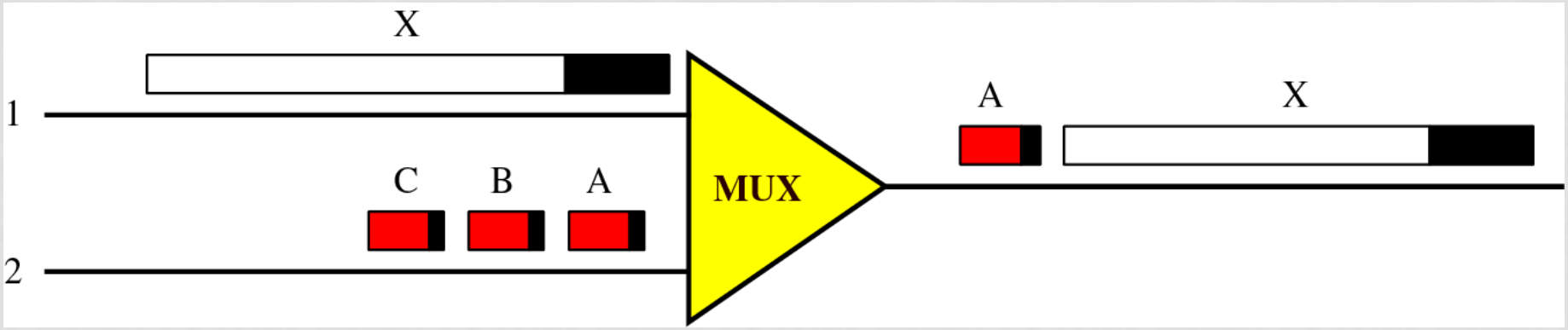
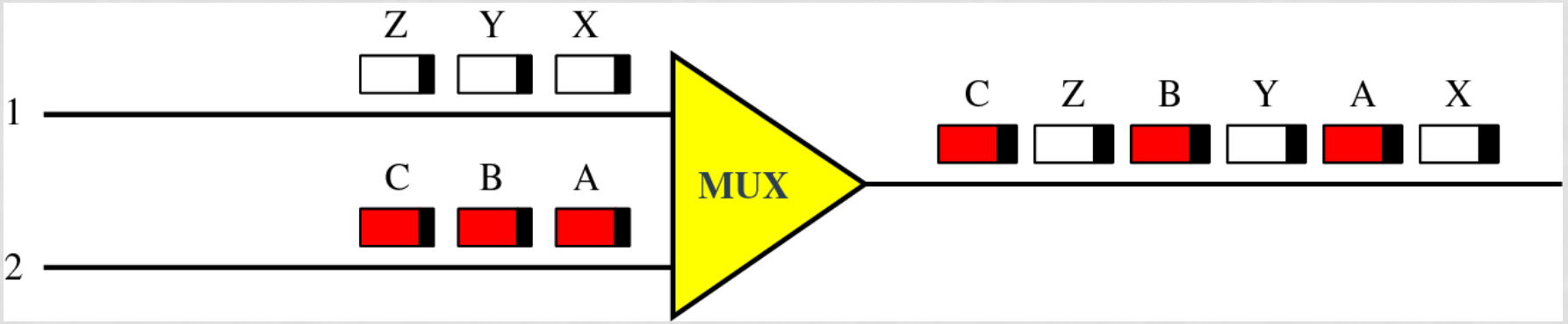
ATM

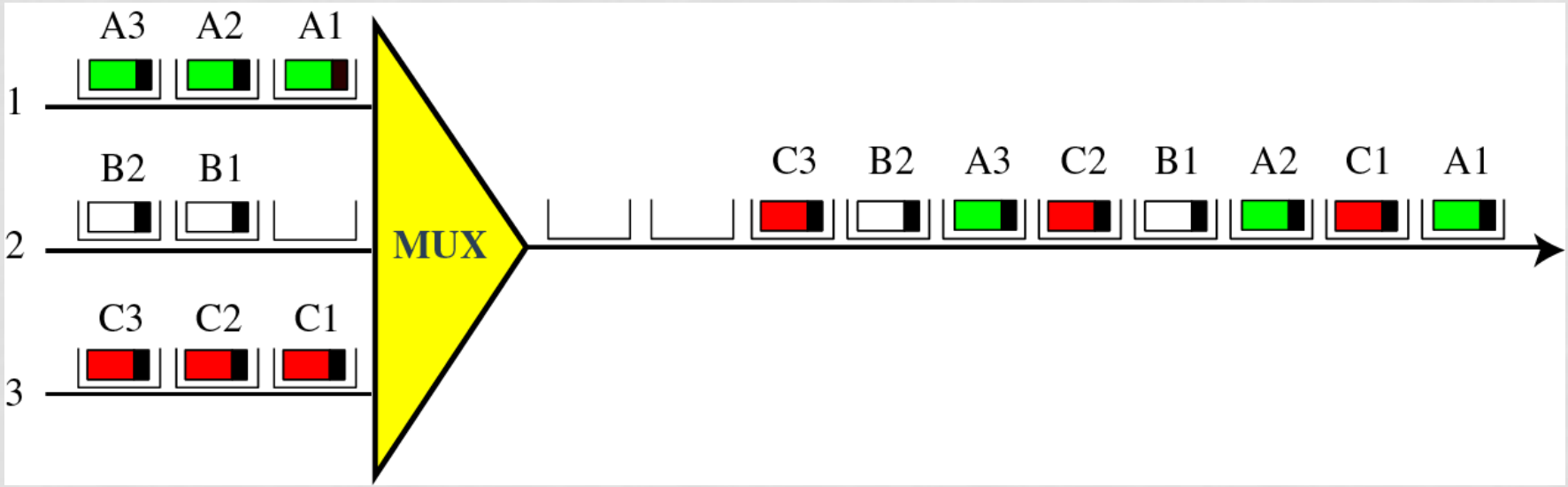
Multiplexing Using Different Packet Sizes



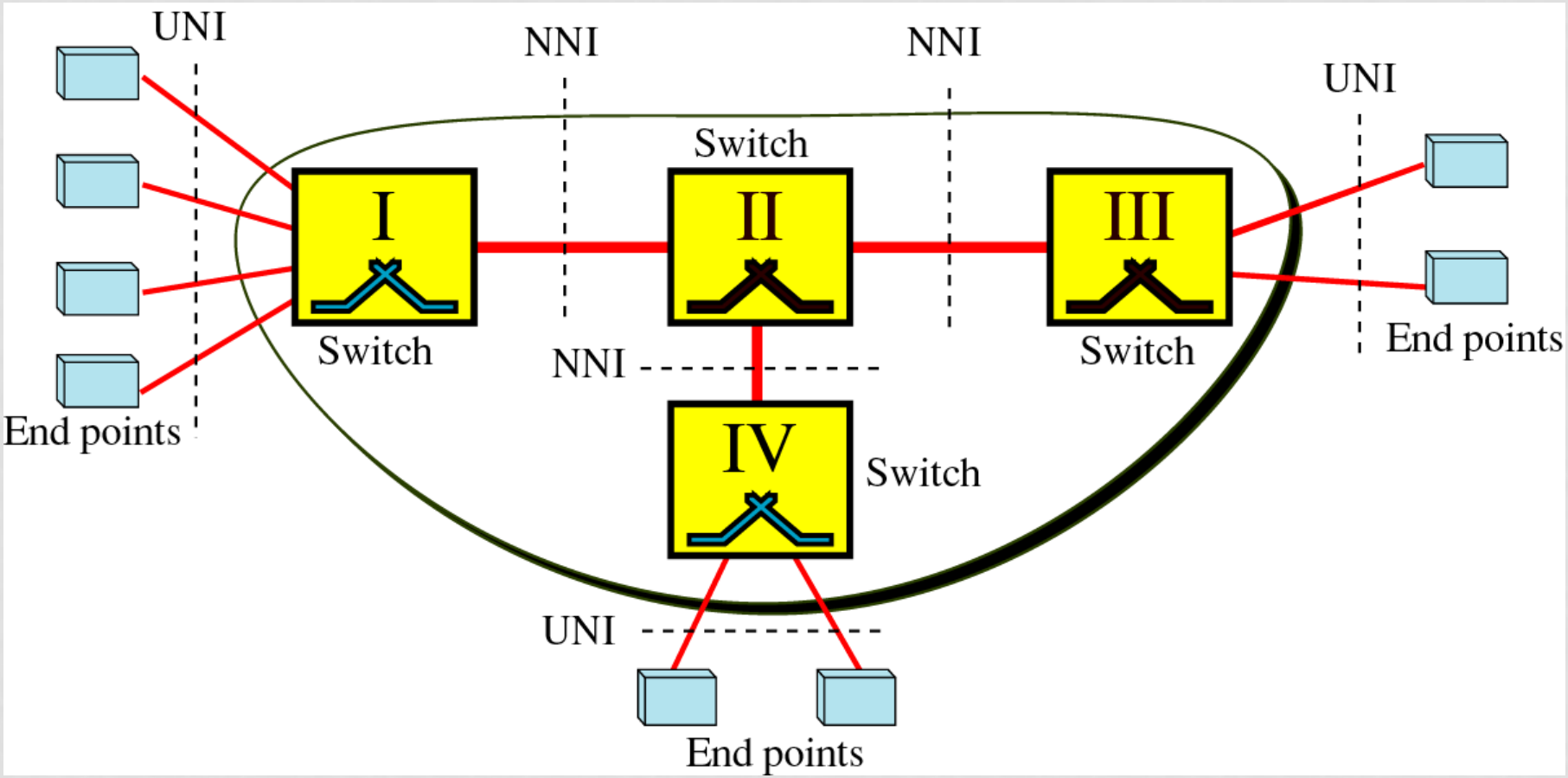
Multiplexing Using Cells



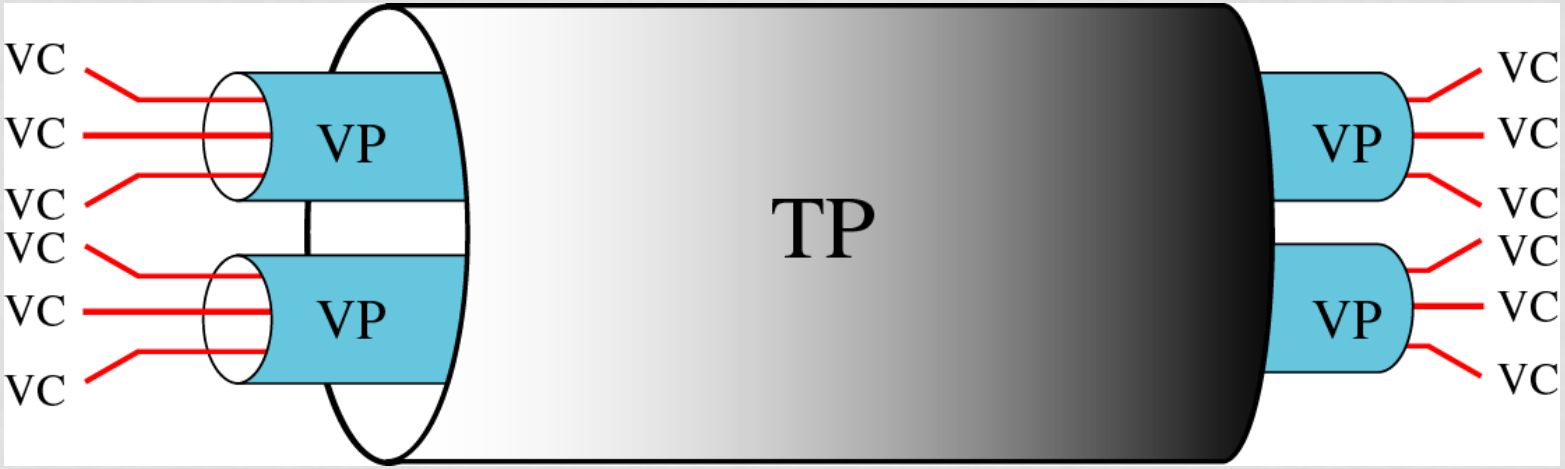
ATM Multiplexing



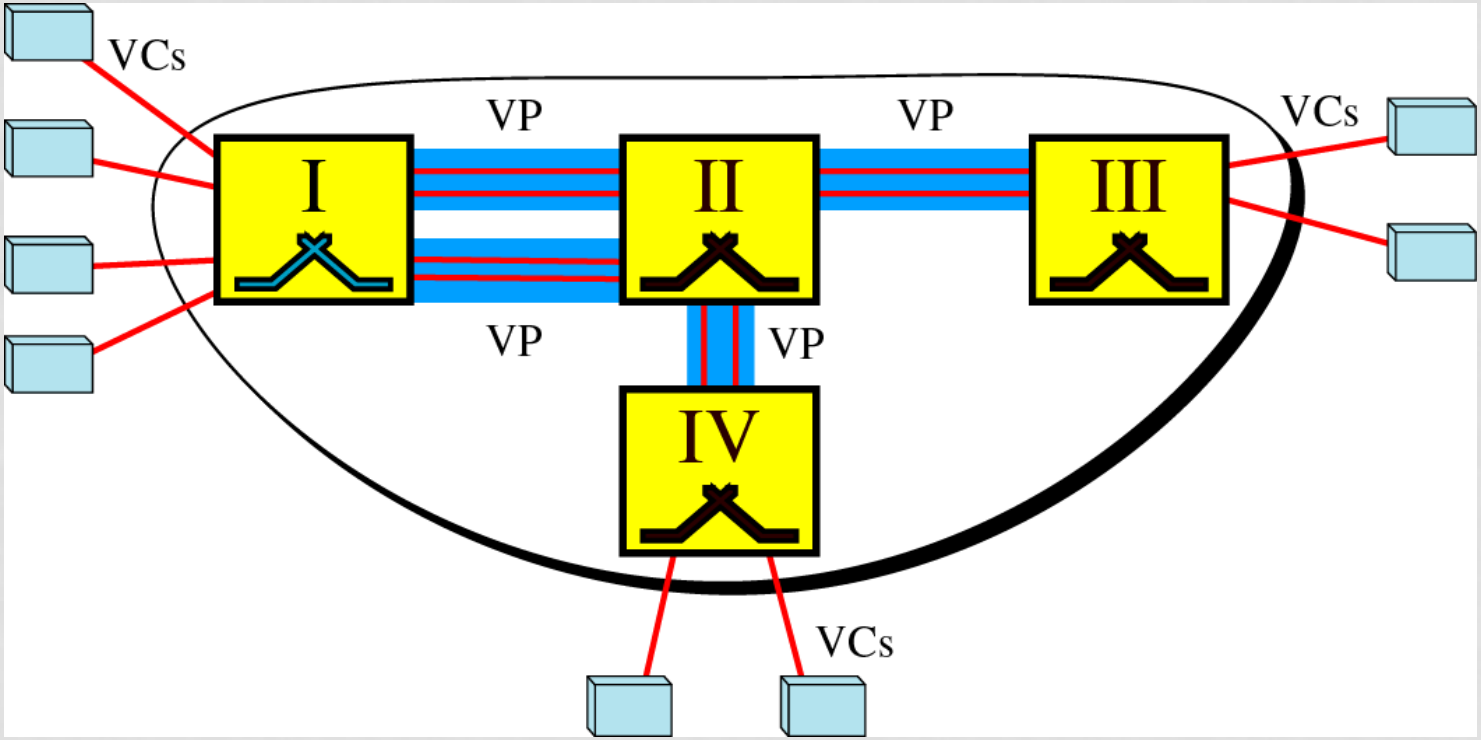
Architecture of an ATM Network



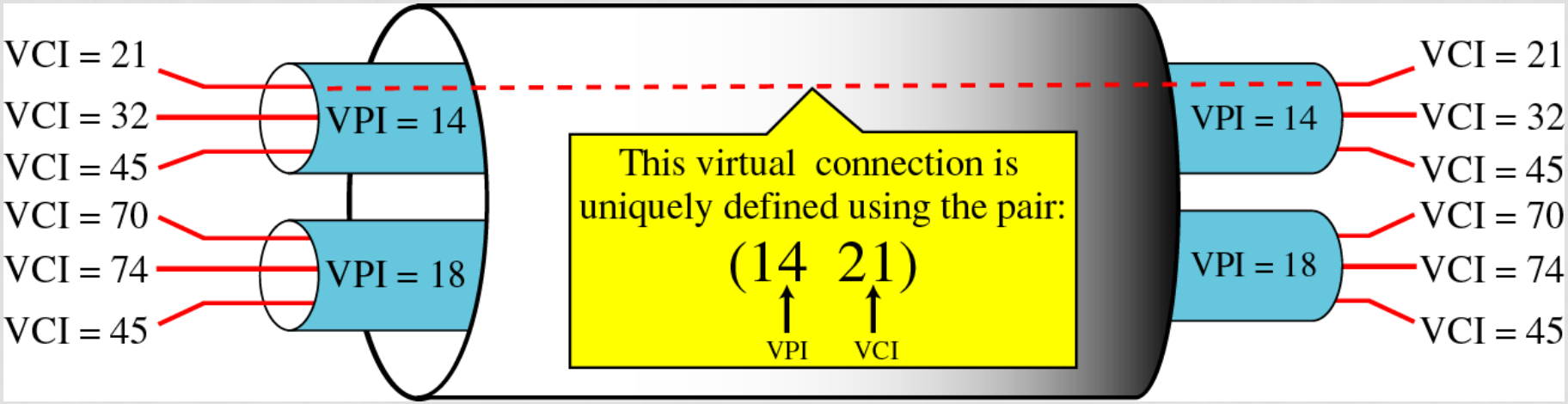
TP, VPs, and VCs



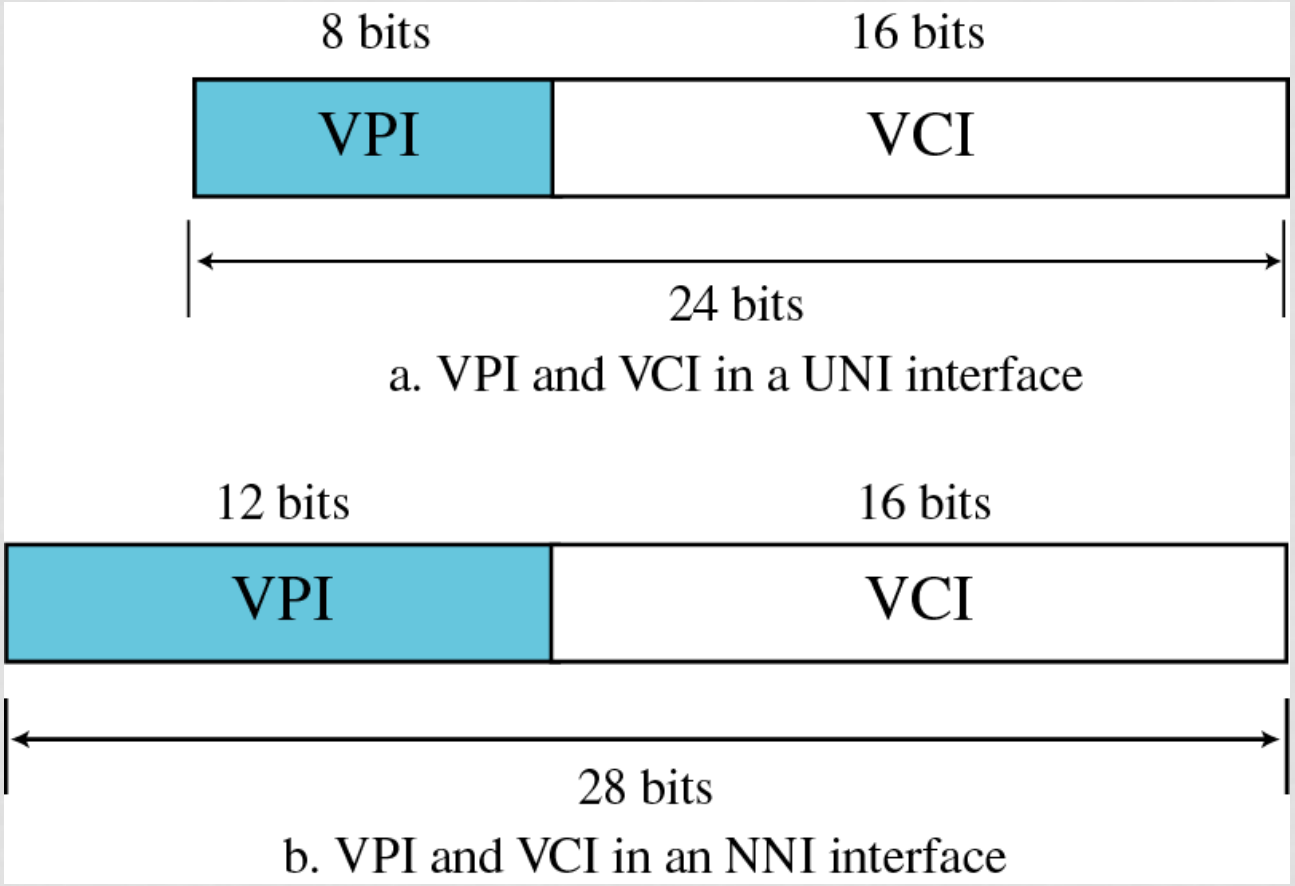
Example of VPs and VCs



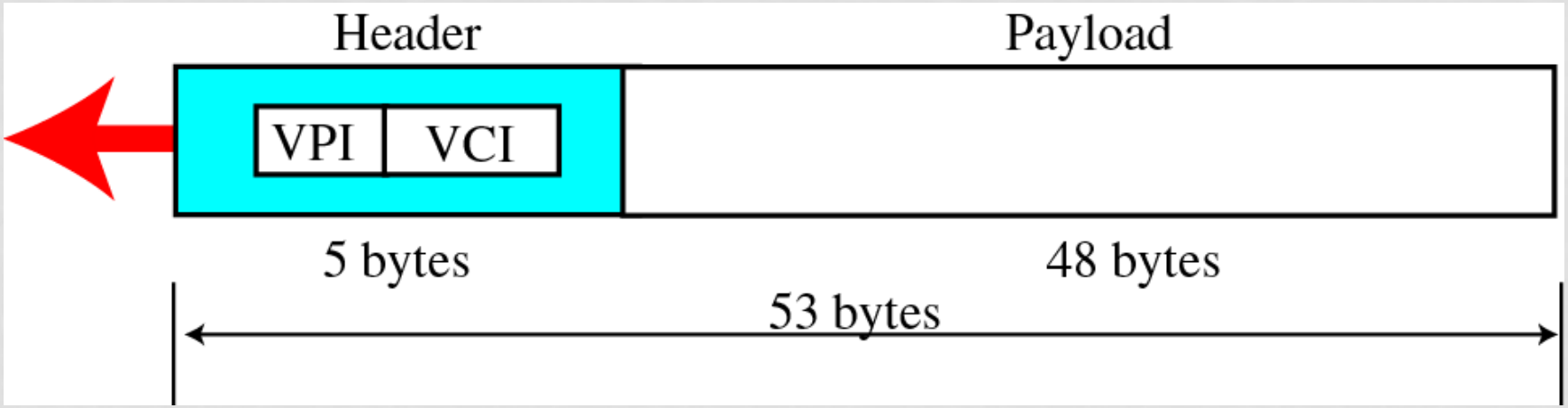
Connection Identifiers



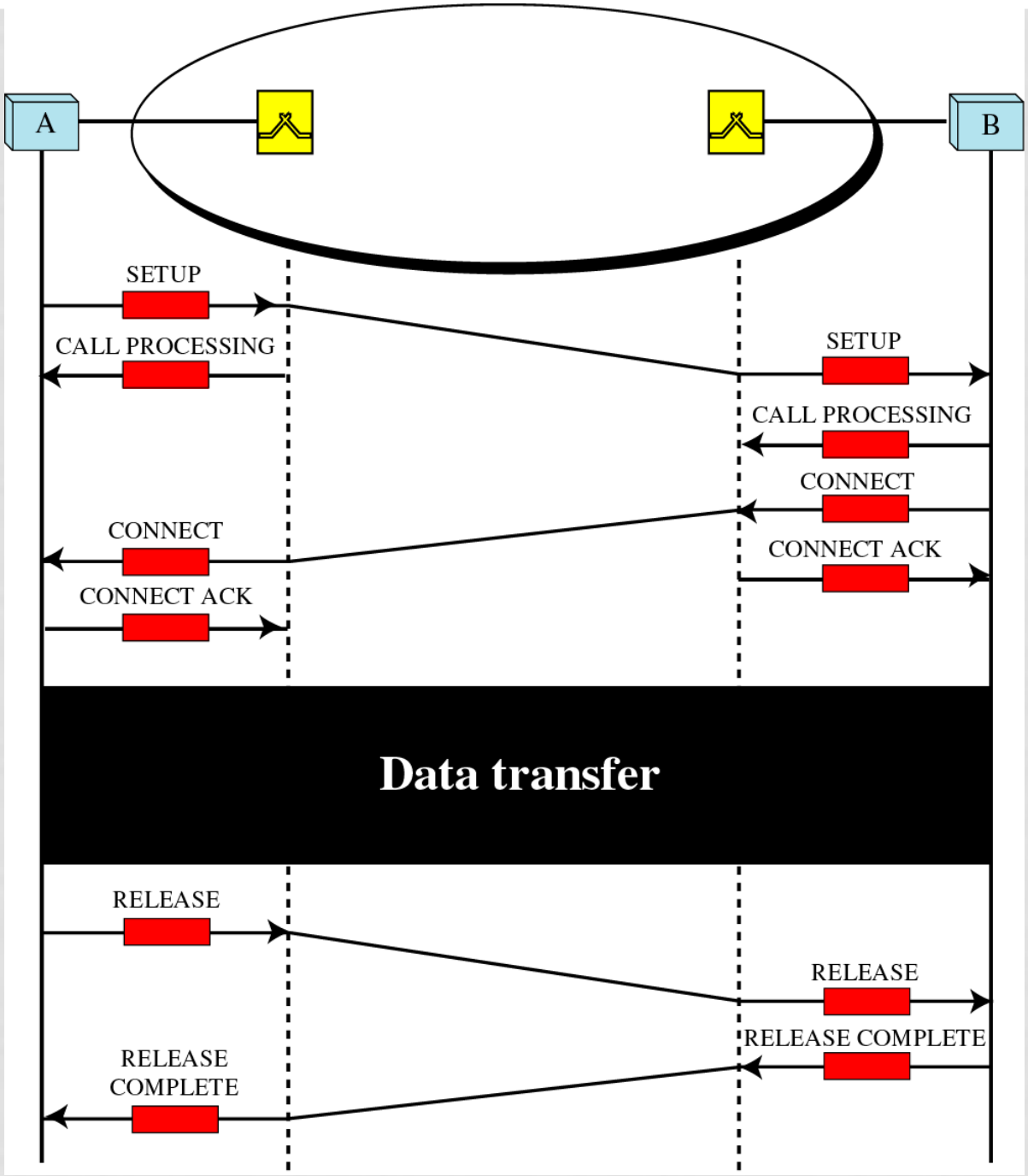
Virtual Connection Identifiers in UNIs and NNIs



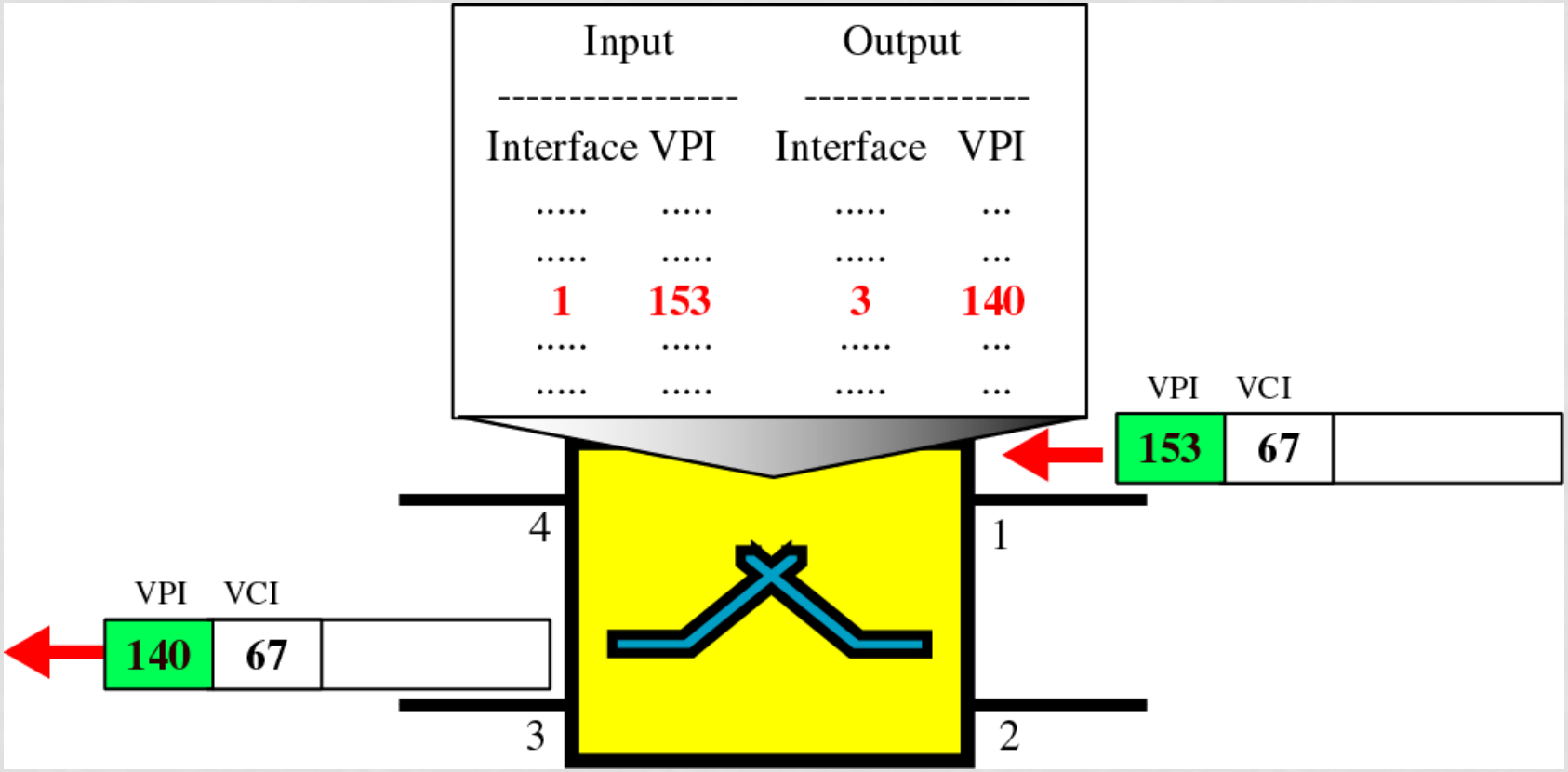
An ATM Cell



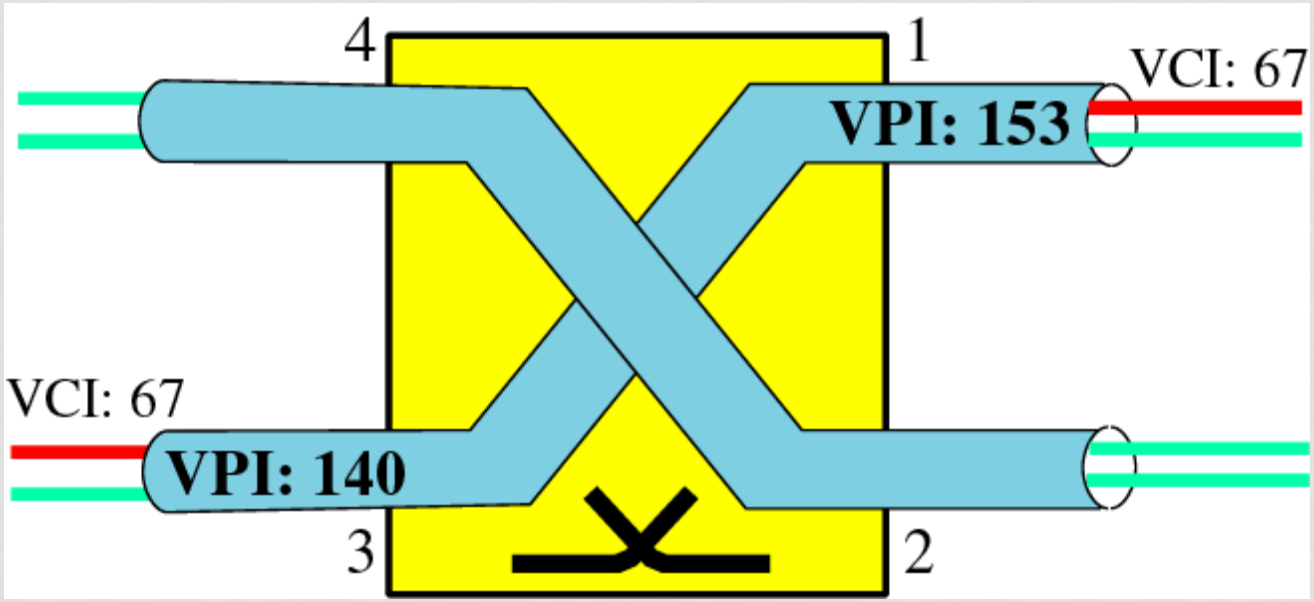
SVC Setup


A
B
SETUP
CALL PROCESSING
SETUP
CALL PROCESSING
CONNECT
CONNECT
CONNECT ACK
CONNECT ACK
Data transfer
RELEASE
RELEASE
RELEASE COMPLETE
RELEASE
COMPLETE

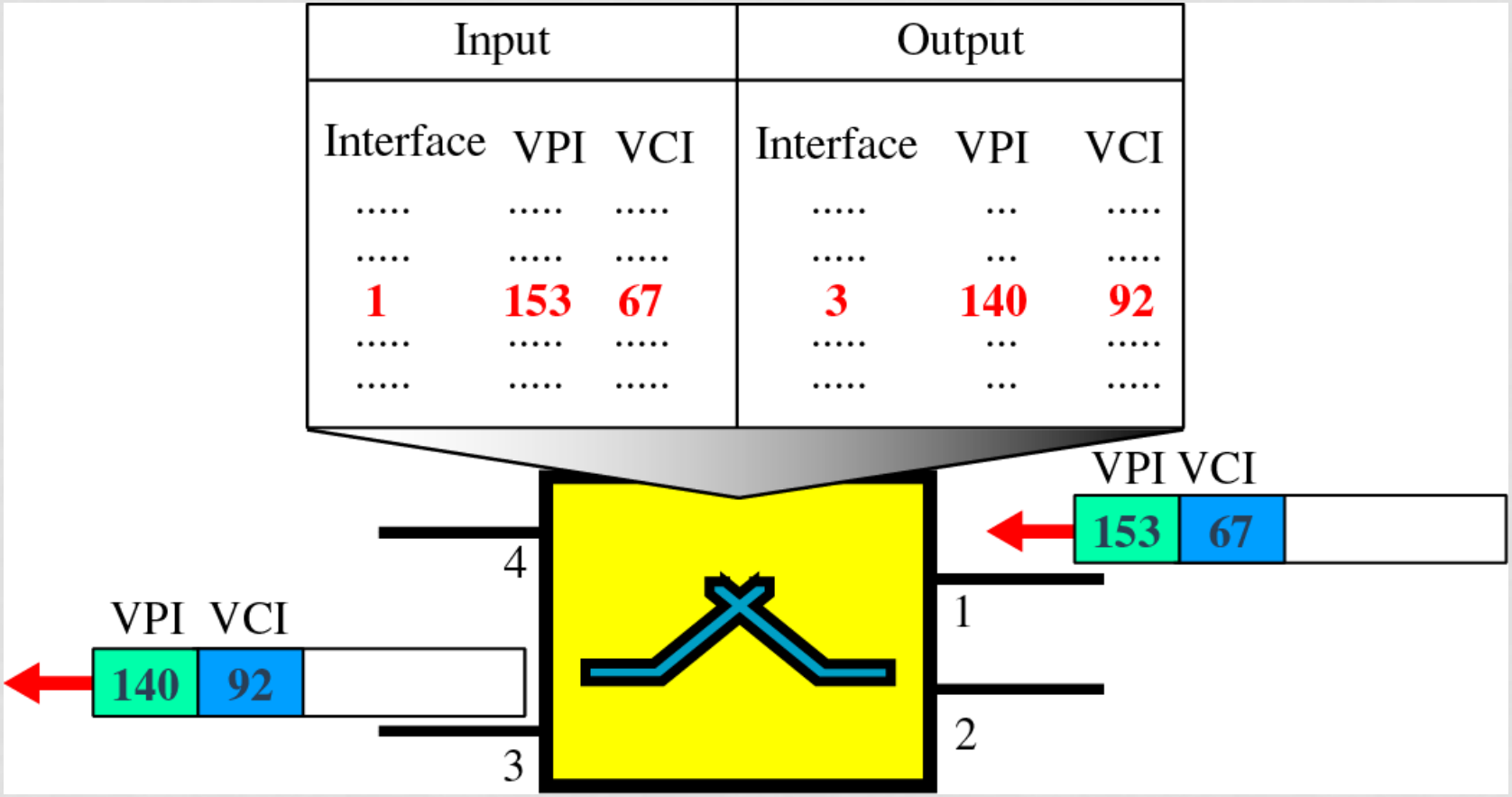
Routing with a VP Switch



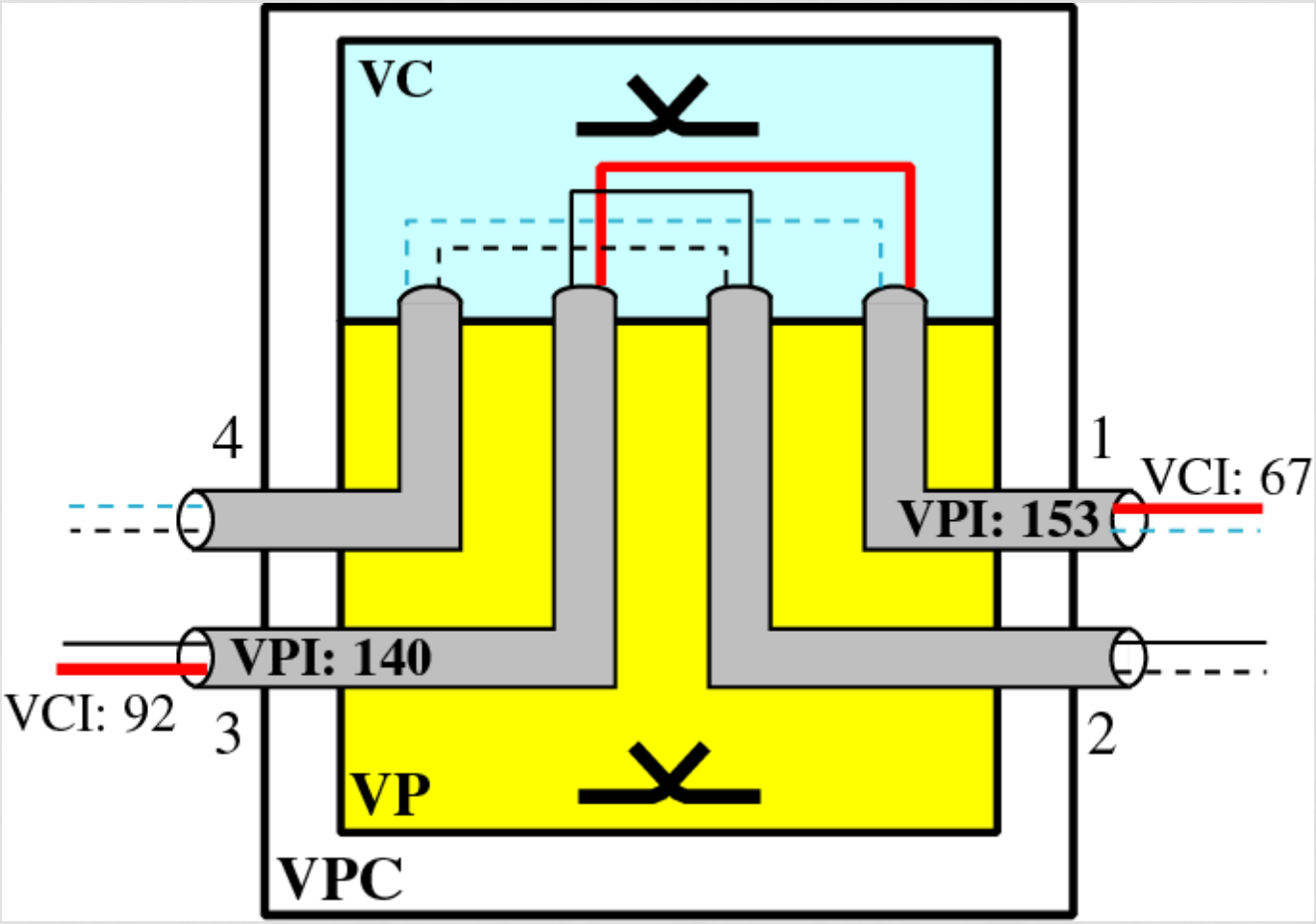
A Conceptual View of a VP Switch



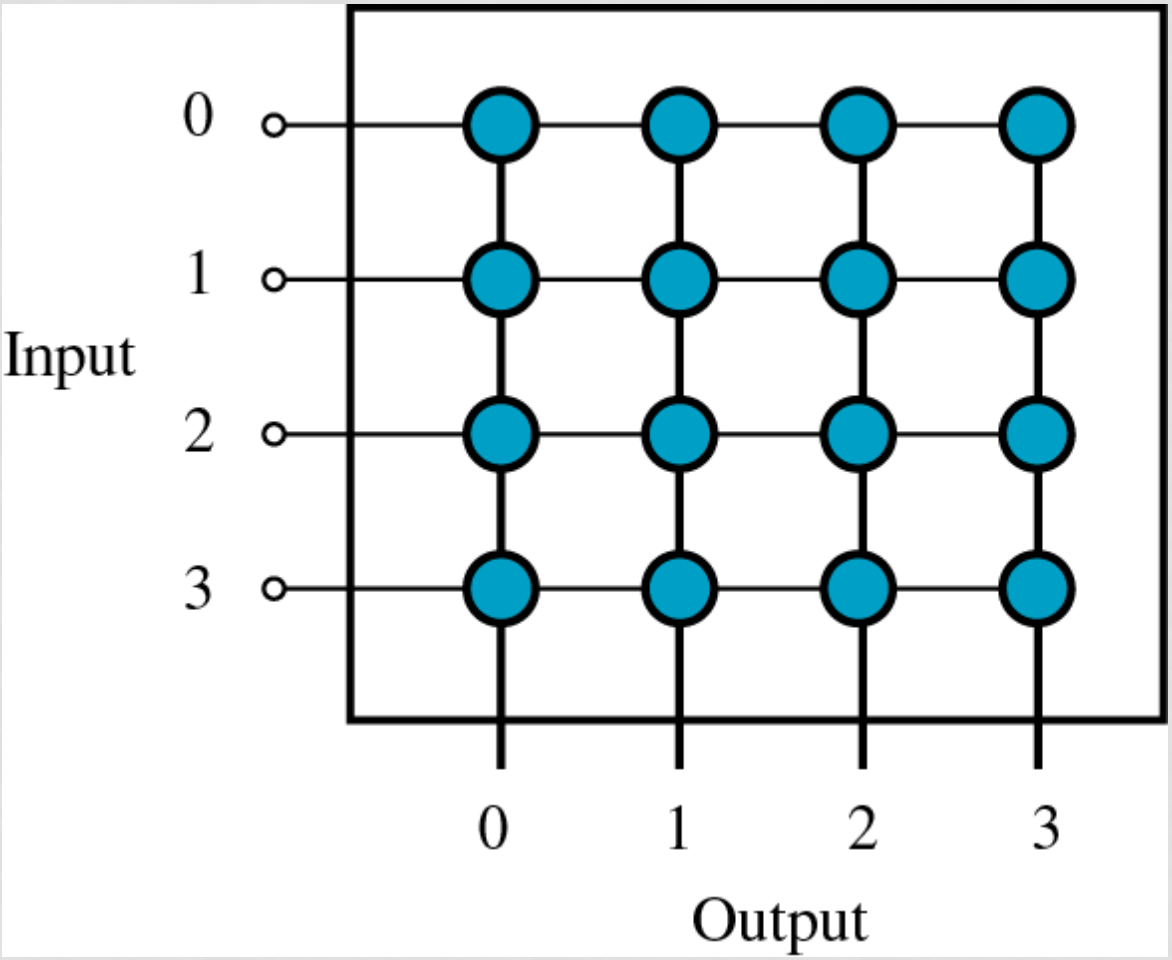
Routing with a VPC Switch



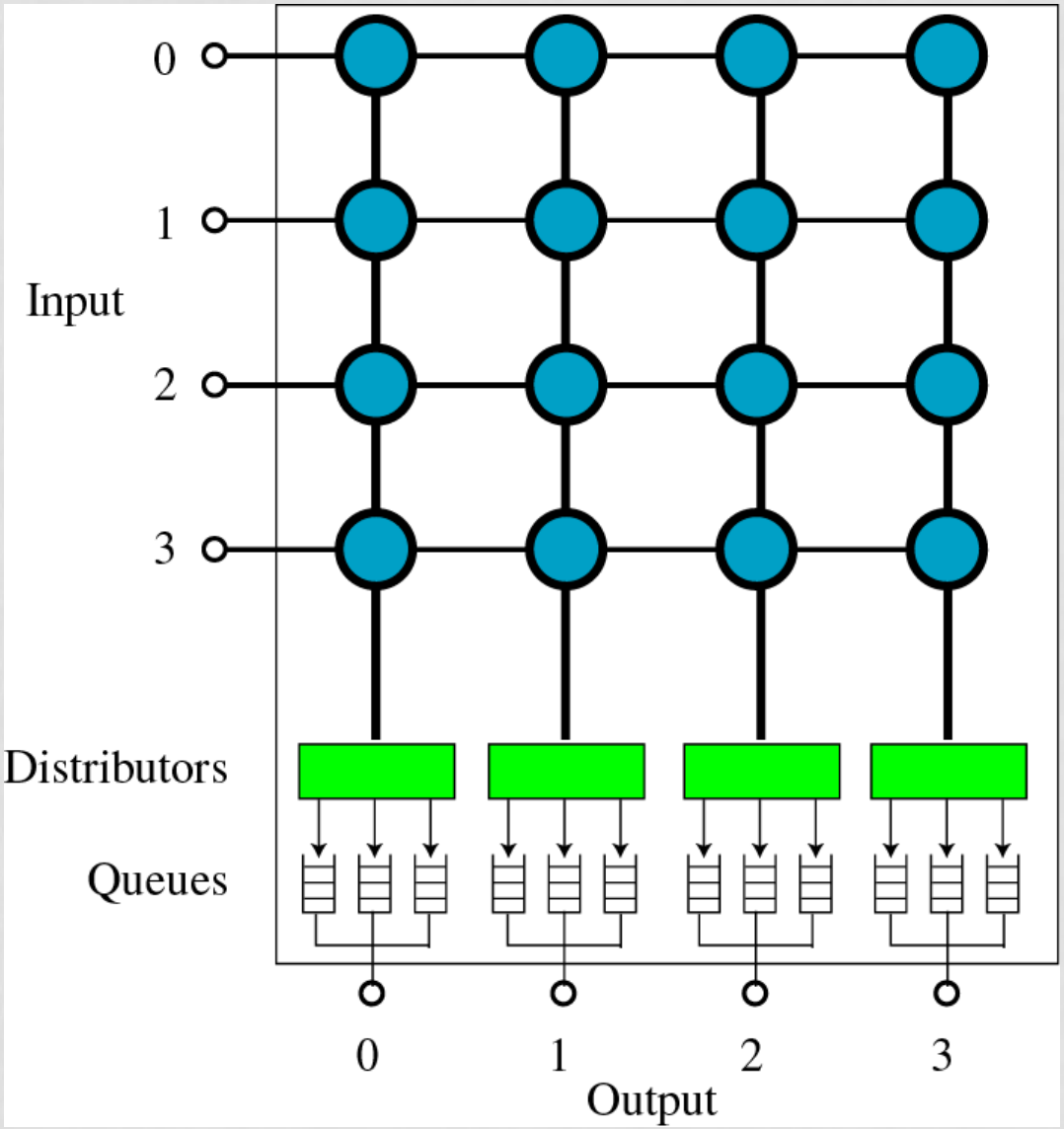
A Conceptual View of a VPC Switch



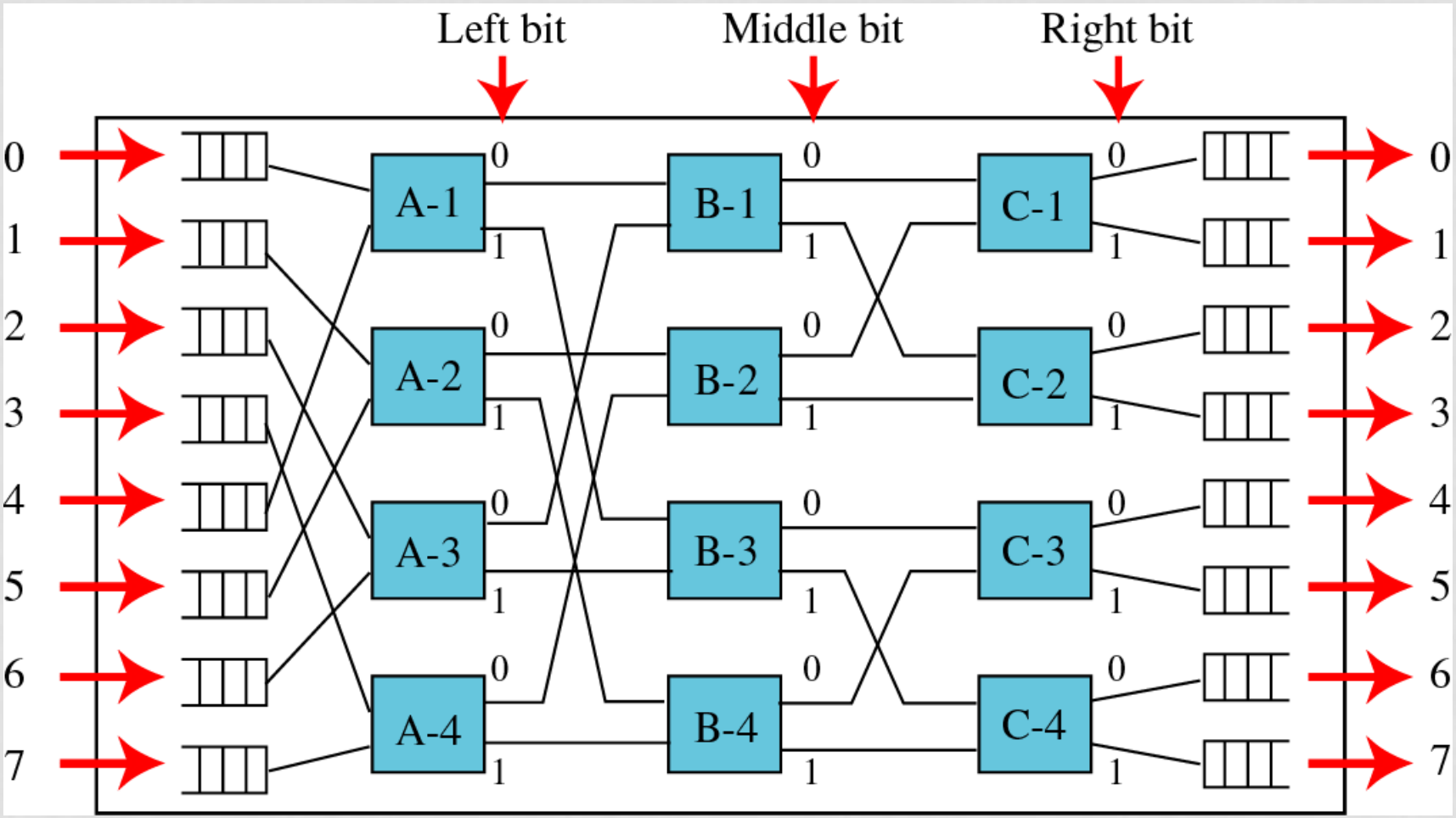
Crossbar Switch



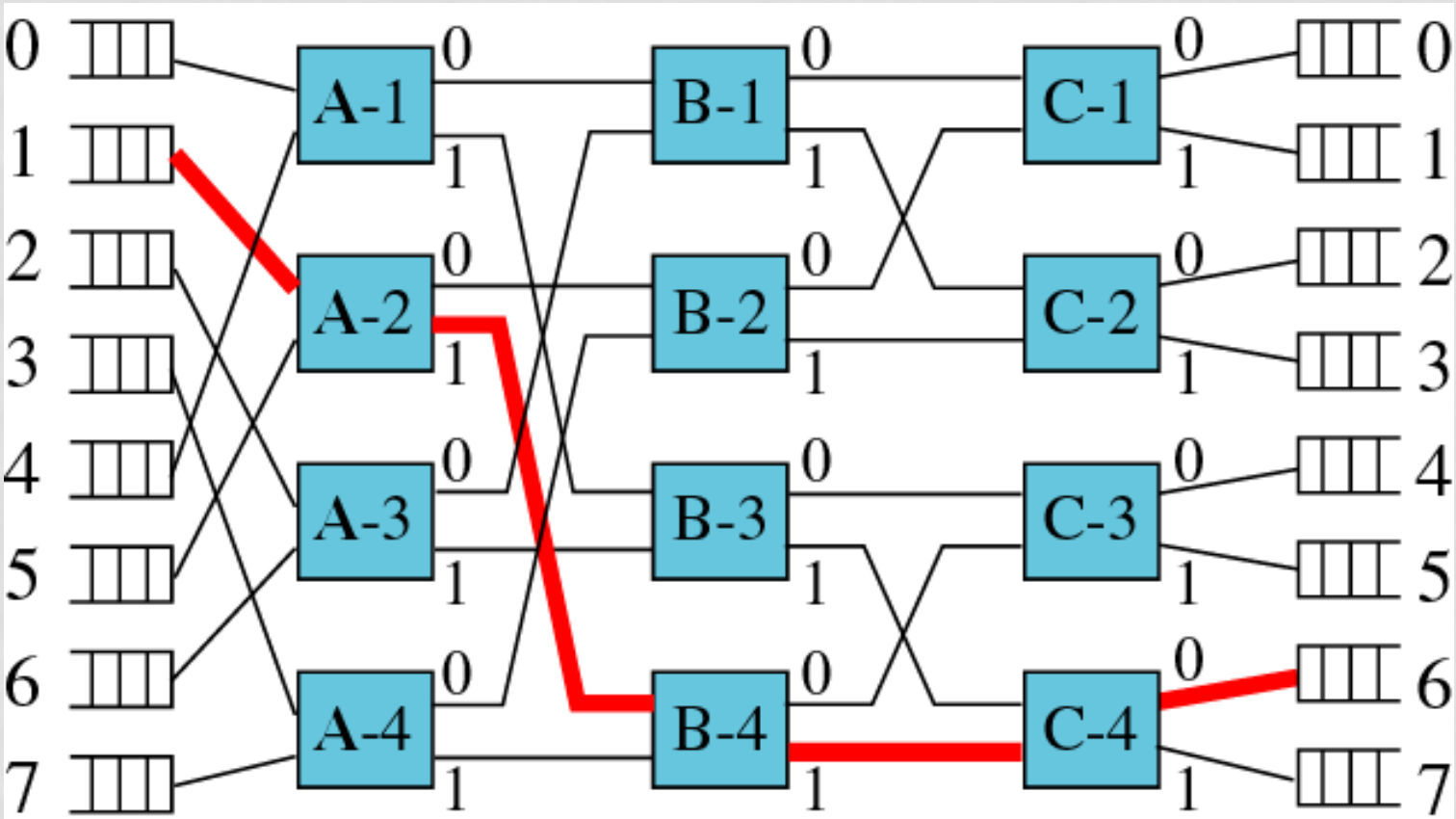
Knockout Switch



A Banyan Switch

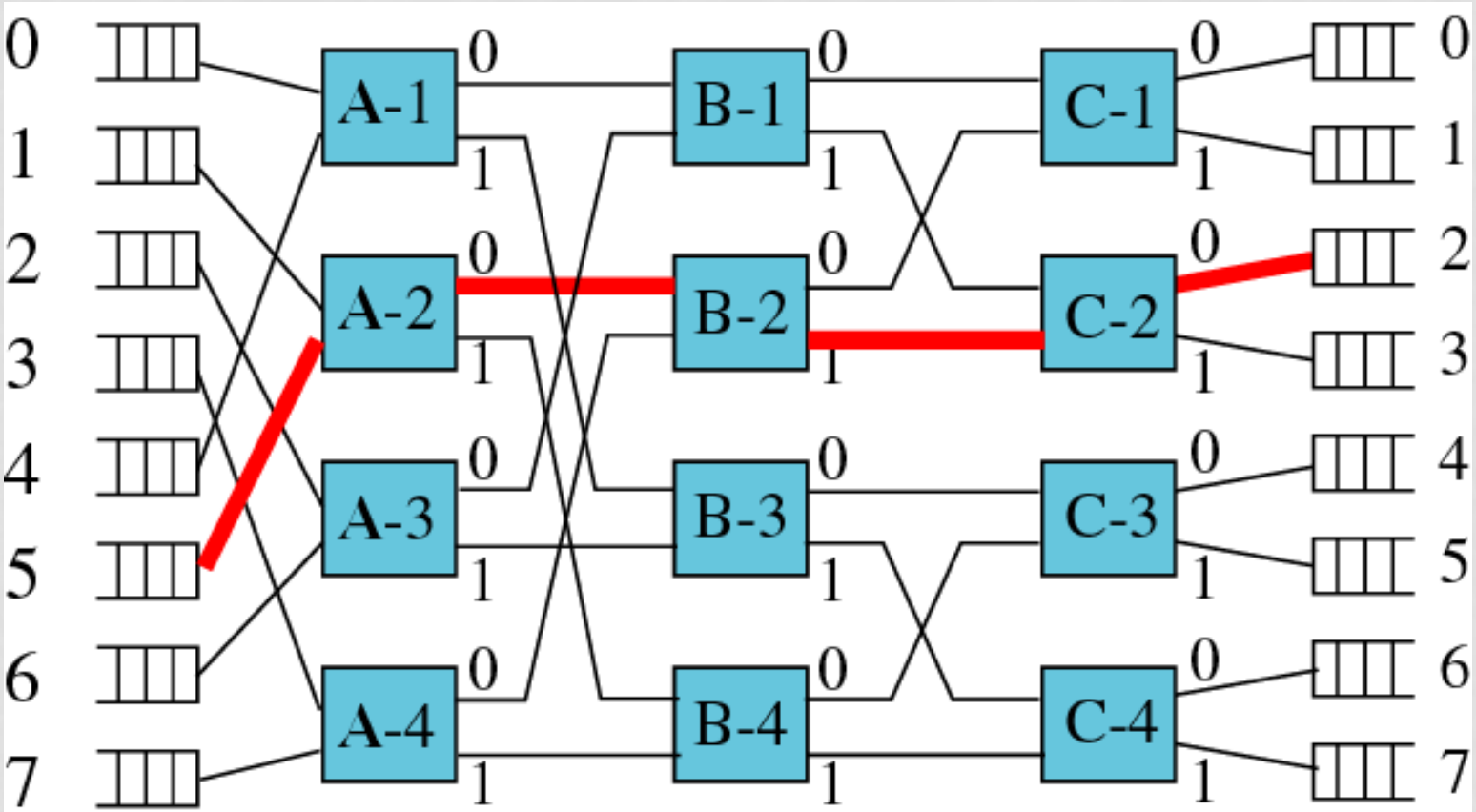


Example of Routing in a Banyan Switch (a)



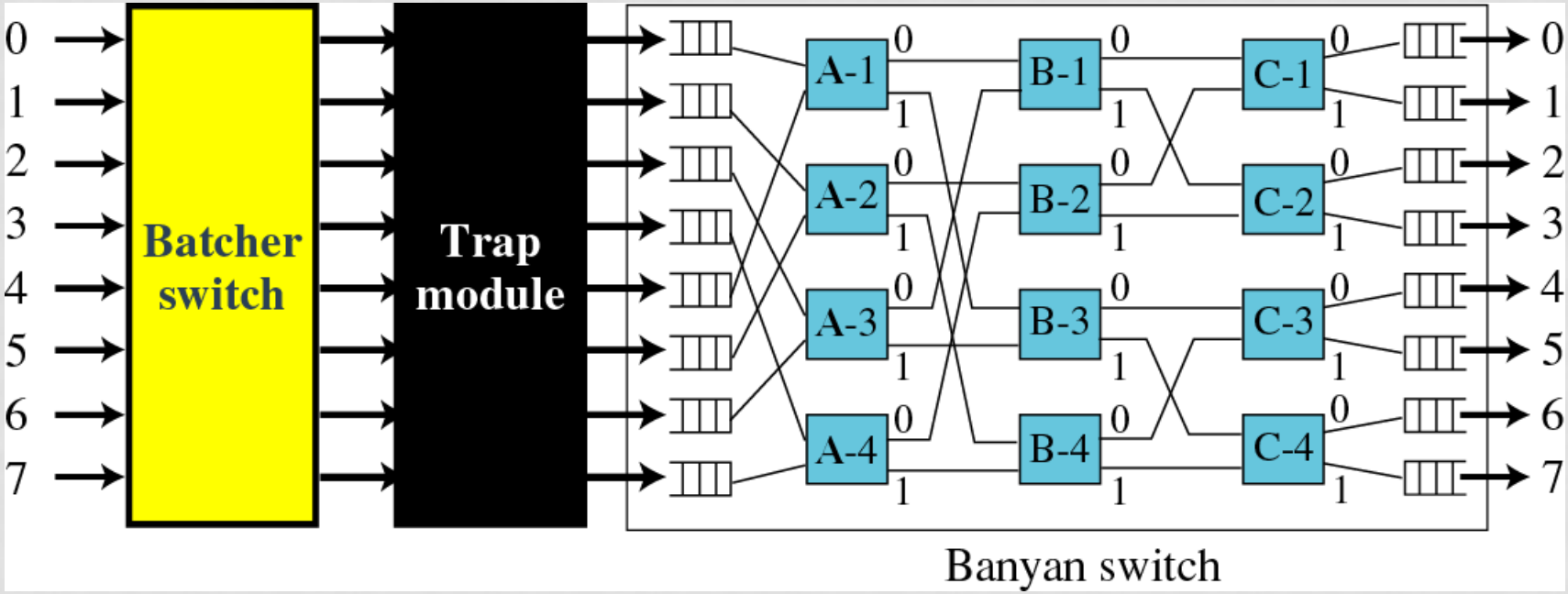
a. Input 1 sending a cell to input 6 (110)

Example of Routing in a Banyan Switch (b)

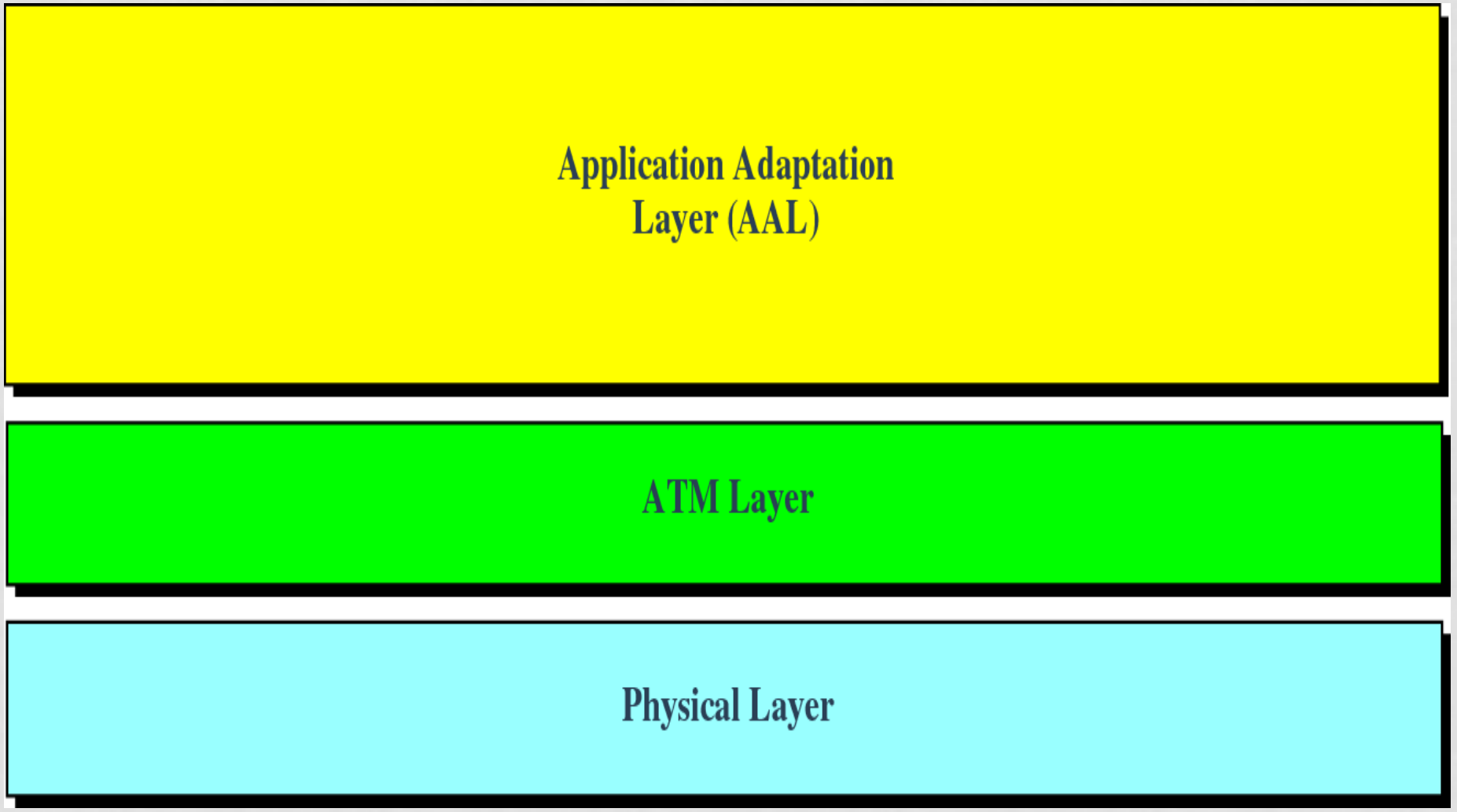


b. Input 5 sending a cell to input 2 (010)

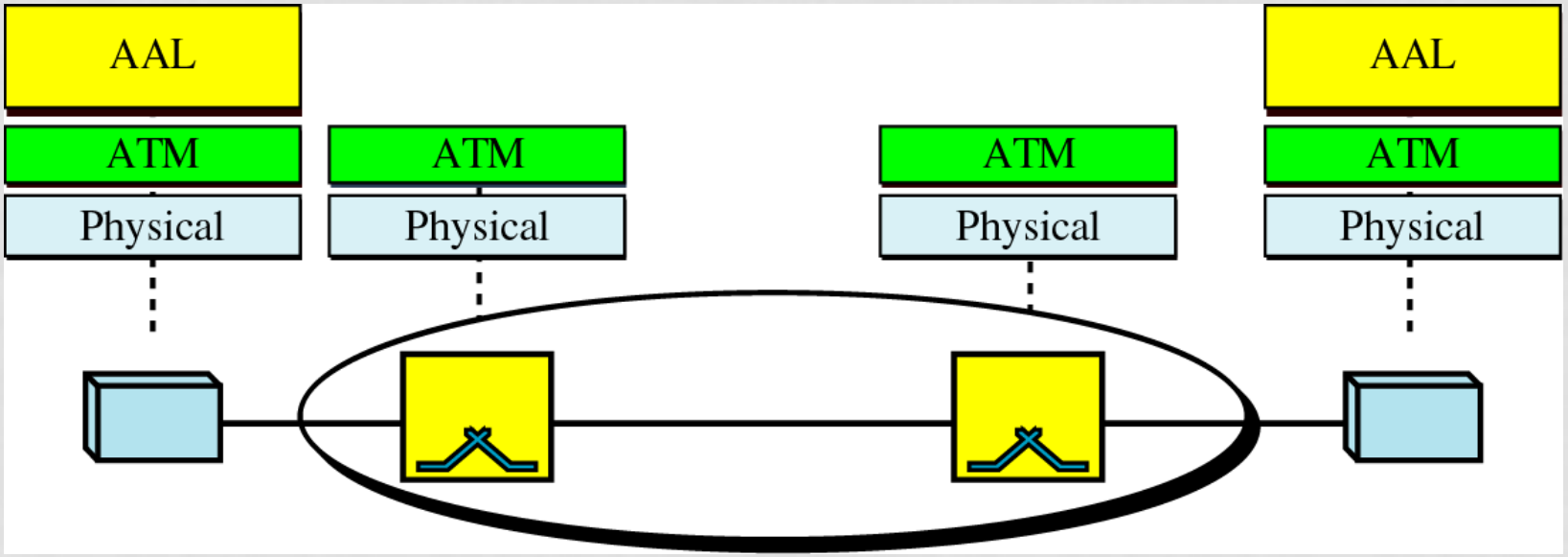
Batcher-Banyan Switch



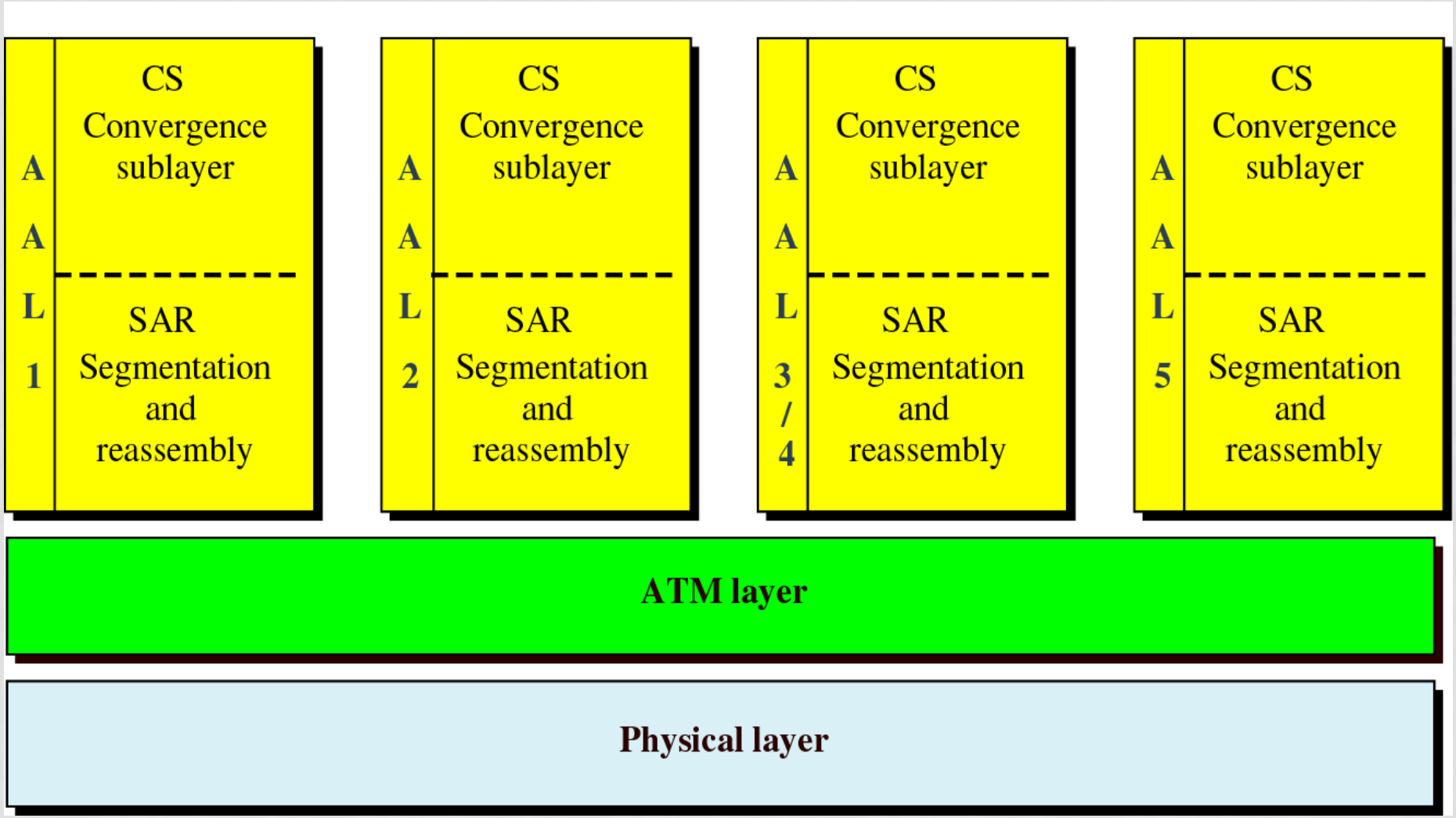
ATM Layers


Application Adaptation
Layer (AAL)
ATM Layer
Physical Layer

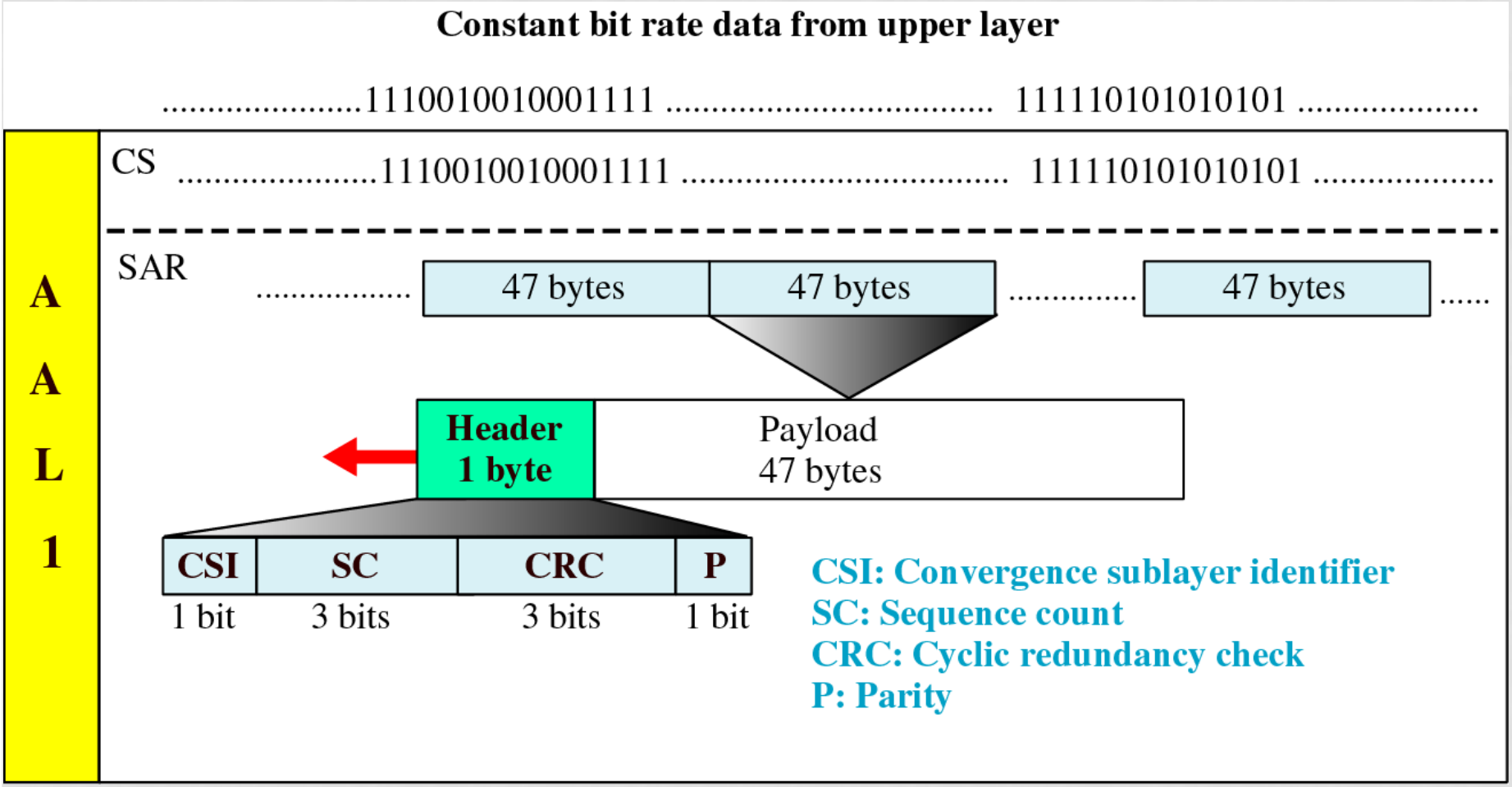
ATM Layers in End-Point Devices and Switches



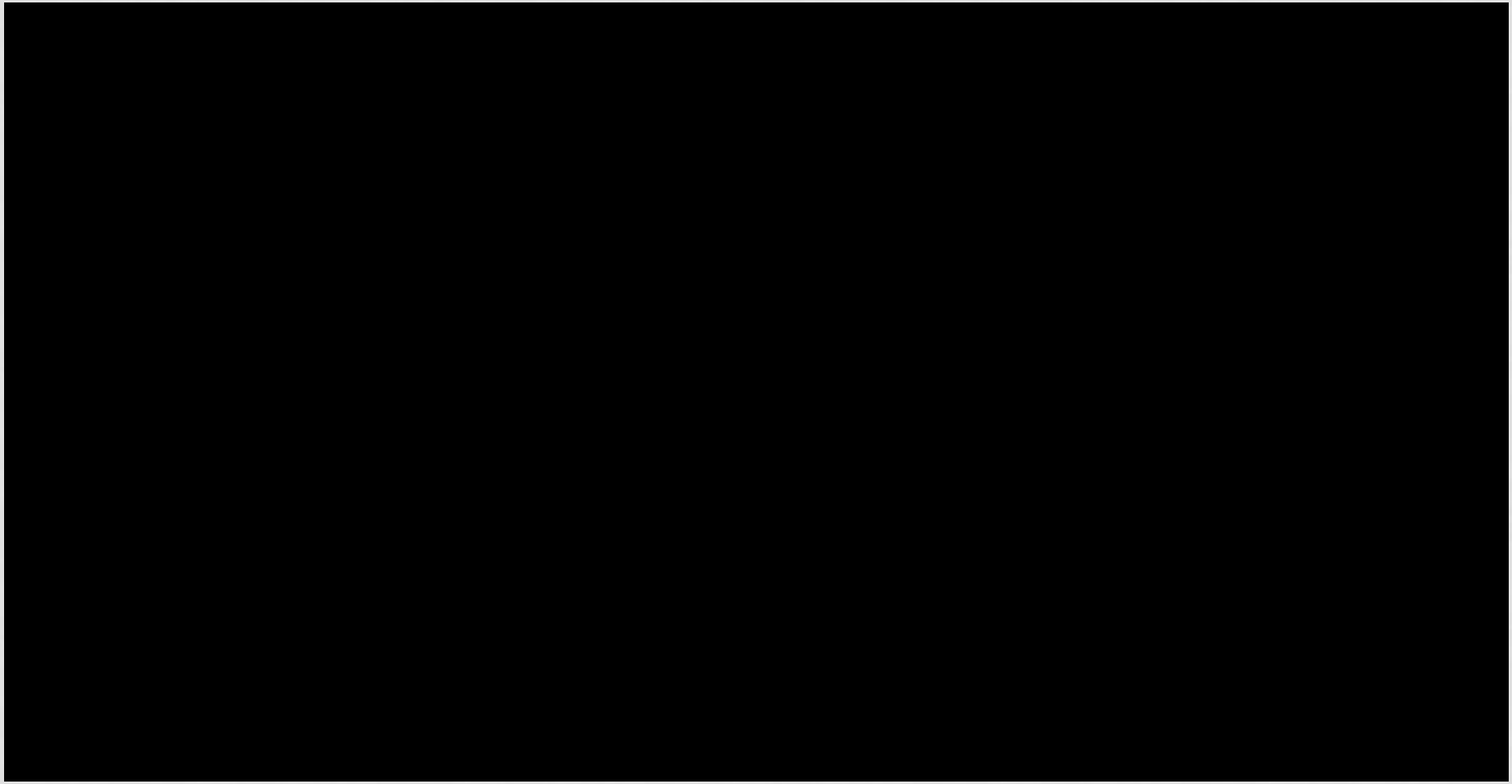
AAL Types


AAL1
CS
Convergence
sublayer
SAR
Segmentation
and
reassembly
AAL2
CS
Convergence
sublayer
SAR
Segmentation
and
reassembly
AAL3/4
CS
Convergence
sublayer
SAR
Segmentation
and
reassembly
AAL5
CS
Convergence
sublayer
SAR
Segmentation
and
reassembly
ATM layer
Physical layer

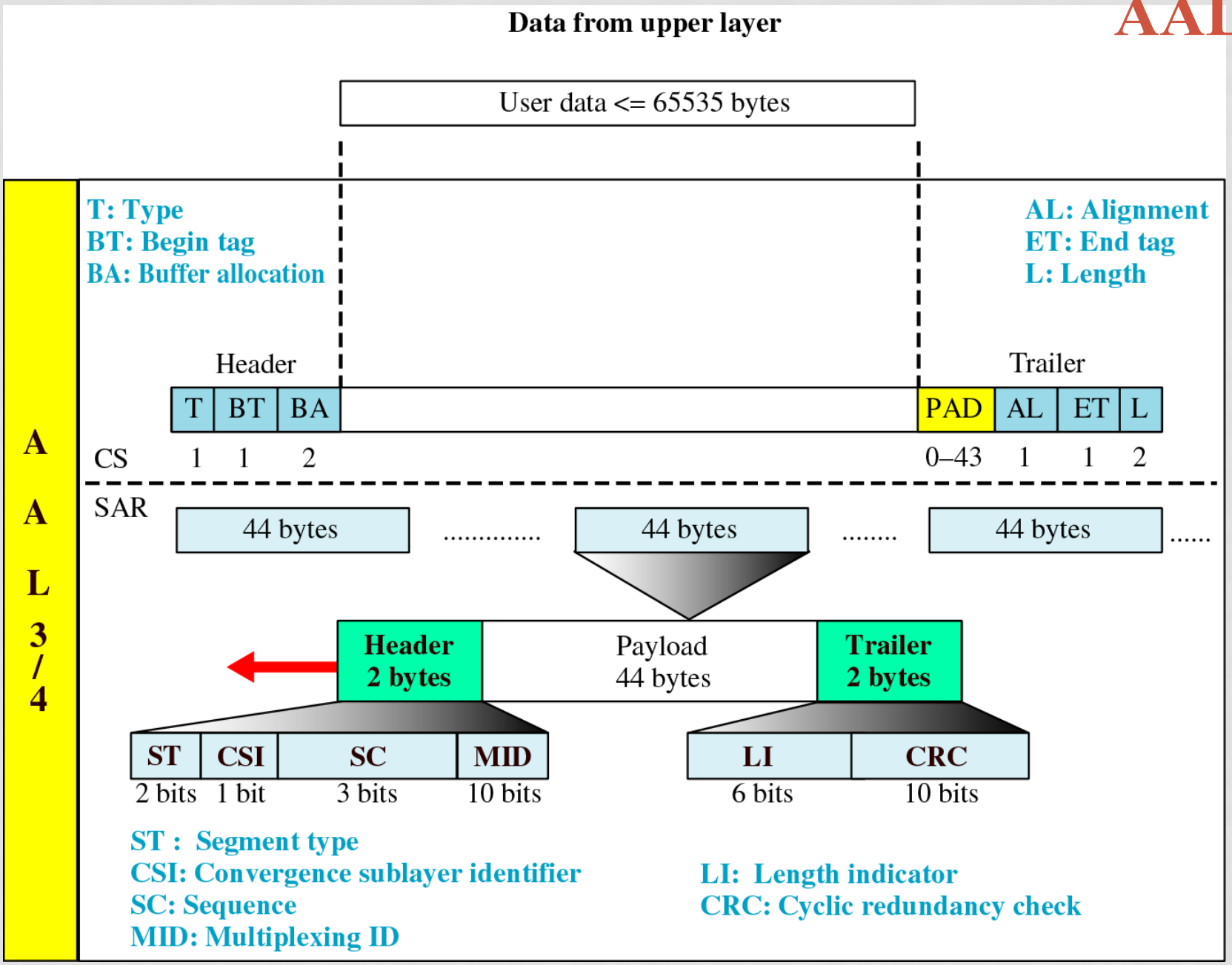
AAL1


Constant bit rate data from upper layer
.....1110010010001111 ..... 111110101010101 .....
AAL1
CS
.....1110010010001111 ..... 111110101010101 .....
SAR
47 bytes
47 bytes
47 bytes
Header
1 byte
Payload
47 bytes
CSI
SC
CRC
P
1 bit
3 bits
3 bits
1 bit
CSI: Convergence sublayer identifier
SC: Sequence count
CRC: Cyclic redundancy check
P: Parity

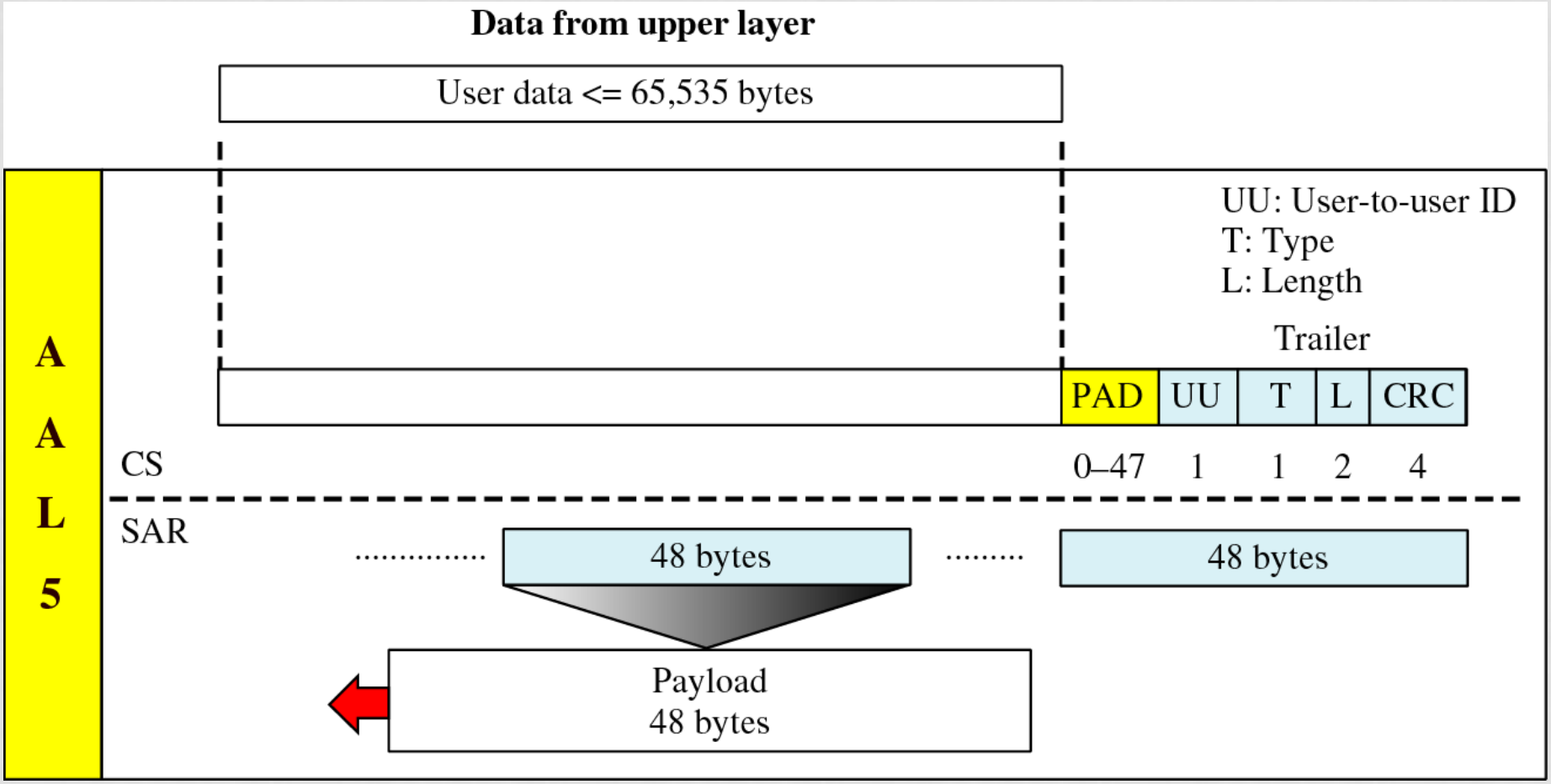
AAL2



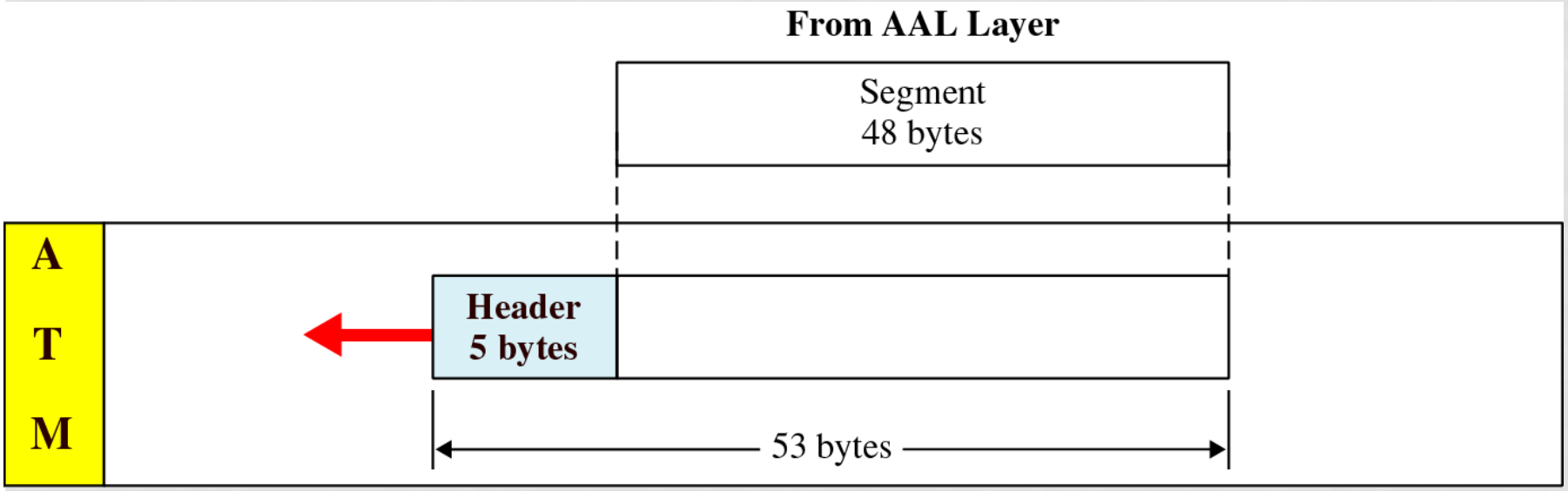
AAL3/4


Data from upper layer
User data <= 65535 bytes
T: Type
BT: Begin tag
BA: Buffer allocation
AL: Alignment
ET: End tag
L: Length
Header
Trailer
T
BT
BA
PAD
AL
ET
L
CS
1
1
2
0–43
1
1
2
AAL3/4
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

AAL5

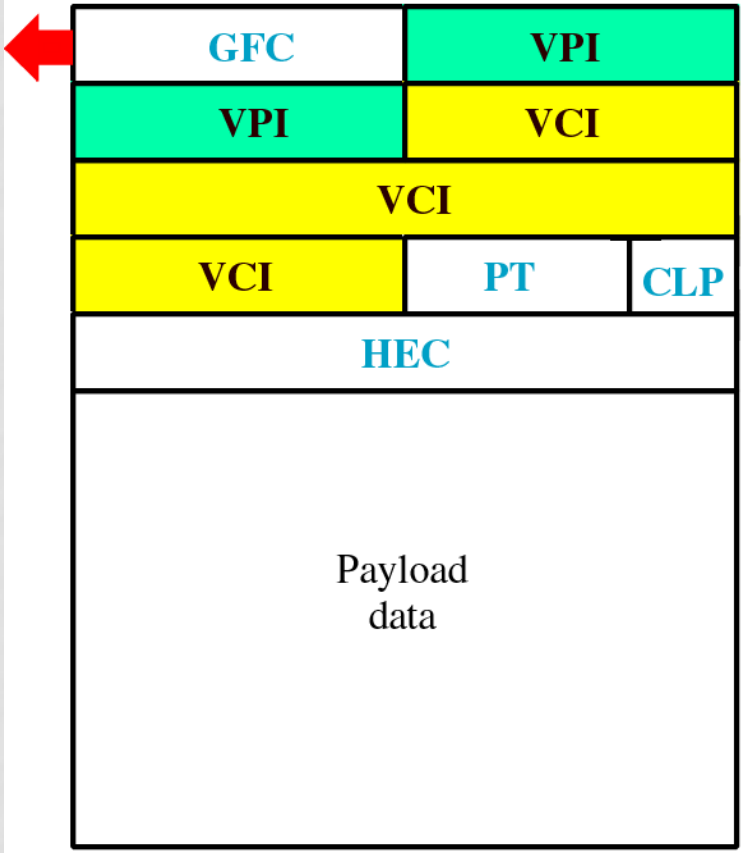

Data from upper layer
User data <= 65,535 bytes
AAL5
UU: User-to-user ID
T: Type
L: Length
Trailer
PAD
UU
T
L
CRC
CS
0–47
1
1
2
4
SAR
48 bytes
48 bytes
Payload
48 bytes

ATM Layer

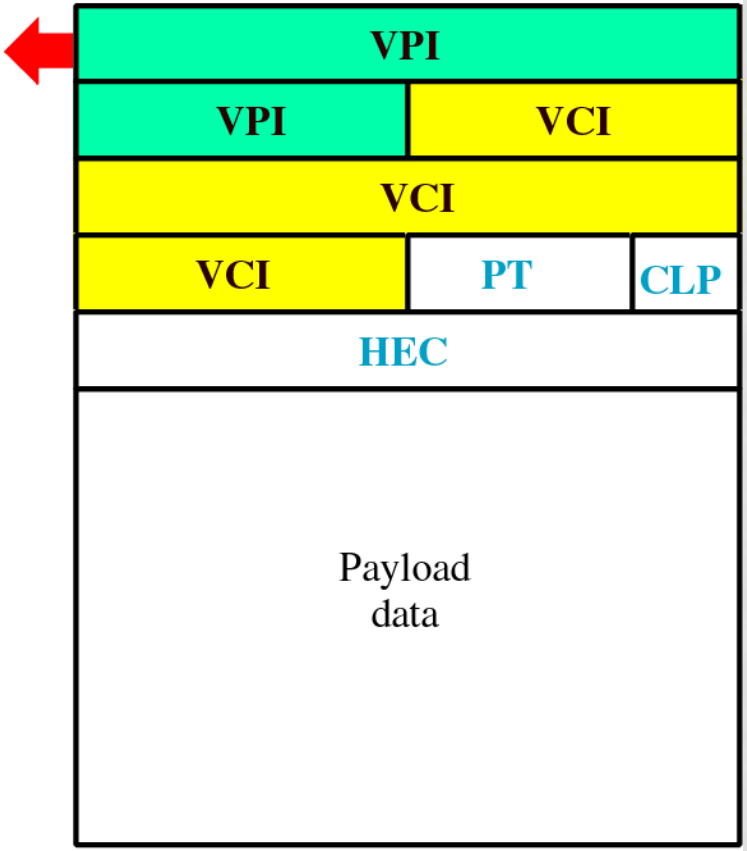


ATM Header

GFC: Generic flow control
VPI: Virtual path identifier
VCI: Virtual channel identifier
PT: Payload type
CLP: Cell loss priority
HEC: Header error control

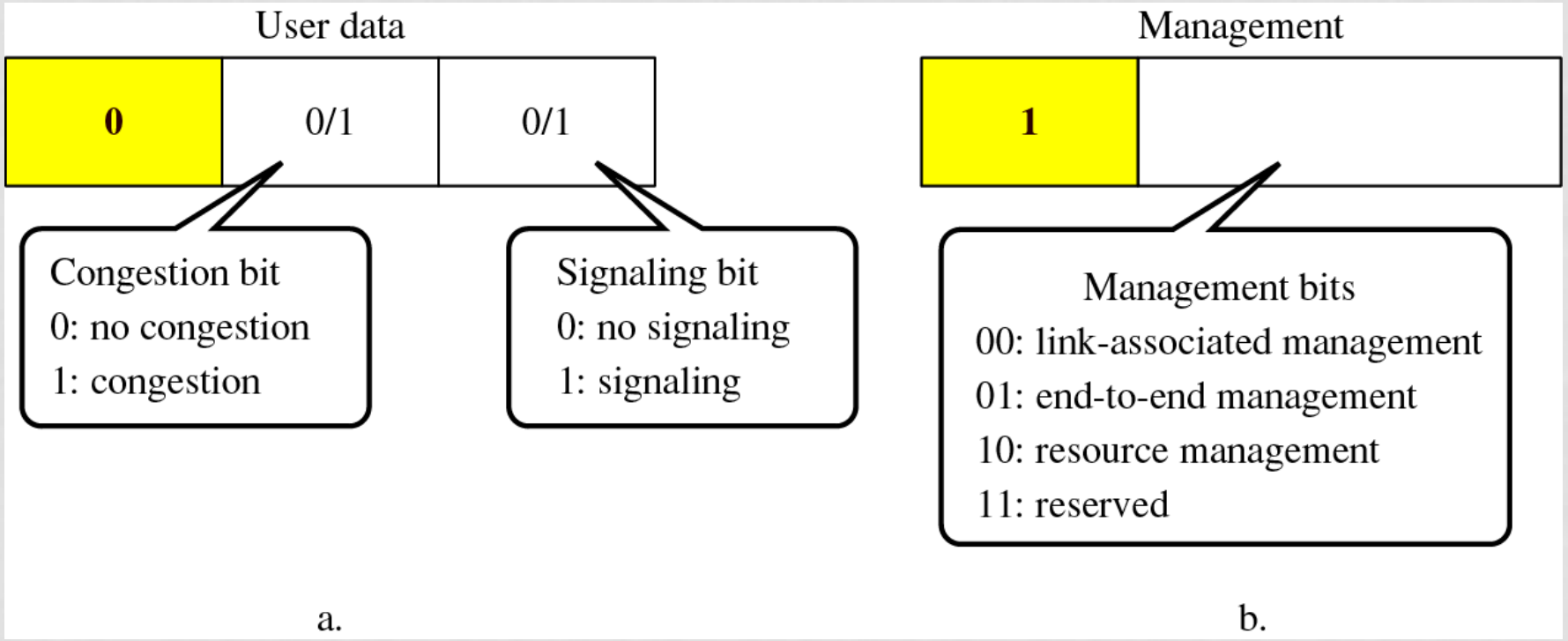


UNI Cell

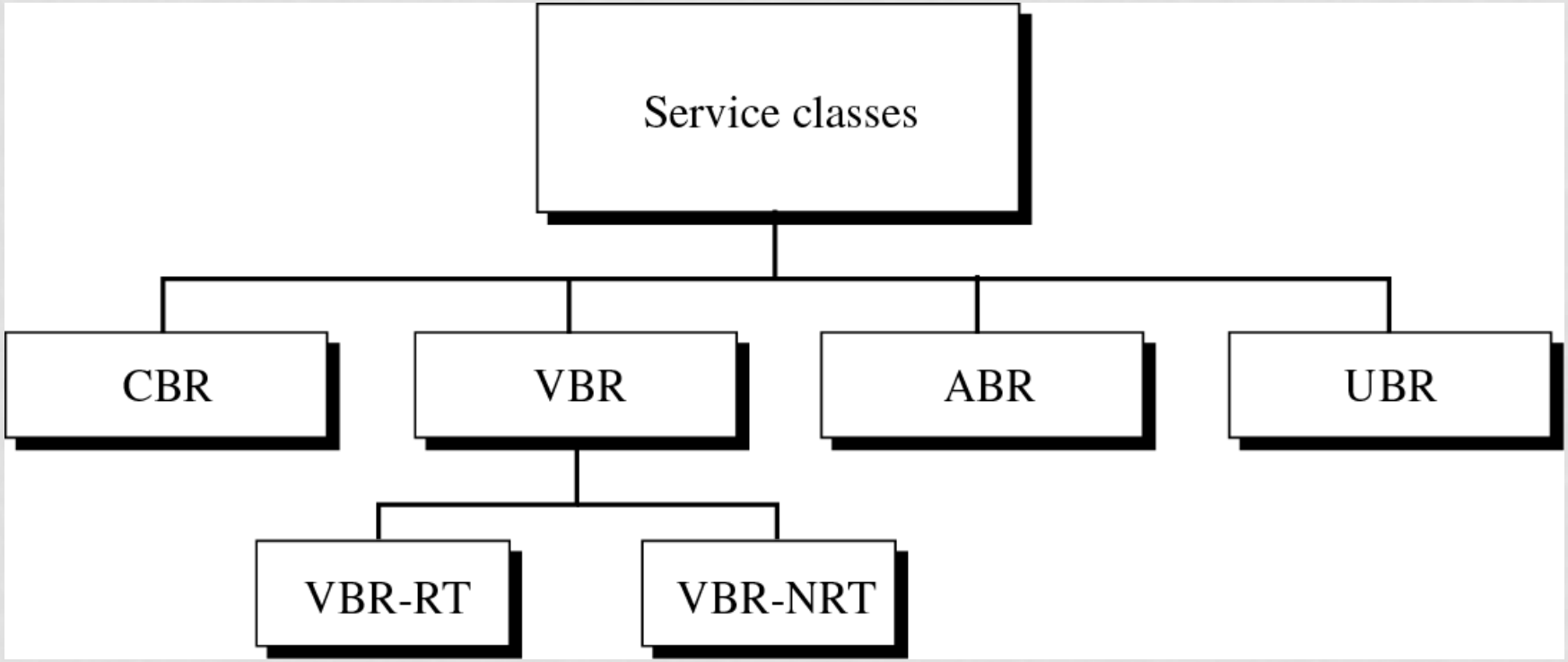


NNI Cell

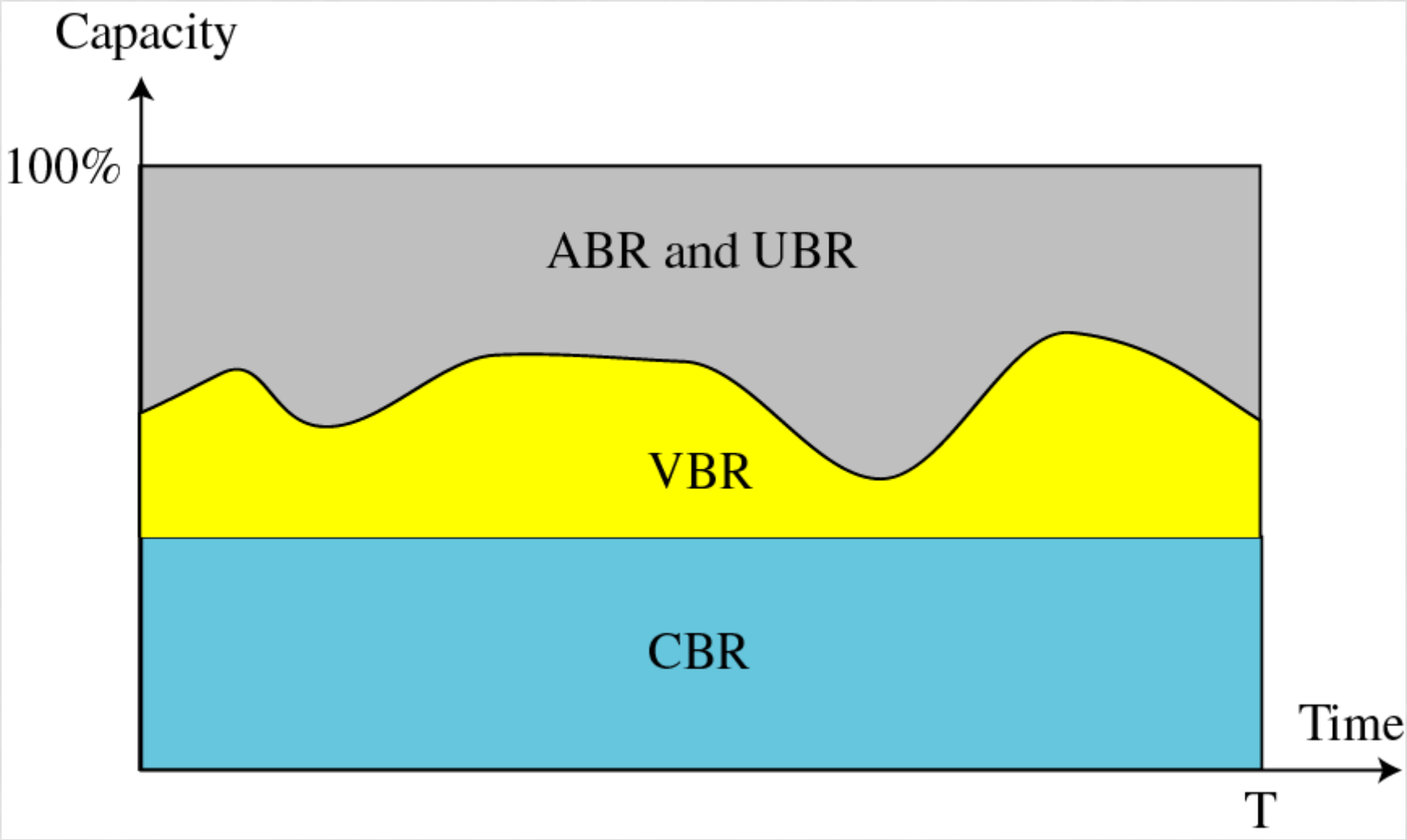
PT Fields


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.

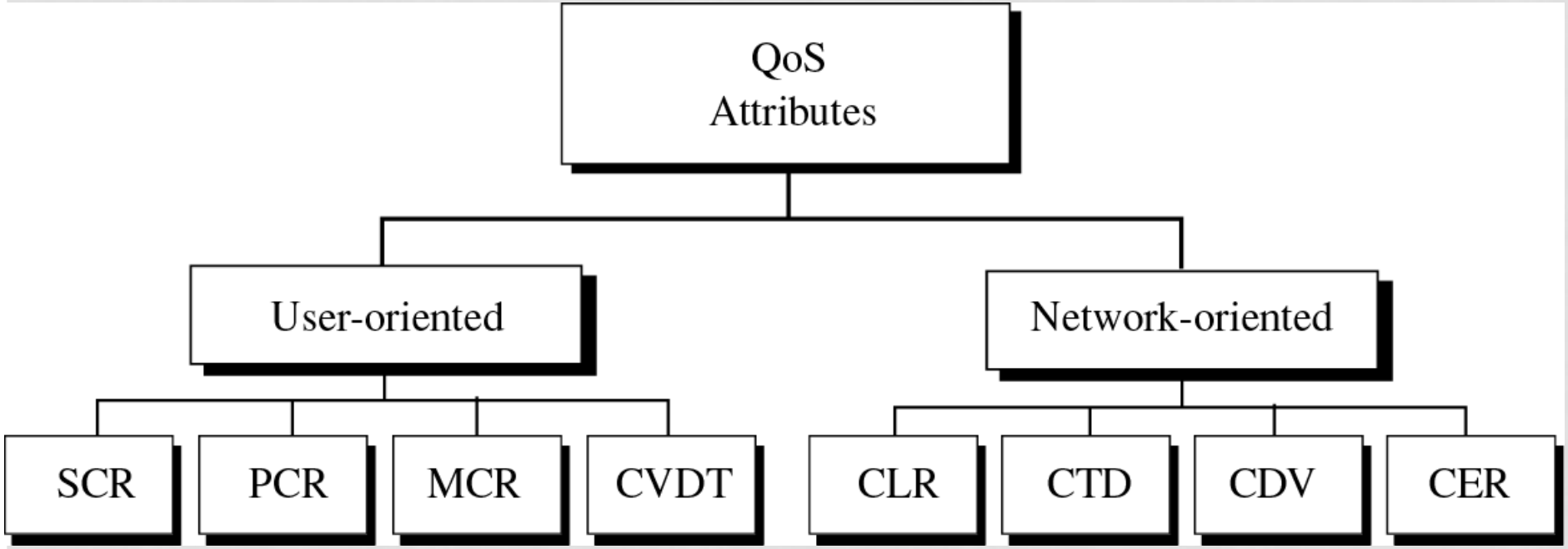
Service Classes



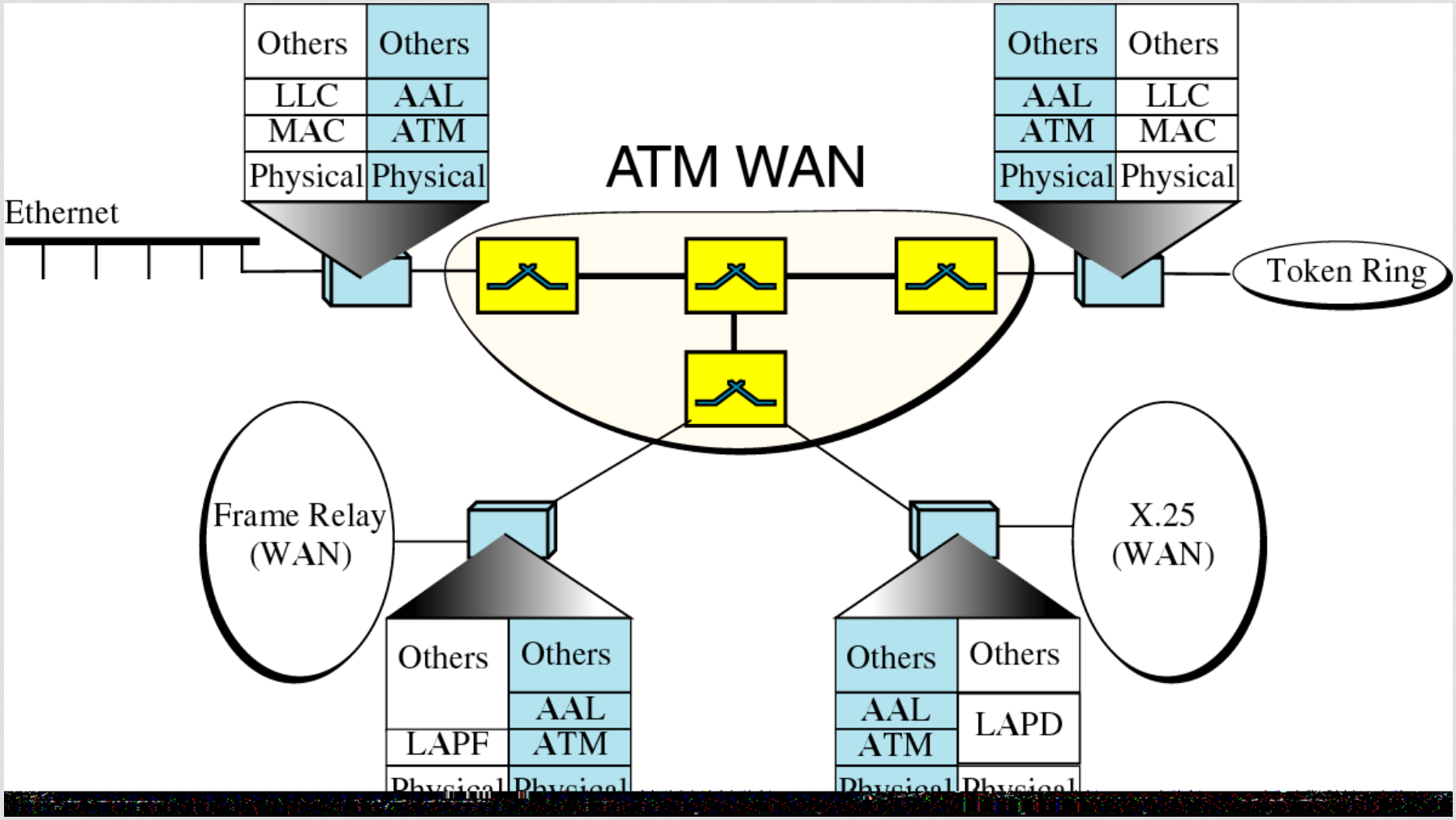
Service Classes and Capacity of Network



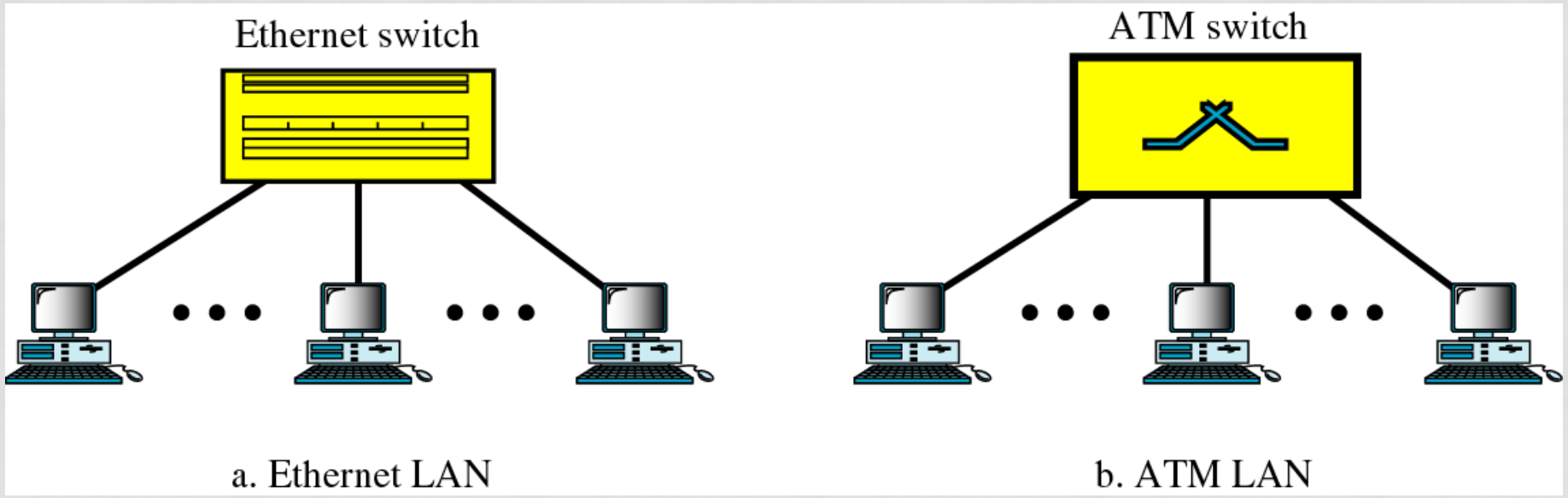
QoS


QoS
Attributes
User-oriented
Network-oriented
SCR
PCR
MCR
CVDT
CLR
CTD
CDV
CER

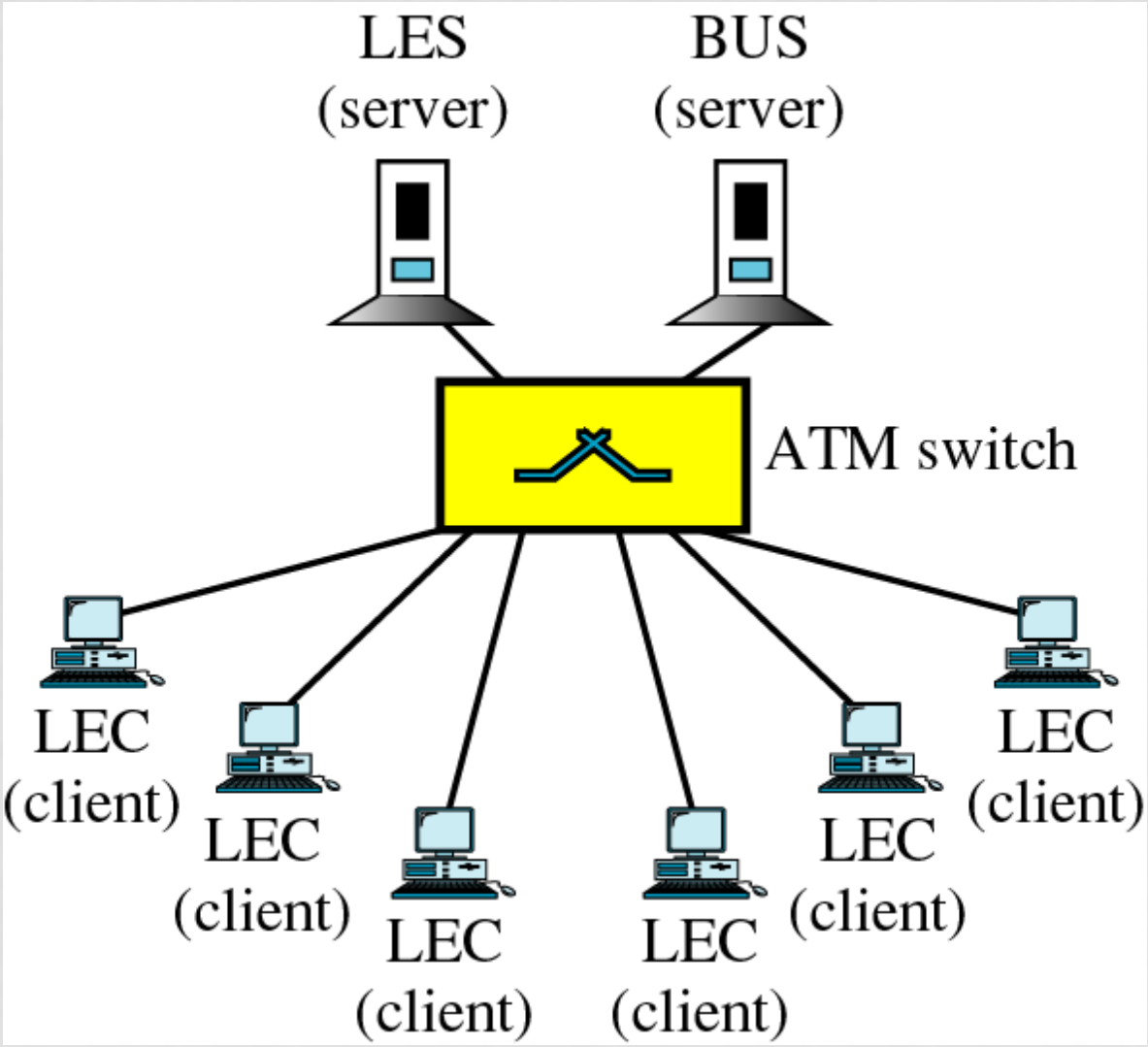
ATM WAN


Others
Others
LLC
AAL
MAC
ATM
Physical
Physical
ATM WAN
Others
Others
AAL
LLC
ATM
MAC
Physical
Physical
Ethernet
Token Ring
Frame Relay
(WAN)
X.25
(WAN)
Others
Others
AAL
LAPF
ATM
Physical
Physical
Others
Others
AAL
LAPD
ATM
Physical
Physical

Ethernet Switch and ATM Switch



LANE Approach



LEC, LES, and BUS