

From: rwirt@ix.netcom.com (Richard Wirt)
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Subject: My Perspective on Pentium - AGS
Newsgroups: comp.sys.intel

Andy Grove has asked me to post the following for him. Since it is the weekend and we are out of the office, I am posting from my home system.

Richard Wirt
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This is Andy Grove, president of Intel. I'd like to comment a bit on the conversations that have been taking place here.

First of all, I am truly sorry for the anxiety created among you by our floating point issue. I read thru some of the postings and it's clear that many of you have done a lot of work around it and that some of you are very angry at us.

Let me give you my perspective on what has happened here.

The Pentium processor was introduced into the market in May of '93 after the most extensive testing program we at Intel have ever embarked on. Because this chip is three times as complex as the 486, and because it includes a number of improved floating point algorithms, we geared up to do an array of tests, validation, and verification that far exceeded anything we had ever done. So did many of our OEM customers. We held the introduction of the chip several months in order to give them more time to check out the chip and their systems. We worked extensively with many software companies to this end as well.

We were very pleased with the result. We ramped the processor faster than any other in our history and encountered no significant problems in the user community. Not that the chip was perfect; no chip ever is. From time to time, we gathered up what problems we found and put into production a new "stepping" -- a new set of masks that incorporated whatever we corrected. Stepping N was better than stepping N minus 1, which was better than stepping N minus 2. After almost 25 years in the microprocessor business, I have come to the the conclusion that no microprocessor is ever perfect; they just come closer to perfection with each stepping. In the life of a typical microprocessor, we go thru half a dozen or more such steppings.

Then, in the summer of '94, in the process of further testing (which continued thru all this time and continues today), we came upon the floating point error. We were puzzled as to why neither we nor anyone else had encountered this earlier. We started a separate project, including mathematicians and

scientists who work for us in areas other than the Pentium processor group to examine the nature of the problem and its impact.

This group concluded after months of work that (1) an error is only likely to occur at a frequency of the order of once in nine billion random floating point divides, and that (2) this many divides in all the programs they evaluated (which included many scientific programs) would require elapsed times of use that would be longer than the mean time to failure of the physical computer subsystems. In other words, the error rate a user might see due to the floating point problem would be swamped by other known computer failure mechanisms. This explained why nobody -- not us, not our OEM customers, not the software vendors we worked with and not the many individual users -- had run into it.

As some of you may recall, we had encountered thornier problems with early versions of the 386 and 486, so we breathed a sigh of relief that with the Pentium processor we had found what turned out to be a problem of far lesser magnitude. We then incorporated the fix into the next stepping of both the 60 and 66 and the 75/90/100 MHz Pentium processor along with whatever else we were correcting in that next stepping.

Then, last month Professor Nicely posted his observations about this problem and the hubbub started. Interestingly, I understand from press reports that Prof. Nicely was attempting to show that Pentium-based computers can do the jobs of big time supercomputers in numbers analyses. Many of you who posted comments are evidently also involved in pretty heavy duty mathematical work.

That gets us to the present time and what we do about all this.

We would like to find all users of the Pentium processor who are engaged in work involving heavy duty scientific/floating point calculations and resolve their problem in the most appropriate fashion including, if necessary, by replacing their chips with new ones. We don't know how to set precise rules on this so we decided to do it thru individual discussions between each of you and a technically trained Intel person. We set up 800# lines for that purpose. It is going to take us time to work thru the calls we are getting, but we will work thru them. I would like to ask for your patience here.

Meanwhile, please don't be concerned that the passing of time will deprive you of the opportunity to get your problem resolved -- we will stand behind these chips for the life of your computer.

Sorry to be so long-winded -- and again please accept my apologies for the situation. We appreciate your interest in the Pentium processor, and we remain dedicated to bringing it as close to perfection as possible.

I will monitor your communications in the future -- forgive me if I can't answer each of you individually.

Andy Grove