管理 MAC 地址转发表

一、实验目的

1、了解交换机的作用

2、通过 MAC 地址转发表，理解交换机基于 MAC 地址转发表的工作过程

3、掌握添加静态 MAC 地址的方法

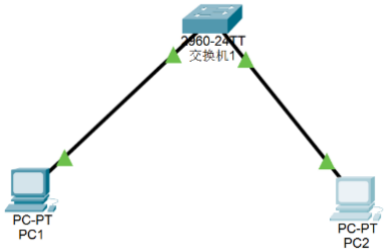
二、实验方案

在交换机中，MAC 地址转发表是一个映射 MAC 地址和交换机接口表。最初交换机中没有转发表，在第一次两设备 ping 通之后，交换机会记录下两者的 MAC 和端口信息，即自学习数据帧源地址。随后将 PC2 的信息设置为静态，修改 PC2 的接口，检测是否能连接。最后取消静态消息，重新测试能否连接。

三、实验步骤

1、网络拓扑结构如图所示，具体连接情况如下

名称	相连的接口	IP 地址
PC1	F0/1	192.168.1.1
PC2	F0/2	192.169.1.2



2、首先在交换机的命令行查看转发表，发现一开始并没有转发表，这是合理的。

```
Switch>en
Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

Switch#
```

3、查看两台 PC 的 IP 配置，并且 PC1 ping PC2，成功。

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig /all

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Physical Address.................: 0002.1660.1C39
   Link-local IPv6 Address.........: FE80::202:16FF:FE60:1C39
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.1.1
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: ::
                                     0.0.0.0
   DHCP Servers....................: 0.0.0.0
   DHCPv6 IAID.....................:
   DHCPv6 Client DUID..............: 00-01-00-01-B8-79-0C-DD-00-02-16-60-1C-39
   DNS Servers.....................: ::
                                     0.0.0.0
```


```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig /all

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Physical Address.................: 0002.1660.1C39
   Link-local IPv6 Address.........: FE80::202:16FF:FE60:1C39
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.1.1
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: ::
                                     0.0.0.0
   DHCP Servers....................: 0.0.0.0
   DHCPv6 IAID.....................:
   DHCPv6 Client DUID..............: 00-01-00-01-B8-79-0C-DD-00-02-16-60-1C-39
   DNS Servers.....................: ::
                                     0.0.0.0
```


```
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

4、再次查看 MAC 转发表，发现已经自动学习到了。

```
Switch>en
Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

Switch#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0002.1660.1c39    DYNAMIC     Fa0/1
   1    000c.cf72.b90c    DYNAMIC     Fa0/2
Switch#
```

5、修改 PC2 对应的类型为 static，即静态，随后将 PC2 从 F0/1 修改到 F0/4，PC1 将无法连接到 PC2。

```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#mac address-table static 000c.cf72.b90c vlan 1 interface f0/2
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0002.1660.1c39    DYNAMIC     Fa0/1
   1    000c.cf72.b90c    STATIC      Fa0/2
Switch#
```

```
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

6、将之前 static 的指令删除，会发现转发表又变成空了，此时 PC1 ping PC2 后，转发表将会更新，PC2 的接口已经变成 F0/4 了。

```
Switch(config)#no mac address-table static 000c.cf72.b90c vlan 1 interface f0/2
MAC address could not be removed
Address not found

Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
```

```
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

```
Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0002.1660.1c39    DYNAMIC     Fa0/1
   1    000c.cf72.b90c    DYNAMIC     Fa0/4
Switch#
```

四、实验结果及分析

MAC 转发表是一个映射 MAC 地址和交换机接口的表。最初交换机中没有转发表，在第一次两设备 ping 通之后，交换机会记录下两者的 MAC 和端口信息，即自学习数据帧源地址。设置为静态后，即使修改了该机器连接交换机的接口，转发表也不会动态地更新。只有取消静态后，转发表被清空，发起 ping 的机器通过广播找到目标机器后才会更新新的转发表。

思考题：

如果在交换机设置静态 MAC 地址，把 PC2 的 MAC 地址设置在 F0/2 接口，但 PC2 实际连接的是 F0/4 接口，这样 PC1 能 Ping 通 PC2 吗？如果不通，请说明原因。

答：不能 Ping 通，因为 PC2 的 MAC 地址设置在 F0/2 接口上，而 PC2 实际连接的是 F0/4 接口。