**Moore’s Law:**

Moore’s Law is an observation that transistor density would double every 2 years. And, it is not a physical law.

**Smaller transistors switch faster**

Exponential increase in density would lead to exponential increase in speed

A screenshot of a map

Description automatically generated

Image Source: Wikipedia

The physical limitations of Moore’s law:

* Transistors consume power when they switch
* Increasing transistor density leads to increased power consumption
* High power leads to high temperature and we fans can only remove a certain amount of heat. After that we would need something like liquid nitrogen or water used in cooling of commercial buildings or in supercomputers for cooling.
* Dennard Scaling says that voltage should scale with transistor size. It would reduce power consumption and temperature. But the voltage can’t go too low since there is a threshold to it and even noise problems would occur. Dennard scaling must stop due to the mentioned reason, additionally, because it doesn’t consider leakage power because the insulation is not thick enough.
* Frequency cannot be increased since it is directly proportional to power as well.
* Lastly, Transistors also leak off power even when not switching