

Theoretical Computer Science

Tutorial - week 2

January 28, 2021



Agenda

- Recap
- Motivation
- Abstraction
- Languages

Recap

- What is the course going to be about?
- What is a model?
- What is a language?
- What is computational power of a model?
- What is FSA (FSM)?
- What models apart from FSA do you know?

Motivation

- Languages

$$L_1 = \{\varepsilon, a, b, c, bc, ca\}$$

$$L_2 = \{aa, ab, ac, ba, bb, bc, ca, cb, cc\}$$

- Abstraction



- Processing strings

If $\Sigma = \{a, b\}$ and L_1 is defined as

$$L_1 = \{x \in \Sigma^* \mid x \text{ ends with } aa\}$$

Does the following FSA accept all strings represented by the language L_1 ?



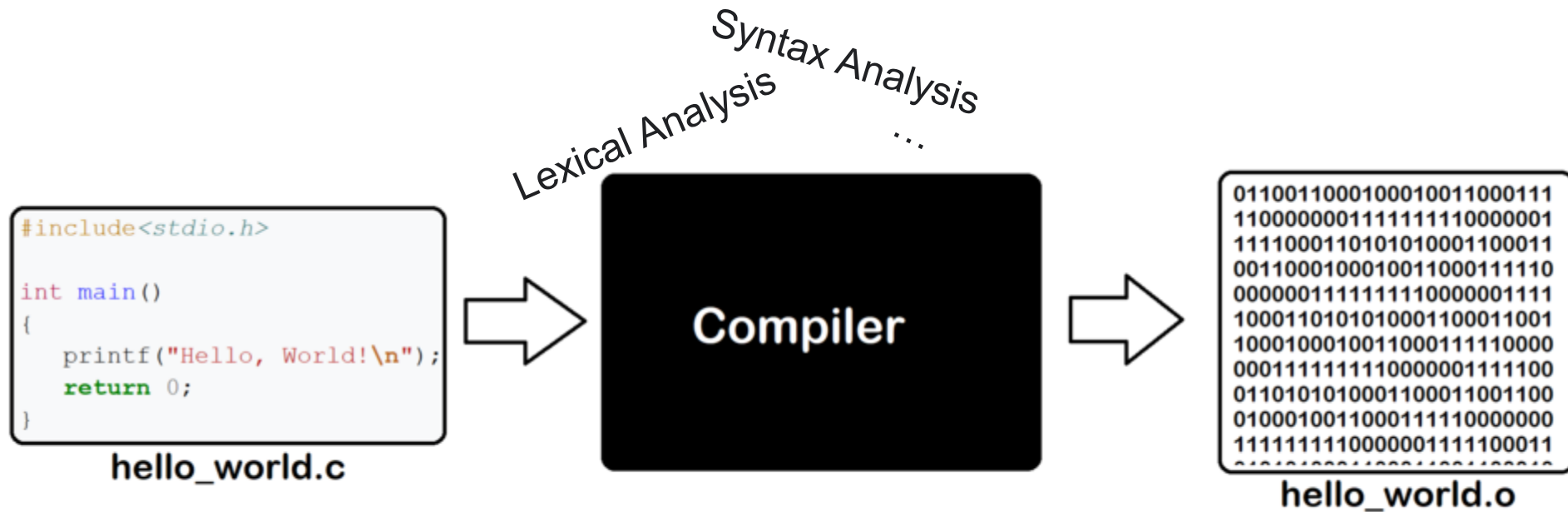
Languages,
Automata,
Computability



coding
testing
coding ...

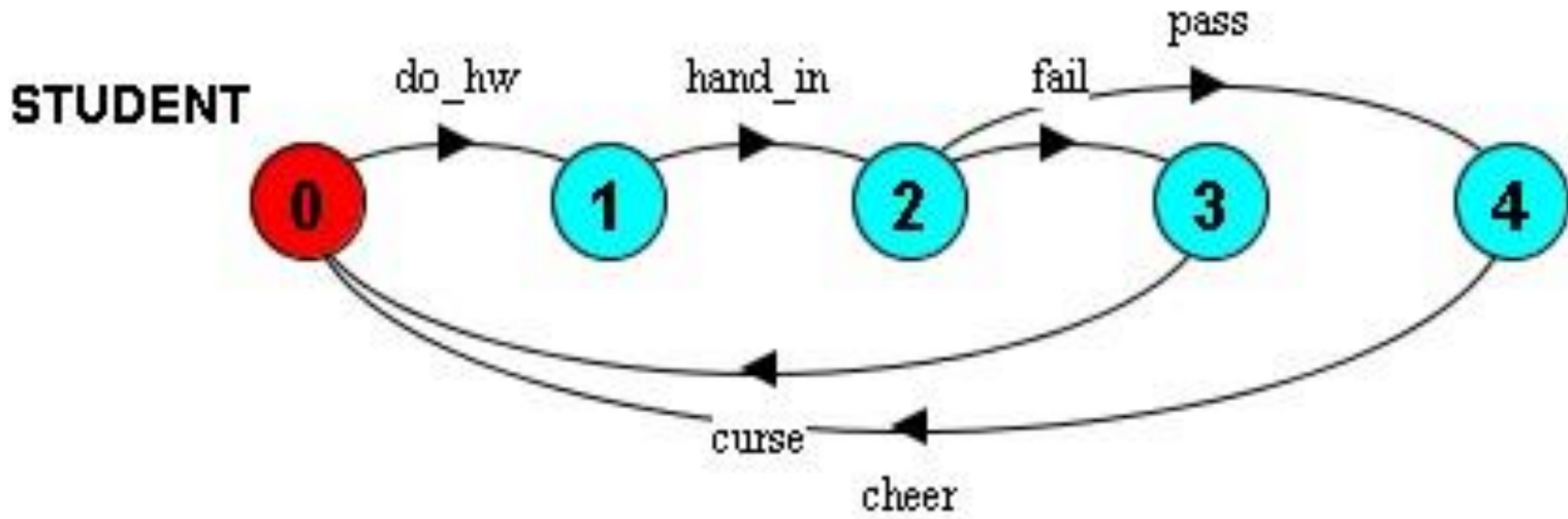
Application

- Compiler construction



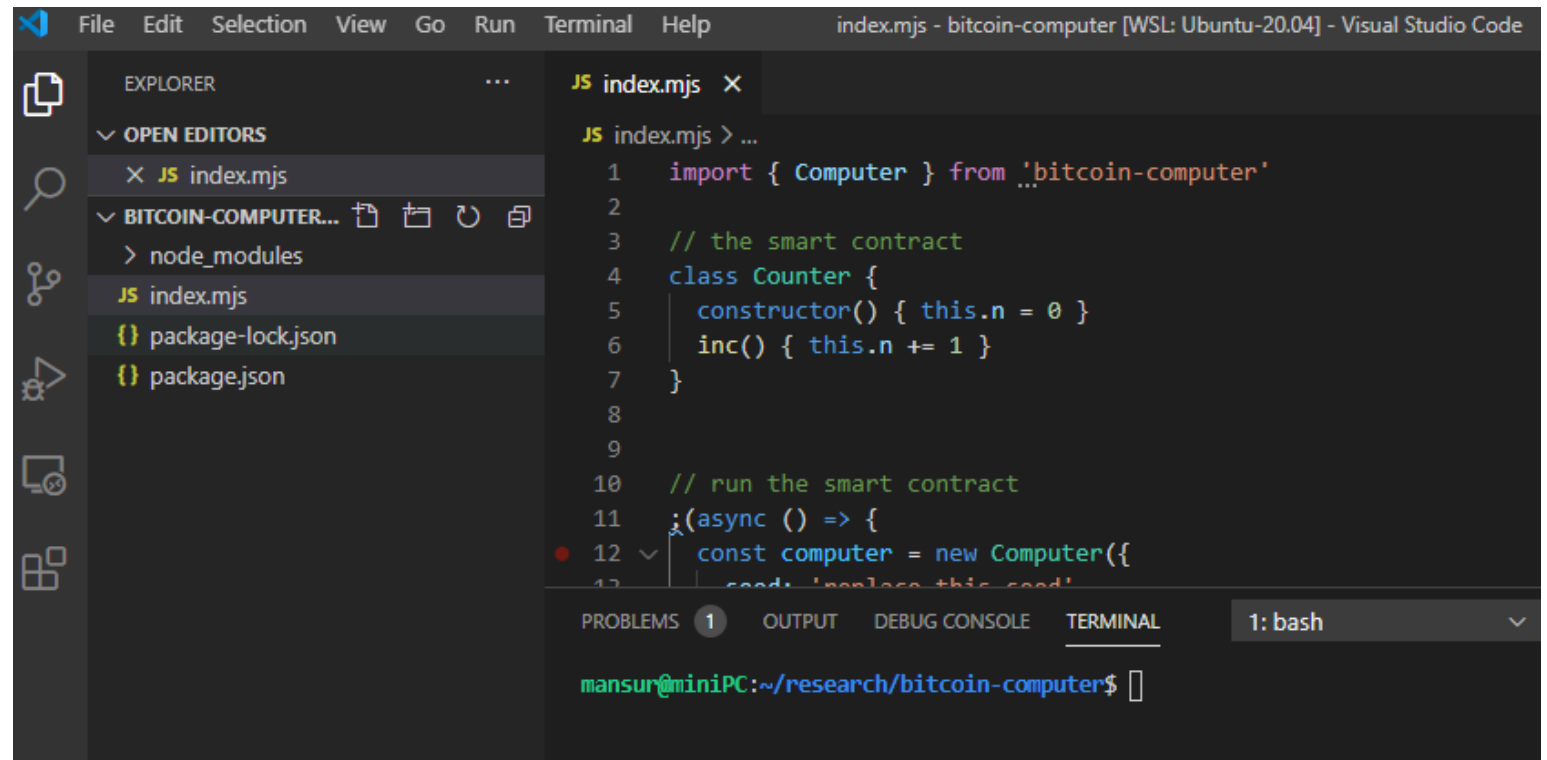
Application

- Compiler construction
- Specification and design



Application

- Compiler construction
- Specification and design
- Verification
 - static analysis



```
File Edit Selection View Go Run Terminal Help index.mjs - bitcoin-computer [WSL: Ubuntu-20.04] - Visual Studio Code

EXPLORER
  OPEN EDITORS
    JS index.mjs
  BITCOIN-COMPUTER...
    node_modules
    JS index.mjs
    package-lock.json
    package.json

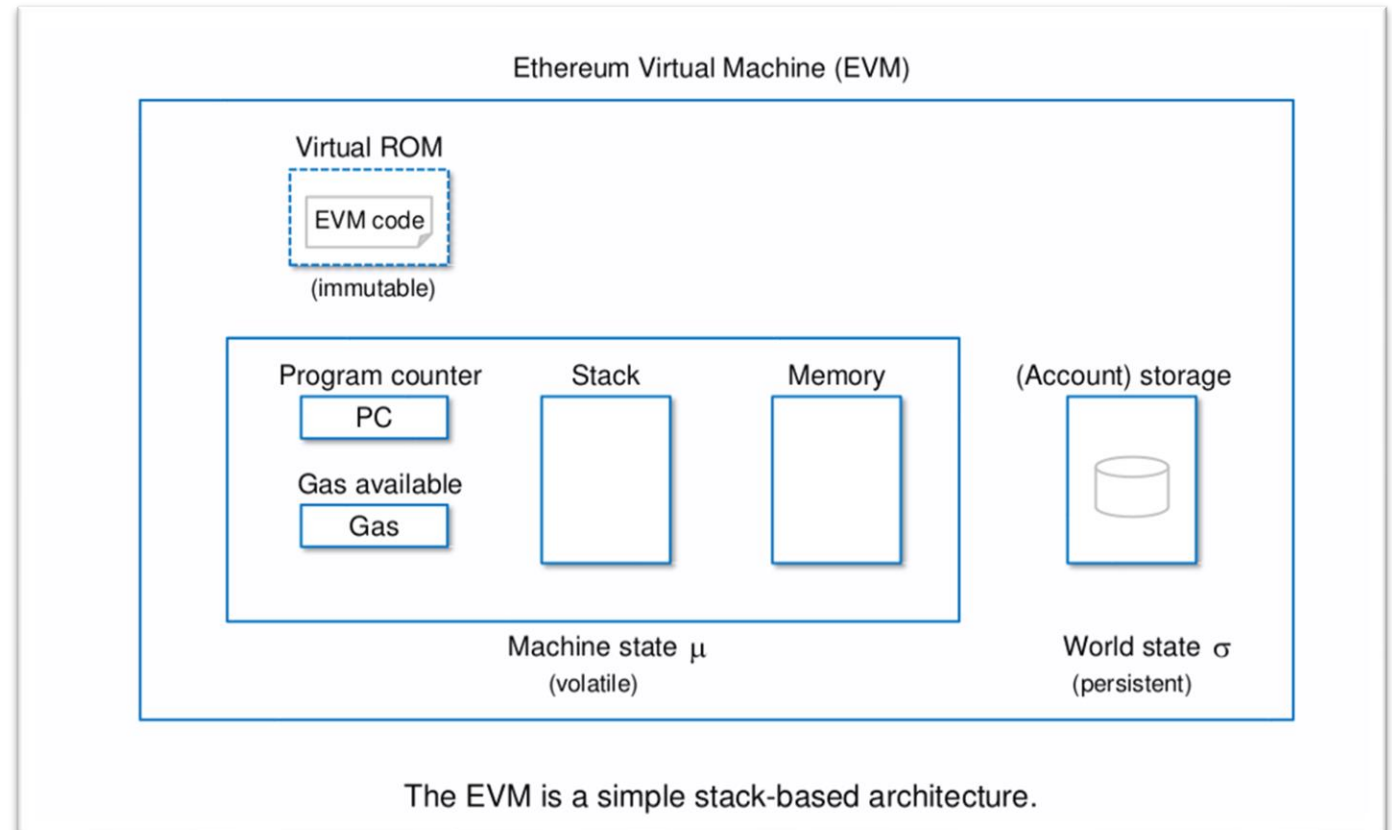
JS index.mjs
1 import { Computer } from './bitcoin-computer'
2
3 // the smart contract
4 class Counter {
5   constructor() { this.n = 0 }
6   inc() { this.n += 1 }
7 }
8
9
10 // run the smart contract
11 ;(async () => {
12   const computer = new Computer({
13     seeds: 'non-lose-this-seed'
```

1: bash

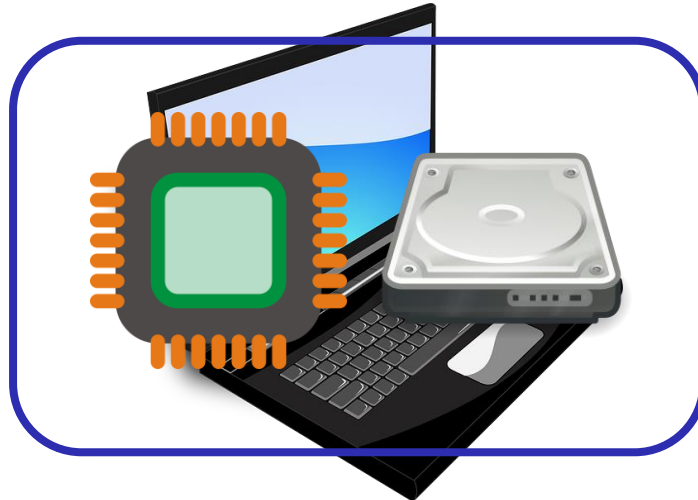
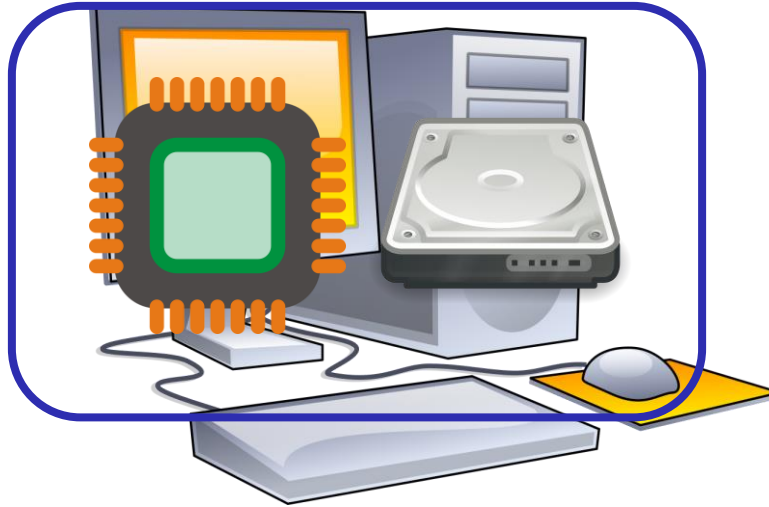
mansur@miniPC:~/research/bitcoin-computer\$

Application

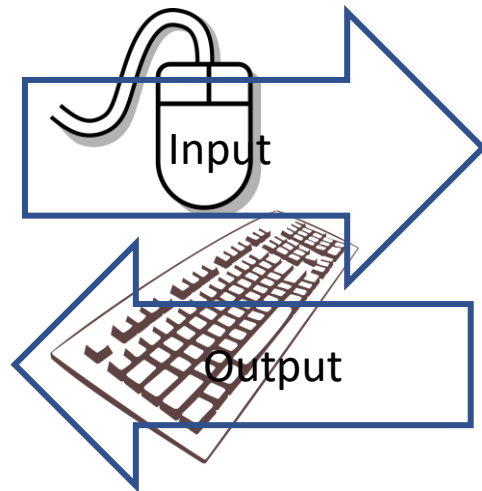
- Compiler construction
- Specification and design
- Verification
 - static analysis
 - test generation
 - ...
- ...



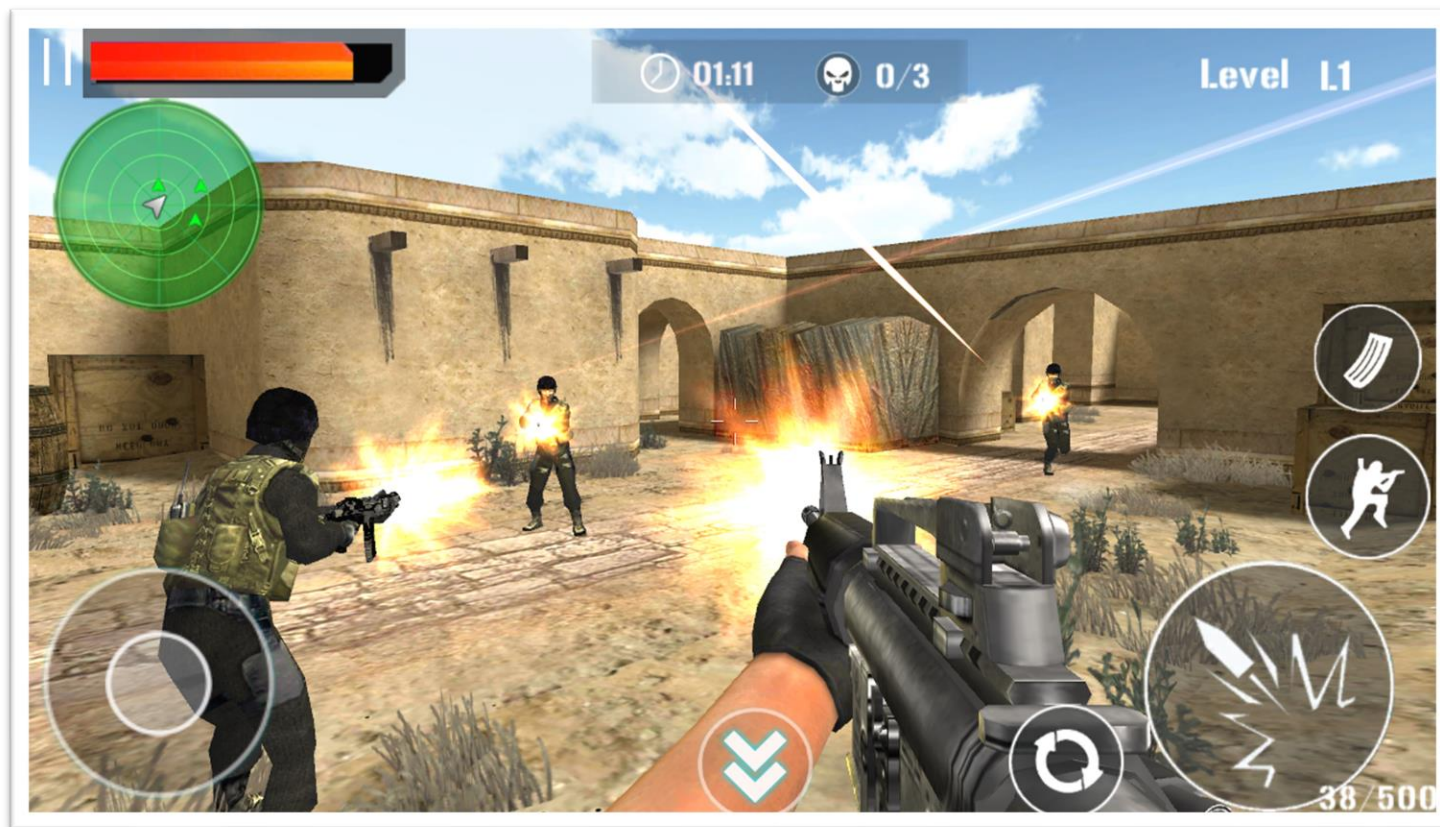
Abstraction



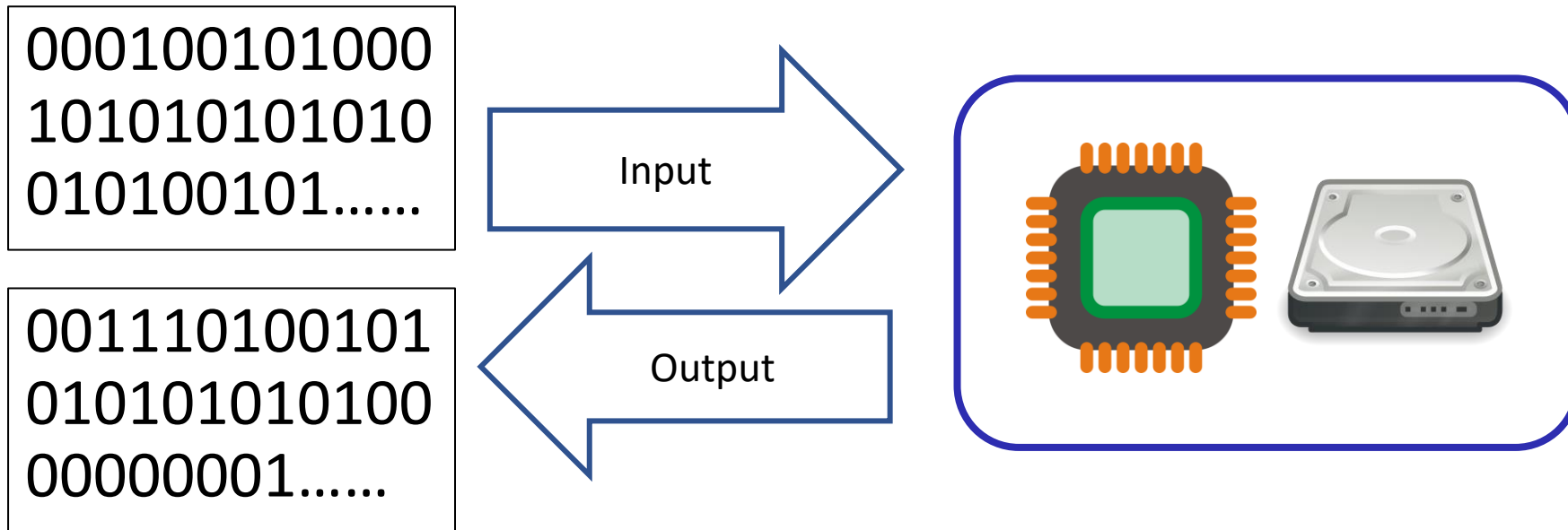
Abstraction



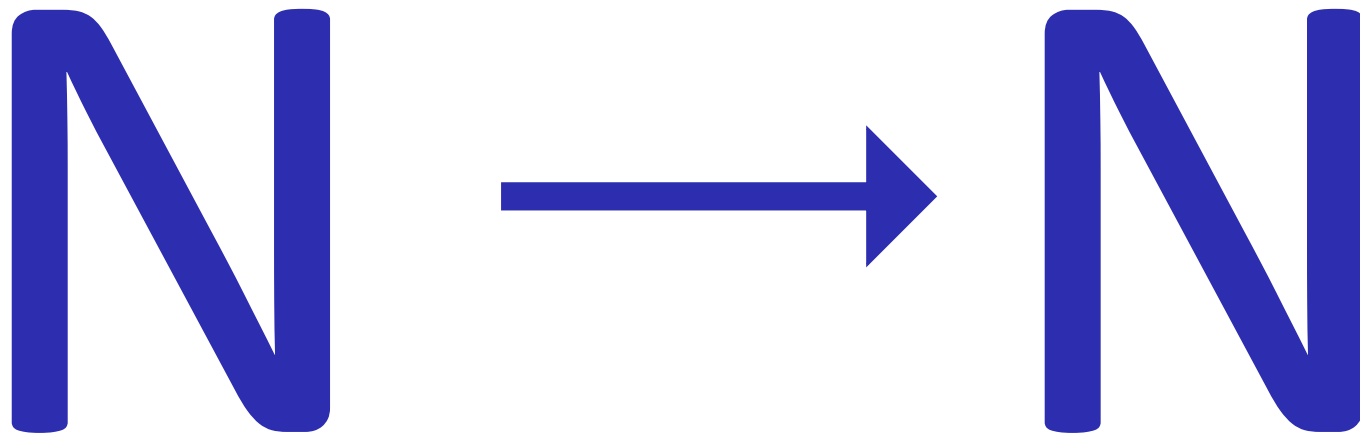
Abstraction



Abstraction

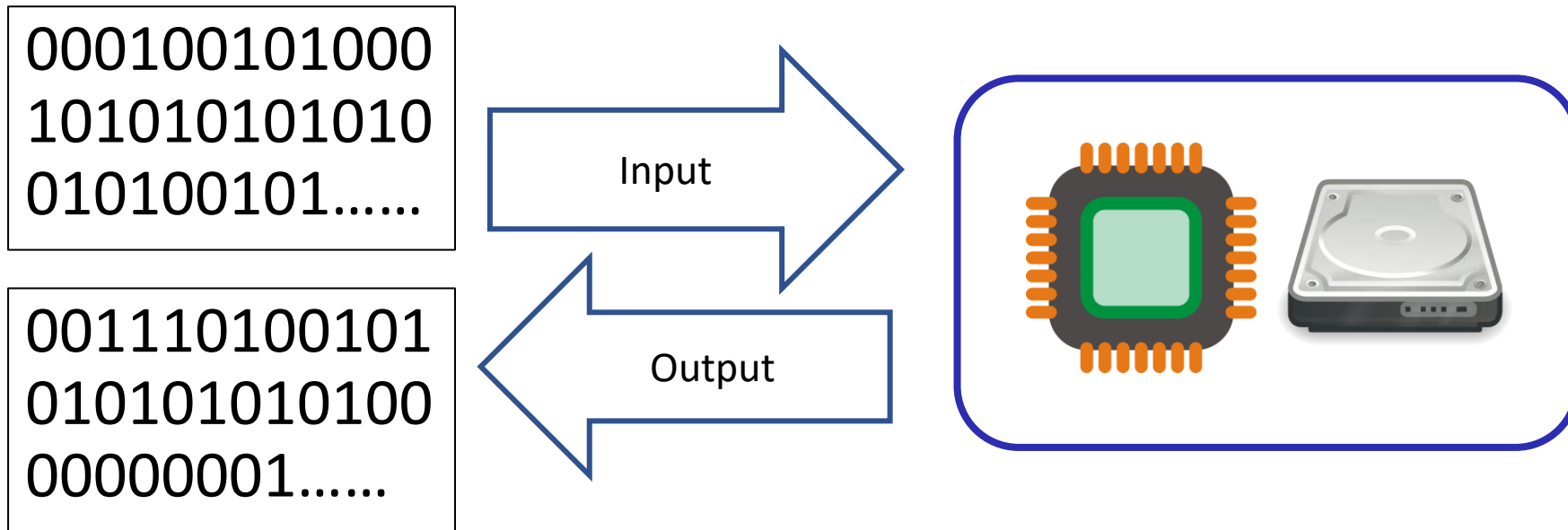


Abstraction



Abstraction

Focus on problem solving!



Languages

A language is a set of strings over an alphabet

Examples:

- Regular language
- Context-free languages
- ...