

Packet Tracer - Examine the ARP Table

Addressing Table

Device	Interface	MAC Address	Switch Interface
Router0	Gg0/0	0001.6458.2501	G0/1
	S0/0/0	N/A	N/A
Router1	G0/0	00E0.F7B1.8901	G0/1
	S0/0/0	N/A	N/A
10.10.10.2	Wireless	0060.2F84.4AB6	F0/2
10.10.10.3	Wireless	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

Objectives

Part 1: Examine an ARP Request

Part 2: Examine a Switch MAC Address Table

Part 3: Examine the ARP Process in Remote Communications

Background

This activity is optimized for viewing PDUs. The devices are already configured. You will gather PDU information in simulation mode and answer a series of questions about the data you collect.

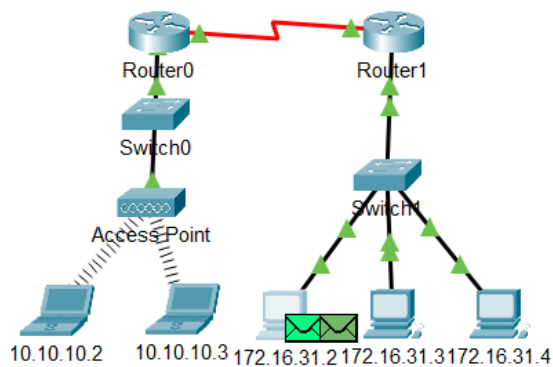
Instructions

Part 1: Examine an ARP Request

Step 1: Generate ARP requests by pinging 172.16.31.3 from 172.16.31.2.

- Click **172.16.31.2** and open the **Command Prompt**.
- Enter the **arp -d** command to clear the ARP table.
- Enter **Simulation** mode and enter the command **ping 172.16.31.3**. Two PDUs will be generated. The **ping** command cannot complete the ICMP packet without knowing the MAC address of the destination. So the computer sends an ARP broadcast frame to find the MAC address of the destination.

Packet Tracer - Examine the ARP Table



- d. Click **Capture/Forward** once. The ARP PDU moves **Switch1** while the ICMP PDU disappears, waiting for the ARP reply. Open the PDU and record the destination MAC address.

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: 172.16.31.3	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	Layer 1: Port(s): FastEthernet0/2 FastEthernet0/3 GigabitEthernet0/1

1. FastEthernet0/1 receives the frame.

PDU Information at Device: Switch1

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

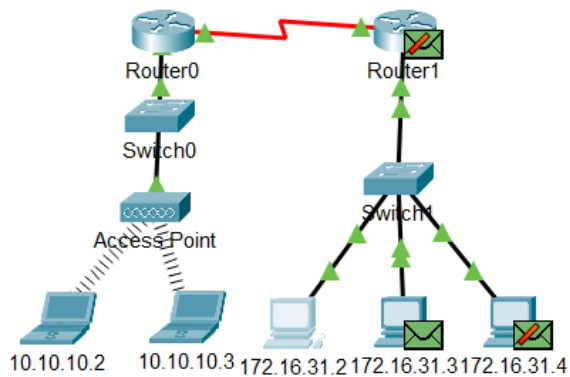
EthernetII

0		4		8		Bytes	
PREAMBLE: 101010..10				SF D		DEST ADDR: FFFF.FFFF.FFF	
SRC ADDR: 000C.85CC.1DA		TYPE: 0x0806		DATA (VARIABLE LENGTH)		FCS: 0x00000000	

Arp

0		8		16		Bits	
HARDWARE TYPE: 0x0001				PROTOCOL TYPE: 0x0800			
HLEN: 0x06		PLEN: 0x04		OPCODE: 0x0001			
SOURCE MAC : 000C.85CC.1DA7							
SOURCE IP : 172.16.31.2							
TARGET MAC: 0000.0000.0000							
TARGET IP: 172.16.31.3							

Packet Tracer - Examine the ARP Table



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

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

Out Layers

Layer7
Layer6
Layer5
Layer4
Layer3
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(s): FastEthernet0

1. FastEthernet0 receives the frame.

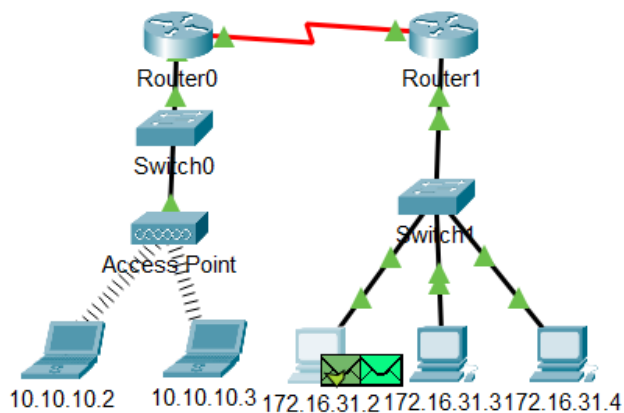
PDU Information at Device: 172.16.31.3

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

EthernetII

0				4				8				16				32				64				128				256				512				1024				2048				4096				8192				16384				32768				65536				131072				262144				524288				1048576				2097152				4194304				8388608				16777216				33554432				67108864				134217728				268435456				536870912				1073741824				2147483648				4294967296				8589934592				17179869184				34359738368				68719476736				137438953472				274877906944				549755813888				1099511627776				2199023255552				4398046511104				8796093022208				17592186044416				35184372088832				70368744177664				140737488355328				281474976710656				562949953421312				1125899906842624				2251799813685248				4503599627370496				9007199254740992				18014398509481984				36028797018963968				72057594037927936				144115188075855872				288230376151711744				576460752303423488				1152921504606846976				2305843009213693952				4611686018427387904				9223372036854775808				18446744073709551616				36893488147419103232				73786976294838206464				147573952589676412928				295147905179352825856				590295810358705651712				1180591620717411303424				2361183241434822606848				4722366482869645213696				9444732965739290427392				18889465931478580854784				37778931862957161709568				75557863725914323419136				151115727451828646838272				302231454903657293676544				604462909807314587353088				1208925819614629174706176				2417851639229258349412352				4835703278458516698824704				9671406556917033397649408				19342813113834066795298816				38685626227668133590597632				77371252455336267181195264				154742504910672534362390528				309485009821345068724781056				618970019642690137449562112				1237940039285380274899124224				2475880078570760549798248448				4951760157141521099596496896				9903520314283042199192993792				19807040628566084398385987584				39614081257132168796771975168				79228162514264337593543950336				158456325028528675187087900672				316912650057057350374175801344				633825300114114700748351602688				1267650600228229401496703205376				2535301200456458802993406410752				5070602400912917605986812821504				10141204801825835211973625643008				20282409603651670423947251286016				40564819207303340847894502572032				81129638414606681695789005144064				162259276829213363391578010288128				324518553658426726783156020576256				649037107316853453566312041152512				1298074214633706907132624082305024				2596148429267413814265248164610048				5192296858534827628530496329220096				10384593717069655257060992658440192				20769187434139310514121985316880384				41538374868278621028243970633760768				83076749736557242056487941267521536				166153499473114484112975882535043072				332306998946228968225951765070086144				664613997892457936451903530140172288				1329227995784915872903807060280344576				2658455991569831745807614120560689152				5316911983139663491615228241121378304				10633823966279326983230456482242756608				21267647932558653966460912964485513216				42535295865117307932921825928971026432				85070591730234615865843651857942052864				170141183460469231731687303715884105728				340282366920938463463374607431768211456				680564733841876926926749214863536422912				1361129467683753853853498429727072845824				2722258935367507707706996859454153691648				5444517870735015415413993718908307383296				10889035741470030830827987437816614766592				21778071482940061661655974875633229533184				43556142965880123323311949751266459066368				87112285931760246646623899502532918132736				174224571863520493293247799005065836265472				348449143727040986586495598010131672530944				696898287454081973172991196020263345061888				1393796574908163946345982392040526690123776				2787593149816327892691964784081053380247552				5575186299632655785383929568162106760495104				11150372599265311570767859136324213520990208				22300745198530623141535718272648427041980416				44601490397061246283071436545296854083960832				89202980794122492566142873090593708167921664				178405961588244985132285746181187416335843328				356811923176489970264571492362374832671686656				71362384635297994052914298472474966534337312				142724769270595988105828596944949933068674624				285449538541191976211657193889899866137349248				570899077082383952423314387779799732274698496				1141798154164767904846628775559599464549396992				2283596308329535809693257551119198929098793984				4567192616659071619386515102238397858197587968				9134385233318143238773030204476795716395175936				18268770466636286477546060408953591432790351872				36537540933272572955092120817907182865580703744				73075081866545145910184241635814365731161407488				146150163733090291820368483271628731462322814976				292300327466180583640736966543257462924645629952				584600654932361167281473933086514925849291259904				1169201309864722334562947866173029851698582519808				2338402619729444669125895732346059703397165039616				4676805239458889338251791464692119406794330079232				9353610478917778676503582929384238813588660158464				18707220957835557353007165858768477627177320316928				37414441915671114706014331717536955254354640633856				74828883831342229412028663435073910508709281267712				149657767662684458824057326870147821017418562535424				299315535325368917648114653740295642034837125070848				598631070650737835296229307480591284069674250141696				1197262141301475670592458614961182568139348500283392				2394524282602951341184917229922365136278697000566784				4789048565205902682369834459844730272557394001133568				9578097130411805364739668919689460545114788002267136				19156194260823610729479337839378921090229576004534304				38312388521647221458958675678757842180459152009068608				76624777043294442917917351357515684360918304018137216				153249554086588885835834702715031368721836608036274432				306499108173177771671669405430062737443673216072548864				612998216346355543343338810860125474887346432145097728				122599643269271108668667762172025094977469286429095552				245199286538542217337335524344050189954938572858191104				490398573077084434674671048688100379909877145716382208				980797146154168869349342097376200759819754291432764416				196159429230833773869868419475240151963950858286552832				392318858461667547739736838950480303927901716573105664				784637716923335095479473677900960607855803433146211328				156927543384667019095894735580192121571160686629242256				313855086769334038191789471160384243142321373258484512				627710173538668076383578942320768486284642746516969024				1255420347077336152767157884641536972569285493033938048				2510840694154672305534315769283073945138570986067876096				5021681388309344611068631538566147890277141972135752192				10043362776618689222137263077132295780554283944271504384				20086725553237378444274526154264591561108567888543008768				40173451106474756888549052308529183122217135777086017536				80346902212949513777098104617058366244434271554172035072				160693804425899027554196209234116732488868543108344070144				321387608851798055108392418468233464977737086216688140288				642775217703596110216784836936466929955474172433376280576				1285550435407192220433569673872933859910948344866752561152				2571100870814384440867139347745867719821896689733505122304				5142201741628768881734278695491735439643793379467010244608				10284403483257537763468557390983470879287586758934020489216				20568806966515075526937114781966941758575173517868400978432				41137613933030151053874229563933883517150347035736801956864				82275227866060302107748459127867767034300694071473603913728				164550455732120604215496918255735534068601388142947207827456				329100911464241208430993836511471068137202776285894415654912				658201822928482416861987673022942136274405552571788831309824				1316403645856964833723975346045884272548811105143777662619648				2632807291713929667447950692091768545097622210287555325239296				5265614583427859334895901384183537090195244420575110650478592				10531229166855718669791802768367074180390488841150221300957184				21062458333711437339583605536734148360780977682300442601914368				42124916667422874679167211073468296721561955364600885203828736				84249833334845749358334422146936593443123910729201770407657472				168499666669691498716668844293873186886247821458403540815314944				336999333339382997433337688587746373772495642916807081630629888				673998666678765994866675377175492747544991285833614163261259776				1347997333357531989733350754350985495089982571667228326522519552				2695994666715063979466701508701970990179965143334456653045039104				5391989333430127958933403017403941980359930286668913306090078208				10783978666860255917866806034807883960719860573337826612180156416				21567957333720511835733612069615767921439721146675653224360312832				43135914667441023671467224139231535842879442293351306448720625664				86271829334882047342934448278463071685758884586702612897441251328				172543658669764094685868896556926143371517769173405225794882502656				345087317339528189371737793113852286743035538346810451589765005312				690174634679056378743475586227704573486071076693620903179530010624				1380349269358112757486951172455409146972142153387241806359060021248				2760698538716225514973902344910818293944284306774483612718120042496				5521397077432451029947804689821636587888568613548967225436240084992				11042794154864902059895609379643273175777137227097934450872481699904				22085588309729804119791218759286546351554274454195868901744963399808				44171176619459608239582437518573092703108548908391737803489926799616				88342353238919216479164875037146185406217097816783475606979853599232				176684706477838432958329750074292370812434195633566951213959707198464				353369412955676865916659500148584741624868391267133902427919414396928				706738825911353731833319000297169483249736782534267804855838828793856				1413477651822707463666638000594338966499473565068535609711677657587712				2826955303645414927333276001188677932998947130137071219423355315175424				5653910607290829854666552002377355865997894260274142438846710630350848				11307821214581659709333104004754711731995788520548284877693421260701696				2261564242916331941866620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Is this address listed in the table above? **No**

- e. Click **Capture/Forward** to move the PDU to the next device.

How many copies of the PDU did **Switch1** make? **3**

What is the IP address of the device that accepted the PDU? **172.16.31.3**

- f. Open the PDU and examine Layer 2.

What happened to the source and destination MAC addresses?

Source became destination, FFFF.FFFF.FFFF turned into MAC address of 172.16.31.3

- g. Click **Capture/Forward** until the PDU returns to **172.16.31.2**.

How many copies of the PDU did the switch make during the ARP reply? **1**

Step 2: Examine the ARP table.

- a. Note that the ICMP packet reappears. Open the PDU and examine the MAC addresses.

Do the MAC addresses of the source and destination align with their IP addresses?

- b. Switch back to **Realtime** and the ping completes.

- c. Click **172.16.31.2** and enter the **arp -a** command.

To what IP address does the MAC address entry correspond?

```
C:\>arp -a
Internet Address      Physical Address      Type
172.16.31.3          0060.7036.2849       dynamic
C:\>
```

In general, when does an end device issue an ARP request?

When it doesn't know about receiver's MAC address.

Part 2: Examine a Switch MAC Address Table

Step 1: Generate additional traffic to populate the switch MAC address table.

- From **172.16.31.2**, enter the ping **172.16.31.4** command.

```
C:\>ping 172.16.31.4

Pinging 172.16.31.4 with 32 bytes of data:

Reply from 172.16.31.4: bytes=32 time<1ms TTL=128
Reply from 172.16.31.4: bytes=32 time<1ms TTL=128
Reply from 172.16.31.4: bytes=32 time<1ms TTL=128
Reply from 172.16.31.4: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.31.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

- Click **10.10.10.2** and open the **Command Prompt**.
- Enter the ping **10.10.10.3** command.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.3

Pinging 10.10.10.3 with 32 bytes of data:

Reply from 10.10.10.3: bytes=32 time=56ms TTL=128
Reply from 10.10.10.3: bytes=32 time=14ms TTL=128
Reply from 10.10.10.3: bytes=32 time=19ms TTL=128
Reply from 10.10.10.3: bytes=32 time=10ms TTL=128

Ping statistics for 10.10.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 56ms, Average = 24ms

C:\>
```

How many replies were sent and received? **4 sent and 4 received**

Step 2: Examine the MAC address table on the switches.

- Click **Switch1** and then the **CLI** tab. Enter the **show mac-address-table** command.

Do the entries correspond to those in the table above?

```
Switch>
Switch>
Switch>enable
Switch#show mac
Switch#show mac-ad
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#
```

- b. Click **Switch0**, then the **CLI** tab. Enter the **show mac-address-table** command.

```
Switch0>enable
Switch0#show mac-
Switch0#show mac-address-table
      Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
1       0001.6458.2501   DYNAMIC Gig0/1
1       0060.2f84.4ab6   DYNAMIC Fa0/2
1       0060.4706.572b   DYNAMIC Fa0/2
Switch0#
```

Do the entries correspond to those in the table above? **Yes**

Why are two MAC addresses associated with one port? **Because both devices connected to one port through the Access Point**

Part 3: Examine the ARP Process in Remote Communications

Step 1: Generate traffic to produce ARP traffic.

- a. Click **172.16.31.2** and open the **Command Prompt**.
- b. Enter the **ping 10.10.10.1** command.

```
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=2ms TTL=254
Reply from 10.10.10.1: bytes=32 time=2ms TTL=254
Reply from 10.10.10.1: bytes=32 time=11ms TTL=254
Reply from 10.10.10.1: bytes=32 time=51ms TTL=254

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 51ms, Average = 16ms

C:\>
```

- c. Type **arp -a**.

What is the IP address of the new ARP table entry?

```
C:\>arp -a
Internet Address      Physical Address      Type
172.16.31.1           00e0.f7b1.8901        dynamic
172.16.31.3           0060.7036.2849        dynamic
172.16.31.4           0002.1640.8d75        dynamic

C:\>
```

- d. Enter **arp -d** to clear the ARP table and switch to **Simulation** mode.
- e. Repeat the ping to 10.10.10.1.

How many PDUs appear? **2**

Packet Tracer - Examine the ARP Table

- f. Click **Capture/Forward**. Click the PDU that is now at **Switch1**.

What is the target destination IP destination address of the ARP request?

```
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 1: Port(s): FastEthernet0/2
```

- g. The destination IP address is not 10.10.10.1.

Why?

The gateway address of the router interface is stored in the IPv4 configuration of the hosts. If the receiving host is not on the same network, the source uses the ARP process to determine a MAC address for the router interface serving as the gateway.

Step 2: Examine the ARP table on Router1.

- a. Switch to **Realtime** mode. Click **Router1** and then the **CLI** tab.
- b. Enter privileged EXEC mode and then the **show mac-address-table** command.

How many MAC addresses are in the table? Why?

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

Zero, This command means something completely different than the switch command **show mac address-table**.

- c. Enter the **show arp** command.

Is there an entry for **172.16.31.2**? **Yes**

```
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        2         000C.85CC.1DA7  ARPA   GigabitEthernet0/0
Router#
```

What happens to the first ping in a situation where the router responds to the ARP request?

It times out