Technology Stack

Shell - CLI
Cmd, powershell
Bash, zsh, csh, COMMAND.COM - DOS
Explore.exe - GUI

Applications
Browser
Console - Javascript
Nodejs - Javascript
Python - Python

Win64 API, POSIX

ABI - Application Binary Interface

Syscalls
fork()
exec()
kill()

Operating System Kernel + Drivers
Compiled -> Executable File [Binary Code]

Assembly

Firmware
- Circuit
- ROM
- EEPROM

Programmed directly in assembly or machine code ->

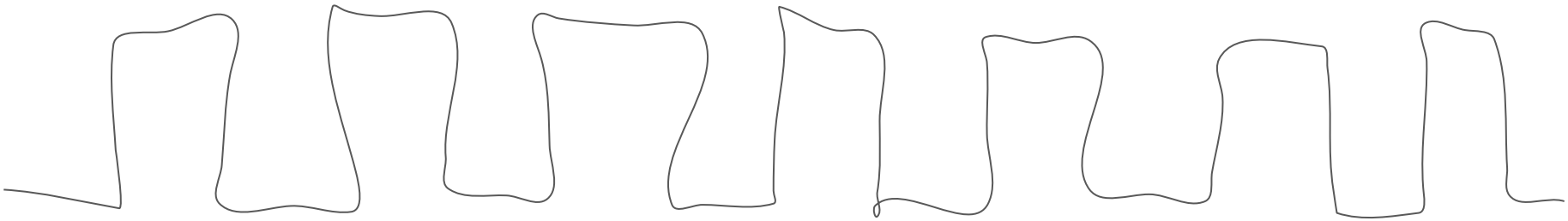
Hardware
- RAM Working Memory
CPU - X86_64, ARM ,RISC
I/O - Mouse, keyboard, monitor, screen, speakers, printer, network card, wifi , bluetooth

mov rx, 0
add 2
int 21h

0000 0001
1001 0011
1010 1001

Can be emulated by software
Machine

Clock Frequency and Bus



4 GHZ - 4 Billion pulses or ‘clock cycles’ per second

The computer will generally execute instructions each clock cycle

Move 0 to register rax => mov rax, 0 => 1001 1001 1010 1101
Add value in rbx to rax store in rax => add rax, rbx => 1001 1001 1010 1101
Output value of rax to stdout => int 21 => 1001 1001 1010 1101

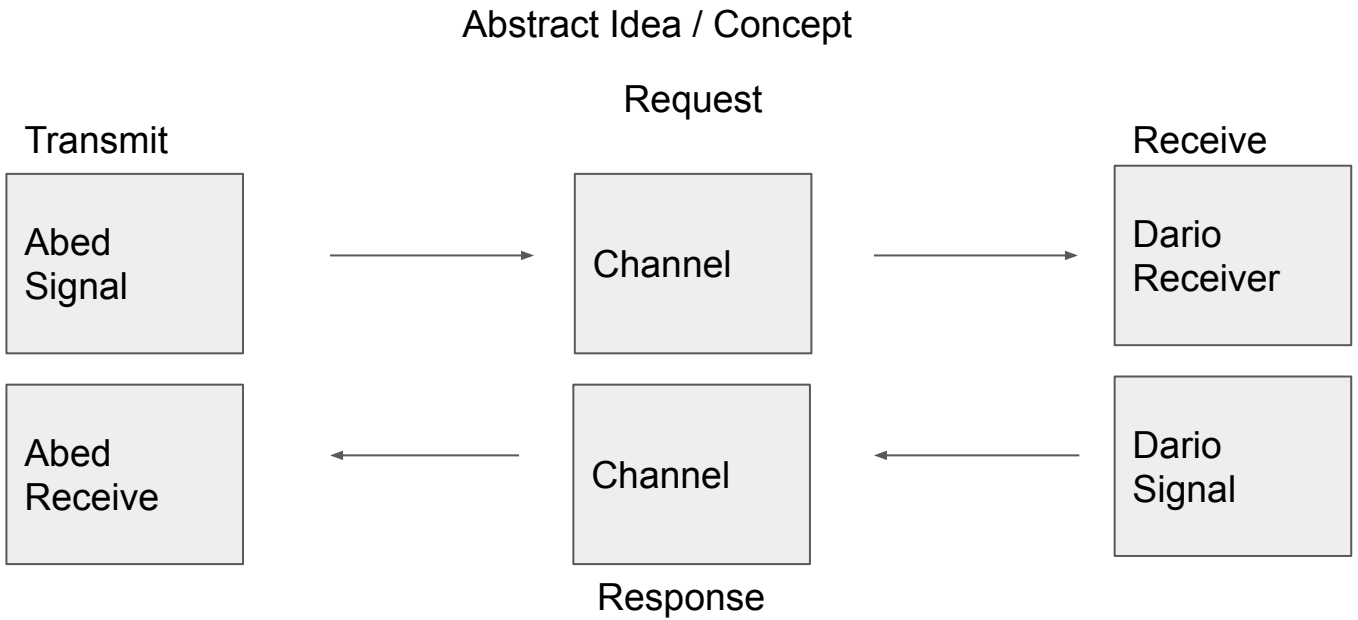
The instructions travel along a data highway know as a bus; the word size is the amount of ‘lanes’ the CPU can handle i.e. 64bit = 64 lanes.

Why do we have have so many languages?

- Machine code is ‘assembled’ from assembly language
  - Specific to type fo machine - x86
  - All machine code can be viewed as assembly code
- Early High Level Languages C / C++ / pascal had compilers which were written in assembly
  - Code is more expressive
    - If, for, while
  - Can be complied to different machine code
    - X86, arm, risc, PPC
- Some high level languages are interpreted Python
  - Build in C, it interprets python code and immediately executes it
  - Internally processed into calls that were built in c /c++
  - Interpreter can process a different language than the implementation
- We do it to make communicating complex concept to the computer much easier
- What’s next? Natural Language?

Communication

- Between two or more ‘entities’ - i.e. person, child, computer, client, server
- Common Language
  - Shared context and experience
  - Knows some terms already
- Common Channel
  - Signs
  - Speech
    - Hearing
      - Sensation - Input
      - Sound is carried by air
  - Writing



Learning is an exercise in communication and programming

Each action you take communicates something to the world

Each observation you make is the world communicating back to you

Learning Cycle

Form a mental model of how things work ← programming
Make a prediction of how an action will result in an effect ← run the program
Perform the action ← Talk to the world
Observe the result ← Listen to it's reply
Update you mental model ← Update your mental program
Make another prediction ← loop!

You have been programming yourself your entire life by accident! Time to take control

How to learn

How to find what you need to solve a problem

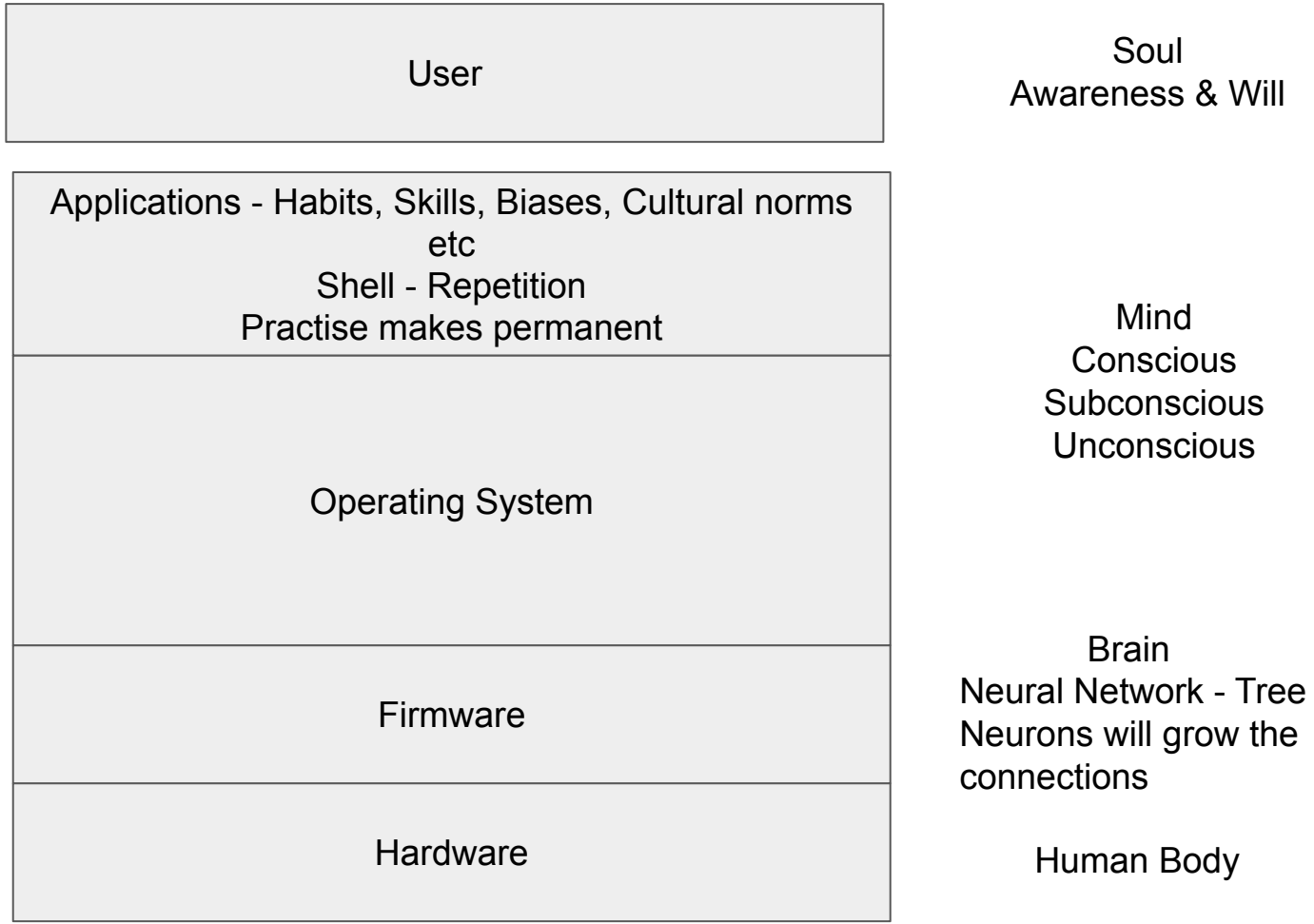
How do you know you have learned?

When behaviour changes.

Why do you learn?

Accumulate tools to solve problems.

Problem - an opportunity to improve.



Soul
Awareness & Will

Mind
Conscious
Subconscious
Unconscious

Brain
Neural Network - Tree
Neurons will grow the connections

Human Body