Getting Started with Go

Installation

> *brew install go*

Add it to your Path

Add the following to your .bashrc or zshrc file

```
export PATH="$PATH:$(go env GOPATH)/bin"
```

Configuration

Setup default workspace

> *mkdir ~/go*
> *mkdir ~/go/src*

Hello World Example

> *vi helloworld.go*

```
package main

import (
  "fmt"
)

func main(){
  fmt.Println("Hello World")
}
```

Run it

> *go run helloworld.go*

Compile it

> *go build*

Install it

> *go install*

Creating a Module

Create a go.mod file

go.mod

```
module mymodule
go 1.18
```

Add Libraries

> *go get github.com/qopher/go-torrentapi*

Commands

Command	Description
go run <src.go>	Run some code
go build	Compile the code. Outputs to local folder. Executable has folder as name.
go install	Compiles and places the output in workspace/bin
go env GOPATH	Outputs the default workspace folder

Variables

Variables are defined using the following syntax:

> *var <variablename> <type>*

example:

> *var x int*

All variables have a zero value and are pre-initialized to their zero value. For example, an int would have a zero value of 0 and a string would have a zero value of empty string "".

Initializing the variable at declaration time:

> *var x int = 5*

Quick Syntax: infers type based on value.

> *x:=5*

Example:

```
package main

import (
  "fmt"
)

func main(){
  var x int
  x = 5
  fmt.Println(x)
}
```

If Statements

```
package main

import (
  "fmt"
)

func main(){
  x := 7

  if x > 6 {
    fmt.Println("More than 6")
  } else if x < 2 {

  } else {

  }
}
```

Arrays

```
package main

import (
  "fmt"
)

func main(){
  //fix size
  var a [5]int
  a[2] = 7
  fmt.Println(a)

  a:= [5]int{5,4,3,2,1}
  fmt.Println(a)

  //slices
  a:= [] int{5,4,3,2,1}
  a = append(a,13)
  fmt.Println(a)

}
```

Maps

```
package main

import (
  "fmt"
)

func main(){

  vertices := make(map[string]int)

  vertices["triangle"] = 2
  vertices["square"] = 3
  vertices["tree"] = 12

  delete(vertices, "square")

  fmt.Println(vertices["traingle"])
  fmt.Println(vertices)


}
```

Loops

The only type of look in go is the for loop.

```
package main

import (
  "fmt"
)

func main(){

  //for loop
  for i :=0; i<5; i++{
    fmt.Println(i)
  }

  //while loop
  j:=0
  for j<5 {
    fmt.Println(j)
    j++
  }

  //loop over array or slice
  arr := []string{"a"m"b","c"}
  for index, value := range arr {
        fmt.Println("index:", index, "value:", value)
  }


  //loop over a map
  m := make(map[string]int)
  m["triangle"] = 2
  m["square"] = 3
  for key, value := range m {
        fmt.Println("key:", key, "value:", value)
  }

}
```

Functions

Example showing error return

```
package main

import (
  "fmt"
  "error"
  "math"
)

func main() {
  result, err := sqrt(16)

  if err != nil {
    fmt.Println(err)
  } else {
    fmt.Println(result)
  }
}

func sqrt(x float64) (float64, error ) {
  if x < 0 {
    return 0, errors.New("Undefined for negative numbers")
  }
  return math.Sqrt(x), nil
}
```

Method Set

```
func (h handler) ServeHTTP(w http.ResponseWriter, r *http.Request) {
    ...
}

func (s *GracefulServer) BlockingClose() bool {
    ...
}
```

This is called the 'receiver'. In the first case `(h handler)` it is a value type, in the second `(s *GracefulServer)` it is a pointer. The way this works in Go may vary a bit from some other languages. The receiving type however, works more or less like a class in most object-oriented programming. It is the thing you call the method from, much like if I put some method `A` in side some class `Person` then I would need an instance of type `Person` in order to call `A` (assuming it's an instance method and not static!).

One gotcha here is that the receiver gets pushed onto the call stack like other arguments so if the receiver is a value type, like in the case of `handler` then you will be working on a copy of the thing you called the method from meaning something like `h.Name = "Evan"` would not persist after you return to the calling scope. For this reason anything that expects to change the state of the receiver, needs to use a pointer or return the modified value (gives more of an immutable type paradigm if you're looking for that).

Here's the relevant section from the spec; https://golang.org/ref/spec#Method_sets

Structs/Types

Example of Person Type

```
package main

import (
  "fmt"
)

type person struct {
  name string
  age int
}

func main(){
  p:= person{name: "Jake", age: 23 }
  fmt.Println(p)

  fmt.Println(p.age)
}
```

Pointers

Pass by Reference Example

```
package main

import (
  "fmt"
)

func main(){
  i := 7
  inc(&i)
  fmt.Println(i)
}

func inc(x *int) {
  *x++
}
```

Concurrency

Go supports concurency by the use of the go command. All go functions in the background will terminate when the main terminates.

```
package main

import (
  "fmt"
)

func main(){

  //run in background
  go count("sheep")

  go count("fish")

  //wait for keyboard press before exiting
  fmt.Scanln()

}

func count(thing string) {
  for i:=0; true; i++ {
    fmt.Println(i, thing)
    time.Sleep(time.Millisecond * 500)
  }
}
```

Using Channels

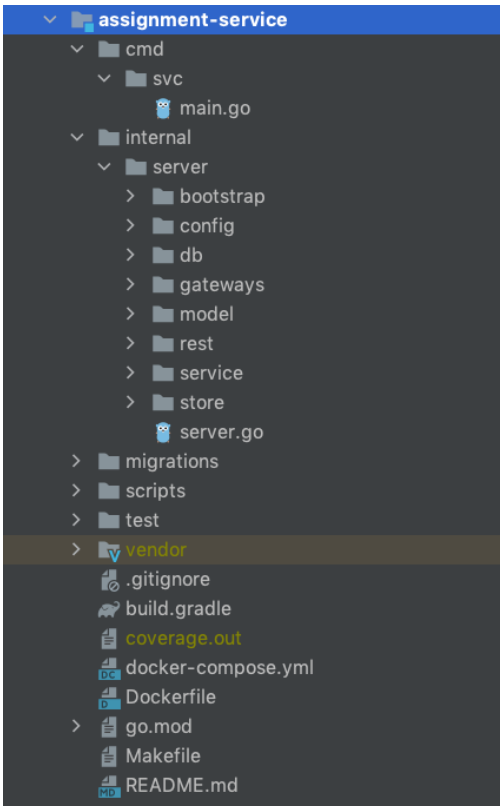
Channels are blocking

```
package main

import (
  "fmt"
  "time"
)

func main(){

  //make channel of type string
  c := make(chan,string)

  //run in background
  go count("sheep", c)

  //block until message is pushed to the channel
  msg:= <- c

  fmt.Println(msg)
}

func count(thing string, c chan string) {
  for i:=0; i <= 5; i++ {
    //send message on channel
    c <- thing
    time.Sleep(time.Millisecond * 500)
  }
}
```

In the above code, the program exits once the count routine returns a message on the channel.

```
package main

import (
  "fmt"
  "time"
)

func main(){

  //make channel of type string
  c := make(chan,string)

  //run in background
  go count("sheep", c)

  //loop until count function closes the channel
  for {
    msg, open := <- c
    if !open {
      //channel closed, break out of for loop
      break
    }
  }

  fmt.Println(msg)
}

func count(thing string, c chan string) {
  for i:=0; i <= 5; i++ {
    //send message on channel
    c <- thing
    time.Sleep(time.Millisecond * 500)
  }

  //close channel
  close(c)
}
```

Organizing your Code



References

Reference	URL
Learn Go in 12 Minutes	https://www.youtube.com/watch?v=C8LgvuEBraI
Concurrency in Go	https://www.youtube.com/watch?v=LvgVSSpwND8
Go Packages	https://golang.org/pkg/
Go By Examples	https://gobyexample.com/