



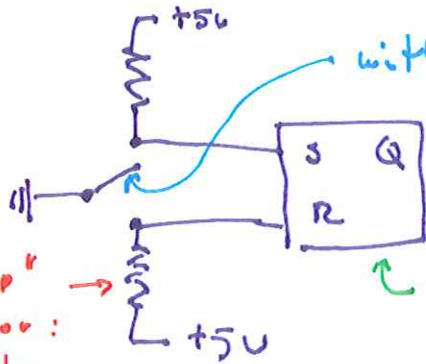


switch bounce: mechanical switches do not make clean connections. When a switch like this  is closed there will be a sequence of touch/release events. If an output looks like this  it will make a poor clock.

Needed: switch debouncing i.e. circuit that converts  to 



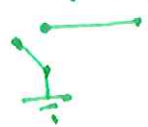
with switch in this position S & R

both H: a hold state
on connection S or R will go L

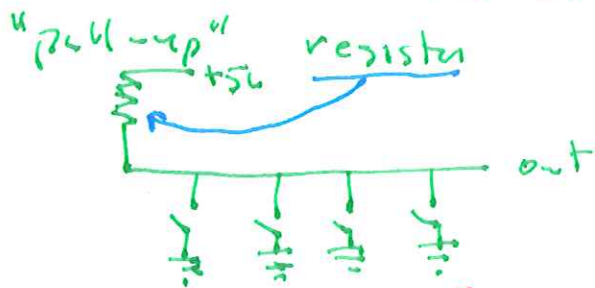
active low SRFF

"pull up" resistor: converts disconnect to +5V

Bus: a communication system between multiple sources & multiple listeners — clearly only one talker at a time.
Problem: How to connect multiple potential talkers to this bus. (Multiple listeners result much of a problem as one output can connect to several inputs — this is "fan-out".)

One way to do this is with "open collector" outputs — essentially the output looks like  i.e. L or disconnect

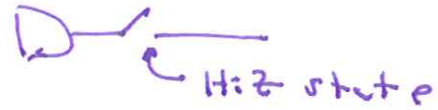
the disconnect can be converted to H by external



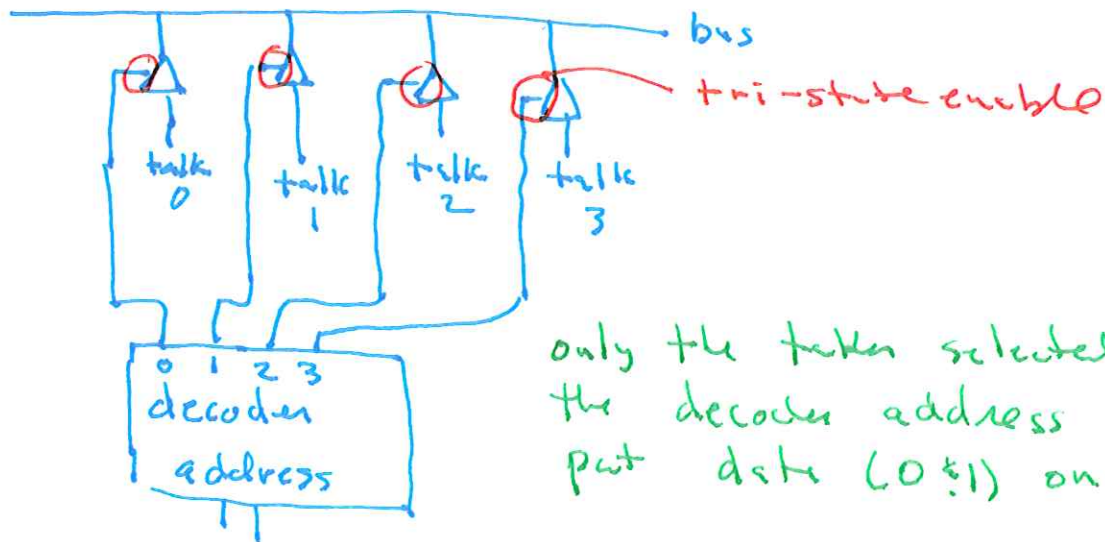
all but one device is disconnected. The talking device can switch connect/disconnect to make out L/H

A more common solution is "Tri-State" logic - an output pin that can be 0, 1, or Hi-Z.

"Hi-Z" corresponds to a disconnect. Effectively such an output pin looks like a normal TTL output protected by a switch



Allow just one talker at a time - perhaps controlled by a decoder



only the talker selected by the decoder address can put data (0 & 1) on bus