MFLOPS Ratings: How They're Calculated and Used

Revised: 3/19/93
Security: Everyone

MFLOPS Ratings: How They're Calculated and Used

==========

Article Created: 22 September 1989

Article Change History

03/16/93 - RETITLED
• From "Motorola 68020/68030: How To Calculate MFLOPS Ratings"

TOPIC ----------

Does Apple publish MFLOPS ratings for the various Macintosh computers? How accurate is this rating for comparing system performance between vendors?

DISCUSSION ----------

MFLOPS (Million Floating Point Operations Per Second) is a measurement generally used in reference to supercomputers rather than personal computers or workstations. Measuring MFLOPS is an inaccurate art, at best. The reference manuals we consulted all stated that an MFLOPS rating can be misleading. The issue that causes MFLOPS ratings to be suspect is that not all instructions take the same time. On the 68881, a single instruction can take from 29 to over 600 machine cycles.

From Motorola's 68020/68030 Performance Report:

> "Benchmarking microprocessors is much like water-witching. Everyone wants to use the results but are skeptical of the 900-methods. From the user's point of view, the best benchmark to use in making a decision on a given microprocessor is to run the code which will be run in the final application. This, however, is usually difficult at best, and expensive and time consuming at least. Since running the actual code is usually not feasible, most users and all microprocessor manufacturers turn to either synthetic benchmarks - ones that simulate real-world conditions - or small standard benchmark programs which are designed to

indicate real-world performance. Not everyone can agree on what simulates real conditions; thus, there are numerous benchmark programs available, each written to test some aspect of performance that the writer is interested in testing."

For many of the same reasons that Apple does not publish MIPS ratings and those stated above, Apple does not publish MFLOPS ratings. However, you can calculate this value on your own.

Using chapter 6 of the Motorola MC68881 Floating-Point Coprocessor User's Manual, figure the average time for a floating-point operation. Here's that problem mentioned above. Do you add the times for all instructions and divide by the number of instructions? Do you pick a few "popular" instructions and average their times? Do you pick the instruction that requires the least amount of time (very sneaky)?

We suggest the first method. For the sake of this discussion, let's say that value is xx cycles/instruction.

Assume that the floating-point unit and the microprocessor are clocked one for one. On the Macintosh IIx, this value would be 15.6672 m-cycles/sec.

Invert the first number and multiply by the second giving you m-instructions/sec (MFLOPS).

```
   1 instructions   15.6672 million cycles     15.6672   million instructions
  -- ------------ * ----------------------  =  --------  --------------------
  xx   cycle                sec                   xx              sec
```

It is generally assumed that the 68882 is 1.5x faster than the 68881.

Copyright 1989, 1993 Apple Computer, Inc.

Tech Info Library Article Number:4390