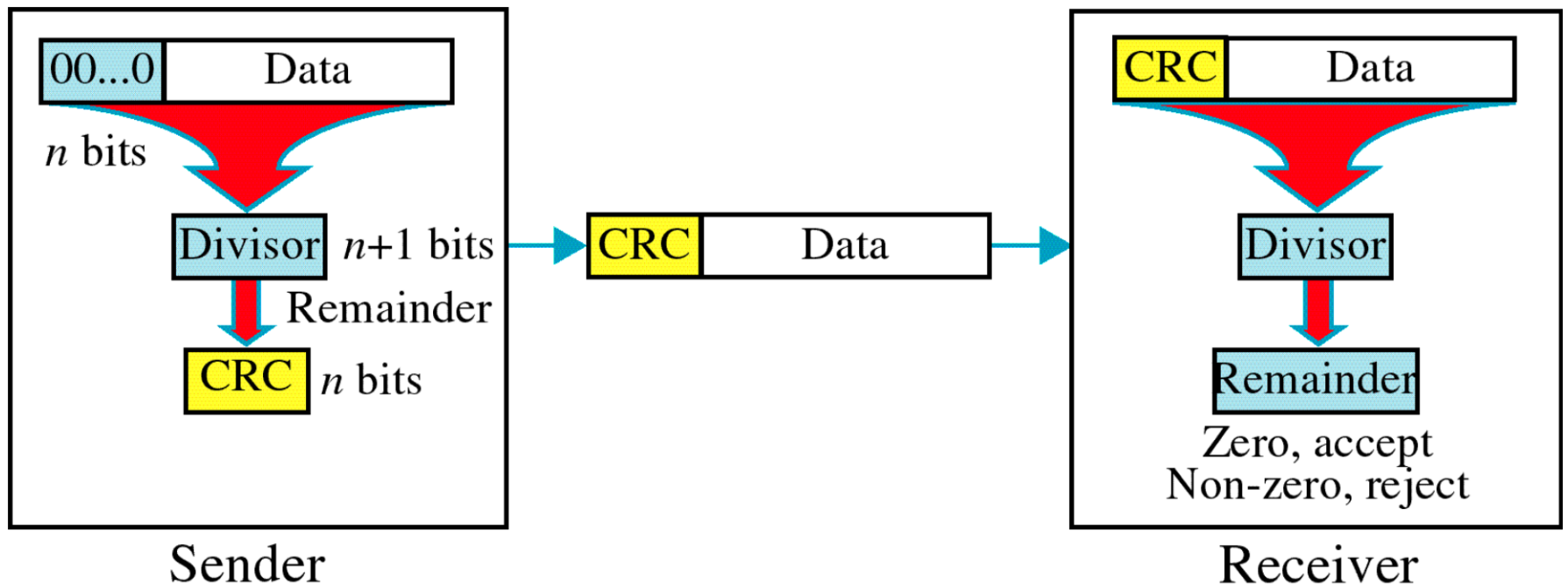
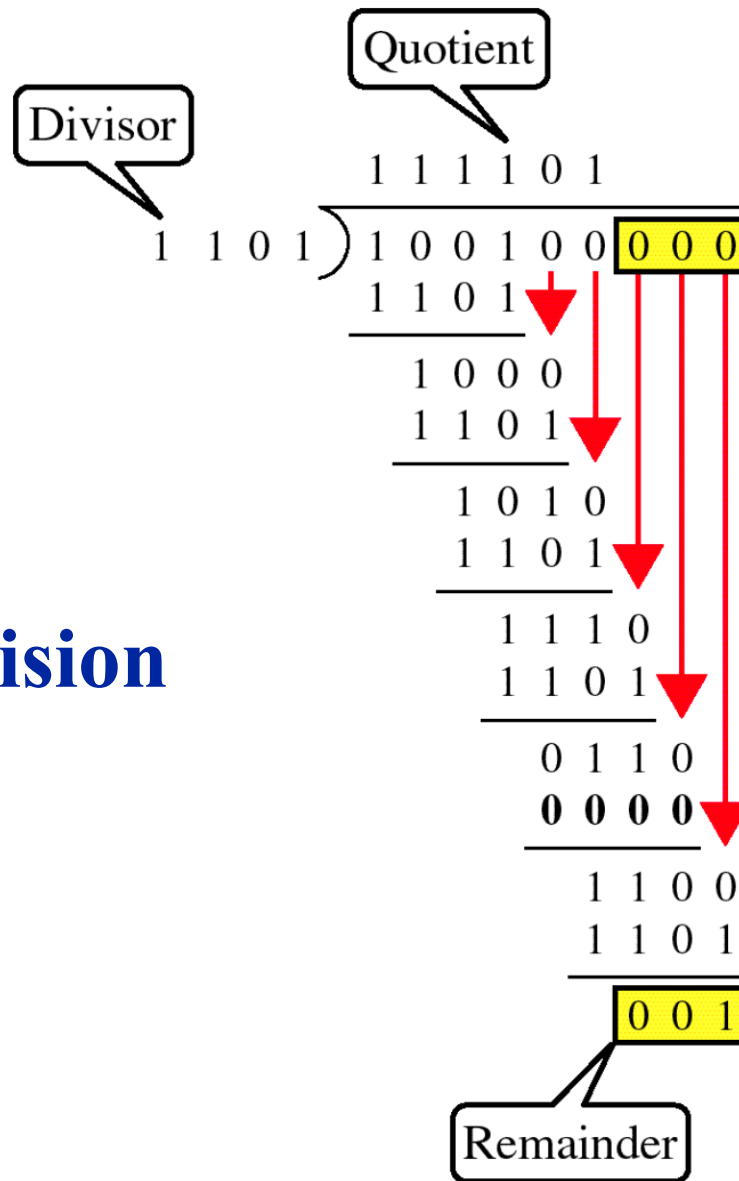


CRC



Binary Division



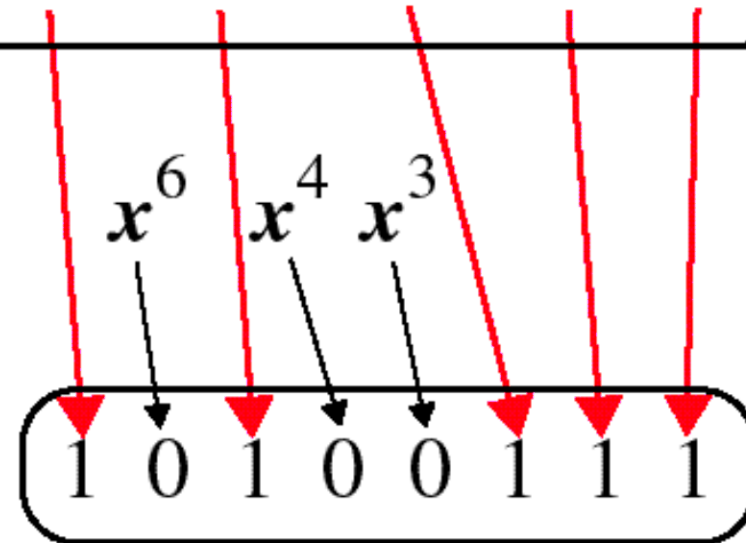
Polynomial

$$x^7 + x^5 + x^2 + x + 1$$

Polynomial and Divisor

Polynomial

$$x^7 + x^5 + x^2 + x + 1$$



Divisor

Standard Polynomials

CRC-12

$$x^{12} + x^{11} + x^3 + x + 1$$

CRC-16

$$x^{16} + x^{15} + x^2 + 1$$

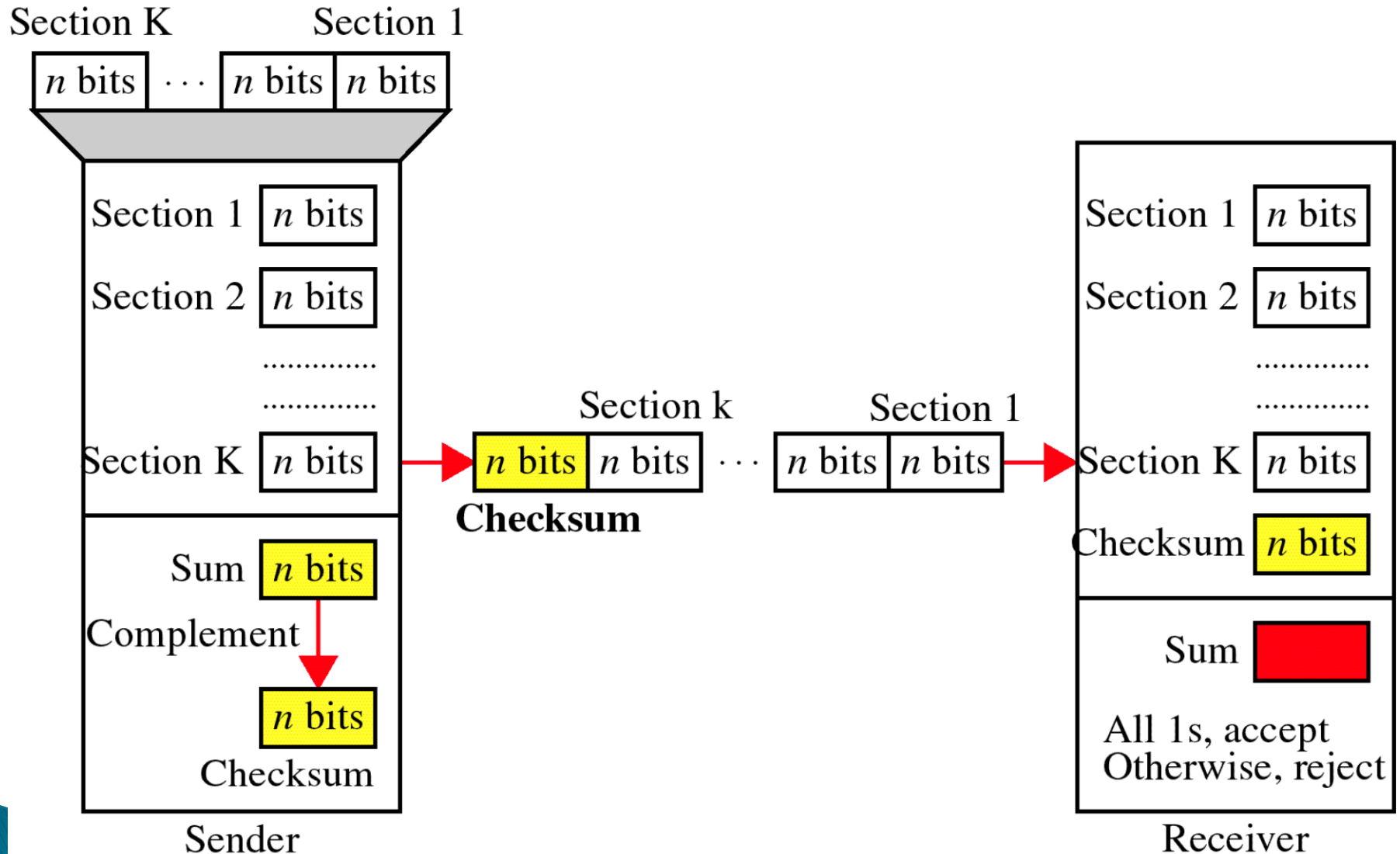
CRC-ITU

$$x^{16} + x^{12} + x^5 + 1$$

CRC-32

$$x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

Checksum

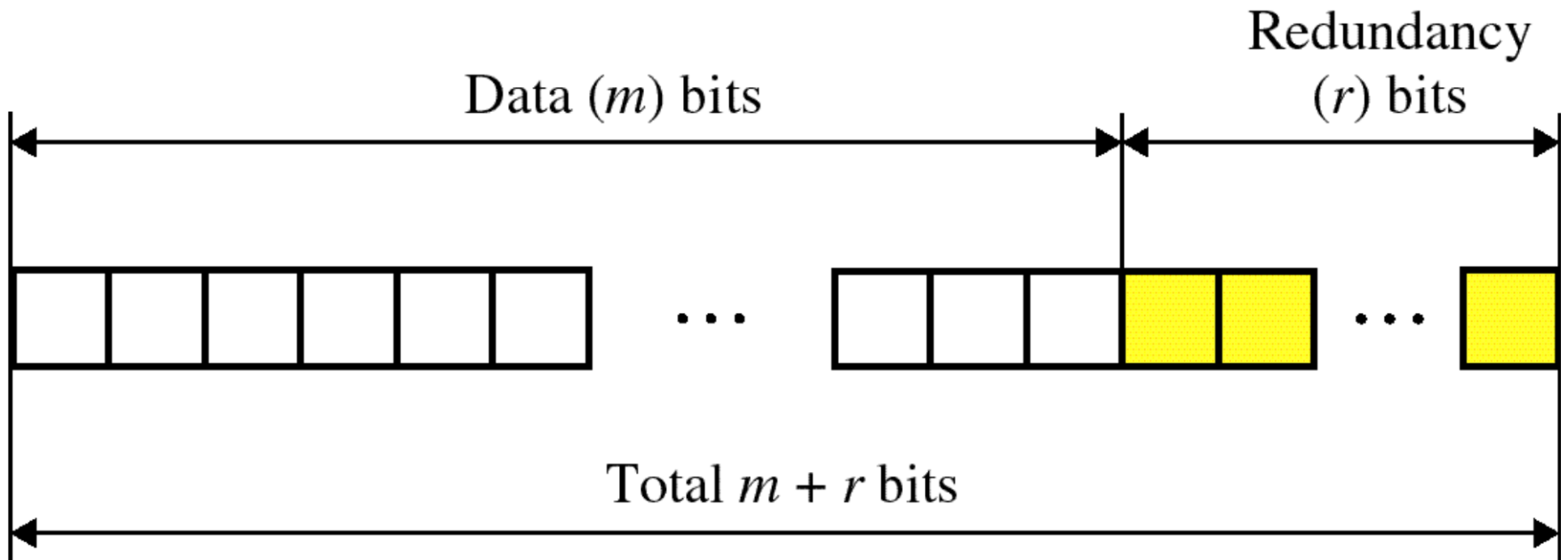


Data Unit and Checksum

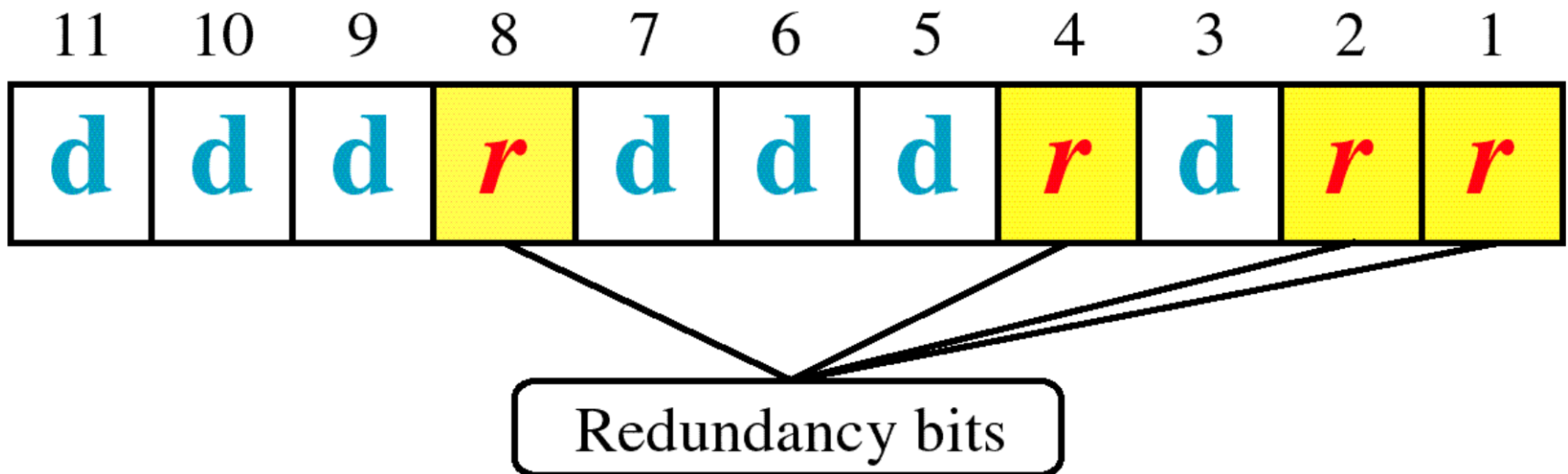
The receiver adds the data unit and the checksum field. If the result is all 1s, the data unit is accepted; otherwise it is discarded.



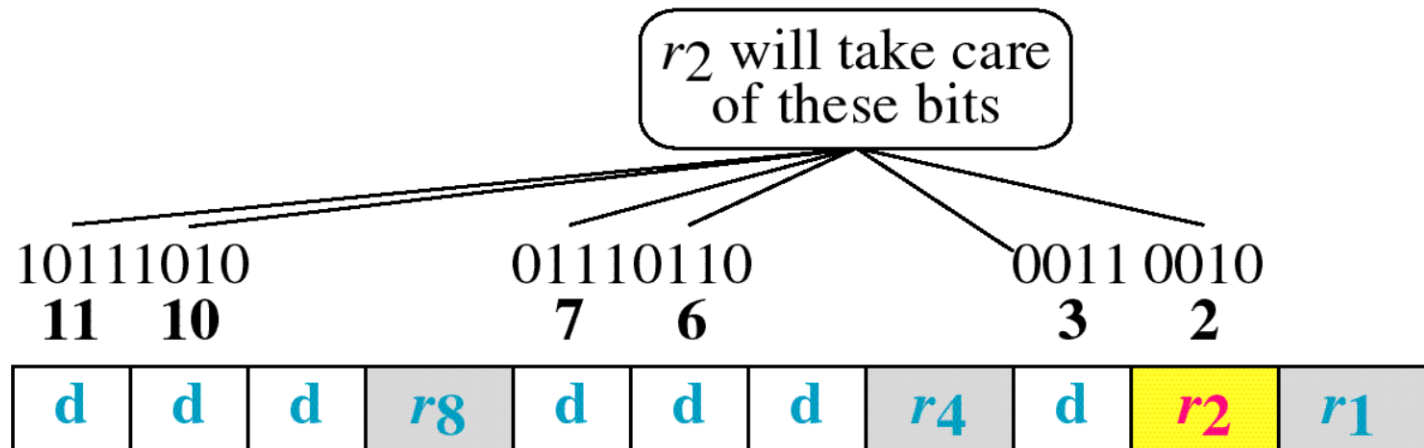
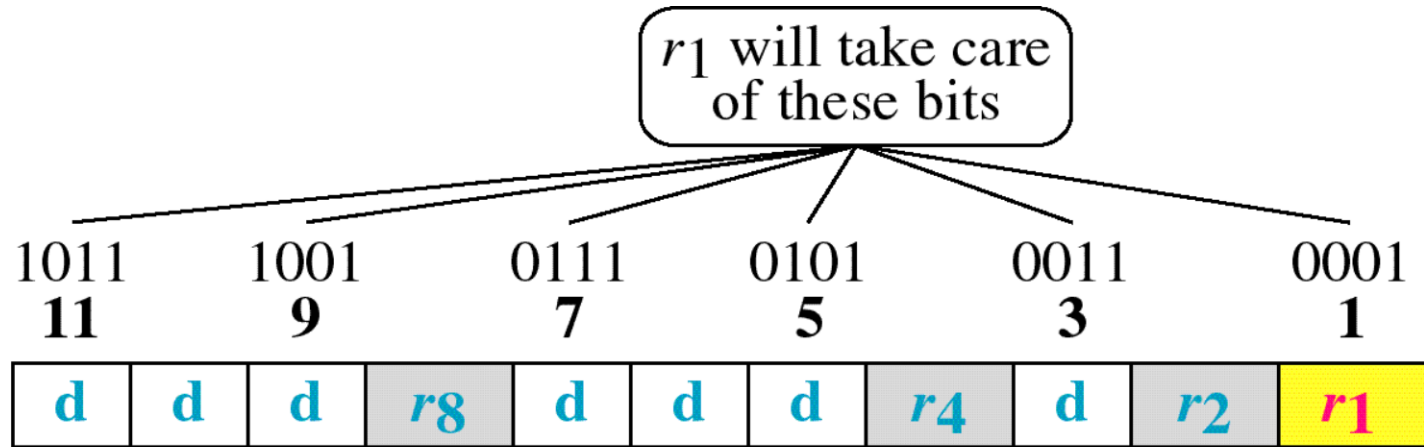
Error Correction



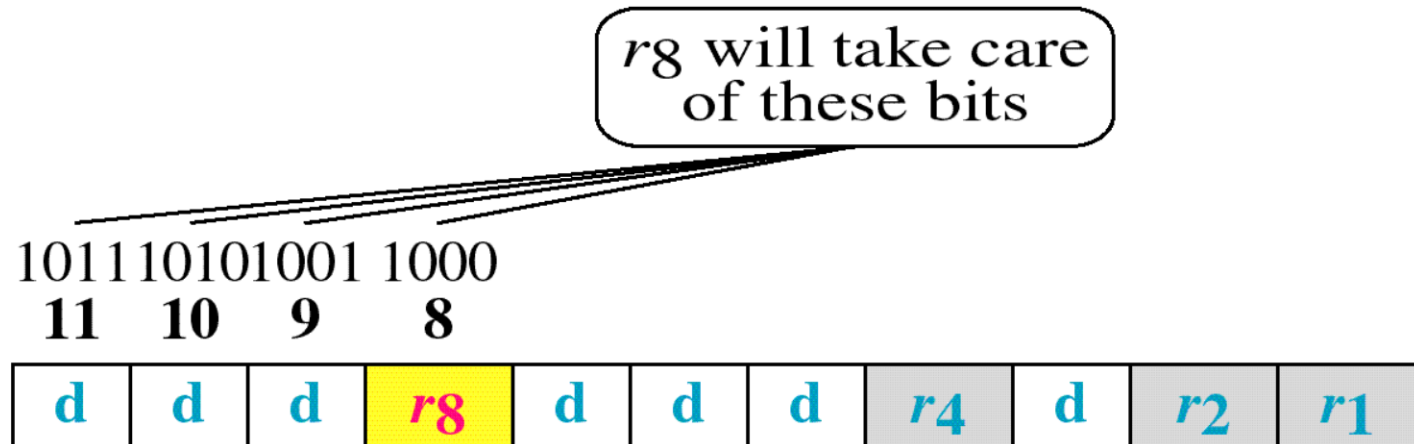
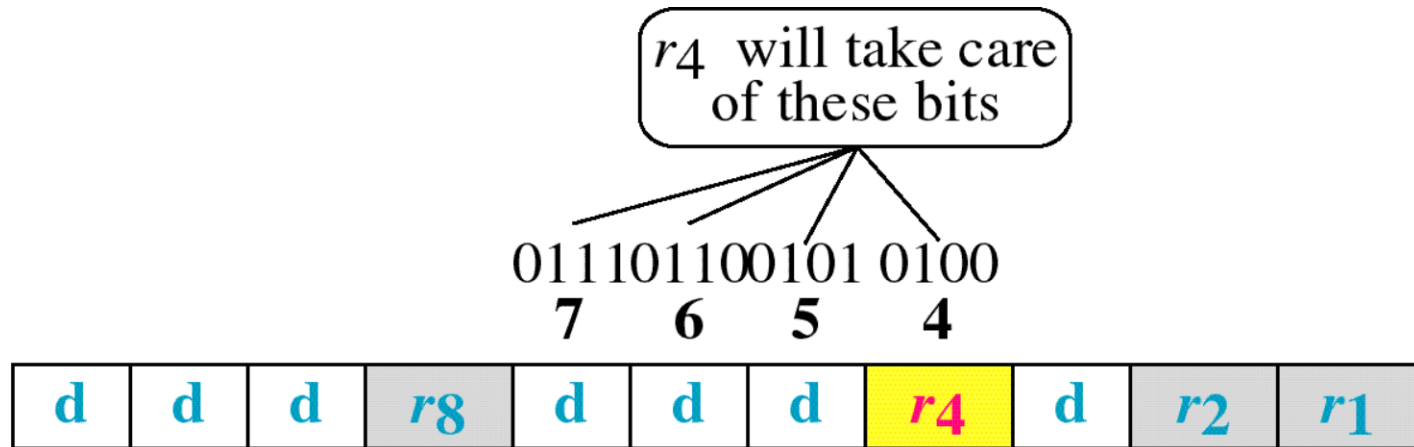
Hamming Code



Hamming Code



Hamming Code



Example of Hamming Code

Data: 1 0 0 1 1 0 1



Data

1	0	0		1	1	0		1		
---	---	---	--	---	---	---	--	---	--	--

Adding r_1

1	0	0		1	1	0		1		1
---	---	---	--	---	---	---	--	---	--	---

Adding r_2

1	0	0		1	1	0		1	0	1
---	---	---	--	---	---	---	--	---	---	---

Adding r_4

1	0	0		1	1	0	0	1	0	1
---	---	---	--	---	---	---	---	---	---	---

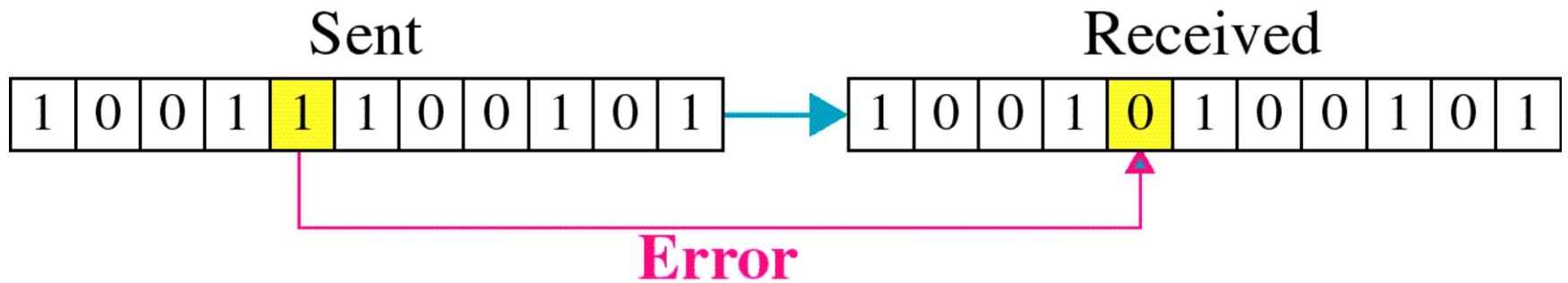
Adding r_8

1	0	0	1	1	1	0	0	1	0	1
---	---	---	---	---	---	---	---	---	---	---



Code: 1 0 0 1 1 1 0 0 1 0 1

Single-bit error



Error Detection

