

计算机网络第三次实验

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1 子网划分方案

假设分配到的网段为 168.6.0.0/16，划分方式为

区域	子网
东区	168.6.0.0/24
西区	168.6.1.0/24
南区	168.6.2.0/24
北区	168.6.3.0/24
中区	168.6.4.0/24
中区-东区路由	168.6.5.0/24
中区-西区路由	168.6.6.0/24
中区-南区路由	168.6.7.0/24
中区-北区路由	168.6.8.0/24

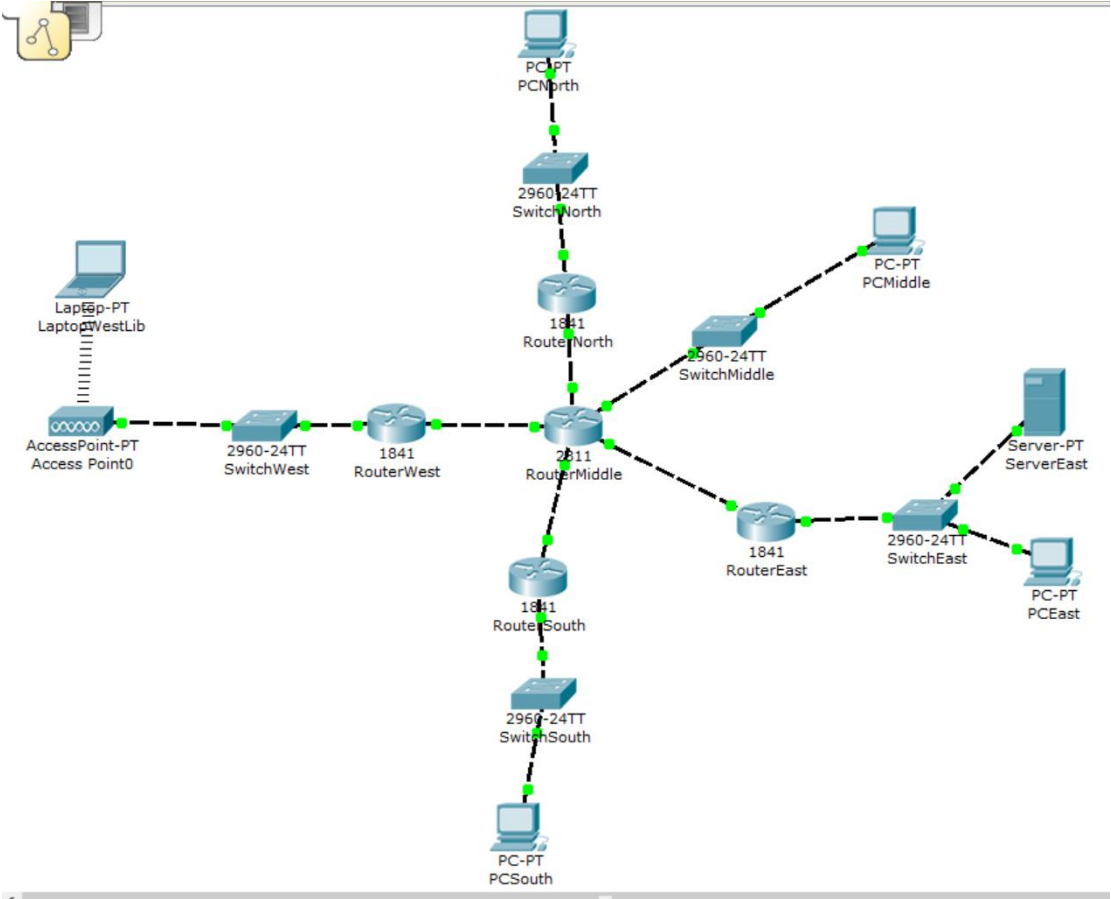
路由器接口连接以及 IP 分配为：

Device	Interface	IP Address	Mask	To Device	To Interface
RouterMiddle	FastEthernet0/1	168.6.5.1	255.255.255.0	RouterEast	FastEthernet0/0
	FastEthernet1/1	168.6.6.1		RouterWest	FastEthernet0/0
	FastEthernet1/0	168.6.7.1		RouterSouth	FastEthernet0/0
	FastEthernet0/0	168.6.8.1		RouterNorth	FastEthernet0/0
	Ethernet0/2/0	168.6.4.1		SwitchMiddle	
RouterEast	FastEthernet0/0	168.6.5.2	255.255.255.0	RouterMiddle	FastEthernet0/0
	FastEthernet0/1	168.6.0.1		SwitchEast	
RouterWest	FastEthernet0/0	168.6.6.2	255.255.255.0	RouterMiddle	FastEthernet0/1
	FastEthernet0/1	168.6.1.1		SwitchWest	
RouterSouth	FastEthernet0/0	168.6.7.2	255.255.255.0	MiddleRouter	FastEthernet1/0
	FastEthernet0/1	168.6.2.1		SwitchSouth	
RouterNorth	FastEthernet0/0	168.6.8.2	255.255.255.0	MiddleRouter	FastEthernet1/1
	FastEthernet0/1	168.6.3.1		SwitchNorth	

终端设备接口连接及 IP 分配为：

Device	IP Address	Mask	Gateway
PCEast	168.6.0.2		168.6.0.1
ServerEast	168.6.0.3		168.6.0.1
LaptopWestLib	168.6.1.2	255.255.255.0	168.6.1.1
PCSouth	168.6.2.2		168.6.2.1
PCNorth	168.6.3.2		168.6.3.1
PCMiddle	168.6.4.2		168.6.4.1

2 网络拓扑结构



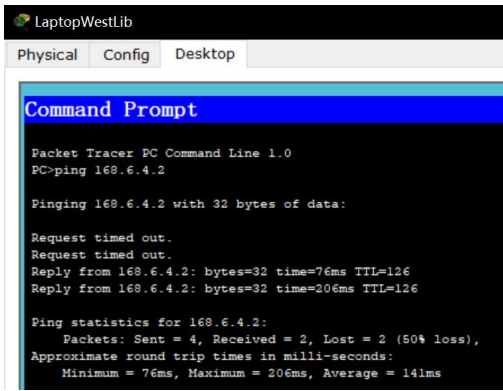
3 静态路由配置

3.1 静态路由配置表

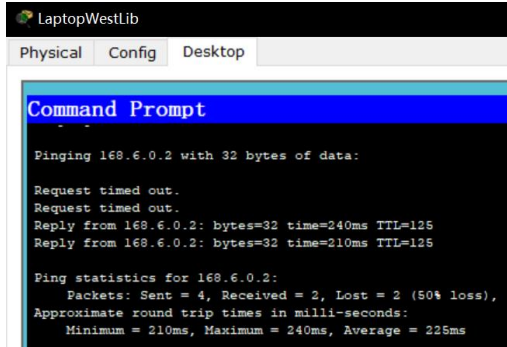
Router	Network	Mask	Next Hop
RouterMiddle	168.6.0.0	255.255.255.0	168.6.5.2
	168.6.1.0		168.6.6.2
	168.6.2.0		168.6.7.2
	168.6.3.0		168.6.8.2
RouterEast	168.6.1.0	255.255.255.0	168.6.5.1
	168.6.2.0		168.6.5.1
	168.6.3.0		168.6.5.1
	168.6.4.0		168.6.5.1
RouterWest	168.6.0.0	255.255.255.0	168.6.6.1
	168.6.2.0		168.6.6.1
	168.6.3.0		168.6.6.1
	168.6.4.0		168.6.6.1
RouterSouth	168.6.0.0	255.255.255.0	168.6.7.1
	168.6.1.0		168.6.7.1
	168.6.3.0		168.6.7.1
	168.6.4.0		168.6.7.1
RouterNorth	168.6.0.0	255.255.255.0	168.6.8.1
	168.6.1.0		168.6.8.1
	168.6.2.0		168.6.8.1
	168.6.4.0		168.6.8.1

3.2 静态路由配置的验证（使用 ping，以西区 LAPTOP 为例）

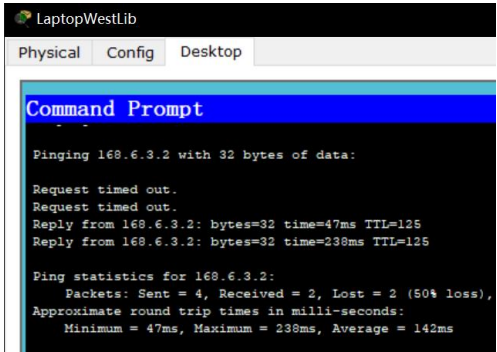
西区 LAPTOP-中区 PC



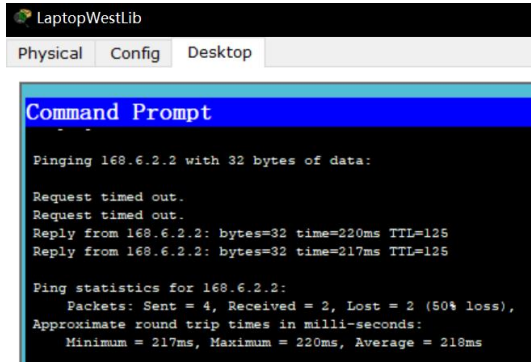
西区 LAPTOP-东区 PC



西区 LAPTOP-北区 PC

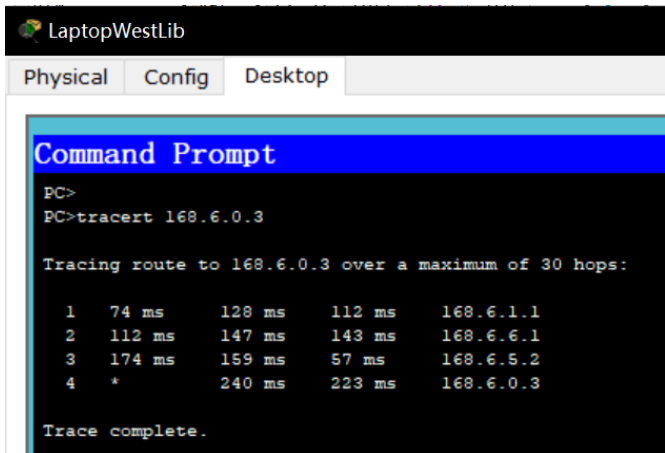


西区 LAPTOP-南区 PC



3.3 静态路由配置的验证（使用 tracert，以西区 LAPTOP 为例）

西区 LAPTOP-东区 Server



3.4 静态路由配置的路由表（使用 show ip route，以中区为例）

中区路由表

```
RouterMiddle
Physical Config CLI
IOS Command Line Interface

RouterMiddle>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobil
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF int
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
E1 - OSPF external type 1, E2 - OSPF external type 2, E
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
* - candidate default, U - per-user static route, o - O
P - periodic downloaded static route

Gateway of last resort is not set

168.6.0.0/24 is subnetted, 9 subnets
S 168.6.0.0 [1/0] via 168.6.5.2
S 168.6.1.0 [1/0] via 168.6.6.2
S 168.6.2.0 [1/0] via 168.6.7.2
S 168.6.3.0 [1/0] via 168.6.8.2
C 168.6.4.0 is directly connected, Ethernet0/2/0
C 168.6.5.0 is directly connected, FastEthernet0/1
C 168.6.6.0 is directly connected, FastEthernet1/1
C 168.6.7.0 is directly connected, FastEthernet1/0
C 168.6.8.0 is directly connected, FastEthernet0/0
RouterMiddle>
```

其中“C”表示成功连接。

4 动态路由配置（采用 RIP）

4.1 动态路由配置表

Router	Network
RouterMiddle	168.6.4.0
	168.6.5.0
	168.6.6.0
	168.6.7.0
	168.6.8.0
RouterEast	168.6.0.0
	168.6.5.0
RouterWest	168.6.1.0
	168.6.6.0
RouterSouth	168.6.2.0
	168.6.7.0
RouterNorth	168.6.3.0
	168.6.8.0

4.2 动态路由配置的验证（使用 ping，以西区 LAPTOP 为例）

西 区 LAPTOP- 中 区 PC

LaptopWestLib

PhysicalConfigDesktop

Command Prompt

Packet Tracer PC Command Line 1.0
PC>ping 168.6.4.2

Pinging 168.6.4.2 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 168.6.4.2: bytes=32 time=192ms TTL=126
Reply from 168.6.4.2: bytes=32 time=84ms TTL=126

Ping statistics for 168.6.4.2:
Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
Minimum = 84ms, Maximum = 192ms, Average = 138ms

西 区 LAPTOP- 东 区 PC

LaptopWestLib

PhysicalConfigDesktop

Command Prompt

PC>ping 168.6.0.2

Pinging 168.6.0.2 with 32 bytes of data:

Request timed out.
Reply from 168.6.0.2: bytes=32 time=244ms TTL=125
Reply from 168.6.0.2: bytes=32 time=224ms TTL=125
Reply from 168.6.0.2: bytes=32 time=208ms TTL=125

Ping statistics for 168.6.0.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 208ms, Maximum = 244ms, Average = 225ms

西区 LAPTOP-北区 PC

```
LaptopWestLib
Physical Config Desktop

Command Prompt
PC>ping 168.6.3.2

Pinging 168.6.3.2 with 32 bytes of data:

Request timed out.
Reply from 168.6.3.2: bytes=32 time=196ms TTL=125
Reply from 168.6.3.2: bytes=32 time=196ms TTL=125
Reply from 168.6.3.2: bytes=32 time=256ms TTL=125

Ping statistics for 168.6.3.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 196ms, Maximum = 256ms, Average = 215ms
```

西区 LAPTOP-南区 PC

```
LaptopWestLib
Physical Config Desktop

Command Prompt
PC>ping 168.6.2.2

Pinging 168.6.2.2 with 32 bytes of data:

Request timed out.
Reply from 168.6.2.2: bytes=32 time=243ms TTL=125
Reply from 168.6.2.2: bytes=32 time=77ms TTL=125
Reply from 168.6.2.2: bytes=32 time=33ms TTL=125

Ping statistics for 168.6.2.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 33ms, Maximum = 243ms, Average = 117ms
```

4.3 动态路由配置的验证（使用 tracer，以西区 LAPTOP 为例）

西区 LAPTOP-东区 Server

```
LaptopWestLib
Physical Config Desktop

Command Prompt
PC>tracert 168.6.0.3

Tracing route to 168.6.0.3 over a maximum of 30 hops:

  0  128 ms    113 ms    112 ms    168.6.1.1
  1  143 ms    159 ms    137 ms    168.6.6.1
  2  176 ms    176 ms    174 ms    168.6.5.2
  3  *         237 ms    247 ms    168.6.0.3

Trace complete.
```

4.4 动态路由配置的路由表（使用 show ip route，以中区为例）

中区路由表

```
RouterMiddle
Physical Config CLI

IOS Command Line Interface

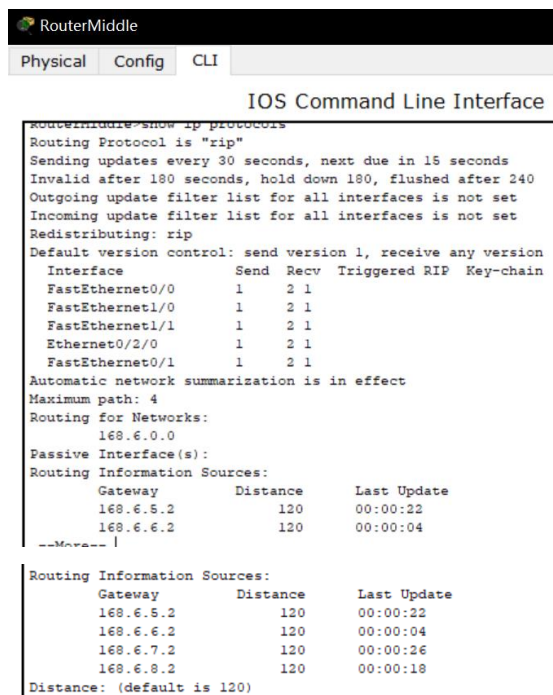
RouterMiddle>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter ar
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EG
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-I
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

    168.6.0.0/24 is subnetted, 9 subnets
R       168.6.0.0 [120/1] via 168.6.5.2, 00:00:13, FastEthernet0/1
R       168.6.1.0 [120/1] via 168.6.6.2, 00:00:23, FastEthernet1/1
R       168.6.2.0 [120/1] via 168.6.7.2, 00:00:15, FastEthernet1/0
R       168.6.3.0 [120/1] via 168.6.8.2, 00:00:05, FastEthernet0/0
C       168.6.4.0 is directly connected, Ethernet0/2/0
C       168.6.5.0 is directly connected, FastEthernet0/1
C       168.6.6.0 is directly connected, FastEthernet1/1
C       168.6.7.0 is directly connected, FastEthernet1/0
C       168.6.8.0 is directly connected, FastEthernet0/0
RouterMiddle>
```

4.5 IP 路由协议配置和统计信息（使用 show ip protocols，以中区为例）

中区 IP 路由协议配置和统计信息



```
RouterMiddle
Physical Config CLI
IOS Command Line Interface
RouterMiddle>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 15 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive any version
  Interface          Send  Recv  Triggered RIP  Key-chain
FastEthernet0/0      1      2      1
FastEthernet1/0      1      2      1
FastEthernet1/1      1      2      1
Ethernet0/2/0        1      2      1
FastEthernet0/1      1      2      1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
  168.6.0.0
Passive Interface(s):
Routing Information Sources:
  Gateway         Distance      Last Update
  168.6.5.2        120           00:00:22
  168.6.6.2        120           00:00:04
--More--
Routing Information Sources:
  Gateway         Distance      Last Update
  168.6.5.2        120           00:00:22
  168.6.6.2        120           00:00:04
  168.6.7.2        120           00:00:26
  168.6.8.2        120           00:00:18
Distance: (default is 120)
```

可以看到使用的是 RIP 协议，每 30s 更新一次，下一次更新在 15s 后，并且给出了发送和收到的次数等信息。最后列出了路由信息。