

Moore's Law

Moore's law is the observation that the number of transistors in a dense integrated circuit doubles about every two years. Moore's law is an observation and projection of a historical trend. Rather than a law of physics, it is an empirical relationship linked to gains from experience in production.

Why did Moore's Law stop to be true?

Starting around 2010, Moore's Law began to break down,

Main reasons were,

1. Temperature increases as power increases
2. Power increases as transistor density increases.
3. Voltage scaling reduces (dynamic) power consumption
4. Voltage scaling cannot prevent leakage power loss
5. Voltage scaling is limited due to noise or threshold voltage.

As we know, heat is produced when a transistor switched from low to high state and vice versa. The faster it happens, the more rapidly the chip heats up and, without proper cooling, melts down. To minimize the chance of the meltdown, many cooling systems have been introduced - liquid nitrogen cooling, immersing the components in non-conductive liquid and so on. Since these methods are too sophisticated for end users, manufacturers have to either minimize the amount of heat the chip produces or improve cooling. Another reason why the Moore's law is slowing down, is the amount of power the microchip can consume. Since any electric device needs power to operate, it has to be either connected to the grid or have some kind of battery installed. Because nowadays there are more and more portable devices which run on batteries, chip manufacturers have to take into consideration how much power transistors consume in a moment of time not to drain the battery instantly.

Moore's Law isn't going to just end like someone turning off gravity. Just because we no longer have a doubling of transistors on a chip every 18

months doesn't mean that progress will come to a complete stop. It just means that the speed of improvements will happen a bit slower.