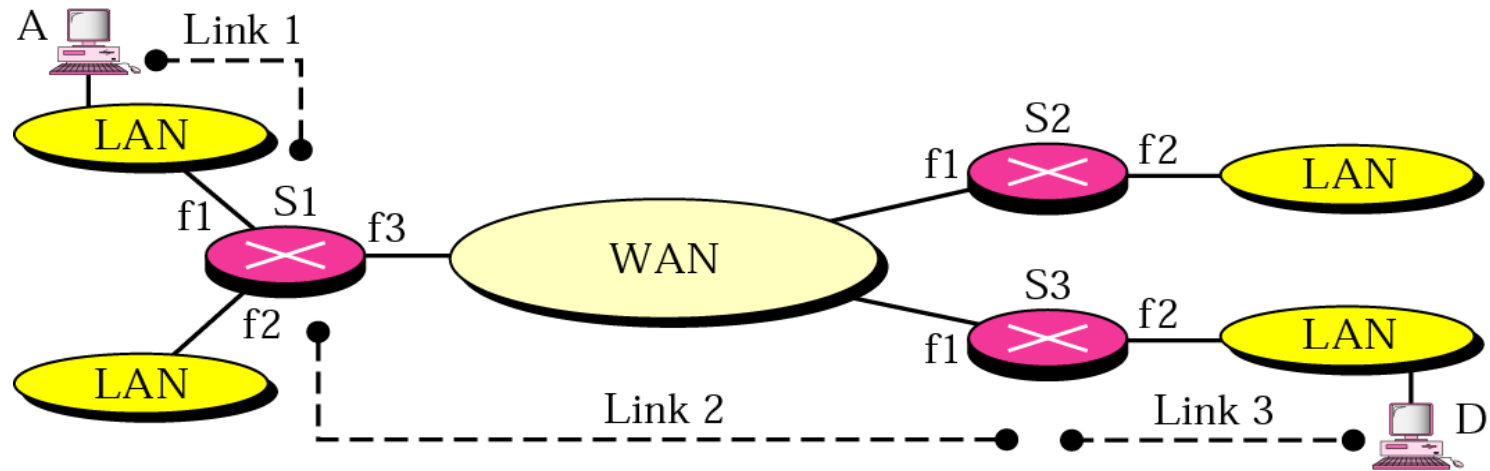


Network Layer : Internetwork

1



Packet Switching

2

- Data Transmitted in Small Packets.
- Each Packet Contains User data plus Control Information.
- Control Information => Routing Information.
- Two Types of Packet Switching
 - ✓ Datagram Packet Switching
 - ✓ Virtual Circuit Packet Switching.

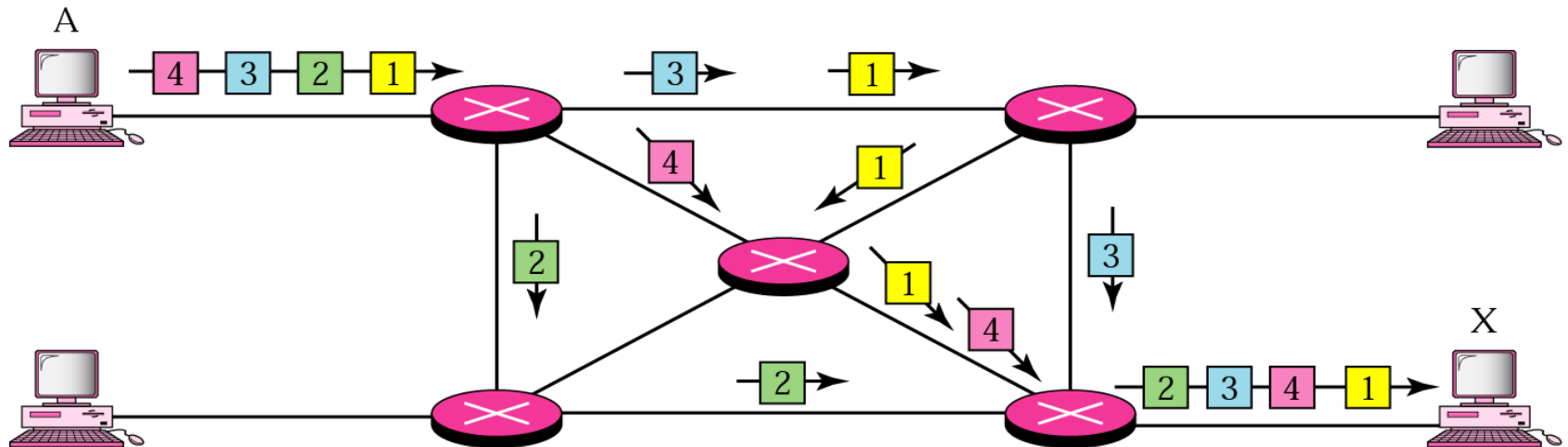
Packet Switching: Datagram Packet Switching

3

- No need to establish the connection between the source and destination.
- Route chosen on packet by packet basis.
- Packets may be stored until delivered => (Store and Forward)
- Different packets may follow different routes.
- Packets may arrive out of order at the destination.

Packet Switching: Datagram Packet Switching

4



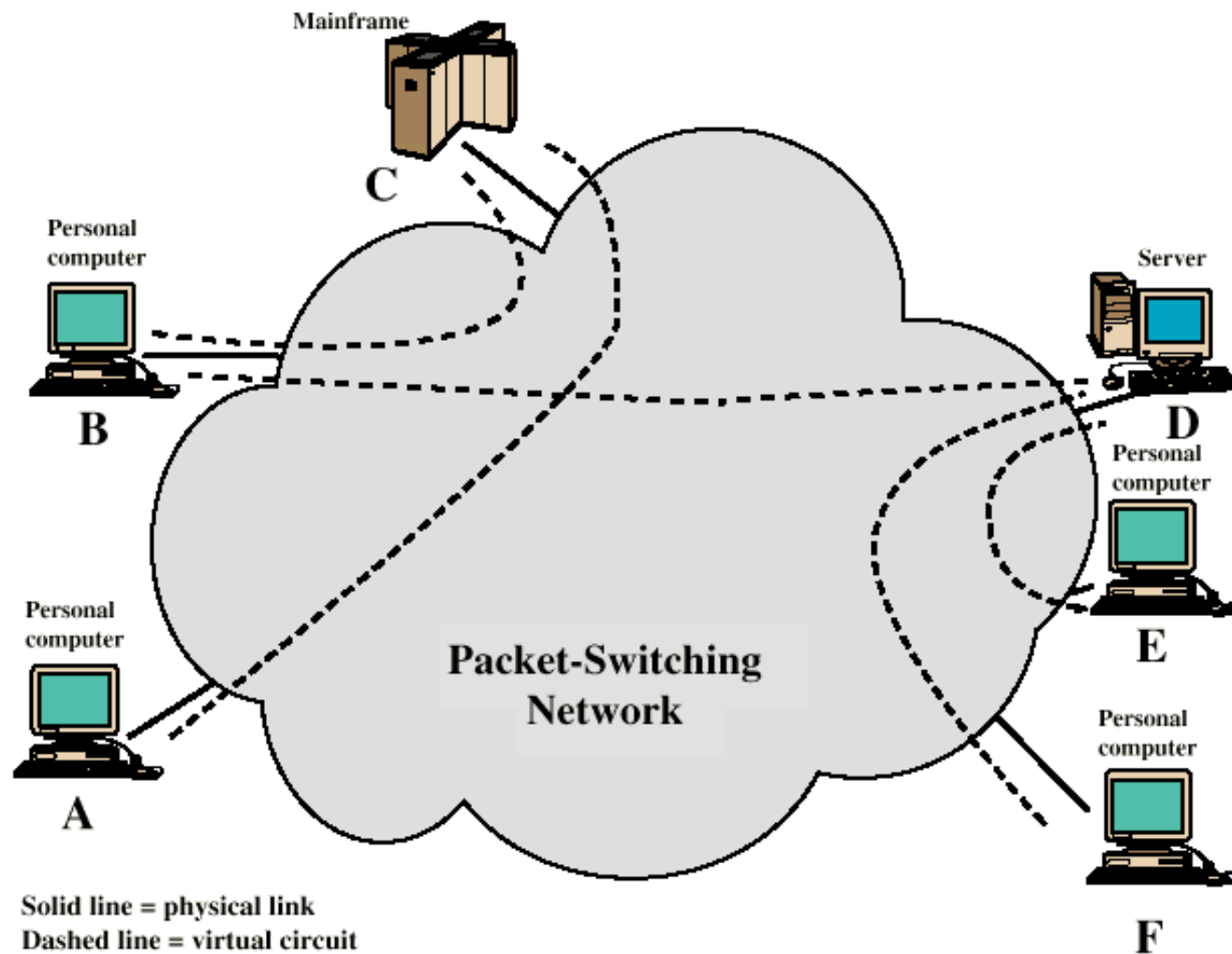
Packet Switching: Virtual Circuit Switching

5

- Route is chosen at the start of session and it is only a logical connection.
- All Packets associated with a session follow the same path.
- Packets are labeled with a VC# designated the route.
- The VC number must be unique on a given link.
- Packets are forwarded more quickly. (No Routing Decisions)
- Example : Asynchronous Transfer Mode

Packet Switching: Virtual Circuit Switching

6



Routing Protocols:

7

- Interior Gateway Routing Protocols
- Exterior Gateway Routing Protocols
- Classful Routing Protocols
- Classless Routing Protocols
- Distance Vector and Link State Routing Protocols
- Adaptive and non-adaptive Routing protocols
- Unicast and Multi cast routing protocols

Routing Protocols

8

□ Interior Routing Protocols

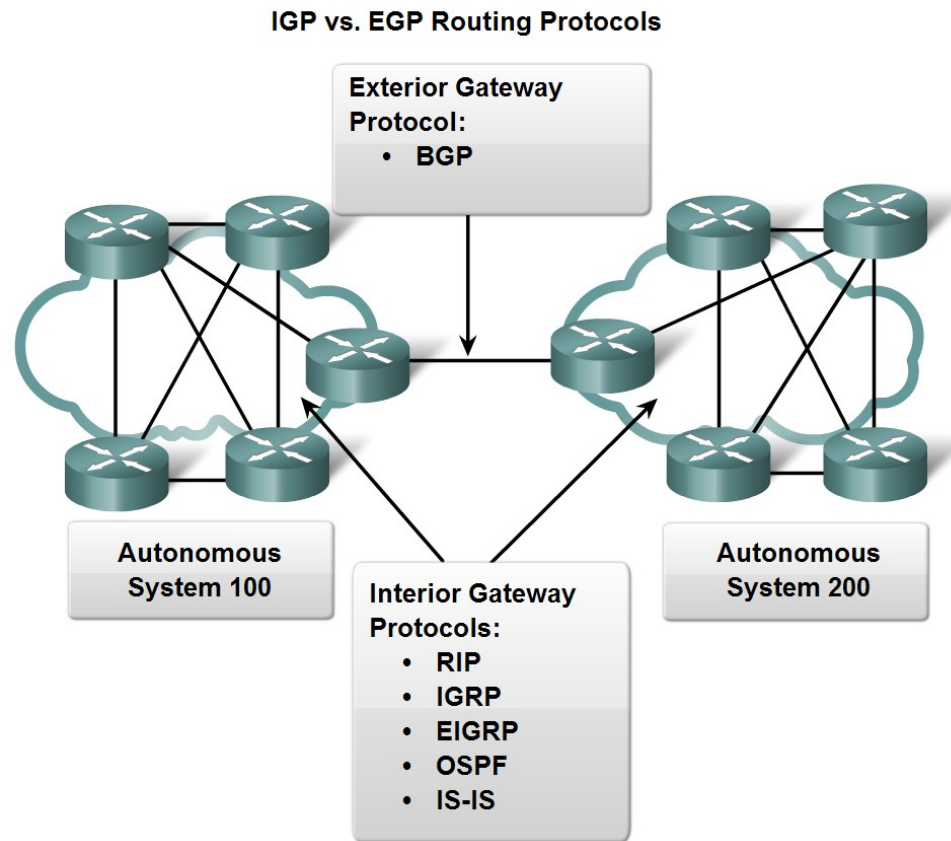
- ✓ Used for Routing Inside an Autonomous System (AS).
- ✓ Used within the Organization
- ✓ AS => Network under Common Administration.
- ✓ Router having Same AS, share their routing tables
- ✓ Examples => RIP, EIGRP and OSPF, IGRP
- ✓ IGRP: **Interior Gateway Routing protocols**

□ Exterior Routing Protocols

- ✓ Used for Routing between Autonomous System (AS)
- ✓ Border Gateway Routing Protocols (BGP)
- ✓ Used between the organization (ISPs to ISPs)

Routing Protocols: Example

9



Routing Protocols

Each interior routing protocol can be characterized based on the underlying logic used by the routing protocol.

The underlying logic is referred to as the *TYPE* of routing protocol.

The three types are:

- Distance vector: Examples RIP version 1 and RIP version 2
- Link-state: OSPF (Open Shortest Path First Protocol)
- Hybrid: EIGRP (Enhanced Interior Gateway Routing Protocols)

Routing Protocols

11

- Distance Vector Routing Protocols
 - ✓ Incomplete View of Topology.
 - ✓ Routes are advertised as Vectors of Distance and Direction.
 - ✓ Generally Periodic Updates with or without the change in the network topology
 - ✓ Examples: RIP, RIP version2
 - ✓ EIGRP also referred as Advance Distance Vector Routing Protocols , sometimes referred as **HYBRID** Routing protocol

- Link State Routing Protocols
 - ✓ Complete View of Network Topology.
 - ✓ Updates are Not Periodic. (Bounded and Triggered Updates).
 - ✓ Routing tables are only Updated when there is change in network links only
 - ✓ Example: OSPF

Routing Protocols

12

□ Classful Routing Protocols

- ✓ Classful routing protocols DO NOT send the subnet mask along with their updates
- ✓ Examples of Classful routing protocol is RIP version 1

□ Classless Routing Protocols

- ✓ Classless Routing Protocols send the Subnet mask along with their updates
- ✓ Benefits or using Classless routing protocols
 - We can save lot of IP address using VLSM techniques in classless routing protocols
- ✓ Examples: OSPF, EIGRP, RIPv2

Routing Protocols

- ✓ Adaptive Routing Protocols
 - ✓ Adaptive routing protocols can easily adapt to network changes
 - ✓ Adaptive Routing protocols are also called Dynamic routing Protocols
 - ✓ Examples of Adaptive routing Protocols are
 - ✓ OSPF
 - ✓ EIGRP
 - ✓ RIP
 - ✓ BGP
 - ✓ IGRP

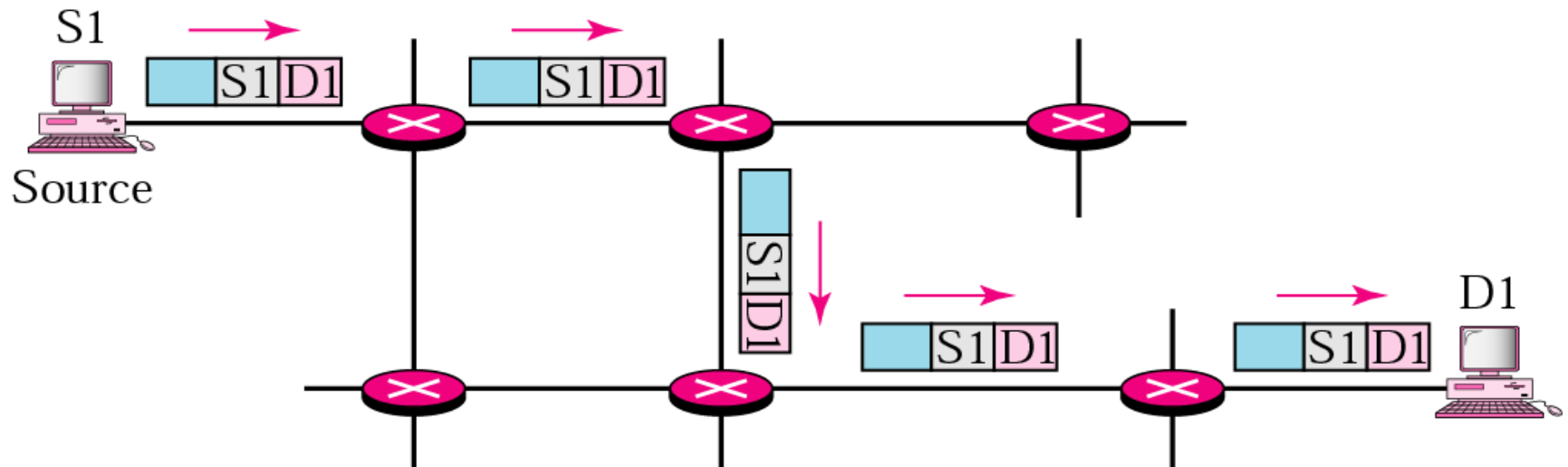
Routing Protocols

- Non-Adaptive Routing Protocols
 - ✓ Non Adaptive Routing Protocols doesn't respond to change in topology
 - ✓ Non-Adaptive Routing Protocols are also called as **Static routing** Protocols
 - ✓ Non-Adaptive Routing protocols are more **secure** than Adaptive Routing protocols as they don't advertise the routing update unnecessarily
 - ✓ Network Administrator is responsible for configuring the static routing in the router
 - ✓ static routes are fixed and do not change if the network is changed or reconfigured

- **Unicast Routing**

- In unicasting there is a single sender (source) and a single receiver (destination)
- In unicast routing, the router forwards the received packet through only one of its interfaces
- Examples of Unicast Routing are
 - OSPF
 - RIP
 - BGP

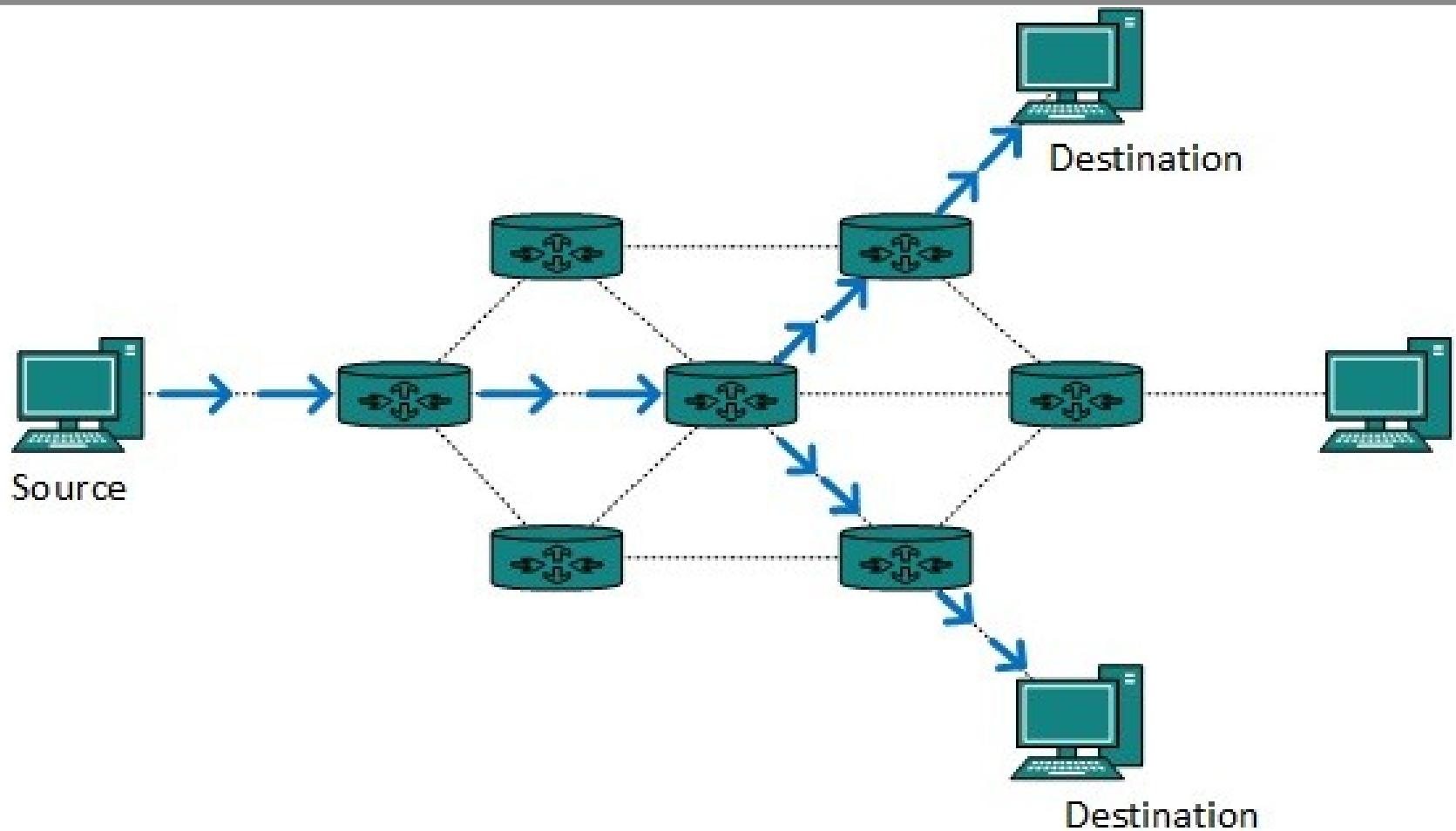
Unicast Routing



MultiCast Routing

- In multicasting there is at least one sender and several receivers (group of receivers called multicast group)
- In multicast routing, the router may forward the received packet through several of its interfaces.
- Examples
 - IGMP

Multicast Routing



Broadcast Routing

- Homework ??