Basic Go

USING GO ON THE WEB

HTTP://S3.JFH.ME/470.PDF

About me

- John Hilliard
- MIT ‘09
- 6-3
- Web Developer for Next Jump since 2008

- eCommerce and loyalty product installed in the majority of Fortune 1000 companies
  - In other words, we run a large scale web application that handles lots of traffic and transactions
- Majority engineers
  - Web developers
  - Database
  - Networking
- Stack
  - Go, PHP, SQL Server, Apache, Linux

Agenda

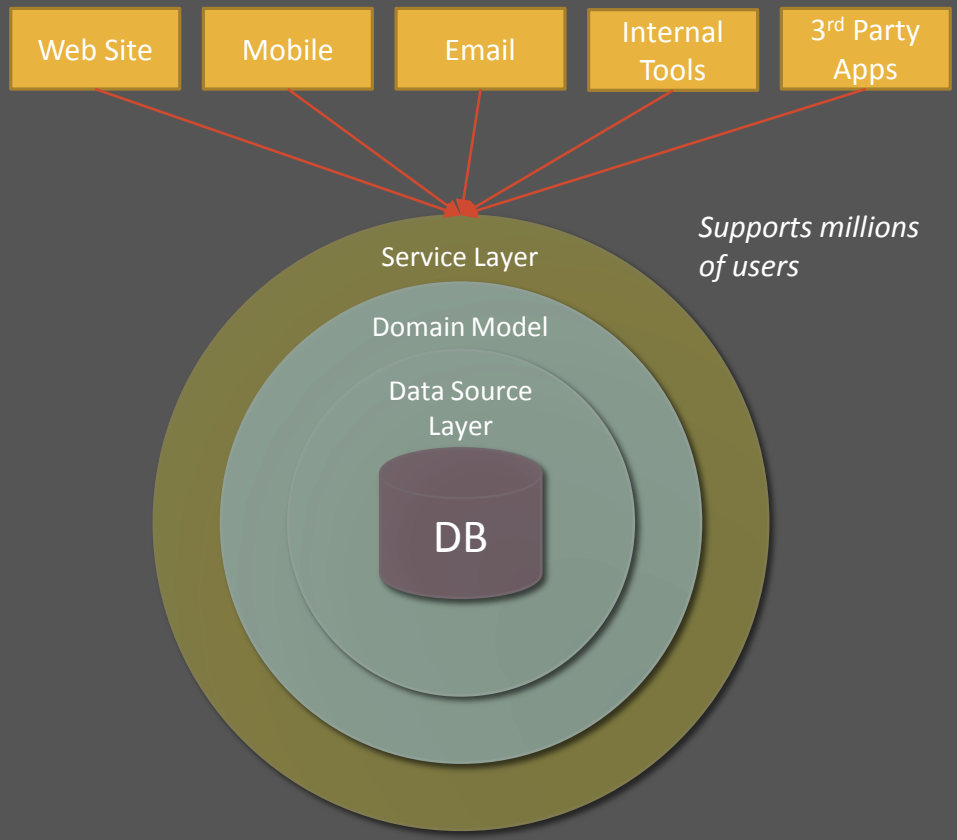
- Go overview
  - Why we use it and why you might want to use it
  - Why you might not want to use it
- Crash course
  - Scratching the surface
- Simple web application in Go
  - End to end example using Go to make a web application

Where Go fits in

Example Products / Services:
- Virtual Currency
- Travel reservation engine
- Transaction processing

We've implemented our service layer in Go

- Consistent data access
  - Logging
  - Security
- Smarter caching
- Shared definitions of objects



M. Fowler, *Patterns of Enterprise Application Architecture*, 1 edition. Boston: Addison-Wesley Professional, 2002.

Hello World

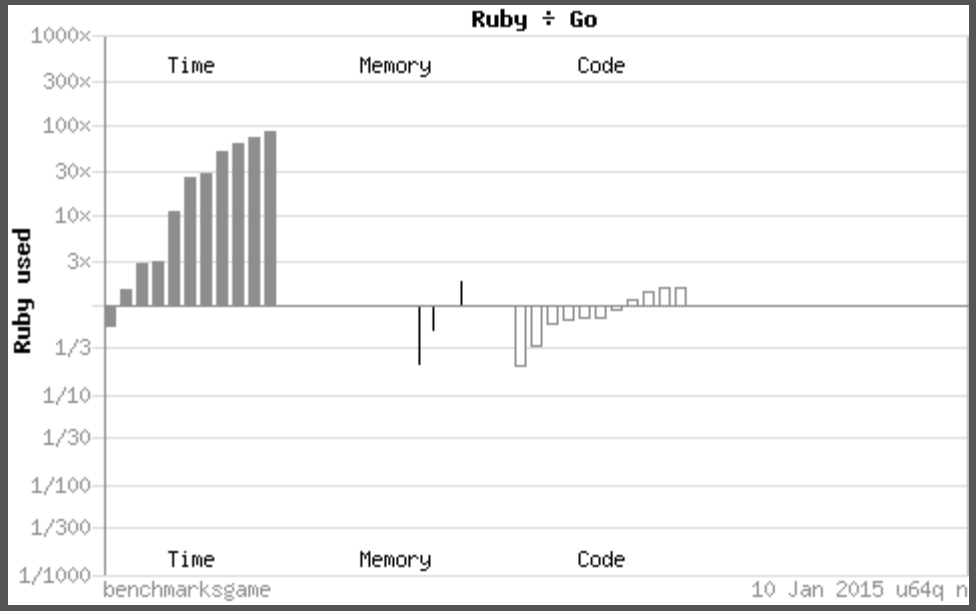
```
package main

import "fmt"

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

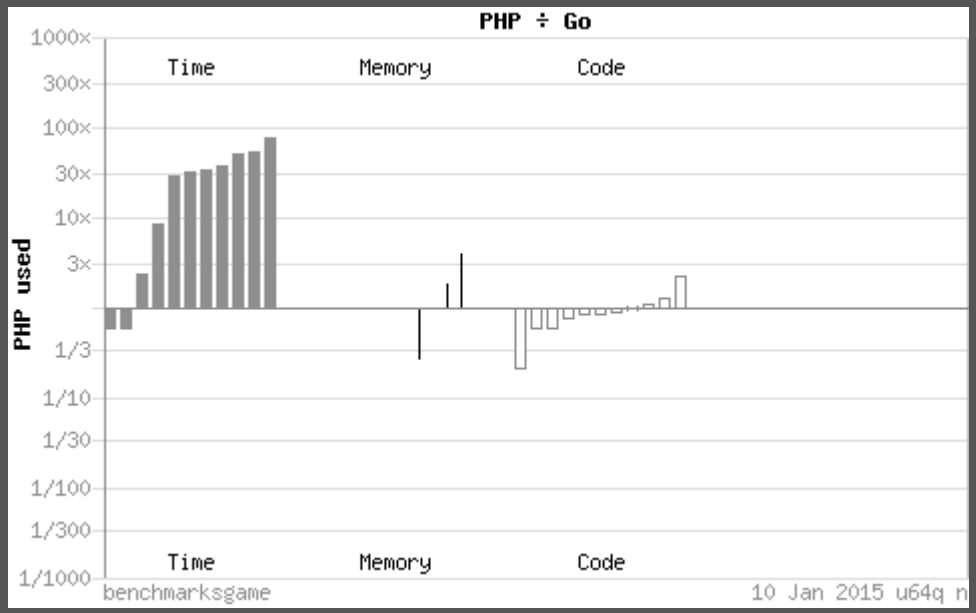
Important Characteristics

- Created in 2009
- Statically typed
- Compiled
- Similar to C

Choosing Go

- Speed
- Static Typing
- Simple Spec
- Simple Stack
- go fmt





Note: These aren't web-specific benchmarks

http://benchmarksgame.alioth.debian.org/u64q/compare.php?lang=yarv&lang2=go

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```
package main

import "fmt"

func main() {
        var a int64
        var b string
        a = 10
        b = "10"
        fmt.Println(a + b)
}
```

```
invalid operation: a + b (mismatched types
int64 and string)
```

Compiler helps keep code clean:

- No unused variables
- Catches simple mistakes
- Safer refactoring

Predictable code is important. No surprises.

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Similar code in Java Script

```
var a;
var b;

a = 10;
b = "10";

console.log(a + b);
```

➔1010

Predictable code is important. No surprises.

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Go Looping

http://golang.org/ref/spec

```go
package main

import "fmt"

func main() {
        var numbers []int64 = []int64{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
        for index, value := range numbers {
                fmt.Printf("Index: %d Value: %d\n", index, value)
        }
}
```

Java Script Looping

```javascript
var numbers = [1,2,3,4,5,6,7,8,9,10];

var number;
for (number in numbers) {
    console.log("Index: " + number + " Value: " + numbers[number]);
}

var len = numbers.length;
var i = 0;
while (i < len) {
    console.log("Index: " + i + " Value: " + numbers[i]);
    i = i + 1
}

i = 0;
do {
    console.log("Index: " + i + " Value: " + numbers[i]);
    i = i + 1
} while(i < len)


numbers.map(function(value, index) {
    console.log("Index: " + index + " Value: " + value);
});
```

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Notable Features Missing From Go

- Inheritance
- Overloading
- Generics

Other Examples

- Prefix increment operator
  - `++i`
- Ternary form
  - `([if] ? [true-value] : [false-value])`

http://golang.org/doc/faq

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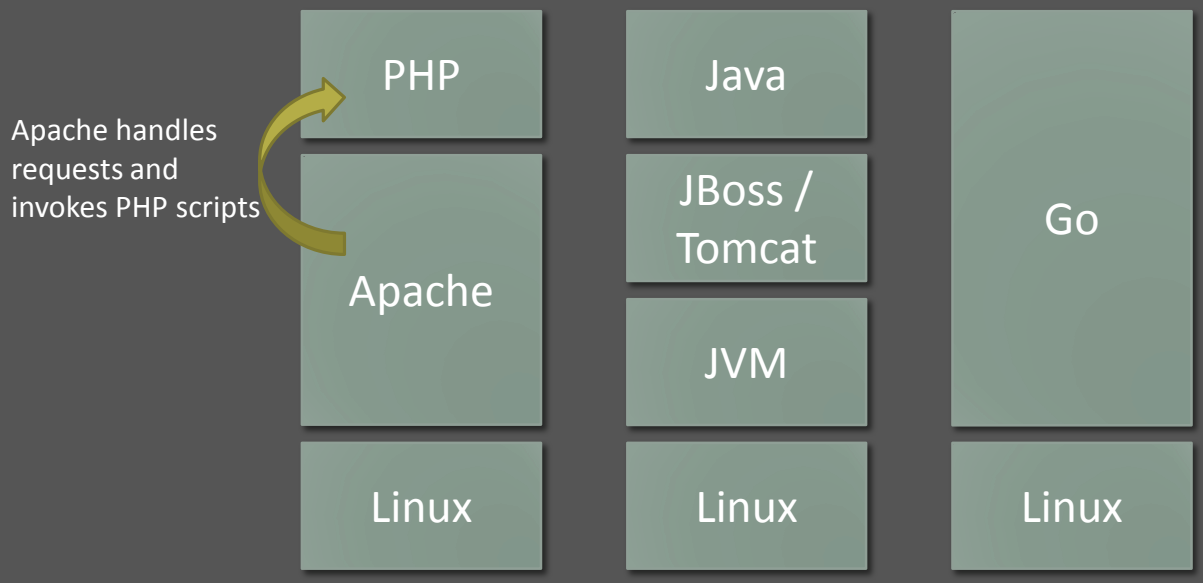
Configuration: Go vs PHP vs Java



- Running a Go server has less overhead
- Less configuration (xml files)
- Tradeoff (you have to do more yourself)
  - Risk reinventing the wheel

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Choosing Go

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Choosing Go

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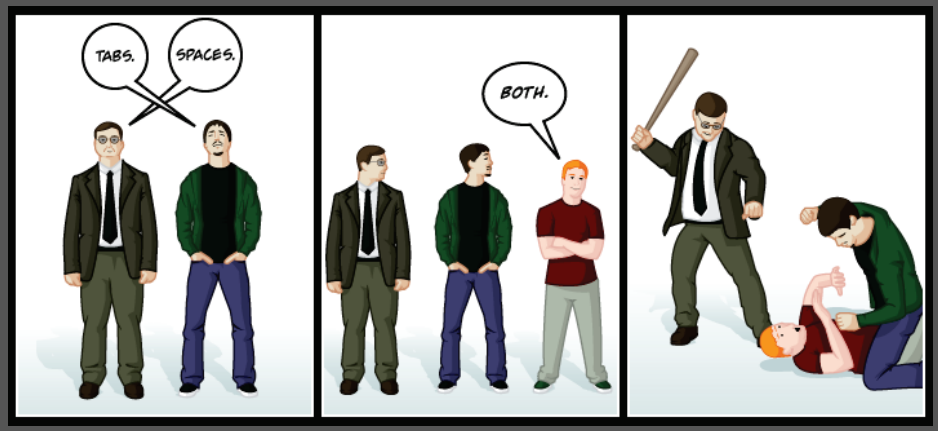
go fmt – no more code standards



http://www.emacswiki.org/emacs/TabsSpacesBoth

go fmt your code:

- Easier to **write**: never worry about minor formatting concerns while hacking away
- Easier to **read**: when all code looks the same you need not mentally convert others' formatting style into something you can understand
- Easier to **maintain**: mechanical changes to the source don't cause unrelated changes to the file's formatting; diffs show only the real changes
- **Uncontroversial**: never have a debate about spacing or brace position ever again!

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Summary

We use Go because:

- It's fast
- It's simple
  - Easy to learn
  - There aren't wildly different styles – no need to be clever
  - Readable
- It's predictable
  - Static typing gives confidence
- Our developers voted for it
  - Top contenders: Go, Scala, Java

Why not Go?

Random Internet Opinions

"Go has the potential to become the next C, that is, to hold the computing world back for 4 (or more?) decades to come. I wish it never had cone into existence."
- fishface60

"Seriously? Why don't we just go back to writing programs by using punch cards? I understand the need to reduce moving parts, but deliberately omitting a very useful abstraction mechanism is just insane."
- torquay

Nobody's perfect…

- Lacks features that are common in many modern languages
- Strict types can be a burden
- Precise memory management is not easy
- New Language → new libraries
- Simple spec → more code (less clever)

Go Crash Course

- Packages
- Variables
- Functions
- Flow Control
- Important Types

For a great intro visit: http://tour.golang.org

Packages

- Packages are modules of code
  - Allows you to split code across multiple files and folders
- Packages are **imported** based on the path
  - The last part of the path is typically the package name
- The default package is named main
  - Starting point of your Go application is in the main package

```
package main

import (
        "fmt"
        "html"
)

func main() {
        var data string = "<h1> hi </h1>"
        fmt.Println(html.EscapeString(data))
}
```

Variables

Common types:
Bool, int, uint, byte, float, string
https://golang.org/ref/spec#Types

- Can be declared at the function or package level
- := is a great shortcut inside functions
- Case matters for package level variables
  - First letter upper case: Public
  - First letter lower case: Protected
- Variables are typed
  - Can't assign to a string then assign to a number

```
package main

import (
        "fmt"
)

var (
        FirstName string // Accessible everywhere
        lastName  string // only accessible in the package
)

func main() {
        var age int // only accessible in this function
        FirstName = "John"
        lastName = "Hilliard"
        age = 28

        city := "Cambridge" // Declare and initalize automatically
        fmt.Printf("%s %s is %d years old and lives in %s.\n",
                FirstName, lastName, age, city)
}
```

Functions

- Exported names work like variables
- Functions take zero or more arguments
- Functions can return zero or more results

```
package main

import "fmt"

func square(x int) int {
        return x * x
}

func main() {
        squaredNumber := square(42)
        fmt.Println(squaredNumber)
}
```

Flow Control

- `if`, `switch`, and `for`
  - No parenthesis
  - No semicolons
- No do, or `while`
- `range` is a special function for iterating

```
package main

import "fmt"

func main() {
        numbers := []int{1, 2, 3, 4, 5}
        for index, value := range numbers {
                if index <= 1 {
                        fmt.Printf("Beginning Number: %d\n", value)
                } else if index <= 3 {
                        fmt.Printf("Middle Number: %d\n", value)
                } else {
                        fmt.Printf("End Number: %d\n", value)
                }
        }
}
```

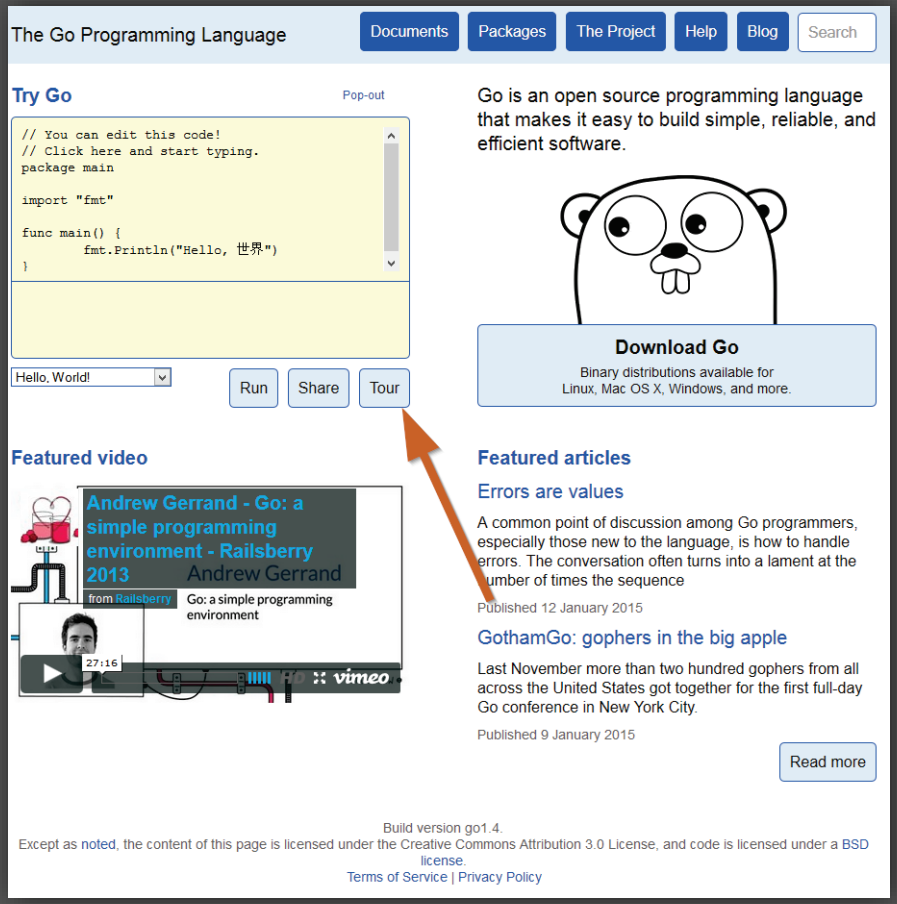
Important Types

- There are a few other important types
  - `Slices` – growable arrays
  - `Maps` – like a dictionary or JS object
  - `Structs` – more rigid data type
- The `make` function is used to allocate `maps` and `slices`
- The `new` function is used to allocate a new `struct`

```go
package main

import "fmt"

type (
        Person struct {
                Name string
                Age  int
        }
)

func main() {
        numbers := []int{1, 2, 3, 4, 5}
        numbers = append(numbers, 10)
        fmt.Println(numbers)

        // Create a map
        var numberMap map[int]string
        // Allocation with make
        numberMap = make(map[int]string)
        numberMap[1] = "one"
        numberMap[2] = "two"
        numberMap[3] = "three"
        fmt.Println(numberMap)

        // Declare a person
        var john *Person
        // Allocate with new
        john = new(Person)
        john.Name = "John Hilliard"
        john.Age = 28
        fmt.Println(john)
}
```

Learn more

- There is a lot more to learn
  - Pointers
  - Concurrency
  - Interfaces
  - Methods
  - Embedded types
  - Higher order
- The standard library



Example Website

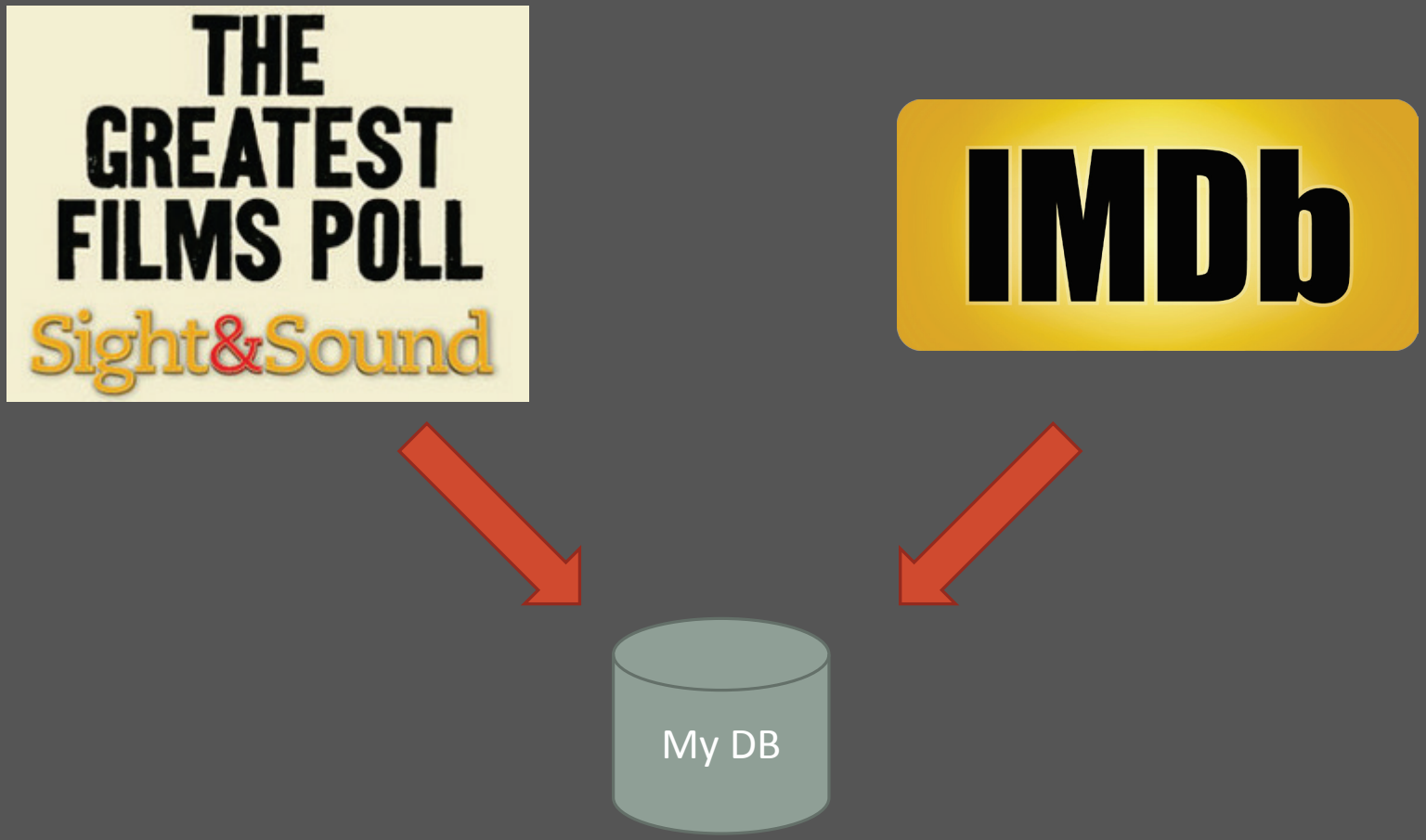
End to end Example:

- I'll walk through my process
- Libraries that I used

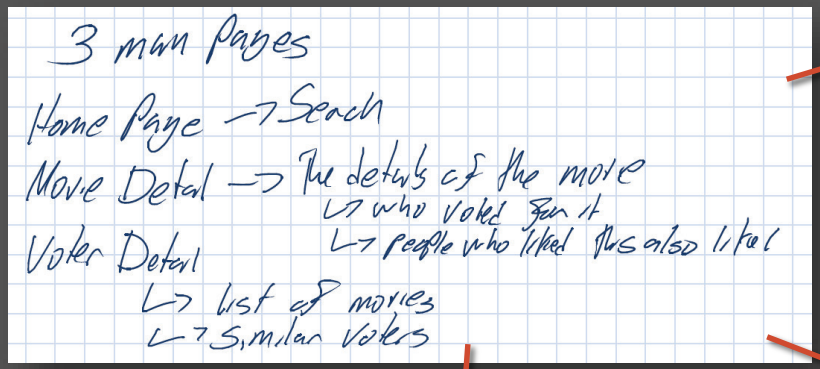
- Product goals
  - Find movies to watch
  - Ability to search
  - Link two different data sets

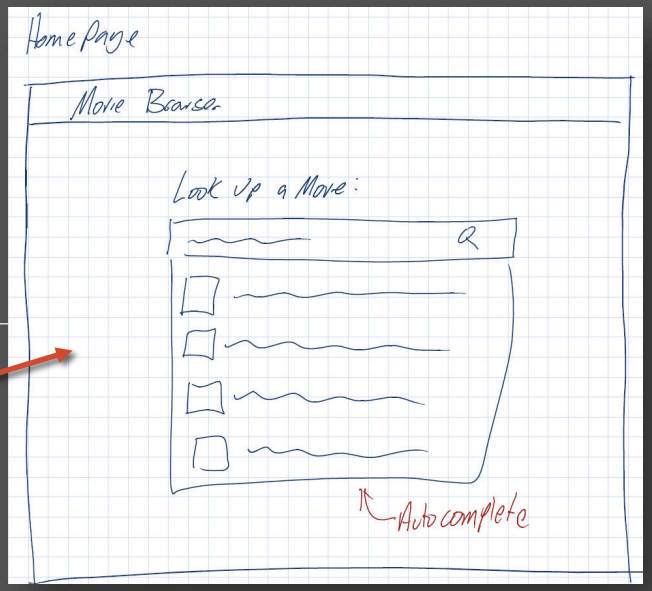
Build Data

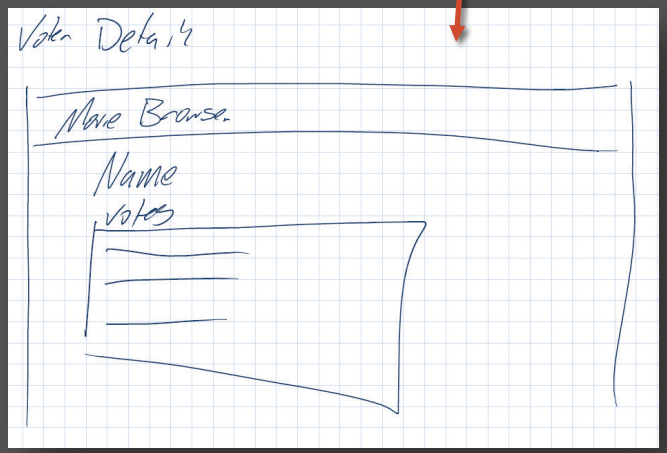
- Spider the BFI site
- Use the IMDb API to pull data
- Insert it all into SQL Db

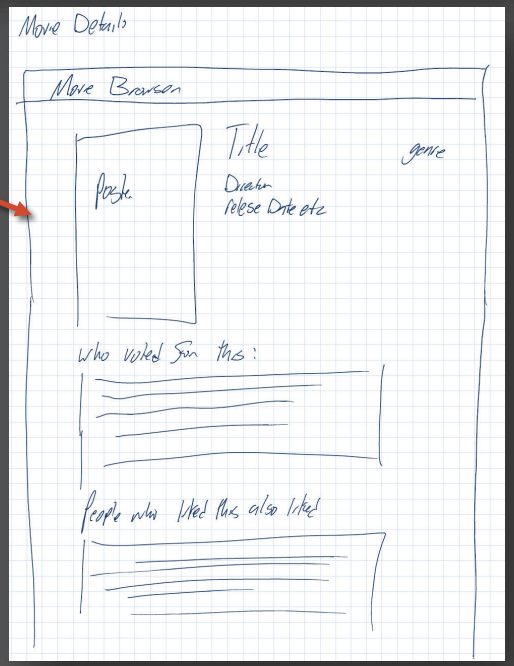


Design


3 main pages
Home Page -> Search
Movie Detail -> The details of the movie
-> who voted for it
-> people who liked this also liked
Voter Detail
-> list of movies
-> Similar voters


Home Page
Movie Browser
Look up a Movie:
Autocomplete


Voter Details
Movie Browser
Name
votes


Movie Details
Movie Browser
Title
genre
Poster
Director
Release Date etc
Who voted for this:
People who liked this also liked

Code

Three Important Libraries

- net/http
  - HTTP server
  - HTTP client
- database/sql
  - Generic interface for various SQL implementations
- html/template
  - Simple template library

net/http

Server

```
package main

import (
        "./handlers"
        "log"
        "net/http"
)

func main() {

        http.HandleFunc("/", handlers.Home)
        http.HandleFunc("/movie/", handlers.Movie)
        http.HandleFunc("/movie/list.json", handlers.MovieJson)
        http.HandleFunc("/voter/", handlers.Voter)

        http.Handle("/js/", http.FileServer(http.Dir("./static")))
        http.Handle("/css/", http.FileServer(http.Dir("./static")))
        http.Handle("/img/", http.FileServer(http.Dir("./static")))
        http.Handle("/favicon.ico", http.FileServer(http.Dir("./static/img")))

        log.Println("Starting Server")
        log.Fatal(http.ListenAndServe(":8888", nil))
}
```

Client

```
resp, err := http.Get(movie.PosterUrl)
if err != nil {
        log.Printf("There was an issue fetching the image: %q", err)
        http.NotFound(rw, rq)
        return
}

defer resp.Body.Close()
imageData, imgErr := ioutil.ReadAll(resp.Body)
```

database/sql

1. Create a connection

```
db, err := sql.Open("sqlite3", "./movies.db")
log.Printf("Opening connection to movies database")

if err != nil {
        log.Fatal("Could not open connection to DB: %q", err)
}
```

2. Pull the data

```
func GetMoviesByVoter(voterId string) []*objects.Movie {
        e := data.GetQueryEngine()
        rows, err := e.Query(`SELECT *
            FROM movie
            WHERE ssid IN (
              SELECT vote.movie_id
              FROM VOTE
              WHERE vote.voter_id = ?)
            ORDER BY movie.raw_title;`, voterId)
        movies := make([]*objects.Movie, 0)

        if err != nil {
                log.Printf("There was an issue fetching the movies: %q", err)
                return movies
        }
        defer rows.Close()

        for rows.Next() {
                movies = append(movies, scanMovie(rows))
        }
        return movies
}
```

html/template

```
<div class="row">
    <div class="col-md-4">
        <img src="/movie/{{ .movie.Ssid }}/image">
    </div>
    <div class="col-md-8">
        <h1> {{ .movie.Title }}</h1>

        <h3> Movie Details </h3>
        <table class="table table-striped">
            <tbody>
                <tr>
                    <td> Director </td>
                    <td> {{.movie.Director}}</td>
                </tr>
                <tr>
                    <td> Language </td>
                    <td> {{.movie.Language}}</td>
                </tr>
```

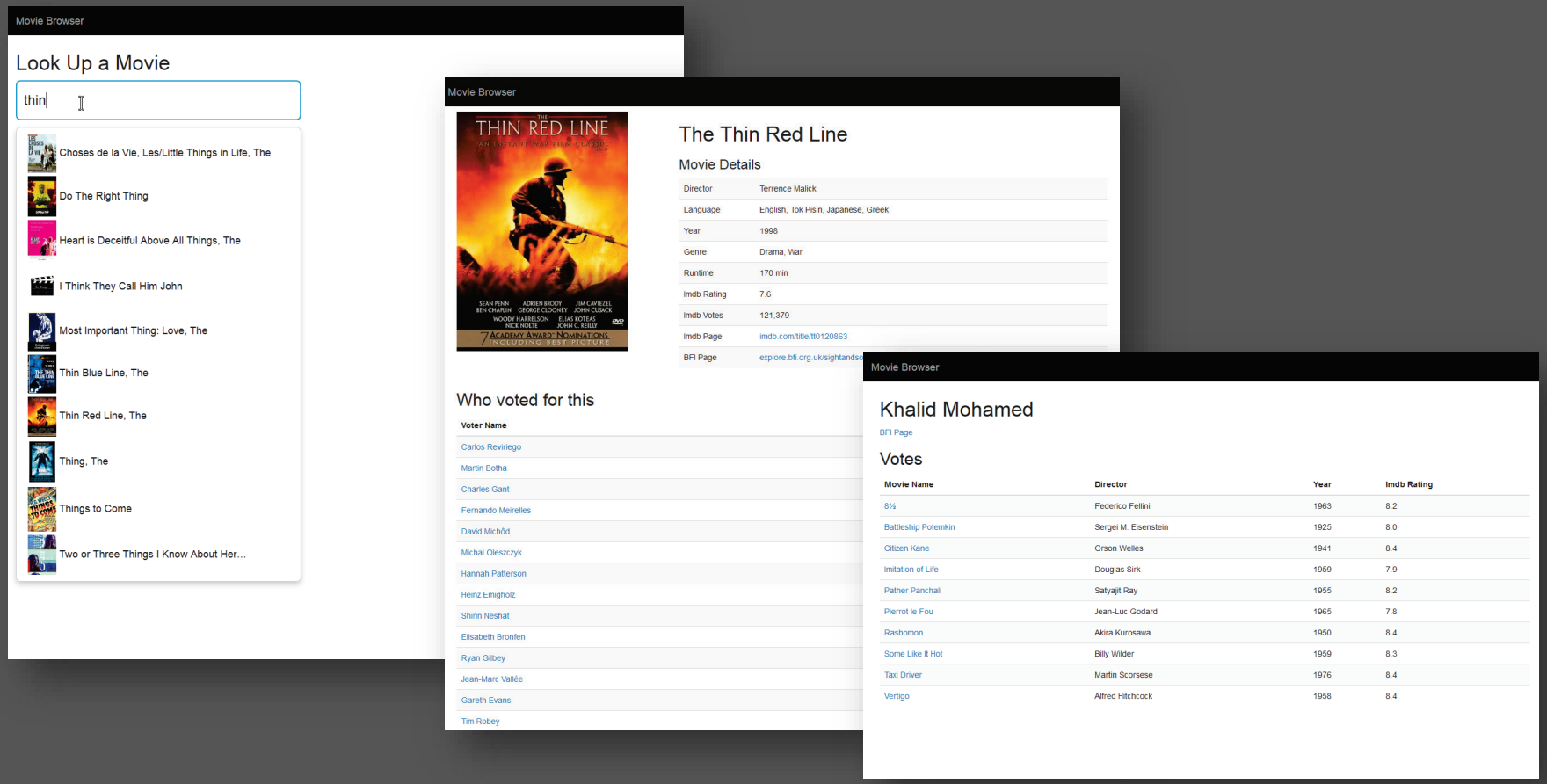
Define a template

```
baseLayout.Execute(rw, body)
```

Execute

https://github.com/praetoriansentry/moviebrowser

Putting it all together



Thanks!

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