

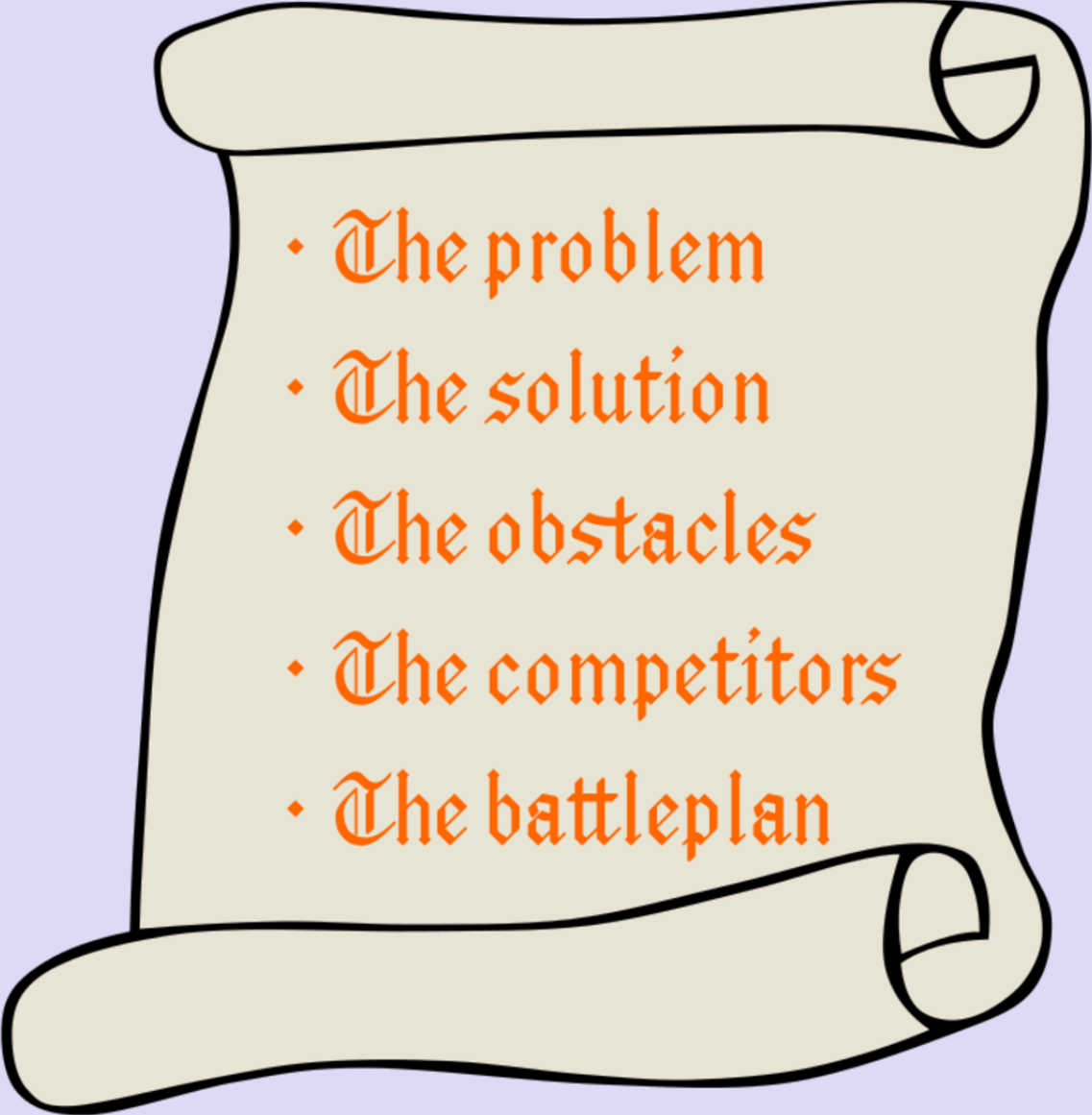


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Superconductivity: the ICT that came from cold

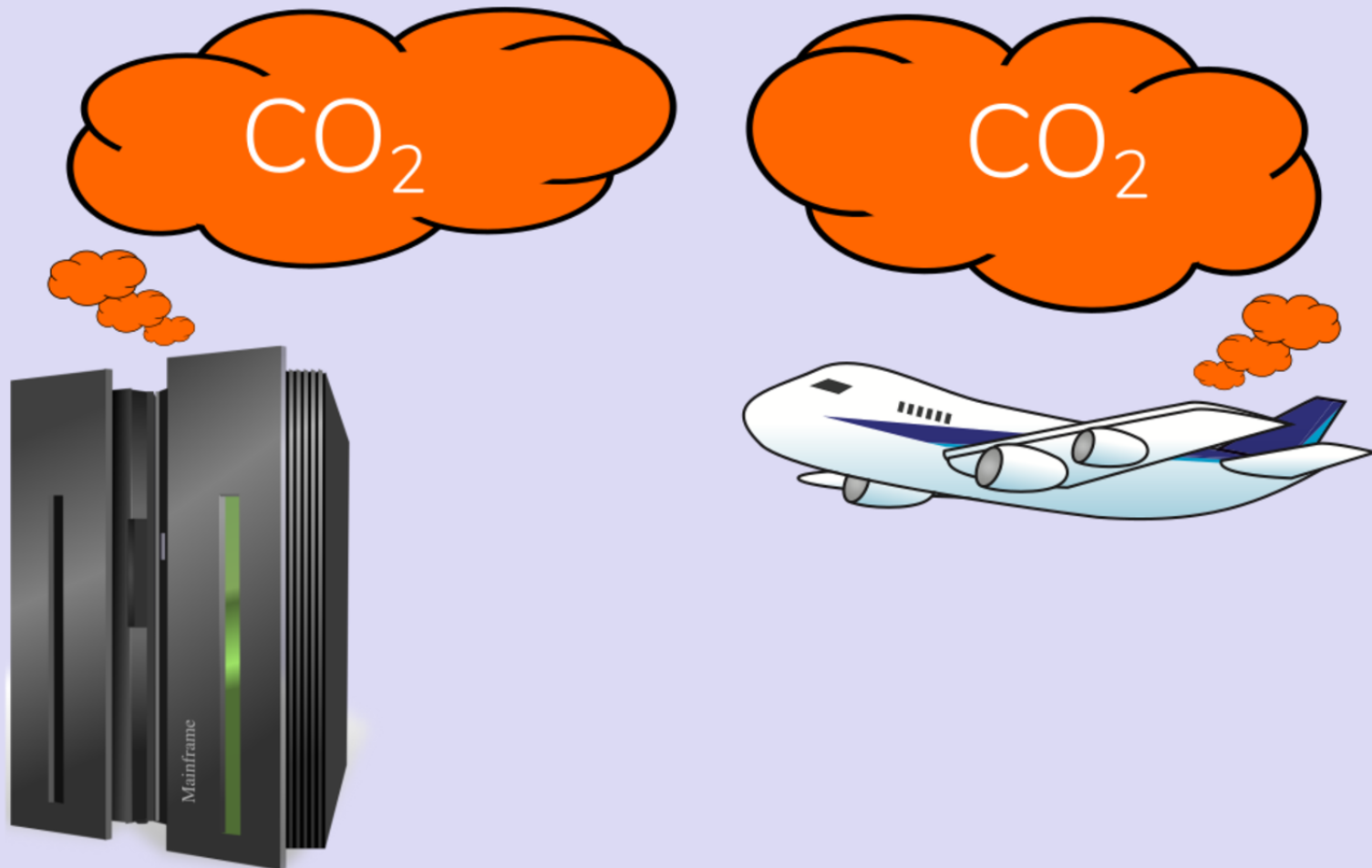
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<https://www.linkedin.com/in/riccardobernardini/>

Outline

- 
- The problem
 - The solution
 - The obstacles
 - The competitors
 - The battleplan

The problem: some numbers

CO₂ production: ICT $\approx$ planes



The problem: some numbers
SUMMIT: most powerful supercomputer

5th most energy efficient

Power consumption = 13MW

The problem: some numbers
SUMMIT: most powerful supercomputer

5th most energy efficient

Power consumption = 13MW

≈ half San Marino



The problem: some numbers
SUMMIT: most powerful supercomputer

Cooling water: 15,000 ℓ /min

The problem: some numbers
SUMMIT: most powerful supercomputer

Cooling water: 15,000 ℓ/min
 $\approx$ San Marino + Monaco + Liechtenstein





The problem: some numbers
SUMMIT: most powerful supercomputer

Power to pump water: 26 MW

The problem: some numbers
SUMMIT: most powerful supercomputer

Power to pump water: 26 MW

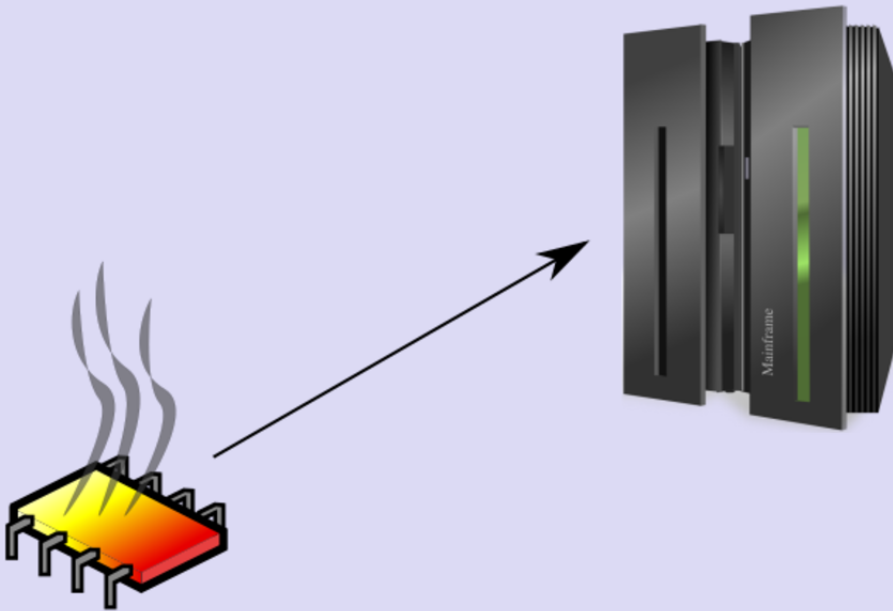
$\approx$ San Marino



Chip consumption: the root of evil



Chip consumption: the root of evil



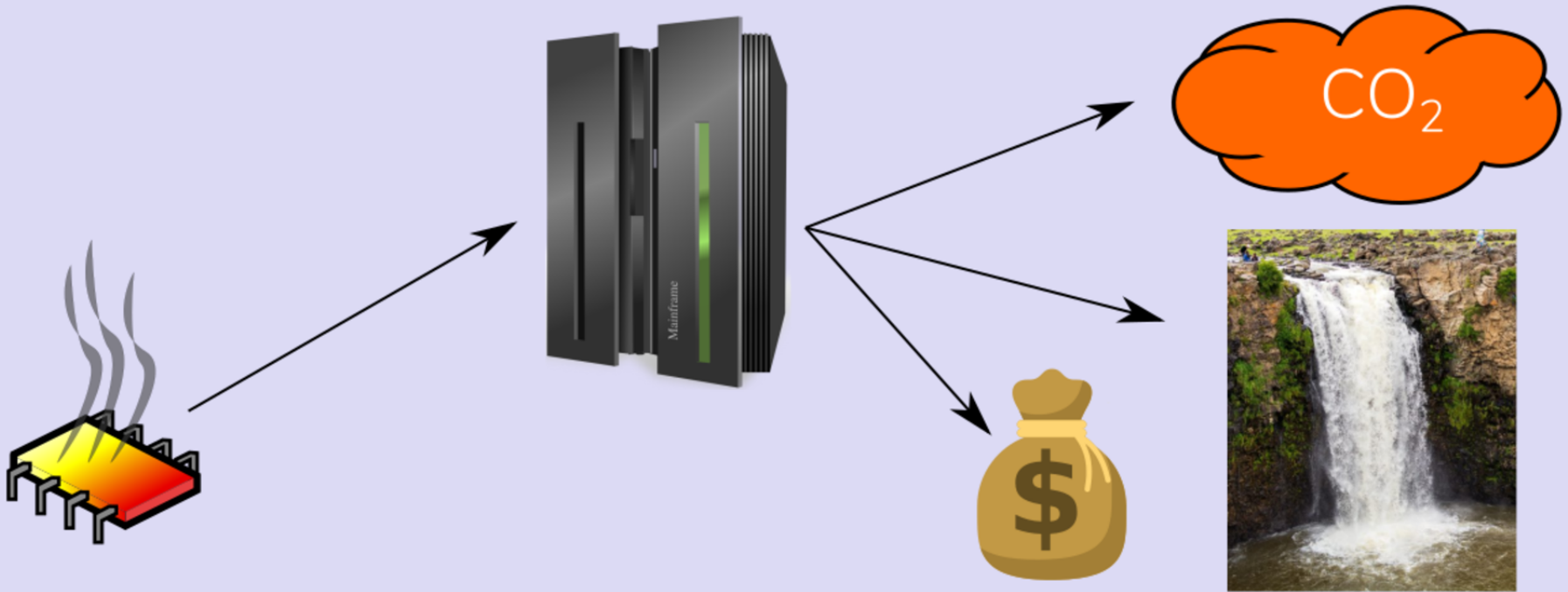
Chip consumption: the root of evil

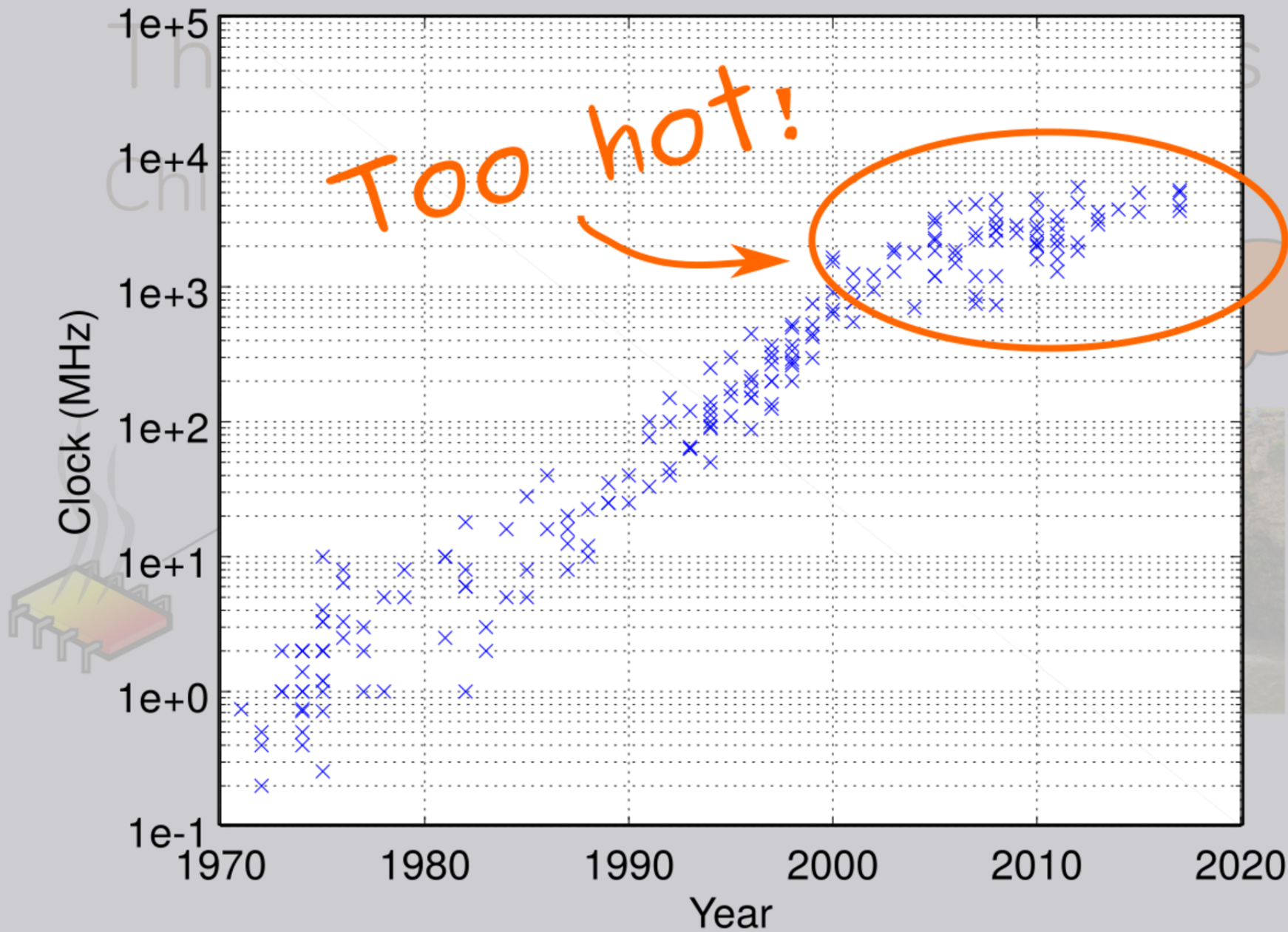


Chip consumption: the root of evil

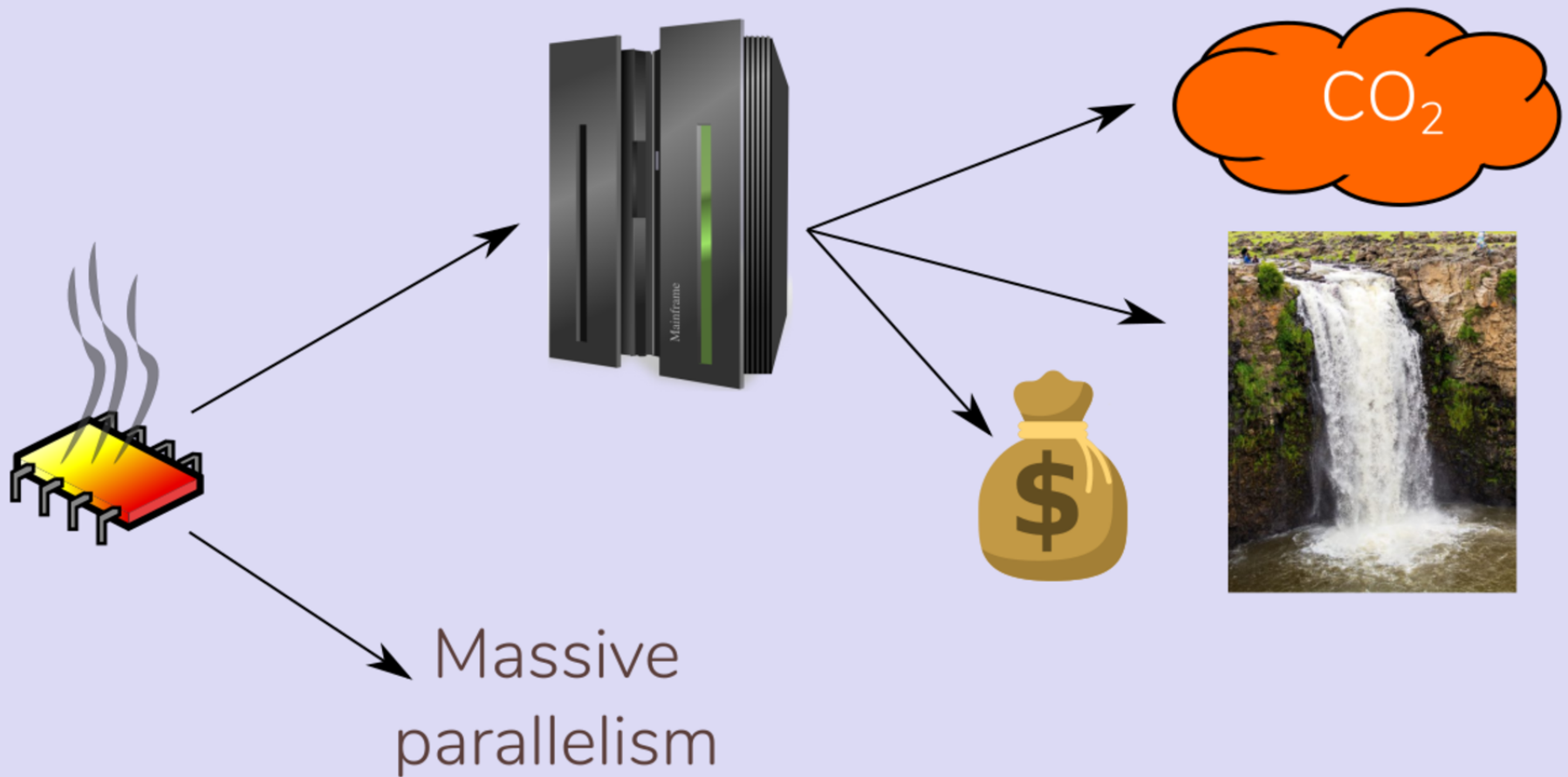


Chip consumption: the root of evil

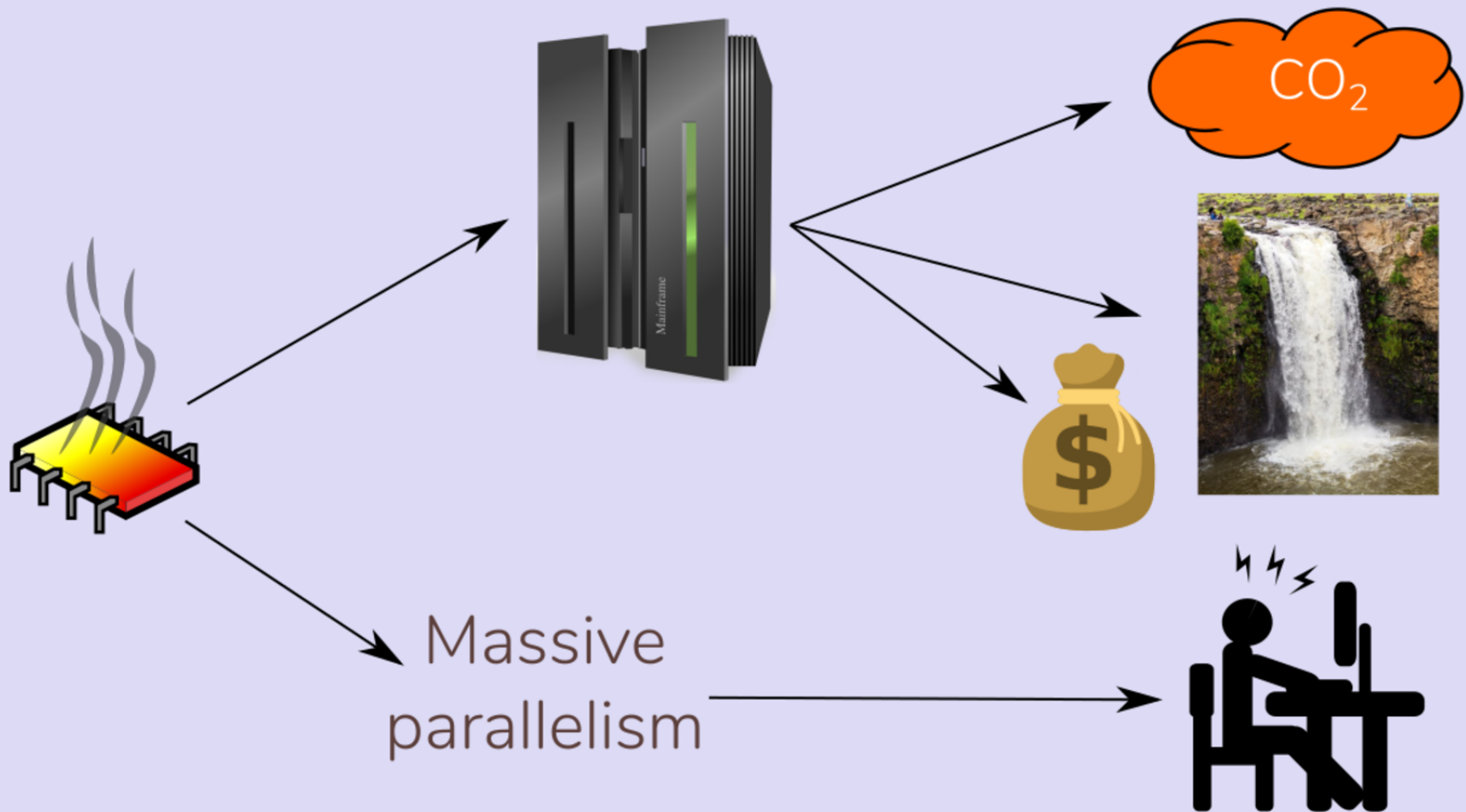




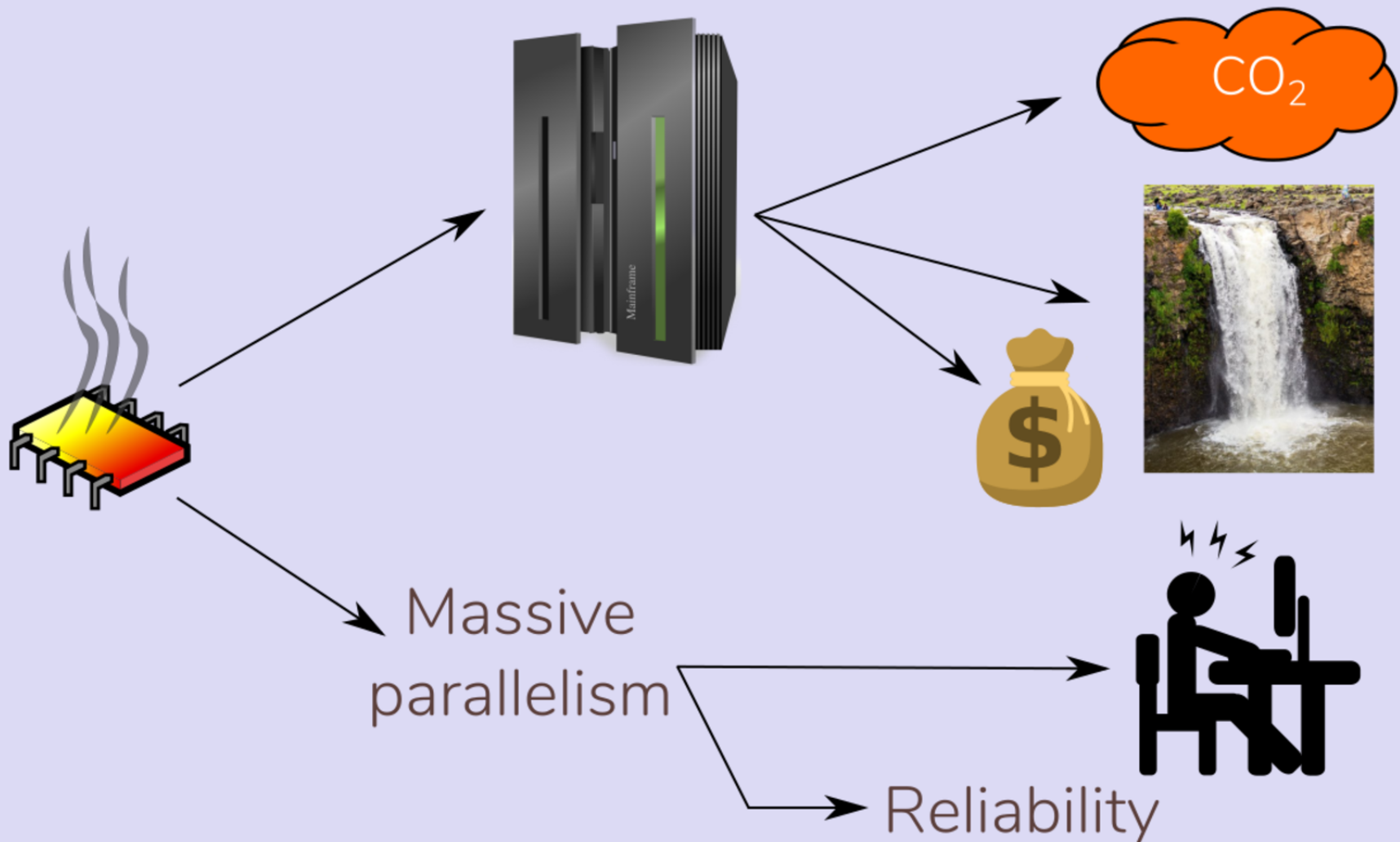
Chip consumption: the root of evil



Chip consumption: the root of evil



Chip consumption: the root of evil



Superconducting digital electronics

Traditional

Superconducting

Speed



$\times 100$



Superconducting digital electronics

Traditional

Superconducting

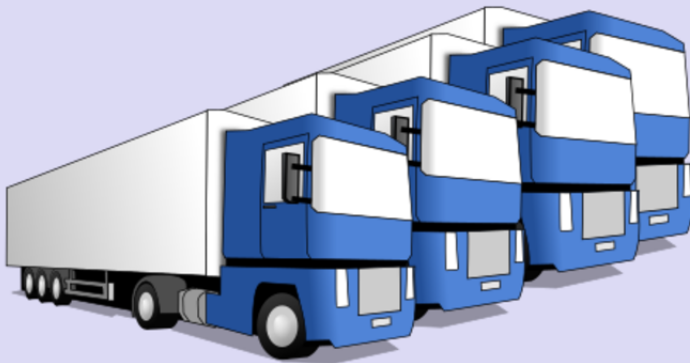
Speed



$\times 100$



Power



$\times 1/10,000$



Superconducting digital electronics

But... If superconducting is so great... why isn't it more popular?



Issue #1: cooling



300K

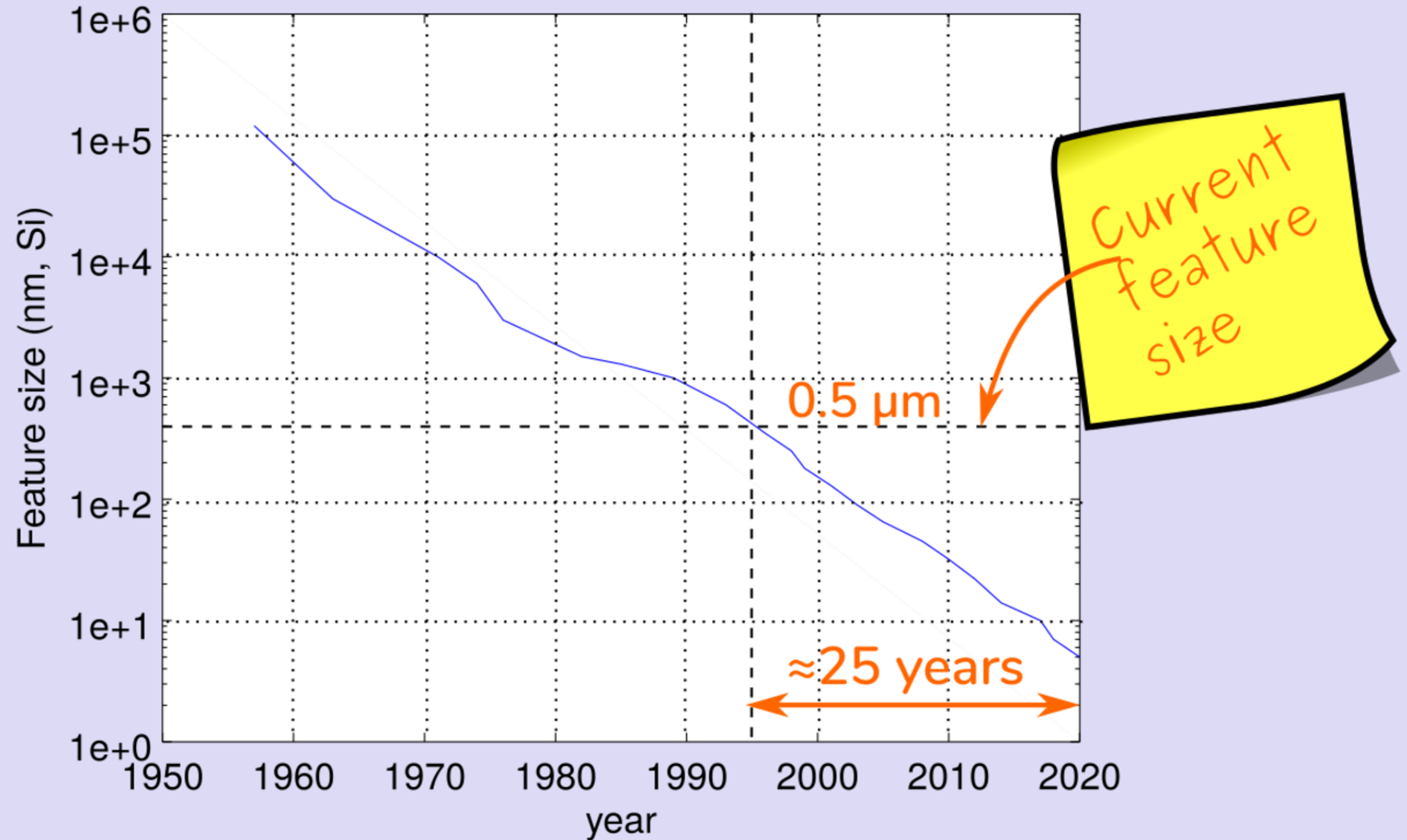
Inefficiencies



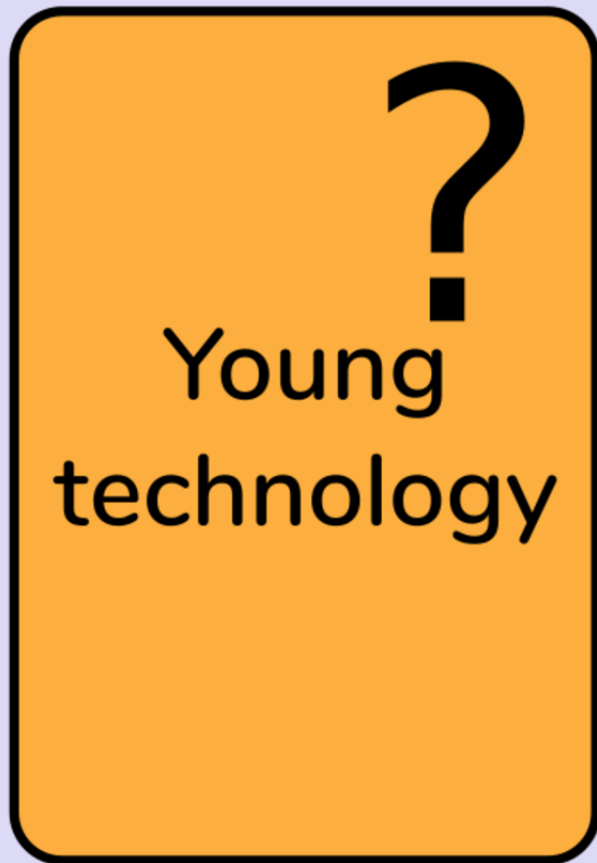
Thermodynamics

Engineering

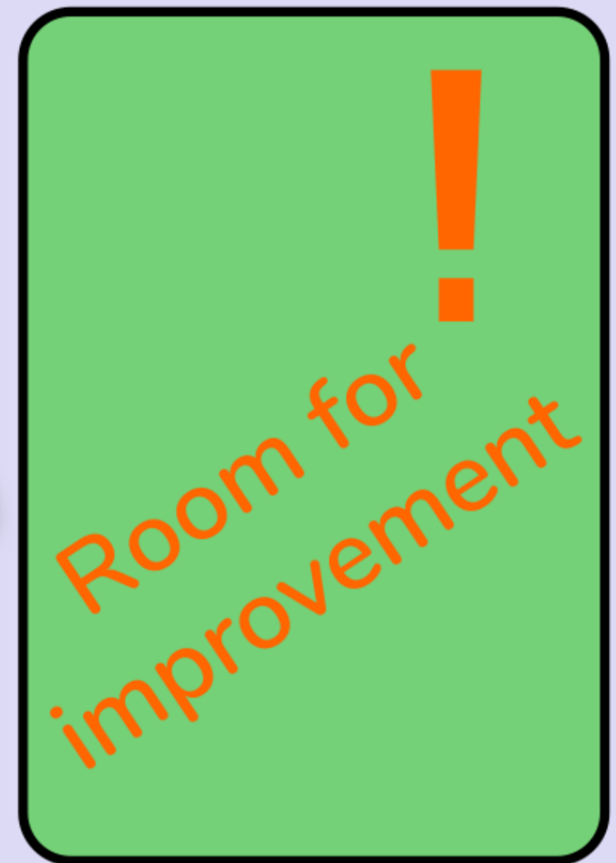
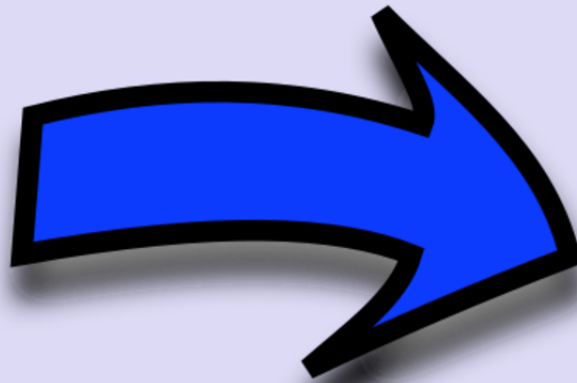
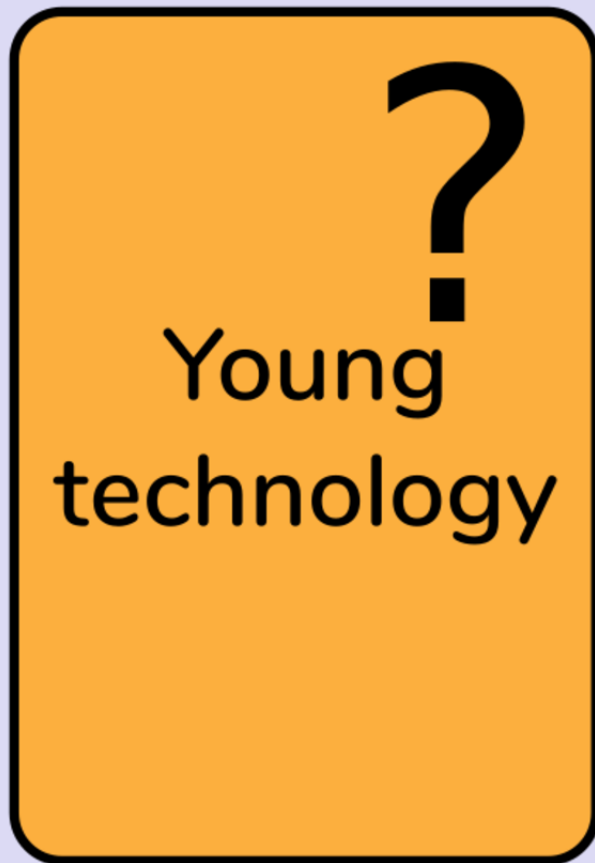
Issue #2: development



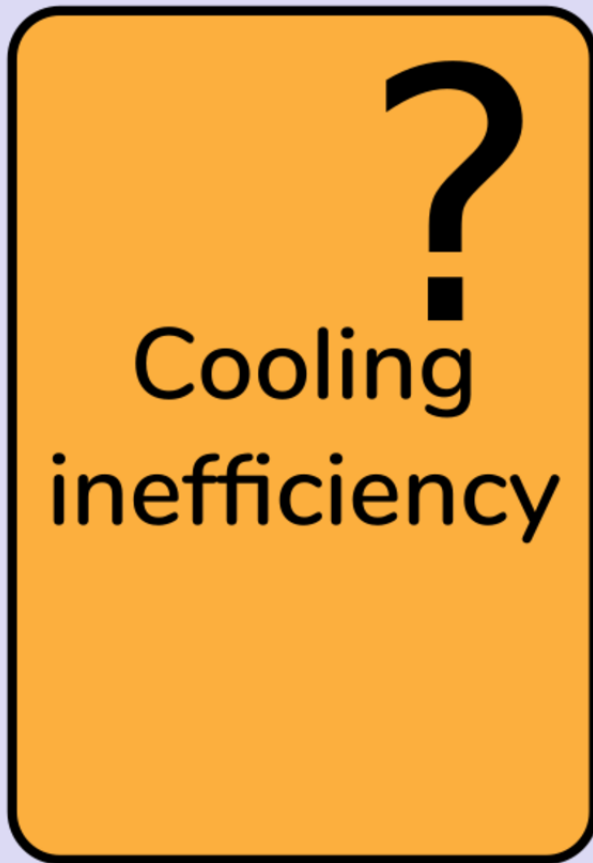
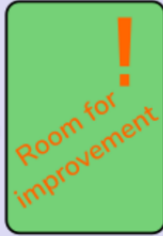
Issues or... opportunities?



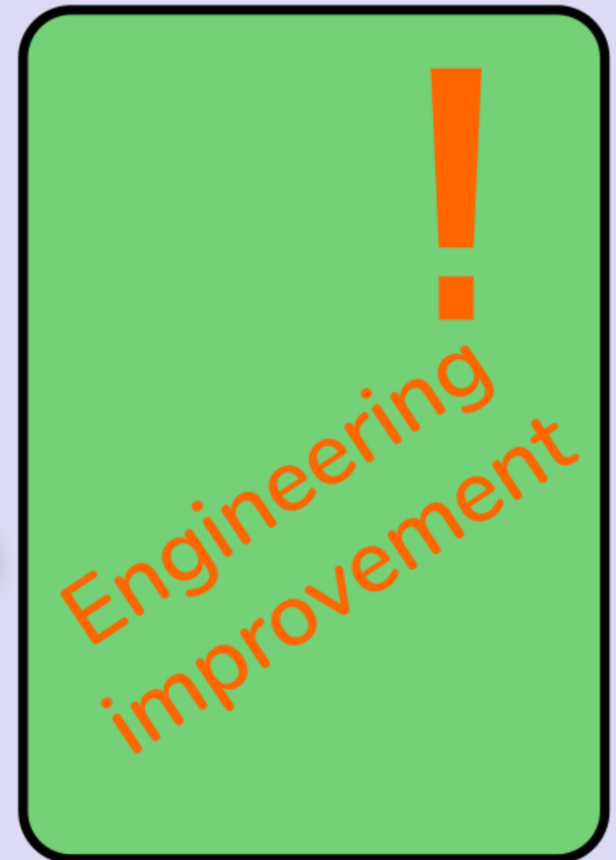
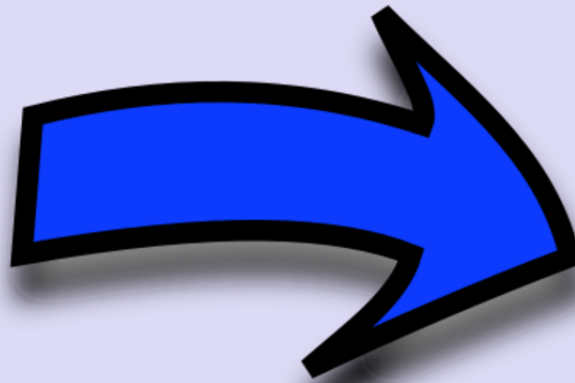
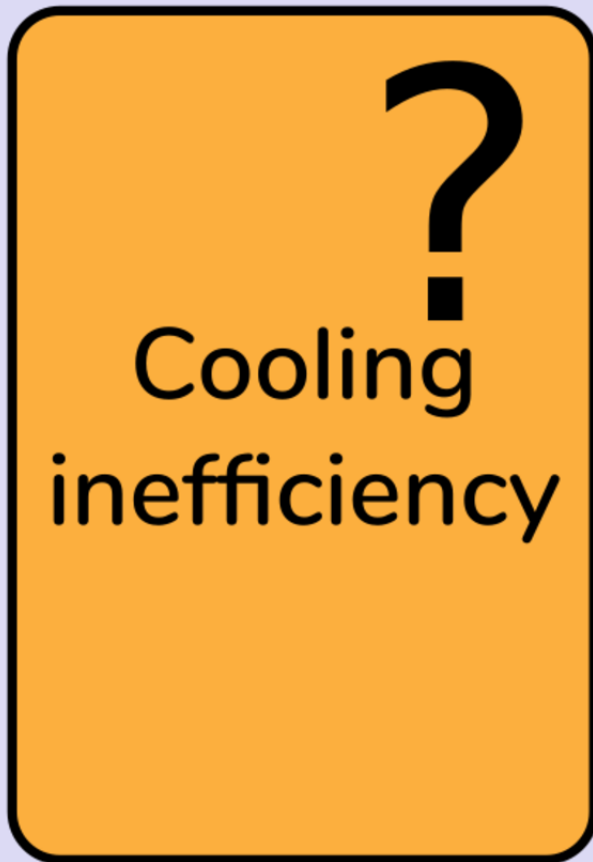
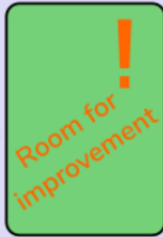
Issues or... opportunities?



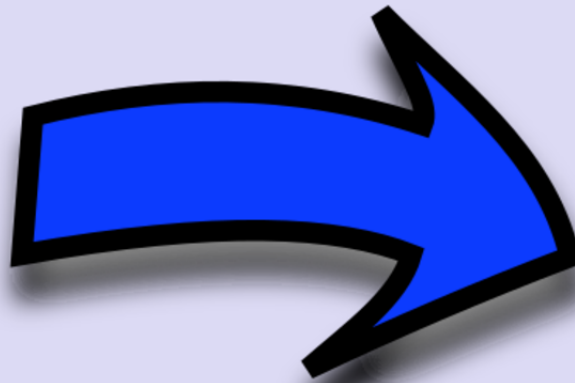
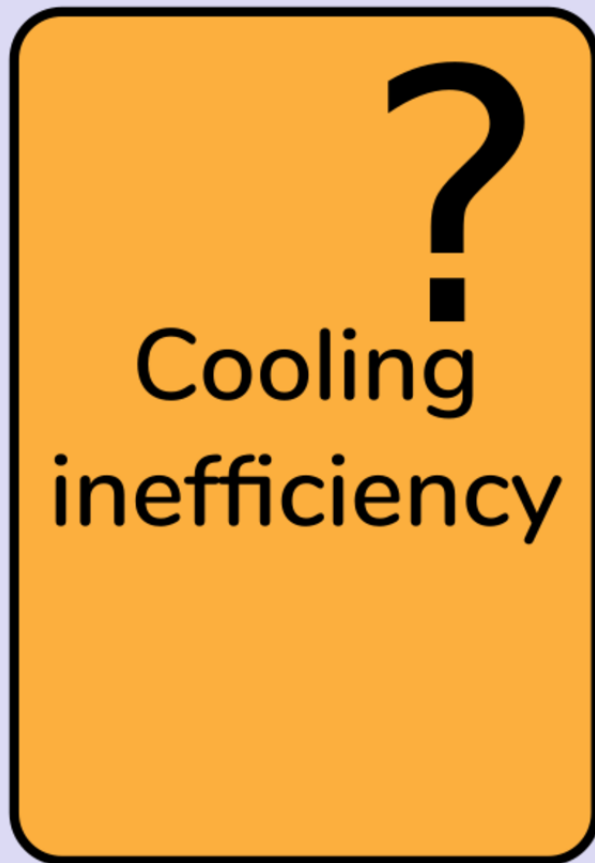
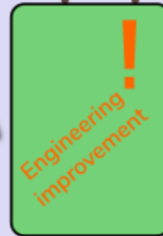
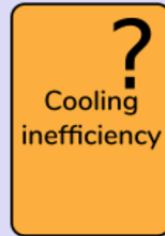
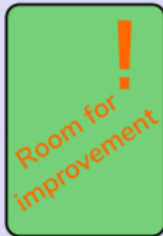
Issues or... opportunities?



Issues or... opportunities?



Issues or... opportunities?



An opportunity...



An opportunity for Europe



Superconducting vs. Quantum

But... what about
Quantum Computers?



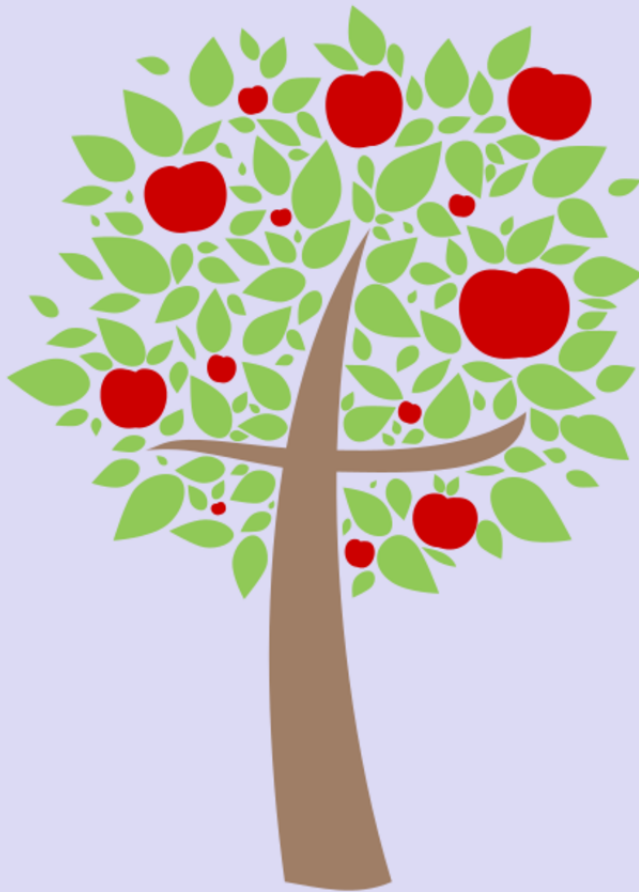
Superconducting vs. Quantum

1) Not really competitors



Superconducting vs. Quantum

2) Different maturity



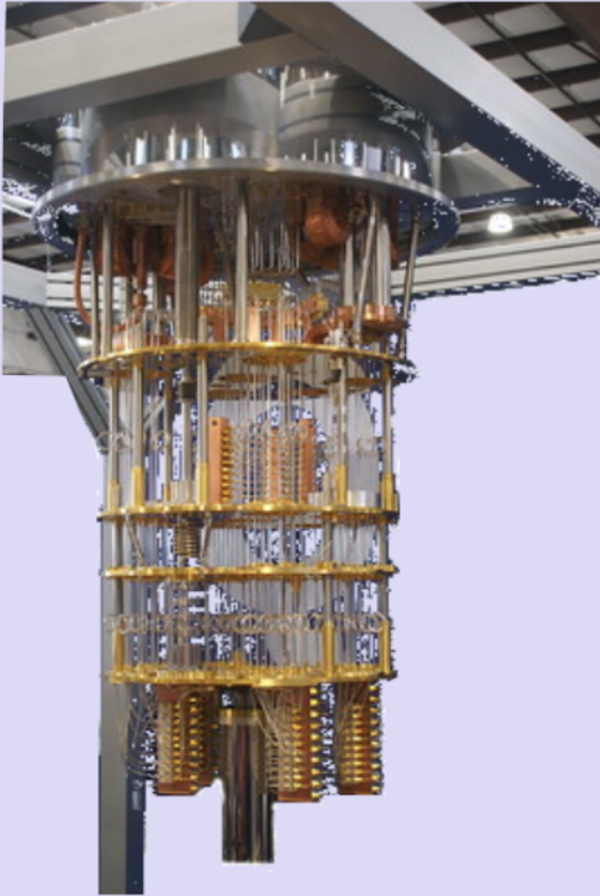
Superconducting
Electronics



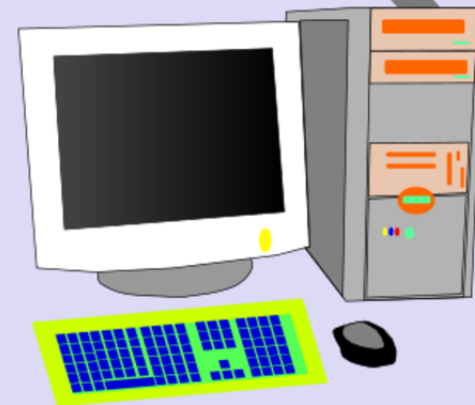
Quantum Computer

Superconducting vs. Quantum

3) software reuse



A superconducting
supercomputer is just a
faster computer.
A QC is totally different

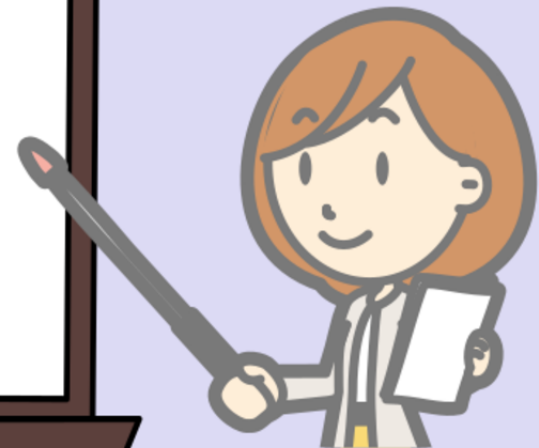


SWOT

• x100 Faster • 1/10,000 power • smaller impact • easier to program • more reliable Strength	• Cooling • Behind silicon • Few researchers • Few foundries and other facilities Weakness
Opportunity • Superconducting chip improvements • Europe as a leader • New computing devices • mm waves sensors	Threat • Cooling issues unsolvable • Percived risk • Low hanging fruit syndrome

Battleplan

- New superconducting digital technologies
- Superconductors foundries
- Higher-T superconducting chips
- Cooling technology improvements
- Innovative computing devices (e.g. neuromorphic)



From this...



...to this



Questions?



Credits

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