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Comments on "Why Aren't Operating Systems Getting Faster As Fast as Hardware?"

by

Ousterhout

In this paper, Outsterhour evaluate different hardware platforms and operating system by using a set of benchmarks that stress kernel functions that related to operating system. There are at least two possible factors that affect performance, one is memory bandwidth and disk I/O. Second is the in the file system and NFS limitation. There are eight different tests. Kernel entry exit, context switching, select, block copy, read form file cache, modified Andrew benchmark, open close and create delete. the results are measured in relative MIPS. relative MIPS is calculated by: ((mvax2 time/c)/(c-MIPS/mvax2-mips) where c is the tested system.

For Kernel entry exit, although the RISC machines were generally faster than the CISC machines, they were not as fast as their MIPS ratings would suggest. Their MIPS-relative speeds were between 0.5 to 0.8. This indicates that the cost of entering and exiting the kernel in the RISC machines has not improved. For context switch, the RISC machines were faster than the CISI, but their MIPS-relative speeds were only in between 0.3 to 0.5. For select and block copy, most systems were in line with their MIPS rating, except HP-UX, and sprite and mach. For read form file cache, RISC machines speed were between 0.6 – 1.0, but their MIPS score is still low. For modified Andrew Benchmark, It appears that the penalty for using NFS is increasing as machine speeds increase. The MIPS-relative speeds are for the foo case, scaled relative to MVAX2 Ultrix 3.0 Local for local configurations and relative to MVAX2 Ultrix 3.0 NFS for remote configurations. For open and close, RISC MIPS-relative speed were in the range 0.8-1.1, for the local case, the sprite MIPS-relative speed were in range 0.27 to 0.34.Finally for Create and delete, in some circumstance, newer operating system has slower benchmark time than the prior version and file creation overhead is excessive in some operating System.

I think this article is out of date compare now, because the memory bandwidth is very large compare to the time Ousterhout wrote, factor one is solved, and the performance will change a lot. For second factor, there are many different alternative file system, if we test with those, the MIPS-relative speed should be more close to 1.0. Also, all this kind of system call might change their algorithm to improve speed as well.

In result, for memory bandwidth and disk I/O. RISC architectures speed is faster than the memory bandwidth, with the result that memory intensive benchmarks do not receive the full benefit of the CPU. For file Systems, the UNIX file systems writes before different key operations. As a result the performance of those operations speed is close to the disk speed, so it did not improve much with the faster CPUS.

The presenter Brian and jack were excellent. Their presentation style is very professional and their slide were detail and highlighted. They also cite other resource and talks about bottleneck, and how to solve the problem in the present now. Their slides covered all the important information about the whole paper, and I very learned a lot form them.