GO WEB DEVELOPMENT 101

3 MONTHS to be productive

74% write **API SERVICES**

45% write **WEB APPS**

* Go Developer Survey 2020 Results

HELLO GOPHER

```go
package main

import "fmt"

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

Run Code

```
go build hellogopher.go // 1. Compile code
./hellogopher           // 2. Run binary
```

```
go run hellogopher.go   // Compile code + run binary
```

DEVELOPMENT

JetBrains
GoLand

Visual
Studio Code

Vim Go

5 FACTS ABOUT GO

1. static type system
2. garbage collection
3. no inheritance
4. built-in concurrency
5. native execution

   Linux, Win, z/OS, 386, amd64, ARM, wasm, ...

VARIABLES, SLICES, LOOPS

```go
// Variable
var kitty string = "Kitty"
bella := "Bella"

// Array (fixed length)
namesArray := [3]string{kitty, bella, "Cleo"}

// Slice (variable length)
namesSlice := make([]string, 2)
namesSlice[0] = kitty

// Loop
for i, name := range namesSlice {
  fmt.Println("Hello " + name + "!")
}
```

STRUCT

```
1 type Cat struct {
2   Name string
3 }
4
5 func main() {
6   c := Cat{Name: "Kitty"}
7   fmt.Println("Hello " + c.Name + "!")
8 }
```

ERRORS

```go
// Error as return value
func (c Cat) feed(food string) error {
  if c.Name == "Kitty" && food != "Steak Tartare" {
      return errors.New("Won't eat!")
  }
  return nil
}

func main() {
  c := Cat{Name: "Kitty"}

  // Handle error
  err := c.feed("Caviar")
  if err != nil {
      fmt.Printf("%v won't eat it.", c.Name)
  }
}
```

THE CATS APP

Cats App Home

Abyssinian

The Abyssinian is easy to care for, and a joy to have in your home. They're affectionate cats and love both people and other animals.

Aegean

Native to the Greek islands known as the Cyclades in the Aegean Sea, these are natural cats, meaning they developed without humans getting involved in their breeding. As a breed, Aegean Cats are rare, although they are numerous on their home islands. They are generally friendly toward people and can be excellent cats for families with children.

CATS APP API

SET UP CATS APP

```
# Create directory
mkdir cats
cd cats
```

```
# Enable dependency tracking
go mod init goday.com/cats
```

```
# Create go file
touch main.go
```

CAT API SIMPLE

```
1 func catAPIHandler(w http.ResponseWriter, r *http.Request)
2   fmt.Fprintf(w, "Meow!")
3   w.WriteHeader(http.StatusOK)
4 }
5
6 func main() {
7   http.HandleFunc("/api/cats", catAPIHandler)
8   http.ListenAndServe(":8080", nil)
9 }
```

CAT API WITH JSON

```go
type Cat struct {
  Name string
}

func catAPIHandler(w http.ResponseWriter, r *http.Request) {
  cats := make([]Cat, 1)
  cats[0] = Cat{Name: "Ginger"}
  json.NewEncoder(w).Encode(c)
}

func main() {
  http.HandleFunc("/api/cats", catAPIHandler)
  http.ListenAndServe(":8080", nil)
}
```

CAT API WITH JSON

```
# Query cat API
curl -s http://localhost:8080/api/cats | jq
[
  {
    "Name": "Ginger"
  }
]
```

CAT API WITH JSON

```
1  type Cat struct {
2    Name string `json:"name"`
3  }
4
5  func catAPIHandler(w http.ResponseWriter, r *http.Request) {
6    cats := make([]Cat, 1)
7    cats[0] = Cat{Name: "Ginger"}
8    json.NewEncoder(w).Encode(cats)
9  }
10
11 func main() {
12   http.HandleFunc("/api/cats", catAPIHandler)
13   http.ListenAndServe(":8080", nil)
14 }
```

TEST CAT API cat_api_test.go

```go
func TestCatAPIHandler(t *testing.T) {
  // 1. Create test request
  req, _ := http.NewRequest("GET", "/api/cats", nil)

  // 2. Create recorder (which satisfies http.ResponseWriter)
  recorder := httptest.NewRecorder()

  // 3. Invoke handler
  catAPIHandler(recorder, req)

  // 4. Check the response
  if recorder.Code != http.StatusOK {
    t.Errorf("Wrong status: got %v expected %v", recorder.Code, http.Sta
  }
}
```

RUN TEST

```
1 # Run tests
2 go test -v ./...
3 === RUN   TestCatAPIHandler
4 --- PASS: TestCatAPIHandler (0.00s)
5 PASS
6 coverage: 50.0% of statements
7 ok      devopscon.com/cats      0.127s  coverage: 50.0% of statem
```

BUILD WITH Makefile

```
1  .DEFAULT_GOAL := build
2  BIN_FILE=cats
3
4  build:
5    go build -o dist/"${BIN_FILE}"
6
7  test:
8    go test -v ./...
9
10 run:
11   ./"${BIN_FILE}"
12
13 clean:
14   go clean
```

DEMO

CATS APP WEB

CATS HANDLER BASIC TEMPLATE SETUP

```
1 func indexHandler(w http.ResponseWriter, r *http.Request) {
2   var tpl = template.Must(template.ParseFiles("index.html"))
3   tpl.Execute(w, nil)
4 }
5
6 func main() {
7   http.HandleFunc("/", indexHandler)
8   http.ListenAndServe(":8080", nil)
9 }
```

CATS HANDLER WITH MULTIPLEXER

```
 1 func indexHandler(w http.ResponseWriter, r *http.Request) {
 2   var tpl = template.Must(template.ParseFiles("index.html"))
 3   tpl.Execute(w, nil)
 4 }
 5
 6 func main() {
 7   mux := http.NewServeMux()
 8   mux.HandleFunc("/", indexHandler)
 9
10   http.ListenAndServe(":8080", mux)
11 }
```

SERVE FILES FROM FILESYSTEM

```
1  func main() {
2    mux := http.NewServeMux()
3    mux.HandleFunc("/", indexHandler)
4
5    // Serve files
6    fs := http.FileServer(http.Dir("assets"))
7    mux.Handle("/assets/", http.StripPrefix("/assets/", fs))
8
9    http.ListenAndServe(":8080", mux)
10 }
```

SERVE FILES EMBEDDED IN BINARY

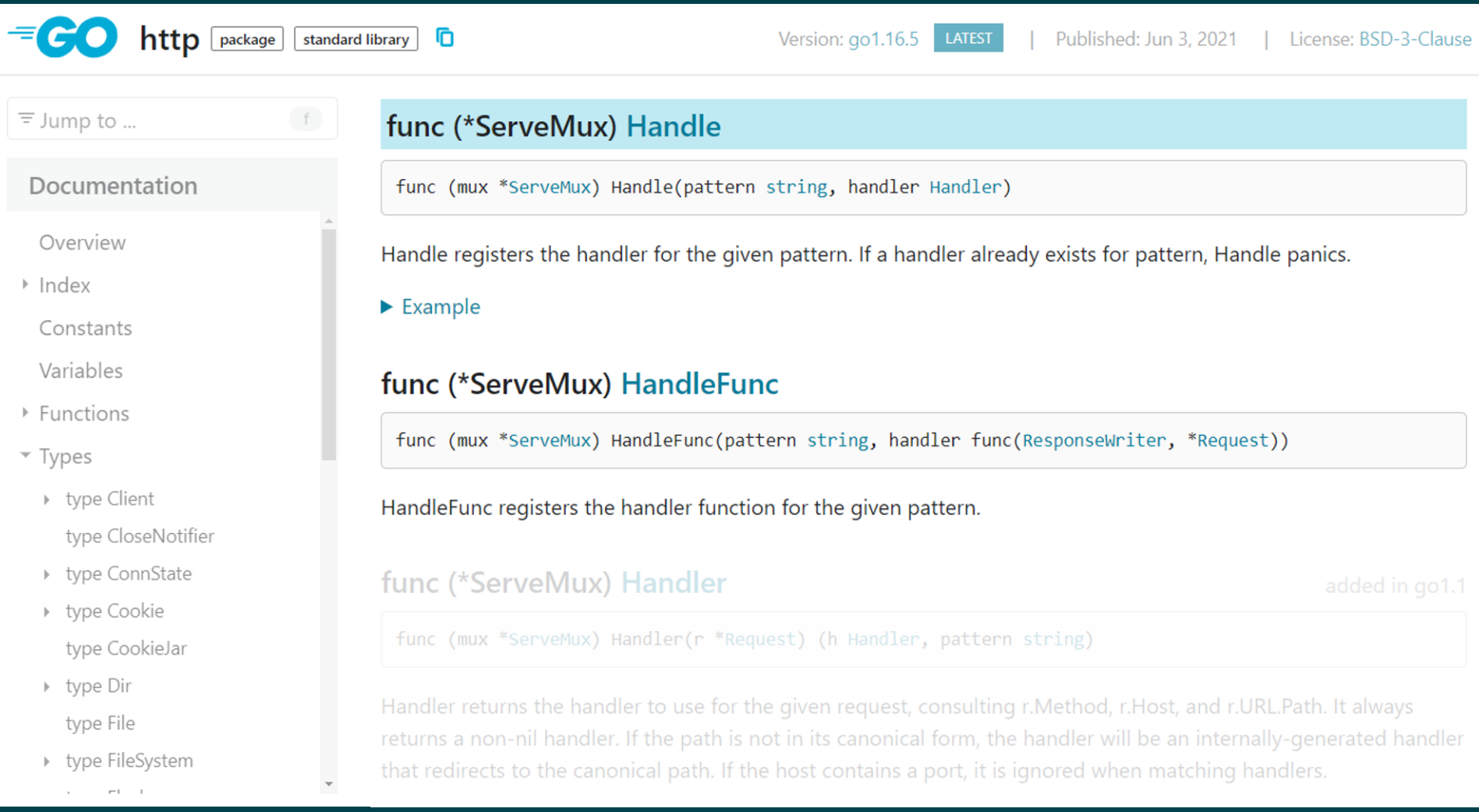
```go
//go:embed assets
var assets embed.FS

func main() {
  mux := http.NewServeMux()
  mux.HandleFunc("/", indexHandler)

  // Serve files
  mux.Handle("/assets/", http.FileServer(http.FS(assets)))

  http.ListenAndServe(":8080", mux)
}
```

HANDLER AND HANDLEFUNC



http package standard library

Version: go1.16.5 LATEST | Published: Jun 3, 2021 | License: BSD-3-Clause

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  - type File
  - type FileSystem

func (*ServeMux) Handle

```
func (mux *ServeMux) Handle(pattern string, handler Handler)
```

Handle registers the handler for the given pattern. If a handler already exists for pattern, Handle panics.

▶ Example

func (*ServeMux) HandleFunc

```
func (mux *ServeMux) HandleFunc(pattern string, handler func(ResponseWriter, *Request))
```

HandleFunc registers the handler function for the given pattern.

func (*ServeMux) Handler

added in go1.1

```
func (mux *ServeMux) Handler(r *Request) (h Handler, pattern string)
```

Handler returns the handler to use for the given request, consulting r.Method, r.Host, and r.URL.Path. It always returns a non-nil handler. If the path is not in its canonical form, the handler will be an internally-generated handler that redirects to the canonical path. If the host contains a port, it is ignored when matching handlers.

CATS HANDLER TEMPLATE WITH DATA

main.go

```
type Cat struct {
  Name string
}

func indexHandler(w ResponseWriter, r *Request) {
  // Create cat slice
  cat := make([]Cat, 1)

  // Add cat ginger
  cat[0] = Cat{Name: "Ginger"}

  // Render template
  tpl.Execute(w, cat)
}
```

index.html

```
<body>
  <h1>Cats App</h1>
  {{ range. }}
    <h2>{{ .Name }}</h2>
  {{ end }}
</body>
```

CATS HANDLER WITH CATS API

Query Cats API

```
GET https://api.thecatapi.com/v1/breeds?limit=5
```

```
[
   {
      "id": "abys",
      "name": "Abyssinian",
      "image": {
         "url": "https://cdn2.thecatapi.com/images/0XYvRd7oD.jpg
      }
   },
   {
      "id": "aege",
      "name": "Aegean",
      "image": {
         "url": "https://cdn2.thecatapi.com/images/ozEvzdVM-.jpg
      }
   },
   ...
]
```

Map JSON

```
type Cat struct {
  ID    string `json:"id"`
  Name  string `json:"name"`
  Image struct {
    URL string `json:"url"`
  } `json:"image"`
}
```

CATS HANDLER WITH CATS API

```
1  func indexHandler(w http.ResponseWriter, r *http.Request) {
2    resp, err := http.Get("https://api.thecatapi.com/v1/breeds?limit=5")
3    if err != nil {
4      http.Error(w, "Cats API error", http.StatusInternalServerError)
5      return
6    }
7
8    // Create cat slice
9    cat := make([]Cat, 5)
10
11   // Read and parse body
12   defer resp.Body.Close()
13   body, _ := ioutil.ReadAll(resp.Body)
14   json.Unmarshal(body, &cat)
15
16   tpl.Execute(w, cat)
17 }
```

MIDDLEWARE

- cross cutting functionality for all requests
  (e.g. logging, authentication)
- create a chain of handlers
  router => middleware handler => application handler
- satisfy the interface `http.Handler`

MIDDLEWARE TO LOG REQUESTS

```
 1 func loggingMiddleware(next http.Handler) http.Handler {
 2   return http.HandlerFunc(func(w http.ResponseWriter, r *http.Reque
 3     log.Printf("%v requested URL %v", r.Host, r.URL)
 4     next.ServeHTTP(w, r)
 5   })
 6 }
 7
 8 func main() {
 9   mux := http.NewServeMux()
10   mux.HandleFunc("/", indexHandler)
11
12   http.ListenAndServe(":8080", loggingMiddleware(mux))
13 }
```

DEMO

BASICS

- # Dev Setup
- # Variables, Slices, Loops
- # Struct
- # Errors

CATS APP API

- # Handler (with JSON)
- # Http Test
- # Build

CATS APP WEB

- # Multiplexer (Router)
- # File Server
- # Template
- # Middleware


GO!
GO!

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