Moore's Law

- It is specifically stated that the number of transistors on an affordable CPU would double every 2 years but more transistors is more accurate according to the prediction of Moore.
- Not a physical law, just an observation
- Smaller transistors switch faster
- Exponential increase in density would lead to exponential increase in speed.

Moore's Law Limitations

Power Wall

Transistors consume power when they switch. Increasing transistor density leads to increased power consumption. Small transistors use less power, but density scaling is faster. High power leads to high temperature.

Dynamic Power

- $P = \alpha * CFV2$
- α is percent of time switching
- C is capacitance (related to size)
- F is the clock frequency
- V is voltage swing (from low to high)
- Voltage is important
- 0 to 5V uses much more power than 0 to 1.3 V

Dennard Scaling

- Voltage should scale with transistor size
- Keeps power consumption, and temperature, low
- Problem: Voltage can't go too low
- Must stay above threshold voltage
- Noise problems occur
- Problem: Doesn't consider leakage power
- Dennard scaling must stop