

Why Diskeeper?

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Most experts agree that defragmentation benefits every major performance feature on today's computers. But some are surprised at the reasons for this.

As everyone knows, the main component in a computer is the CPU, and CPUs keep getting faster and faster. You can buy a computer with a 500MHz CPU for \$1,000. That "500MHz" means the CPU completes 500 million operations per second. That's a lot (current CPUs available are much faster).

The second component of a computer is its memory. Memory today operates at a 50 nanosecond cycle time, which means you can get something out of it or put something into it in 50 billionths of a second. That works out to 20 million memory operations per second. Not as fast as the CPU, but still pretty darned fast. In fact, the "slowness" of the memory holds back the CPU from operating as fast as it ought to all the time. But still, 20 million operations per second is a lot.

The third major component in a computer is the hard disk. While the CPU does the computation, and the memory is used for short-term storage (seconds), the hard drive is where you keep things you expect to have around for a while (months or years). It is much bigger than memory, often measured in gigabytes (billions of bytes) as opposed to megabytes (millions of bytes) of memory. However, relatively speaking, the disk is S-L-O-W. The hottest disks today have average access times of 5 milliseconds. That's 5 thousandths of a second to get one unit of information off the disk. (The units of information tend to be bigger than the single bytes handled by memory and CPU, usually measured in hundreds of byte blocks.) But at a rate of 5 milliseconds, that's only 200 operations per second. S-L-O-W.

So if CPUs are capable of 500 million operations per second, memory is capable of 20 million operations per second, and disks are capable of no more than 200 operations a second, where do you think the performance bottleneck is in a computer? That's right: it's the disk which is 100,000 times slower than the memory and over two million times slower than the CPU. In other words, if your computer program requires any information to be read from or written to the disk, it is going to be sitting there waiting (and waiting, and waiting) while the S-L-O-W disk processes the disk input and output.

Now, introduce fragmentation into this picture. A contiguous file can be read by your program with a single disk access. A file fragmented into two pieces requires TWO accesses to get the same information. With files fragmented into two pieces on average, your 200 disk operations per second is suddenly reduced to an effective rate of 100 operations a second—half the expected speed—and S-L-O-W just got magnified by a factor of two. Imagine a program trying to read information from a file fragmented into 200 pieces (not uncommon). It would take a WHOLE SECOND to read the same information that should only take 1/200th of a second.

If you step back and take a look at this in perspective, it really doesn't matter a hoot how fast your CPU is or how fast your memory is if that disk is fragmented. Every extra fragment (per file, average) is going to slow down that computer so much, the machine is set back a generation or two in terms of power. The obvious conclusion is that defragmenting your disks is the FIRST performance enhancement anyone should make. Because the disk is the slowest component and therefore the #1 potential bottleneck, the disk should be kept in peak operating condition at all times. Only then should you worry about memory and CPU speeds.

So, in other words, defragmentation really allows your hardware to perform at its most optimum levels. And this pretty well explains "Why Diskeeper!"