Implementing Enterprise Routing and Switching Network

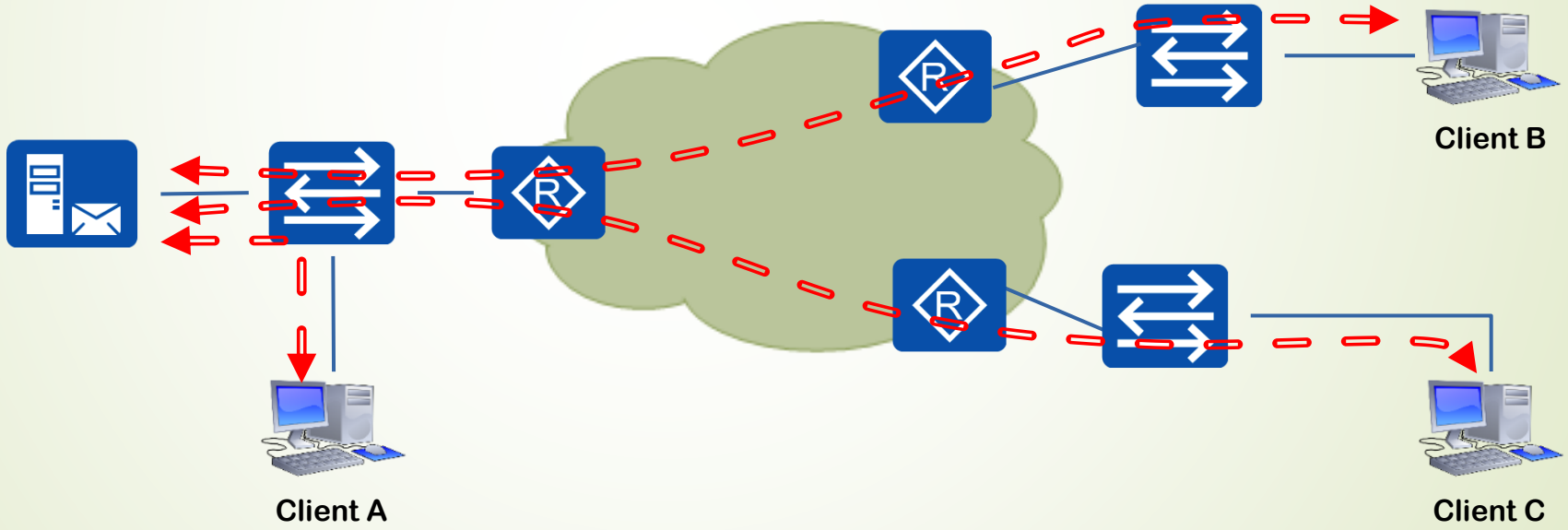
IP Multicast Basics

Multicast Basics

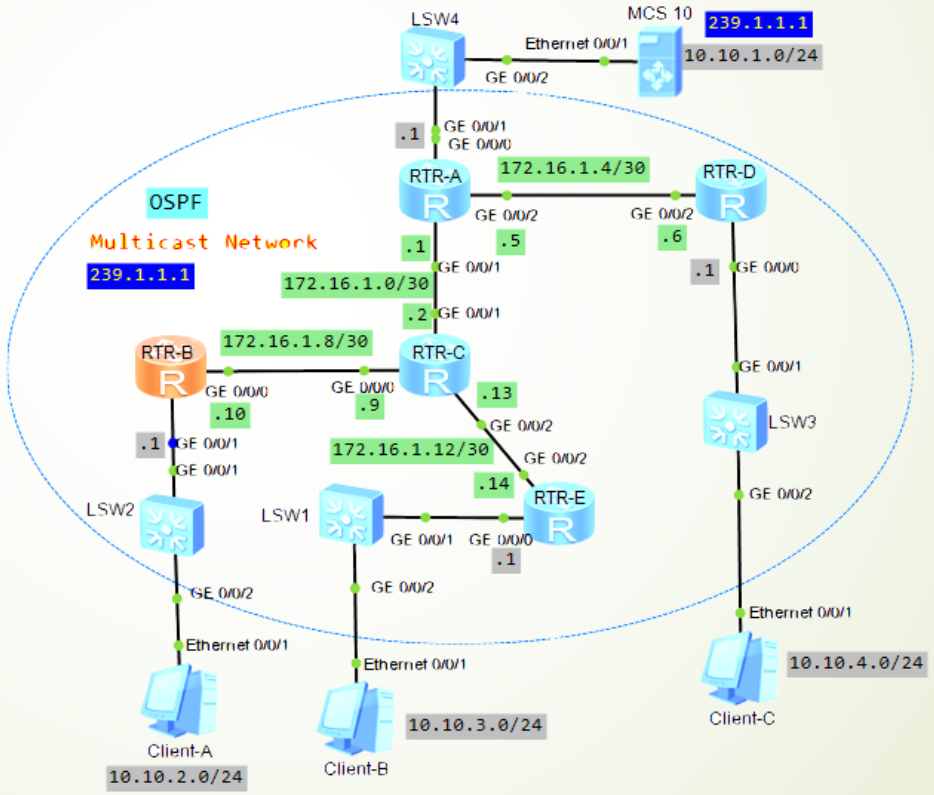
- If unicast technology is used for point-to-multipoint communication, the amount of data transmitted on the network will be proportional to the number of users that require the data.
- Sending multiple copies of identical data to different users wasted resources on the data source and network bandwidth.
- If broadcast technology is used, hosts that do not require the data will also receive the data. This threatens information security and causes storms on the local network segment.
- IP multicast technology resolves the preceding problems. The multicast source send only one copy of data, which is then replicated and forwarded by network nodes, and finally sent to specific receivers.

Traditional Point-to-Point Applications

- A service provider delivers services on a per user basis.
- The service provider transmits different data to different users.



PIM-DM Configuration



PIM-DM Configuration

```
[RTR-A]multicast routing-enable

[RTR-A]int g0/0/0
[RTR-A-GigabitEthernet0/0/0]pim dm
[RTR-A-GigabitEthernet0/0/0]int g0/0/1
[RTR-A-GigabitEthernet0/0/1]pim dm
[RTR-A-GigabitEthernet0/0/1]int g0/0/2
[RTR-A-GigabitEthernet0/0/2]pim dm

[RTR-D]multicast routing-enable

[RTR-D]int g0/0/0
[RTR-D-GigabitEthernet0/0/0]pim dm
[RTR-D-GigabitEthernet0/0/0]int g0/0/2
[RTR-D-GigabitEthernet0/0/2]pim dm
[RTR-D-GigabitEthernet0/0/2]
```

Jun 29 2026 19:08:11-08:00 RTR-D %%01PIM/4/NBR_UP(l)[0]:In VPN instance "public net(IPv4)", a new neighbor was created on the interface. (NeighborIpAddress=172.16.1.5, Interface=GigabitEthernet0/0/2, FlCode=P062214658048)

PIM-DM Configuration

```
[RTR-B]multicast routing-enable

[RTR-B]int g0/0/0
[RTR-B-GigabitEthernet0/0/0]pim dm
[RTR-B-GigabitEthernet0/0/0]int g0/0/1
[RTR-B-GigabitEthernet0/0/1]pim dm
```

```
[RTR-C]multicast routing-enable

[RTR-C]int g0/0/0
[RTR-C-GigabitEthernet0/0/0]pim dm
[RTR-C-GigabitEthernet0/0/0]int g0/0/1
[RTR-C-GigabitEthernet0/0/1]pim dm
[RTR-C-GigabitEthernet0/0/1]int g0/0/2
[RTR-C-GigabitEthernet0/0/2]pim dm
```

PIM-DM Configuration

```
[RTR-E]multicast routing-enable

[RTR-E]int g0/0/0
[RTR-E-GigabitEthernet0/0/0]pim dm
[RTR-E-GigabitEthernet0/0/0]int g0/0/2
[RTR-E-GigabitEthernet0/0/2]pim dm
```

Jun 29 2026 19:11:12-08:00 RTR-E %%01PIM/4/NBR_UP(l)[0]:In VPN instance "public net(IPv4)", a new neighbor was created on the interface. (NeighborIpAddress=172.16.1.13, Interface=GigabitEthernet0/0/2, FlCode=P062214658048)

PIM-DM Configuration

```
<RTR-D>display pim neighbor
 VPN-Instance: public net
 Total Number of Neighbors = 1

 Neighbor        Interface  Uptime        Expires       Dr-Priority     BFD-Session
 172.16.1.5      GE0/0/2    00:07:48      00:01:17      1               N


<RTR-D>display pim routing-table
 VPN-Instance: public net
 Total 0 (*, G) entry; 1 (S, G) entry

 (10.10.1.10, 239.1.1.1)
     Protocol: pim-dm, Flag:
     UpTime: 00:03:58
     Upstream interface: GigabitEthernet0/0/2
         Upstream neighbor: 172.16.1.5
         RPF prime neighbor: 172.16.1.5
     Downstream interface(s) information: None
```

PIM-DM Configuration

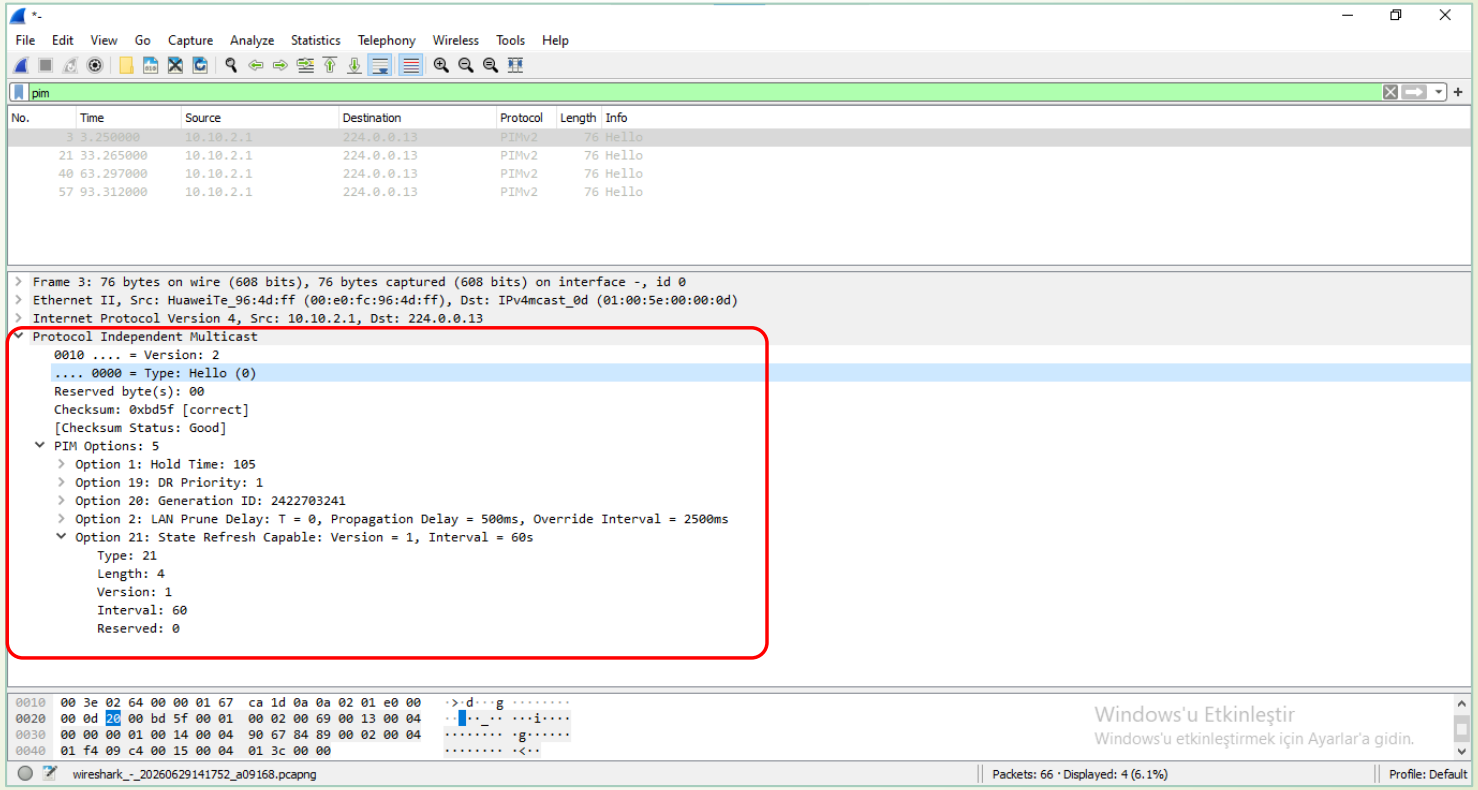
```
<RTR-C>display pim neighbor
 VPN-Instance: public net
 Total Number of Neighbors = 3
```

Neighbor	Interface	Uptime	Expires	Dr-Priority	BFD-Session
172.16.1.10	GE0/0/0	00:07:50	00:01:36	1	N
172.16.1.1	GE0/0/1	00:07:43	00:01:16	1	N
172.16.1.14	GE0/0/2	00:06:44	00:01:30	1	N

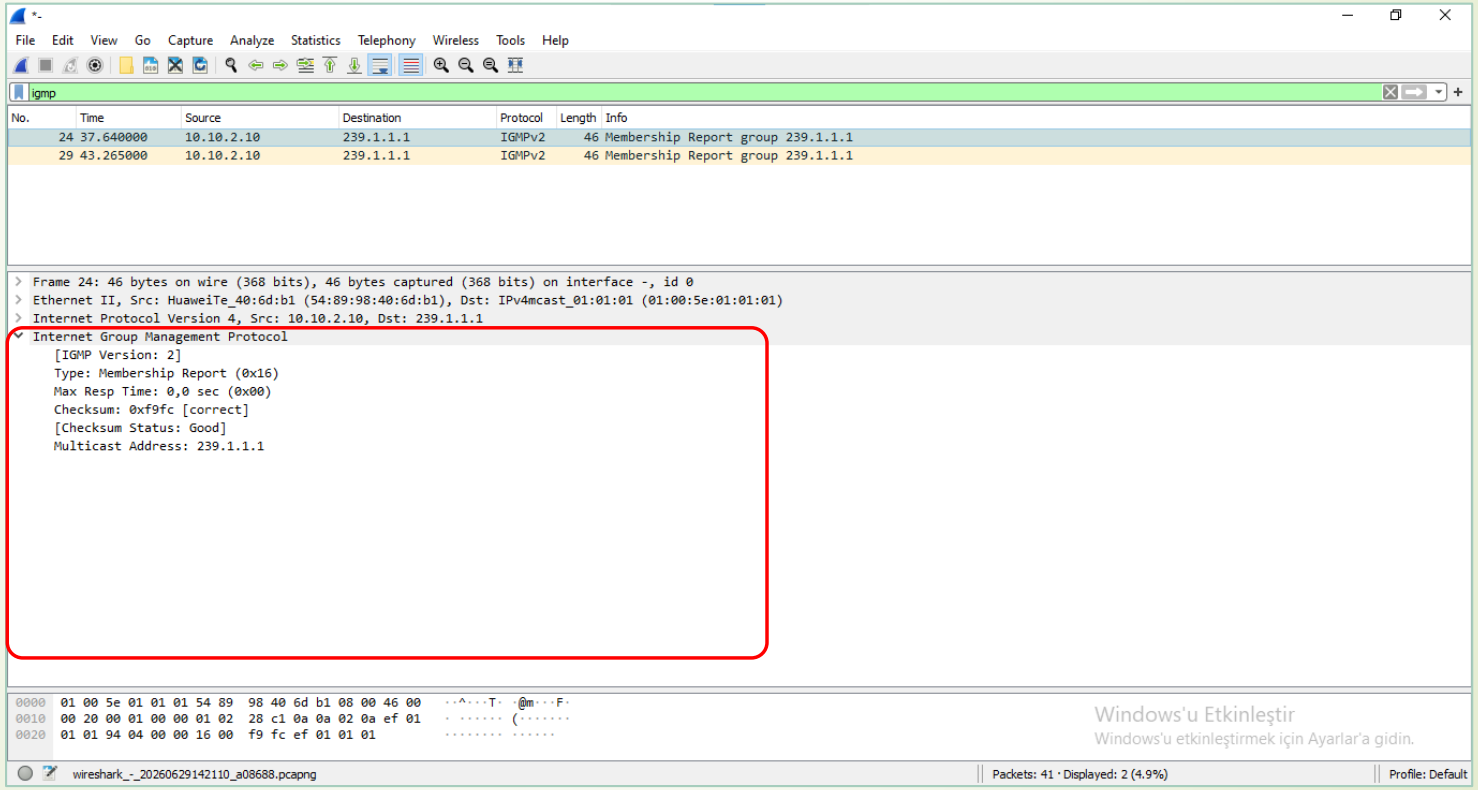
```
<RTR-C>display pim routing-table
 VPN-Instance: public net
 Total 0 (*, G) entry; 1 (S, G) entry

 (10.10.1.10, 239.1.1.1)
     Protocol: pim-dm, Flag:
     UpTime: 00:05:55
     Upstream interface: GigabitEthernet0/0/1
         Upstream neighbor: 172.16.1.1
         RPF prime neighbor: 172.16.1.1
     Downstream interface(s) information: None
```

PIM-DM Configuration



PIM-DM Configuration



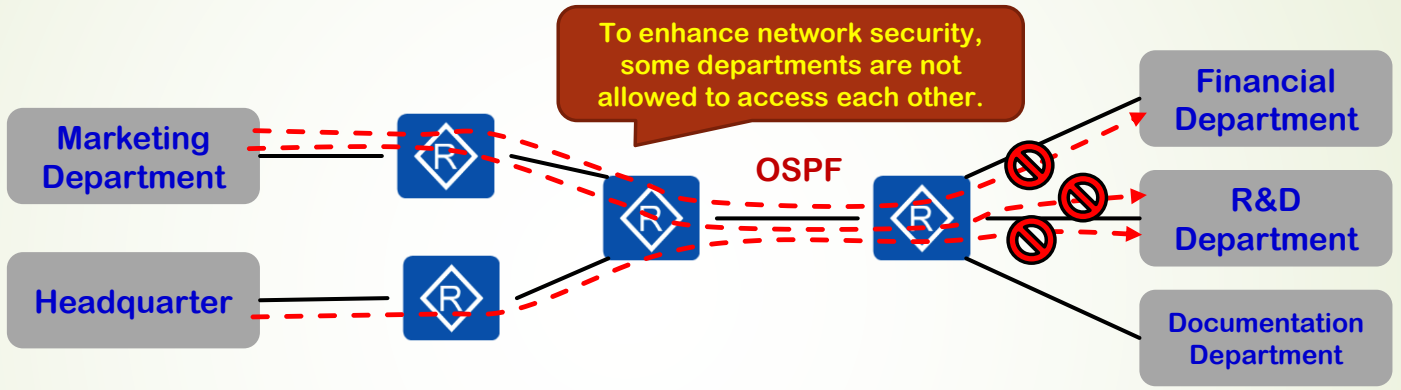
Route Control

Route Control

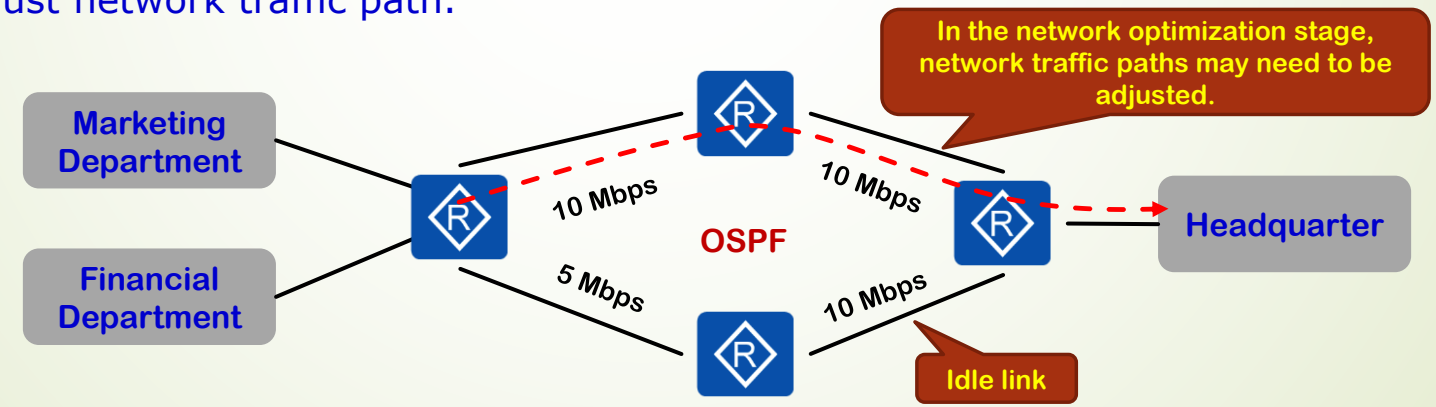
- Enterprise networks may encounter the problems such as unauthorized access of certain traffic and sub-optimal traffic path selection. To ensure data access security and improve link bandwidth usage, traffic behavior on the network must be controlled, for example, reachability control and traffic path adjustment.
- Tools may be required to meet complicated and precise traffic control requirements.

Traffic Behavior Control Requirement

1. Control traffic reachability.

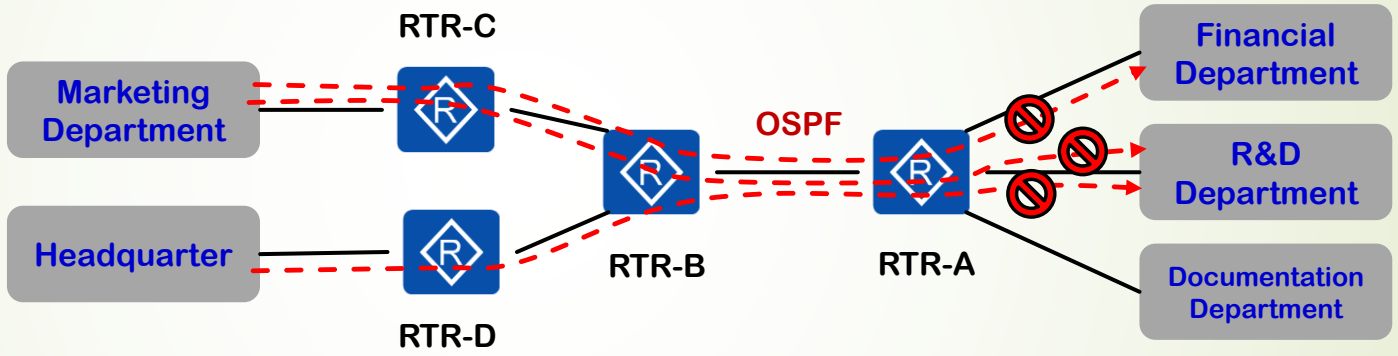


2. Adjust network traffic path.



Control Traffic Reachability

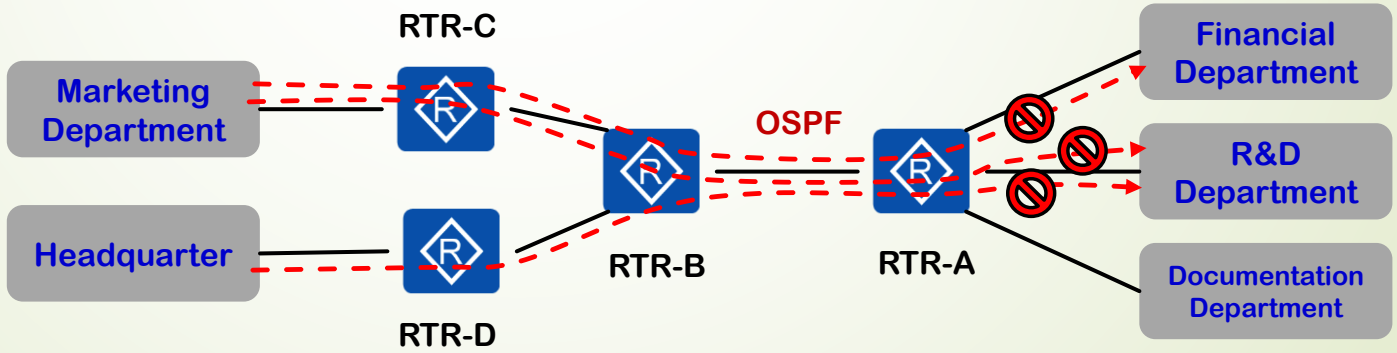
- Question: How to control network traffic reachability.



- Solution 1: Change the number of routing entries (filter the received and advertised routes) to control reachability. This is called routing policy.
- Solution 2: Deploy traffic filter to deny or permit specified traffic flow. This method is called traffic filter.

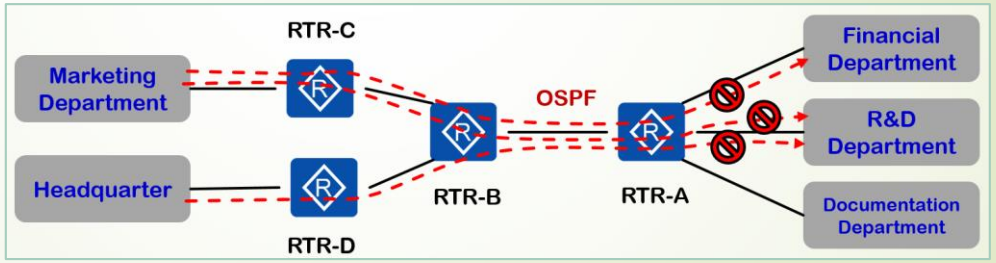
Control Traffic Reachability

- When advertising, receiving, and importing routes, routing policy implements certain policies according to actual networking requirements in order to filter the routes and change the attributes of the routes. Purposes of routing policies are as follows:
  - Control route advertisement: Advertises only the routes matching certain conditions
  - Control route sending and receiving: Receives only necessary and valid routes to control the capacity of routing table, enhancing network security.
  - Filter and control imported routes: Imports only the routes meeting certain conditions from other routing protocols, and sets the attributes of imported routes.
  - Set route attributes: Sets attributes for the routes filtered by routing policy.



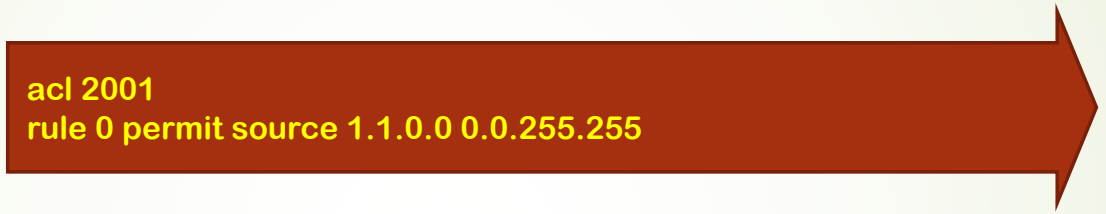
Solution 1: Routing Policy

- Routing policies are implemented in the following steps:
  - Define attributes of routing information to which routing policies are applied. Define a set of matching rules regarding various attributes of routing information such as the destination address and AS number.
  - Apply matching rules to route advertising, receiving, and importing.
- Currently, the following filters are provided for routing protocols:
  - ACL
  - Address prefix list
  - AS_Path filter
  - Community attribute filter
  - Extended community attribute filter



ACL Application Example (1)

- ACL classifies packets into different types by based on packet information.



1.1.1.1/32	1.1.1.1/32
1.1.1.0/24	1.1.1.0/24
1.1.0.0/16	1.1.0.0/16
1.0.0.0/8	

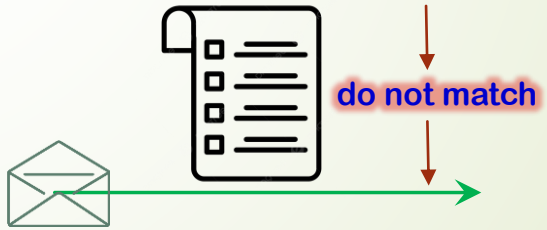
ACL Application Example (1)

- An ACL is composed of a list of rules. Each rule contains a permit or deny clause. These rules define packets with information in the packets.
- ACL classification:
  - Basic ACL: matches packets against source address, fragmentation flag, and time range. The ACL number ranges from 2000 to 2999.
  - Advanced ACL: matches packets against source address, destination address, source port number, destination port number, protocol type, priority, and time range. the ACL number ranges from 3000 to 3999.
  - Layer 2 ACL: matches packets against source MAC address, destination MAC address, and packet type. The ACL number ranges from 4000 to 4999.
  - User-defined ACL: matches packets against user-defined rules. The ACL number ranges from 5000 to 5999.

ACL Application Example (1)

- An ACL can consist of multiple deny or permit clauses. Each clause describes a rule. After receiving data packets, the device matches the packets against the first ACL rule.
- If the packets do not match the first ACL rule, the device matches the packets against the next ACL rule.

- Once the packets match a rule, the device executes the action in the rule and does not match packets against other rules. If the packets do not match any rule, the device directly forwards the packets.



- Note: The ACL rules may overlap or conflict with each other. The rule matching order decides the rule priorities. The ACL processes rule overlapping or conflict based on rule priorities.

ACL Application Example (2)

```
acl 2001
rule 0 permit source 1.1.1.1 0
rule 1 deny source 1.1.1.0 0
rule 2 permit source 1.1.0.0 0.0.255.255
rule 3 deny source any
```

1.1.1.1/32	1.1.1.1/32
1.1.1.0/24	
1.1.0.0/16	1.1.0.0/16
1.0.0.0/8	

ACL Application Example (3)

acl 2001
rule 0 permit source 1.1.1.0 0

1.1.1.1/32	1.1.1.0/24
1.1.1.0/24	1.1.1.0/25
1.1.1.0/25	
1.1.0.0/16	
1.0.0.0/8	

ACL can flexibly match packets against IP address prefixes, but cannot match mask length.

Question: How to filter out the route 1.1.1.0/25 ?

IP-Prefix List Application Example (1)

- IP-Prefix List can match both IP address prefix and mask length.
- IP-Prefix List cannot filter IP packets, but can filter only routing information.

```
ip ip-prefix test index 10 permit 10.0.0.0 16
  greater-equal 24 less-equal 28
```

IP address range: 10.0.0.0 – 10.0.X.X
24 <= Mask Length <= 28

Example: 10.0.1.0/24, 10.0.2.0/25, 10.0.2.192/26

IP-Prefix List Application Example (1)

- IP prefix list is the address prefix list. The address prefix list filters the routes based on the defined prefix filter list.
- Format and matching rule of prefix list:
  - The prefix filter list consists of IP addresses and masks. An IP address can be a subnet address or host address. The mask length ranges from 0 to 32.
  - Each IP prefix in the IP prefix list has an index. The IP prefixes are processed in an ascending order of index.
  - If the indexes are not manually set, the device allocates indexes to the IP prefixes with an interval of 10. If a new IP prefix has the same name and index as an existing IP prefix but their contents are different, the new IP prefix overwrites the old one.
  - If no IP prefix is matched, the default matching mode of the last IP prefix is deny by default. **If a referenced IP prefix list does not exist, the default mode permit is used.**

IP-Prefix List Application Example (1)

- Prefix mask length range:
  - The IP prefix list can match a specific route or match the routes within a certain mask length.
  - The prefix mask length can also be specified using the keywords greater-equal or less-equal.
  - If the keyword greater-equal or less-equal is not specified, the precise matching is used. That is, only the route with the same mask length as the prefix list is matched
  - If the keyword greater-equal is specified, the routes of which the mask lengths range from greater-equal value to 32 bits are matched.
  - If the keyword less-equal is specified, the routes of which the mask lengths range from the specified value to less-equal are matched.

IP-Prefix List Application Example (2)

```
ip ip-prefix Pref1 index 10 permit 1.1.1.0 24
  greater-equal 24 less-equal 24
```

"greater-equal 24 less-equal 24" indicates that the mask length is 24

1.1.1.1/32

1.1.1.0/24

1.1.1.0/25

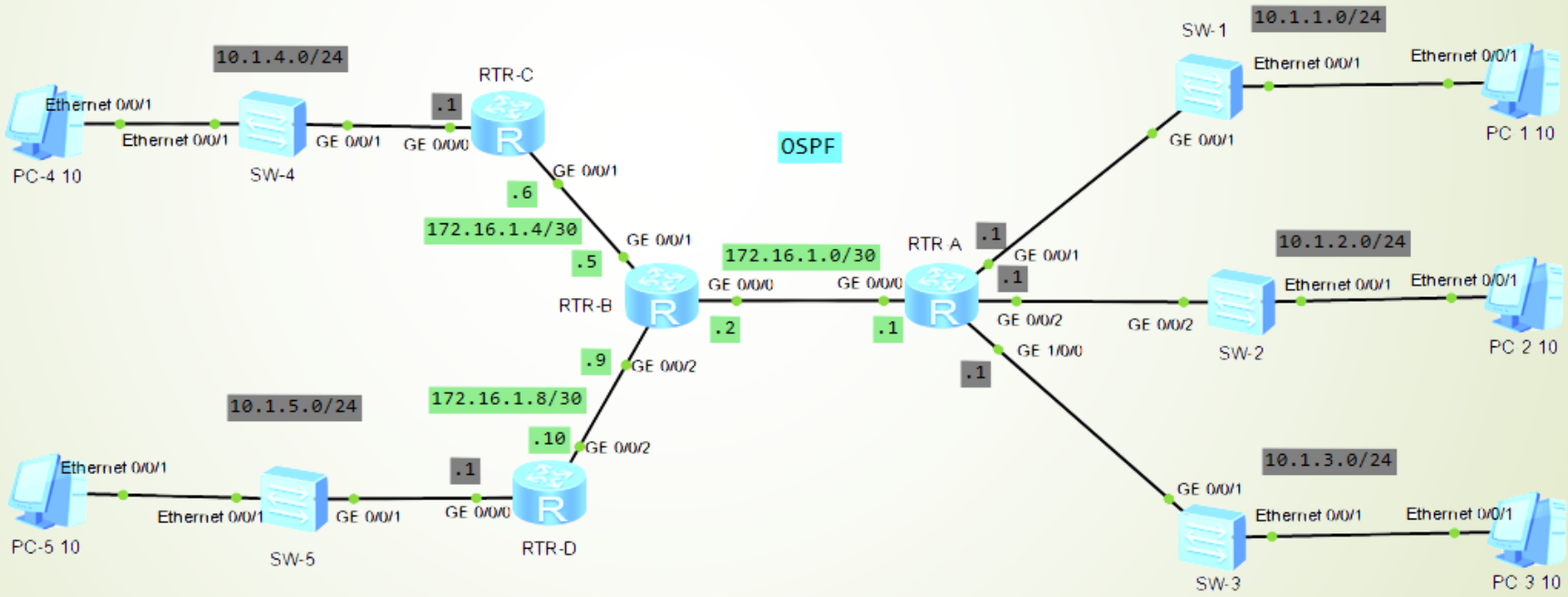
1.1.0.0/16

1.0.0.0/8

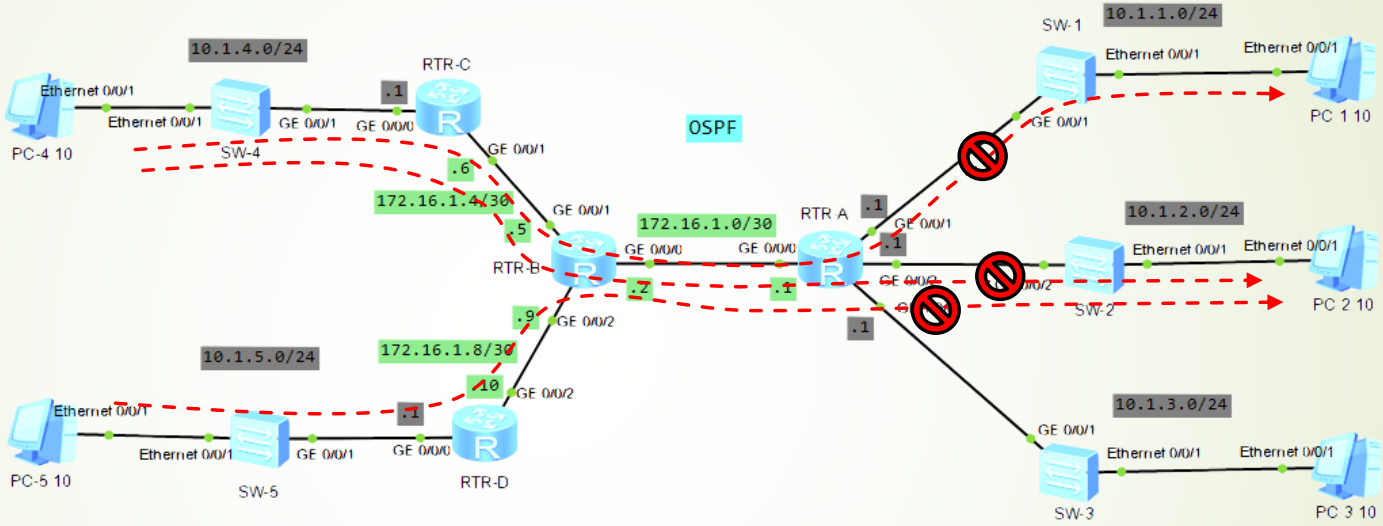
1.1.1.0/24

The other routes will be filtered out.

Route-Policy Configuration (1)



Route-Policy Configuration (1)




```
[RTR-C]acl 2000
[RTR-C-acl-basic-2000]rule 5 deny source 10.1.1.0 0.0.0.255
[RTR-C-acl-basic-2000]rule 10 permit source any
[RTR-C-acl-basic-2000]quit

[RTR-C]ospf 1
[RTR-C-ospf-1]filter-policy 2000 import
```

Route-Policy Configuration (2)

```
<RTR-C>display ip routing-table protocol ospf
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Public routing table : OSPF
         Destinations : 5        Routes : 5

OSPF routing table status : <Active>
         Destinations : 5        Routes : 5

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.1.2.0/24  OSPF    10   3         D   172.16.1.5      GigabitEthernet 0/0/1
        10.1.3.0/24  OSPF    10   3         D   172.16.1.5      GigabitEthernet 0/0/1
        10.1.5.0/24  OSPF    10   3         D   172.16.1.5      GigabitEthernet 0/0/1
     172.16.1.0/30   OSPF    10   2         D   172.16.1.5      GigabitEthernet 0/0/1
     172.16.1.8/30   OSPF    10   2         D   172.16.1.5      GigabitEthernet 0/0/1

OSPF routing table status : <Inactive>
         Destinations : 0        Routes : 0
```

Route-Policy Configuration (2)

```
<RTR-A>display current-configuration section ospf
[V200R003C00]
#
ospf 1 router-id 1.1.1.1
 filter-policy ip-prefix ab export direct
 area 0.0.0.0
  network 172.16.1.0 0.0.0.3
#
return
```

```
[RTR-A-ospf-1]import-route direct
```

```
[RTR-A]ip ip-prefix ab index 10 permit 10.1.1.0 24
[RTR-A]ip ip-prefix ab index 20 permit 10.1.3.0 24
```

```
[RTR-A]ospf 1
[RTR-A-ospf-1]filter-policy ip-prefix ab export direct
```

Route-Policy Configuration (3)

```
<RTR-C>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 14        Routes : 14

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.1.3.0/24  O_ASE   150  1           D   172.16.1.5      GigabitEthernet 0/0/1
        10.1.4.0/24  Direct  0    0           D   10.1.4.1        GigabitEthernet 0/0/0
        10.1.4.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet  0/0/0
      10.1.4.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet 0/0/0
        10.1.5.0/24  OSPF    10   3           D   172.16.1.5      GigabitEthernet 0/0/1
       ......
```

Route-Policy Configuration (3)

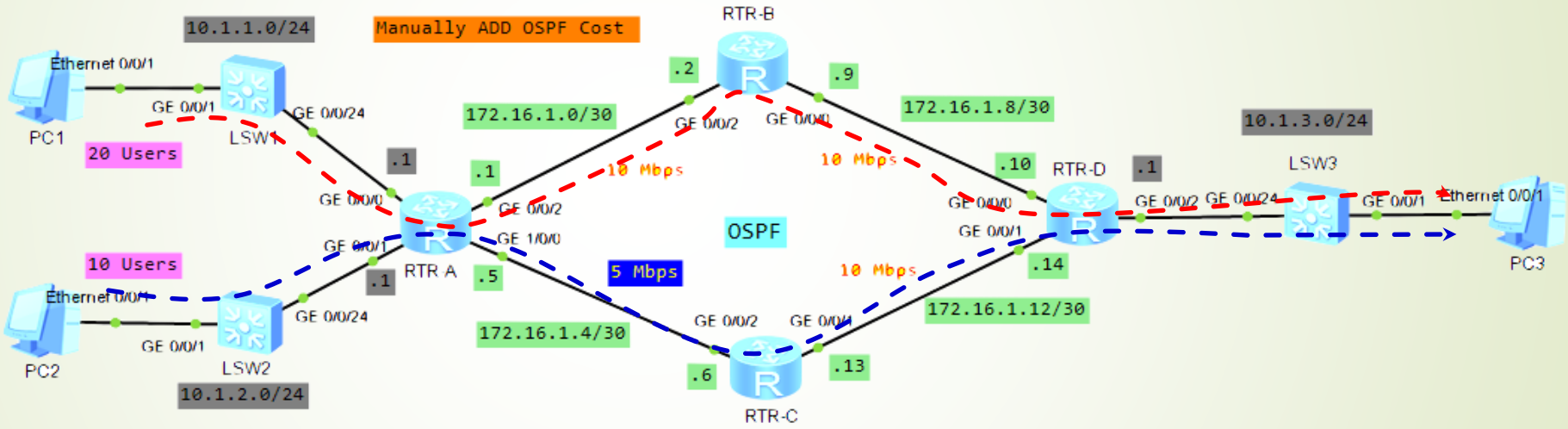
```
<RTR-D>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 15        Routes : 15

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.1.1.0/24  O_ASE   150  1           D   172.16.1.9      GigabitEthernet 0/0/2
        10.1.3.0/24  O_ASE   150  1           D   172.16.1.9      GigabitEthernet 0/0/2
        10.1.4.0/24  OSPF    10   3           D   172.16.1.9      GigabitEthernet 0/0/2
        10.1.5.0/24  Direct  0    0           D   10.1.5.1        GigabitEthernet 0/0/0
        10.1.5.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet 0/0/0
      10.1.5.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet 0/0/0
      ......
```

Solution 1: Routing Policy

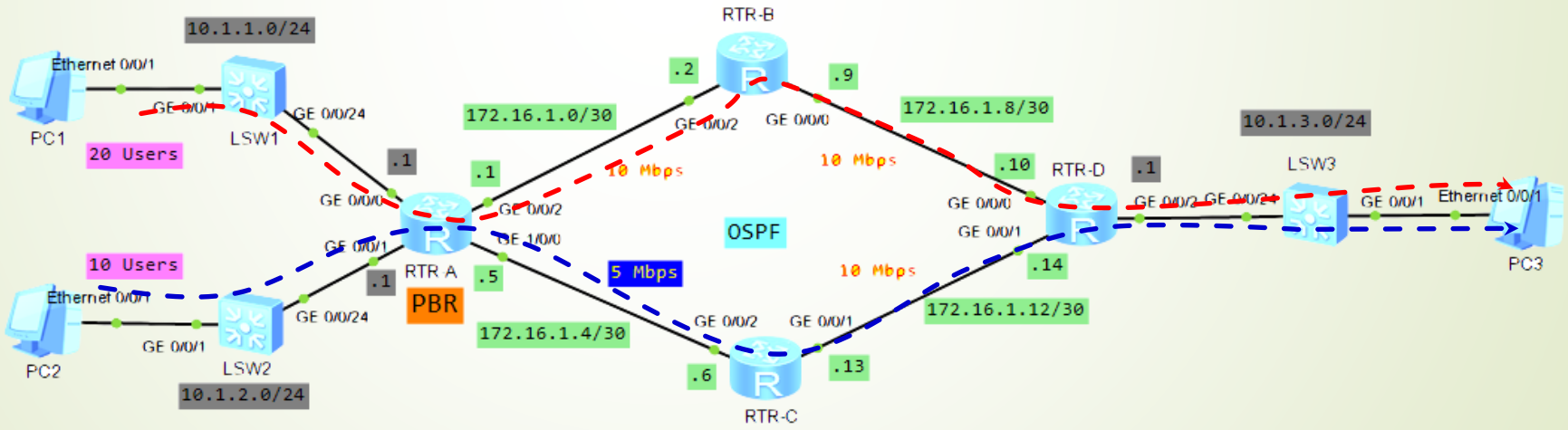
- PLANNED, The traffic path from the Marketing department to HQ is RTR-A, RTR-B, RTR-D and the traffic path from the Financial Department to HQ is RTR-A, RTR-C, RTR-D.



- As shown in the figure, solution 1 cannot meet the requirement because packets forwarded based on destination address. It cannot meet the requirements of source address-based, destination address-based, or application layer-based forwarding.

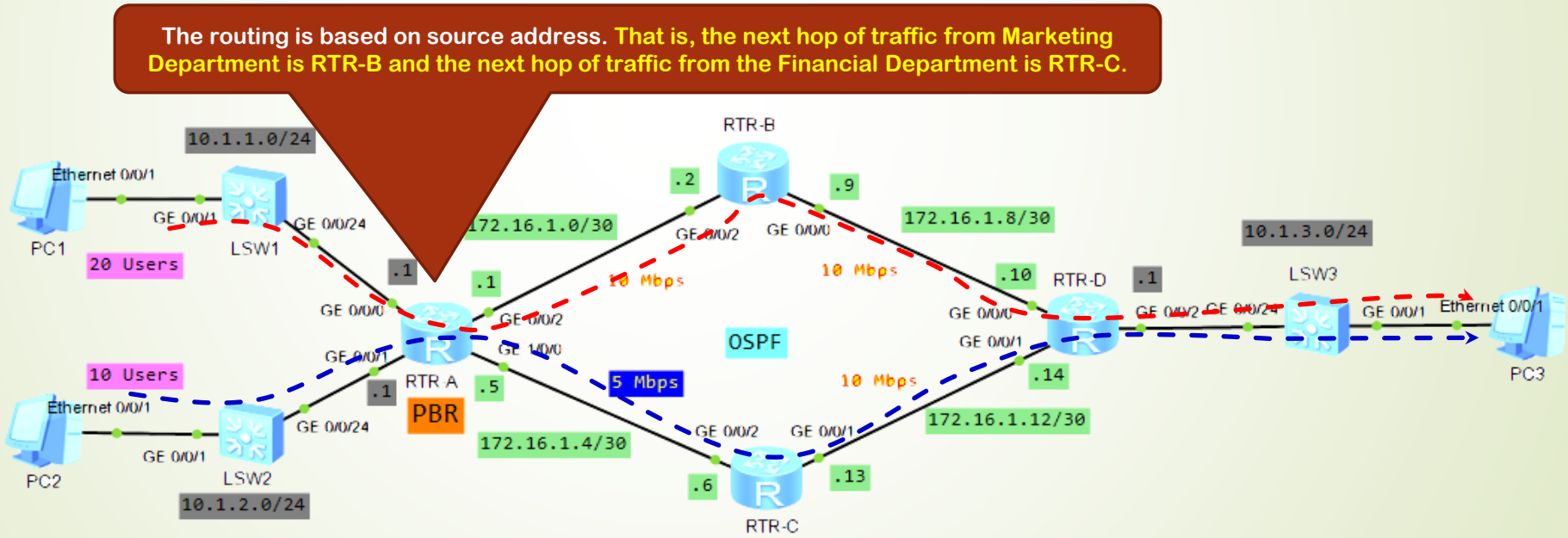
Solution 2: Policy-based Routing (1)

- Different from the routing mechanism that forwards packets by searching for the routes based on the destination addresses of IP packets, policy-based routing (PBR) is based on the user-defined routing policies. PBR has a higher priority than routing policy. Before forwarding a data packet, the router matches the packet against the PBR rule first. If matched, the packet is forwarded based on the policy. Otherwise, the packet is forwarded based on the routing table. The PBR does not modify the routing table. It affects data packet forwarding based on the pre-defined rules.



Solution 2: Policy-based Routing (1)

- Policy-based routing (PBR) is implemented using traffic policy:
  - Use ACL to match the traffic,
  - Define behavior for traffic, for example, change the next hop.



Solution 2: Policy-based Routing (1)

- PBR includes:
- Local PBR: applies to packets sent by the device, such as ICMP and BGP packets.
  - To send the packets with different source addresses and lengths, configure local PBR.
  - It is implemented using the Policy-Based-Route tool.
- Interface PBR: applies to the packets forwarded (not initiated) by the local device.
  - To forward packets to the specified next hop, configure the interface PBR. The packets matching the redirection rule are forwarded through the specified next hop interface. The packets not matching the redirection rule are forwarded based on routing table. Interface PBR applies to load balancing and monitoring.
  - It is implemented using the traffic policy.
- Smart PBR: selects the optimal path for service traffic based on link quality.
  - To select paths for different services based on link quality, configure smart PBR.
  - It is implemented using the Smart-Policy-Route tool. This method is not described in this course.

Solution 2: Policy-based Routing (1)

```
<RTR-A>display current-configuration interface g0/0/2
#
interface GigabitEthernet0/0/2
 bandwidth 10
 ip address 172.16.1.1 255.255.255.252
#
<RTR-A>display current-configuration interface g1/0/0
#
interface GigabitEthernet1/0/0
 bandwidth 5
 ip address 172.16.1.5 255.255.255.252
#
<RTR-A>display current-configuration section ospf
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
  network 10.1.2.0 0.0.0.255
  network 172.16.1.0 0.0.0.3
  network 172.16.1.4 0.0.0.3
#
```

Solution 2: Policy-based Routing (1)

```
<RTR-B>display current-configuration interface g0/0/0
#
interface GigabitEthernet0/0/0
 bandwidth 10
 ip address 172.16.1.9 255.255.255.252
#
<RTR-B>display current-configuration interface g0/0/2
#
interface GigabitEthernet0/0/2
 bandwidth 10
 ip address 172.16.1.2 255.255.255.252
#
<RTR-B>display current-configuration section ospf
[V200R003C00]
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.0
  network 172.16.1.0 0.0.0.3
  network 172.16.1.8 0.0.0.3
#
```

Solution 2: Policy-based Routing (1)

```
<RTR-C>display current-configuration interface g0/0/1
#
interface GigabitEthernet0/0/1
 bandwidth 10
 ip address 172.16.1.13 255.255.255.252
#
<RTR-C>display current-configuration interface g0/0/2
#
interface GigabitEthernet0/0/2
 bandwidth 5
 ip address 172.16.1.6 255.255.255.252
#
<RTR-C>display current-configuration section ospf
#
ospf 1 router-id 3.3.3.3
 area 0.0.0.0
  network 172.16.1.4 0.0.0.3
  network 172.16.1.12 0.0.0.3
#
```

Solution 2: Policy-based Routing (1)

```
<RTR-D>display current-configuration interface g0/0/0
#
interface GigabitEthernet0/0/0
 bandwidth 10
 ip address 172.16.1.10 255.255.255.252
#
<RTR-D>display current-configuration interface g0/0/1
#
interface GigabitEthernet0/0/1
 bandwidth 10
 ip address 172.16.1.14 255.255.255.252
#
<RTR-D>display current-configuration section ospf
#
ospf 1 router-id 4.4.4.4
 area 0.0.0.0
  network 10.1.3.0 0.0.0.255
  network 172.16.1.8 0.0.0.3
  network 172.16.1.12 0.0.0.3
#
```

Solution 2: Policy-based Routing (1)

```
[RTR-A]display ip routing-table 10.1.3.0
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Table : Public
Summary Count : 2
Destination/Mask    Proto   Pre  Cost      Flag NextHop         Interface

        10.1.3.0/24 OSPF    10   3         D    172.16.1.6      GigabitEthernet 1/0/0
                    OSPF    10   3         D    172.16.1.2      GigabitEthernet 0/0/2

[RTR-A]int g1/0/0
[RTR-A-GigabitEthernet1/0/0]ospf cost 2

[RTR-A-GigabitEthernet1/0/0]display ip routing-table 10.1.3.0
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Table : Public
Summary Count : 1
Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.1.3.0/24 OSPF    10   3         D    172.16.1.2      GigabitEthernet 0/0/2
```

Eth-Trunk Principles

Eth-Trunk Concepts

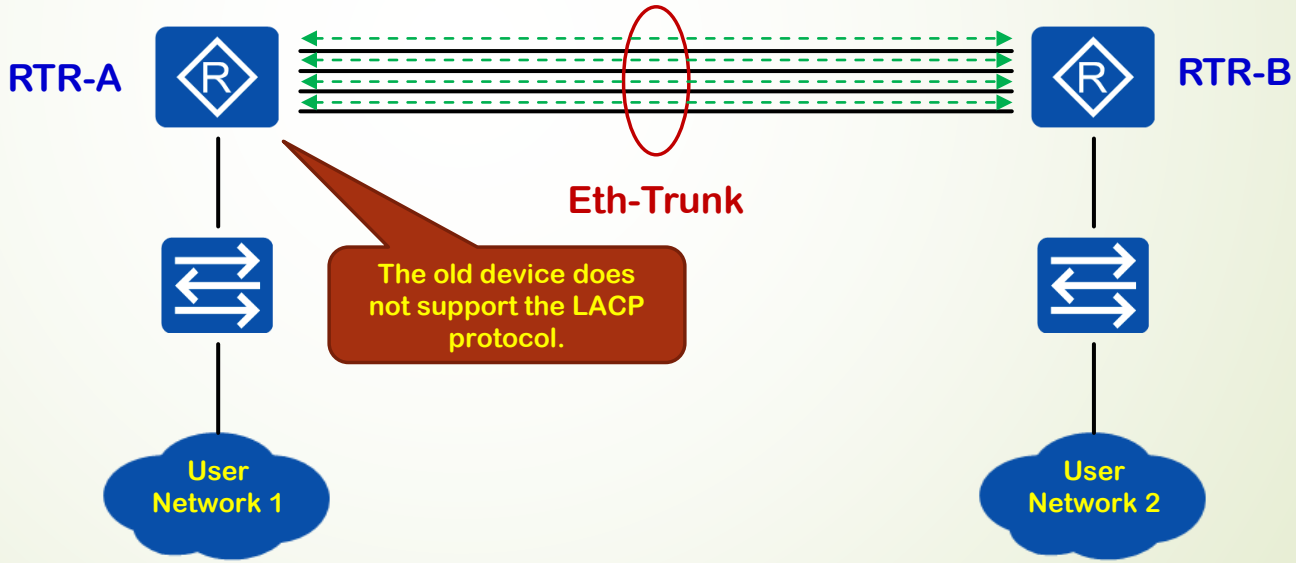
- Eth-Trunk is a binding technology that bundles multiple Ethernet interfaces into a logical interface.
- Eth-Trunk modes:
  - Manual load balancing mode
  - LACP mode

Eth-Trunk Concepts

- The Eth-Trunk can increase bandwidth, implement load balancing, and improve network reliability depending on the link aggregation mode.
- Eth-Trunk can be used for Layer 2 and Layer 3 link aggregation. By default, an Ethernet interface works in layer 2 mode. To configure a Layer 2 Eth-Trunk, run the portswitch command to switch the Ethernet interface to Layer 2 interface.
- To configure a Layer 3 Eth-Trunk, run the undo portswitch command to switch the Ethernet interface to Layer 3 interface.

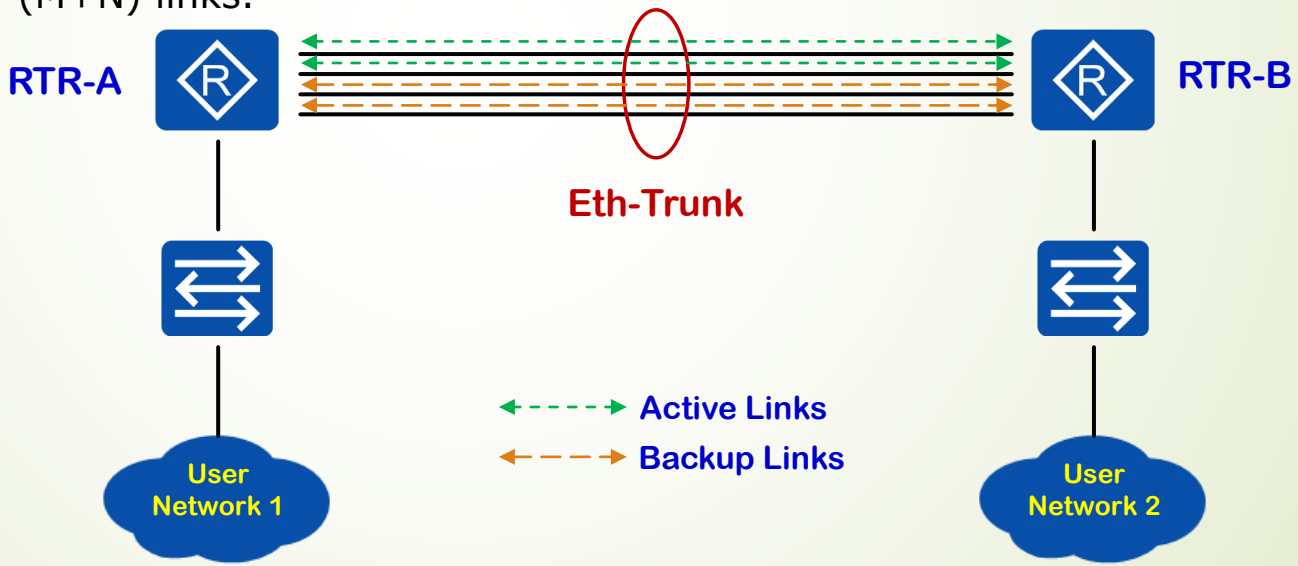
Manual Load Balancing Mode

- When at least one device of two devices does not support the LACP protocol, you can configure the Eth-Trunk in manual load balancing mode to increase the bandwidth between the two devices and improve reliability.
- In manual load balancing mode, all links added to Eth-Trunk forward data.



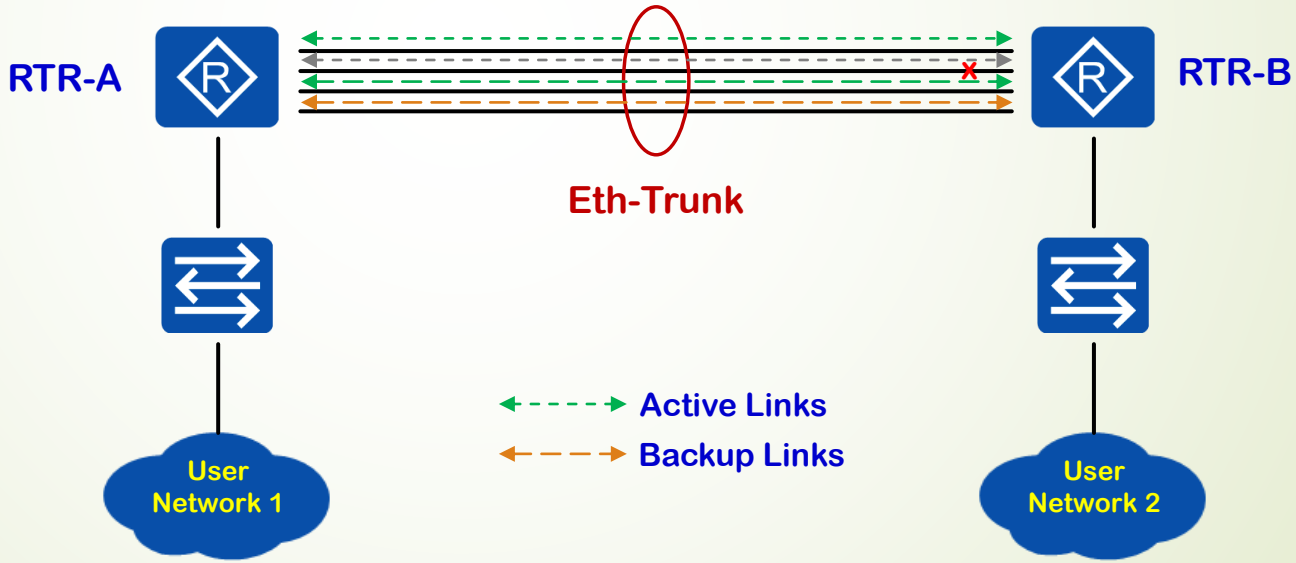
LACP Mode

- The LACP mode is also called the M:N mode, where M links are active and forward data and N links are inactive and used as backup links.
- When traffic is forwarded on the aggregated link, traffic is load balanced on M links and the other N link does not forward traffic. The actual bandwidth of the aggregated link is the sum of the bandwidth of M links. The maximum bandwidth of the aggregated link is the sum of the bandwidth of (M+N) links.

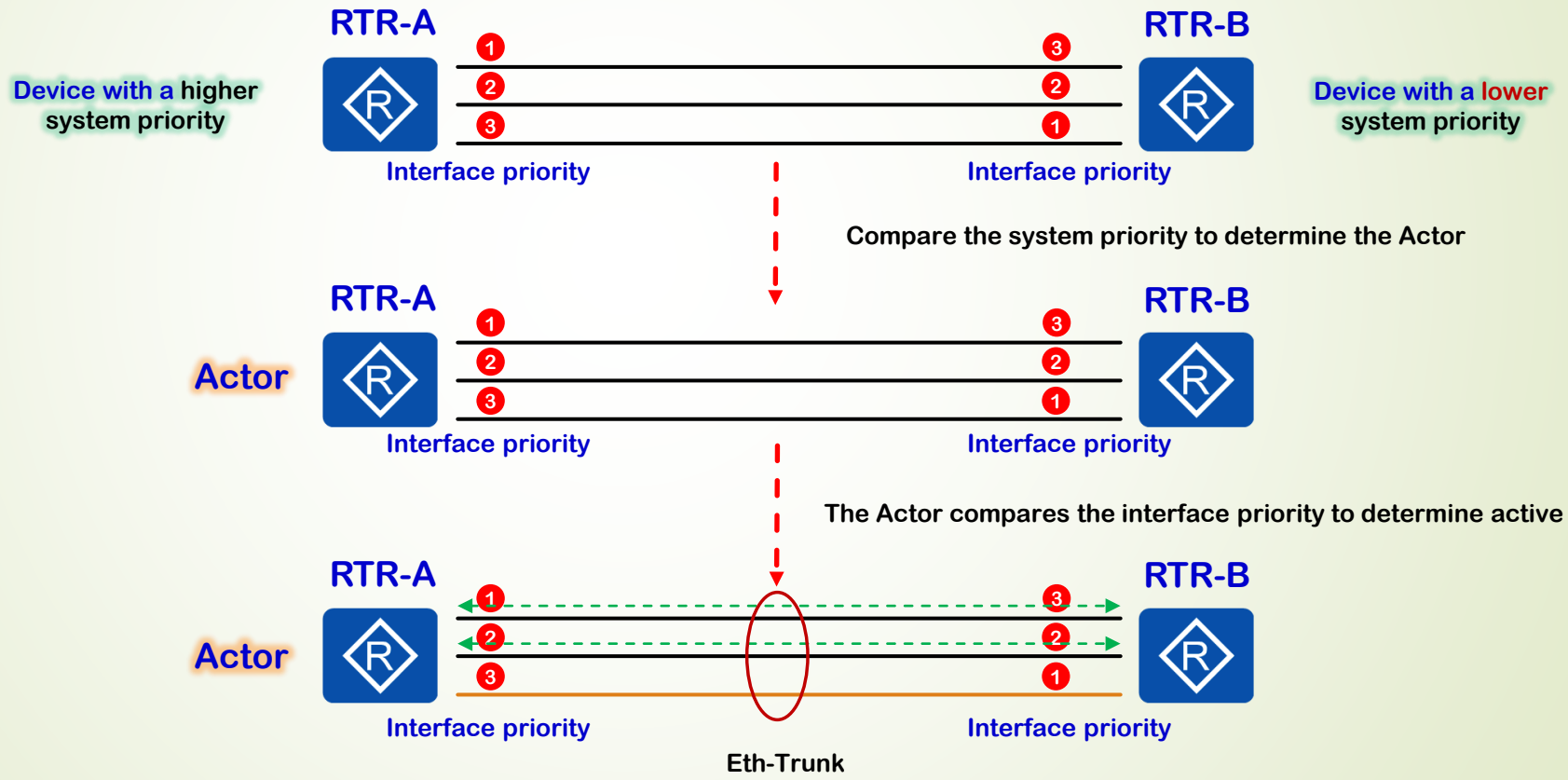


LACP Mode

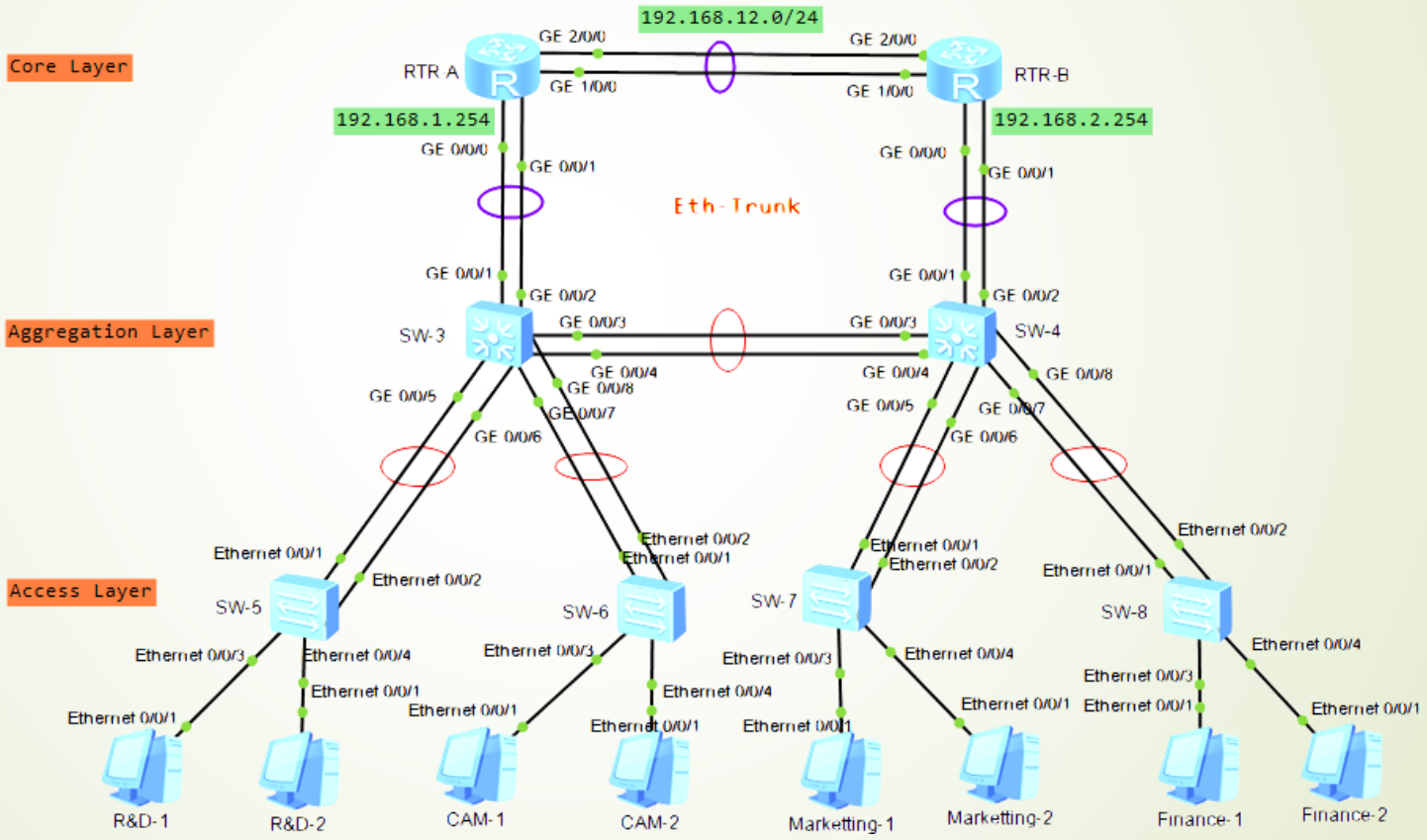
- When one link among M links fails, LACP selects one link with the high priority from N backup links to replace the faulty link. The actual bandwidth of the aggregated link is still the sum of the bandwidth of M links, but the maximum bandwidth of the aggregated link is the sum of the bandwidth of (M+N-1) links.



Selecting Active Links in LACP Mode



Eth-Trunk Configuration Requirements



Eth-Trunk Configuration Requirements

```
[RTR-A]interface Eth-Trunk 1
[RTR-A-Eth-Trunk1]undo portswitch
[RTR-A-Eth-Trunk1]description Core-RTR-A to Aggragate-SW-3
[RTR-A-Eth-Trunk1]ip address 192.168.1.254 24
[RTR-A-Eth-Trunk1]quit
```

```
[RTR-A]interface Eth-Trunk 2
[RTR-A-Eth-Trunk2]undo portswitch
[RTR-A-Eth-Trunk2]description Core-RTR-A to Core-RTR-B
[RTR-A-Eth-Trunk2]ip address 192.168.12.1 24
[RTR-A-Eth-Trunk2]quit
```

Eth-Trunk Configuration Requirements

```
[RTR-A]interface g0/0/0
[RTR-A-GigabitEthernet0/0/0]eth-trunk 1
[RTR-A-GigabitEthernet0/0/0]interface g0/0/1
[RTR-A-GigabitEthernet0/0/1]eth-trunk 1
[RTR-A-GigabitEthernet0/0/1]quit
```

```
[RTR-A]interface g1/0/0
[RTR-A-GigabitEthernet1/0/0]eth-trunk 2
[RTR-A-GigabitEthernet1/0/0]interface g2/0/0
[RTR-A-GigabitEthernet2/0/0]eth-trunk 2
```

Eth-Trunk Configuration Requirements

```
[RTR-B]interface Eth-Trunk 1
[RTR-B-Eth-Trunk1]undo portswitch
[RTR-B-Eth-Trunk1]description Core-RTR-B to Aggragate-SW-4
[RTR-B-Eth-Trunk1]ip address 192.168.2.254 24
[RTR-B-Eth-Trunk1]quit
```

```
[RTR-B]interface Eth-Trunk 2
[RTR-B-Eth-Trunk2]undo portswitch
[RTR-B-Eth-Trunk2]description Core-RTR-B to Core-RTR-A
[RTR-B-Eth-Trunk2]ip address 192.168.12.2 24
[RTR-B-Eth-Trunk2]quit
```

Eth-Trunk Configuration Requirements

```
[RTR-B]interface g0/0/0
[RTR-B-GigabitEthernet0/0/0]eth-trunk 1
[RTR-B-GigabitEthernet0/0/0]interface g0/0/1
[RTR-B-GigabitEthernet0/0/1]eth-trunk 1
[RTR-B-GigabitEthernet0/0/1]quit
```

```
[RTR-B]interface g1/0/0
[RTR-B-GigabitEthernet1/0/0]eth-trunk 2
[RTR-B-GigabitEthernet1/0/0]interface g2/0/0
[RTR-B-GigabitEthernet2/0/0]eth-trunk 2
```

Eth-Trunk Configuration Requirements

```
[SW-3]interface Eth-Trunk 1
[SW-3-Eth-Trunk1]description Aggragate-SW-3 to Core-RTR-A
[SW-3-Eth-Trunk1]quit

[SW-3]interface Eth-Trunk 2
[SW-3-Eth-Trunk2]description Aggragate-SW-3 to SW-4
[SW-3-Eth-Trunk2]quit

[SW-3]interface Eth-Trunk 3
[SW-3-Eth-Trunk3]description Aggragate-SW-3 to Access-SW-5
[SW-3-Eth-Trunk3]quit

[SW-3]interface Eth-Trunk 4
[SW-3-Eth-Trunk4]description Aggragate-SW-3 to Access-SW-6
[SW-3-Eth-Trunk4]quit
```

Eth-Trunk Configuration Requirements

```
[SW-3]interface g0/0/1
[SW-3-GigabitEthernet0/0/1]eth-trunk 1
[SW-3-GigabitEthernet0/0/1]interface g0/0/2
[SW-3-GigabitEthernet0/0/2]eth-trunk 1

[SW-3-GigabitEthernet0/0/2]interface g0/0/3
[SW-3-GigabitEthernet0/0/3]eth-trunk 2
[SW-3-GigabitEthernet0/0/3]interface g0/0/4
[SW-3-GigabitEthernet0/0/4]eth-trunk 2

[SW-3-GigabitEthernet0/0/4]interface g0/0/5
[SW-3-GigabitEthernet0/0/5]eth-trunk 3
[SW-3-GigabitEthernet0/0/5]interface g0/0/6
[SW-3-GigabitEthernet0/0/6]eth-trunk 3

[SW-3-GigabitEthernet0/0/6]interface g0/0/7
[SW-3-GigabitEthernet0/0/7]eth-trunk 4
[SW-3-GigabitEthernet0/0/7]interface g0/0/8
[SW-3-GigabitEthernet0/0/8]eth-trunk 4
```

Eth-Trunk Configuration Requirements

```
[SW-4]interface Eth-Trunk 1
[SW-4-Eth-Trunk1]description Aggragate-SW-4 to Core-RTR-B
[SW-4-Eth-Trunk1]quit

[SW-4]interface Eth-Trunk 2
[SW-4-Eth-Trunk2]description Aggragate-SW-4 to Aggragate-SW-3
[SW-4-Eth-Trunk2]quit

[SW-4]interface Eth-Trunk 3
[SW-4-Eth-Trunk3]description Aggragate-SW-4 to Access-SW-7
[SW-4-Eth-Trunk3]quit

[SW-4]interface Eth-Trunk 4
[SW-4-Eth-Trunk4]description Aggragate-SW-4 to Access-SW-8
[SW-4-Eth-Trunk4]quit
```

Eth-Trunk Configuration Requirements

```
[SW-4]interface g0/0/1
[SW-4-GigabitEthernet0/0/1]eth-trunk 1
[SW-4-GigabitEthernet0/0/1]interface g0/0/2
[SW-4-GigabitEthernet0/0/2]eth-trunk 1

[SW-4-GigabitEthernet0/0/2]interface g0/0/3
[SW-4-GigabitEthernet0/0/3]eth-trunk 2
[SW-4-GigabitEthernet0/0/3]interface g0/0/4
[SW-4-GigabitEthernet0/0/4]eth-trunk 2

[SW-4-GigabitEthernet0/0/4]interface g0/0/5
[SW-4-GigabitEthernet0/0/5]eth-trunk 3
[SW-4-GigabitEthernet0/0/5]interface g0/0/6
[SW-4-GigabitEthernet0/0/6]eth-trunk 3

[SW-4-GigabitEthernet0/0/6]interface g0/0/7
[SW-4-GigabitEthernet0/0/7]eth-trunk 4
[SW-4-GigabitEthernet0/0/7]interface g0/0/8
[SW-4-GigabitEthernet0/0/8]eth-trunk 4
```

Eth-Trunk Configuration Requirements

```
[SW-5]interface Eth-Trunk 1
[SW-5-Eth-Trunk1]description Access-SW-5 to Aggragate-SW-3
[SW-5-Eth-Trunk1]quit

[SW-5]interface e0/0/1
[SW-5-Ethernet0/0/1]eth-trunk 1
[SW-5-Ethernet0/0/1]interface e0/0/2
[SW-5-Ethernet0/0/2]eth-trunk 1

[SW-6]interface Eth-Trunk 1
[SW-6-Eth-Trunk1]description Access-SW-6 to Aggragate-SW-3
[SW-6-Eth-Trunk1]quit

[SW-6]interface e0/0/1
[SW-6-Ethernet0/0/1]eth-trunk 1
[SW-6-Ethernet0/0/1]interface e0/0/2
[SW-6-Ethernet0/0/2]eth-trunk 1
```

Eth-Trunk Configuration Requirements

```
[SW-7]interface Eth-Trunk 1
[SW-7-Eth-Trunk1]description Access-SW-7 to Aggragate-SW-4
[SW-7-Eth-Trunk1]quit

[SW-7]interface e0/0/1
[SW-7-Ethernet0/0/1]eth-trunk 1
[SW-7-Ethernet0/0/1]interface e0/0/2
[SW-7-Ethernet0/0/2]eth-trunk 1

[SW-8]interface Eth-Trunk 1
[SW-8-Eth-Trunk1]description Access-SW-8 to Aggragate-SW-4
[SW-8-Eth-Trunk1]quit

[SW-8]interface e0/0/1
[SW-8-Ethernet0/0/1]eth-trunk 1
[SW-8-Ethernet0/0/1]interface e0/0/2
[SW-8-Ethernet0/0/2]eth-trunk 1
```

Eth-Trunk Configuration Requirements

```
<SW-8>display eth-trunk
Eth-Trunk1's state information is:
WorkingMode: NORMAL          Hash arithmetic: According to SIP-XOR-DIP
Least Active-linknumber:     1  Max Bandwidth-affected-linknumber: 8
Operate status: up           Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
PortName                     Status     Weight
Ethernet0/0/1                Up         1
Ethernet0/0/2                Up         1
```

Eth-Trunk Configuration Requirements

```
<SW-8>display interface Eth-Trunk
Eth-Trunk1 current state : UP
Line protocol current state : UP
Description:Access-SW-8 to Aggragate-SW-4
Switch Port, PVID :    1, Hash arithmetic : According to SIP-XOR-DIP,Maximal BW: 200M, Current
BW: 200M, The Maximum Frame Length is 9216
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 4c1f-cccb-25d5
Current system time: 2026-07-09 11:50:07-08:00
   Input bandwidth utilization       :    0%
   Output bandwidth utilization      :    0%
--------------------------------------------------
PortName                  Status     Weight
--------------------------------------------------
Ethernet0/0/1             UP         1
Ethernet0/0/2             UP         1
--------------------------------------------------
The Number of Ports in Trunk : 2
The Number of UP Ports in Trunk : 2
```

Eth-Trunk Configuration Requirements

```
<SW-4>display eth-trunk
Eth-Trunk1's state information is:
WorkingMode: NORMAL              Hash arithmetic: According to SIP-XOR-DIP
Least Active-linknumber: 1       Max Bandwidth-affected-linknumber: 8
Operate status: up               Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
PortName                         Status      Weight
GigabitEthernet0/0/1             Up          1
GigabitEthernet0/0/2             Up          1

Eth-Trunk2's state information is:
WorkingMode: NORMAL              Hash arithmetic: According to SIP-XOR-DIP
Least Active-linknumber: 1       Max Bandwidth-affected-linknumber: 8
Operate status: up               Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
PortName                         Status      Weight
GigabitEthernet0/0/3             Up          1
GigabitEthernet0/0/4             Up          1

Eth-Trunk3's state information is:
……
```

Eth-Trunk Configuration Requirements

```
<SW-4>display interface eth-trunk 1
Eth-Trunk1 current state : UP
Line protocol current state : UP
Description:Aggragate-SW-4 to Core-RTR-B
Switch Port, PVID :    1, Hash arithmetic : According to SIP-XOR-DIP,Maximal BW: 2G, Current BW:
2G, The Maximum Frame Length is 9216
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 4c1f-cce9-0e46
Current system time: 2026-07-09 11:51:08-08:00
   Input bandwidth utilization        :    0%
   Output bandwidth utilization       :    0%
--------------------------------------------------
PortName                       Status     Weight
--------------------------------------------------
GigabitEthernet0/0/1           UP         1
GigabitEthernet0/0/2           UP         1
--------------------------------------------------
The Number of Ports in Trunk : 2
The Number of UP Ports in Trunk : 2
```

Eth-Trunk Configuration Requirements

```
<SW-4>display interface eth-trunk 2
Eth-Trunk2 current state : UP
Line protocol current state : UP
Description:Aggragate-SW-4 to Aggragate-SW-3
Switch Port, PVID :    1, Hash arithmetic : According to SIP-XOR-DIP,Maximal BW: 2G, Current BW:
2G, The Maximum Frame Length is 9216
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 4c1f-cce9-0e46
Current system time: 2026-07-09 11:51:11-08:00
    Input bandwidth utilization  :    0%
    Output bandwidth utilization :    0%
--------------------------------------------------
PortName                  Status     Weight
--------------------------------------------------
GigabitEthernet0/0/3      UP         1
GigabitEthernet0/0/4      UP         1
--------------------------------------------------
The Number of Ports in Trunk : 2
The Number of UP Ports in Trunk : 2
```

Eth-Trunk Configuration Requirements

```
<RTR-B>display eth-trunk
Eth-Trunk1's state information is:
WorkingMode: NORMAL          Hash arithmetic: According to SIP-XOR-DIP
Least Active-linknumber: 1   Max Bandwidth-affected-linknumber: 8
Operate status: up           Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
PortName                     Status     Weight
GigabitEthernet0/0/0         Up         1
GigabitEthernet0/0/1         Up         1

Eth-Trunk2's state information is:
WorkingMode: NORMAL          Hash arithmetic: According to SIP-XOR-DIP
Least Active-linknumber: 1   Max Bandwidth-affected-linknumber: 8
Operate status: up           Number Of Up Port In Trunk: 2
--------------------------------------------------------------------------------
PortName                     Status     Weight
GigabitEthernet1/0/0         Up         1
GigabitEthernet2/0/0         Up         1
```

Eth-Trunk Configuration Requirements

```
<RTR-B>display interface Eth-Trunk 1
Eth-Trunk1 current state : UP
Line protocol current state : UP
Last line protocol up time : 2026-07-09 16:26:01 UTC-08:00
Description:Core-RTR-B to Aggragate-SW-4
Route Port,Hash arithmetic : According to SIP-XOR-DIP,Maximal BW: 2G, Current BW: 2G, The Maximum Transmit Unit is 1500
Internet Address is 192.168.2.254/24
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 00e0-fcac-7e6f
Current system time: 2026-07-09 16:52:37-08:00
Input: 1502 packets, 178738 bytes
  Unicast:            0,  Multicast:          1502
  Broadcast:          0,  Discard:            0
  Total Error:        0

Output: 1 packets, 60 bytes
  Unicast:            0,  Multicast:          0
  Broadcast:          1,  Discard:            0
  Total Error:        0

    Input bandwidth utilization       :    0%
    Output bandwidth utilization      :    0%
-------------------------------------------------
PortName                      Status        Weight
-------------------------------------------------
GigabitEthernet0/0/0          UP            1
GigabitEthernet0/0/1          UP            1
-------------------------------------------------
The Number of Ports in Trunk : 2
The Number of UP Ports in Trunk : 2
```

Eth-Trunk Configuration Requirements

```
PC>ping 192.168.2.10

Ping 192.168.2.10: 32 data bytes, Press Ctrl_C to break
Request timeout!
Request timeout!
From 192.168.2.10: bytes=32 seq=3 ttl=126 time=156 ms
From 192.168.2.10: bytes=32 seq=4 ttl=126 time=125 ms
From 192.168.2.10: bytes=32 seq=5 ttl=126 time=125 ms

--- 192.168.2.10 ping statistics ---
  5 packet(s) transmitted
  3 packet(s) received
  40.00% packet loss
  round-trip min/avg/max = 0/135/156 ms

PC>tracert 192.168.2.10

traceroute to 192.168.2.10, 8 hops max
(ICMP), press Ctrl+C to stop
 1  192.168.1.254   62 ms  63 ms  78 ms
 2  192.168.12.2   109 ms  78 ms  94 ms
 3  192.168.2.10   141 ms  171 ms  141 ms
```

QUESTIONS?

Prepared by Ayhan KOŞAR
ayhankosar@gmail.com
ayhan.k@inetworkeskisehir.com
www.inetworkeskisehir.com

linkedin.com/in/ayhankosar