中山大學 SUN YAT-SEN UNIVERSITY 实验报告

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【实验题目】VLAN 实验

【实验目的】掌握 VLAN 配置方法。

【实验说明】

截屏只是记录一下实验结果，应尽量缩小，可以大致看清楚就可以了。

注意实验开始前重启交换机：#reload

【预备知识】

- 两台交换机之间采用干道(trunk)端口连接，干道端口属于所有 VLAN。非干道端口为普通 VLAN 接口(主机端口)，默认为 VLAN 1。
- 进入干道的帧需要封装 VLAN ID，使得接收方可以知道该帧来自哪个 VLAN。从干道收到的没有封装 VLAN ID 的帧属于 Native VLAN，默认为 VLAN 1。

【配置举例】

- *启动 VLAN 10*

  (config)#vlan 10
- *把接口 f0/5 配置为 VLAN 10 接口*

  (config)#interface f0/5

  (config-if)#switchport access vlan 10
- *把接口 f0/24 配置为干道接口*

  (config)#interface f0/24

  (config-if)#switchport mode trunk
- *把接口 f0/20 配置为主机接口*

  (config)#interface f0/24

  (config-if)#switchport mode access

  或者

  (config-if)#no switchport mode trunk
- *显示 VLAN（不显示 trunk 接口）*

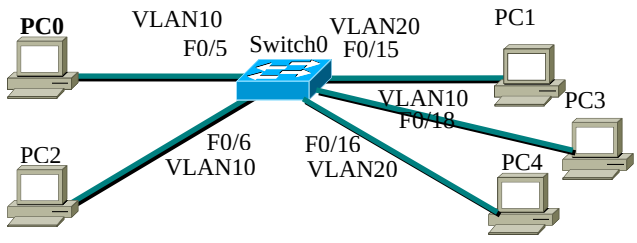
  #show vlan

【实验任务】

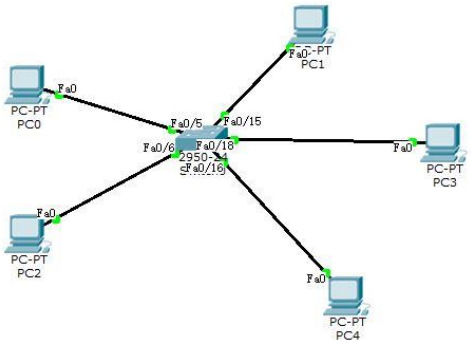
注意保存每一步的结果。

1、(vlan1.pkt)按下图配置 VLAN（四台主机的 IP 地址为 192.168.1.1~192.168.1.5/24）：

单交换机实现 VLAN



[设备连接图]



[PC0 可以 ping 其它主机，截图]

```
PC>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),

PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=1ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

[PC1 可以 ping 其它主机，截图]

```
PC>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

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

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

Reply from 192.168.1.5: bytes=32 time=1ms TTL=128
Reply from 192.168.1.5: bytes=32 time=0ms TTL=128
Reply from 192.168.1.5: bytes=32 time=0ms TTL=128
Reply from 192.168.1.5: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

[Switch0#show vlan 并截图]

```
Switch>sh vl

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                 Fa0/17, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24
10   VLAN0010                          active    Fa0/5, Fa0/6, Fa0/18
20   VLAN0020                          active    Fa0/15, Fa0/16
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

[结果是否合理]

合理。PC0 只能 ping 通同为 VLAN10 的 PC2，不能 ping 通 VLAN20 的 PC1。同时 PC1 只能 ping 通同为 VLAN20 的 PC5，不能 ping 通 VLAN10 的 PC4。

2、(vlan2.pkt)按下图进行配置:

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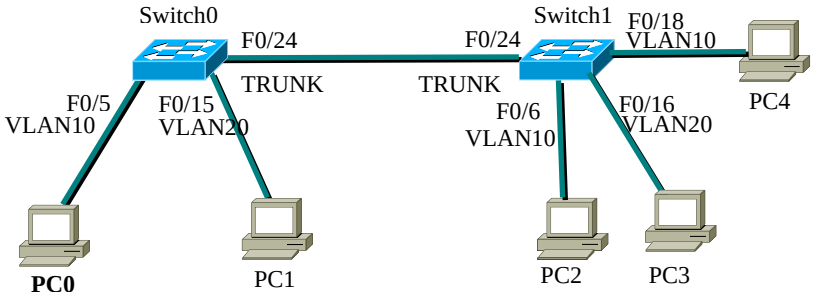
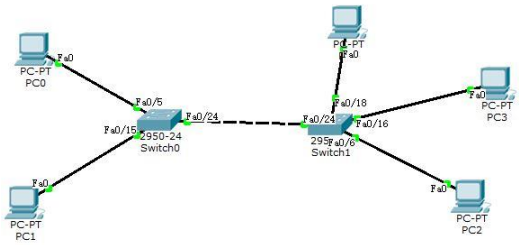
跨交换机实现 VLAN



[设备连接图]



[PC0 分别 ping 其它主机的结果]

```
PC>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),

PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Reply from 192.168.1.3: bytes=32 time=1ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

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

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

Reply from 192.168.1.5: bytes=32 time=0ms TTL=128
Reply from 192.168.1.5: bytes=32 time=0ms TTL=128
Reply from 192.168.1.5: bytes=32 time=0ms TTL=128
Reply from 192.168.1.5: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

[PC1 分别 ping 其它主机的结果]

```
PC>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

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

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

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

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

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```
PC>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

Reply from 192.168.1.4: bytes=32 time=1ms TTL=128
Reply from 192.168.1.4: bytes=32 time=6ms TTL=128
Reply from 192.168.1.4: bytes=32 time=0ms TTL=128
Reply from 192.168.1.4: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 6ms, Average = 1ms

PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

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

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

[Switch0#show vlan 的结果]

```
Switch#sh vl

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                Fa0/14, Fa0/16, Fa0/17, Fa0/18
                                                Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                Fa0/23
10   VLAN0010                         active    Fa0/5
20   VLAN0020                         active    Fa0/15
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup
```

[Switch1#show vlan 的结果]

```
Switch#sh vl

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/7, Fa0/8, Fa0/9
                                                Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                Fa0/14, Fa0/15, Fa0/17, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
10   VLAN0010                         active    Fa0/6, Fa0/18
20   VLAN0020                         active    Fa0/16
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup
```

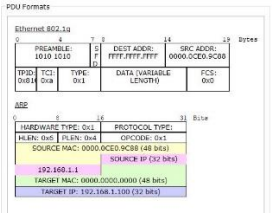
[Switch0#show mac-address-table 的结果]

```
Switch#sh mac-
          Mac Address Table
-------------------------------------------

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

   1    0060.3e04.9318    DYNAMIC     Fa0/24
  10    0000.0ce0.9c88    DYNAMIC     Fa0/5
  10    0002.169a.b04d    DYNAMIC     Fa0/24
  10    0040.0b15.1eba    DYNAMIC     Fa0/24
  20    0090.216a.30e6    DYNAMIC     Fa0/15
  20    00e0.f724.a4ed    DYNAMIC     Fa0/24
```

[Switch1#show mac-address-table 的结果]

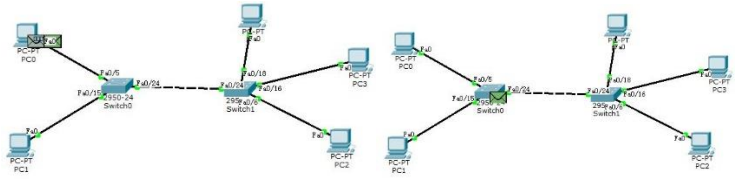
```
Switch#sh mac-
          Mac Address Table
-------------------------------------------

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

   1    0002.168d.2618    DYNAMIC     Fa0/24
  10    0000.0ce0.9c88    DYNAMIC     Fa0/24
  10    0002.168d.2618    DYNAMIC     Fa0/24
  10    0002.169a.b04d    DYNAMIC     Fa0/6
  10    0040.0b15.1eba    DYNAMIC     Fa0/18
  20    0002.168d.2618    DYNAMIC     Fa0/24
  20    0090.216a.30e6    DYNAMIC     Fa0/24
  20    00e0.f724.a4ed    DYNAMIC     Fa0/16
```

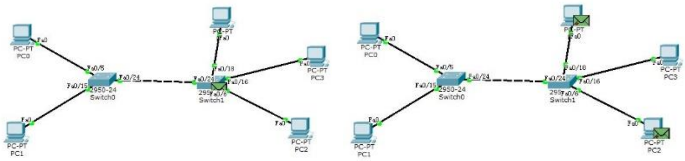
[(仿真)PC0 ping 一个不存在的地址（同一个子网，例如：192.168.1.100）经过干道的 ARP 请求包（802.1Q 的帧）]



[(仿真)上面的 ARP 包会到达哪些主机]

PC2，PC4





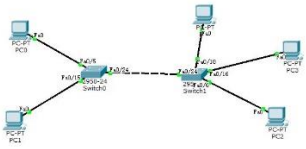
[分析实验结果的合理性]

不同 VLAN 的端口都可以发包到 trunk 端口,所以两交换机端口 VLAN 相同处连接的 PC 都可以 ping 通。MAC 地址表中首先都有各 PC 的 MAC 地址和最近的端口 VLAN，然后都有相连的交换机的 VLAN 为 1 的项（感觉应该是在进行生成树协议互相发包时出现的）。此外，在 Switch1 中还有 MAC 地址为 Switch0，VLAN 为 10 或 20 的项（因为实验中仅从 PC0,PC1 开始 ping，可能是这个过程留下了额外的项，后经实验发现即使从右方发包，Switch0 仍然没有这些额外项，最后猜测可能是因为 Switch0 是根，所以没有这些额外项）。

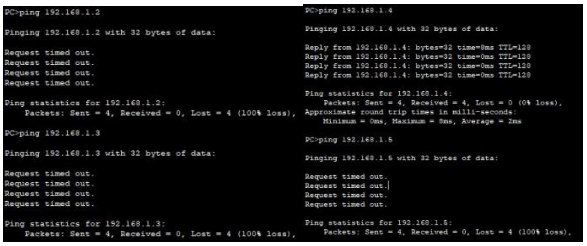
最后，ARP 包也只会经 VLAN 相同的端口到达相应主机。

3、(vlan3.pkt)接上一步骤，将 Switch0 和 Switch1 的接口 F0/24 分别改为 VLAN 10 和 VLAN 20：

[设备连接图]



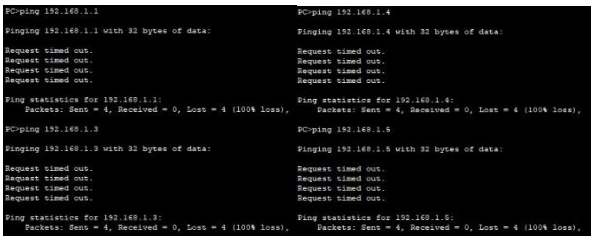
[PC0 分别 ping 其它主机的结果]



```
PC>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),

PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

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

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

```
PC>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

Reply from 192.168.1.4: bytes=32 time=0ms TTL=128
Reply from 192.168.1.4: bytes=32 time=0ms TTL=128
Reply from 192.168.1.4: bytes=32 time=0ms TTL=128
Reply from 192.168.1.4: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

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

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

[PC1 分别 ping 其它主机的结果]



```
PC>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

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

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

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

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

```
PC>ping 192.168.1.4

Pinging 192.168.1.4 with 32 bytes of data:

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

Ping statistics for 192.168.1.4:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

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

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

[Switch0#show vlan 的结果]

```
Switch#sh vl
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                 Fa0/23
10   VLAN0010                          active    Fa0/5, Fa0/24
20   VLAN0020                          active    Fa0/16
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

[Switch1#show vlan 的结果]

```
Switch#sh vl
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa1/1, Fa1/2, Fa1/3, Fa1/4
                                                 Fa1/5, Fa1/7, Fa1/8, Fa1/9
                                                 Fa1/10, Fa1/11, Fa1/12, Fa1/13
                                                 Fa1/14, Fa1/15, Fa1/17, Fa1/18
                                                 Fa1/20, Fa1/21, Fa1/22, Fa1/23
10   VLAN0010                          active    Fa1/6, Fa1/19
20   VLAN0020                          active    Fa1/16, Fa1/24
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

[Switch0#show mac-address-table 的结果]

```
Switch#sh mac-
          Mac Address Table
-------------------------------------------

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

  10    0000.0ce0.5c88    DYNAMIC     Fa0/5
  10    0060.3e04.9318    DYNAMIC     Fa0/24
  10    00e0.f724.a4ed    DYNAMIC     Fa0/24
  20    0090.216a.30e6    DYNAMIC     Fa0/15
```

[Switch1#show mac-address-table 的结果]

```
Switch#sh mac-
          Mac Address Table
-------------------------------------------

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

  20    0000.0ce0.9c88    DYNAMIC     Fa0/24
  20    0002.169d.2618    DYNAMIC     Fa0/24
  20    00e0.f724.a4ed    DYNAMIC     Fa0/16
```

[结果是否合理]

合理。只有 PC0 能从 Switch0 收发包，只有 PC3 能从 Switch1 收发包。还有 PC2 和 PC4 间可互相发。所以只有 PC0 能 ping 到 PC3。

【实验体会】

写出实验过程中的问题、思考及解决方法，简述实验体会（如果有的话）。

在第二步的过程中对 MAC 表项有些不理解。

【交实验报告】

上传地址：http://103.26.79.35/netdisk/default.aspx?vm=18net

实验上交/配置实验

截止日期（不迟于）：2020 年 6 月 23 日 23:00（周二）

文件名：学号_姓名_VLAN 实验.doc

学号_姓名_VLAN 实验.rar （包含 pkt 文件）