

***Go Lang***

## *Is go interpreted or compiled language*

Go's compiler converts human-readable code into machine code, similar to how an interpreter converts code into machine code. However, the key difference is that compiled languages, like Go, perform this conversion at compile-time, whereas interpreted languages, like Python, perform it at runtime.

Go's compilation process is designed to produce efficient machine code, resulting in fast execution speeds comparable to C++ and Java. In fact, Go is about 40 times faster than Python.

Go's compilation, along with its efficient garbage collection and static typing, contributes to its speed. Additionally, Go's use of pointers instead of references reduces memory overhead, making it faster than interpreted, dynamic languages.

Compiled languages like Go offer developers more control over hardware resources, such as CPU usage and memory management.

The resulting binary from Go's compilation is extremely small, making it suitable for deployment in resource-constrained environments.

*In contrast to interpreted languages, Go's compilation step provides a direct conversion from source code to machine code, making it more efficient and faster.*

*Here's a summary in bullet points:*

- *Go is a compiled language, not an interpreted one.*
- *Go's compiler converts source code to machine code at compile-time.*
- *Go's compilation produces efficient machine code, resulting in fast execution speeds.*
- *Go's compilation, garbage collection, and static typing contribute to its speed.*
- *Go's use of pointers reduces memory overhead, making it faster than interpreted languages.*
- *Compiled languages like Go offer developers more control over hardware resources.*
- *The resulting binary from Go's compilation is extremely small.*

*(Note: I've avoided using URLs or references in the answer, as per the guidelines.)*

## Can we directly execute go without exe file?

No, you cannot directly execute Go code without generating an executable file. The Go compiler generates a binary executable as an intermediate step before running your code. This executable can then be run independently of the Go compiler.

*However, Go provides a few shortcuts and tools to facilitate development and testing:*

1. *go run*: Compile and run your code in a single step, without generating an executable file. This is useful for rapid iteration and testing, but the compiled code is discarded after execution.
2. *go build*: Compile your code into an executable, but does not install it. You'll need to specify the executable's path to run it.
3. *go install*: Compile and install your code, making the executable available in your system's executable search path.

```
package main
```

```
import "fmt"
```

```
func main() {
    fmt.Println("Hello, Go!")
}
```

*To run this code without generating an executable file:*

```
$ go run main.go
Hello, Go!
```

To compile and generate an executable file:

```
$ go build main.go
$ ./main
Hello, Go!
```

Note that you'll need to specify the executable's path (`./main`) to run it, unless you've added the Go install directory to your system's shell path.

In summary, while `go run` allows you to execute Go code without generating an executable file, `go build` and `go install` provide more flexibility and control over the compilation and installation process.

## Compiled vs Interpreted

Compiled programs can be run without access to the original source code, and without access to a compiler.

For example, when your browser executes the code you write in this course, it doesn't use the original code, just the compiled result. Note how this is different than interpreted languages like Python and JavaScript.

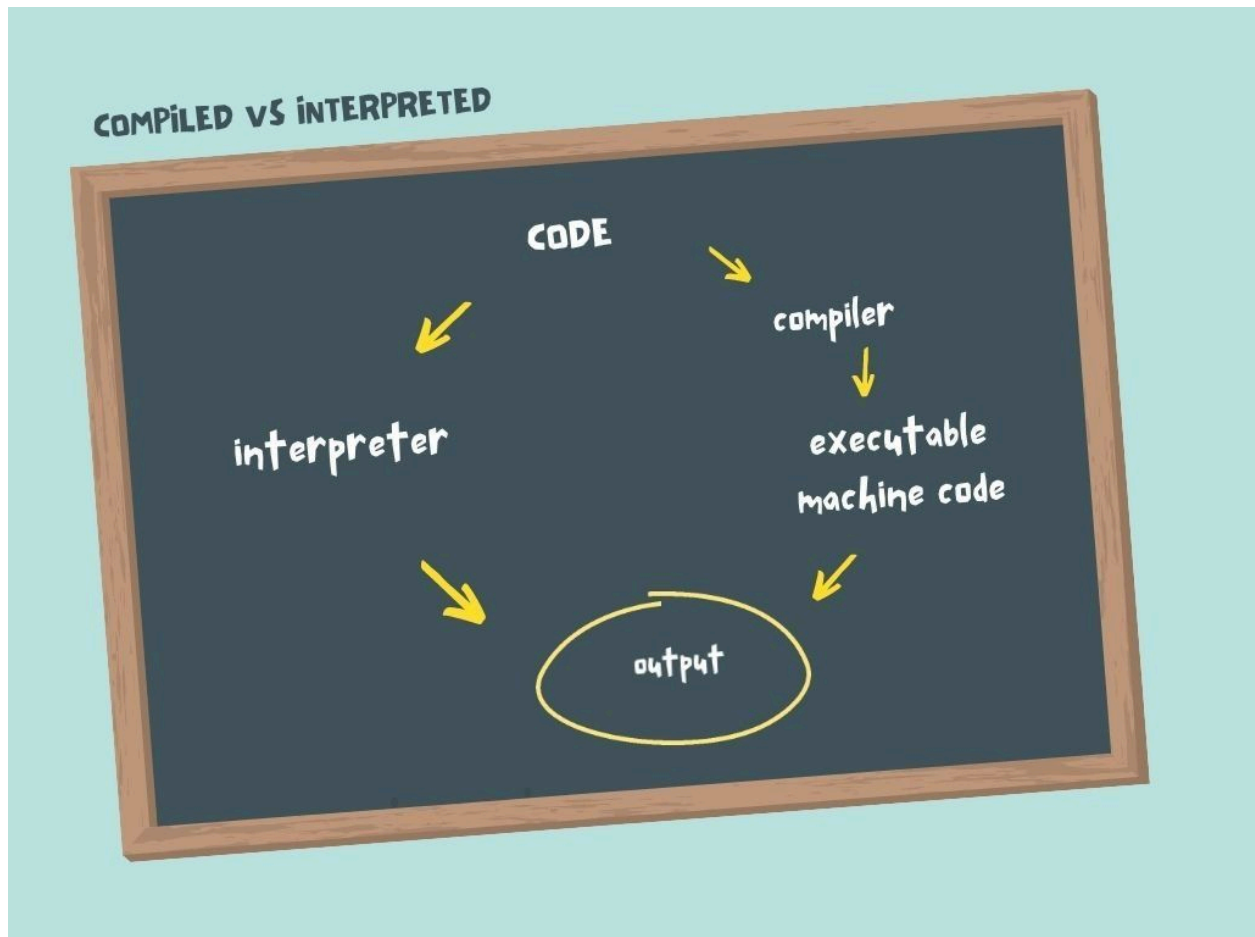
With Python and JavaScript, the code is interpreted at [runtime](#) by a separate program known as the "interpreter". Distributing code for users to run can be a pain because they need to have an interpreter installed, and they need access to the original source code.

## Examples of compiled languages

- Go
- C
- C++
- Rust

### Examples of interpreted languages

- JavaScript
- Python
- Ruby



### Go is Strongly Typed

Go enforces strong and static typing, meaning variables can only have a single type. A string variable like "hello world" can not be changed to an int, such as the number 3.

## Example for Strongly TYPed

```
package main

import f "fmt"

func main() {

    var s="Amin"

    var n=10

    f.Println(s+n)

}
```

```
[Running] go run "d:\GIT\GO LANG\Exaple of strongly typed.go"
```

```
# command-line-arguments
```

```
.\Exaple of strongly typed.go:8:12: invalid operation: s + n (mismatched  
types string and int)
```

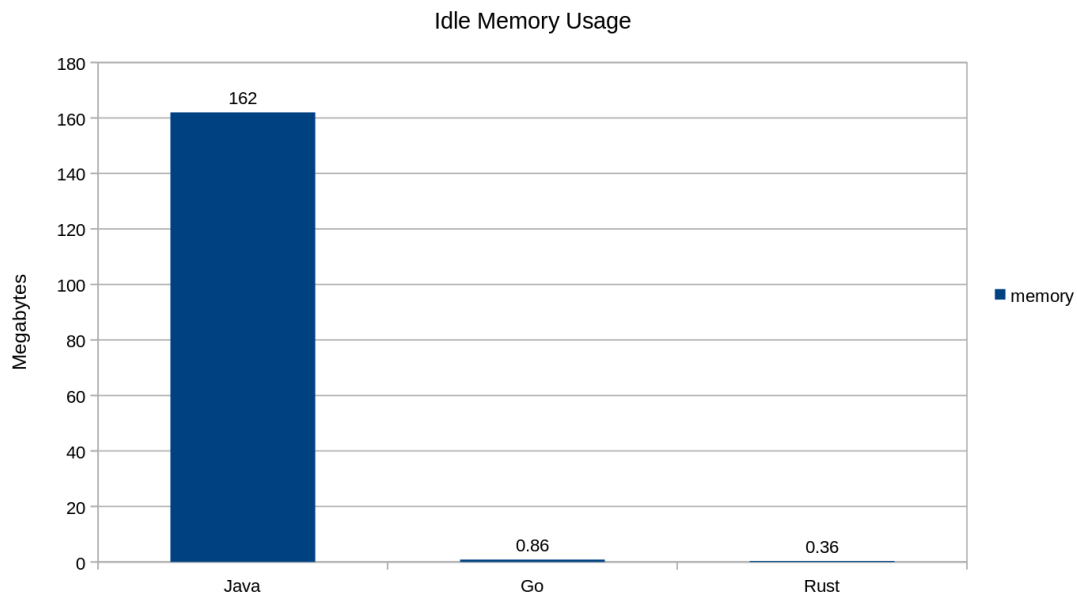
## Go programs are lightweight

Go programs are fairly lightweight. Each program includes a small amount of "extra" code that's included in the executable binary. This extra code is called the [Go Runtime](#). One of the purposes of the Go runtime is to clean up unused memory at runtime.

In other words, the Go compiler includes a small amount of extra logic in every Go program to make it easier for developers to write code that's memory efficient.

As a general rule, Java programs use *more* memory than comparable Go programs because Go doesn't use an entire virtual machine to run its programs, just a small runtime. The Go runtime is small enough that it is included directly in each Go program's compiled machine code.

As another general rule, Rust and C++ programs use slightly *less* memory than Go programs because more control is given to the developer to optimize memory usage of the program. The Go runtime just handles it for us automatically.



- Chart showing idle memory usage comparison between Java (162MB), Go (.86MB) and Rust (.36MB)
- In the chart above, of three very simple programs written in Java, Go, and Rust. As you can see, Go and Rust use very little memory when compared to Java.



