Module Four Introduction and Learning Objectives

Welcome to the Memory Hierarchy Module!

If we consider computer hardware as a brain, then two abilities are necessary to make it function. One of the abilities is to think, or to process information, which is done by the processor microarchitecture. And the other crucial ability is to memorize things so that it has the information needed to be processed. Reflected in the hardware, this is done by the memory system, which usually employs multiple levels of different memory technologies, including caches, main memory, and external storage. This hierarchy design allows us to create the illusion of a large memory that we can access as fast as a very small memory. Nowadays, a good memory hierarchy design has become the key to achieving high overall system performance. In other words, the memory system has become the bottleneck of the computer's performance improvement. This "memory wall" problem is due to the fact that the development of memory systems has fallen far behind the Moore's law in the past 40 years. Therefore, as we will see in this module, various optimization techniques have been adopted by the current memory design to alleviate this issue.

Learning Objectives

By the end of the module, you will be able to

1. Understand the goals and principles behind the memory hierarchy design.
2. Know the details about each level of the memory hierarchy.
3. Understand advanced memory design considerations about performance, reliability, and security.

How to Achieve the Objectives

You can achieve this module's learning objective by accomplishing the following:

Readings

1. Chapter 5 of the textbook: **COD_Chapter5.pdf (https://sjsu.instructure.com/courses/1491749/files/69324432?wrap=1)**

2. Extra reading: **DDCA_Chapter8.pdf (https://sjsu.instructure.com/courses/1491749/files/69324418?wrap=1)**

Lectures

Check the module for the latest lecture slides and recordings.

Discussions

Module discussion: **Module Four General Discussion (https://sjsu.instructure.com/courses/1491749/discussion_topics/4728254)**

How You Will Demonstrate Your Achievement of the Learning Objectives

1. In-class problem-solving.
2. Quiz.
3. Extra practice questions.