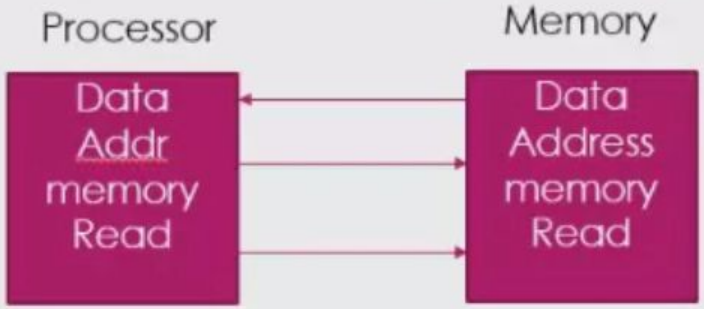
Memory Operation

- Load (or Read or Fetch)
  - Copy the content. The memory content doesn't change.
  - Address – Load
  - Registers can be used
- Store (or Write)
  - Overwrite the content in memory
  - Address and Data – Store
  - Registers can be used

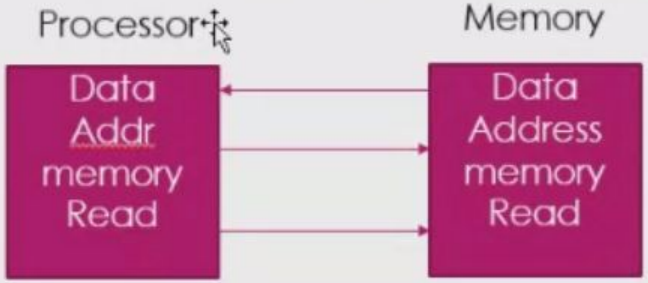
You

Load operation



You

Store | operation



Instruction and Instruction Sequencing

You

"Must-Perform" Operations

- Data transfers between the memory and the processor registers
- Arithmetic and logic operations on data
- Program sequencing and control
- I/O transfers

You

Register Transfer Notation

- Identify a location by a symbolic name standing for its hardware binary address (LOC, R0,...)
- Contents of a location are denoted by placing square brackets around the name of the location (R1←[LOC], R3 ←[R1]+[R2])
- Register Transfer Notation (RTN)
- Loc,place,mem...
- Data in,data out...
- r2← [loc]

You

Assembly Language Notation

- Represent machine instructions and programs.
- Move LOC, R1 = R1←[LOC]
- Add R1, R2, R3 = R3 ←[R1]+[R2]

You

Register Transfer Notation

- Identify a location by a symbolic name standing for its hardware binary address (LOC, R0,…)
- Contents of a location are denoted by placing square brackets around the name of the location (R1←[LOC], R3←[R1]+[R2])
- Register Transfer Notation (RTN)
- Loc,place,mem…
- Data in,data out…
- r2← [loc]

You

Instruction Formats

Example: Evaluate (A+B) * (C+D)

- Three-Address

1. ADD R1, A, B ; R1 ← M[A] + M[B]
2. ADD R2, C, D ; R2 ← M[C] + M[D]
3. MUL X, R1, R2 ; M[X] ← R1 * R2

Click to add title

- C=A+B
- C<- [A]+[B]
- ADD A,B,C
- OPCODE SOURCE1,SOURCCE2,DESTINATION
- P BITS K BITS KBITS K BITS
- P+3kBITS

You

Click to add title

- ADD A,B,
- OPCODE SOURCE, DESTINATION
- MOVE B,C C<-[B]
- ADD A,C C<-[A]+[C]

You

Click to add title

- OPCODE SOURCE/DESTINATION
- LOAD A
- STORE B

Rodrigo A. Obando

You

Click to add title

- OPCODE SOURCE/DESTINATION
- C=A+B

- LOAD A
- ADD B
- STORE C

You

Click to add title

- OPCODE(NO SOURCE/DESTINATION)

- PUSH
- POP

You

Click to add title

A+B*C+D

MPY B,C,T1 ; [B]*[C]-→T1

ADD A,T1,T2; [A]+[T1]→T2

ADD T2,D,T3; [T2]+[D]→ T3

HLT

You

A+B*C+D

MPY B,C,T1 ; [B]*[C]-→T1

ADD A,T1,T2; [A]+[T1]→T2

ADD T2,D,T3; [T2]+[D]→ T3

HLT

A=B*(C+D*E-F/G)

You

Instruction Formats

Example: Evaluate (A+B) * (C+D)

- Three-Address

1.	ADD	R1, A, ;		R1 ← M[A] + M[B]
2.	ADD	R2, C,	:	R2 ← M[C] + M[D]
3.	MUL	X, R1, R:		M[X] ← R1 * R2