Week 6 Memory

In order to answer these questions, you may be required to look up some information on your own. You are encouraged to discuss these questions and share useful links you've found with others in the discussion forum.

Question 1

What is the difference between memory bandwidth, and memory latency? Can you think of any kinds of workloads with which one quality may be more important than the other?

Question 2

Compare and contrast and find a hardware example of each:

1. PROM
2. EPROM
3. EEPROM

Question 3

Describe what cache is, and explain how it is used by the system to manage data.

Question 4

Why is it preferable to balance the peak bandwidths of the memory technology and the CPU's front side bus FSB (or connection to the memory)?

Question 5

In the above figure, you can see a PC3-10666 memory module, which uses DDR3-1333 memory chips.

1. What is the maximum theoretical transfer rate?
2. What are the causes of latency in DDR type RAM?

Question 6

At a basic level, latency refers to the time delay between when a command is entered and executed. **Latency is specified in clock cycles instead of real time.**

With this in mind, there are two variables that determine a module's latency:

- The total number of clock cycles the data must go through (measured in CAS Latency or CL)
- The duration of each clock cycle (measured in nanoseconds)

Combining these two variables gives us the latency equation:

true latency (ns) = clock cycle time (ns) × number of clock cycles (CL)

The **clock cycle time** is the **inverse** of clock speed (**keep in mind that you need to use the real clock rate.** (The real clock rate of the DDR, DDR2, and DDR3 memories is **half** of the labeled transfer rate, since double data rate type RAM operates using two transfers per clock cycle.)

Compare the true latency of the following memory modules, and discuss which is more important: speed or latency?

- DDR3-1333 CL9
- DDR4-1866 CL13
- DDR4-2133 CL15
- DDR4-2400 CL17
- DDR4-2666 CL18

Question 7

What are the potential issues with trying to run memory faster than rated (either in terms of bus speed, or latency timings)?

Can these issues also occur when trying to run other core components faster than originally intended?

Question 8

PassMark Software has delved into the thousands of benchmark results that PerformanceTest users have posted to its web site and produced charts to help compare the relative performance of different Memory from major manufacturers such as G- Skill, Corsair, Mushkin, Kingston, Patriot, Crucial and others. Higher quality Memory improves overall system performance for many computing activities such as PC gaming, video editing, software development and normal everyday activity.

Take a look at the “Memory Benchmarked & Graphically Compared” at http://www.memorybenchmark.net/.

Discuss how it can be used to choose the right RAM for your PC.