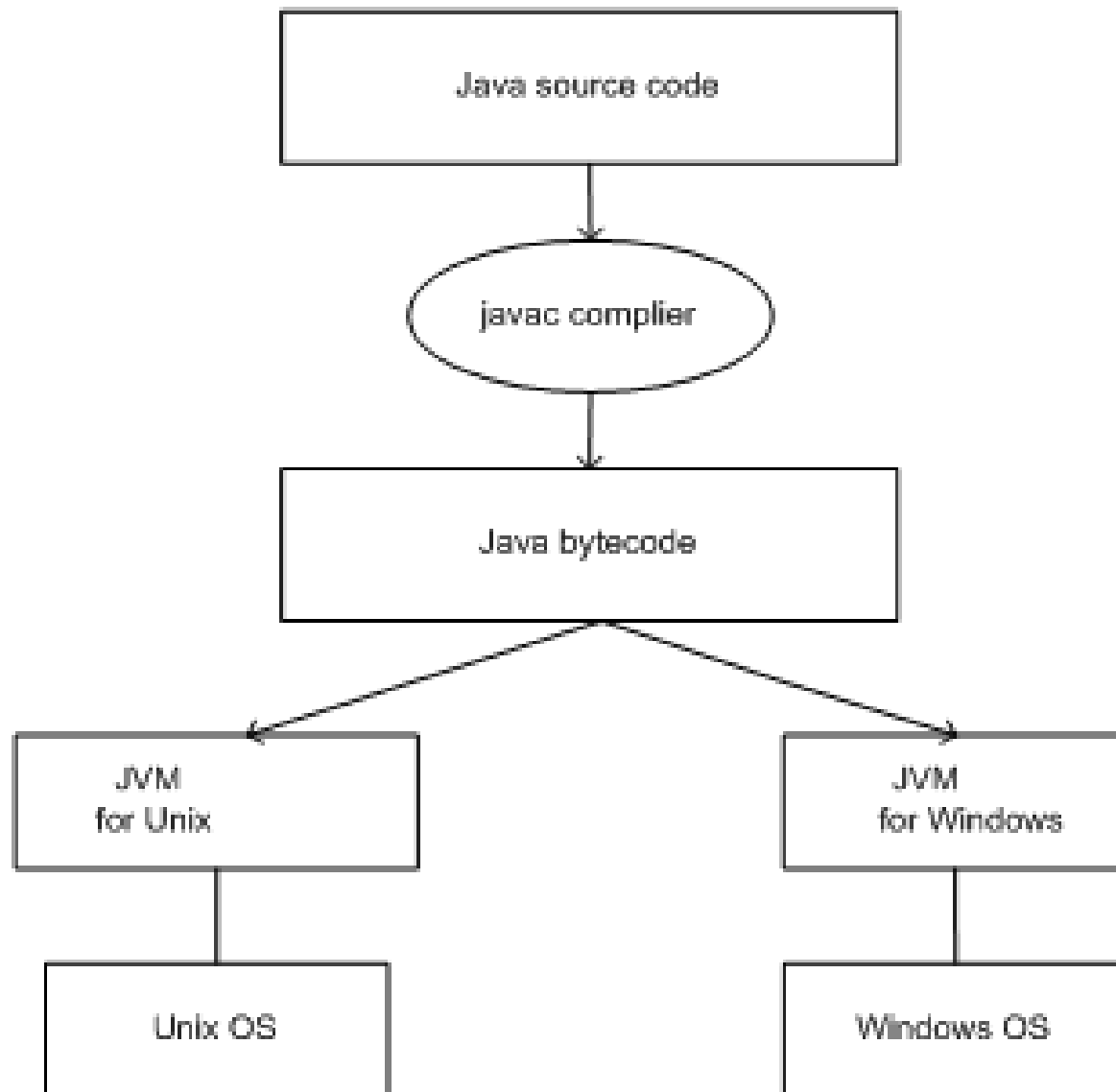# Software Design and Architecture
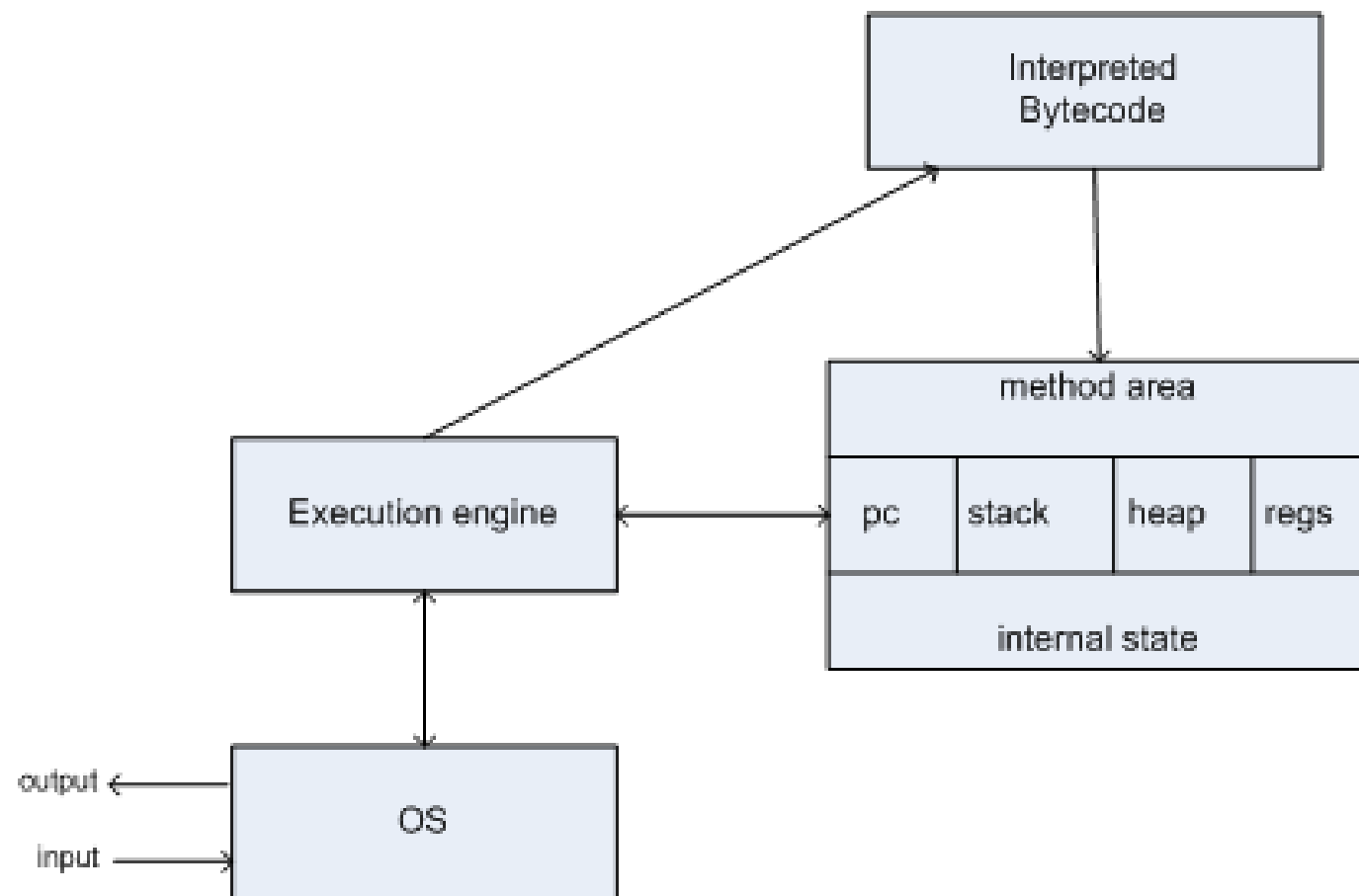
Virtual Machine

Virtual machine

▶ A virtual machine is built up on an existing system and provides a virtual abstraction, a set of attributes, and operations.

▶ In most cases, we find that a virtual machine separates a programming language or application environment from a execution platform.

```
┌─────────────────────────────────────┐
│          Java source code           │
└─────────────────────────────────────┘
                   │
                   ▼
            ╭───────────────╮
            │ javac complier │
            ╰───────────────╯
                   │
                   ▼
┌─────────────────────────────────────┐
│           Java bytecode             │
└─────────────────────────────────────┘
              ╱            ╲
             ╱              ╲
            ▼                ▼
┌──────────────┐        ┌──────────────┐
│     JVM      │        │     JVM      │
│   for Unix   │        │  for Windows │
└──────────────┘        └──────────────┘
       │                       │
┌──────────────┐        ┌──────────────┐
│   Unix OS    │        │  Windows OS  │
└──────────────┘        └──────────────┘
```

- In previous diagram the JVM separates the bytecode from the OS machine code.

- The bytecode is actually in a method format, and each op codes can which can be interpreted by an interpreter.

- The virtual machine itself is thus implemented as an interpreter.

VM Applicable Design Domain

▸ Suitable for solving a problem by simulation or translation if there is no direct solution.

▸ Sample applications include interpreters of microprogramming, XML processing, script command language execution, rule-based system execution, Smalltalk and Java interpreter typed programming language.

VM Benefits

- Portability and machine platform independency.
- Simplicity of software development.
- Simulation for disaster working model.

VM Limitations

- Slow execution of the interpreter due to the interpreter nature.
- Additional overhead due to the new layer.

Summary

▸ Introduction to virtual machine architecture

▸ Applicable domain of virtual machine

▸ Benefits of virtual machine