Moore's Law and limitations

What is Moore's Law:

Moore's law (or rather Moore's observation) is that the that the number of transistors in an integrated circuit doubles about every two years

Limitations and what has prevented it from continuing to be true:

1. As you add **more transistors to the core the temperature increases as power required by the transistor also increases**
2. **Power increases as density of transistor increases** leading to cooling issues
3. **Leckage**: As transistors are becoming smaller the size of insulator is also thinning out leading to more and more leakage which is difficult to contain and manage
4. **Dennards scaling issue:** Every transistor has a minimum threshold voltage to switch states. Hence we can't go below that threshold
5. As we add more transistors we try to reduce Voltage (V) to maintain Power to ensure efficiency but we can't go below the threshold Voltage. Hence, **we can't keep adding more transistors due to this limitation since voltage scaling reduces dynamic power consumption**
6. **The voltage gap or scaling is also limited by the side-effects of Noise** which become more visible and starts to become a problem
7. **Multi-Core design and improvements**:
   - It efficient to add more cores than the amount to effort needed increase frequency or adding more transistor to the same processor
   - We can have multiple cores on the SOC with a limited number of transistors than cores with more transistors. Parallelism can work more efficiently on a multi-core system