

Computer Architecture

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1 Fundamentals of Quantitative Design and Analysis

1.1 Introduction

1.2 Classes of Computers

Classes of Parallelism and Parallel Architectures

1. Basic classification:
 - Data-Level Parallelism.
 - Task-Level Parallelism.
2. Classification by exploitation:
 - Instruction-Level.
 - Vector Architectures and Graphic Processor Units.
 - Thread-Level(tightly coupled).
 - Request-Level(largely decoupled).
3. Classification by **instruction-stream**
 - SISD.
 - SIMD. Applying the same operations to multiple items of data in parallel. Mainly for DLP.
 - MISD. None.
 - MIMD. Mainly for task-level parallelism.

1.3 Defining Computer Architecture **p.40**

ISA(Instruction Set Architecture)

1. Class of ISA.
 - *register-memory*: 80x86.
 - *load-store*: ARM, MIPS.
2. Memory addressing.
Byte addressing and alignment. **p.531**
3. Addressing modes.
Register, Immediate, and Displacement(variations).
4. Types and sizes of operands.
5. Operations.

6. Control flow instructions.
Conditional branches, unconditional jumps, procedure calls, returns.
7. Encoding an ISA.
Fixed length v.s. variable length.

Designing the Organization and Hardware

1.4 Trends in Technology

Performance Trends: Bandwidth over Latency [p.48](#)