江苏大学

JIANGSU UNIVERSITY

计算机网络实验报告

实验名称：无线局域网组网实验

学院名称：计算机科学与通信工程学院

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报告日期：2024/10/22

目录

1 无线局域网基本组网实验

1.1 实验目的

（1）了解信道的概念；

（2）了解基本服务集的通行区域概念；

（3）掌握无线终端与 AP 之间建立关联的方法。

（4）掌握无线局域网中终端 IP 地址自动分配和手动配置的方法

（5）掌握无线局域网与有线网的连接方法。

1.2 实验思路

（1）熟悉 PT 中无线局域网物理工作区的使用方法；

（2）了解在 PT 中台式电脑和笔记本电脑无线网卡的更换方法。

（3）掌握无线终端与 AP 之间建立关联的方法与过程。

（4）掌握无线局域网中终端 IP 地址自动分配方法

（5）掌握无线局域网中终端 IP 地址手动配置方法

（6）了解基于交换的无线扩展组网方法，进一步了解局域网 IP 地址的分配规则。

1.3 实验步骤

1.3.1 物理工作区设备部

点击“物理工作区”按钮，进入物理工作区界面：

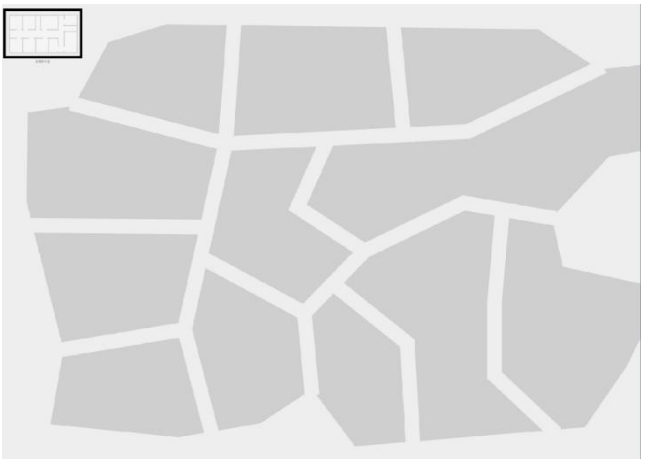

图 1 物理工作界面

选择物理定位，点击“Navigation”按钮，选中“Home City”，在设备类别

的“Wireless Devices”中选择一个“AccessPoint-PT”型 AP 节点设备拖放到物理工作区，在 AP 节点网格覆盖区域（其无线信号覆盖区域）分别拖放一台台式电脑和笔记本电脑：

图 2　设备部署

1.3.2 AP 节点设置

鼠标单击 AP 节点，系统将弹出如图 3.7 所示的设置对话框，选中其中的“Config”标签页，并选中“Interface”中的“Port 1”，在设置栏中将 SSID 设置为 123456，授权设置为 WPA2 方式，密钥为 12345678：

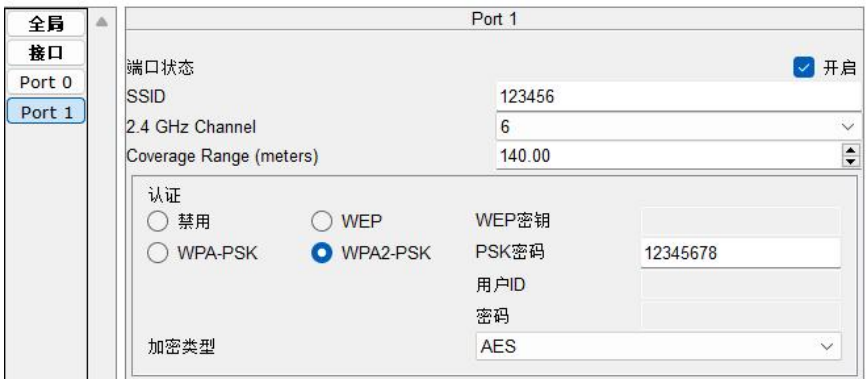

图 3　AP 节点设置

1.3.3 无线上网方式设置

点击其中的一台笔记本电脑，点击其中的电源按钮关闭电脑。卸载有线网卡，然后拖入无线网卡，然后点击电源按钮打开电脑：

图 4　配置笔记本电脑

切换到“Config”标签页，并选中“Interface”中的“Wireless0”，在设置栏中将 SSID 设置为 123456，授权设置为 WPA2-PSK 方式，密钥为 12345678：

图 5　设置无线上网

1.3.4 连通性测试

切换回逻辑工作界面，在物理工作界面中点击“Logical”按钮，切换回逻辑工作界面：

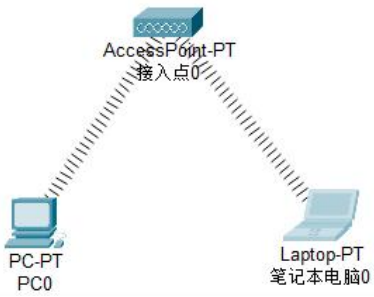

图 6　逻辑界面拓扑

检查各电脑的 IP 地址，在此基础上进入各电脑的命令行状态，验证彼此之间的连通性：

图 7　各电脑 IP 地址

此时，PC 彼此之间可以 Ping 通：

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

ping 169.254.196.211

Pinging 169.254.196.211 with 32 bytes of data:

Reply from 169.254.196.211: bytes=32 time=43ms TTL=128
Reply from 169.254.196.211: bytes=32 time=27ms TTL=128
Reply from 169.254.196.211: bytes=32 time=18ms TTL=128
Reply from 169.254.196.211: bytes=32 time=24ms TTL=128

Ping statistics for 169.254.196.211:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 18ms, Maximum = 43ms, Average = 28ms
```

图 8　Ping 结果

1.3.5 扩展无线局域网

在逻辑工作界面中，添加一台交换机 2950-24 和一台台式电脑，并且连接 AP 节点和交换机，连接交换机和新添的电脑，将新添电脑（PC1）的 IP 地址设置为 192.1.1.3/24。此时，PC1 和其他 PC 不可以 Ping 通：

```
C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

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

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

图 9　Ping 结果

1.3.6 静态设置 IP 地址

将电脑 PC0 和 Laptop0 的 IP 地址设置 为静态“Static”地址，如图 3.13 所示，并分别设置为 192.1.1.1/24 和 192.1.1.2/24：

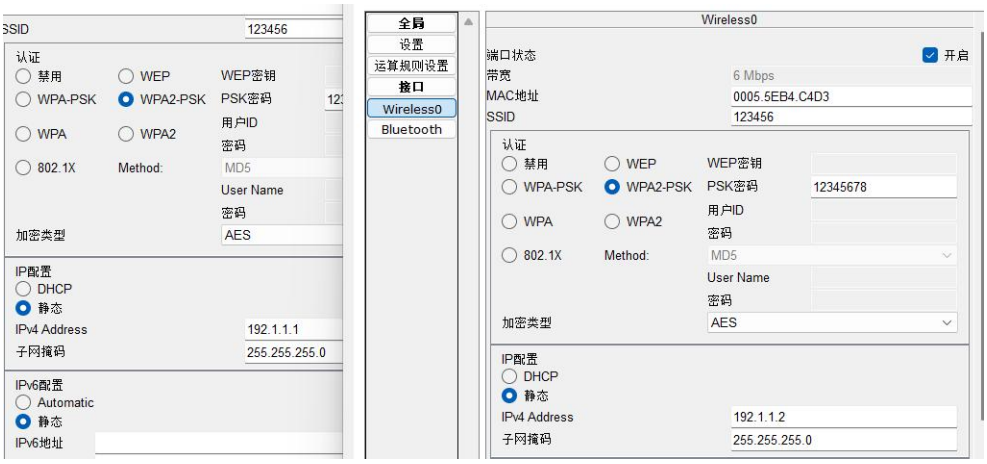

图 10　设置 IP 地址

此时，PC 彼此之间可以 Ping 通：

```
C:\>ping 192.1.1.2

Pinging 192.1.1.2 with 32 bytes of data:

Reply from 192.1.1.2: bytes=32 time=40ms TTL=128
Reply from 192.1.1.2: bytes=32 time=16ms TTL=128
Reply from 192.1.1.2: bytes=32 time=20ms TTL=128
Reply from 192.1.1.2: bytes=32 time=22ms TTL=128

Ping statistics for 192.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 40ms, Average = 24ms

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

Reply from 192.1.1.3: bytes=32 time=30ms TTL=128
Reply from 192.1.1.3: bytes=32 time=22ms TTL=128
Reply from 192.1.1.3: bytes=32 time=59ms TTL=128
Reply from 192.1.1.3: bytes=32 time=18ms TTL=128

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 18ms, Maximum = 59ms, Average = 32ms
```

图 11　Ping 结果

将电脑 PC0 和 Laptop0 的 IP 地址分别设置 192.1.2.1/24 和 192.1.2.2/24，不可以 Ping 通：

```
C:\>ping 192.1.2.2

Pinging 192.1.2.2 with 32 bytes of data:

Reply from 192.1.2.2: bytes=32 time=43ms TTL=128
Reply from 192.1.2.2: bytes=32 time=24ms TTL=128
Reply from 192.1.2.2: bytes=32 time=16ms TTL=128
Reply from 192.1.2.2: bytes=32 time=17ms TTL=128

Ping statistics for 192.1.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 43ms, Average = 25ms

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

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

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

图 12　Ping 结果

1.4 实验提高

按图 3.14 建立一个包含五台电脑的拓扑网络，按图示连接好相应接口和配置好电脑的 IP 地址，制定配置方案使各电脑之间互联互通，并测试各电脑之间的连通性。

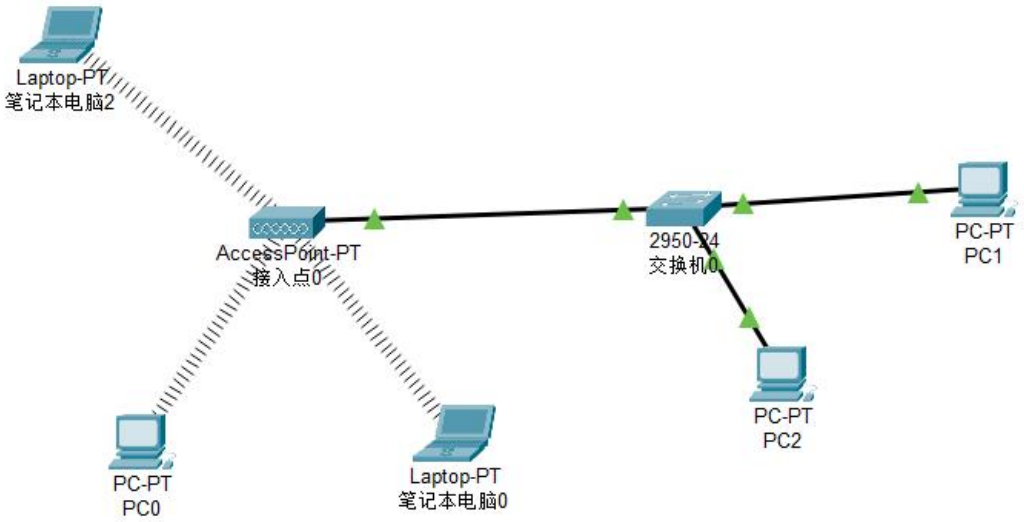

图 13　网络拓扑

将笔记本电脑 SSID 设置为 123456，授权设置为 WPA2，密钥为 12345678，设置静态 IP 地址，并在物理工作区中放入 AP 节点网络覆盖区域：

图 14　配置笔记本电脑

此时 PC 之间可以 Ping 通：

```
C:\>ping 192.1.1.4

Pinging 192.1.1.4 with 32 bytes of data:

Reply from 192.1.1.4: bytes=32 time=28ms TTL=128
Reply from 192.1.1.4: bytes=32 time=13ms TTL=128
Reply from 192.1.1.4: bytes=32 time=20ms TTL=128
Reply from 192.1.1.4: bytes=32 time=20ms TTL=128

Ping statistics for 192.1.1.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 13ms, Maximum = 28ms, Average = 20ms

C:\>ping 192.1.1.5

Pinging 192.1.1.5 with 32 bytes of data:

Reply from 192.1.1.5: bytes=32 time=44ms TTL=128
Reply from 192.1.1.5: bytes=32 time=22ms TTL=128
Reply from 192.1.1.5: bytes=32 time=16ms TTL=128
Reply from 192.1.1.5: bytes=32 time=21ms TTL=128

Ping statistics for 192.1.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 44ms, Average = 25ms
```

图 15　Ping 结果

2 无线局域网扩展组网实验

2.1 实验目的

（1）了解基于交换的扩展服务器组网方法，以及在扩展服务集中终端漫游的

机制。

（2）思考面向扩展服务集的 VLAN 的建立方法。

2.2 实验思路

（1）了解基于交换的扩展服务器组网方法，以及在扩展服务集中终端漫游的机制。

（2）思考面向扩展服务集的 VLAN 的建立方法。

2.3 实验步骤

2.3.1 物理工作区设备部署

切换到物理工作区，并在其中部署如图 3.16 所示的两个 AP 和四台电脑。：

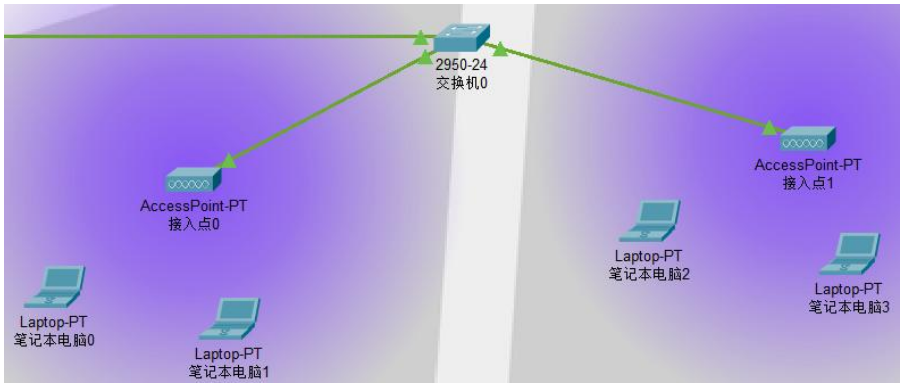

图 16 设备部署

2.3.2 AP 节点设置

鼠标单击任一 AP 节点，系统将弹出如图 3.17 所示的设置对话框，选中其中的“Config”标签页，并选中“Interface”中的“Port 1”，在设置栏中将 SSID 设置为 123456，授权设置为 WPA2 方式，密钥为 12345678。同样的方式设置另外一台 AP 节点：

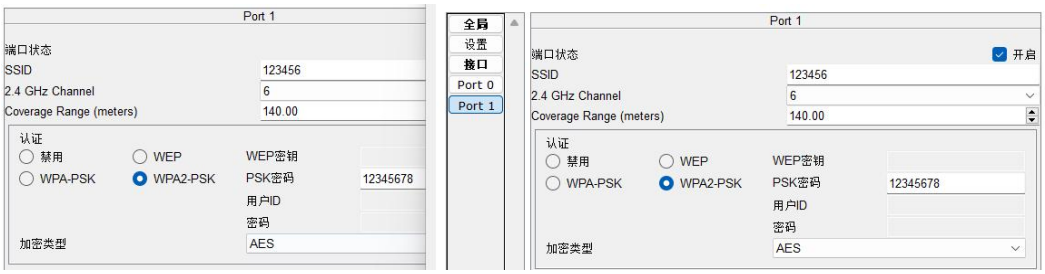

图 17 AP 节点设置

2.3.3 无线上网方式设置

更换四台电脑的网卡，换成无线网卡，并设置无线上网参数，包括 SSID 和密钥。，即将 SSID 设置为 123456，授权设置为 WPA2-PSK 方式，密钥为 12345678：

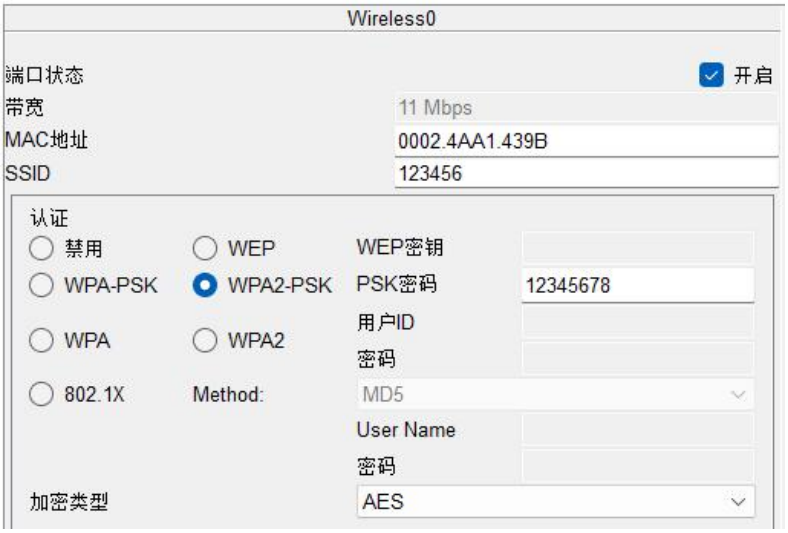

图 18　配置笔记本电脑

2.3.4 连通性测试

切换回逻辑工作界面，在物理工作界面中点击“Logical” 按钮，切换回逻辑工作界面：

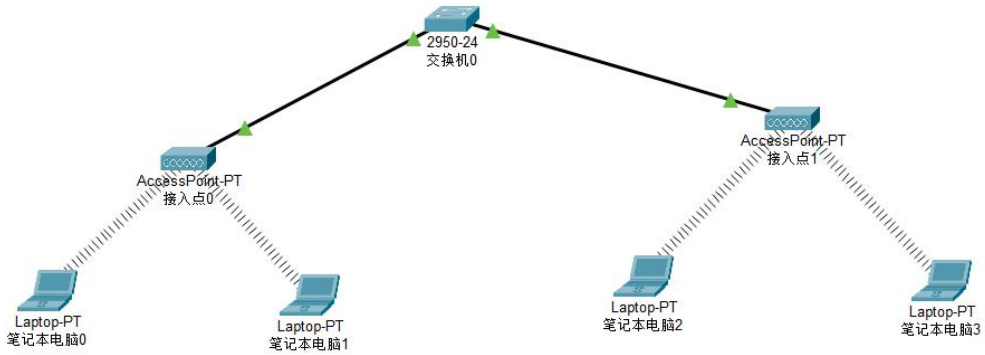

图 19　拓扑图

检查各电脑的 IP 地址，在此基础上进入各电脑的命令行状态，验证彼此之间的连通性：

```
Cisco Packet Tracer PC Command Line 1.0
C:\>
ping 169.254.68.3

Pinging 169.254.68.3 with 32 bytes of data:

Reply from 169.254.68.3: bytes=32 time=51ms TTL=128
Reply from 169.254.68.3: bytes=32 time=31ms TTL=128
Reply from 169.254.68.3: bytes=32 time=194ms TTL=128
Reply from 169.254.68.3: bytes=32 time=31ms TTL=128

Ping statistics for 169.254.68.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
    Minimum = 31ms, Maximum = 194ms, Average = 76ms

C:\>ping 169.254.21.92

Pinging 169.254.21.92 with 32 bytes of data:

Reply from 169.254.21.92: bytes=32 time=46ms TTL=128
Reply from 169.254.21.92: bytes=32 time=29ms TTL=128
Reply from 169.254.21.92: bytes=32 time=38ms TTL=128
Reply from 169.254.21.92: bytes=32 time=36ms TTL=128

Ping statistics for 169.254.21.92:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
    Minimum = 29ms, Maximum = 46ms, Average = 37ms

C:\>ping 169.254.36.110

Pinging 169.254.36.110 with 32 bytes of data:

Reply from 169.254.36.110: bytes=32 time=35ms TTL=128
Reply from 169.254.36.110: bytes=32 time=19ms TTL=128
Reply from 169.254.36.110: bytes=32 time=16ms TTL=128
Reply from 169.254.36.110: bytes=32 time=90ms TTL=128

Ping statistics for 169.254.36.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 90ms, Average = 40ms
```

图 20　Ping 结果

2.3.5 静态设置 IP 地址

将各电脑的 IP 地址设置为静态“Static”地址：

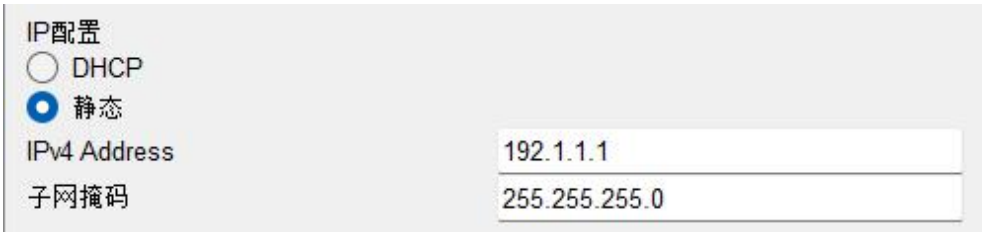

图 21　设置 IP 地址

在此基础上进一步验证彼此之间的连通性：

```
C:\>ping 192.1.1.2

Pinging 192.1.1.2 with 32 bytes of data:

Reply from 192.1.1.2: bytes=32 time=32ms TTL=128
Reply from 192.1.1.2: bytes=32 time=19ms TTL=128
Reply from 192.1.1.2: bytes=32 time=20ms TTL=128
Reply from 192.1.1.2: bytes=32 time=17ms TTL=128

Ping statistics for 192.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 17ms, Maximum = 32ms, Average = 22ms

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

Reply from 192.1.1.3: bytes=32 time=40ms TTL=128
Reply from 192.1.1.3: bytes=32 time=23ms TTL=128
Reply from 192.1.1.3: bytes=32 time=21ms TTL=128
Reply from 192.1.1.3: bytes=32 time=23ms TTL=128

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 21ms, Maximum = 40ms, Average = 26ms
```

图 22　Ping 结果

2.3.6 不同 BSS 之间漫游

重新切换回物理工作区模式，将其中一台笔记本电脑从一台 AP 节点的作用区域拖入另一台 AP 节点的作用区域：

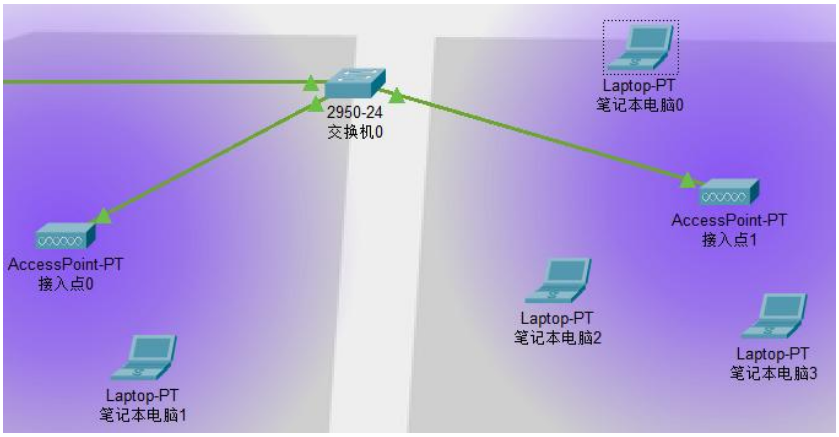

图 23　修改关联 AP

切换回逻辑工作区方式，电脑与 AP 节点之间的关联关系已经调整：

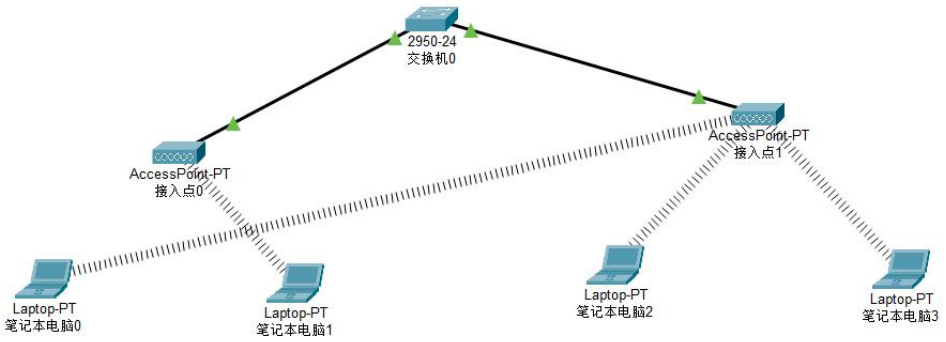

图 24　网络拓扑

进一步检查各电脑的上网参数，验证各电脑彼此之间的连通性：

```
C:\>ping 192.1.1.2

Pinging 192.1.1.2 with 32 bytes of data:

Reply from 192.1.1.2: bytes=32 time=32ms TTL=128
Reply from 192.1.1.2: bytes=32 time=19ms TTL=128
Reply from 192.1.1.2: bytes=32 time=16ms TTL=128
Reply from 192.1.1.2: bytes=32 time=12ms TTL=128

Ping statistics for 192.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 12ms, Maximum = 32ms, Average = 19ms

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

Reply from 192.1.1.3: bytes=32 time=42ms TTL=128
Reply from 192.1.1.3: bytes=32 time=26ms TTL=128
Reply from 192.1.1.3: bytes=32 time=119ms TTL=128
Reply from 192.1.1.3: bytes=32 time=25ms TTL=128

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 25ms, Maximum = 119ms, Average = 53ms
```

图 25　Ping 结果

如果两台 AP 的 SSID 分别是 123456 和 123457：

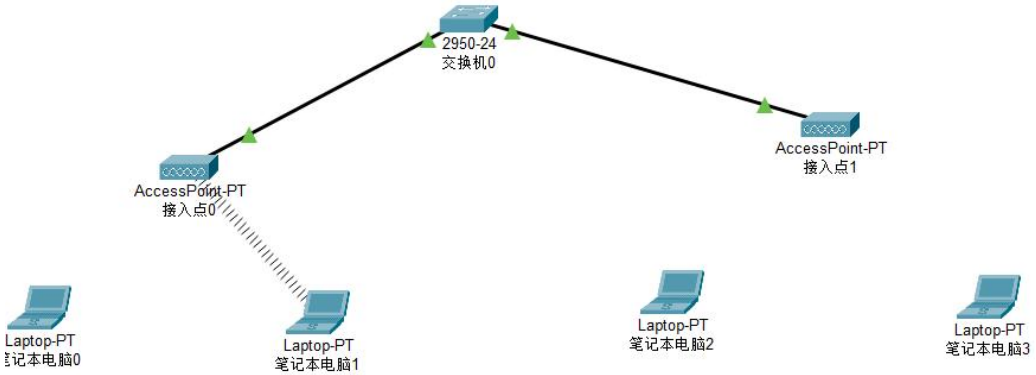

图 26　网络拓扑

此时笔记本电脑不能在不同 AP 节点之间漫游：

```
C:\>ping 192.1.1.2

Pinging 192.1.1.2 with 32 bytes of data:

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

Ping statistics for 192.1.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

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

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

图 27　Ping 结果

2.4 实验提高

按图 3.24 建立一个包含六台电脑的拓扑网络，按图示连接好相应接口和配置好电脑的 IP 地址：

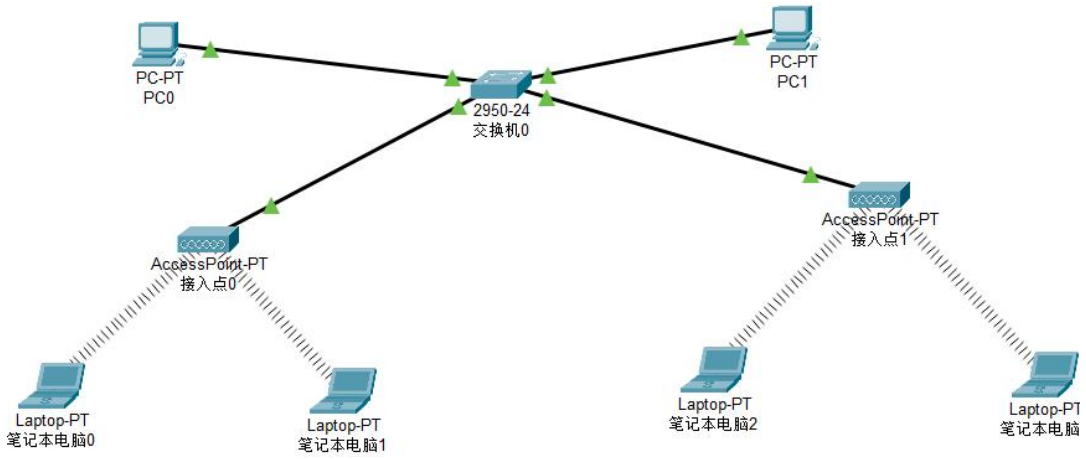

图 28　网络拓扑

测试各电脑之间的连通性，PC 间可以连通：

```
C:\>ping 192.1.1.5

Pinging 192.1.1.5 with 32 bytes of data:

Reply from 192.1.1.5: bytes=32 time=35ms TTL=128
Reply from 192.1.1.5: bytes=32 time=17ms TTL=128
Reply from 192.1.1.5: bytes=32 time=16ms TTL=128
Reply from 192.1.1.5: bytes=32 time=16ms TTL=128

Ping statistics for 192.1.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 35ms, Average = 21ms

C:\>ping 192.1.1.6

Pinging 192.1.1.6 with 32 bytes of data:

Reply from 192.1.1.6: bytes=32 time=35ms TTL=128
Reply from 192.1.1.6: bytes=32 time=19ms TTL=128
Reply from 192.1.1.6: bytes=32 time=17ms TTL=128
Reply from 192.1.1.6: bytes=32 time=12ms TTL=128

Ping statistics for 192.1.1.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 12ms, Maximum = 35ms, Average = 20ms
```

图 29　Ping 结果

在交换机上面建立 vlan 2 和 vlan 3：

```
Switch>enable
Switch#vlan database
% Warning: It is recommended to configure VLAN from config mode,
  as VLAN database mode is being deprecated. Please consult user
  documentation for configuring VTP/VLAN in config mode.

Switch(vlan)#vlan 2 name vlan2
VLAN 2 added:
    Name: vlan2
Switch(vlan)#vlan 3 name vlan3
VLAN 3 added:
    Name: vlan3
Switch(vlan)#exit
APPLY completed.
Exiting....
Switch#conf t
```

图 30　CLI 命令

```
Device Name: 交换机0
Device Model: 2950-24
主机名:Switch

端口                链路   VLAN   IP地址          MAC地址
FastEthernet0/1     启用   2      --              0090.0C77.1C01
FastEthernet0/2     启用   3      --              0090.0C77.1C02
FastEthernet0/3     启用   2      --              0090.0C77.1C03
FastEthernet0/4     启用   3      --              0090.0C77.1C04
```

图 31　VLAN 分配结果

测试各电脑之间的连通性，发现只有同一 VLAN 下的 PC 能连通：

```
Ping statistics for 192.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 54ms, Average = 30ms

C:\>ping 192.1.1.3

Pinging 192.1.1.3 with 32 bytes of data:

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

Ping statistics for 192.1.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.1.1.4

Pinging 192.1.1.4 with 32 bytes of data:

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

Ping statistics for 192.1.1.4:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.1.1.5

Pinging 192.1.1.5 with 32 bytes of data:

Reply from 192.1.1.5: bytes=32 time=21ms TTL=128
Reply from 192.1.1.5: bytes=32 time=18ms TTL=128
Reply from 192.1.1.5: bytes=32 time=12ms TTL=128
Reply from 192.1.1.5: bytes=32 time=18ms TTL=128

Ping statistics for 192.1.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 12ms, Maximum = 21ms, Average = 17ms

C:\>ping 192.1.1.6

Pinging 192.1.1.6 with 32 bytes of data:

Request timed out.
```

图 32　Ping 结果

3 实验总结

3.1 收获

在完成无线局域网组网实验后，我深刻体会到了无线网络的灵活性和便利性。通过实验，我不仅掌握了无线接入点(AP)的配置方法，还了解了 SSID、WPA2 加密等无线网络的安全设置。实验中，我学会了如何为无线终端分配静态 IP 地址，以及如何通过 VLAN 技术来提高网络的安全性和管理效率。此外，我还了解了在不同 BSS 之间进行漫游的机制。