Concurrency in Go - Module 1 Activity

Moore's Law Definition

- Moore's Law is an observation that the density of transistors doubles every 2 years.

Moore's law is an observation based on historical information and not a physical law or natural law.

Physical Limitations

1. Most commonly used systems are air cooled. With increase in the density of transistors, temperature also increases and air cooled systems can dissipate only that much heat. Air cooling cannot scale to handle the resultant increase in temperature arising from doubling of transistor density.
2. Power consumption increases with the increase in the transistor density as transistors consume power to switch. With most systems being portable that run on a battery, power cannot be consumed so fast that it drains the battery almost immediately. Increase in power consumption also causes an increase in temperature which would reach such high levels that the chip could physically melt.
3. Transistors need a minimum voltage to switch which is called the threshold voltage. Power consumption can be decreased by scaling the voltage but we are limited by the threshold voltage.
4. Voltage reduction has lower noise tolerance. If the transistor treated 5V as high and 0V as low, a 0.5V noise would still be acceptable without causing the transistor to get confused between whether the signal was a high or low. But, if the transistor treated 1V as high and 0V as low, a 0.5V noise would make detection as to whether the signal was high or low as good as a random guess.
5. Clock frequency cannot increase exponentially. A higher frequency results in such a high temperature that the processors could physically melt.
6. Voltage scaling does not prevent power leakage. Power leakage becomes increasingly hard to contain as the transistors become smaller and smaller because of which the insulation layer also needs to reduce in size.