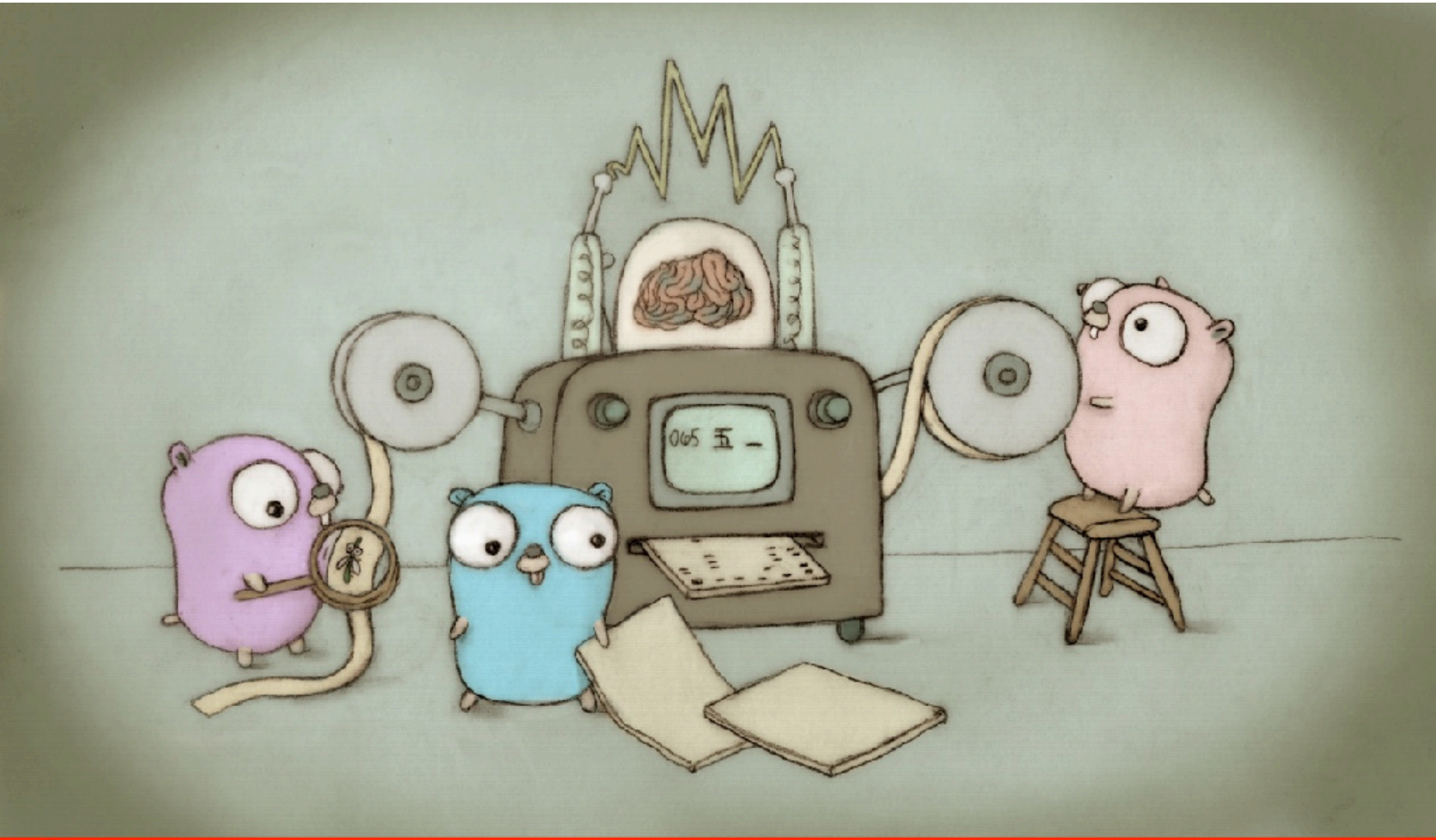
TDD with Golang



https://www.facebook.com/somkiatspns

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About

Agenda

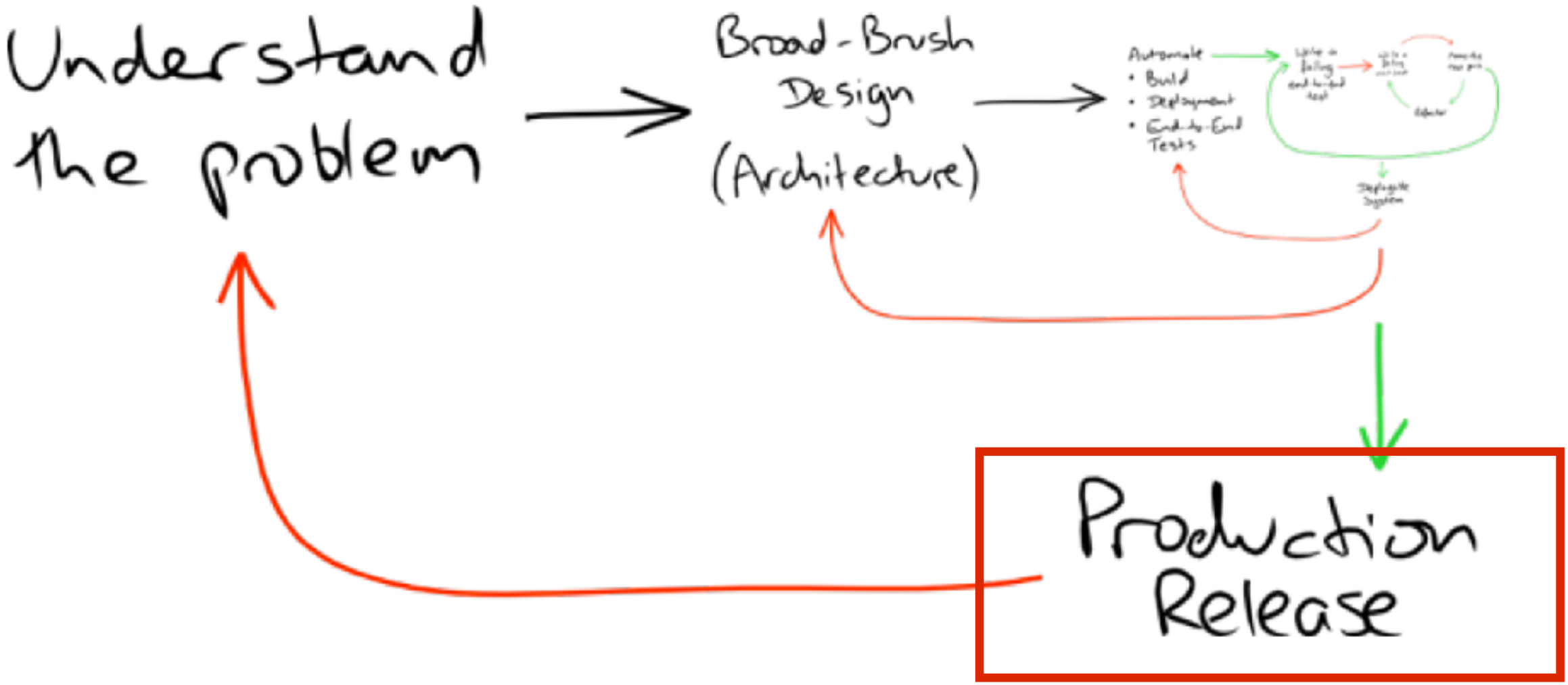
Basic of TDD
Basic of Go
Using interface
Building REST APIs
Testing REST APIs
Working with MongoDB

TestDrivenDevelopment

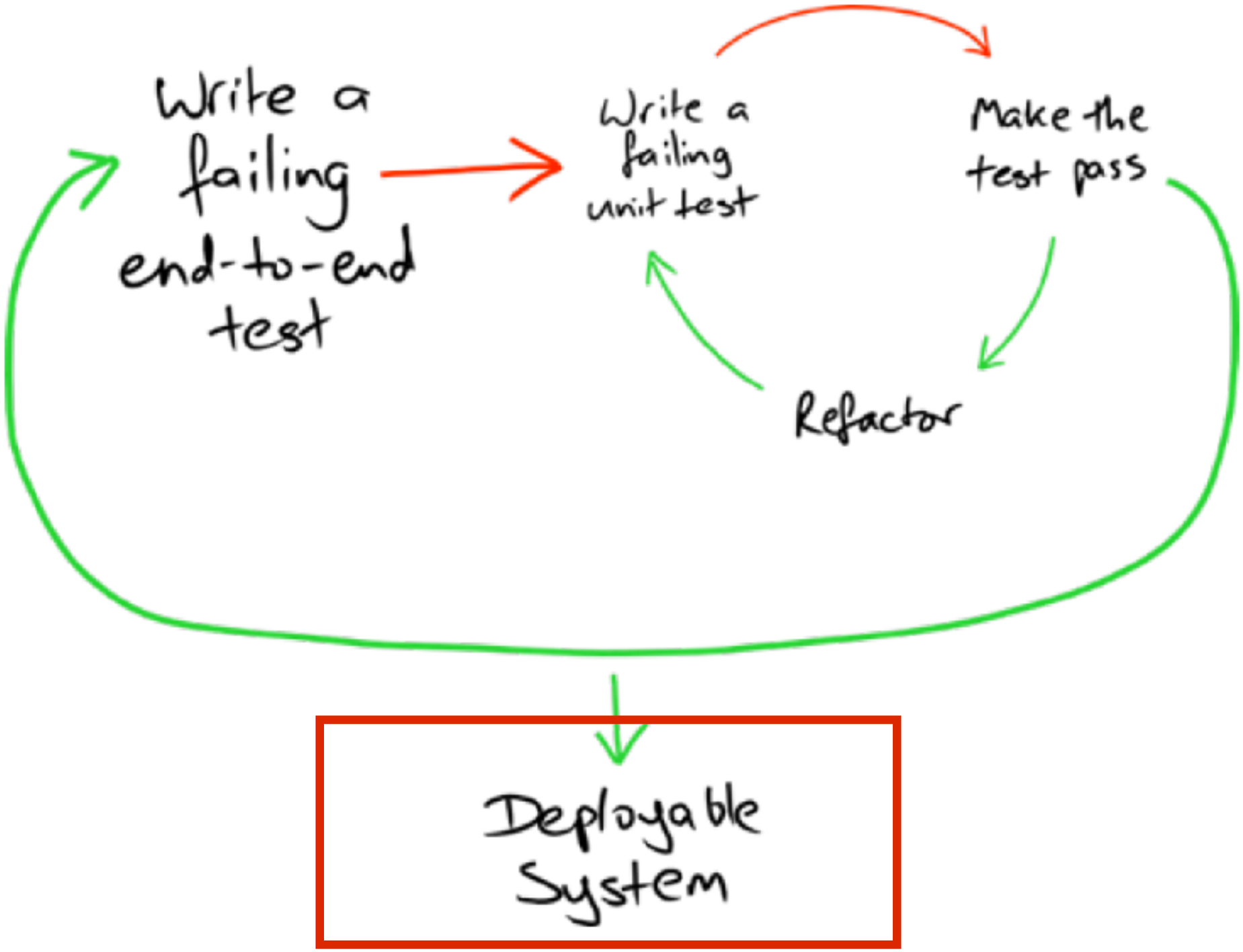
TestDrivenDevelopment

ทำ ดี ดี

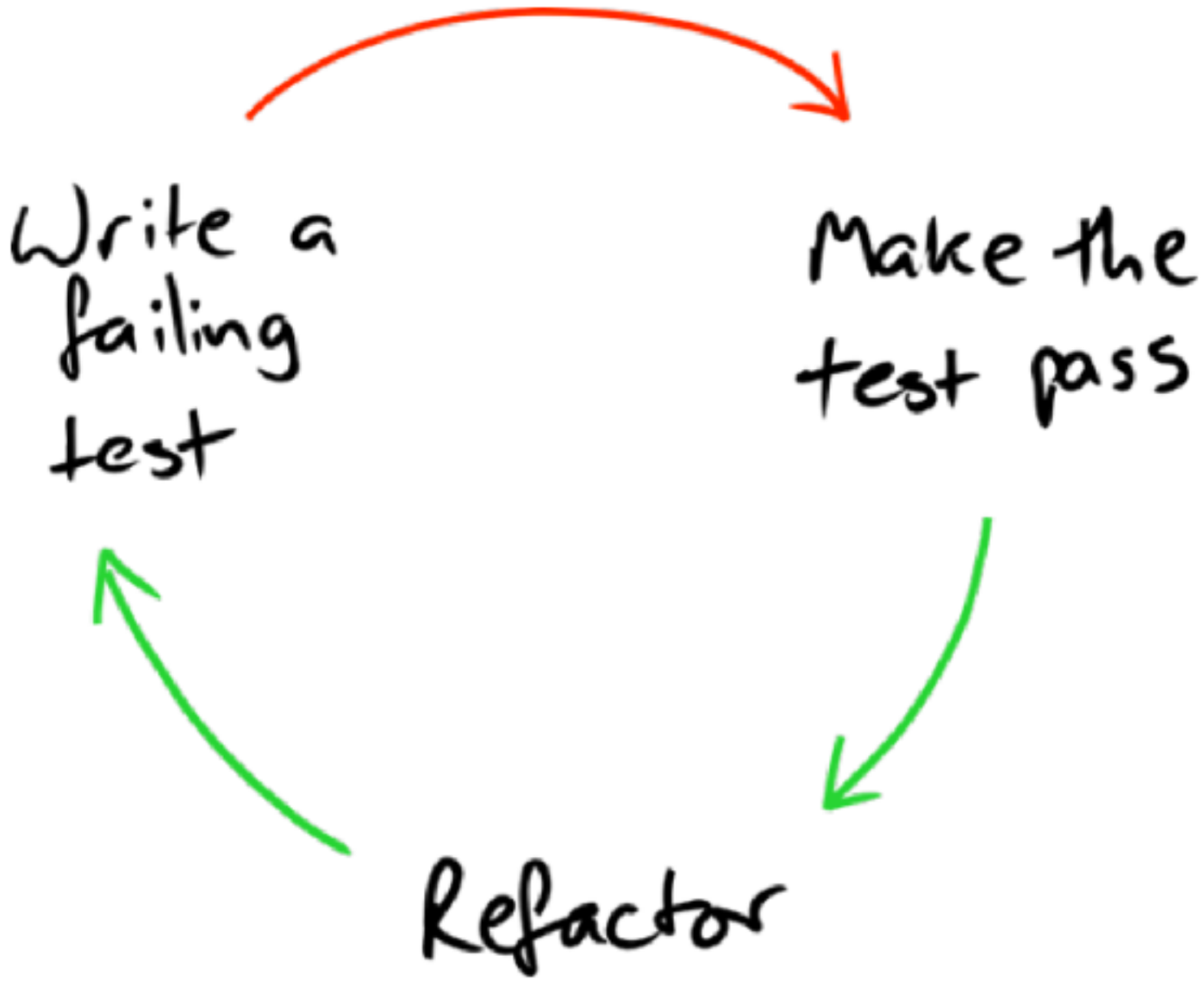
LARGER FEEDBACK LOOP



ACCEPTANCE TEST DRIVEN DEVELOPMENT

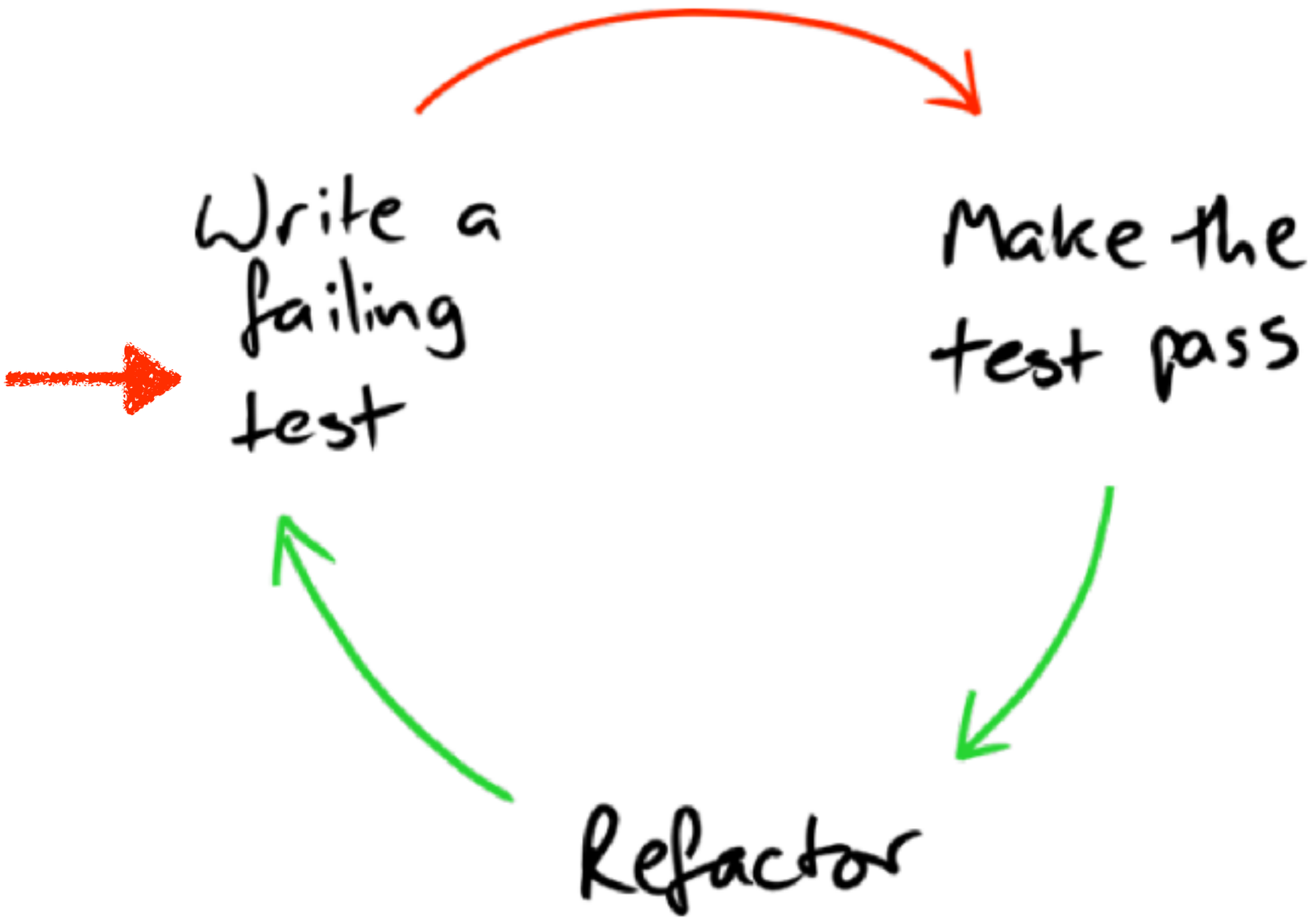


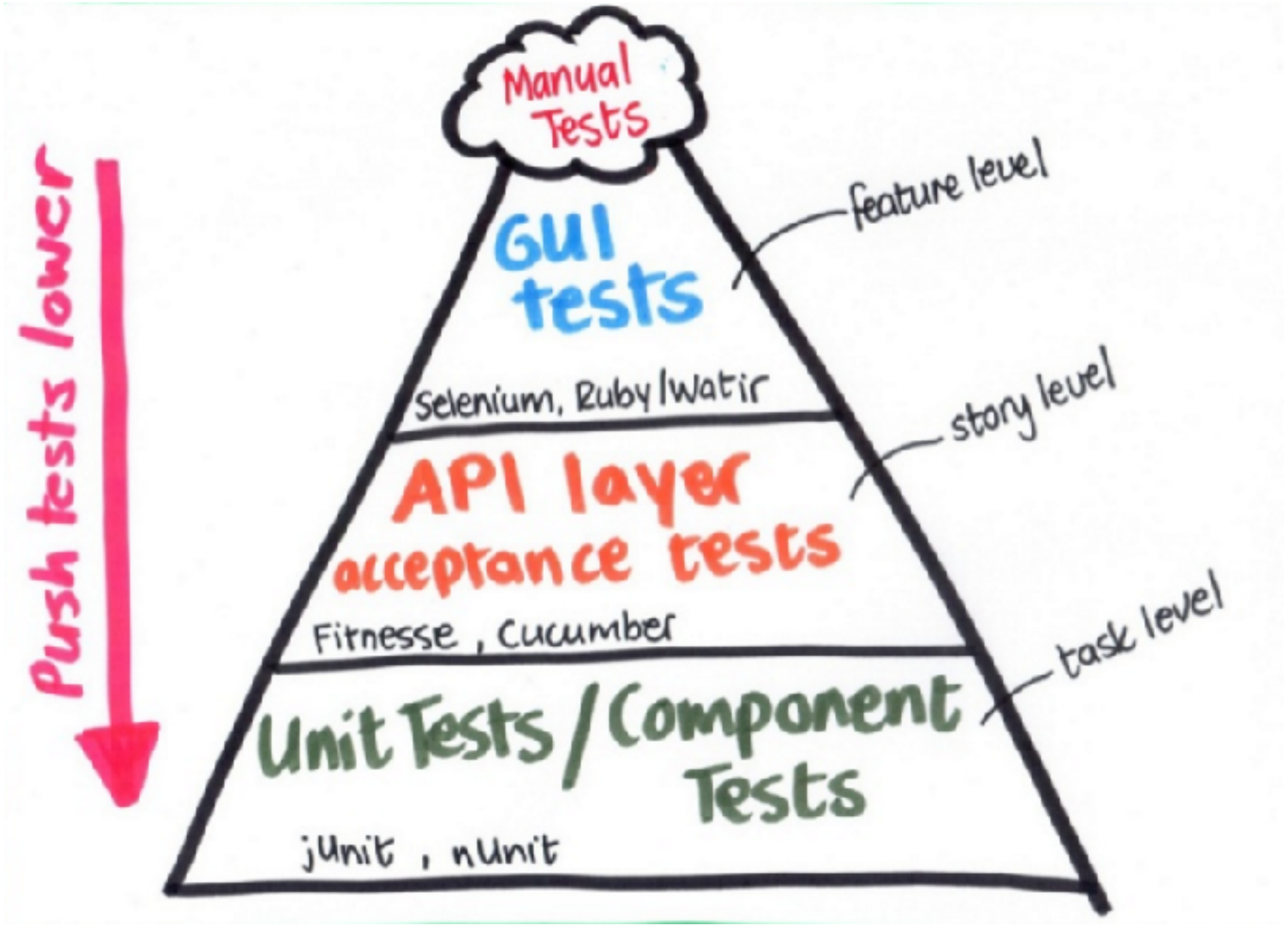
TEST DRIVEN DEVELOPMENT



TEST DRIVEN DEVELOPMENT

Start with THINK





http://www.slideshare.net/growingagile/expoqa-tutorial-agile-testing-techniques-for-the-whole-team

TDD Rules

Write **a failing test** before write any code

Remove duplication

Disadvantage of TDD

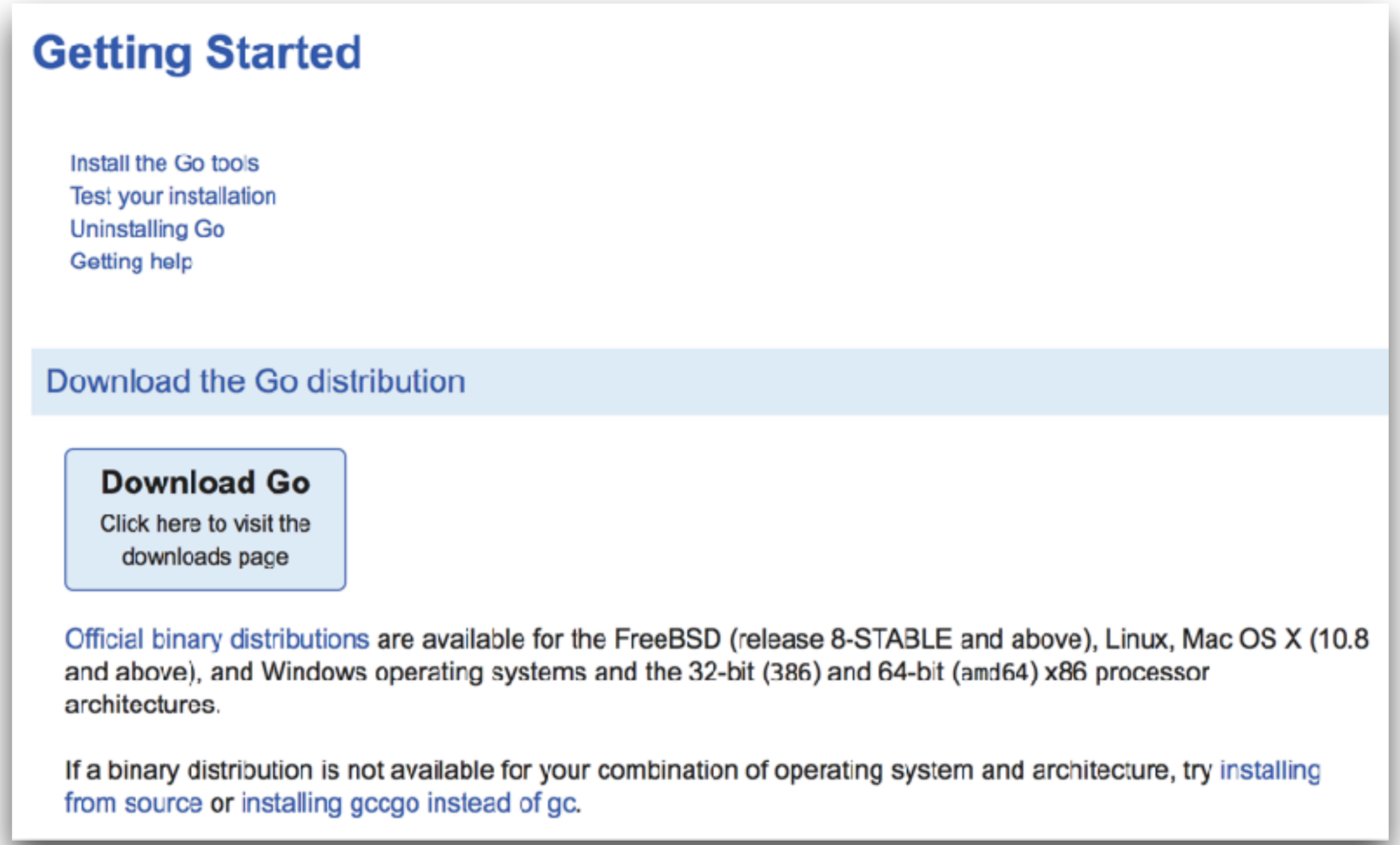
Increase development time
Increase complexity
Design changes

Basic of Go

Installation

Install Go
Install Git
Install Text editor/IDE

Install Go

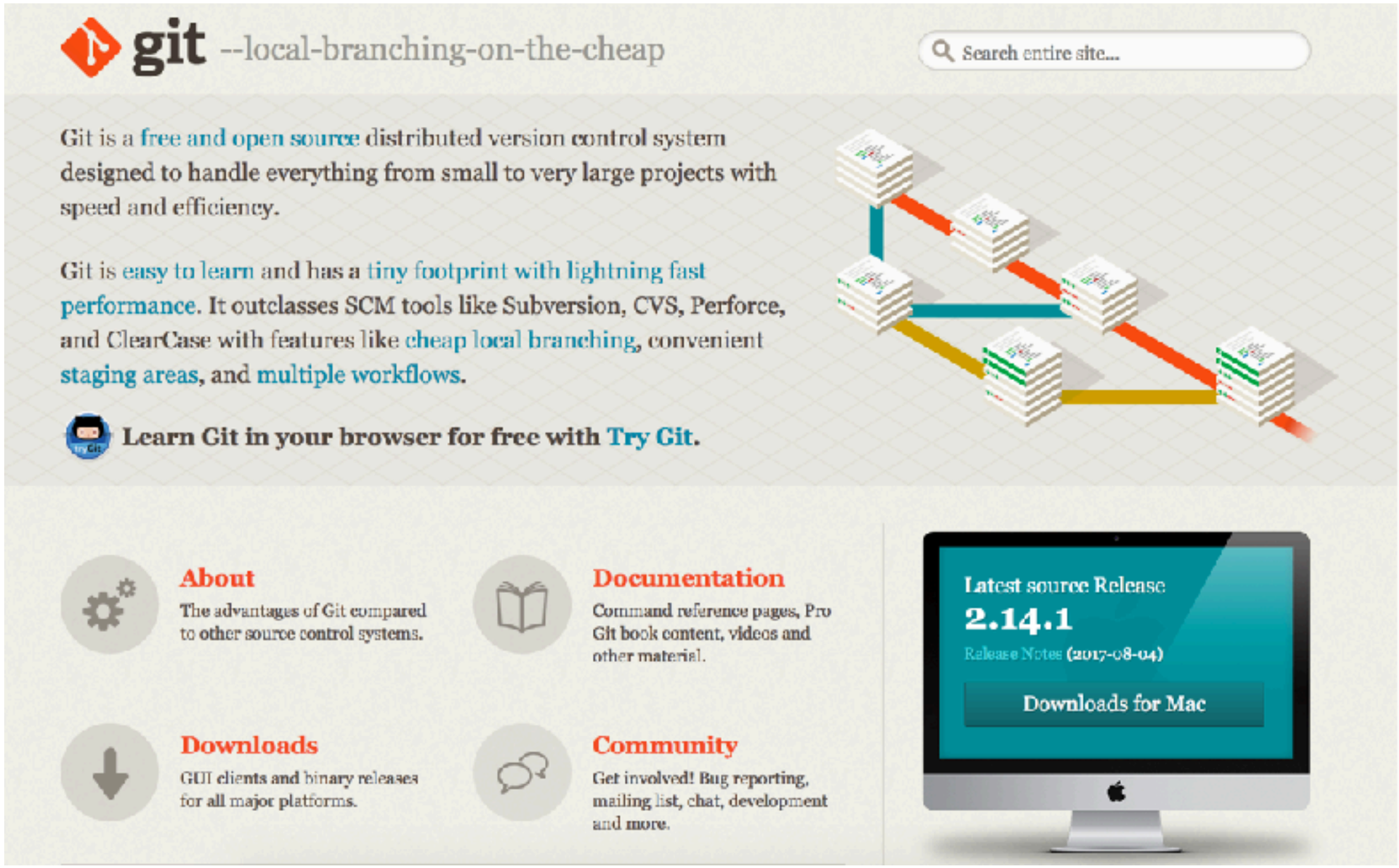


https://golang.org/doc/install

Hello go !!

$go version

Install Git



https://git-scm.com/

Install Text editor/IDE

Sublime
Atom
Visual Studio Code
Gogland

Why another language ?

Software is **slow**

Software is **hard** to write

Software is does not **scale** well

Summary of Go

Modern, **fast**
Powerful of standard library
Concurrency build-in
Use **interface** as the building block of code

Go is friendly

Single binary installation
No dependencies
No exceptions
Very small core language
Easy to remember

Go's inspiration

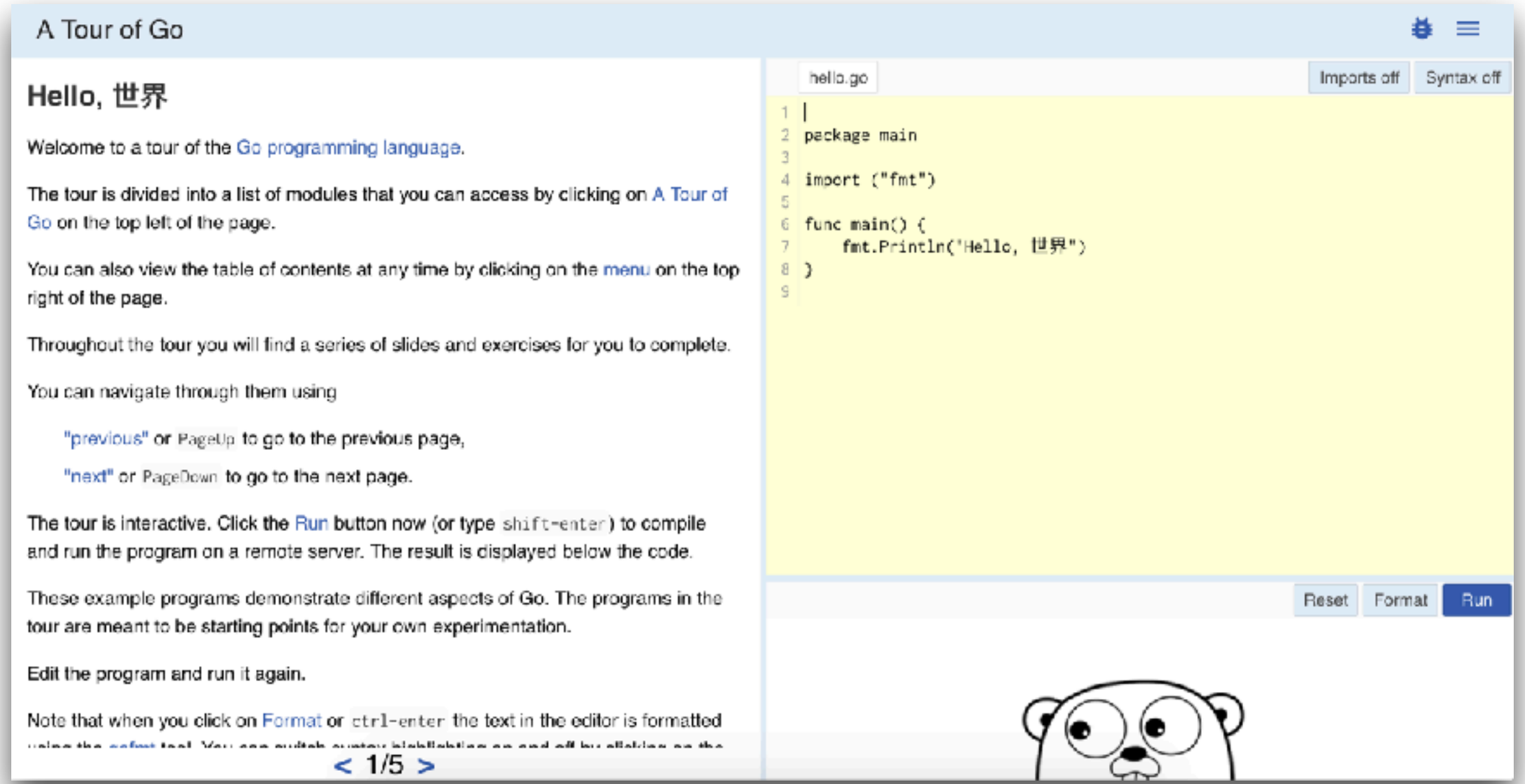
C => statement and expression syntax
Pascal => declaration syntax
Modula/Oberon 2 => package
CSP/Occam/Limbo => concurrency
BCPL => the semicolon rule
Smalltalk => method
Newsqueak => <-, :=
APL => iota

Go's inspiration

Lessons **good** and **bad** from other
C++, C#, Java, JavaScript
LISP, Python, Scala

Resources for beginner

Go tour



https://tour.golang.org/welcome/1

Effective go

Effective Go

https://golang.org/doc/effective_go.html

Learn go

Learn

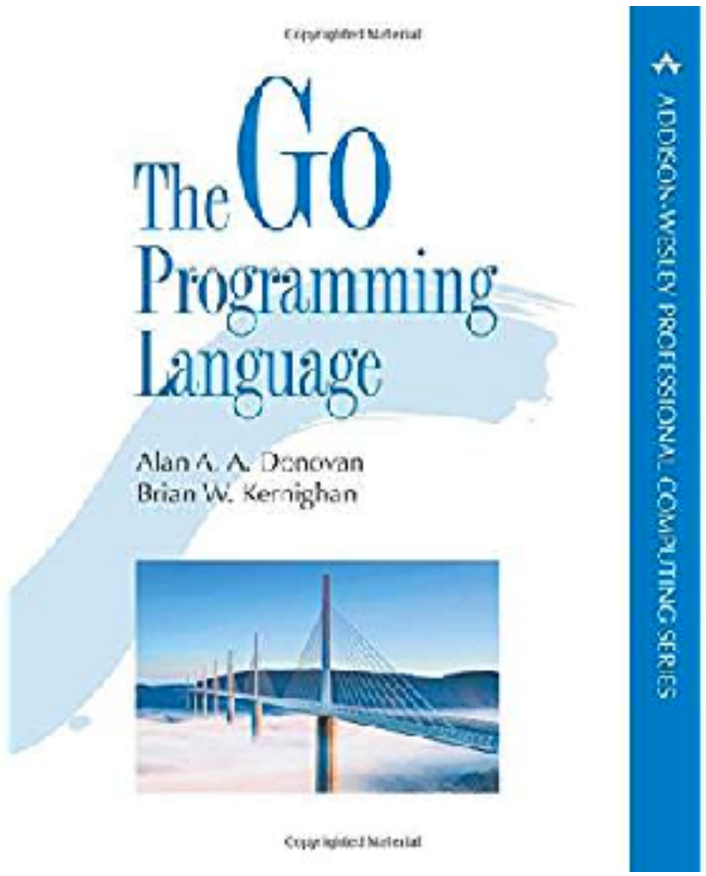
Saurabh Hooda edited this page on Jul 1 · 33 revisions

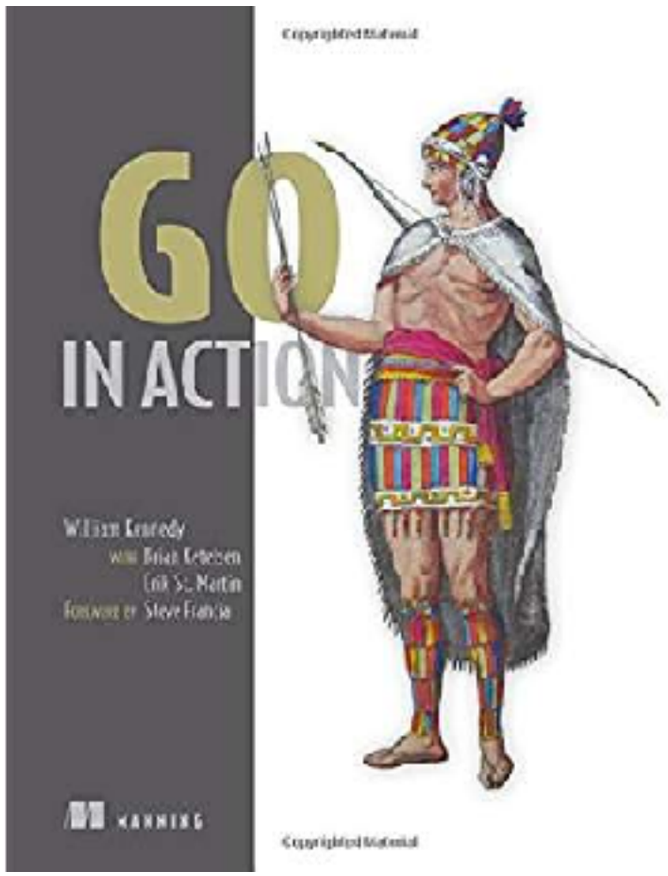
In addition to the resources available at golang.org there are a range of community-driven initiatives:

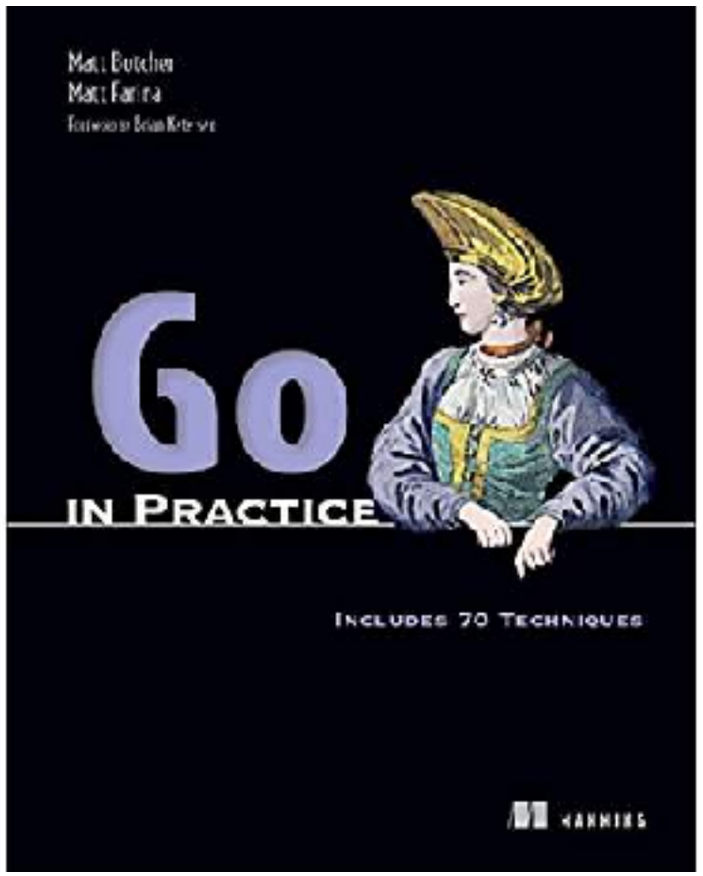
- The Little Go Book
- Exercism.io - Go - Online code exercises for Go for practice and mentorship.
- Learn Go in an Hour - Video *2015-02-15*
- Learning to Program in Go, a multi-part video training class.
- Pluralsight Classes for Go - A growing collection of (paid) online classes.
- Ardan Labs Training - Commercial, live instruction for Go programming.
- O'Reilly Go Fundamentals - Video learning path for Go programming.
- Go By Example provides a series of annotated code snippets.
- Learn Go in Y minutes is a top-to-bottom walk-through of the language.
- Workshop-Go - Startup Slam Go Workshop - examples and slides.
- Go Fragments - A collection of annotated Go code examples.
- 50 Shades of Go: Traps, Gotchas, Common Mistakes for New Golang Devs

https://github.com/golang/go/wiki/Learn

Go books







Let’s coding

Hello Go

```go
package main

import "fmt"

func main() {
  message := "Hello world"
  fmt.Printf("%s", message)
}
```

Running program

$go run hello.go

$go build hello.go

$hello

Go document

$**godoc** fmt Printf

```
use 'godoc cmd/fmt' for documentation on the fmt command

func Printf(format string, a ...interface{}) (n int, err error)
    Printf formats according to a format specifier and writes to standard
    output. It returns the number of bytes written and any write error
    encountered.
```

Types

Number (int, float, complex)

String

Boolean (true, false)

Types

```
func main() {
   i := 1
   f := 1.0
   s := "Hello"
   b := true
   fmt.Printf("Type %T has value %d\n", i, i)
   fmt.Printf("Type %T has value %.2f\n", f, f)
   fmt.Printf("Type %T has value %s\n", s, s)
   fmt.Printf("Type %T has value %v\n", b, b)
}
```

Variables

Number (int, float, complex)

String

Boolean (true, false)

Declaration variable

Using **var** keyword

```
func main() {
   var a string = "first"
   var b string
   b = "second"

   var c = "third"

   d := "forth"
}
```

Constant

Using **const** keyword

```
package main

import "fmt"

func main() {
   const name string = "Somkiat"
   fmt.Println(name)
}
```

Multiple variables

```
func main() {
  var (
    a = 1
    b = 2
    c = 3
  )

  fmt.Println(a, b, c)
}
```

Multiple variables

```
func main() {
  var a, b, c = 1, 2, 3

  fmt.Println(a, b, c)
}
```

Multiple variables

```
func main() {
  a, b, c := 1, 2, 3

  fmt.Println(a, b, c)
}
```

Control flow statement

For

If

Switch

For

```
func main() {

   for i := 0; i<10; i++ {
      fmt.Println(i)
   }
```

```
   var i = 0
   for i < 10 {
      fmt.Println(i)
      i++
   }
}
```

Switch

```
func main() {
   i := 1

   switch i {
   case 0: fmt.Println("case 0")
   case 1: fmt.Println("case 1")
   case 2: fmt.Println("case 2")
   case 3: fmt.Println("case 2")
   default: fmt.Println("Unknow number")
   }
}
```

Data structure

Array

Slice

Map

Array

```
func main() {
  var data [10]string
  for i := 0; i<len(data); i++ {
    data[i] = strconv.Itoa(i+1)
  }

  for i, value := range data {
    fmt.Println(i, value)
  }

}
```

Array

```
func main() {
  var data [10]string
  for i := 0; i<len(data); i++ {
    data[i] = strconv.Itoa(i+1)
  }

  for _, value := range data {
    fmt.Println(value)
  }

}
```

Array trick !!

```
func main() {

   x := [4]int {
      1,
      2,
      3,
      //4,
      5,
   }

   fmt.Println(len(x))

}
```

Slice

Segment of an array

Look like an array BUT

Length of slice can be change !!

Create Slice

Using **make** function

```
func main() {
   var x = []int  // len = 0
   x := make([]int, 5)
   fmt.Println(len(x), cap(x))

   y := make([]int, 5, 10)
   fmt.Println(len(y), cap(y))
}
```

Create Slice

```
x := make([]int, 5, 10)
```

Create Slice from array

```go
func main() {
  arr := [5]int {1, 2, 3, 4, 5}

  fmt.Printf("%v\n", arr[0:5])
  fmt.Printf("%v\n", arr[0:len(arr)])
  fmt.Printf("%v\n", arr[0:])
  fmt.Printf("%v\n", arr[:5])
  fmt.Printf("%v\n", arr[:])

  fmt.Printf("%v\n", arr[1:5])
  fmt.Printf("%v\n", arr[1:4])
}
```

Slice functions

2 Build-in function => **append**, copy

```
func main() {
  slice1 := []int {1, 2, 3}
  slice2 := append(slice1, 4, 5)

  fmt.Printf("%v\n", slice1)
  fmt.Printf("%v\n", slice2)
}
```

Slice functions

2 Build-in function => append, **copy**

```
func main() {
   slice1 := []int{1, 2, 3}
   slice2 := make([]int, 2)

   copy(slice2, slice1)

   fmt.Println(slice1, slice2)
}
```

Map

An **unordered** collection of **key-value** pair

key	value
firstname	Somkiat
lastname	Puisungnoen
gender	Male

Create Map

Using **map** and **make**

```
func main() {
   x := make(map[string]string)
   x["firstname"] = "Somkiat"
   x["lastname"] = "Puisungoen"
   x["gender"] = "Male"

   fmt.Println(x["firstname"])
   fmt.Println(x["lastname"])
   fmt.Println(x["gender"])
}
```

Iterate data in map

```
func main() {
   x := make(map[string]string)
   x["firstname"] = "Somkiat"
   x["lastname"] = "Puisungoen"
   x["gender"] = "Male"

   for key, value := range x {
      fmt.Println(key, value)
   }
}
```

Check data in map

```
func main() {
   x := make(map[string]string)
   x["firstname"] = "Somkiat"
   x["lastname"] = "Puisungoen"
   x["gender"] = "Male"

   if x["firstname"] == "" {
      fmt.Println(x["firstname"])
   }

   if data, ok := x["firstname"]; ok {
      fmt.Println(data, ok)
   }
}
```

Delete data in map

delete(map, key)

Function

Declaration Function

```
func average(data []int) float64 {
  panic(“Not implement”)
}

func main() {
  data := []int{10, 2, 3, 4, 5}
  fmt.Println(average(data))
}
```

Return

```
func average(data []int) float64 {
  total := 0.0
  for _, v := range data {
    total += float64(v)
  }
  return total/float64(len(data))
}

func main() {
  data := []int{10, 2, 3, 4, 5}
  fmt.Println(average(data))
}
```

Name of return type

```
func average(data []int) (result float64) {
    total := 0.0
    for _, v := range data {
        total += float64(v)
    }
    result = total/float64(len(data))
    return
}
```

Return multiple values

```
func call() (int, int) {
  return 1, 2
}

func main() {
  x, y := call()
  fmt.Print(x, y)
}
```

Variadic function

```go
func add(ops ...int) int {
    total := 0
    for _, v := range ops {
        total += v
    }
    return total
}

func main() {
    fmt.Println(add())
    fmt.Println(add(1))
    fmt.Println(add(1, 2))
    fmt.Println(add(1, 2, 3))
}
```

Defer, Panic, Recover

Defer

Schedules a function call
to be run after the function completes

Defer

```
func first() {
  fmt.Println("Call first")
}

func second() {
  fmt.Println("Call second")
}

func main() {
  defer second()
  first()
}
```

Defer

Often used when resources need to be free

```
func main() {
   f, err := os.Open(“some_file.txt”)
   defer f.Close()

   if err != nil {
      fmt.Println("Start...")
   }
}
```

Advantage of Defer

Easy to understand

Keep **Close** near **Open**

Deferred functions are run even if error

Panic and Recover

Panic to cause a runtime error

Handle a runtime panic with **recover**

Panic and Recover

```
func main() {
  panic("PANIC")
  str := recover()
  fmt.Println(str)
}
```

Panic, Recover and Defer

```
func main() {
   defer func(){
      str := recover()
      fmt.Println(str)
   }()
   panic("PANIC")
}
```

More example

```
func f() {
  defer func(){
    str := recover()
    fmt.Println(str)
  }()
  x := []int{1, 2, 3}
  fmt.Println(x[10])
}

func main() {
  f()
  fmt.Println("TODO NEXT")
}
```

Testing with Go

Testing with go

Build-in testing framework
Using **testing** package
Command **go test**

https://golang.org/pkg/testing/

Hello Testing

```go
package main

import(
   "testing"
)
```

```go
func TestHello(t *testing.T) {
   expectedResult := "Hello my first testing"
   result := hello()
   if result != expectedResult {
      t.Fatalf("Expected %s but got %s", expectedResult, result)
   }
}
```

Hello Testing

```go
package main

func hello() string {
   return "Hello my first testing"
}
```

Running test

Run tests for specified package
It defaults to package in **current directory**

```
$go test
$go test -v
```

Running test

Run tests for all my project

$go test ./...

*testing.T ?

Used for error reporting

t.**Errorf**
t.**Fatalf**
t.**Logf**

*testing.T ?

Enable parallel testing

t.**Parallel**()

*testing.T ?

To control a test run

t.**Skip**()

Table driven test

Working with data driven testing

Operand 1	Operand 2	Expected result
1	2	3
5	10	15
10	-5	5

https://dave.cheney.net/2013/06/09/writing-table-driven-tests-in-go

Table driven test

```
func TestAdd(t *testing.T) {
  var dataTests = []struct{
    op1 int
    op2 int
    expectedResult int
  }{
    {1, 2, 3},
    {5, 10, 15},
    {10, -5, 5},
  }

}
```

Table driven test

```
func TestAdd(t *testing.T) {
  …

  for _, test := range dataTests{
    result := add(test.op1, test.op2)
    if result != test.expectedResult {
      t.Fatalf("Expected %d but got %d",
                test.expectedResult, result)
    }
  }
}
```

Test coverage

Go tool can report test coverage statistic

$go test -cover

Workshop

Struct

Data value which contains name fields

```
type Point struct {
  x float64
  y float64
}

type Point struct {
  x, y float64
}
```

Initial Struct

```
type Point struct {
  x, y float64
}

func main() {
  p1 := Point{x: 1.0, y: 2.0}
  p2 := Point{2.0, 4.0}

  fmt.Println(p1, p2)
}
```

Add function to struct

```
type Point struct {
  x, y float64
}
```

```
func (p *Point) someFunc() float64 {
  return math.Sqrt(p.x)
}
```

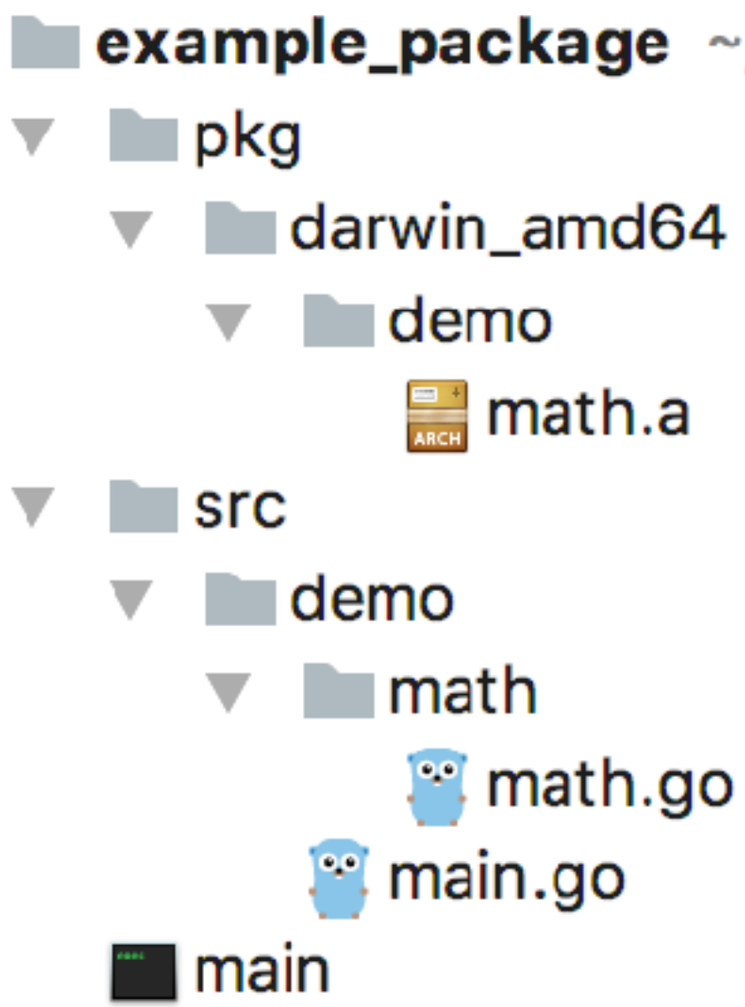
```
func main() {
  p := Point{x: 1.0, y: 2.0}
  fmt.Println(p.someFunc())
}
```

Package

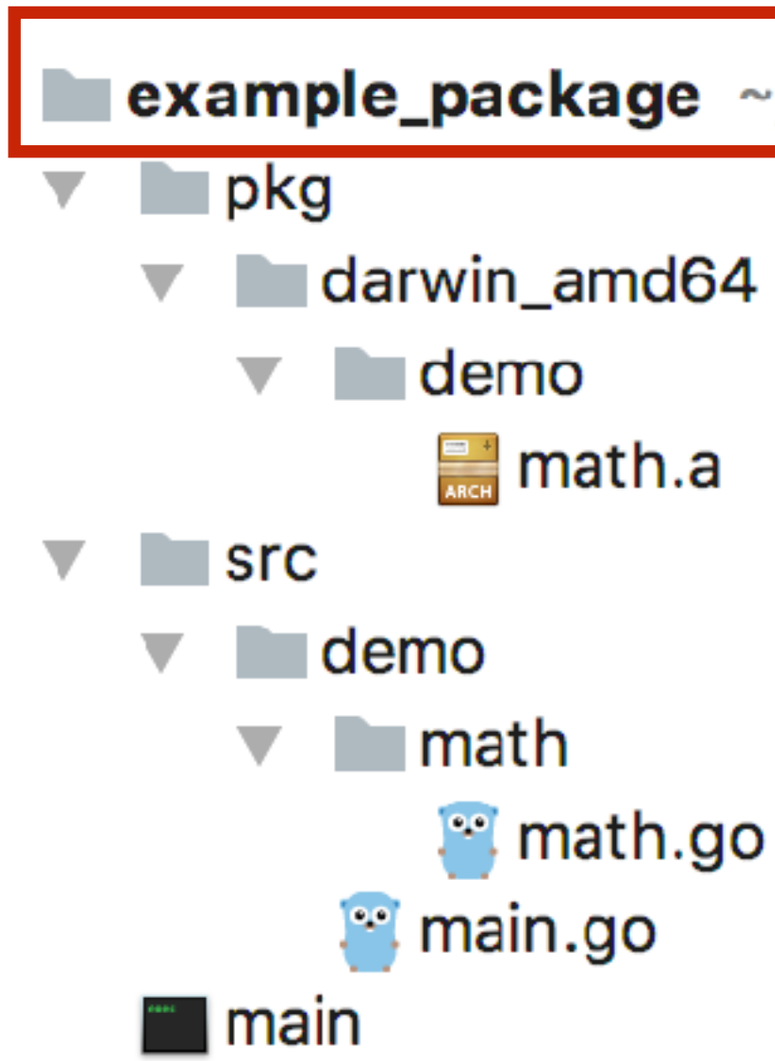
Package

Designed with **good** engineering practices
High quality software is **reuse**
Don’t Repeat Yourself (DRY)

Demo Package



Demo Package



Call GOPATH

Where is your GOPATH ?

$go env

Create my package

src/demo/main.go
src/demo/math/math.go

demo/math/Math.go

public function with **First capital letter**

```go
package math

func Average(datas []float64) float64 {
  total := float64(0)
  for _, v := range datas {
    total += v
  }
  return total / float64(len(datas))
}
```

demo/Main.go

```go
package main

import (
    "demo/math"
    "fmt"
)

func main() {
    datas := []float64{1, 2, 3 ,4 ,5}
    average := math.Average(datas)
    fmt.Println(average)
}
```

Install my package

$go install

Run my program

$go run main.go

Build my program

$go build main.go

Godoc my package

$godoc demo/math
$godoc --http=":6060"

Workshop

REST APIs with Go

Building REST APIs

HTTP + JSON

Go provide **net/http** package

https://golang.org/pkg/net/http/

REST

REpresentational **S**tate **T**ransfer

HTTP Verb	Description
GET	Get data
POST	Create data
PUT	Update data
DELETE	Delete data

TODO App

http://todomvc.com/

Design REST APIs

http://todomvc.com/

Design REST APIs

Resource	Path	HTTP Verb	Description

Design REST APIs

Resource	Path	HTTP Verb	Description
todo	/todo/	GET	List of TODO
todo	/todo/	POST	Create new TODO
todo	/todo/1	GET	Get detail of TODO by id
todo	/todo/1	PUT	Update TODO by id
todo	/todo/1	DELETE	Delete TODO by id

Hello API Server

```
package main

import (
   "net/http"
)

func response(rw http.ResponseWriter, r *http.Request) {
   rw.Write([]byte("Hello world."))
}

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

Run server

$go run <filename.go>

We need more router !!

Problem ?

```
func main() {

  http.HandleFunc("/todo", ListOfTODO)
  http.HandleFunc("/todo", CreateTOFO)
  http.HandleFunc("/todo/1", GetTODOByID)
  http.HandleFunc("/todo/1", UpdateTODOByID)
  http.HandleFunc("/todo/1", DeleteTODOByID)

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

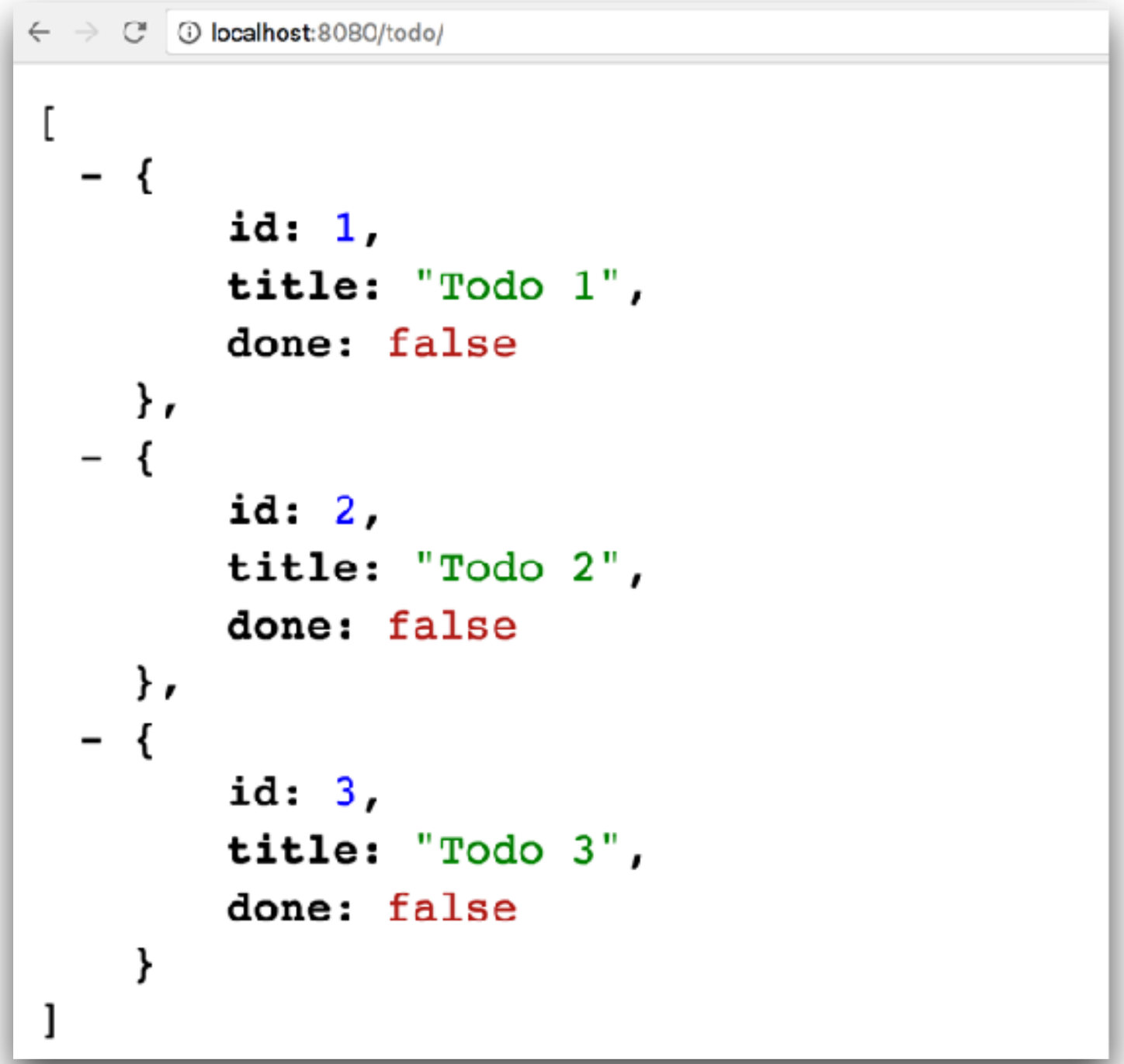
Solution

Custom default router of net/http package

```
regHandler.HandleFunc("/todo/$", "GET", ListOfTODO)
regHandler.HandleFunc("/todo$", "POST", CreateTOFO)
regHandler.HandleFunc("/todo/[0-9]$", "GET", GetTODOByID)
regHandler.HandleFunc("/todo/[0-9]$", "PUT", UpdateTODOByID)
regHandler.HandleFunc("/todo/[0-9]$", "DELETE", DeleteTODOByID)
```

Let’s workshop with REST

List of TODO


localhost:8080/todo/
[
- {
id: 1,
title: "Todo 1",
done: false
},
- {
id: 2,
title: "Todo 2",
done: false
},
- {
id: 3,
title: "Todo 3",
done: false
}
]

Create new TODO

POST http://localhost:8080/todo/ Params Send

Authorization Headers (1) Body Pre-request Script Tests

form-data x-www-form-urlencoded raw binary JSON (application/json)

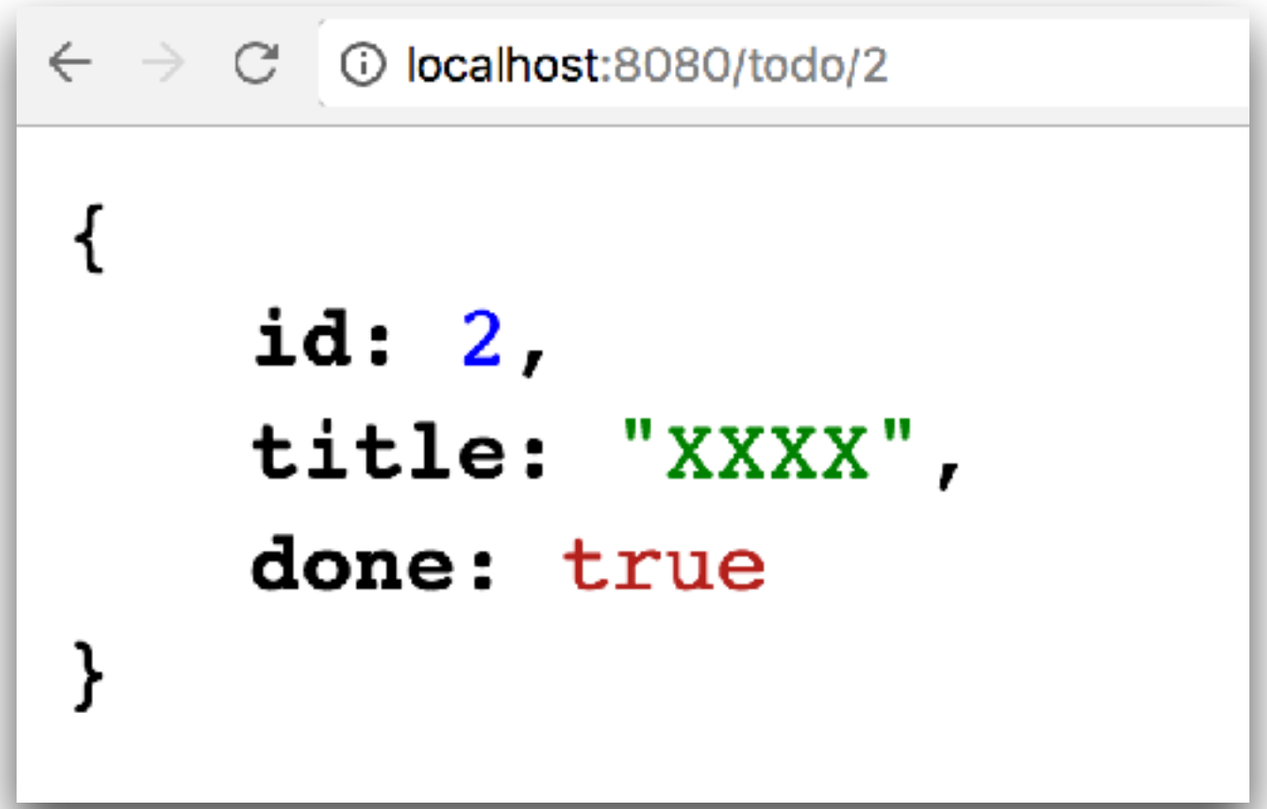
```
{
    "title": "test",
    "done": true
}
```

Body Cookies (25) Headers (3) Tests Status: 200 OK

Pretty Raw Preview JSON

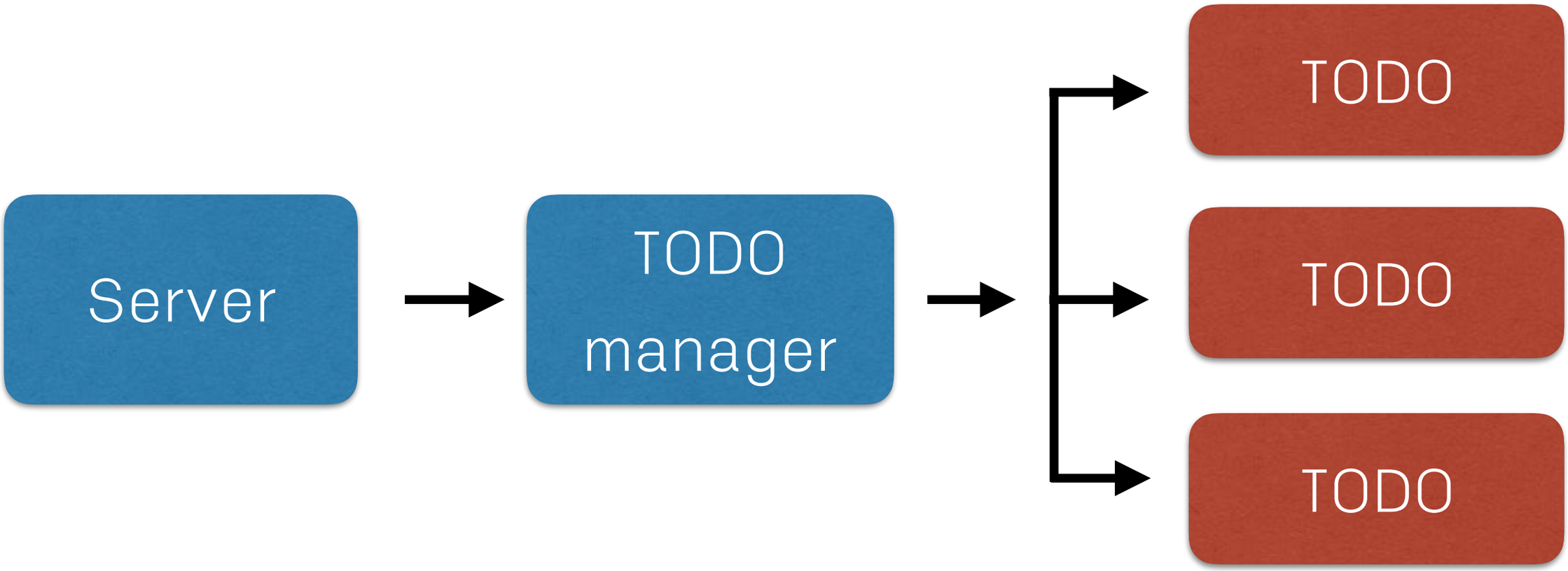
```
{
  "id": 0,
  "title": "test",
  "done": true
}
```

Get TODO by ID



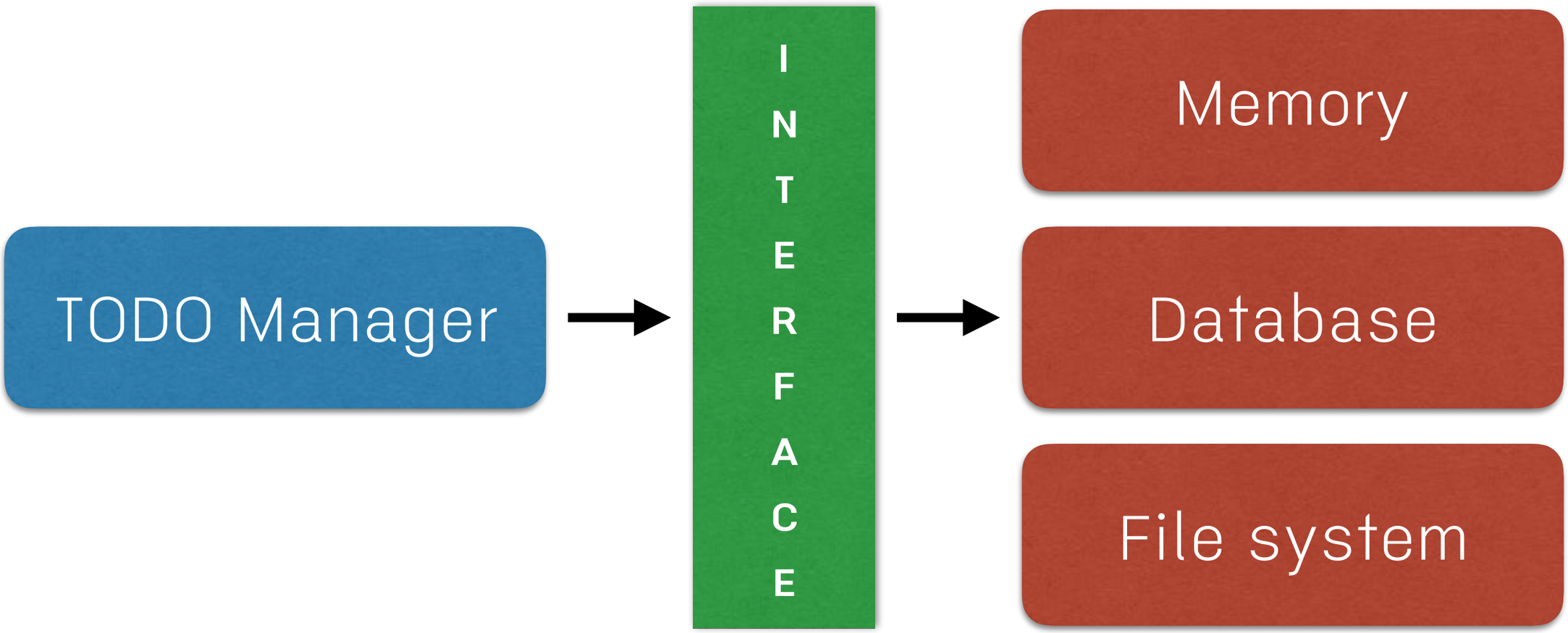
Let’s workshop

Manage TODO



Change persistence ?

Change persistence ?



Testing REST APIs

Testing REST APIs

With Go

With silk

With Robotframework

With Postman

Testing with Silk

https://github.com/matryer/silk
Markdown based document driven

Install Silk

$go get github.com/matryer/silk

Run Silk

$silk -silk.url=**<server> <testfiles>**

Interface with Go

Interface

Types that just declare behavior

Problem ?

```
type Circle struct {
  x, y, r float64
}

func (c *Circle) area() float64 {
  return math.Pi * c.r * c.r
}

type Rectangle struct {
  w, h float64
}
func (r *Rectangle) area() float64 {
  return r.w * r.h
}
```

Solution ?

```
type Shape interface {
  area() float64
}
```

Solution ?

Implement function from interface

```
type Circle struct {
  x, y, r float64
}
```

```
func (c Circle) area() float64 {
  return math.Pi * c.r * c.r
}
```

Solution ?

Implement function from interface

```
type Rectangle struct {
  w, h float64
}
```

```
func (r Rectangle) area() float64 {
  return r.w * r.h
}
```

Solution ?

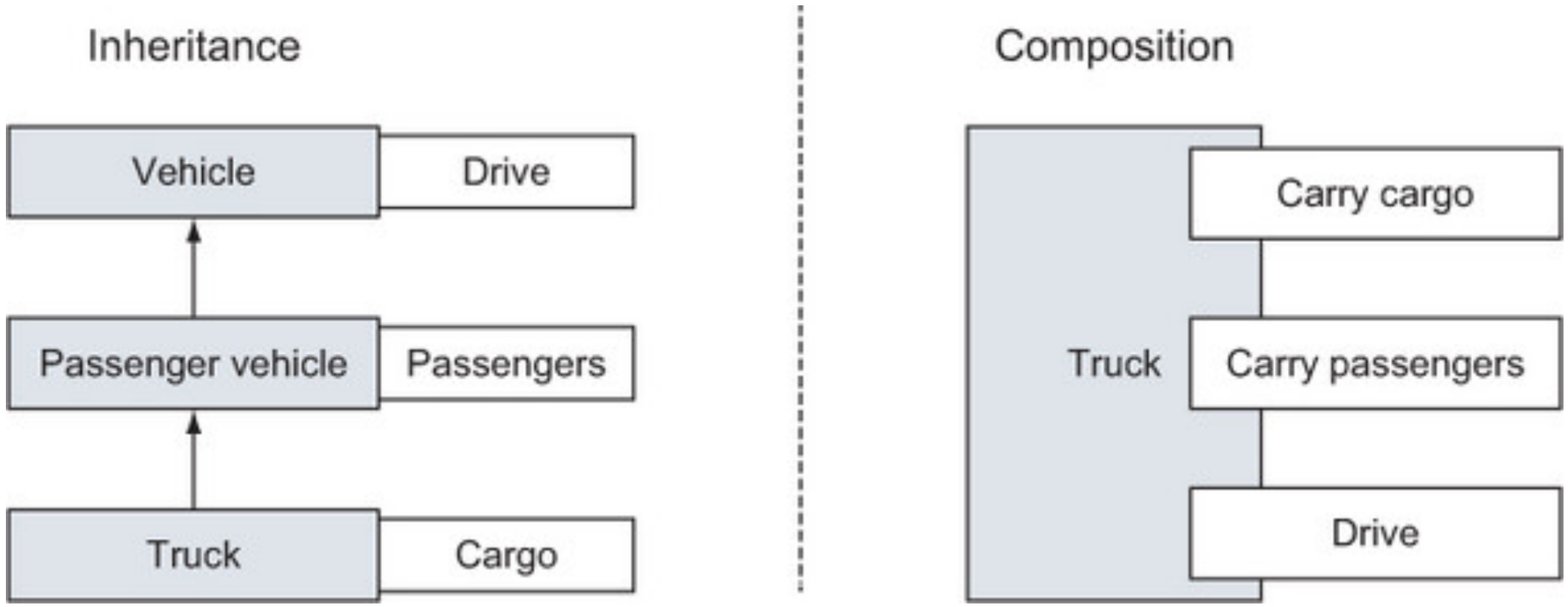
```
func main() {
    c := Circle{1, 1, 10}
    r := Rectangle{5, 10}
    shapes := []Shape{c, r}
    for _, s := range shapes {
        fmt.Println(s.area())
    }
}
```

Go’s Type System

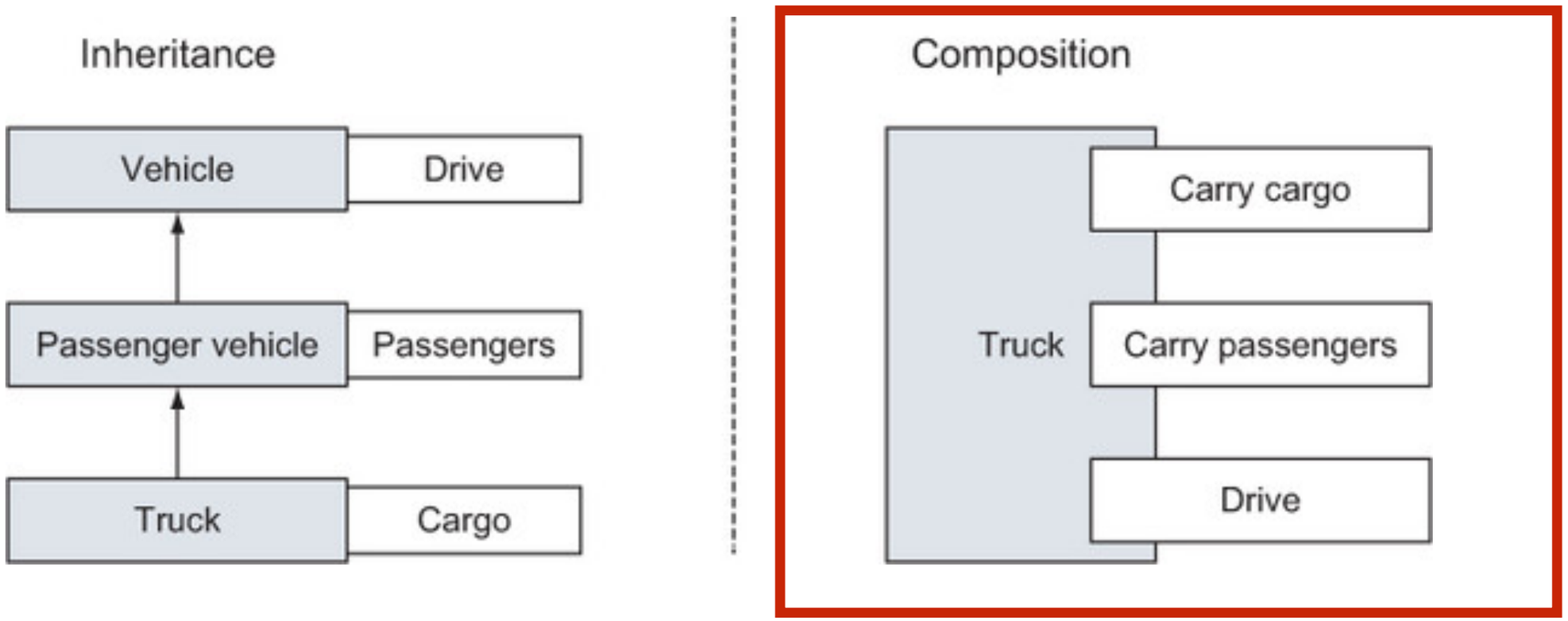
Type System

Types are **simple**
Types are **composed** of smaller types

Inheritance vs Composition



Inheritance vs Composition



Go Interface

Interface allow you to express
the **behavior** of a type

```
type Reader interface {
        Read(p []byte) (n int, err error)
}
```

https://golang.org/pkg/io/#Reader

Go Interface

Just **single** action/behavior

```
type Reader interface {
        Read(p []byte) (n int, err error)
}
```

https://golang.org/pkg/io/#Reader

Go Interface

Just single action/behavior

Smaller

Enable **reuse** and **composability**

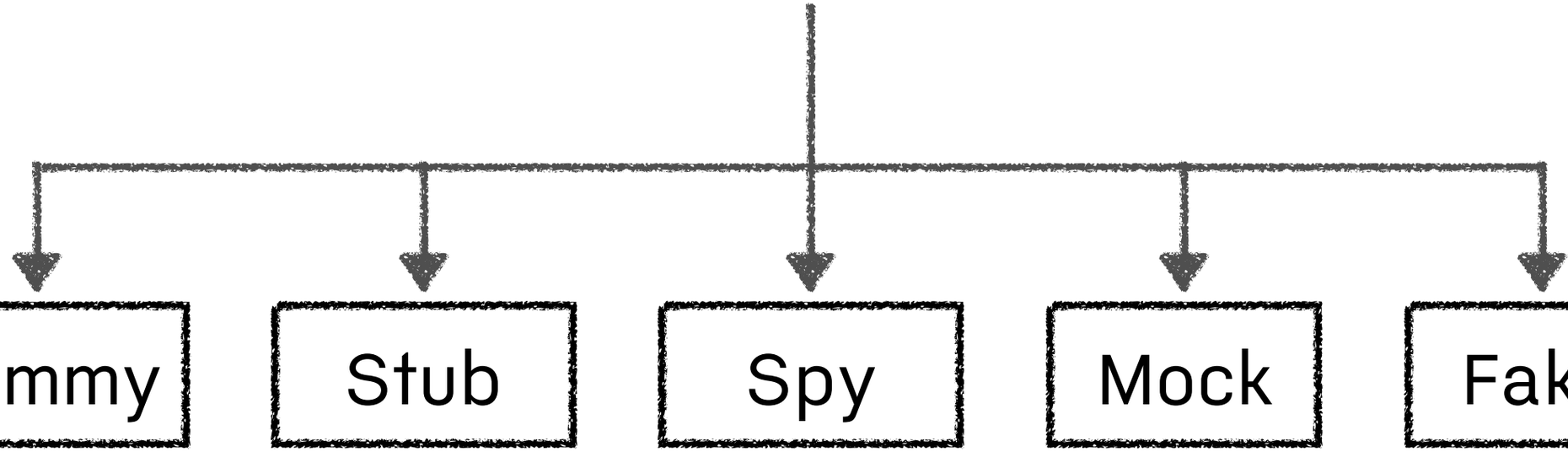
Example in go

Go Interface !!

Using a single interface
allow you to operate
on **data efficiently**

Test Double with Go

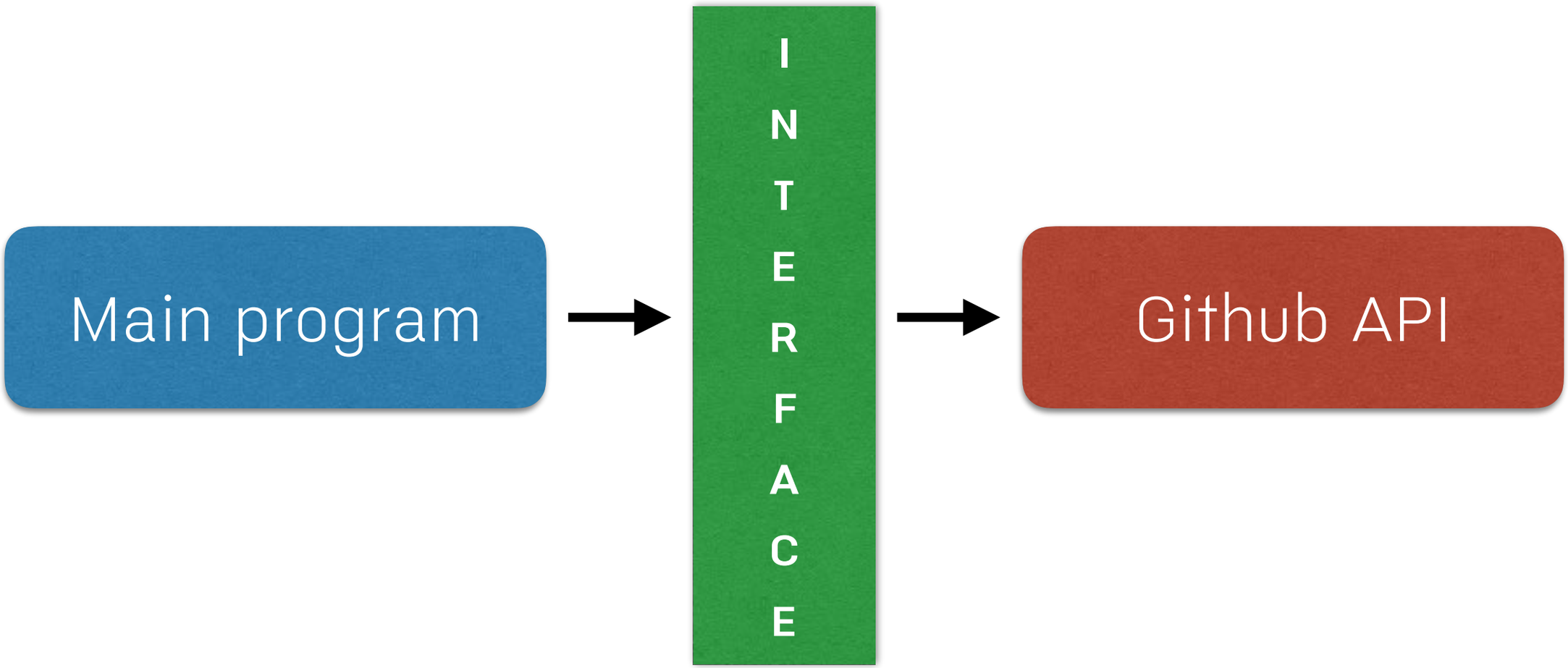
Test double



Problem

How to test ?

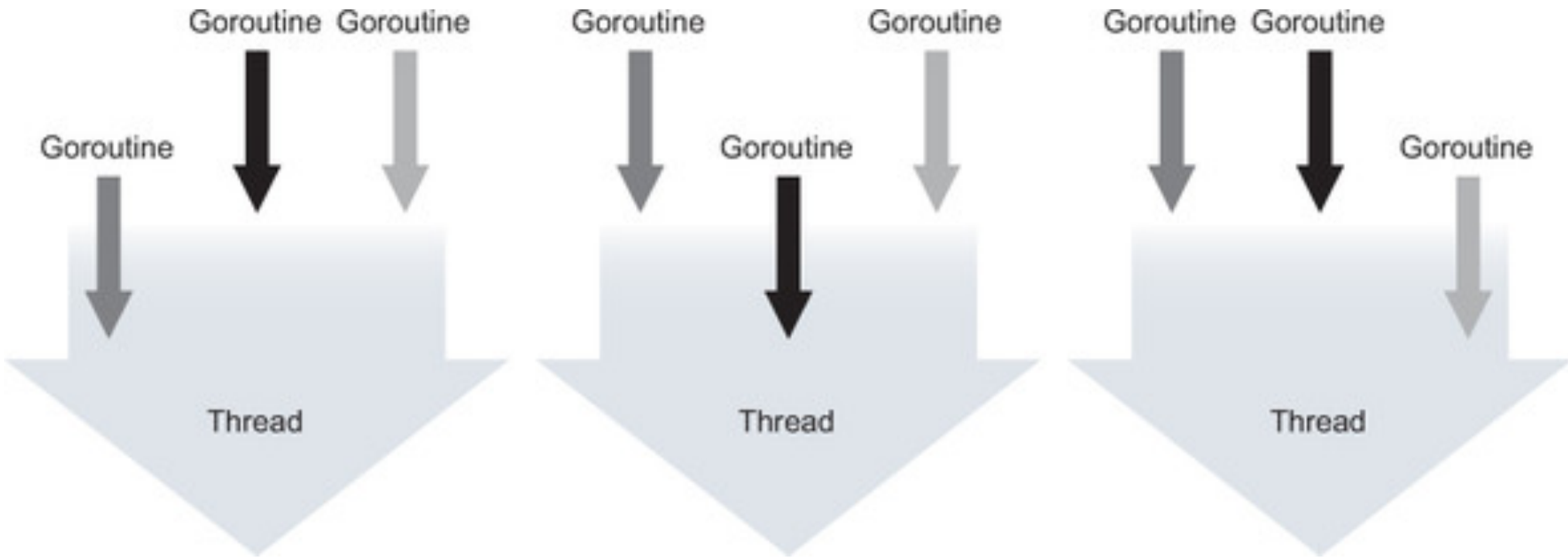
Solution



How to code ?

And more ...

Go routine


Goroutine
Goroutine
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Thread
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Goroutine
Thread

Go routine

```
package main

import "fmt"

func log(msg string) {
    //TODO
}


func main() {
   go log("Some message")
}
```

Go channel