THE GO PROGRAMMING LANGUAGE

PART 1

THE BASICS

- What is Go?

THE BASICS

- What is Go?
- Why is Go?

THE BASICS

- What is Go?
- Why is Go?
- Where is Go?

THE BASICS

- What is Go?
- Why is Go?
- Where is Go?
- How is Go?

WHO ARE YOU TO BE TELLING ME THESE THINGS

- Joel Auterson

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- 4th year undergrad

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- http://gobyexample.com

WHAT IS GO?

THE BEARD SCALE

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Dennis Ritchie

THE C PROGRAMMING LANGUAGE

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James Gosling

Dennis Ritchie

Java

THE C PROGRAMMING LANGUAGE

THE BEARD SCALE

Guido van Rossum

James Gosling

Dennis Ritchie

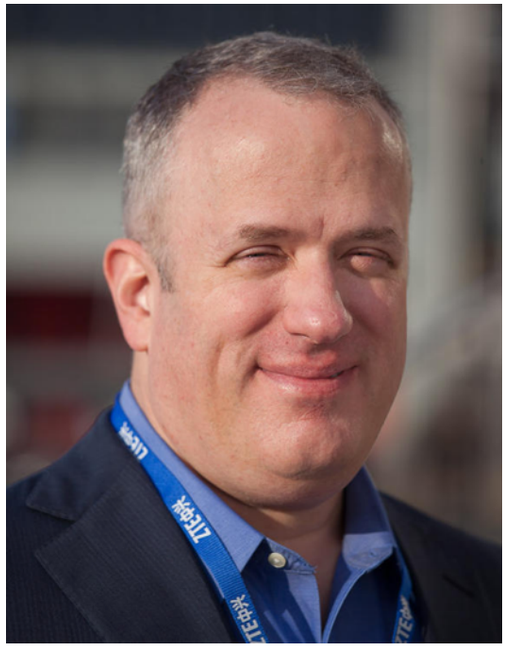
python™

Java™

THE C PROGRAMMING LANGUAGE

THE BEARD SCALE

Brendan Eich



Guido van Rossum

James Gosling

Dennis Ritchie

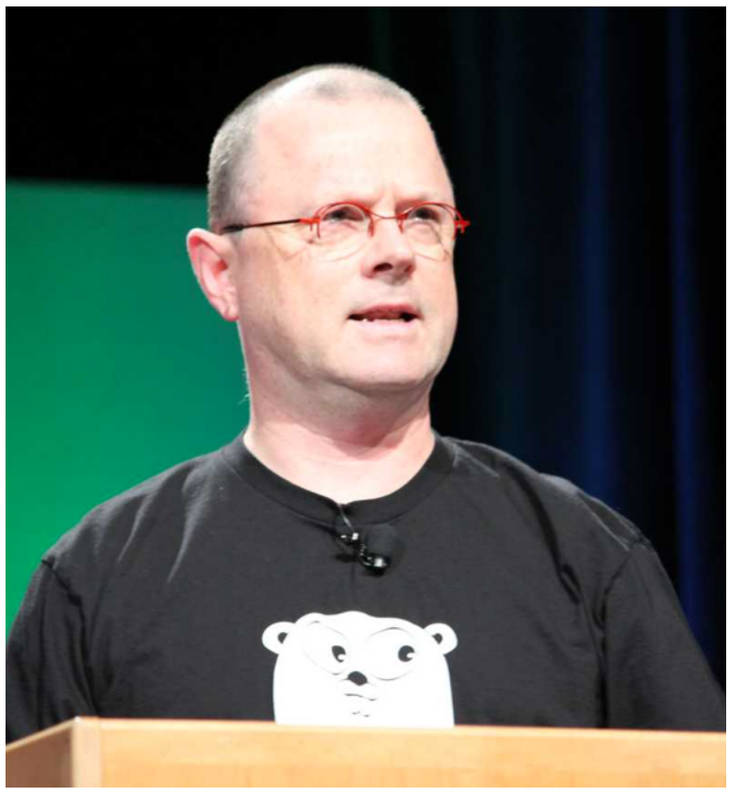
JS

python™

Java™

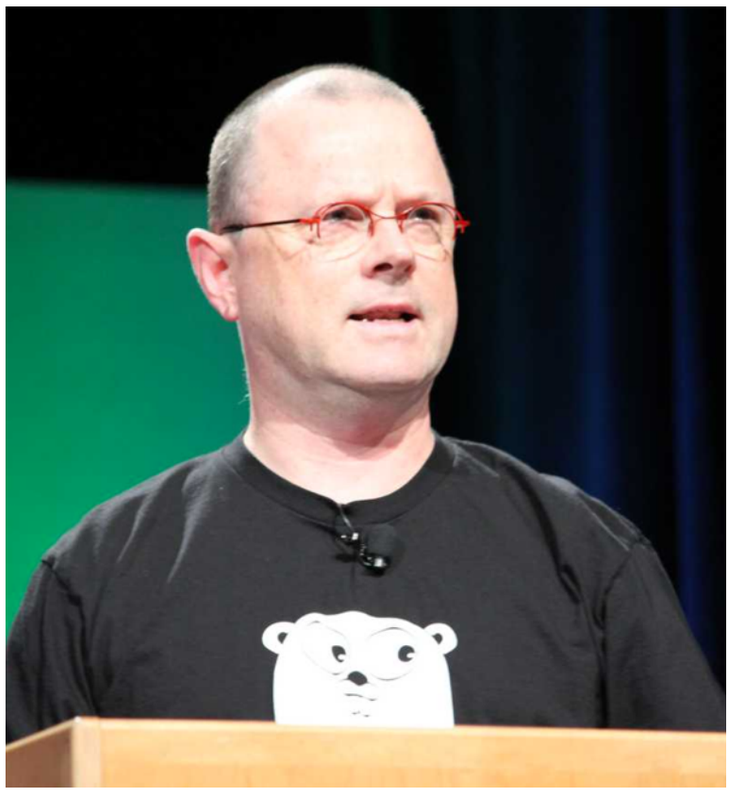
THE C PROGRAMMING LANGUAGE

GO



Rob Pike

GO



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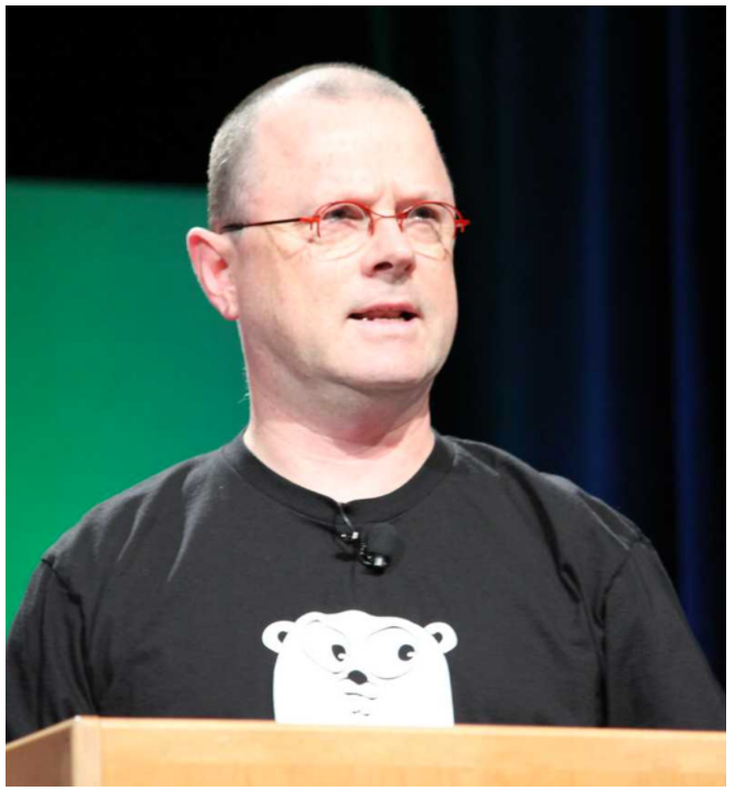


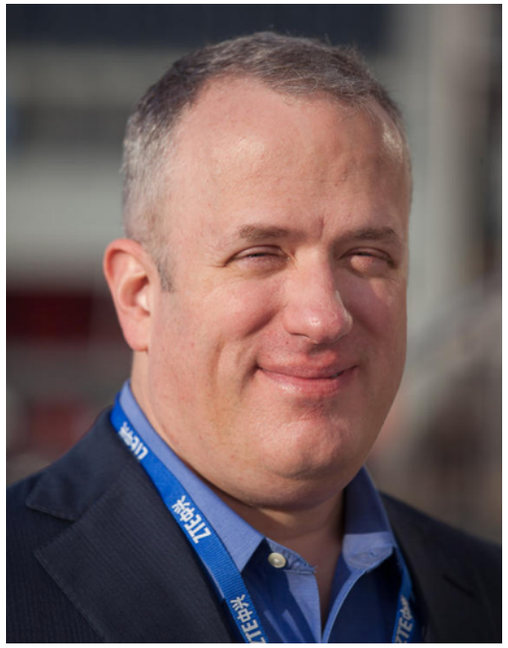
Rob Pike

Robert Griesemer

Ken Thompson

THE BEARD SCALE

Brendan Eich



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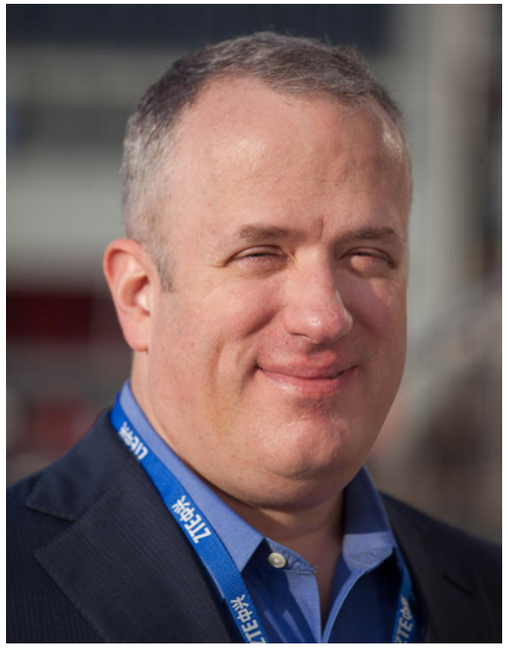

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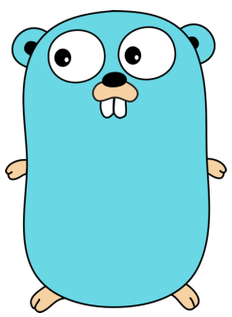

GO IS...

- Compiled

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- Compiled - but garbage collected

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- Compiled - but garbage collected
- Statically typed - but with type inference
- Not (really) object-oriented - but has some OO concepts

WHY IS GO?

GO IS...

- Really fast

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- Cross-platform, and has cross-compilation

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GO IS...

- Really fast
- Cross-platform, and has cross-compilation
- Simple
- Portable
- Good at concurrency

WHERE IS GO?

SETTING UP

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```
joel@Carrot[~/.go]
-> tree -L 1 $GOPATH
/Users/joel/.go
├── bin
├── pkg
└── src
```

THE GOPATH

- src/
  - Source code for libraries
- pkg/
  - Compiled libraries
- bin/
  - Compiled commands

GO GET

- go get github.com/joelotter/termloop

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```
.gopath/
├── pkg
│   └── darwin_amd64
│       └── github.com
│           ├── joelotter
│           ├── mattn
│           └── nsf
└── src
    └── github.com
        ├── joelotter
        │   └── termloop
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        │   └── go-runewidth
        └── nsf
            └── termbox-go
```

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```

HOW IS GO?

HELLO WORLD!

- Entry point is in function ‘main’.
- It needs to be in a package called ‘main’.
- “fmt” is a package providing Println and other formatting.

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

HELLO WORLD!

- Run a Go program with ‘go run’.
- Compile with ‘go build’.

VARIABLES

```
1  // Initialise a string
2  var hello string = "Hello!"
3
4  // Initialise a string, then assign after
5  var hello string
6  hello = "Hello!"
7
8  // We can assign multiple variables
9  var apple, pear int = 1, 2
10
11 // Go has type inference, which is nice
12 banana := 3
13 myName := "Joel"
14
15 // Uninitialised variables are 'zero-valued'.
16 var emptyVariable int
17 fmt.Println(emptyVariable)
```

ZERO VALUES

Type	Zero value
int	0
float	0.0
string	""
bool	FALSE
Everything else…	nil

CONDITIONALS

```
1  if x > 10 {
2      fmt.Println("Big number!")
3  } else if x > 5 {
4      fmt.Println("Medium number!")
5  } else {
6      fmt.Println("Small number!")
7  }
8
9  if y := x; y > 10 {
10     fmt.Println("Big number!")
11 }
```

- There is no ternary ‘if’ operator in Go.

LOOPING

- There is no ‘while’ in Go - only ‘for’.

```
for {
    fmt.Println("Will print once.")
    break
}

i := 0
for i < 10 {
    fmt.Println("Will print 10 times.")
    i += 1
}

for j := 0; j < 5; j++ {
    fmt.Println("Will print 5 times.")
}
```

SWITCHES

- There's no fallthrough by default - can use 'fallthrough'.
- Yes, this *is* the correct indentation...

```
1 i := 2
2 switch i {
3 case 1:
4     fmt.Println("One")
5 case 2:
6     fmt.Println("Two")
7 default:
8     fmt.Println("That's as high as I can count...")
9 }
```

ARRAYS

- Arrays are fixed-length.

```
1  // Declare array of length 5
2  var xs [5]int
3  fmt.Println(xs) // => [0 0 0 0 0]
4
5  // Addressing is pretty standard
6  xs[2] = 3
7  fmt.Println(xs[2]) // => 3
8
9  // Can declare and initialise
10 ys := [5]int{1, 2, 3, 4, 5}
11
12 // Can declare multi-dimensional
13 var zs [2][2]int
14 fmt.Println(zs) // => [[0 0] [0 0]]
```

SLICES

- Slices are variable-length.

```
1  // We use 'make' to create slices
2  words := make([]string, 3)
3  // Initially zero-valued
4  fmt.Println(words) // => [  ]
5
6  // Initialise explicitly
7  dogs := []string{"Pug", "Corgi"}
8  dogs = append(dogs, "The Hound")
9  fmt.Println(dogs) // => [Pug Corgi The Hound]
10
11 // Can copy slices too
12 alsoDogs := make([]string, len(dogs))
13 copy(alsoDogs, dogs)
14 fmt.Println(alsoDogs) // => [Pug Corgi The Hound]
15
16 fmt.Println(dogs[1:]) // => [Corgi The Hound]
17 fmt.Println(dogs[:1]) // => [Pug]
```

MAPS

- Maps are Go's key/value structure.

```go
// We use 'make' to create a new map
prices := make(map[string]float32)
prices["banana"] = 0.48
fmt.Println(prices) // => map[banana:0.48]

// Deleting from a map
prices["apple"] = 0.29
delete(prices, "banana")
fmt.Println(prices) // => map[apple:0.29]

// Explicit initialisation
ages := map[string]int{"Bob": 22, "Alice": 23}

// We can check for membership...
_, bobExists := ages["Bob"]
fmt.Println(bobExists) // => true
```

RANGE

- We can use ‘range’ to iterate over a data structure.

```
1 dogs := []string{"Pug", "Corgi"}
2 for i, dog := range dogs {
3         fmt.Printf("%v: %v\n", i, dog) // %v is default format
4 }
5
6 ages := map[string]int{"Alice": 21, "Bob": 22}
7 for person, age := range ages {
8         fmt.Printf("%v: %v\n", person, age)
9 }
```

FUNCTIONS

- We specify the input and output types.
- The function ‘sum’ takes two integers, and returns an integer.

```
1 func sum(a int, b int) int {
2     return a + b
3 }
```

FUNCTIONS

- If adjacent arguments have the same type, we can just denote it once.
- This function does exactly the same as before.

```
1 func sum(a, b int) int {
2       return a + b
3 }
```

FUNCTIONS

- We can define variadic functions, which take any number of trailing arguments.
- This function is the same, but can add any number of integers!

```
1 func sum(nums ...int) int {
2         result := 0
3         for _, num := range nums {
4                 result += num
5         }
6         return result
7 }
```

FUNCTIONS

- Functions can have multiple return values.
- (Note that fmt.Println is a variadic function! Neat.)

```
1 func divideWithRemainder(a, b int) (int, int) {
2         return a / b, a % b
3 }
4
5 func main() {
6         div, rem := divideWithRemainder(10, 3)
7         fmt.Println(div, rem) // => 3 1
8 }
```

FUNCTIONS CAN RETURN ANONYMOUS FUNCTIONS

- This lets us create **closures**.

```
1  func sequence() func() int {
2          i := 0
3          return func() int {
4                  i += 1
5                  return i
6          }
7  }
8
9  func main() {
10         seq := sequence()
11         fmt.Println(seq()) // => 1
12         fmt.Println(seq()) // => 2
13
14         seq = sequence()
15         fmt.Println(seq()) // => 1
16 }
```

STRUCTS

- Similar to structs in C.

```
1  type Person struct {
2          name string
3          age  int
4  }
5
6  func main() {
7          bob := Person{"Bob", 22}
8          alice := Person{name: "Alice", age: 21}
9          fmt.Println(bob.age)     // => 22
10         fmt.Println(alice.name) // => Alice
11 }
```

WE CAN DEFINE METHODS ON STRUCTS

```
1  type Rectangle struct {
2          width, height int
3  }
4
5  func (r *Rectangle) Area() int {
6          return r.width * r.height
7  }
8
9  func (r *Rectangle) Perimeter() int {
10         return (2 * r.width) + (2 * r.height)
11 }
12
13 func main() {
14         r := Rectangle{width: 2, height: 3}
15         fmt.Println(r.Area())       // => 6
16         fmt.Println(r.Perimeter()) // => 10
17 }
```

INTERFACES

- Collections of method signatures.
- To make sure a type implements Shape, we just need to make sure it has Area and Perimeter methods.

```
 1 type Shape interface {
 2     Area() int
 3     Perimeter() int
 4 }
 5
 6 func main() {
 7     shapes := []Shape{Rectangle{2, 3}}
 8     for _, shape := range shapes {
 9         fmt.Println(shape.Area())
10     }
11 }
```

ERRORS

- Go doesn't have 'exceptions' to catch. Instead, we return an additional value for the error.

```
1  import "errors"
2
3  func divideTenBy(n int) (int, error) {
4          if n == 0 {
5                  return -1, errors.New("Can't divide by zero")
6          }
7          return 10 / n, nil
8  }
9
10 func main() {
11         if n, err := divideTenBy(0); err != nil {
12                 fmt.Println("Got error:", err)
13         } else {
14                 fmt.Println("Got result:", n)
15         }
16 }
```

NEXT WEEK...

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- Concurrency!

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- Panic and defer

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- A simple game (if there's time...)

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- A simple game (if there's time...)
- Anything else?

THANKS!