Go programming patterns

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罗健文

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Go programming patterns

The Creators of Golang

Robert Griesemer	Rob Pike	Ken Thompson
Born 1964	Born 1956	Born 1943
Java HotSpot JVM	Unix	Unix/C
V8 Javascript engine	UTF-8	UTF-8
Golang	Golang	Golang

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Topics

- Functional Options
- Error Handing

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Functional Options

你有一个任务就是编写一些关键的服务组件，就像这样的代码：

```
page gplusplus

import "net"

type Server struct {
    listener net.Listener
}

func (s *Server) Add() net.Addr
func (s *Server) Shutdown()

// NewServer returns a new Server listenering on addr.
func NewServer(addr string) (*Server, error) {
    l, err := net.Listen("tcp", addr)
    if err !=nil {
        return nil, err
    }

    srv := Server{listener: l}
    go src.run()
    return &srv, nil
}
```

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Functional Options

新需求来了

- does your server support TLS ?
- can I limit the number of clients ?
- can I specify the port ?
- can I set the timeout ?
- ... and more ...

```
func NewServer(addr string, port int, maxconns int, timeout time.Duration, tls *tls.Config) (*Server, er
    //...
}
```

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Functional Options

```
// We need a number of New Server function for different senarios
func NewServer(addr string, port int) (*Server, error) {
    //...
}
func NewTLSServer(addr string, port int, tls *tls.Config) (*Server, error) {
    //...
}
func NewServerWithTimeout(addr string, port int, timeout time.Duration) (*Server, error) {
    //...
}
func NewTLSServerWithMaxConnAndTimeout(addr string, port int, maxconns int, timeout time.Duration, tls *
    //...
}
```

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One Popular Solution

```
type Config struct {
    Protocol string
    Timeout  time.Duration
    Maxconns int
    TLS      *tls.Config
}

func NewServer(add string, port int, config *Config) (*Server, error) {
    //...
}

srv1, _ := NewServer("localhost", 9000, nil)
```

```
conf := Config{Protocol: "tcp", Timeout: 60 * time.Second, Maxconns: 10}
svc2, _ := NewServer("localhost", 9000, &conf)
```

```
conf.Maxconns=15
```

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Functional Options

```
func NewServer(add string, port int, config ...*Config) (*Server, error) {
    //...
}

func main() {
    svc1, _ := NewServer("localhost", 9000)
    svc2, _ := NewServer("localhost", 9000, &Config{
        Timeout:  10 * time.Second,
        Maxconns: 10,
    })
}
```

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Functional Options

```
type Option func(*Server)

func Protocol(p string) Option {
    return func(s *Server) {
        s.Protocol = p
    }
}

func Timeout(timeout time.Duration) Option {
    return func(s *Server) {
        s.Timeout = timeout
    }
}

func MaxConns(maxconns int) Option {
    return func(s *Server) {
        s.Maxconns = maxconns
    }
}

func TLS(tls *tls.Config) Option {
    return func(s *Server) {
        s.TLS = tls
    }
}
```

Functional Options

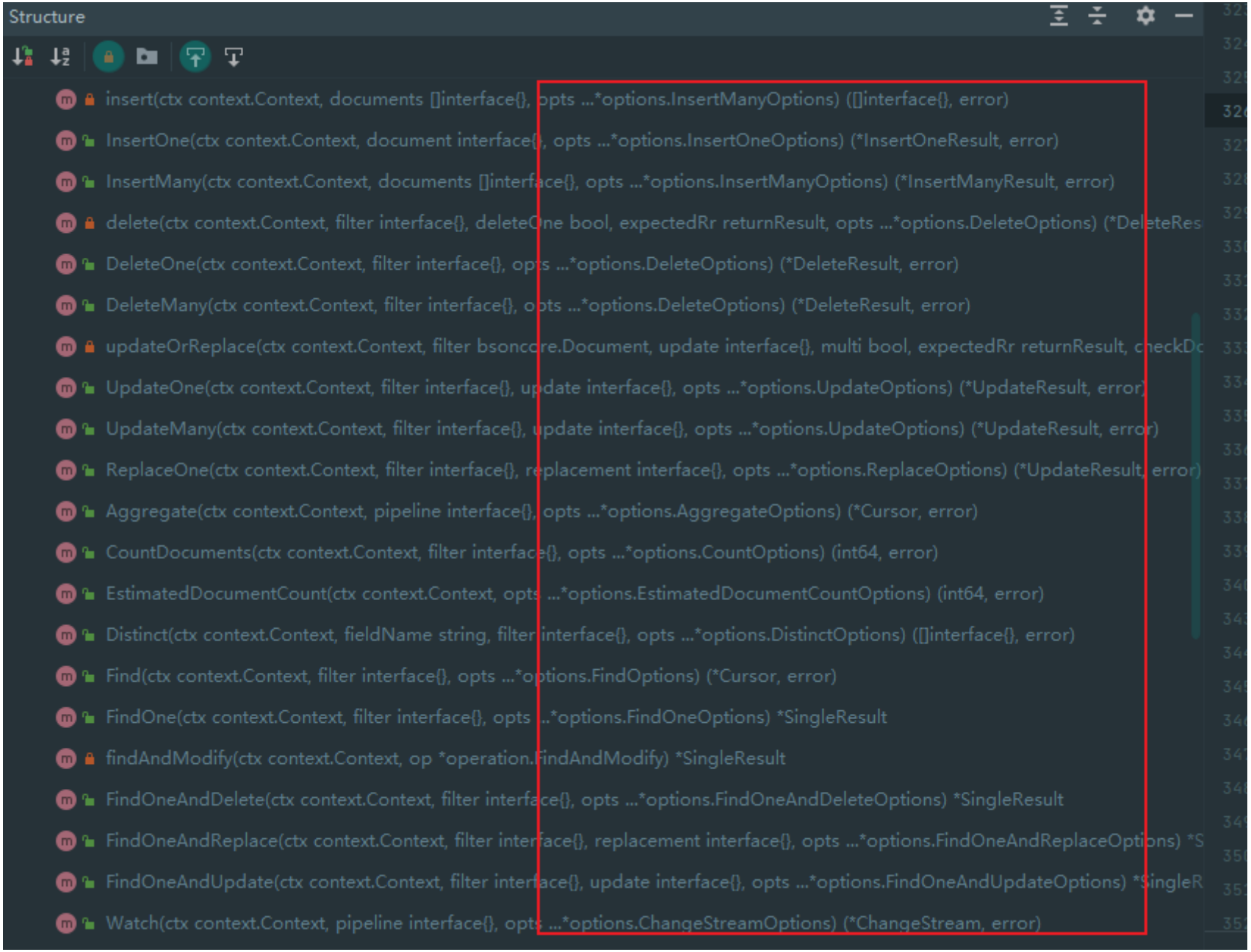
```
func NewServer(addr string, port int, options ...func(*Server)) (*Server, error) {
    l, err := net.Listen("tcp", addr)
    if err !=nil {
        return nil, err
    }

    srv := Server{listener: l}
    for _, option := range options {
        option(&srv)
    }
    return &srv, nil
}
```

Article:

self-referential-functions-and-design--Robe Pike (https://commandcenter.blogspot.com/2014/01/self-referential-functions-and-design.html)

functional-options-for-friendly-apis--Dave Cheney (https://dave.cheney.net/2014/10/17/functional-options-for-friendly-apis) 15

Functional Options


Structure
insert(ctx context.Context, documents []interface{}, opts ...*options.InsertManyOptions) ([]interface{}, error)
InsertOne(ctx context.Context, document interface{}, opts ...*options.InsertOneOptions) (*InsertOneResult, error)
InsertMany(ctx context.Context, documents []interface{}, opts ...*options.InsertManyOptions) (*InsertManyResult, error)
delete(ctx context.Context, filter interface{}, deleteOne bool, expectedRr returnResult, opts ...*options.DeleteOptions) (*DeleteRes
DeleteOne(ctx context.Context, filter interface{}, opts ...*options.DeleteOptions) (*DeleteResult, error)
DeleteMany(ctx context.Context, filter interface{}, opts ...*options.DeleteOptions) (*DeleteResult, error)
updateOrReplace(ctx context.Context, filter bsoncore.Document, update interface{}, multi bool, expectedRr returnResult, checkDo
UpdateOne(ctx context.Context, filter interface{}, update interface{}, opts ...*options.UpdateOptions) (*UpdateResult, error)
UpdateMany(ctx context.Context, filter interface{}, update interface{}, opts ...*options.UpdateOptions) (*UpdateResult, error)
ReplaceOne(ctx context.Context, filter interface{}, replacement interface{}, opts ...*options.ReplaceOptions) (*UpdateResult, error)
Aggregate(ctx context.Context, pipeline interface{}, opts ...*options.AggregateOptions) (*Cursor, error)
CountDocuments(ctx context.Context, filter interface{}, opts ...*options.CountOptions) (int64, error)
EstimatedDocumentCount(ctx context.Context, opts ...*options.EstimatedDocumentCountOptions) (int64, error)
Distinct(ctx context.Context, fieldName string, filter interface{}, opts ...*options.DistinctOptions) ([]interface{}, error)
Find(ctx context.Context, filter interface{}, opts ...*options.FindOptions) (*Cursor, error)
FindOne(ctx context.Context, filter interface{}, opts ...*options.FindOneOptions) *SingleResult
findAndModify(ctx context.Context, op *operation.FindAndModify) *SingleResult
FindOneAndDelete(ctx context.Context, filter interface{}, opts ...*options.FindOneAndDeleteOptions) *SingleResult
FindOneAndReplace(ctx context.Context, filter interface{}, replacement interface{}, opts ...*options.FindOneAndReplaceOptions) *S
FindOneAndUpdate(ctx context.Context, filter interface{}, update interface{}, opts ...*options.FindOneAndUpdateOptions) *SingleR
Watch(ctx context.Context, pipeline interface{}, opts ...*options.ChangeStreamOptions) (*ChangeStream, error)

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Error Handing

Go 语言的函数支持多返回值，所以，可以在返回接口把业务语义（业务返回值）和控制语义（出错返回值）区分开来。Go 语言的很多函数都会返回 result, err 两个值。

- 参数上基本上就是入参，而返回接口把结果和错误分离，这样使得函数的接口语义清晰；
- 而且，Go 语言中的错误参数如果要忽略，需要显式地忽略，用 _ 这样的变量来忽略；
- 另外，因为返回的 error 是个接口（其中只有一个方法 Error()，返回一个 string ），所以你可以扩展自定义的错误处理。

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Error Handing

如果一个函数返回了多个不同类型的 error，可以这样做：

```
if err != nil {
switch err.(type) {
    case *json.SyntaxError:
    ...
    case *ZeroDivisionError:
    ...
    case *NullPointerError:
    ...
    default:
    ...
}
}
```

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Error Check Hell

```
func parse(r io.Reader) (*Point, error) {

    var p Point

    if err := binary.Read(r, binary.BigEndian, &p.Longitude); err != nil {
        return nil, err
    }
    if err := binary.Read(r, binary.BigEndian, &p.Latitude); err != nil {
        return nil, err
    }
    if err := binary.Read(r, binary.BigEndian, &p.Distance); err != nil {
        return nil, err
    }
    if err := binary.Read(r, binary.BigEndian, &p.ElevationGain); err != nil {
        return nil, err
    }
    if err := binary.Read(r, binary.BigEndian, &p.ElevationLoss); err != nil {
        return nil, err
    }
}
```

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Error Handing

```
func parse(r io.Reader) (*Point, error) {
    var p Point
    var err error
    read := func(data interface{}) {
        if err != nil {
            return
        }
        err = binary.Read(r, binary.BigEndian, data)
    }

    read(&p.Longitude)
    read(&p.Latitude)
    read(&p.Distance)
    read(&p.ElevationGain)
    read(&p.ElevationLoss)

    if err != nil {
        return &p, err
    }
    return &p, nil
}
```

Error Handing

可以通过函数式编程的方式

```
func parse(r io.Reader) (*Point, error) {
    var p Point
    var err error
    read := func(data interface{}) {
        if err != nil {
            return
        }
        err = binary.Read(r, binary.BigEndian, data)
    }

    read(&p.Longitude)
    read(&p.Latitude)
    read(&p.Distance)
    read(&p.ElevationGain)
    read(&p.ElevationLoss)

    if err != nil {
        return &p, err
    }
    return &p, nil
}
```

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Error Handing

```
type Reader struct {
    r   io.Reader
    err error
}

func (r *Reader) read(data interface{}) {
    if r.err == nil {
        r.err = binary.Read(r.r, binary.BigEndian, data)
    }
}

func parse(input io.Reader) (*Point, error) {
    var p Point
    r := Reader{r: input}

    r.read(&p.Longitude)
    r.read(&p.Latitude)
    r.read(&p.Distance)
    r.read(&p.ElevationGain)
    r.read(&p.ElevationLoss)
    if r.err != nil {
        return nil, r.err
    }
    return &p, nil
}
```

Error Handing

Article:

golang-error-handling-lesson-by-rob-pike (http://jxck.hatenablog.com/entry/golang-error-handling-lesson-by-rob-pike)

Go编程模式——错误处理--左耳耗子 (https://coolshell.cn/articles/21140.html)

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

资料

Golang中present工具--萝卜头LJW (https://blog.csdn.net/u013164931/article/details/101004573)

GopherChina2020-ppt (https://github.com/robotLJW/GopherChina)

左耳耗子的博客 (https://coolshell.cn/)

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Thank you

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