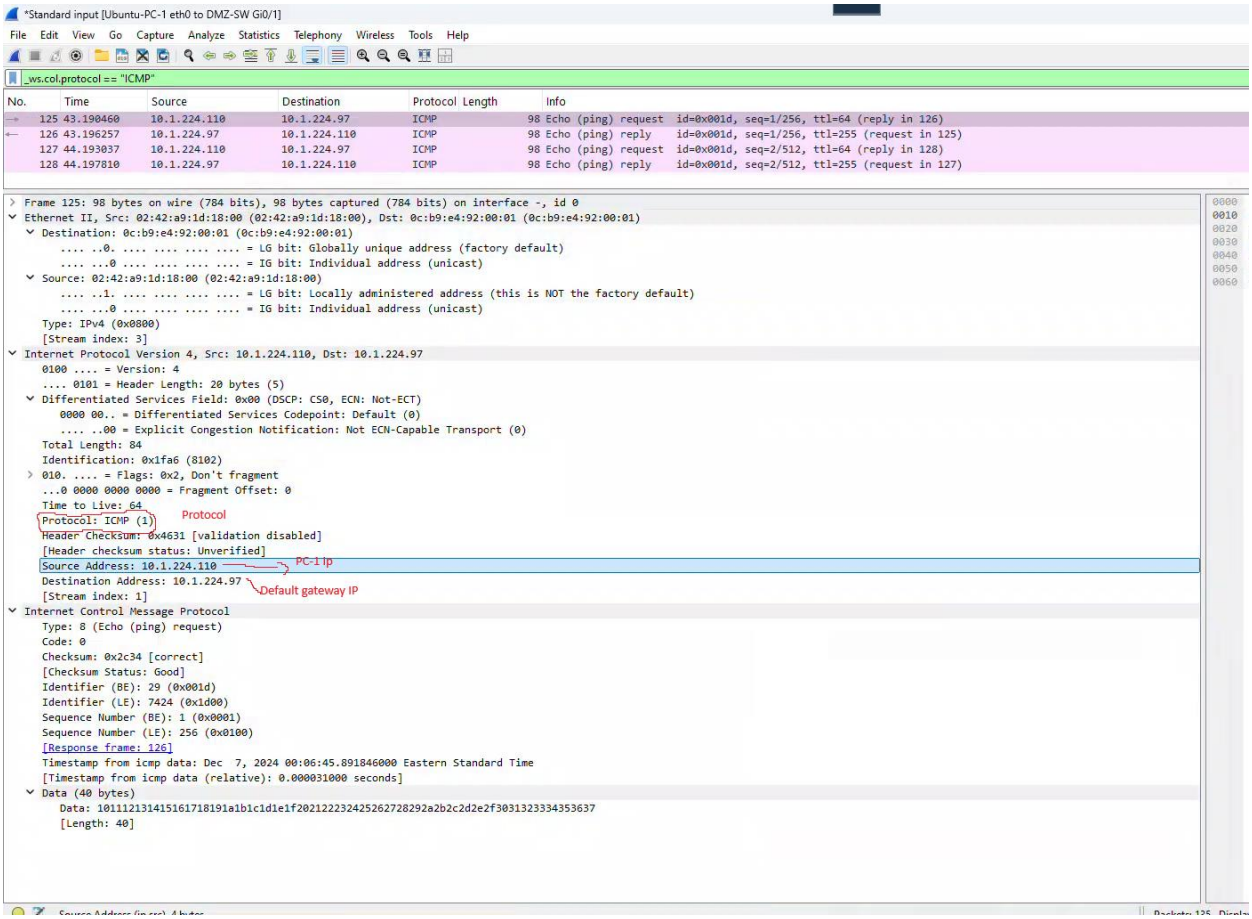
The resulting Wireshark captures are shown below for ICMP and SSH traffic.

A quick analysis was done for some data, notes in red in Wireshark capture.

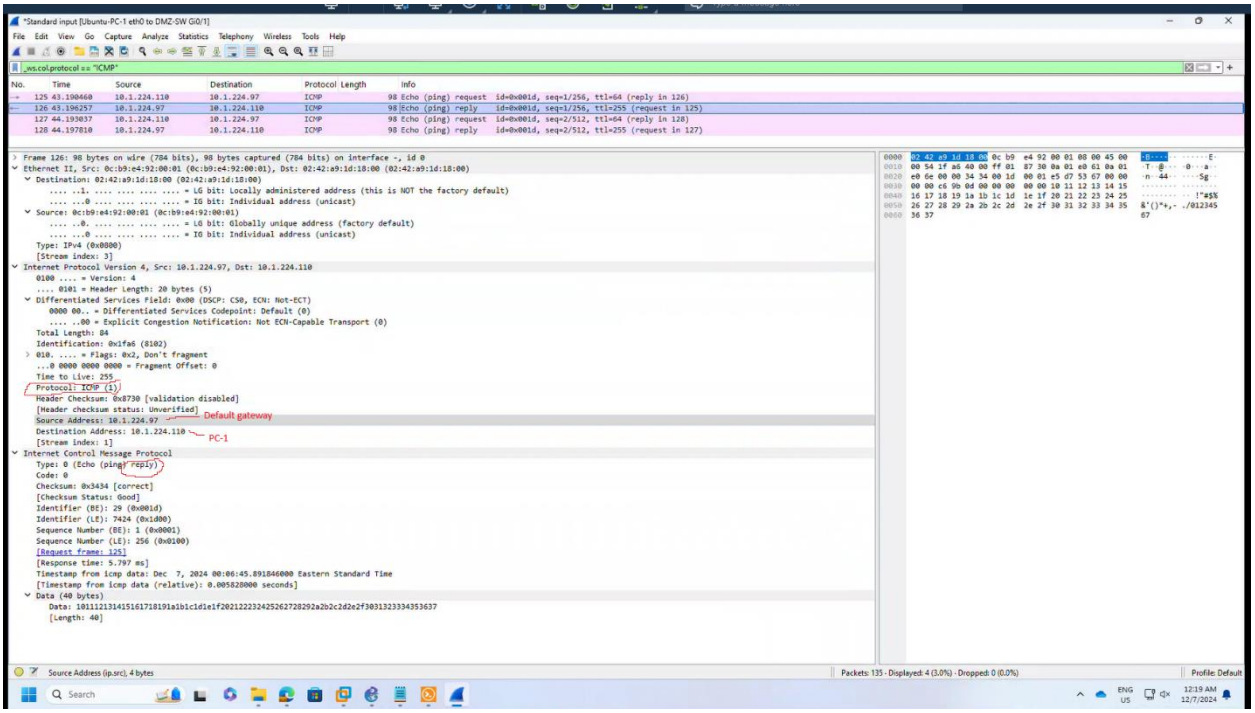
ICMPV4 traffic

ICMP protocol from UBUNTU-PC1

ICMP request

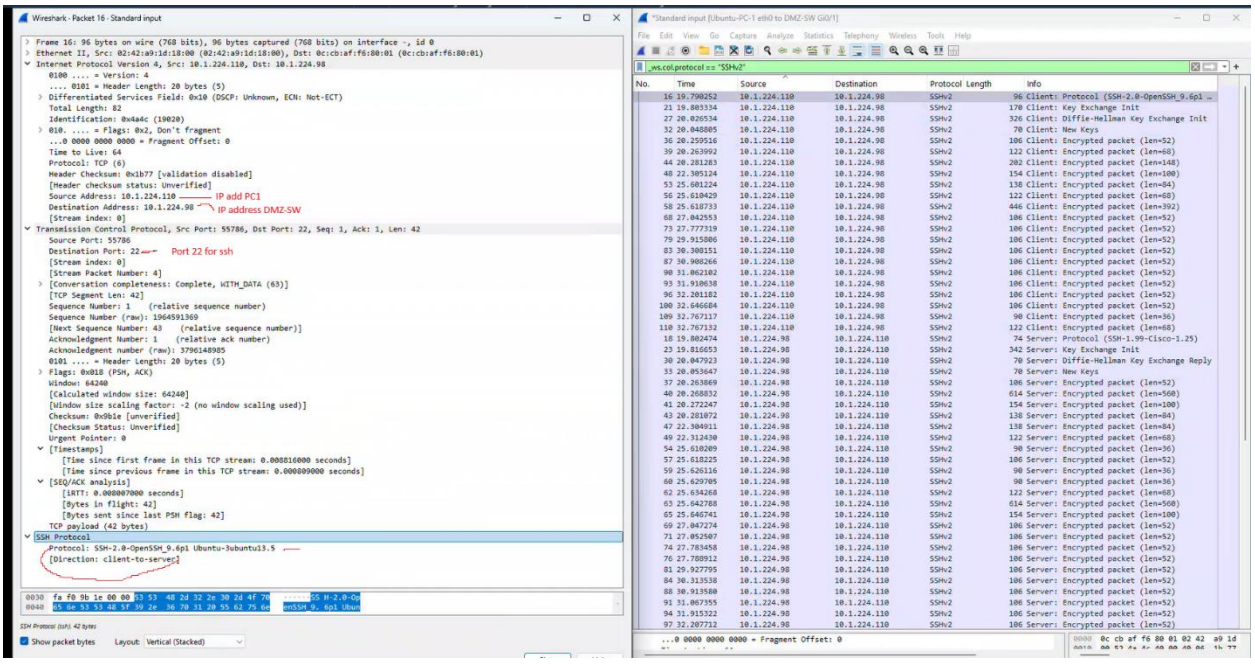


ICMP reply



SSH Traffic testing

Client to server



Server to Client