

# 无线网络组网实验

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节

## 【实验目的】

- 1.了解无线网络技术 Wi-Fi 的工作原理。
- 2.掌握无线网络组网实验操作步骤。
- 3.通过实验掌握 Wi-Fi 路由的配置操作。
- 4.通过实验再次熟悉 DHCP 动态地址分配路由配置操作。
- 5.通过实验现象理解 IP 复用与子网节点隐藏原理。

## 【实验原理】

### 1.Wi-Fi 基本介绍

无线保真（Wireless Fidelity，Wi-Fi）是当今使用最广泛的一种无线网络传输技术，其原理是将有线网络信号转换成无线网络信号，供支持无线网络技术的相关电脑、手机和 PDA 接收。目前的大部分场景下，移动设备都通过 Wi-Fi 上网，这样可以不通过运营商的蜂窝网络上网，从而省掉了大量的流量费。

Wi-Fi 无线网络在无线局域网的范畴是指“无线相容性认证”，实质上是一种商业认证，同时也是一种无线联网技术，有线网络通过网线连接互联网，而无线保真（Wi-Fi）通过无线电波来联网。

常见的无线网络接入点（Access Point，AP）是一个无线路由器，在这个无线路由器电波覆盖的有效范围内都可以采用无线保真连接方式进行联网，如果无线路由器连接了 Internet，则又被称为热点。

Wi-Fi 是一个无线网络通信技术的品牌，由 Wi-Fi 联盟（Wi-Fi Alliance）持有，是一个非营利组织，其目的是改善基于 IEEE802.11 标准的无线网络产品之间的互通性，很大

程度上采用 IEEE802.11 系列协议的局域网就称为无线保真，一定程度上还接近于无线网际网路，但其实 Wi-Fi 只是 WLAN 的重要组成部分。

## 2.Wi-Fi 基本架构

Wi-Fi 一般架构是一个接入点（Access Point，AP，通常又称为无线网络接入点或桥接器，其主要在媒体存取控制层 MAC 中扮演无线工作站及有线有线局域网的桥梁）和无线网卡，经过简单配置就能以无线模式配合既有的有线网络架构共享网络资源，其架设费用和复杂程度远远低于传统的有线网络。如果只是几台电脑的对等网络，也可以不采用 AP 而采用点对点，只需要每台电脑配备无线网卡。

## 3.Wi-Fi 主要协议

Wi-Fi 主要协议是 IEEE802.11，其定义了系统应该提供的服务，即分配系统的任务，分别为联接（Association）、结束联接（Disassociation）、分配（Distribution）、集成（Integration）、再联接（Reassociation）。

属于站点的任务则分别为鉴权（Authentication）、结束鉴权（DE authentication）、隐私(Privacy)、MAC 数据传输(MSDU delivery)。

## 4.无线网络传输机制 MACA

无线网络传输协调机制，采用了分布式帧传输间隔 CSMA/CA 机制，CA 是指碰撞避免机制，CSMA 是载波侦听多路复用机制，通过监听通道传输状态决定是否发送，但由于无线局域网的可移动性，会导致隐藏节点现象，隐藏节点是那些在接收节点的覆盖范围内而在发送节点的范围外或在发送节点的覆盖范围内而在接收节点的覆盖范围外的节点，因此 CA 采取 Rts 和 Cts 先预约后发送的模式以避免隐藏节点现象。

### 【实验设备】

- 1.一台运行 Windows 系统的电脑。
- 2.网络终端模拟仿真软件 Cisco Packet Tracer。

## 【实验步骤】

### 1.简单 Wi-Fi 路由器的配置

- (1) 构建以 Wi-Fi 路由器为接入点的网络拓扑结构;
- (2) 将路由器网络设置中连接类型设置为 DHCP;
- (3) 将其局域网 IP 地址设置为 192.168.4.1 255.255.255.0;
- (4) 无线设置将 SSID 更名为 testWifi, 信道设为 1, 认证方式无密码;
- (5) 然后转到 GUI, 将 DHCP Server 开启, 无线栏中将 SSID 广播打开。

### 2.简单 AP 接入点设置

- (1) 构建以局部网络拓扑图;
- (2) 将 AP 的端口 1 设置为开启, 认证方式无密码。

### 3.Wi-Fi 组网步骤

- (1) 规划网络地址及拓扑图;
- (2) 配置路由器端口 IP 地址;
- (3) 配置路由器 DHCP;
- (4) 验证主机之间的互通性。

## 【实验现象】

### 1. 简单 Wi-Fi 路由器的配置

局部图拓扑图如图:



Wireless Router0

Physical Config GUI

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

Internet

LAN

Wireless

### LAN Settings

IP Address	192.168.4.1
Subnet Mask	255.255.255.0

Wireless Router0

Physical Config GUI

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

Internet

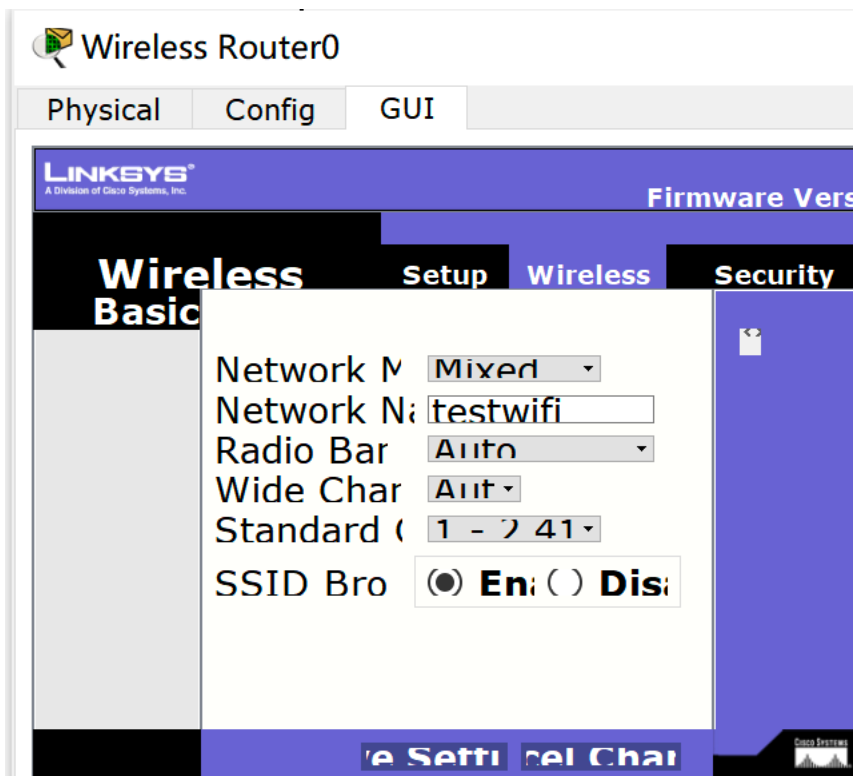
LAN

Wireless

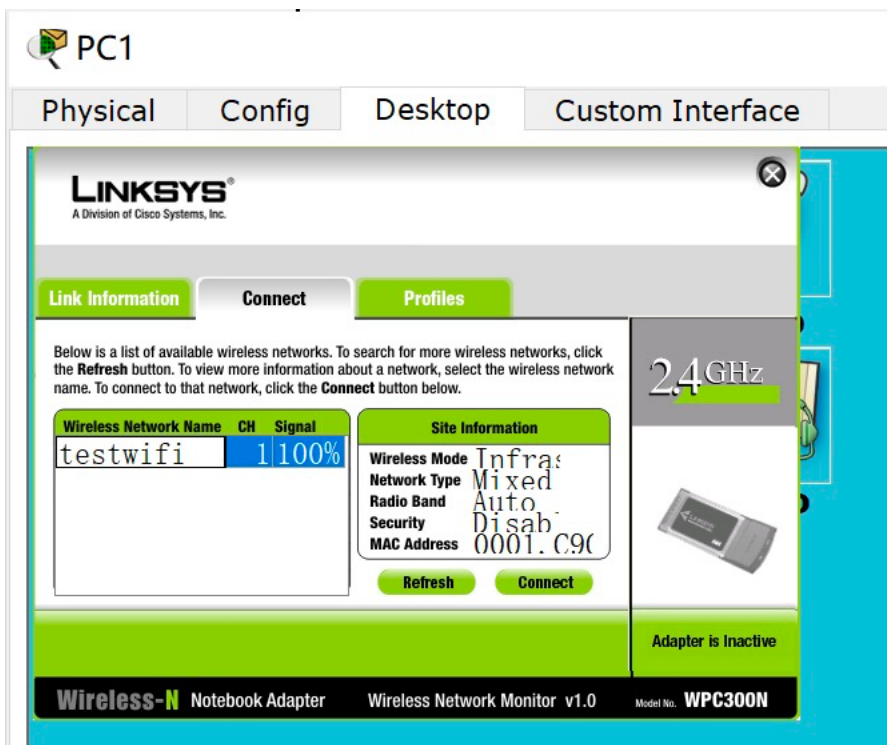
### Wireless Settings

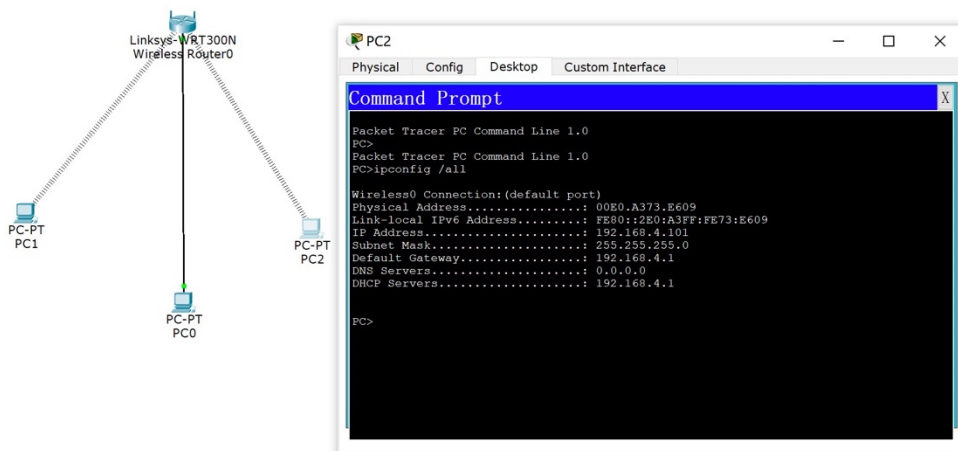
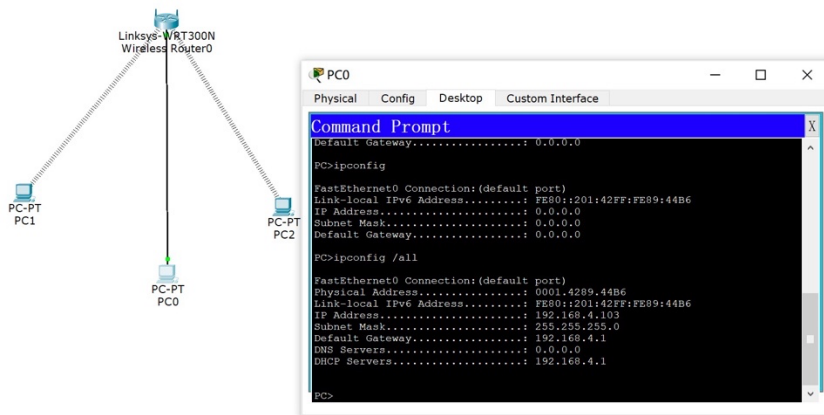
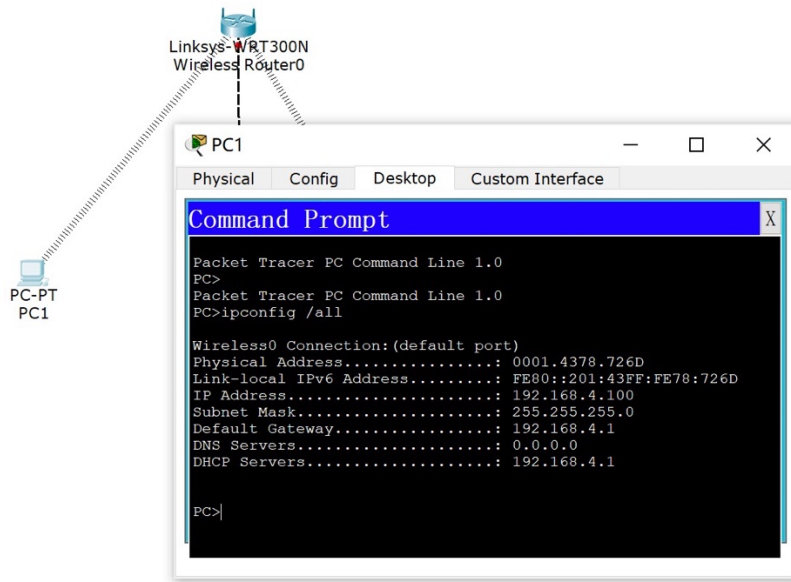
SSID	testwifi
Channel	1
Authentication	
<input checked="" type="radio"/> Disabled	<input type="radio"/> WEP
Key	
<input type="radio"/> WPA-PSK	<input type="radio"/> WPA2-PSK
Pass Phrase	
<input type="radio"/> WPA	<input type="radio"/> WPA2
RADIUS Server Settings	
IP Address	
Shared Secret	
Encryption Type	Disabled

Physical	Config	GUI
<div> <div>LINKSYS® A Division of Cisco Systems, Inc.</div> <div>Firmware Vers</div> </div>		
<div> <div>Setup</div> <div>Setup Wireless Security</div> </div>		
<div>Internet</div> <div>Connect</div> <div>Optional</div> <div>(required</div> <div>interne</div>	<div>Automatic Conti</div> <div>Host N</div> <div>Domain</div> <div>MTU</div> <div>Si: 500</div>	
<div>Network</div> <div>Router</div> <div>DHCP</div>	<div>IP Add 92.68.4.1</div> <div>Subnet 255.255.</div> <div>DHCP</div> <div>En: () Dis: DHCP</div> <div>Start IP 168.4.00</div> <div>Maximun 50</div> <div>IP Addre 168.4.10.14</div> <div>Client Le 0 minutes (0 mear</div> <div>Static 0.0.0.0</div>	

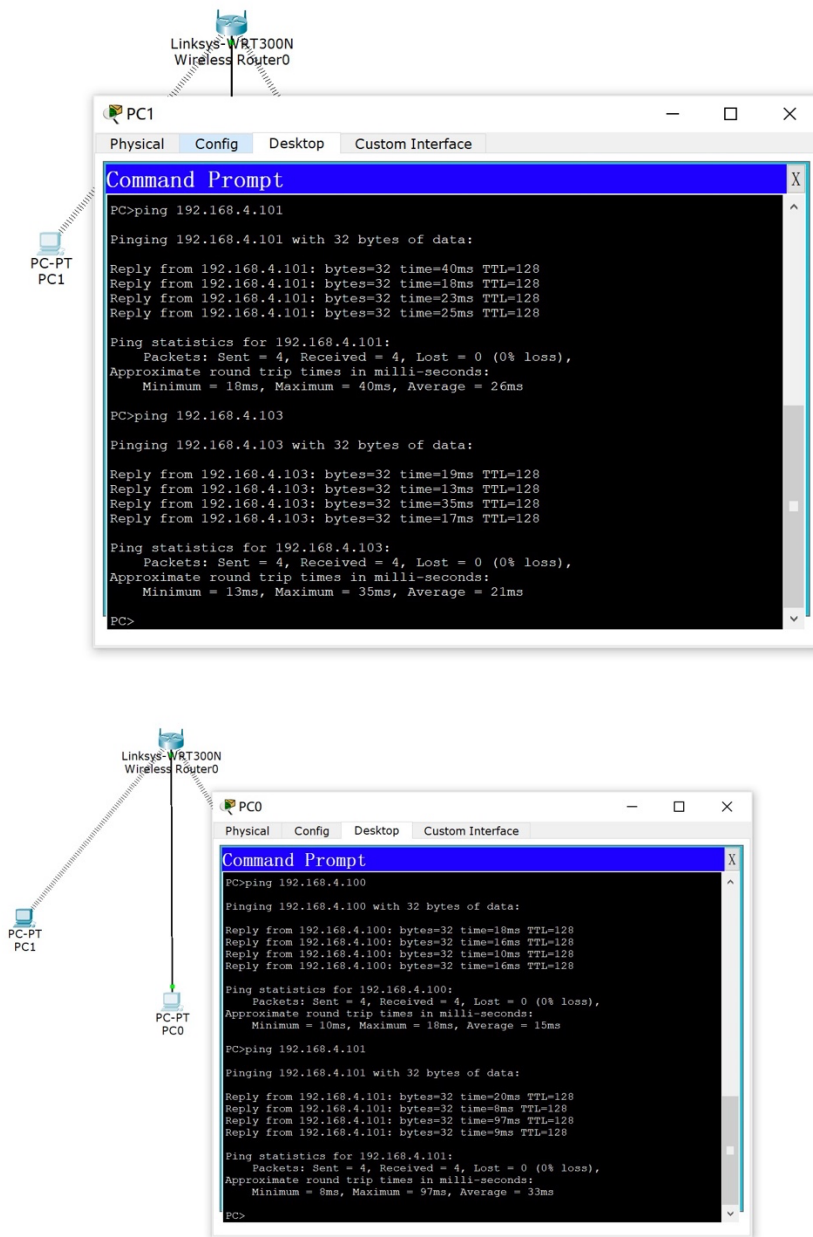


连接 Wi-Fi:



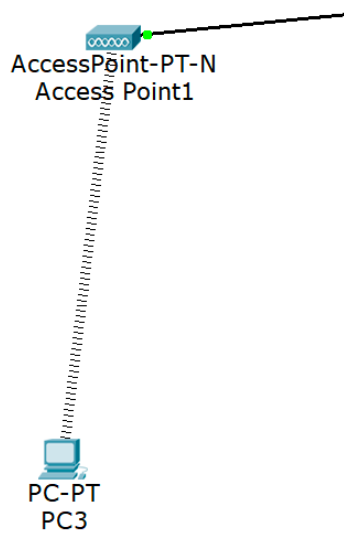






## 2.简单 AP 接入点配置:

局部网络拓扑结构如图:



AP 接入点主要配置：

Access Point1

Physical Config

**GLOBAL**

Settings

**INTERFACE**

Port 0

Port 1

**Port 1**

Port Status ☒ On

SSID AP0

Channel 6

Authentication

☒ Disabled ☐ WEP

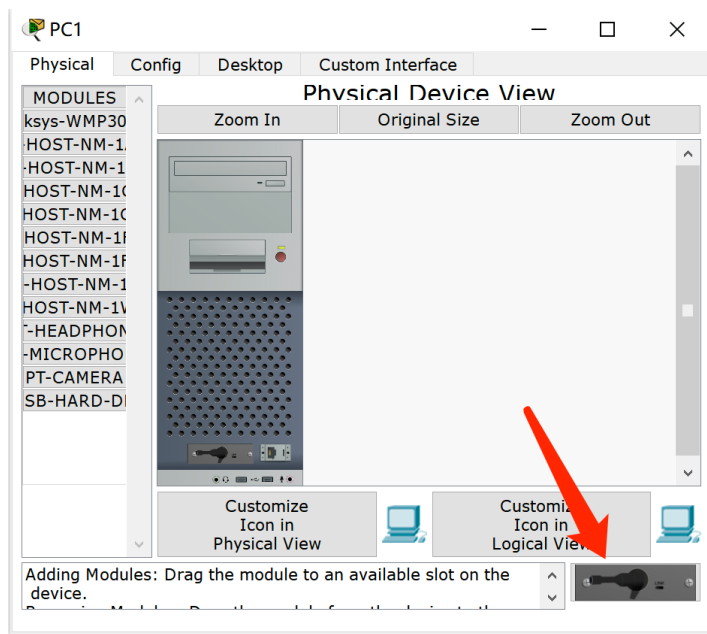
Key

☐ WPA-PSK ☐ WPA2-PSK

Pass Phrase

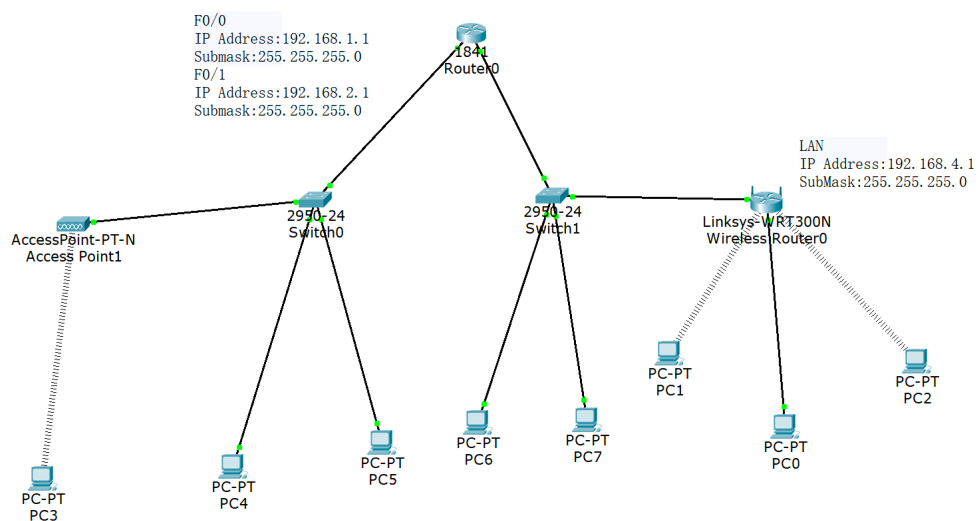
Encryption Type Disabled

更换台式机的网卡为无线网卡：



### 3.Wi-Fi 组网步骤:

网络完整拓扑结构如图所示:



路由器端口地址命令如下:

```

interface FastEthernet 0/0
ip address 192.168.1.1 255.255.255.0
no shutdown
interface FastEthernet 0/1

```

```
ip address 192.168.2.1 255.255.255.0  
no shutdown
```

路由器 DHCP 网络配置:

路由器左边网络 DHCP 配置:

```
ip dhcp excluded-address 192.168.1.0 192.168.1.10  
ip dhcp pool myleftnet  
network 192.168.1.0 255.255.255.0  
default-router 192.168.1.1  
option 150 ip 192.168.1.3  
dns-server 192.168.1.2
```

路由器右边网络 DHCP 配置:

```
ip dhcp excluded-address 192.168.2.0 192.168.2.10  
ip dhcp pool myrightnet  
network 192.168.2.0 255.255.255.0  
default-router 192.168.2.1  
option 150 ip 192.168.2.3  
dns-server 192.168.2.2
```

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
ip address 192.168.1.1 255.255.255.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#exit
Router(config)#ip dhcp
Router(config)#ip dhcp
Router(config)#ip dhcp pool left
Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#option 150 ip 192.168.1.3
Router(dhcp-config)#dns
Router(dhcp-config)#dns-server 192.168.1.2
Router(dhcp-config)#ip dhcp
Router(dhcp-config)#ip dhcp
Router(dhcp-config)#ip dhcp
Router(dhcp-config)#exit
Router(config)#ip dhcp
Router(config)#ip dhcp ex
Router(config)#ip dhcp excluded-address 192.168.1.0 192.168.1.10
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#config
Router#configure t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp
Router(config)#ip dhcp ex
Router(config)#ip dhcp excluded-address 192.168.2.0 192.168.2.10
Router(config)#ip dhcp
Router(config)#ip dhcp po
Router(config)#ip dhcp pool right
Router(dhcp-config)#network 192.168.2.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.2.1
Router(dhcp-config)#option 150 ip 192.168.2.3
Router(dhcp-config)#dns
Router(dhcp-config)#dns-server 192.168.2.2
Router(dhcp-config)#exit
Router(config)#exitr
^
% Invalid input detected at '^' marker.

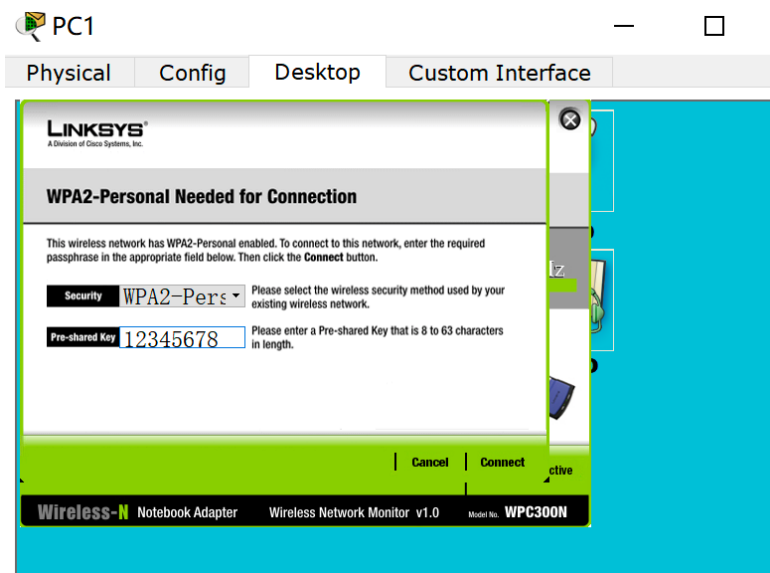
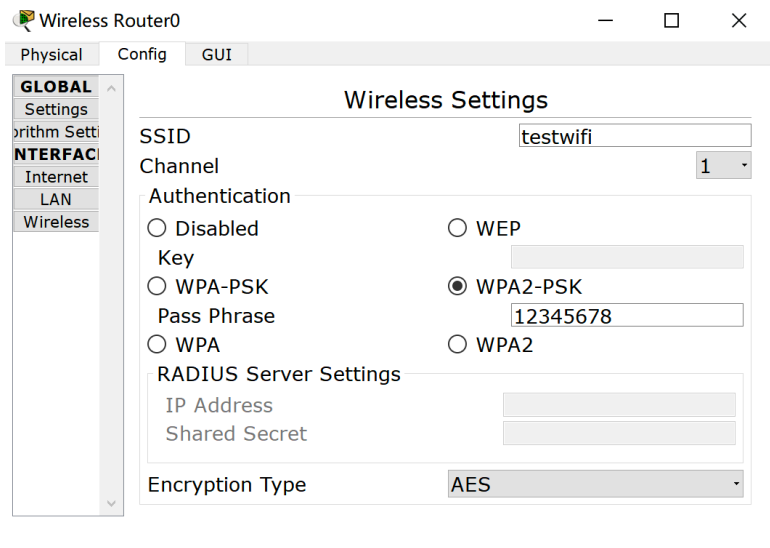
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#

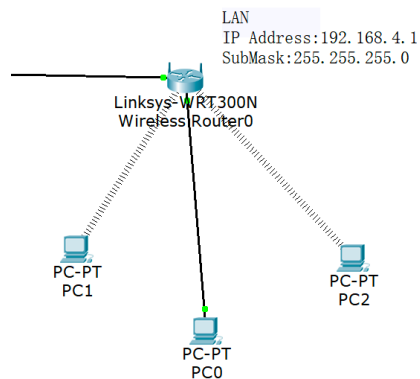
```

## 4.测试

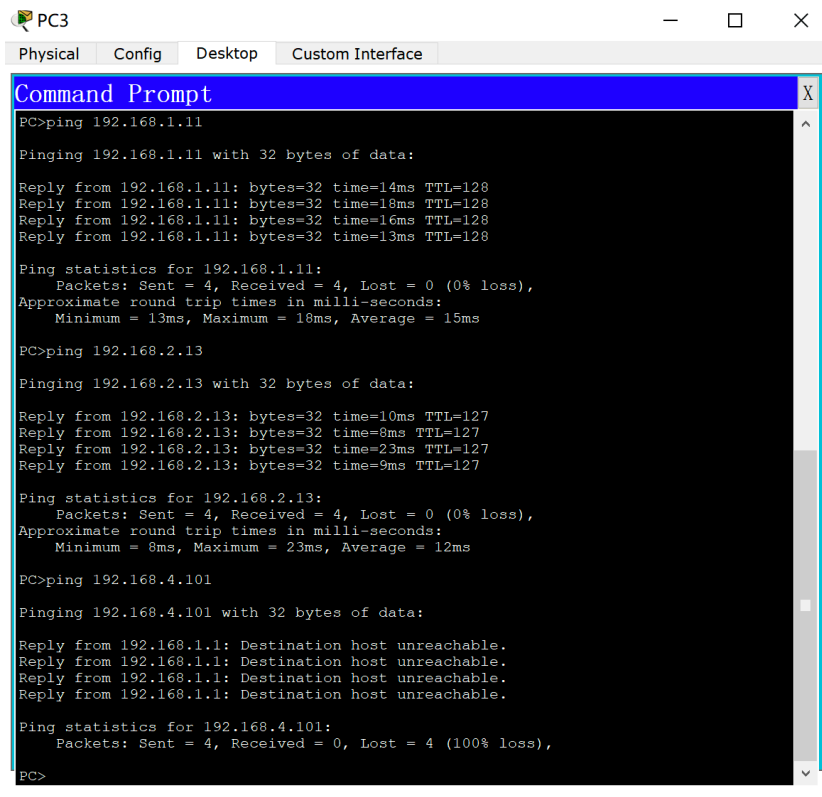
(1) 为无线路由器配置密码并进行测试。



连通成功:



(2) 观测各个 PC 终端的连通情况。



PC3

Physical Config Desktop Custom Interface

Command Prompt

```
PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time=14ms TTL=128
Reply from 192.168.1.11: bytes=32 time=18ms TTL=128
Reply from 192.168.1.11: bytes=32 time=16ms TTL=128
Reply from 192.168.1.11: bytes=32 time=13ms TTL=128

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 18ms, Average = 15ms

PC>ping 192.168.2.13

Pinging 192.168.2.13 with 32 bytes of data:

Reply from 192.168.2.13: bytes=32 time=10ms TTL=127
Reply from 192.168.2.13: bytes=32 time=8ms TTL=127
Reply from 192.168.2.13: bytes=32 time=23ms TTL=127
Reply from 192.168.2.13: bytes=32 time=9ms TTL=127

Ping statistics for 192.168.2.13:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 23ms, Average = 12ms

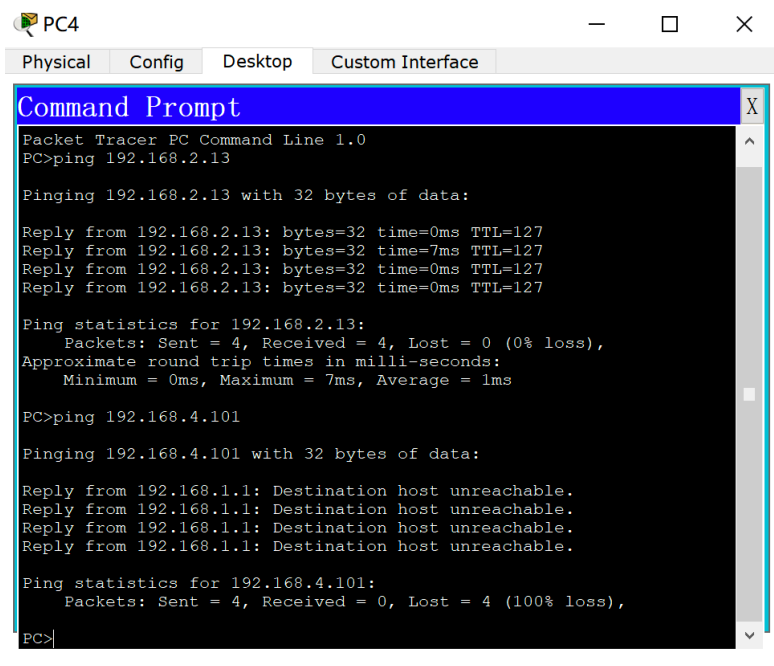
PC>ping 192.168.4.101

Pinging 192.168.4.101 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.4.101:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>
```



PC4

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.13

Pinging 192.168.2.13 with 32 bytes of data:

Reply from 192.168.2.13: bytes=32 time=0ms TTL=127
Reply from 192.168.2.13: bytes=32 time=7ms TTL=127
Reply from 192.168.2.13: bytes=32 time=0ms TTL=127
Reply from 192.168.2.13: bytes=32 time=0ms TTL=127

Ping statistics for 192.168.2.13:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 1ms

PC>ping 192.168.4.101

Pinging 192.168.4.101 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.4.101:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>
```

PC1

Physical Config Desktop Custom Interface

Command Prompt

```

PC>ping 192.168.2.13

Pinging 192.168.2.13 with 32 bytes of data:

Reply from 192.168.2.13: bytes=32 time=19ms TTL=127
Reply from 192.168.2.13: bytes=32 time=11ms TTL=127
Reply from 192.168.2.13: bytes=32 time=13ms TTL=127
Reply from 192.168.2.13: bytes=32 time=13ms TTL=127

Ping statistics for 192.168.2.13:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 19ms, Average = 14ms

PC>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.11: bytes=32 time=13ms TTL=126
Reply from 192.168.1.11: bytes=32 time=10ms TTL=126
Reply from 192.168.1.11: bytes=32 time=8ms TTL=126

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 13ms, Average = 10ms

PC>ping 192.168.1.13

Pinging 192.168.1.13 with 32 bytes of data:

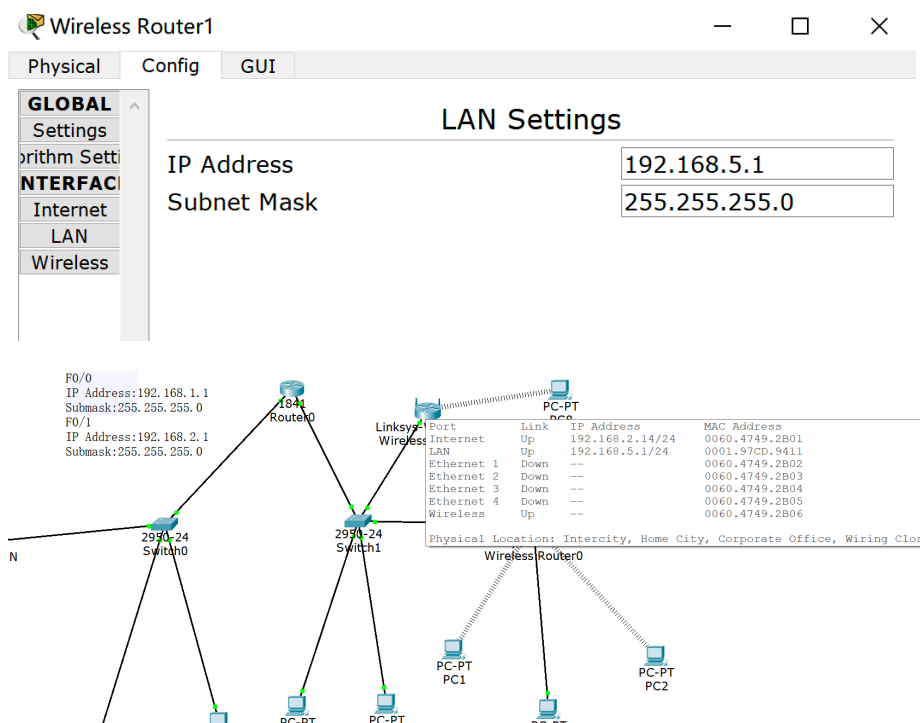
Reply from 192.168.1.13: bytes=32 time=23ms TTL=126
Reply from 192.168.1.13: bytes=32 time=25ms TTL=126
Reply from 192.168.1.13: bytes=32 time=23ms TTL=126
Reply from 192.168.1.13: bytes=32 time=26ms TTL=126

Ping statistics for 192.168.1.13:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 23ms, Maximum = 26ms, Average = 24ms

PC>

```

(3) 再接入一台路由器。





(4) 如果改为静态 IP 地址则分别需要为每一台 PC 和无线路由器配置相应的 IP 地址和子网掩码，如前面的实验所述，这样只会使得整个网络结构更加难以管理，且容易产生 IP 冲突，因此这是不建议的配置网络方法，而且本次实验中已经有多达 13 台终端需要配置，其配置工作是相当繁琐的，再次验证 DHCP 动态地址分配的好处。

### **【分析讨论】**