

# 路由器基本配置

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## 一、实验目的

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- 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

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- 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;
- 3) 实验配置完成后，两台主机要能够相互 ping 通。

## 三、实验步骤

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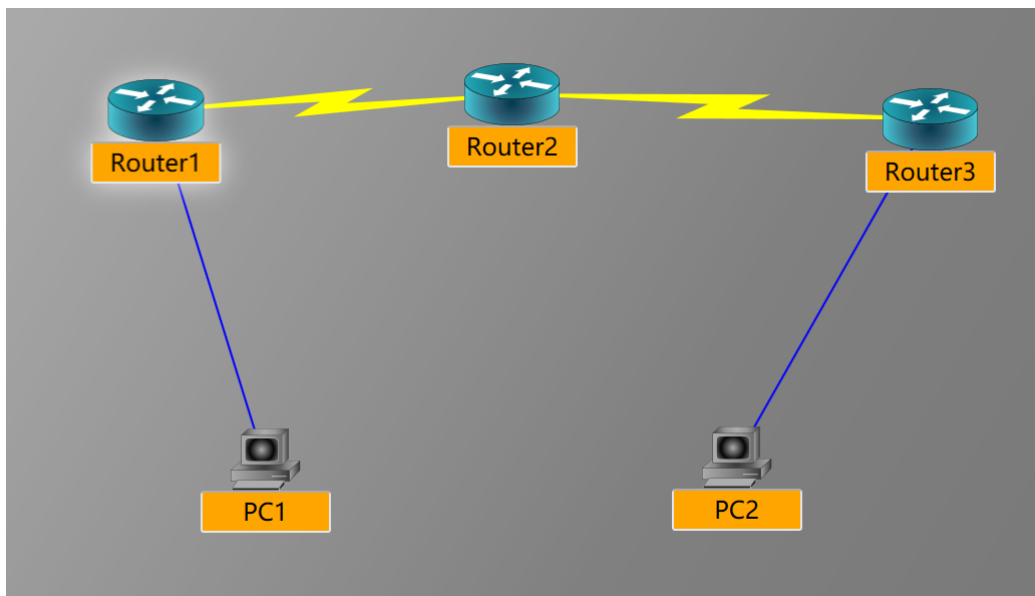
- 1) 连接拓扑图;
- 2) 配置各个路由器的名称、端口 IP 地址、子网掩码、封装格式及时钟频率;
- 3) 配置各个主机的 IP 地址、子网掩码、以及与其相连的路由器端口地址;
- 4) 为各个路由器配置 RIP 协议。
- 5) 主机之间双向ping通。
- 6) 查看路由器的路由表。

## 四、实验过程及结果

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### 1) 网络拓扑图:

路由器选用3620型，Router1和Router3均有1个Ethernet接口和1个Serial接口；Router2由4个Serial接口；PC均为Ethernet接口，PC的类型为WinPC。将PC1和Router1、PC2和Router3用Ethernet接口连接；将路由器之间用Serial接口连接，绘制拓扑图。



PC1:

**PC1**

Device Statistics  
**Device Type: PC**  
 Model: WinPC

Disconnected Interfaces  
 Console0

Connected Interfaces

Local Interface	Remote Device	Remote Interface
Ethernet0	Router1	Ethernet0/0

PC2:

**PC2**

Device Statistics  
**Device Type: PC**  
 Model: WinPC

Disconnected Interfaces  
 Console0

Connected Interfaces

Local Interface	Remote Device	Remote Interface
Ethernet0	Router3	Ethernet0/0

Router1:

**Router1**

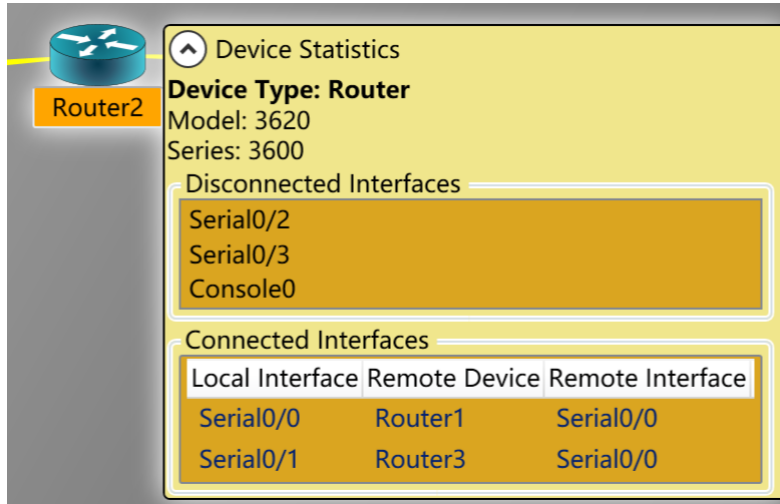
Device Statistics  
**Device Type: Router**  
 Model: 3620  
 Series: 3600

Disconnected Interfaces  
 Console0

Connected Interfaces

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

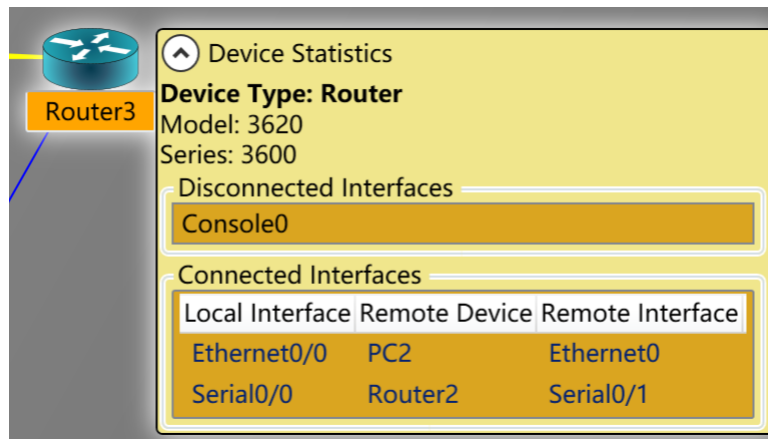
## Router2:



The screenshot shows the configuration page for Router2. On the left is a router icon labeled 'Router2'. The main panel is titled 'Device Statistics' and shows 'Device Type: Router', 'Model: 3620', and 'Series: 3600'. It has two sections: 'Disconnected Interfaces' and 'Connected Interfaces'. The 'Disconnected Interfaces' section lists 'Serial0/2', 'Serial0/3', and 'Console0'. The 'Connected Interfaces' section contains a table with three columns: 'Local Interface', 'Remote Device', and 'Remote Interface'.

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

## Router3:



The screenshot shows the configuration page for Router3. On the left is a router icon labeled 'Router3'. The main panel is titled 'Device Statistics' and shows 'Device Type: Router', 'Model: 3620', and 'Series: 3600'. It has two sections: 'Disconnected Interfaces' and 'Connected Interfaces'. The 'Disconnected Interfaces' section lists 'Console0'. The 'Connected Interfaces' section contains a table with three columns: 'Local Interface', 'Remote Device', and 'Remote Interface'.

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

## 2)配置路由器:

R1: 左端口 192.168.1.1, 右端口 192.168.2.1

```
en
conf t
hostname R1
int e0/0
ip address 192.168.1.1 255.255.255.0
no shut
int s0/0
encapsulation hdlc
ip address 192.168.2.1 255.255.255.0
no shut
clock rate 64000
end
```

```
Consoles
Devices: Router1 [Device #1]

Press Enter to Start

Router1>en
Router1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#hostname R1
R1(config)#int e0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shut
00:01:05: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
00:01:05: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R1(config-if)#int s0/0
R1(config-if)#encapsulation hdlc
R1(config-if)#ip address 192.168.2.1 255.255.255.0
R1(config-if)#no shut
00:01:47: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
00:01:53: %LINK-3-UPDOWN: Interface Serial0/0, changed state to down
R1(config-if)#clock rate 64000
R1(config-if)#end
R1#
```

R2: 左端口 192.168.2.2, 右端口 192.168.3.1

```
en
conf t
hostname R2
int s0/0
encapsulation hdlc
ip address 192.168.2.2 255.255.255.0
no shut
clock rate 64000
int s0/1
encapsulation hdlc
ip address 192.168.3.1 255.255.255.0
no shut
clock rate 64000
end
```

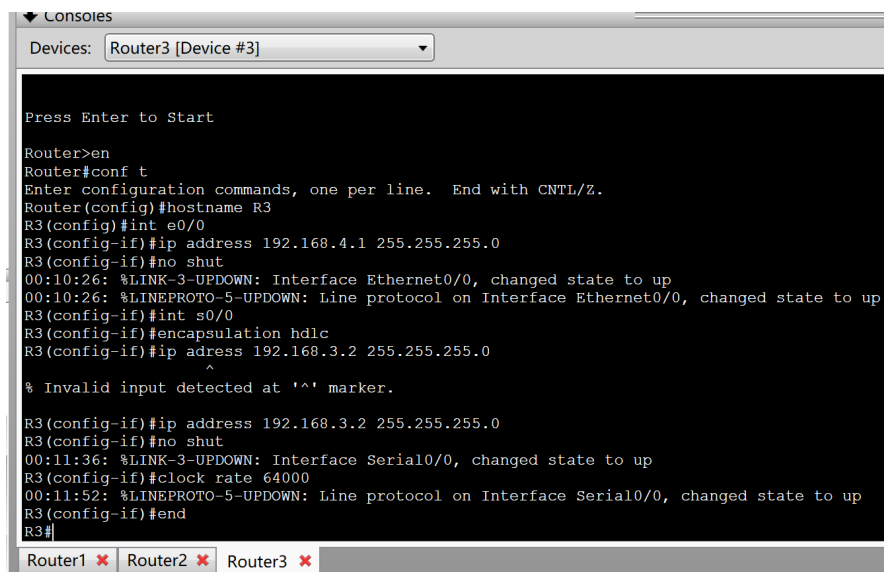
```
Consoles
Devices: Router2 [Device #2]

Press Enter to Start

Router2>en
Router2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router2(config)#hostname R2
R2(config)#int s0/0
R2(config-if)#encapsulation hdlc
R2(config-if)#ip address 192.168.2.2 255.255.255.0
R2(config-if)#no shut
00:06:06: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
00:06:07: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
R2(config-if)#clock rate 64000
R2(config-if)#int s0/1
R2(config-if)#encapsulation hdlc
R2(config-if)#ip address 192.168.3.1 255.255.255.0
R2(config-if)#no shut
00:07:23: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
00:07:25: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up
00:07:31: %LINK-3-UPDOWN: Interface Serial0/1, changed state to down
00:07:31: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to down
R2(config-if)#clock rate 64000
R2(config-if)#end
R2#
```

R3: 左端口 192.168.3.2, 右端口 192.168.4.1

```
en
conf t
hostname R3
int e0/0
ip address 192.168.4.1 255.255.255.0
no shut
int s0/0
encapsulation hdlc
ip address 192.168.3.2 255.255.255.0
no shut
clock rate 64000
end
```



The screenshot shows a console window titled "Consoles" with a dropdown menu set to "Router3 [Device #3]". The terminal output displays the following sequence of commands and system messages:

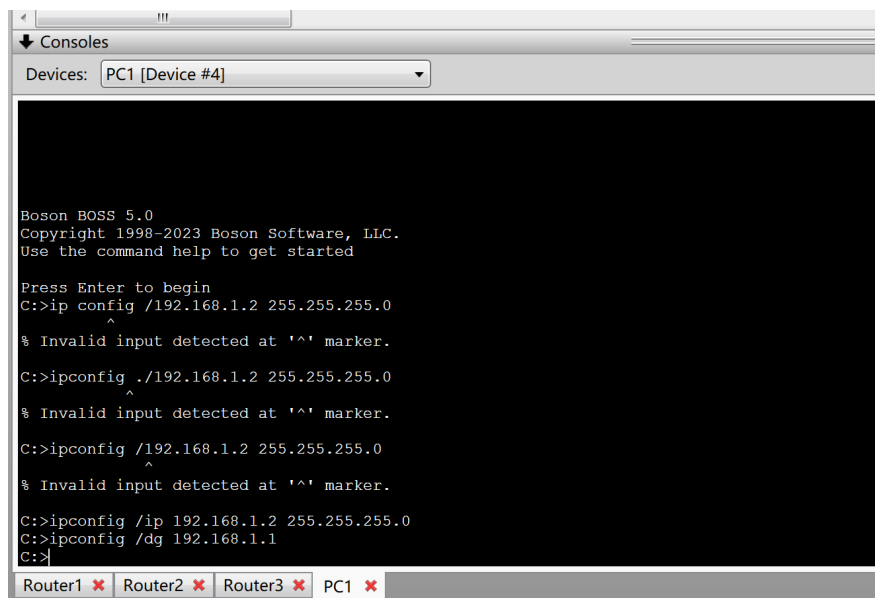
```
Press Enter to Start
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#int e0/0
R3(config-if)#ip address 192.168.4.1 255.255.255.0
R3(config-if)#no shut
00:10:26: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
00:10:26: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R3(config-if)#int s0/0
R3(config-if)#encapsulation hdlc
R3(config-if)#ip address 192.168.3.2 255.255.255.0
^
% Invalid input detected at '^' marker.
R3(config-if)#ip address 192.168.3.2 255.255.255.0
R3(config-if)#no shut
00:11:36: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
R3(config-if)#clock rate 64000
00:11:52: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
R3(config-if)#end
R3#
```

At the bottom of the window, there are three tabs labeled "Router1", "Router2", and "Router3", each with a red 'X' icon.

### 3) 主机配置:

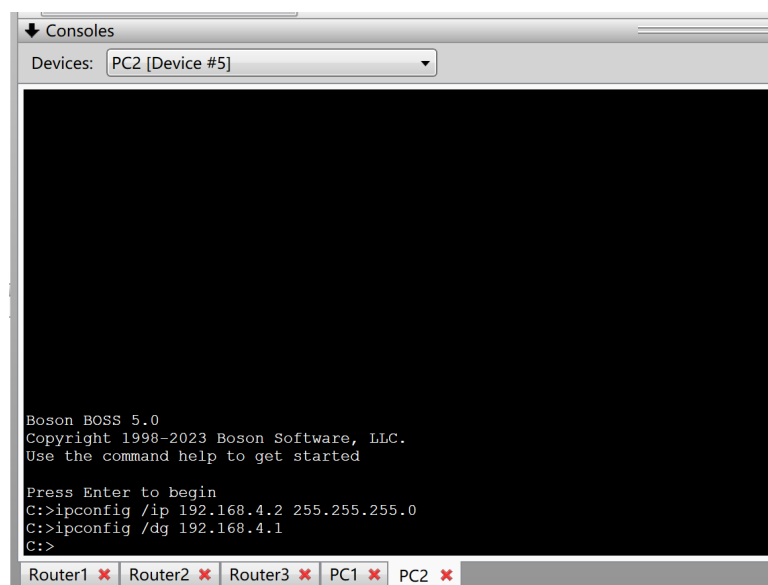
PC1: ip 地址 192.168.1.2, 网关 192.168.1.1

```
ipconfig /ip 192.168.1.2 255.255.255.0
ipconfig /dg 192.168.1.1
```



PC2: ip 地址 192.168.4.2, 网关 192.168.4.1

```
ipconfig /ip 192.168.4.2 255.255.255.0
ipconfig /dg 192.168.4.1
```



#### 4) RIP配置:

R1:

```
conf t
router rip
net 192.168.1.0
net 192.168.2.0
end
```

```

R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#net 192.168.1.0
      ^
% Invalid input detected at '^' marker.

R1(config)#router rip
R1(config-router)#net 192.168.1.0
R1(config-router)#net 192.168.2.0
R1(config-router)#end
R1#

```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

R2:

```

conf t
router rip
net 192.168.2.0
net 192,168.3.0
end

```

```

R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router rip
R2(config-router)#net 192.168.2.0
R2(config-router)#net 192.168.3.0
R2(config-router)#end
R2#

```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

R3:

```

conf t
router rip
net 192.168.3.0
net 192,168.4.0
end

```

```

R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router rip
R3(config-router)#net 192.168.3.0
R3(config-router)#net 192.168.4.0
R3(config-router)#end
R3#

```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

## 5) 双向ping:

PC1->PC2: `ping 192.168.4.2`

```
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=54ms TTL=241
Reply from 192.168.4.2: bytes=32 time=52ms TTL=241
Reply from 192.168.4.2: bytes=32 time=71ms TTL=241
Reply from 192.168.4.2: bytes=32 time=56ms TTL=241
Reply from 192.168.4.2: bytes=32 time=52ms 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 = 52ms, Maximum = 71ms, Average = 57ms

C:>
```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

PC2->PC1: `ping 192.168.1.2`

```
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=64ms TTL=241
Reply from 192.168.1.2: bytes=32 time=71ms TTL=241
Reply from 192.168.1.2: bytes=32 time=51ms TTL=241
Reply from 192.168.1.2: bytes=32 time=67ms TTL=241
Reply from 192.168.1.2: bytes=32 time=67ms TTL=241

Ping statistics for 192.168.1.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 51ms, Maximum = 71ms, Average = 64ms

C:>
```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

## 6)路由表:

`show ip route`

R1:

```
R1#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, 00:05:31, Serial0/0
R    192.168.4.0 [120/2] via 192.168.2.2, 00:08:33, Serial0/0

R1#
```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

R2:



```

R2#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    192.168.4.0 [120/1] via 192.168.3.2, 00:04:38, Serial0/1
R    192.168.1.0 [120/1] via 192.168.2.1, 00:04:42, Serial0/0

R2#

```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖

R3:

```

R3#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, 00:03:34, Serial0/0
R    192.168.1.0 [120/2] via 192.168.3.1, 00:08:39, Serial0/0

R3#

```

Router1 ✖ Router2 ✖ Router3 ✖ PC1 ✖ PC2 ✖