Golang

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What is Go?

- General purpose, higher-level, imperative language
  - Used in cloud and network services, command-line interfaces, web development, DevOps and Site Reliability, and more.

- Open source language developed by Google in 2009
  - Robert Griesemer, Rob Pike, and Ken Thompson
  - Primarily motivated by shared dislike of C++ and frustration with current toolset

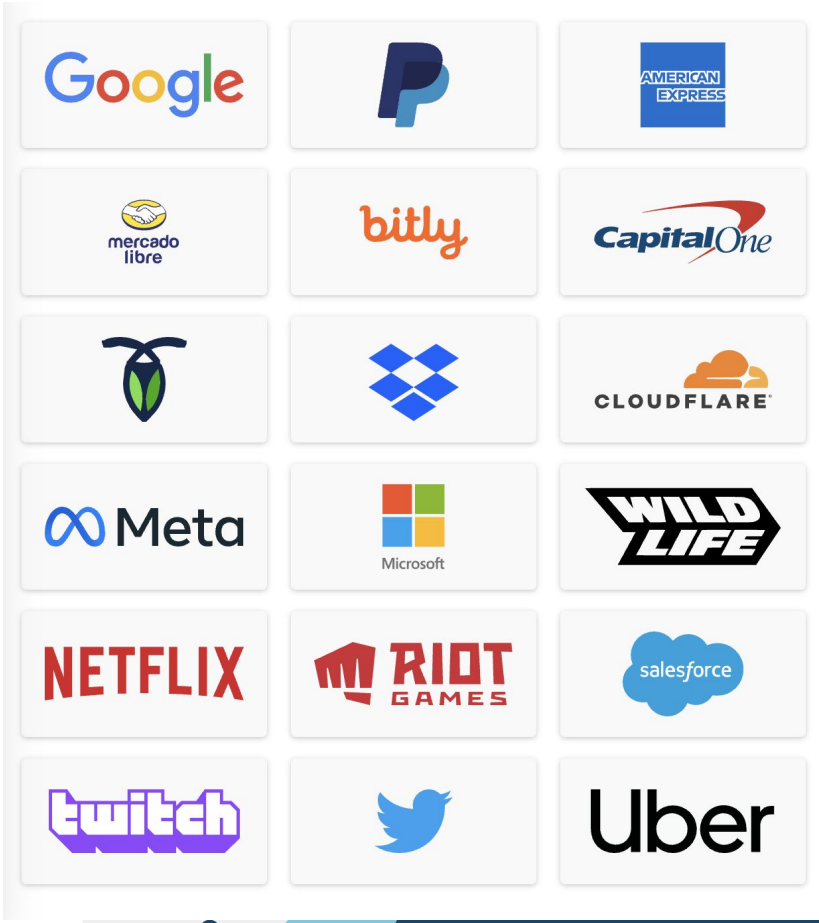
- Syntactically similar to C but with additional features
  - Memory safety, garbage collection, structural typing, and concurrency

https://stackoverflow.blog/2020/11/02/go-golang-learn-fast-programming-languages/

Main Focuses of Go

- Static typing and run-time efficiency (like C)
- Readability and useability (like Python or JS)
- High-performance networking and multiprocessing

https://go.dev/



Benefits of Go

- Designed to run on multiple cores
  - built to support massive multithreading, concurrency, and can scale as more cores are added
- Go toolbox is compilable across all platforms & on all hardware
- Simple package management is extremely portable
- Similar to pearl as a “swiss army knife” but Go is stripped of the overhead

Benefits of Go

- Easy to learn and only takes a couple of hours if you have experience in any other programming language
- Go compiles the program into a single binary
  - Run your app anywhere and don't have to worry about dependencies
- Opinionated language; rigorous way to write Golang code
  - Less variation in how people write Go code leading to code consistency, readability, and maintainability

https://betterprogramming.pub/build-a-simple-todolist-app-in-golang-82297ec25c7d

Uses for Go

- Go is a potential alternative for both scripting languages and compiled languages.

“Personally, I believe Go is the new Java. Many open-source projects (e.g., Kubernetes, Docker, InfluxDB, Serf, etc.) are written in Go. In contrast, the older projects (e.g., Apache Kafka, Apache Hadoop, Apache Spark, etc.) are written in Java.” - Mohamad Fadhil

- Go was designed for the state of software engineering today
  - Designed to run on the environments that developers use - scalable, cloud-based servers that are optimized for performance

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Goroutines

- Goro st of the progr
- Start of its proce
- Netw nd the main

```
package main
import (
  "fmt"
  "time"
)
func hello() {
  fmt.Println("Hello world goroutine")
}
func main() {
  go hello()
  time.Sleep(1 * time.Second)
  fmt.Println("main function")
}
```

https://stack

https://golangexample.com/go-cheat-sheet-an-overview-of-go-syntax-and-features/

Benefits of Goroutines

- Goroutines allow the program to keep running even if the concurrent processes take longer than expected.

- Goroutines are cheap which is what makes Go so fast
  - In Regex test, Go ran in 3.55 sec (102 lines of code) and Java ran in 5.58 (70 lines of code).

- There can be one thread in a program with thousands of Goroutines. If a Goroutine is blocked in that thread then a new thread is created and the remaining Goroutines are transferred to the new thread.
  - All of this is managed by the runtime so the programmer is given a clear API to work with concurrently

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Key Syntax

- No semicolons
- No classes; struct with methods
- Interfaces (only abstract type allowed)
- No implementation inheritance (no subclasses)
  - Type embedding (interface and struct embedding)
- Functions can return multiple values
- Has closures
- Pointers but no pointer arithmetic
- Built-in concurrency primitives (Goroutines and channels)
- Type goes after identifier (var foo int)
- No exception handling
  - Function that might produce an error? Declare an additional return type for the error

Cool Features

- Speed advancements
  - Stores as much as it can on the stack (retrieving from the heap is 10-20 times slower) -> the fastest way to read from memory is to read it sequentially which means reducing to a minimum the number of pointers randomly stored in RAM
- Doesn't rely on centrally hosted service like Java's Maven Central
  - Making your module available to others is so simple- just put in on GitHub for easy distribution.
- Go has a lot of functional features
  - Functions are values; they can be added to maps, passed as parameters to other functions, set to variables and returned from other 'higher order functions'
  - Anonymous functions can be created and automatically invoked
- Structs & Primitives are passed by value by default with option of passing a pointer

https://itnext.io/10-features-of-go-that-set-it-apart-from-other-languages-89337e5ee551

Golang Demo

- Built a Golang API server that connects to a front-end page built by Mohamad Fadhil for a To-Do List.
  - MySQL database
  - GORM as an ORM (object-relational mapping) to interact with the database -> converts between relational database and the heap
  - gorilla/mux request router
  - Logrus for logging