

# 实验任务 4：动态路由设计与实施

## 一、实验目的

分析网络需求，设计网络动态路由，配置路由进行网络测试，比较两种动态路由算法生成的路由表。

## 二、实验任务

- 1) 设计动态路由
- 2) 路由测试
- 3) 应用数据协议分析

## 三、实验内容：

### 3.1 动态路由设计

网络拓扑就是用实验 3 中的网络拓扑。

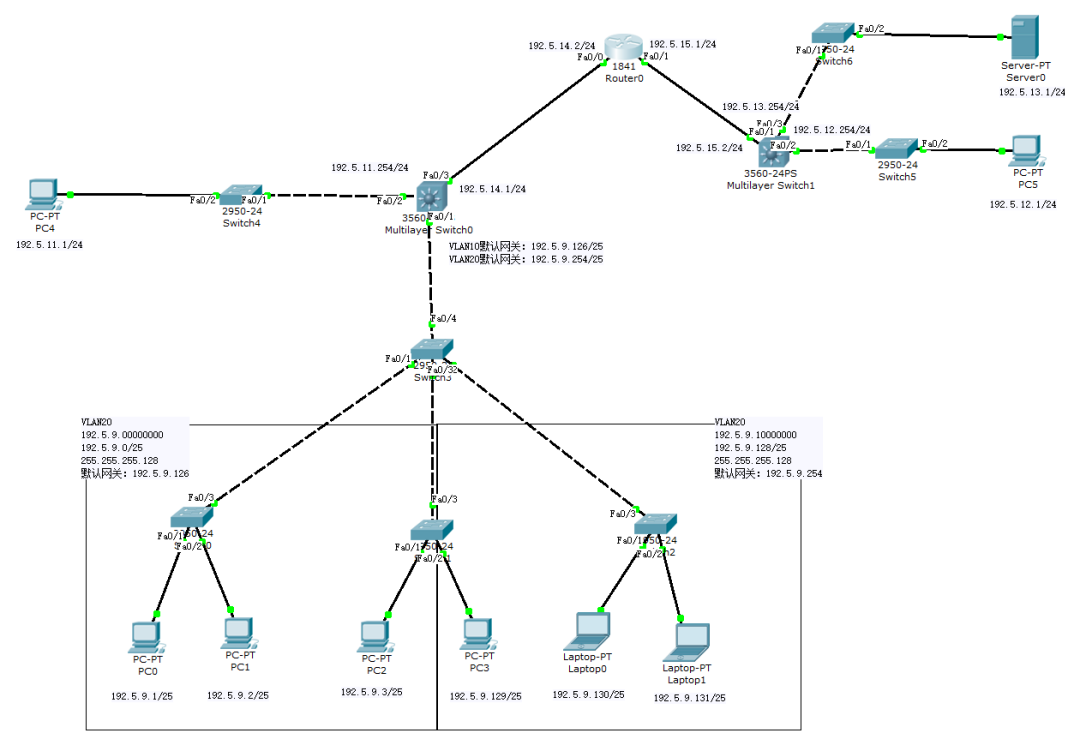


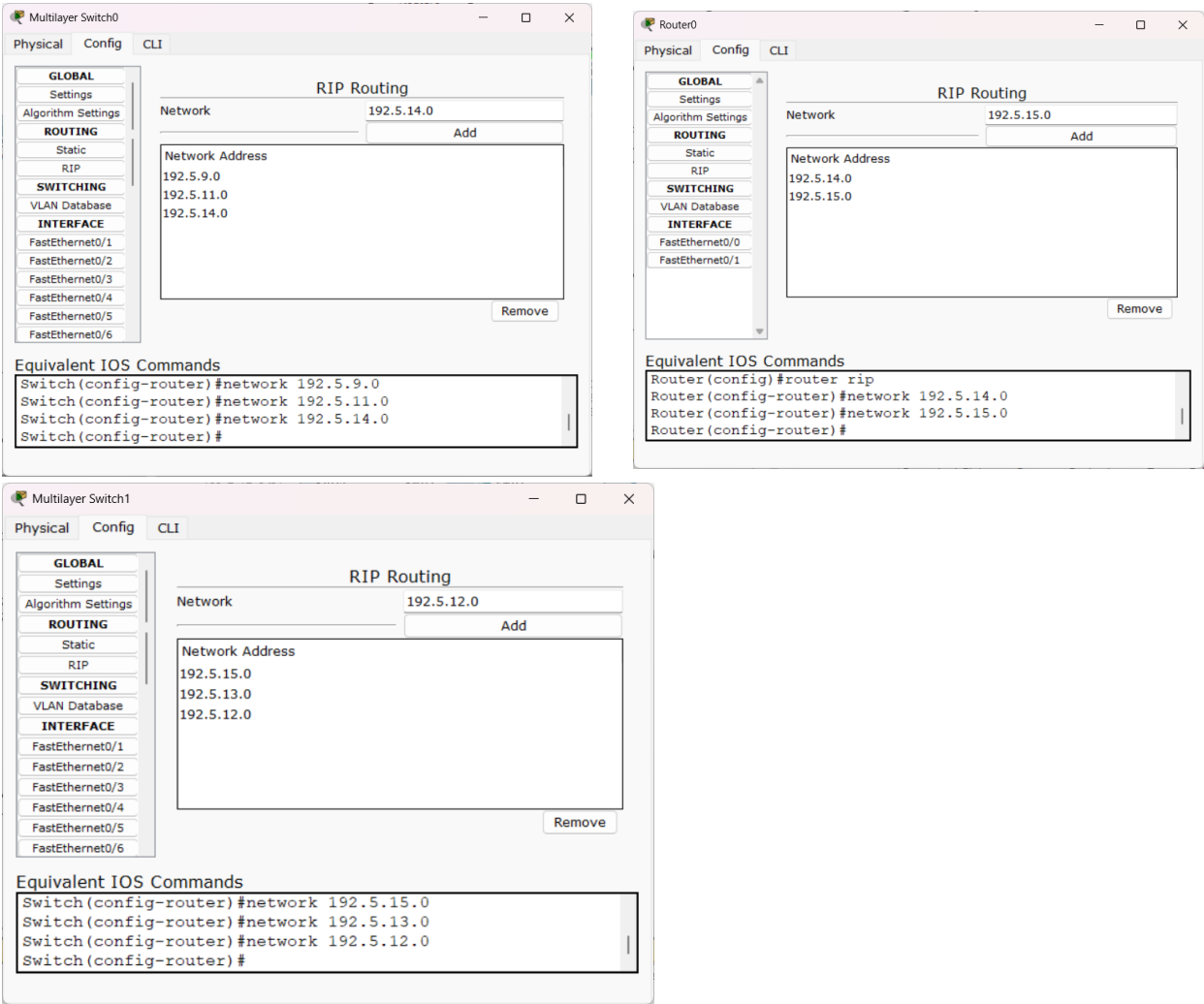
图 4.1 企业网拓扑示意图

网络设备分别将自身端口连接的网络地址加入到自身的 RIP 列表中，路由器通过

RIP 协议与相邻路由器交换路由表，自动学习路由，直到全网同步所有路由信息。

### 3.2 配置过程

首先删除路由器和三层交换机中的静态路由表：  
用图形界面的方式配置 rip 协议动态路由：



我切换到仿真环境，进行了 rip 协议报文的转发（路由器之间周期性的转发 rip 报文），然后查看各个路由器和三层交换机的路由表：

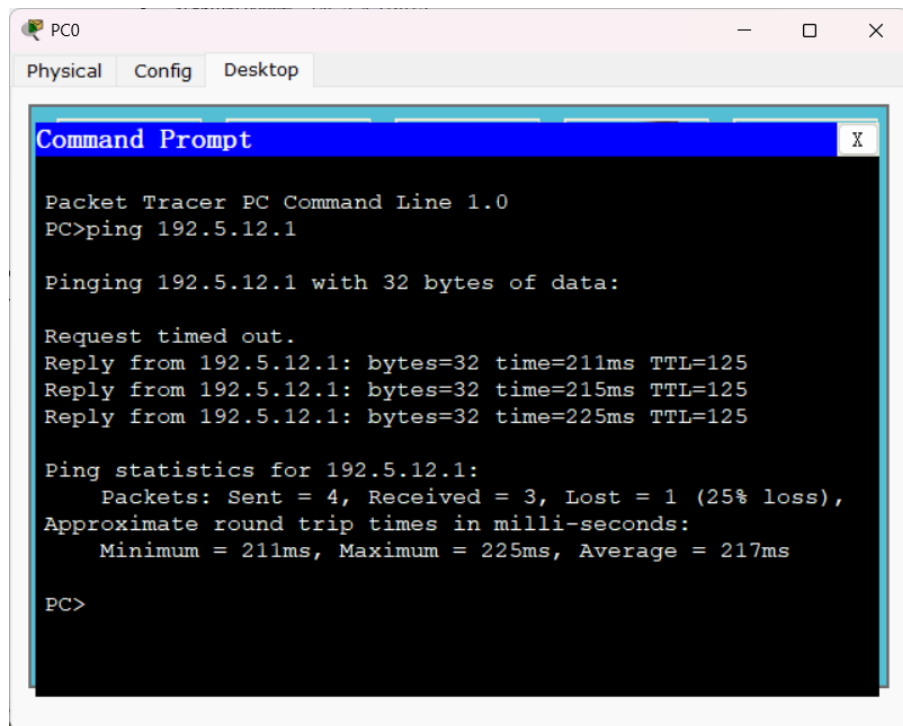
Routing Table for Multilayer Switch0				
Type	Network	Port	Next Hop IP	Metric
C	192.5.11.0/24	FastEthernet0/2	---	0/0
C	192.5.14.0/24	FastEthernet0/3	---	0/0
C	192.5.9.0/25	Vlan10	---	0/0
C	192.5.9.128/25	Vlan20	---	0/0
R	192.5.12.0/24	FastEthernet0/3	192.5.14.2	120/2
R	192.5.13.0/24	FastEthernet0/3	192.5.14.2	120/2
R	192.5.15.0/24	FastEthernet0/3	192.5.14.2	120/1

Routing Table for Router0				
Type	Network	Port	Next Hop IP	Metric
C	192.5.15.0/24	FastEthernet0/1	---	0/0
C	192.5.14.0/24	FastEthernet0/0	---	0/0
R	192.5.11.0/24	FastEthernet0/0	192.5.14.1	120/1
R	192.5.12.0/24	FastEthernet0/1	192.5.15.2	120/1
R	192.5.13.0/24	FastEthernet0/1	192.5.15.2	120/1
R	192.5.9.0/24	FastEthernet0/0	192.5.14.1	120/1

Routing Table for Multilayer Switch1				
Type	Network	Port	Next Hop IP	Metric
C	192.5.12.0/24	FastEthernet0/2	---	0/0
C	192.5.13.0/24	FastEthernet0/3	---	0/0
C	192.5.15.0/24	FastEthernet0/1	---	0/0
R	192.5.11.0/24	FastEthernet0/1	192.5.15.1	120/2
R	192.5.14.0/24	FastEthernet0/1	192.5.15.1	120/1
R	192.5.9.0/24	FastEthernet0/1	192.5.15.1	120/2

### 3.3 连通性测试

Pc0 (192.5.9.1/25) ping pc5 (192.5.12.1/24) :



The screenshot shows a Packet Tracer PC window for PC0. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The command prompt shows the execution of the command 'ping 192.5.12.1'. The output indicates that the first packet request timed out, while the subsequent three packets were received successfully. The statistics show a 25% loss (1 out of 4 packets) and an average round trip time of 217ms.

```
PC0
Physical Config Desktop
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.5.12.1

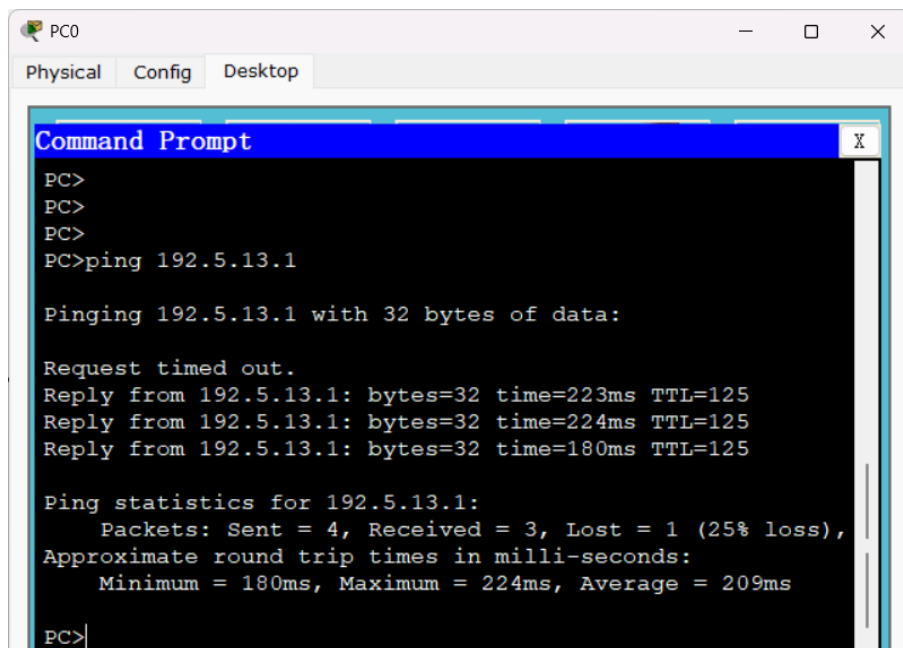
Pinging 192.5.12.1 with 32 bytes of data:

Request timed out.
Reply from 192.5.12.1: bytes=32 time=211ms TTL=125
Reply from 192.5.12.1: bytes=32 time=215ms TTL=125
Reply from 192.5.12.1: bytes=32 time=225ms TTL=125

Ping statistics for 192.5.12.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 211ms, Maximum = 225ms, Average = 217ms

PC>
```

Pc0 (192.5.9.1/25) ping 服务器 server0 (192.5.13.1/24) :



The screenshot shows the same PC0 window, but now the command 'ping 192.5.13.1' has been entered. The output shows a similar result: one request timed out, and three replies were received. The statistics indicate a 25% loss (1 out of 4 packets) and an average round trip time of 209ms.

```
PC0
Physical Config Desktop
Command Prompt
PC>
PC>
PC>
PC>ping 192.5.13.1

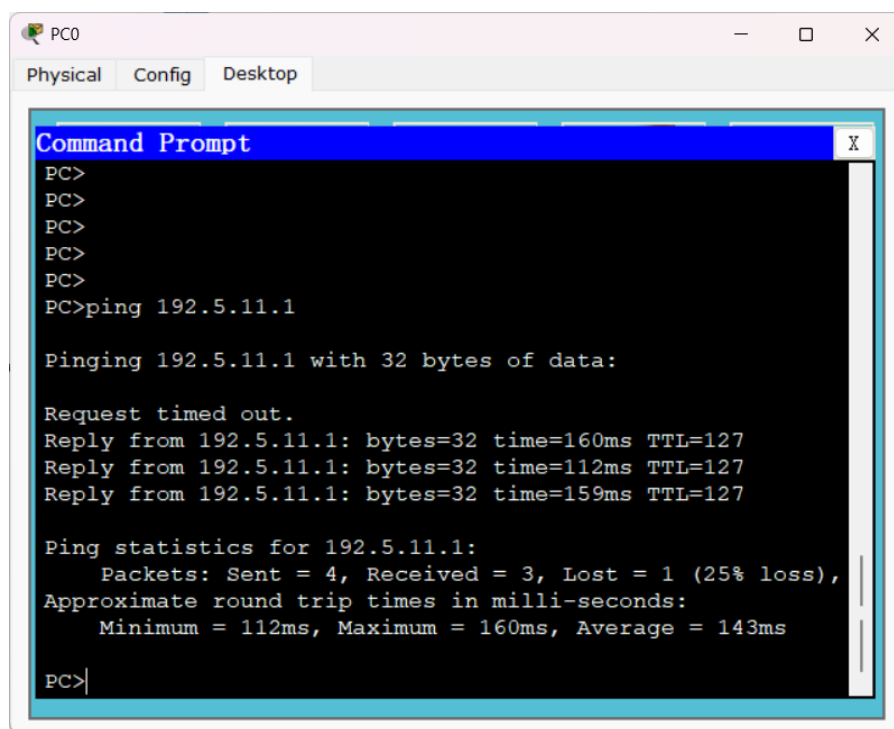
Pinging 192.5.13.1 with 32 bytes of data:

Request timed out.
Reply from 192.5.13.1: bytes=32 time=223ms TTL=125
Reply from 192.5.13.1: bytes=32 time=224ms TTL=125
Reply from 192.5.13.1: bytes=32 time=180ms TTL=125

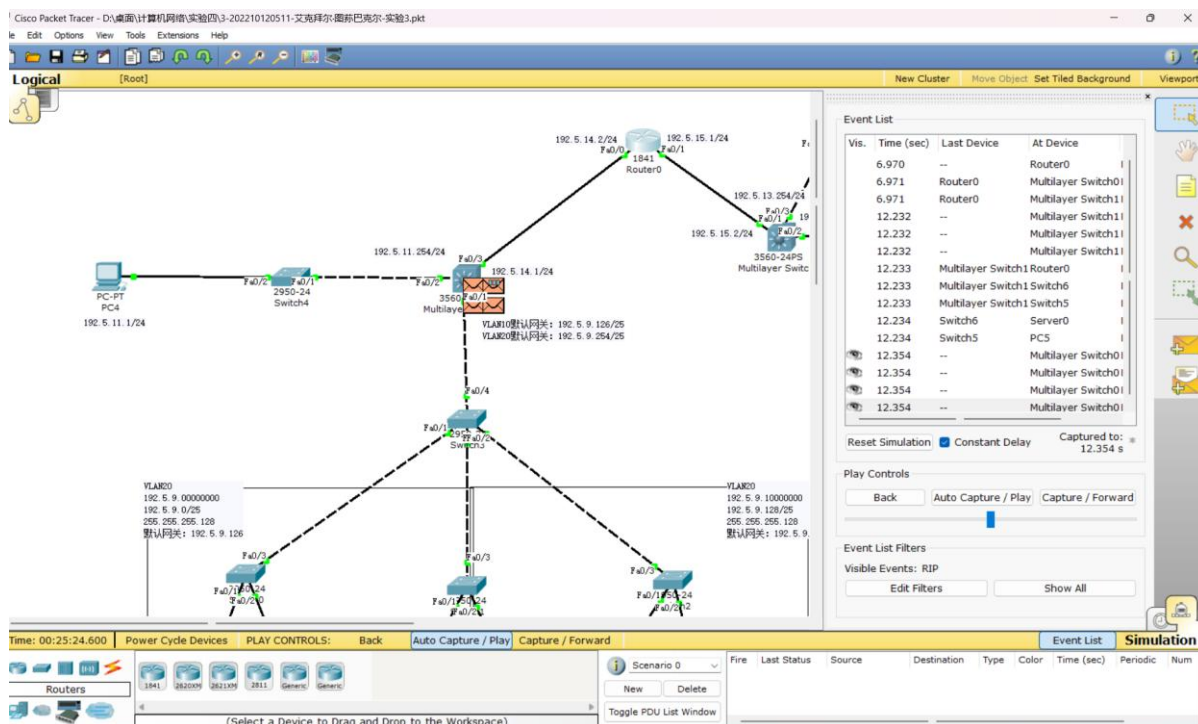
Ping statistics for 192.5.13.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 180ms, Maximum = 224ms, Average = 209ms

PC>
```

Pc0 (192.5.9.1/25) ping pc4 (192.5.11.1/24) :



### 3.4RIP 协议抓包



分析 pdu 在 Multilayer Switch1 中的 rip 协议:

PDU Information at Device: Multilayer Switch1

OSI Model
Outbound PDU Details

At Device: Multilayer Switch1  
Source: Multilayer Switch1  
Destination: 255.255.255.255

In Layers

Layer7  
Layer6  
Layer5  
Layer4  
Layer3  
Layer2  
Layer1

Out Layers

Layer 7: RIP Version: 1, Command: 2  
Layer6  
Layer5  
Layer 4: UDP Src Port: 520, Dst Port: 520  
Layer 3: IP Header Src. IP: 192.5.15.2, Dest. IP: 255.255.255.255  
Layer 2: Ethernet II Header 0040.08DB.0901 >> FFFF.FFFF.FFFF  
Layer 1: Port(s): FastEthernet0/1

1. The router builds a periodic RIP update packet to send out to FastEthernet0/1.  
2. The router adds an update route 192.5.12.0 to the RIP packet.  
3. The router adds an update route 192.5.13.0 to the RIP packet.

Challenge Me
<< Previous Layer
Next Layer >>

PDU Information at Device: Multilayer Switch1

OSI Model
Outbound PDU Details

PDU Formats

Ethernet II

0 4 8 14 19 Bytes

PREAMBLE: 101010...1011		DEST MAC: FFFF.FFFF.FFFF	SRC MAC: 0040.08DB.0901
TYPE: 0x800	DATA (VARIABLE LENGTH)		FCS: 0x0

IP

0 4 8 16 19 31 Bits

4	IHL	DSCP: 0x0	TL: 72
ID: 0x78		0x0	0x0
TTL: 255	PRO: 0x11	CHKSUM	
SRC IP: 192.5.15.2			
DST IP: 255.255.255.255			
OPT: 0x0		0x0	
DATA (VARIABLE LENGTH)			

UDP

0 16 31 Bits

SRC PORT: 520	DEST PORT: 520
LENGTH: 0x34	CHECKSUM: 0x0
DATA (VARIABLE)	

RIP v.1

0 4 8 16 19 31 Bits

CMD: 0x2	VER: 0x1	0000 0000 0000 0000
ADDR FAMILY: 0x2	0000 0000 0000 0000	
NETWORK: 192.5.12.0		
0000 0000 0000 0000		
NEXT HOP: 0.0.0.0		
METRIC: 0x1		
ADDR FAMILY: 0x2	0000 0000 0000 0000	
NETWORK: 192.5.13.0		
0000 0000 0000 0000		
NEXT HOP: 0.0.0.0		
METRIC: 0x1		