

Routing Protocols of IGP

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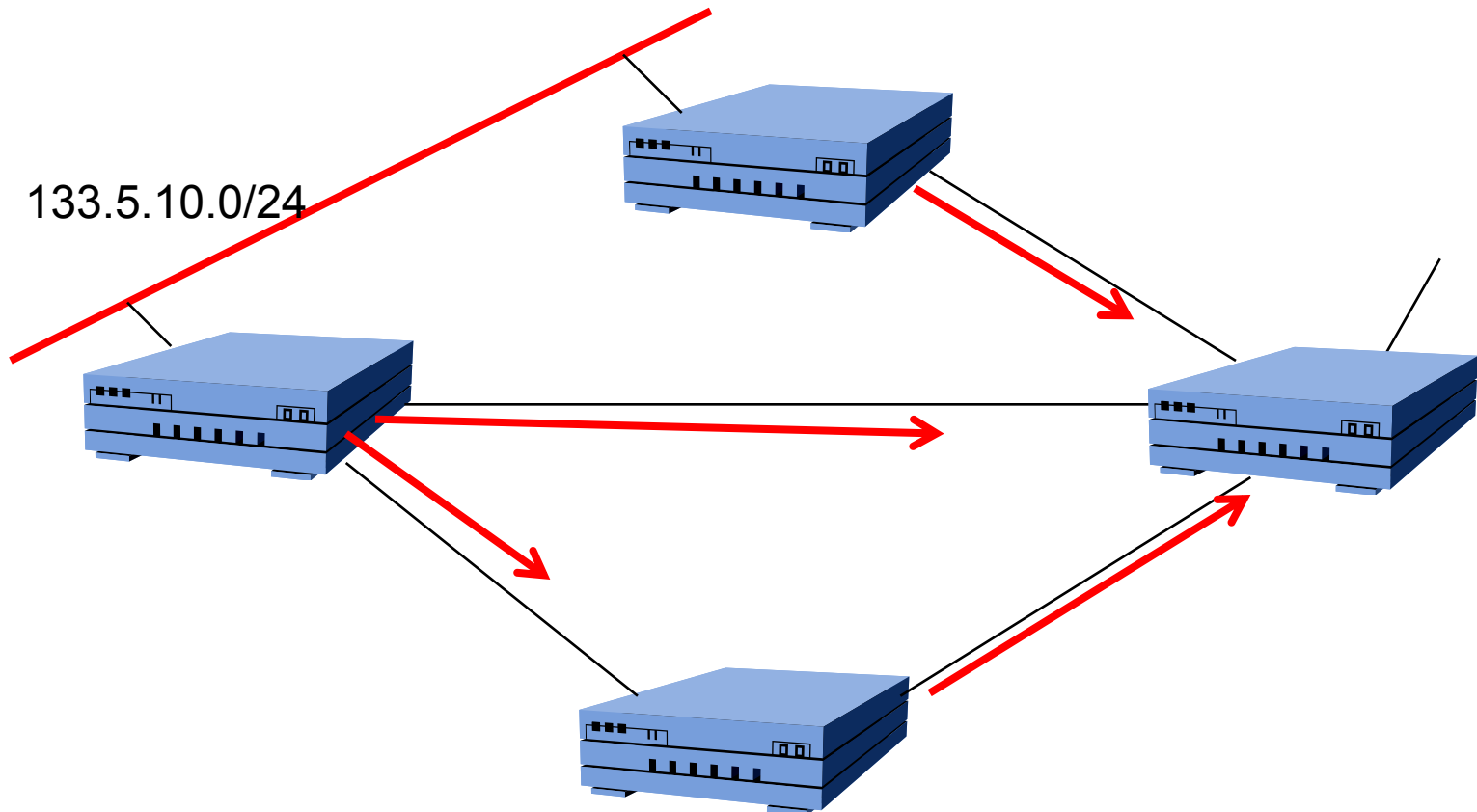
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Routing Protocol

- AS (Autonomous System)
 - Is operated autonomous in the organization.
 - 16bit
- IGP (Interior Gateway Protocol)
 - Routing Control inside AS
 - Routing Protocol for small network
 - RIP, OSPF
- EGP (Exterior Gateway Protocol)
 - Routing Control among AS
 - Routing Protocol for big network
 - BGP

Basic Routing Protocol

- Routing: Network address is distributed by announcement from the original.



AS, IGP, EGP

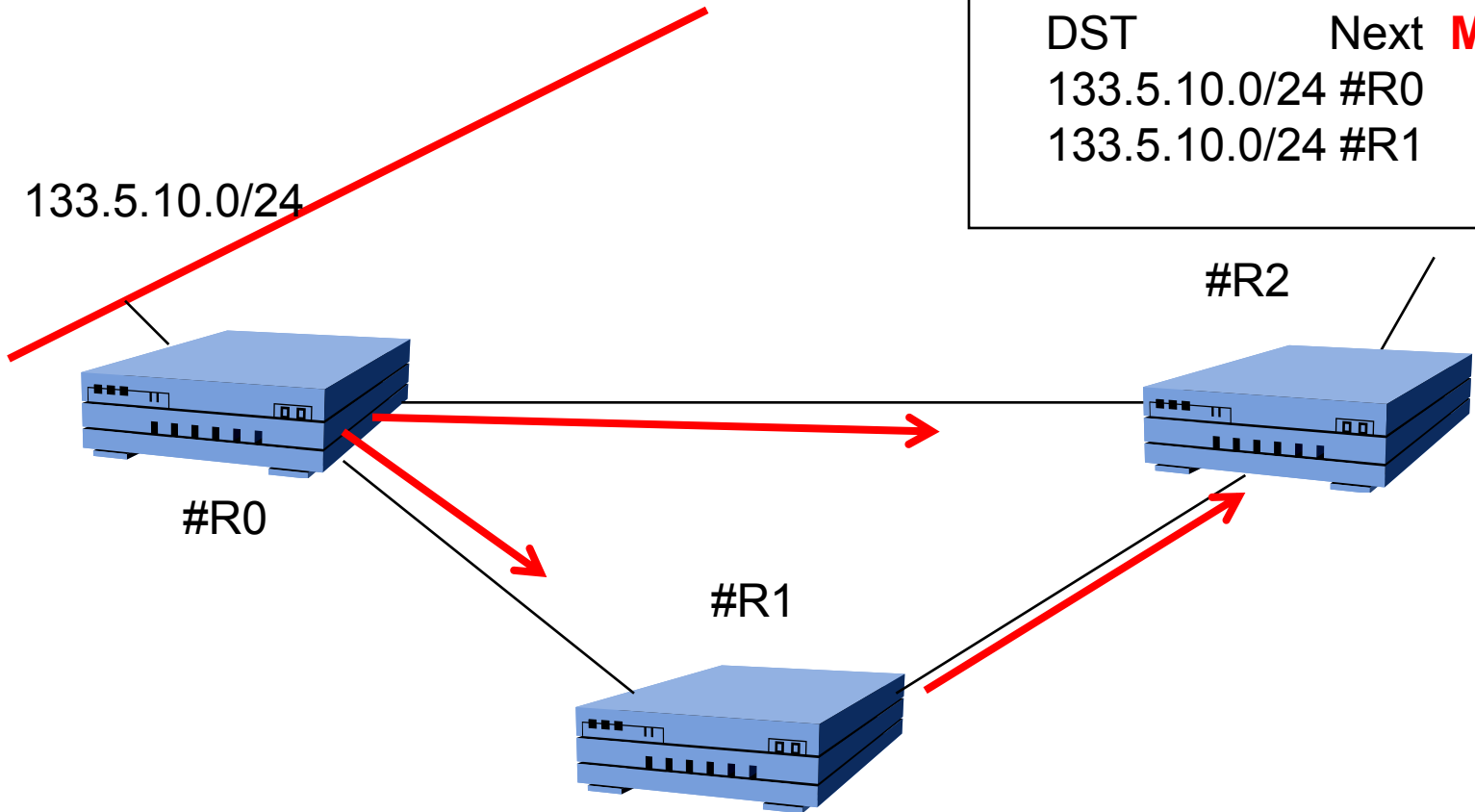
- Automatic Routing table update
 - The update is noticed to network
 - Many packets by the notification may consume the network
- Because there are not so many networks inside AS, the traffic is no problem.
 - IGP
- Because the number of whole network included inside AS might be huge, the traffic should be problem.
 - EGP

RIP

RIP (Routing Information Protocol)

Routing Table

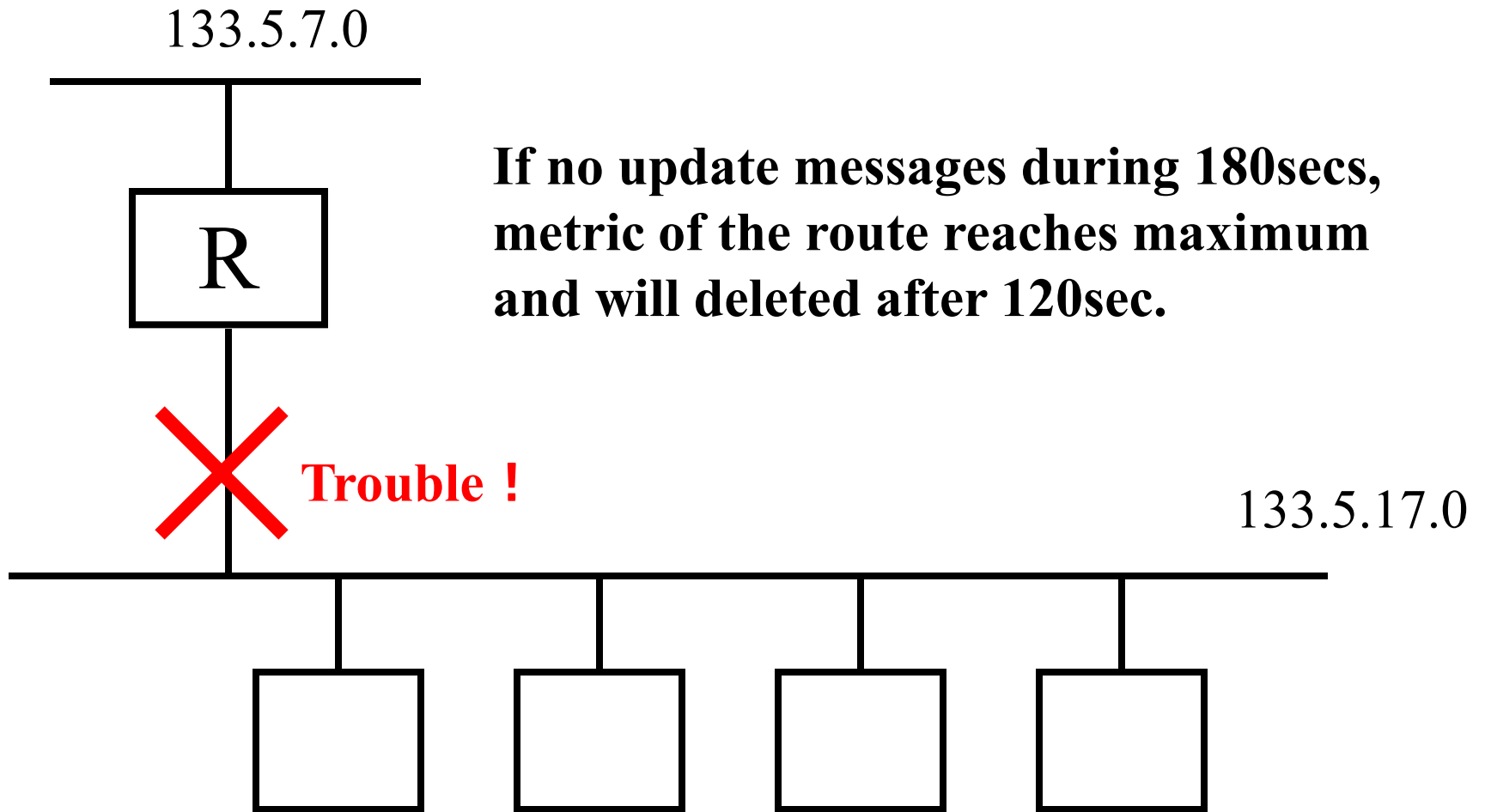
DST	Next	Metric
133.5.10.0/24	#R0	1
133.5.10.0/24	#R1	2



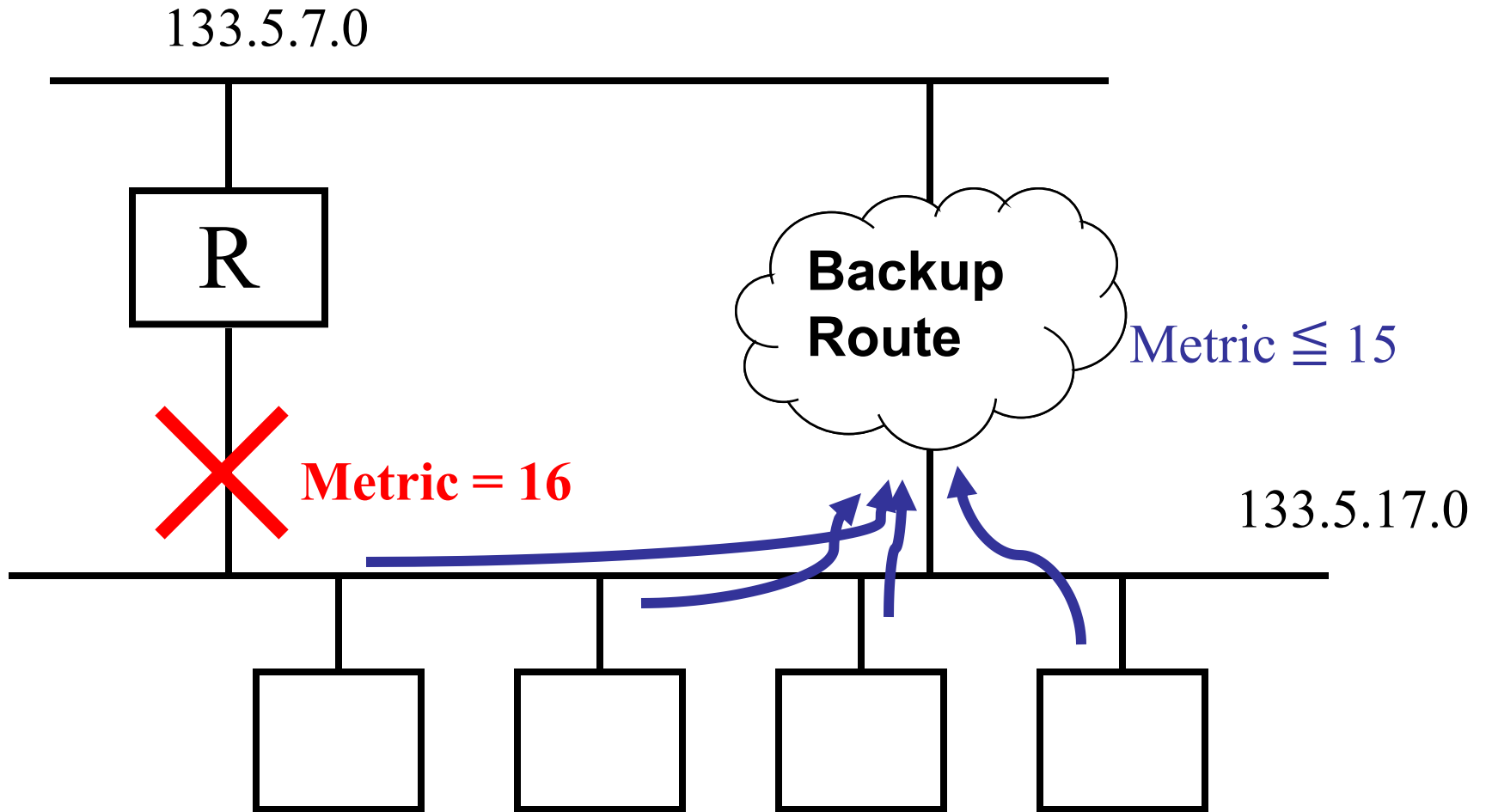
Information managed by RIP

- Records on Routing Table of RIP
 - Destination IP address
 - next hop (The First Router to destination)
 - metric (4bit)
 - route change flag (showing changing of route)
 - Timer
 - Subnet mask (RIP v2)

Trouble and Timer



Backup Route



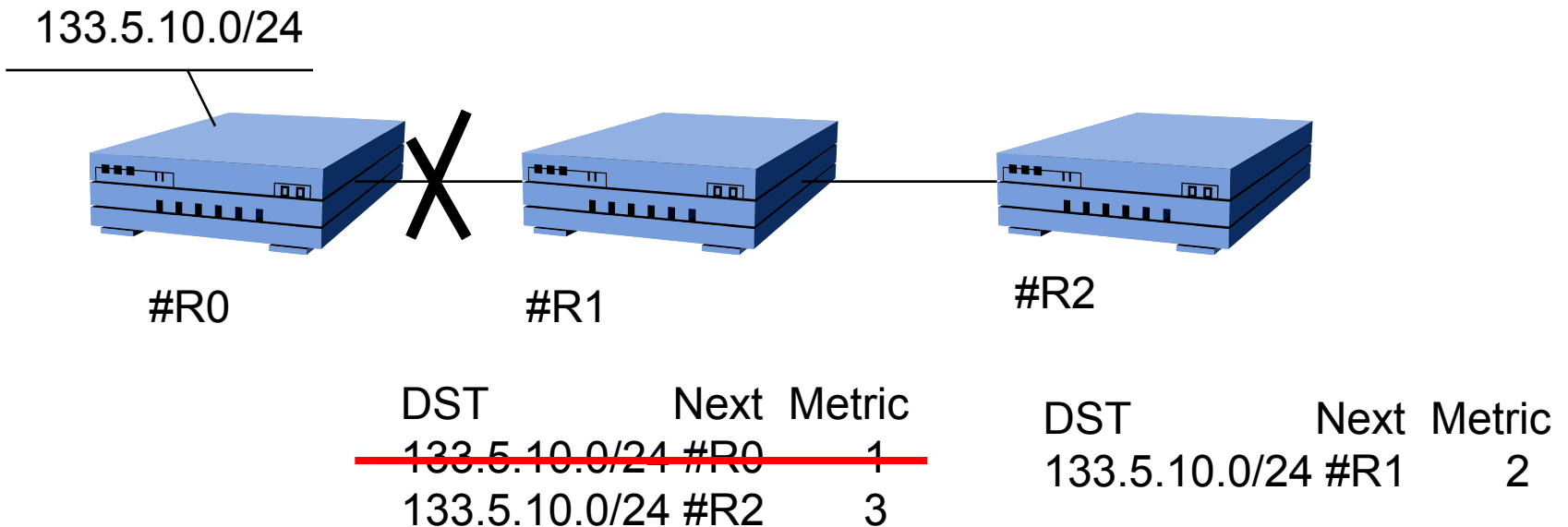
Problem of RIP

- Rip announces the routing information which has been announced by itself.



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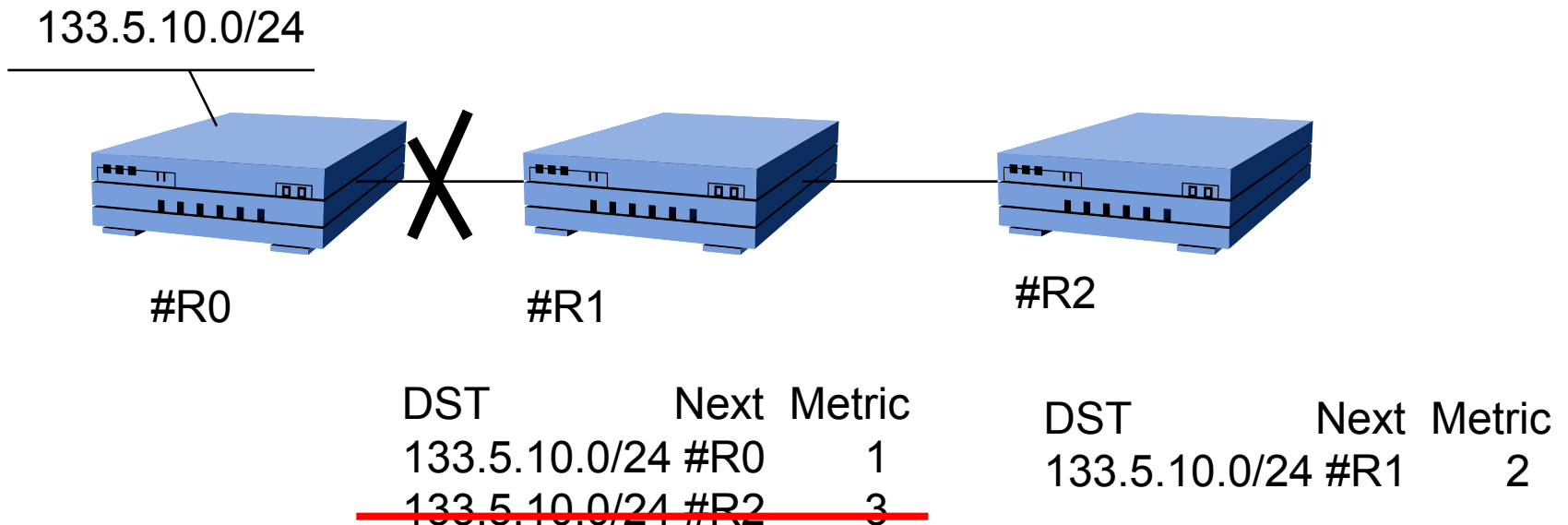


Split Horizon

- Simple Split Horizon
 - Deletes the route which has been announced.
- Poison Reverse Update
 - Shows that the route can be reached by maximum metric

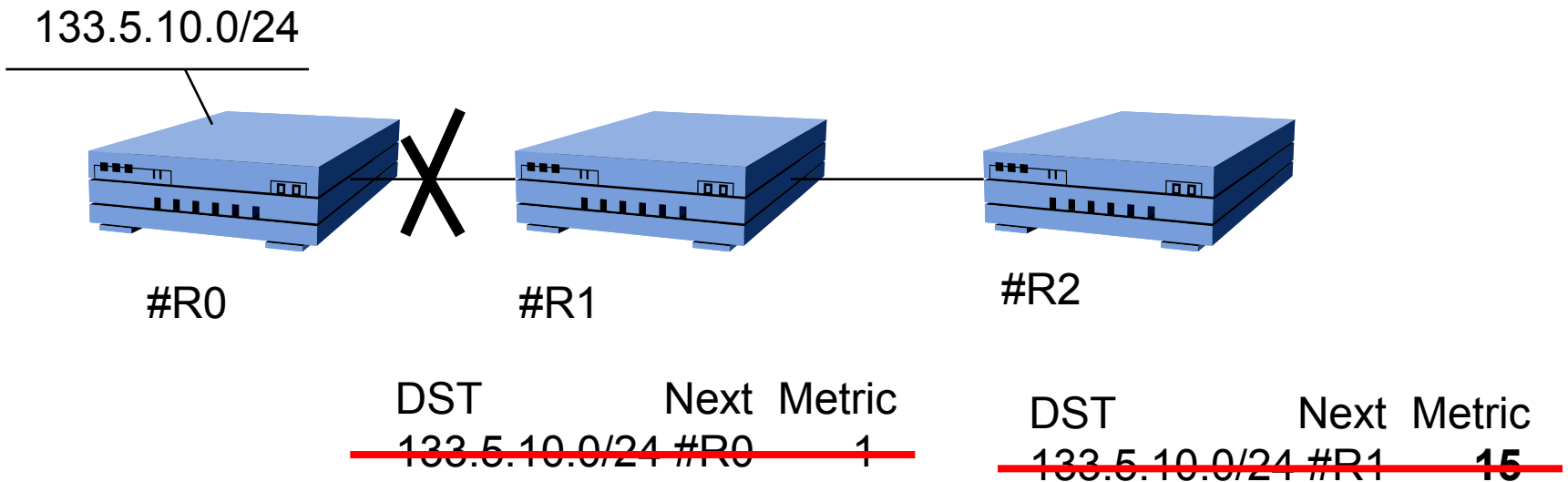
Simple Split Horizon

- Deleting the route which has been announced.



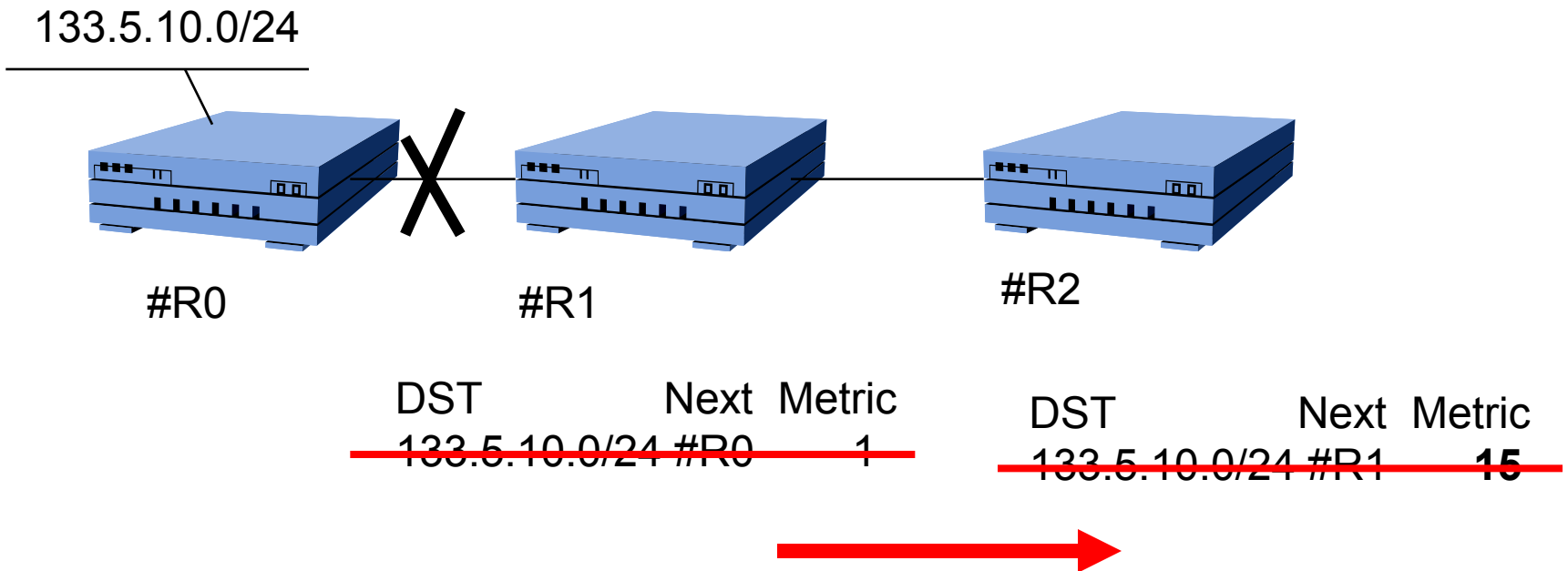
Poison Reverse Update

- Showing that the route can be reached by maximum metric



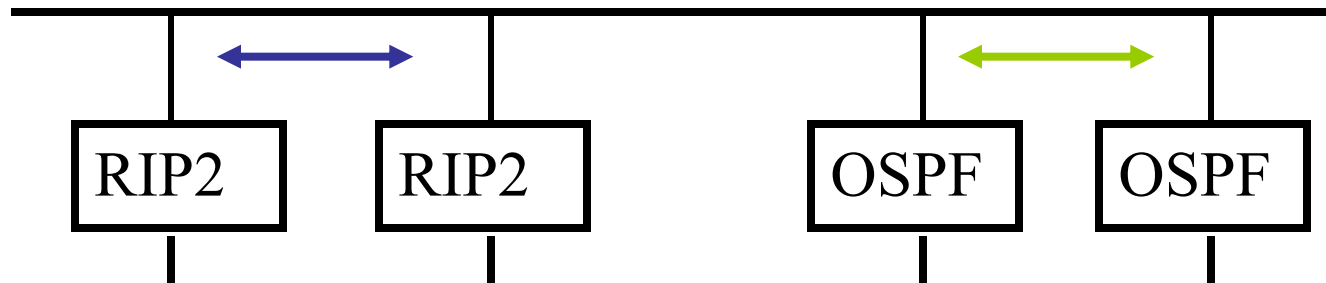
Triggered Update

- If there is a update of the network, the update messaged for that network prefix will be announced within 30sec.



RIP2 Extensions

- Subnet Mask
 - VLSM(Variable Length Subnet Mask)
- Route Tag
 - Is used by EGP(BGP)
- Authentication
- Announcement by Multicast
 - 224.0.0.9
 - Has advantage When all of IGP router is not only RIP.

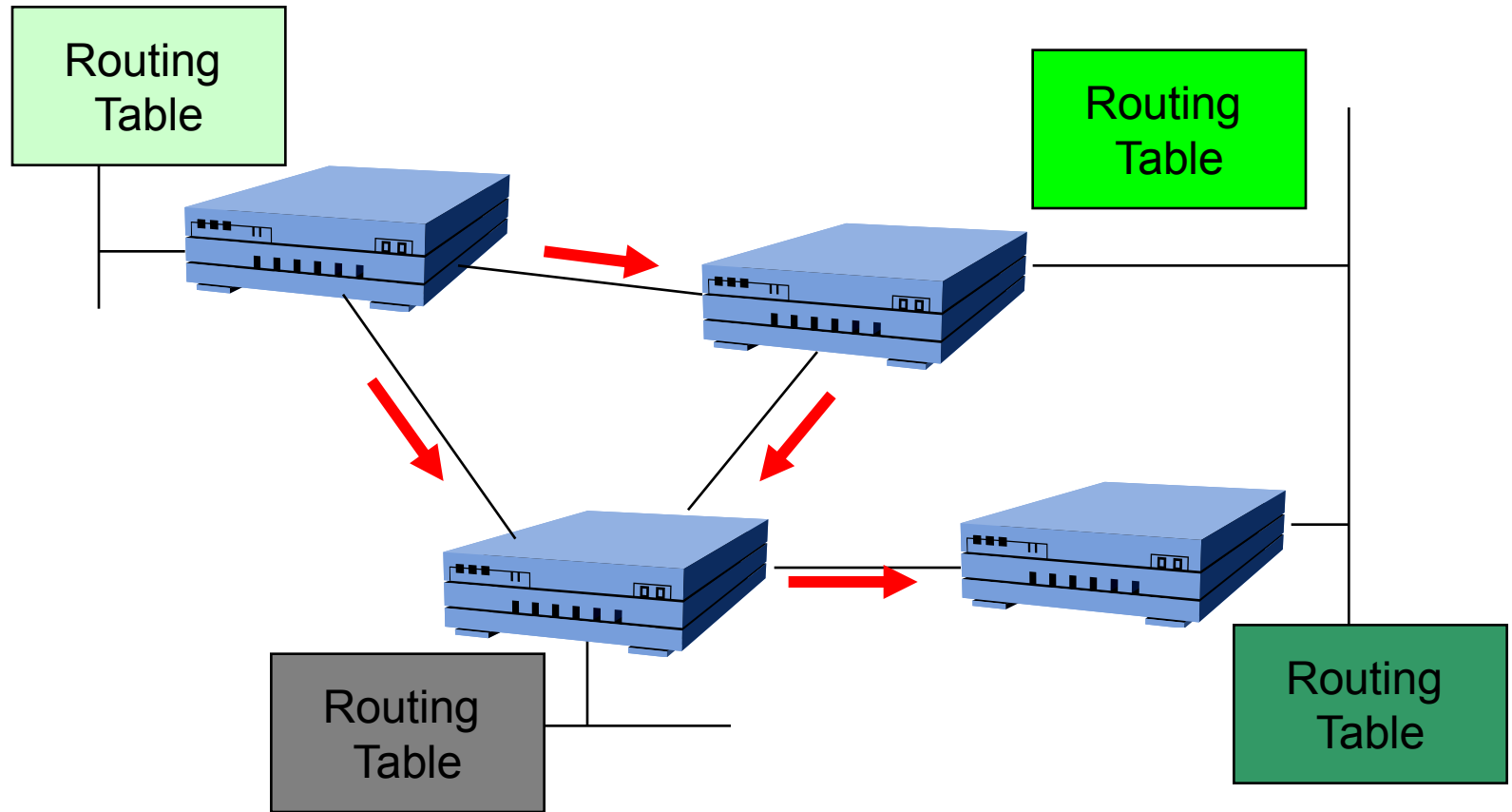


OSPF

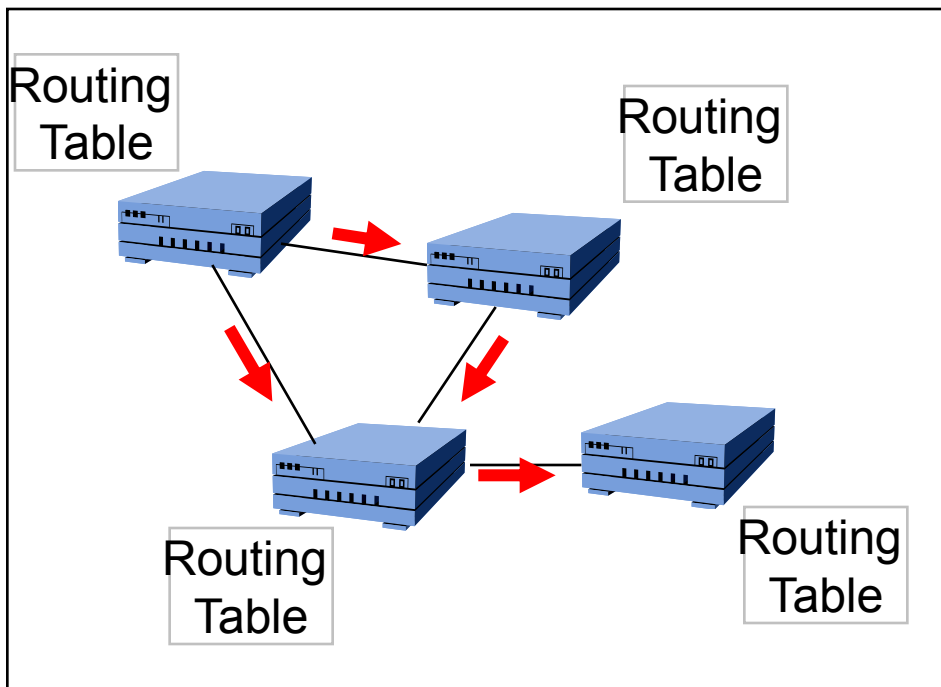
Problems of RIP

- Too long for update
- version 1 can not use VLSM (Various Length Subnet Mask)
- version 1 does not use Multicast
- version 1 does not have Authentication.
- Overhead by constant update message
- RIP can not decide optimal route
- No Hierarchical Routing Information
- 16bit of Matric is too small.

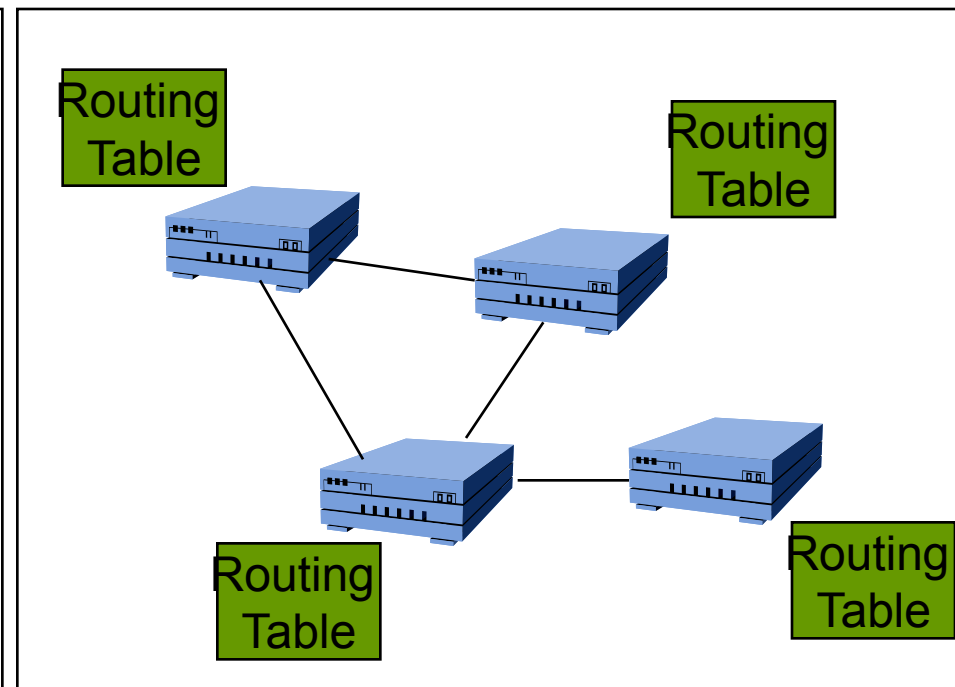
RIP (Routing Information Protocol)



OSPF (Open Shortest Path First)



Exchanging of Routing Information

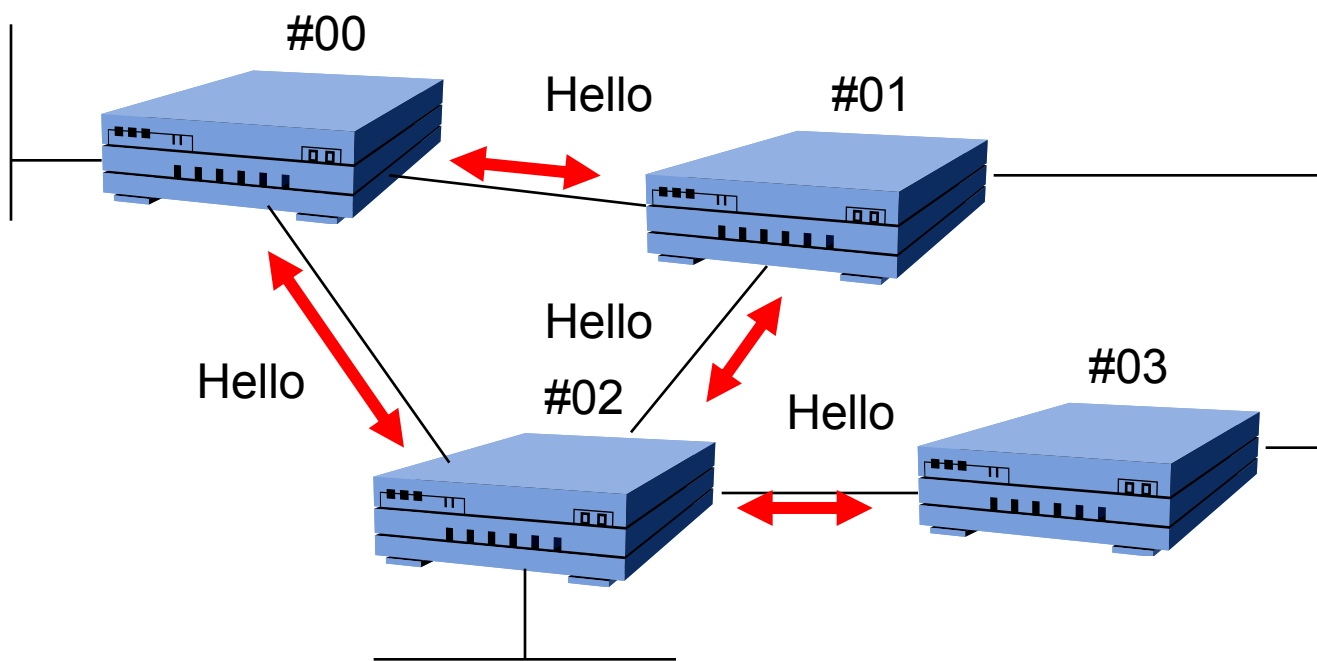


All of routers share Routing Information

OSPF (Open Shortest Path First)

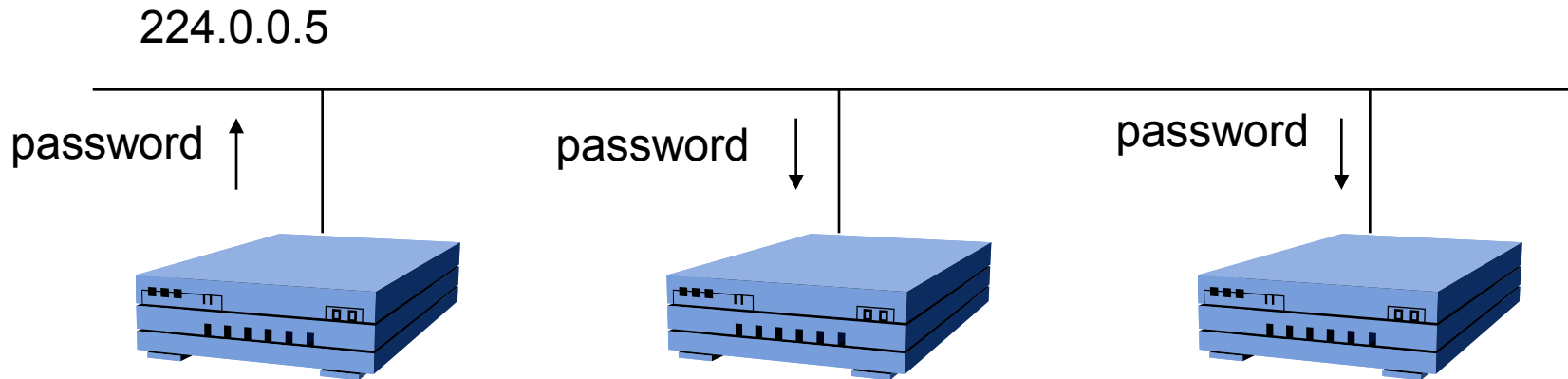
- Detection of the neighbor
 - OSPF Routers which are on the same segment
- Sharing of Link State Information
 - Link State Information (Interface, Network Prefix and Network Prefix length) are sent to other OSPF routers.
- Calculation for the Routing Information
 - All of router have the same routing table, the routing table is calculated from the same set of link state information from all of the routers.

Establishment of connection with Neighbor



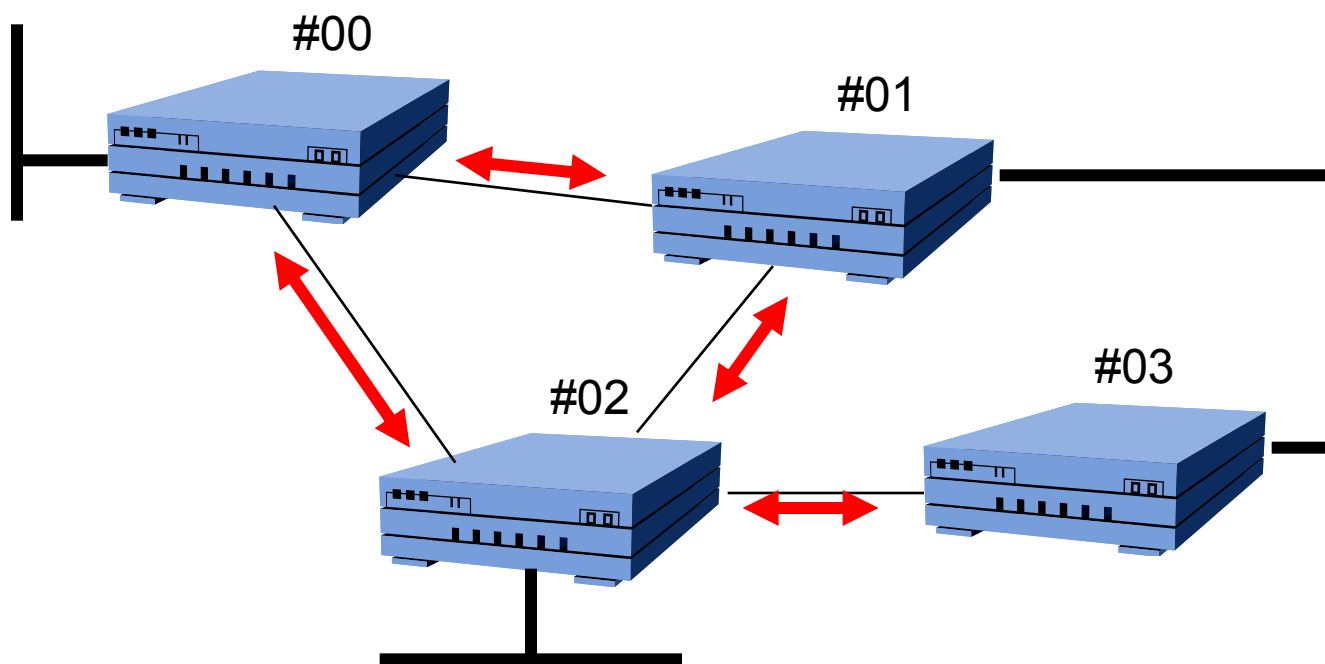
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Authentication for the connection with Neighbor



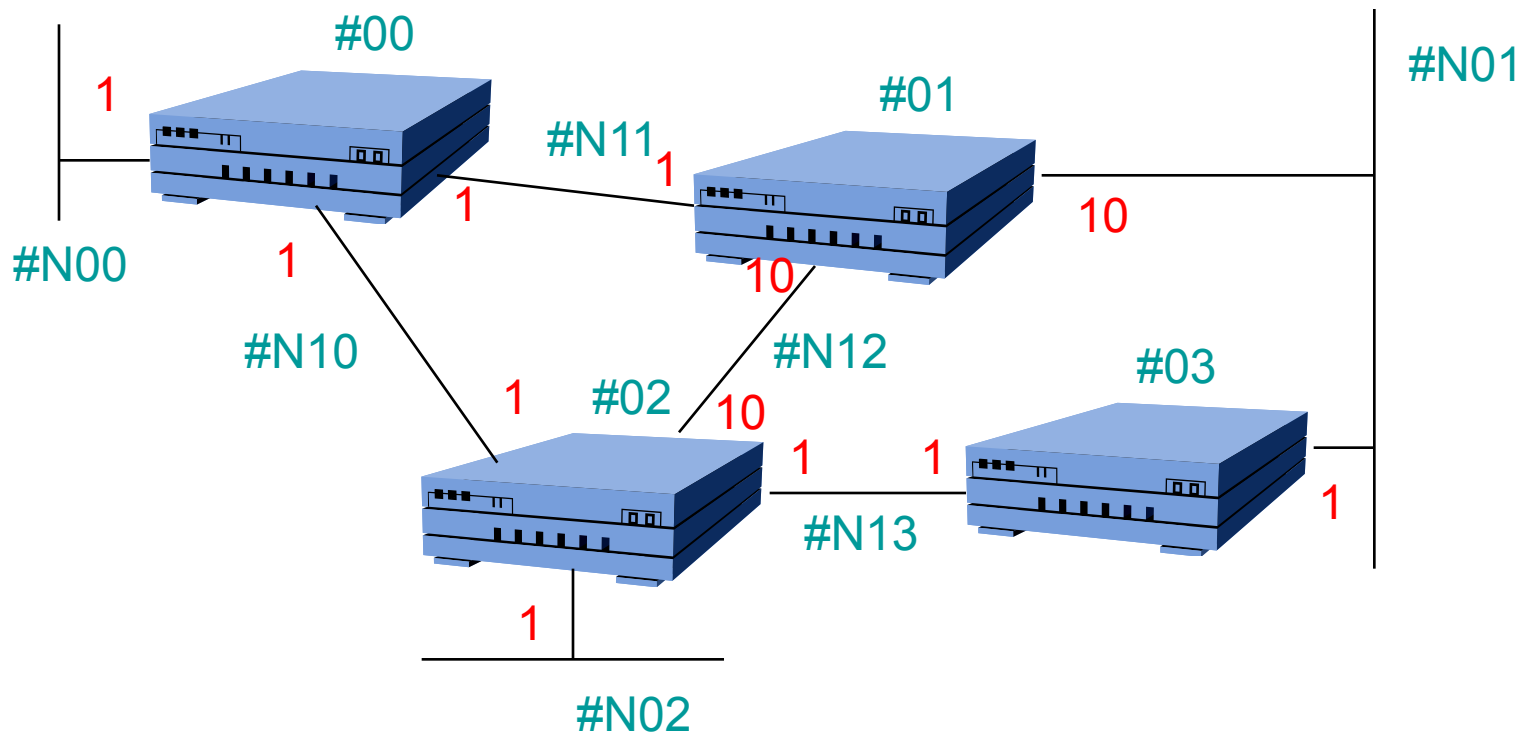
Sharing of Link State Information

LSA: Link State Advertisement



Link State Information (Interface, Network Prefix and Network Prefix length) is used instead of Routing information

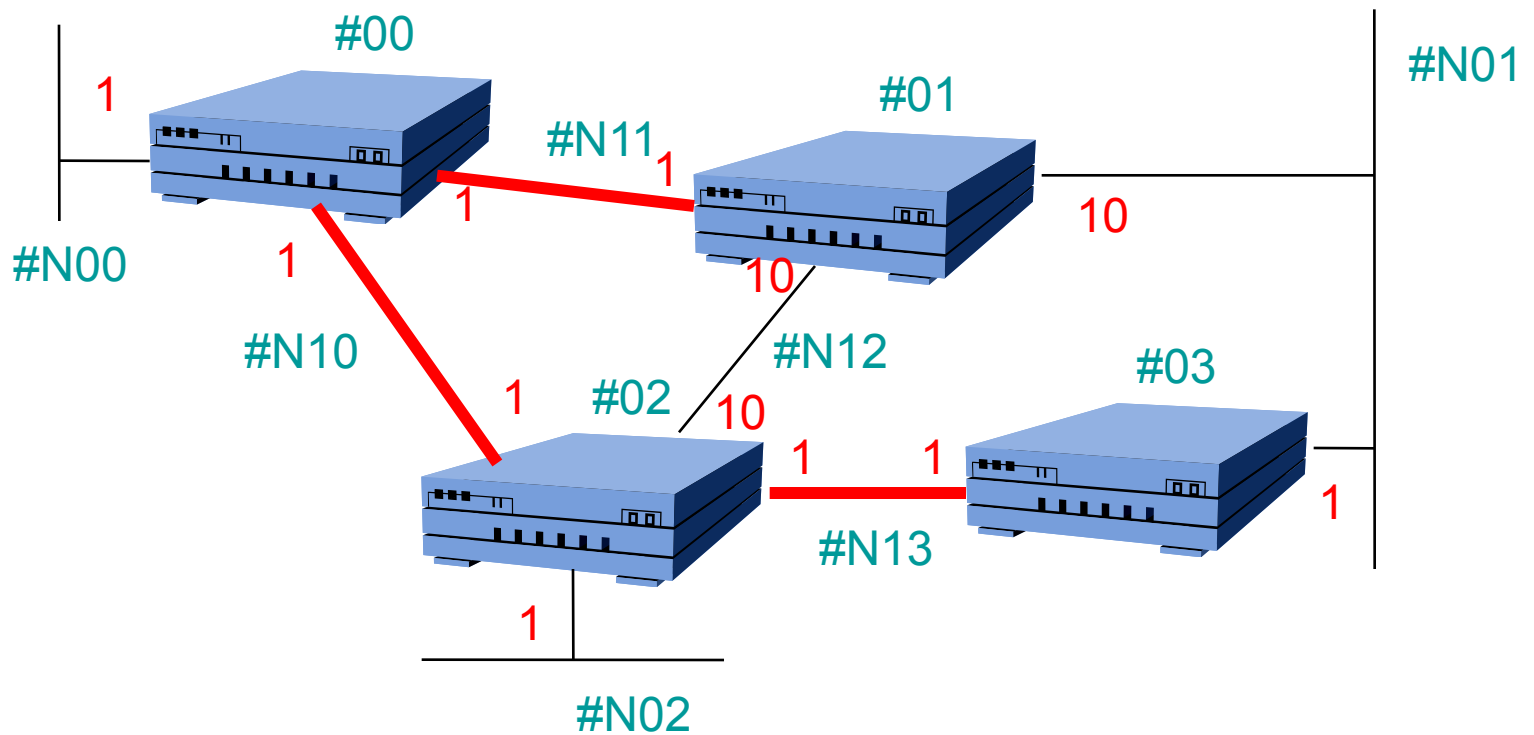
Calculation of Routing Information



LSDB (Link State Data Base)

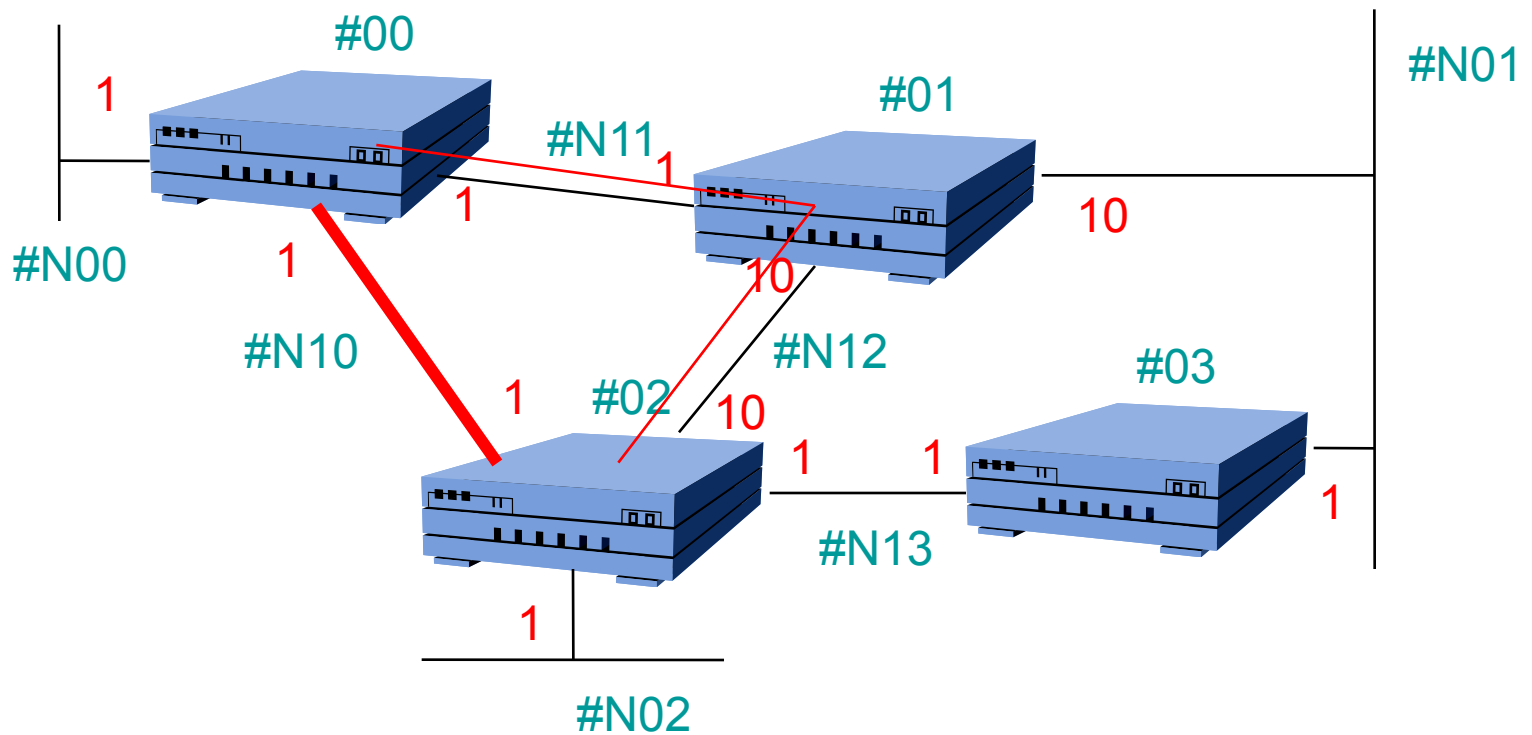
	#00	#01	#02	#03	#N00	#N01	#N02	#N10	#N11	#N12	#N13
#00					1			1	1		
#01						10			1	10	
#02			1					1		10	1
#03		1									1
#N00	0										
#N01		0		0							
#N02			0								
#N10	0		0								
#N11	0	0									
#N12	0		0								
#N13			0	0							

Shortest Path First Algorithm of Dijkstra



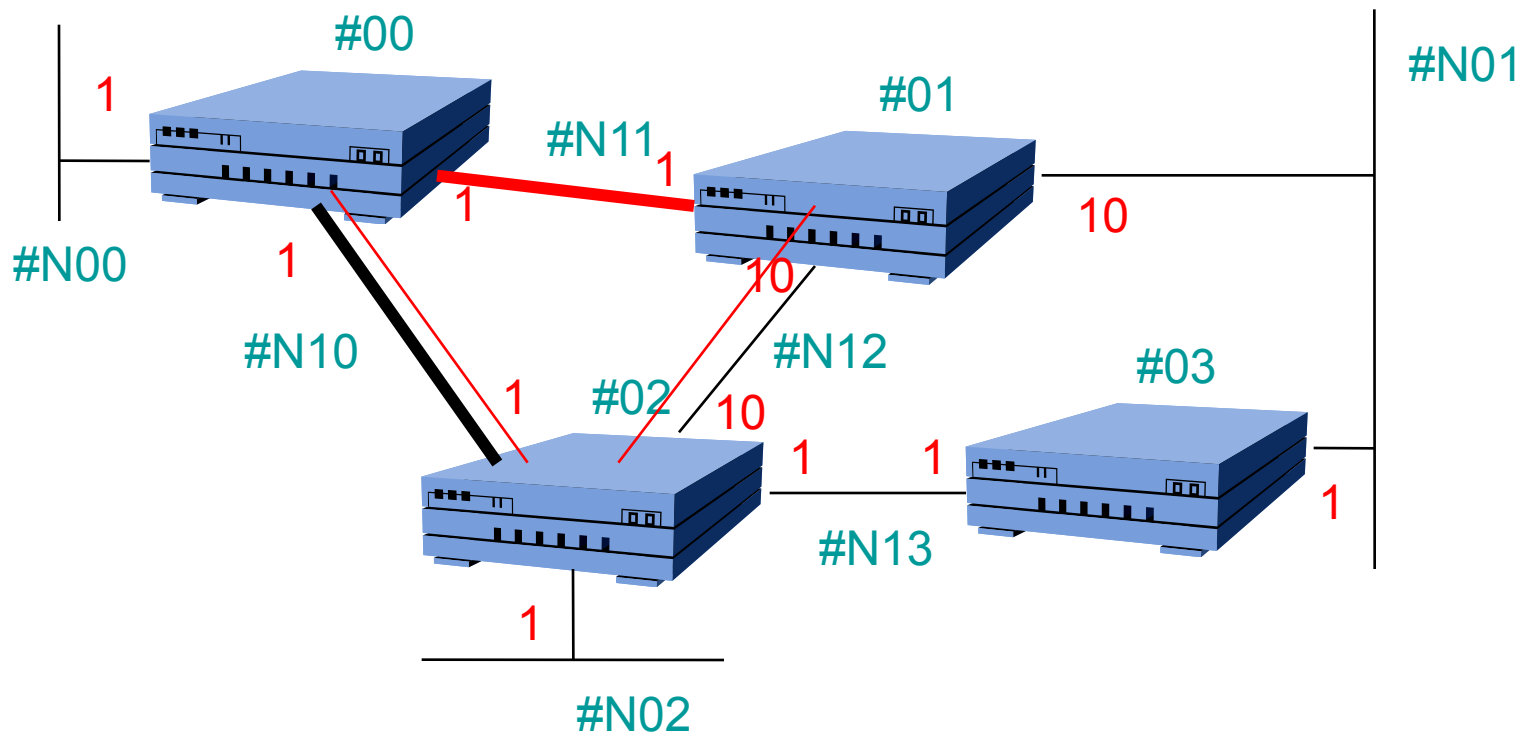
Routing path is Shortest Path

Shortest Path First Algorithm of Dijkstra



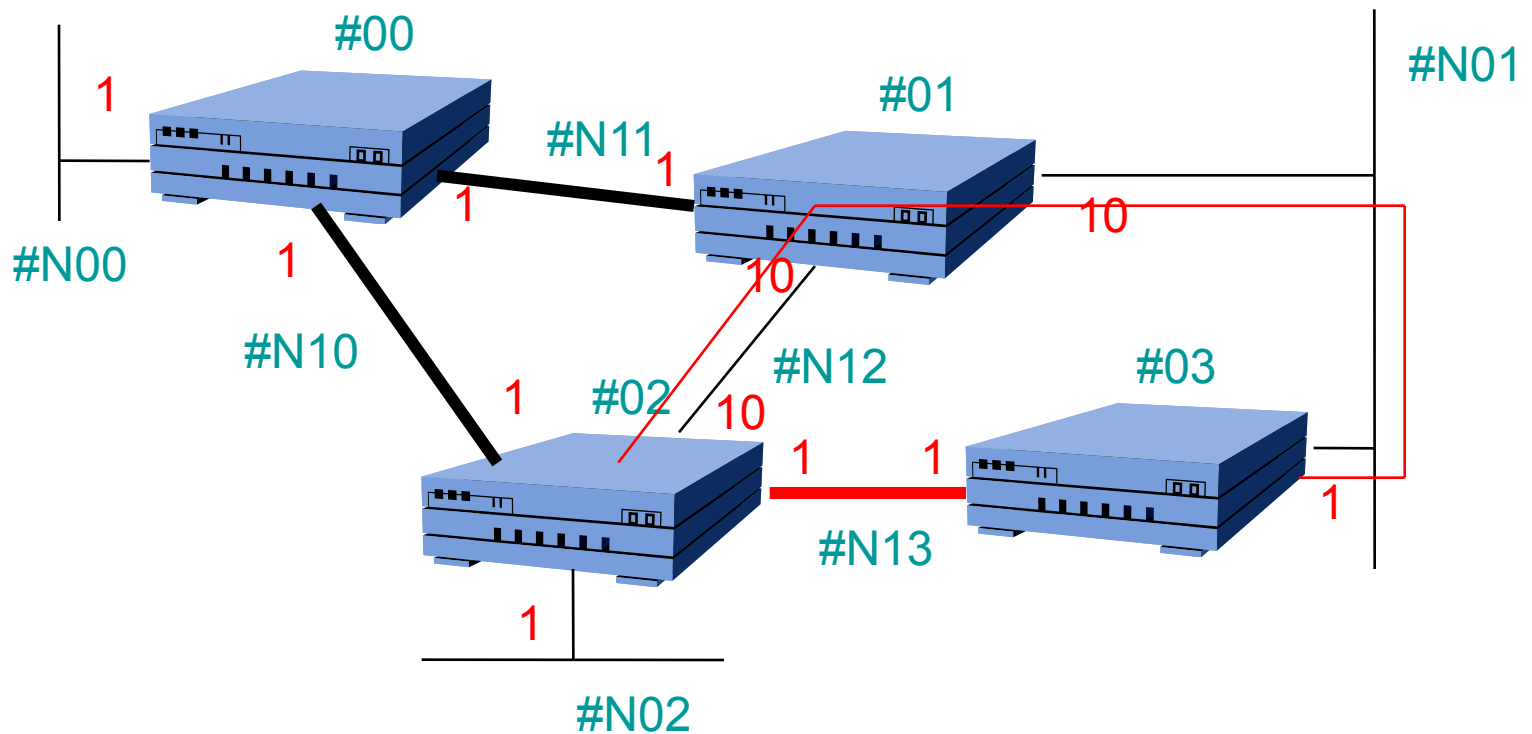
Finding the shortest path

Shortest Path First Algorithm of Dijkstra



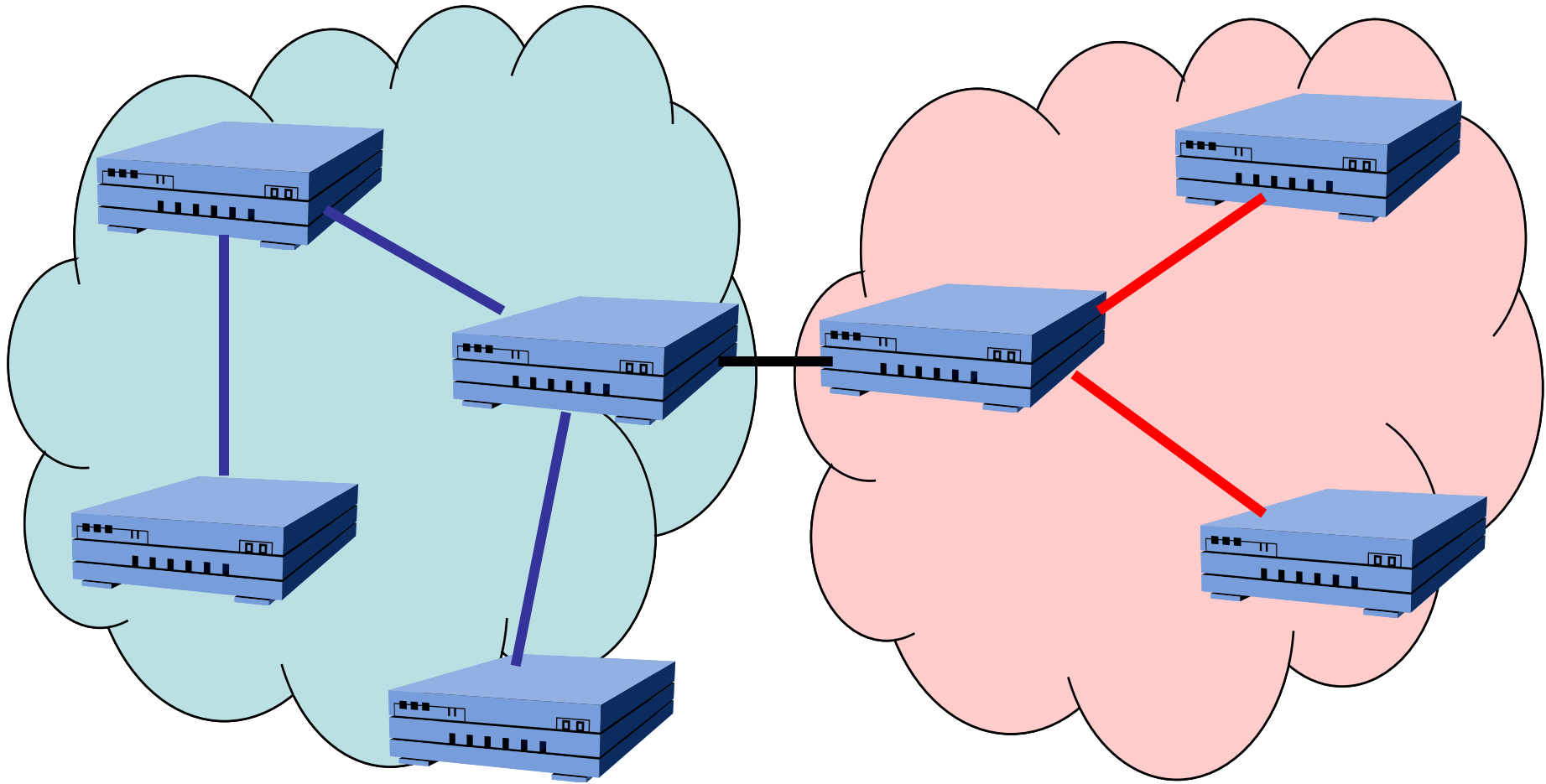
Decide the shortest path

Shortest Path First Algorithm of Dijkstra



Finding the next shortest path

Hierarchical Routing Information by “Area”



#area 0.0.0.1

#area 0.0.0.2

OSPF

- Reduce the overhead of the traffic for the routing
 - The Link State information is announced when it is updated.
- No routing loop
 - Shortest PATH
- Route selection by the cost
 - Cost is used than just network topology
- Large Network
 - 16 bit for Cost information