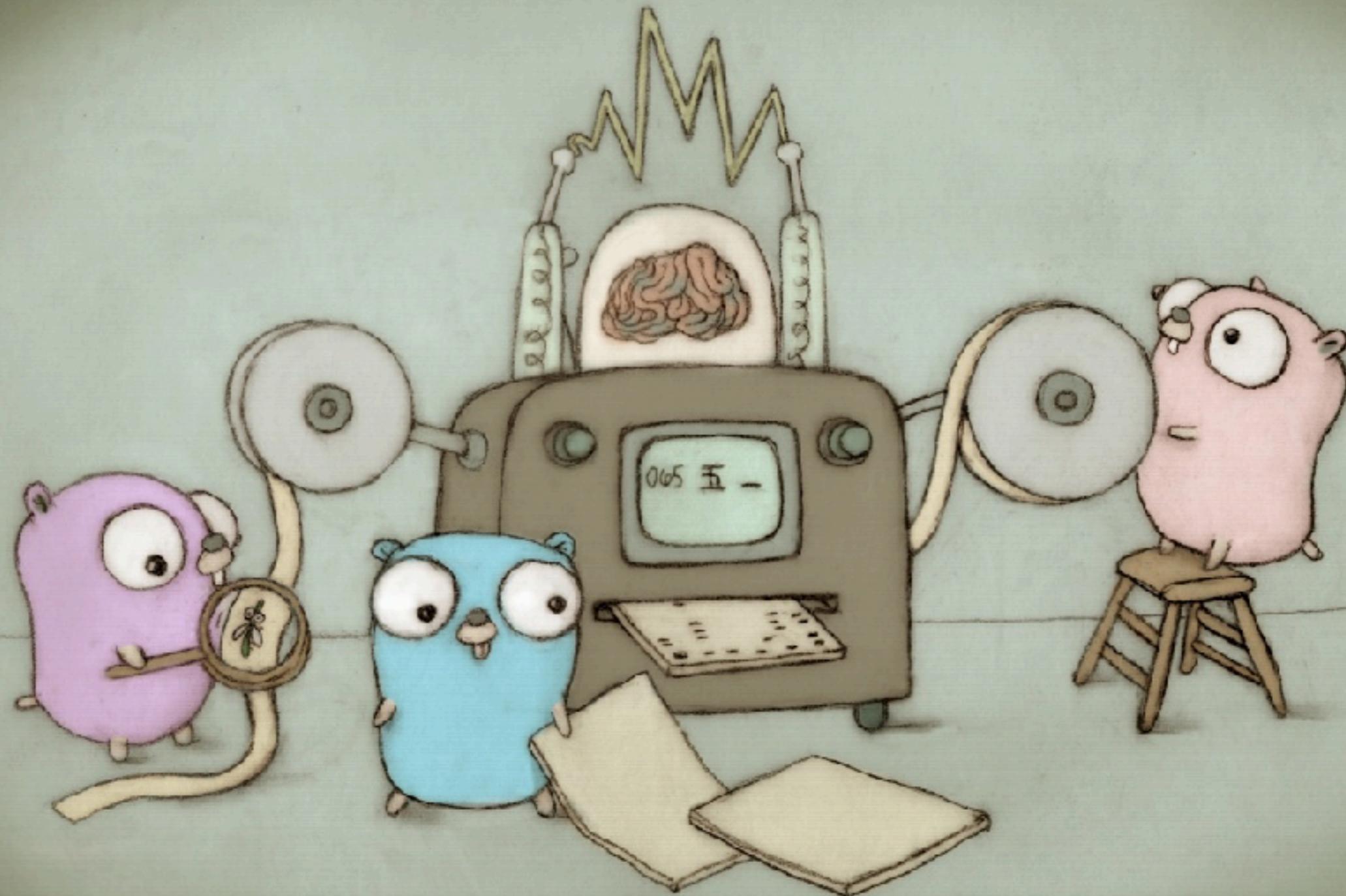


TDD with Golang



Somkiat Puisungnoen

Somkiat Puisungnoen

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Home About



Agenda

Basic of TDD

Basic of Go

Using interface

Building REST APIs

Testing REST APIs

Working with MongoDB



TestDrivenDevelopment

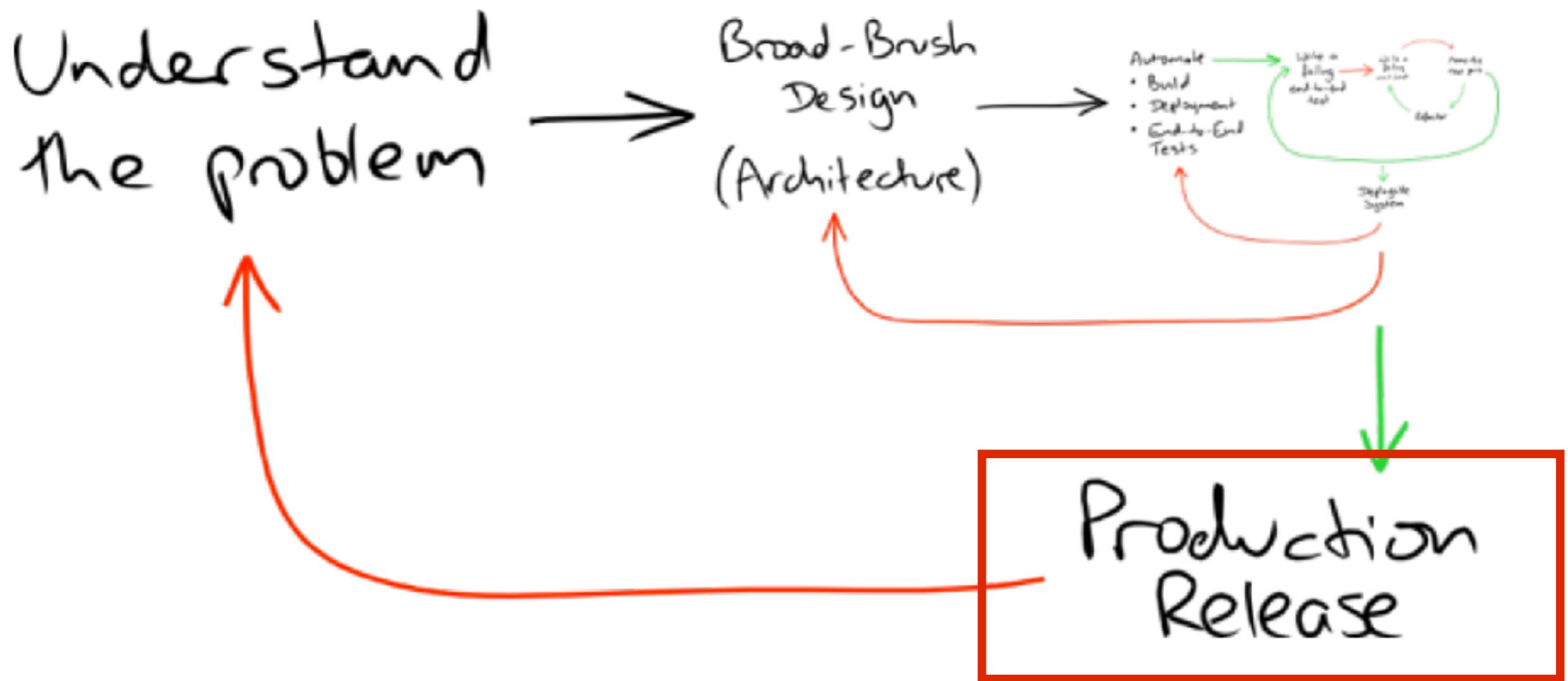


TestDrivenDevelopment

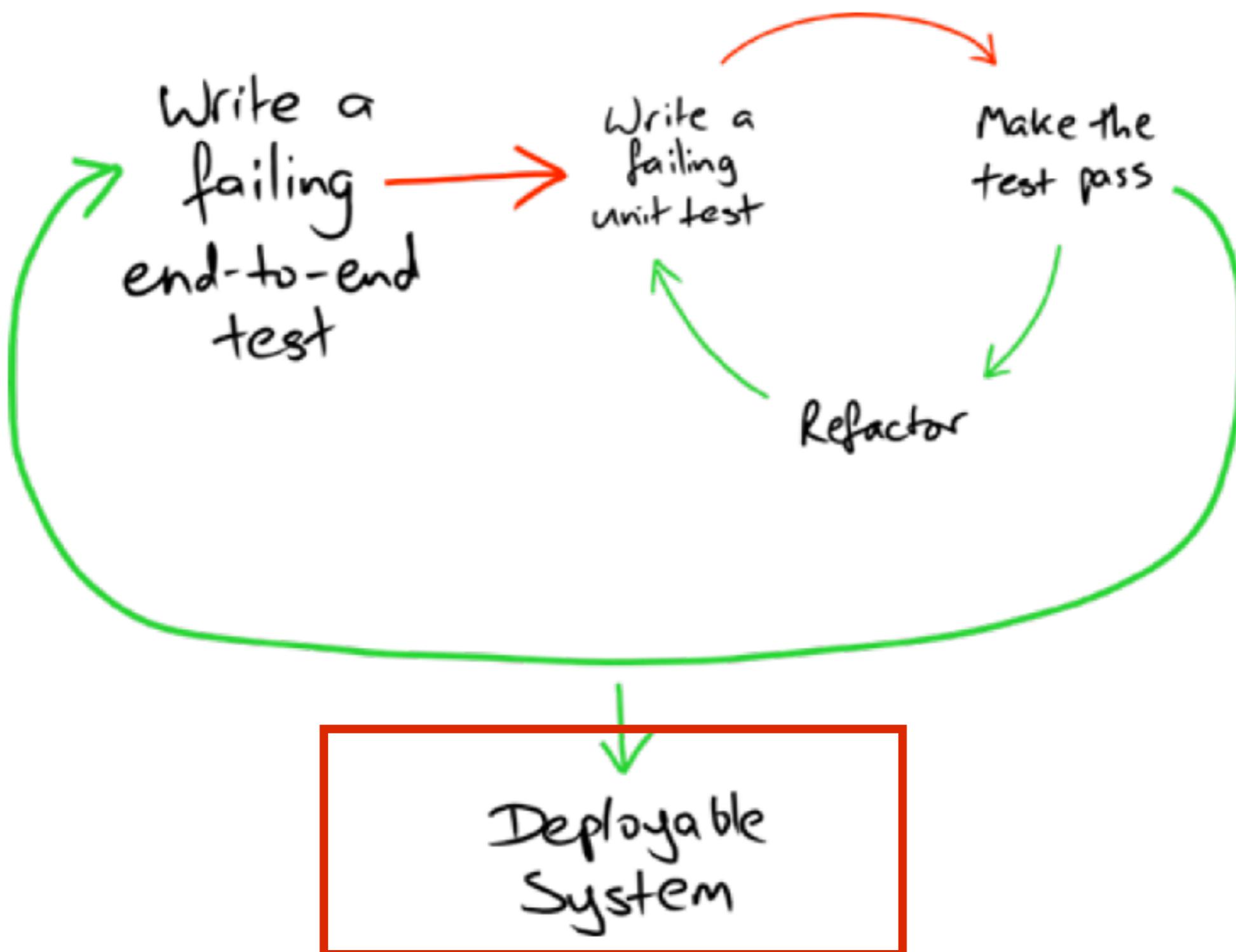
ทำ ดี ดี



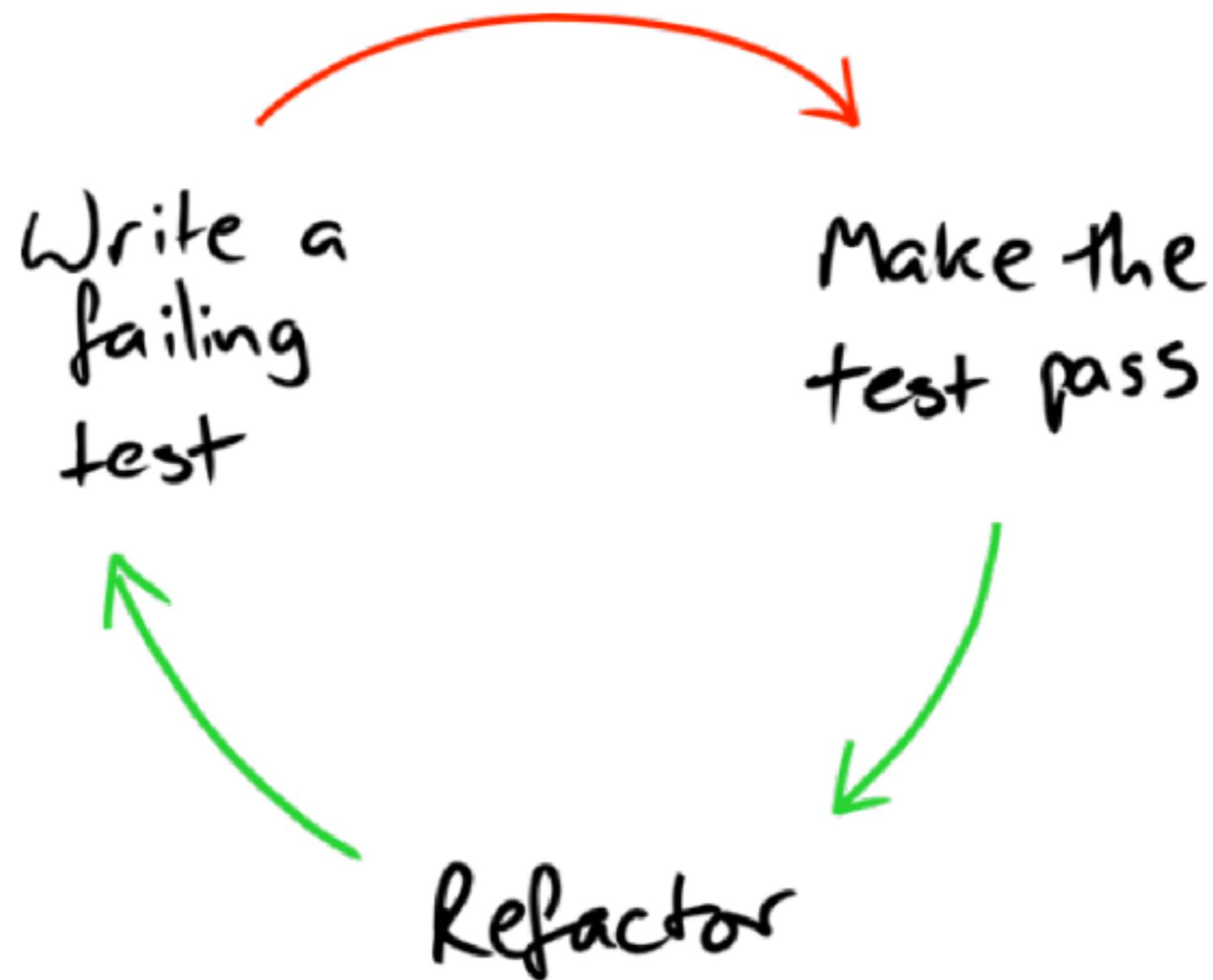
LARGER FEEDBACK LOOP



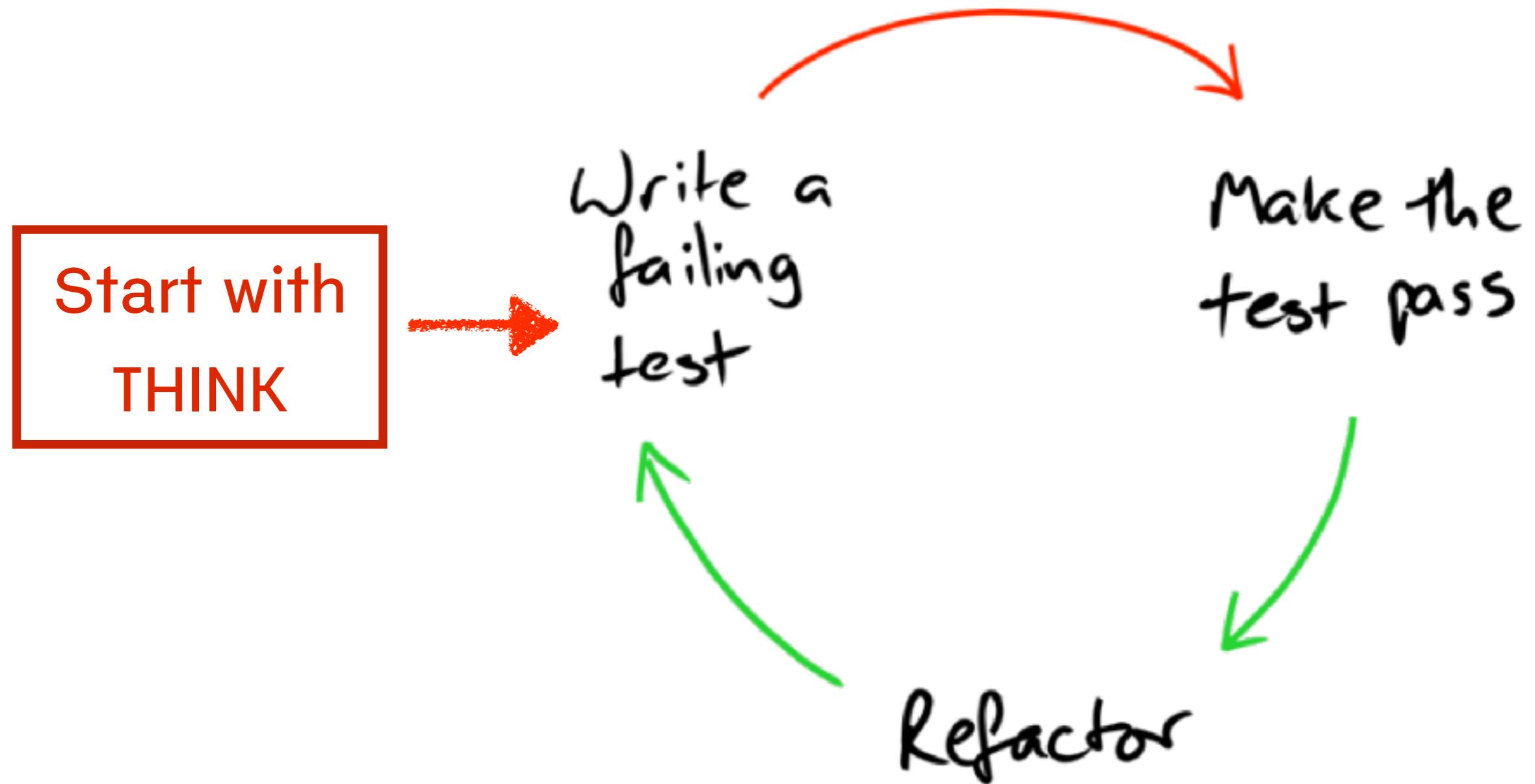
ACCEPTANCE TEST DRIVEN DEVELOPMENT

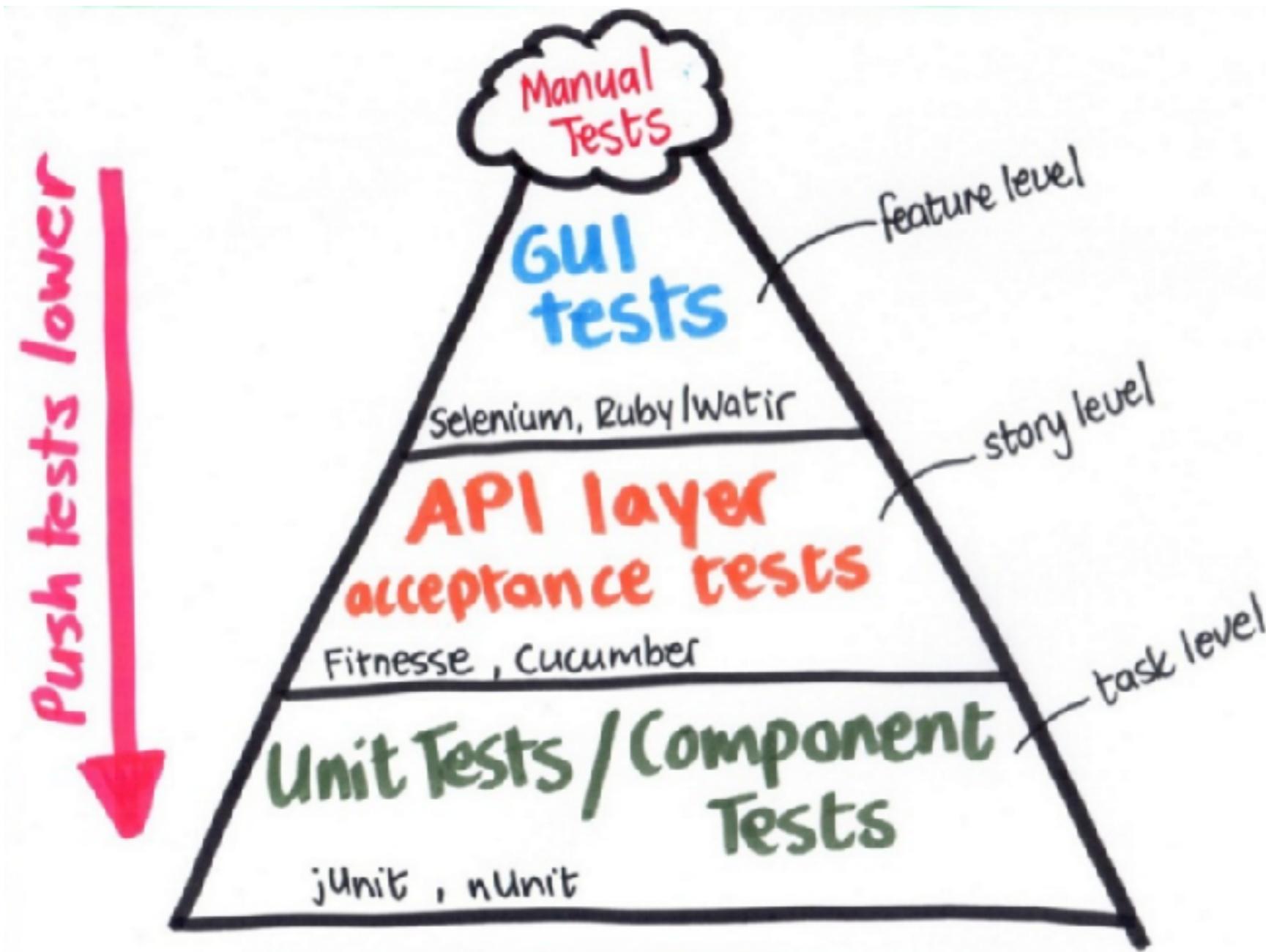


TEST DRIVEN DEVELOPMENT



TEST DRIVEN DEVELOPMENT





<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



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Installation

Install Go

Install Git

Install Text editor/IDE



Install Go

Getting Started

[Install the Go tools](#)

[Test your installation](#)

[Uninstalling Go](#)

[Getting help](#)

Download the Go distribution

Download Go

Click here to visit the
downloads page

[Official binary distributions](#) are available for the FreeBSD (release 8-STABLE and above), Linux, Mac OS X (10.8 and above), and Windows operating systems and the 32-bit (386) and 64-bit (amd64) x86 processor architectures.

If a binary distribution is not available for your combination of operating system and architecture, try [installing from source](#) or [installing gccgo instead of gc](#).

<https://golang.org/doc/install>



Hello go !!

\$go version



Install Git

The screenshot shows the official website for Git (<https://git-scm.com/>). At the top left is the Git logo with the tagline "git --local-branching-on-the-cheap". A search bar at the top right contains the placeholder "Search entire site...". The main content area features two sections: "Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency." and "Git is easy to learn and has a tiny footprint with lightning fast performance. It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like cheap local branching, convenient staging areas, and multiple workflows." Below these are several links: "Learn Git in your browser for free with Try Git.", "About" (with a gear icon), "Documentation" (with a book icon), "Downloads" (with a download arrow icon), and "Community" (with a speech bubble icon). To the right, there's a diagram of seven white server stacks connected by red and blue lines on a grid background, representing a distributed network. Further down, a computer monitor displays the "Latest source Release 2.14.1" with "Release Notes (2017-08-04)" and a "Downloads for Mac" button.

git --local-branching-on-the-cheap

Search entire site...

Git is a **free and open source** distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is **easy to learn** and has a **tiny footprint with lightning fast performance**. It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like **cheap local branching**, convenient **staging areas**, and **multiple workflows**.

Learn Git in your browser for free with [Try Git](#).

About
The advantages of Git compared to other source control systems.

Documentation
Command reference pages, Pro Git book content, videos and other material.

Downloads
GUI clients and binary releases for all major platforms.

Community
Get involved! Bug reporting, mailing list, chat, development and more.

Latest source Release
2.14.1
Release Notes (2017-08-04)
Downloads for Mac

<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



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Go tour

A Tour of Go

Hello, 世界

Welcome to a tour of the Go programming language.

The tour is divided into a list of modules that you can access by clicking on [A Tour of Go](#) on the top left of the page.

You can also view the table of contents at any time by clicking on the [menu](#) on the top right of the page.

Throughout the tour you will find a series of slides and exercises for you to complete.

You can navigate through them using

- "[previous](#)" or PageUp to go to the previous page,
- "[next](#)" or PageDown to go to the next page.

The tour is interactive. Click the [Run](#) button now (or type shift-enter) to compile and run the program on a remote server. The result is displayed below the code.

These example programs demonstrate different aspects of Go. The programs in the tour are meant to be starting points for your own experimentation.

Edit the program and run it again.

Note that when you click on [Format](#) or ctrl-enter the text in the editor is formatted

< 1/5 >

hello.go

```
1 |
2 package main
3
4 import ("fmt")
5
6 func main() {
7     fmt.Println("Hello, 世界")
8 }
```

Imports off Syntax off

Reset Format Run



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



Effective go

Effective Go

Introduction	Constants
Examples	Variables
Formatting	The init function
Commentary	Methods
Names	Pointers vs. Values
Package names	Interfaces and other types
Getters	Interfaces
Interface names	Conversions
MixedCaps	Interface conversions and type assertions
Semicolons	Generality
Control structures	Interfaces and methods
If	The blank identifier
Redeclaration and reassignment	The blank identifier in multiple assignment
For	Unused imports and variables
Switch	Import for side effect
Type switch	Interface checks
Functions	Embedding
Multiple return values	Concurrency
Named result parameters	Share by communicating
Defer	Goroutines

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



Learn go

Learn

Saurabh Hooda edited this page on Jul 1 · 33 revisions

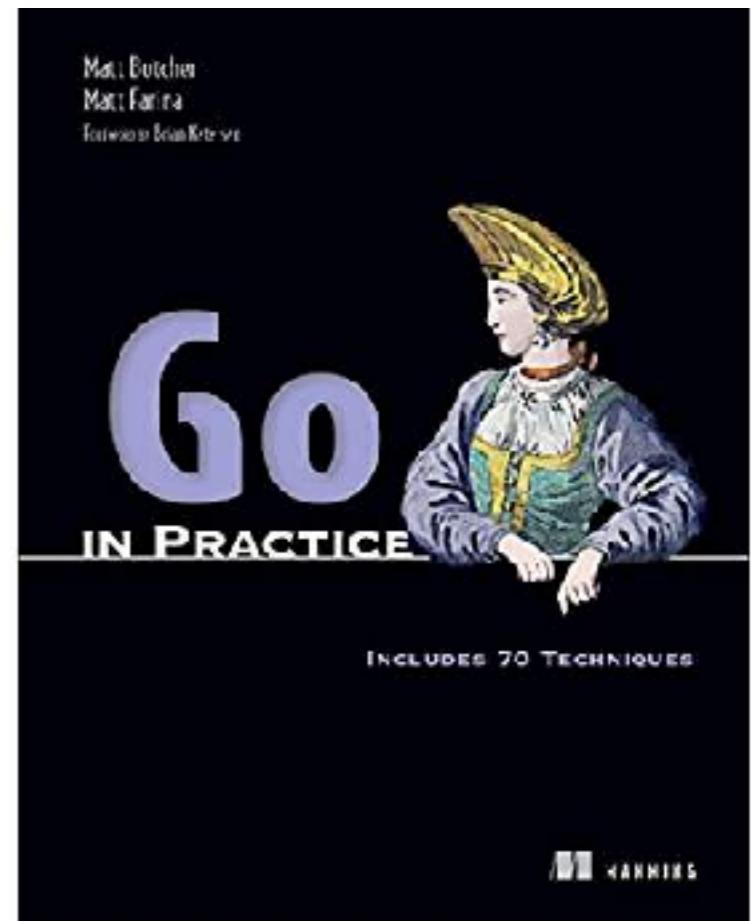
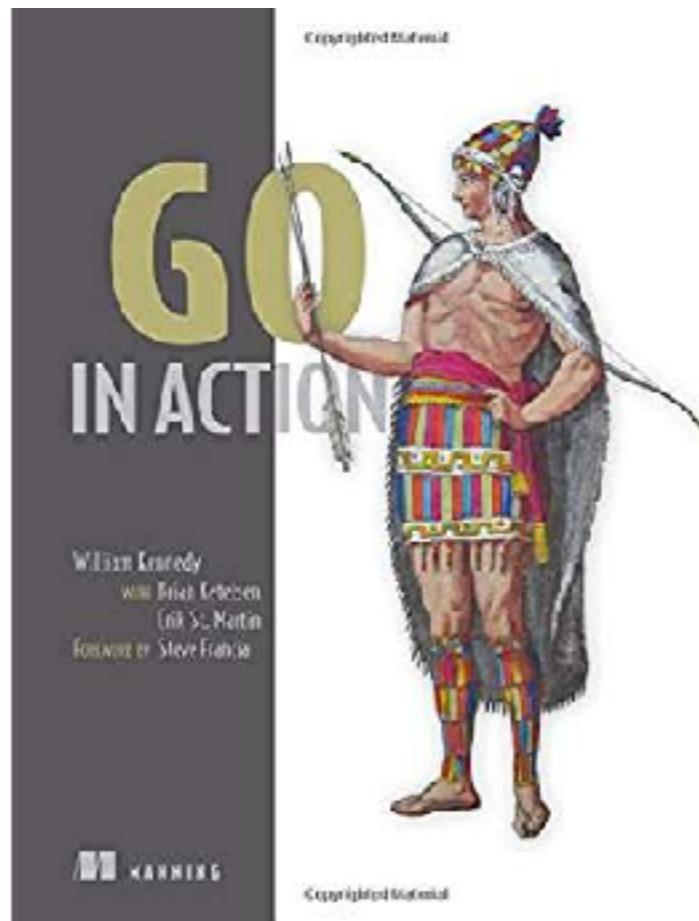
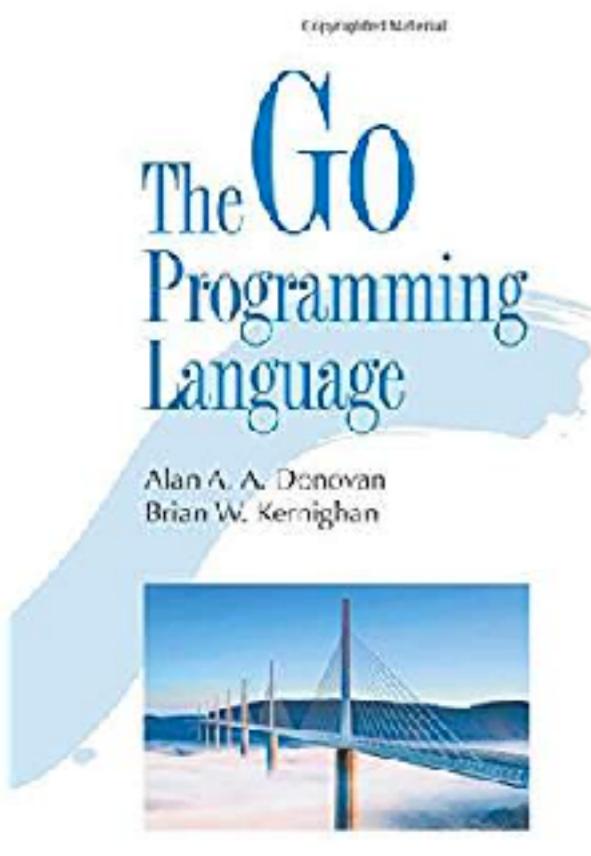
In addition to the resources available at golang.org there are a range of community-driven initiatives:

- [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



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Let's coding



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Hello 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

```
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.Println(x, y)  
}
```



Variadic function

```
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

```
package main

import(
    "testing"
)

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

```
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.Error

t.Fatal

t.Log



*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)

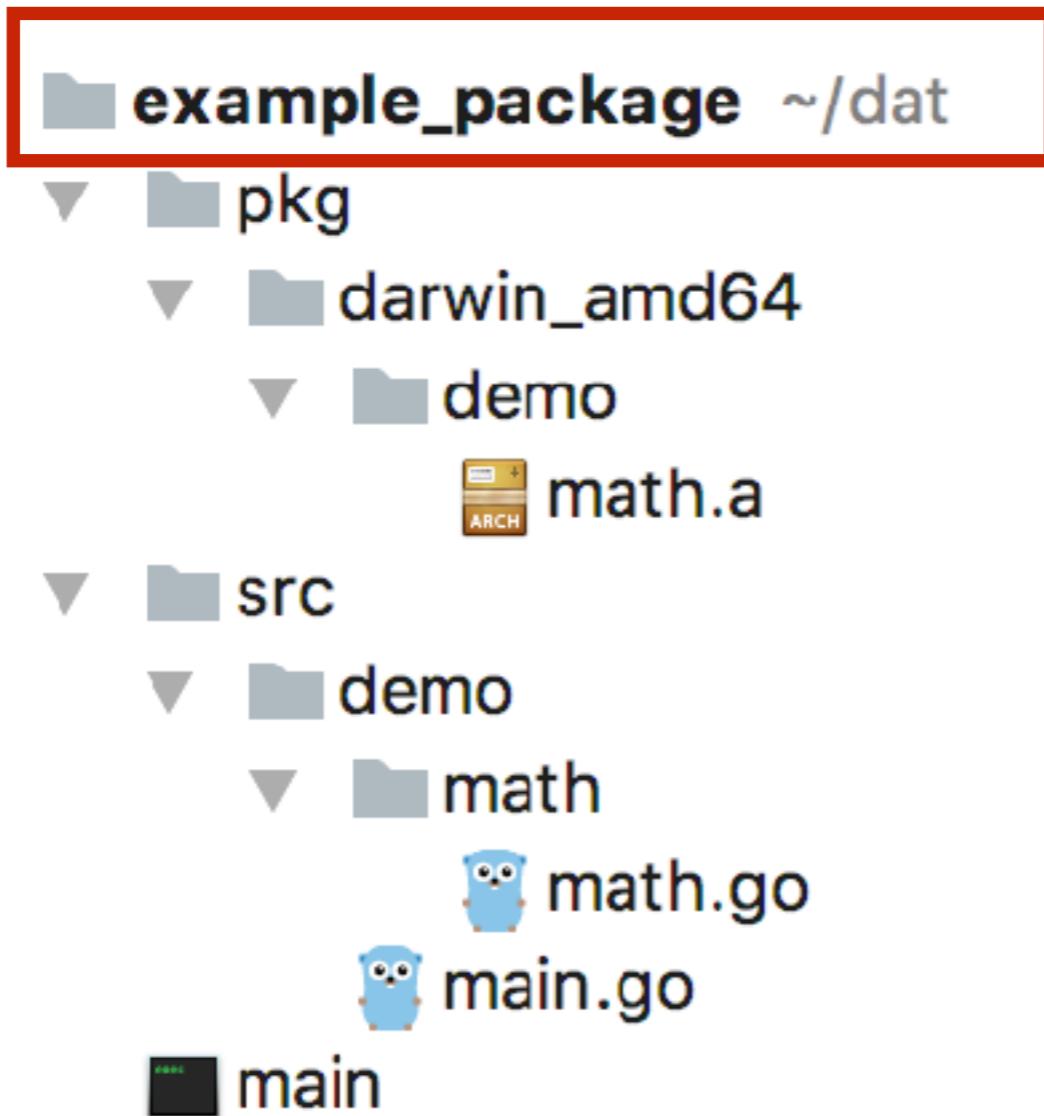


Demo Package

```
📁 example_package ~/dat
  ▼ 📁 pkg
    ▼ 📁 darwin_amd64
      ▼ 📁 demo
        📜 math.a
  ▼ 📁 src
    ▼ 📁 demo
      ▼ 📁 math
        🐧 math.go
        🐧 main.go
    📜 main
```



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

```
package math
```

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



demo/Main.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



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Building REST APIs

HTTP + JSON

Go provide **net/http** package



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



REST

REpresentational State Transfer

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 !!!



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Problem ?

```
func main() {  
  
    http.HandleFunc("/todo", ListOfTODO)  
    http.HandleFunc("/todo", CreateT0F0)  
    http.HandleFunc("/todo/1", GetT0D0ByID)  
    http.HandleFunc("/todo/1", UpdateT0D0ByID)  
    http.HandleFunc("/todo/1", DeleteT0D0ByID)  
  
    http.ListenAndServe(":8080", nil)  
}
```



Solution

Custom default router of net/http package

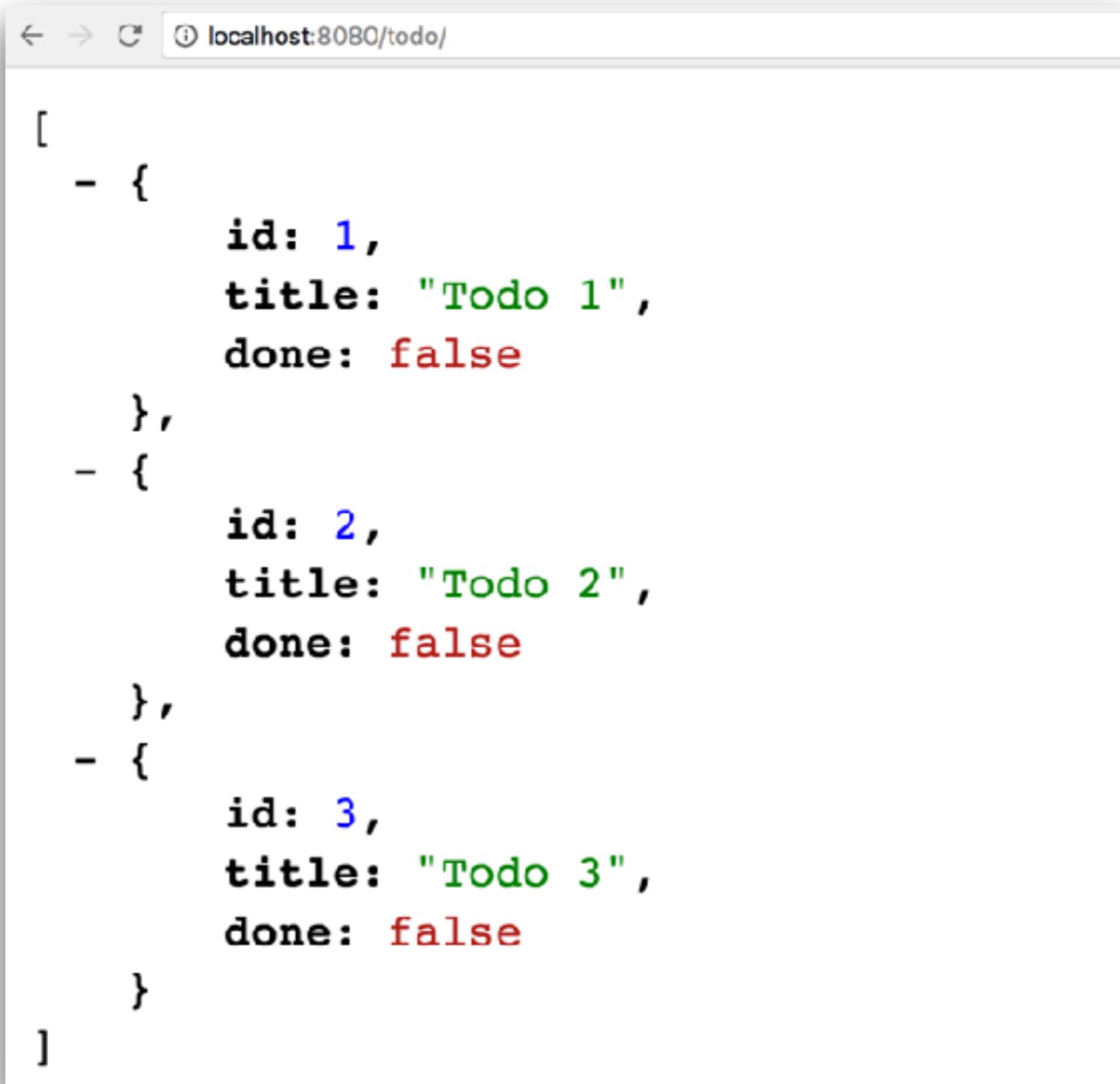
```
regHandler.HandleFunc("/todo/$", "GET", List0FTODO)
regHandler.HandleFunc("/todo$", "POST", CreateT0F0)
regHandler.HandleFunc("/todo/[0-9]$", "GET", GetTOD0ByID)
regHandler.HandleFunc("/todo/[0-9]$", "PUT", UpdateTOD0ByID)
regHandler.HandleFunc("/todo/[0-9]$", "DELETE", DeleteTOD0ByID)
```



Let's workshop with REST



List of TODO



A screenshot of a web browser window displaying a JSON response at the URL `localhost:8080/todo/`. The JSON data represents a list of three TODO items, each defined by an object with properties: `id`, `title`, and `done`.

```
[  
  - {  
      id: 1,  
      title: "Todo 1",  
      done: false  
    },  
  - {  
      id: 2,  
      title: "Todo 2",  
      done: false  
    },  
  - {  
      id: 3,  
      title: "Todo 3",  
      done: false  
    }  
]
```



Create new TODO

The screenshot shows the Postman application interface for making a POST request to create a new TODO item.

Request Details:

- Method: POST
- URL: <http://localhost:8080/todo/>
- Headers (1): (This tab is selected)
- Body (raw JSON):

```
1 {  
2   "title": "test",  
3   "done": true  
4 }
```

Response Details:

- Status: 200 OK
- Body (Pretty JSON):

```
1 {  
2   "id": 0,  
3   "title": "test",  
4   "done": true  
5 }
```




Get TODO by ID



A screenshot of a web browser window. The address bar shows the URL `localhost:8080/todo/2`. The main content area displays the following JSON object:

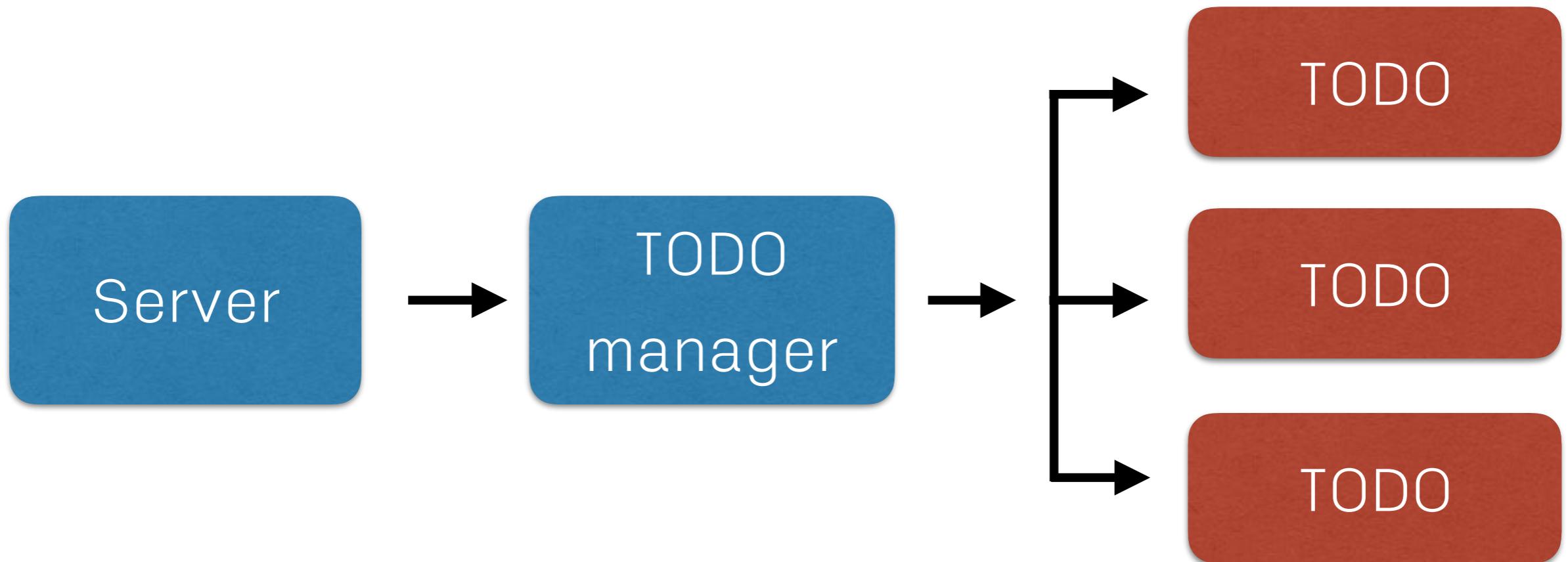
```
{  
  id: 2,  
  title: "XXXX",  
  done: true  
}
```



Let's workshop



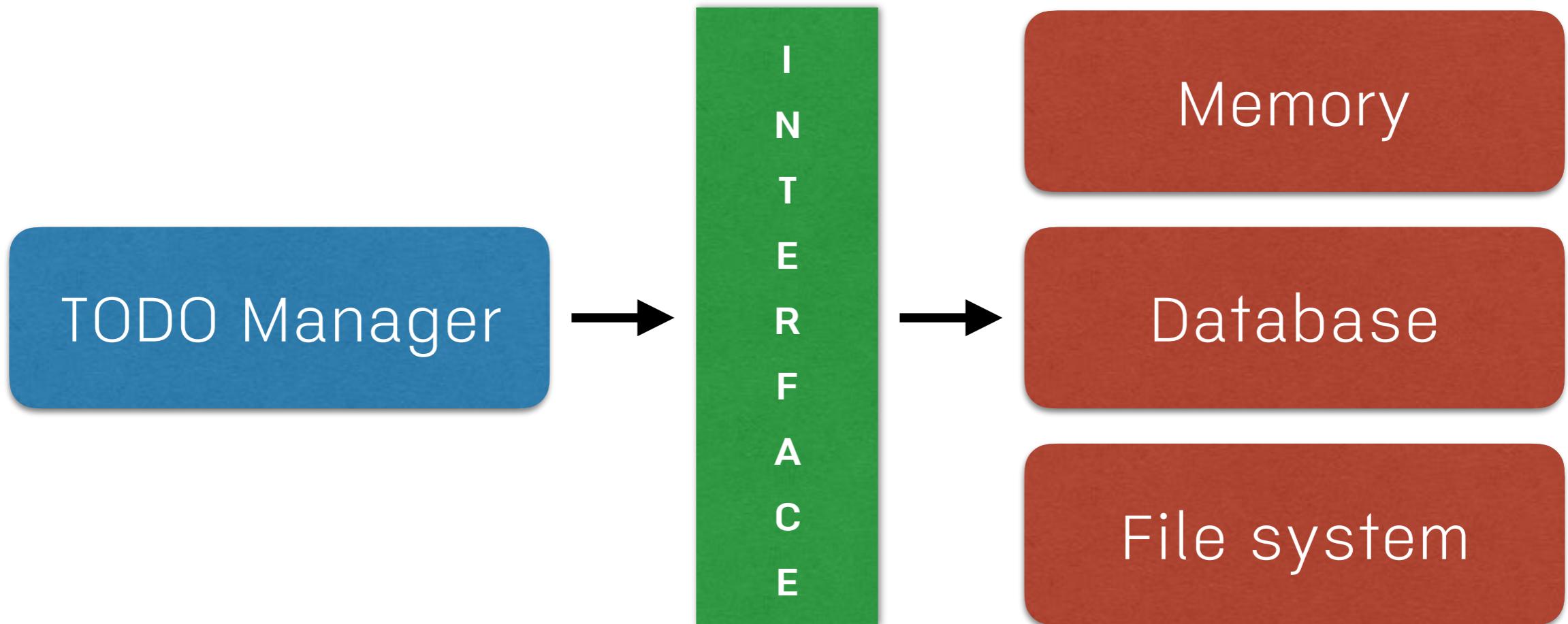
Manage TODO



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

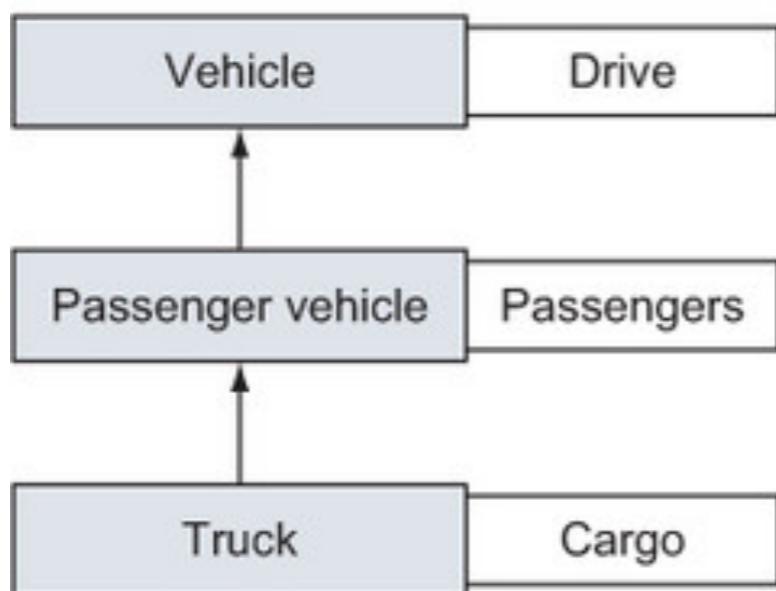
Types are **simple**

Types are **composed** of smaller types

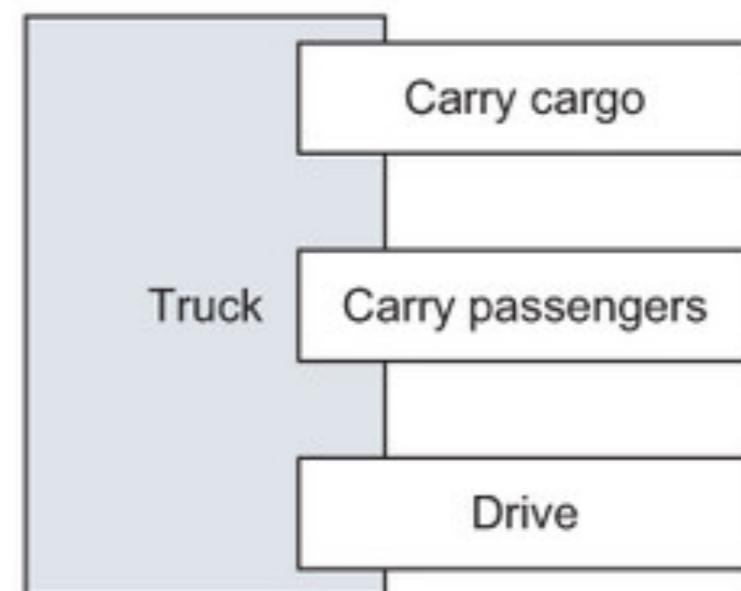


Inheritance vs Composition

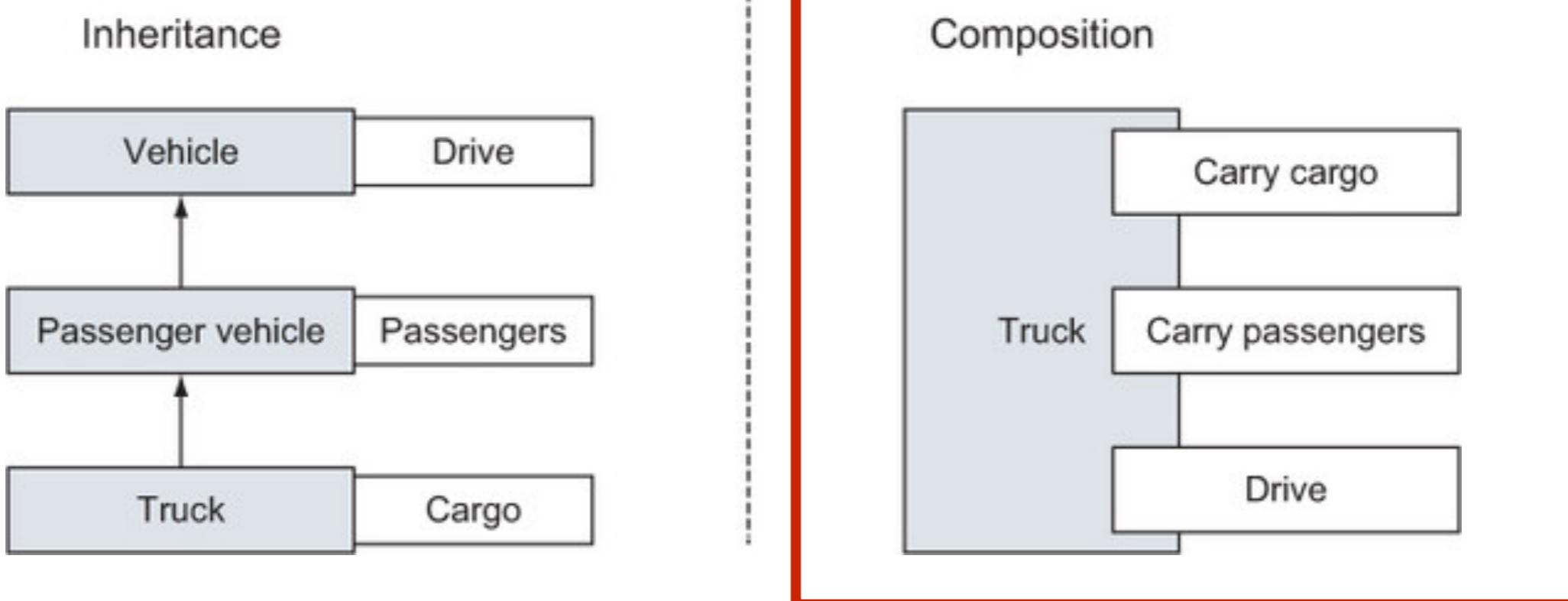
Inheritance



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

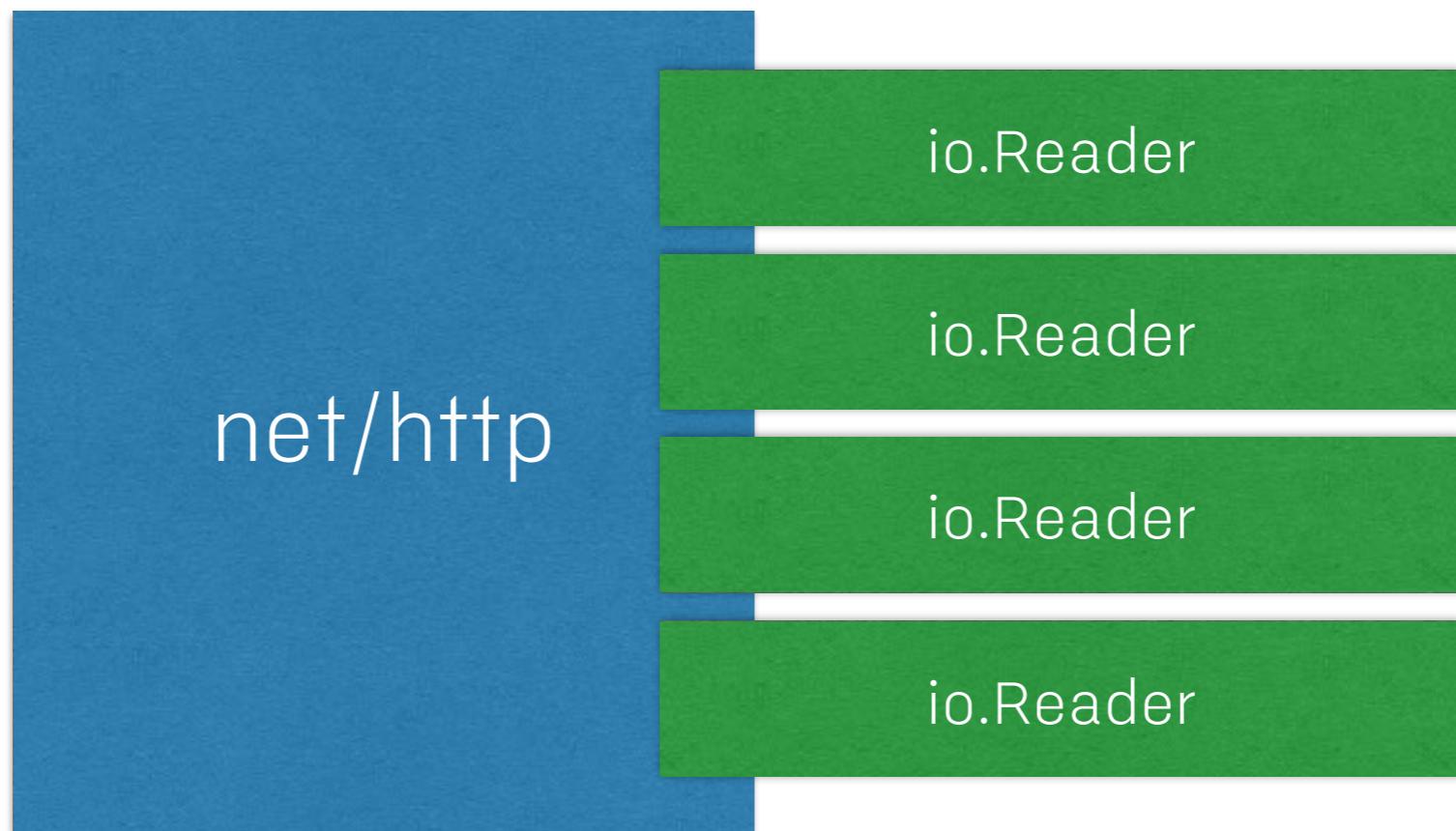
Just single action/behavior

Smaller

Enable reuse and **composability**



Example in go



Go Interface !!

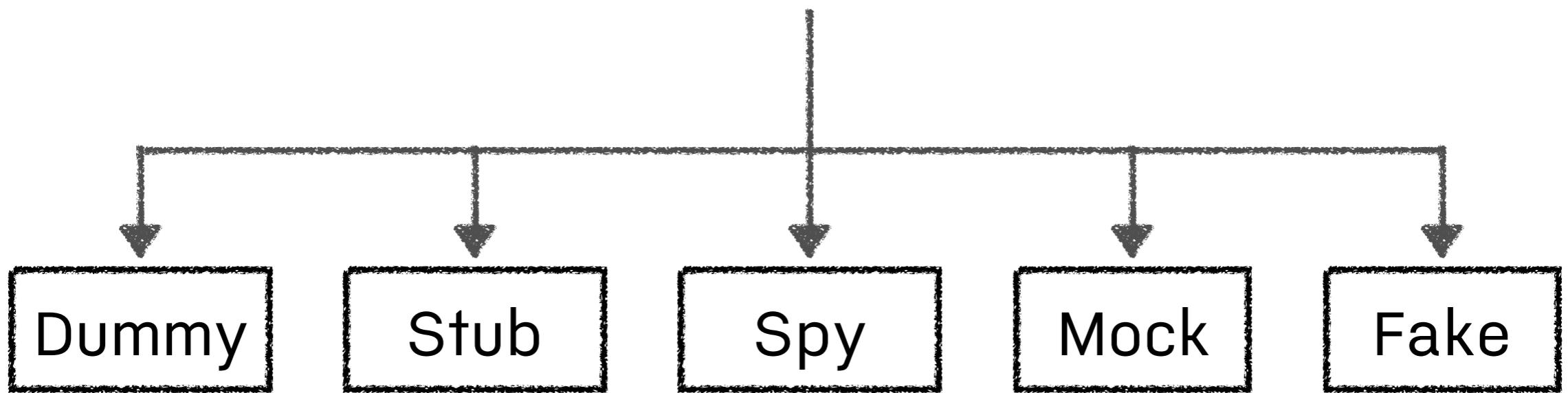
Using a single interface
allow you to operate
on data efficiently



Test Double with Go



Test double



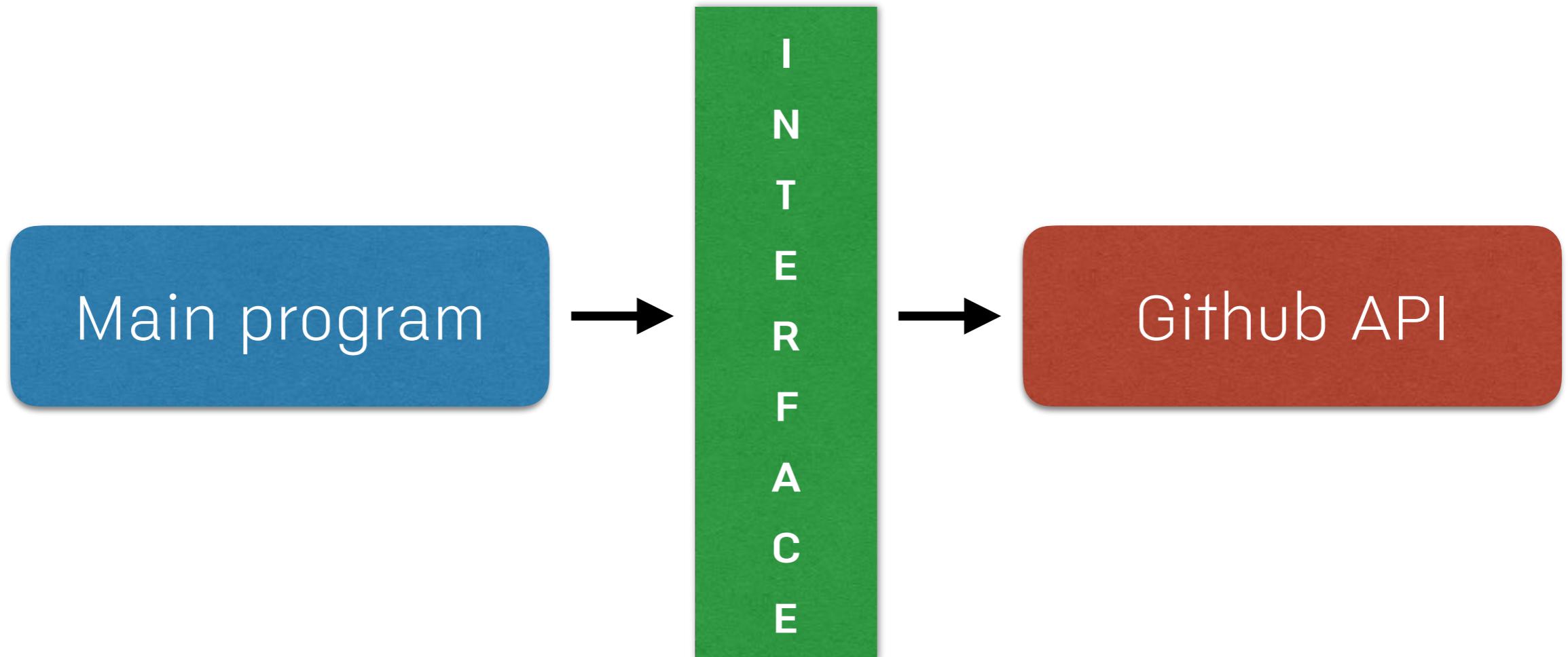
Problem



How to test ?



Solution



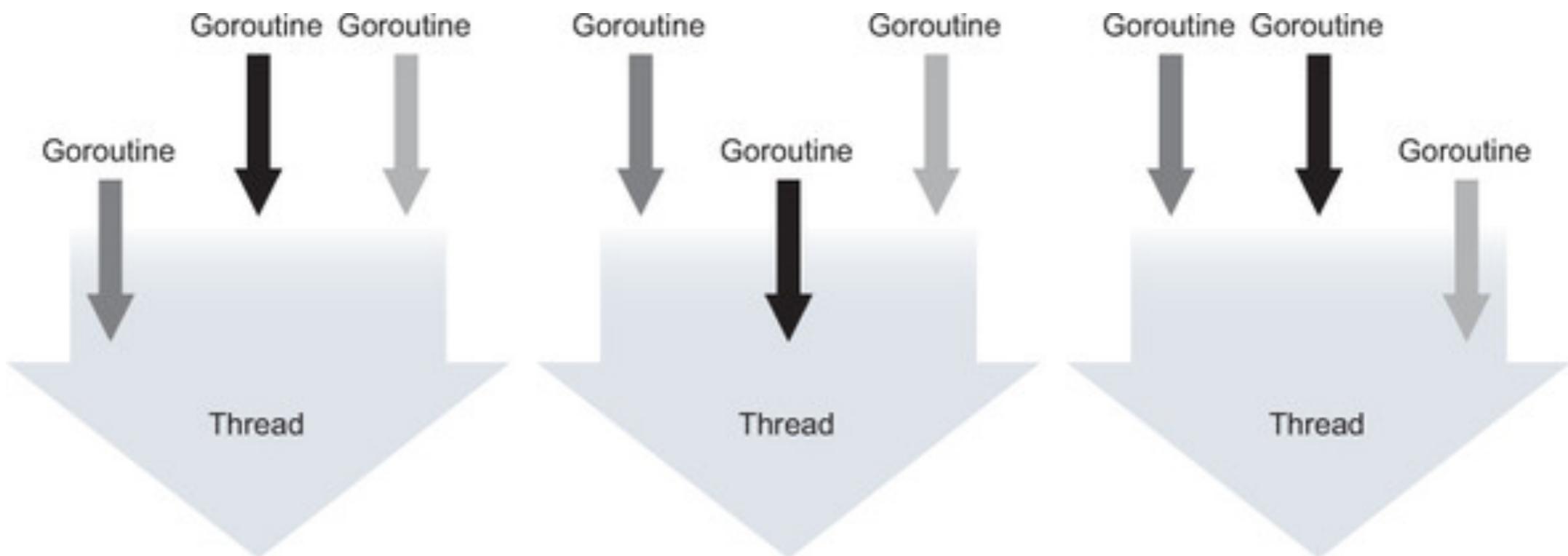
How to code ?



And more ...



Go routine



Go routine

```
package main

import "fmt"

func log(msg string) {
    //TODO
}

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



Go channel

