



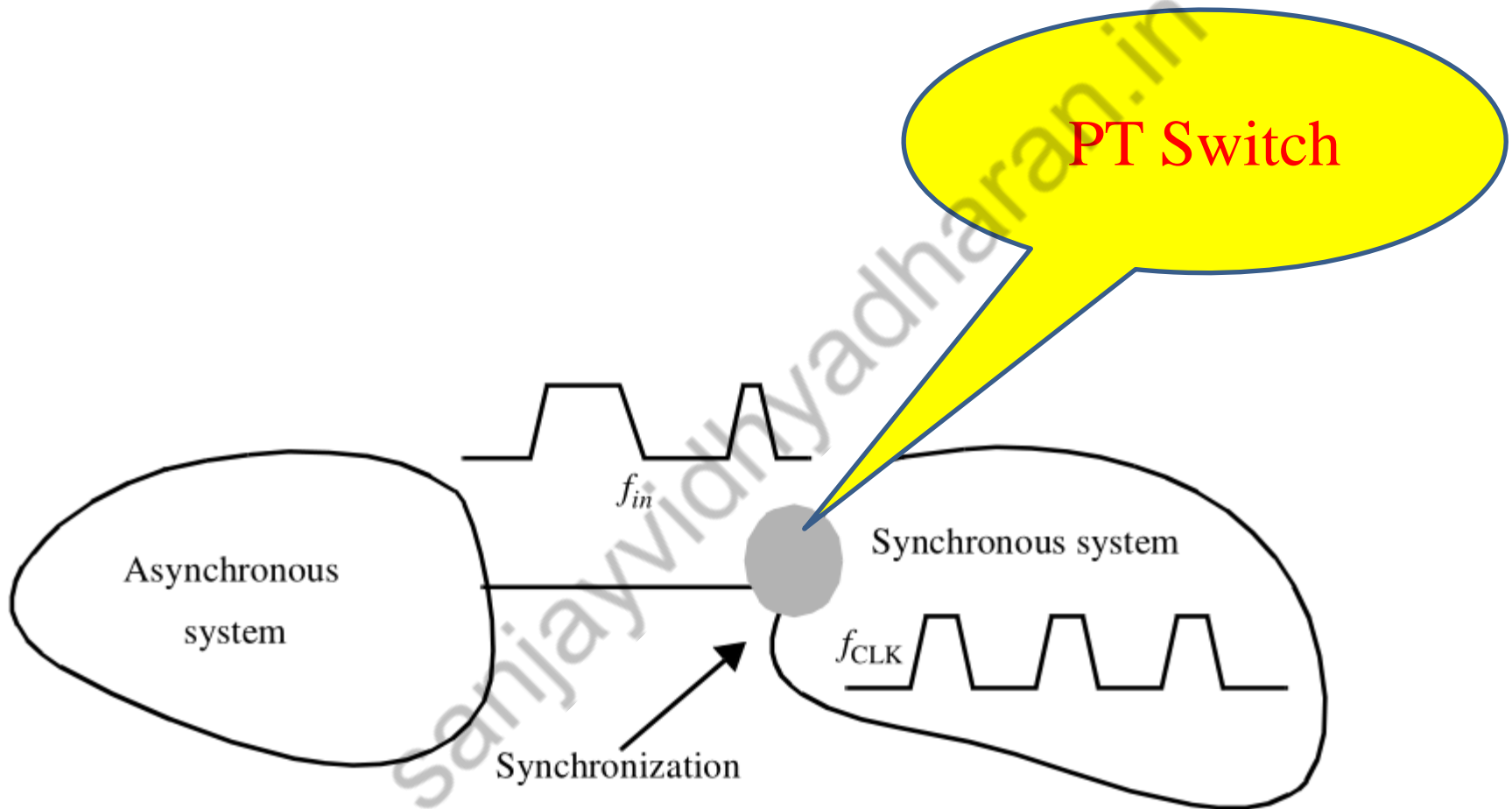
Advanced VLSI Design: 2021-22

Lecture 7

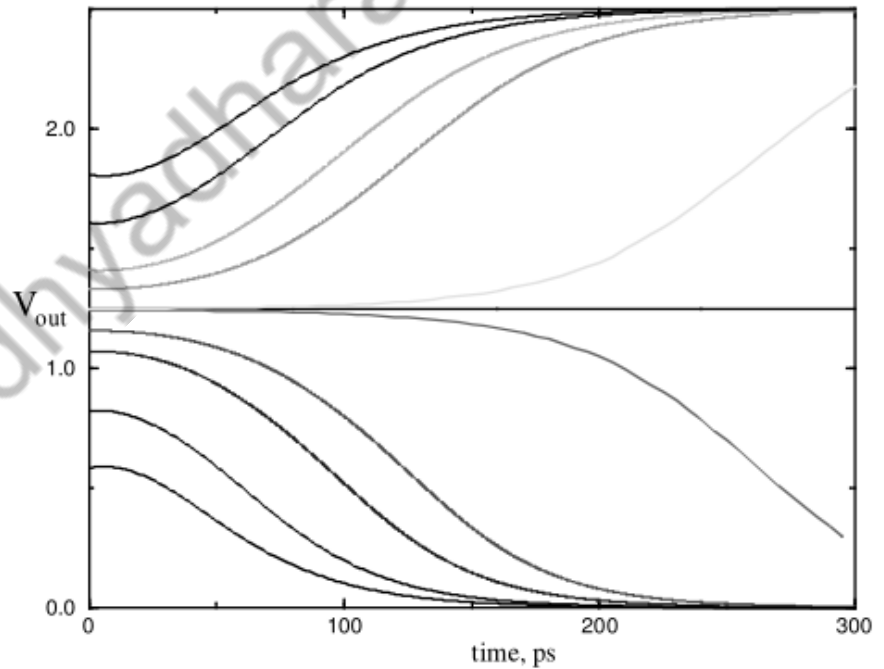
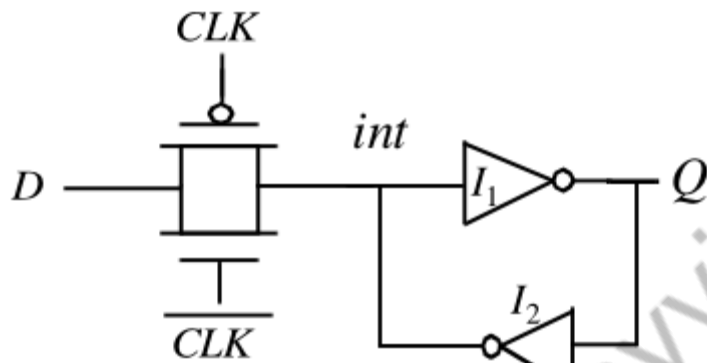
Interfacing Circuits – Part-1 Synchronizer and Arbiters

By Dr. Sanjay Vidhyadharan

Synchronizer

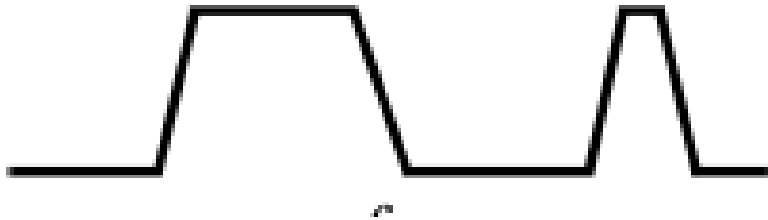


Synchronizer



Synchronizer

$$V_{MS} - (V_{MS} - V_{IL})e^{-T/\tau} \leq v(0) \leq V_{MS} + (V_{IH} - V_{MS})e^{-T/\tau}$$



$$\text{For } T = 0, \quad \text{Range} = V_{IH} - V_{IL}$$

$$\text{For } T = 2\tau, \quad \text{Range} = (V_{IH} - V_{IL}) e^{-2}$$

$$\text{For } T = 4\tau, \quad \text{Range} = (V_{IH} - V_{IL}) e^{-4}$$

Synchronizer

V_{in} is a periodical waveform with an average period T signal between transitions and with identical rise and fall times t_r .



$$P_{init} = \frac{\left(\frac{V_{IH} - V_{IL}}{V_{swing}}\right) t_r}{T_{signal}}$$

Average synchronization errors per second with no synchronizer

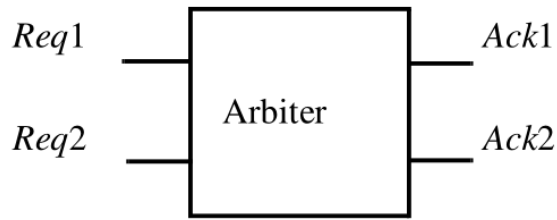
$$N_{sync}(0) = \frac{P_{init}}{T_\phi}$$

Average synchronization errors per second with synchronizer

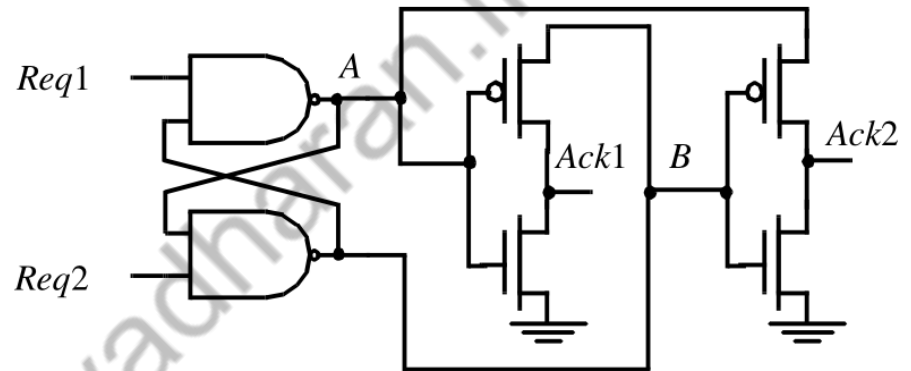
$$N_{sync}(T) = \frac{P_{init} e^{-T/\tau}}{T_\phi} = \frac{(V_{IH} - V_{IL}) e^{-T/\tau}}{V_{swing}} \frac{t_r}{T_{signal} T_\phi} \text{ errors/sec}$$

$$\text{Mean time-to-failure (MTF)} = 1/N_{syn}(T)$$

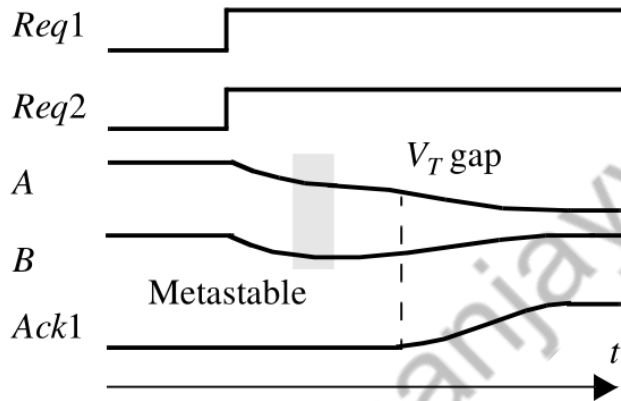
Arbiters



(a) Schematic symbol



(b) Implementation



(c) Timing diagram

Thank you