Nil today, outage tomorrow

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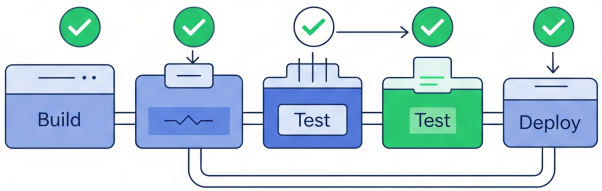
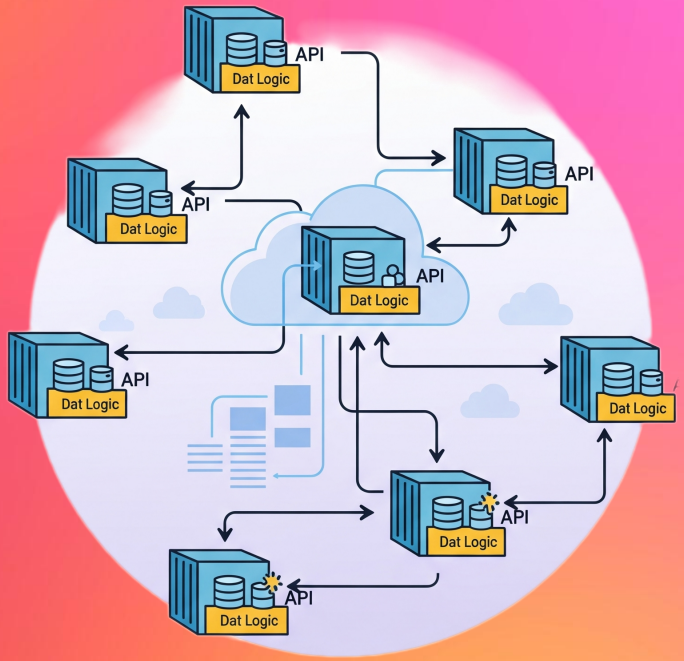
Developer Advocate

JETBRAINS

Logos by Maria Letta | https://github.com/MariaLetta/free-gophers-pack


With All checks passing
Build
Test
Test
Deploy


API
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API
Dat Logic

Staging Lied. Production Died.

Manager “Why is the app down?”
Developer “Something was nil.
Manager “What was nil?”
Developer “Exactly, line number 27”

Looks familiar?

```
> <4 go setup calls>
  panic: runtime error: invalid memory address or nil pointer dereference
  [signal SIGSEGV: segmentation violation code=0x2 addr=0x8 pc=0x104210c88]

  goroutine 1 [running]:
  main.SafeCreateUser(0x14000098f38?, {0x104211a50?, 0x0?})
      /Users/mukulmantosh/GolandProjects/nil_dereference/main.go:12 +0x78
  main.main()
      /Users/mukulmantosh/GolandProjects/nil_dereference/main.go:17 +0x2c

  Process finished with the exit code 2
```

Something doesn’t seem quite right here...

```
func RegisterUser(name string) {  1 usage  new *
    user := CreateUser(name)
    fmt.Printf( format: "Name: %s, ID: %d\n", user.Name, user.ID)
}
```

Time to investigate...

```
func CreateUser(name string) *User {  1 usage  new *
    if !validName(name) {
        // ❌ Returns nil without signaling failure
        return nil
    }
    return &User{ID: GenerateUniqueIntID(), Name: name}
}
```

Time to refactor

```go
func RegisterUser(name string, email string) (*User, error) {  1 usage
    user, err := CreateUser(name, email)

    if err != nil {
        return nil, fmt.Errorf( format: "create user: %w", err)
    }
    fmt.Printf( format: "User ID: %d, Name: %s\n", user.ID, user.Name)
    return user, nil
}
```

```go
func CreateUser(name string, email string) (*User, error) {
    if !IsValidEmail(email) {
        return nil, errors.New( text: "the email is invalid")
    }
    if !IsValidName(name) {
        return nil, nil
    }
    return &User{ID: GenerateUniqueIntID(), Name: name}, nil
}
```

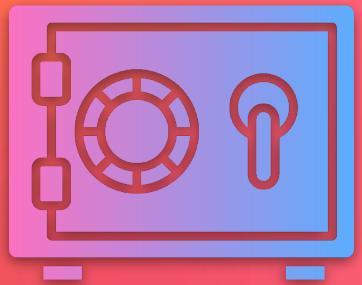
```
if !IsValidName(name) {
    return nil, errors.New( text: "invalid name")
}
```

the silence of nil is deceptive.

Here I come...

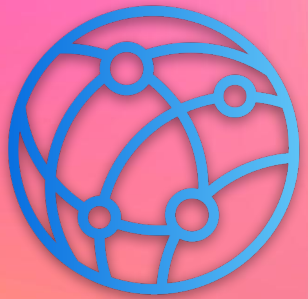
Global

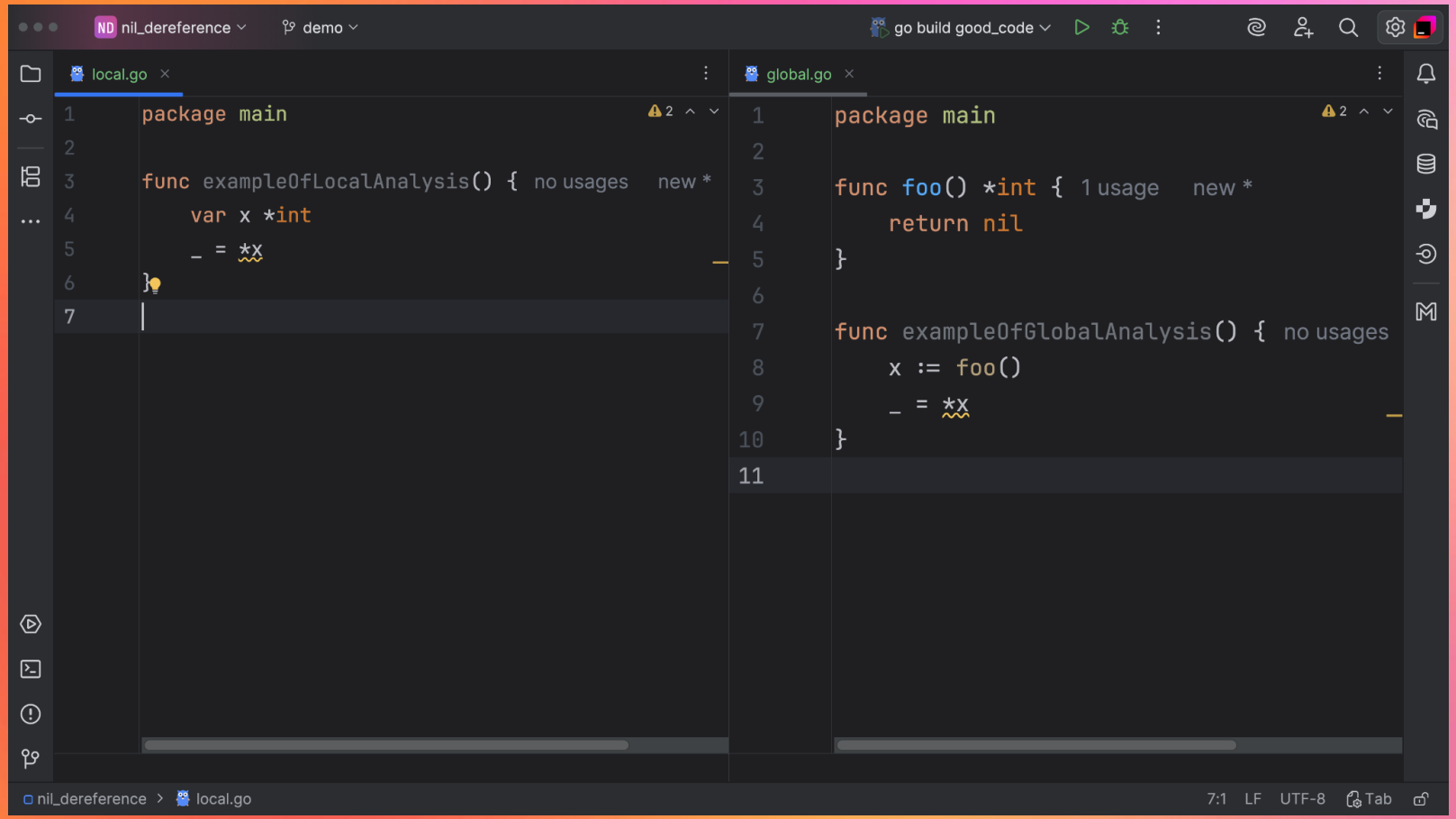
Intraprocedural



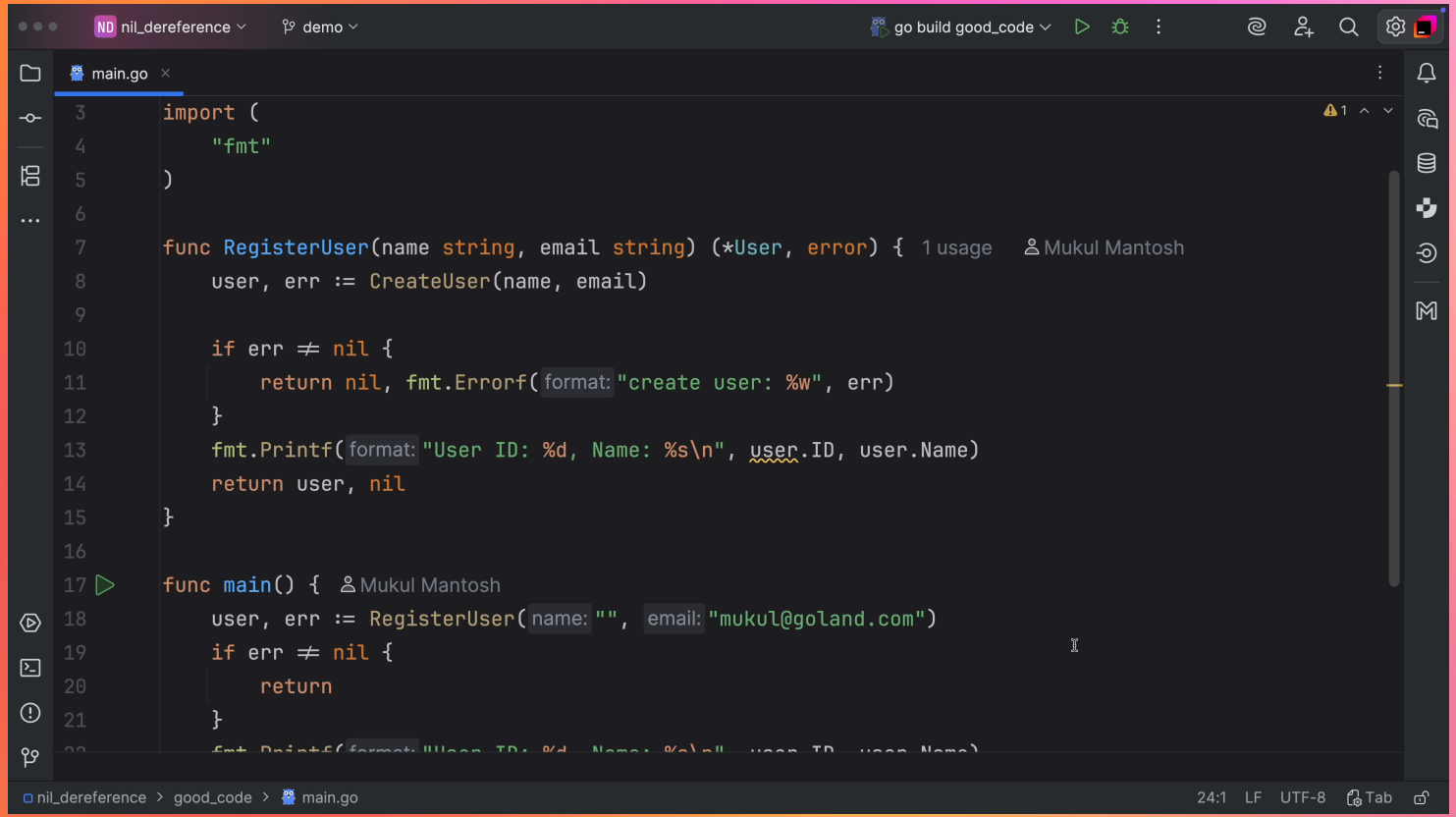
Local

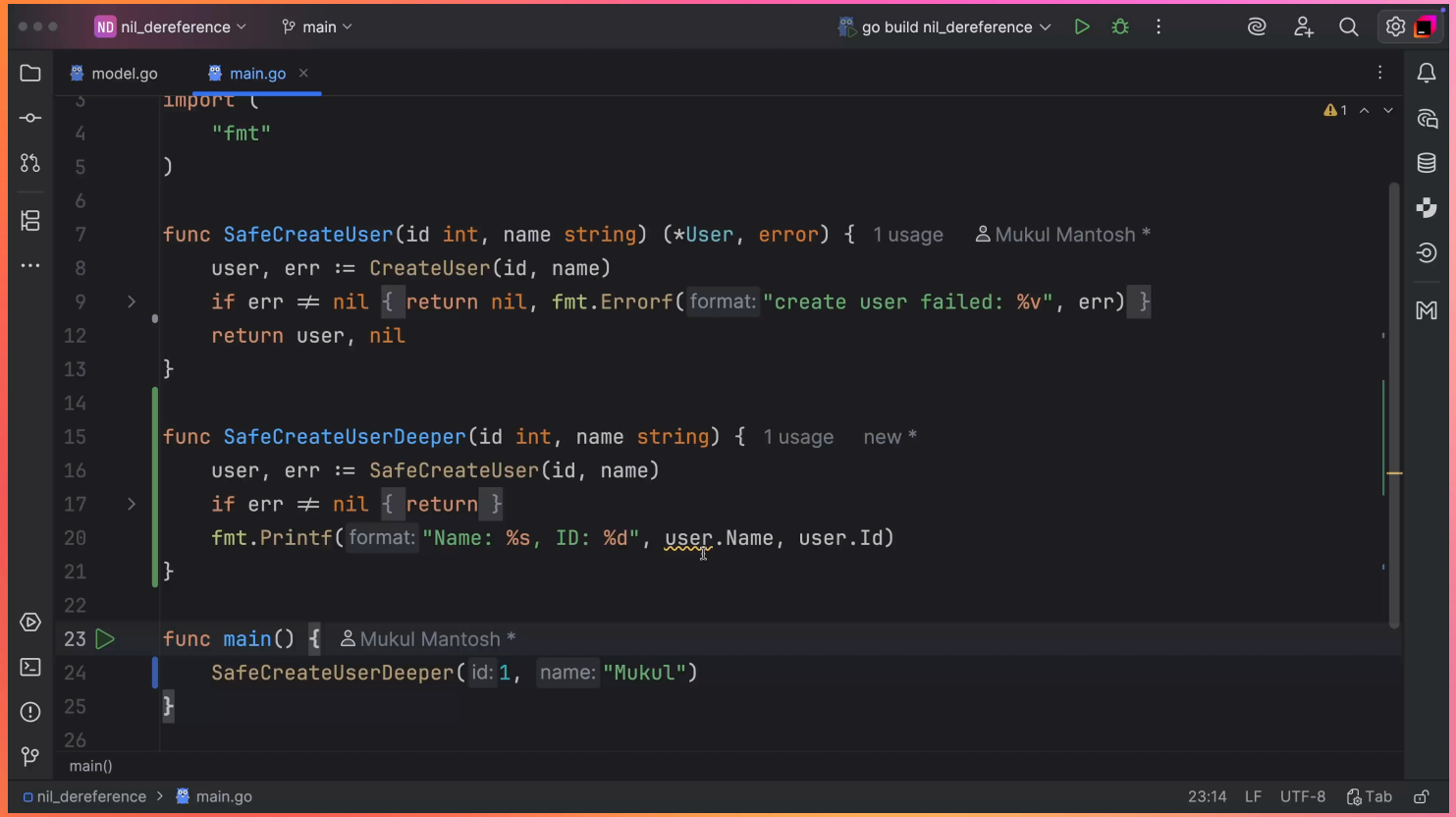
Interprocedural




nil_dereference
demo
go build good_code
local.go
package main
func exampleOfLocalAnalysis() { no usages new *
var x *int
_ = *x
}
global.go
package main
func foo() *int { 1 usage new *
return nil
}
func exampleOfGlobalAnalysis() { no usages
x := foo()
_ = *x
}
nil_dereference
local.go
7:1
LF
UTF-8
Tab

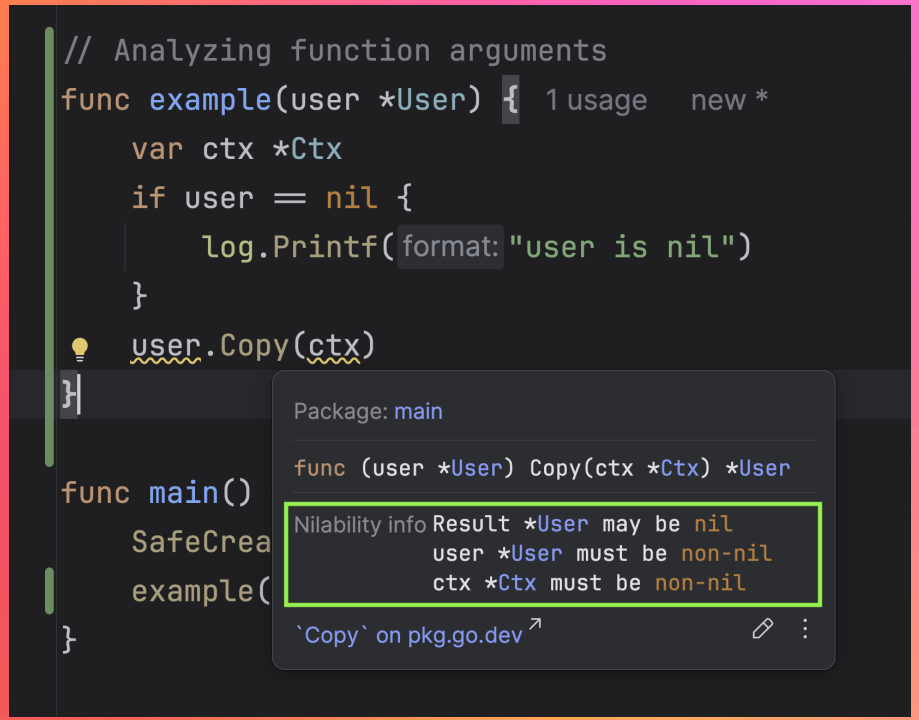

You didn’t show any demo, right?
Programming
FWP


nil_dereference
demo
go build good_code
main.go
import (
"fmt"
)
func RegisterUser(name string, email string) (*User, error) { 1 usage Mukul Mantosh
user, err := CreateUser(name, email)
if err != nil {
return nil, fmt.Errorf(format: "create user: %w", err)
}
fmt.Printf(format: "User ID: %d, Name: %s\n", user.ID, user.Name)
return user, nil
}
func main() { Mukul Mantosh
user, err := RegisterUser(name: "", email: "mukul@goland.com")
if err != nil {
return
}
nil_dereference
good_code
main.go
24:1
LF
UTF-8
Tab


nil_dereference
main
go build nil_dereference
model.go
main.go
import (
"fmt"
)
func SafeCreateUser(id int, name string) (*User, error) { 1 usage Mukul Mantosh *
user, err := CreateUser(id, name)
if err != nil { return nil, fmt.Errorf(format: "create user failed: %v", err) }
return user, nil
}
func SafeCreateUserDeeper(id int, name string) { 1 usage new *
user, err := SafeCreateUser(id, name)
if err != nil { return }
fmt.Printf(format: "Name: %s, ID: %d", user.Name, user.Id)
}
func main() { Mukul Mantosh *
SafeCreateUserDeeper(id: 1, name: "Mukul")
}
main()
nil_dereference
main.go
23:14
LF
UTF-8
Tab


8 func process(user *common.User) { 1 usage Arseniy Terekhov
9 if user == nil {
10 log.Println(v...: "user is nil")
11 }
12 copiedUser := user.Copy(ctx: nil)
13 handleUser(copiedUser)
14 }
Potential nil dereference when passing 'nil' to 'Copy'
Line 12: 'nil' is passed to 'user.Copy'

Quick Docs


// Analyzing function arguments
func example(user *User) { 1 usage new *
var ctx *Ctx
if user == nil {
log.Printf(format: "user is nil")
}
user.Copy(ctx)
}
func main()
SafeCrea
example(
}
Package: main
func (user *User) Copy(ctx *Ctx) *User
Nilability info Result *User may be nil
user *User must be non-nil
ctx *Ctx must be non-nil
`Copy` on pkg.go.dev

Doesn't it resemble NilAway?

Avengers... assemble

Thank you!

mukulmantosh

MantoshMukul

mukul-mantosh