

Packet Tracer – Exame da Tabela ARP

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Tabela de Endereçamento

Dispositivo	Interface	Endereço MAC	Interface do Switch
Router0	Gg0/0	0001.6458.2501	G0/1
	S0/0/0	N/D	N/D
Router1	G0/0	00E0.F7B1.8901	G0/1
	S0/0/0	N/D	N/D
10.10.10.2	Rede Sem Fio	0060.2F84.4AB6	F0/2
10.10.10.3	Rede Sem Fio	0060.4706.572B	F0/2
172.16.31.2	F0	000C.85CC.1DA7	F0/1
172.16.31.3	F0	0060.7036.2849	F0/2
172.16.31.4	G0	0002.1640.8D75	F0/3

Objetivos

Parte 1: Examinar uma Requisição ARP

Parte 2: Examinar a Tabela de Endereços MAC de um Switch

Parte 3: Examinar o Processo ARP em Comunicações Remotas

Histórico

Esta atividade é otimizada para a visualização de PDUs. Os dispositivos já estão configurados. Você reunirá informações da PDU no modo de simulação e responderá a uma série de perguntas sobre os dados coletados.

Instruções

Parte 1: Examinar uma Requisição ARP

Etapa 1: Gere requisições ARP enviando ping para 172.16.31.2 de 172.16.31.3.

- Clique em **172.16.31.2** e abra o **Command Prompt** (Prompt de Comando).
- Digite o comando **arp -d** para limpar a tabela ARP.
- Entre no modo **Simulation** (Simulação) e insira o comando **ping 172.16.31.3**. Serão geradas duas PDUs. O comando **ping** não pode completar o pacote ICMP sem saber o endereço MAC de destino. Por isso, o computador envia um quadro broadcast ARP para localizar o endereço MAC destino.

The screenshot shows the Packet Tracer interface. On the left, a 'Command Prompt' window for device 172.16.31.2 is open, displaying the following text:

```

Packet Tracer PC Command Line 1.0
C:\>
arp -d
C:\>ping 172.16.31.3

Pinging 172.16.31.3 with 32 bytes of data:

Reply from 172.16.31.3: bytes=32 time<1ms TTL=128
Reply from 172.16.31.3: bytes=32 time<1ms TTL=128
Reply from 172.16.31.3: bytes=32 time<1ms TTL=128
Reply from 172.16.31.3: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.31.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.16.31.3

Pinging 172.16.31.3 with 32 bytes of data:

C:\>ping 172.16.31.3

Pinging 172.16.31.3 with 32 bytes of data:
|
    
```

On the right, the 'Simulation Panel' is visible. It contains an 'Event List' table with the following data:

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	172.16.31.2	ICMP
	0.000	--	172.16.31.2	ARP

Below the table, there are controls for 'Reset Simulation', 'Constant Delay' (checked), and 'Captured to: 0.000 s'. There are also 'Play Controls' (Previous, Play, Next buttons) and 'Event List Filters - Visible Events' (a list of protocols like ARP, BGP, CDP, etc.).

- d. Clique uma vez em **Capture/Forward** (Capturar/Encaminhar). A PDU ARP se moverá para **Switch1** quando a PDU do ICMP desaparecer, aguardando a resposta ARP. Abra a PDU e registre o endereço MAC de destino.

PDU Information at Device: Switch1

OSI Model

Inbound PDU Details

Outbound PDU Details

At Device: Switch1
Source: 172.16.31.2
Destination: Broadcast

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.3
Layer 1: Port FastEthernet0/1

Out Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.3
Layer 1: Port(s): FastEthernet0/2 FastEthernet0/3 GigabitEthernet0/1

1. FastEthernet0/1 receives the frame.

Challenge Me

<< Previous Layer

Next Layer >>

O endereço está listado na tabela acima?

Não, pois este MAC address é destinado a quando se faz broadcast

- e. Clique em **Capture/Forward** (Capturar/Encaminhar) para mover a PDU para o próximo dispositivo.

Quantas cópias da PDU o **Switch1** fez?

Ele fez mais 3 cópias, para mandar para os outros dispositivos conectados ao switch

Packet Tracer – Exame da Tabela ARP

The screenshot shows the Cisco Packet Tracer interface. The main workspace displays a network topology with two routers (Router0 and Router1) connected by a red line. Router0 is connected to Switch0, which is connected to an Access Point. Router1 is connected to Switch1. The Access Point is connected to two laptops with IP addresses 10.10.10.2 and 10.10.10.3. Switch1 is connected to three laptops with IP addresses 172.16.31.2, 172.16.31.3, and 172.16.31.4. The Simulation Panel on the right shows an Event List table.

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	172.16.31.2	ICMP
	0.000	--	172.16.31.2	ARP
	0.001	172.16.31.2	Switch1	ARP
	0.002	Switch1	172.16.31.3	ARP
	0.002	Switch1	172.16.31.4	ARP
	0.002	Switch1	Router1	ARP
	0.003	172.16.31.3	Switch1	ARP

Below the table, there are buttons for "Reset Simulation" and "Constant Delay" (checked). The "Captured to:" field shows "0.003 s". The "Play Controls" section includes buttons for "Previous", "Play", and "Next". The "Event List Filters - Visible Events" section lists various protocols: ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, LACP, NDP, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP. There are buttons for "Edit Filters" and "Show All/None".

At the bottom of the interface, there is a "Time" display showing "00:06:29.460" and "PLAY CONTROLS" buttons. Below this is a "Device List" showing various devices with their IDs: 4331, 4321, 1941, 2901, 2911, 8191OX, 819HGW, 829, 1240, PT-Router, PT-Empty, 184. The "ISR4331" device is selected. On the right side, there is a "Scenario 0" dropdown, "New" and "Delete" buttons, and a "Toggle PDU List Window" button.

Qual é o endereço IP do dispositivo que aceitou a PDU?

172.16.31.3

PDU Information at Device: 172.16.31.3

OSI Model Inbound PDU Details Outbound PDU Details

At Device: 172.16.31.3
Source: 172.16.31.2
Destination: Broadcast

In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.3	Layer 2: Ethernet II Header 0060.7036.2849 >> 000C.85CC.1DA7 ARP Packet Src. IP: 172.16.31.3, Dest. IP: 172.16.31.2
Layer 1: Port FastEthernet0	Layer 1: Port(s): FastEthernet0

1. FastEthernet0 receives the frame.

Challenge Me << Previous Layer Next Layer >>

- f. Abra a PDU e examine a Camada 2.

O que aconteceu com os endereços MAC de origem e de destino?

O endereço de origem no Out Layer se transformou no endereço MAC do próprio host que aceitou a PDU e o endereço MAC de destino se transformou no endereço MAC do host que enviou o ping.

PDU Information at Device: 172.16.31.3

OSI Model Inbound PDU Details Outbound PDU Details

At Device: 172.16.31.3
Source: 172.16.31.2
Destination: Broadcast

In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.3	Layer 2: Ethernet II Header 0060.7036.2849 >> 000C.85CC.1DA7 ARP Packet Src. IP: 172.16.31.3, Dest. IP: 172.16.31.2
Layer 1: Port FastEthernet0	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 >>

- g. Clique em **Capture/Forward** (Capturar/Encaminhar) até que a PDU retorne para **172.16.31.2**.

Quantas cópias da PDU o switch fez durante a resposta ARP?

Apenas uma cópia.

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	172.16.31.2	ICMP
	0.000	--	172.16.31.2	ARP
	0.001	172.16.31.2	Switch1	ARP
	0.002	Switch1	172.16.31.3	ARP
	0.002	Switch1	172.16.31.4	ARP
	0.002	Switch1	Router1	ARP
	0.003	172.16.31.3	Switch1	ARP
	0.004	Switch1	172.16.31.2	ARP
	0.004	--	172.16.31.2	ICMP

Reset Simulation ☒ Constant Delay Captured to: 0.004 s

Play Controls

Event List Filters - Visible Events
 ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

Edit Filters Show All/None

Time: 00:08:32.045 PLAY CONTROLS: [Previous] [Play] [Next]

Event List Realtime Simulation

Scenario 0 Fire Last Status

New Delete

Toggle PDU List Window

829

Etapa 2: Examinar a tabela ARP.

- Observe que o pacote ICMP será exibido novamente. Abra a PDU e examine os endereços MAC.

Os endereços MAC origem e destino estão alinhados aos respectivos endereços IP?

Sim.

PDU Information at Device: 172.16.31.2 x

OSI Model
Outbound PDU Details

At Device: 172.16.31.2
 Source: 172.16.31.2
 Destination: 172.16.31.3

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

Out Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> 0060.7036.2849
Layer 1: Port(s): FastEthernet0

1. The ARP process takes out this packet from the buffer and resends it.

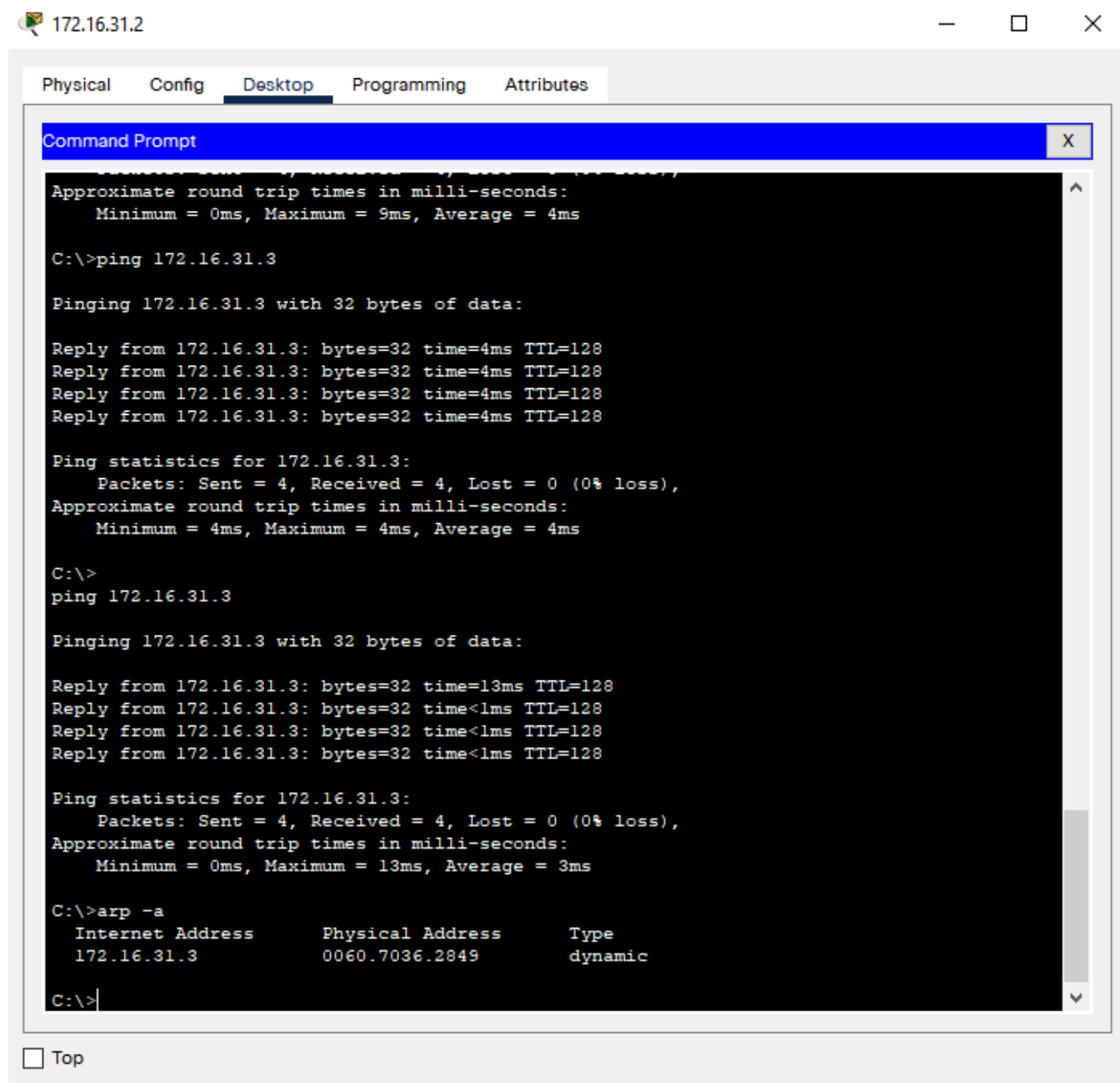
2. The device encapsulates the PDU into an Ethernet frame.

Challenge Me
<< Previous Layer
Next Layer >>

- b. Volte para o modo **Realtime** (Tempo real) e o ping será concluído.
- c. Clique em **172.16.31.2** e insira o comando **arp -a**.

A qual endereço IP corresponde a entrada do endereço MAC?

Corresponde ao endereço de IP que foi realizado o ping, 172.16.31.3.



Em geral, quando um dispositivo final envia uma requisição ARP?

Ele envia a requisição quando ele não sabe o MAC address de quem ele está tentando se conectar.

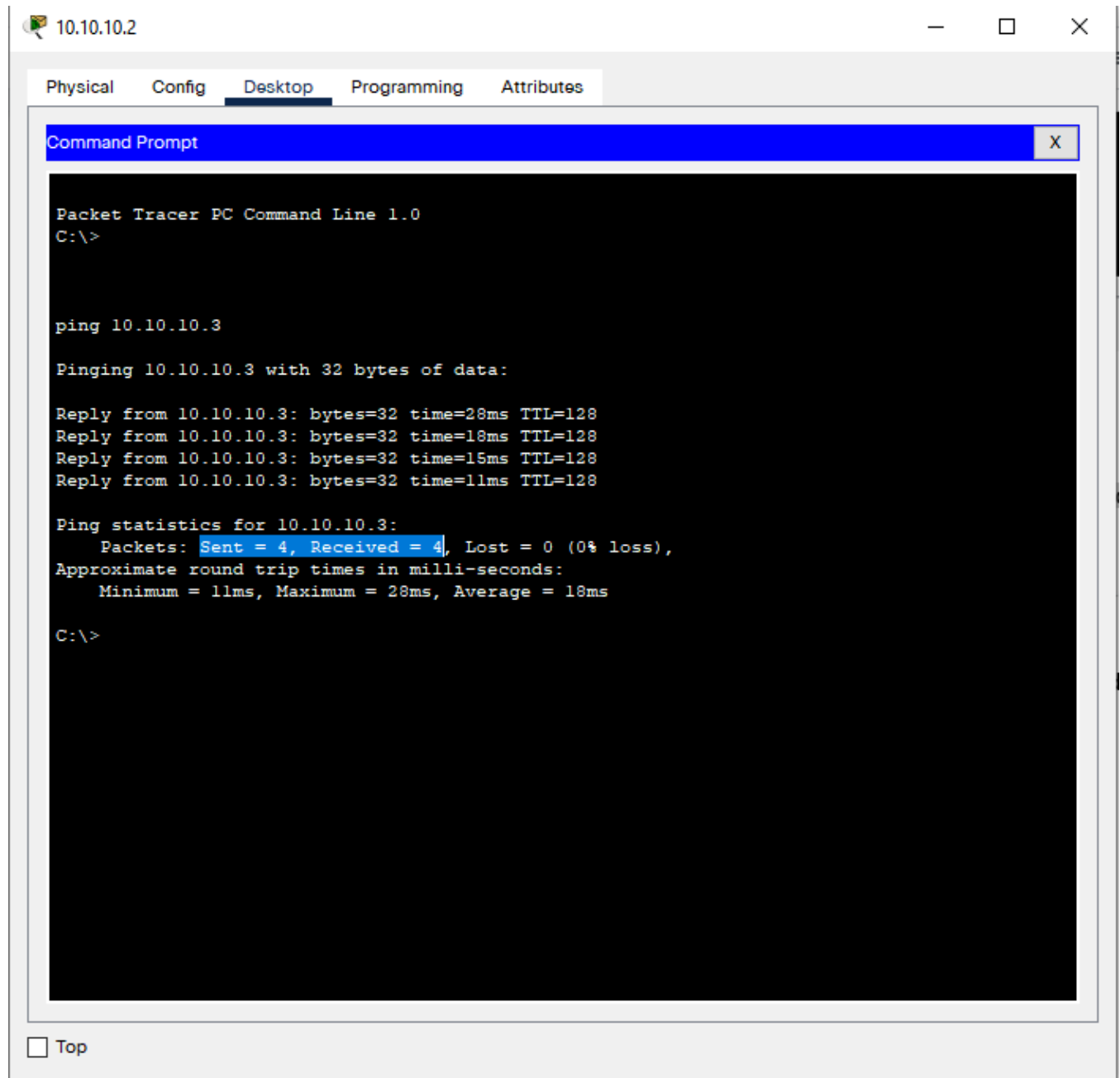
Parte 2: Examinar a Tabela de Endereços MAC de um Switch

Etapa 1: Gerar tráfego adicional para preencher a tabela de endereços MAC do switch.

- a. Em **172.16.31.2**, insira o comando ping **172.16.31.4**.
- b. Clique em **10.10.10. 2** e abra o **Prompt de Comando**.
- c. Insira o comando **ping 10.10.10.3**.

Quantas respostas foram enviadas e recebidas?

Foram mandadas 4 e recebidas 4

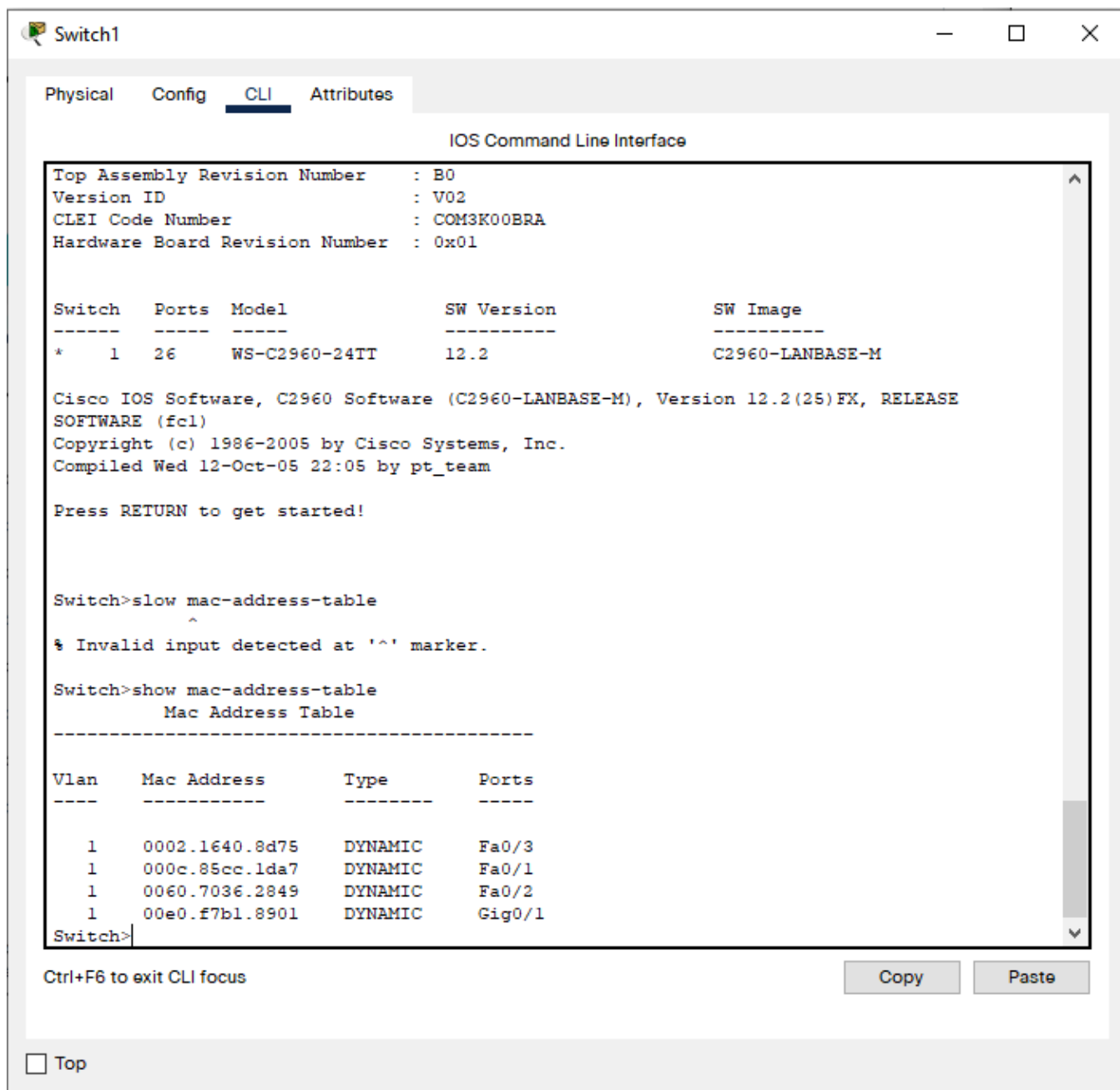


Etapa 2: Examinar a tabela de endereços MAC nos switches.

- Clique em **Switch1** e depois na guia **CLI**. Insira o comando **show mac-address-table**.

As entradas correspondem às da tabela acima?

Sim.



Switch1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

Top Assembly Revision Number : B0
Version ID : V02
CLEI Code Number : COM3K00BRA
Hardware Board Revision Number : 0x01

Switch  Ports  Model          SW Version  SW Image
-----  -
*    1    26    WS-C2960-24TT  12.2        C2960-LANBASE-M

Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE
SOFTWARE (fcl)
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

Press RETURN to get started!

Switch>show mac-address-table
^
% Invalid input detected at '^' marker.

Switch>show mac-address-table
      Mac Address Table
-----
Vlan    Mac Address      Type      Ports
----    -
1       0002.1640.8d75   DYNAMIC   Fa0/3
1       000c.85cc.1da7   DYNAMIC   Fa0/1
1       0060.7036.2849   DYNAMIC   Fa0/2
1       00e0.f7b1.8901   DYNAMIC   Gig0/1
Switch>
  
```

Ctrl+F6 to exit CLI focus

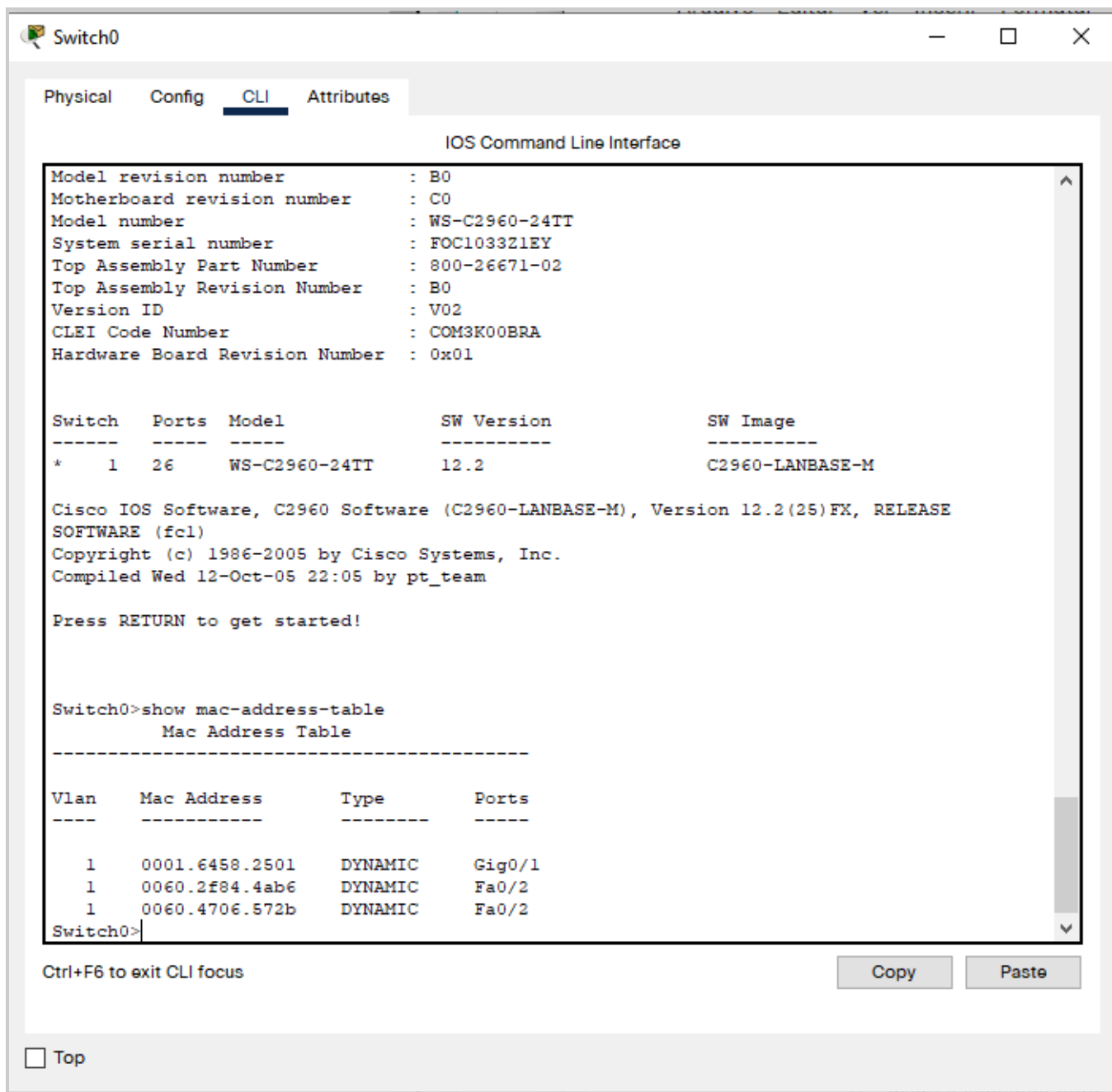
Copy Paste

☐ Top

- b. Clique em **Switch0** e depois na guia **CLI**. Insira o comando **show mac-address-table**.

As entradas correspondem às da tabela acima?

Sim.



Por que dois endereços MAC estão associados a uma porta?

Pois existe uma conexão via access point dos dois dispositivos a uma porta.

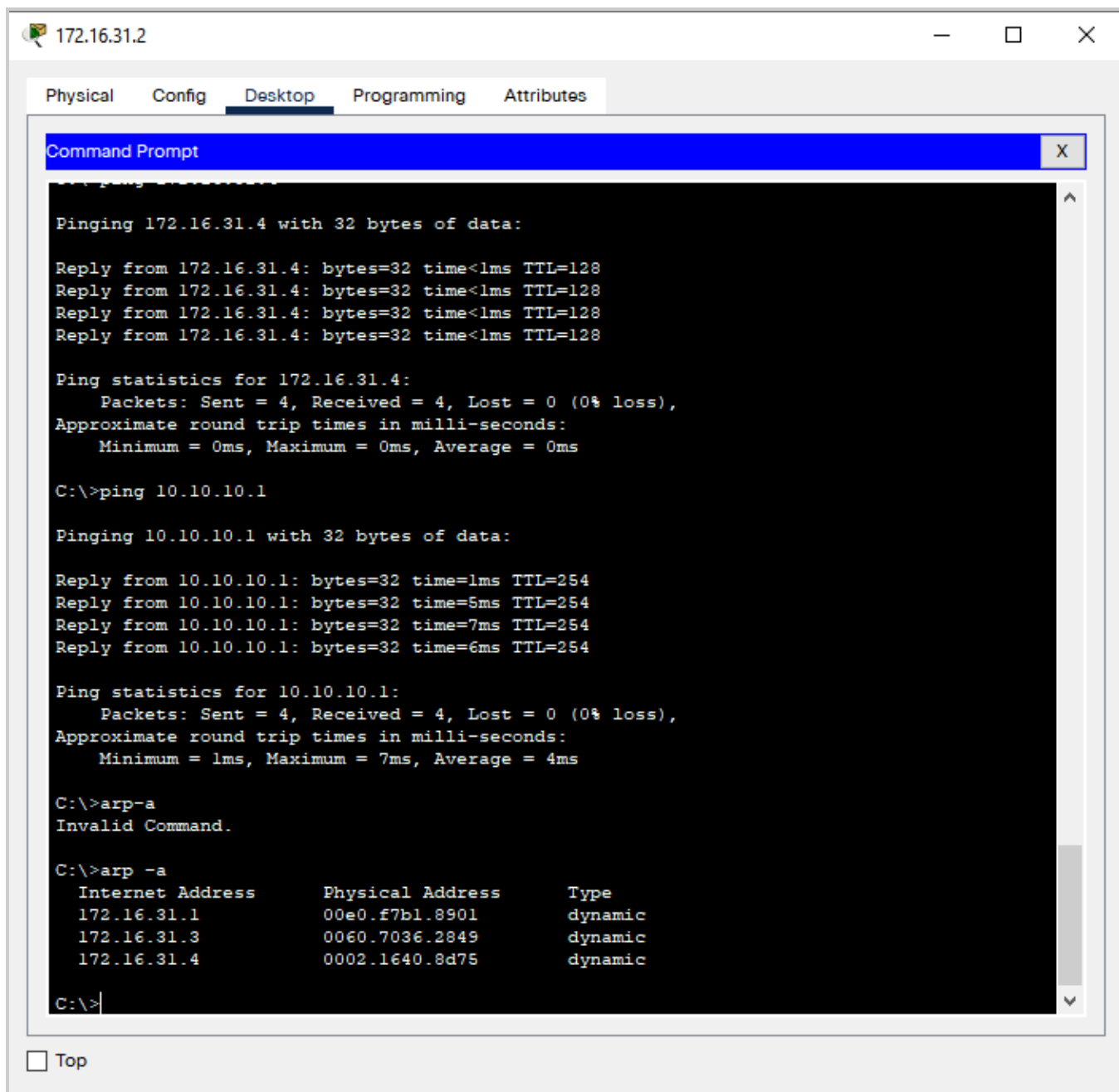
Parte 3: Examinar o Processo ARP em Comunicações Remotas

Etapa 1: Gerar tráfego para produzir tráfego ARP.

- a. Clique em **172.16.31.2** e abra o **Prompt de Comando**.
- b. Insira o comando **ping 10.10.10.1**.
- c. Digite **arp -a**.

Qual é o endereço IP da nova entrada da tabela ARP?

172.16.31.1



- d. Insira **arp -d** para limpar a tabela ARP e mude para o modo **Simulation** (Simulação).
- e. Repita o ping para 10.10.10.1.

Quantas PDUs são exibidas?

Dois PDUs, uma de ICMP e outra de ARP

Packet Tracer – Exame da Tabela ARP

The screenshot shows the Cisco Packet Tracer interface. The main workspace displays a network topology with two routers, Router0 and Router1, connected by a red line. Router0 is connected to Switch0, which is connected to an Access Point. Router1 is connected to Switch1. The Access Point is connected to two laptops with IP addresses 10.10.10.2 and 10.10.10.3. Switch1 is connected to three laptops with IP addresses 172.16.31.2, 172.16.31.3, and 172.16.31.4. The Event List panel on the right shows a table of events:

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	172.16.31.2	ICMP
	0.000	--	172.16.31.2	ARP

Below the table, there are buttons for 'Reset Simulation', 'Constant Delay', and 'Captured to: 0.000 s'. There are also 'Play Controls' buttons (play, stop, pause) and a section for 'Event List Filters - Visible Events' listing various protocols like ARP, BGP, CDP, DHCP, etc. At the bottom, there is a 'Simulation' panel with a 'Scenario 0' dropdown, 'New' and 'Delete' buttons, and a 'Toggle PDU List Window' button.

- f. Clique em **Capture/Forward** (Capturar/Encaminhar). Clique na PDU que agora está em **Switch1**.

Qual é o endereço IP destino da requisição ARP?

172.16.31.1

PDU Information at Device: Switch1

OSI Model Inbound PDU Details Outbound PDU Details

At Device: Switch1
Source: 172.16.31.2
Destination: Broadcast

In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.1	Layer 2: Ethernet II Header 000C.85CC.1DA7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 172.16.31.2, Dest. IP: 172.16.31.1
Layer 1: Port FastEthernet0/1	Layer 1: Port(s): FastEthernet0/2 FastEthernet0/3 GigabitEthernet0/1

1. This is a broadcast frame. The Switch sends out the frame to all ports in the same VLAN except the receiving port.

Challenge Me << Previous Layer Next Layer >>

g. O endereço IP destino não é 10.10.10.1.

Por quê?

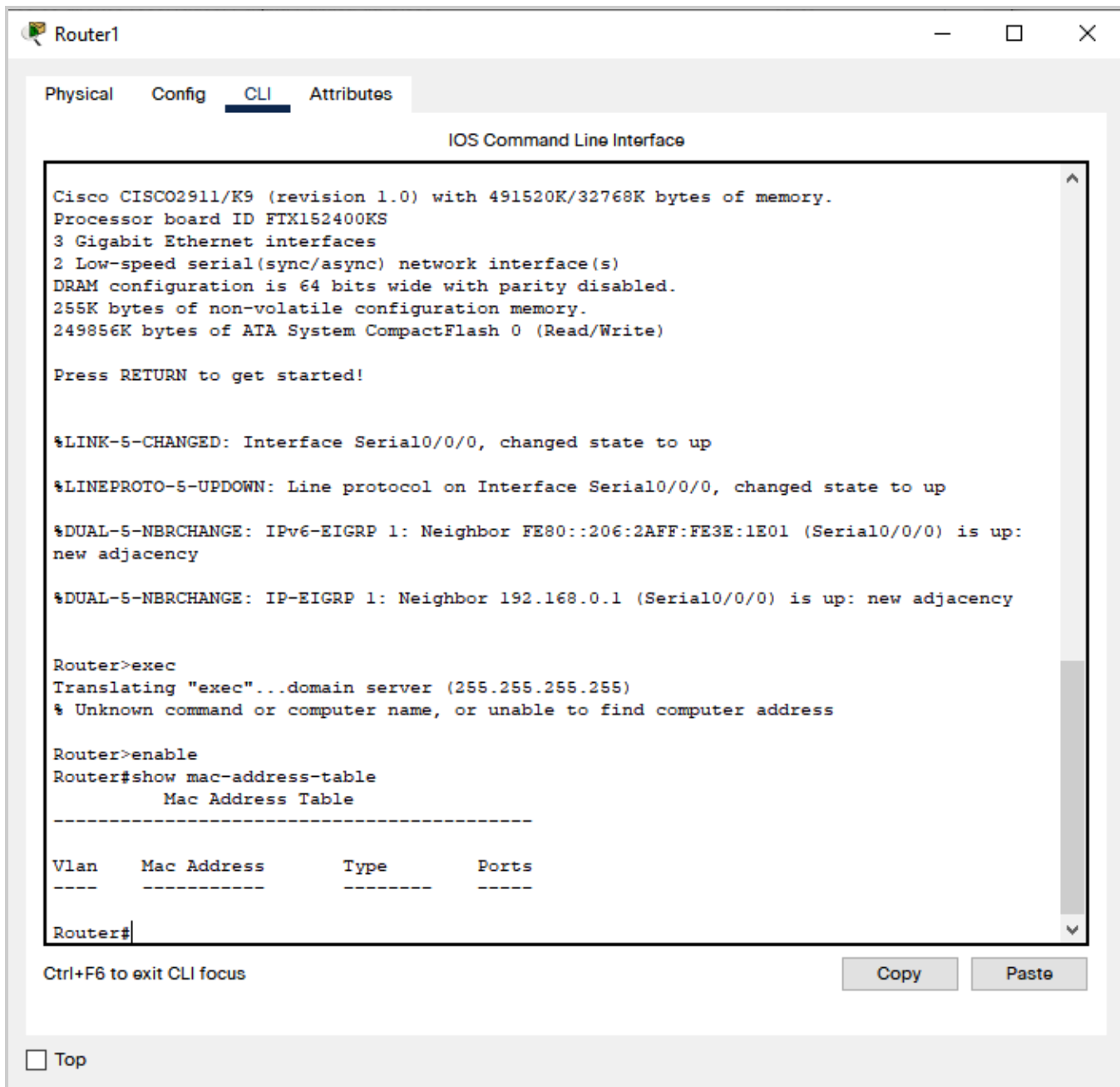
Pois o endereço do gateway da interface do roteador é armazenado na configuração IPv4 dos hosts. Quando o host receptor não está na mesma rede que o host de origem, o de origem então determina um endereço MAC através do processo ARP para o roteador para servir de gateway.

Etapa 2: Examinar a tabela ARP em Router1.

- Altere para o modo **Realtime** (Tempo real). Clique em **Router1** em em seguida na guia **CLI**.
- Entre no modo EXEC privilegiado e insira o comando **show mac-address-table**.

Quantos endereços MAC há na tabela? Por quê?

Nenhum, pois esse comando não tem a mesma semântica no router do que tem no switch.



The screenshot shows the CLI of Router1. The user has entered the command `show mac-address-table` in privileged EXEC mode. The output shows an empty Mac Address Table with headers: Vlan, Mac Address, Type, and Ports. Below the headers, there are four dashed lines representing empty rows. The prompt is `Router#`.

```

Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
2 Low-speed serial(sync/async) network interface(s)
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
%DUAL-5-NBRCHANGE: IPv6-EIGRP 1: Neighbor FE80::206:2AFF:FE3E:1E01 (Serial0/0/0) is up:
new adjacency
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 192.168.0.1 (Serial0/0/0) is up: new adjacency

Router>exec
Translating "exec"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

Router>enable
Router#show mac-address-table
          Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
Router#
  
```

Ctrl+F6 to exit CLI focus

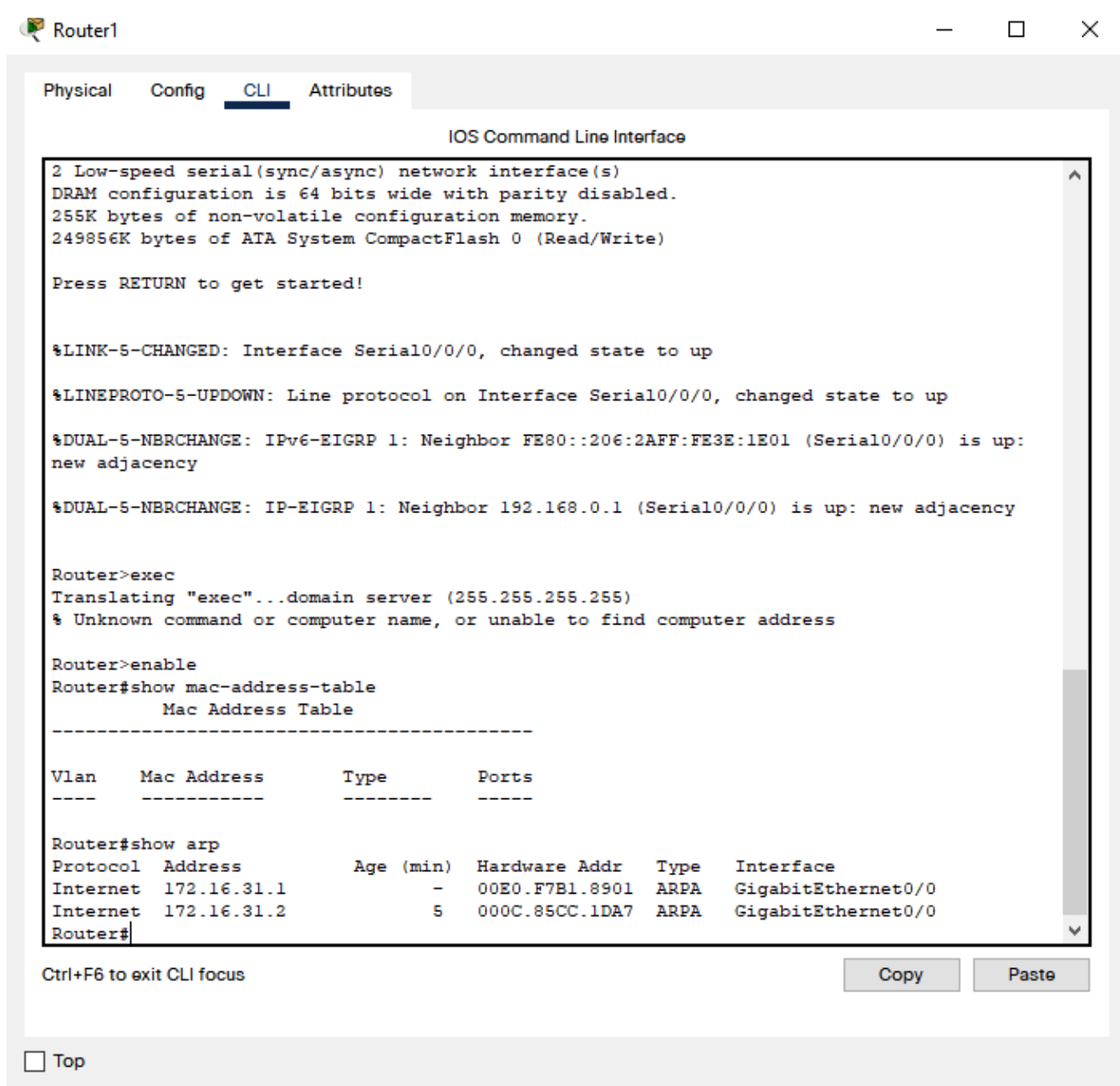
Copy Paste

☐ Top

- c. Insira o comando **show arp**.

Existe uma entrada para **172.16.31.2**?

Sim.



The screenshot shows the CLI of Router1. The user has entered the command `show arp`, and the output displays the ARP table with two entries for the interface GigabitEthernet0/0.

```

Router1
Physical Config CLI Attributes
IOS Command Line Interface

2 Low-speed serial(sync/async) network interface(s)
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
%DUAL-5-NBRCHANGE: IPv6-EIGRP 1: Neighbor FE80::206:2AFF:FE3E:1E01 (Serial0/0/0) is up: new adjacency
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 192.168.0.1 (Serial0/0/0) is up: new adjacency

Router>exec
Translating "exec"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

Router>enable
Router#show mac-address-table
      Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
Router#show arp
Protocol Address          Age (min)  Hardware Addr   Type   Interface
Internet 172.16.31.1       -         00E0.F7B1.8901  ARPA   GigabitEthernet0/0
Internet 172.16.31.2       5         000C.85CC.1DA7  ARPA   GigabitEthernet0/0
Router#
  
```

At the bottom of the CLI window, there are buttons for "Copy" and "Paste", and a "Top" link.

O que acontece com o primeiro ping em uma situação em que o roteador responde à requisição ARP?

Ocorre o time out do ping.

