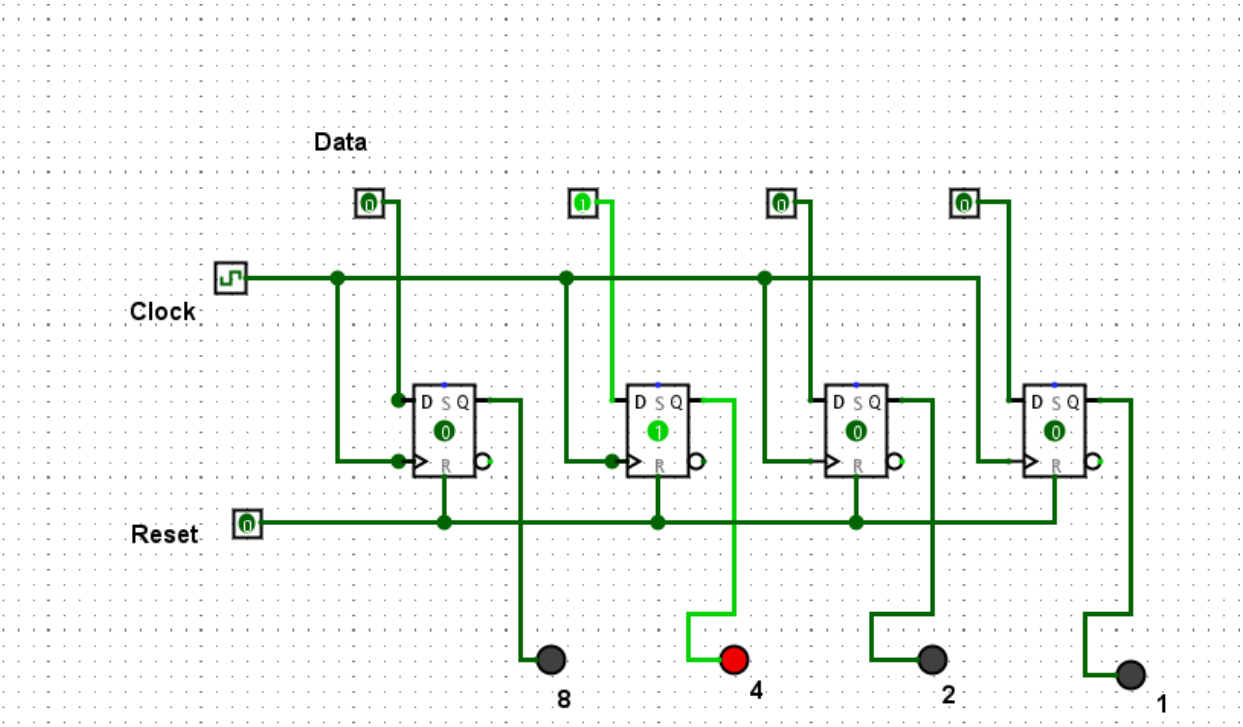
Lab03

Nguyen Nam Tung 103181157

4-bit register



Ox	Input Binary	Output Binary
0	0000	0000
1	0001	0001
2	0010	0010
3	0011	0011
4	0100	0100
5	0101	0101
A	1010	1010
B	1011	1011
C	1100	1100
D	1101	1101
E	1110	1110
F	1111	1111

Name one crucial role (hardware) counters play in modern computing architectures

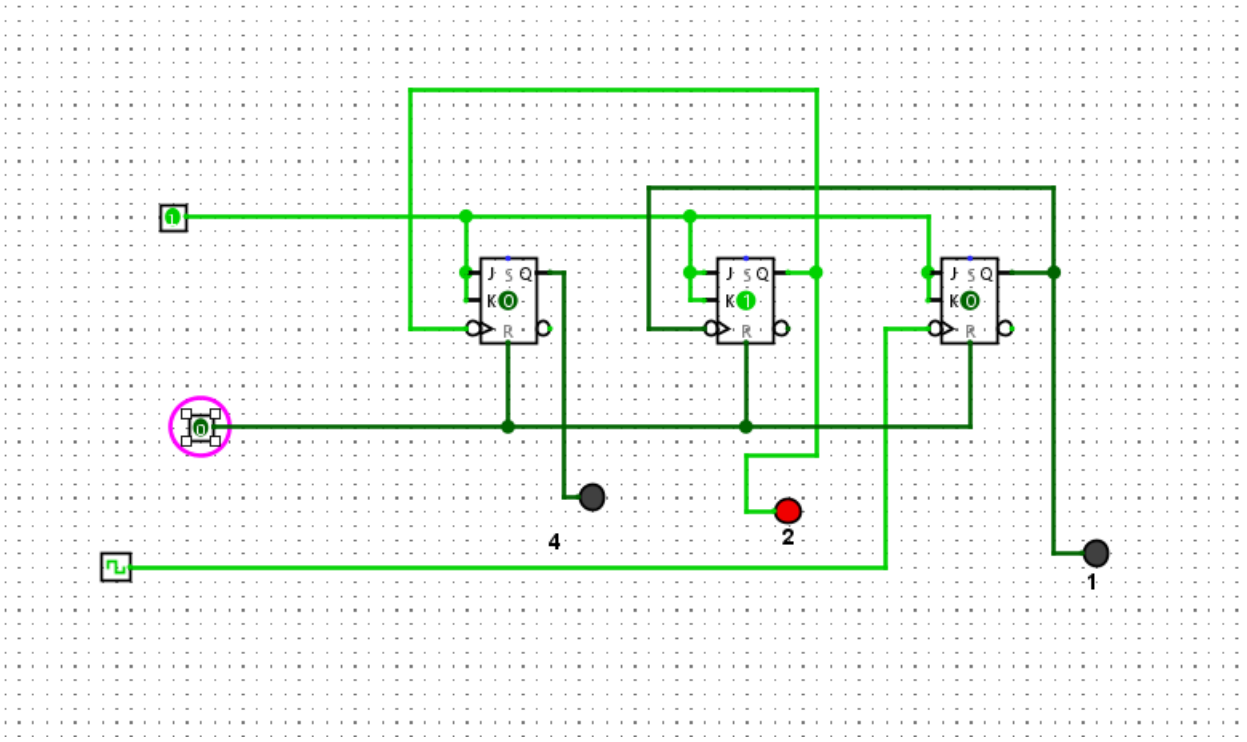
Counters are used to store the count of activities in a computer

Describe in a few sentences how a ripple counter works. How does the "ripple" occur?

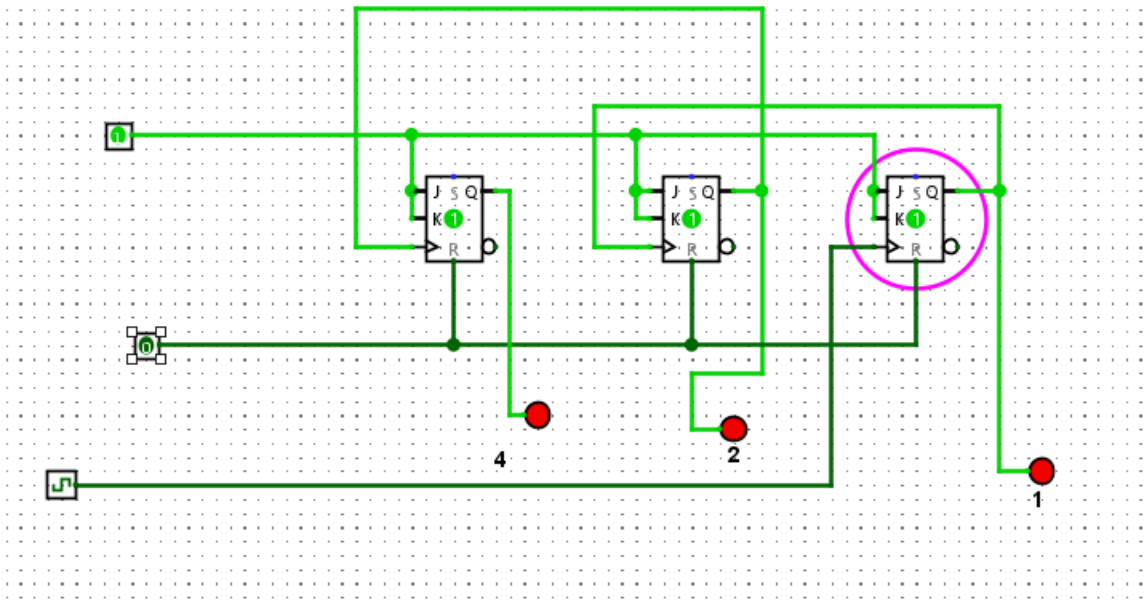
It is an asynchronous binary counter, which uses toggle FFs to put the output of one into another.

Big-endian 3 ripples counter

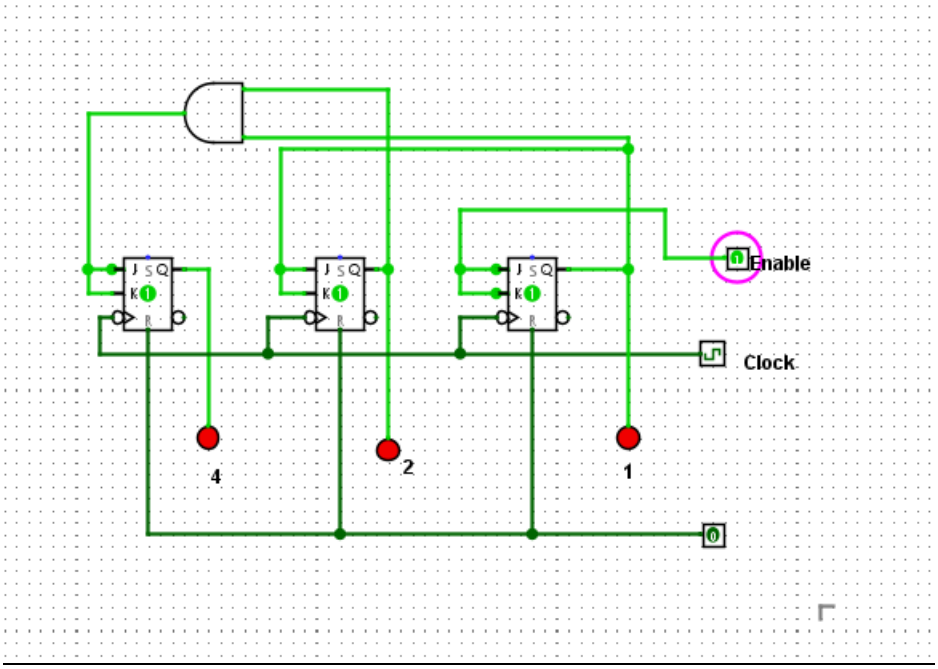
JK Flip Flop: Falling Edge => Count up



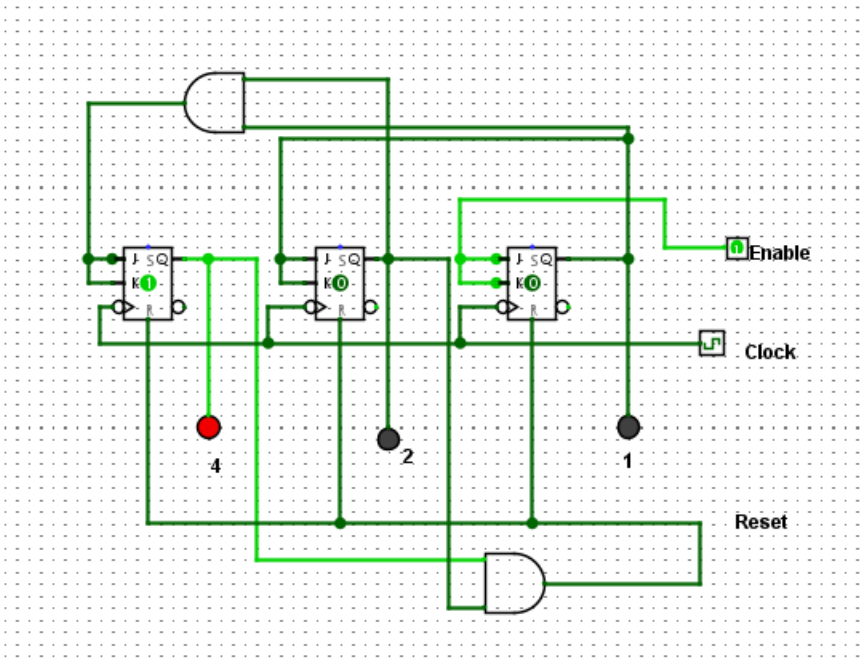
JK Flip Flop: Rising Edge: Count Down



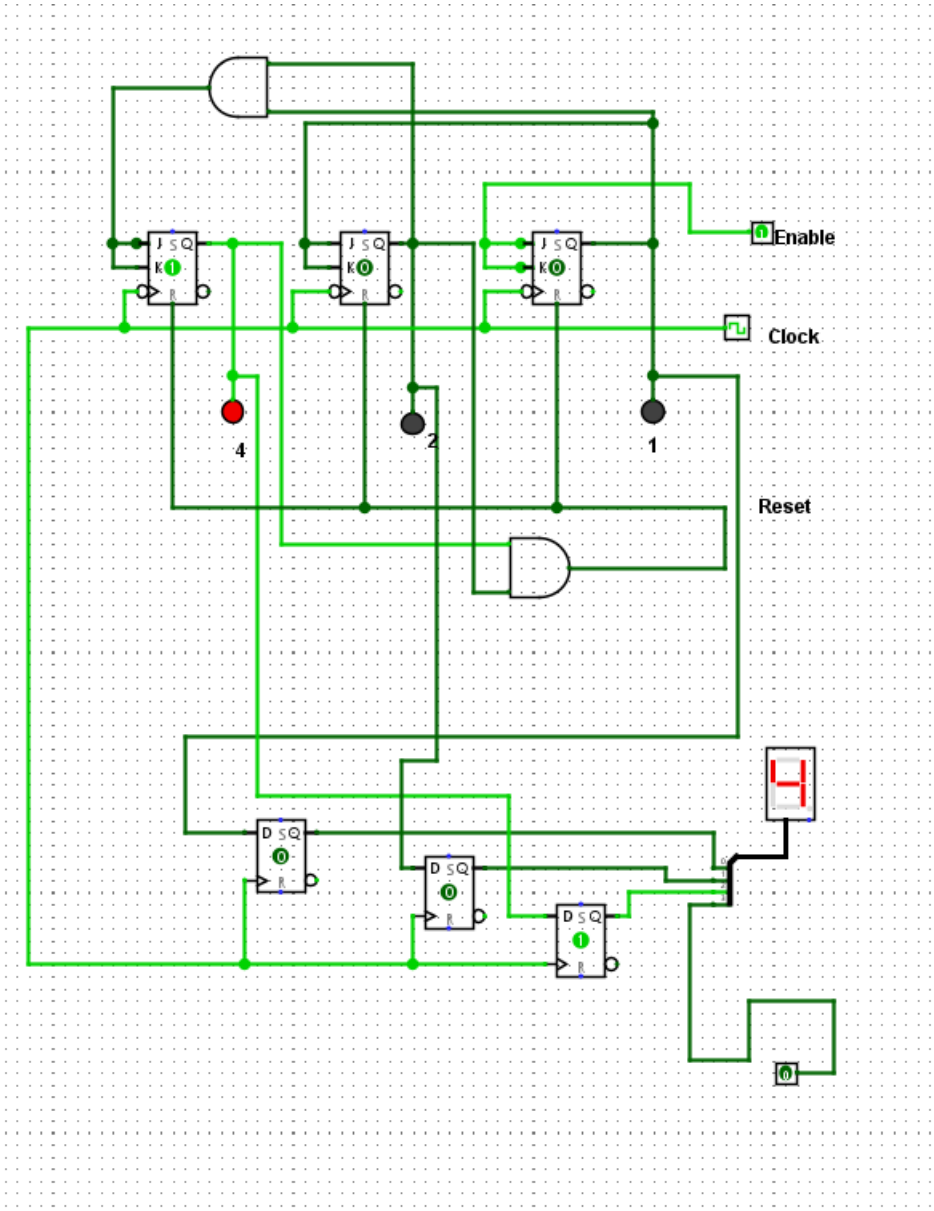
Common Clock



Count from 0 to 5 (Reset at 6)



Common Clock No illegal state with Hex Display (Circuit for step 17 + 18 combination)



Modify your counter so that it resets after 5 (101) back to 0 (000) without the momentary illegal state.

Using D Flip Flop as a buffer (above image)

Why is handling such things important?

There will be no illegal state => Circuit can be stabilized