The Stored Program Machine

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1   Administrivia

Today's Objectives

1. Describe the concept of the stored program computer and its fundamental operation.

2. Demonstrate the binding between symbolic names and memory values and locations.

3. Describe the attributes of the memory hierarchy.

4. Discuss the properties of the bus.

Next Up

Read 2.1–2.4.

1. Understand that everything within a computer system is represented by binary values.

2. Understand the properties of, write, read, and convert ASCII data and unsigned and two's complement binary integers.

3. Convert between decimal, binary, octal, and hexadecimal representations of binary data.

4. Perform binary integer addition and subtraction, recognizing when overflow has occurred.

2 Warm-Up

1. In the expression

   ```
   j = i + 1;
   ```

   (a) i's and j's values are referenced

   (b) i's and j's locations (addresses) are referenced

   (c) i's location is referenced and j's value is referenced

   (d) i's value is referenced and j's location is referenced

2. After the following RTL code has executed

```
[0] <- 12
[1] <- 34
[2] <- [0] + 1
```

the value stored in memory location 2 is

(a) 1

(b) 12

(c) 13

(d) 46

3. After the following RTL code has executed

```
[0] <- 12
[1] <- 34
[2] <- 56
[10] <- 1
[11] <- [[10] + 1]
```

the value stored in memory location 11 is

(a) 12

(b) 34

(c) 56

(d) 35

(e) The value cannot be determined.

4. The stored program concept implies that

   (a) memory holds both data and instructions

   (b) programs can modify themselves while running

   (c) both a and b

   (d) neither a nor b

5. The amount of time necessary to deliver the first piece of data in a bus transaction is called

   (a) width

   (b) bandwidth

   (c) latency

   (d) protocol

   (e) standard

3 Problems

1. Show the contents of the memory system after the execution of these RTL statements

   ```
   [5] <- 2
   [6] <- 12
   [7] <- [5] + [6]
   [6] <- [7] + 4
   [5] <- [[5] + 4]
   ```

2. What are the relative advantages of one-, two-, and three-address architectures?

3. The textbook describes four types of memory: registers, cache, RAM, and hard disk. Describe two other types of memory in terms of their speed, size, and volatility.

4. Using online resources, describe the following bus protocols: HyperTransport, PCI Express, and USB 3.0.