

JUSTIFICATION FOR ADDITIONAL RAM IN ARCHICAD COMPUTERS

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The Impetus

This week, Joel asked me to help him with an extremely slow PlotMaker layout book. I opened the layout book on my computer and watched as the memory use crawled its way up to 1.75 Gig. Since my computer only has 1.25 Gig, this means that my computer was swapping pages and pages of information from RAM onto my hard drive. Joel's computer only has 1 Gig of RAM, so his situation was even worse

About Memory Paging

When any Windows program needs to use more RAM than the computer actually has, Windows will start writing the oldest sections of RAM to the hard drive to make space for the new information. Eventually, when the old section of RAM is needed again, Windows writes other RAM sections to the hard drive, then retrieves the old section and writes it into RAM.

This slows down computer performance in two ways. First is just the fact that the computer has to *take time* to swap hundreds of megabytes of information to, and from, the hard drive. Second is the fact that hard drives don't read or write nearly as fast as RAM. On average, information can be written/read in RAM five times faster than on a hard drive.

The Test

I performed a carefully controlled series of tests on Joel's computer. There were 6 steps in each test, and two tests were performed for each RAM configuration. The steps were as follows:

1. Opened PlotMaker, then opened AC083. Timing was from click on AC083 until completely loaded.
2. Updated first floor plan in PlotMaker.
3. Signed in to AC083 model in ArchiCAD. Timing was from double-click until completely signed in.
4. Updated second floor plan in PlotMaker.
5. Signed out of model AC083 without saving and exited ArchiCAD.
6. Closed PlotMaker without saving.

The first test was performed right after a reboot of the computer. The second test was performed right after the first test, the only difference being that we opened a PDF file just to change the memory profile.

The Results

The results of this series of tests are shown in the following chart. Times are given in decimal minutes.

RAM TEST RESULTS							
	1 Gig of RAM			2 Gig of RAM			
Step Number	After Reboot	After 1 st Test	Average	After Reboot	After 1 st Test	Average	Average Savings
1	2.36	1.88	2.12	1.75	1.52	1.64	0.48
2	4.13	4.13	4.13	3.73	3.57	3.65	0.48
3	4.90	4.63	4.77	2.47	2.45	2.46	2.31
4	2.12	2.17	2.15	1.67	1.72	1.7	0.47
5	2.82	2.82	2.82	1.43	1.43	1.43	1.39
6	2.60	2.68	2.64	0.13	0.13	0.13	2.51
Totals	18.93	18.31	18.63	11.18	10.82	11.01	7.64

As you can see, when the computer had 2 Gig of RAM, it saved 7.64 minutes on average over the configuration with only 1 Gig of RAM. The savings would have been even more dramatic had we installed 3 Gig of RAM because during the test, the RAM use peaked at 2.55 Gig – which means that there was still some memory swapping going on between the RAM and the hard drive.

An informal poll revealed that drafters open/close ArchiCAD and PlotMaker an average of 6 to 10 times each day. Using 4 times per day as a conservative number, a single drafter will save 76.40 minutes per week – that's 1.27 hours. (Remember: 7.64 minutes of savings was for opening and closing *both* programs.) Using a burden rate of \$50 per hour (for simplicity), this yields a weekly savings of approximately \$63.67 per drafter.

Currently, two 512MB DDR2 RAM sticks can be purchased for \$240. A single 1GB DDR2 RAM stick costs \$160. Simple math reveals that our investment in RAM will pay us back within 4 weeks. Even if the savings were only 25% of what I have calculated, we would still be paid back within 4 months. In addition, I'm not sure we need DDR2 RAM. We may only need DDR – which costs 30-40% less – which means an even faster return on our investment.

Recommendations

I was going to suggest that we load each computer up with a total of 2 Gig of RAM, but with this kind of ROI, I whole-heartedly recommend that we get 3 Gig for each ArchiCAD machine. Whatever smaller RAM sticks are left can be distributed to computers that use AutoCAD exclusively so they have either 3/4 or 1 Gig total. We may even be able to give some RAM to the slowest of the Marketing department computers.