Managing Memory - Chapter #6

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Key Terms

Bank — An area on the motherboard that contains slots for memory modules (typically labeled bank 0, 1, 2, and 3).

Burst EDO (BEDO) — A refined version of EDO memory that significantly improved access time over EDO. BEDO was not widely used because Intel chose not to support it. BEDO memory is stored on 168-pin DIMM modules.

COAST (cache on a stick) — Memory modules that hold memory used as a memory cache. See memory cache.

CAS Latency (CL) — A feature of memory that reflects the number of clock cycles that pass while data is written to memory.

Conventional memory — Memory addresses between 0 and 640K. Also called base memory.

C-RIMM (Continuity RIMM) — A placeholder RIMM module that provides continuity so that every RIMM slot is filled.

DDR2 SDRAM —

Direct Rambus DRAM — A memory technology by Rambus and Intel that uses a narrow, very fast network-type system bus. Memory is stored on a RIMM module. Also called RDRAM or Direct RDRAM.

Direct RDRAM — See Direct Rambus DRAM.

Disk thrashing — A condition that results when the hard drive is excessively used for virtual memory because RAM is full. It dramatically slows down processing and can cause premature hard drive failure.

Double Data Rate SDRAM (DDR SDRAM) — A type of memory technology used on DIMMs that runs at twice the speed of the system clock.

Dual Channel –

Dynamic RAM (DRAM) — The most common type of system memory, it requires refreshing every few milliseconds.

ECC (error-correcting code) — A chip set feature on a motherboard that checks the integrity of data stored on DIMMs or RIMMs and can correct single- bit errors in a byte. More advanced ECC system service, EFS is transparent to users and applications and is difficult to attack.

EDO (extended data out) — A type of RAM that may be 10–20 percent faster than conventional RAM because it eliminates the delay before it issues the next memory address.

Emm386.exe — A DOS and Windows 9x utility that provides access to upper memory for 16-bit device drivers and other software.

Extended memory — Memory above 1024K used in a DOS or Windows 9x system.

General Protection Fault (GPF) — A Windows error that occurs when a program attempts to access a memory address that is not available or is no longer assigned to it.

High memory area (HMA) — The first 64K of extended memory.

Himem.sys — The DOS and Windows 9x memory manager extension that allowed access to memory addresses above 1 MB.

Memory paging — In Windows, swapping blocks of RAM memory to an area of the hard drive to serve as virtual memory when RAM is low.

Nonparity memory — Eight-bit memory without error checking. A SIMM part number with a 32 in it (4×8 bits) is nonparity.

Pages — 4K segments in which Windows NT/ 2000/ XP allocates memory.

Page file — See swap file.

Pagefile.sys — The Windows NT/2000/XP swap file.

Parity — An error-checking scheme in which a ninth, or "parity," bit is added. The value of the parity bit is set to either 0 or 1 to provide an even number of ones for even parity and an odd number of ones for odd parity.

Parity error — An error that occurs when the number of 1s in the byte is not in agreement with the expected number.

Parity memory — Nine-bit memory in which the ninth bit is used for error checking. A SIMM part number with a 36 in it (4×9 bits) is parity. Older PCs almost always use parity chips.

RAS Latency –

RDRAM — See Direct Rambus DRAM.

Refresh — The process of periodically rewriting data, such as on dynamic RAM.

Re-marked chips — Chips that have been used and returned to the factory, marked again, and resold. The surface of the chips may be dull or scratched.

SDRAM II — See Double Data Rate SDRAM (DDR SDRAM).

Static RAM (SRAM) — RAM chips that retain information without the need for refreshing, as long as the computer's power is on. They are more expensive than traditional DRAM.

Swap file — A file on the hard drive that is used by the OS for virtual memory. Also called a page file.

Synchronous DRAM (SDRAM) — A type of memory stored on DIMMs that runs in sync with the system clock, running at the same speed as the motherboard.

SyncLink DRAM (SLDRAM) — A type of DRAM developed by a consortium of 12 DRAM manufacturers. It improved on regular SDRAM but is now obsolete.

Upper memory — In DOS and Windows 9x, the memory addresses from 640K up to 1024K, originally reserved for BIOS, device drivers, and TSRs.

Upper memory block (UMB) — In DOS and Windows 9x, a group of consecutive memory addresses in RAM from 640K to 1MB that can be used by 16-bit device drivers and TSRs.

Virtual DOS Machine (VDM) –

Virtual memory — A method whereby the OS uses the hard drive as though it were RAM. Compare to RAM drive.

Win386.swp — The name of the Windows 9x swap file. Its default location is C:\Windows.

REVIEWING THE BASICS

1. Name two ways that a SIMM and a DIMM are alike. Name two ways they are different.
They both are types of DRAM and connect directly to the motherboard. Differences include the width of data path that each type accommodates and the way data moves from system bus to module.

2. How many pins are on a SDRAM DIMM? On a DDR DIMM? On a SIMM? On a RIMM?
SDRAM DIMM – 168
DDR DIMM – 184
SIMM – 72
RIMM – 232

3. Which is likely to be more expensive, a 512-MB DIMM or a 512-MB RIMM? Why?
512-MB RIMM

4. How many notches are on a DDR SDRAM module?
One

5. How does a memory cache speed up computer processing?
When memory cache is used, the cache controller anticipates what data or programming code the CPU will request next and copies that data or programming code to SRAM. Then, if the cache guessed correctly, it can satisfy the CPU request from SRAM without accessing the slower DRAM. Under normal conditions, memory caching guesses right more than 90% of the time and is an effective way of speeding up memory access.

6. Explain how L1 cache, L2 cache, and L3 cache differ.
L1 cache is located on the CPU die, L2 cache is located inside the CPU housing, and L3 cache is located inside the CPU housing too but farther away from the CPU than the L2 cache or L3 cache is sometimes located on the motherboard when there is L2 cache in the CPU housing.

7. What types of memory can be used on a 100-MHz motherboard?
SDRAM

8. Looking at an SDRAM DIMM, how can you know for certain the voltage needed by the module?

9. How many 30-pin SIMMs are installed in one bank?
Four

10. How many 72-pin SIMMs are installed in one bank?
Two

11. What are two current speeds of RIMMs?
600 MHz and 800 Mhz

12. List at least four things you can do if you receive memory errors during a memory upgrade.
- **Check that you have the right memory modules supported by your motherboard.**
- **Verify that CMOS setup recognizes the memory features correctly**
- **Check that you have installed the right module size, as stated in the motherboard documentation.**
- **Remove the newly installed memory and check whether the error message disappears.**
- **Try flashing BIOS**

13. What might be a symptom in Windows of unreliable memory on a motherboard?
Recurring errors during normal operations.

14. List at least four things you can do if you receive memory errors during normal operation when you have not recently upgraded memory.
- **Run a current version of an antivirus software to check for viruses**
- **Run diagnostic software to test memory**
- **Check to see if memory modules are properly seated**
- **Remove memory modules and replace them one at a time.**

15. If your motherboard calls for 60-ns memory, can you substitute 70-ns memory? Why or why not?
Yes because if the motherboard supports the faster speed then it would also support the slower speed.

16. When buying memory, what can you look for that might indicate that the memory is remanufactured?
Look for the date in the YYWW format, where YY is the year the chip was made, and WW is the week of that year. Date stamps that are older than one year indicate the chip is probably used memory.

17. What are the two major categories of static RAM memory?
Fast, and used as a memory cache

18. What improvements did DDR make over regular SDRAM?
Faster

19. When might there not be any SRAM on a motherboard?

20. List two operating systems that allow 16-bit drivers.
Windows 95/98

21. List four operating systems that allow only 32-bit drivers.
Windows NT/2000/XP/98

22. What are the three types of memory address that Windows 9x/Me manages? What are the memory address ranges for each?
Conventional-0-640K, Upper-640K-1024K, Extended-above 1MB

23. What is the hexadecimal address range for upper memory?
FFFFF-A0000

24. Name the two utilities that Windows uses to manage memory above 640K. Give a brief description of each.
High memory area- the 1st 64K extended memory, extended memory-includes HMA

25. Define memory paging. What problem can excessive memory paging cause? What are some symptoms of this problem?
Memory paging is the in and out of physical RAM. Can cause excessive hard drive use, decreases overall performance, and can cause system to lock up and or applications fail

26. Give one reason you should make the paging file maximum size the same as the paging file initial size.
To prevent disk fragmentation that might result from setting them to a different value

27. What is the name of the Windows 9x/Me swap file?
Win386.swp

28. What is the name of the Windows 2000/XP swap file?
Pagefile.sys

29. By default, Windows 2000/XP makes the paging file how large compared to the amount of RAM installed?
1.5 times the amount of RAM

30. List the steps in Windows 2000 to change the size of the paging file.
Right click My Computer and select properties. Click Advanced tab. Click performance options button, click the change button. In this dialog box you can change size and view information for the paging file and registry.

CRITICALLY THINKING

1. If your motherboard supports DIMM memory, will RIMM memory still work on the board?

2. If your motherboard supports ECC SDRAM memory, can you substitute SDRAM memory that does not support ECC? If your motherboard supports buffered SDRAM memory, can you substitute unbuffered SDRAM modules?

3. You have just upgraded memory on a computer from 64 MB to 128 MB by adding one DIMM. When you first turn on the PC, the memory count shows only 64MB. Which of the following is most likely the source of the problem? What can you do to fix it?

a. Windows is giving an error because it likely became corrupted while the PC was disassembled.
b. The new DIMM you installed is faulty.
c. The new DIMM is not properly seated.
d. The DIMM is installed in the wrong slot.

4. Why is it necessary to understand how to create and use upper memory blocks in Windows 9x/ME?

5. What is the DOS=HIGH,UMB command used for? Explain both parts of the command.

6. Can an application or device driver specify which physical memory or memory addresses it wants in Windows NT/2000/XP? Why or why not?