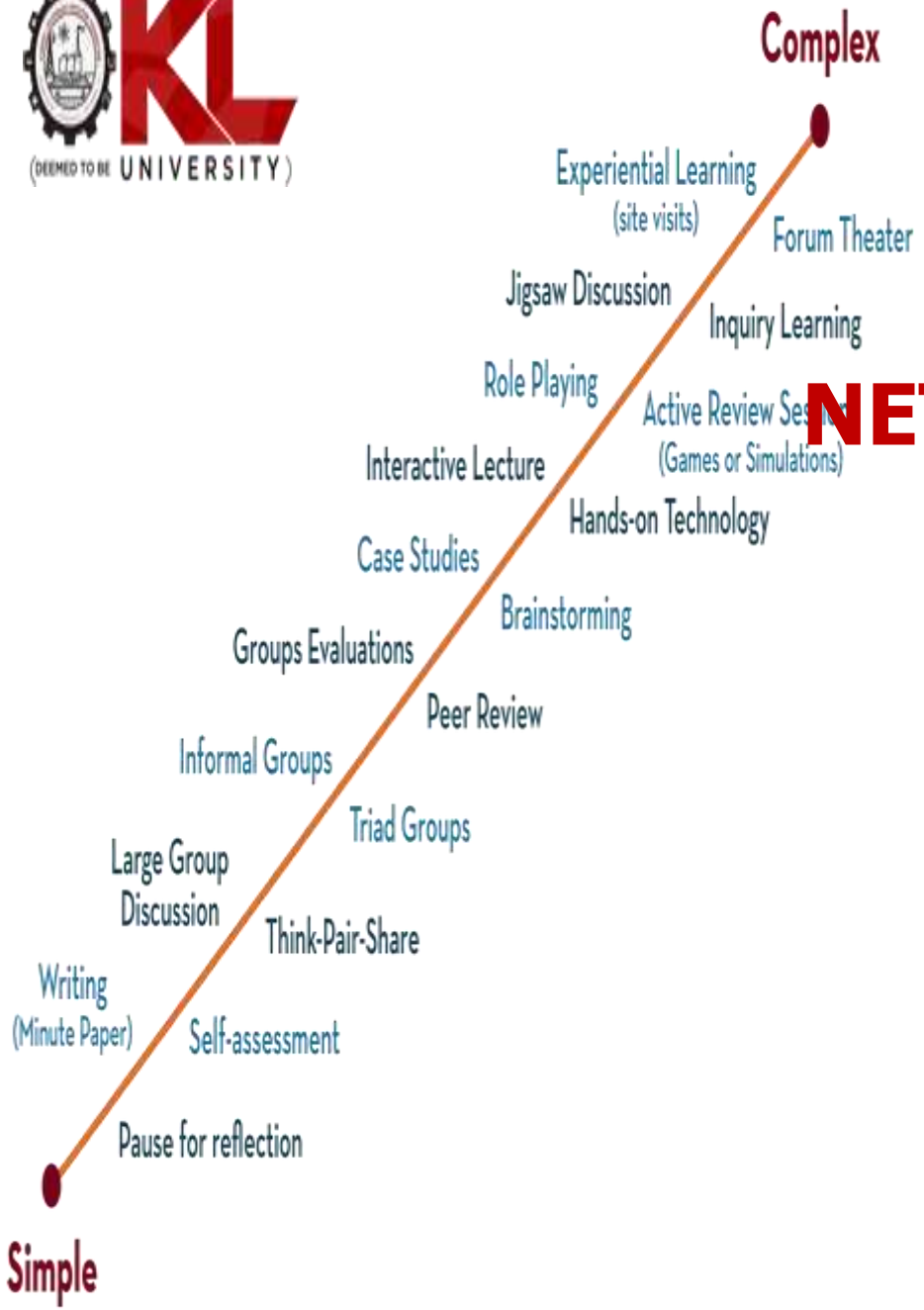


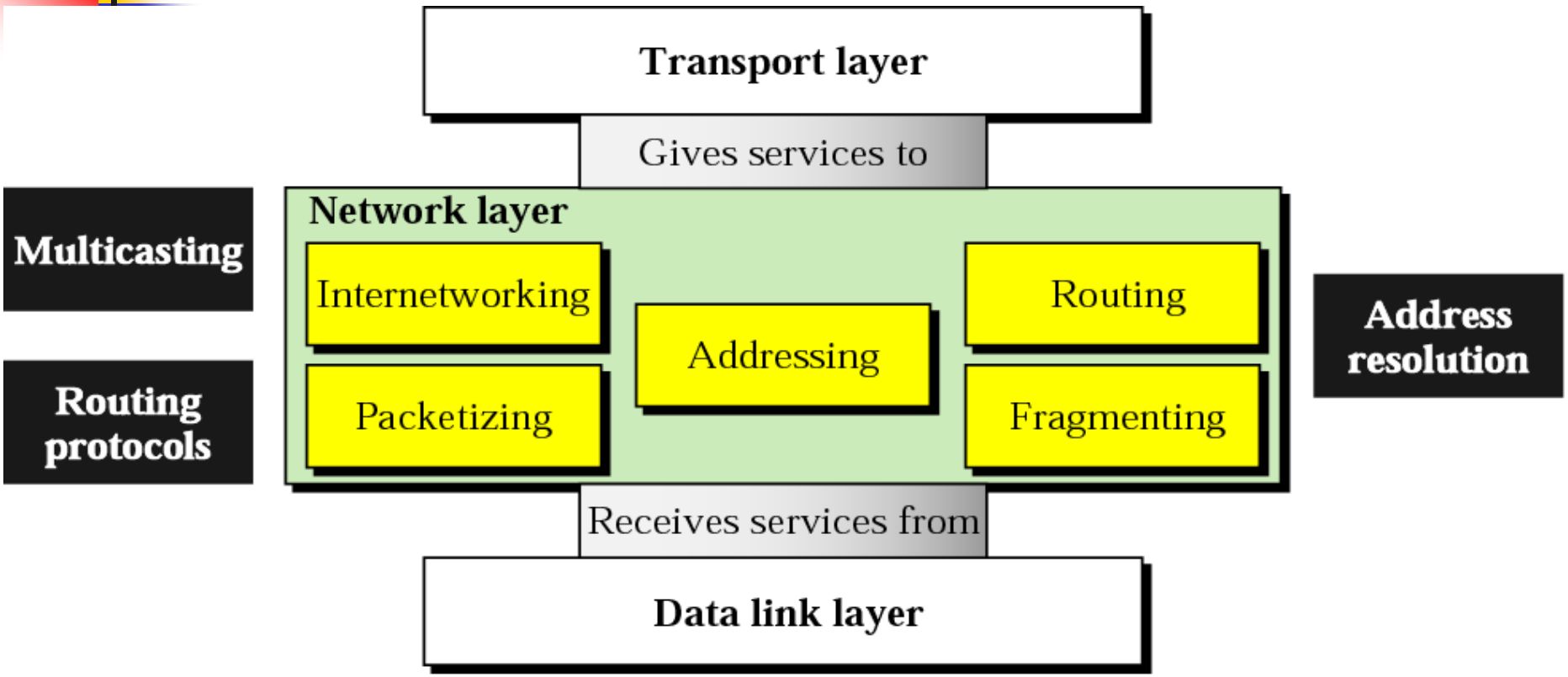
NETWORK PROTOCOLS & SECURITY
23EC2210 R/A/E

Topic:

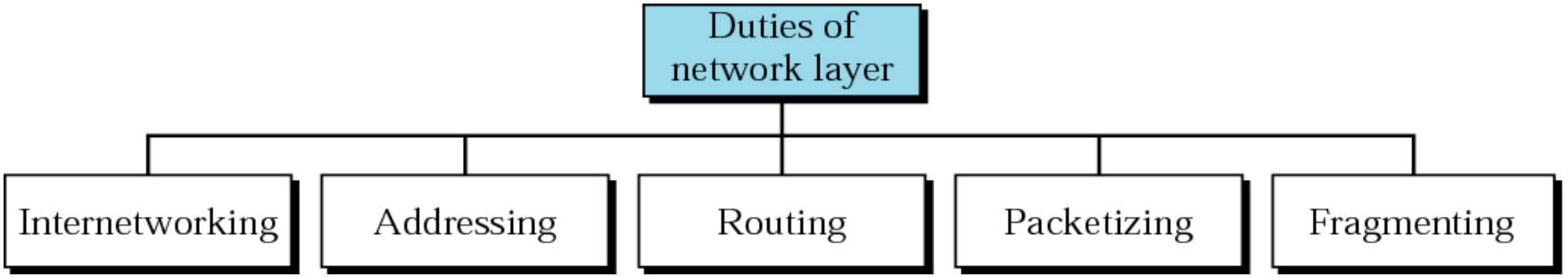
Session – 13

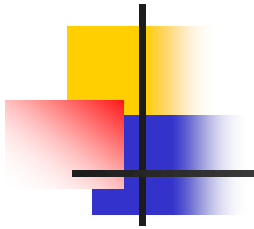
Design issues of Network layer

Position of network layer



Network layer duties





Host-to-Host Delivery:

Internetworking, Addressing, and Routing

Internetworks

- *Need For Network Layer*
- *Internet As A Packet-Switched Network*
- *Internet As A Connectionless Network*

Figure Internetwork

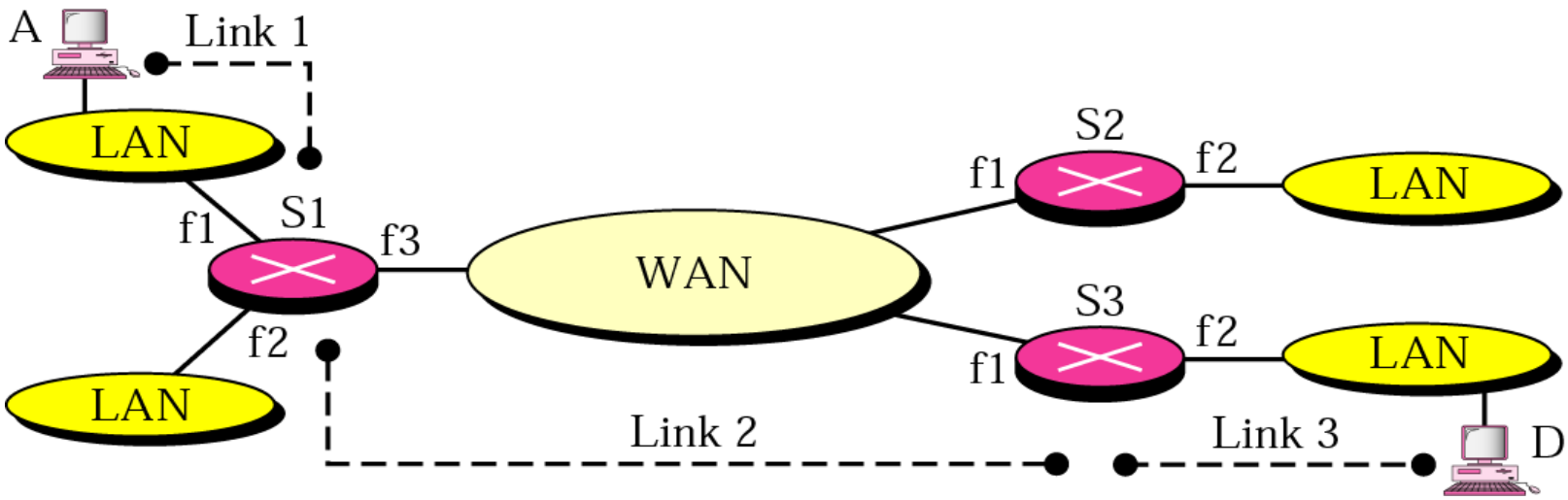


Figure Links in an internetwork

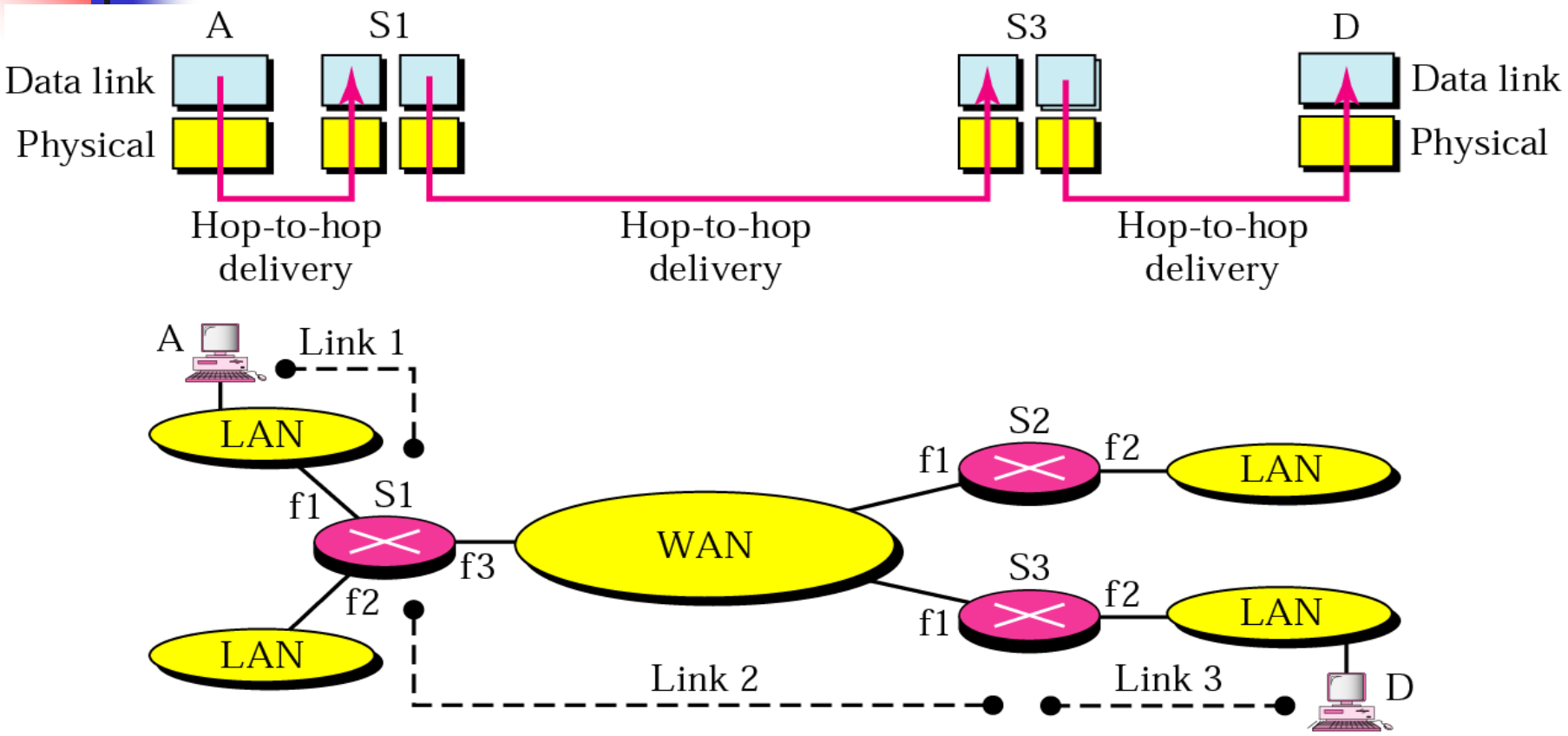


Figure Network layer in an internetwork

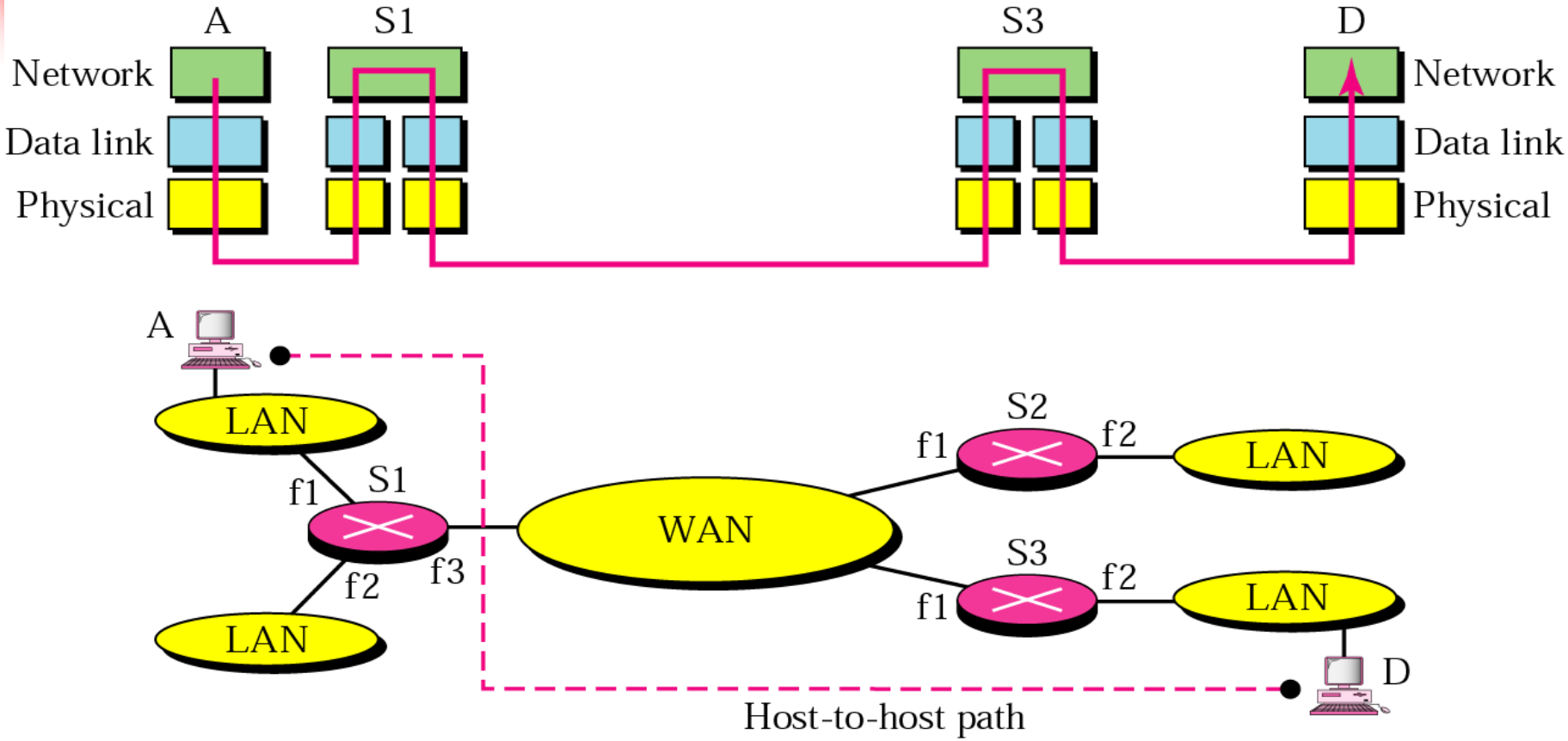


Figure Network layer at the source

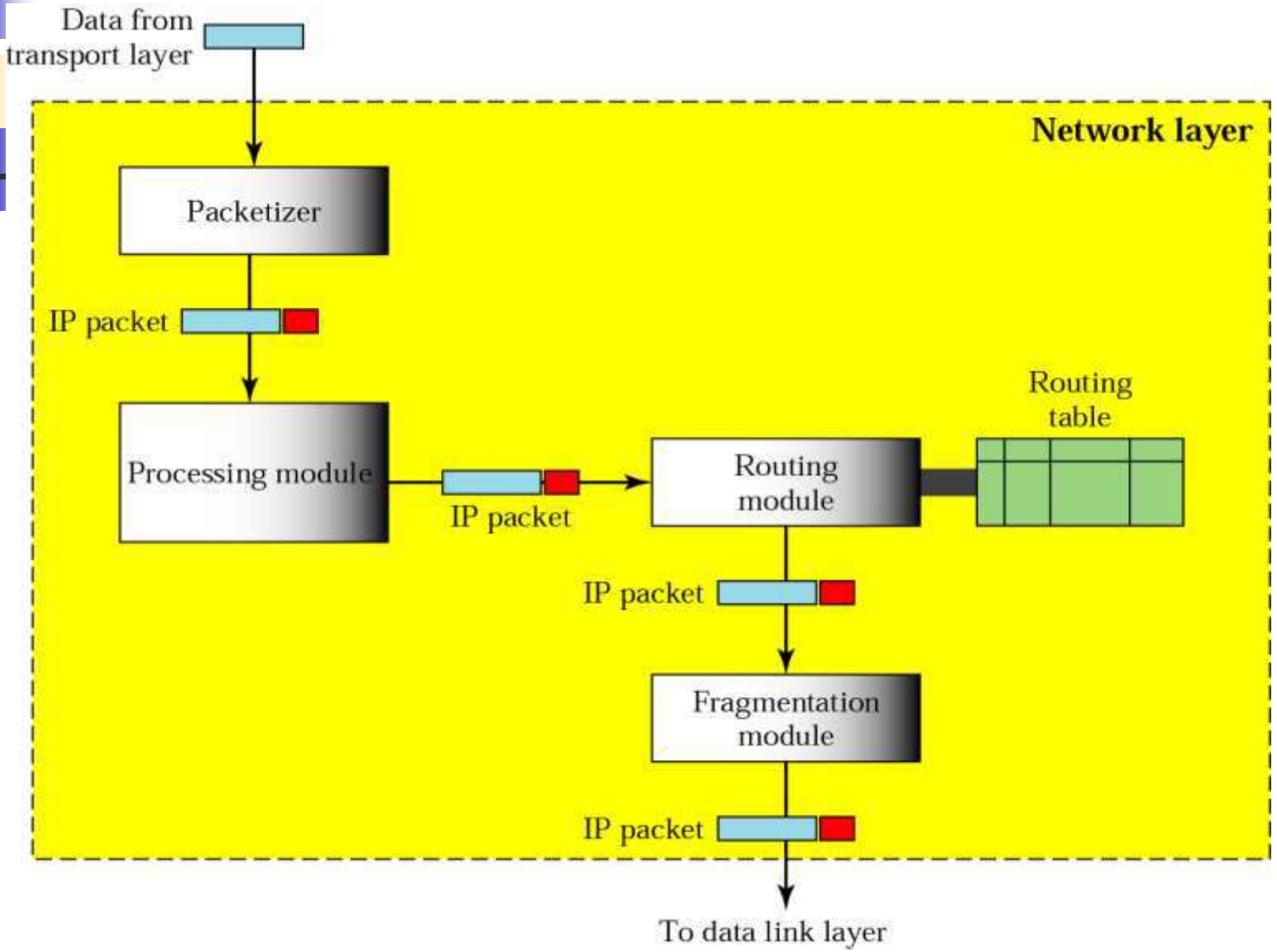


Figure Network layer at a router

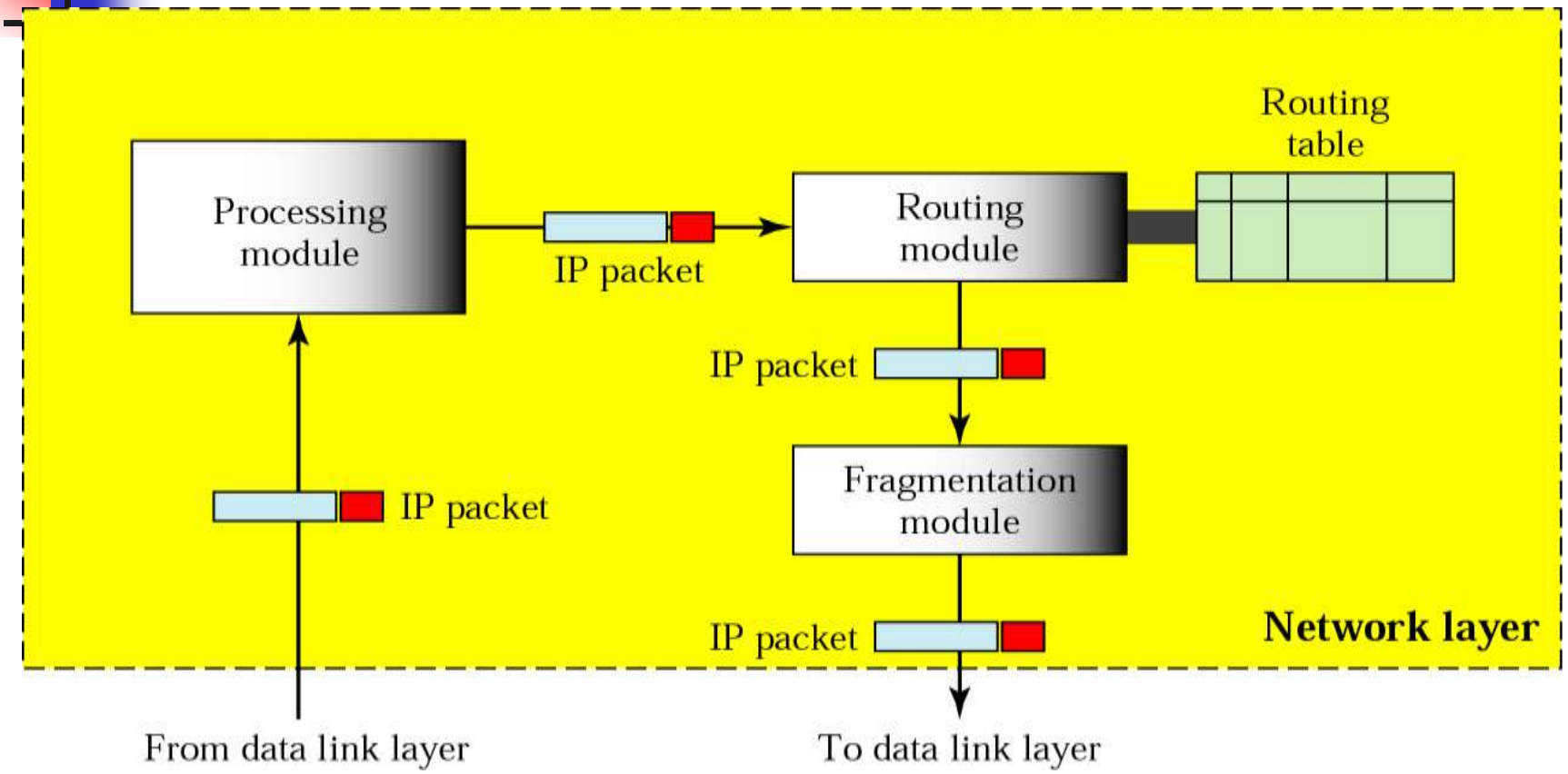


Figure Network layer at the destination

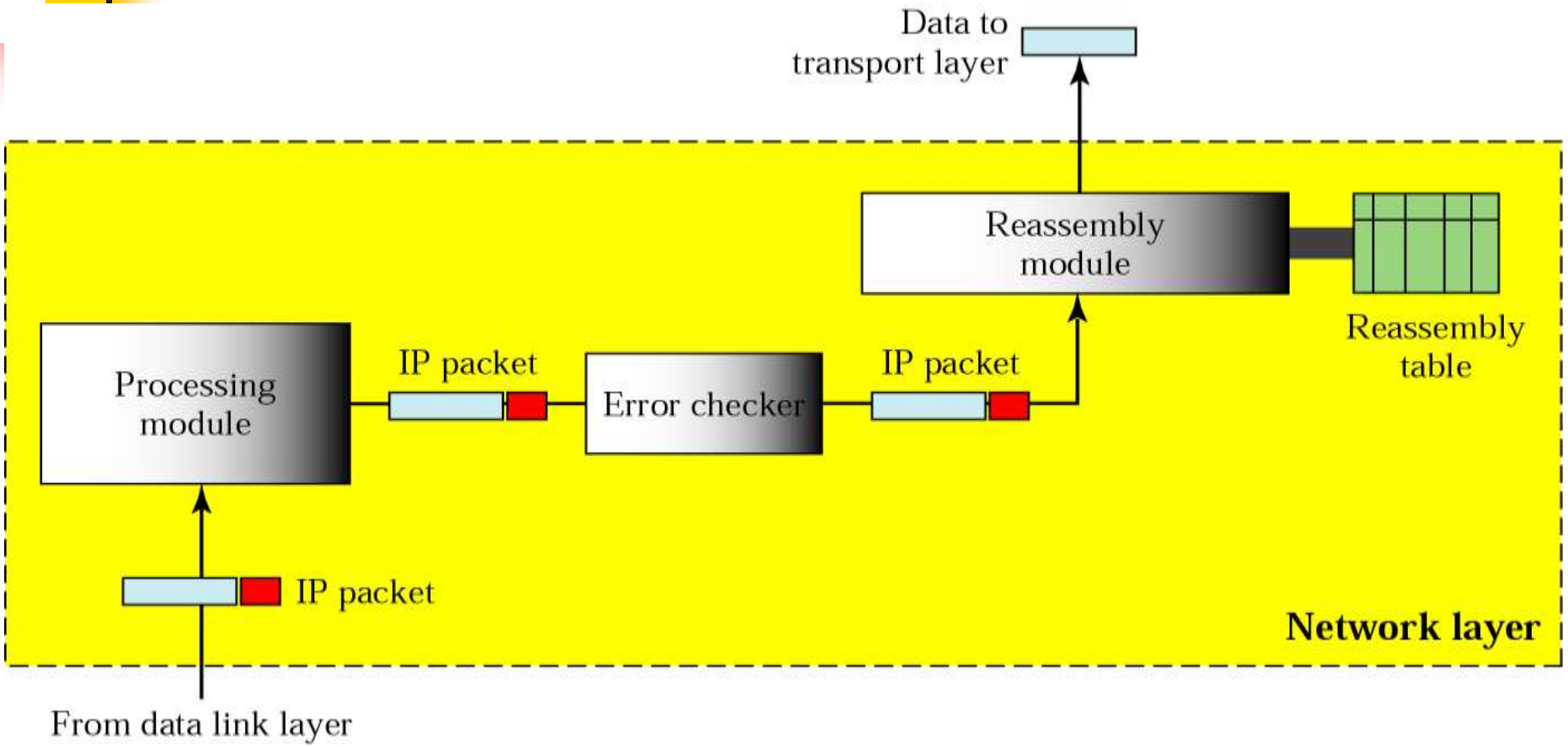


Figure Switching

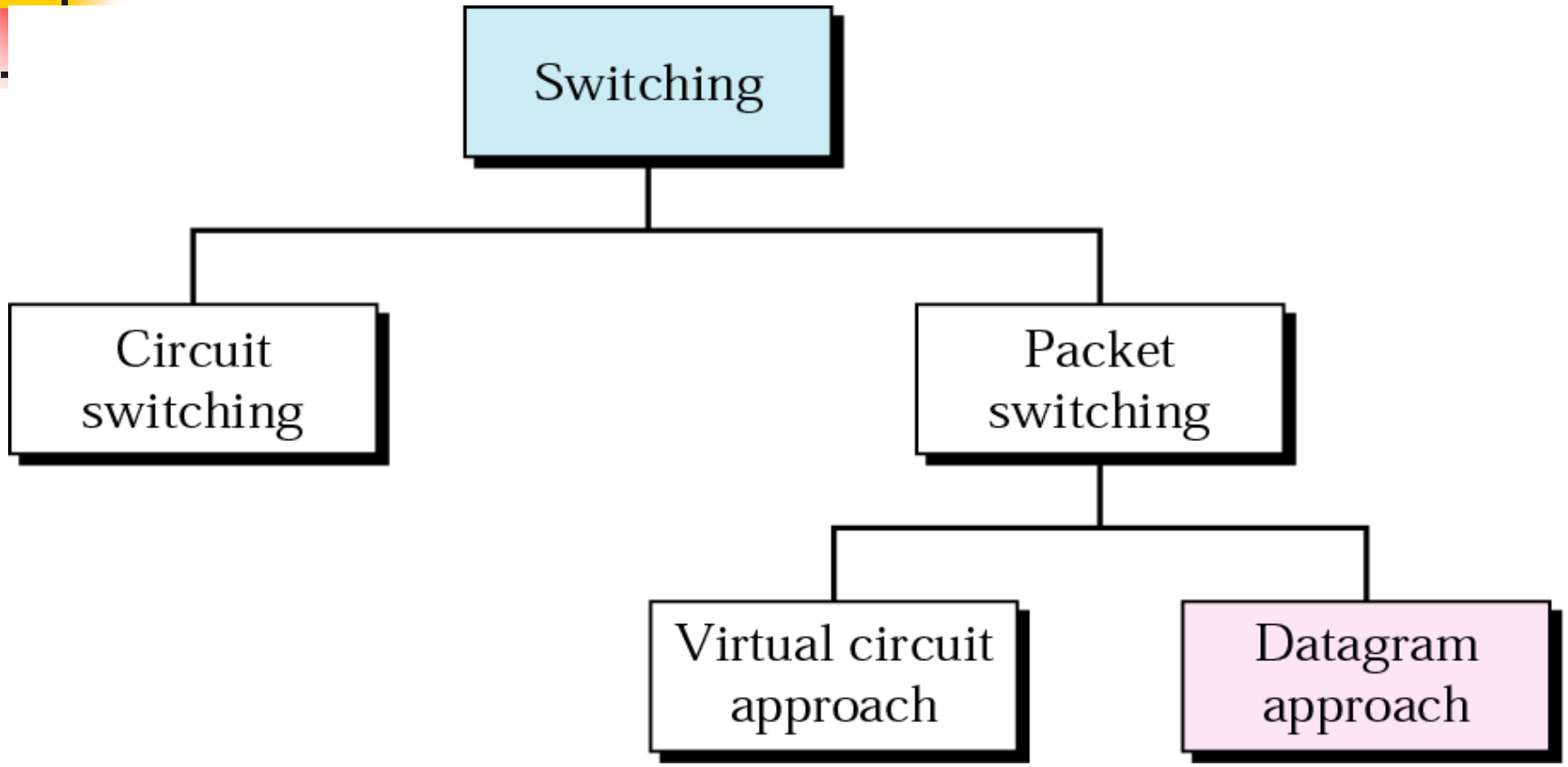
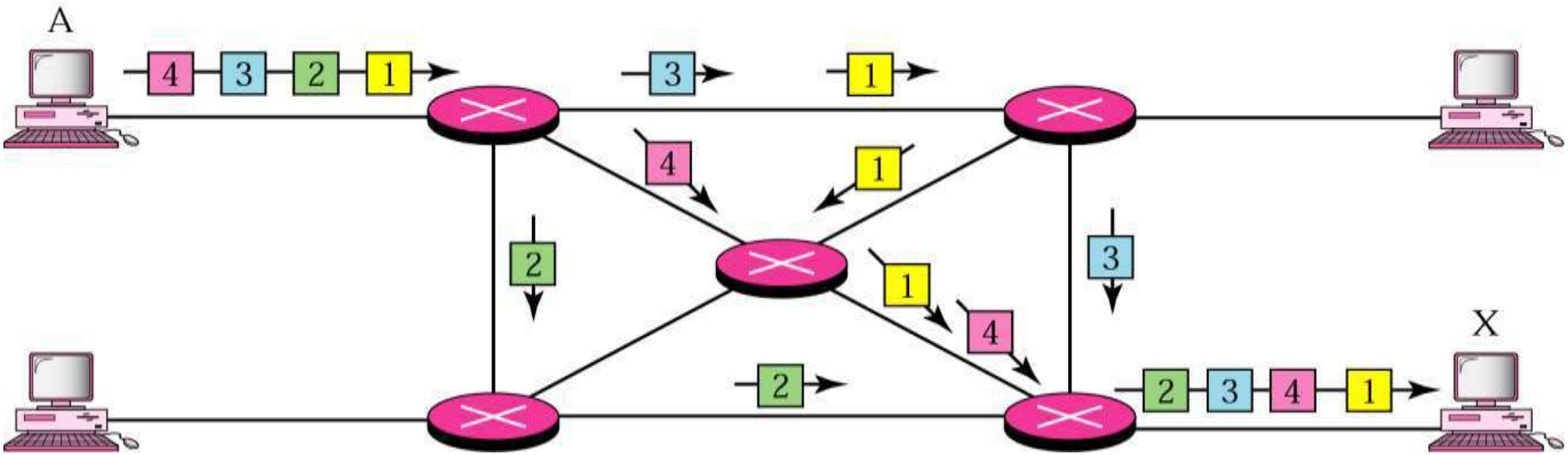


Figure Datagram approach

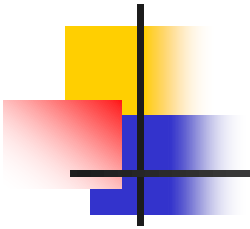


Note:

Switching at the network layer in the Internet is done using the datagram approach to packet switching.

Note:

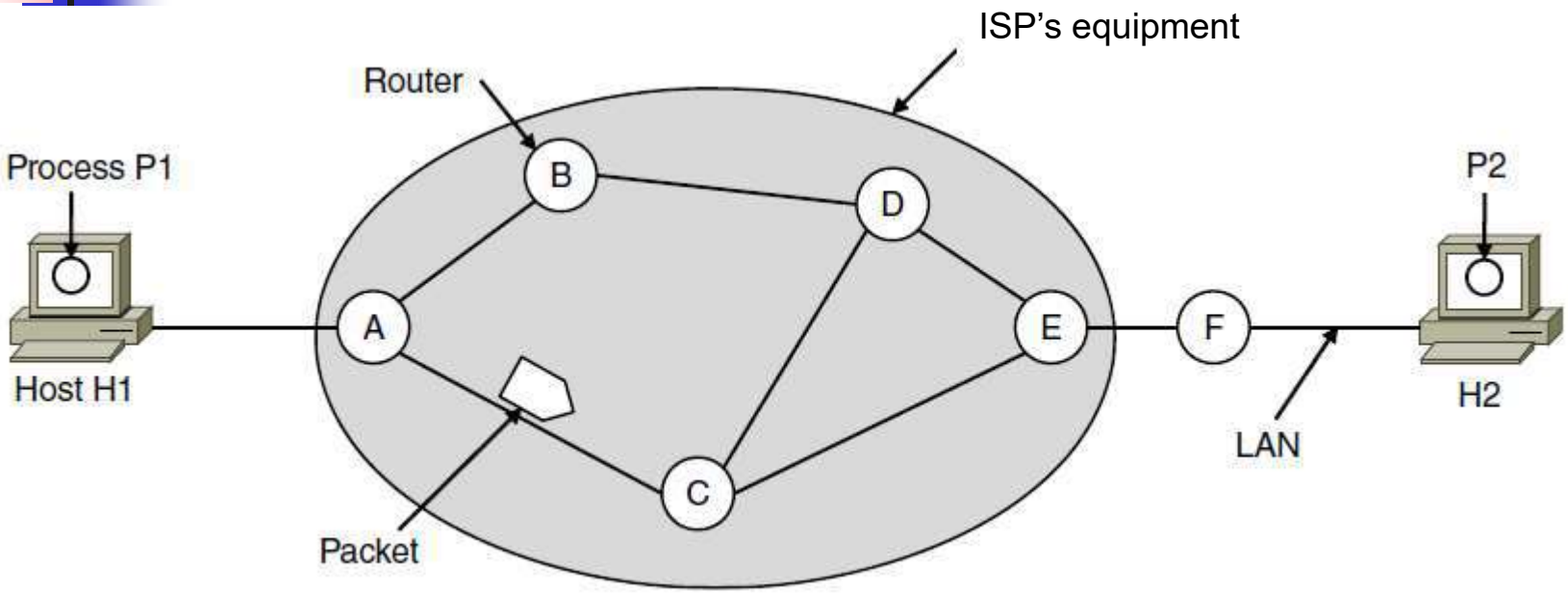
Communication at the network layer in the Internet is connectionless.



Network Layer Design Issues

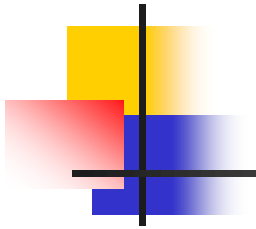
- Store-and-forward packet switching
- Services provided to transport layer
- Implementation of connectionless service
- Implementation of connection-oriented service
- Comparison of virtual-circuit and datagram networks

Store-and-Forward Packet Switching



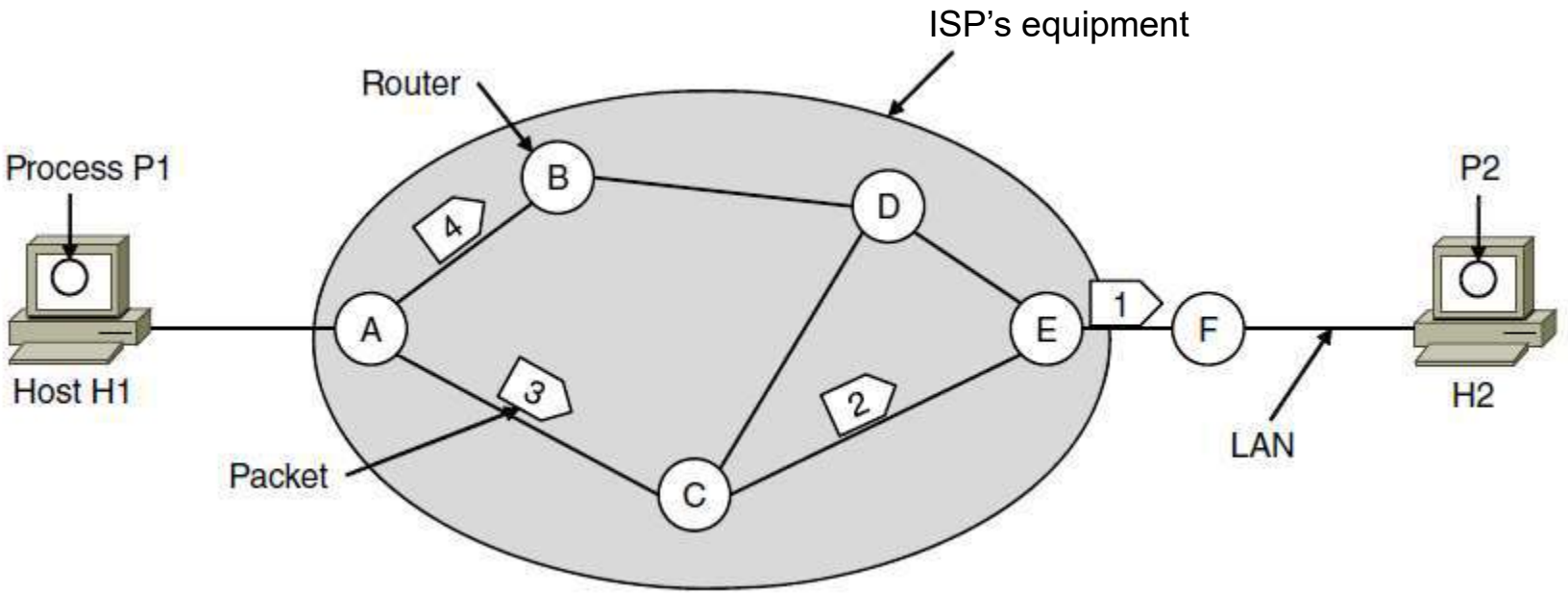
The environment of the network layer protocols.

Services Provided to the Transport Layer



1. Services independent of router technology.
2. Transport layer shielded from number, type, topology of routers.
3. Network addresses available to transport layer use uniform numbering plan
   - even across LANs and WANs

Implementation of Connectionless Service



A's table (initially)

Dest.	Line
A	
B	B
C	C
D	B
E	C
F	C

A's table (later)

A	
B	B
C	C
D	B
E	D
F	D

C's Table

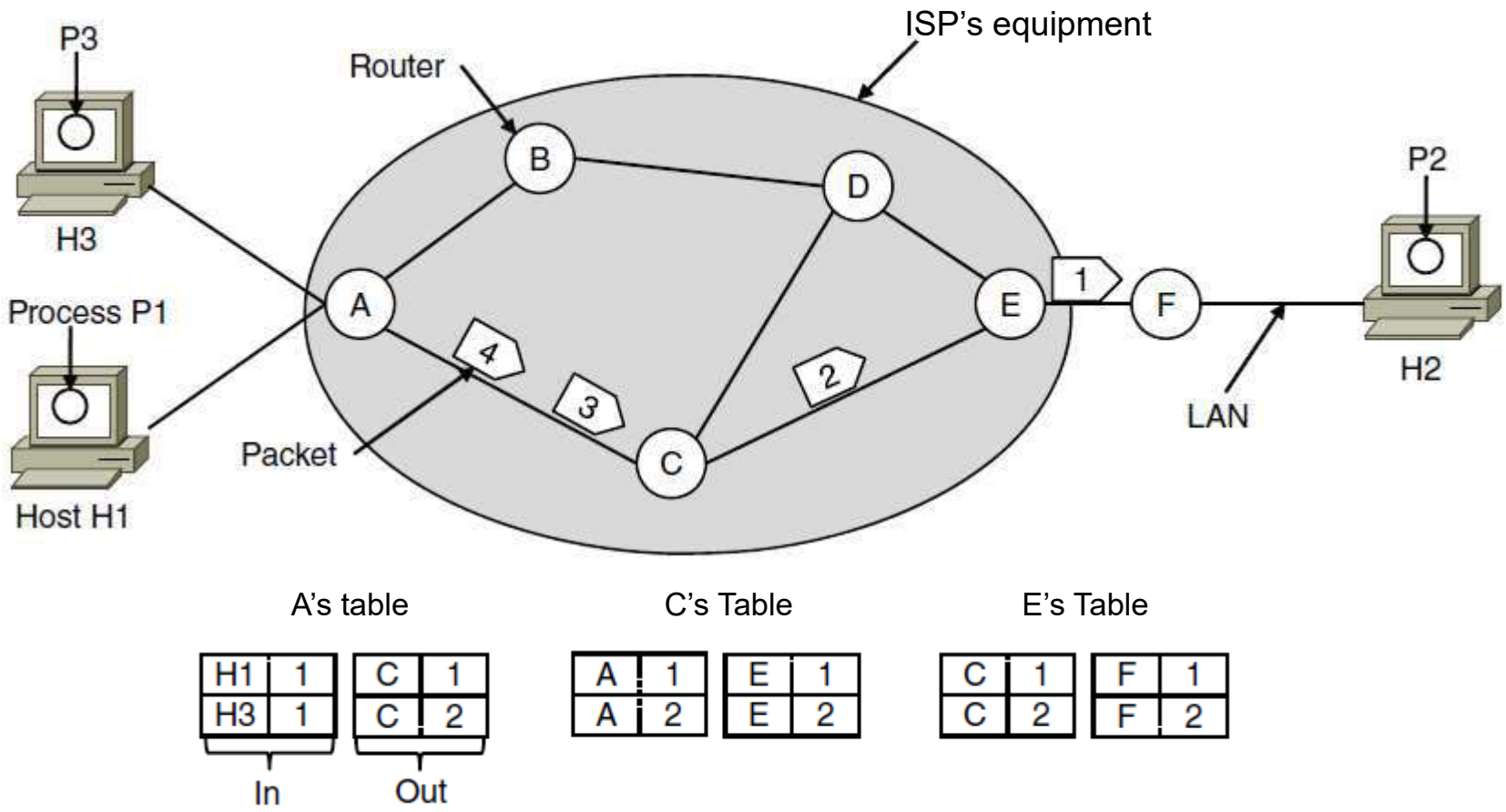
A	A
B	A
C	
D	E
E	E
F	E

E's Table

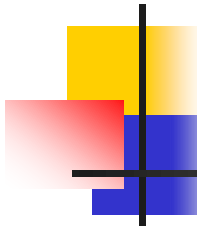
A	C
B	D
C	C
D	D
E	
F	F

Routing within a datagram network

Implementation of Connection-Oriented Service



Routing within a virtual-circuit network



Issue	Datagram network	Virtual-circuit network
Circuit setup	Not needed	Required
Addressing	Each packet contains the full source and destination address	Each packet contains a short VC number
State information	Routers do not hold state information about connections	Each VC requires router table space per connection
Routing	Each packet is routed independently	Route chosen when VC is set up; all packets follow it
Effect of router failures	None, except for packets lost during the crash	All VCs that passed through the failed router are terminated
Quality of service	Difficult	Easy if enough resources can be allocated in advance for each VC
Congestion control	Difficult	Easy if enough resources can be allocated in advance for each VC

Comparison of datagram and virtual-circuit networks

SUMMARY

- Design issues of Network Layer
- Services provided by network layer
- Connection-oriented and connectionless services.

TERMINAL QUESTIONS

1. Describe the design issues of Network layer.

2. Explain the implementation of connection-oriented and connectionless services by network layer.

3. Compare virtual circuit and datagram subnet.

REFERENCES FOR FURTHER LEARNING OF THE SESSION

Reference Books:

1. Behrouz A. Forouzan , “Data Communication and Networking”, TMH, 5th Edition, 2012.
2. A.S. Tanenbaum, David J. Wetheral “Computer Networks” Pearson, 5th Edition.

THANK YOU

Team – Network Protocols & Security