Principles of Computer Architecture

Miles Murdocca and Vincent Heuring

Chapter 9: Communication

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Chapter Contents

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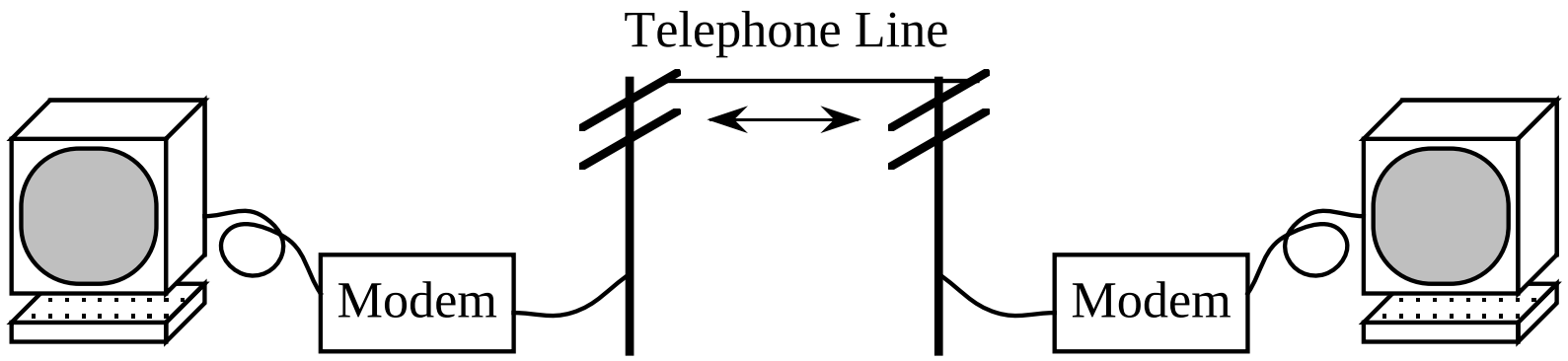
Modem Communication

- **Communication over a telephone line with modems.**



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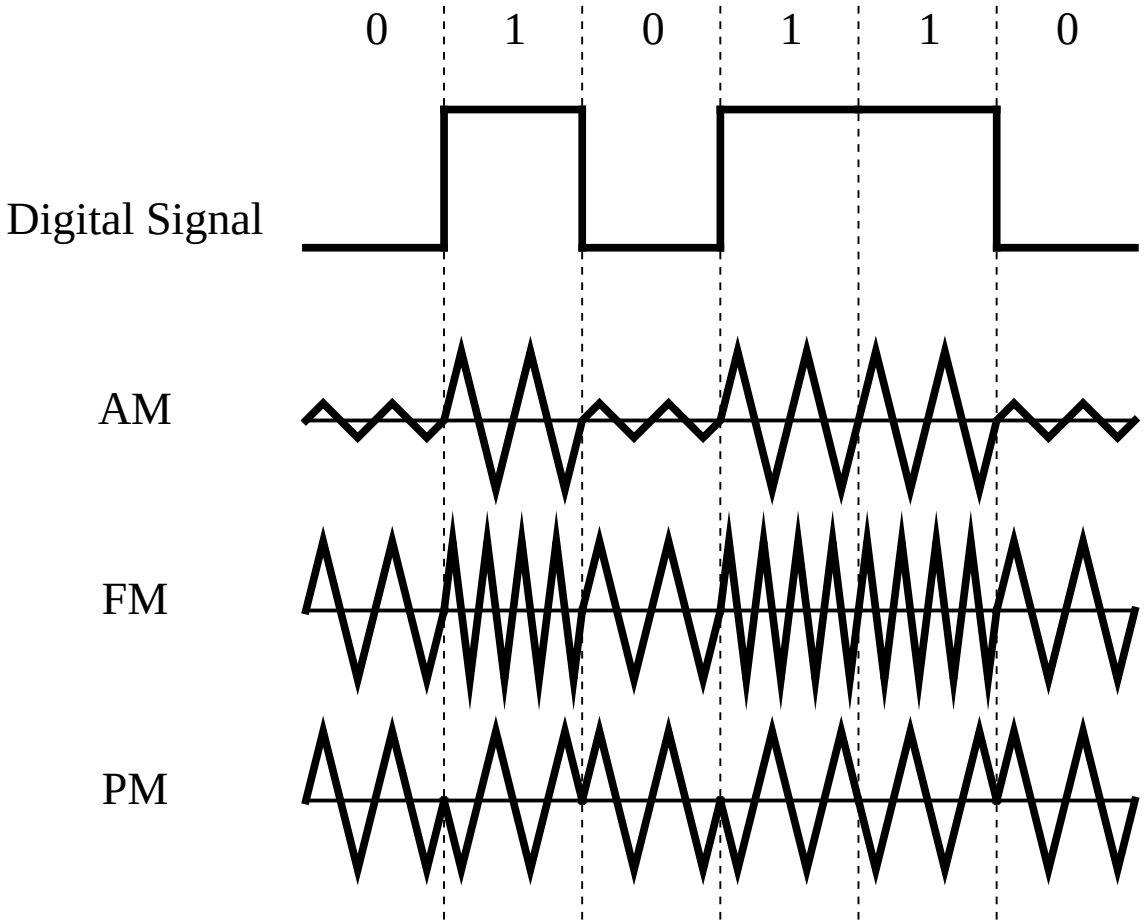
Modulation Schemes

- **Three common forms of modulation.**



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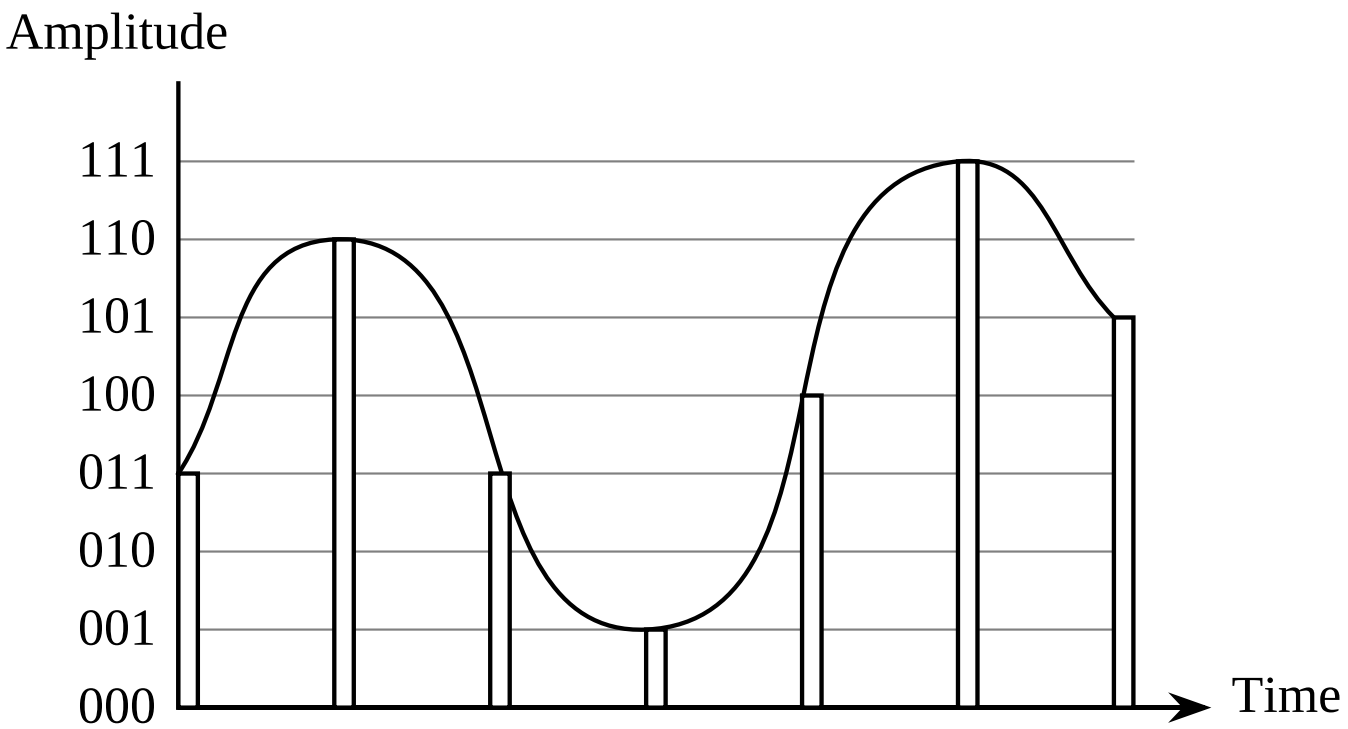
Pulse Code Modulation

- **Conversion of an analog signal into a PCM binary sequence.**



PCM sequence = 011 110 011 001 100 111 101

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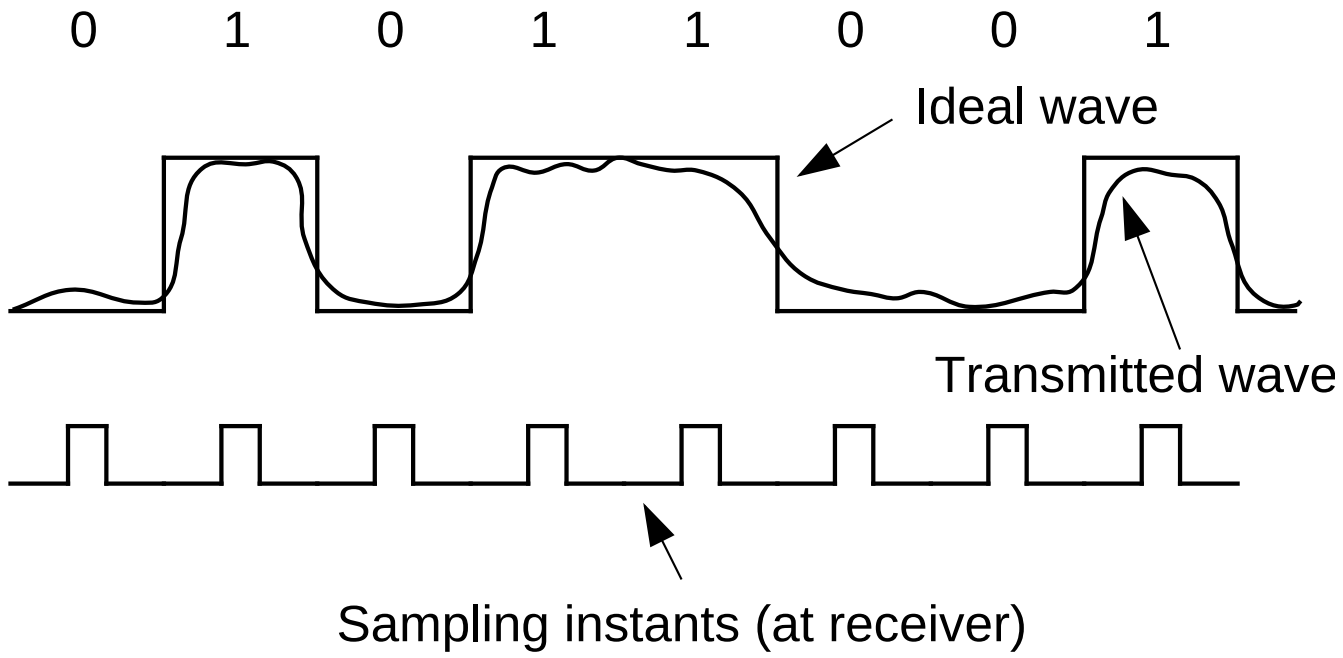
Ideal vs. Transmitted Waves



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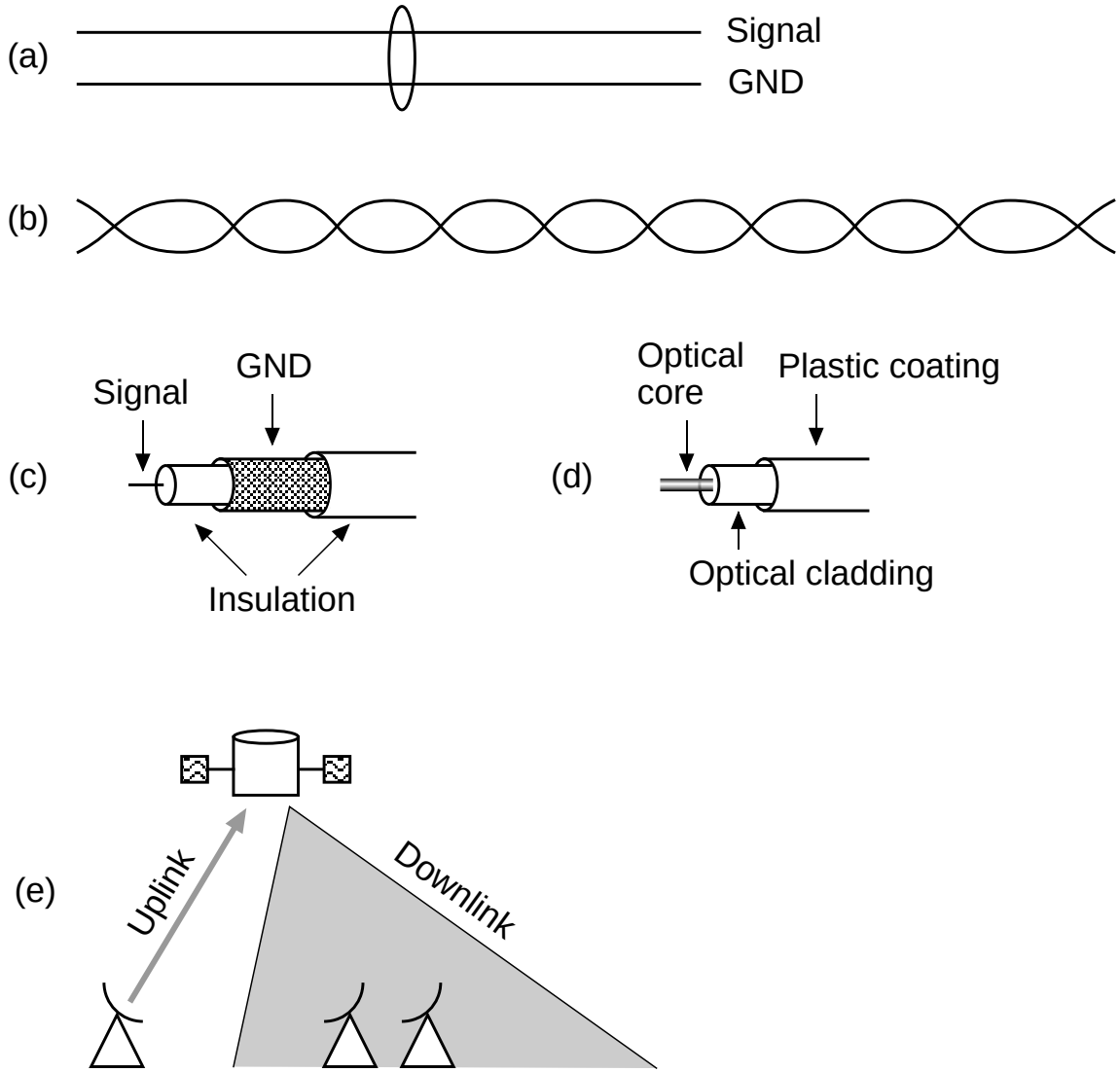
Transmission Media

- **Transmisson media. (a) Two-wire open lines; (b) twisted-pair lines; (c) coaxial cable; (d) optical fiber; (e)satellites.**



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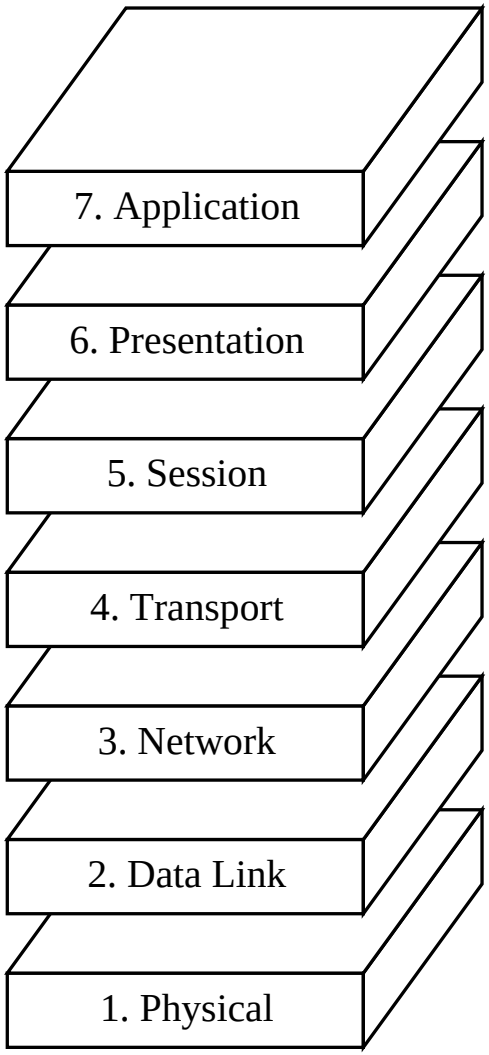
The Seven Layers of the OSI Model



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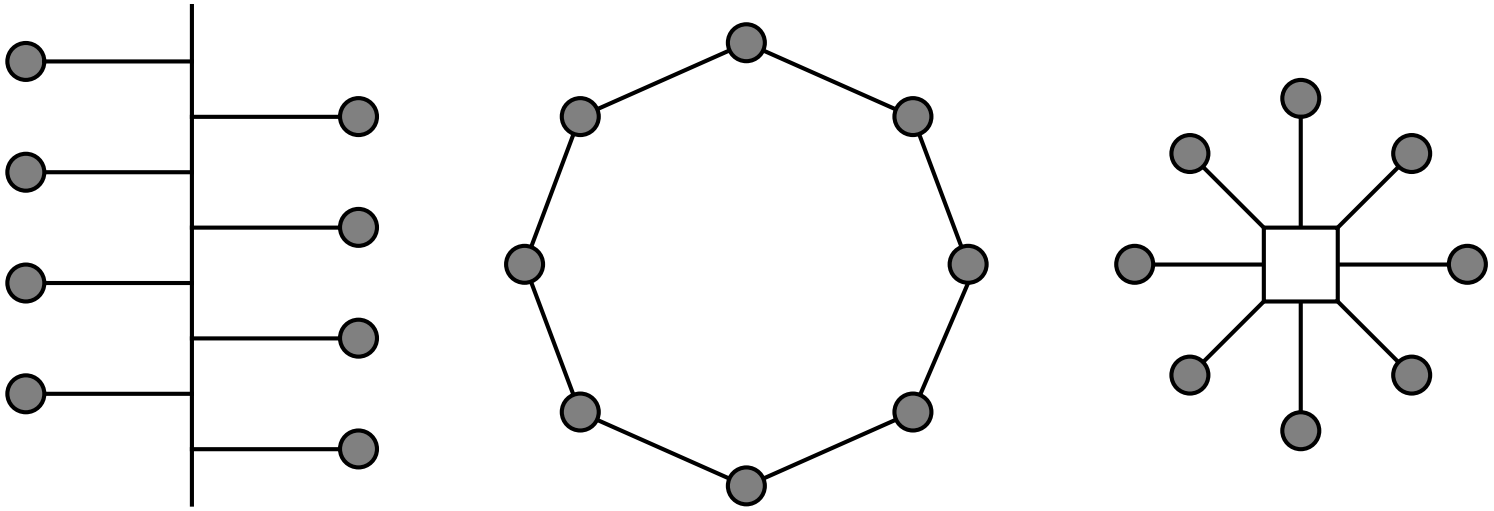
A Few Network Topologies

- **(a) Bus; (b) ring; and (c) star network topologies.**



(a) (b) (c)

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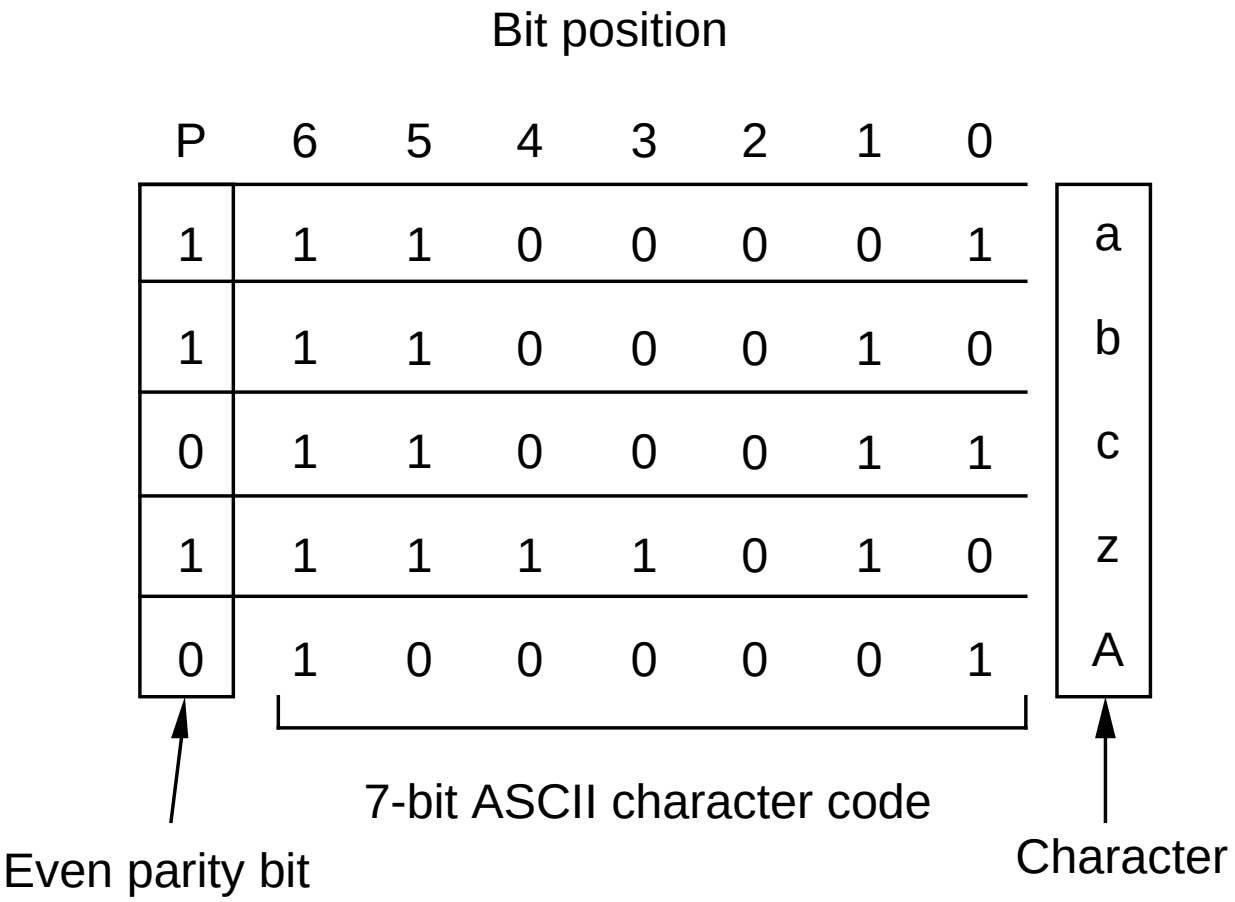
Parity

- **Even parity bits are assigned to a few ASCII characters.**



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Check Bits

- **Check bits for a single error correcting ASCII code.**

Check bits C8 C4 C2 C1	Bit position checked
0 0 0 1	1
0 0 1 0	2
0 0 1 1	3
0 1 0 0	4
0 1 0 1	5
0 1 1 0	6
0 1 1 1	7
1 0 0 0	8
1 0 0 1	9
1 0 1 0	10
1 0 1 1	11

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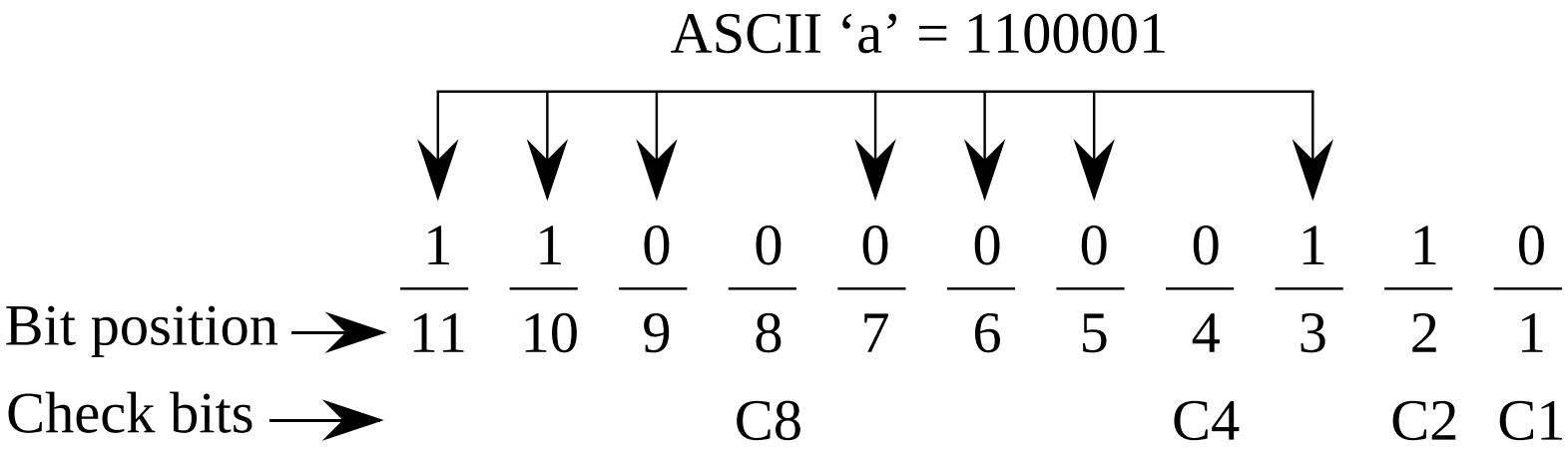
SEC coded ‘a’

- **Format for a single error correcting ASCII code.**



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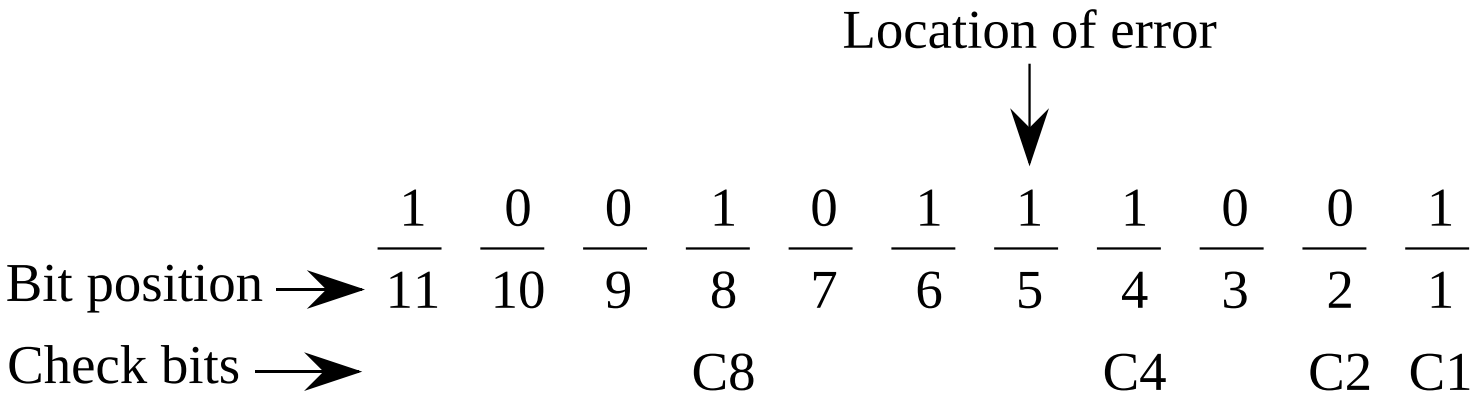
SEC Coded ‘d’

- **Parity computation for an ASCII character in an SEC code.**



		Parity
C1 checks:	1, 3, 5, 7, 9, 11	odd
C2 checks:	2, 3, 6, 7, 10, 11	even
C4 checks:	4, 5, 6, 7	odd
C8 checks:	8, 9, 10, 11	even

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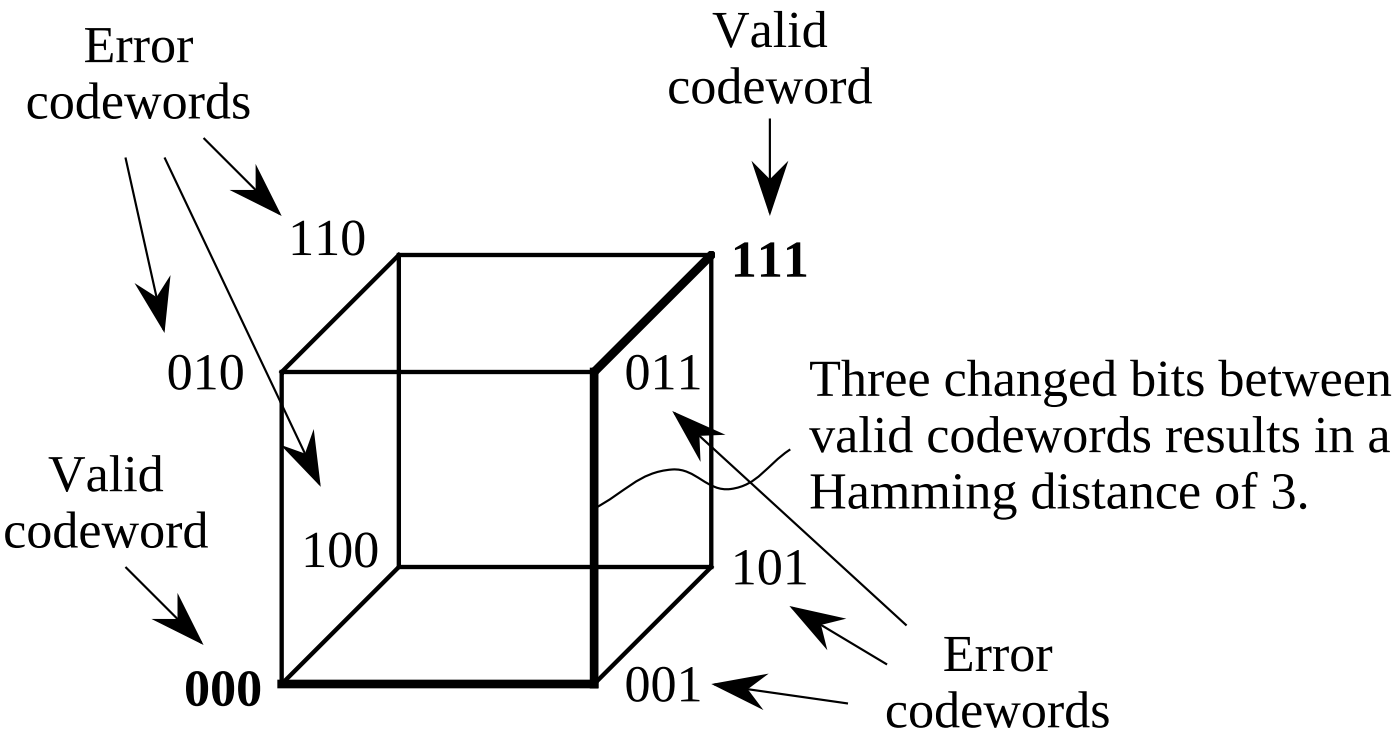
3-Bit SEC Hypercube

- **Hamming distance relationships among three-bit codewords. Valid codewords are 000 and 111. The remaining codewords represent errors.**



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LRC and VRC Checking

- **Combined LRC and VRC checking. Checksum bits form even parity for each column.**

P	*Code*	*Character*
0	1 0 0 0 0 0 1	A
0	1 0 0 0 0 1 0	B
1	1 0 0 0 0 1 1	C
0	1 0 0 0 1 0 0	D
1	1 0 0 0 1 0 1	E
1	1 0 0 0 1 1 0	F
0	1 0 0 0 1 1 1	G
0	1 0 0 1 0 0 0	H
1	0 0 0 1 0 0 0	Checksum

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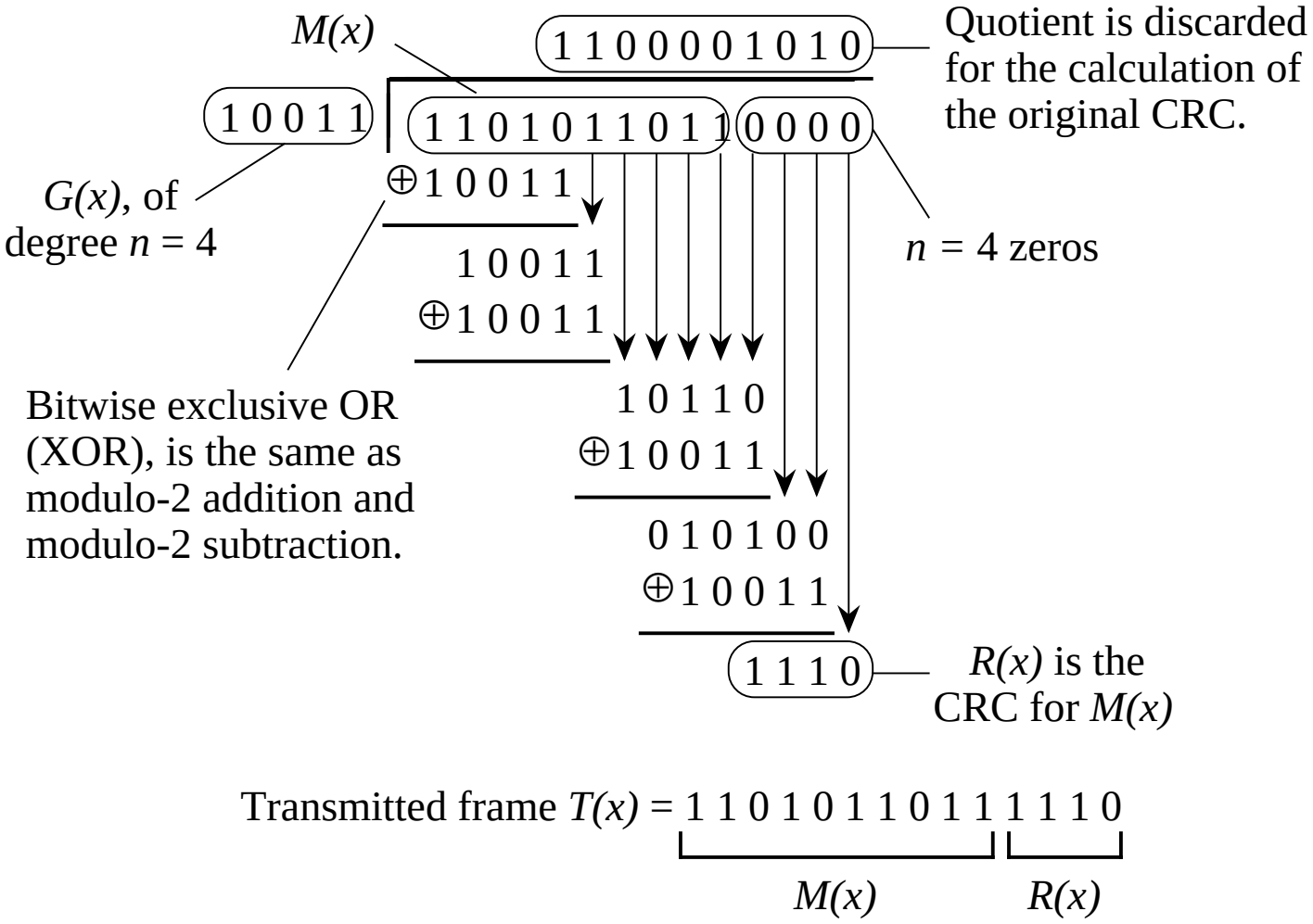
Cyclic Redundancy Checking



Transmitted frame $T(x)$ = 1 1 0 1 0 1 1 0 1 1 1 1 1 0

$M(x)$ $R(x)$

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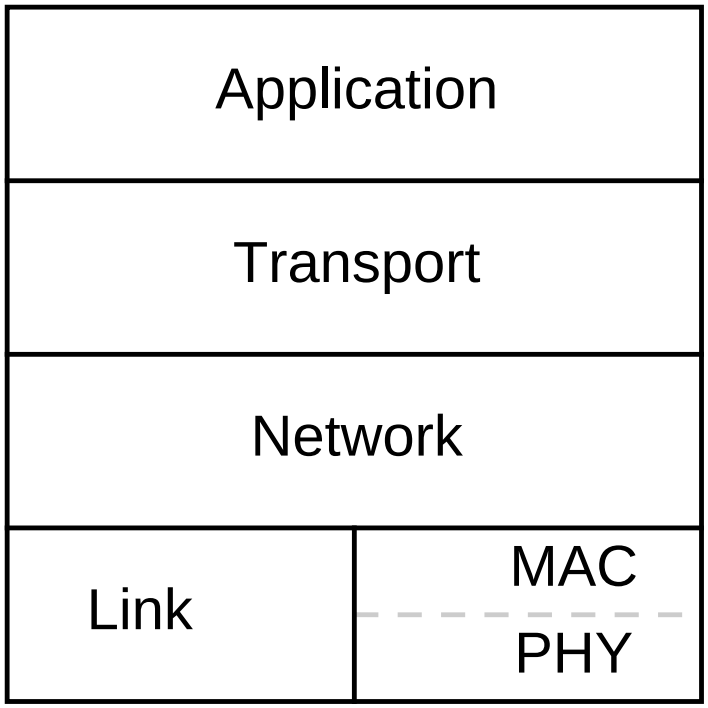
Internet Protocol Stack



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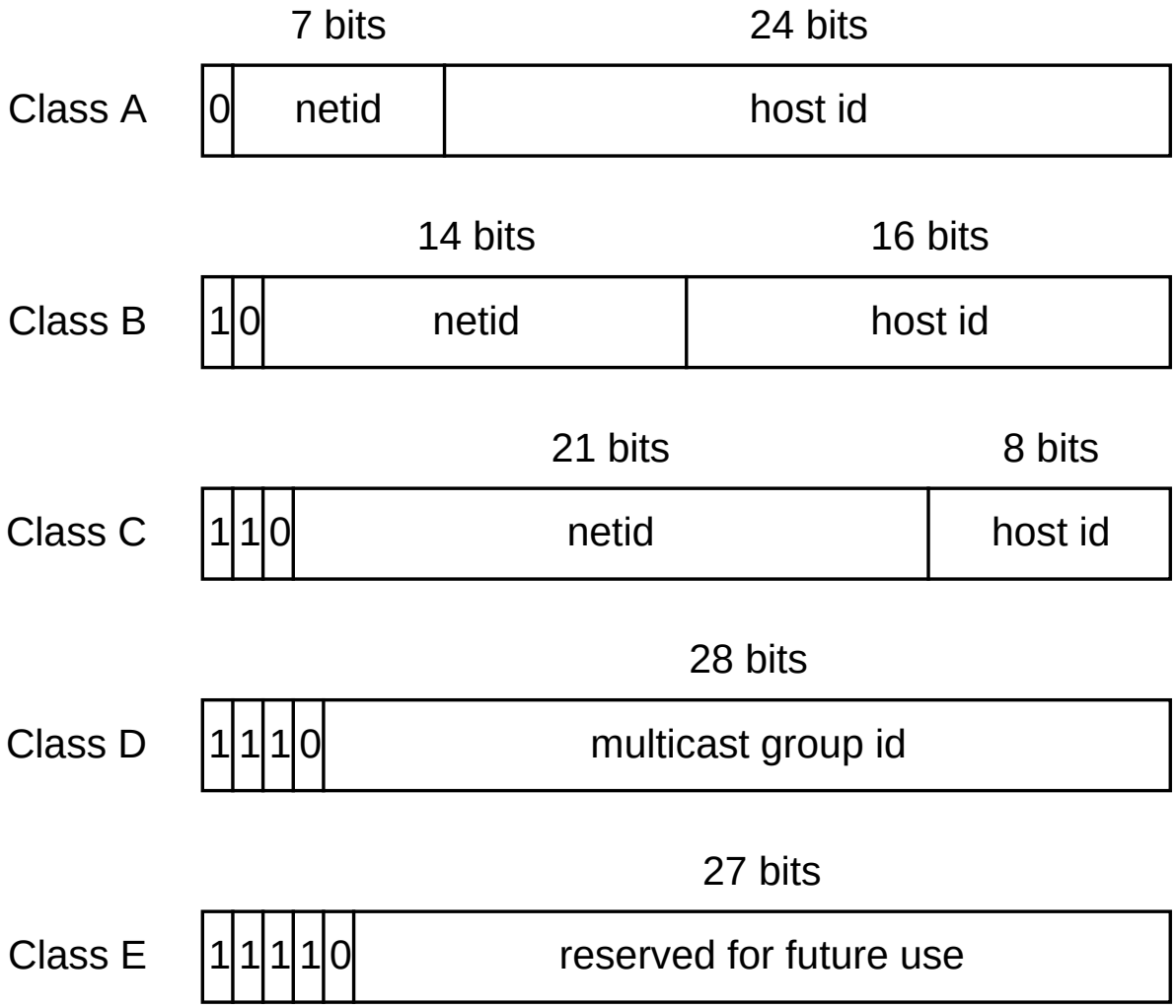
IPv4 Address Classes



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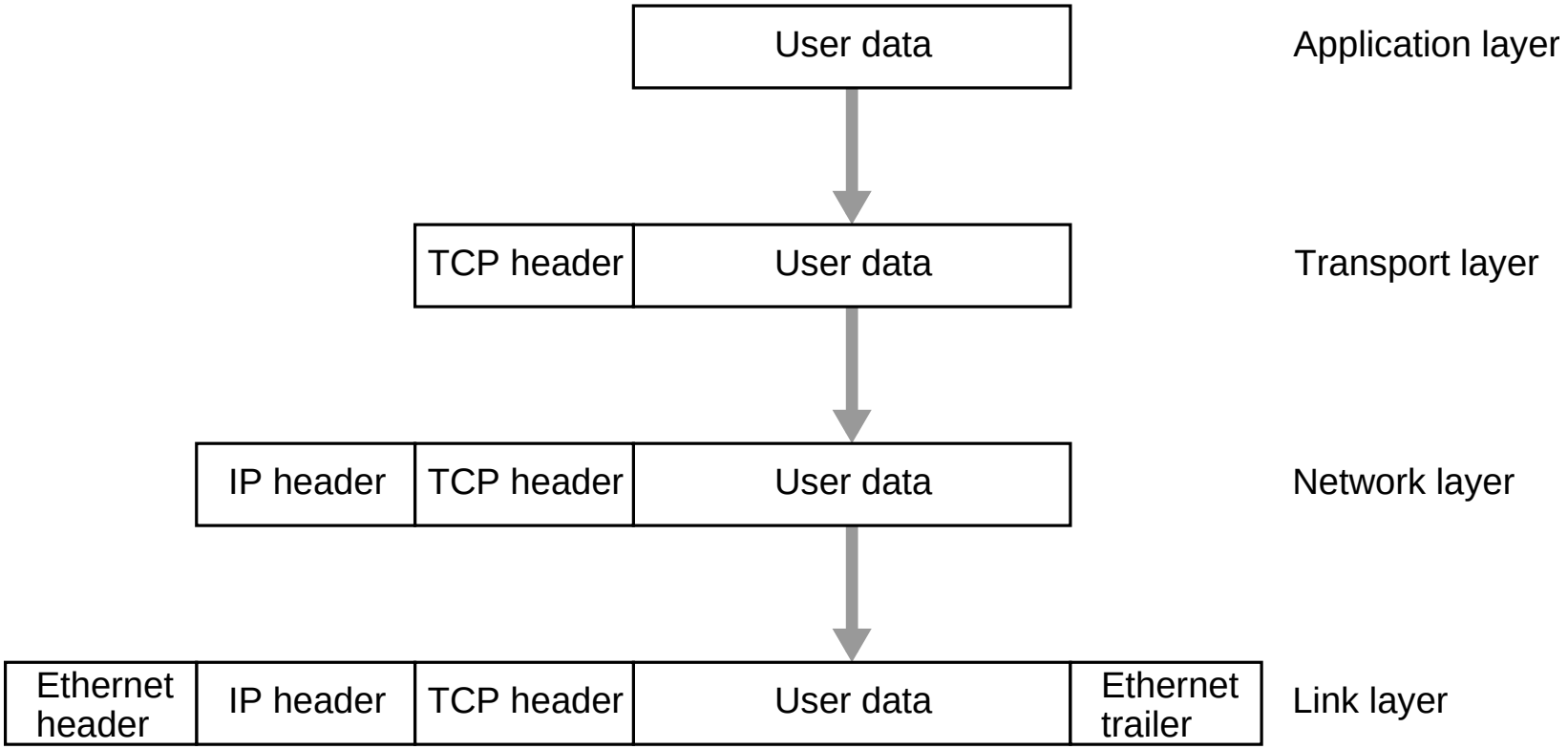
Encapsulation

- **Encapsulation in the TCP/IP protocol suite.**



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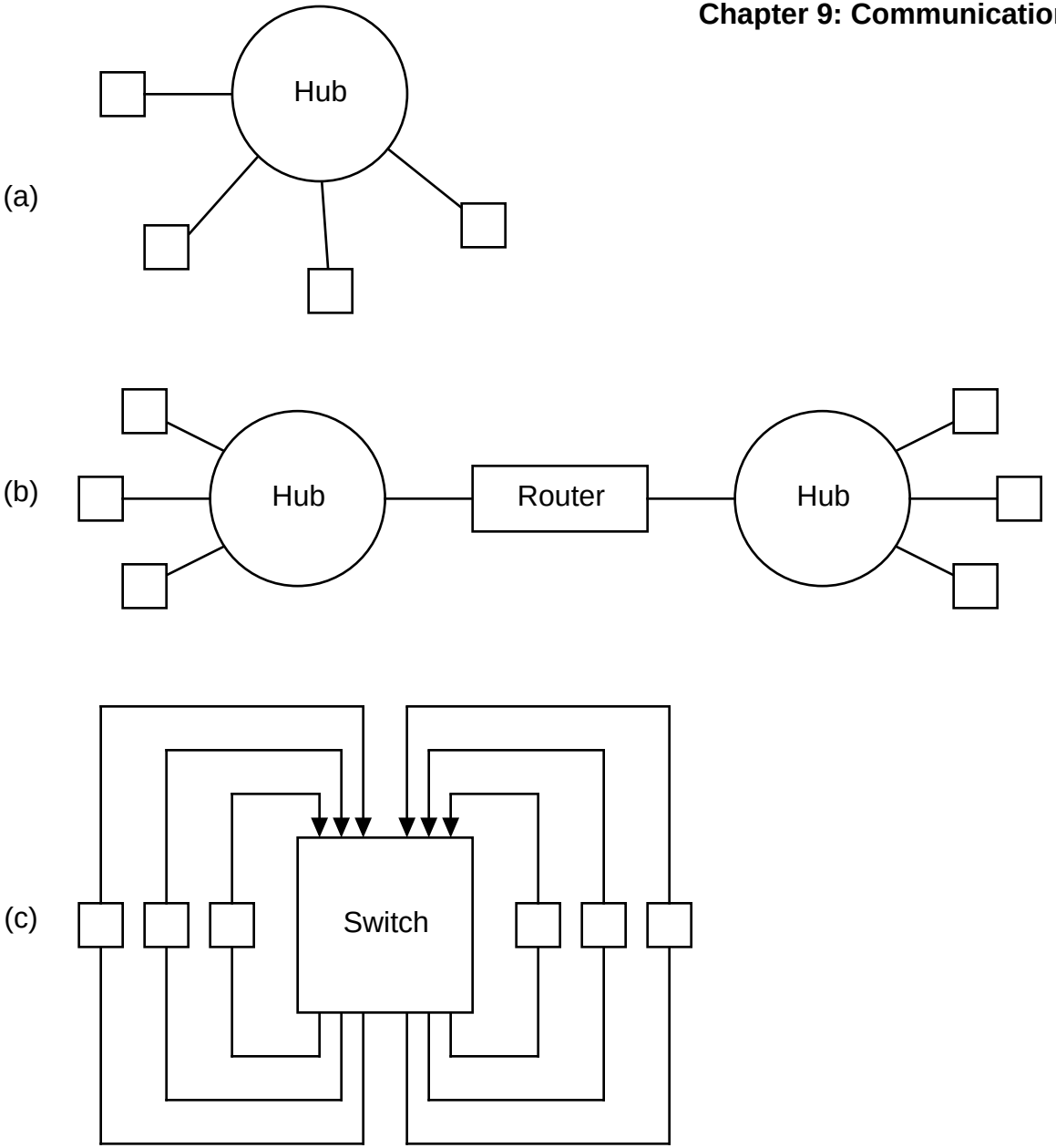
Hub vs. Router vs. Switch



- **Configurations shown for (a) a hub; (b) a router; and (c) a switch.**

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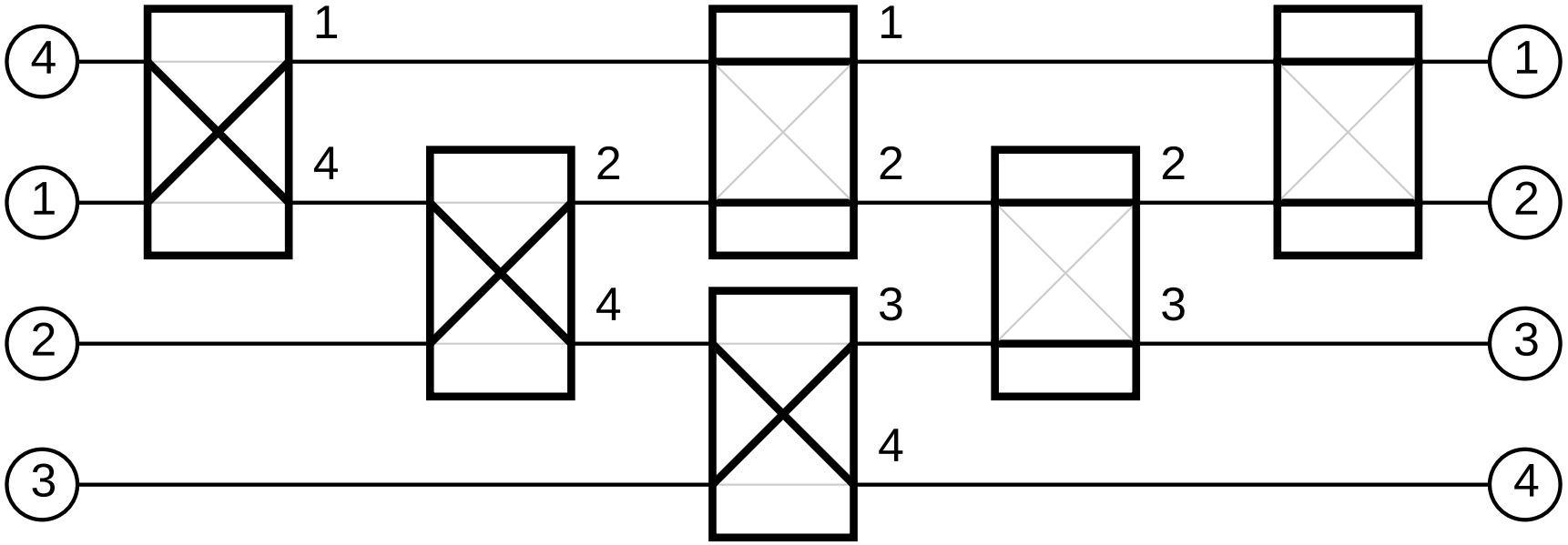
Self-Routing Switch

- **A 4×4 self-routing switch based on the bubblesort algorithm.**



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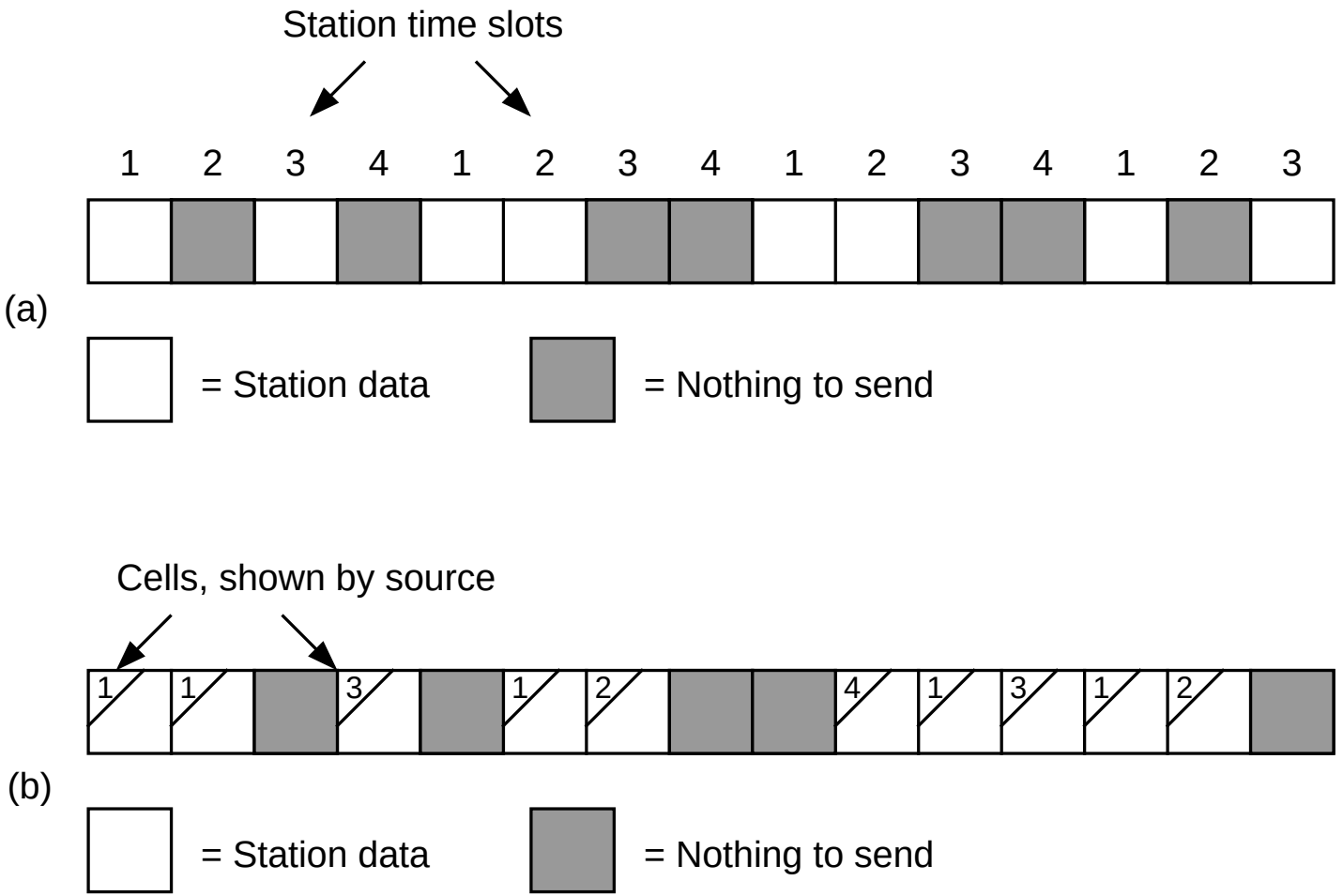
TDM vs. ATM

- **(a) Time division multiplexing vs. (b) asynchronous transfer mode.**



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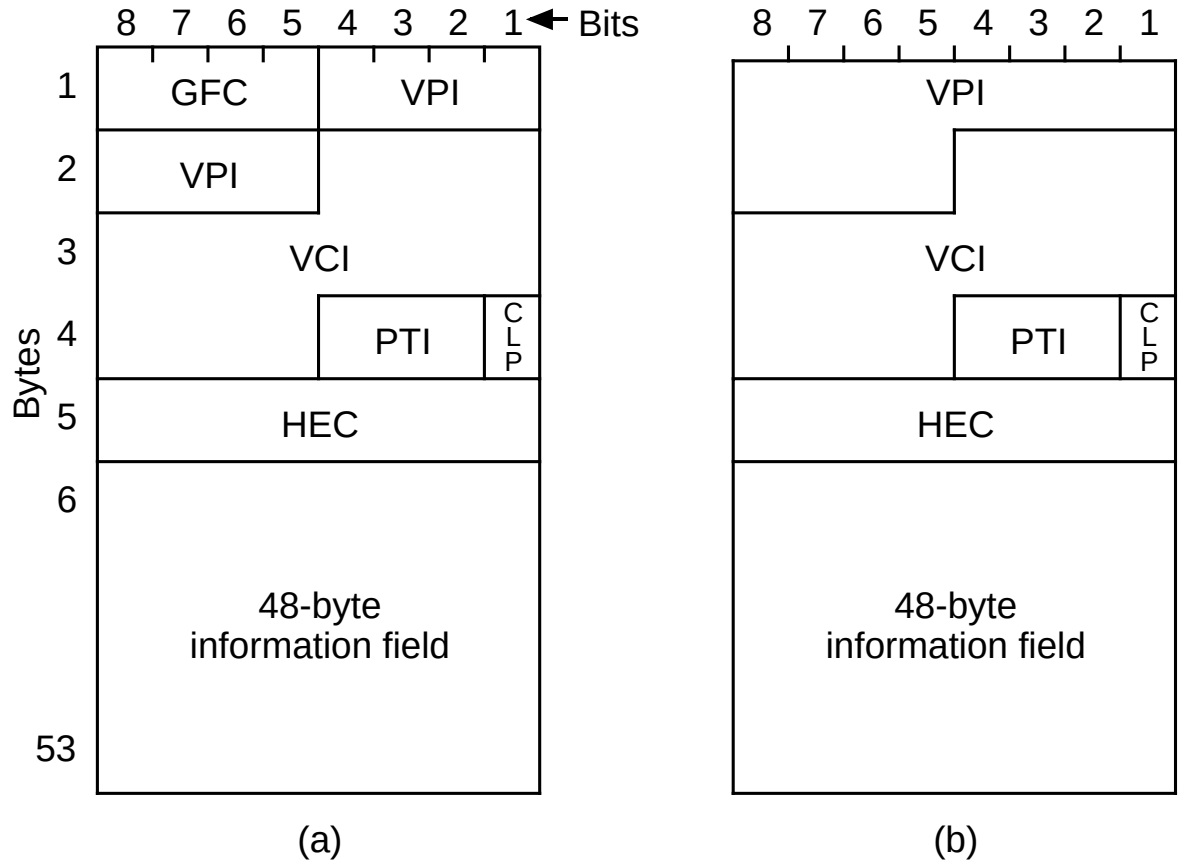
Format of an ATM Packet

- **Format of an ATM packet. (a) User-to-network interface (UNI) format; and (b) network-to-network interface (NNI) format.**



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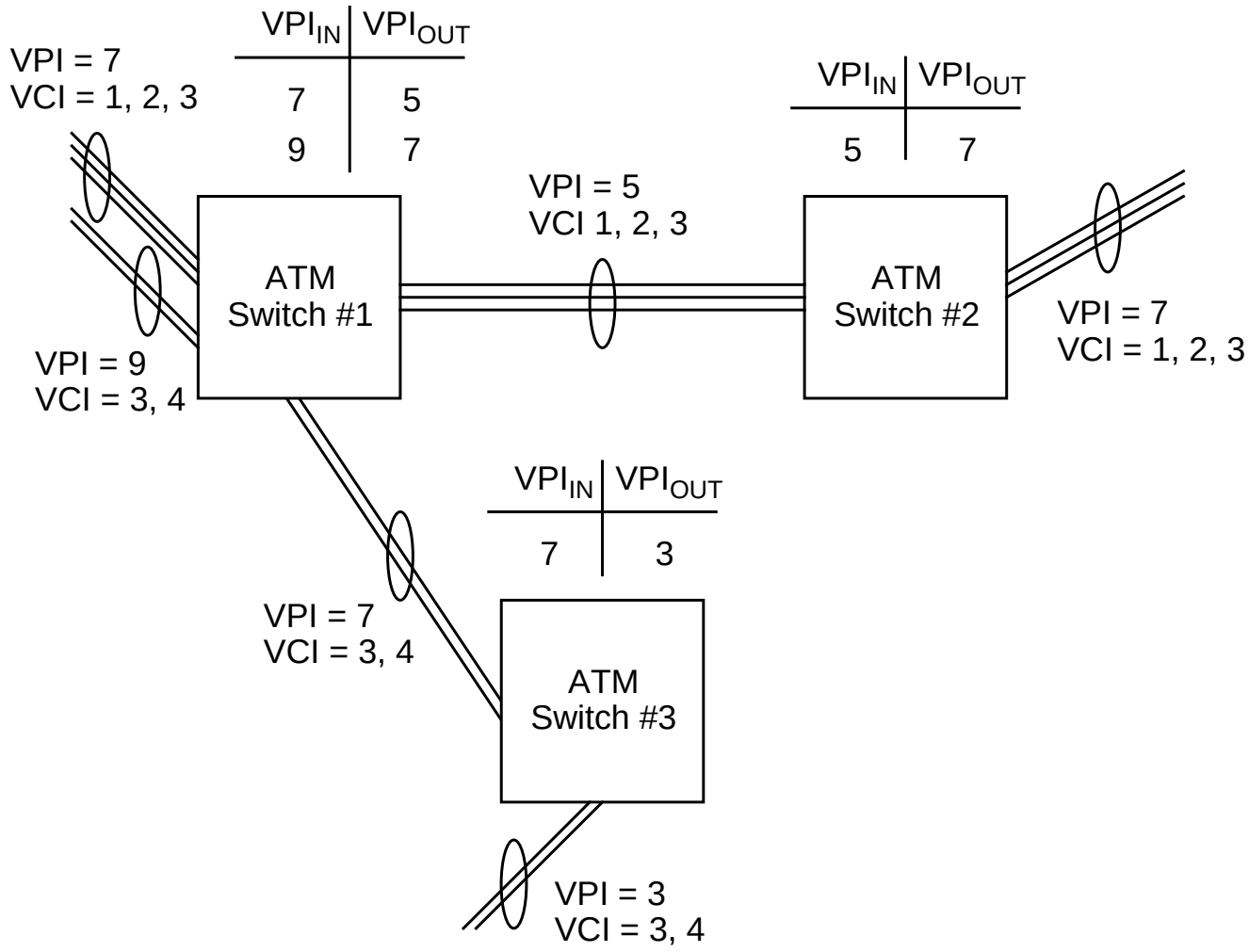
Simple ATM Network



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