CSE 378
Machine Organization
and Assembly Language Programming

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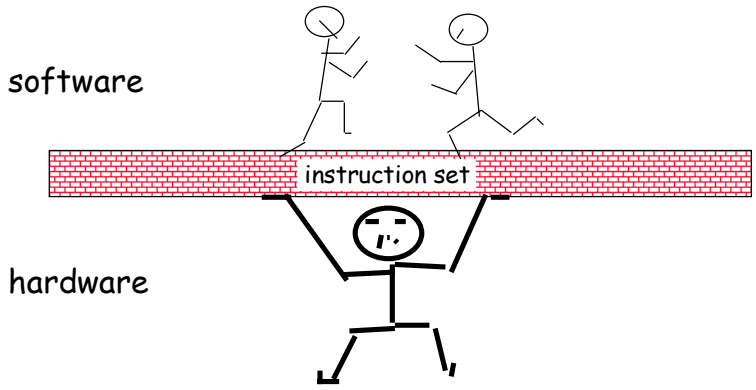
What is "Computer Architecture"?

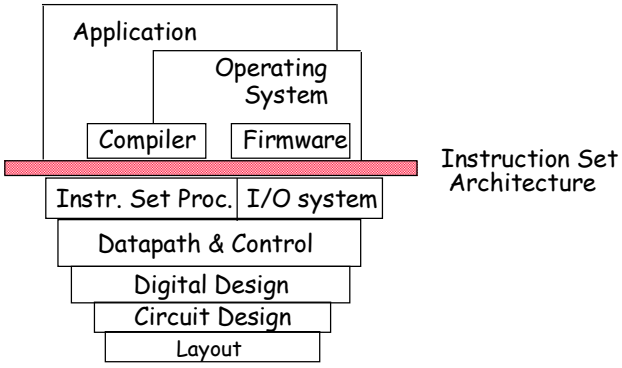
Computer Architecture =

- Instruction Set Architecture +
- Machine Organization + …

The Instruction Set: a Critical Interface



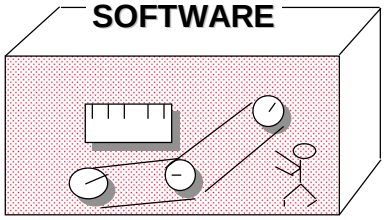
What is "Computer Architecture"?



- Coordination of many levels of abstraction
- Under a rapidly changing set of forces
- Design, Measurement, and Evaluation

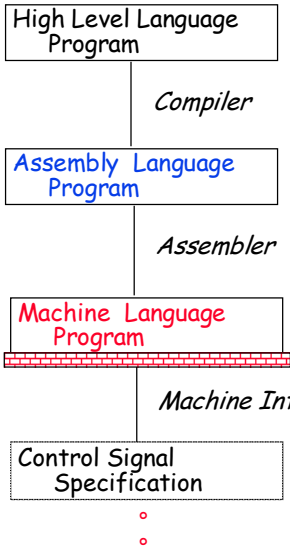
Instruction Set Architecture
(subset of Computer Architecture)

"... the attributes of a [computing] system as seen by the programmer, *i.e.*, the conceptual structure and functional behavior, as distinct from the organization of the data flows and controls the logic design, and the physical implementation."
– Amdahl, Blaaw, and Brooks, 1964



- Organization of Programmable Storage
- Data Types & Data Structures: Encodings & Representations
- Instruction Set
- Instruction Formats
- Modes of Addressing and Accessing Data Items and Instructions
- Exceptional Conditions

Levels of Representation (61C Review)



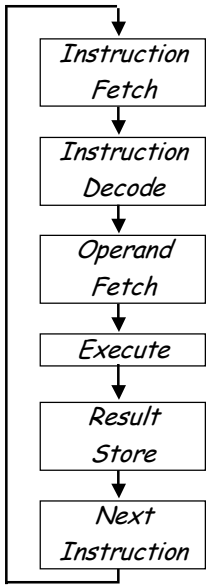

```
temp = v[k];
v[k] = v[k+1];
v[k+1] = temp;
```

```
lw $15, 0($2)
lw $16, 4($2)
sw   $16, 0($2)
sw   $15, 4($2)
```

```
0000 1001 1100 0110 1010 1111 0101 1000
1010 1111 0101 1000 0000 1001 1100 0110
1100 0110 1010 1111 0101 1000 0000 1001
0101 1000 0000 1001 1100 0110 1010 1111
```

ALUOP[0:3] <= InstReg[9:11] & MASK

Execution Cycle



Obtain instruction from program storage

Determine required actions and instruction size

Locate and obtain operand data

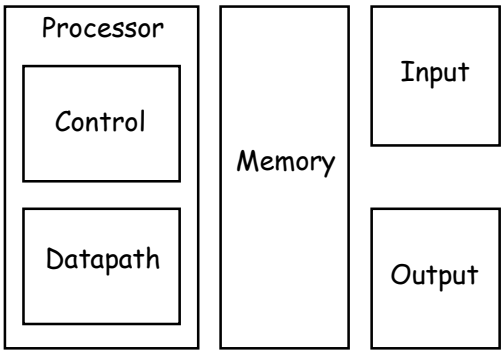
Compute result value or status

Deposit results in storage for later use

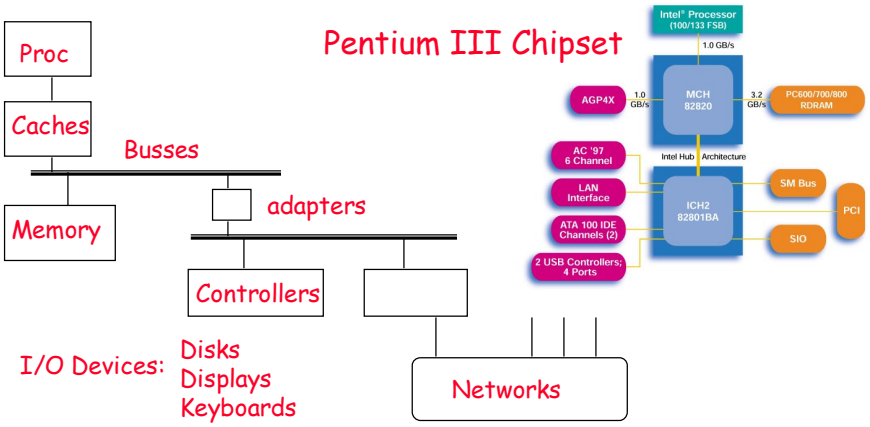
Determine successor instruction

Machine Organization

- Since 1946 all computers have had 5 components



A Machine (is not just a CPU)



Where are We Going??