Network devices

OSI model

7. Application layer

Consists of application programs that use the network.

6. Presentation layer

Standardizes data presentation to the applications that use the network.

5. Session layer

Manages sessions between applications.

4. Transport layer

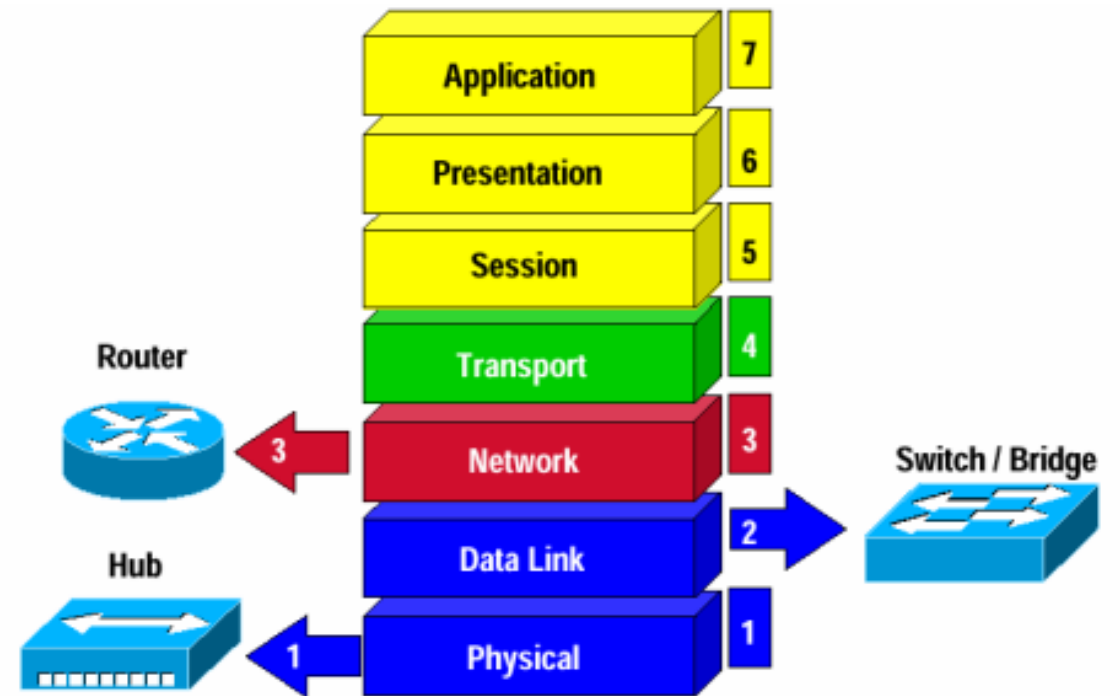Provides end-to-end error detection and correction.

3. Network layer

Decides which physical path the data will take.
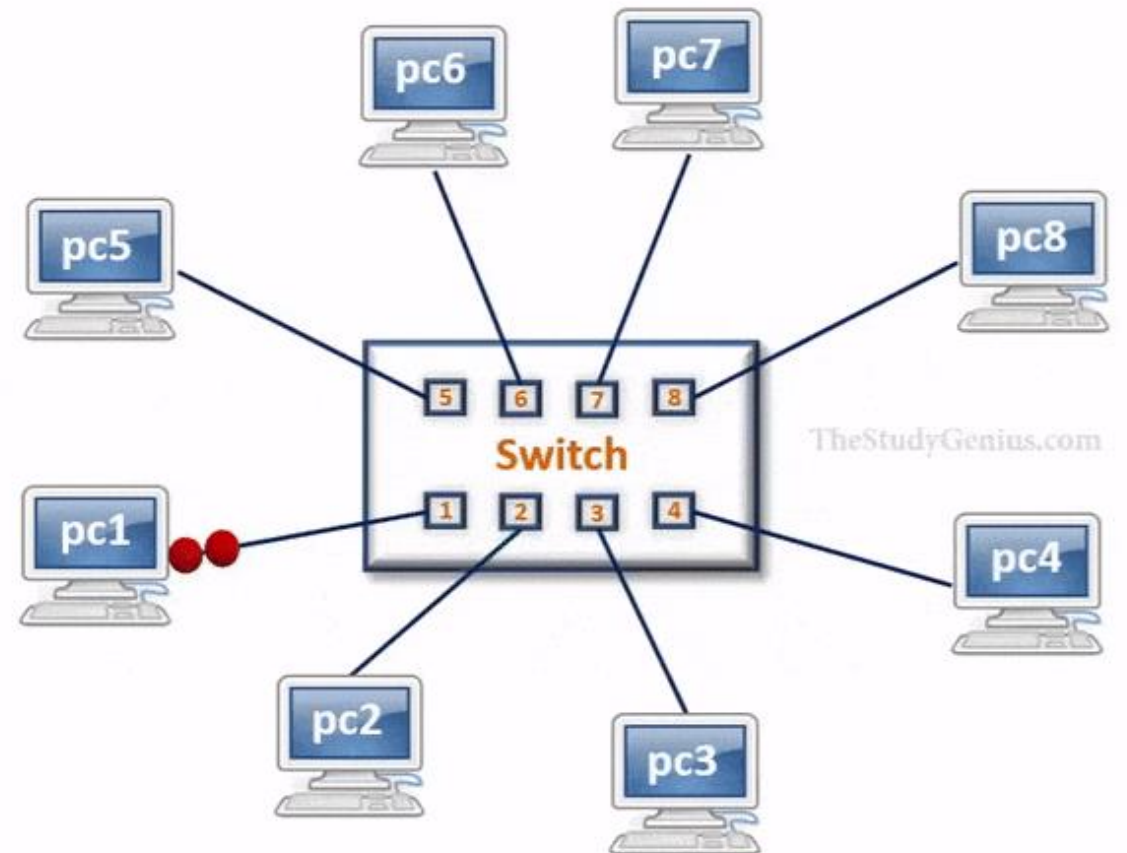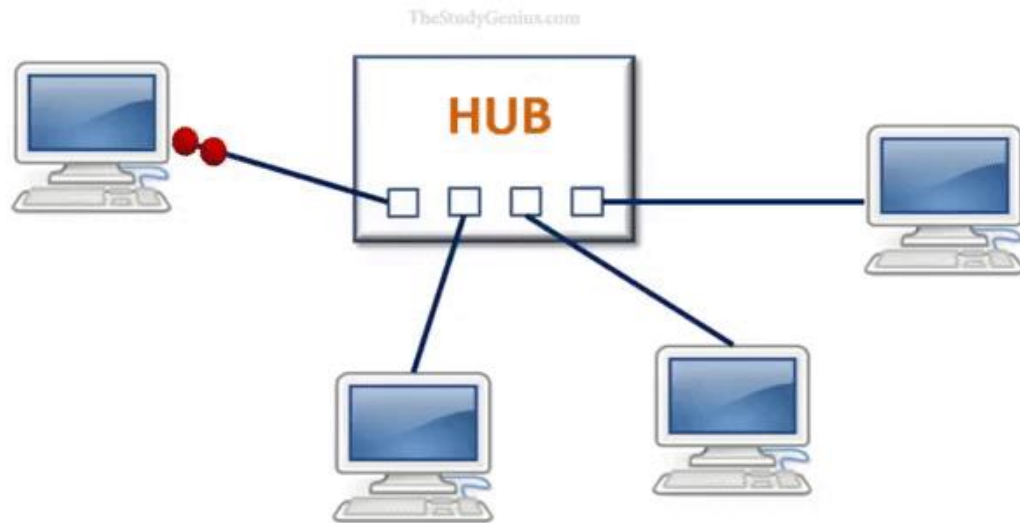
2. Data link layer

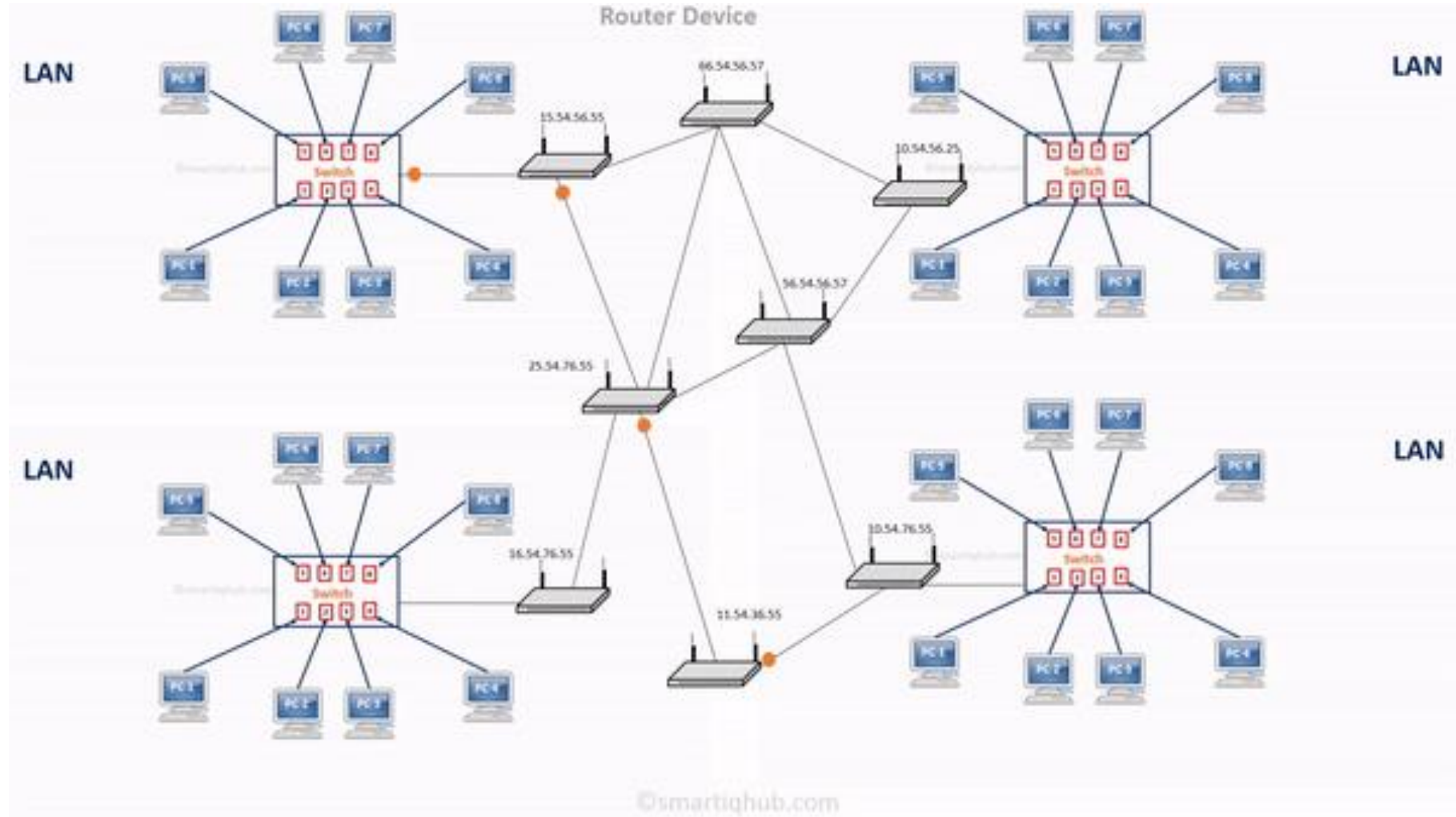Provides reliable data delivery across the physical link.

1. Physical layer
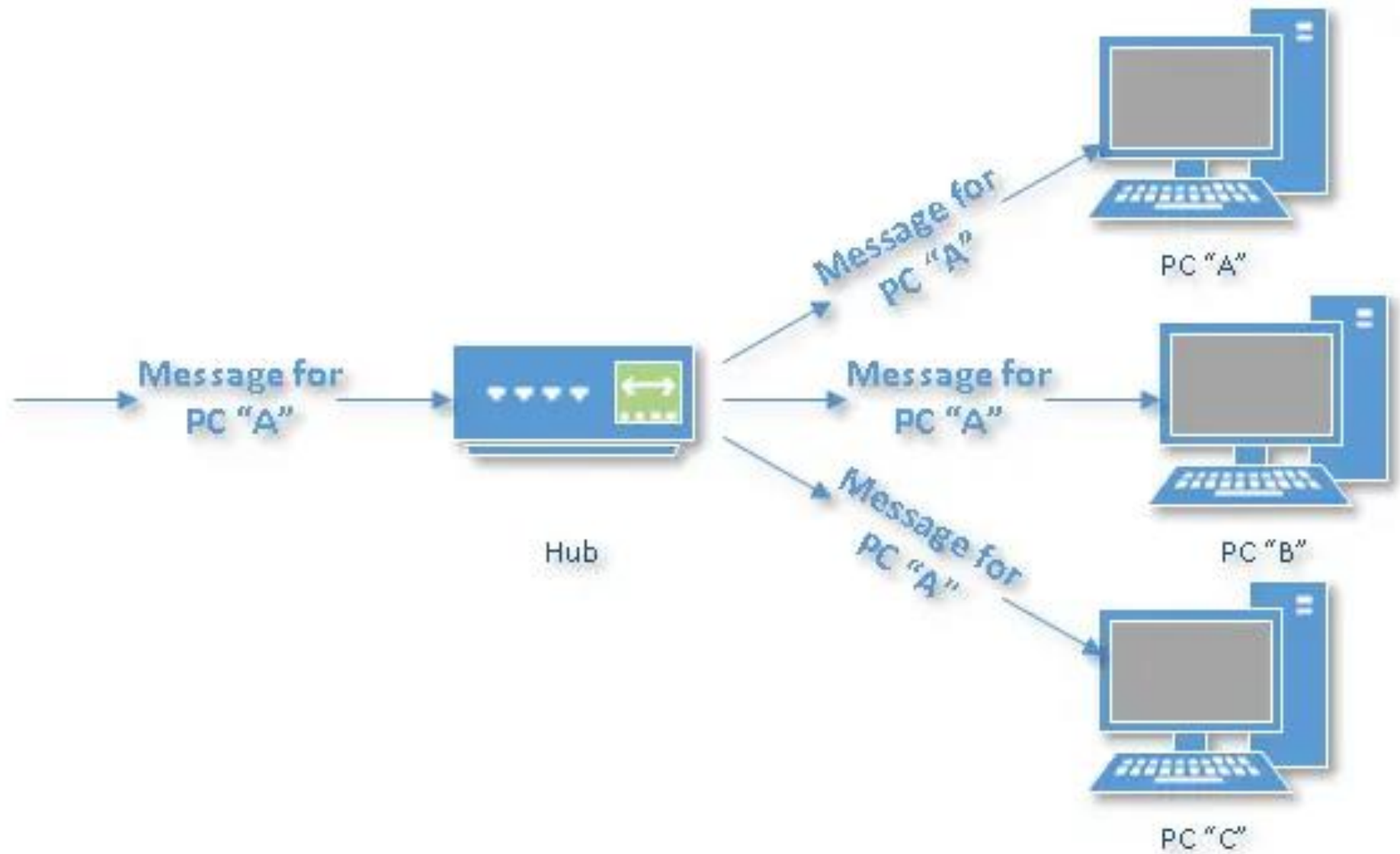
Defines the physical characteristics of the network media.
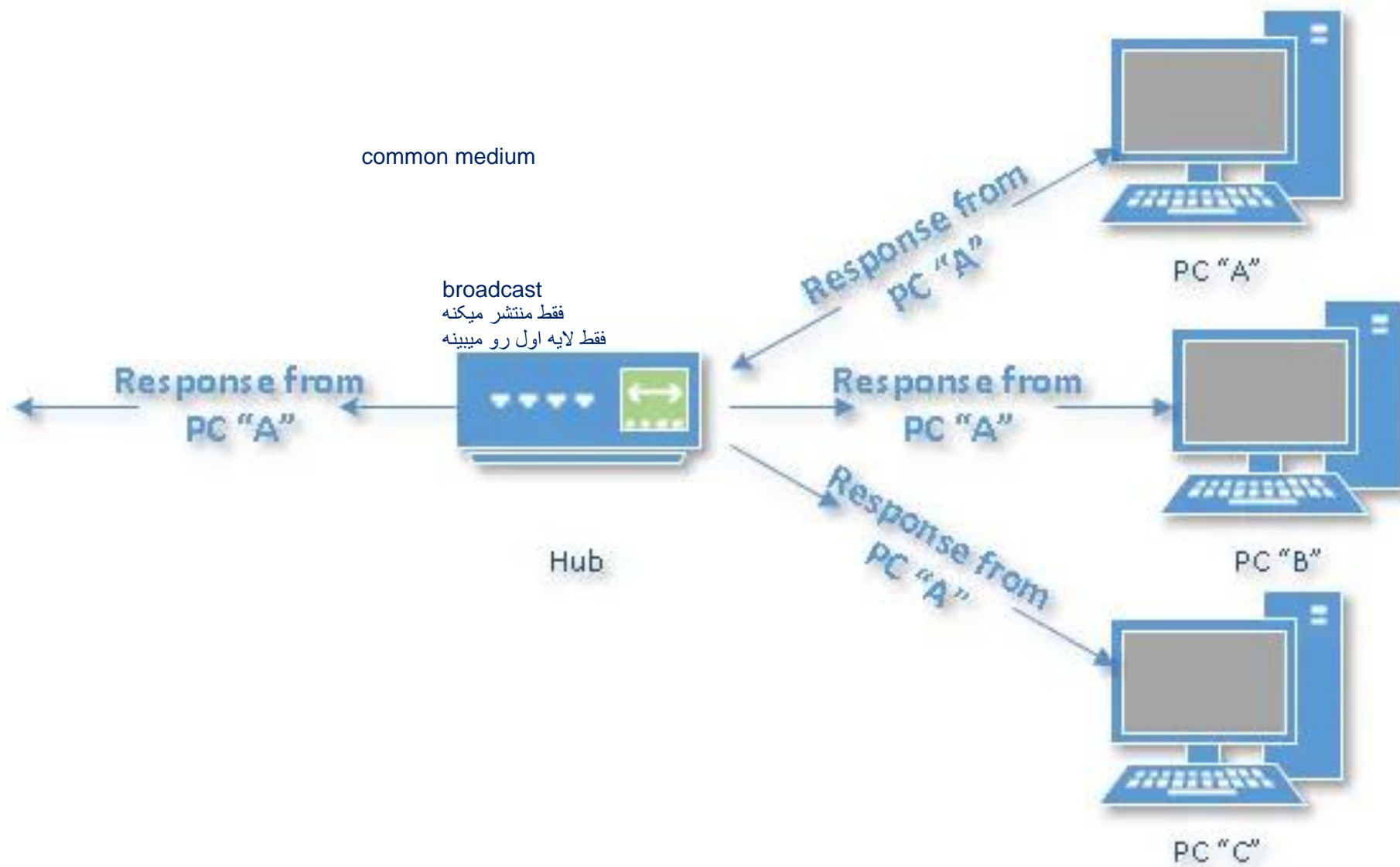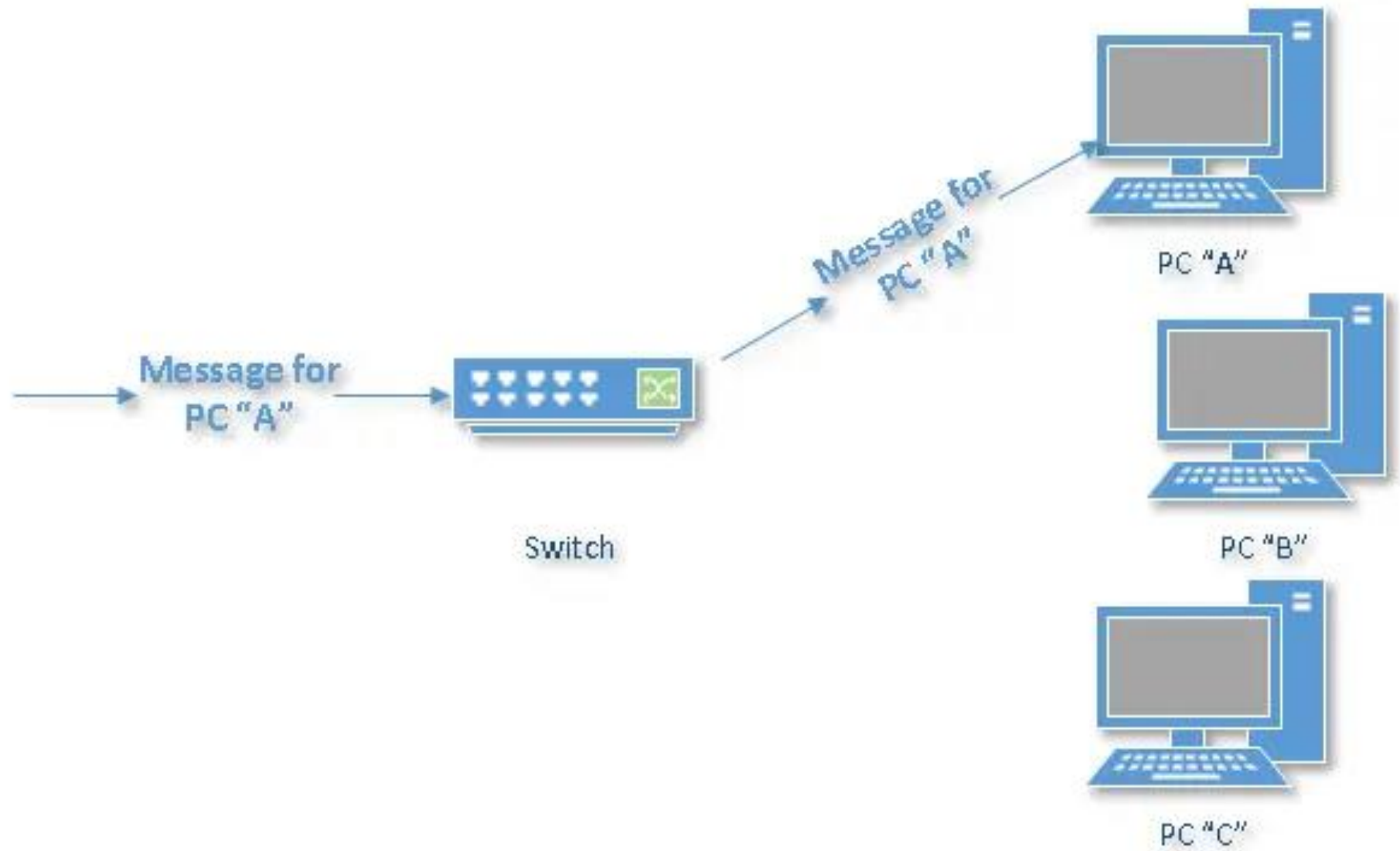
Hub vs. Switch

Routers

Hub

Message for PC "A" → Hub →

Message for PC "A" → PC "A"

Message for PC "A" → PC "B"

Message for PC "A" → PC "C"

Hub

common medium

broadcast
فقط منتشر میکنه
فقط لایه اول رو میبینه
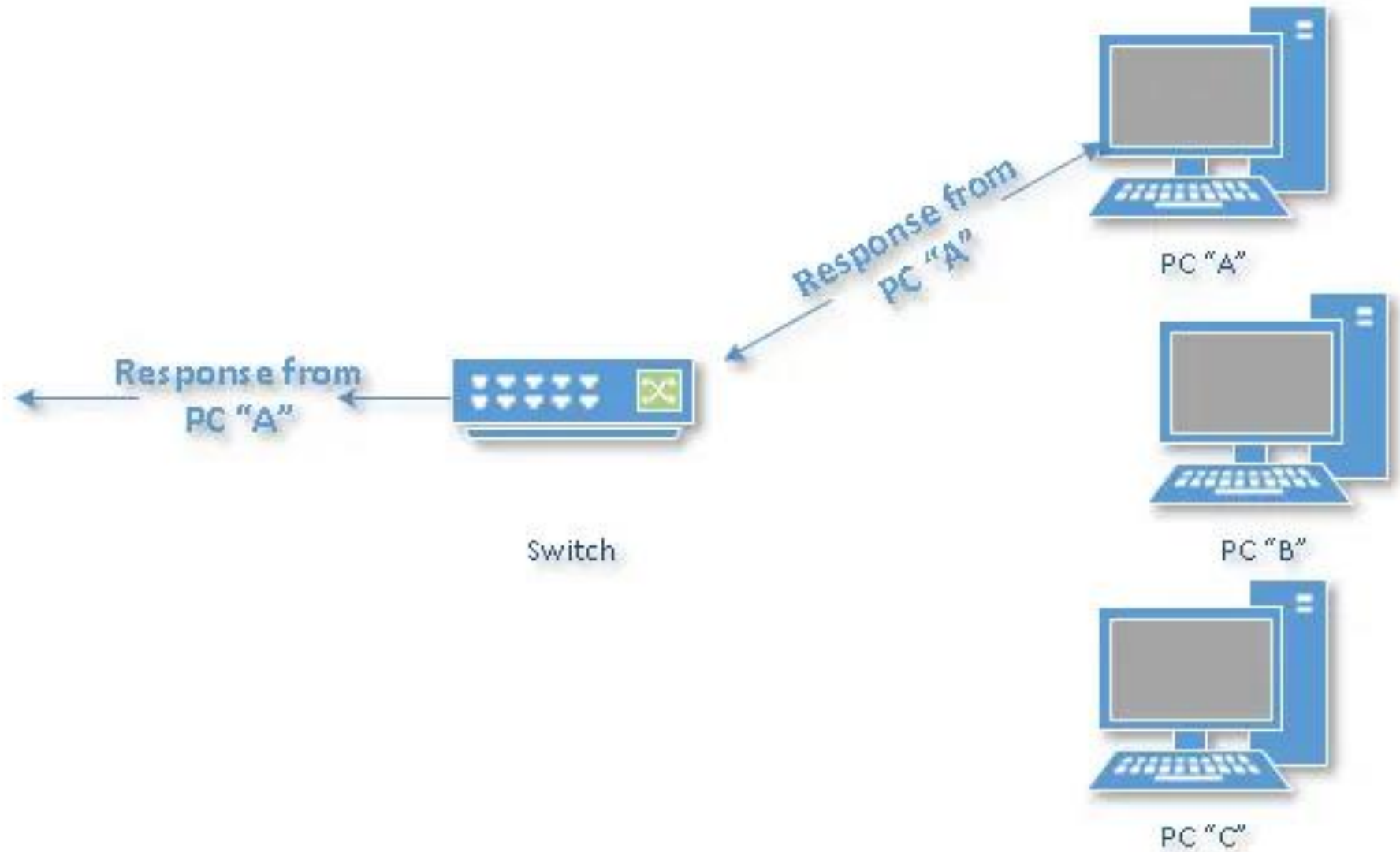
Switch

Switch

Network devices
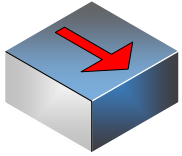
- Hub   layer 1
  - Broadcast packets
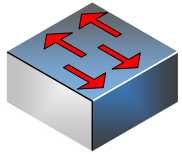
- Switch   layer 1,2
  - Forward packet to the destination interface
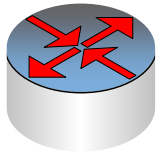
- Router   layer 1,2,3
  - Change source MAC address and then forward packet to the destination interface

Comparison

Hub	Switch	Router
HUB work on Physical Layer of OSI Model	Switch work on Data Link Layer of OSI Model	Router work on Network Layer of OSI Model
HUB is Broadcast Device	Switch is Unicast/Multicast Device	Router is a routing device use to create route for transmitting data packets
Hus is use to connect device in the same network	Switch is use to connect devices in the same network	Router is use to connect two or more different network.
Hub sends data in the form of binary bits	Switch sends data in the form of frames	Router sends data in the form packets
Hub only works in half duplex	Switch works in full duplex	Router works in full duplex
Only one device can send data at a time	Multiple devices can send data at the same time	Multiple devices can send data at the same time
Hub does not store any mac address or IP address	Switch store MAC Address	Router stores IP address

Hub function

- $ cd Desktop/shared

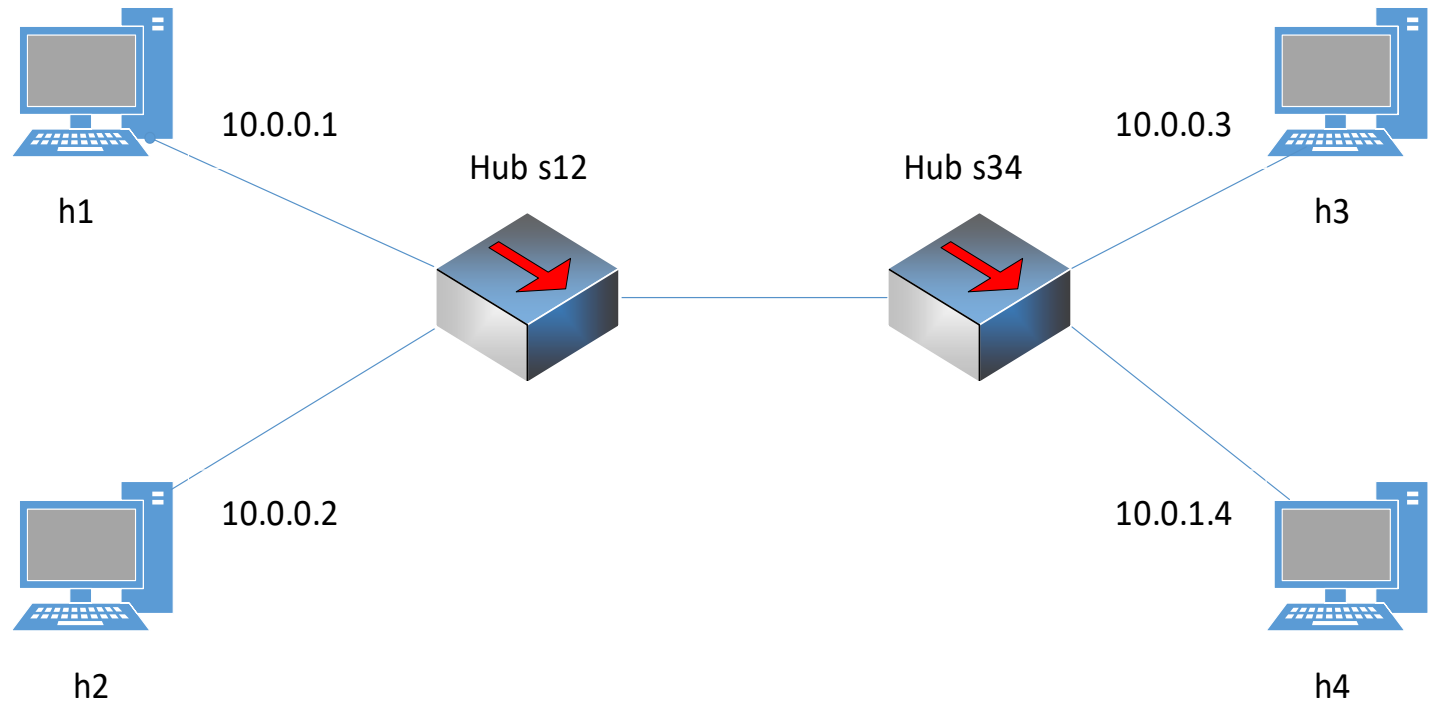- $ sudo python lab4-1.py

- # ifconfig

- Lan1: h1, h2, h3

- Lan2: h4

- Correct subnet mask of h2-eth0:
  - # ifconfig h2-eth0 10.0.0.2 netmask 255.255.255.0

10.0.0.1/24

10.0.0.3/24

Switch s12

Switch s34

h1

h3

10.0.0.2/31

10.0.1.4/24

h2

h4
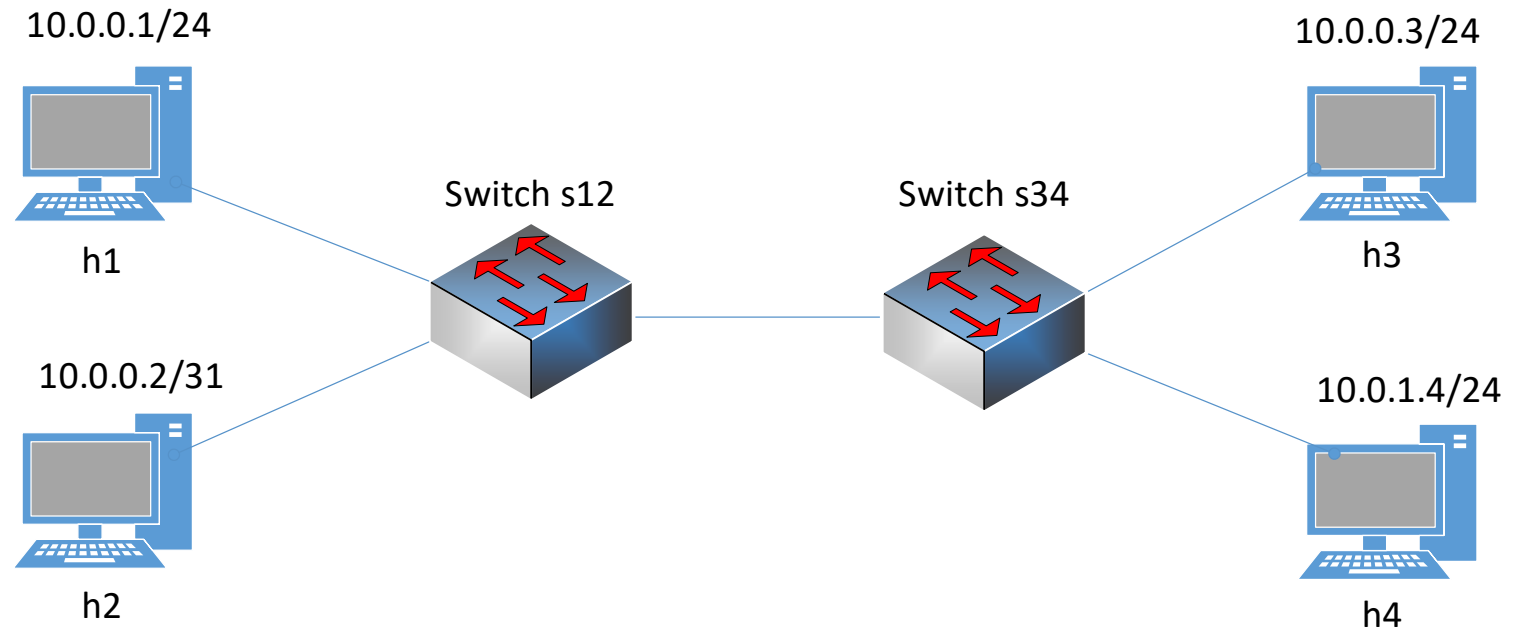
Hub function

- Configure s12 and s34 as hubs:
  - mininet> sh ovs-ofctl add-flow s12 action=flood
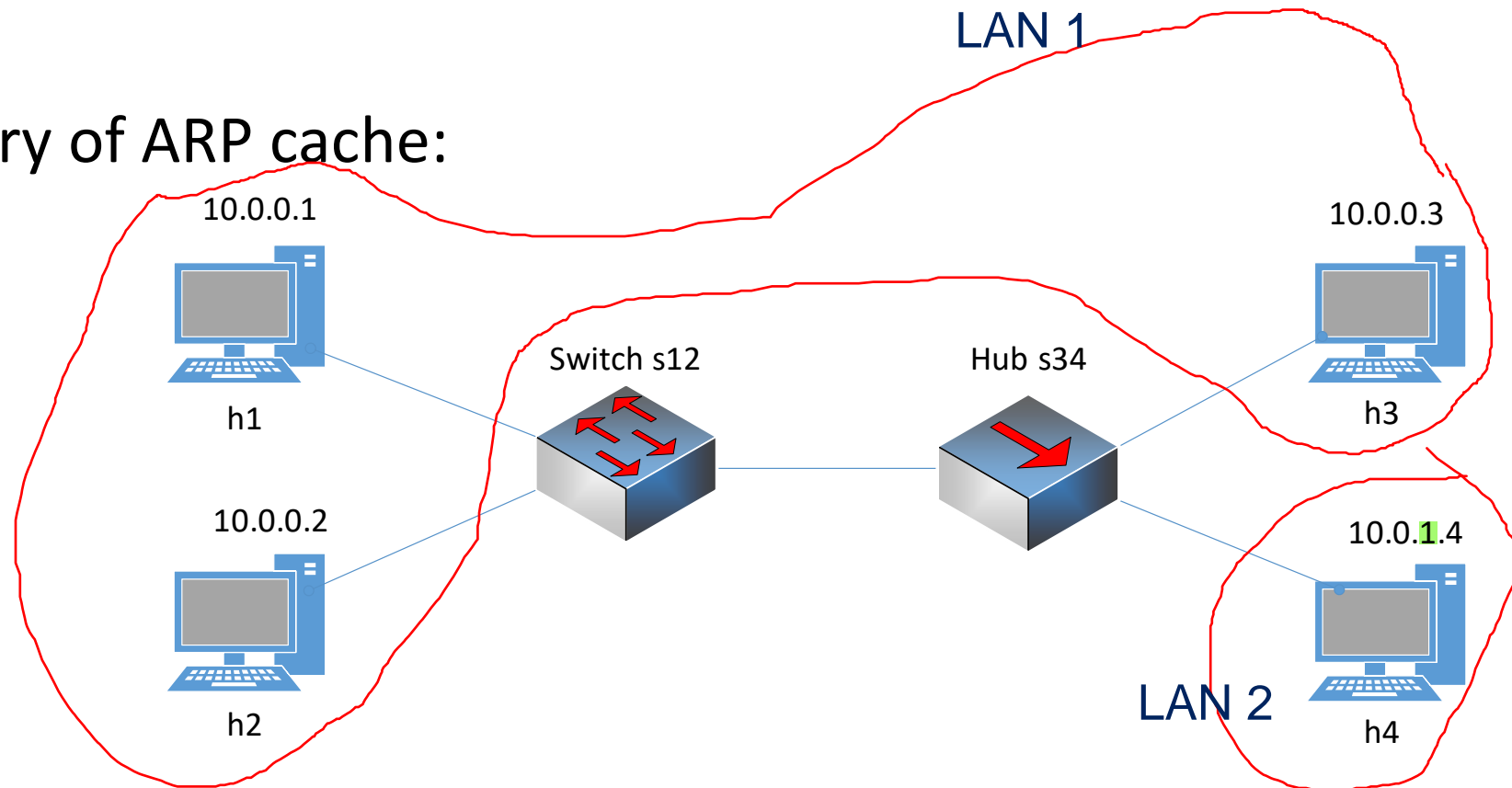 - mininet> sh ovs-ofctl add-flow s34 action=flood

- h1 ping h2

Switch function

- Return s12 to a switch:
  - mininet> sh ovs-ofctl add-flow s12 action=normal
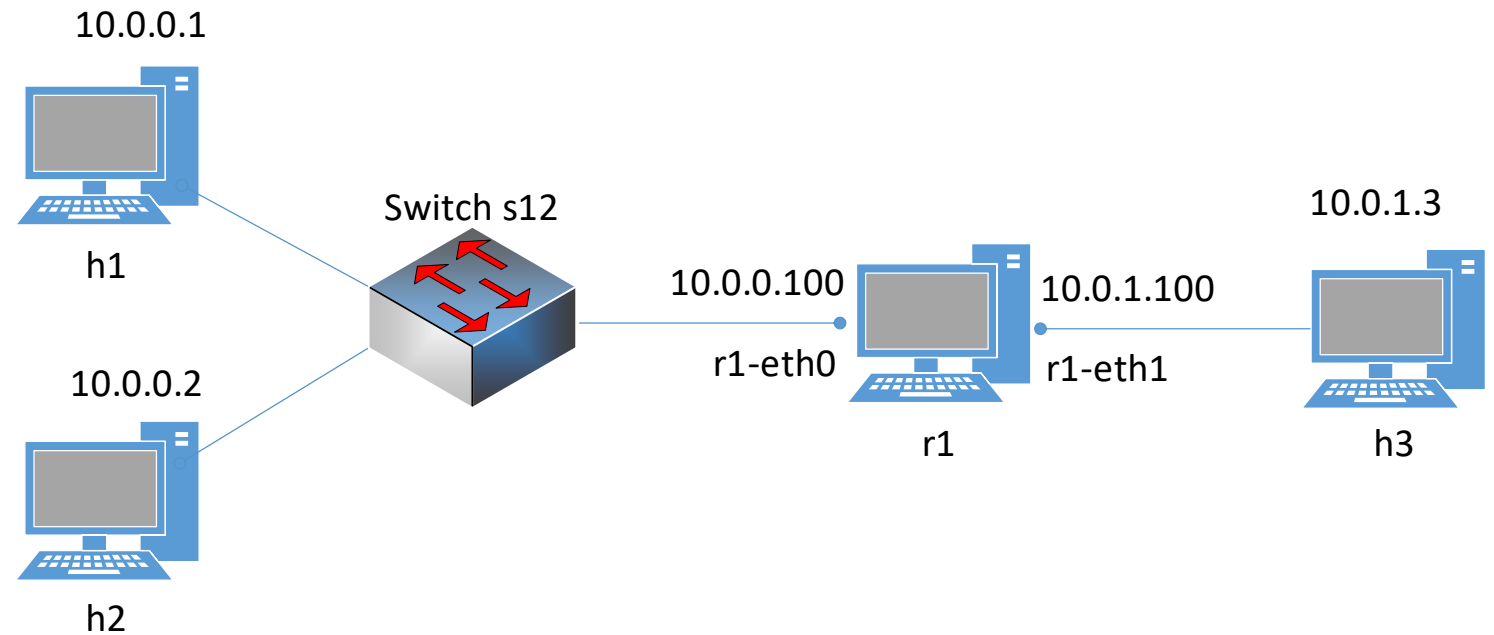
- Delete a specified entry of ARP cache:
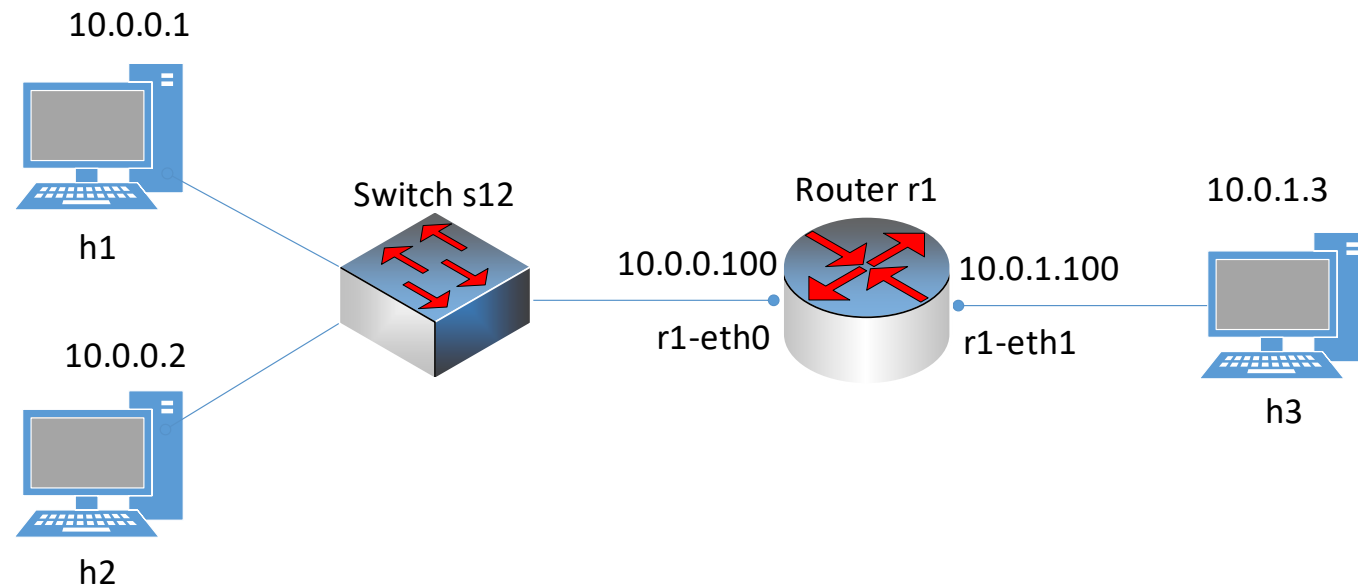 - # arp -d 10.0.0.2

- h1 ping h2
- h1 ping h4
- h1 ping h3

Router function

- mininet> exit

- $ sudo mn -c

- $ sudo python lab4-2.py

- mininet> pingall

Router function
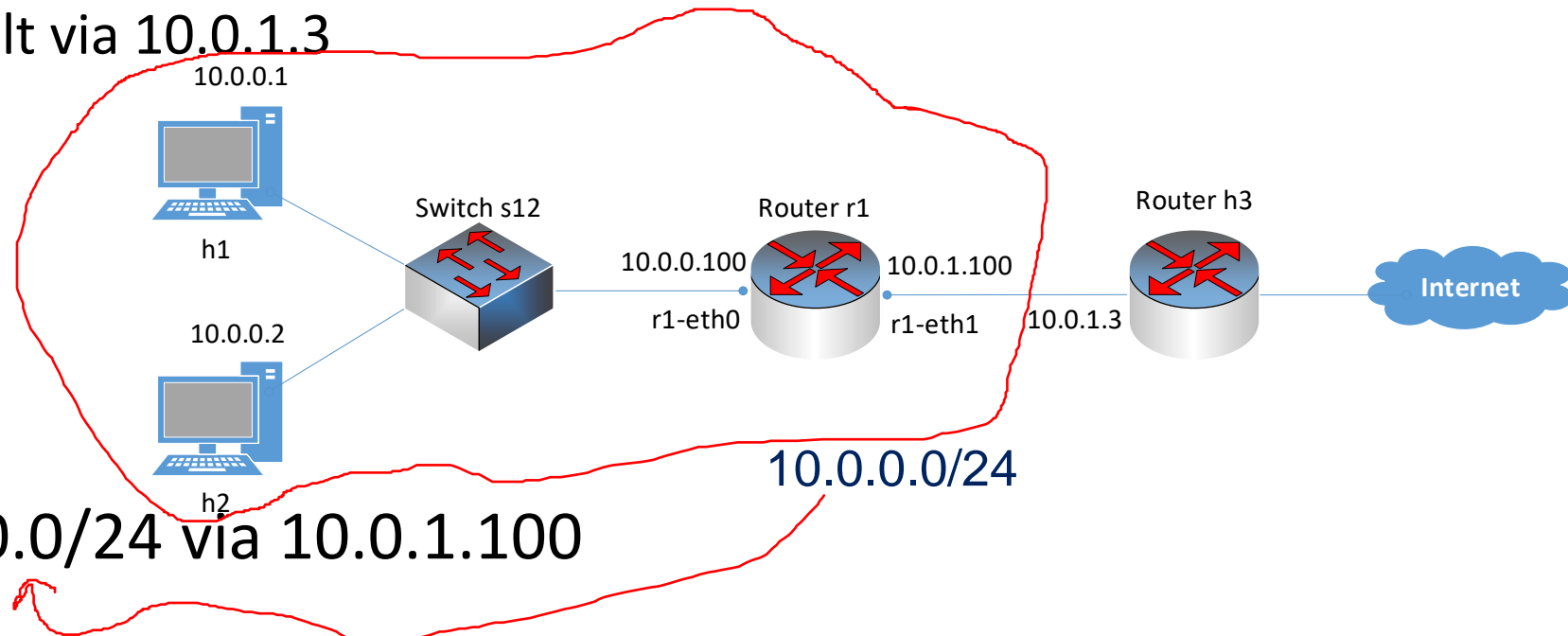
- Enable IP forwarding on r1:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward

- mininet> pingall

- Show gateway of each host:
  - # ip route

- Correct gateway:
  - # ip route del default via 10.0.0.101
  - # ip route add default via 10.0.0.100

Routing with multiple hops

- For h3:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward   change host to router
  - # ip route del default via 10.0.1.100

- For r1:
  - # ip route add default via 10.0.1.3

- h1 ping h3

- h2 ping h3

in h3: • # ip route add 10.0.0.0/24 via 10.0.1.100

10.0.0.1

10.0.0.2

h1

h2

Switch s12

Router r1

10.0.0.100

r1-eth0

10.0.1.100

r1-eth1

Router h3

10.0.1.3

Internet

10.0.0.0/24