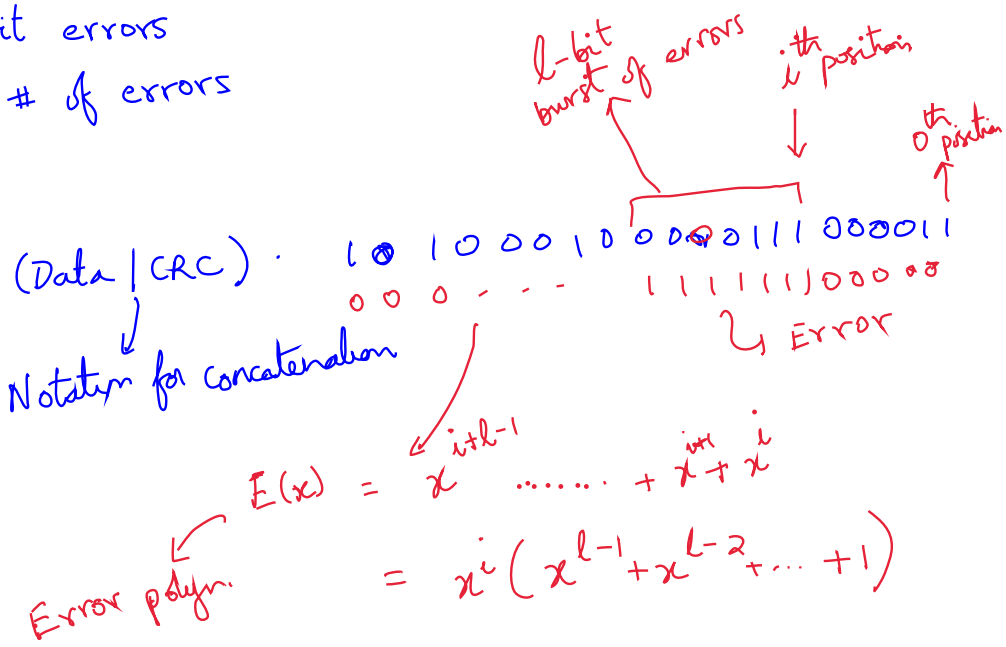
CRC , ARQ

C(x)
- a) Single-bit errors
- b) 2-bit errors
- c) Odd # of errors
- d) Burst of errors



$C(x) = x^k + \underbrace{\cdots\cdots}_{\text{anything here}} + 1$

Is $E(x)$ divisible by $C(x)$? ? Div. by $C(x)$?

$$\frac{E(x)}{C(x)} = \frac{x^i \left(x^{l-1} + x^{l-2} + \cdots + 1 \right)}{x^k + \underbrace{\cdots\cdots}_{\text{ends with 1}} + 1}$$

no factor x^p for any 'p'

If $l-1 < k$, then $C(x)$ cannot divide $x^{l-1} + x^{l-2} + \cdots + 1$

$(x^k + \cdots + 1) \cdot (\underbrace{\cdots}_{\text{power of } k \text{ or higher}}) \stackrel{?}{=} x^{l-1} + x^{l-2} + \cdots + 1$

Hence bursts of length $l < k+1$ will be detected

ARQ: Automatic Repeat request

RELIABILITY

WIFI uses ARQ

(SEGMENT) App.

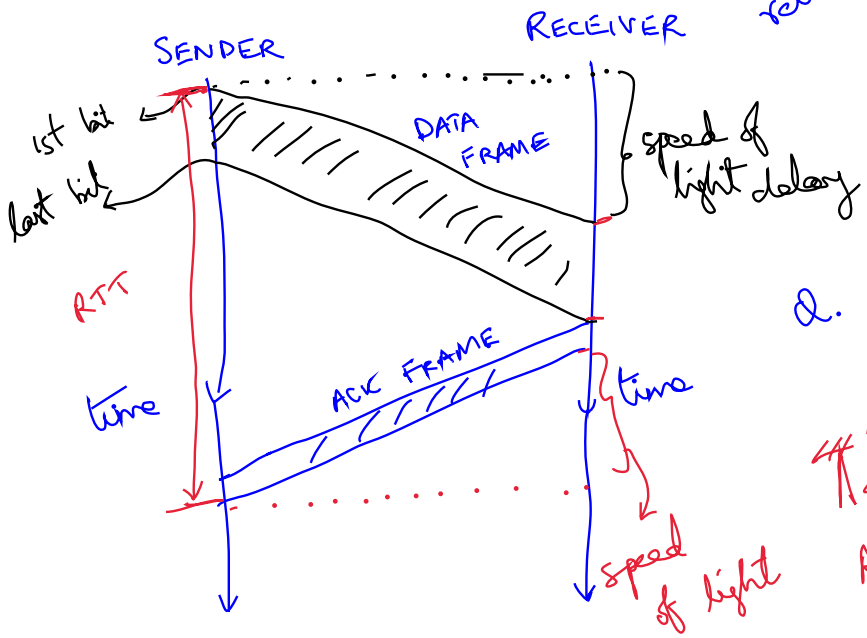
TCP ← Trans.

Network → PACKET

← DLL → FRAME

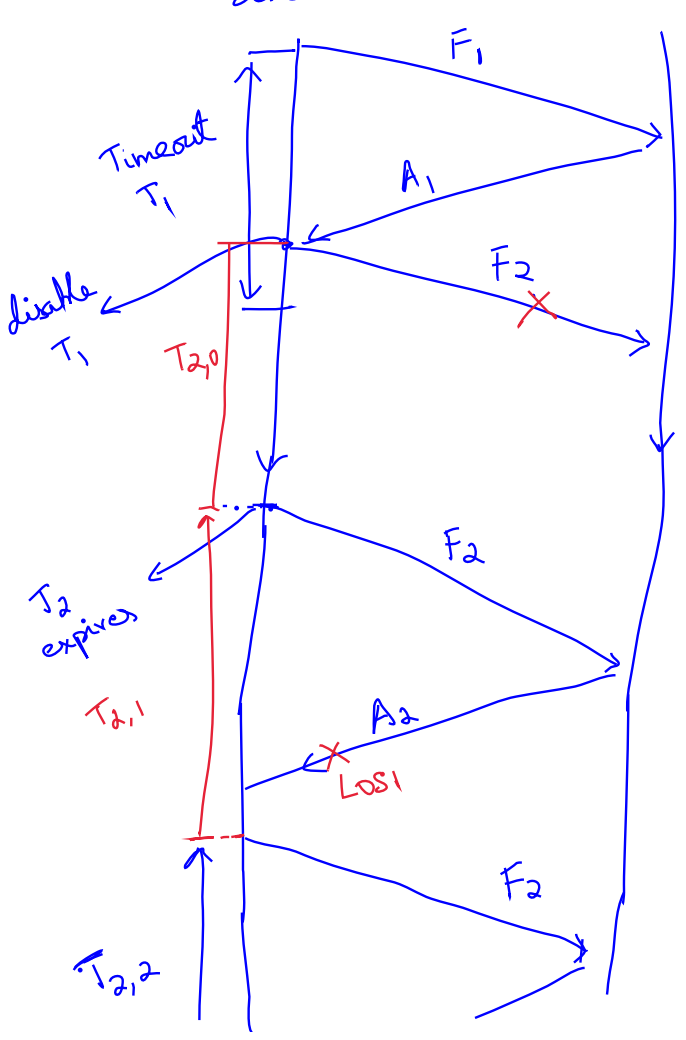
PHY

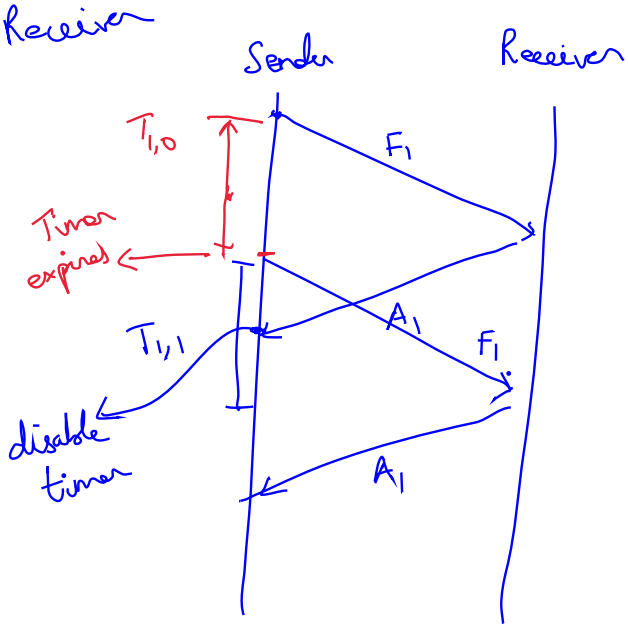
handles reliability

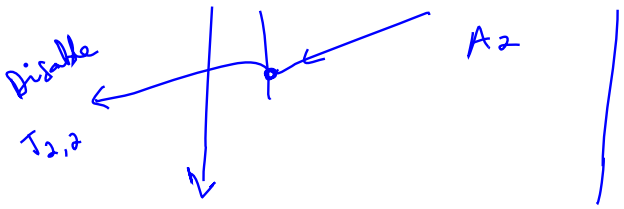


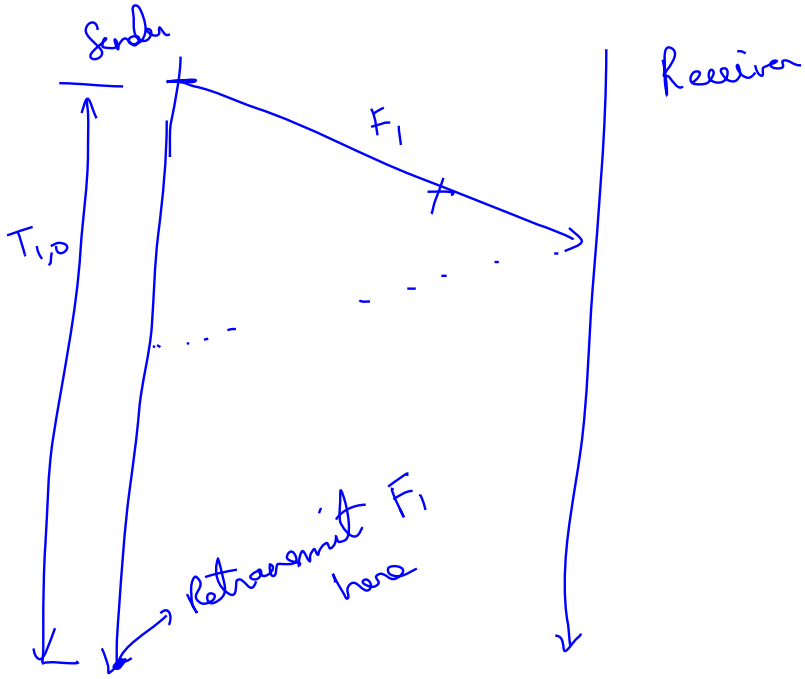
Q. How long to wait for ACK

$3 \times 10^8 \ m\,s^{-1}$



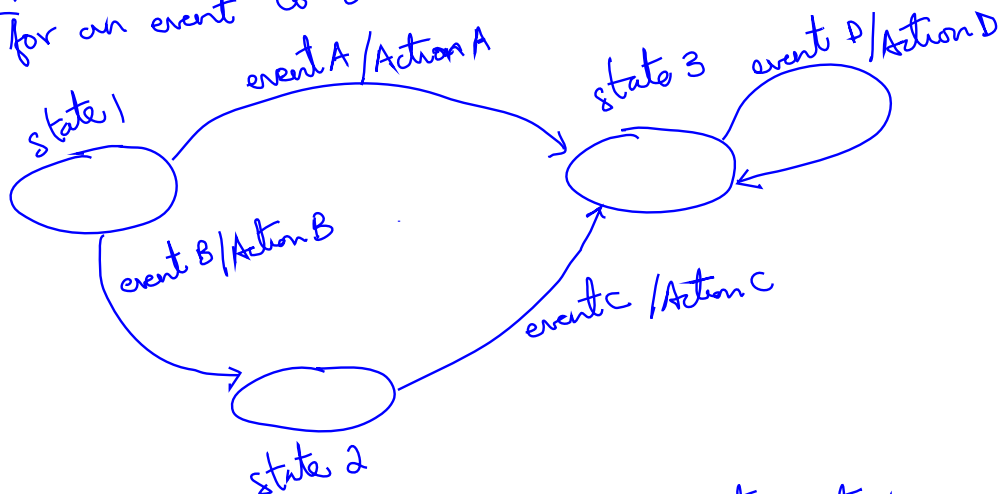




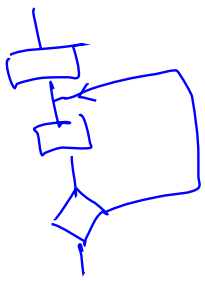


STATE-DIAGRAMS

State: Wait for an event to occur



Event / Action Draw Flow chart to express action steps



State diagram at Sender for ARQ (DLL)