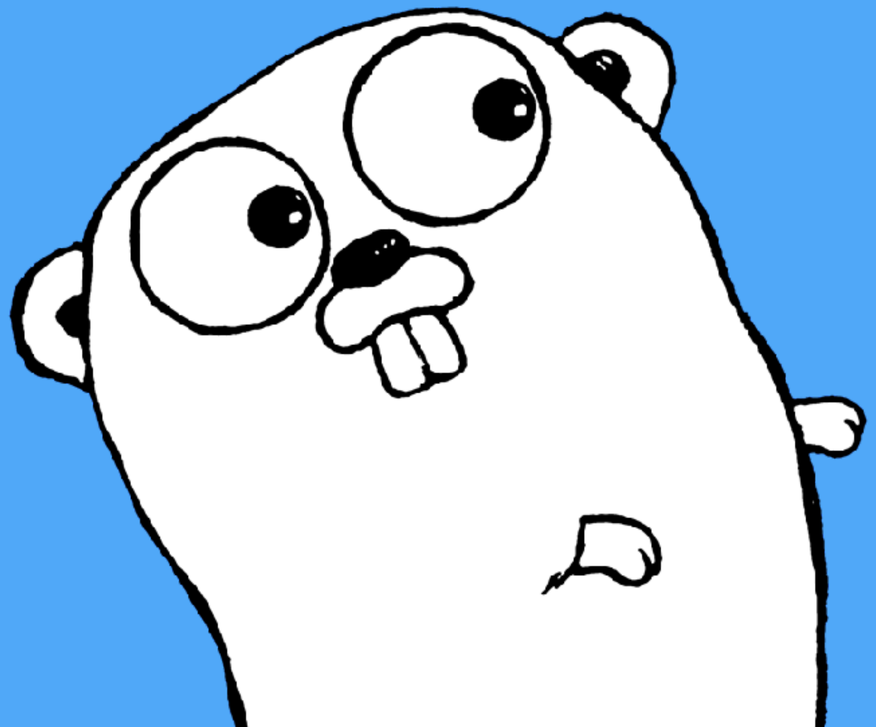
go get better



framework training.

3 Day Go Training Course

framework training

Dom Davis

@idomdavis

framework training

GOD

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GO Developer

Goal Oriented Developer

Goal Oriented Developer

Goal Oriented Developer

Goal Oriented Developer

Goal Oriented Developer

Deliberate Practice

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Deliberate Practice

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Goals

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Goals

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Introductions

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House Rules

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House Rules

There is no such thing as a stupid question

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House Rules

There is no such thing as a stupid question

We go at your pace

framework training.

House Rules

There is no such thing as a stupid question

We go at your pace

This is your course

framework training.

House Rules

There is no such thing as a stupid question

We go at your pace

This is your course

This is not school

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House Rules

There is no such thing as a stupid question

We go at your pace

This is your course

This is not school

Have fun

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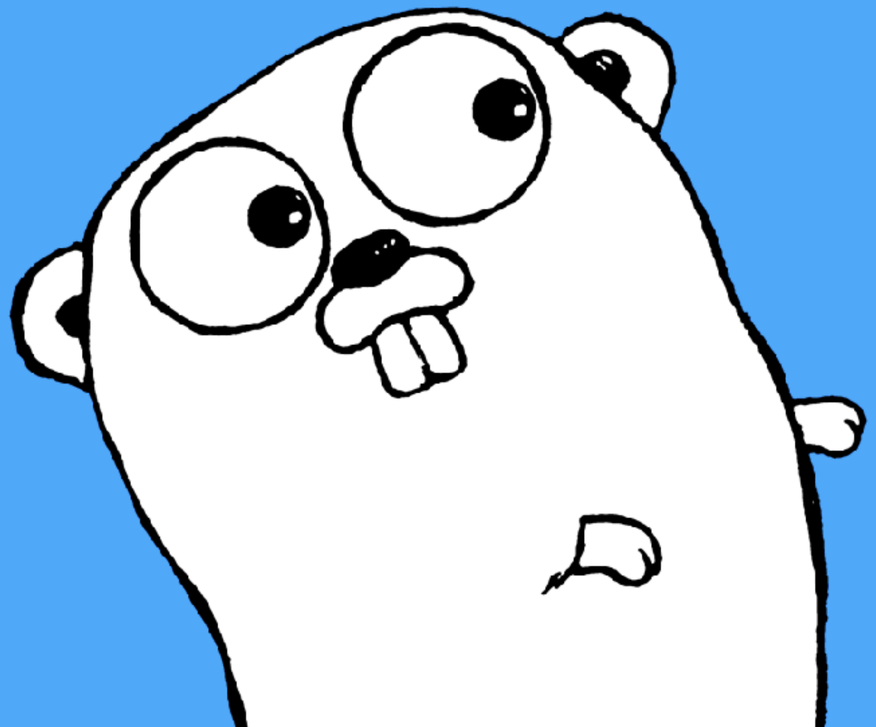
Go



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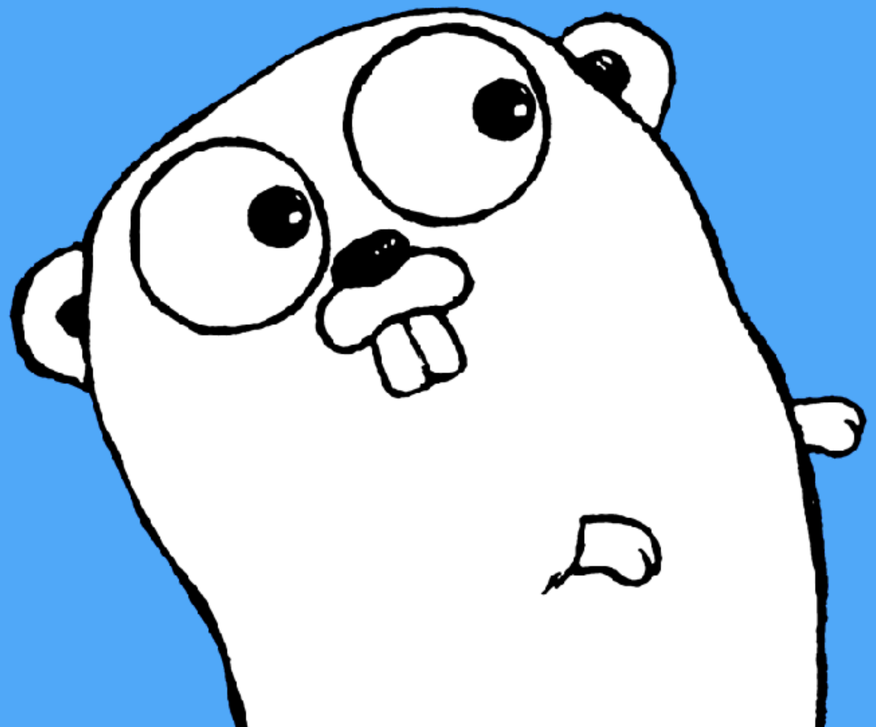
Go



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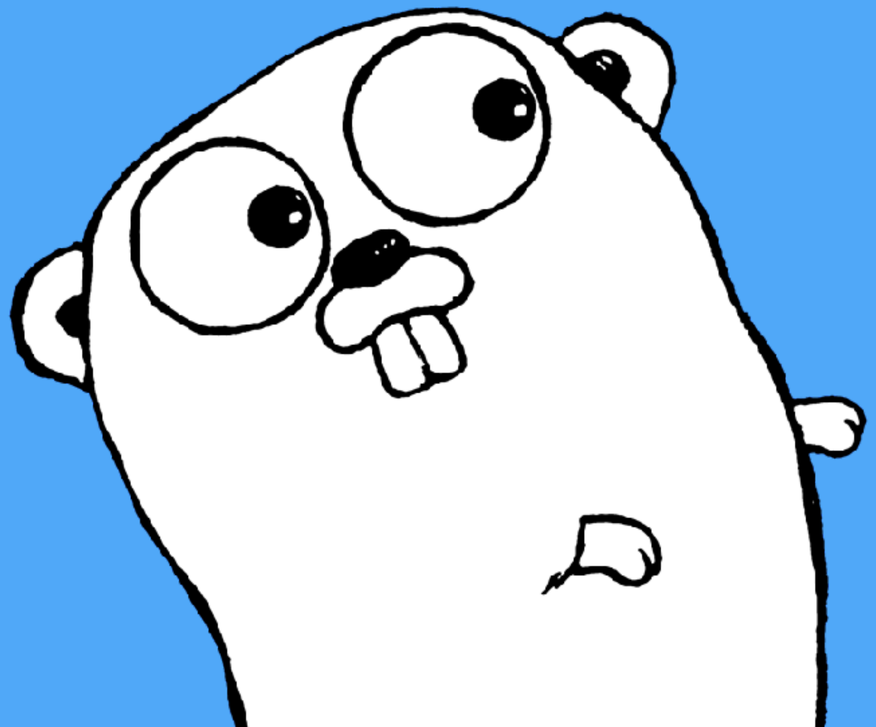
Simple, orthogonal features, that must carry their weight

Simple, orthogonal features, that must carry their weight
Prefer maintainability over expressiveness

Simple, orthogonal features, that must carry their weight
Prefer maintainability over expressiveness
Typing is not so difficult

Gophers



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0: Goals

Make a list of goals for this course
Make a list of your programming experience

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Introduction, Setup & Go Katas
Go Idiosyncrasies
Types Interfaces and Polymorphism
Concurrency and Parallelism
Networking
Packaging and Distribution
Go Nuts

Introduction, Setup & Go Katas
Go Idiosyncrasies
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Introduction, Setup & Go Katas
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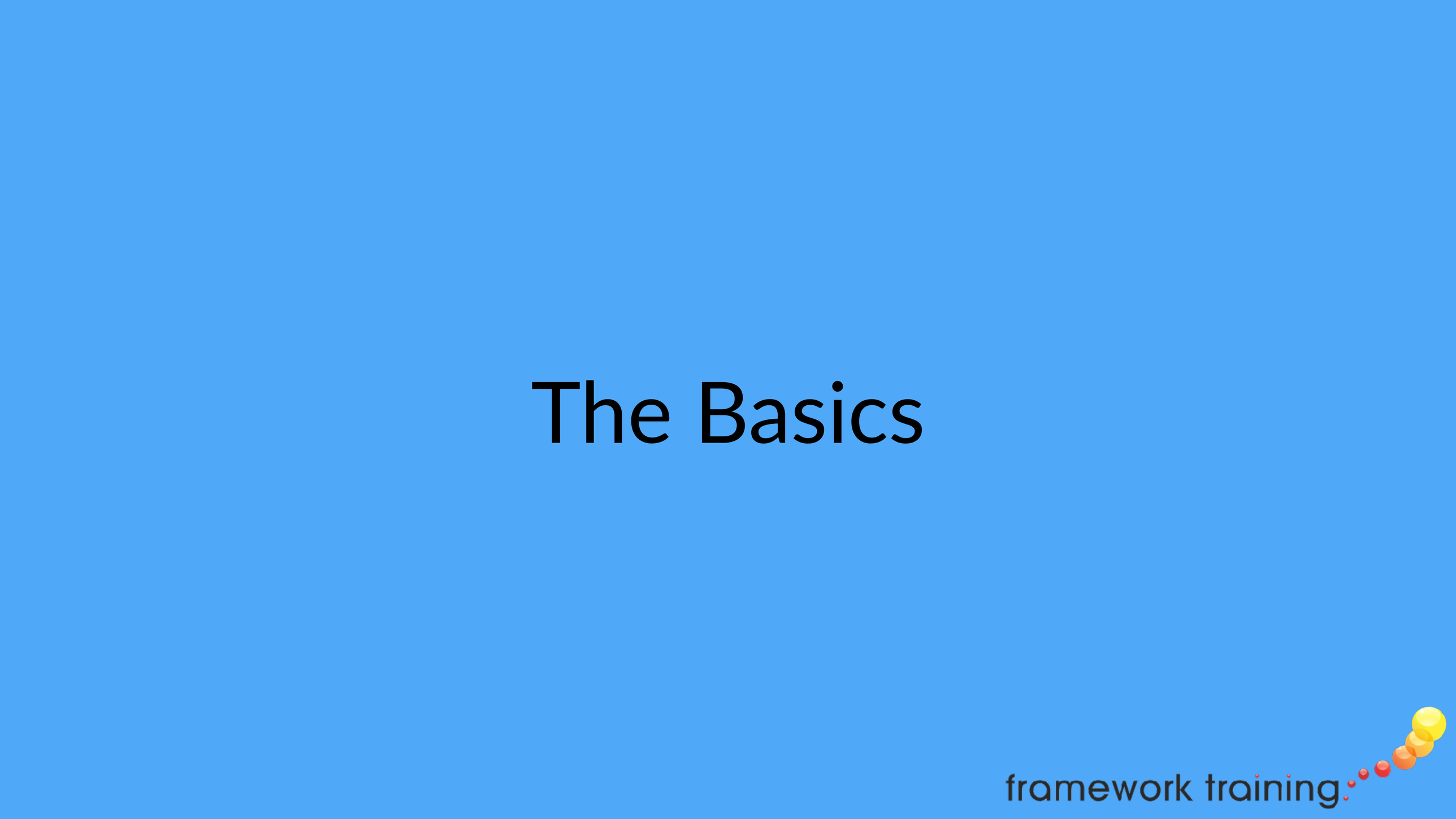
Packaging and Distribution
Go Nuts

The Basics



```
package main

func main() {
    var s string = "Hello"
    println(s)
}
```

```
package main

func main() {
    var s1 string = "Hello"
    var s2 = “World"

    println(s1, s2)
}
```

framework training.

```
package main

func main() {
    var s1 string = "Hello"
    s2 := “World"

    println(s1, s2)
}
```

```
package main

func main() {
    s1, s2 := "Hello", "World"
    println(s1, s2)
}
```

framework training.

```
package main

func main() {
    var (
        s1 = "Hello"
        s2 = "World"
    )
    println(s1, s2)
}
```

bool
byte
uintptr
int, int8, int16, int32, int64
uint, uint8, uint16, uint32, uint64
float32, float64
complex64, complex128
rune, string

```
if a == "A" {
    println("Good")
} else if a == "B" {
    println(“Close enough")
} else {
    println(“Nope!")
}
```

framework training.

```
if a, b := 1, 2; a == b {
    println(a, "equal to", b)
} else {
    println(a, "not equal to", b)
}

// a, b are undefined here
```

framework training.

```
for i := 0; i < 100; i++ {
    println(i)
}
```

framework training.

FizzBuzz

1, 2, Fizz, 4, Buzz, Fizz, 7, 8, 9, Buzz, 11, Fizz, 13, 14, FizzBuzz

If a number is divisible by 3 output Fizz
If a number is divisible by 5 output Buzz
If a number is divisible by 3 and 5 output FizzBuzz
Otherwise output the number

1: FizzBuzz

For the numbers 1 to 100
If a number is divisible by 3 output Fizz
If a number is divisible by 5 output Buzz
If a number is divisible by 3 and 5 output FizzBuzz
Otherwise output the number

https://play.golang.org/

```go
package main

import (
  "fmt"
  "math/rand"
)

func main() {
  for i := 1; i <= 100; i++ {
    if i%15 == 1 {
      rand.Seed(int64(176064004))
    }
    fmt.Println([]string{fmt.Sprintf("%d", i),
      "fizz", "buzz", "fizzbuzz"}[rand.Int63()%4])
  }
}
```

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for i := 1; i <= 100; i++ {
        if i%3 == 0 && i%5 == 0 {
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        } else if i%3 == 0 {
            fmt.Printf("%-5d - %s", i, fizz)
        } else if i%5 == 0 {
            fmt.Printf("%-5d - %s", i, buzz)
        } else {
            fmt.Print(i)
        }
        fmt.Println()
    }
}
```

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EnterpriseQualityCoding / FizzBuzzEnterpriseEdition

Watch 166 | Star 8,086 | Fork 424

Code | Issues 184 | Pull requests 22 | Projects 0 | Wiki | Insights

FizzBuzz Enterprise Edition is a no-nonsense implementation of FizzBuzz made by serious businessmen for serious business purposes. http://www.fizzbuzz.enterprises

161 commits | **1** branch | **0** releases | **30** contributors

Branch: **master** | New pull request | Create new file | Upload files | Find file | Clone or download

emiln committed on **GitHub** Merge pull request #281 from tkellogg/master ··· Latest commit `cdfac75` on 4 Feb

gradle/wrapper	Include Gradle config closes #230	2 years ago
resources/assets/configuration/sp...	Installed spring and restructured for dependency injection.	3 years ago
src	FizzStringReturner may not have copied all characters	8 months ago
.gitattributes	Started the project. Time to learn!	5 years ago
.gitignore	Add unsupported platform files to the .gitignore	2 years ago
.travis.yml	Reverting the revert commit, since it clearly did not revert as inten...	2 years ago
CONTRIBUTING.md	Reverting the revert commit, since it clearly did not revert as inten...	2 years ago
README.md	Reverting the revert commit, since it clearly did not revert as inten...	2 years ago
build.gradle	Include Gradle config closes #230	2 years ago
gradlew	Include Gradle config closes #230	2 years ago
gradlew.bat	Include Gradle config closes #230	2 years ago
pom.xml	Merge pull request #232 from kristianperkins/patch-1	a year ago
settings.gradle	Include Gradle config closes #230	2 years ago

```go
package main

import (
  "fmt"
  "math/rand"
)

func main() {
  for i := 1; i <= 100; i++ {
    if i%15 == 1 {
      rand.Seed(int64(176064004))
    }
    fmt.Println([]string{fmt.Sprintf("%d", i),
      "fizz", "buzz", "fizzbuzz"}[rand.Int63()%4])
  }
}
```

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for i := 1; i <= 100; i++ {
        if i%3 == 0 && i%5 == 0 {
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        } else if i%3 == 0 {
            fmt.Printf("%-5d - %s", i, fizz)
        } else if i%5 == 0 {
            fmt.Printf("%-5d - %s", i, buzz)
        } else {
            fmt.Print(i)
        }
        fmt.Println()
    }
}
```

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for i := 1; i <= 100; i++ {
        switch {
        case i%3 == 0 && i%5 == 0:
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        case i%3 == 0:
            fmt.Printf("%-5d - %s", i, fizz)
        case i%5 == 0:
            fmt.Printf("%-5d - %s", i, buzz)
        default:
            fmt.Print(i)
        }

        fmt.Println()
    }
}
```

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```
switch i {
case 1:
    println("One")
case 2:
    println(“A couple")
default:
    println("Many")
}
```

framework training.

```
switch i {
case 1:
    println(“One")
case 2, 3, 4, 5:
    println("Some")
default:
    println("Many")
}
```

```
switch {
case i == 1:
    println(“One")
case i <= 5:
    println("Some")
default:
    println("Many")
}
```

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Go Is Opinionated

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Go Is Opinionated

Go is not a language to express your inner artist

Go Is Opinionated

Go is not a language to express your inner artist
There is [almost] always one idiomatic way to do something

framework training.

Go Is Opinionated

Go is not a language to express your inner artist
There is [almost] always one idiomatic way to do something
There is only one way to format your code: `go fmt`

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for i := 1; i <= 100; i++ {
        switch {
        case i%3 == 0 && i%5 == 0:
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        case i%3 == 0:
            fmt.Printf("%-5d - %s", i, fizz)
        case i%5 == 0:
            fmt.Printf("%-5d - %s", i, buzz)
        default:
            fmt.Print(i)
        }

        fmt.Println()
    }
}
```

framework training.

go vet
goimports
golint

go get setup

2: FizzBuzz Binary

For the numbers 1 to 100
If a number is divisible by 3 output Fizz
If a number is divisible by 5 output Buzz
If a number is divisible by 3 and 5 output FizzBuzz
Otherwise output the number

Run your program as a compiled binary from the command line

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for i := 1; i <= 100; i++ {
        txt := ""

        if i%3 == 0 {
            txt += fizz
        }

        if i%5 == 0 {
            txt += buzz
        }

        fmt.Printf("%-5d - %s\n", i, txt)
    }
}
```

framework training.

```go
package main

import "fmt"

var pattern = []int{0, 0, 1, 0, 2, 1, 0, 0, 1, 2, 0, 1, 0, 0, 3}

func main() {
  for i := 1; i <= 100; i++ {
    fmt.Println([]string{fmt.Sprintf("%d", i),
      "fizz", "buzz", "fizzbuzz"}[pattern[(i-1)%15]])
  }
}
```

framework training.

loops

```
for i := 0; i < 100; i++ {
    println(i)
}
```

framework training.

```
i := 0
for i < 100 {
    i++
}
```

framework training.

```
for true {
    println("spam")
}
```

framework training.

```
for {
    println("spam")
}
```

framework training.

```
for i := range []int{1, 1, 2, 3, 5, 8} {
    println(i)
}
```

```
for _, v := range []int{1, 1, 2, 3, 5, 8} {
    println(v)
}
```

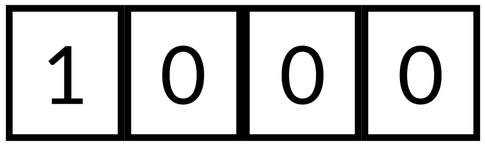
```
m := map[string]int{
    "one": 1,
    "two": 2,
}

for k, v := range m {
    println(k, v)
}
```

framework training.

Arrays and Slices

```
var a [4]int
a[0] = 1
```



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```
a := [2]int{1, 2}
b := [4]int{1, 2}
c := [...]int{1, 2}
```

framework training.

```
var a []int // read "slice of int"
a = append(a, 123)
a = append(a, 456)
```

framework training.

```
a := []int{123, 456, 789}

fmt.Printf("%v\n", a[0])
a[1] = 555
fmt.Printf("%v\n", a[1:])
fmt.Printf("%v\n", a[:1])
fmt.Printf("%v\n", a[1:2])
```

framework training.

```
a := [][]int{
    []int{1, 2, 3},
    []int{4, 5},
    []int{6, 7, 8, 9},
}

a = append(a, []int{10, 11, 12})
```

framework training.

```
a := [][]int{
    {1, 2, 3},
    {4, 5},
    {6, 7, 8, 9},
}

a = append(a, []int{10, 11, 12})
```

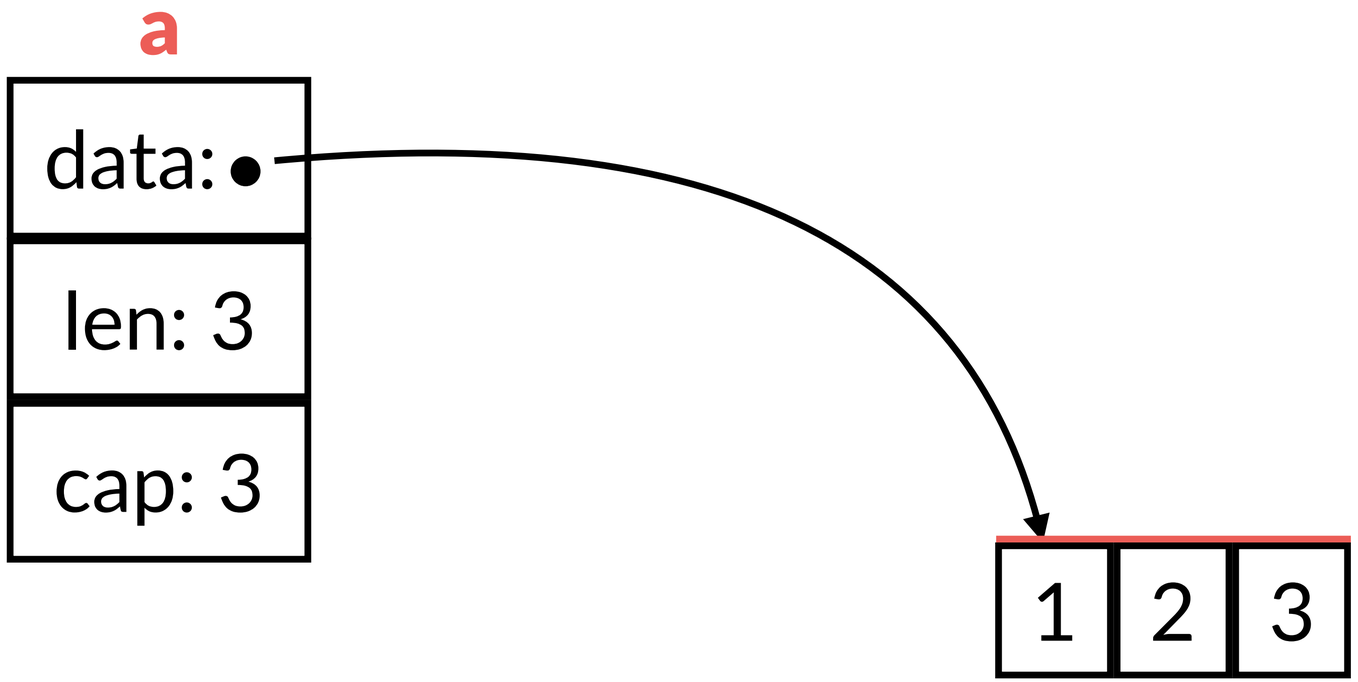
framework training.

```
a := make([]int, 5)
a[3] = 123 // OK
a = append(a, 456)

b := make([]int, 0, 5)
b[3] = 123 // panic!
b = append(b, 789)
```

Slice Implementation

```
a := []int{1, 2, 3}
```



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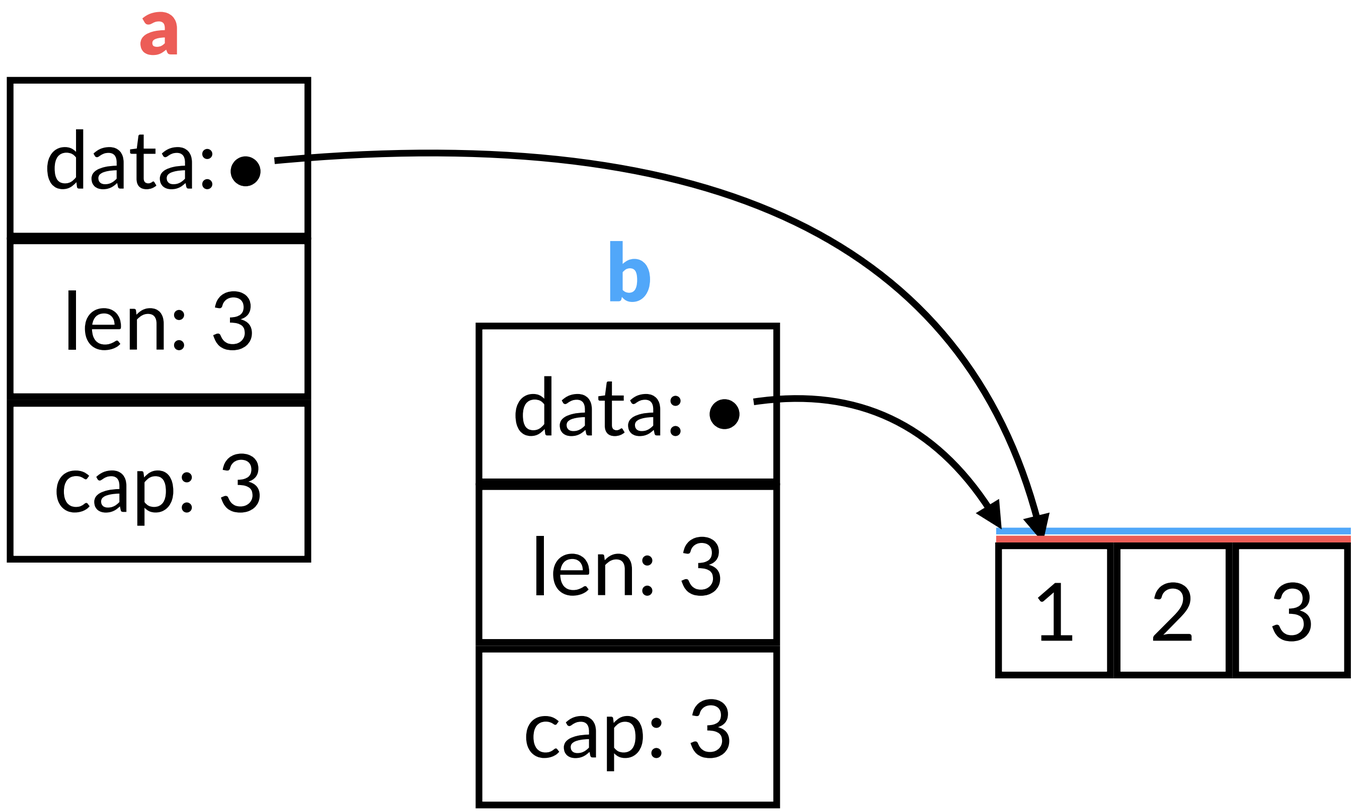
Slice Implementation

```
a := []int{1, 2, 3}
b := a
```



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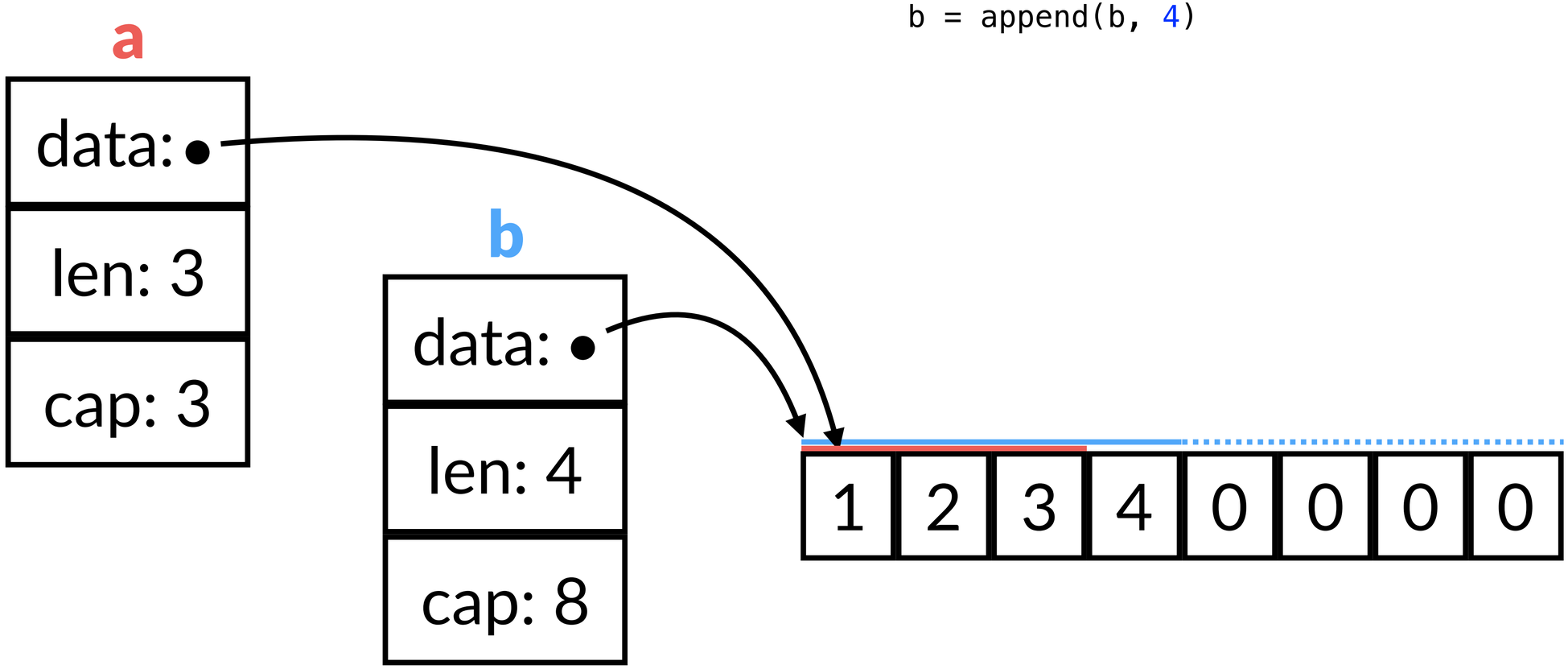
Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
```



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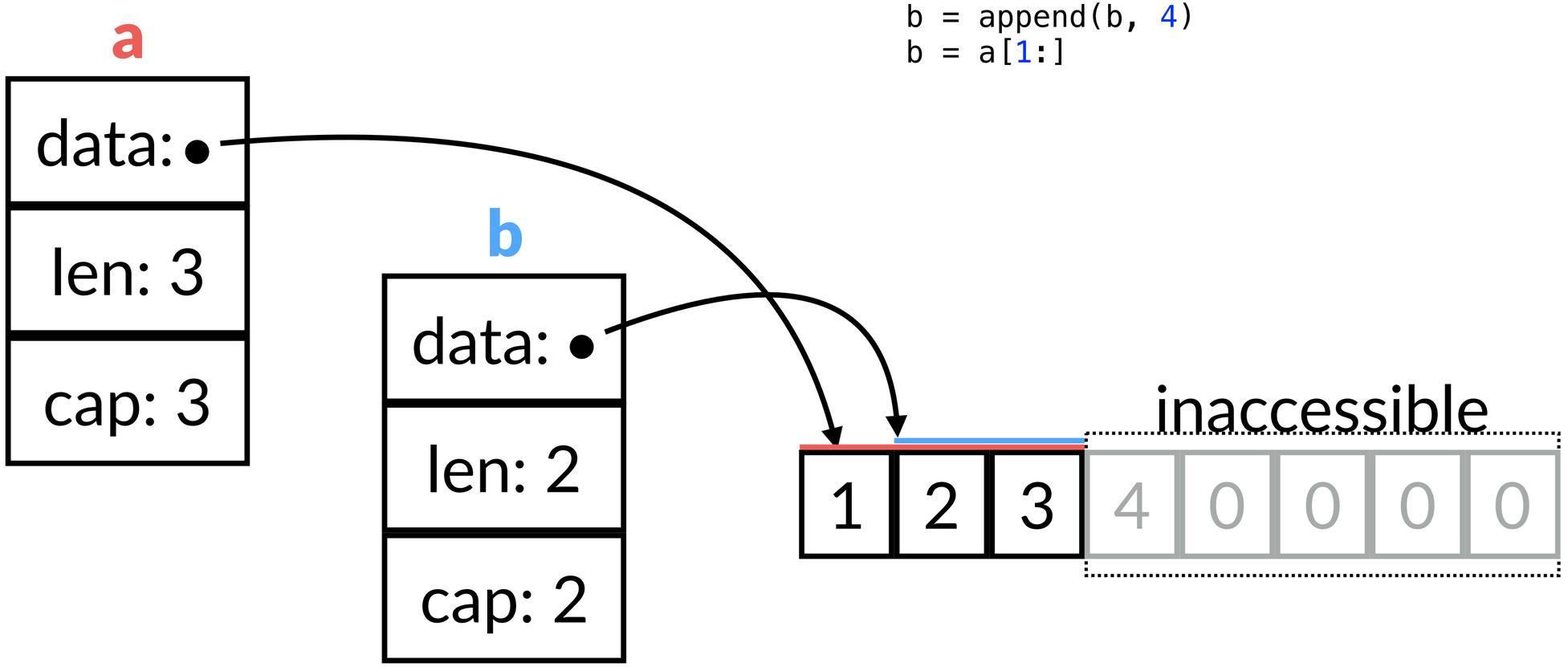
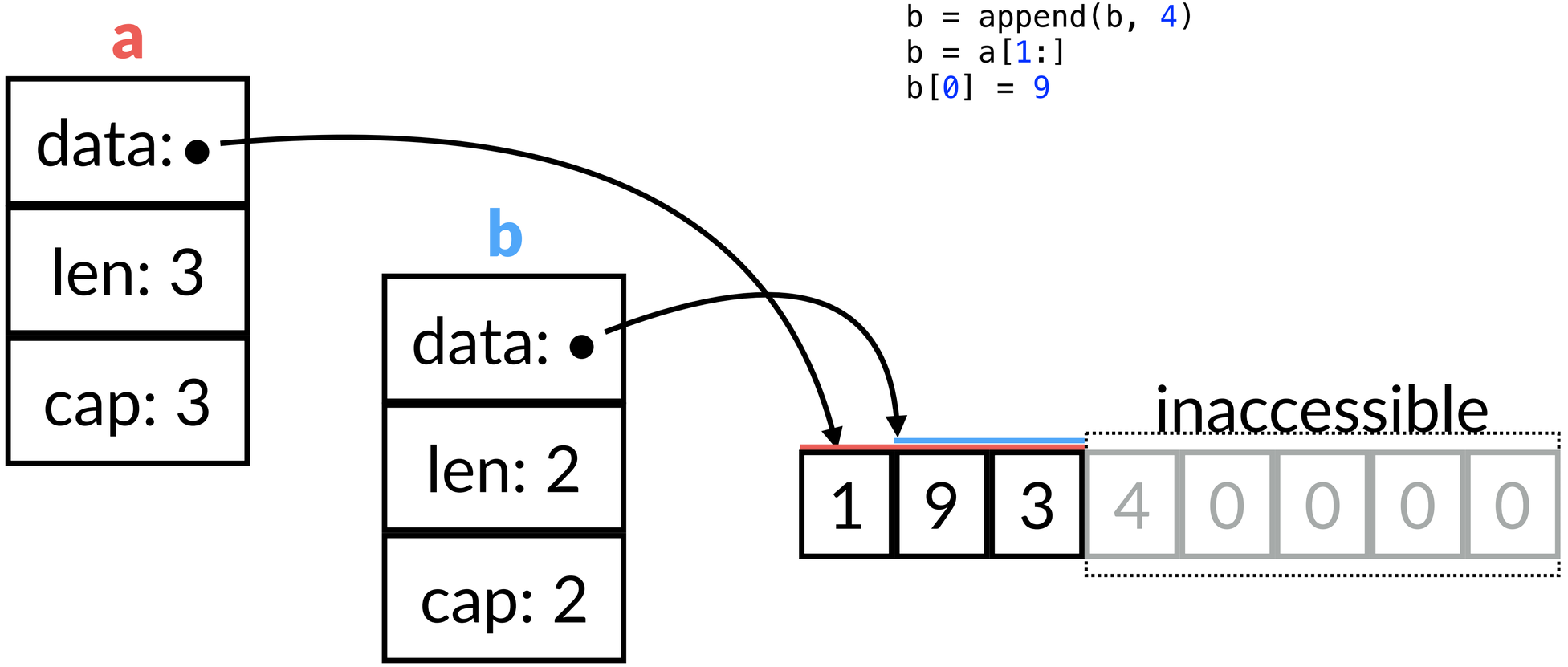
Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
b = a[1:]
```



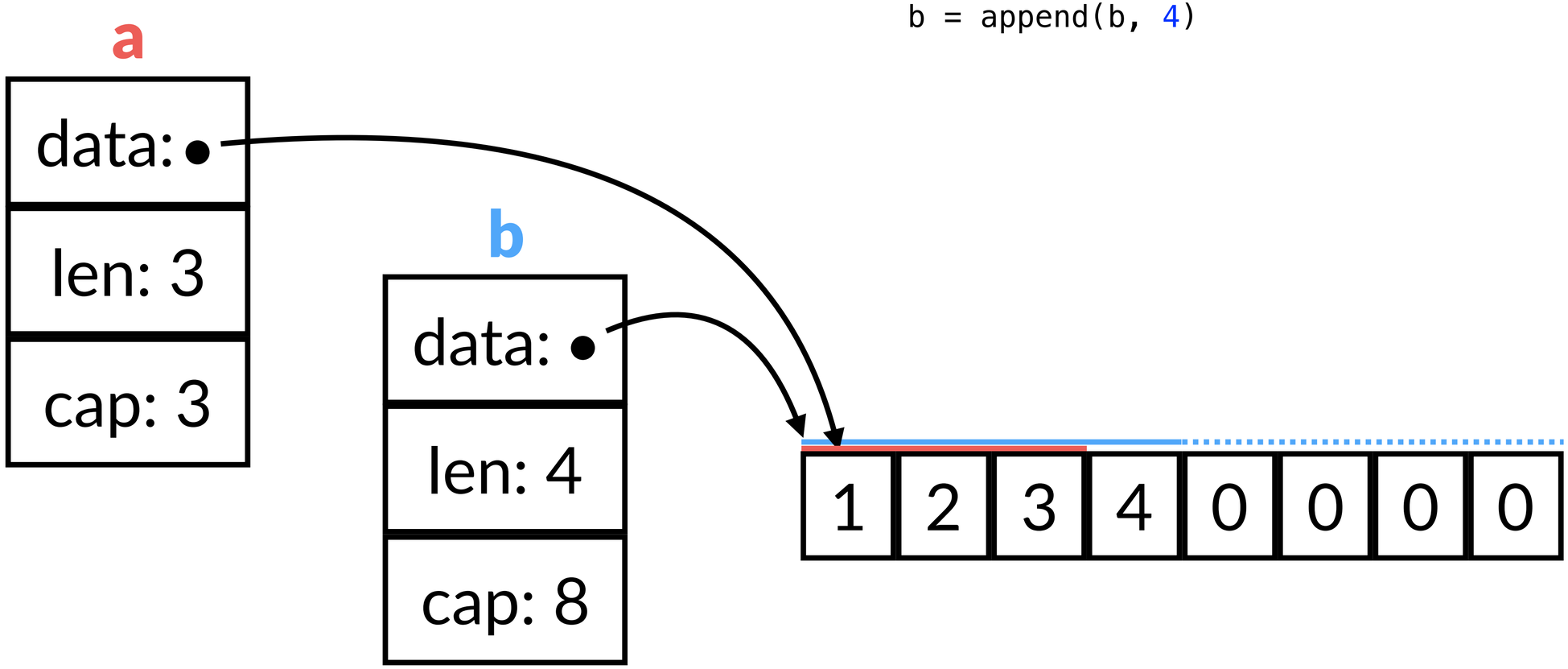
Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
b = a[1:]
b[0] = 9
```



Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
```



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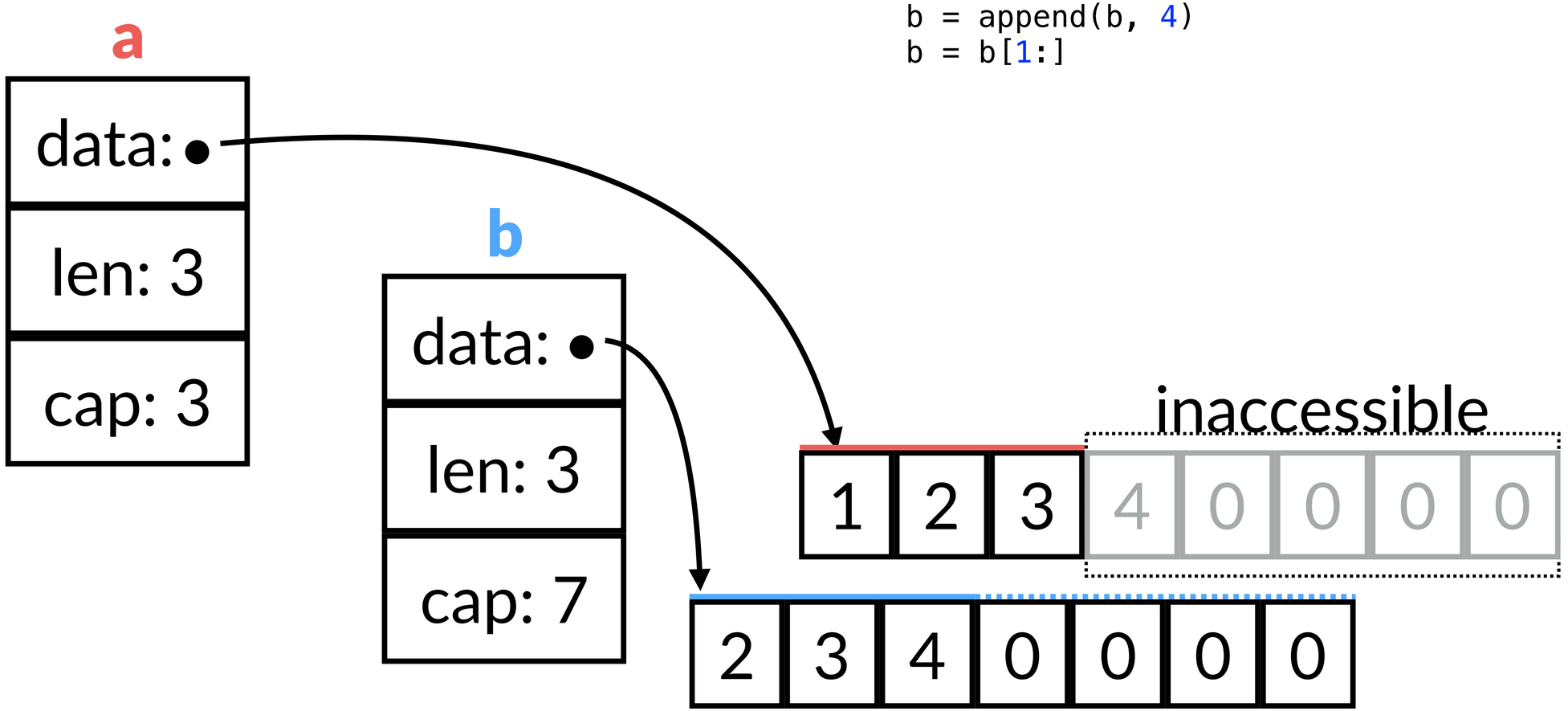
Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
b = b[1:]
```



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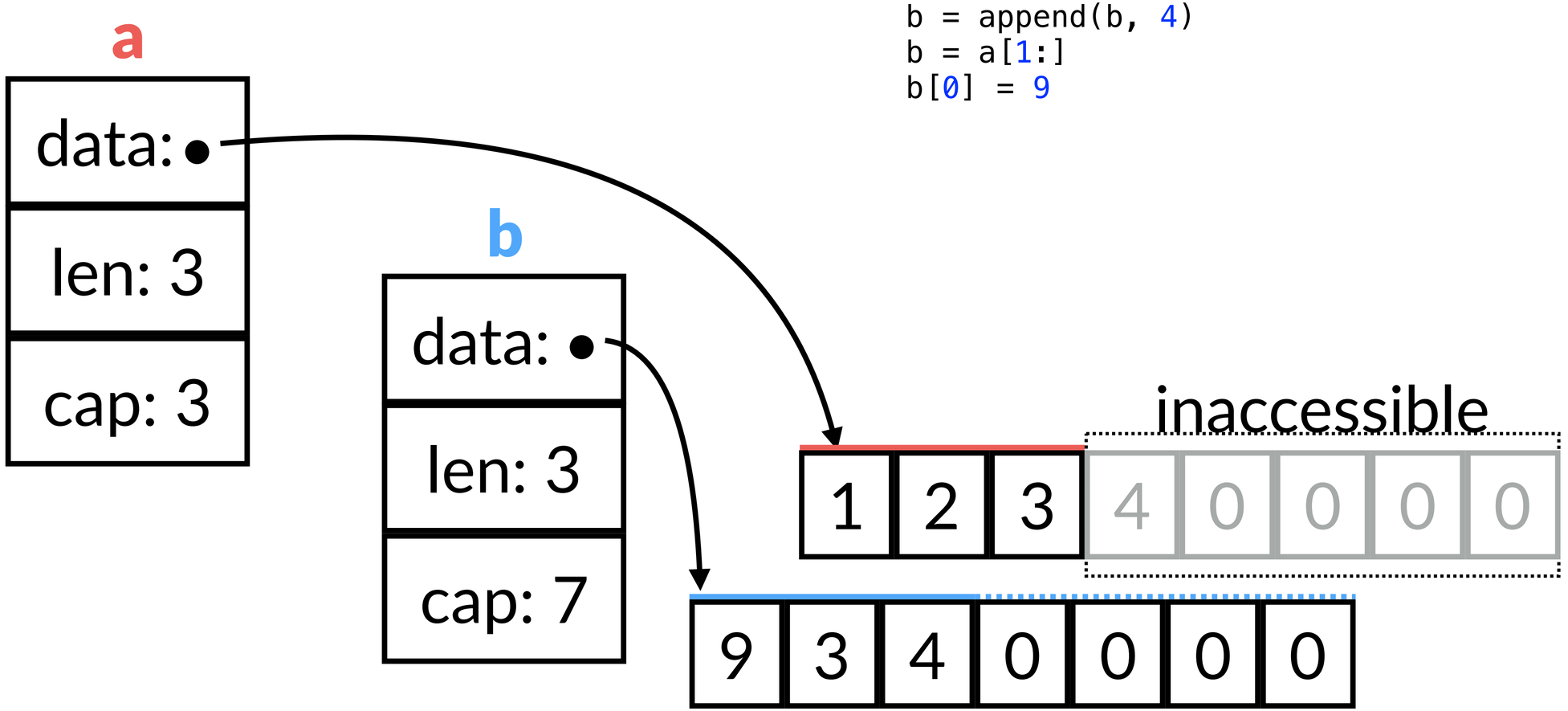
Slice Implementation

```
a := []int{1, 2, 3}
b := a
b = append(b, 4)
b = a[1:]
b[0] = 9
```



framework training.

```
for _, v := range []int{1, 1, 2, 3, 5, 8} {
    println(v)
}
```

3: Partial FizzBuzz

For the numbers 1, 2, 4, 5, 6, 7, 8, 10, 21, 42
If a number is divisible by 3 output Fizz
If a number is divisible by 5 output Buzz
If a number is divisible by 3 and 5 output FizzBuzz
Otherwise output the number

Run your program as a compiled binary from the command line

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    for _, i := range []int{1, 2, 4, 5, 6, 7, 8, 15, 21, 42} {
        switch {
        case i%3 == 0 && i%5 == 0:
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        case i%3 == 0:
            fmt.Printf("%-5d - %s", i, fizz)
        case i%5 == 0:
            fmt.Printf("%-5d - %s", i, buzz)
        default:
            fmt.Print(i)
        }

        fmt.Println()
    }
}
```

framework training.

4: FizzBuzz Function

For an arbitrary set of integers
If a number is divisible by 3 output Fizz
If a number is divisible by 5 output Buzz
If a number is divisible by 3 and 5 output FizzBuzz
Otherwise output the number

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    fizzbuzz([]int{1, 2, 4, 5, 6, 7, 8, 15, 21, 42})
}

func fizzbuzz(values []int) {
    for _, i := range values {
        switch {
        case i%3 == 0 && i%5 == 0:
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        case i%3 == 0:
            fmt.Printf("%-5d - %s", i, fizz)
        case i%5 == 0:
            fmt.Printf("%-5d - %s", i, buzz)
        default:
            fmt.Print(i)
        }

        fmt.Println()
    }
}
```

framework training.

```go
package main

import "fmt"

const (
    fizz = "Fizz"
    buzz = "Buzz"
)

func main() {
    fizzbuzz(1, 2, 4, 5, 6, 7, 8, 15, 21, 42)
}

func fizzbuzz(values ...int) {
    for _, i := range values {
        switch {
        case i%3 == 0 && i%5 == 0:
            fmt.Printf("%-5d - %s%s", i, fizz, buzz)
        case i%3 == 0:
            fmt.Printf("%-5d - %s", i, fizz)
        case i%5 == 0:
            fmt.Printf("%-5d - %s", i, buzz)
        default:
            fmt.Print(i)
        }

        fmt.Println()
    }
}
```

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Pointers

Maps

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```
var m map[string]int
m["A"] = 1
```

framework training.

```
nil
```

framework training.

```
var m map[string]int = make(map[string]int)
m["A"] = 1
```

framework training.

```
m := make(map[string]int)
m["A"] = 1
```

framework training.

```
m := map[string]int{}
m["A"] = 1
```

framework training.

```
m := make(map[string]int, 100)
m["A"] = 1
```

framework training.

```
m := map[string]int{
    "A": 1,
}
```

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MapType = "map" "[" **KeyType** "]" ElementType

"The comparison operators == and != must be fully defined for operands of the key type; thus the key type must not be a function, map, or slice."

https://golang.org/doc/ref#KeyType

framework training.

```
m := map[string]int{
    "A": 1,
}

println(m["A"])
```

framework training.

```
m := map[string]int{
    "A": 1,
}

println(m["B"])
```

framework training.

```
m := map[string]int{
    "A": 1,
}

i, ok := m["B"]
println(i, ok)
```

framework training.

```
m := map[string]int{
    "A": 0,
}

_, ok := m["A"]
println(ok)
```

```
m := map[string]int{
    "A": 1,
}
delete(m, "A")
```

framework training.

```
m := map[int]string{
    1: "A",
    2: "B",
    3: "C",
}

for k := range m {
    println(k)
}
```

framework training.

```
m := map[int]string{
    1: "A", 2: "B", 3: "C"}

for k := range m {
    println(k)
}
```

framework training.

```
func main() {
    m := map[int]string{
        1: "A", 2: "B", 3: "C"}

    for k, v := range m {
        println(k, v)
    }
}
```

```
m := map[int]string{
    1: "A", 2: "B", 3: "C"}

for k := range m {
    if k%2 == 0 {
        delete(m, k)
    }
}
```

framework training.

The iteration order over maps is not specified and is not guaranteed to be the same from one iteration to the next. If map entries that have not yet been reached are **removed during iteration**, the corresponding iteration values will not be produced. If map entries are **created during iteration**, that entry may be produced during the iteration or may be skipped. The choice may vary for each entry created and from one iteration to the next. If the map is nil, the number of iterations is 0.

5: FizzBuzz Results

For an arbitrary set of integers return a map such that
The key is the integer
If a number is divisible by 3 the value is Fizz
If a number is divisible by 5 the value is Buzz
If a number is divisible by 3 and 5 the value FizzBuzz
Otherwise the value is the number
Output the map

```go
func main() {
    for k, v := range fizzbuzz(1, 2, 4, 5, 6, 7, 8, 15, 21, 42) {
        println(k, v)
    }
}

func fizzbuzz(values ...int) map[int]string {
    m := make(map[int]string, len(values))

    for _, i := range values {
        switch {
        case i%3 == 0 && i%5 == 0:
            m[i] = fmt.Sprintf("%s%s", fizz, buzz)
        case i%3 == 0:
            m[i] = fizz
        case i%5 == 0:
            m[i] = buzz
        default:
            m[i] = fmt.Sprintf("%d", i)
        }
    }

    return m
}
```

framework training.

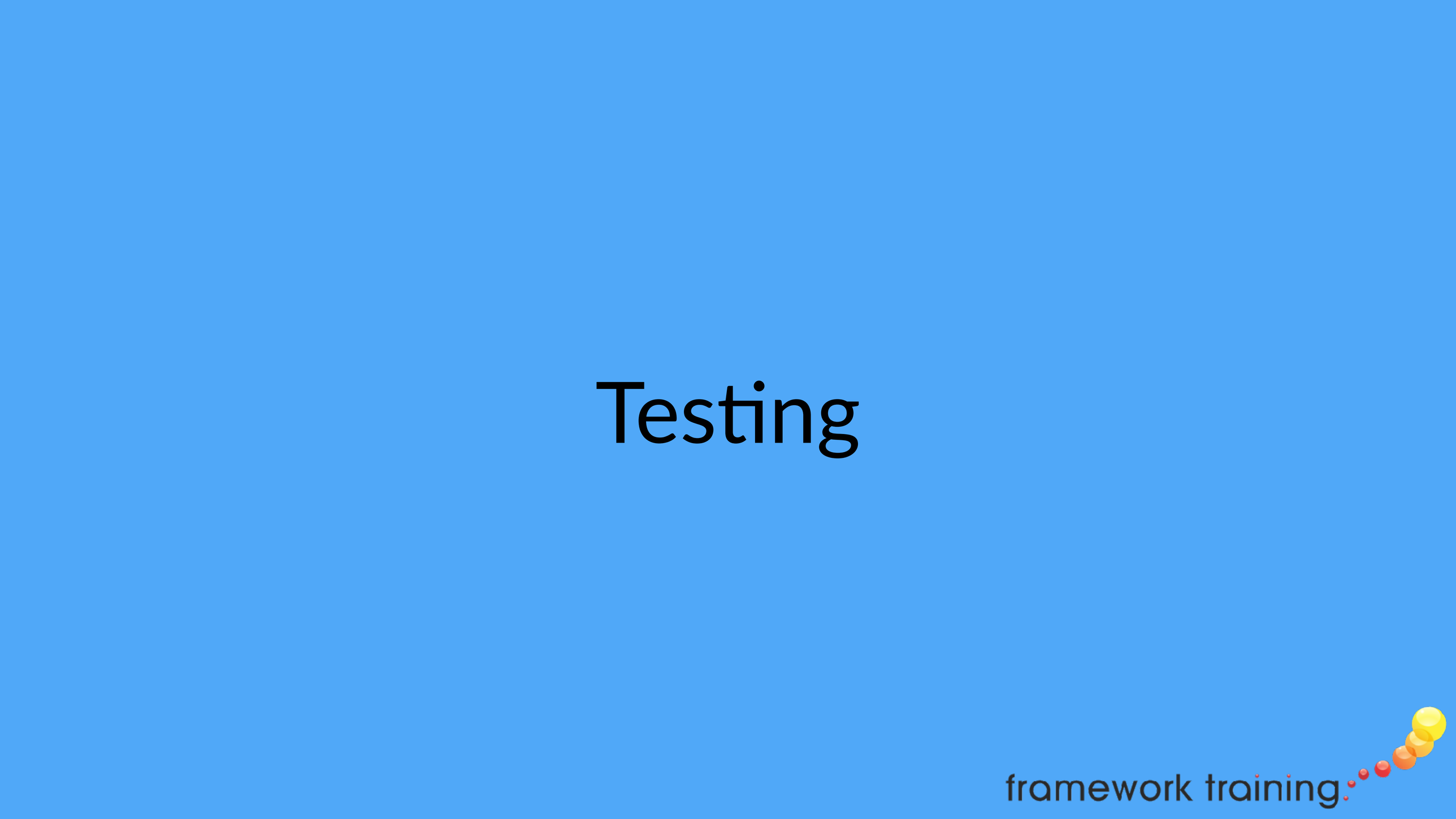
```go
func main() {
    for k, v := range fizzbuzz(1, 2, 4, 5, 6, 7, 8, 15, 21, 42) {
        println(k, v)
    }
}

func fizzbuzz(values ...int) map[int]string {
    m := make(map[int]string, len(values))

    for _, i := range values {
        switch {
        case i%3 == 0 && i%5 == 0:
            m[i] = fmt.Sprintf("%s%s", fizz, buzz)
        case i%3 == 0:
            m[i] = fizz
        case i%5 == 0:
            m[i] = buzz
        default:
            m[i] = strconv.Itoa(i)
        }
    }

    return m
}
```

framework training.

```go
func main() {
    for k, v := range fizzbuzz(1, 2, 4, 5, 6, 7, 8, 15, 21, 42) {
        println(k, v)
    }
}

func fizzbuzz(values ...int) map[int]string {
    m := make(map[int]string, len(values))

    for _, i := range values {
        switch {
        case i%3 == 0 && i%5 == 0:
            m[i] = fmt.Sprintf("%s%s", fizz, buzz)
        case i%3 == 0:
            m[i] = fizz
        case i%5 == 0:
            m[i] = buzz
        default:
            m[i] = strconv.Itoa(i)
        }
    }

    return m
}
```

framework training.

Testing



6: Testing FizzBuzz

Write `fizzbuzz(int) string`
Create a test suite for the function

framework training.

Go Convey

func

framework training.

```
package main

func main() {
    println("Hello, World!")
}
```

framework training.

```
package main

func main() {
    hello()
}

func hello() {
    println("Hello, World!")
}
```

framework training.

```
package main

func main() {
    hello("World!")
}

func hello(n string) {
    println("Hello,", n)
}
```

framework training.

```
package main

func main() {
    println(square(3))
}

func square(i int) int {
    return i * i
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (int, int) {
    i := x / y
    r := x % y

    return i, r
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (i int, r int) {
    i = x / y
    r = x % y

    return
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (i int, r int) {
    i = x / y
    r = x % y

    return i, r
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (i, r int) {
    i = x / y
    r = x % y

    return i, r
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (i, r int) {
    i, r = x/y, x%y
    return i, r
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 2)
    println(i, r)
}

func divide(x, y int) (int, int) {
    return x/y, x%y
}
```

framework training.

```
package main

func main() {
    i, r := divide(5, 0)
    println(i, r)
}

func divide(x, y int) (int, int) {
    return x/y, x%y
}
```

framework training.

Error Handling

framework training.

```go
package main

import "errors"

func main() {
    i, r, err := divide(0, 5)
    println(i, r, err)
}

func divide(x, y int) (int, int, error) {
    if y == 0 {
        return 0, 0, errors.New("divide by zero")
    }
    return x / y, x % y, nil
}
```

framework training.

```go
func main() {
    r, err := f()

    if err != nil {
        println(err)
    }

    println(r)
}

func f() (int, error) {
    if someCondition {
        return 0, errors.New("some error condition has occurred")
    }

    return 1, nil
}
```

framework training.

```go
func main() {
    if r, err := f(); err != nil {
        println(err)
    } else {
        println(r)
    }
}

func f() (int, error) {
    if someCondition {
        return 0, errors.New("some error condition has occurred")
    }

    return 1, nil
}
```

framework training.

"Values can be programmed, and since errors are values, errors can be programmed."

https://blog.golang.org/errors-are-values

```
scanner := bufio.NewScanner(input)
for scanner.Scan() {
    token := scanner.Text()
    // process token
}
if err := scanner.Err(); err != nil {
    // process the error
}
```

```
scanner := bufio.NewScanner(input)
for scanner.Scan() {
    token := scanner.Text()
    if err := scanner.Err(); err != nil {
        // process the error, or maybe break
    }
    // process token
}
```

```
var (
    CustomError = errors.New("some custom error")
    DivideByZero = errors.New("divide by zero")
)
```

framework training.

```
var (
    TryAgain = errors.New("try again")
    SlowDown = errors.New("slow down")
)

func main() {
    for {
        switch err := doSomething(); err {
        case nil:
            break
        case TryAgain:
            continue
        case SlowDown:
            time.Sleep(1 * time.Second)
        default:
            return err // give up
        }
    }
}
```

framework training.

defer

framework training.

```
package main

func main() {
    defer println("goodbye")
    println("hello")
}
```

framework training.

```
func main() {
    f, err := os.Open("/etc/passwd")
    if err != nil {
        log.Fatal(err)
    }
    defer f.Close()
    // use f
}
```

```
func main() {
    defer println("one")
    println("two")
    defer println("three")
}
```

framework training.

```
package main

func main() {
    i := 1
    defer println(i)
    i++
    defer println(i)
    println(i)
}
```

framework training.

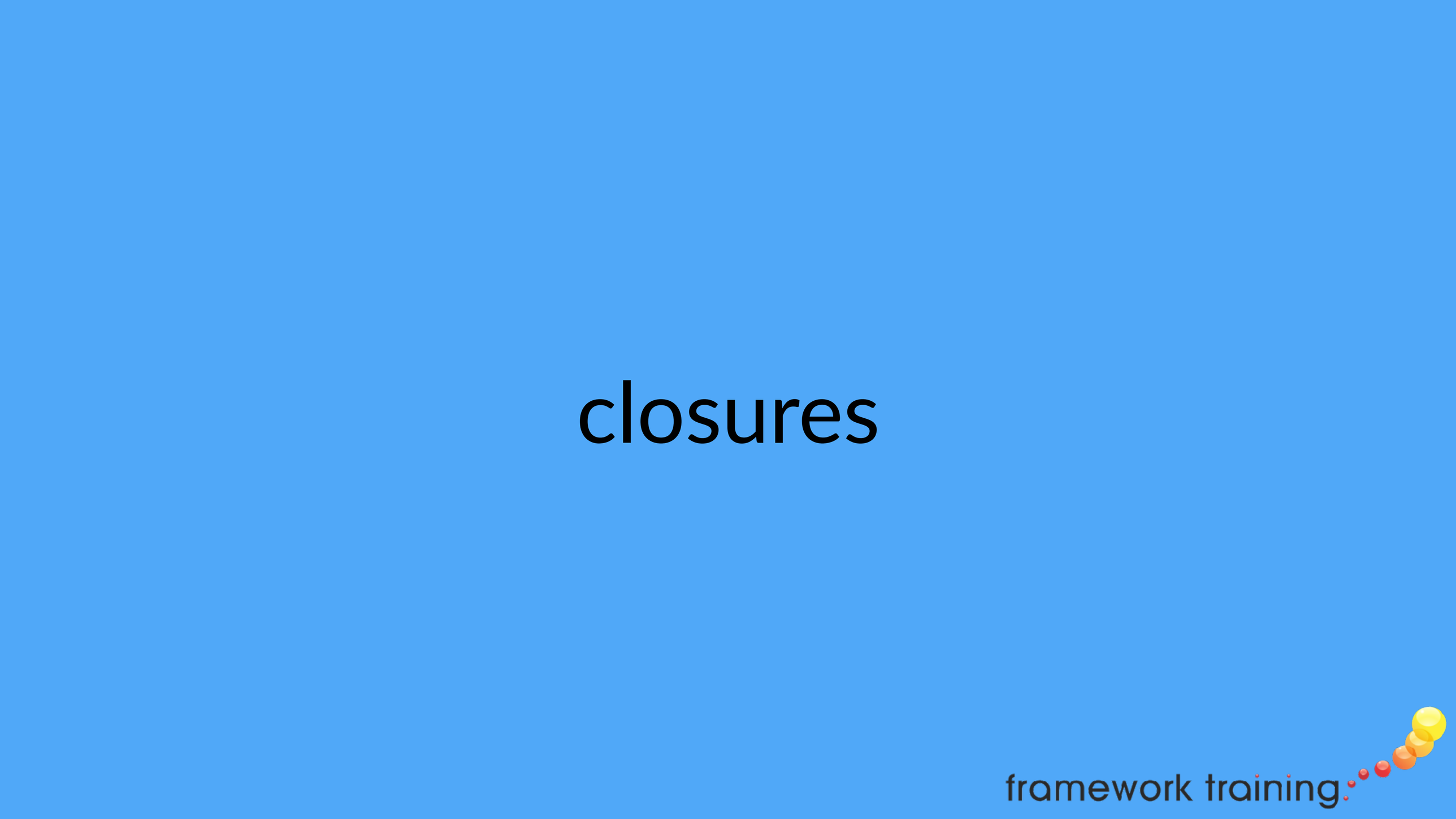
```go
package main

func main() {
    for i := 0; i < 5; i++ {
        println("open file", i)
        defer println("close file", i)
        println("use file", i)
    }
}
```

framework training.

7: Deferred FizzBuzz

Iterate though a set of numbers, deferring the call to FizzBuzz
Output the result in the call to defer

closures



```
func main() {
    a := func() int { return 123 }
    b := func() int { return 123 }()
}
```

```
func apply(f func(int) int, i int) int {
    return f(i)
}

func main() {
    double := func(x int) int { return x+x }
    square := func(x int) int { return x*x }
    i := apply(double, apply(square, 3))
    println(i)
}
```

framework training.

```
func apply(f func(int) int, i int) int {
    return f(i)
}

func main() {
    i := apply(func(x int) int { return x+x }, 3)
    println(i)
}
```

framework training.

```
func apply(f func(int) int, i int) int {
    return f(i)
}

func main() {
    n := 123
    f := func(x int) int { return n }
    i := apply(f, 3)
    println(i)
}
```

framework training.

8: FizzBuzz Closures

Iterate though a set of numbers
Pass the number to a fizz closure
Pass the number to a buzz closure
Pass the number to a number closure
Have the program output FizzBuzz
Verify through testing

```go
package main

import (
    "strconv"
    "fmt"
)

const (
    Fizz = "Fizz"
    Buzz = "Buzz"
)

var fizz func(int) string = func(i int) string {
    if i%3 == 0 {
        return Fizz
    }

    return ""
}

var buzz func(int) string = func(i int) string {
    if i%5 == 0 {
        return Buzz
    }

    return ""
}
```

```go
var number func(int) string = func(i int) string
{
    if i%3 != 0 && i%5 != 0 {
        return strconv.Itoa(i)
    }

    return ""
}

func main() {
    for _, i := range []int{1, 2, 4, 5, 6, 7, 8,
15, 21, 42} {
        fmt.Printf("%d - %s%s%s\n", i, fizz(i),
buzz(i), number(i))
    }
}
```

framework training.

Panic and Recover

```
package main

func foo() {
    panic("kaboom")
}

func main() {
    foo()
    println("hello")
}
```

framework training.

```
func foo() {
    defer func() {
        if x := recover(); x != nil {
            fmt.Printf("recovered: %v\n", x)
        }
    }()
    panic("kaboom")
}
```

framework training.

Don't Panic!

Packages

```
package main

func main() {
    println("Hello, world!")
}
```

framework training.

```
package foo

func bar() {
    println("Hello, world!")
}
```

framework training.

```
package foo

func bar() {
    println("Hello, world!")
}

func Bar() {
    println("Hello, world!")
}
```

```
package foo

func bar() {
    println("Hello, world!")
}

func Bar() {
    bar()
}
```

framework training.

```
package foo

var Hello = "Hello"
const World = "World"
var internal = "foo"
```

framework training.

```go
package main

import "fmt"

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

framework training.

```
package main

import (
    "fmt"
    "time"
)

func main() {
    fmt.Printf("The time is now: %s", time.Now())
}
```

framework training.

```go
package main

import (
    "fmt"
    stdtime "time"
)

func main() {
    fmt.Printf("The time is now: %s", stdtime.Now())
}
```

framework training.

```go
package main

import (
    "fmt"
    _ "github.com/go-mysql/mysql"
)

func main() {
    // ...
}
```

framework training.

```
package main

import (
    "fmt"
    . "time"
)

func main() {
    fmt.Printf("The time is now: %s", Now())
}
```

framework training.

Creating Packages

framework training.

framework training.

godoc

9: Roman Numerals

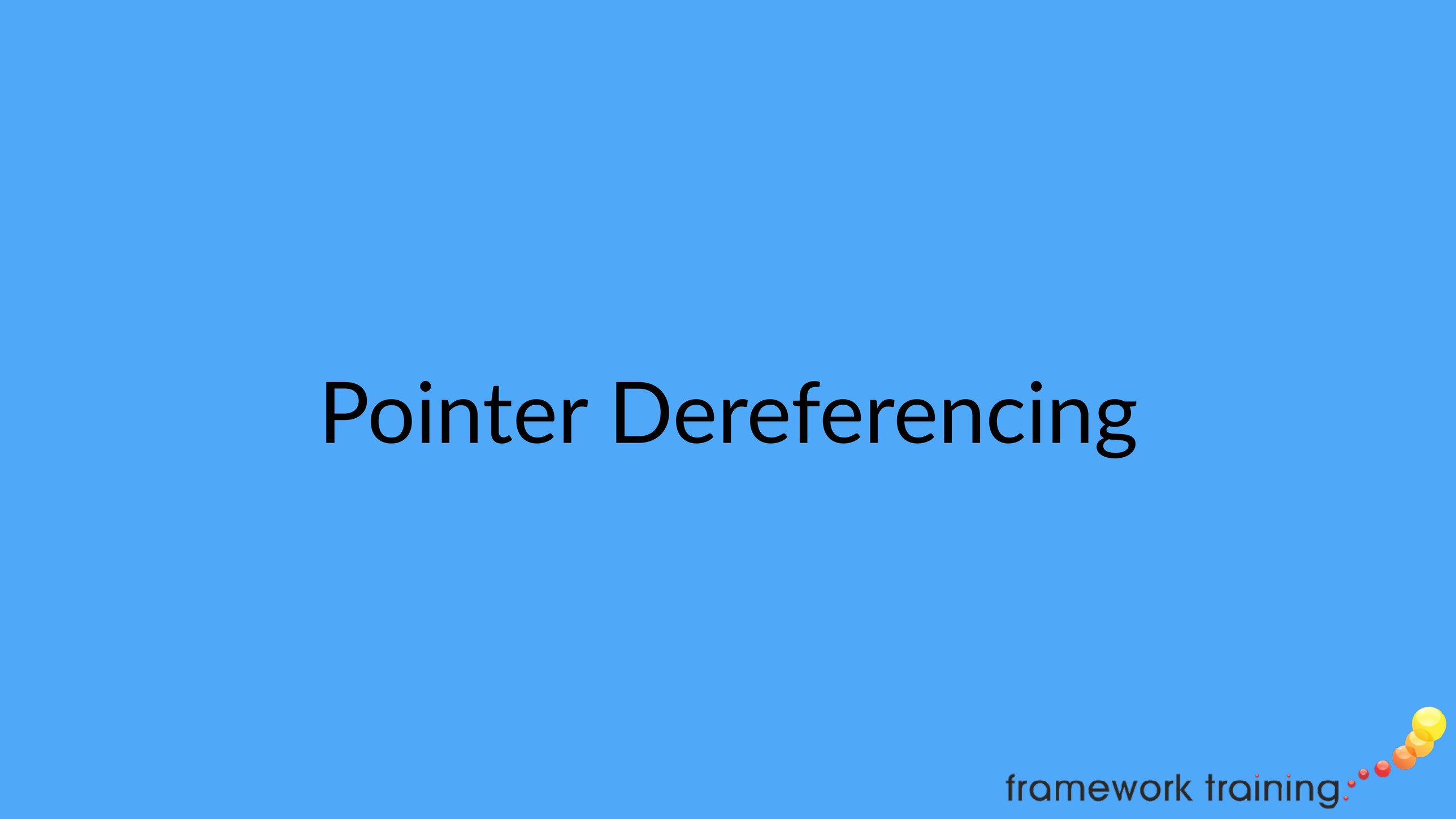
Create a package to handle Roman numerals
Allow conversion from int to Roman numeral string
Allow conversion from Roman numeral string to int
Should be fully documented
Should be fully tested
Bonus: Allow mathematical functions on Roman numerals

framework training.

go get

```
$ go get github.com/domdavis/foo

# roughly equivalent to...

$ cd $GOPATH/src/github.com/domdavis
$ git clone https://github.com/domdavis/foo
$ go install github.com/domdavis/foo
```

Pointer Dereferencing



```
foo := &[]int{1, 2, 3}
// bar := &foo[1]
// bar := *foo[1]
bar := *foo
println(bar[1])
```

framework training.

types

framework training.

```go
package main

type name string
type username string

func main() {
    n := name("Dom")
    u := username("davisd")

    if n == u { // compile error
        println("Items match!")
    }
}
```

```go
package main

type name string
type username string

func main() {
    n := name("Dom")
    u := username("davisd")

    if n == name(u) { // fixed
        println("Items match!")
    }
}
```

framework training.

```
package main

type name string
type username string

func main() {
    n := name("Dom")
    u := username("davisd")

    if username(n) == u {
        println("Items match!")
    }
}
```

```
package main

type name string
type username string

func main() {
    n := name("Dom")
    u := username("davisd")

    if string(n) == string(u) {
        println("Items match!")
    }
}
```

framework training.

```
type binaryOp func(int, int) int

func add(i, j int) int { return i+j }
func sub(i, j int) int { return i-j }
func mul(i, j int) int { return i*j }
func div(i, j int) int { return i/j }
func mod(i, j int) int { return i%j }

func calc(op binaryOp, i, j int) int {
    return op(i, j)
}
```

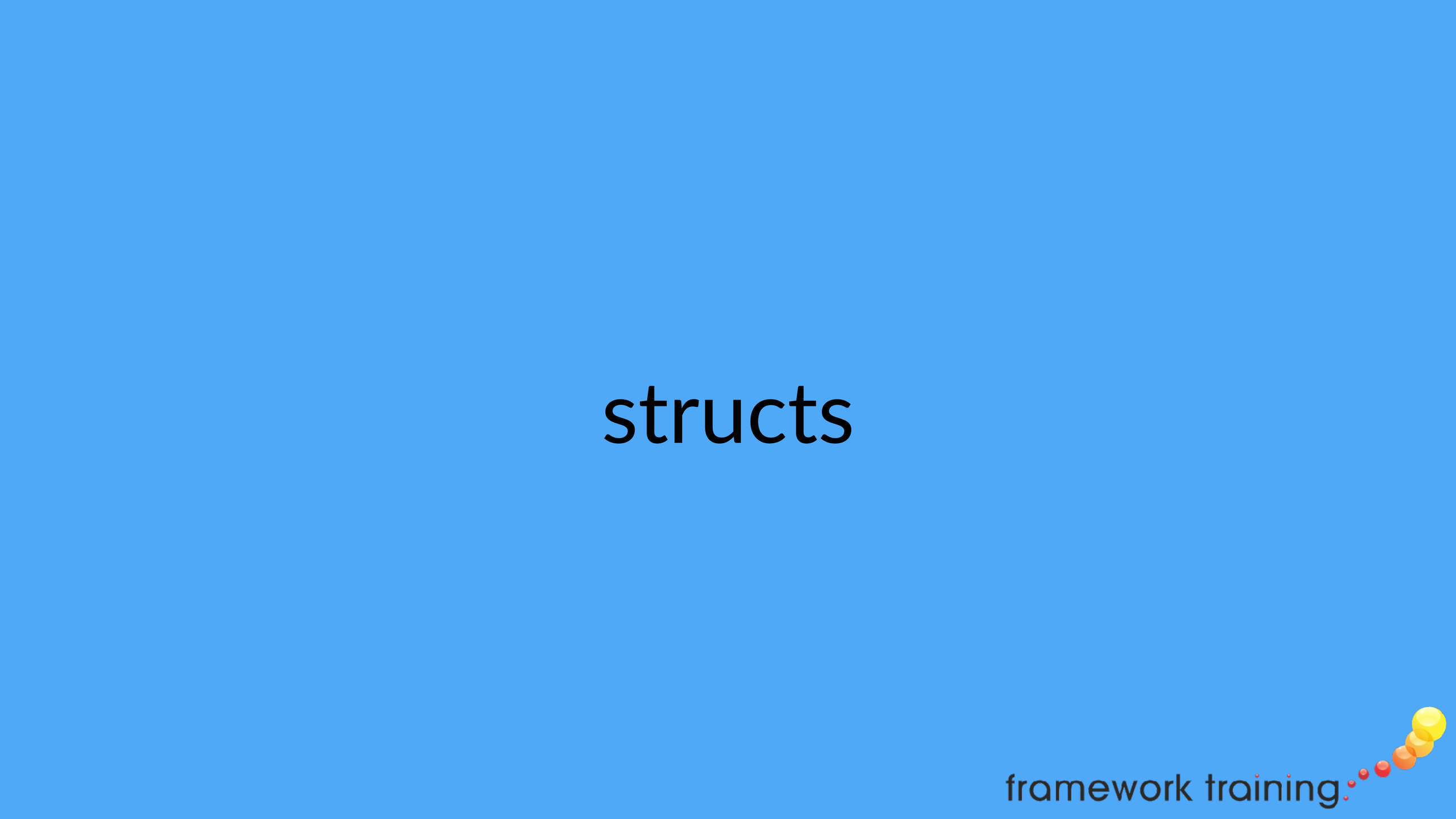
framework training.

10: FizzBuzz Type

```
package main

import (
    "fmt"

    "path/to/your/fizzbuzz"
)

func main() {
    for i := 0; i < 100; i++ {
        fmt.Printf("%d - %s%s%s\n", i,
            fizzbuzz.FizzBuzz(fizzbuzz.Fizz, i),
            fizzbuzz.FizzBuzz(fizzbuzz.Buzz, i),
            fizzbuzz.FizzBuzz(fizzbuzz.Number, i),
        )
    }
}
```

framework training.

structs



```
type FizzBuzzed struct {
    input int
    output string
}
```

```go
package main

import "fmt"

type FizzBuzzed struct {
    input  int
    output string
}

func main() {
    v := FizzBuzzed{}
    fmt.Printf("%v/n", v)
}
```

framework training.

```go
package main

import "fmt"

type FizzBuzzed struct {
    input  int
    output string
}

func main() {
    v := FizzBuzzed{}
    v.input = 15
    v.output = "FizzBuzz"
    fmt.Printf("%v/n", v)
}
```

framework training.

```go
package main

import "fmt"

type FizzBuzzed struct {
    input  int
    output string
}

func main() {
    v := FizzBuzzed{
        input: 15,
        output: "FizzBuzz",
    }
    fmt.Printf("%v/n", v)
}
```

```go
package main

import "fmt"

type FizzBuzzed struct {
    input  int
    output string
}

func main() {
    v := FizzBuzzed{input: 15}
    v.output = "FizzBuzz"
    fmt.Printf("%v/n", v)
}
```

framework training.

```
type Value struct {
    input  int
    output string
}

type Conversion struct {
    Value
    Converter string
}
```

framework training.

```
v := Value{1, "1"}
c := Conversion{v, "FizzBuzz"}
```

```
c := Conversion{Value{1, "1"}, "FizzBuzz"}
```

framework training.

```
c := Conversion{}
c.input = 1
c.output = "1"
c.Converter = "FizzBuzz"
```

```go
package main

type Value struct {
    input  int
    output string
}

func Print(v Value) {
    println(v.input, v.output)
}

func main() {
    v := Value{1, "1"}
    Print(v)
}
```

framework training.

```go
package main

type Value struct {
    input  int
    output string
}

func (v Value) Print() {
    println(v.input, v.output)
}

func main() {
    v := Value{1, "1"}
    v.Print()
}
```

```
package main

type Value struct {
    input  int
    output string
}

func (v Value) Print() {
    println(v.input, v.output)
}

func (v Value) Output(o string) {
    v.output = o
}

func main() {
    v := Value{1, "1"}
    v.Output("FizzBuzz")
    v.Print()
}
```

framework training.

```
package main

type Value struct {
    input  int
    output string
}

func (v *Value) Print() {
    println(v.input, v.output)
}

func (v *Value) Output(o string) {
    v.output = o
}

func main() {
    v := &Value{1, "1"}
    v.Output("FizzBuzz")
    v.Print()
}
```

framework training.

```go
package main

type Value struct {
    input  int
    output string
}

func (v *Value) Print() {
    println(v.input, v.output)
}

func (v *Value) Output(o string) {
    v.output = o
}

func main() {
    v := Value{1, "1"}
    v.Output("FizzBuzz")
    v.Print()
}
```

framework training.

Pointers

```
// Value types
var a thing
var b thing = make(thing)
var c thing = thing{}
var d = make(thing)
var e = thing{}
f := make(thing)
g := thing{}
```

```
// Pointer types
var a *thing
var b *thing = new(thing)
var c *thing = &thing{}
var d = new(thing)
var e = &thing{}
f := new(thing)
g := &thing{}
```

framework training.

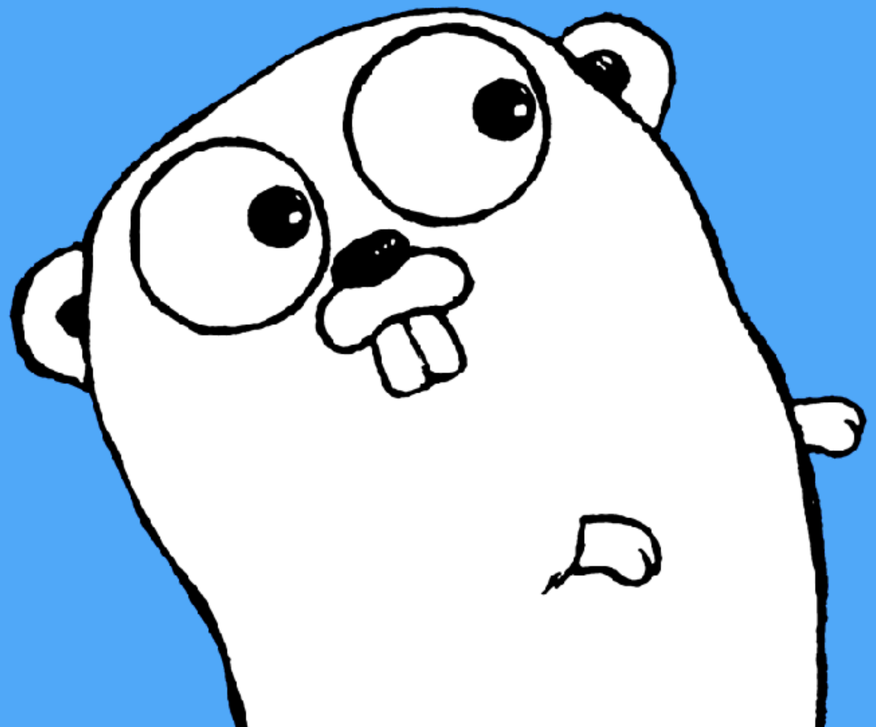
Pointers

```
// Value types
var a thing
var b thing = make(thing)
var c thing = thing{}
var d = make(thing)
var e = thing{}
f := make(thing)
g := thing{}
```

```
// Pointer types
var a *thing
var b *thing = new(thing)
var c *thing = &thing{}
var d = new(thing)
var e = &thing{}
f := new(thing)
g := &thing{}
```

framework training.

Welcome Back



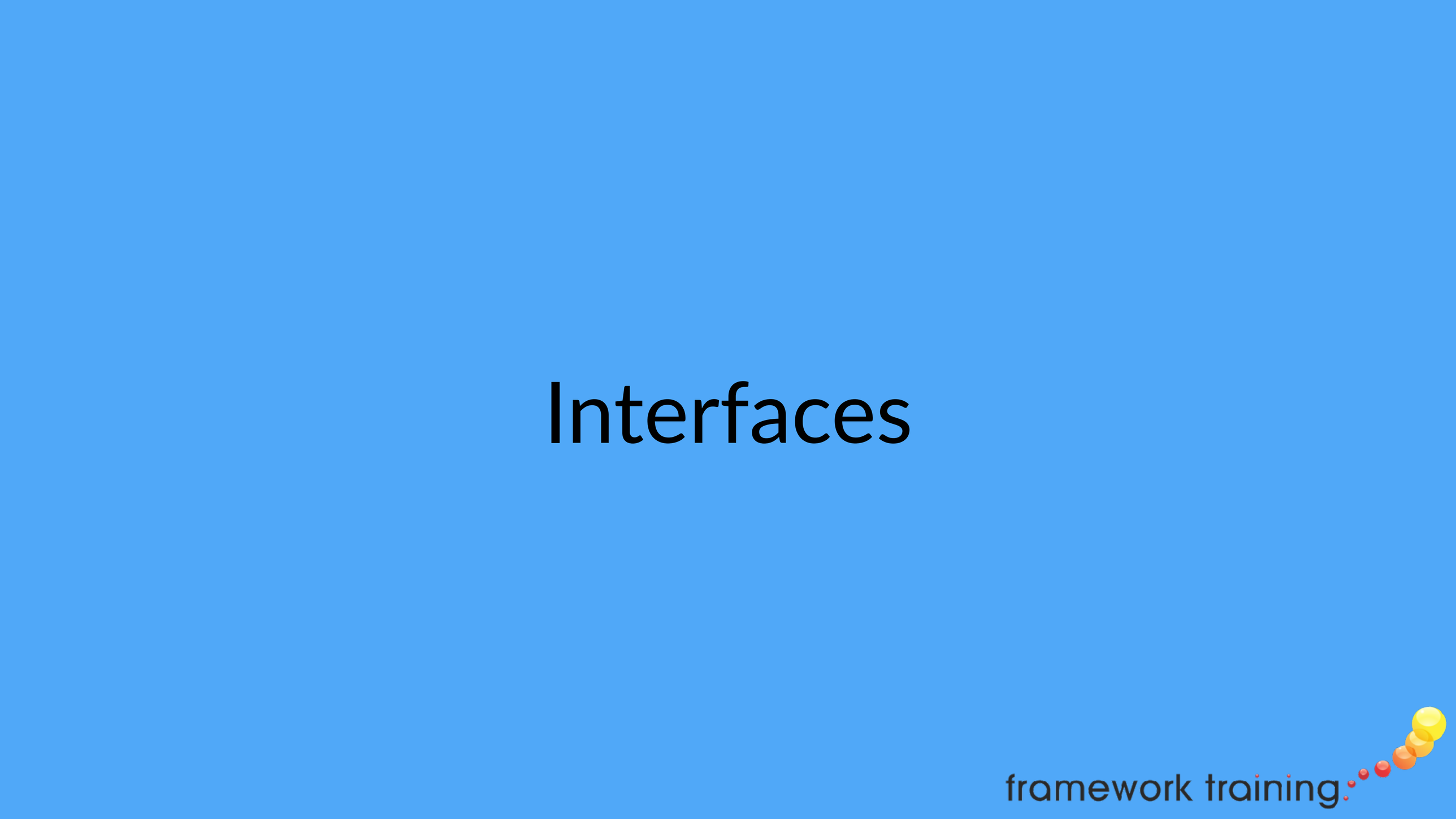
framework training.

11: FizzBuzz Type Method

```
package main

import (
    "fmt"

    "path/to/your/fizzbuzz"
)

func main() {
    for i := 0; i < 100; i++ {
        fmt.Printf("%d - %s%s%s\n", i,
            fizzbuzz.Fizz.Translate(i),
            fizzbuzz.Buzz.Translate(i),
            fizzbuzz.Number.Translate(i),
        )
    }
}
```

framework training.

Interfaces



```
type duck interface {
  walk()
  quack()
}
```

```
type duck interface {
    walk()
    quack()
}

type goose struct{}

func (g goose) walk()  { println("waddle") }
func (g goose) quack() { println("HONK") }
func (g goose) eat()   { println("om nom nom") }
```

framework training.

```
var d duck  // initially nil
d = goose{} // d may now be used
d.walk()
d.quack()
```

framework training.

```
func annoy(d duck) {
    d.walk()
    d.quack()
    //d.eat() // doesn't work
}

func main() {
    g := goose{}
    annoy(g)
}
```

```
var walker interface{
    walk()
}

walker = goose{}
walker.walk()
```

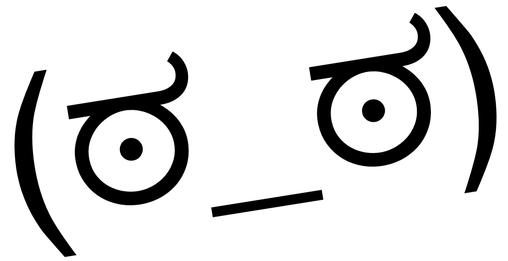
framework training.

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

type Writer interface {
    Write(p []byte) (n int, err error)
}

type ReadWriter interface {
    Reader
    Writer
}
```

framework training.

Interfaces Should Be Small

```
type Store interface {
    Put(key string, value []byte, options *WriteOptions) error
    Get(key string) (*KVPair, error)
    Delete(key string) error
    Exists(key string) (bool, error)
    Watch(key string, stopCh <-chan struct{}) (<-chan *KVPair, error)
    WatchTree(directory string, stopCh <-chan struct{}) (<-chan []*KVPair, error)
    NewLock(key string, options *LockOptions) (Locker, error)
    List(directory string) ([]*KVPair, error)
    DeleteTree(directory string) error
    AtomicPut(key string, value []byte, previous *KVPair, options *WriteOptions) (bool, *KVPair, error)
    AtomicDelete(key string, previous *KVPair) (bool, error)
    Close()
}
```



framework training.

```
type NotVeryUseful interface{}
```

```go
var i interface{}
i = 123     // valid
i = "hello" // valid
i = true    // valid
fmt.Println(i)
```

framework training.

```
func foo(v interface{}) {
    // ???
}
```

```
func foo(v interface{}) {
    i := v.(int)
    println("int", i)
}
```

framework training.

```
func foo(v interface{}) {
    if i, ok := v.(int); ok {
        println("int", i)
    } else {
        println("not an int")
    }
}
```

framework training.

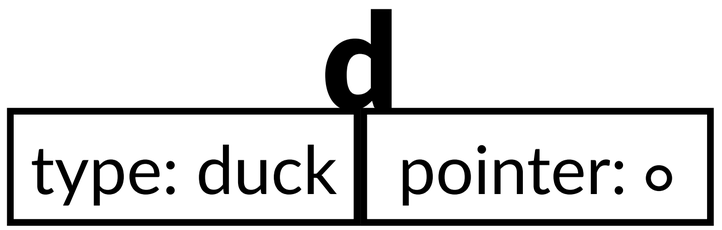
```
func foo(v interface{}) {
    switch v := v.(type) {
    case int:
        println("int", v)
    case string:
        println("string", v)
    case io.Reader:
        println("io.Reader")
    default:
        println("unknown")
    }
}
```

```
switch x := v.(type) {
case int, float32:
    println("int", x + x)
}
```

framework training.

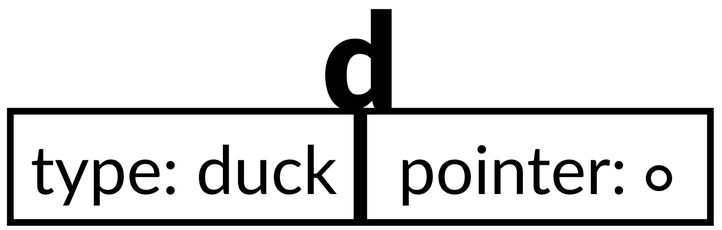
This is not generics

```
var d duck
```

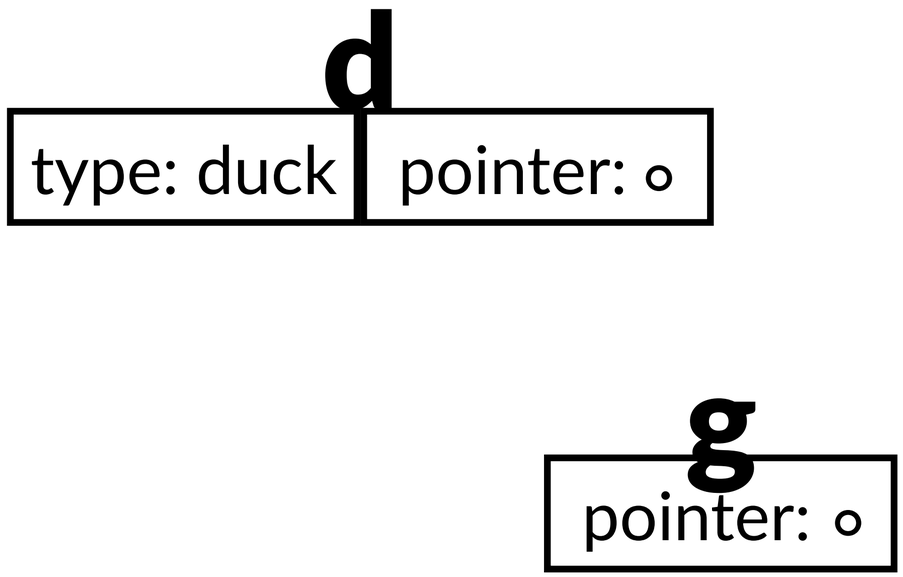


framework training.

```
var d duck
//d.quack()
```

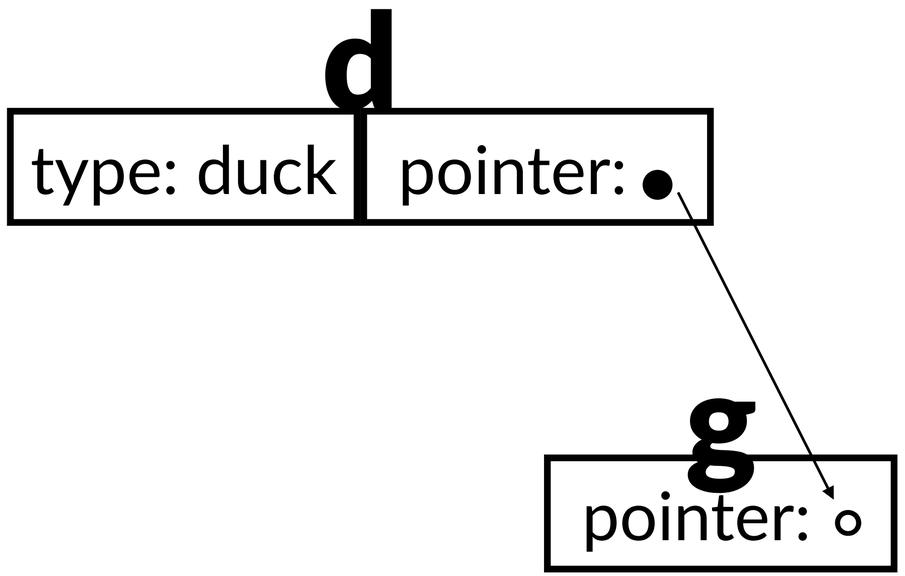


```
var d duck
//d.quack()
var g *goose
```



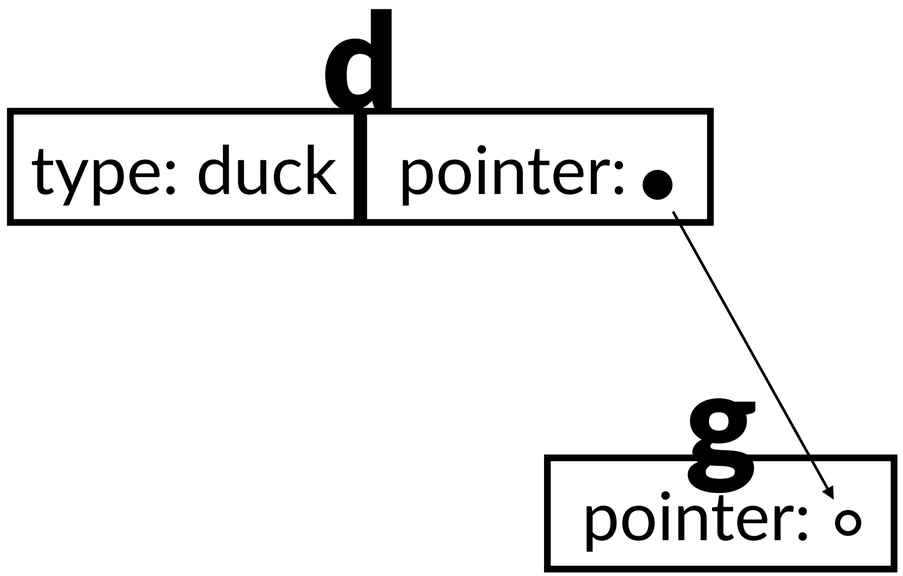
framework training.

```
var d duck
//d.quack()
var g *goose
d = g
```



framework training.

```
var d duck
//d.quack()
var g *goose
d = g
d.quack() // ?
```



```go
func (g goose) quack() {
    // it's not possible to get here via a nil ptr
    // "value method main.goose.quack called using
    // nil *goose pointer"
}

func (g *goose) quack() {
    // it is possible to get here with a nil ptr!
    // g may be nil
}
```

framework training.

Interfaces and Testing

framework training.

Whenever possible, write code in a functional style.

Whenever possible, write code in a functional style.
Take all dependencies as parameters.

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Take all dependencies as parameters.
Avoid depending on or (especially) mutating global state.

Whenever possible, write code in a functional style.
Take all dependencies as parameters.
Avoid depending on or (especially) mutating global state.
Make heavy use of interfaces!

```go
package main

func process(db *database) (result, error) {
    rows, err := db.Query("SELECT foo")
    if err != nil {
        return result{}, err
    }
    defer rows.Close()
    var r result
    if err := rows.Scan(&r); err != nil {
        return result{}, err
    }
    return r, nil
}

func main() {
    db := newDatabase()
    r, err := process(db)
}
```

framework training.

```go
package main

type queryer interface {
    Query(s string) (rows, error)
}

func process(db *queryer) (result, error) {
    rows, err := db.Query("SELECT foo")
    if err != nil {
        return result{}, err
    }
    defer rows.Close()
    var r result
    if err := rows.Scan(&r); err != nil {
        return result{}, err
    }
    return r, nil
}

func main() {
    db := newDatabase()
    r, err := process(db)
}
```

framework training.

```go
type fakeQueryer struct{}

func (q fakeQueryer) Query(s string) (rows, error) {
    return []row{"fakerow"}, nil
}
```

framework training.

```go
type fakeQueryer struct{}

func (q fakeQueryer) Query(s string) (rows, error) {
    return []row{"fakerow"}, nil
}

func TestProcess(t *testing.T) {
    q := fakeQueryer{}
    have, err := process(q)
    if err != nil {
        t.Fatal(err)
    }
    want := result{"fakedata"} // or whatever
    if want != have {
        t.Errorf("process: want %v, have %v", want, have)
    }
}
```

framework training.

12: Putting it all together

Create an integer translation package
Package will convert an int to a string
Package uses an arbitrary conversion function
The returned result should contain the input
The returned result should contain the conversion type
Provide FizzBuzz and Roman numeral converters

```
f() {
    sleep "$1"
    echo "$1"
}
while [ -n "$1" ]
do
    f "$1" &
    shift
done
wait
```

framework training.

```go
package main

import (
    "fmt"
    "sort"
)

func main() {
    strs := []string{"c", "a", "b"}
    sort.Strings(strs)
    fmt.Println("Strings:", strs)

    ints := []int{7, 2, 4}
    sort.Ints(ints)
    fmt.Println("Ints:   ", ints)

    s := sort.IntsAreSorted(ints)
    fmt.Println("Sorted: ", s)
}
```

framework training.

```go
package main

import (
    "fmt"
    "sort"
)

type ByLength []string

func (s ByLength) Len() int {
    return len(s)
}
func (s ByLength) Swap(i, j int) {
    s[i], s[j] = s[j], s[i]
}
func (s ByLength) Less(i, j int) bool {
    return len(s[i]) < len(s[j])
}

func main() {
    fruits := []string{"peach", "banana", "kiwi"}
    sort.Sort(ByLength(fruits))
    fmt.Println(fruits)
}
```

framework training.

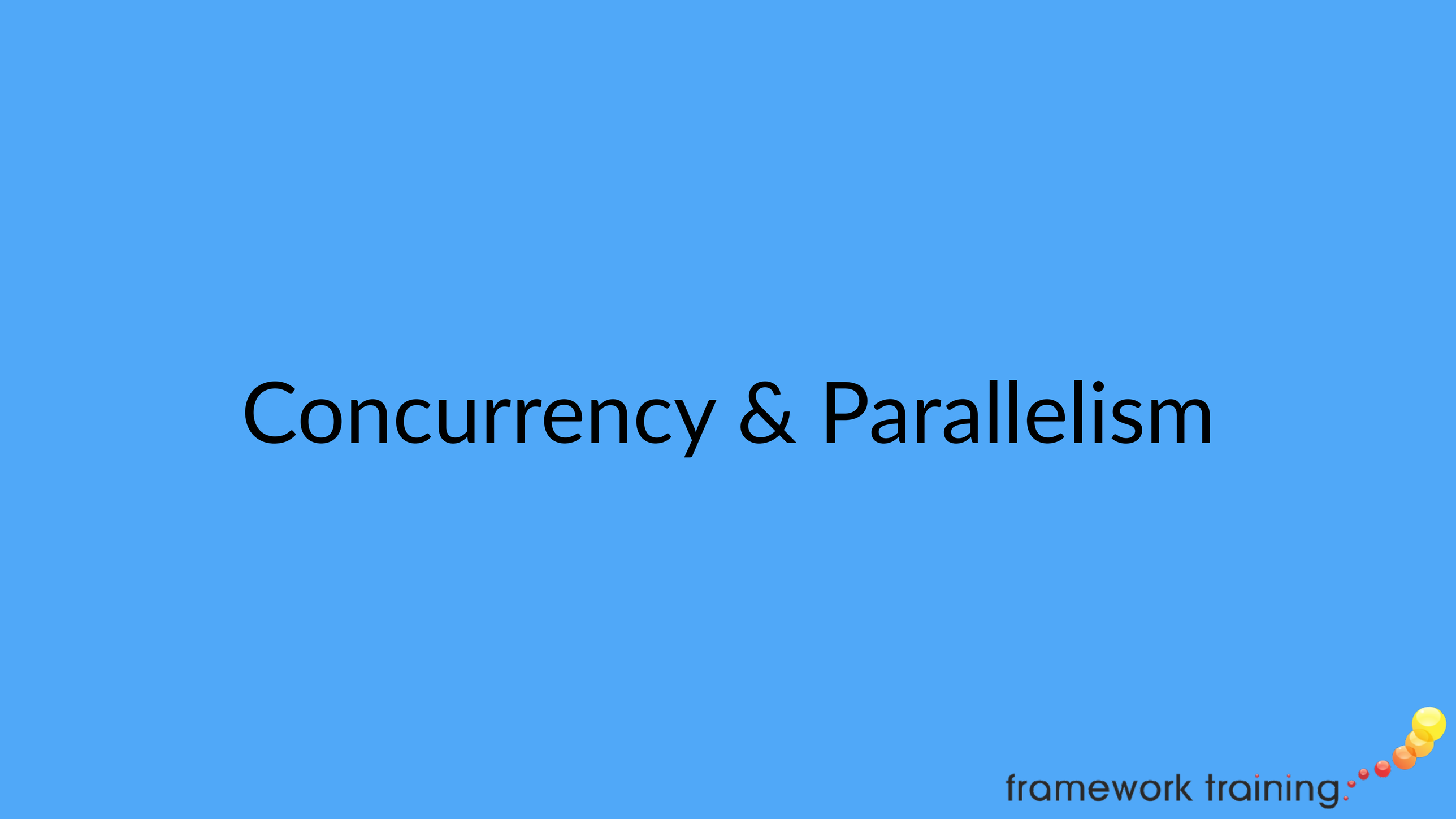
KISS
DRY
SOLID

@KevlinHenney

JSON Parsing


framework training

Concurrency & Parallelism



Concurrency != Parallelism

Concurrency is about designing your program so that multiple things can execute independently of each other.

Concurrency is about designing your program so that multiple things can execute independently of each other.
Parallelism is executing those things at the same time.

Concurrency is about designing your program so that multiple things can execute independently of each other.
Parallelism is executing those things at the same time.
Go programs should be written for concurrency, but parallelism is a decision for the runner!

```go
package main

func main() {
    foo("a")
    go foo("b")
}

func foo(s string) {
    println(s)
}
```

framework training.

```
package main

import "time"

func main() {
    foo("a")
    go foo("b")
    time.Sleep(time.Second)
}

func foo(s string) {
    println(s)
}
```

framework training.

Channels

Don’t communicate by sharing memory

Don’t communicate by sharing memory
Share memory by communicating

Don’t communicate by sharing memory
Share memory by communicating
A channel is like a UNIX pipe

Don’t communicate by sharing memory
Share memory by communicating
A channel is like a UNIX pipe
Typed conduit for information, typically between goroutines

```
package main

func main() {
    c := make(chan int)
    go compute(c)
    println(<-c)
}

func compute(c chan int) {
    c <- 123
}
```

framework training.

```
package main

func main() {
    c := make(chan int, 100)
    go compute(c)
    println(<-c)
}

func compute(c chan int) {
    c <- 123
}
```

```
package main

func main() {
    c := make(chan int)
    for i := 0; i < 10; i++ {
        go compute(i, c)
    }
    for i := 0; i < 10; i++ {
        println(i, <-c)
    }
}

func compute(id int, c chan int) {
    c <- id
}
```

framework training.

```go
package main

func main() {
    c := make(chan int)
    for i := 0; i < 10; i++ {
        go readOne(c)
    }
    c <- 123
    c <- 456
    c <- 789
}

func readOne(c chan int) {
    println(<-c)
}
```

framework training.

```go
package main

func main() {
    c := make(chan int)
    for i := 0; i < 10; i++ {
        go readOne(c)
    }
    c <- 123
    c <- 456
    c <- 789
    close(c)
}

func readOne(c chan int) {
    println(<-c)
}
```

framework training.

```go
package main

import "time"

func main() {
    c := make(chan int)
    for i := 0; i < 10; i++ {
        go readOne(c)
    }
    c <- 123
    c <- 456
    c <- 789
    close(c)
    time.Sleep(time.Second)
}

func readOne(c chan int) {
    println(<-c)
}
```

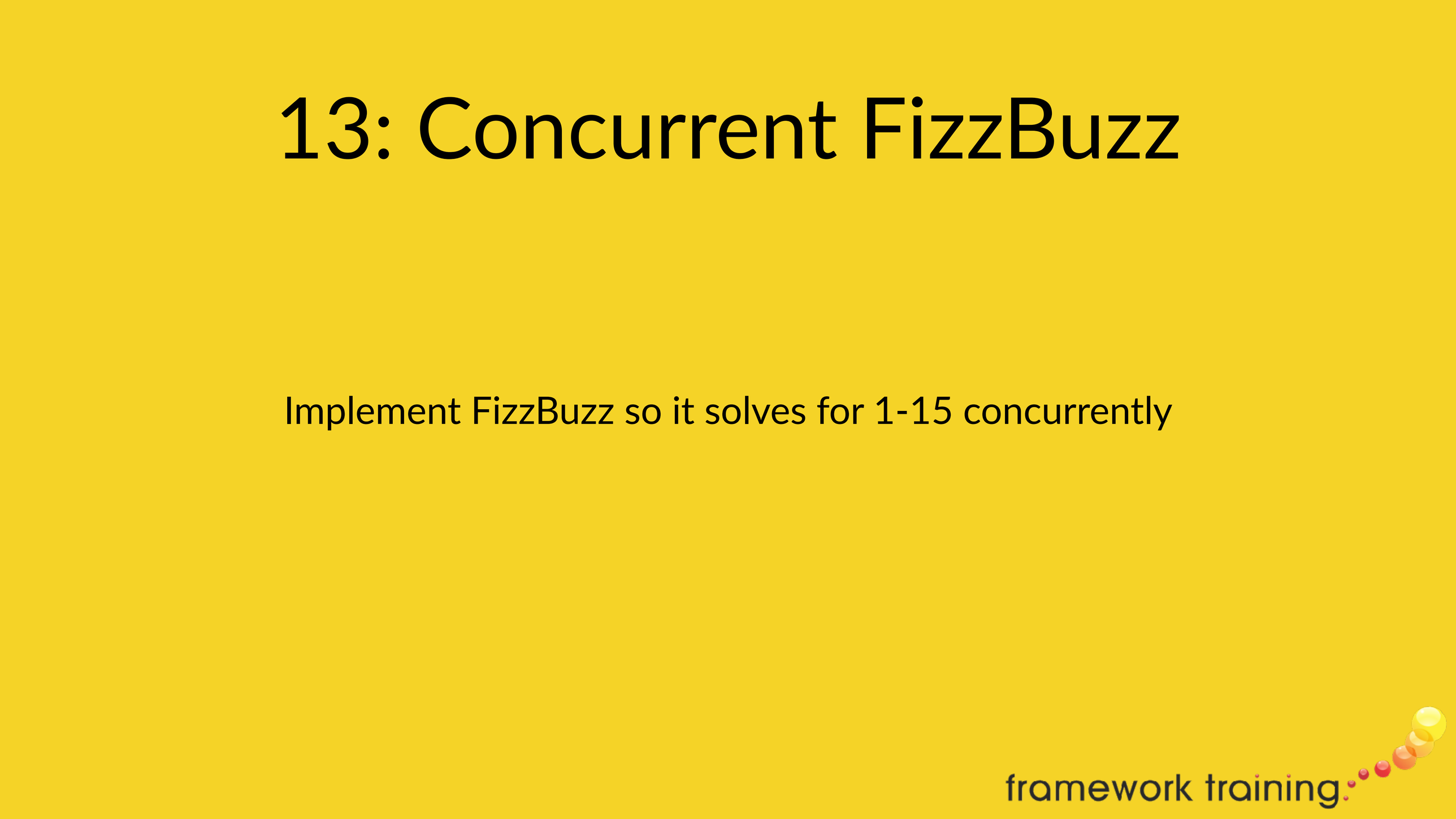
framework training.

```
v, ok := <-c
if ok {
    println("received value", v)
} else {
    println("channel was closed")
}
```

```
for v := range c {
    println("received value", v)
}
```

13: Concurrent FizzBuzz

Implement FizzBuzz so it solves for 1-15 concurrently



Select

framework training.

```
select {
case v1 := <-c1:
    // use value v1
case v2 := <-c2:
    // use value v2
}
```

framework training.

```
select {
case v1 := <-c1:
    // use value v1
case v2 := <-c2:
    // use value v2
default:
    // no channel was ready
}
```

```
func doWork(i chan int, s chan string, t chan thing) {
    for {
        select {
        case v := <-i:
            println("do work with int", i)
        case v := <-s:
            println("do work with string", s)
        case v := <-t:
            println("do work with thing", t)
        }
    }
}
```

framework training.

```go
func (a *Actor) SendEvent(e Event) {
    a.eventc <- e
}

func (a *Actor) SendReq(r *Request) {
    a.requestc <- r
}

func (a *Actor) Stop() {
    close(a.quitc)
}

func (a *Actor) loop() {
    for {
        select {
        case e := <-a.eventc:
            // process event
        case r := <-a.requestc:
            // process request
        case <-a.quitc:
            return
        }
    }
}
```

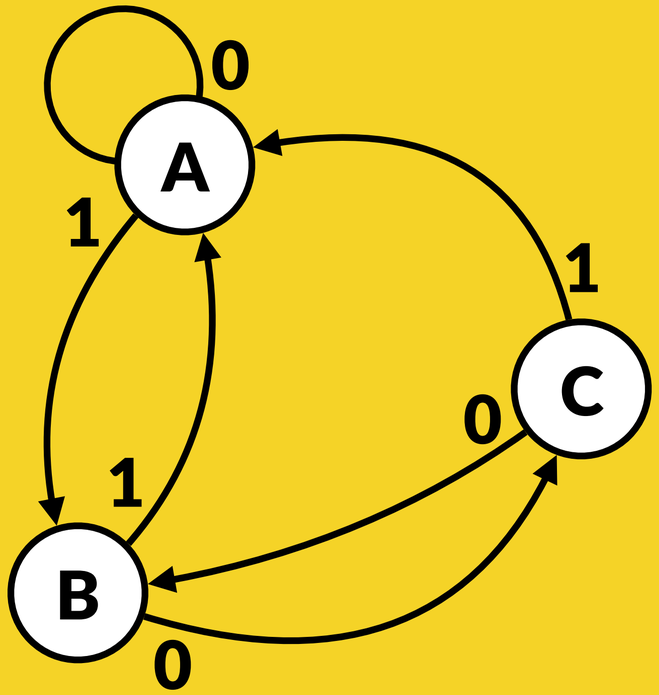
framework training.

```
type Actor struct {
    eventc   chan Event
    requestc chan *Request
    quitc    chan struct{}
}
```

framework training.

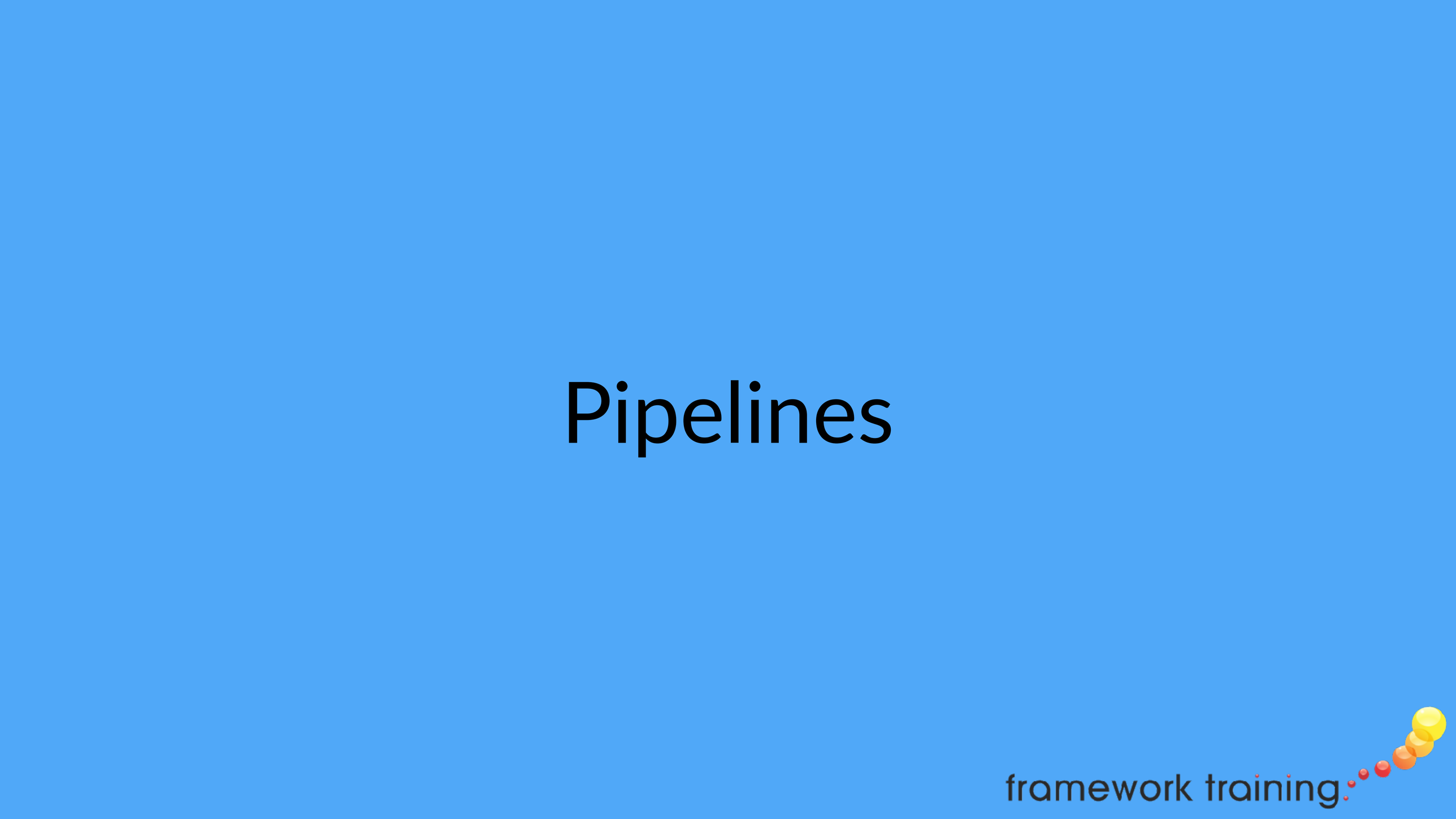
14: State Machine

```
package main

// Implement stateMachine.
type stateMachine struct{}

func main() {
    sm := stateMachine{}
    sm.send(1)           // "state A + 1 => state B"
    sm.send(0)           // "state B + 0 => state C"
    println(sm.state()) // "state C"
}
```



framework training.

Pipelines



```go
package main

import "strings"

func trim(in chan string, out chan string) {
    for s := range in {
        s = strings.TrimSpace(s)
        out <- s
    }
}

func capitalize(in chan string, out chan string) {
    for s := range in {
        s = strings.ToUpper(s)
        out <- s
    }
}
```

framework training.

```go
package main

import "strings"

func trim(in <-chan string, out chan<- string) {
    for s := range in {
        s = strings.TrimSpace(s)
        out <- s
    }
}

func capitalize(in <-chan string, out chan<- string) {
    for s := range in {
        s = strings.ToUpper(s)
        out <- s
    }
}
```

framework training.

```
func main() {
    a, b, c := make(chan string), make(chan string), make(chan string)
    go trim(a, b);
    go capitalize(b, c)

    a <- " hello world  "
    fmt.Printf("%q", <-c)

    close(a)
    close(b)
    close(c)
}
```

framework training.

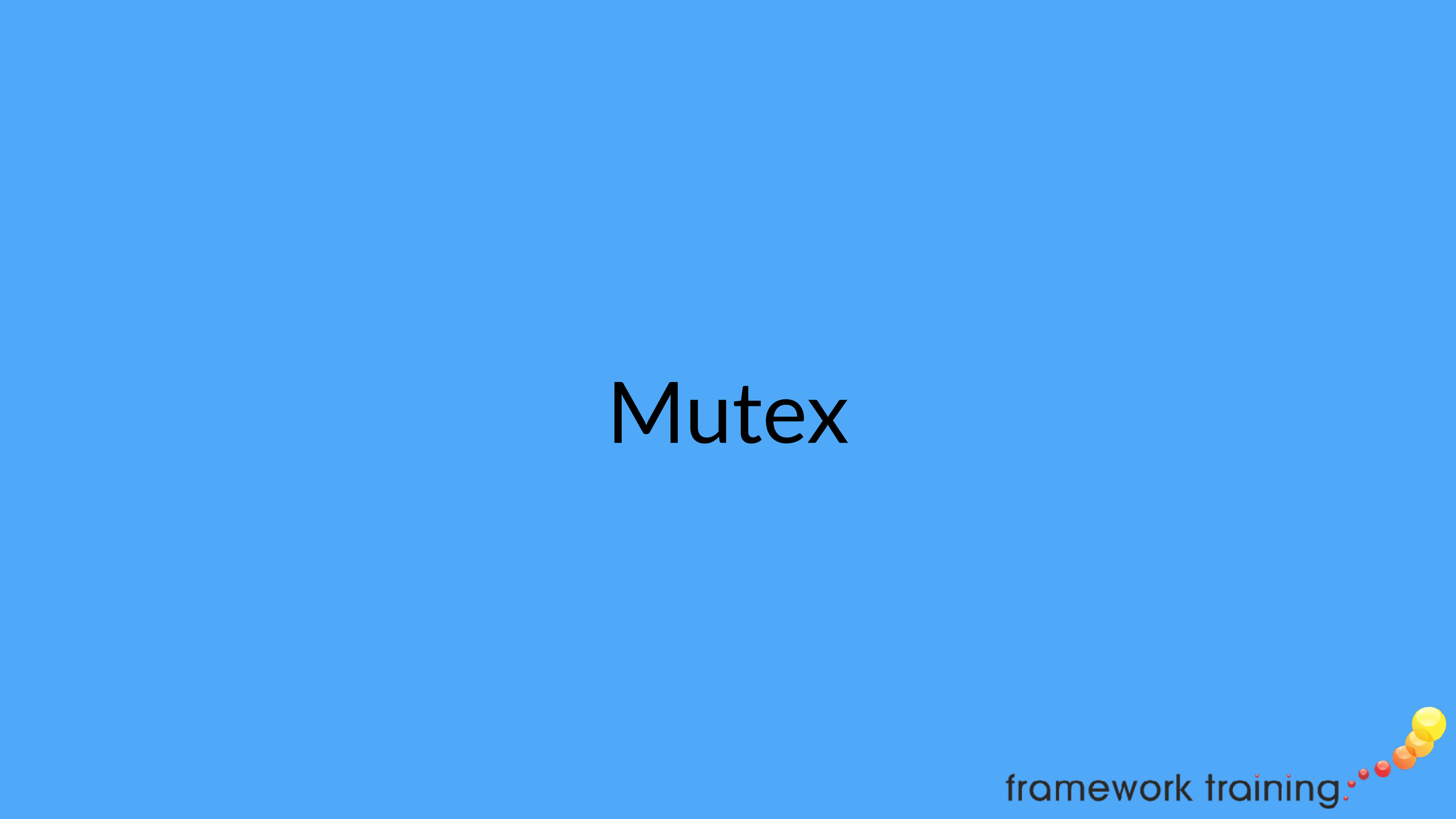
```go
func main() {
    a, b, c := make(chan string), make(chan string), make(chan string)
    go trim(a, b); go trim(a, b); go trim(a, b); go trim(a, b);
    go capitalize(b, c)

    a <- " hello world  "
    fmt.Printf("%q", <-c)

    close(a)
    close(b)
    close(c)
}
```

15: FizzBuzz Pipelines

```
type converter func(in <-chan int, out chan<- int)
var converters = []converter{fizz, buzz, number}

func main() {
    chans := make([]chan int, 4)

    for i := range chans {
        chans[i] = make(chan int)
        defer close(chans[i])
    }

    for i := 0; i < len(chans)-1; i++ {
        go f(chans[i], chans[i+1])
    }

    for i := 1; i < 100; i++ {
        chans[0] <- i
        fmt.Printf("%d\n", <-chans[len(chans)-1])
    }
}
```

framework training.

Mutex



```go
package main

type thing struct {
    m map[int]int
}

func newThing() *thing {
    return &thing{
        m: map[int]int{},
    }
}

func (t *thing) set(k, v int) {
    t.m[k] = v
}

func (t *thing) get(k int) int {
    return t.m[k]
}
```

framework training.

```go
package main

import "sync"

type thing struct {
    mtx sync.Mutex
    m   map[int]int
}

func newThing() *thing {
    return &thing{
        m: map[int]int{},
    }
}

func (t *thing) set(k, v int) {
    t.mtx.Lock()
    defer t.mtx.Unlock()
    t.m[k] = v
}

func (t *thing) get(k int) int {
    t.mtx.Lock()
    defer t.mtx.Unlock()
    return t.m[k]
}
```

framework training.

```go
package main

import "sync"

type thing struct {
    mtx sync.RWMutex
    m   map[int]int
}

func newThing() *thing {
    return &thing{
        m: map[int]int{},
    }
}

func (t *thing) set(k, v int) {
    t.mtx.Lock()
    defer t.mtx.Unlock()
    t.m[k] = v
}

func (t *thing) get(k int) int {
    t.mtx.RLock()
    defer t.mtx.RUnlock()
    return t.m[k]
}
```

framework training.

```go
package main

func main() {
    n := 10
    for i := 0; i < n; i++ {
        go println(i)
    }
    // when is everything done?
}
```

```go
package main

import "sync"

func main() {
    var wg sync.WaitGroup
    n := 10
    for i := 0; i < n; i++ {
        wg.Add(1)
        go func() {
            defer wg.Done()
            println(i)
        }()
    }

    wg.Wait()
}
```

framework training.

```go
package main

import (
    "fmt"
    "sync"
)

func main() {
    var wg sync.WaitGroup
    n := 10
    wg.Add(n)
    for i := 0; i < n; i++ {
        go func() {
            defer wg.Done()
            fmt.Println(i)
        }()
    }

    wg.Wait()
}
```

framework training.

```go
package main

import (
    "fmt"
    "sync"
)

func main() {
    var wg sync.WaitGroup
    n := 10
    wg.Add(n)
    for i := 0; i < n; i++ {
        go func(i int) {
            defer wg.Done()
            fmt.Println(i)
        }(i)
    }

    wg.Wait()
}
```

framework training.

Parallelism

goroutines are multiplexed onto OS threads

framework training.

goroutines are multiplexed onto OS threads
GOMAXPROCS controls number of threads available

goroutines are multiplexed onto OS threads
GOMAXPROCS controls number of threads available
By default, GOMAXPROCS = num CPUs

16: Playtime

https://divan.github.io/posts/go_concurrency_visualize/

Networking

framework training.

```
resp, err := http.Get("http://google.com")
if err != nil {
    panic(err)
}
```

```
resp, err := http.Get("http://google.com")
if err != nil {
    panic(err)
}

defer resp.Body.Close()

buf, err := ioutil.ReadAll(resp.Body)
if err != nil {
    panic(err)
}
fmt.Printf("%s\n", buf)
```

framework training.

```
resp, err := http.Get("http://google.com")
if err != nil {
    panic(err)
}

defer resp.Body.Close()

io.Copy(os.Stdout, resp.Body)
```

```go
c := http.Client{} // zero value is usable

req, err := http.NewRequest("GET", "http://google.com", nil)
if err != nil {
    panic(err)
}

resp, err := c.Do(req)
if err != nil {
    panic(err)
}
```

framework training.

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

func h(w http.ResponseWriter, r *http.Request) {
    fmt.Fprintf(w, "Hello world\n")
}
```

framework training.

```go
func main() {
    s := &server{msg: "Hello from server"}
    http.Handle("/", s)
    http.ListenAndServe(":8080", nil)
}

type server struct{ msg string }

func (s *server) ServeHTTP(w http.ResponseWriter, r *http.Request) {
    log.Printf("%s %s from %s", r.Method, r.URL, r.RemoteAddr)
    fmt.Fprintf(w, s.msg+"\n")
}
```

framework training.

```
mux := http.NewServeMux()
mux.HandleFunc("/foo", handleFoo)
mux.HandleFunc("/bar", handleBar)
log.Fatal(http.ListenAndServe(":8080", mux))
```

Other Routers and Mixers

Usability: github.com/gorilla/mux
Raw speed: github.com/julienschmidt/httprouter

17: FizzBuzz Microservice

framework training.

```
ln, err := net.Listen("tcp4", ":1234")
    if err != nil {
        panic(err)
    }
    defer ln.Close()

    for {
        c, err := ln.Accept()
        if err != nil {
            break
        }
        go handle(c)
    }
}
```

framework training.

```
func handle(c net.Conn) {
    log.Printf("%s: start conn", c.RemoteAddr())
    defer log.Printf("%s: close conn", c.RemoteAddr())

    s := bufio.NewScanner(c)
    for s.Scan() {
        log.Printf("%s: %s", c.RemoteAddr(), s.Text())
    }
}
```

framework training.

```
func handle(c net.Conn) {
    log.Printf("%s: start conn", c.RemoteAddr())
    defer log.Printf("%s: close conn", c.RemoteAddr())

    s := bufio.NewScanner(c)
    for s.Scan() {
        log.Printf("%s: %s", c.RemoteAddr(), s.Text())
        fmt.Fprintf(c, "%s\n", strings.ToUpper(s.Text()))
    }
}
```

framework training.

Go Nuts

framework training