

SP-1
SP. Show for

B.K

2/27/2016

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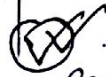
Computer Architecture & Design

Introduction

Computer Architecture:

Computer architecture is about selecting and interconnecting hardware components to create a computer that meet functional performance of cost goals.

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Computer architecture refers to instruction/set design and implementation.

• The term Instruction Set Architecture (ISA) refers to the actual programmer visible instruction set. It serves as the boundary of software and hardware.

• Implementation of machine has two components:

• Organization - includes the high level aspects of computer design. Such as memory system, bus structure.

• Hardware - refers to the specifics of a machine, including the detailed logic design and packaging technology of the machine.



Task of a Computer Designer

- Determine the attributes that are important for new machine.
- Design a machine to maximize performance while staying within cost constraints and power constraints.

Some important design aspects:

- ▶ Instruction set design
- ▶ Functional organization
- ▶ Logic design
- ▶ Implementation

▶ Must be aware of important trends in both implementation technology and the use of computers.

Measuring and Reporting

► Response time - the time between the start and the completion of an event. It is also referred to as execution time.

► Response time high → slower
low → faster

► Throughput - the total amount of work done in a given time.

→ Throughput high → faster
→ Throughput low → slower

X is faster than Y:

► X is faster than Y is used to mean that the response/execution time is lower on X than to Y for the given task. Thus,

$$\frac{\text{Execution time}_Y}{\text{Execution time}_X} = n$$

► Since execution time is reciprocal to performance, the following relationship holds,

$$n = \frac{\text{Execution time}_Y}{\text{Execution time}_X} = \frac{\frac{1}{\text{Performance}_Y}}{\frac{1}{\text{Performance}_X}} = \frac{\text{Performance}_X}{\text{Performance}_Y}$$

Throughput of X is 1.3 higher than Y:

The throughput of X is 1.3 times higher than Y means that the number of tasks completed per unit time on machine X is 1.3 times the number completed on Y.

$$(X = 1.3Y)$$

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Choosing programs to evaluate performance

► There are five levels of programs used to evaluate performance. They are listed below in decreasing order of accuracy of prediction.

1. Real-time application - compiler, word, Photoshop etc.
2. Modified application
3. Kernels.
4. Toy benchmarks.
5. Synthetic benchmark.