

# 路由器基本配置实验

## 一、实验目的

- 1) 掌握路由器的基本知识;
- 2) 掌握路由器端口的配置;
- 3) 掌握路由协议的基本配置;
- 4) 熟悉使用 Boson Netsim 模拟器。

## 二、实验内容

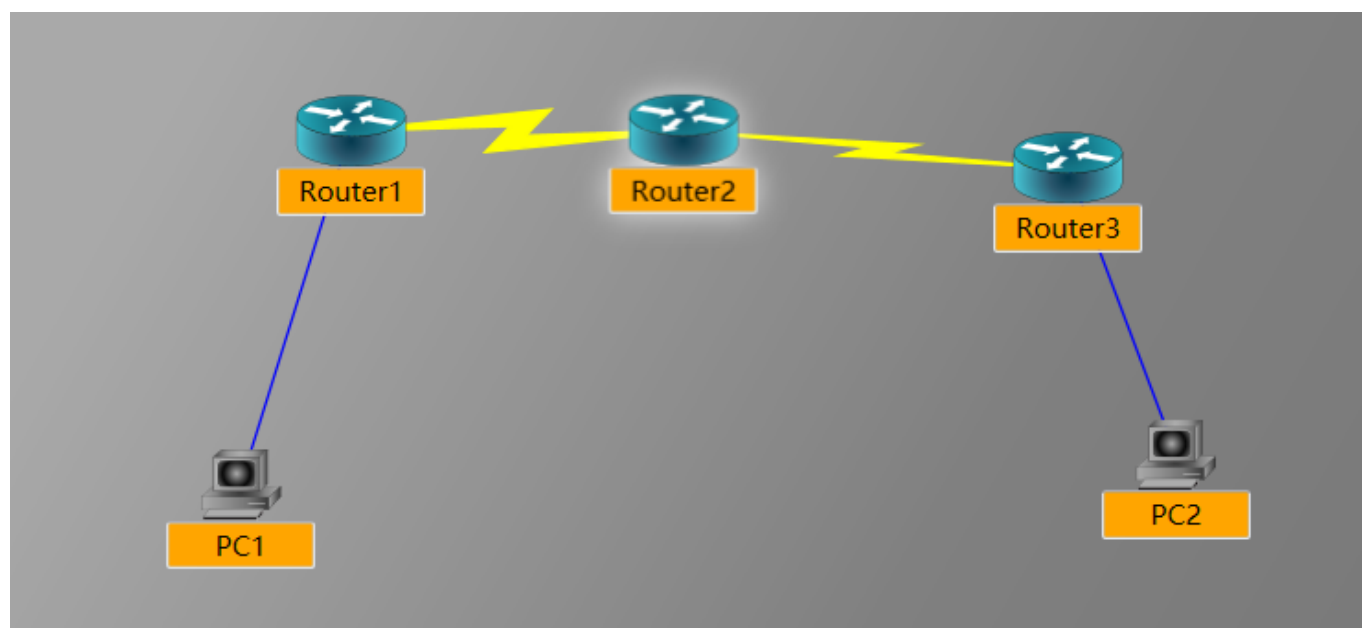
- 1) 自行构建一个网络拓扑，要求包括 3 个以上路由器（路由器采用串行连接），用于连接两个以太网，每个以太网至少包括 1 台主机;
- 2) 完成路由器、主机等设备的配置，使用 RIP 或 OSPF 来维护路由器的路由表；（本实验使用RIP协议）
- 3) 实验配置完成后，两台主机要能够相互 ping 通。

## 三、实验步骤


- 1) 连接拓扑图;
- 2) 配置各个路由器的名称、端口 IP 地址、子网掩码、封装格式及时钟频率;
- 3) 配置各个主机的 IP 地址、子网掩码、以及与其相连的路由器端口地址;
- 4) 为各个路由器配置 RIP 协议。

## 四、实验过程及结果

### 1) 网络拓扑图



各个路由器的连接工作情况： Router1:



Router1

Device Statistics

**Device Type: Router**  
Model: 3620  
Series: 3600


Disconnected Interfaces

Ethernet0/1  
Console0

Connected Interfaces

Local Interface	Remote Device	Remote Interface
Ethernet0/0	PC1	Ethernet0
Serial0/0	Router2	Serial0/0

Router2:



Router2

Device Statistics

**Device Type: Router**  
Model: 3620  
Series: 3600

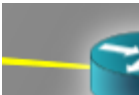
Disconnected Interfaces

Serial0/2  
Serial0/3  
Console0

Connected Interfaces

Local Interface	Remote Device	Remote Interface
Serial0/0	Router1	Serial0/0
Serial0/1	Router3	Serial0/0

Router3:



Router3

Device Statistics

**Device Type: Router**  
Model: 3620  
Series: 3600

Disconnected Interfaces

Ethernet0/1  
Console0

Connected Interfaces

Local Interface	Remote Device	Remote Interface
Serial0/0	Router2	Serial0/1
Ethernet0/0	PC2	Ethernet0

2) 路由器IP配置

设备	左端口IP	右端口IP	子网掩码
Router1	192.168.1.2	192.168.2.1	255.255.255.0
Router2	192.168.2.2	192.168.3.1	255.255.255.0
Router3	192.168.3.2	192.168.4.1	255.255.255.0

配置过程： Router1:

Devices: Router1 [Device #1]

```
Press Enter to Start

Router>
Router>en
Router#hostname Router1
      ^
% Invalid input detected at '^' marker.

Router#hostname Router1
      ^
% Invalid input detected at '^' marker.

Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router1
Router1(config)#int e0/0
Router1(config-if)#ip address 192.168.1.2 255.255.255.0
Router1(config-if)#no shut
00:01:15: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
00:01:17: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
Router1(config-if)#int s0/0
Router1(config-if)#encapsulation hdlc
Router1(config-if)#ip address 192.168.2.1 255.255.255.0
Router1(config-if)#no shut
00:01:41: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
00:01:41: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
00:01:47: %LINK-3-UPDOWN: Interface Serial0/0, changed state to down
00:01:47: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to down
Router1(config-if)#clock rate 64000
Router1(config-if)#end
```

Router2:

Devices: Router2 [Device #2]

```
Press Enter to Start

Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router2(config)#hostname Router2
Router2(config)#int s0/0
Router2(config-if)#encapsulation hdlc
Router2(config-if)#ip address 192.168.2.2 255.255.255.0
Router2(config-if)#no shut
00:02:48: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
Router2(config-if)#clock rate 64000
00:02:55: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
Router2(config-if)#int s0/1
Router2(config-if)#encapsulation hdlc
Router2(config-if)#ip address 192.168.3.1 255.255.255.0
Router2(config-if)#no shut
00:03:20: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
Router2(config-if)#clock rate 64000
00:03:27: %LINK-3-UPDOWN: Interface Serial0/1, changed state to down
Router2(config-if)#end
```

Router3:

```
Press Enter to Start

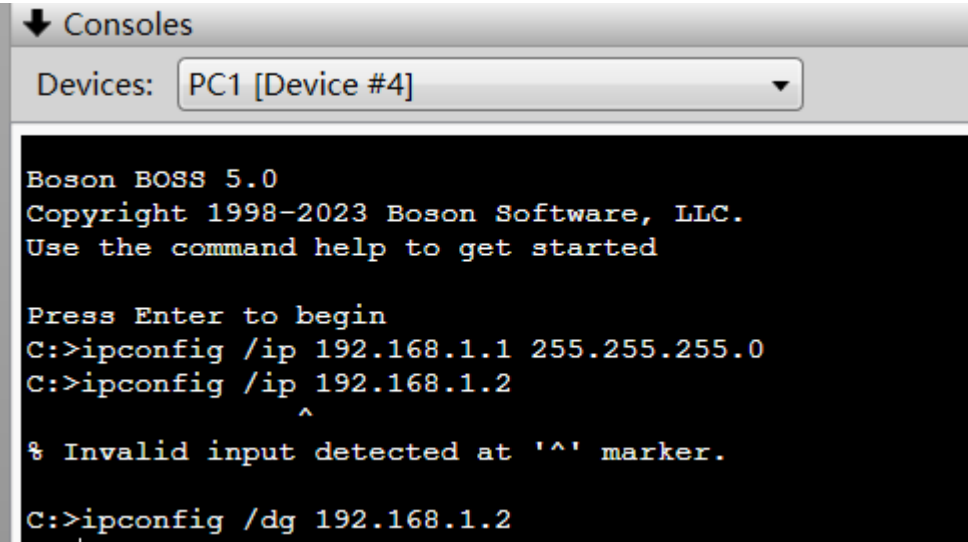
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router3
Router3(config)#int e0/0
Router3(config-if)#ip address 192.168.4.1 255.255.255.0
Router3(config-if)#no shut
00:04:26: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
00:04:27: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
Router3(config-if)#int s0/0
Router3(config-if)#encapsulation hdlc
Router3(config-if)#ip address 192.168.3.2 255.255.255.0
Router3(config-if)#no shut
00:04:57: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
00:04:59: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
Router3(config-if)#clock rate 64000
Router3(config-if)#end
```

配置代码： en -- 进入管理员权限  
conf t -- 进入配置模式  
int e0/0 -- 进入相对应的端口配置模式  
ip address ... -- 配置对应端口的ip地址即子网掩码  
clock rate 64000 -- 配置时钟间隔  
no shut -- 打开端口开始工作

3) 主机IP地址配置

主机号	主机IP	网关号	子网掩码
PC1	192.168.1.1	192.168.1.2	255.255.255.0
PC2	192.168.4.2	192.168.4.1	255.255.255.0

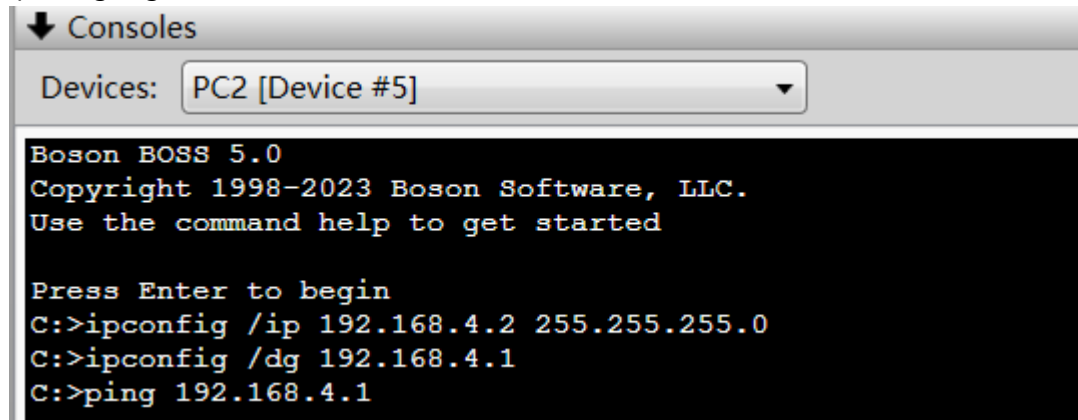
PC1配置命令：  
ipconfig /ip 192.168.1.1 255.255.255.0 -- 配置主机IP  
ipconfig /dg 192.168.1.2 -- 配置主机连接的端口号



The screenshot shows a console window titled "Consoles" with a dropdown menu set to "PC1 [Device #4]". The console output displays the Boson BOSS 5.0 startup message, followed by the user pressing Enter to begin. The user enters the command "C:>ipconfig /ip 192.168.1.1 255.255.255.0", then "C:>ipconfig /ip 192.168.1.2", which results in an error message: "% Invalid input detected at '^' marker." Finally, the user enters "C:>ipconfig /dg 192.168.1.2".

PC2配置命令：  
ipconfig /ip 192.168.4.2 255.255.255.0 -- 配置主机IP

ipconfig /dg 192.168.4.1 -- 配置主机连接的端口号



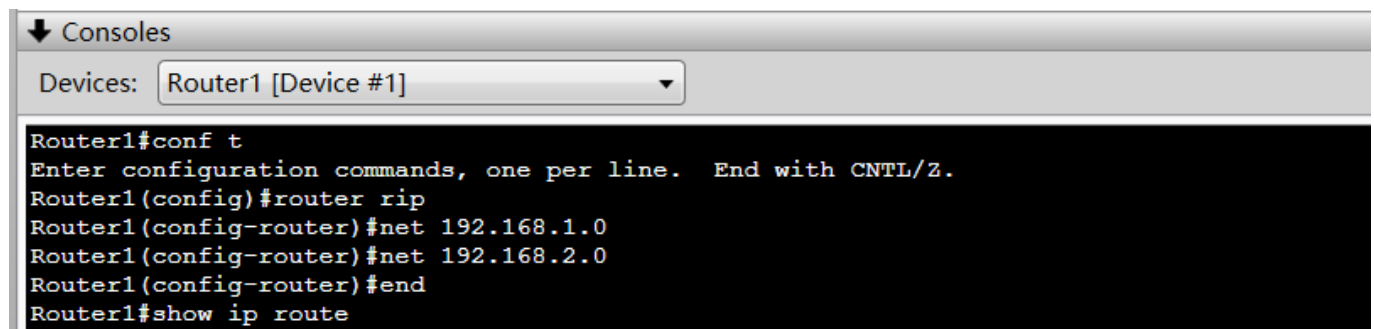
The screenshot shows a console window titled "Consoles" with a dropdown menu set to "PC2 [Device #5]". The terminal output displays the Boson BOSS 5.0 copyright notice and a series of commands entered at the C: prompt: ipconfig /ip 192.168.4.2 255.255.255.0, ipconfig /dg 192.168.4.1, and ping 192.168.4.1.

```
Boson BOSS 5.0
Copyright 1998-2023 Boson Software, LLC.
Use the command help to get started

Press Enter to begin
C:>ipconfig /ip 192.168.4.2 255.255.255.0
C:>ipconfig /dg 192.168.4.1
C:>ping 192.168.4.1
```

#### 4) 配置RIP协议

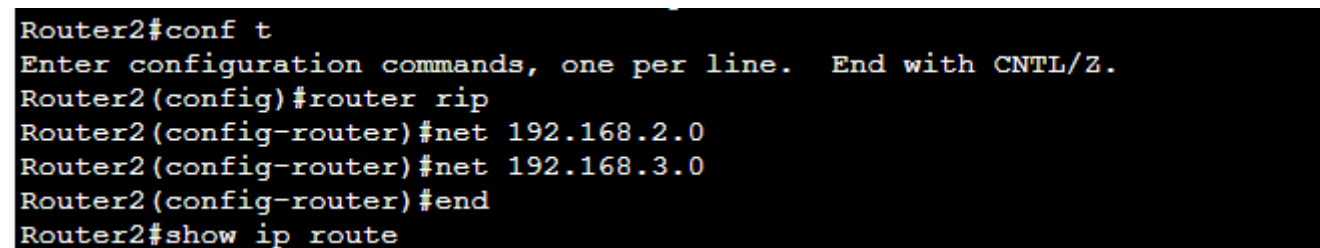
Router1:



The screenshot shows a console window titled "Consoles" with a dropdown menu set to "Router1 [Device #1]". The terminal output shows the configuration commands for Router1: Router1#conf t, Router1(config)#router rip, Router1(config-router)#net 192.168.1.0, Router1(config-router)#net 192.168.2.0, Router1(config-router)#end, and Router1#show ip route.

```
Router1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#router rip
Router1(config-router)#net 192.168.1.0
Router1(config-router)#net 192.168.2.0
Router1(config-router)#end
Router1#show ip route
```

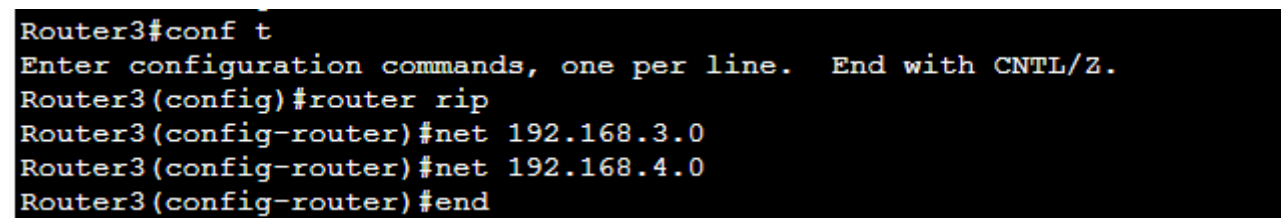
Router2:



The screenshot shows a console window titled "Consoles" with a dropdown menu set to "Router2 [Device #2]". The terminal output shows the configuration commands for Router2: Router2#conf t, Router2(config)#router rip, Router2(config-router)#net 192.168.2.0, Router2(config-router)#net 192.168.3.0, Router2(config-router)#end, and Router2#show ip route.

```
Router2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router2(config)#router rip
Router2(config-router)#net 192.168.2.0
Router2(config-router)#net 192.168.3.0
Router2(config-router)#end
Router2#show ip route
```

Router3:



The screenshot shows a console window titled "Consoles" with a dropdown menu set to "Router3 [Device #3]". The terminal output shows the configuration commands for Router3: Router3#conf t, Router3(config)#router rip, Router3(config-router)#net 192.168.3.0, Router3(config-router)#net 192.168.4.0, and Router3(config-router)#end.

```
Router3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router3(config)#router rip
Router3(config-router)#net 192.168.3.0
Router3(config-router)#net 192.168.4.0
Router3(config-router)#end
```

rip协议配置代码：使用router rip进入rip协议配置 按顺序使用 net + ip 配置子网 end 结束配置

#### 5) 各路由器路由表：

Router1:

```
Router1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route

Gateway of last resort is not set

C    192.168.1.0 is directly connected, Ethernet0/0
C    192.168.2.0 is directly connected, Serial0/0
R    192.168.3.0 [120/1] via 192.168.2.2, 00:03:16, Serial0/0
R    192.168.4.0 [120/2] via 192.168.2.2, 00:04:24, Serial0/0
```

Router2:

```
Router2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route

Gateway of last resort is not set

C    192.168.2.0 is directly connected, Serial0/0
C    192.168.3.0 is directly connected, Serial0/1
R    192.168.1.0 [120/1] via 192.168.2.1, 00:07:36, Serial0/0
R    192.168.4.0 [120/1] via 192.168.3.2, 00:09:15, Serial0/1
```

Router3:

```
Router3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route

Gateway of last resort is not set

C    192.168.4.0 is directly connected, Ethernet0/0
C    192.168.3.0 is directly connected, Serial0/0
R    192.168.2.0 [120/1] via 192.168.3.1, 00:04:29, Serial0/0
R    192.168.1.0 [120/2] via 192.168.3.1, 00:03:43, Serial0/0
```

可以观察到除了各个路由器表中既有标示为C的直接相连的设备，也有标示为R的通过RIP协议产生的没有直接相连的设备的路由项，这为双向ping通提供了基础。

## 6) 双向ping通

PC1 ping通 PC2

```
Devices: PC1 [Device #4]

C:>ping 192.168.4.2

Pinging 192.168.4.2 with 32 bytes of data:
Reply from 192.168.4.2: bytes=32 time=70ms TTL=241
Reply from 192.168.4.2: bytes=32 time=55ms TTL=241
Reply from 192.168.4.2: bytes=32 time=56ms TTL=241
Reply from 192.168.4.2: bytes=32 time=60ms TTL=241
Reply from 192.168.4.2: bytes=32 time=65ms TTL=241

Ping statistics for 192.168.4.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 55ms, Maximum = 70ms, Average = 61ms

C:>
```

PC2 ping通 PC1

```
↓ Consoles

Devices: PC2 [Device #5]

C:>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time=65ms TTL=241
Reply from 192.168.1.1: bytes=32 time=63ms TTL=241
Reply from 192.168.1.1: bytes=32 time=49ms TTL=241
Reply from 192.168.1.1: bytes=32 time=60ms TTL=241
Reply from 192.168.1.1: bytes=32 time=72ms TTL=241

Ping statistics for 192.168.1.1:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 49ms, Maximum = 72ms, Average = 62ms

C:>
```

包丢失率为0，双向ping通

## 五、心得体会

通过本次实验，让我掌握了Boson Netsim模拟器的使用方法，学会了在Boson中使用配置路由器和主机IP、连接以及使用RIP协议动态维护路由表。经过本次实验，让我对路由器的工作原理有了更清晰的认识，对网络间的通信有了更深的了解。