

Estimating worlds computational power

Küberkaitse eriseminar

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Approach

- Estimation base: currently about 3% of electrical power generated worldwide goes to computing.
 - This is not just CPU, but includes all the supporting infrastructure.
 - But we can make some wild estimations based on that and additional anecdotal evidence and arrive on entertaining conclusions.



Assumptions

Computing power of appliances and embedded CPU's at any time is relatively small compared to classical computers and can be discarded without influencing the estimation too much.

In other words – your iPad doesn't matter.



Average CPU

- For the basis of our calculation lets assume average worldwide CPU is something a mid-range consumer PC would use 5 years ago.
- Intel Core 2 Duo E4400 (Allendale) , 2.0Ghz
 - ~20000 MIPS
 - 65W



The Numbers

- In typical data center/desktop setup, around 30% of power is consumed by CPU.
- 3% of electrical power generated worldwide goes to computing.
- Current worldwide electricity generation capacity is around 5000Gw.



The Answer

- MIPS per Watt of our model system:
 - $20\,000 / 65 = 307 \text{ MIPS/w}$
 - FLOPS per watt: 58 MFLOPS/w
- World's CPU power consumption:
 - $5\,000\,000\,000\,000 \text{ W} * 0.03 * 0.3 = 45 \text{ Gw}$
- World's Computation Power:
 - $45 \text{ Gw} * 307 \text{ MIPS/w} = 13815 \text{ PMIPS}$
 - $45 \text{ Gw} * 58 \text{ MFLOPS/w} = 2610 \text{ PFLOPS}$



References

- Wikipedia, duh
 - <http://en.wikipedia.org/wiki/FLOPS>
 - http://en.wikipedia.org/wiki/Million_instructions_per_second
 - http://en.wikipedia.org/wiki/Electric_energy_consumption#World_Electricity_Consumption_Highlights_in_2009
 - http://en.wikipedia.org/wiki/Top_500
 - www.cs.wichita.edu/~vnambood/mypubs/eEnergy09.pdf
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