International Federation for Information Processing
Technical Committee 2: Software Theory and Practice
Working Group 2.5: Numerical Software
http://www.nsc.liu.se/wg25/

September 4, 2007

Bob Davis, Chair
IEEE Microprocessor Standards Committee
Summit Computer Systems, Inc.
22685 Summit Road
Los Gatos, CA 95033-9310

Dear Mr. Davis,

The IFIP Working Group 2.5 on Numerical Software very much appreciates the work of the Standards Committee of the IEEE Computer Society in revising the IEEE Floating-Point Arithmetic Standards 754 and 854.

We think that the tremendous progress in computer technology and the great increase in computer speed should be accompanied by extension of the mathematical capacity of the computer. Beyond what has already been done by IEEE754R, IFIP WG 2.5 expresses its desire that the following two requirements are included in the future computer arithmetic standard.

a) *For the data format double precision, interval arithmetic should be made available at the speed of simple floating-point arithmetic.*

   Most processors on the market are equipped with arithmetic for multimedia applications. On these processors we believe that it is likely that only about 0.1% more silicon in the arithmetic circuitry would suffice to realize this capability.

   See, for example, Reinhard Kirchner and Ulrich W. Kulisch, "Hardware Support for Interval Arithmetic," *Reliable Computing* **12**:3 (June 2006), pp.225-237.

b) *High speed arithmetic for dynamic precision should be made available for real and for interval data.*

The basic tool to achieve high speed dynamic precision arithmetic for real and interval data is an exact *multiply and accumulate* (i.e., continued addition) operation for the data format double precision. Pipelining gives it high speed and exactitude brings very high accuracy into computation.

See, for example, Ulrich W. Kulisch, "Advanced Arithmetic for the Digital Computer," Springer, 2002.

We believe that these requirements reflect the needs of a significant portion of the numerical computing community. With 30 members and 18 affiliates from 13 countries, WG 2.5 represents a wide cross-section of this community. These issues have been discussed at length by the Working Group, which voted unanimously at its meeting in August 2007 to make its views known to your committee.

Please alert us if there is to be further periods of public comment on the draft standard. We would be happy to provide the names of experts from the Working Group who could discuss these issues with you in more technical detail.

Thank you for your kind attention.

Sincerely,

Dr. Ronald F. Boisvert
Chair, IFIP Working Group 2.5

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