1. Machine-level Language

1s and 0s

```
-----------------
  hardware
processor   hdd
ram   motherboard
```
Computer/
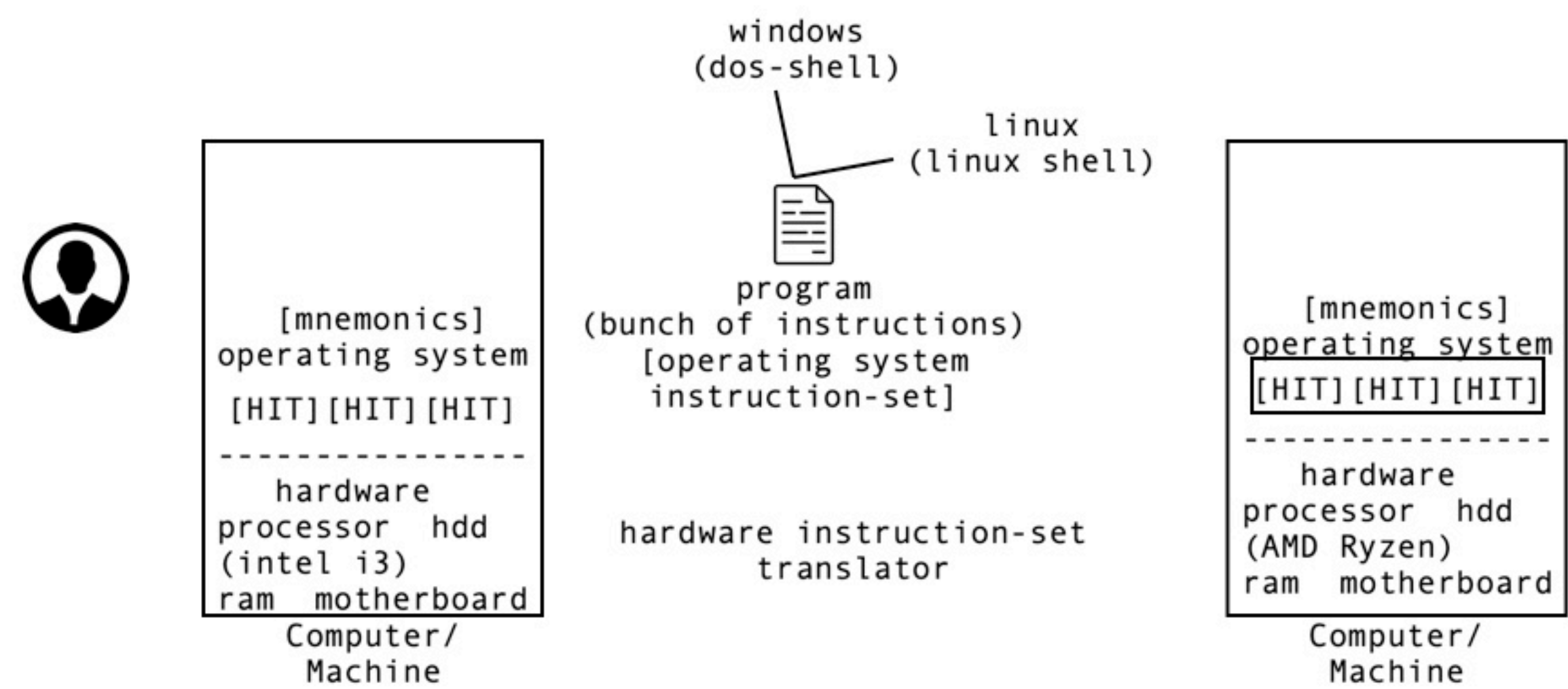Machine

instructions
(0s & 1s)
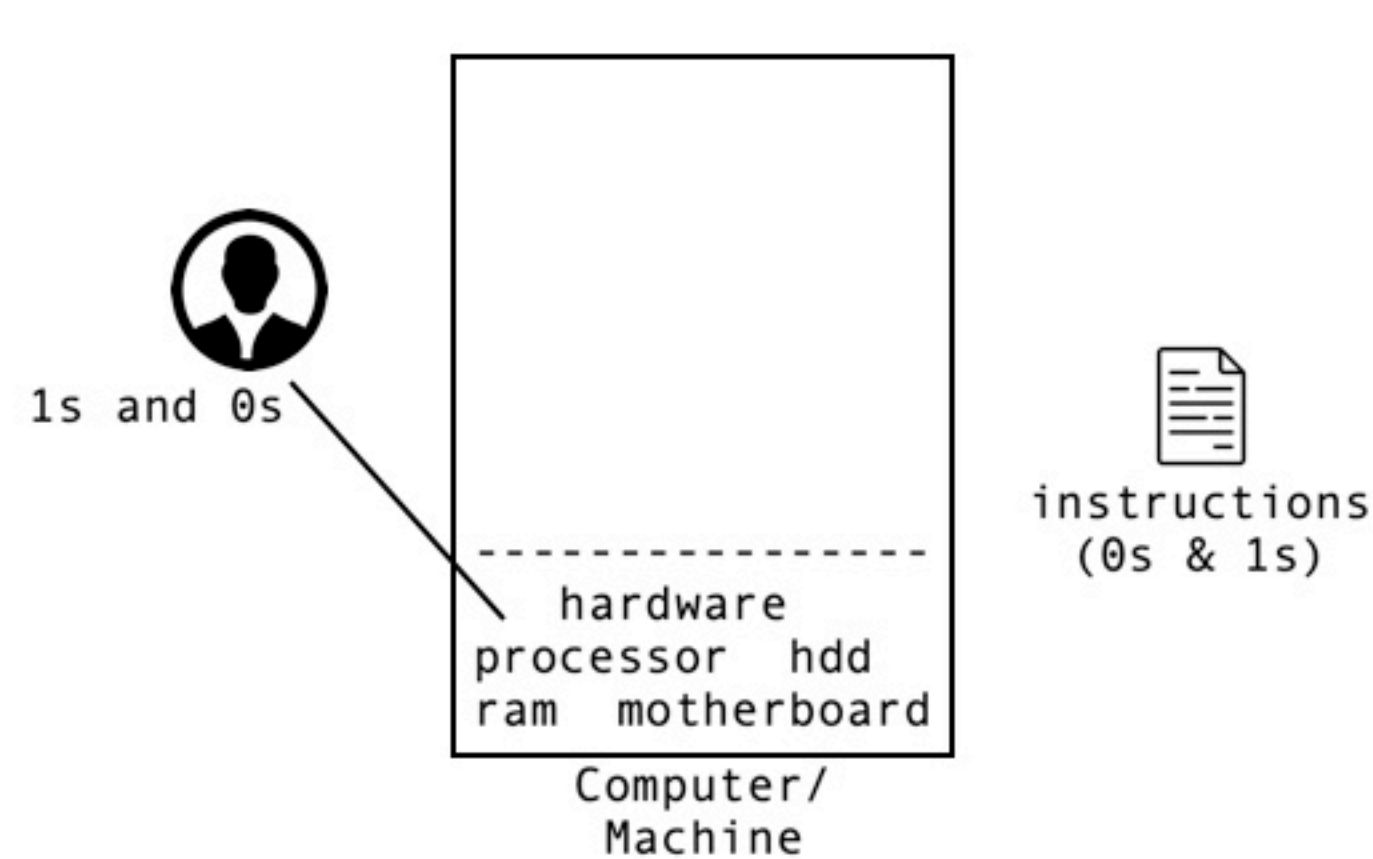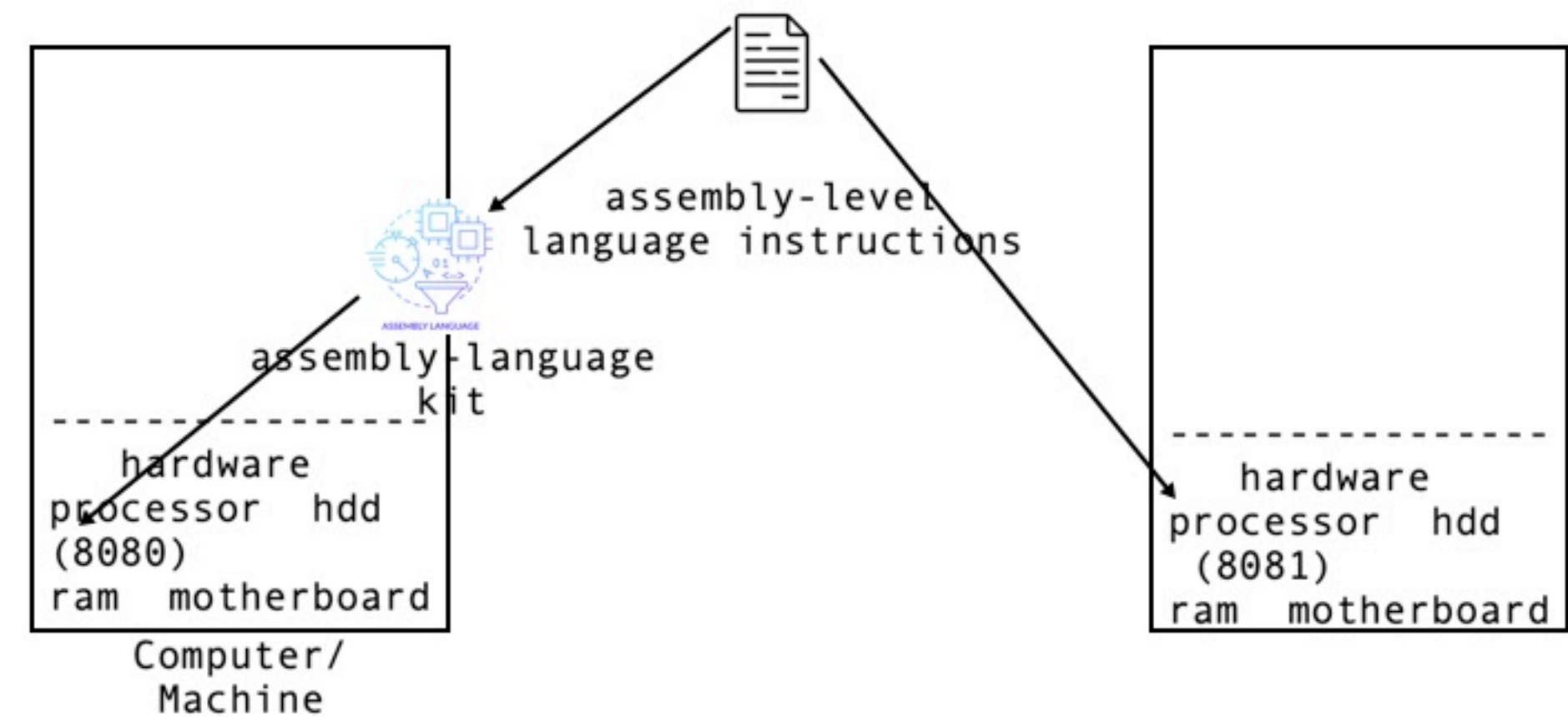
The processor only can understand anything that is
expressed in 1s and 0s only and it would be hard to
talk to the processor interms of 1s and 0s

humans are not good at remembering numbers or
digits rather they are very good at words

2. Assembly-level Language

assembly-level
language instructions

assembly-language
kit

```
-----------------
  hardware
processor   hdd
(8080)
ram   motherboard
```
Computer/
Machine

```
-----------------
  hardware
processor   hdd
(8081)
ram   motherboard
```

---

windows
(dos-shell)

linux
(linux shell)

program
(bunch of instructions)
[operating system
instruction-set]

```
[mnemonics]
operating system

[HIT][HIT][HIT]
-----------------
  hardware
processor   hdd
(intel i3)
ram   motherboard
```
Computer/
Machine

hardware instruction-set
translator

```
[mnemonics]
operating system

[HIT][HIT][HIT]
-----------------
  hardware
processor   hdd
(AMD Ryzen)
ram   motherboard
```
Computer/
Machine

What is an operating system?
operating system is an system software, that sits between the
enduser and the hardware of the computer.

system software = software that helps us in using the hardware
of the computer

it provides mnemonics or instruction-set that is independent of
the hardware (processor) of the computer.

The endusers has to write programs (with instructions) using
operating system provided mnemonics and pass it as an input to
the underlying operating system.

The operating system carries the responsibility of making the
program portable across the various different hardwares
(processors) of the computer.

How does portability is achieved?
The operating system has an inbuilt component called "HIT" stands for "Hardware instruction-set translator". For each processor manufacturers (intell/amd/
snapdragon..) and their different models (i3, i5, i7, amd ryzen..) the operating system provides one HIT translator.

the HIT translator takes the operating system instructions and convert into processor specific instruction and pass it to the underlying processor of the
computer asking him to perform the operation

So that the program written with operating system instructions upon passing to the operating system asking to execute, it uses the corresponding HIT
translator specific to the processor arch of the computer and converts into processor specific instructions and passed to the underlying processor of the
computer asking him to execute

So that the program once written will become portable across various different hardwares (processors) of the computer.

What is the job of operating system?
Operating system is responsible for ensuring the program written are portable across the hardware manufacturer vendors of the computers.