SIZE OF A COMPUTER SYSTEM[1]

Present day personal computers execute hundreds of million of instructions per second. An instruction may be, for instance, the multiplication of two floating point numbers. Suppose that the execution of such operation entails the transfer of the operands from main memory to the processor where the multiplication is carried out, and the transfer back to the main memory of the result.

Assume, in a first approximation, that the technology used to build both the processor and the memory modules is such that logic switching times may be neglected *vis a vis* propagation times of the electrical signals in the buses (both internal and external to the modules).

i) What is the maximum average distance between the processor internal registers and the memory storage cells so that the computer may perform 10^{15} floating point multiplications per second, that is, working at 1 PFlop?

ii) Give a reason why present day supercomputers, which attain a peak performance of up to 100 PFlop, consist of a very large array (up to tens of thousands) of computing nodes interconnected by an ultra fast network.

GRADING

- +1 unit on the course theoretical mark if completed with success.

DELIVERABLE

- a pdf file, named `ACAChal<name+nMec>.zip`, where the answer to the above questions are presented.

DEADLINE

- January, 26, at midnight.

1 Idea taken from "SpaceTime Physics - Introduction to Special Relativity", Taylor E. F. & Wheeler J. A., 2nd Edition, 1992, W. H. Freeman & Company