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Article #1

Supercomputers

This article talks about how the super computers of years ago are now what our average gaming consoles are pumping out. Processors started out very basic but started getting a lot better. The problem is with better processors comes more heat. Things really started to get hard around the 3-gigahertz clock speed. We can push individual processors to run faster but with millions of them found on a processor the chip can’t dissipate the heat.

In 2007 the U.S Defense Advanced Research Agency asked the question of what kind of technology would we need by 205 to build supercomputers that can execute a quintillion mathematical operations per second. The term for this is flops. A flop is floating point operations per second. The quintillion mathematical operations per second is can a exaflop. The research group were given half the time the last advancement from teraflops to petaflops. Which is a thousand times advance! These machines are seriously packing a punch.

They came to the conclusions that an exaflop computer wasn’t going to be happening soon and probably not for a really long time. A super computer from the 1980s would be beat by a super computer from 2011 by a factor of a million.

One of the biggest problems with super computers is power consumption. A supercomputer from 2011 consumed about 6 megawatts of power! This is enough to power around about 5000 homes! There are researchers at the University of Illinois that are building a supercomputer called Blue Waters. This computer is going to use 15 MW. 15 MW before the cooling system, so a little bit more. This computer is going to have 10 petaflops which is about 100 times less than the exaflop. If you used the Blue Waters consumption and scaled it to the exaflop it would take 1.5 gigawatts of power to run. That is .1 percent of the entire US power grid. I did some math, and if you were to power this machine with 285-watt solar panels it would take about 351,000 solar panels.

They had to find a way to use less power we need to go back to how processors are made and the fundamentals. Processors now are made from silicon and it is safe to assume that future processors are going to be made from silicone as well. Right now, most chip voltages are at 1 volt. They did a test on .5V because it represents the best projection of what silicon based logic circuitry would offer in the future.

The biggest problem of using processors with low voltage is you lose speed. There is a major trade off of speed and power. With using the .5V it would run with a lot less consumption but the speed would be less.