

# In1020 - Fysiske begrensninger og Synkronisering

Omid Mirmotahari og Yngvar Berg

# Dagens forelesning

- Kort repetisjon med Boolean Rhapsody
- Hva er en datamaskin bygd opp av?
- Hva er en port bygd opp av?
- Fysiske begrensninger og utfordringer med hardware
- Hvordan bruke synkronisering som en del av løsningen
- Shakespear - To be or not to be!

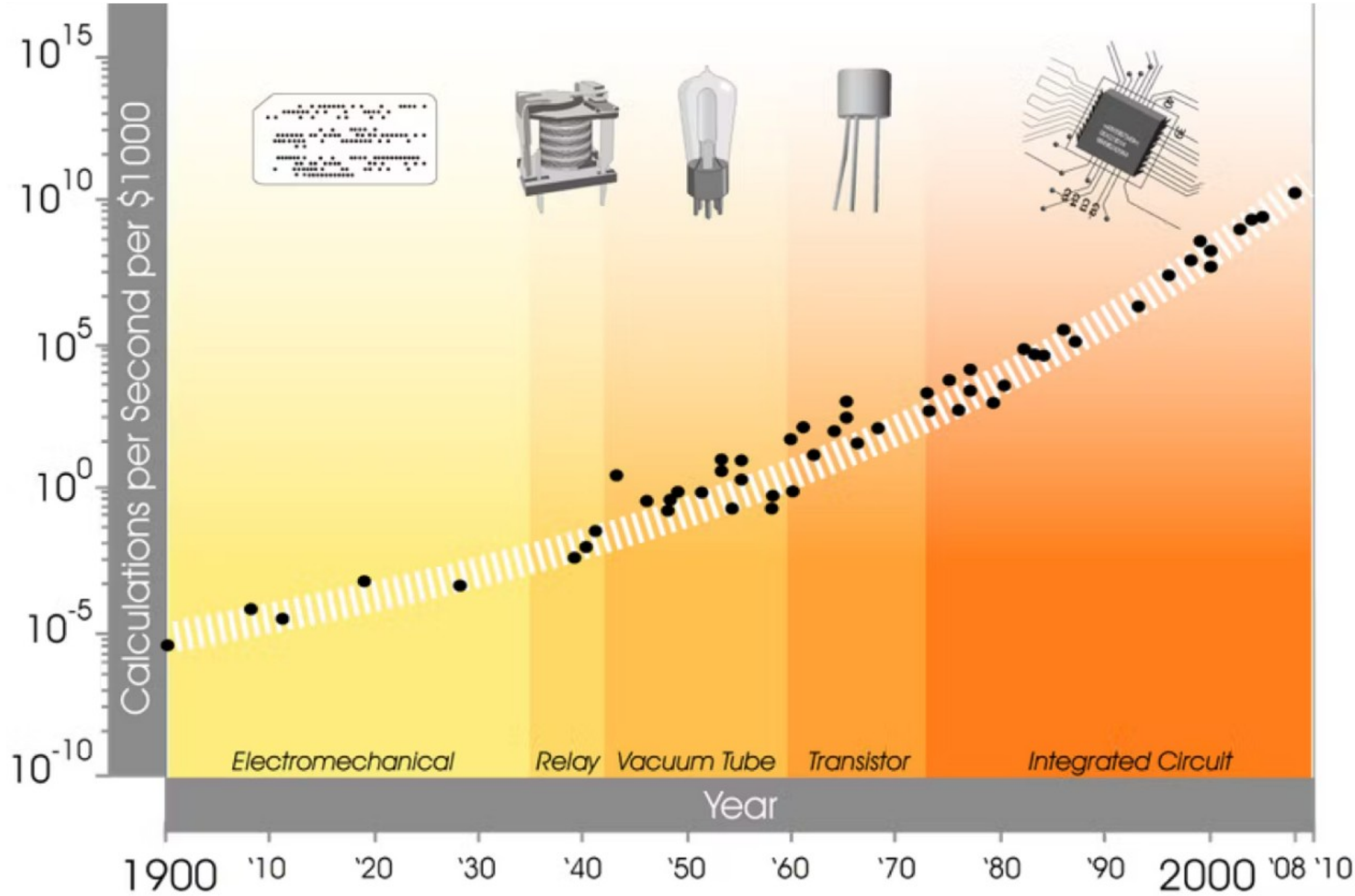






**Inne i en datamaskin :)**

# teknologiutviklingen

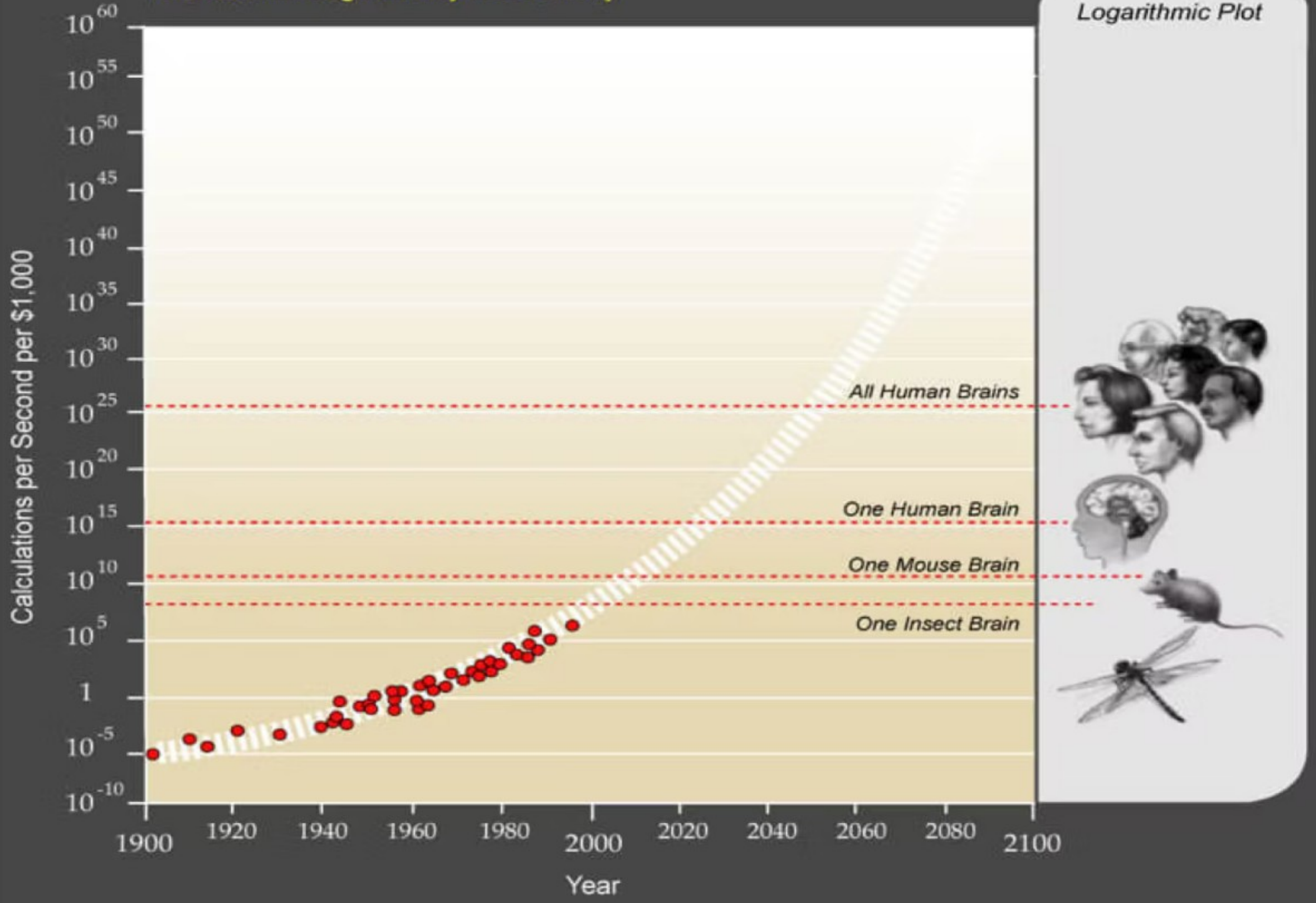


Moore's law



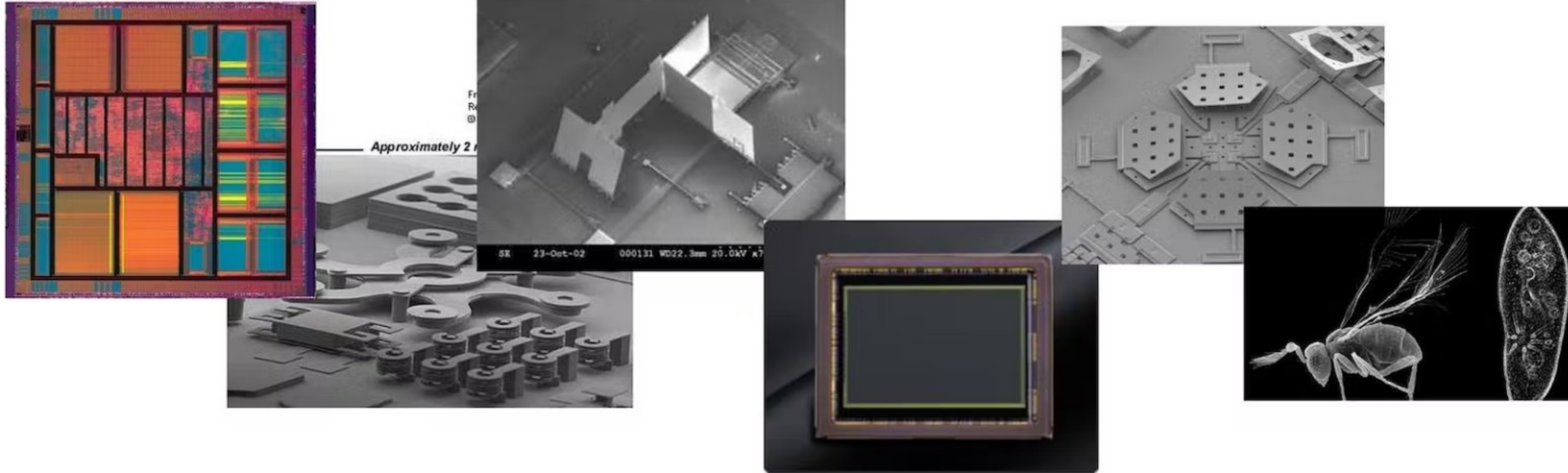
# Exponential Growth of Computing

Twentieth through twenty first century



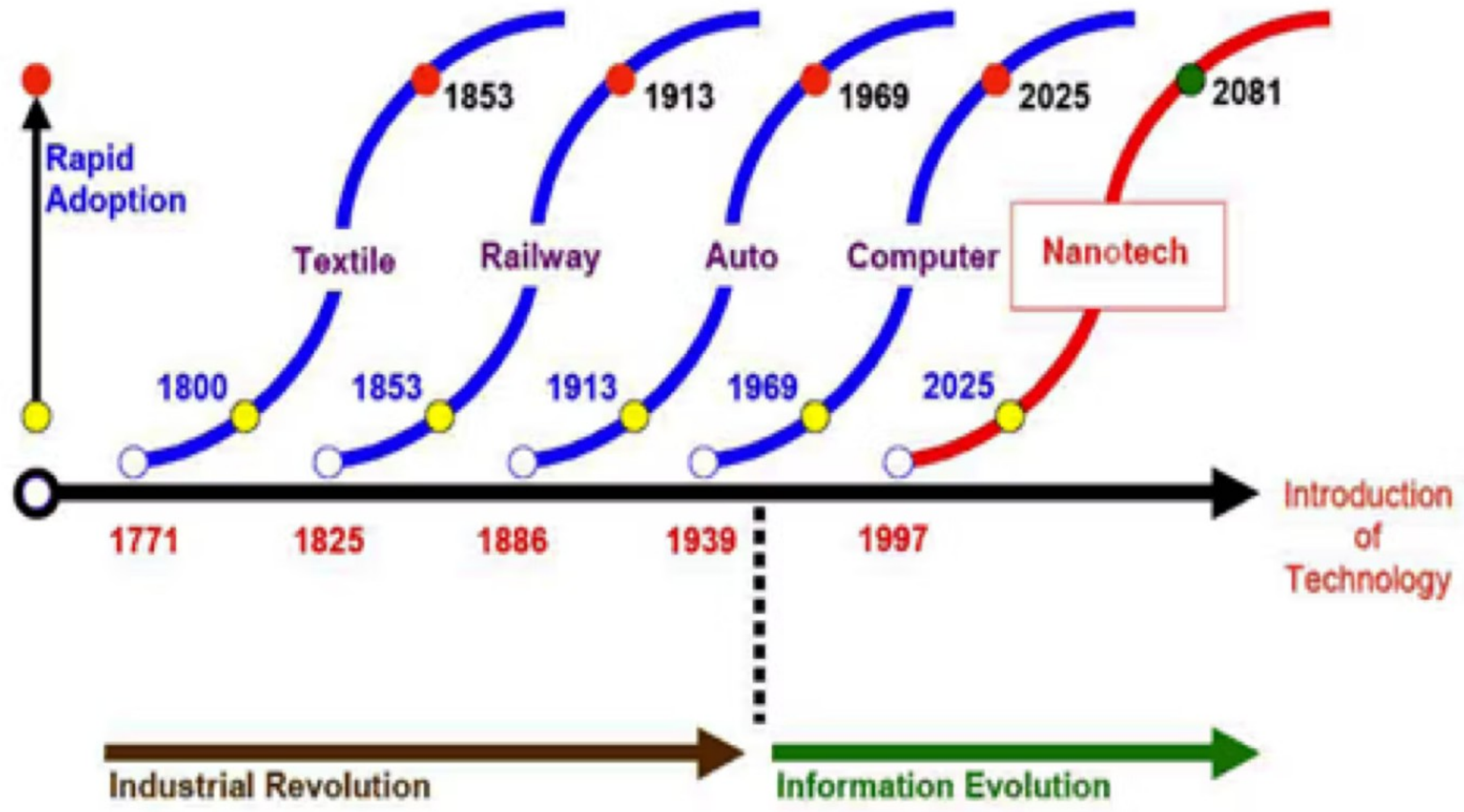


# Hva kan lages i et system $\leq 30\mu\text{m}$ (usynlig)?



	2019	2041
Proessor	(Nesten)	Ja
MEMS*	Nei	Ja
Sensorer	40k pixel	100M pixel
Kommunikasjon	Nei	Ja
GPS	Nei	Ja





Source: Economist Norman Poire



# Noen spådommer om teknologiutviklingen

**Julius Sextus Frontinus i år 10:**

"Inventions have long since reached their limit, and I see no hope for further developments."

**Sir William Preece, sjefingeniør i British Post Office, 1878 :**

"The Americans have need of the telephone, but we do not. We have plenty of messenger boys."

**Thomas Watson, styreleder i IBM, 1943:**

"I think there is a world market for maybe five computers."

**Popular mechanics, 1949:**

" In the future, computers may weight no more than 1.5 tonnes."

**Ken Olsen, grunnlegger av Digital Equipment Corp., 1977:**

"There is no reason anyone would want a computer in their home."

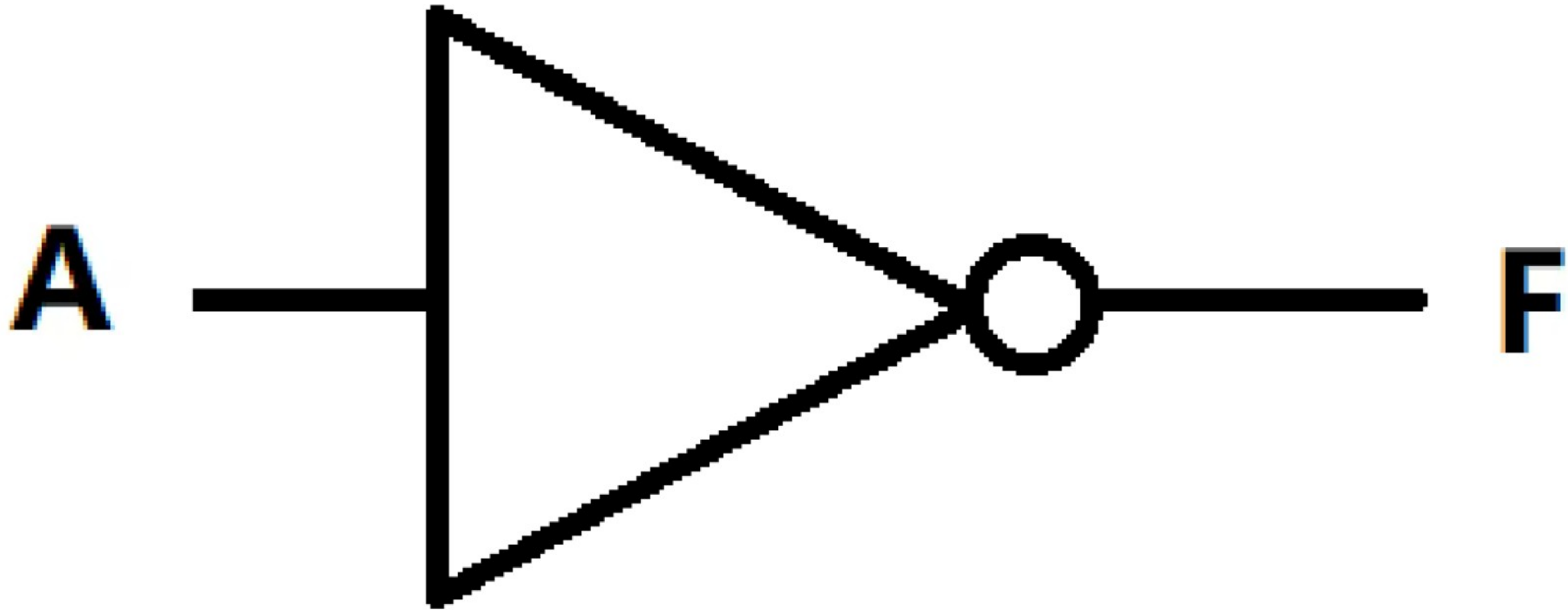
**Bill Gates, Microsoft, 1993:**

" The Internet? We are not interested in it."

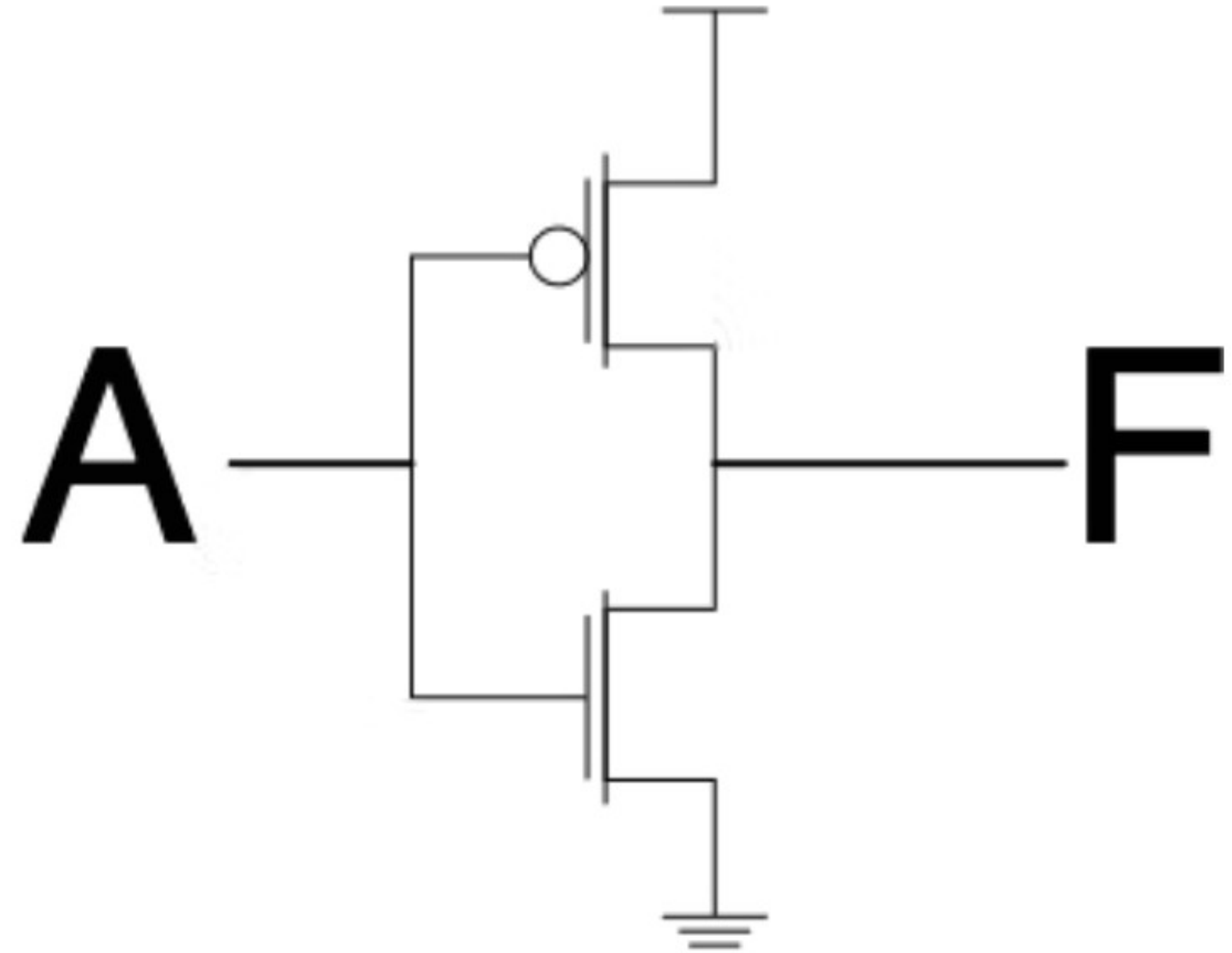
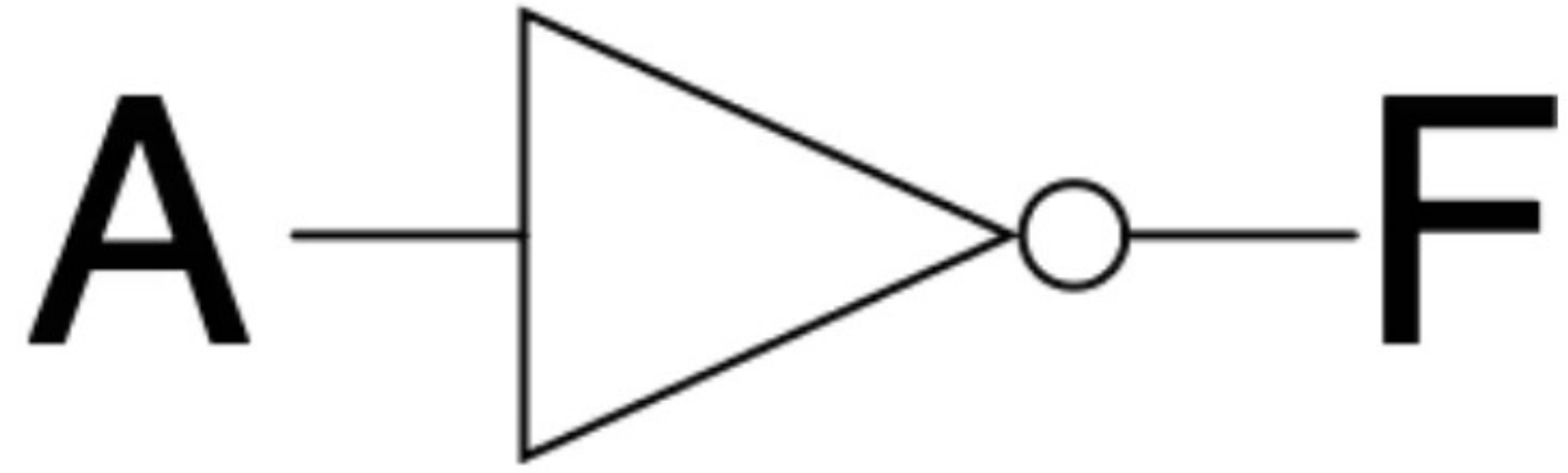




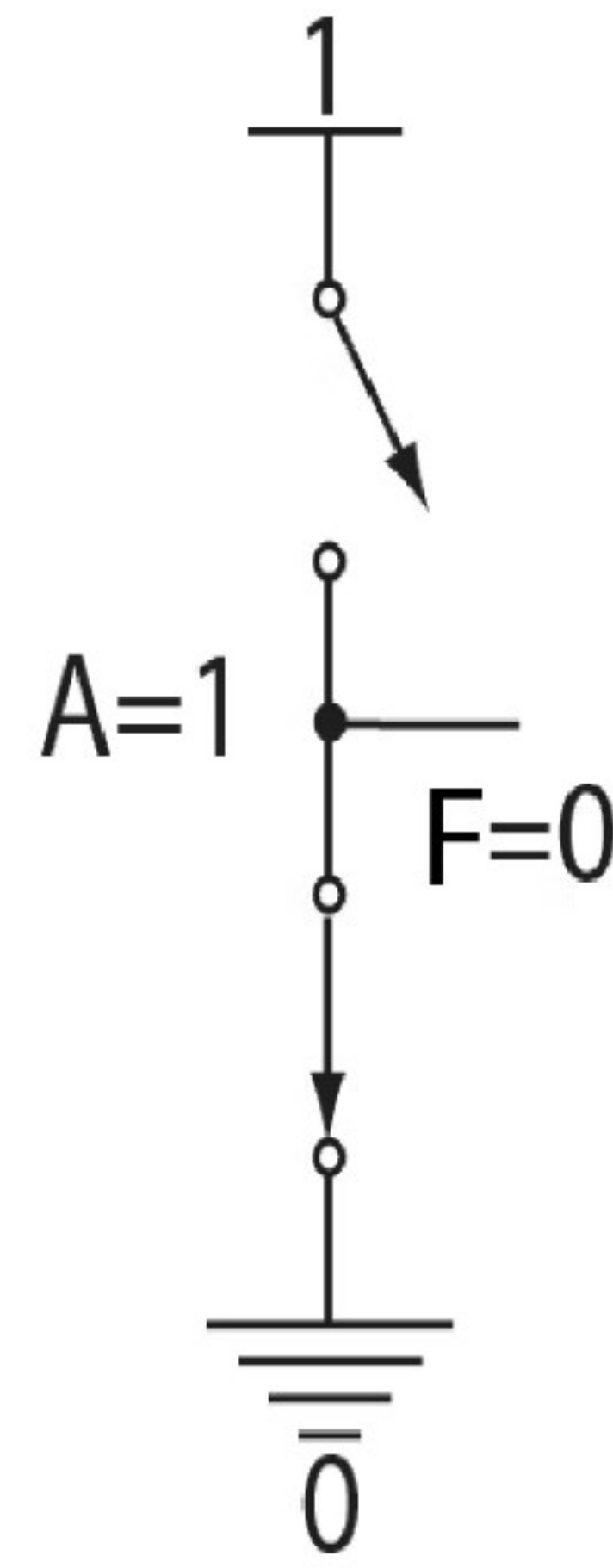
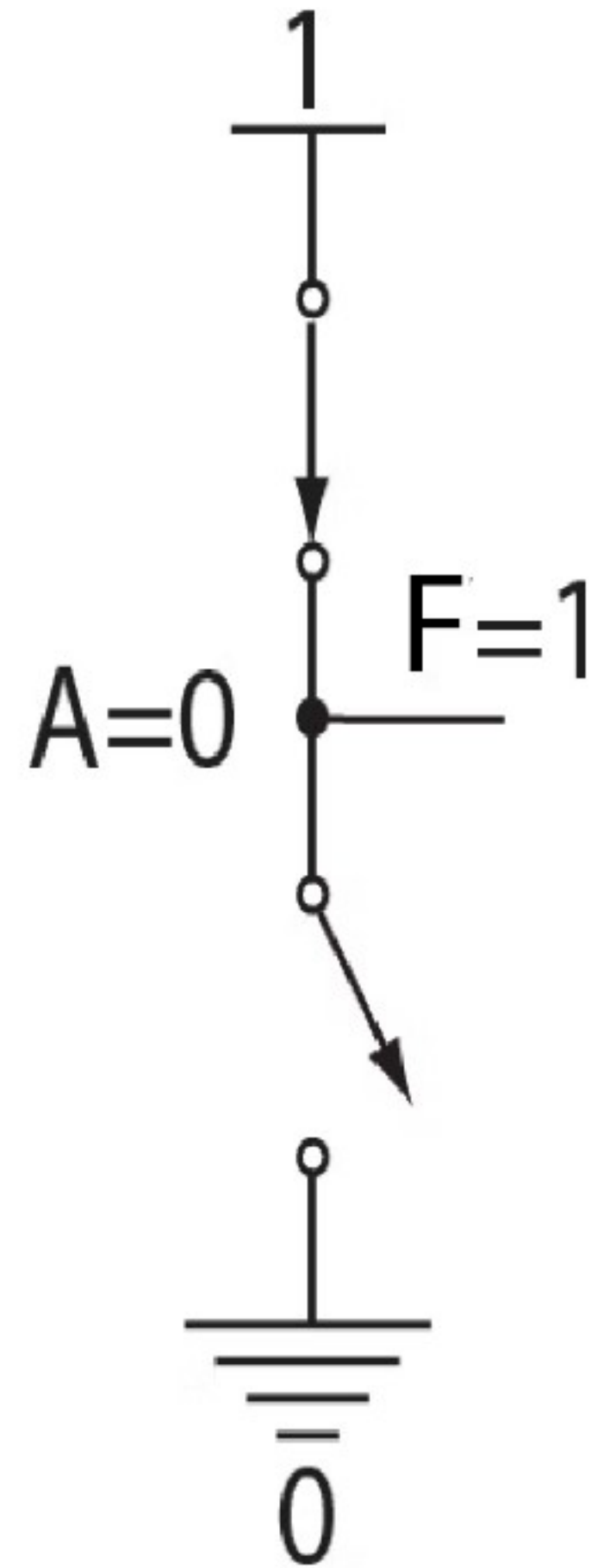
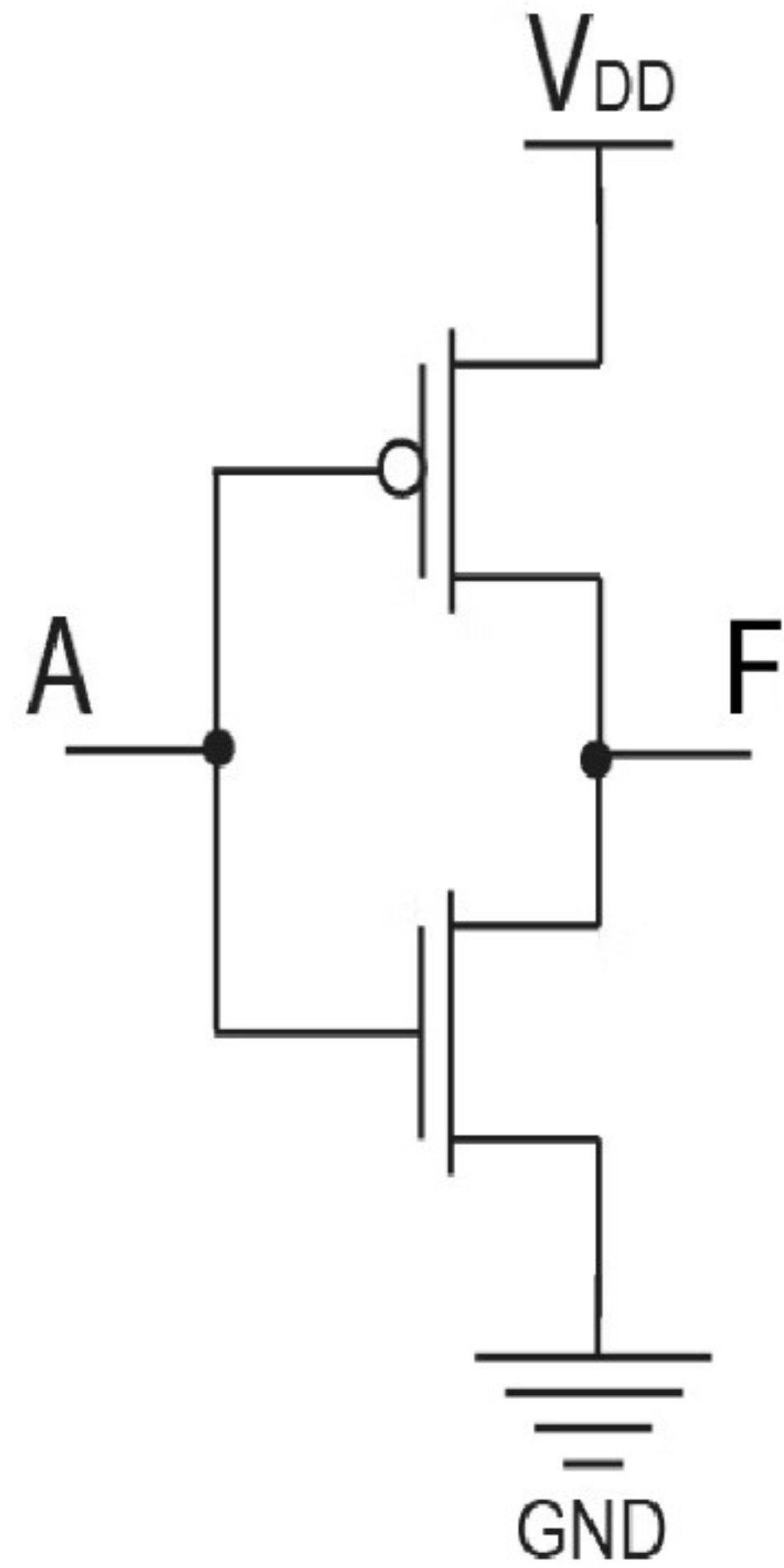




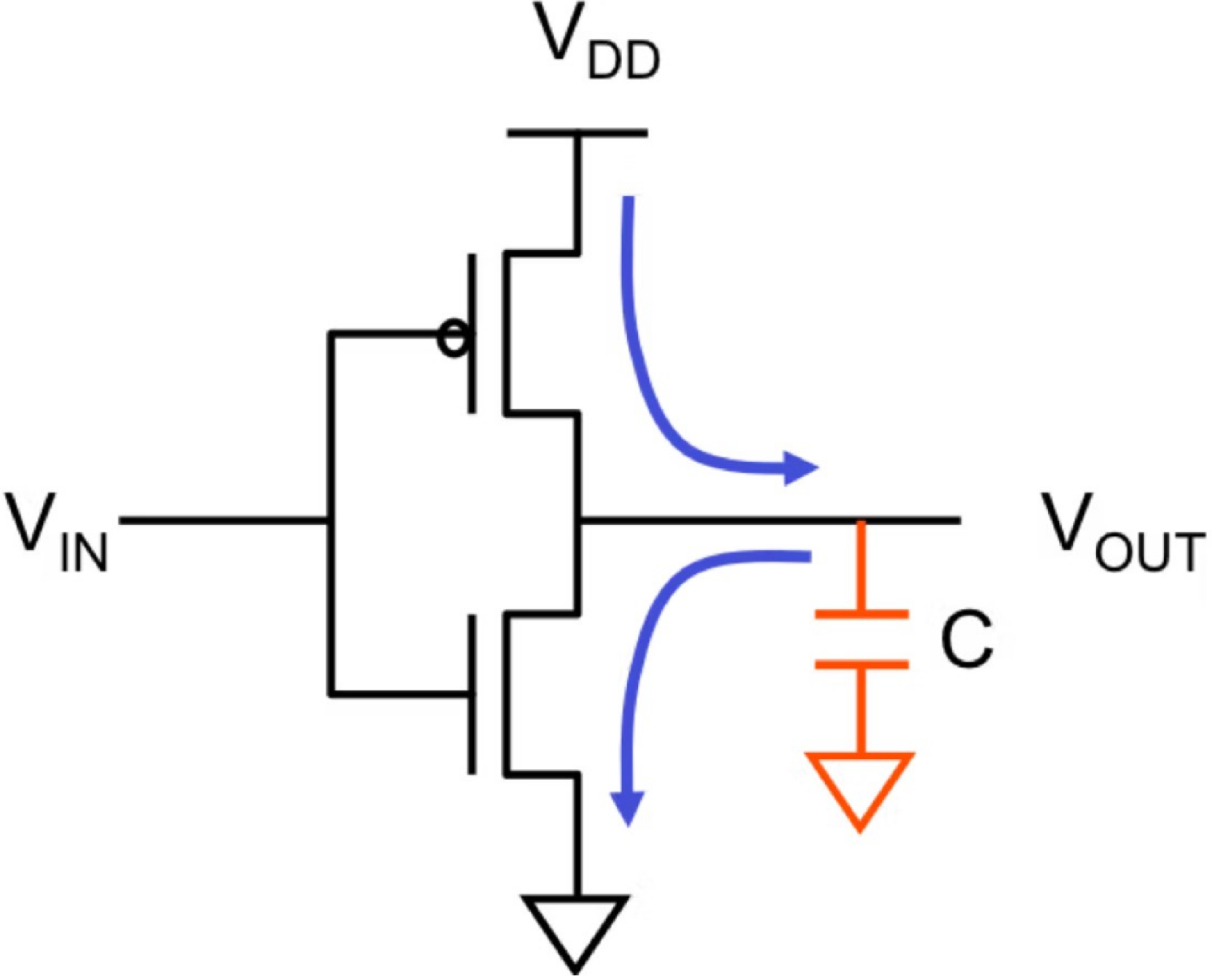




A	F
0	1
1	0



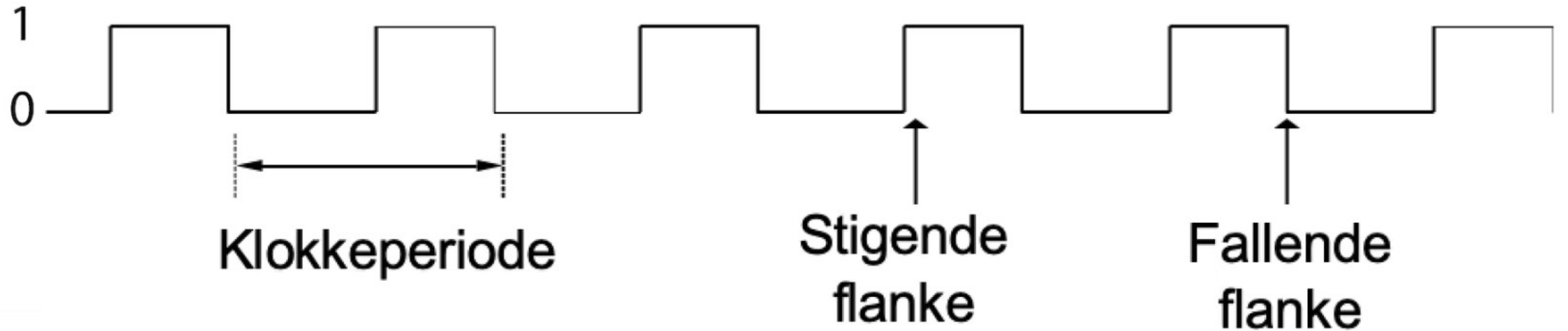








Et klokkesignal er et digitalt signal som veksler mellom '0' og '1' med fast takt



$$\textit{frekvens} = \frac{1}{\textit{klokkeperioden}}$$



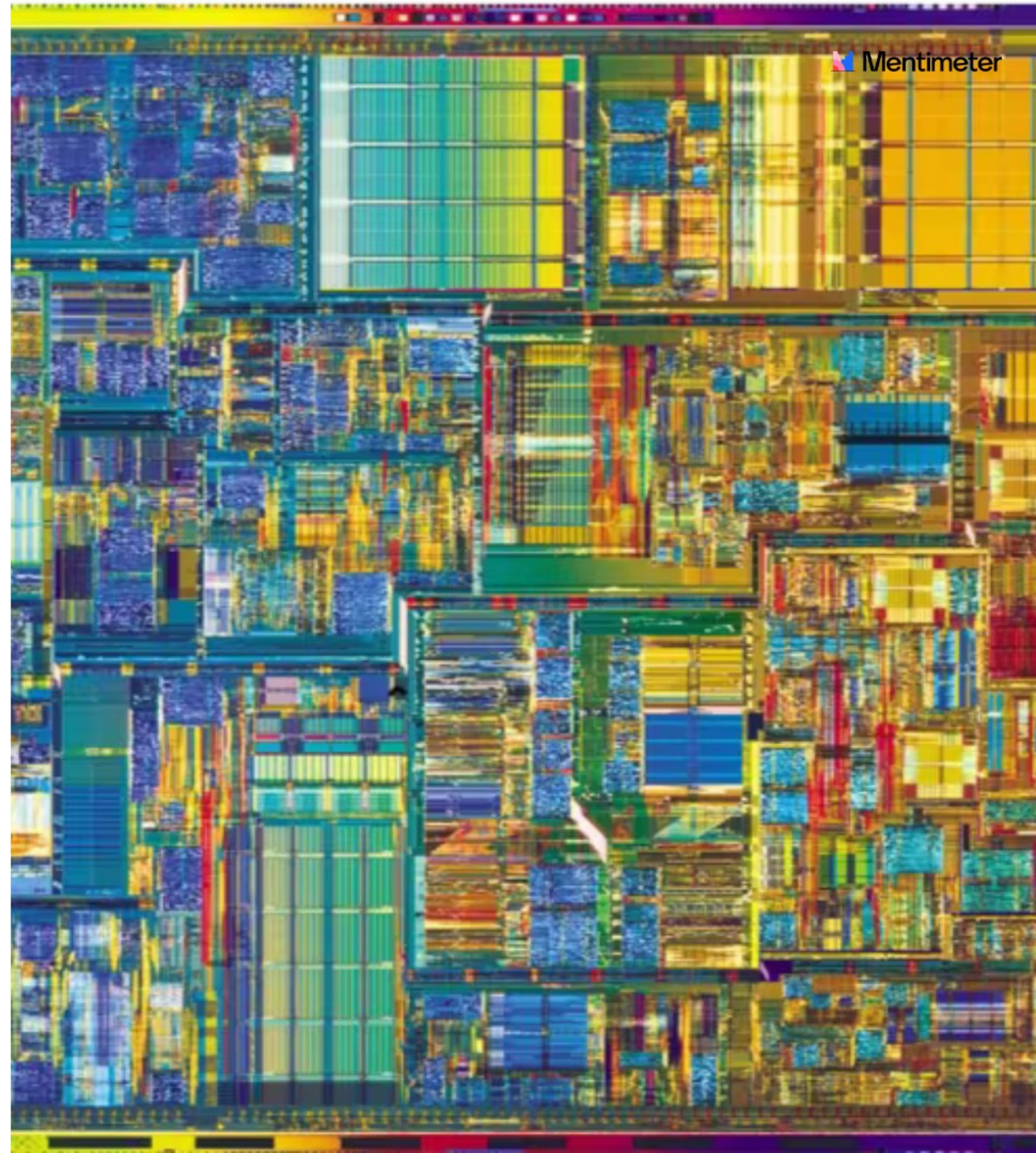
# Maksimal klokkefrekvens bestemmes av flere faktorer, blant annet:

- Forsinkelse gjennom en port (delay)
- Teknologi

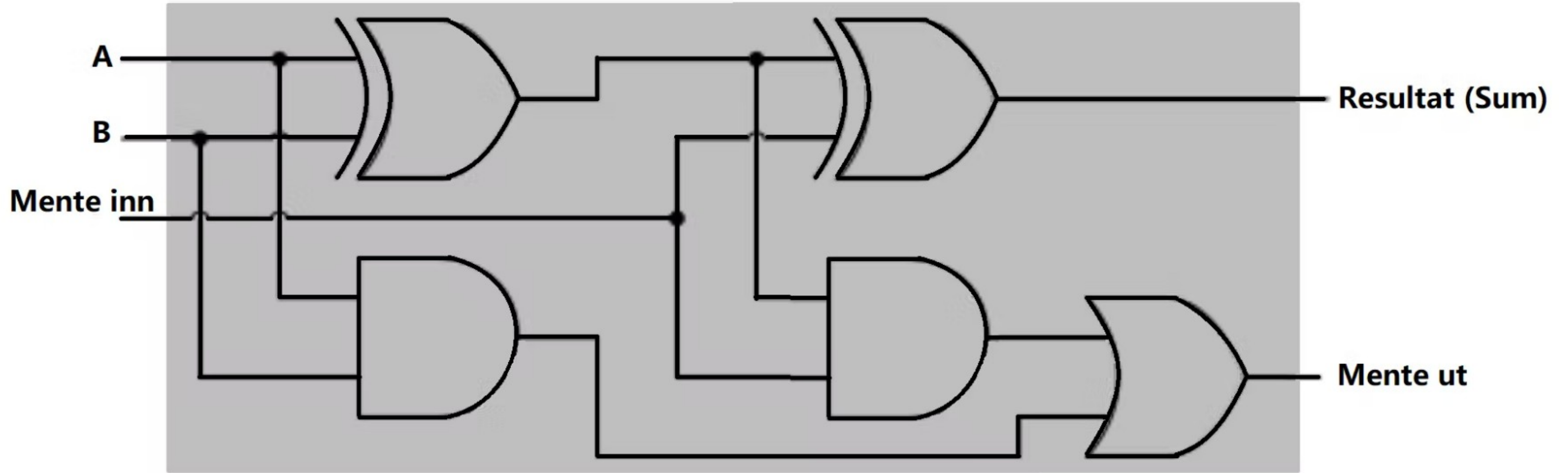


# Synkronisering

- Global klokkesignal
- Lokale klokkesignaler
- Synkronisering

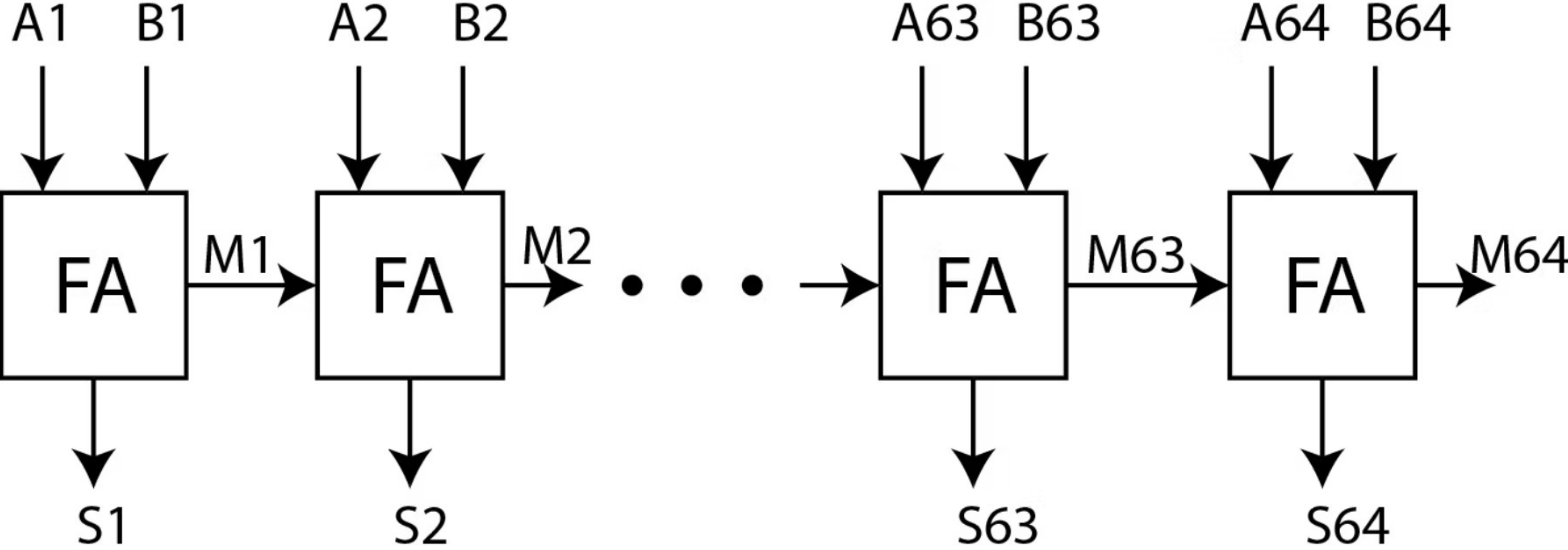
















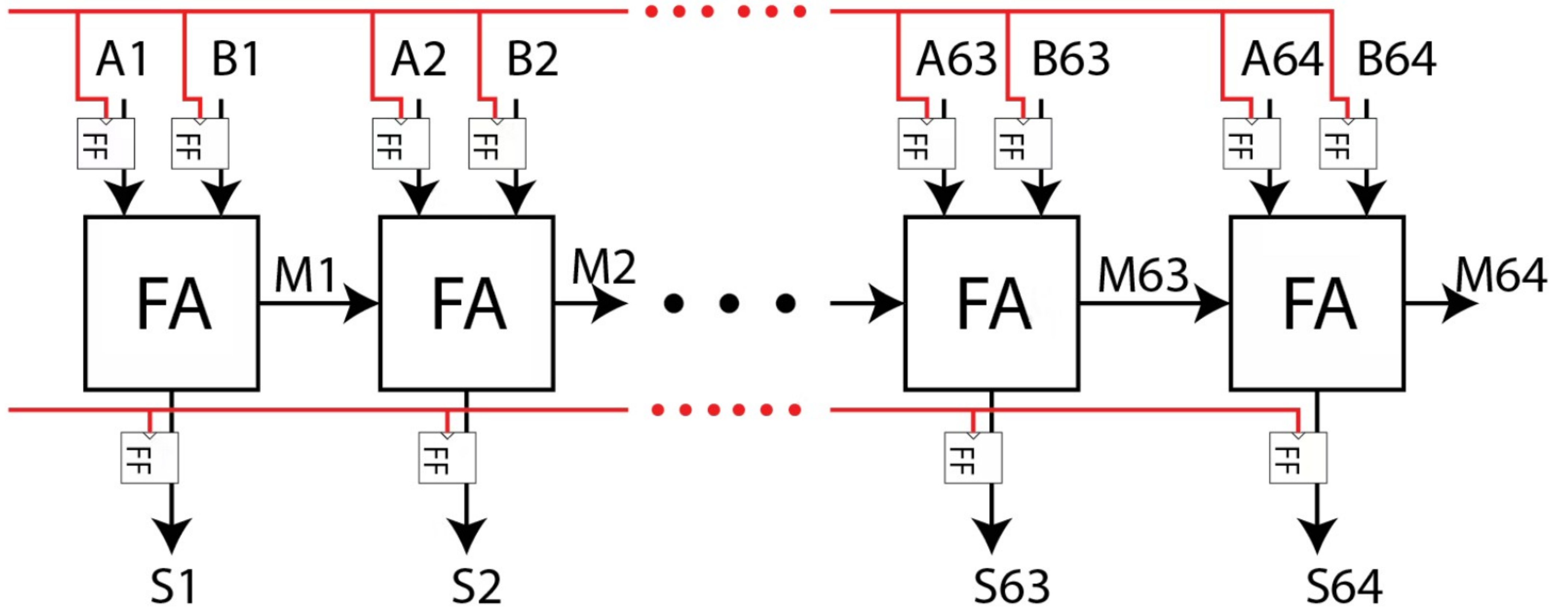
# Synkronisering

Hvordan kan dette tas vare på som ett tall?



Klokke1

Klokke2



Seriell adder med minne og klokke

# Spørsmål

0 questions  
0 upvotes



# Shakespeare



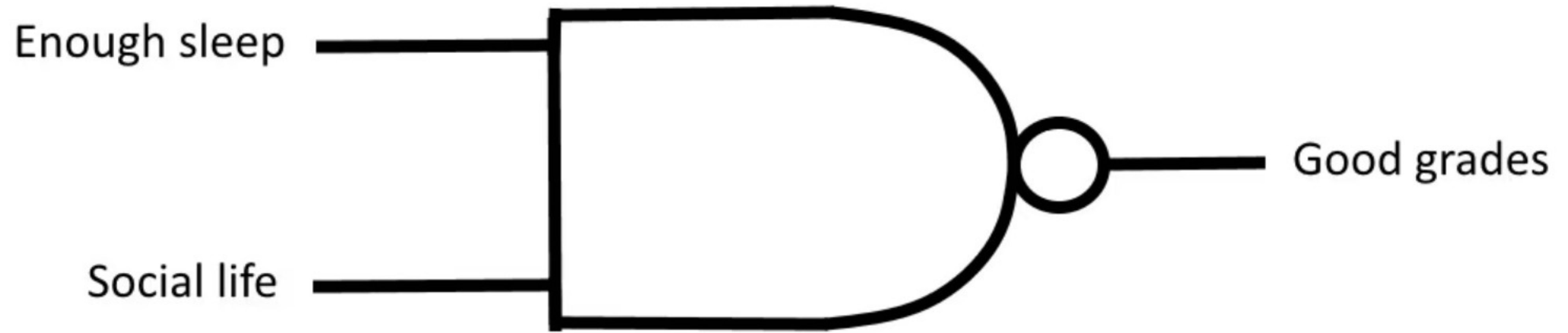

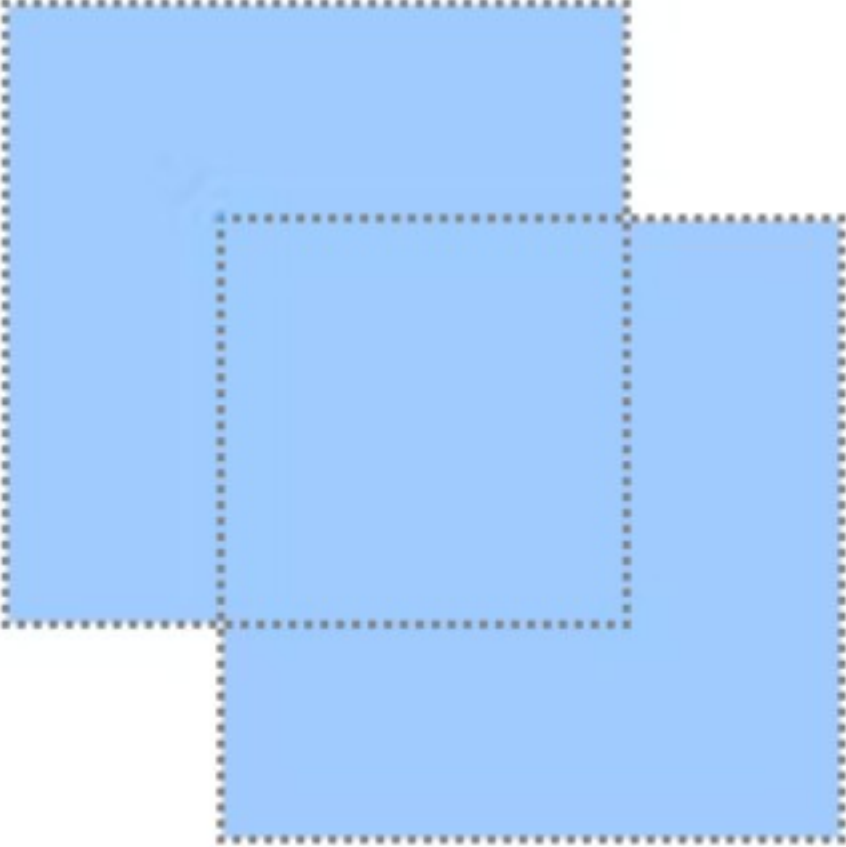
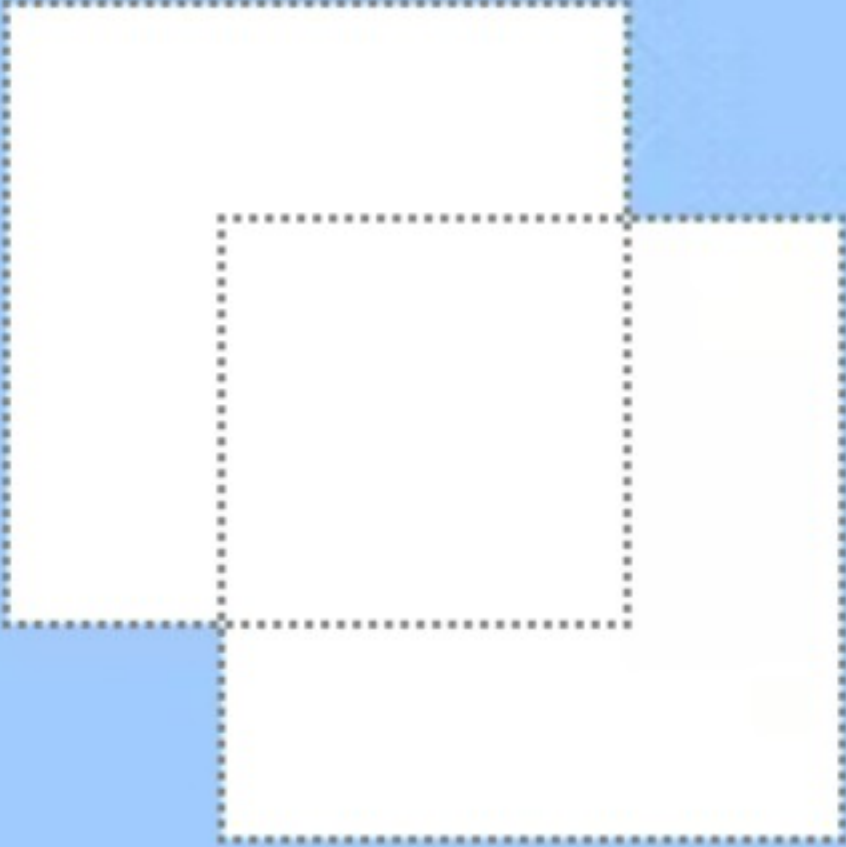
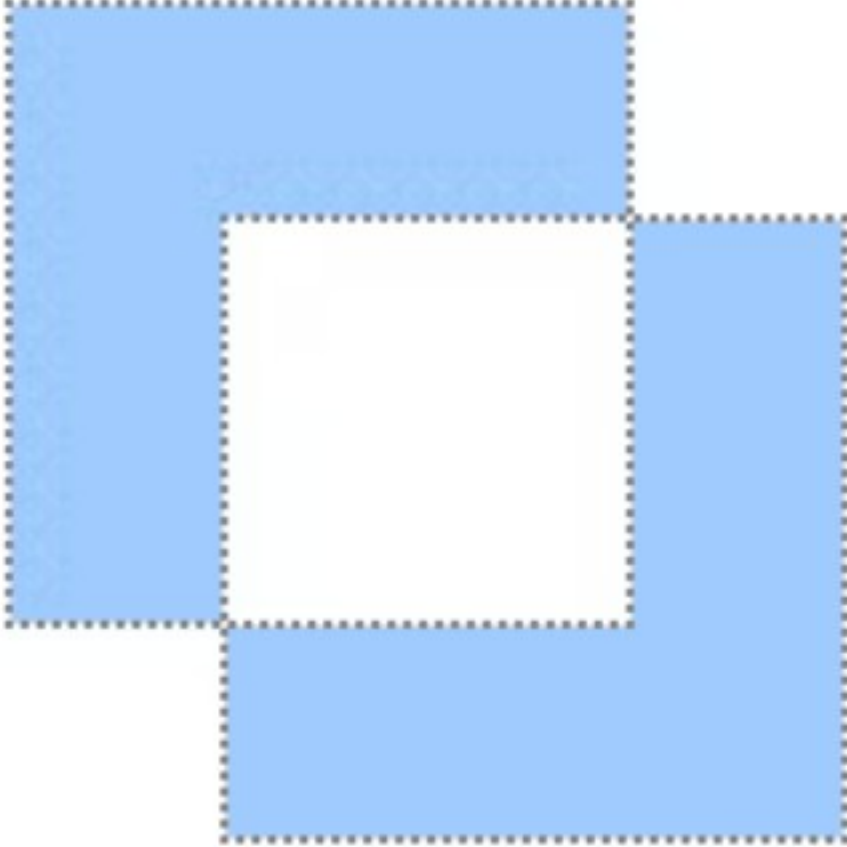

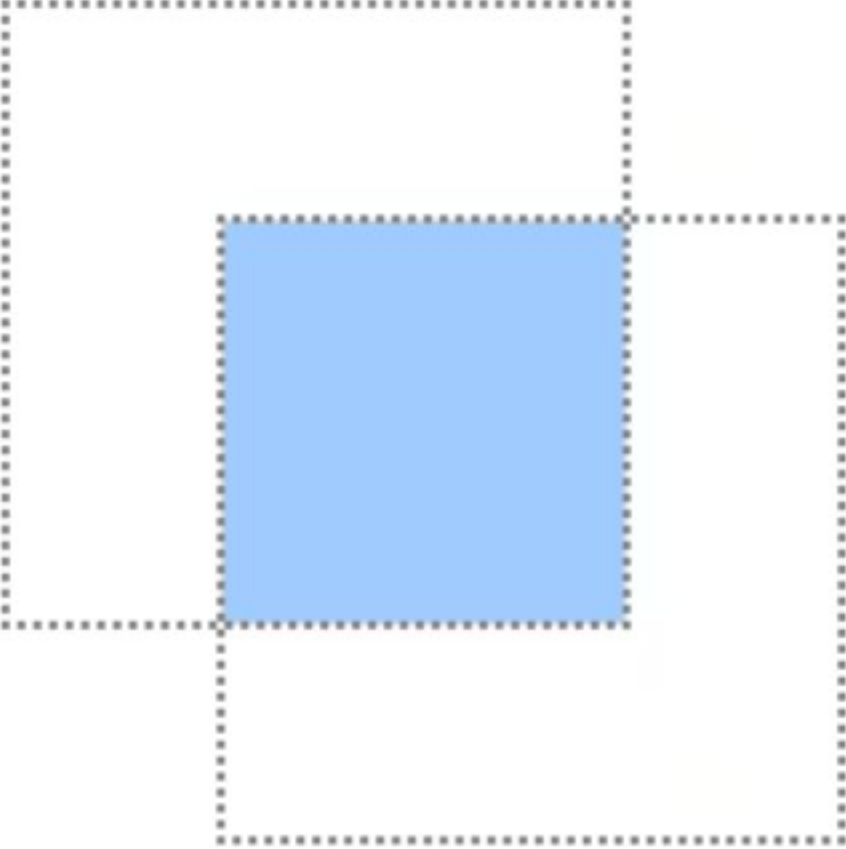
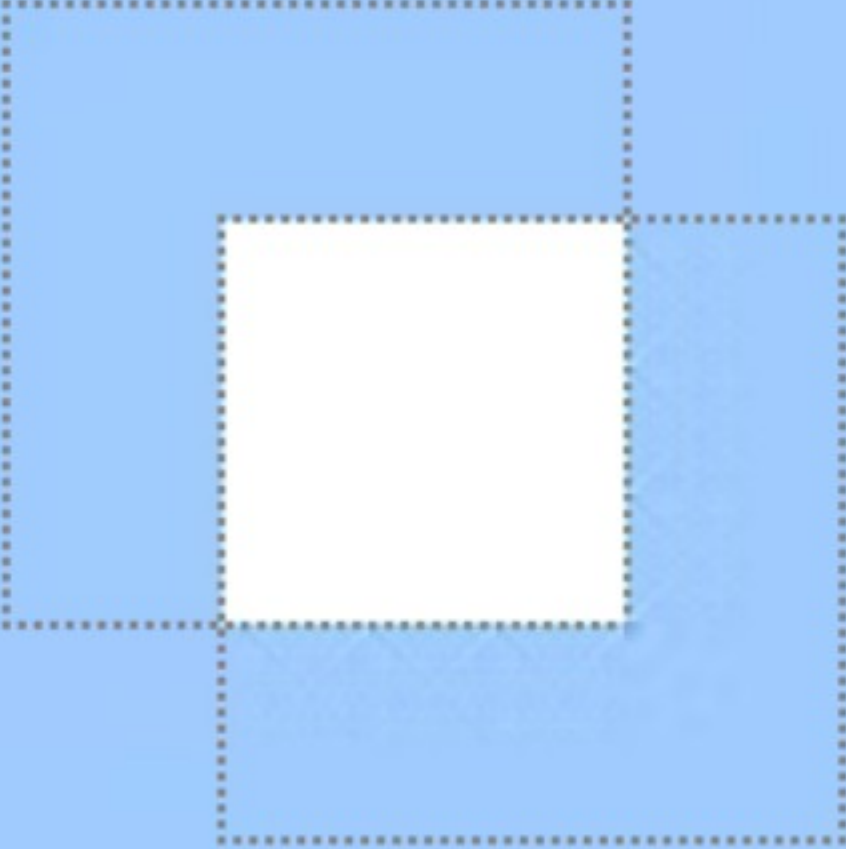
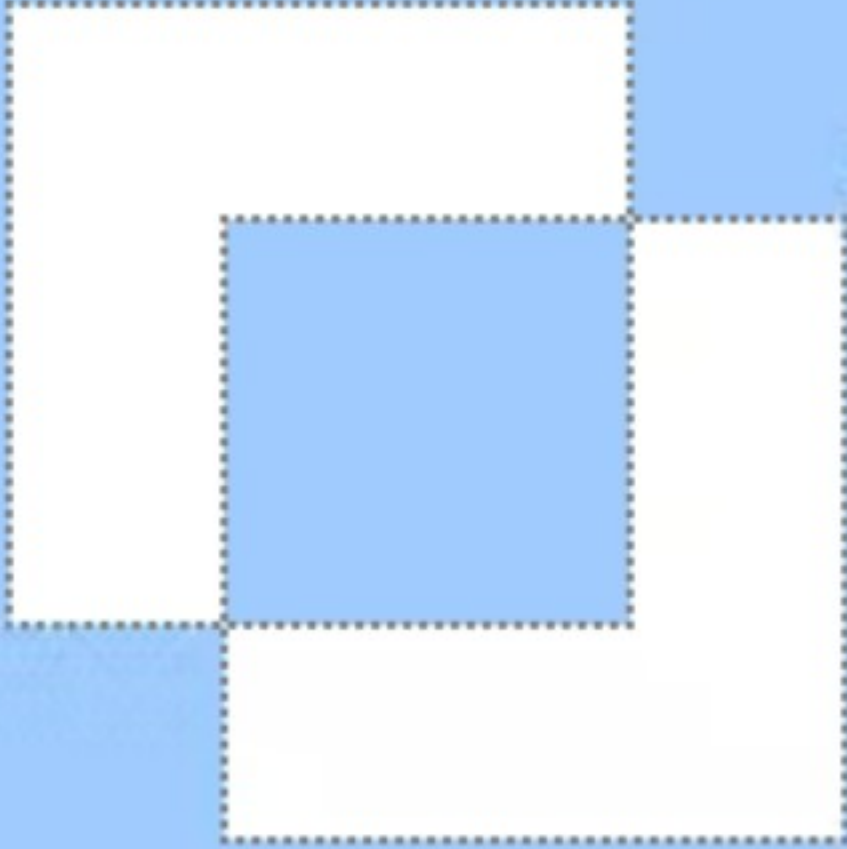




Diagram made by Danatron1

			
<b>Normal</b> <small>(aka: Buffer)</small>	<b>OR</b>	<b>NOR</b>	<b>XOR</b>
			
<b>NOT</b> <small>(aka: invert)</small>	<b>AND</b>	<b>NAND</b>	<b>XNOR</b>

