THE VON NEUMANN MODEL

Model components

* Memory: stores data and program
* Processing unit: performs data processing
* Control unit: in charge of making other parts play together
* Input: means to enter information
* Output: means to retrieve information
Stored program concept

Program is stored in some part of computer memory
Instructions are represented and stored in memory as binary words

Memory
Data
Instructions
The instruction

Most basic unit of computer processing

Components:  * Opcode
              * Operands

Example:  

                  [15:12]       [11:0]
              Opcode        Operands

Types of instructions:
* Operate: perform operation
* Data movement: move data from one place to another
* Control: change sequence of execution
Von Neumann instruction cycle

Instruction cycle: sequence of steps in which instructions are loaded and executed

Fundamentally, there are 6 phases:

1) FETCH: obtains next instruction to process
   
   MAR ← PC
   PC ← PC + 1
   MDR ← M[MAR]
   IR ← MDR
2) **DECODE**: instruction in IR is examined to determine what to do next
   
   **Example**: for a 9-bit opcode, we use a 4:16 decoder

3) **EVALUATE ADDRESS**: compute memory location needed to process instruction

4) **FETCH OPERANDS**: operands needed are obtained from memory or registers

5) **EXECUTE**: carries out execution of instruction

6) **STORE RESULT**: result is written to designated destination
Control of instruction cycle

Each step is controlled by an FSM