# COMPUTER NETWORKS LAB 1

## OBJECTIVES

- To familiarize students with Cisco Packet Tracer.
- To set up a peer-to-peer (P2P) communication network.
- To study different types of network cables and their colour codes.
- To document the observations and save the configuration file in a GitHub repository.

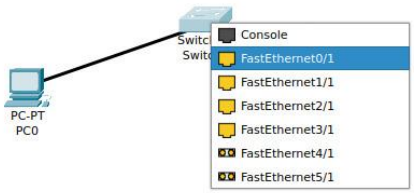
## STEPS TAKEN TO SET UP THE NETWORK

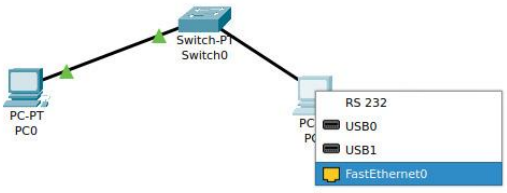
STEP 1: Dragged the end devices and a Switch-PT on to the canvas.


STEP 2: connected the end devices to the switch using Straight-through copper cables.

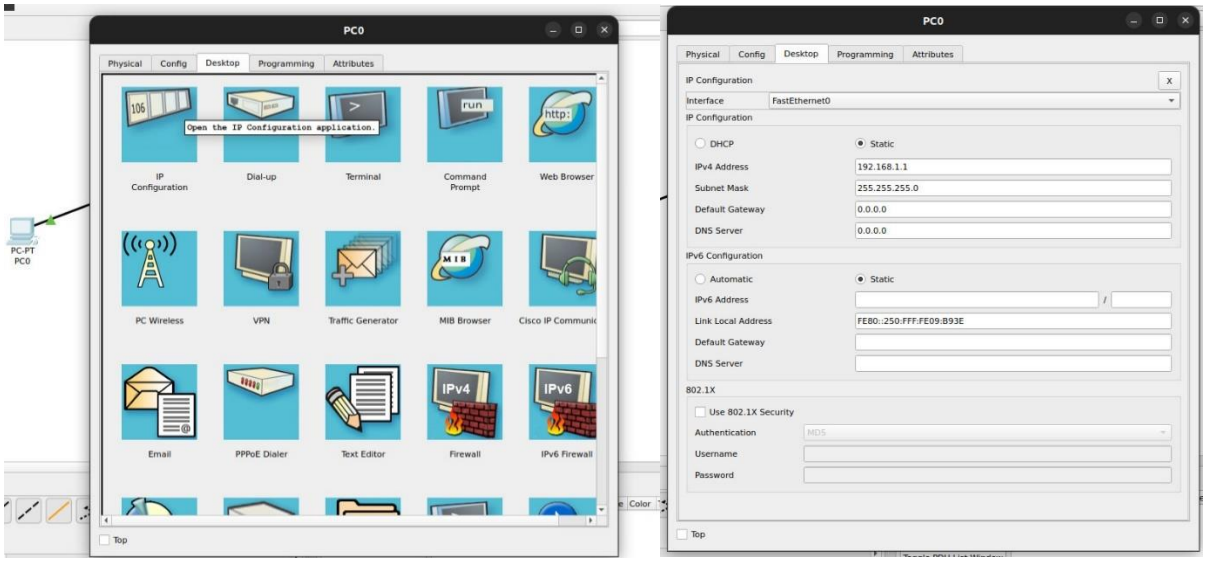
FastEthernet0 on PC0 to FastEthernet0/1 on Switch-PT

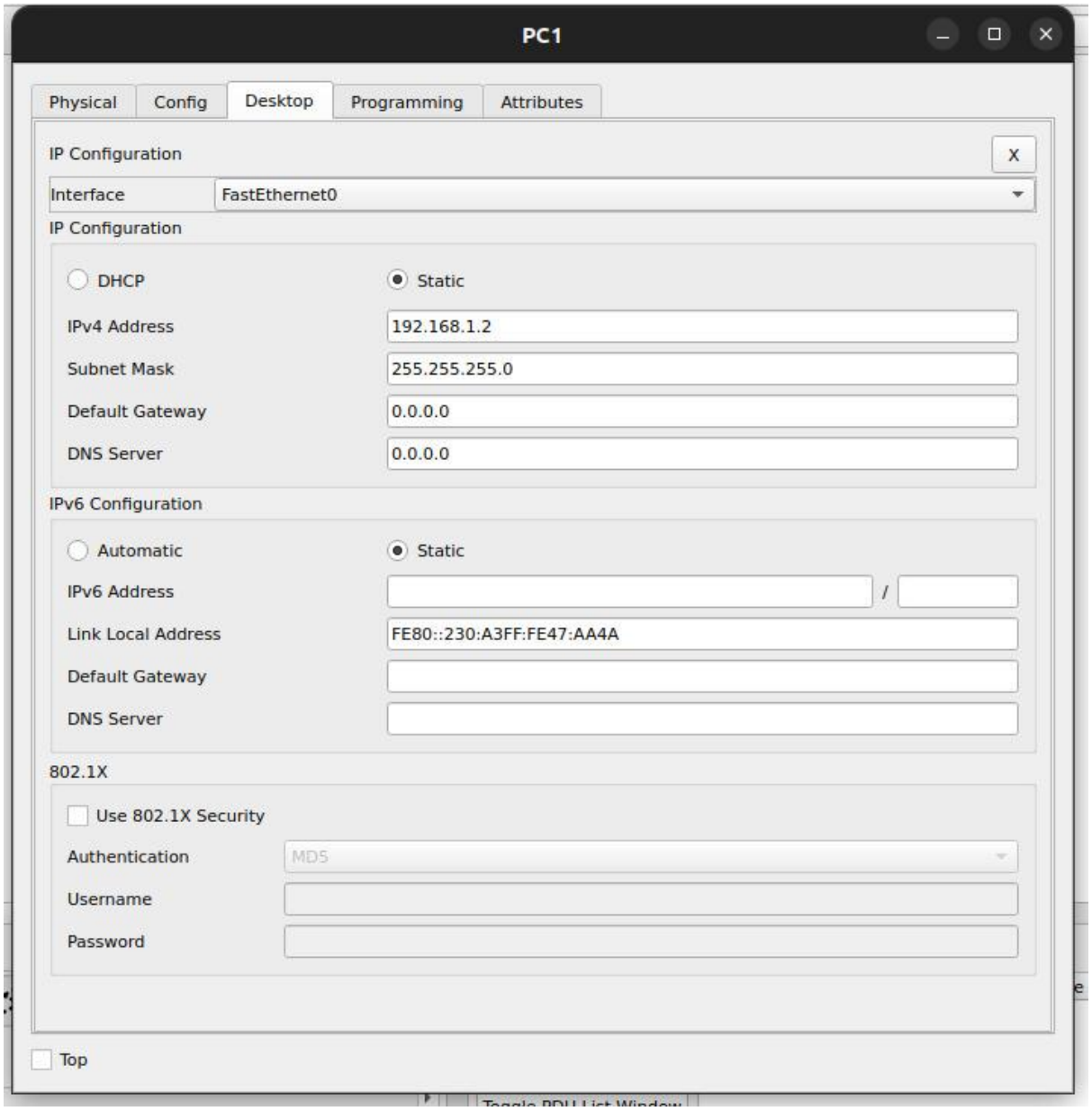
Fs/0 on PC1 to Fs0/2 on Switch-PT



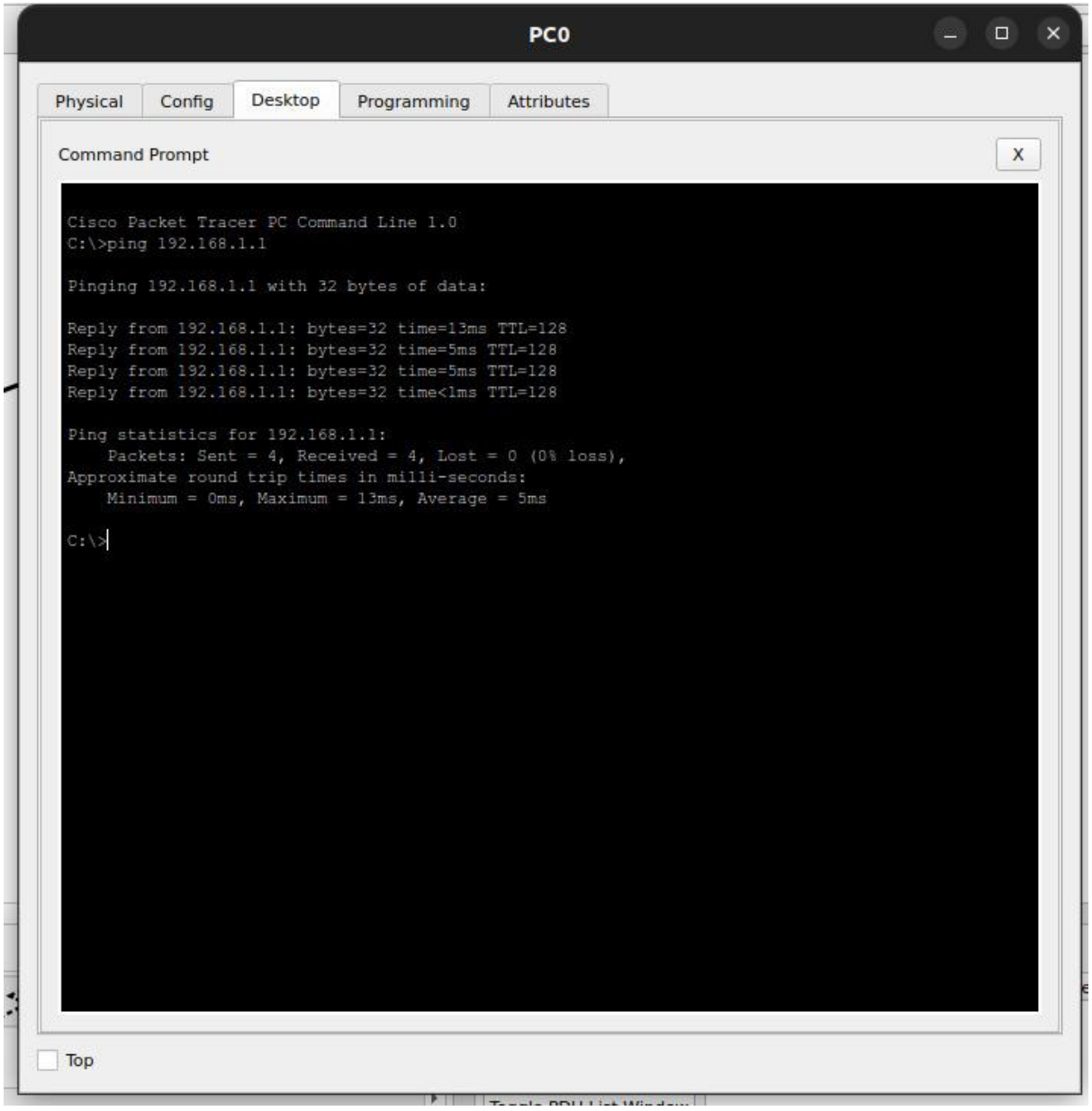




STEP 3: Started configuring the IP address and subnet mask for each end device in the network.

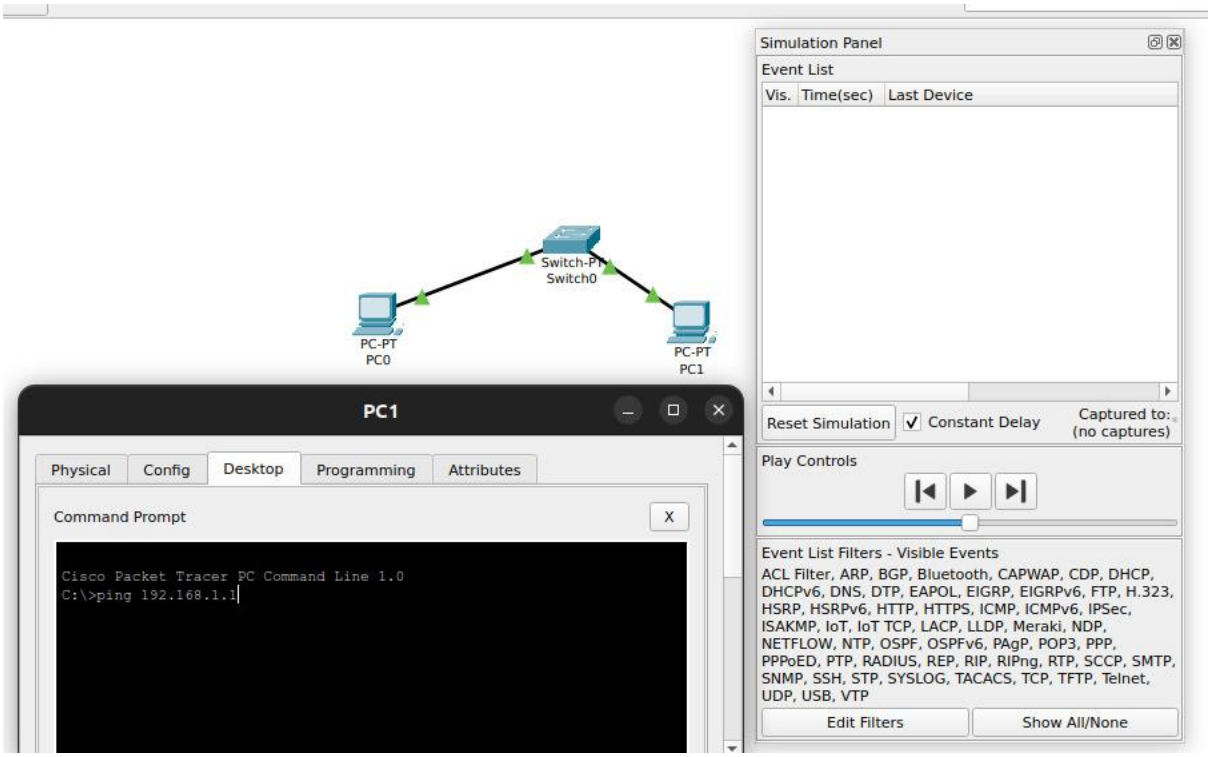

PC0
Physical
Config
Desktop
Programming
Attributes
Open the IP Configuration application.
IP Configuration
Dial-up
Terminal
Command Prompt
Web Browser
PC Wireless
VPN
Traffic Generator
MIB Browser
Email
PPPoE Dialer
Text Editor
Firewall
IPv6 Firewall
Top
PC-PT PC0
IP Configuration
Interface
FastEthernet0
DHCP
Static
IPv4 Address
192.168.1.1
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
IPv6 Configuration
Automatic
IPv6 Address
Link Local Address
FE80::250:FFF:FE09:B93E
802.1X
Use 802.1X Security
Authentication
Username
Password


PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.0
Default Gateway
0.0.0.0
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::230:A3FF:FE47:AA4A
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

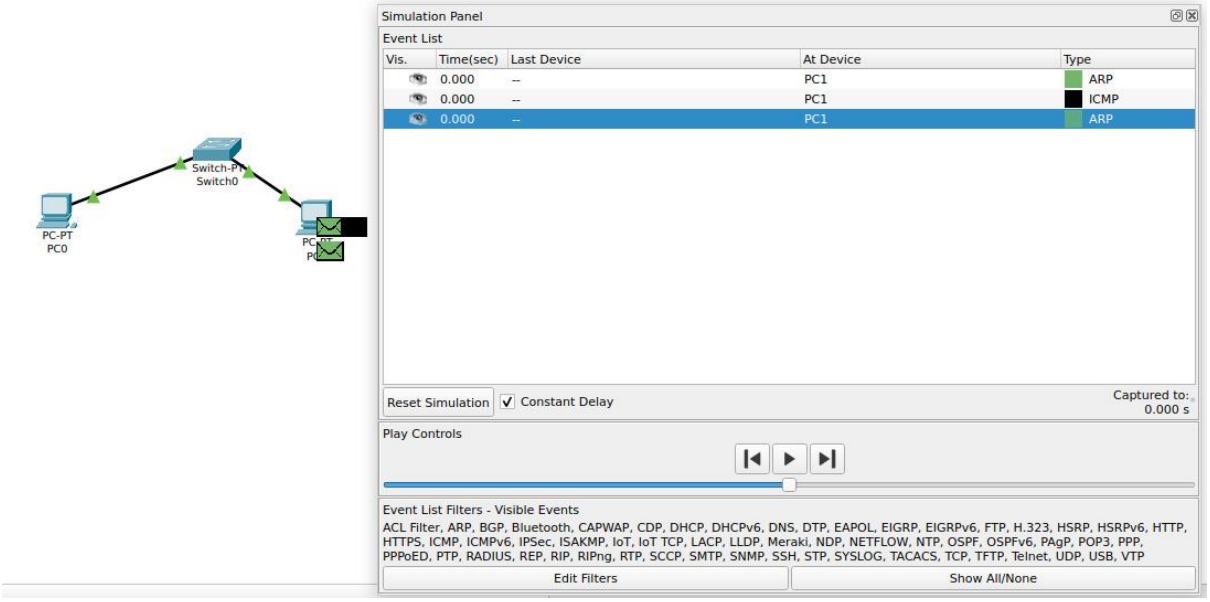
STEP 4: Using the ping command



## Observations using simulation mode:

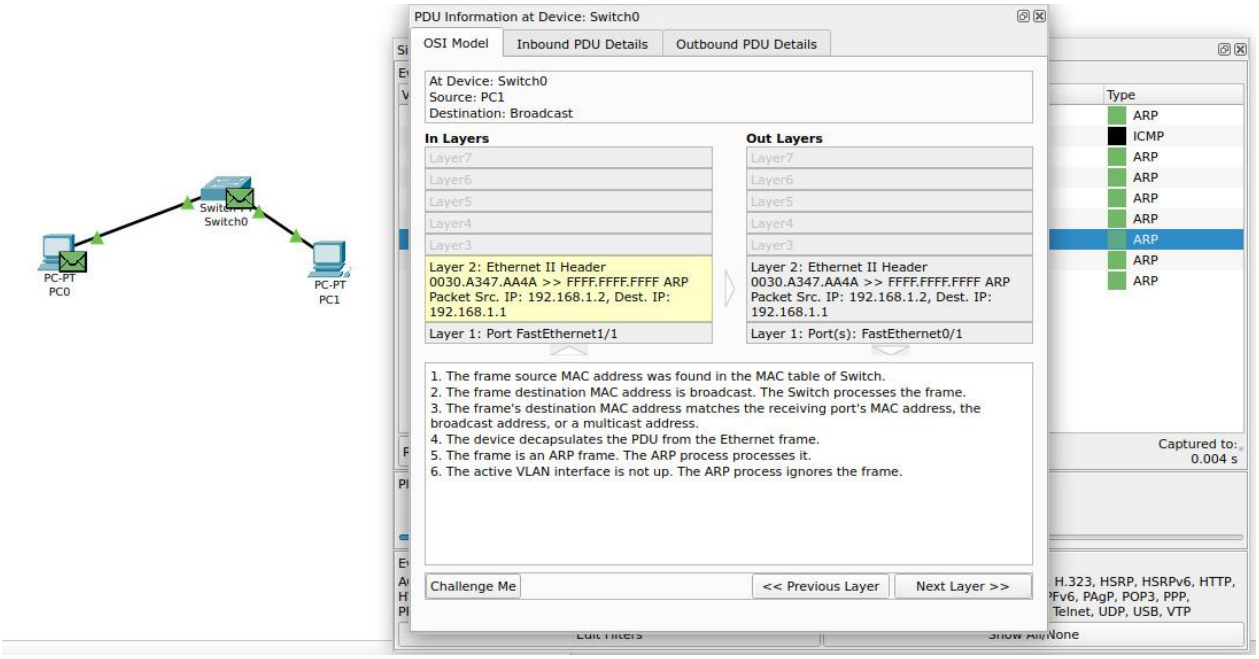


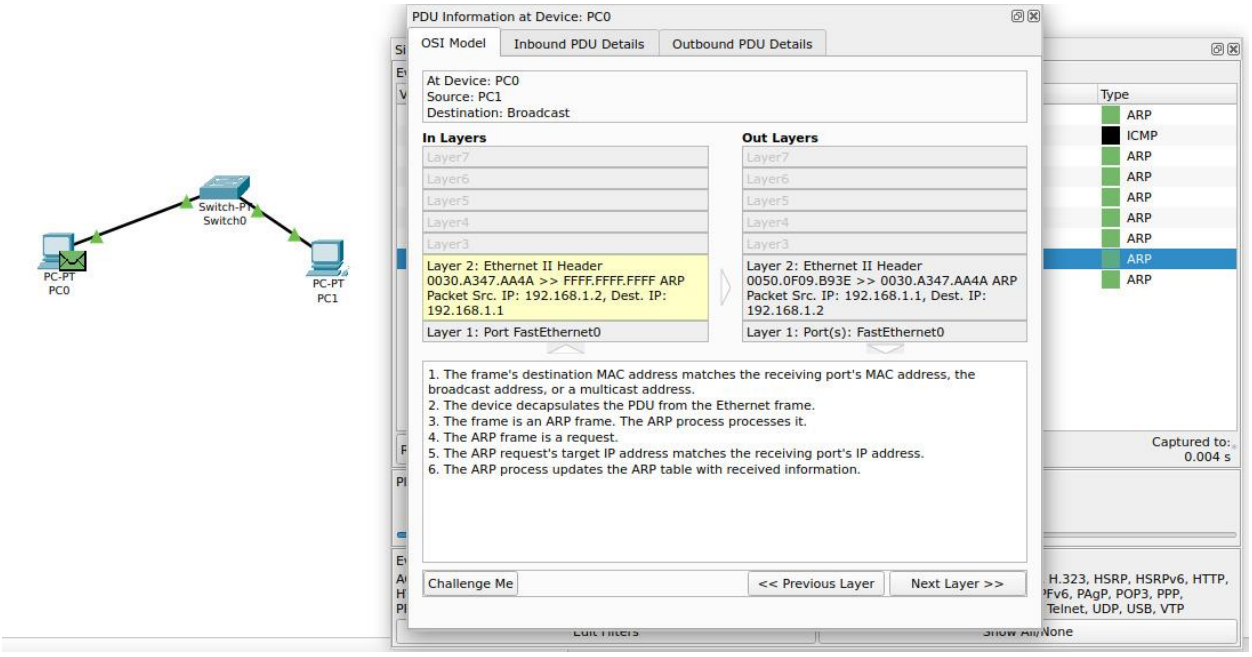

I pinged PC0 from PC1.

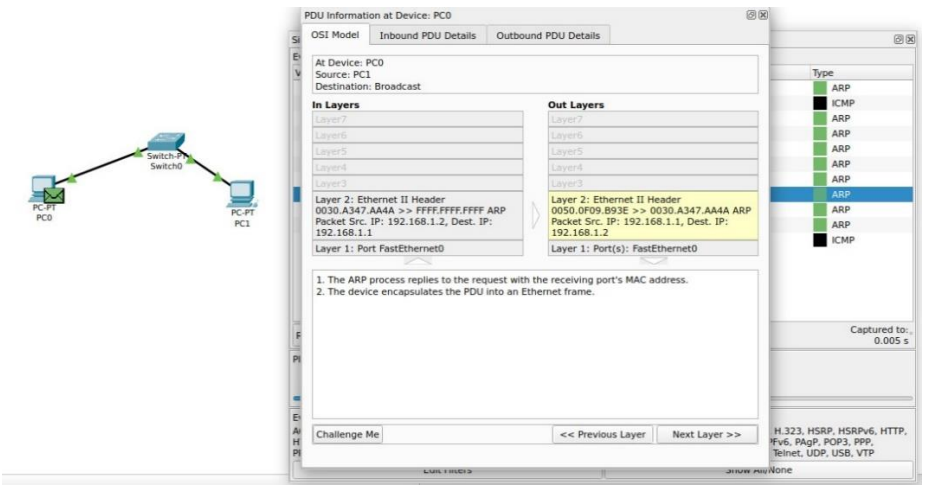


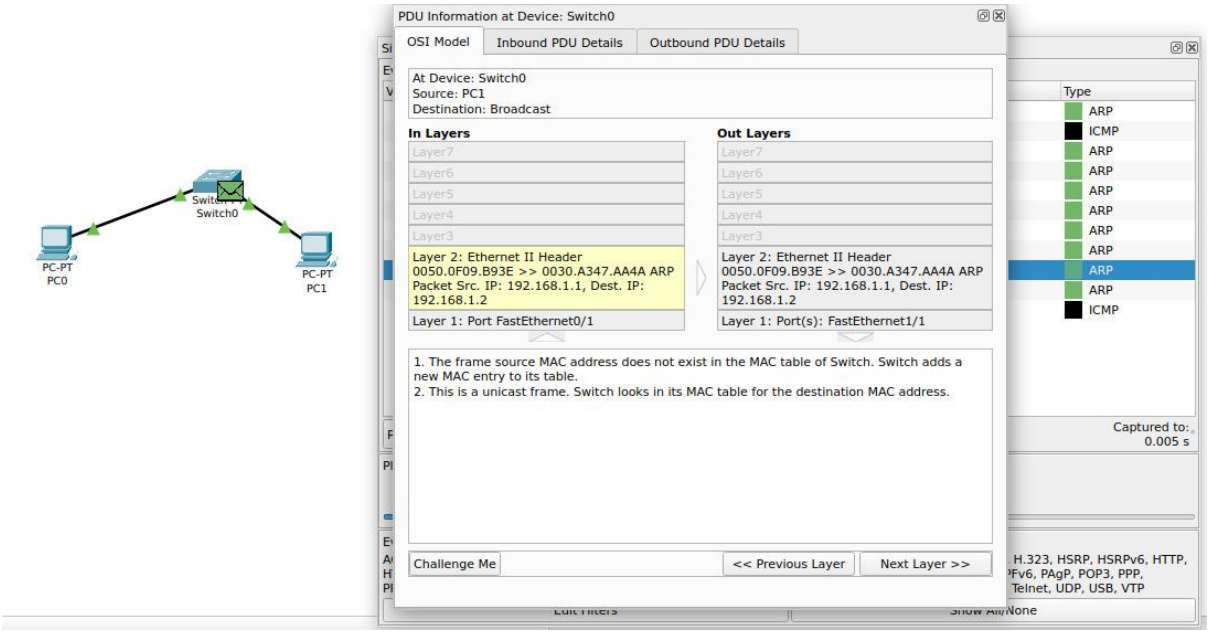

An ICMP packet and an ARP packet were generated. The ARP packet seems to be an ARP request.

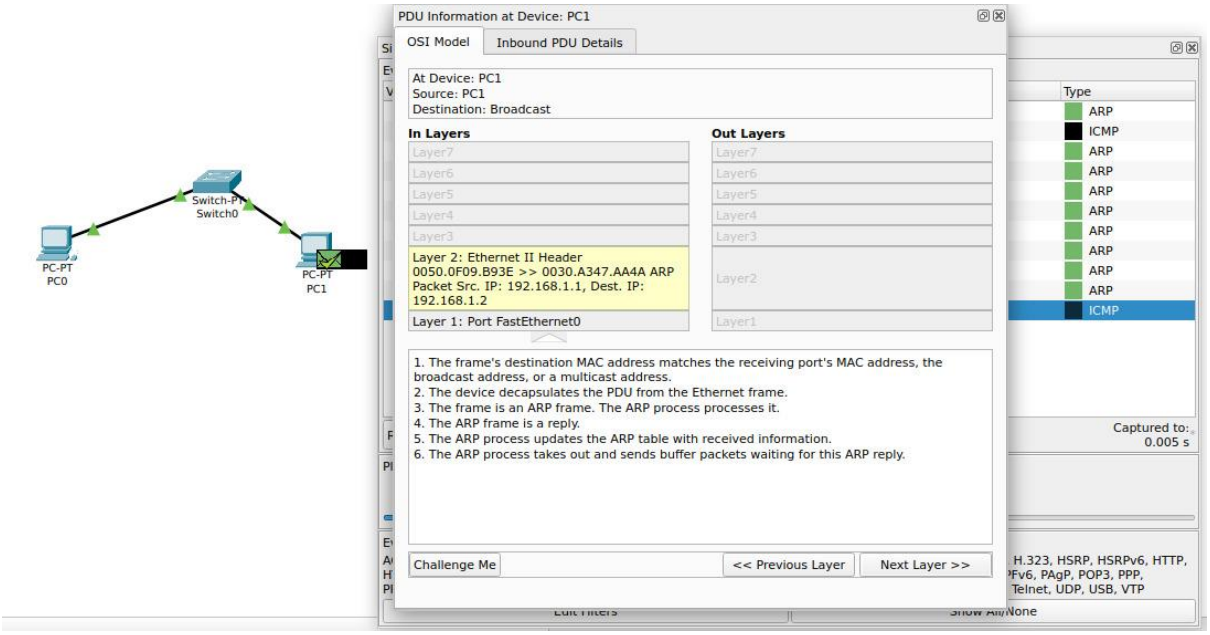
The destination MAC of this ARP packet is a broadcast MAC FFFF.FFFF.FFFF


PDU Information at Device: Switch0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: Switch0
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0030.A347.AA4A >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1
Layer 1: Port FastEthernet1/1
Layer 2: Ethernet II Header 0030.A347.AA4A >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1
Layer 1: Port(s): FastEthernet0/1
1. The frame source MAC address was found in the MAC table of Switch.
2. The frame destination MAC address is broadcast. The Switch processes the frame.
3. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
4. The device decapsulates the PDU from the Ethernet frame.
5. The frame is an ARP frame. The ARP process processes it.
6. The active VLAN interface is not up. The ARP process ignores the frame.
Challenge Me
<< Previous Layer
Next Layer >>
Type
ARP
ICMP
Captured to:
0.004 s
H.323, HSRP, HSRPv6, HTTP,
Telnet, UDP, USB, VTP
Switch0
PC-PT
PC0
PC-PT
PC1

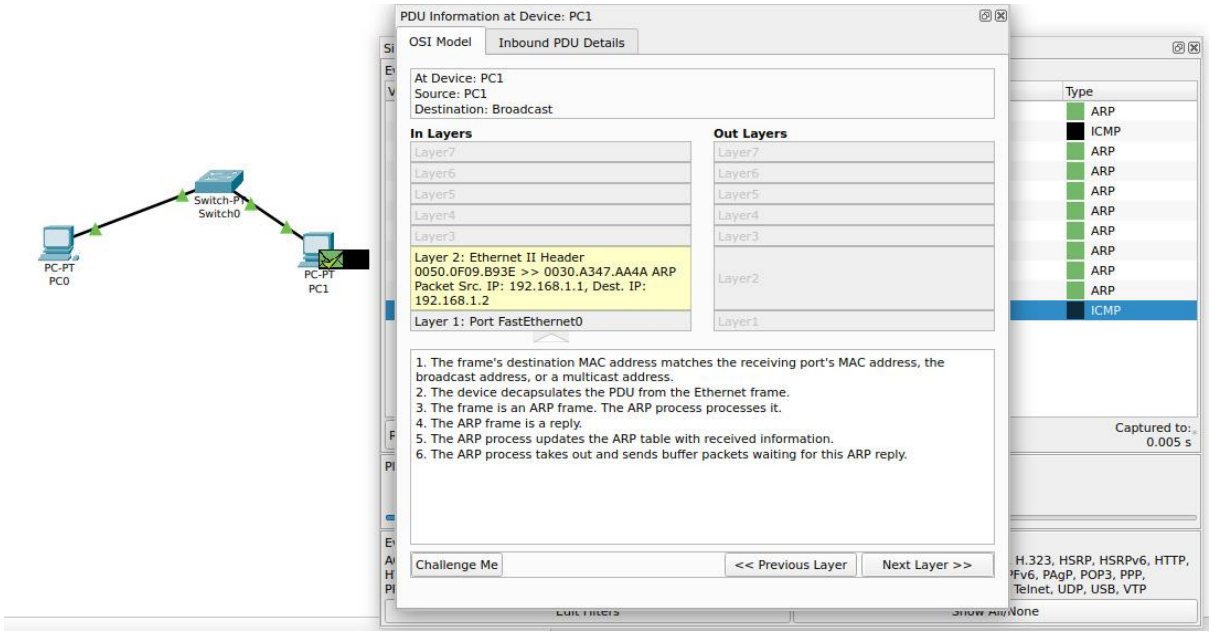

PDU Information at Device: PC0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: PC0
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0030.A347.AA4A >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1
Layer 1: Port FastEthernet0
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2
Layer 1: Port(s): FastEthernet0
1. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
2. The device decapsulates the PDU from the Ethernet frame.
3. The frame is an ARP frame. The ARP process processes it.
4. The ARP frame is a request.
5. The ARP request's target IP address matches the receiving port's IP address.
6. The ARP process updates the ARP table with received information.
Challenge Me
<< Previous Layer
Next Layer >>
Type
ARP
ICMP
Captured to:
0.004 s
H.323, HSRP, HSRPv6, HTTP,
Telnet, UDP, USB, VTP
Switch0
PC-PT
PC0
PC-PT
PC1

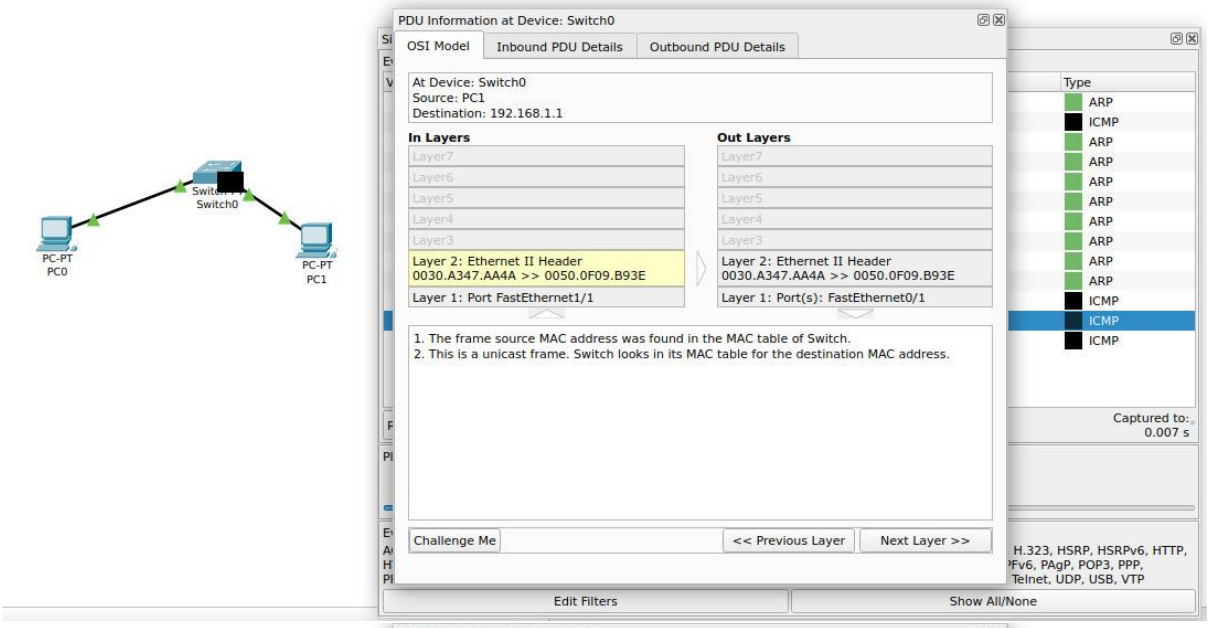

PDU Information at Device: PC0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: PC0
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0030.A347.AA4A >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1
Layer 1: Port FastEthernet0
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2
Layer 1: Port(s): FastEthernet0
1. The ARP process replies to the request with the receiving port's MAC address.
2. The device encapsulates the PDU into an Ethernet frame.
Challenge Me
<< Previous Layer
Next Layer >>
Type
ARP
ICMP
Captured to:
0.005 s
H.323, HSRP, HSRPv6, HTTP,
Telnet, UDP, USB, VTP
Switch0
PC-PT
PC0
PC-PT
PC1

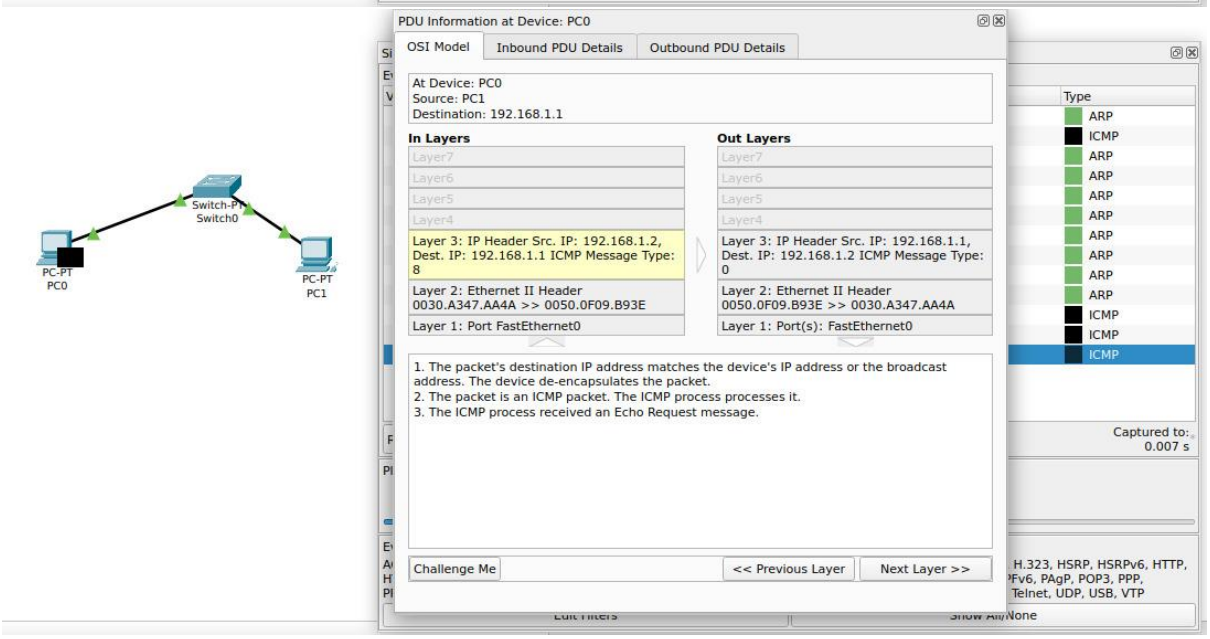

PDU Information at Device: Switch0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: Switch0
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2
Layer 1: Port FastEthernet0/1
Layer 1: Port(s): FastEthernet1/1
1. The frame source MAC address does not exist in the MAC table of Switch. Switch adds a new MAC entry to its table.
2. This is a unicast frame. Switch looks in its MAC table for the destination MAC address.
Challenge Me
<< Previous Layer
Next Layer >>
Switch0
PC-PT PC0
PC-PT PC1
Type
ARP
ICMP
Captured to: 0.005 s
H.323, HSRP, HSRPv6, HTTP, PAgP, POP3, PPP, Telnet, UDP, USB, VTP

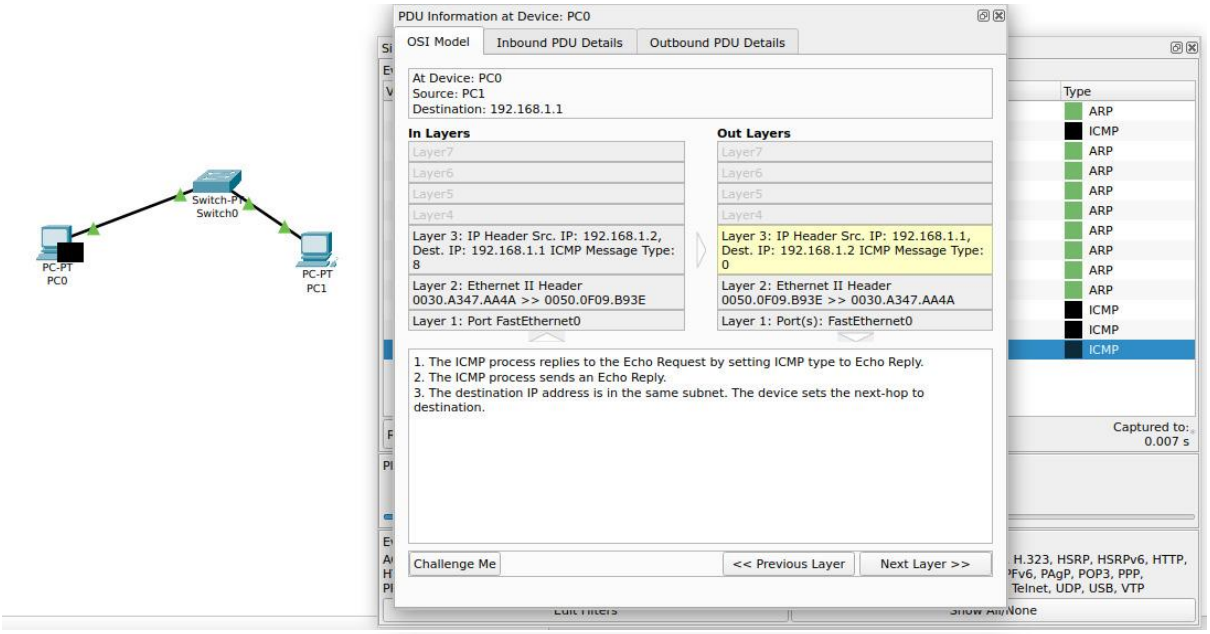

PDU Information at Device: PC1
OSI Model
Inbound PDU Details
At Device: PC1
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2
Layer 1: Port FastEthernet0
1. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
2. The device decapsulates the PDU from the Ethernet frame.
3. The frame is an ARP frame. The ARP process processes it.
4. The ARP frame is a reply.
5. The ARP process updates the ARP table with received information.
6. The ARP process takes out and sends buffer packets waiting for this ARP reply.
Challenge Me
<< Previous Layer
Next Layer >>
Switch0
PC-PT PC0
PC-PT PC1
Type
ARP
ICMP
Captured to: 0.005 s
H.323, HSRP, HSRPv6, HTTP, PAgP, POP3, PPP, Telnet, UDP, USB, VTP

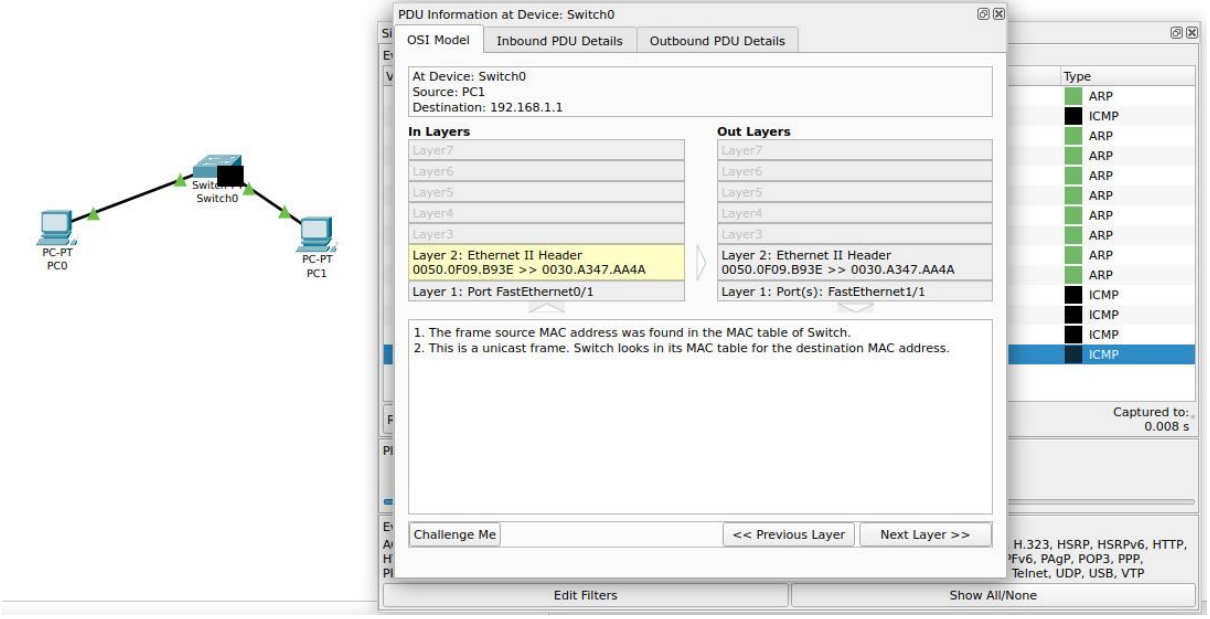
ICMP:

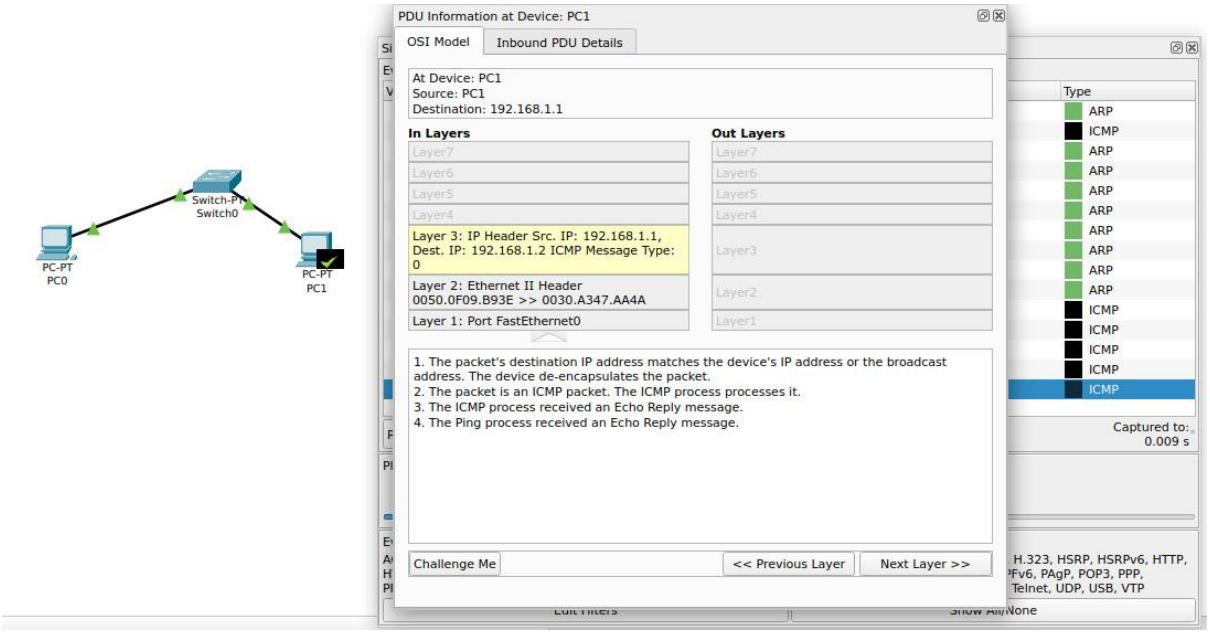

PDU Information at Device: PC1
OSI Model
Inbound PDU Details
At Device: PC1
Source: PC1
Destination: Broadcast
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2
Layer2
Layer1: Port FastEthernet0
Layer1
1. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
2. The device decapsulates the PDU from the Ethernet frame.
3. The frame is an ARP frame. The ARP process processes it.
4. The ARP frame is a reply.
5. The ARP process updates the ARP table with received information.
6. The ARP process takes out and sends buffer packets waiting for this ARP reply.
Challenge Me
<< Previous Layer
Next Layer >>
Switch-PT
Switch0
PC-PT
PC0
PC-PT
PC1
Type
ARP
ICMP
ARP
ARP
ARP
ARP
ARP
ARP
ARP
ICMP
Captured to:
0.005 s
H.323, HSRP, HSRPv6, HTTP,
Fv6, PAgP, POP3, PPP,
Telnet, UDP, USB, VTP


Switch0
PC-PT
PC0
PC-PT
PC1
PDU Information at Device: Switch0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: Switch0
Source: PC1
Destination: 192.168.1.1
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0030.A347.AA4A >> 0050.0F09.B93E
Layer 1: Port FastEthernet1/1
Layer 2: Ethernet II Header 0030.A347.AA4A >> 0050.0F09.B93E
Layer 1: Port(s): FastEthernet0/1
1. The frame source MAC address was found in the MAC table of Switch.
2. This is a unicast frame. Switch looks in its MAC table for the destination MAC address.
Challenge Me
<< Previous Layer
Next Layer >>
Type
ARP
ICMP
Captured to:
0.007 s
H.323, HSRP, HSRPv6, HTTP,
Telnet, UDP, USB, VTP
Edit Filters
Show All/None


Switch-PT
Switch0
PC-PT
PC0
PC-PT
PC1
PDU Information at Device: PC0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: PC0
Source: PC1
Destination: 192.168.1.1
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1 ICMP Message Type: 8
Layer 2: Ethernet II Header 0030.A347.AA4A >> 0050.0F09.B93E
Layer 1: Port FastEthernet0
Layer 3: IP Header Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2 ICMP Message Type: 0
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A
Layer 1: Port(s): FastEthernet0
1. The packet's destination IP address matches the device's IP address or the broadcast address. The device de-encapsulates the packet.
2. The packet is an ICMP packet. The ICMP process processes it.
3. The ICMP process received an Echo Request message.
Challenge Me
<< Previous Layer
Next Layer >>
Type
ARP
ICMP
Captured to:
0.007 s
H.323, HSRP, HSRPv6, HTTP,
Telnet, UDP, USB, VTP
Show All/None


PDU Information at Device: PC0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: PC0
Source: PC1
Destination: 192.168.1.1
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 192.168.1.2, Dest. IP: 192.168.1.1 ICMP Message Type: 8
Layer 3: IP Header Src. IP: 192.168.1.1, Dest. IP: 192.168.1.2 ICMP Message Type: 0
Layer 2: Ethernet II Header 0030.A347.AA4A >> 0050.0F09.B93E
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A
Layer 1: Port FastEthernet0
Layer 1: Port(s): FastEthernet0
1. The ICMP process replies to the Echo Request by setting ICMP type to Echo Reply.
2. The ICMP process sends an Echo Reply.
3. The destination IP address is in the same subnet. The device sets the next-hop to destination.
Challenge Me
<< Previous Layer
Next Layer >>
Switch0
PC-PT PC0
PC-PT PC1
Type
ARP
ICMP
Captured to: 0.007 s
Edit Filters
Show All/None


PDU Information at Device: Switch0
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: Switch0
Source: PC1
Destination: 192.168.1.1
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A
Layer 2: Ethernet II Header 0050.0F09.B93E >> 0030.A347.AA4A
Layer 1: Port FastEthernet0/1
Layer 1: Port(s): FastEthernet1/1
1. The frame source MAC address was found in the MAC table of Switch.
2. This is a unicast frame. Switch looks in its MAC table for the destination MAC address.
Challenge Me
<< Previous Layer
Next Layer >>
Switch0
PC-PT PC0
PC-PT PC1
Type
ARP
ICMP
Captured to: 0.008 s
Edit Filters
Show All/None




To ping the PC0 from PC1, the PC1 needs the MAC address of PC0; which is acquired by the ARP request (observed to be a broadcast). After the ARP reply comes from the PC0, PC1 will know the MAC address of PC0 and send the ICMP echo request to the destination MAC of PC0(unicast). PC0 will send a ICMP Echo reply to the PC1 upon receiving the ICMP Echo request.

## CABLES:

### CONSOLE CABLE:

A console cable, often called a "rollover cable" or "Cisco console cable," is used to connect a computer or terminal to the console port of a networking device, such as a router, switch, or firewall. This connection allows direct access to the device's command-line interface (CLI) for configuration, monitoring, and troubleshooting purposes.

### COPPER STRAIGHT THROUGH CABLE:

A copper straight cable, commonly referred to as a straight-through Ethernet cable, is used to connect different types of devices in a network, such as a computer to a switch, a router to a modem, or a switch to a router. It is the most common type of Ethernet cable used in local area networks (LANs).

**Usage**:

- **PC to Switch/Hub**: Connecting a computer to a network switch or hub.
- **Router to Modem**: Connecting a router to a broadband modem.
- **PC to Router**: Directly connecting a computer to a router.
- **Switch to Router**: Connecting a network switch to a router.

## COPPER CROSSOVER CABLE:

A copper crossover cable is a type of Ethernet cable used to connect similar devices directly to each other without the need for a network switch or router. The wiring of the cable is designed to "cross over" the transmit and receive signals, allowing two devices to communicate directly.

**PC to PC:** Connecting two computers directly without a switch or hub.

**Switch to Switch:** Connecting two network switches directly without using a router or another intermediate device.

**Router to Router:** Connecting two routers directly for certain networking setups.

**PC to Router:** In older setups, sometimes used to connect a computer directly to a router for configuration or testing purposes.

## FIBER OPTIC CABLES:

Fiber optic cables are used to transmit data as pulses of light through thin strands of glass or plastic fibers. They are a key component in modern telecommunications and networking, offering high-speed data transfer, long-distance communication, and resistance to electromagnetic interference.

## PHONE CABLES:

Phone cables, also known as telephone or landline cables, are used to connect telephones to the public switched telephone network (PSTN) or a private branch exchange (PBX) system. They carry voice signals (and sometimes data) over relatively short distances, typically within homes, offices, or other buildings.

## COAXIAL CABLES:

Coaxial cables, commonly known as coax cables, are used to transmit high-frequency signals, particularly for television, internet, and radio communications. They consist of a central conductor, an insulating layer, a metallic shield, and an outer insulating layer, all arranged coaxially, meaning they share the same axis.

## SERIAL DCE:

Serial DCE (Data Circuit-terminating Equipment) cables are used to connect Data Terminal Equipment (DTE), such as a computer or router, to Data Circuit-terminating Equipment (DCE), such as a modem or a network switch. The DCE cable is responsible for establishing and maintaining the data connection, typically in serial communication.

## SERIAL DTE:

Serial DTE (Data Terminal Equipment) refers to a device that communicates with a Data Circuit-terminating Equipment (DCE) in a serial communication setup. The role of a DTE device is to generate, process, or consume data, while the DCE device typically provides the connection to a network or communication line.

## OCTAL CABLE:

An octal cable, also known as an octopus cable or a serial breakout cable, is used in networking and telecommunications environments to connect multiple serial devices to a single serial interface on a server, router, or terminal server. The cable typically has a single connector on one end that connects to the serial interface and breaks out into eight individual serial connectors on the other end.

## IOT CUSTOM CABLE:

**IoT (Internet of Things) custom cables** are specialized cables designed to connect various IoT devices to each other or to a central system for data transmission and power supply. These cables are tailored to meet the specific needs of IoT applications, which often involve diverse types of sensors, actuators, and communication modules.

## USB CABLES:

USB (Universal Serial Bus) cables are a type of data and power cable used to connect various devices to computers and other electronic devices. They are one of the most common types of cables used for connecting peripherals and transferring data