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

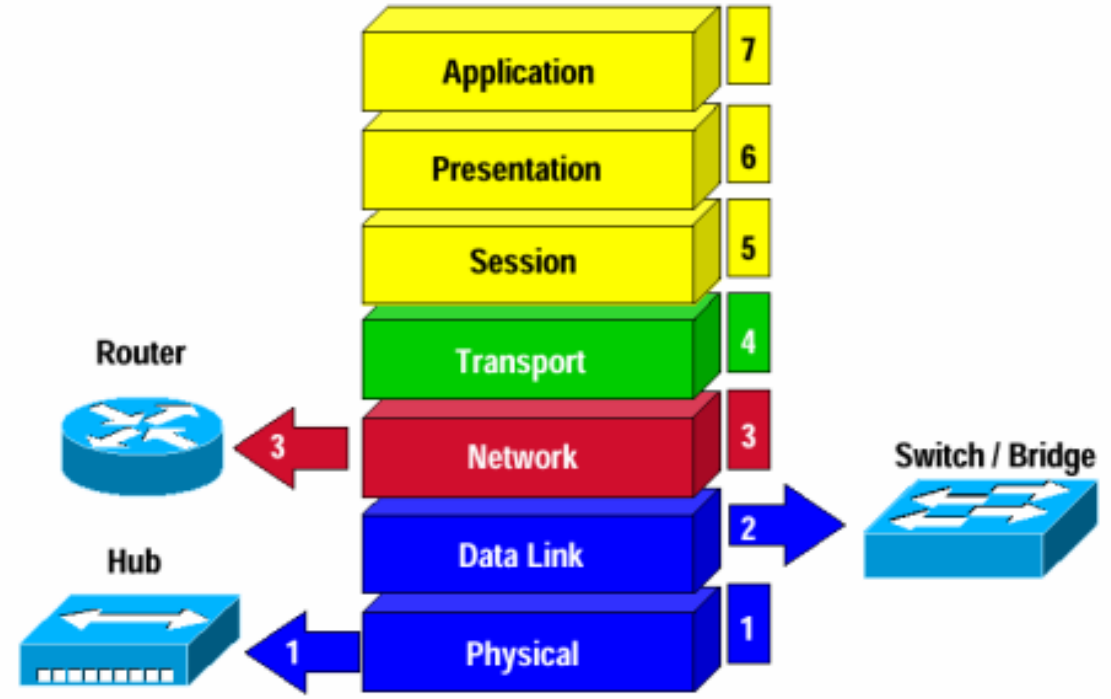
    Decides which physical path the data will take.

2. Data link layer

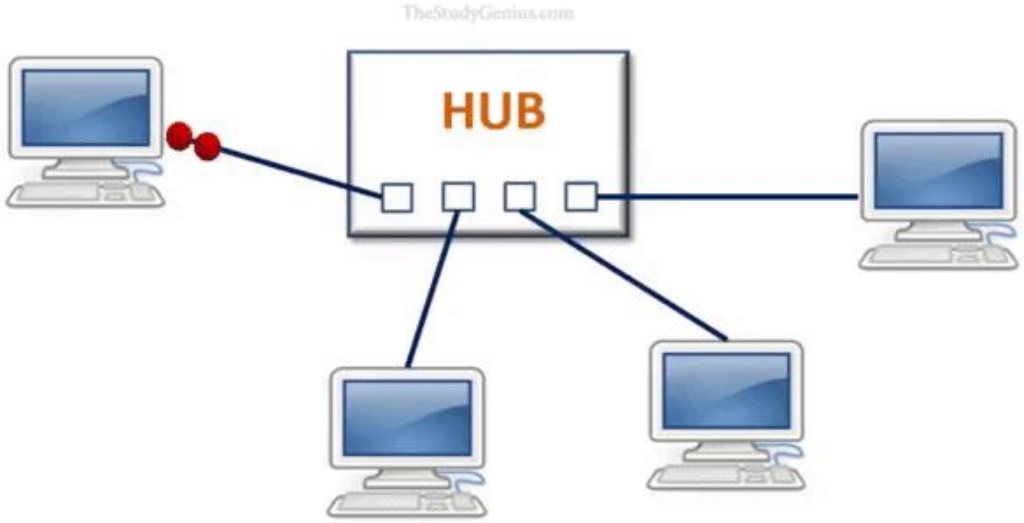
    Provides reliable data delivery across the physical link.

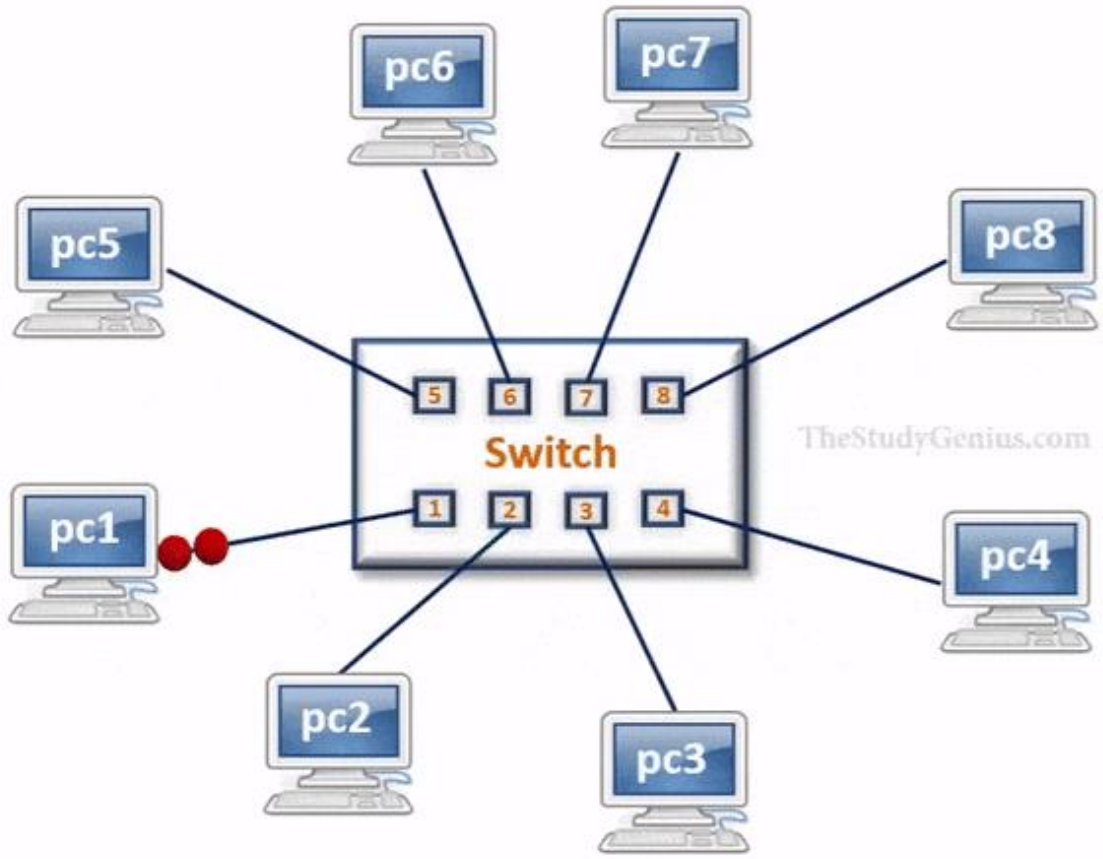
1. Physical layer

    Defines the physical characteristics of the network media.

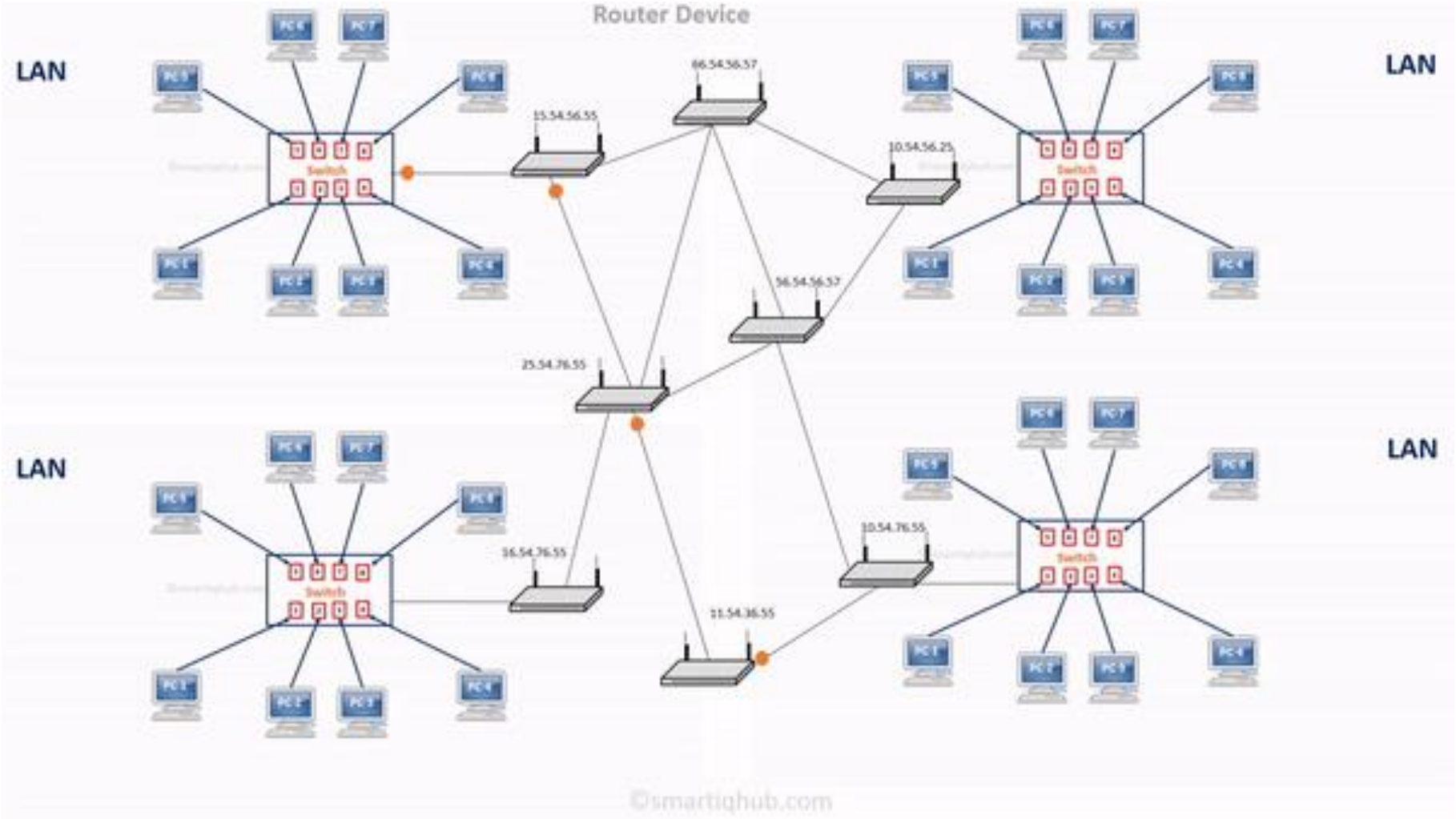


Hub vs. Switch

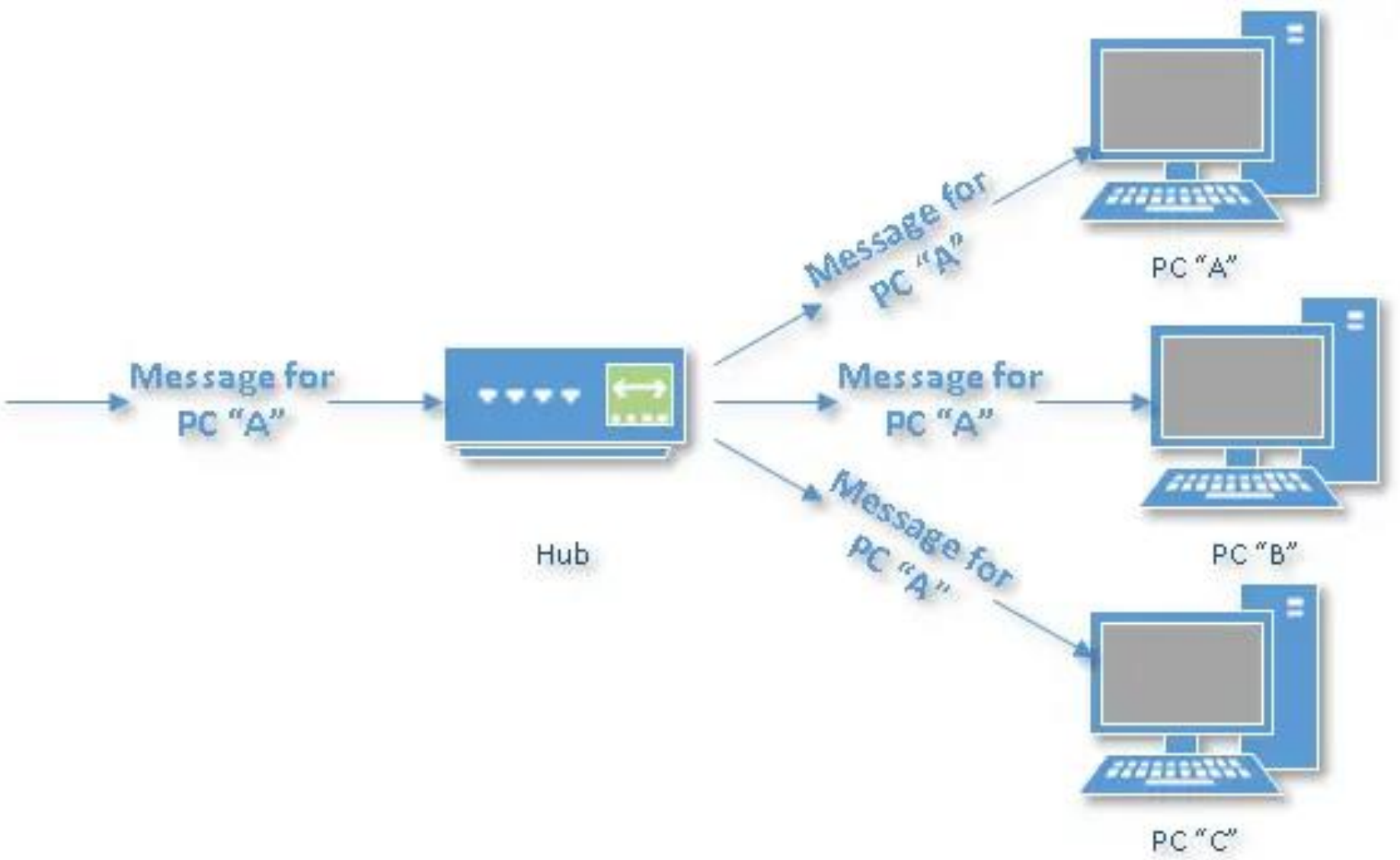




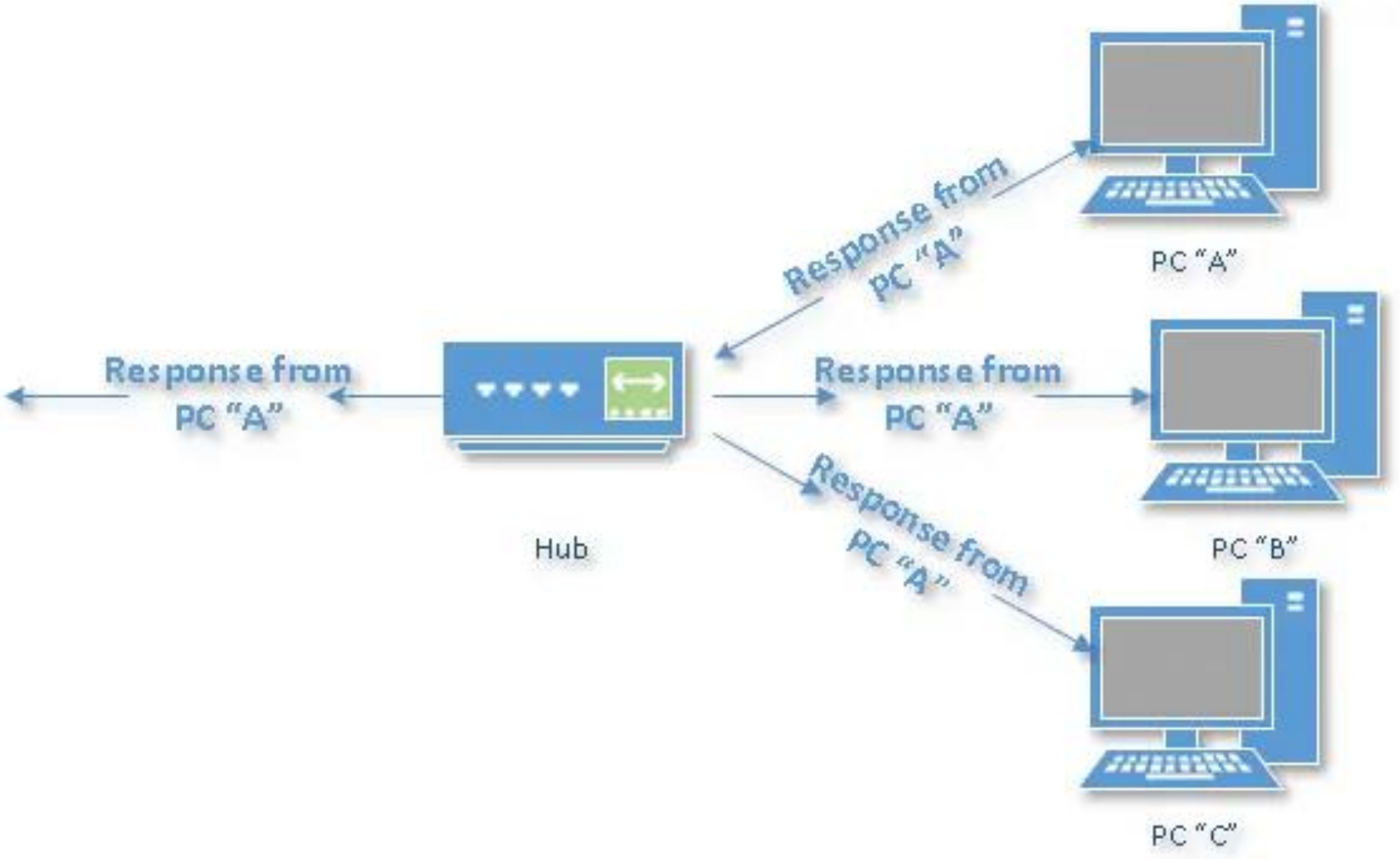
Routers


Router Device
LAN
LAN
LAN
LAN
66.54.56.57
15.54.56.55
10.54.56.25
56.54.56.57
25.54.76.55
16.54.76.55
10.54.76.55
11.54.36.55
©smartiqhub.com

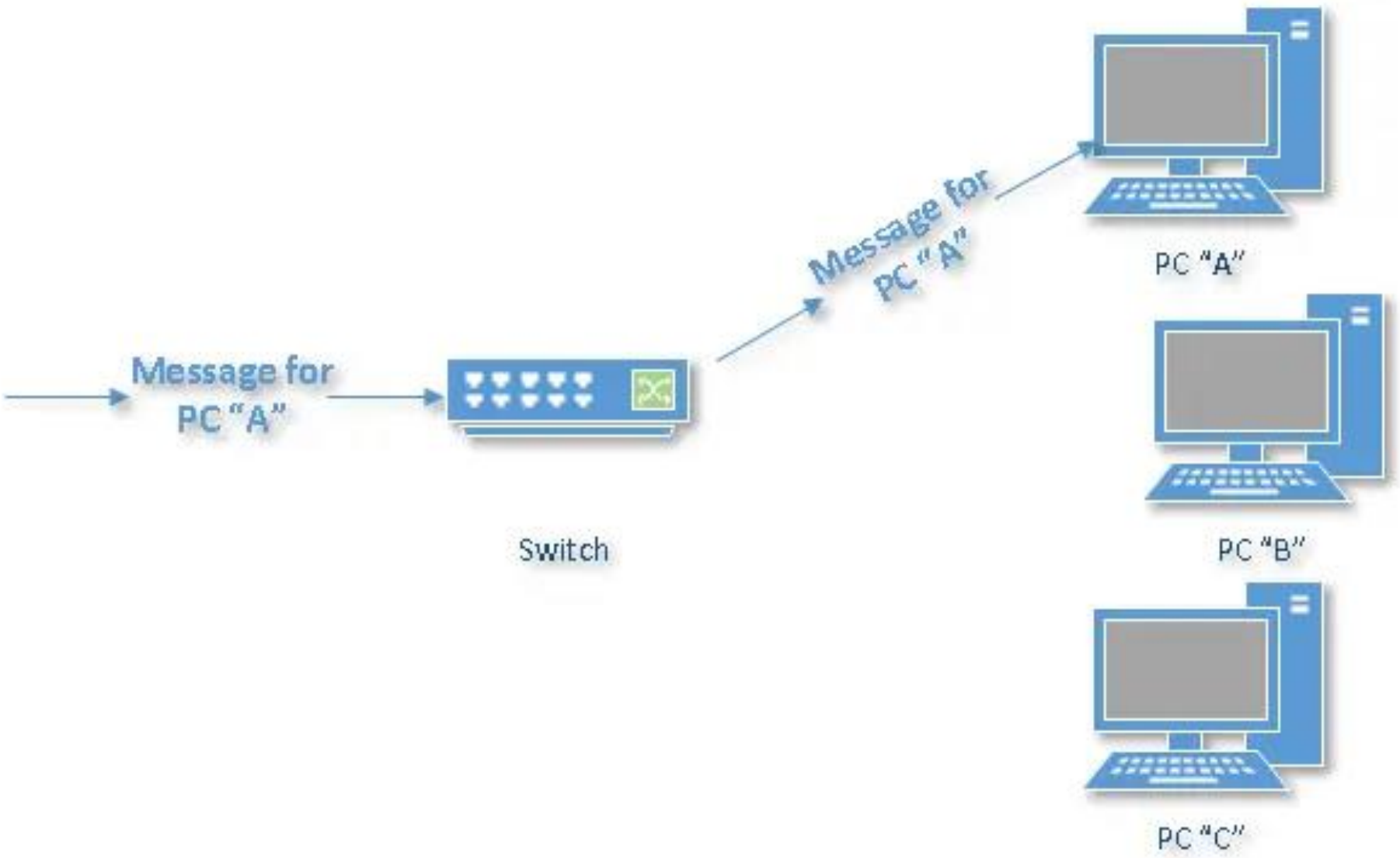
Hub


Message for PC "A"
Hub
Message for PC "A"
Message for PC "A"
Message for PC "A"
PC "A"
PC "B"
PC "C"

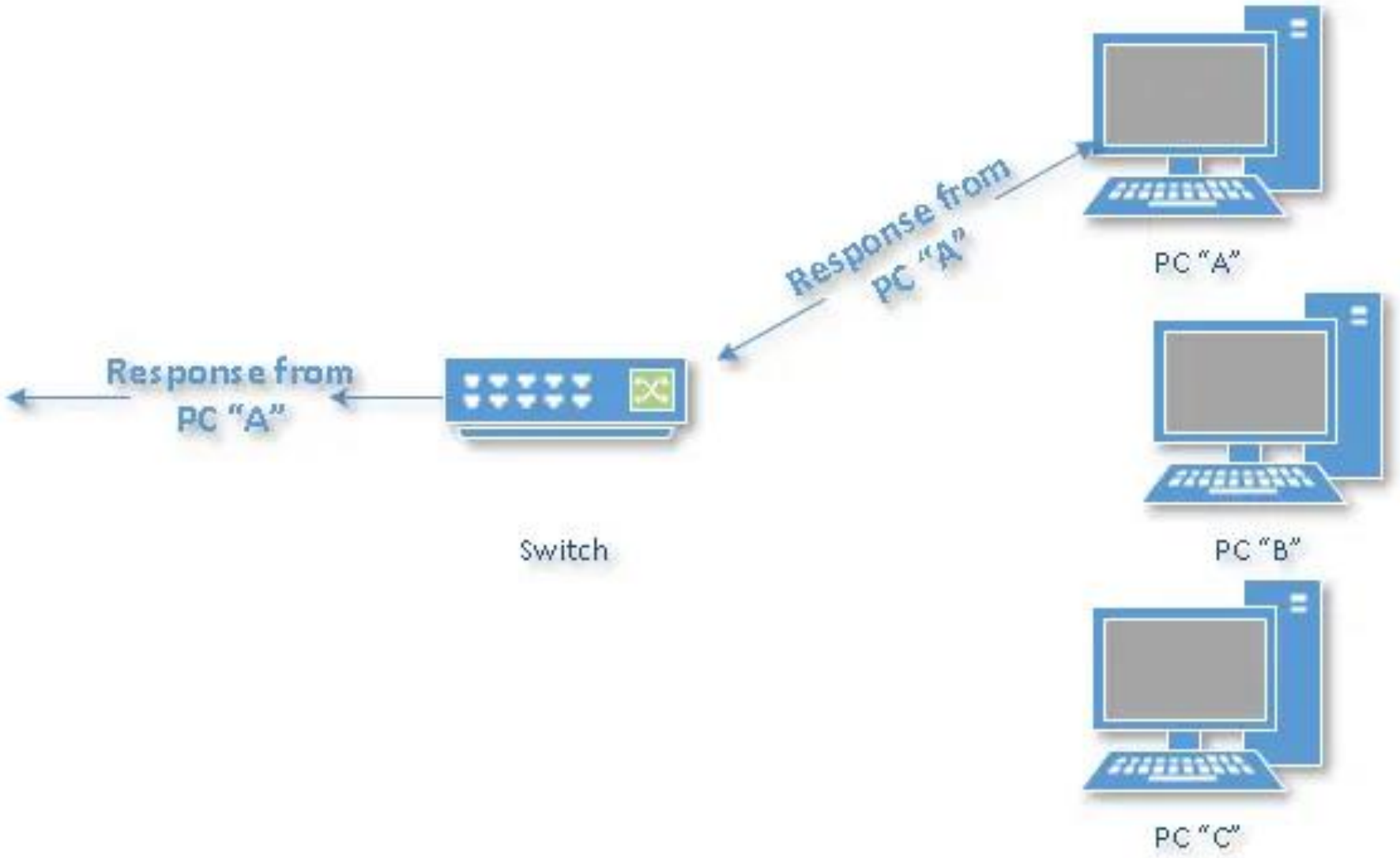
Hub


Response from
PC "A"
PC "A"
Response from
PC "A"
Response from
PC "A"
Response from
PC "A"
Hub
PC "B"
PC "C"

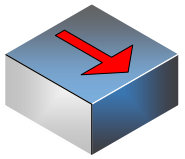
Switch



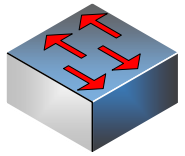
Switch



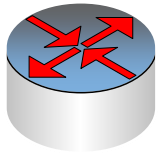
Network devices



- Hub
  - Broadcast packets



- Switch
  - Forward packet to the destination interface



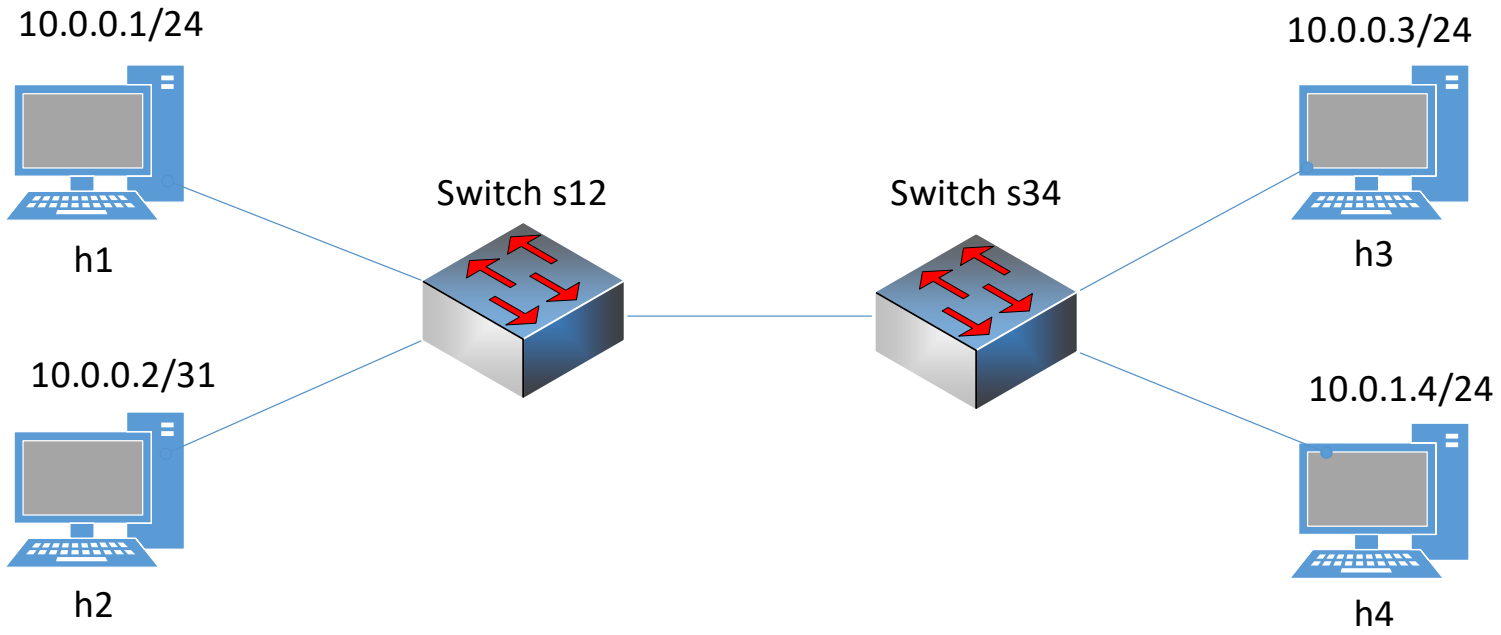
- Router
  - Change source MAC address and then forward packet to the destination interface

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



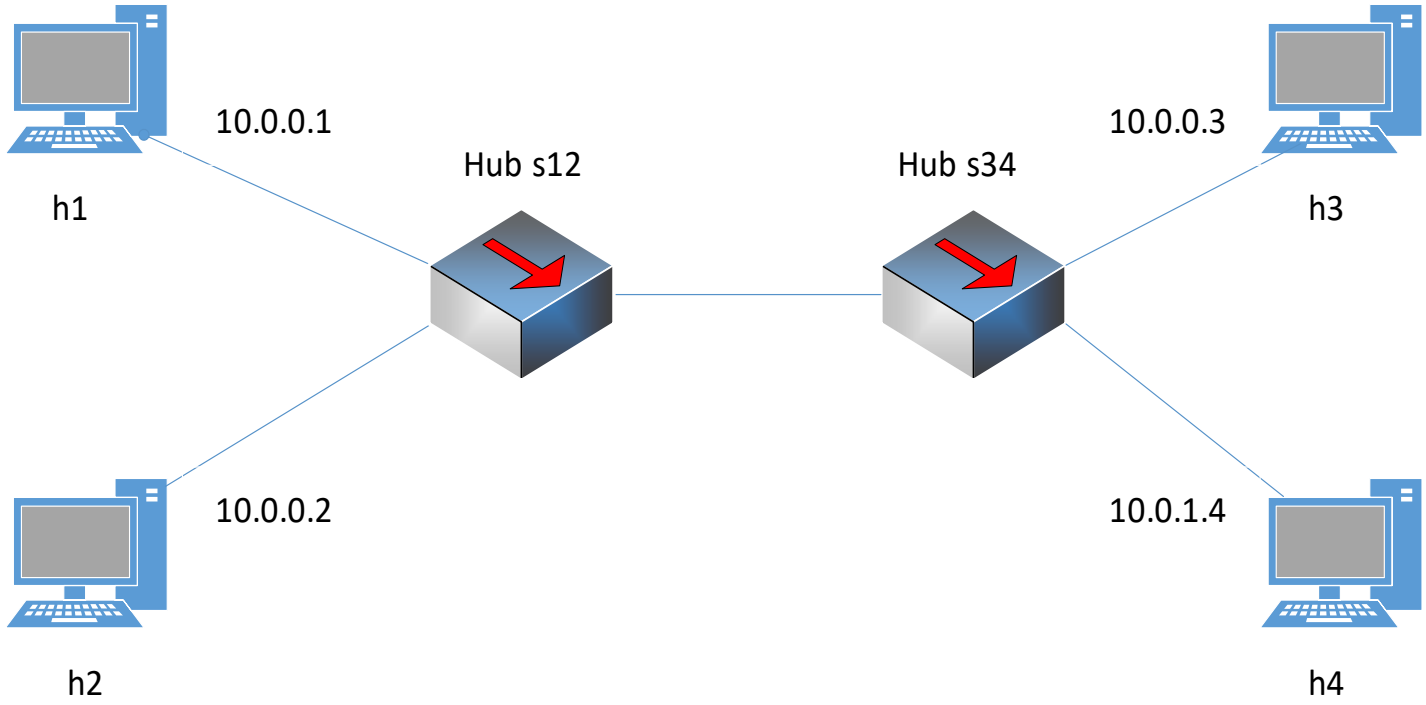
- # ifconfig
- Lan1: h1, h2, h3
- Lan2: h4

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

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

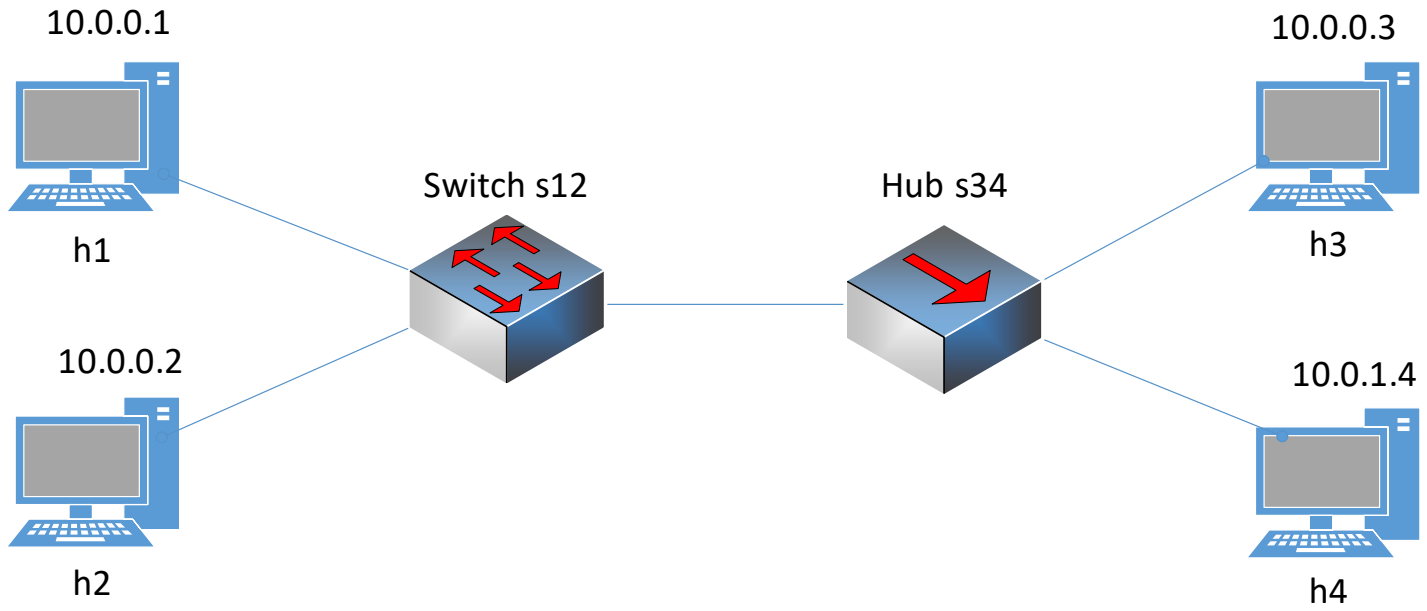


Switch function

- 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

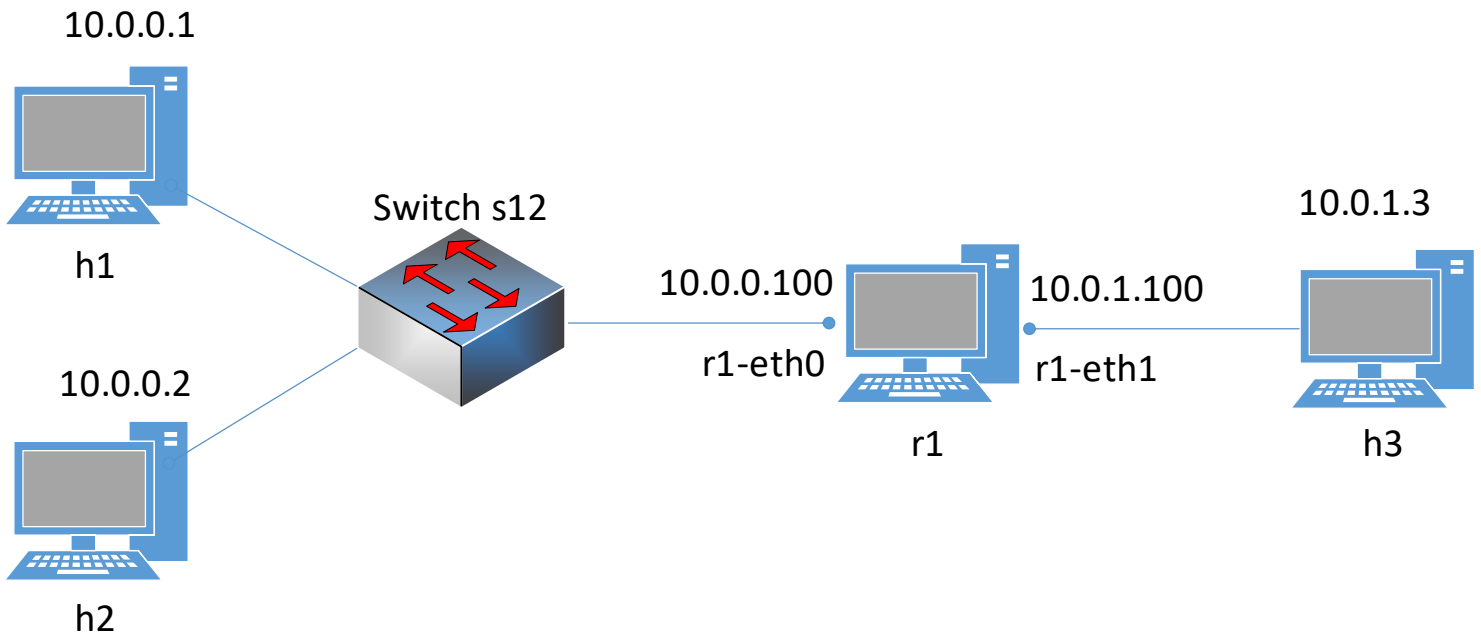
- h1 ping h2
- h1 ping h4
- h1 ping h3



Router function

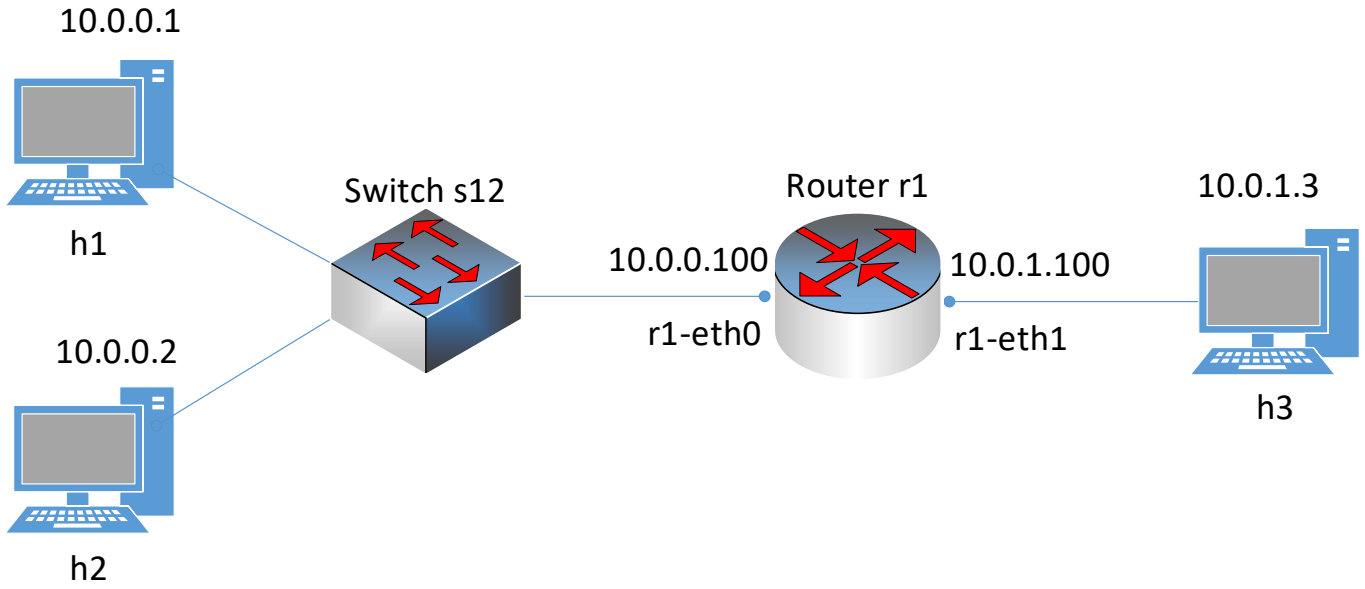
- mininet> exit
- $ sudo mn -c
- $ sudo python lab4-2.py

- mininet> pingall



Router function

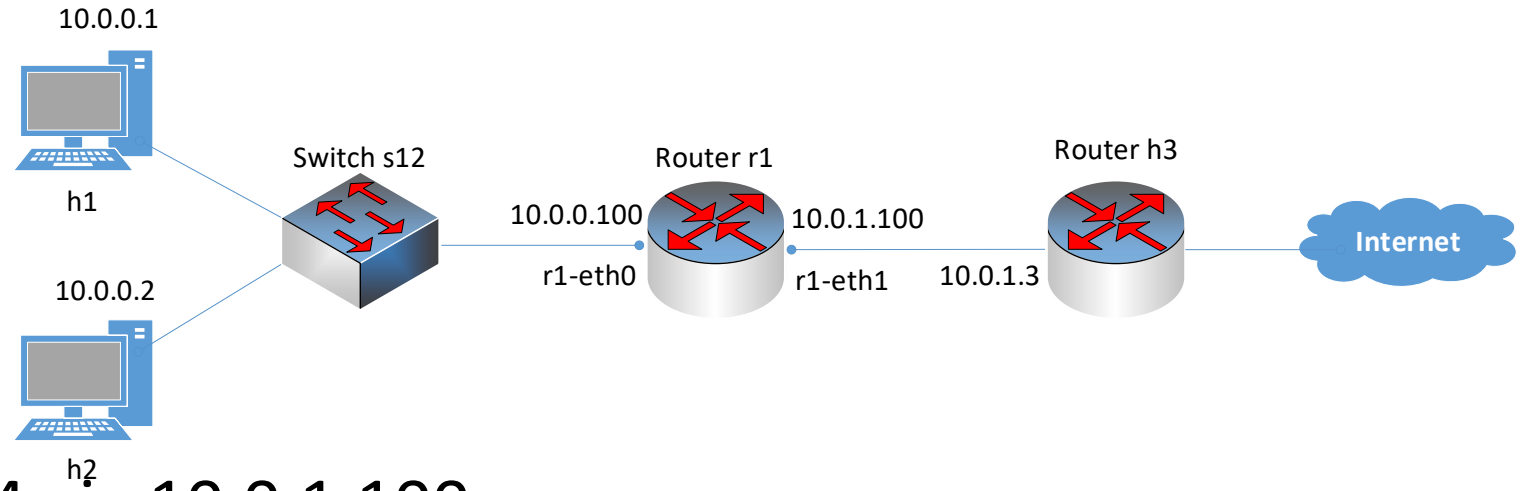
- Enable IP forwarding on r1:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward
- mininet> pingall
- Show gateway of each host:
  - # ip route
- Correct gateway:
  - # ip route del default via 10.0.0.101
  - # ip route add default via 10.0.0.100



Routing with multiple hops

- For h3:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward
  - # 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



- # ip route add 10.0.0.0/24 via 10.0.1.100