ATM

Figure 19-1

Multiplexing Using Different Packet Sizes
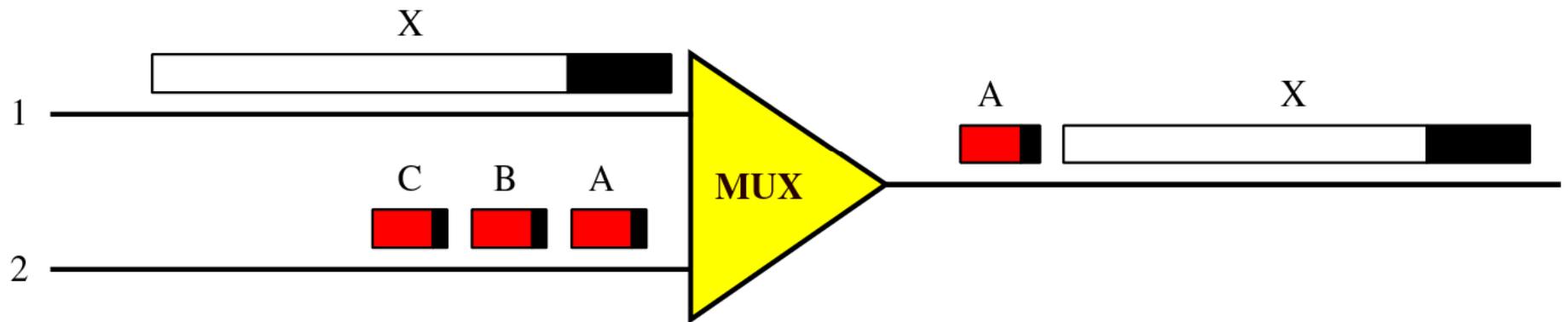
Figure 19-2

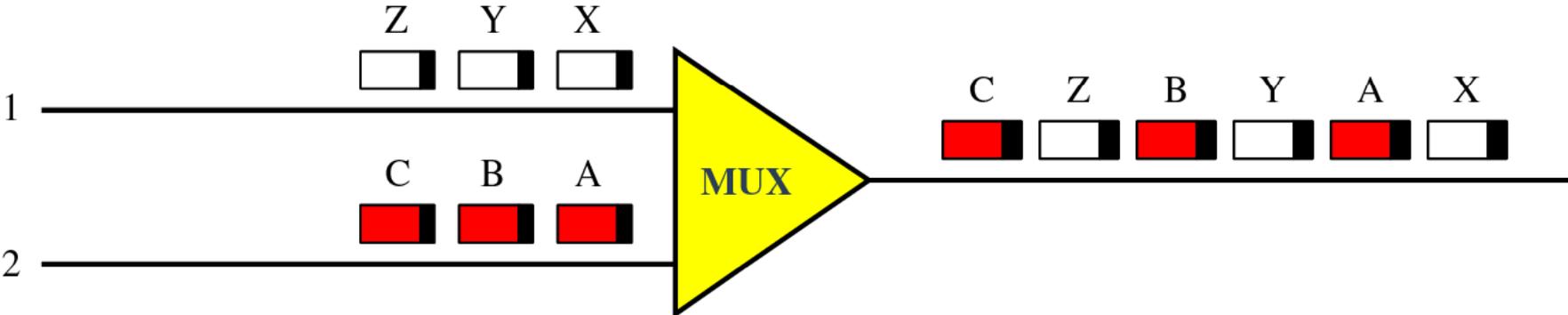# Multiplexing Using Cells

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Figure 19-3

ATM Multiplexing

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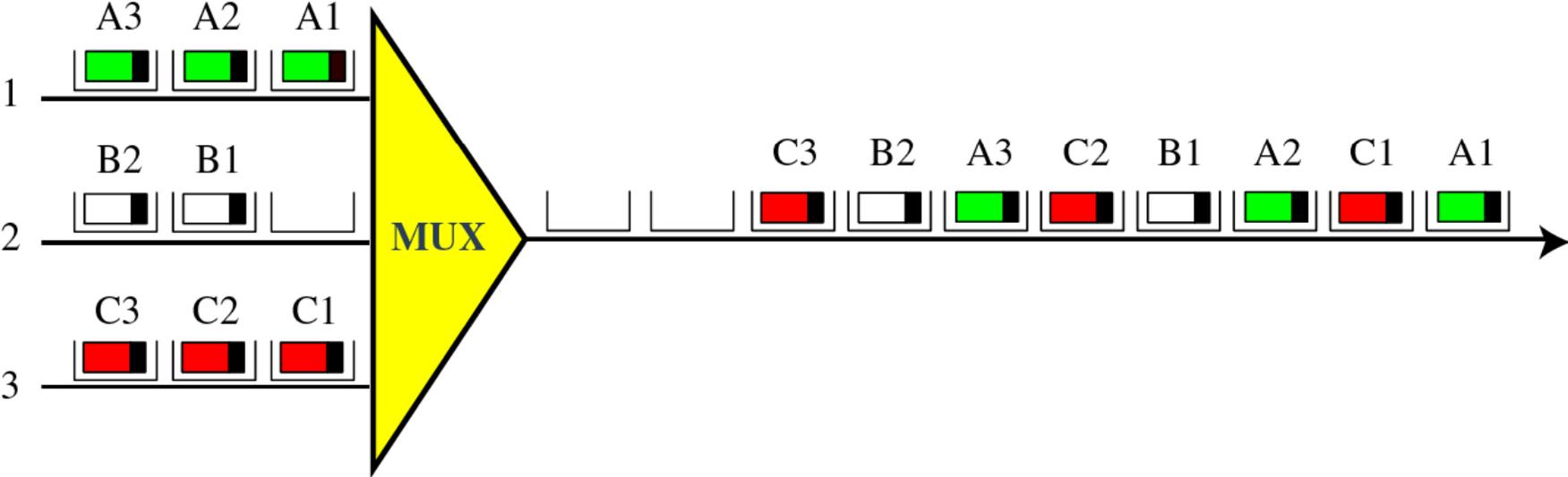
Figure 19-4

Architecture of an ATM Network

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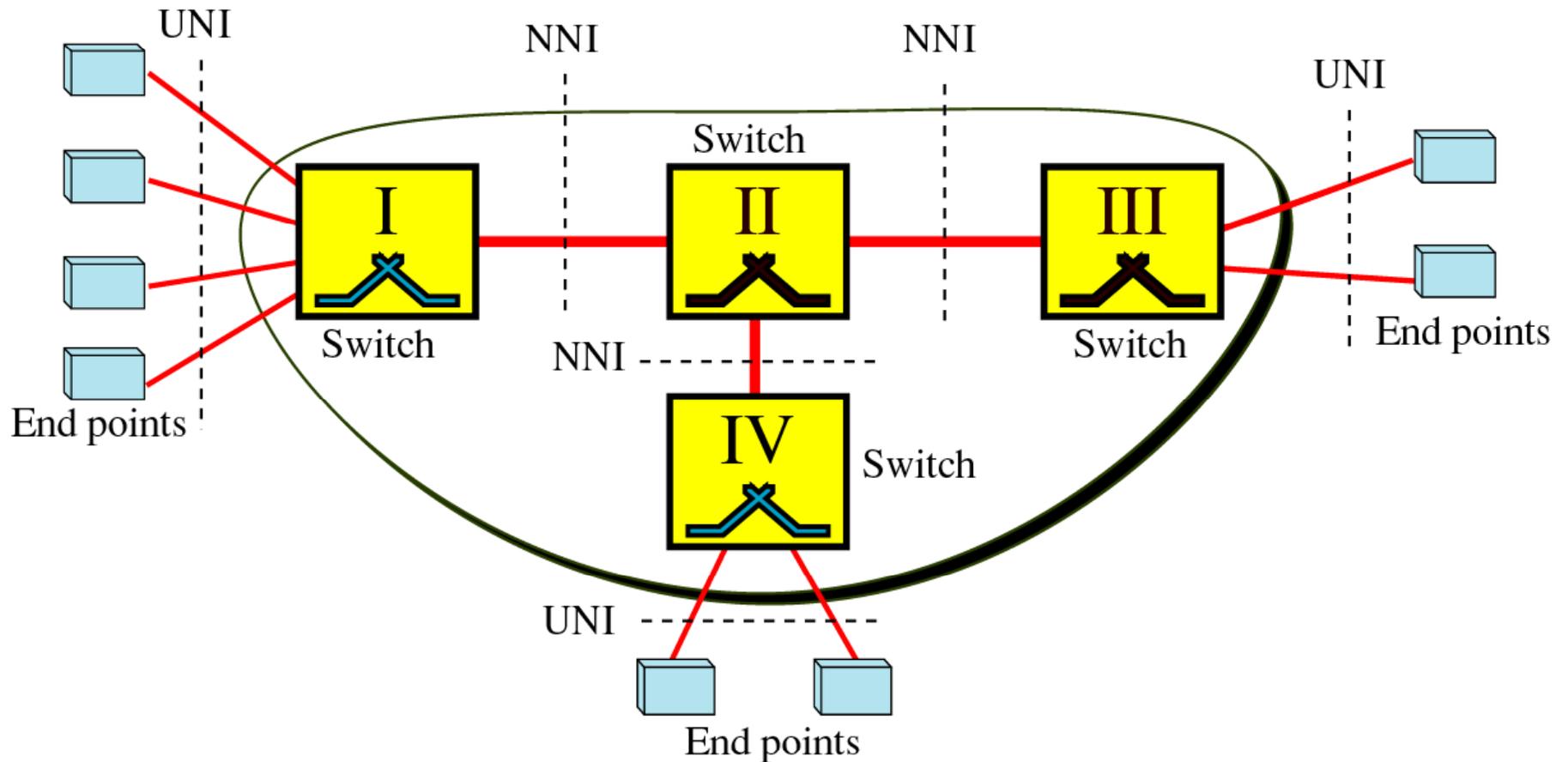
Figure 19-5
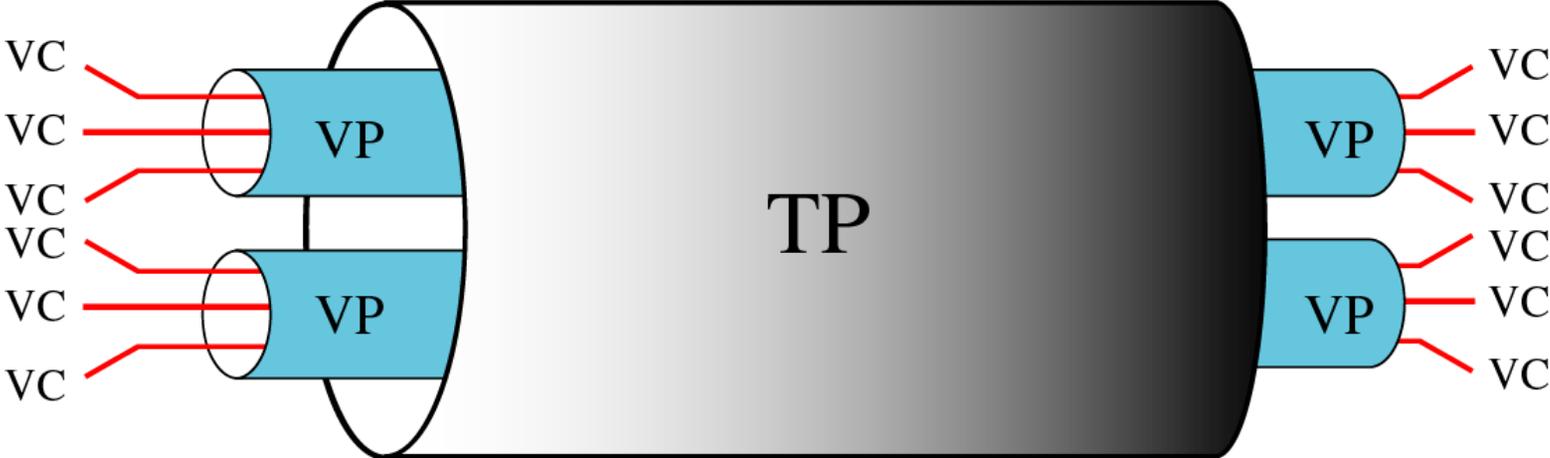
TP, VPs, and VCs

Figure 19-6

Example of VPs and VCs

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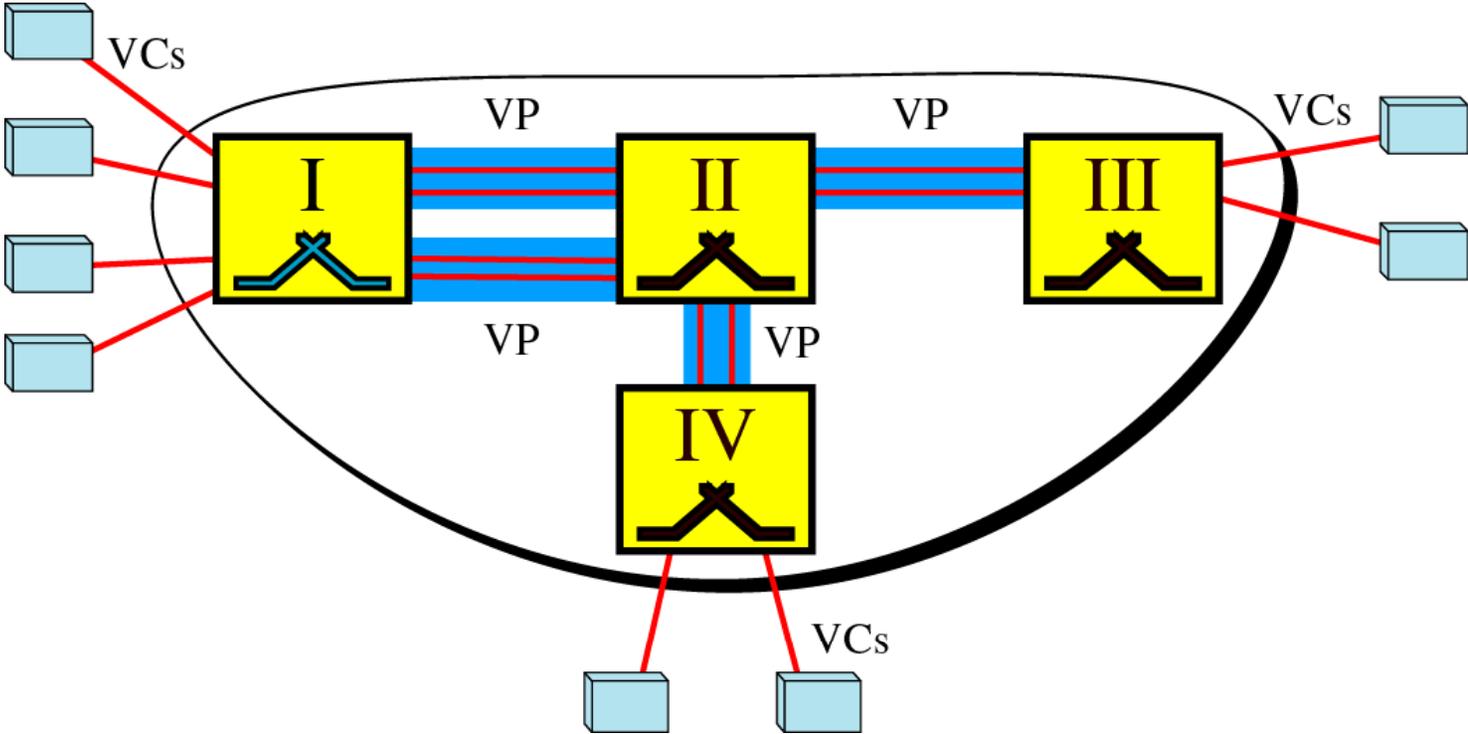
Figure 19-7

Connection Identifiers

VCI = 21
VCI = 32   VPI = 14
VCI = 45
VCI = 70
VCI = 74   VPI = 18
VCI = 45

This virtual connection is
uniquely defined using the pair:

(14 21)

VPI   VCI

VPI = 14   VCI = 21
VCI = 32
VCI = 45
VPI = 18   VCI = 70
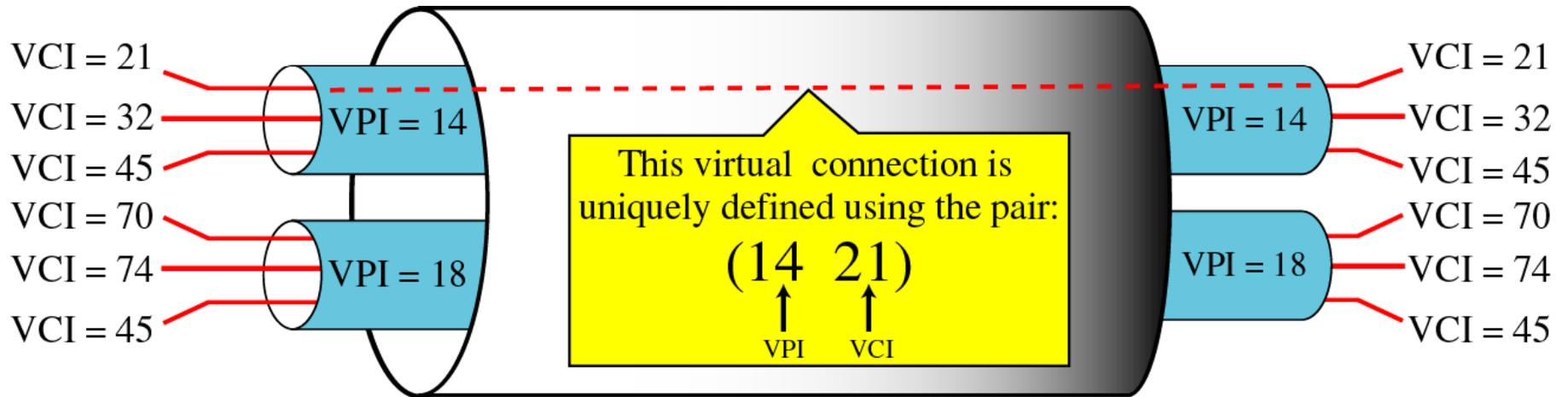VCI = 74
VCI = 45

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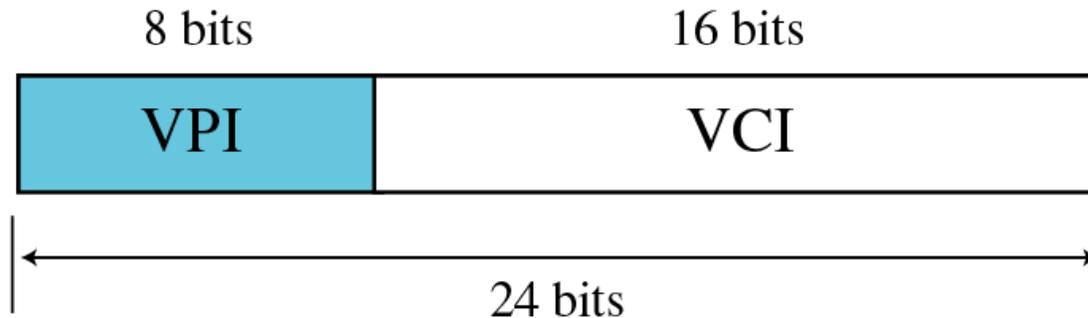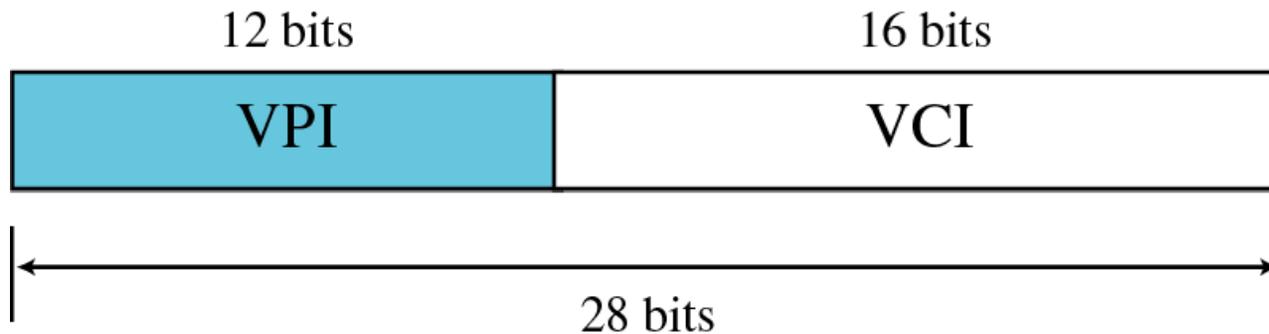**Figure 19-8**

Virtual Connection Identifiers in UNIs and NNIs

a. VPI and VCI in a UNI interface

b. VPI and VCI in an NNI interface

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Figure 19-9

An ATM Cell

Header   Payload

| VPI | VCI |

5 bytes   48 bytes

53 bytes

Figure 19-10

SVC Setup

A   B

SETUP

CALL PROCESSING

SETUP

CALL PROCESSING

CONNECT

CONNECT

CONNECT ACK

CONNECT ACK

Data transfer

RELEASE

RELEASE

RELEASE COMPLETE

RELEASE COMPLETE

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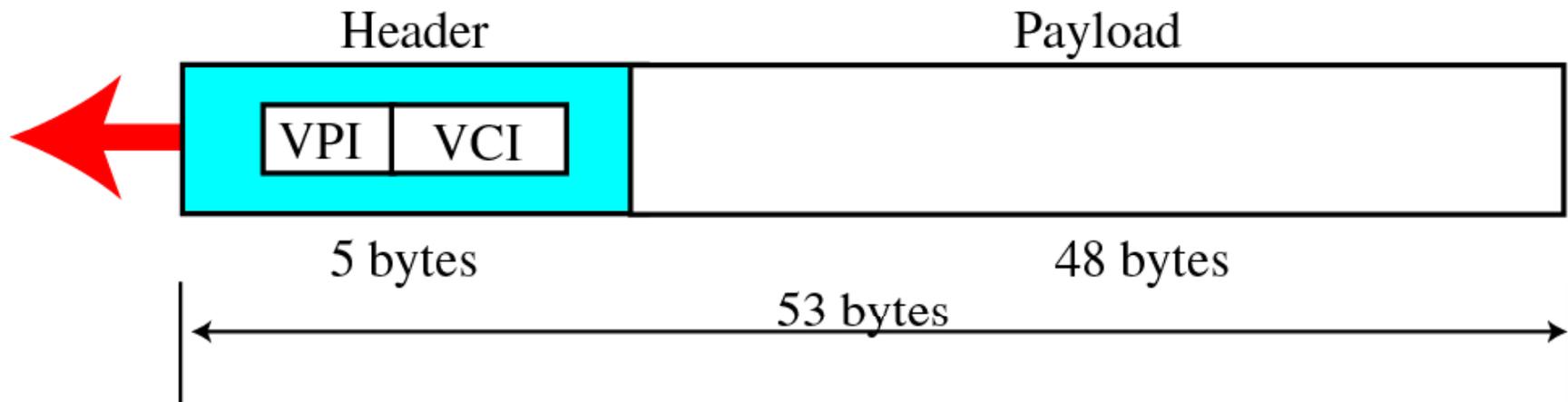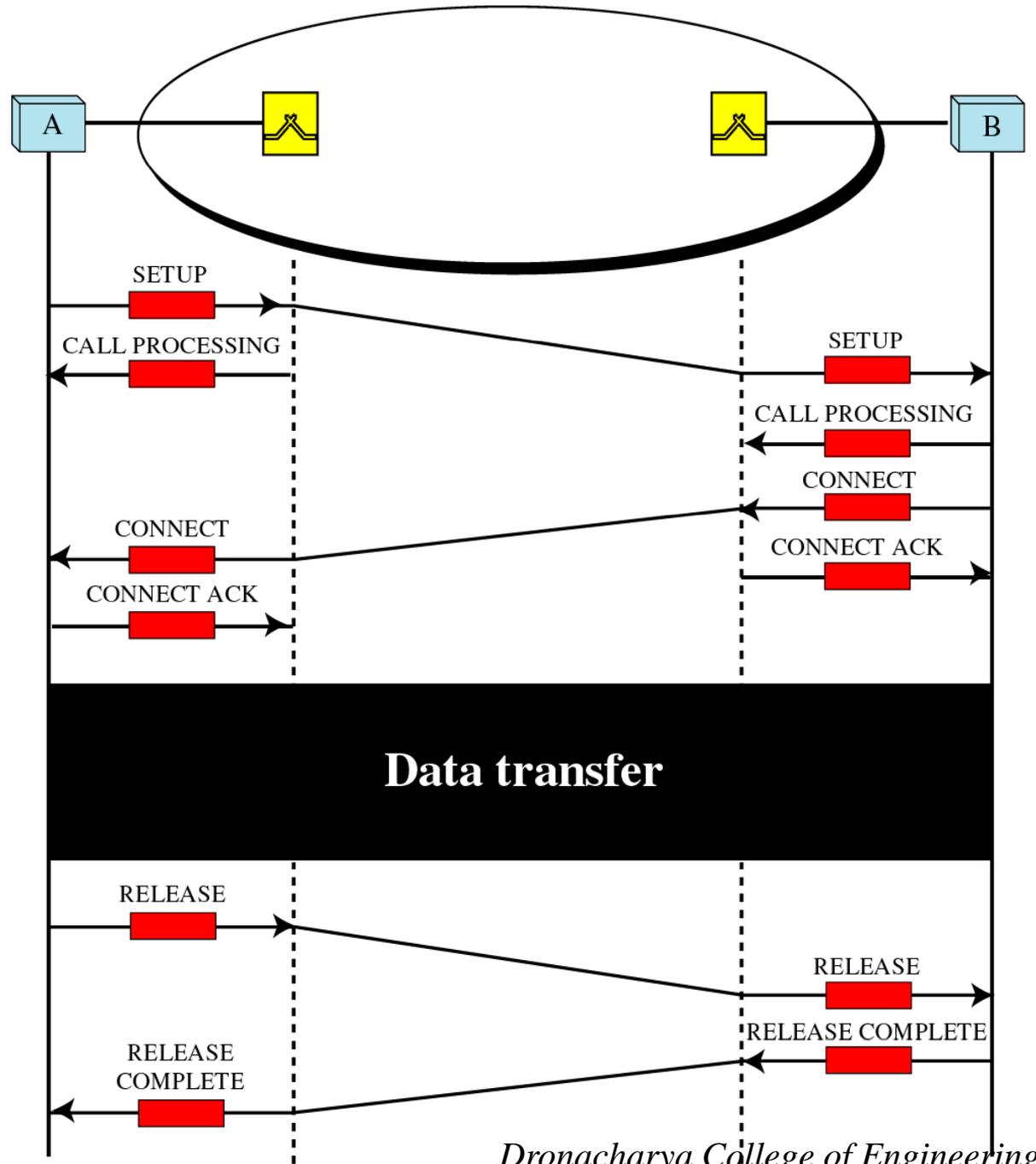
Figure 19-11

Routing with a VP Switch

Input		Output	
Interface	VPI	Interface	VPI
.....	.....	.....	...
.....	.....	.....	...
1	153	3	140
.....	.....	.....	...
.....	.....	.....	...

VPI VCI
153 67

VPI VCI
140 67

4   1
3   2

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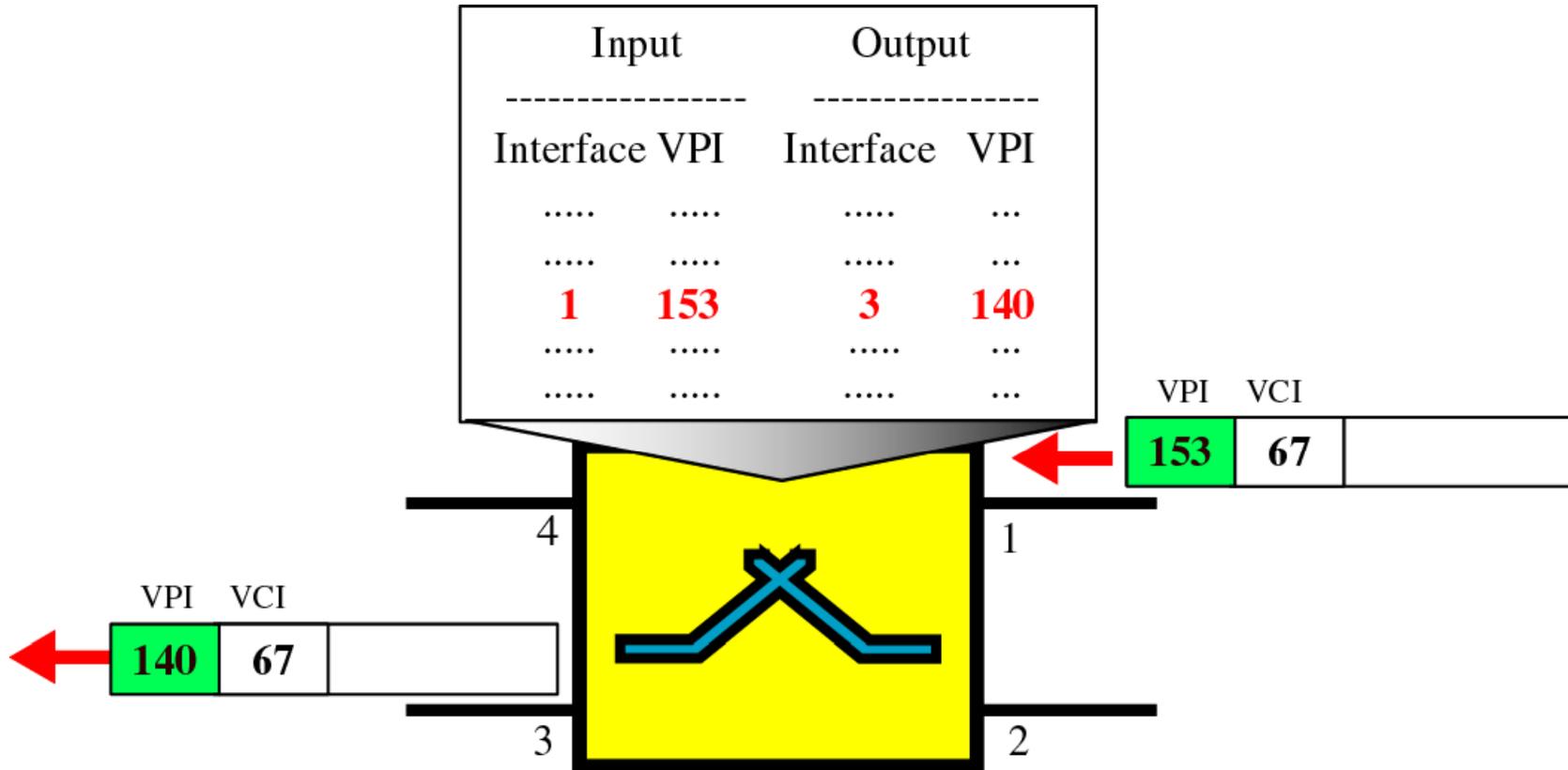
Figure 19-12

A Conceptual View of a VP Switch
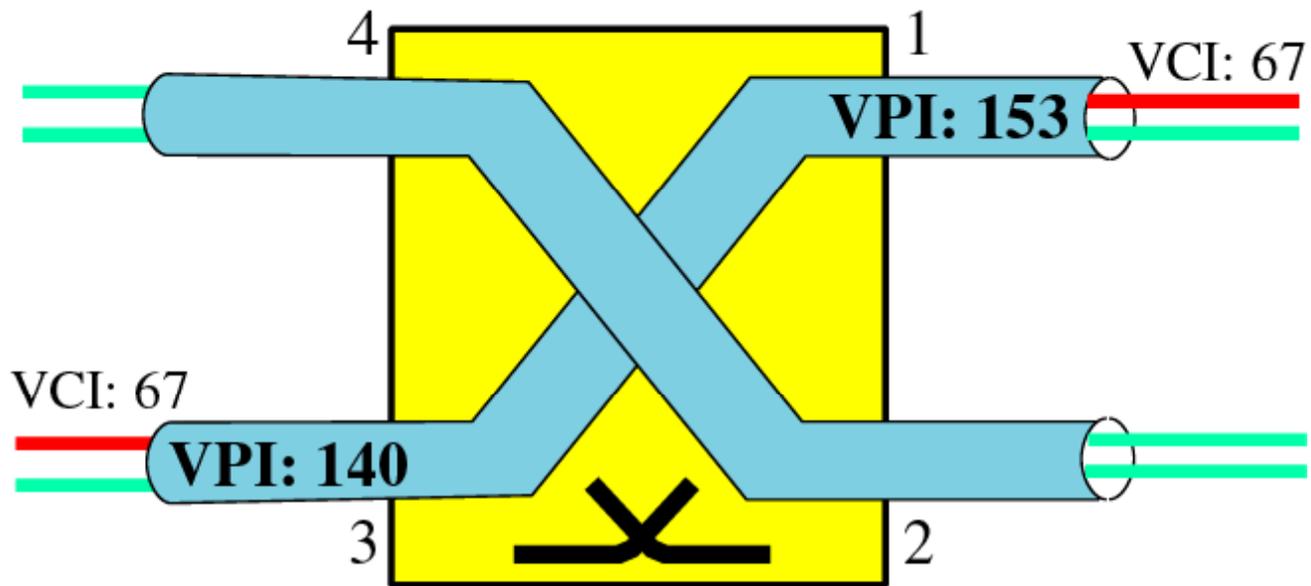
Figure 19-13

Routing with a VPC Switch

Input			Output		
Interface	VPI	VCI	Interface	VPI	VCI
.....	.....	.....	.....	...	.....
.....	.....	.....	.....	...	.....
1	153	67	3	140	92
.....	.....	.....	.....	...	.....
.....	.....	.....	.....	...	.....

VPI VCI

153 67

VPI VCI

140 92

4

1

2

3

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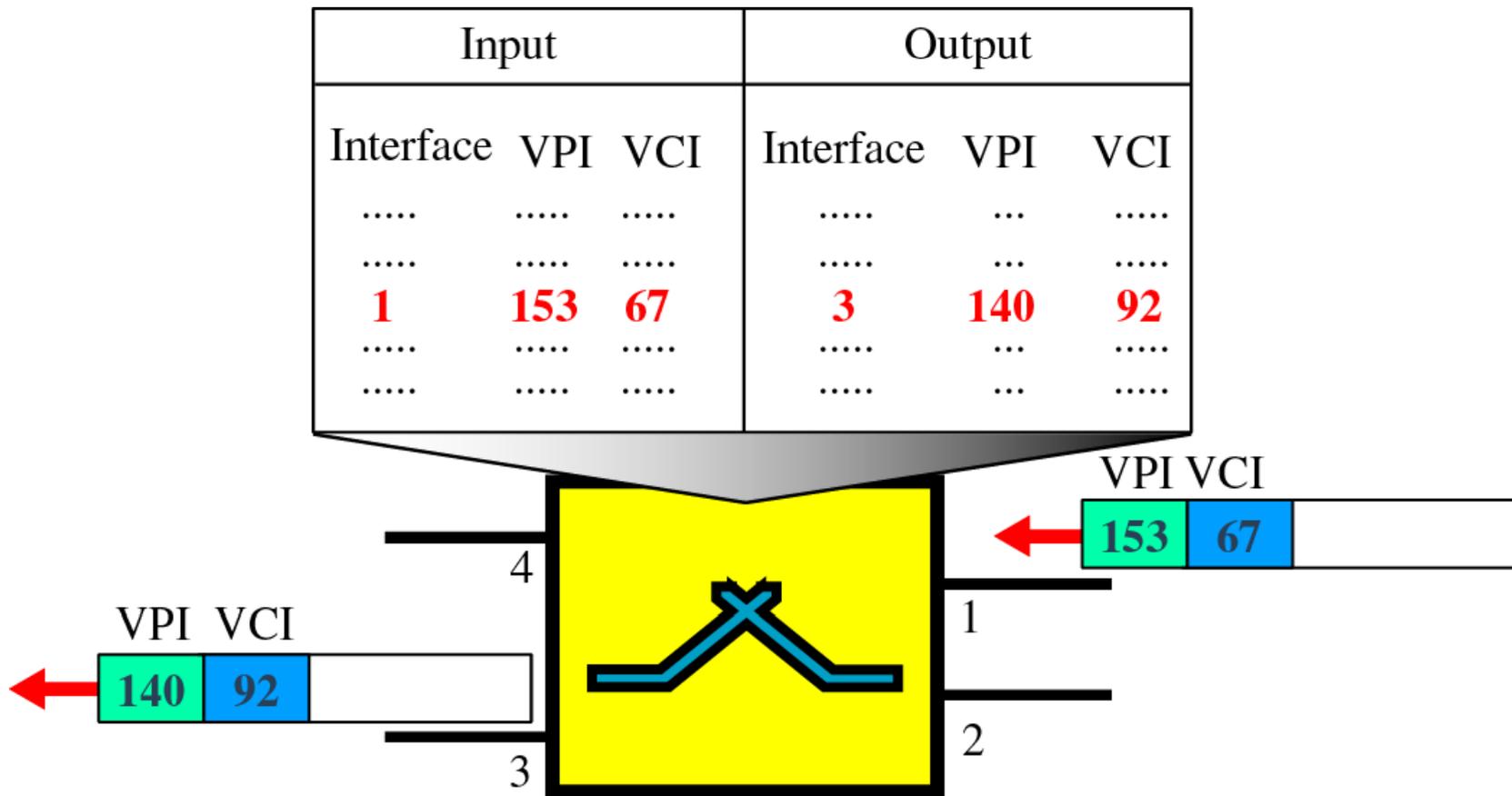
Figure 19-14

A Conceptual View of a VPC Switch
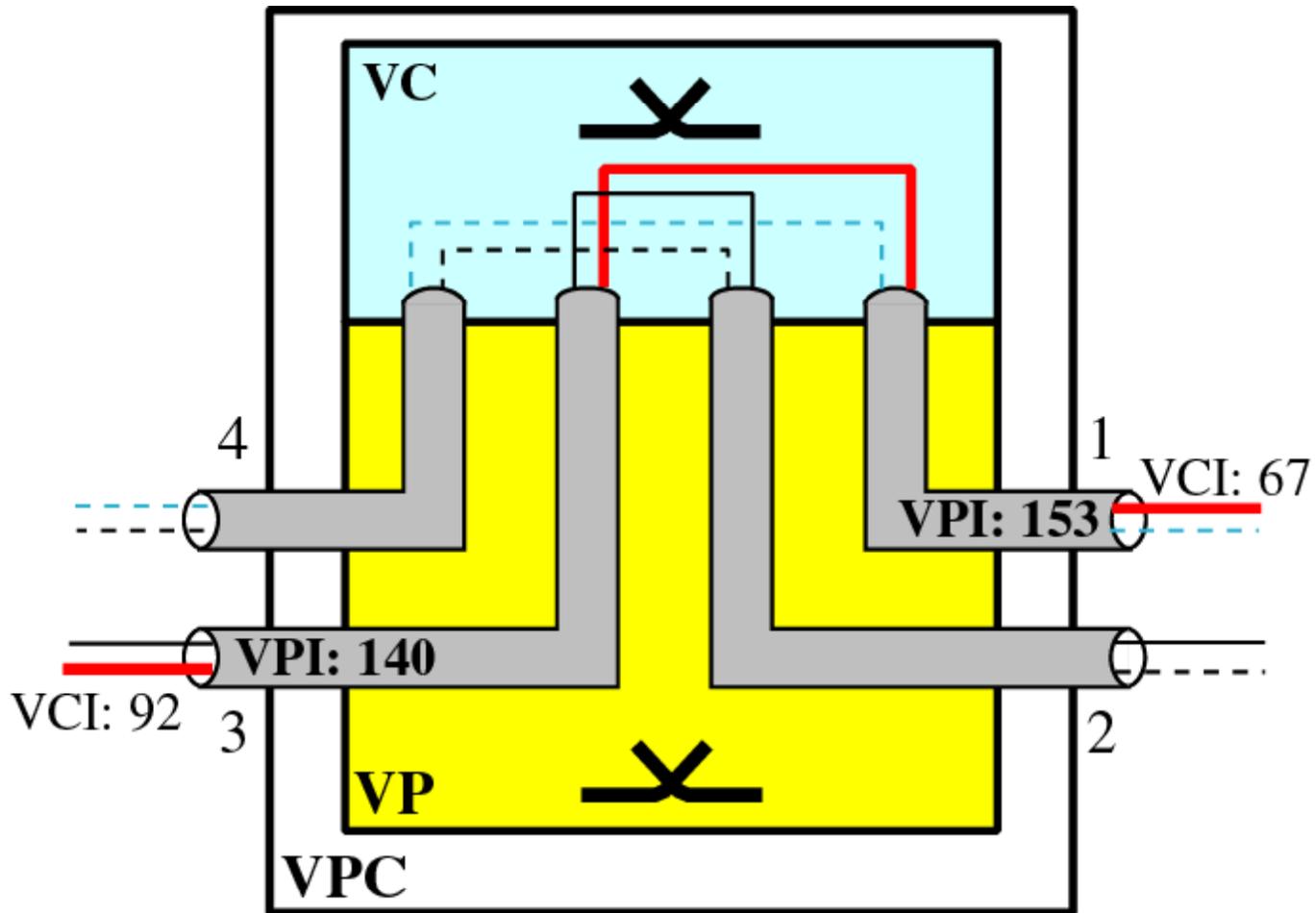
Figure 19-15

Crossbar Switch
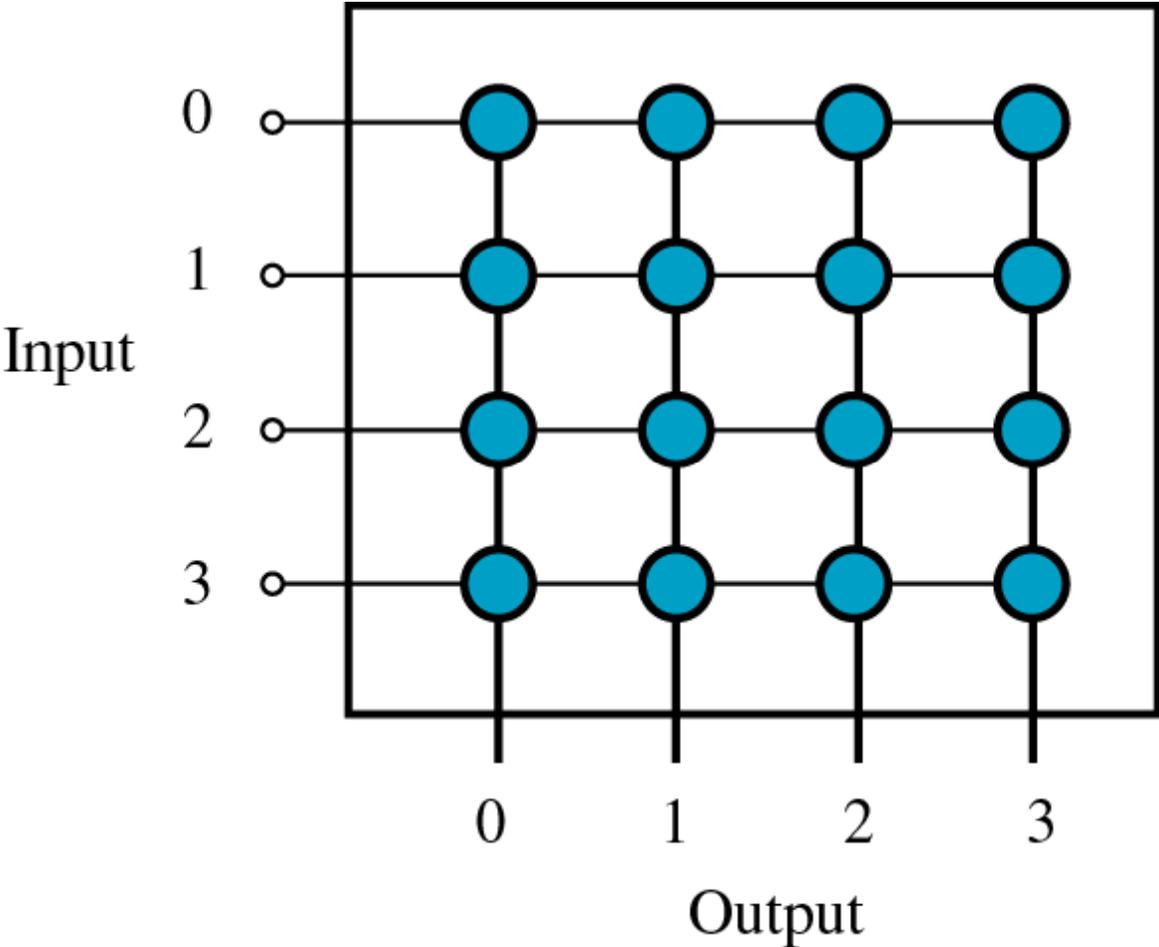
Figure 19-16

Knockout Switch

0

1

Input

2

3

Distributors

Queues

0   1   2   3

Output

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Figure 19-17
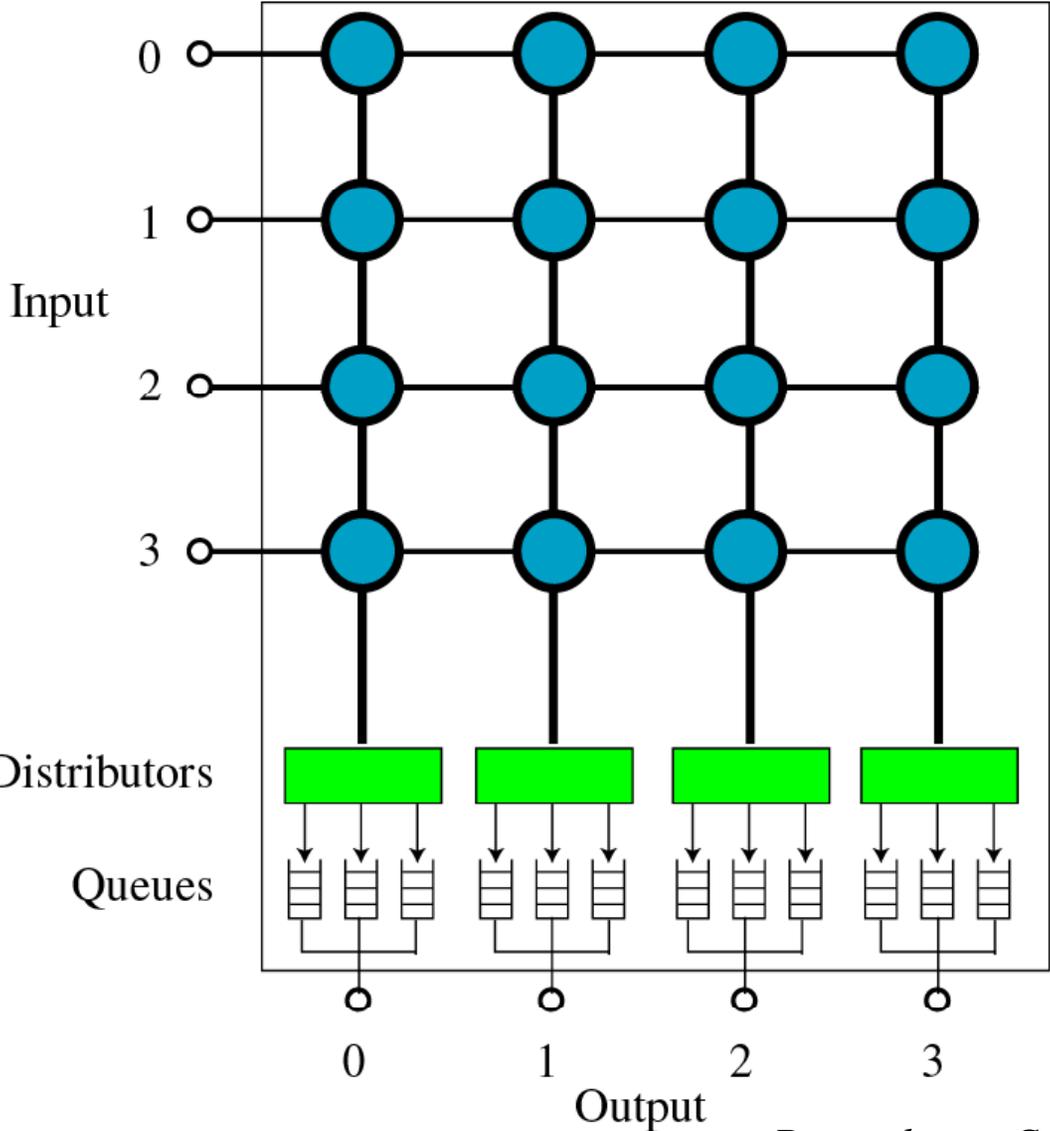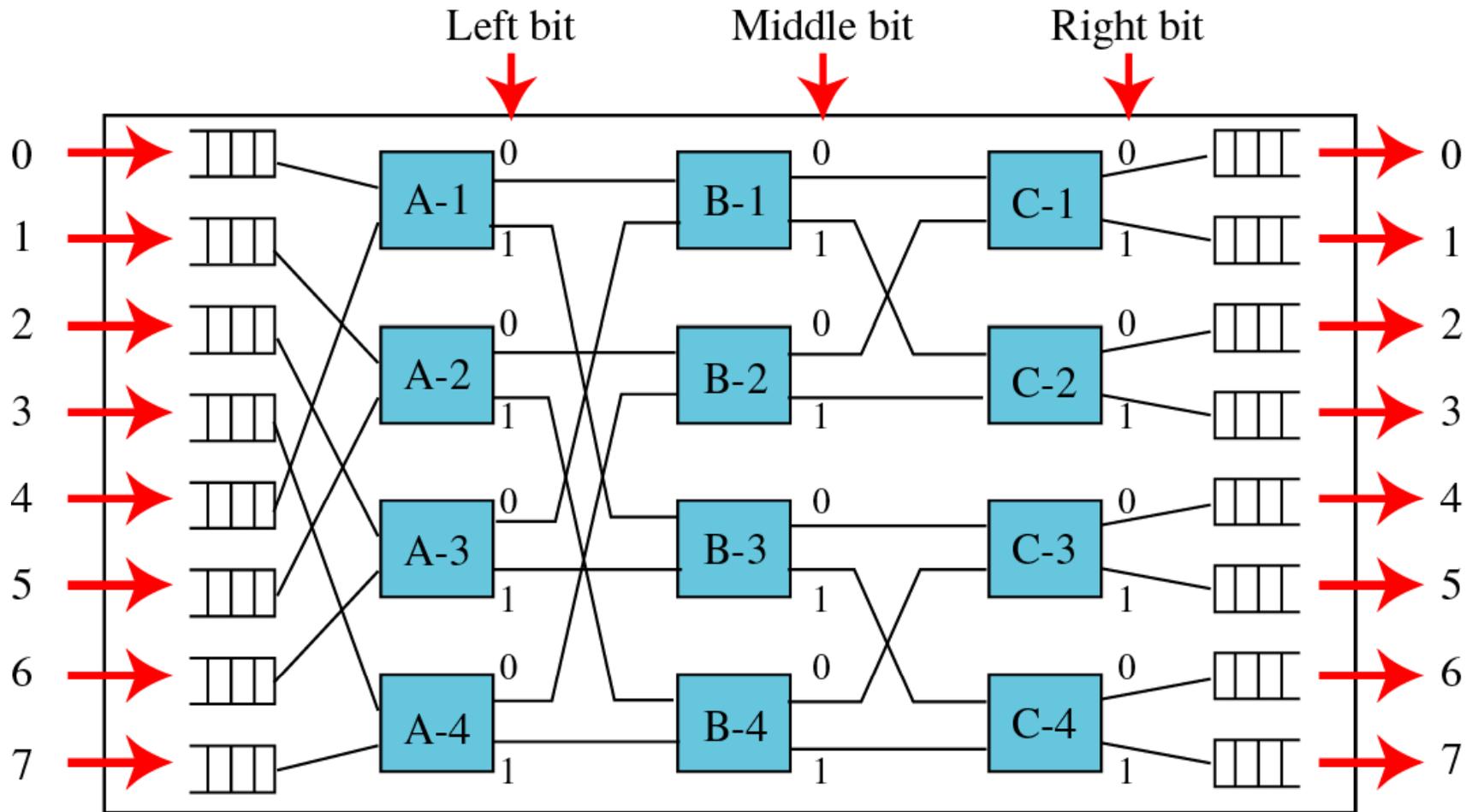
A Banyan Switch

Figure 19-18-Part I

Example of Routing in a Banyan Switch (a)
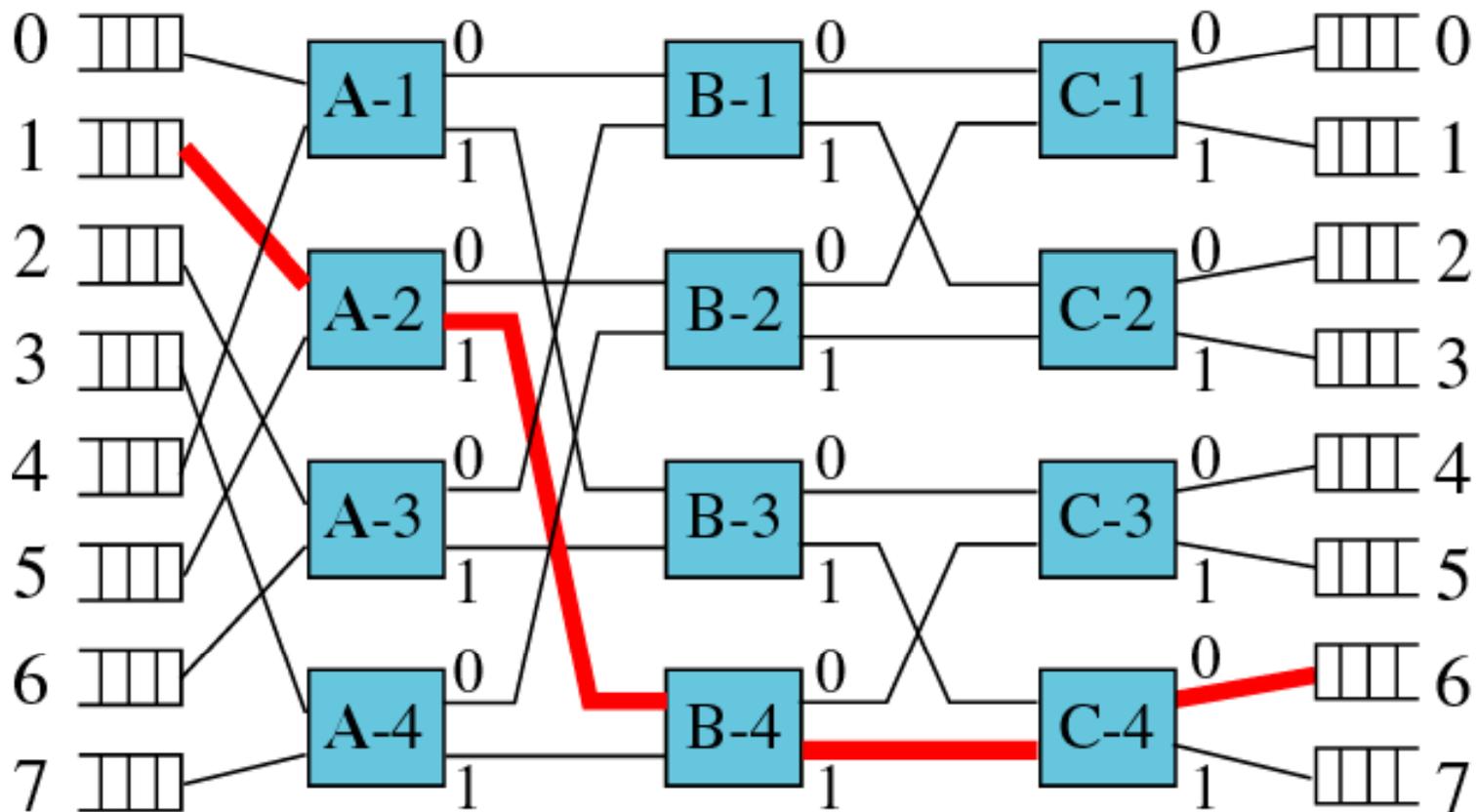
a. Input 1 sending a cell to input 6 (110)

Figure 19-18-Part II

Example of Routing in a Banyan Switch (b)
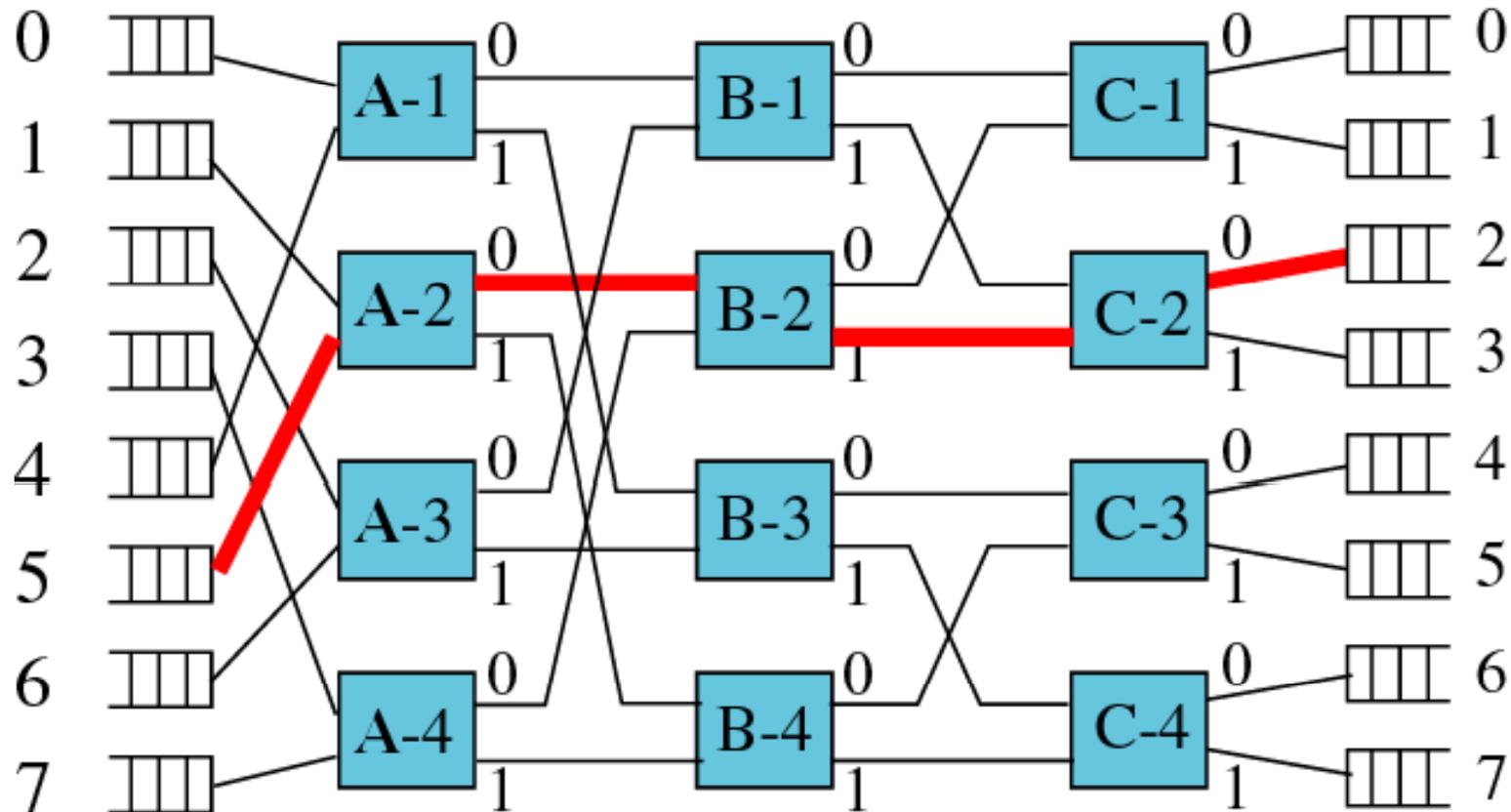
b. Input 5 sending a cell to input 2 (010)

Figure 19-19

Batcher-Banyan Switch

Banyan switch

Figure 19-20

ATM Layers

Application Adaptation
Layer (AAL)

ATM Layer

Physical Layer

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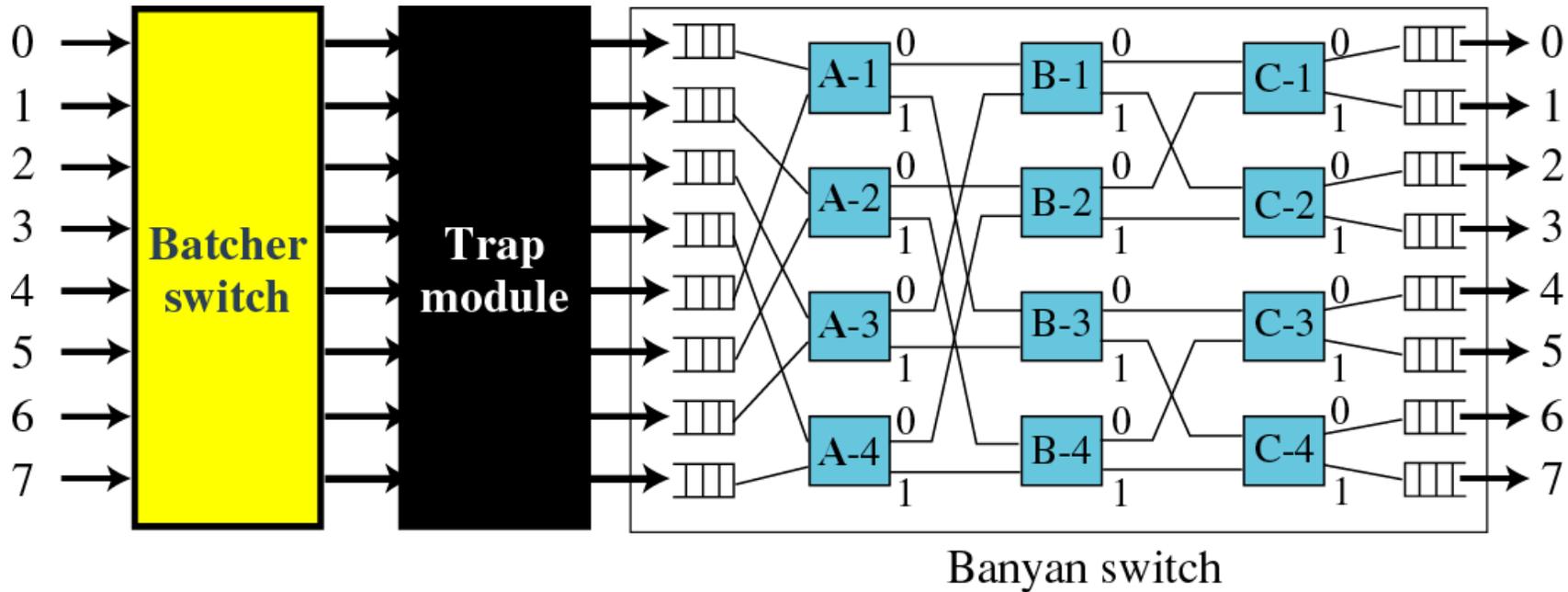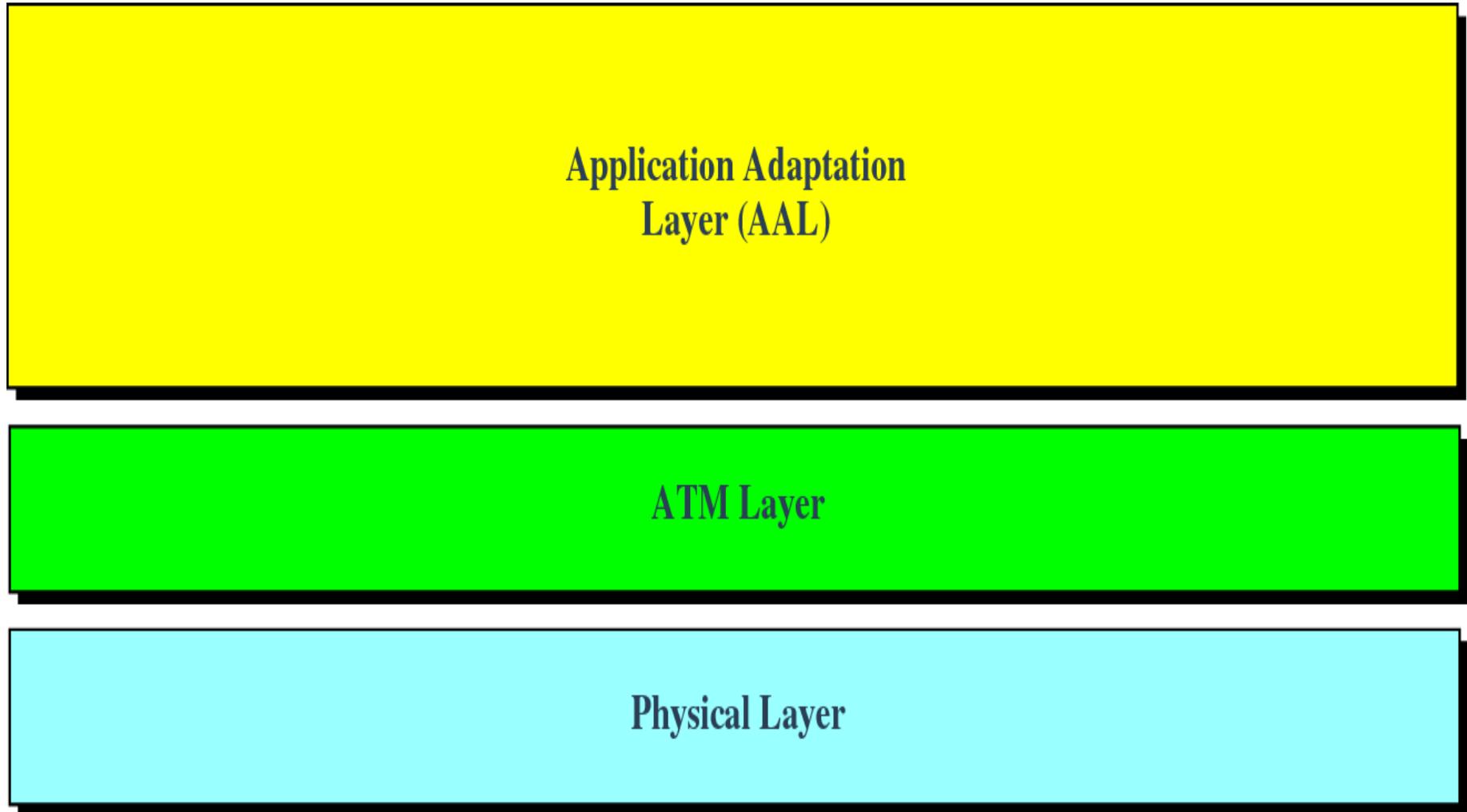
Figure 19-21

ATM Layers in End-Point Devices and Switches

Figure 19-22

AAL Types

AAL1		AAL2		AAL 3/4		AAL5	
	CS Convergence sublayer		CS Convergence sublayer		CS Convergence sublayer		CS Convergence sublayer
	SAR Segmentation and reassembly		SAR Segmentation and reassembly		SAR Segmentation and reassembly		SAR Segmentation and reassembly

ATM layer

Physical layer
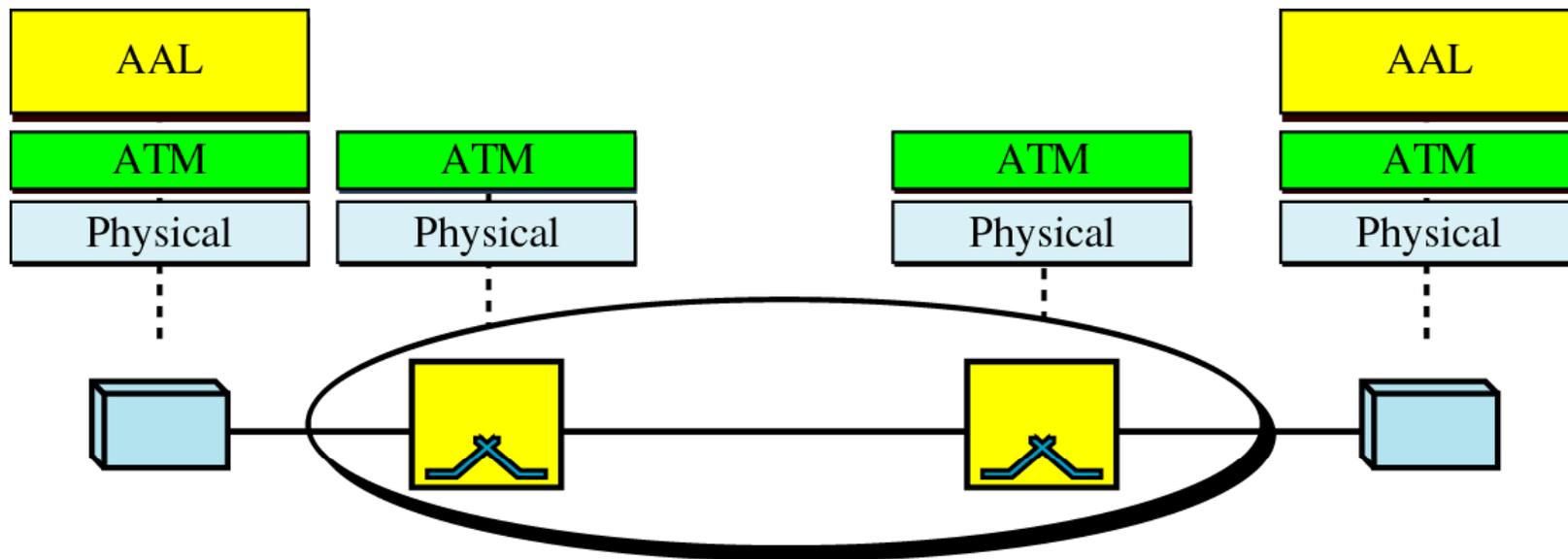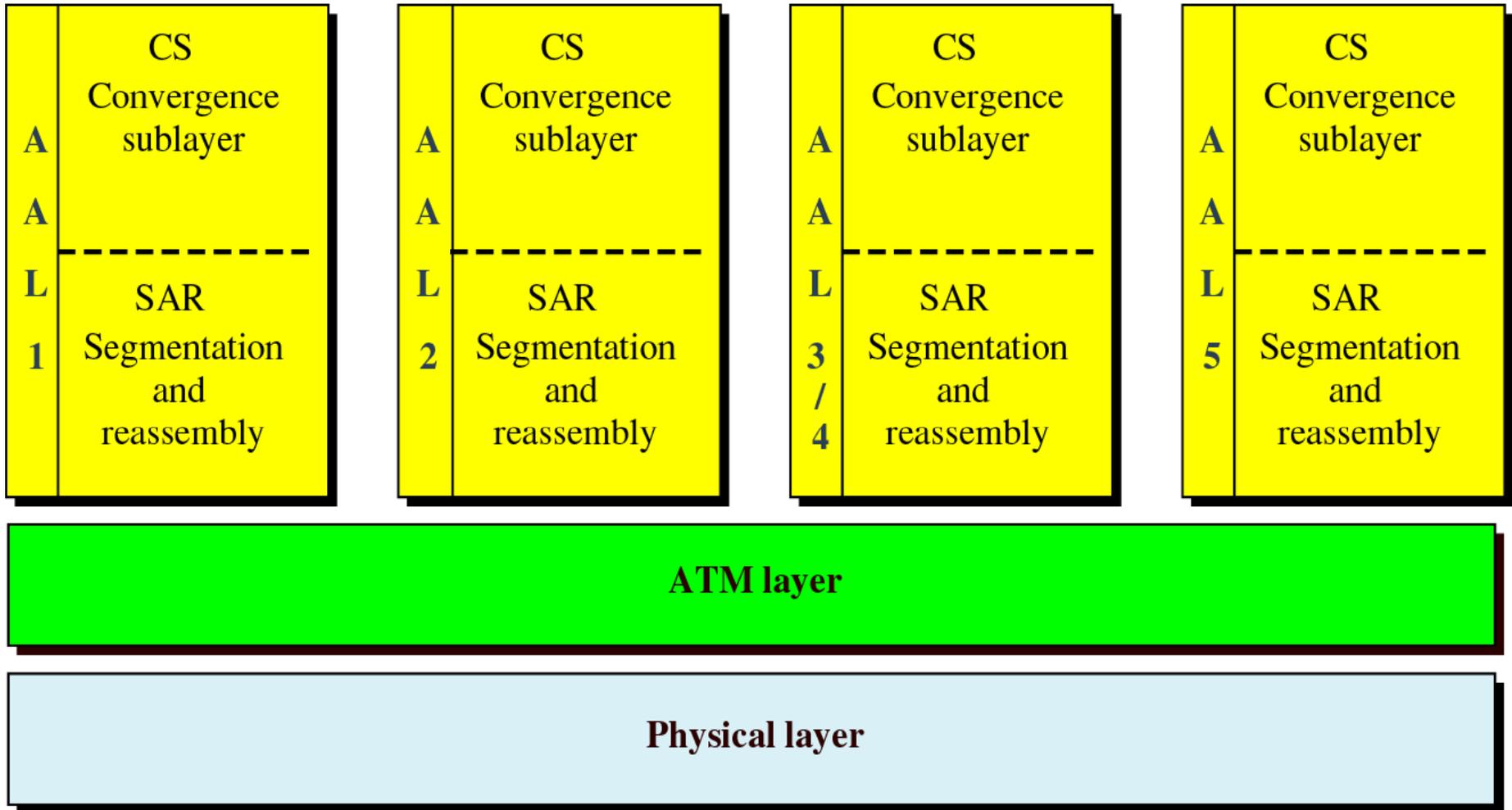
Figure 19-23

AAL1

Constant bit rate data from upper layer

CSI: Convergence sublayer identifier
SC: Sequence count
CRC: Cyclic redundancy check
P: Parity

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Figure 19-25

AAL3/4

Data from upper layer

User data <= 65535 bytes

A A L 3 / 4

T: Type
BT: Begin tag
BA: Buffer allocation

AL: Alignment
ET: End tag
L: Length

Header

T	BT	BA
1	1	2

CS

Trailer

PAD	AL	ET	L
0–43	1	1	2

SAR

44 bytes .... 44 bytes .... 44 bytes ......

Header 2 bytes	Payload 44 bytes	Trailer 2 bytes

ST	CSI	SC	MID
2 bits	1 bit	3 bits	10 bits

LI	CRC
6 bits	10 bits

ST : Segment type
CSI: Convergence sublayer identifier
SC: Sequence
MID: Multiplexing ID

LI: Length indicator
CRC: Cyclic redundancy check

Figure 19-26

AAL5

Data from upper layer

User data <= 65,535 bytes

	PAD	UU	T	L	CRC
	0–47	1	1	2	4

UU: User-to-user ID
T: Type
L: Length

Trailer

A A L 5

CS

SAR

48 bytes ············· ········· 48 bytes

Payload
48 bytes
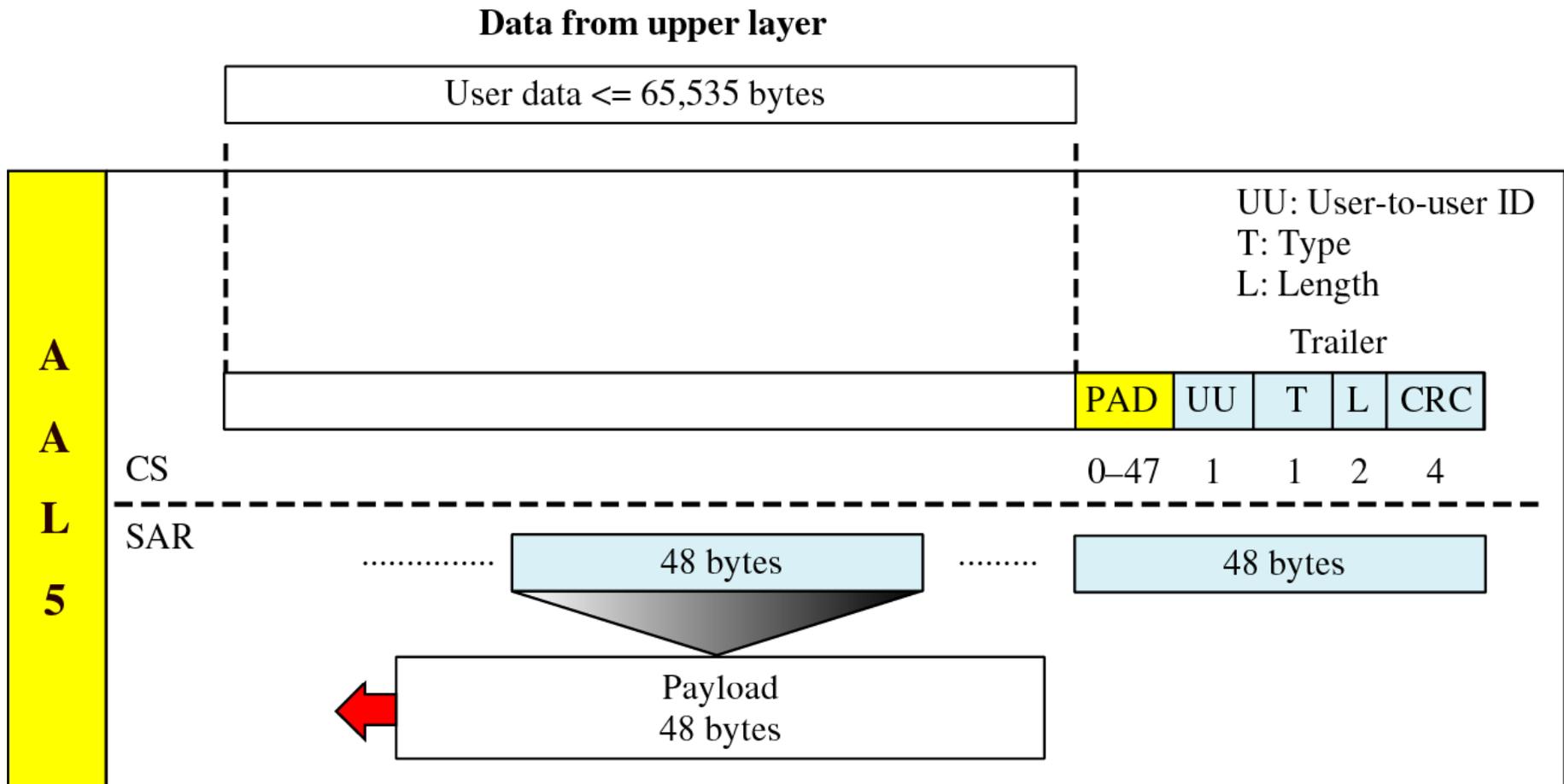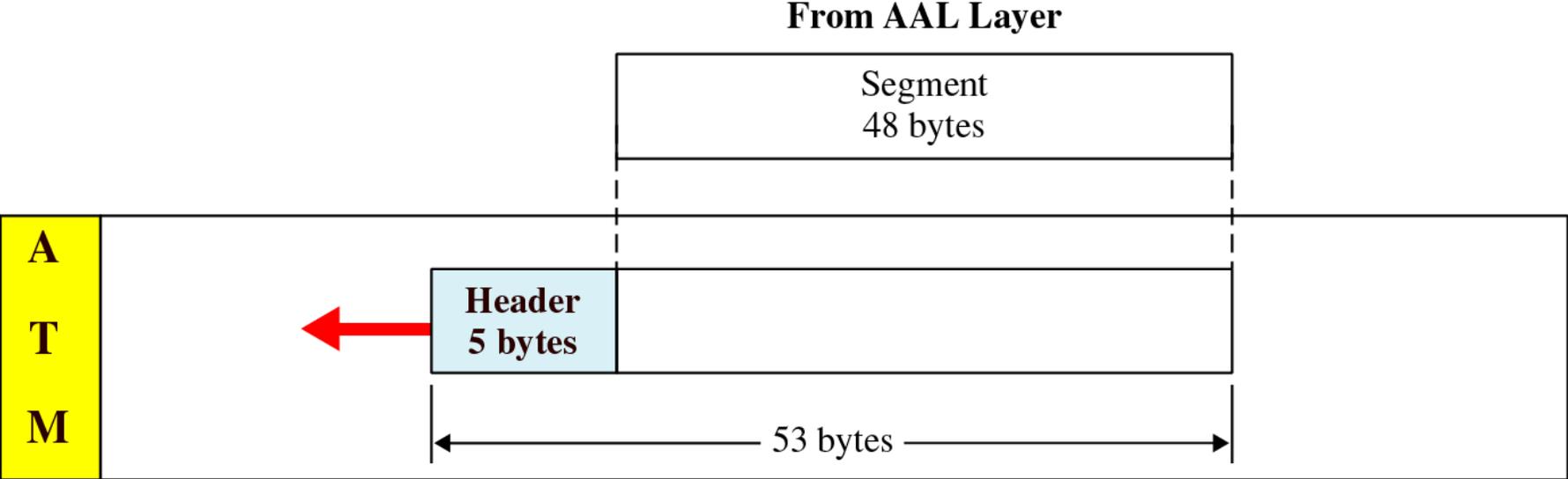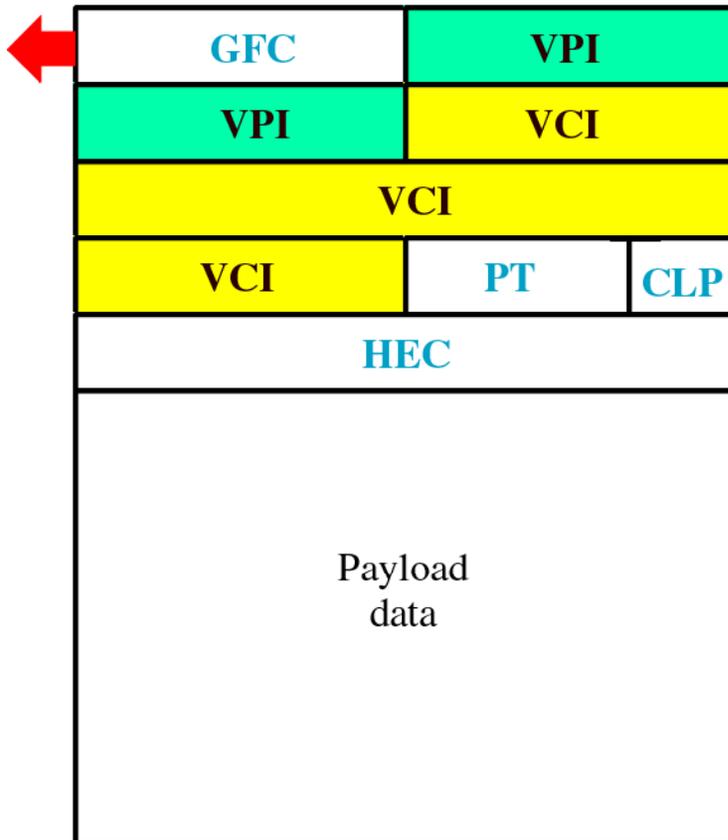
Figure 19-27

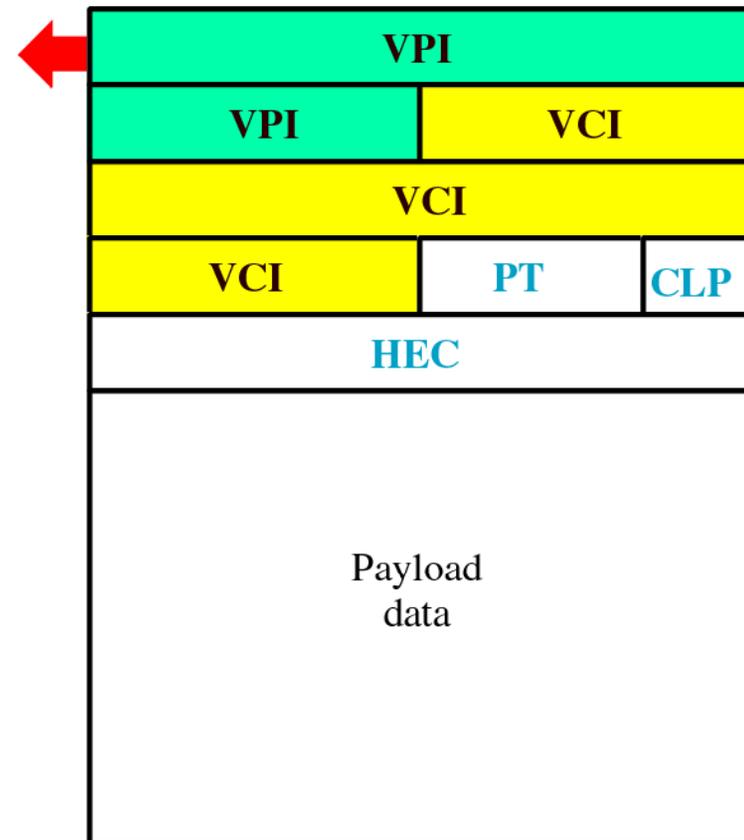# ATM Layer

Figure 19-28

ATM Header

GFC: Generic flow control

VPI: Virtual path identifier

VCI: Virtual channel identifier

PT: Payload type

CLP: Cell loss priority

HEC: Header error control

UNI Cell

NNI Cell

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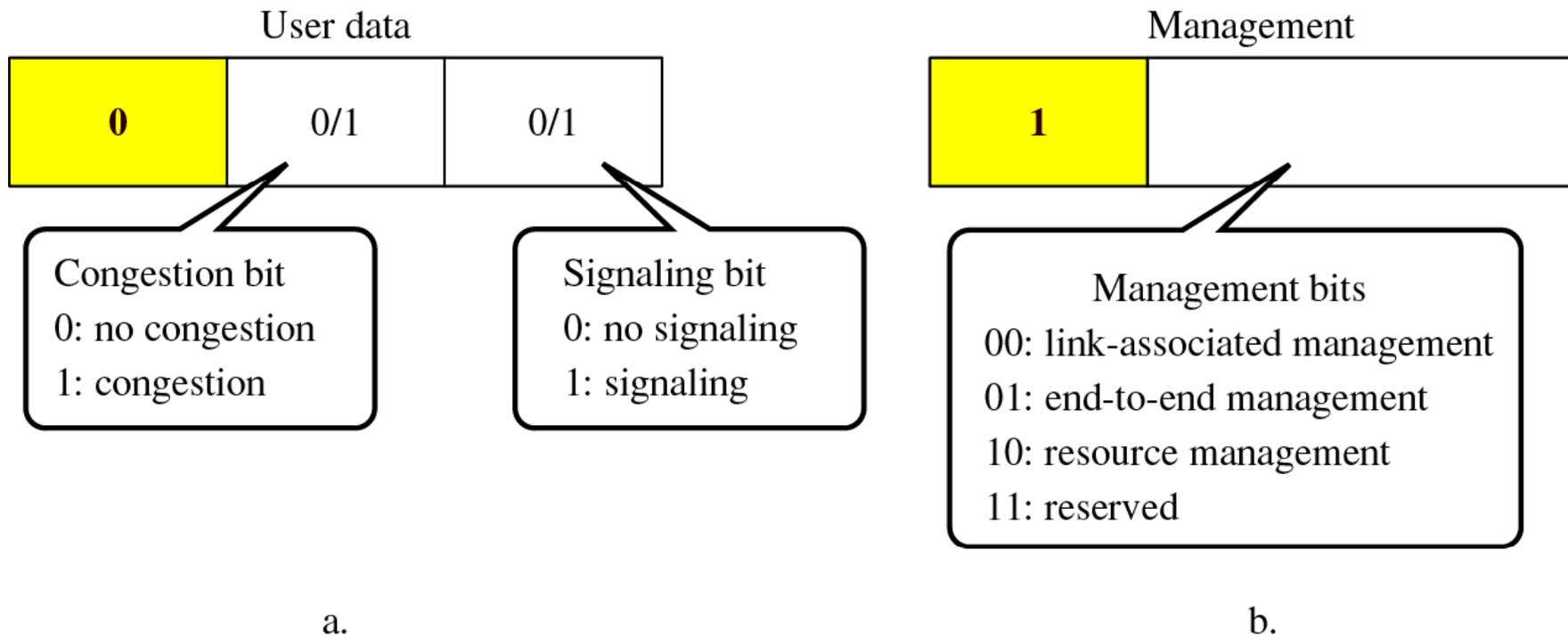
Figure 19-29

PT Fields

User data

0	0/1	0/1

Congestion bit
0: no congestion
1: congestion

Signaling bit
0: no signaling
1: signaling

a.

Management

1	

Management bits
00: link-associated management
01: end-to-end management
10: resource management
11: reserved

b.

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Figure 19-30

Service Classes
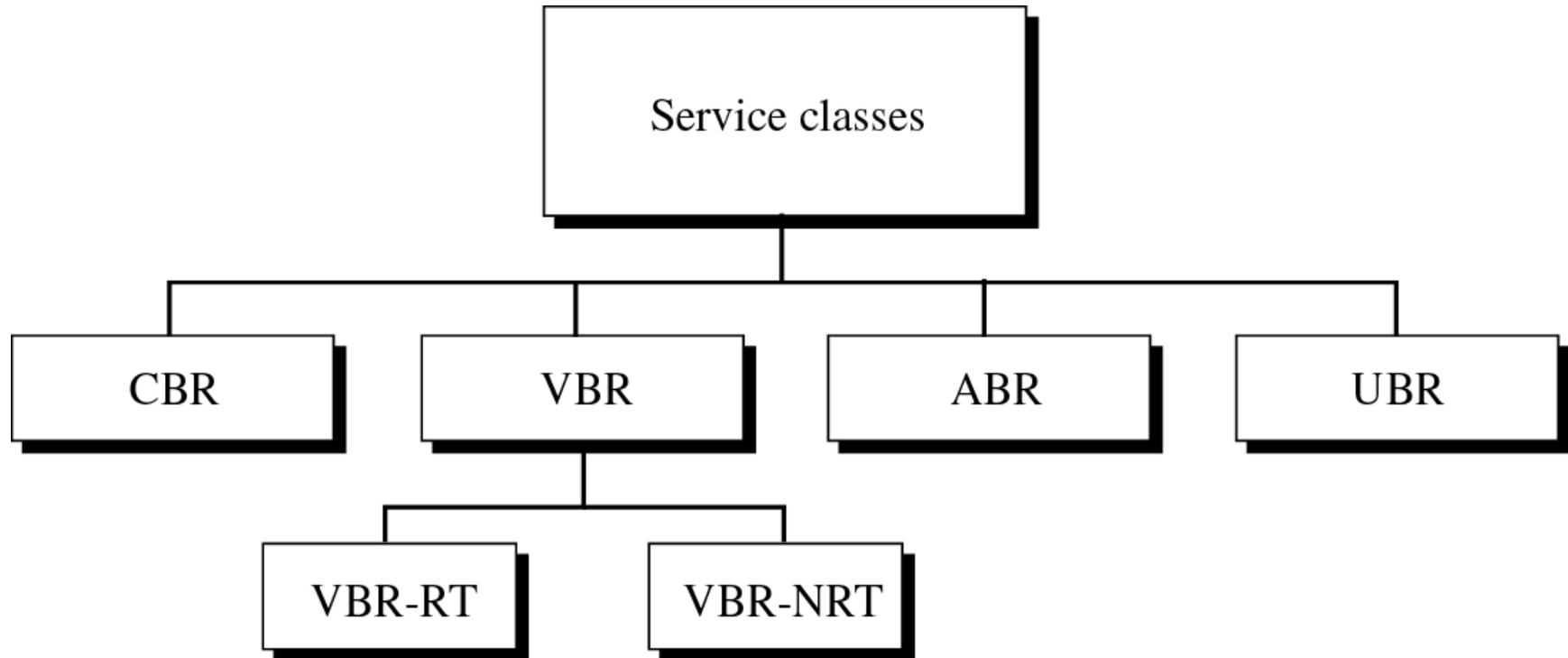
Figure 19-31

Service Classes and Capacity of Network

Figure 19-32

QoS

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Figure 19-33

ATM WAN

Others	Others
LLC	AAL
MAC	ATM
Physical	Physical

Ethernet

ATM WAN

Others	Others
AAL	LLC
ATM	MAC
Physical	Physical

Token Ring

Frame Relay (WAN)

X.25 (WAN)

Others	Others
	AAL
LAPF	ATM
Physical	Physical

Others	Others
AAL	
ATM	LAPD
Physical	Physical

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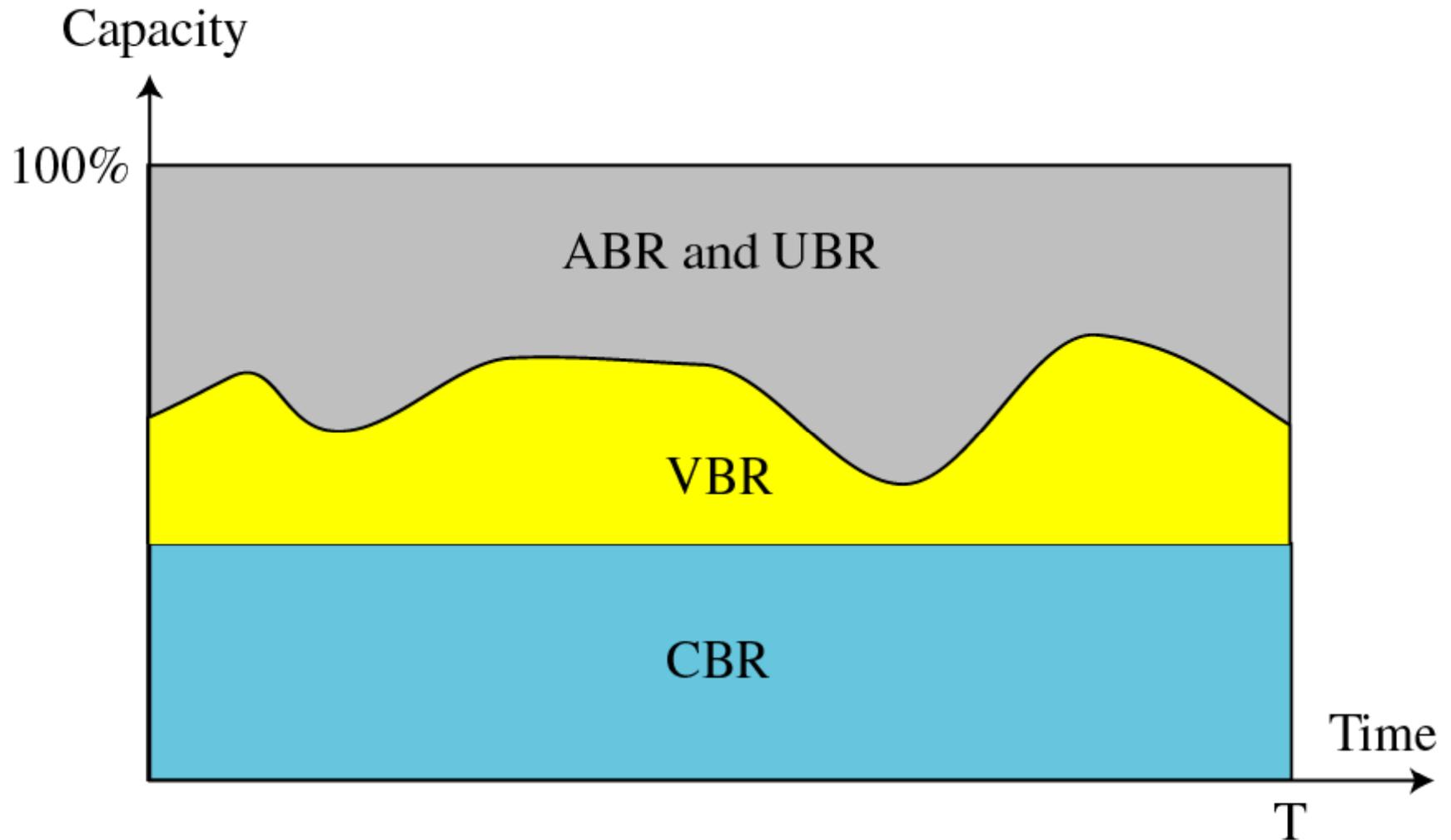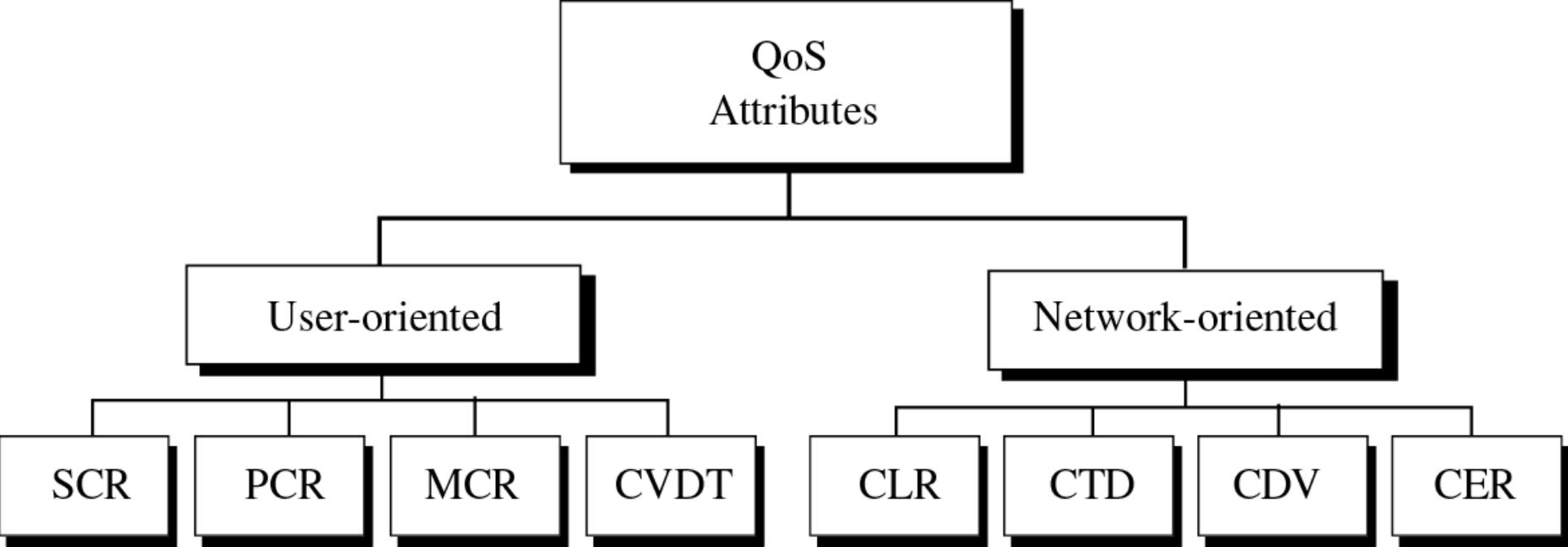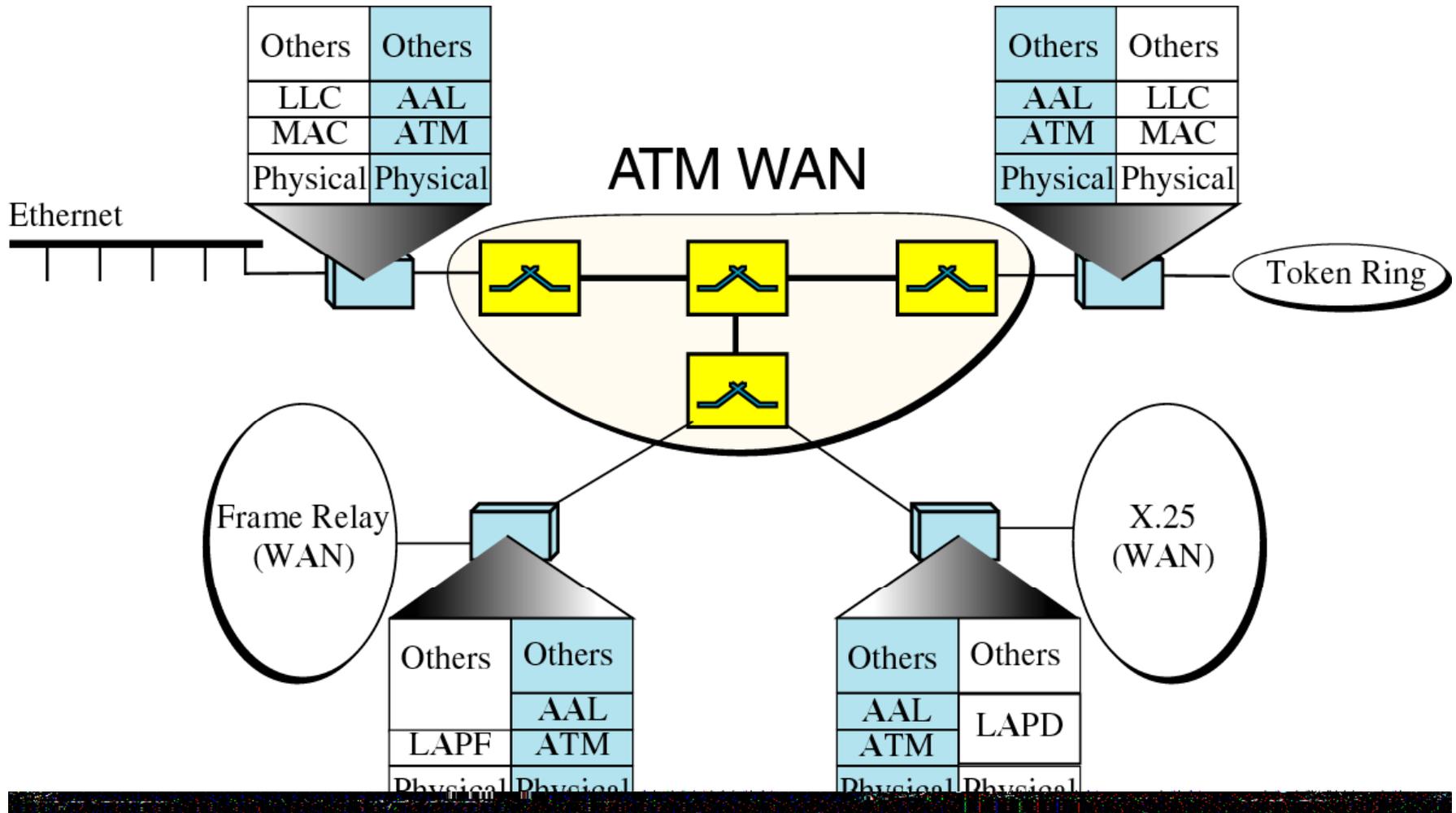
Figure 19-34

Ethernet Switch and ATM Switch

a. Ethernet LAN

b. ATM LAN

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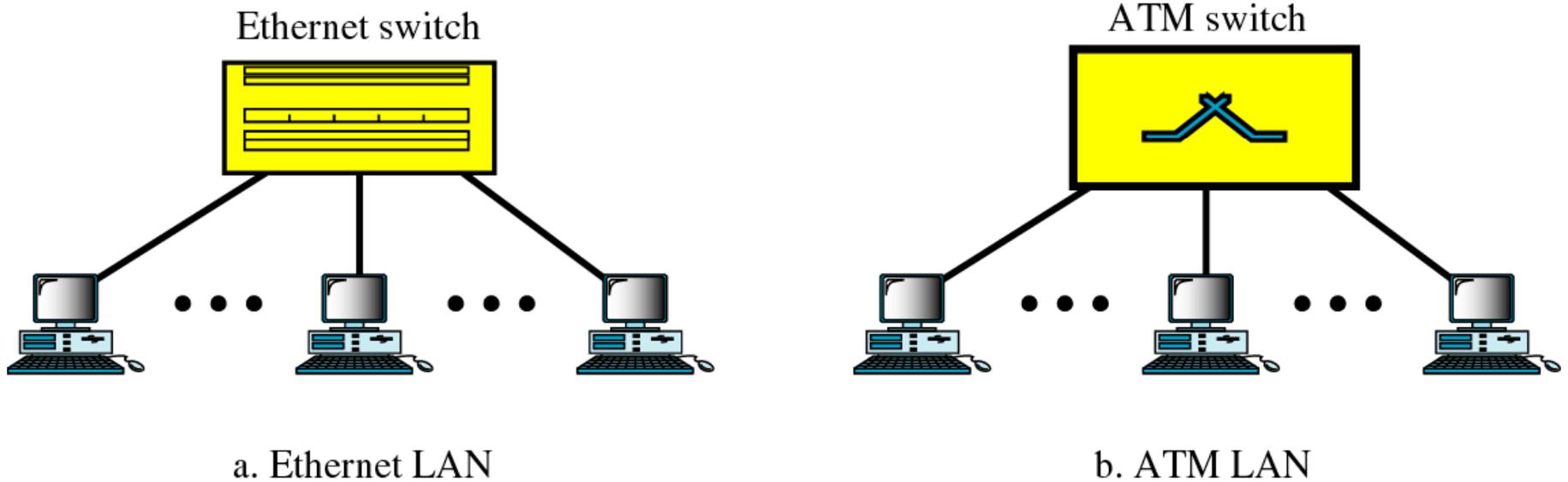
Figure 19-35

LANE Approach

LES
(server)

BUS
(server)

ATM switch

LEC
(client)

LEC
(client)

LEC
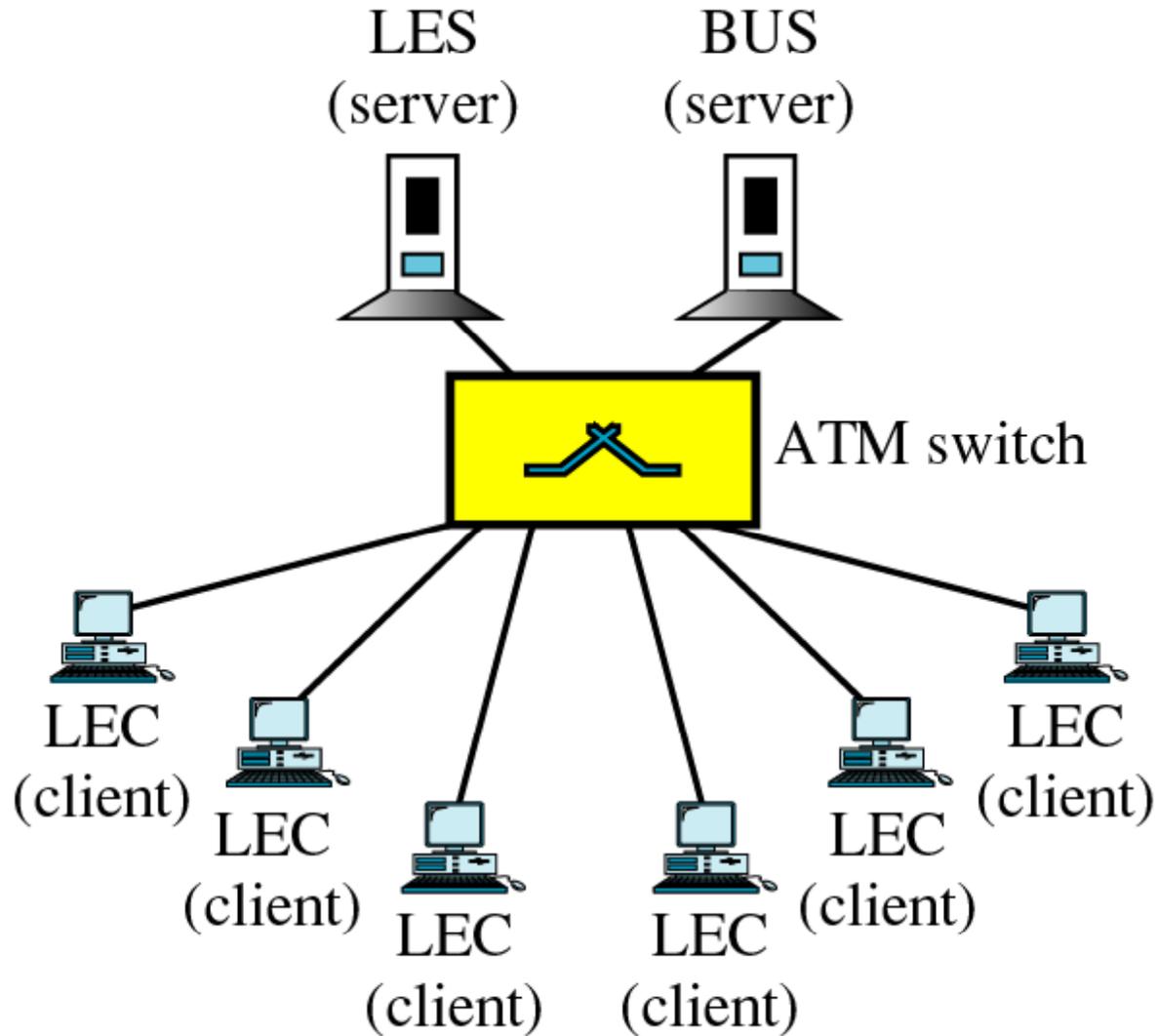(client)

LEC
(client)

LEC
(client)

LEC
(client)

LEC
(client)

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Figure 19-36

LEC, LES, and BUS