

Distance Vector Routing Protocols

RIP version 1

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RIP version 1

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Dynamic Routing Protocols



- Function(s) of Dynamic Routing Protocols:
 - Dynamically share information between routers.
 - Automatically update routing table when topology changes.
 - Determine best path to a destination.
- The purpose of a dynamic routing protocol is to:
 - Discover remote networks
 - Maintaining up-to-date routing information
 - Choosing the best path to destination networks
 - Ability to find a new best path if the current path is no longer available

Dynamic Routing Protocols

- Components of a routing protocol

Algorithm

- In the case of a routing protocol algorithms are used for facilitating routing information and best path determination

Routing protocol messages

- These are messages for discovering neighbors and exchange of routing information

Dynamic Routing Protocols



Dynamic routing		VS	Static routing
Configuration Complexity	Generally independent of the network size	configration	Increases with network size: config routers
Required administrator knowledge	Advanced knowledge required		No extra knowledge required no route information
Topology changes	Automatically adapts to topology changes		Administrator intervention required
Scaling	Suitable for simple and complex topologies	simple config	Suitable for simple topologies no config
Security	Less secure	secure	More secure
Resource usage	Uses CPU, memory, link bandwidth	resource	No extra resources needed no resources
Predictability	Route depends on the current topology	support	Route to destination is always the same no support

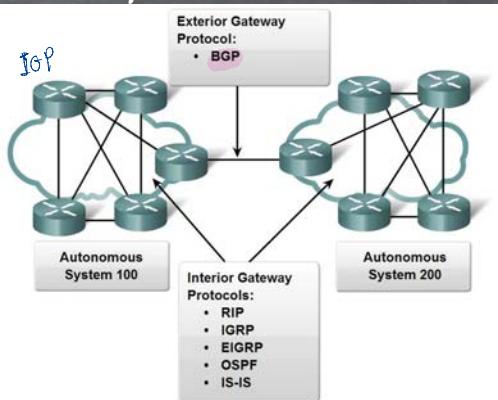
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Classifying Routing Protocols

- Types of routing protocols:

- Interior Gateway Protocols (IGP)
- Exterior Gateway Protocols (EGP)



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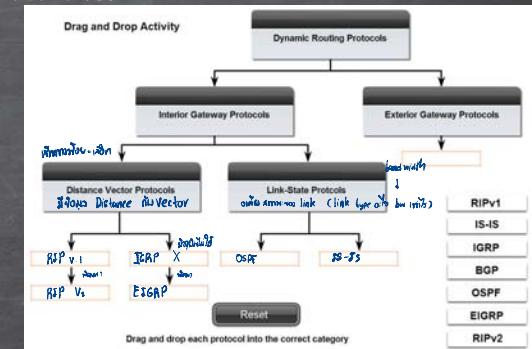
Classifying Routing Protocols

- Dynamic routing protocols are grouped according to characteristics. Examples include:

- RIP
- IGRP
- EIGRP
- OSPF
- IS-IS
- BGP

Tjwv BGP, siph IGP

- Autonomous System is a group of routers under the control of a single authority.



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Classifying Routing Protocols

- Interior Gateway Protocols (IGP)

– Distance vector

- routes are advertised as vectors of distance & direction.
ตัวอย่าง vector คือ ไปทางทิศทางใดๆ ก็เดินทางไปได้
- incomplete view of network topology.
- Generally, periodic updates. ข้อมูลไม่สมบูรณ์

– Link state

- complete view of network topology is created.
- updates are not periodic. ข้อมูลใหม่ทุกครั้ง

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Classifying Routing Protocols

ມີສຳເນົາ Routing Protocol ທີ່ແກ່ມາ

- Classifying Routing Protocols

ມີຫຼັບຫວັງ ອັດຕະກຳ ລັບສິນ

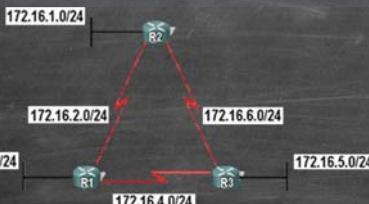
- ① — Classful routing protocols ມີການສືບສຸດ ຂອງ subnet

ລົງທະບຽນ subnet ມີຄືນ

- Do NOT send subnet mask in routing updates

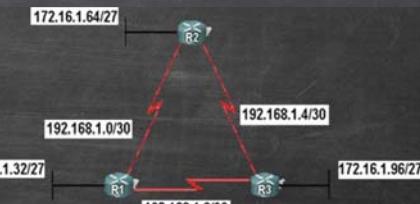
- ② — Classless routing protocols ລັບດາວໂຫຼວກທີ່ສັນ subnet

- Do send subnet mask in routing updates.



Classful: Subnet mask is the same throughout the topology

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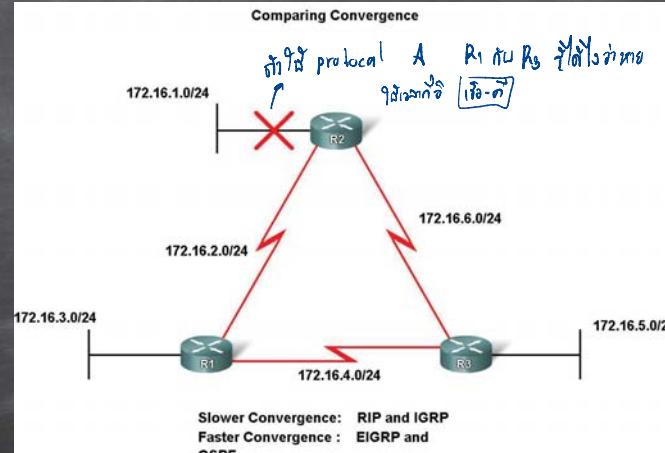


Classless: Subnet mask can vary in the topology

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Classifying Routing Protocols

- Convergence is defined as when all routers' routing tables are at a state of consistency



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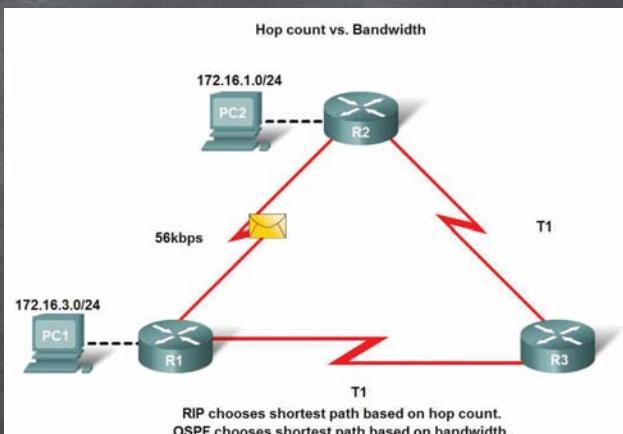
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Routing Protocols Metrics

ມີຫຼັບຫວັງ ອັດຕະກຳ path ທີ່ສັນ

- Metric : A value used by a routing protocol to determine which routes are better than others.

- Hop count
- Bandwidth
- Cost
- Delay
- Load
- Reliability



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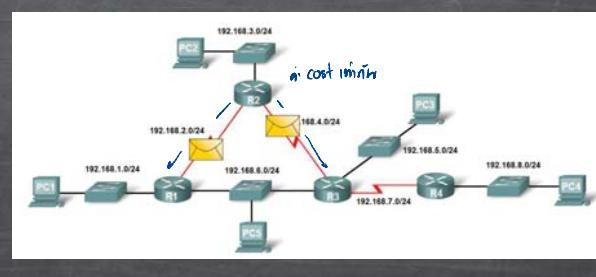
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Routing Protocols Metrics

- Load balancing

- This is the ability of a router to distribute packets among multiple same cost paths

Load Balancing Across Equal Cost Paths



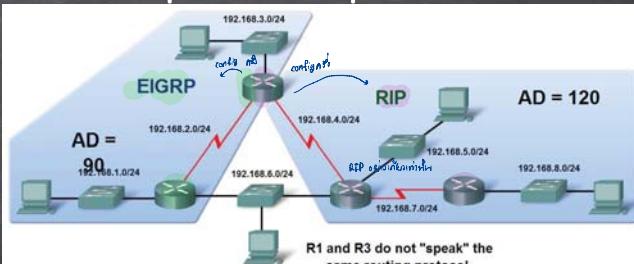
```
R2#show ip route
output omitted
R2#show ip route 192.168.2.1/24
  192.168.2.1 via 192.168.2.1, 00:00:24, Serial0/0/0
  192.168.2.1 via 192.168.4.3, 00:00:24, Serial0/0/1
```

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Administrative Distance of a Route

- Purpose of a metric
 - It's a calculated value used to determine the best path to a destination
- Purpose of Administrative Distance
 - It's a numeric value that specifies the preference of a particular route



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Distance Vector Routing Protocols

- Examples of Distance Vector routing protocols:
 - Routing Information Protocol (RIP)
 - Interior Gateway Routing Protocol (IGRP)
 - Enhanced Interior Gateway Routing Protocol (EIGRP)
- Distance Vector Technology
 - The Meaning of Distance Vector:
 - A router using distance vector routing protocols knows 2 things:
 - Distance to final destination
 - Vector, or direction, traffic should be directed

距
向

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Administrative Distance of a Route

Default Administrative Distances

Route Source	Administrative Distance
Connected	0
Static	1
EIGRP summary route	5
External BGP	20
Internal EIGRP	90
IGRP	100
OSPF	110
IS-IS	115
External EIGRP	170
Internal BGP	200

RIP

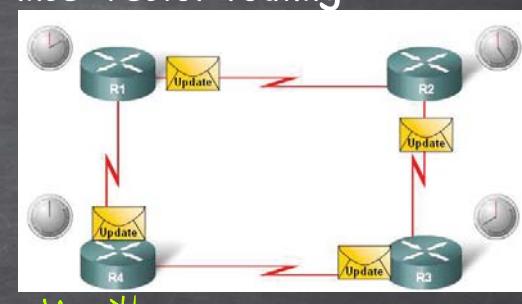
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Distance Vector Routing Protocols

- Characteristics of Distance Vector routing protocols:
 - Periodic updates
 - Neighbors
 - Broadcast updates
 - Entire routing table is included with routing update



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Distance Vector Routing Protocols

- Routing Protocol Characteristics

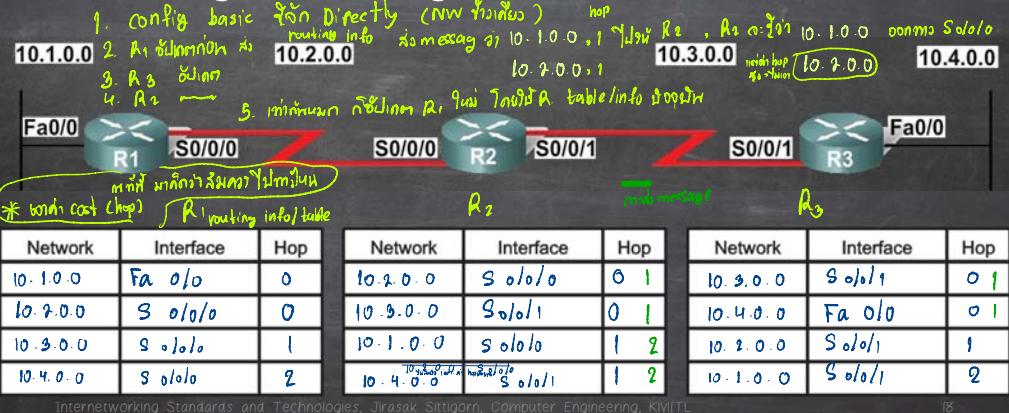
- Criteria used to compare routing protocols includes

- Time to convergence
- Scalability
- Resource usage
- Implementation & maintenance

Network Discovery

全局广播 broadcast

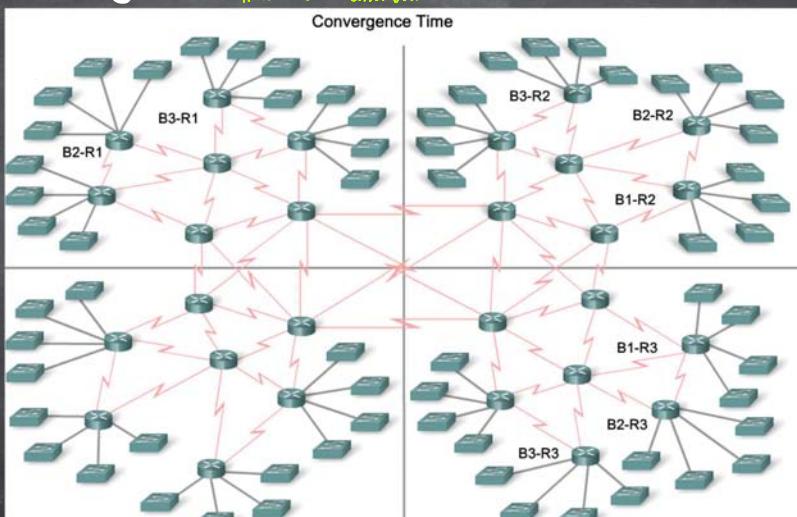
- Cold Starts : Router Initial Start Up
- Initial Exchange of Routing Information
- Exchange of Routing Information



Network Discovery

- Convergence

RIP 有慢速收敛
慢速收敛的 30 秒间隔



Routing Table Maintenance

- Periodic Updates : RIP Update timer (default 30)

— RIP Timers : In addition to the update timer, the IOS implements three additional timers for RIP:

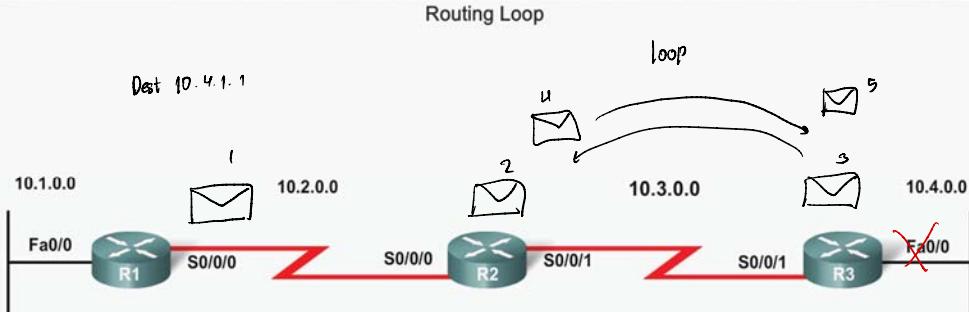
- Invalid timer (default 180)
- Holddown timer (default 180)
- Flush timer (default 240)

```
R#show ip protocols
Routing Protocol is "rip" v1
  Sending updates every 30 seconds, next due in 13 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  <output omitted>
  Routing for Networks:
    10.0.0.0
  Routing Information Sources:
    Gateway          Distance      Last Update
    10.3.0.1          120           00:00:27
    Distance: (default is 120)
```

- Bounded Update : EIGRP
- Triggered Update
- Random Jitter

Routing Loops

- Definition and Implications



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/0	1
10.4.0.0	S0/0/0	2

Network	Interface	Hop
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.1.0.0	S0/0/0	1
10.4.0.0	S0/0/1	1

Network	Interface	Hop
10.3.0.0	S0/0/1	0
10.4.0.0	Fa0/0	0
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/1	2

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Routing Loops

- The loop may be a result of:

- pk လျှော့မြန် တွေ
- ကိုယ်တွေ bw min, ဒါပဲ အမျိုးမျိုး ဘေးမြတ် static
- its time out အား retransmis တော်းတွေ ဖြစ်ပါ

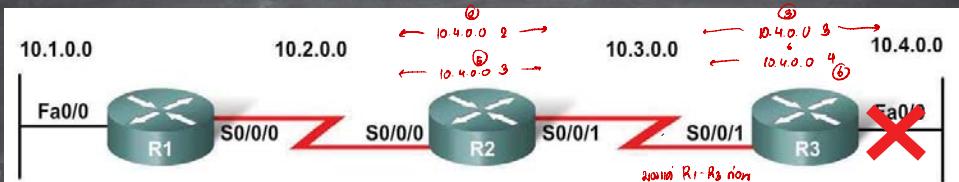
- A routing loop can create the following conditions:

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Routing Loops

- Problem : Count to Infinity hop count မျှော်စိတ်



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/0	1
10.4.0.0	S0/0/0	2

Network	Interface	Hop
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.1.0.0	S0/0/0	1
10.4.0.0	S0/0/1	1,3

Network	Interface	Hop
10.3.0.0	S0/0/1	0
10.4.0.0	Fa0/0	0
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/1	2

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Routing Loops

- Setting a Maximum hop ဂုဏ်

— RIP defines infinity as 16 hops - an "unreachable" metric.

Once the routers "count to infinity," they mark the route as unreachable.



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.4.0.0	S0/0/1	16
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/0	1
10.4.0.0	S0/0/0	16
10.3.0.0	S0/0/1	2

Routing Loops

loop 2

Hold down +

up

- Preventing Routing Loop with Holddown Timers

— Holddown timers instruct routers to hold any changes that might affect routes for a specified period of time. If a route is identified as down or possibly down, any other information for that route containing the same status, or worse, is ignored for a predetermined amount of time (the holddown period).

Routing Loops

loop 3

- Split Horizon Rule

— The split horizon rule says that a router should not advertise a network through the interface from which the update came.

debug ip rip 7-127



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/0	1
10.4.0.0	S0/0/0	2

Network	Interface	Hop
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.1.0.0	S0/0/0	1
10.4.0.0	S0/0/1	1

Network	Interface	Hop
10.3.0.0	S0/0/1	0
10.4.0.0	Fa0/0	0
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/1	2

Routing Loops

- Route Poisoning \rightarrow poisoning

network down hop = 16

— Route poisoning is used to mark the route as unreachable in a routing update that is sent to other routers. \rightarrow - กอน

Network is converged on "poisoned" route.



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.4.0.0	Fa0/0	16

Network	Interface	Hop
10.1.0.0	S0/0/0	1
10.1.0.0	S0/0/0	1
10.2.0.0	S0/0/0	1
10.3.0.0	S0/0/1	1

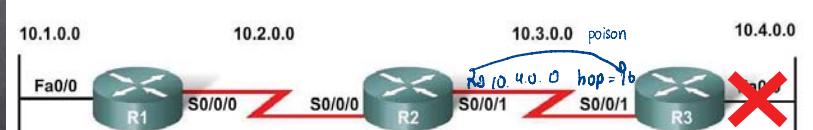
Network	Interface	Hop
10.4.0.0	S0/0/1	2
10.1.0.0	S0/0/1	2
10.2.0.0	S0/0/1	2
10.3.0.0	S0/0/1	2

Routing Loops

~

- Split horizon with poison reverse \rightarrow กรณีป

— The rule for split horizon with poison reverse states when sending updates out a specific interface, designate any networks that were learned on that interface as unreachable.



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.4.0.0	Fa0/0	16

Network	Interface	Hop
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.1.0.0	S0/0/0	1
10.2.0.0	S0/0/0	1

Network	Interface	Hop
10.4.0.0	S0/0/1	1
10.1.0.0	S0/0/1	2
10.2.0.0	S0/0/1	2
10.3.0.0	S0/0/1	2

Routing Loops

- IP & TTL

- Time to Live (TTL) is an 8-bit field in the IP header that limits the number of hops a packet can traverse through the network before it is discarded.



Network	Interface	Hop
10.1.0.0	Fa0/0	0
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/0	1
10.4.0.0	S0/0/0	4

Network	Interface	Hop
10.2.0.0	S0/0/0	0
10.3.0.0	S0/0/1	0
10.4.0.0	S0/0/1	2
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/1	3

Network	Interface	Hop
10.3.0.0	S0/0/1	0
10.4.0.0	S0/0/1	2
10.2.0.0	S0/0/1	1
10.1.0.0	S0/0/1	2

RIP & IGRP & EIGRP

Distance Vector Routing Protocols Compared

	RIPv1	RIPv2	OSPF	EIGRP
Speed of Convergence	Slow	slow	fast	fast
Scalability - size of network	small	small	large	large
Use of VLSM	No	Yes	Yes	Yes
Resource usage	Low	Low	minimum start time less link state	medium
Implementation and maintenance	Simple	Simple	Complex	Complex
	Slow	Fast	Low	Medium
	Small	Large	Simple	Complex
	Yes	No		

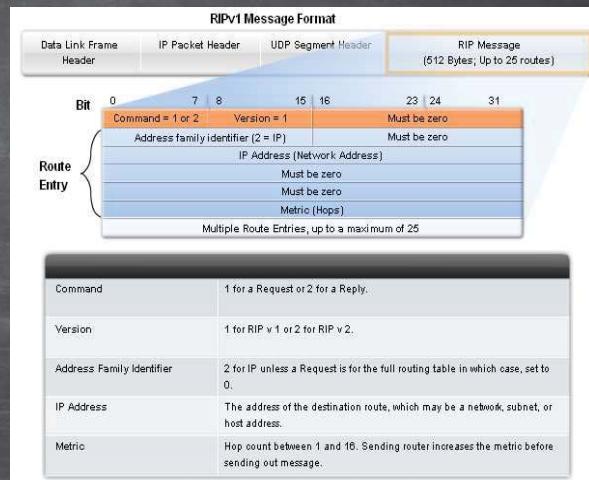
RIP version 1

- RIP Characteristics

- A classful, Distance Vector (DV) routing protocol
- Metric = hop count
- Routes with a hop count > 15 are unreachable
- Updates are broadcast every 30 seconds

RIP version 1

- RIP Message Format
- RIP header - divided into 3 fields
 - Command field
 - Version field
 - Must be zero
- Route Entry - composed of 3 fields
 - Address family identifier
 - IP address
 - Metric



RIP version 1

- RIP Operation

- RIP uses 2 message types:

- Request message

- This is sent out on startup by each RIP enabled interface
- Requests all RIP enabled neighbors to send routing table

- Response message

- Message sent to requesting router containing routing table

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RIP version 1

- IP addresses initially divided into classes

- Class A

- Class B

- Class C

- RIP is a classful routing protocol

မျှတောက်စီပြန်ရန် Class划分
— Does not send subnet masks in routing updates
မျှတောက်စီပြန်ရန် Class划分
Normal update
/ 16 > / 25 = ပုံမှန်လိုအပ်သူများ
/ 16 < / 10 = ပုံမှန်လိုအပ်သူများ
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Default Subnet Masks for Address Classes

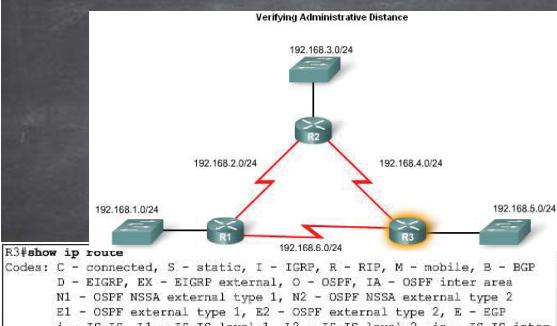
	8 bits	8 bits	8 bits	8 bits
Class A:	Network	Host	Host	Host
	255	.	0	.
Class B:	Network	Network	Host	Host
	255	.	255	.
Class C:	Network	Network	Network	Host
	255	.	255	.

Class A Address Range: 1.0.0.0 to 126.255.255.255
Class B Address Range: 128.0.0.0 to 191.255.255.255
Class C Address Range: 192.0.0.0 to 223.255.255.255

RIP version 1

- Administrative Distance

- RIP's default administrative distance is 120



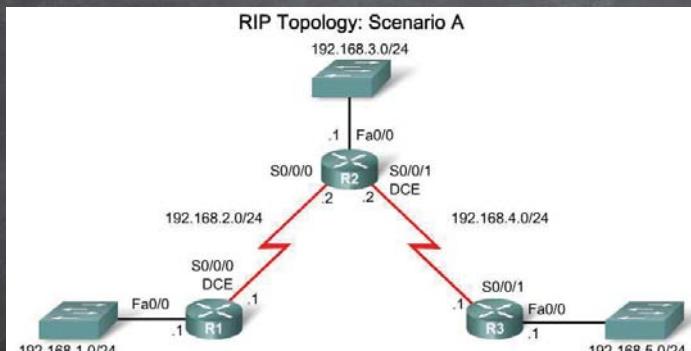
```
R3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route
Gateway of last resort is not set

R  192.168.1.0/24 [120/1] via 192.168.6.2, 00:00:05, Serial0/0/0
R  192.168.2.0/24 [120/1] via 192.168.6.2, 00:00:05, Serial0/0/0
      [120/1] via 192.168.4.2, 00:00:05, Serial0/0/1
R  192.168.3.0/24 [120/1] via 192.168.4.2, 00:00:05, Serial0/0/1
C  192.168.4.0/24 is directly connected, Serial0/0/1
C  192.168.5.0/24 is directly connected, FastEthernet0/0
C  192.168.6.0/24 is directly connected, Serial0/0/0

R3#show protocols
Routing Protocol is "rip"
<output omitted>
Redistributing: rip
Default version control: send version 1, receive any version
  Interface      Send   Recv  Triggered RIP  Key-chain
  FastEthernet0/0    1     1 2
  Serial0/0/0      1     1 2
  Serial0/0/1      1     1 2
  Serial0/0/2      1     1 2
Automatic network summarization is in effect
  Routing for Networks:
    192.168.4.0
    192.168.5.0
    192.168.6.0
  Routing Information Sources:
    Gateway          Distance      Last Update
    192.168.6.2      120          00:00:10
    192.168.4.2      120          00:00:18
  Distance: (default is 120)
```

Basic RIPv1 Configuration

- A typical topology suitable for use by RIPv1 :



Addressing Table: Scenario A

Device	Interface	IP Address	Subnet Mask
R1	Fa0/0	192.168.1.1	255.255.255.0
	S0/0/0	192.168.2.1	255.255.255.0
R2	Fa0/0	192.168.3.1	255.255.255.0
	S0/0/0	192.168.2.2	255.255.255.0
R3	S0/0/1	192.168.4.2	255.255.255.0
	Fa0/0	192.168.5.1	255.255.255.0
	S0/0/1	192.168.4.1	255.255.255.0

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Basic RIPv1 Configuration

Basic RIPv1 Configuration

- Basic Settings on a Router

- Router RIP Command

– Specifying Networks

```
R1(config)#router rip  
R1(config-router)#network 192.168.1.0  
R1(config-router)#network 192.168.2.0  
      Area 0 IP範囲 (vnon)  
      Area 0 内部ルーティング
```

```
R2(config)#router rip  
R2(config-router)#network 192.168.2.0  
R2(config-router)#network 192.168.3.0  
R2(config-router)#network 192.168.4.0
```

```
R3(config)#router rip  
R3(config-router)#network 192.168.4.0  
R3(config-router)#network 192.168.5.0
```

Verification and Troubleshooting

- Use the following commands:
how running-config
how ip route
how ip protocols
debug ip rip

Routing Protocol ip protocols

Routing Protocol is "rip"

- Sending updates every 30 seconds, next due in 23 seconds
- Interval 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	1		
Serial0/0/0	1	1		
Serial0/0/1	1	1		

Automatic network summarization is in effect

Maximum path: 4

Routing for Networks:

- 192.168.2.0
- 192.168.3.0
- 192.168.4.0

Routing Information Sources:

Gateway	Distance	Last Update
192.168.2.1	120	00:00:18
192.168.4.1	120	00:00:22

Distance: (default is 120)

Shows which routing processes are enabled

Timers currently in use including when the next update will be sent out by this router (23 seconds)

CCNP-level topics include:

- Filtering what updates this router will send and receive
- Redistributing: rip means that this router is sending and receiving only RIP.

Shows which interfaces are currently sending and receiving RIP updates as well as which RIP version.

- Automatic summarization in effect means this router is summarizing to the classful network boundary.
- Maximum paths specifies how many equal-cost routes RIP will use to send traffic to the same destination.

Routing for Networks displays the classful network address configured in RIP router configuration mode.

Routing Information Sources are the RIP neighbors this router is currently receiving updates from.

- Includes next-hop IP address, the AD, and when the last update was received.

Last line above the IP for this router

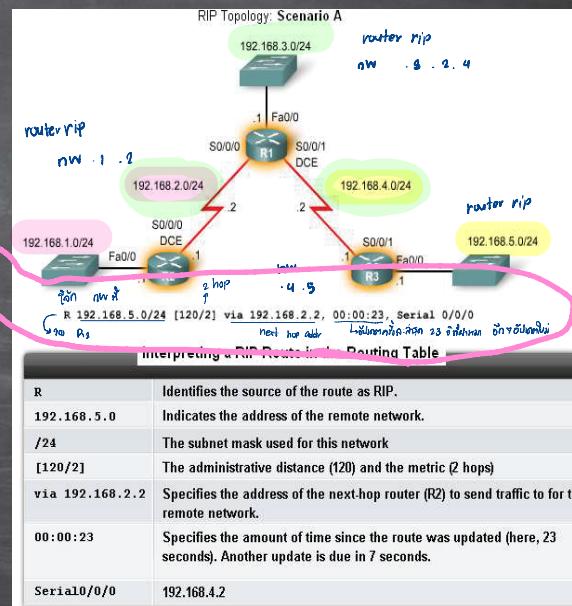
Verification and Troubleshooting

- Use the following

commands:

```
show running-config  
show ip route  
show ip protocols  
debug ip rip
```

mesothoracicus ແລກມົວຂາຍສົ່ງໄວ



Verification and Troubleshooting

- Use the following commands:

```
show running-config  
show ip route  
show ip protocols  
no debgg all မရမင်း လောင်း အကြောင်း  
debug ip rip (၁၇ ၃၂)
```

```
R2#debug ip rip
RIP protocol debugging is on
RIP: received v1 update from 192.168.2.1 on Serial0/0/0 - R2 receives an update from R1 advertising the R1's directly connected LAN.
    192.168.1.0 in 1 hops via interface R3
RIP: received v1 update from 192.168.4.1 on Serial0/0/1 - R2 receives an update from R3 advertising the R3's directly connected LAN.
    192.168.5.0 in 1 hops via interface R4
RIP: sending v1 update to 255.255.255.255 via FastEthernet0/0 (192.168.3.1) to urba
RIP: build update entries
    - R2 sends an update out Fa0/0 to all networks in the routing table except the network attached to Fa0/0.
RIP: build update entries
    network 192.168.1.0 metric 2
    network 192.168.2.0 metric 1
    network 192.168.4.0 metric 1
    network 192.168.5.0 metric 2
RIP: sending v1 update to 255.255.255.255 via Serial0/0/1 (192.168.4.2)
RIP: build update entries
    - R2 sends an update out S0/0/1 to R3. Included in the update are R1's LAN, the WAN between R1 and R2, and R2's LAN.
    network 192.168.1.0 metric 2
    network 192.168.2.0 metric 1
    network 192.168.3.0 metric 1
    - Note that split horizon is in effect. R2 does not advertise the R3 LAN back to R3.
RIP: sending v1 update to 255.255.255.255 via Serial0/0/0 (192.168.2.2)
RIP: build update entries
```

Verification and Troubleshooting

- Passive interface command

—Used to prevent a router from sending updates through an interface

**Router(config-router) #passive-interface
interface-type interface-number**

fa 0/0
လျှပ်စီးနည်းမြေ
မြတ်နည်းမြေ

Verification and Troubleshooting

- Passive interface command

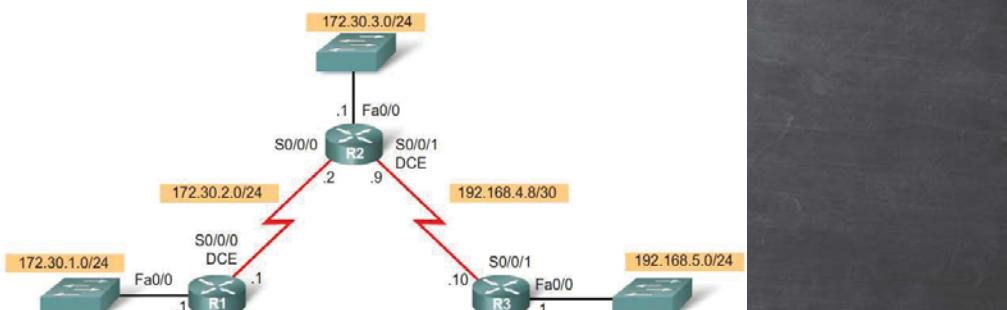
```
R2(config)#router rip
R2(config-router)#passive-interface FastEthernet 0/0
R2(config-router)#end
R2#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 14 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface      Send   Recv   Triggered RIP  Key-chain
    Serial0/0/0     1       1 2
    Serial0/0/1     1       1 2
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.2.0
    192.168.3.0
    192.168.3.0
    192.168.4.0
  Passive Interface(s):
    FastEthernet0/0
  Routing Information Sources:
    Gateway          Distance      Last Update
    192.168.2.1        120          00:00:27
    192.168.4.1        120          00:00:23
  Distance: (default is 120)
```

Show running config
→

Automatic Summarization

- Modified Topology : Scenario B

RIP Topology: Scenario B



RIP Topology: Scenario B

	Subnet Mask	Subnet Mask	Subnet Mask	Subnet Mask
R1	Fa0/0	172.30.1.1	255.255.255.0	
	S0/0/0	172.30.2.1	255.255.255.0	
R2	Fa0/0	172.30.3.1	255.255.255.0	
	S0/0/0	172.30.2.2	255.255.255.0	
R3	S0/0/0	192.168.4.9	255.255.255.252	
	S0/0/1	192.168.5.1	255.255.255.0	
		192.168.4.10	255.255.255.252	

Automatic Summarization

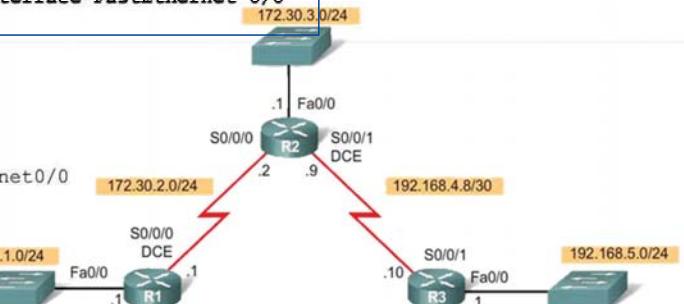
```
R1(config)#interface fa0/0
R1(config-if)#ip address 172.30.1.1 255.255.255.0
R1(config-if)#interface s0/0/0
R1(config-if)#ip address 172.30.2.1 255.255.255.0
R1(config-if)#no router rip
R1(config)#router rip
R1(config-router)#network 172.30.1.0
R1(config-router)#network 172.30.2.0
R1(config-router)#passive-interface FastEthernet 0/0
R1(config-router)#end
```

```
R1#show run
(**output omitted**)
```

```
!
router rip
  passive-interface FastEthernet0/0
  network 172.30.0.0
!
```

```
(**output omitted**)
```

```
R1#
```



Automatic Summarization



```
R2(config)#interface S0/0/0
R2(config-if)#ip address 172.30.2.2 255.255.255.0
R2(config-if)#interface fa0/0
R2(config-if)#ip address 172.30.3.1 255.255.255.0
R2(config-if)#interface S0/0/1
R2(config-if)#ip address 192.168.4.9 255.255.255.252
R2(config-if)#no router rip
R2(config)#router rip
R2(config-router)#network 172.30.0.0
R2(config-router)#network 192.168.4.0
R2(config-router)#passive-interface FastEthernet 0/0
R2(config-router)#end
R2#show run
(**output omitted*)
!
router rip
  passive-interface FastEthernet0/0
  network 172.30.0.0
  network 192.168.4.0
!
(**output omitted*)
R2#
```

Class သိမ်္မာန် တွင် မြတ် ဘုရား၏
မြတ် ဘုရား၏ 192.30.0.0

192.30.0.0

172.30.3.0/24

R2

.1 Fa0/0

S0/0/0

.2 .9

S0/0/1 DCE

172.30.2.0/24

R1

.1 Fa0/0

S0/0/0

DCE

172.30.1.0/24

R3

.10 Fa0/0

S0/0/1

192.168.5.0/24

192.168.4.8/30

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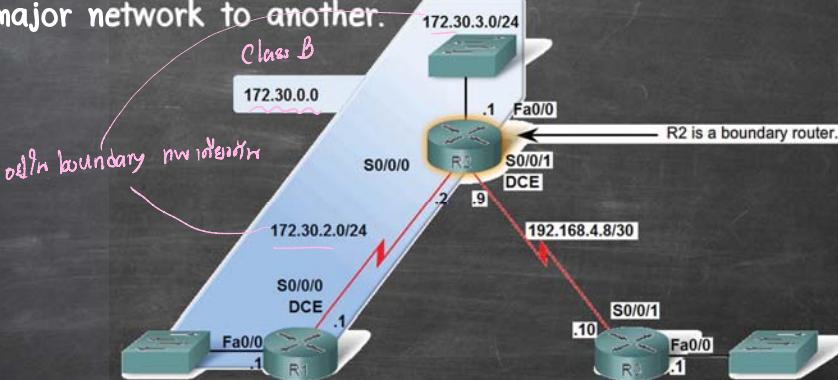
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Automatic Summarization



Boundary Routers

- RIP automatically summarizes classful networks
- Boundary routers summarize RIP subnets from one major network to another.

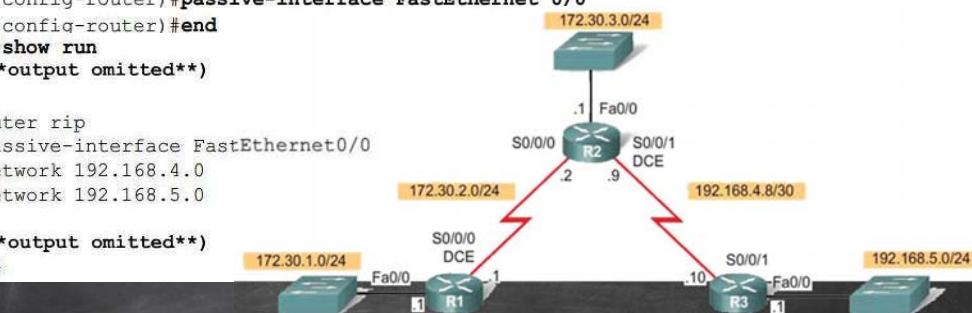


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Automatic Summarization

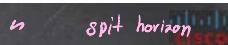
```
R3(config)#interface fa0/0
R3(config-if)#ip address 192.168.5.1 255.255.255.0
R3(config-if)#interface S0/0/1
R3(config-if)#ip address 192.168.4.10 255.255.255.252
R3(config-if)#no router rip
R3(config)#router rip
R3(config-router)#network 192.168.4.0
R3(config-router)#network 192.168.5.0
R3(config-router)#passive-interface FastEthernet 0/0
R3(config-router)#end
R3#show run
(**output omitted*)
!
router rip
  passive-interface FastEthernet0/0
  network 192.168.4.0
  network 192.168.5.0
!
(**output omitted*)
R3#
```



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Automatic Summarization



Processing RIP Updates

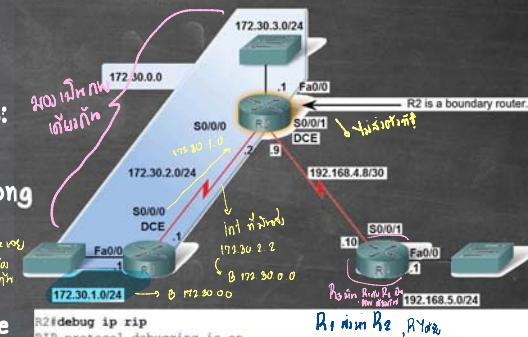
2 rules govern RIPv1 updates:

- If a routing update and the interface it's received on belong to the same network then

- The subnet mask of the interface is applied to the network in the routing update

- If a routing update and the interface it's received on belong to a different network then

- The classful subnet mask of the network is applied to the network in the routing update.



```
R2#debug ip rip
RIP protocol debugging is on
RIP: received v1 update from 172.30.2.1 on Serial0/0/0
  via 172.30.1.0 in 1 hops
(**output omitted**)

R2#undebug all
All possible debugging has been turned off
R2#show ip route
(*output omitted*)

Gateway of last resort is not set
  172.30.0.24 is subnetted, 3 subnets
  C 172.30.1.0 [120/1] via 172.30.2.1, 00:00:18, Serial0/0/0
  C 172.30.2.0 is directly connected, Serial0/0/0
  C 172.30.3.0 is directly connected, FastEthernet0/0
  192.168.4.0/30 is subnetted, 1 subnets
  C 192.168.4.8 is directly connected, Serial0/0/1
  R 192.168.5.0/24 [120/1] via 192.168.4.10, 00:00:16, Serial0/0/1

R2#
```

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Automatic Summarization

- Sending RIP Updates

- RIP uses automatic summarization to reduce the size of a routing table.

```
R2#debug ip rip
RIP protocol debugging is on
RIP: sending v1 update to 255.255.255.255 via Serial0/0/0 (172.30.2.2)
RIP: build update entries
  network 172.30.3.0 metric 1
  network 192.168.4.0 metric 1
  network 192.168.5.0 metric 2
RIP: sending v1 update to 255.255.255.255 via Serial0/0/1 (192.168.4.9)
RIP: build update entries
  o.s network 172.30.0.0 metric 1
R2#undebug all
All possible debugging has been turned off
R2#
```

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      (*output omitted*)
Gateway of last resort is not set

  172.30.0.0/24 is subnetted, 3 subnets
C    172.30.1.0 is directly connected, FastEthernet0/0
C    172.30.2.0 is directly connected, Serial0/0/0
R    172.30.3.0 [120/1] via 172.30.2.2, 00:00:17, Serial0/0/0
R    192.168.4.0/24 [120/1] via 172.30.2.2, 00:00:17, Serial0/0/0
R    192.168.5.0/24 [120/2] via 172.30.2.2, 00:00:17, Serial0/0/0
```

```
R3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      (*output omitted*)
Gateway of last resort is not set

R    172.30.0.0/16 [120/1] via 192.168.4.9, 00:00:15, Serial0/0/1
  192.168.4.0/30 is subnetted, 1 subnets
C    192.168.4.8 is directly connected, Serial0/0/1
C    192.168.5.0/24 is directly connected, FastEthernet0/0
```

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Automatic Summarization

- Advantages of automatic summarization:

- The size of routing updates is reduced
- Single routes are used to represent multiple routes which results in faster lookup in the routing table.

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
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, II - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

```
R    172.30.0.0/16 [120/1] via 192.168.4.9, 00:00:15, Serial0/0/1
  192.168.4.0/30 is subnetted, 1 subnets
C    192.168.4.8 is directly connected, Serial0/0/1
C    192.168.5.0/24 is directly connected, FastEthernet0/0
```

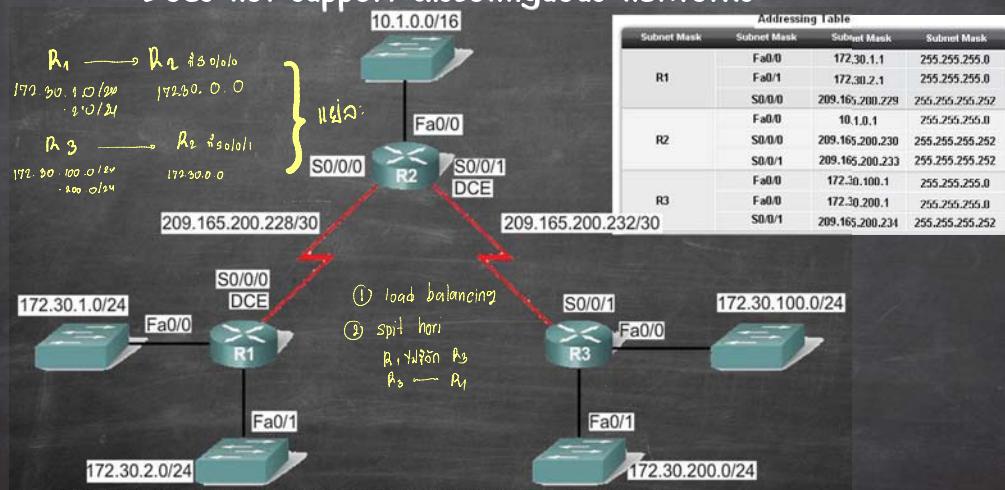
Automatic Summarization

缺点

- Disadvantage of Automatic Summarization:

只支持

- Does not support "discontiguous" networks



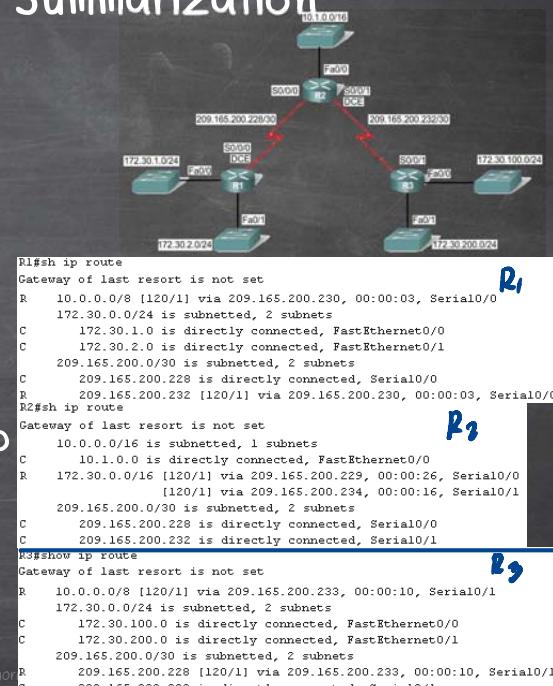
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Automatic Summarization

- Discontiguous Topologies do not converge with RIPv1

- A router will only advertise major network addresses out interfaces that do not belong to the advertised route.



Default Route and RIPv1

- ## • Modified Topology : Scenario C

- Default routes

- Packets that are not defined specifically in a routing table will go to the specified interface for the default route

- Example: Customer routers use default routes to connect to an ISP router.
 - Command used to configure a default route is
`ip route 0.0.0.0 0.0.0.0 s0/0/1`

Default Route and RIPv1

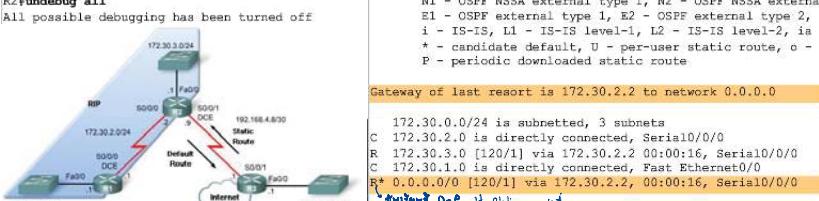
- Propagating the Default Route in RIPv1

- Default-information originate command

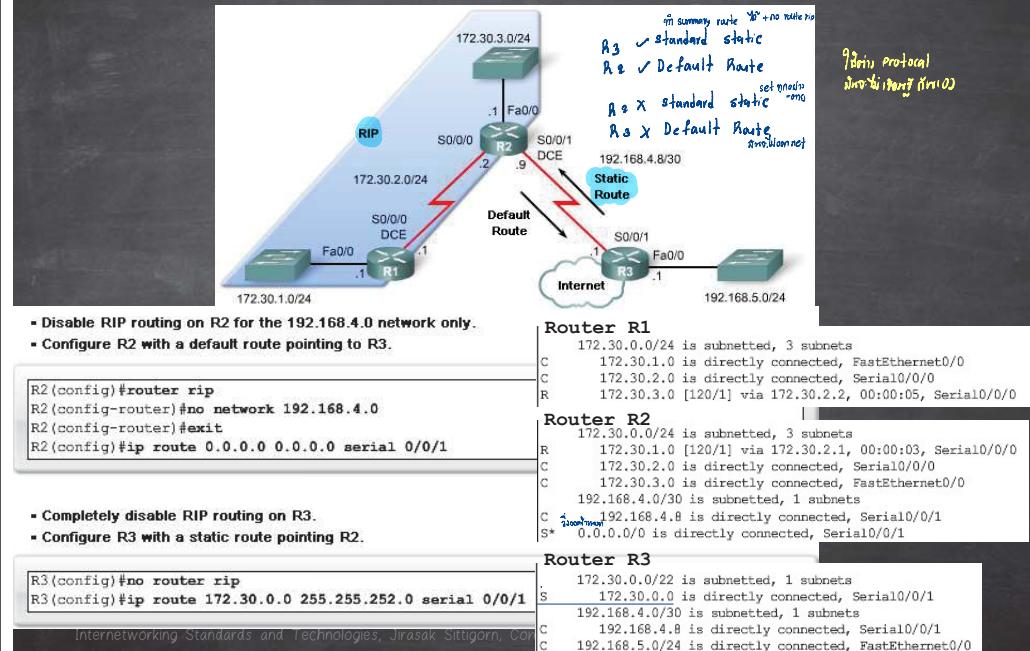
- This command is used to specify that the router is to originate default information, by propagating the static default route in RIP update.

originate default information, by pr
default route in RIP update.
R2(config)#router rip
R2(config-router)#default-information originate 10.7.0.1 always rip default
route
R2(config-router)#end
R2#show ip route

```
R1#debug ip rip
RIP protocol debugging is on
RIP: sending v1 update to 255.255.255.255 v
RIP: build update entries
      subnet 0.0.0 metric 1
      subnet 172.30.3.0 metric 2
R2#undebug all
All possible debugging has been turned off
```



Default Route and RIPv1



Internetworking Standards and Technologies Jirasak Sittipoon (Cor)

InterNetworking: Protocols and Technologies, Second Edition, 63

Summary

- RIP characteristics include:
 - Classful, distance vector routing protocol
 - Metric is Hop Count
 - Does not support VLSM or discontiguous subnets
 - Updates every 30 seconds
 - Rip messages are encapsulated in a UDP segment with source and destination ports of 520

Summary: Commands used by RIP

Command	Command's purpose
Rtr(config)#router rip	Enables RIP routing process
Rtr(config-router)#network	Associates a network with a RIP routing process
Rtr#debug ip rip gn3n no debug all <i>message ที่รับ</i>	used to view real time RIP routing updates
Rtr(config-router)#passive-interface fa0/0 <i>message ที่ update rip ไม่ได้</i>	Prevent RIP updates from going out an interface
Rtr(config-router)#default-information originate <i>Default Route</i>	Used by RIP to propagate default routes
Rtr#show ip protocols	Used to display timers used by RIP

Questions and Answers

