

CDA3101 Exam 3 Study Topics

Covers slides, assignments 6-7, examples presented in class, and sections 5.1-5.4, 5.7, 5.9, and 5.11 from the textbook.

1. Memory Hierarchy Slide Set

1.1. Memory Hierarchy Introduction

1.1.1. Principle of Locality

1.1.1.1. Temporal Locality

1.1.1.2. Spatial Locality

1.1.2. General Memory Hierarchy Introduction

1.1.3. SRAM and DRAM

1.2. Caches

1.2.1. Using the Physical Address to Access the Cache

1.2.2. Cache Organizations

1.2.2.1. Direct Mapped

1.2.2.2. Fully Associative

1.2.2.3. Set Associative

1.2.3. Calculating the Number of Bits Stored in a Cache

1.2.4. Steps Taken on a Cache Miss

1.2.5. Average Memory Access Time with a Cache

1.2.6. Using Separate L1 Caches with Pipelining

1.2.7. Block Replacement

1.2.8. Write Policy

1.2.8.1. Write Through

1.2.8.2. Write Back

1.2.9. Write Miss Policy

1.2.9.1. Write Allocate

1.2.9.2. No-Write Allocate

1.2.10. Categorizing Cache Misses

1.2.10.1. Compulsory

1.2.10.2. Capacity

1.2.10.3. Conflict

1.2.11. Multilevel Caches

1.2.12. Improving Cache Performance

1.2.12.1. Techniques for Improving the Miss Rate

1.2.12.1.1. Increasing the Associativity Level

1.2.12.1.2. Increasing the Block Size

1.2.12.1.3. Increasing the Cache Size

1.2.12.2. Techniques for Reducing the Miss Penalty

1.2.12.2.1. Critical Word First and Early Restart

1.2.12.2.2. Multilevel Caches

1.2.12.3. Techniques for Reducing the Hit Time

1.2.12.3.1. Small and Simple Caches

1.2.13. Designing a Cache Controller

- 1.3. Virtual Memory
 - 1.3.1. Overlays
 - 1.3.2. Virtual Memory Introduction
 - 1.3.3. Mapping Virtual to Physical Addresses
 - 1.3.4. Page Tables
 - 1.3.5. Handling Page Faults
 - 1.3.6. Translation Lookaside Buffers
 - 1.3.7. Virtual Memory and Multiprogramming
 - 1.3.8. Virtually Indexed, Physically Tagged Caches
 - 1.3.9. Process Protection

2. I/O Slide Set

- 2.1. I/O Introduction
 - 2.1.1. I/O Issues
 - 2.1.2. I/O Devices
- 2.2. Magnetic Disks
 - 2.2.1. Magnetic Disk Organization
 - 2.2.2. Average Disk Access Time
 - 2.2.2.1. Seek Time
 - 2.2.2.2. Rotational Delay
 - 2.2.2.3. Transfer Time
 - 2.2.2.4. Controller Overhead
 - 2.2.3. Disk Density
 - 2.2.4. File Caches and Disk Buffers
 - 2.2.5. Smarter Disk Controllers
- 2.3. Redundant Array of Inexpensive Disks (RAID)
 - 2.3.1. Motivation
 - 2.3.2. RAID 0 - Nonredundant
 - 2.3.3. RAID 1 - Mirroring
 - 2.3.4. RAID 2 - Memory-Style ECC
 - 2.3.5. RAID 3 - Bit-Interleaved Parity
 - 2.3.6. RAID 4 - Block-Interleaved Parity
 - 2.3.7. RAID 5 - Distributed Block-Interleaved Parity
 - 2.3.8. RAID 6 - Row-Diagonal Parity
- 2.4. Flash Memory
- 2.5. Controlling I/O
 - 2.5.1. Steps of I/O Operations
 - 2.5.2. Specifying I/O Operations
 - 2.5.2.1. dedicated CPU I/O Instructions
 - 2.5.2.2. memory mapped I/O
 - 2.5.3. Managing I/O Operations
 - 2.5.3.1. Polling
 - 2.5.3.2. Interrupt-Driven I/O
 - 2.5.3.3. Direct Memory Access (DMA)
 - 2.5.4. Asynchronous I/O
 - 2.5.5. Stale Data