

Own Your Own Middleware

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introduction

- ▶ a way to build a web service
- ▶ lessons learned along the way

Outline

Demo

Assumptions

Logging

Contexts

Errors

Routing

Integration

Conclusions

always be closing

- ▶ Always Be Closing is a GitHub service
- ▶ improves development workflow
- ▶ 5 min demo

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- ▶ beta testers needed at thoughtdealership.com
- ▶ slides at github.com/thoughtdealership/howto
- ▶ howto is CC0 licensed

tyranny of metrics

- ▶ lines of code metric used throughout the presentation
- ▶ loc is generally a useless metric
- ▶ using it as a proxy for understanding the entire application
- ▶ we'll revisit this

logging standards?

- ▶ lots of prior discussions about loggers
- ▶ [Let's Talk About Logging](#)
- ▶ [The Hunt for a Logger Interface](#)
- ▶ logging levels should be actionable
- ▶ level error goes to PagerDuty
- ▶ level warning goes to non-immediate reporting
- ▶ use structured logging to your advantage

rs/zerolog to the rescue

- ▶ github.com/rs/zerolog
- ▶ leveled logger
- ▶ structured logger
- ▶ zero allocation (or low allocation) logger
- ▶ uses types not interfaces
- ▶ 5055 lines of code
- ▶ tradeoff: you can't inspect fields

contexts

```
package context

// The provided key must be comparable and should not
// be of type string or any other built-in type to
// avoid collisions between packages using context.
// Users of WithValue should define their own types
// for keys. To avoid allocating when assigning to
// an interface{}, context keys often have concrete
// type struct{}.

func WithValue(parent Context, key,
               val interface{}) Context {
    ...
    return &valueCtx{parent, key, val}
}
```

context → values → in → list

contexts

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context → values → in → list

Actually interface{} → interface{} → interface{} → interface{}

type-safe contexts

```
package frame

type frameCtx struct{}

var frameKey frameCtx

type Frame struct {
    UUID    uuid.UUID
    Logger  zerolog.Logger

    Foo string
    Bar bool
    Baz struct {
        A int
        B byte
        C string
    }
}
```

type-safe contexts

```
package frame

func NewContext(ctx context.Context) context.Context {
    fr := new(Frame)
    fr.Logger = log.Logger
    return ctx.WithValue(frameKey, fr)
}

func FromContext(ctx context.Context) *Frame {
    fr := ctx.Value(frameKey)
    if fr == nil {
        return nil
    }
    return fr.(*Frame)
}
```

error handling

- ▶ generate http response codes
- ▶ combine multiple errors
- ▶ generate http response codes for combined errors

external errors

```
package exterror

type ExtError struct {
    Status int
    Err     error
}

func (e ExtError) Error() string {
    return e.Err.Error()
}

func Create(status int, err error) ExtError {
    return ExtError{Status: status, Err: err}
}
```

combining errors

```
package multierr  
  
type Error []error
```

- ▶ github.com/jonbodner/multierr
- ▶ 62 lines of code

combining errors

```
func Append(e1 error, e2 error) error {  
    if isNil(e1) && isNil(e2) { return nil }  
    if isNil(e1) { return e2 }  
    if isNil(e2) { return e1 }  
    switch e1 := e1.(type) {  
    case Error:  
        switch e2 := e2.(type) {  
            case Error: return append(e1, e2...)  
            default: return append(e1, e2)  
        }  
    default:  
        ...  
    }  
}
```


combining external errors

```
// Convert generates an ExtError from  
// a non-nil error input  
func Convert(err error) ExtError {  
    switch err := err.(type) {  
    case ExtError:  
        return err  
    case multierr.Error:  
        return ExtError{  
            Status: convertMultiErr(err),  
            Err: err  
        }  
    default:  
        return ExtError{Status: 500, Err: err}  
    }  
}
```

combining external errors

```
func convertMultiErr(errs multierr.Error) int {  
    if !allExtError(errs) {  
        return 500  
    } else if allEqualStatus(errs) {  
        return errs[0].(ExtError).Status  
    } else if allRangeStatus(errs, 400, 500) {  
        return 400  
    }  
    return 500  
}
```

so many routers...

- ▶ github.com/julienschmidt/httprouter
- ▶ limited scope
- ▶ explicit matches
- ▶ builds radix tree (trie) for routes
- ▶ zero allocation (or low allocation) router
- ▶ 1232 lines of code

finally lets talk middleware

- ▶ github.com/justinas/alice
- ▶ syntactic sugar
- ▶ Transforms `alice.New(Func1, Func2, Func3).Then(App)`
- ▶ to `Func1(Func2(Func3(App)))`
- ▶ 112 lines of code
- ▶ bonus points for clever name

create router

```
func Create() http.Handler {  
    router := httprouter.New()  
  
    router.Handle("GET", "/", Response(Hello))  
  
    return alice.New(  
        RecoveryHandler,  
        FrameHandler,  
        RequestIDHandler).  
        Then(router)  
}
```

create frame

```
func FrameHandler(h http.Handler) http.Handler {  
    return http.HandlerFunc(func(  
        w http.ResponseWriter,  
        r *http.Request) {  
        ctx := r.Context()  
        ctx = frame.NewContext(ctx)  
        r = r.WithContext(ctx)  
        h.ServeHTTP(w, r)  
    })  
}
```

populate frame

```
func RequestIDHandler(h http.Handler) http.Handler {  
    return http.HandlerFunc(func(  
        w http.ResponseWriter,  
        r *http.Request) {  
        ctx := r.Context()  
        fr := frame.FromContext(ctx)  
        id := uuid.New()  
        fr.UUID = id  
        fr.Logger = fr.Logger.With().  
            Str("uuid", id.String()).  
            Logger()  
        h.ServeHTTP(w, r)  
    })  
}
```

what's a response?

```
type respHandle func(*http.Request,
    httprouter.Params) (string, error)

func Hello(r *http.Request,
    p httprouter.Params) (string, error) {
    return "world", nil
}

func UserError(r *http.Request,
    p httprouter.Params) (string, error) {
    err := exterror.Create(http.StatusBadRequest,
        errors.New("user error"))
    return "", err
}
```


response handler

```
func Response(handle respHandle) httprouter.Handle {  
    return func(w http.ResponseWriter,  
        r *http.Request, p httprouter.Params) {  
        msg, err := handle(r, p)  
        if err != nil {  
            HandleError(w, r, err)  
        } else {  
            HandleResult(w, r, msg)  
        }  
    }  
}
```

error response handler

```
func HandleError(w http.ResponseWriter,
    r *http.Request, err error) {

    ctx := r.Context()
    fr := frame.FromContext(ctx)
    exterr := exterror.Convert(ctx, err)
    if exterr.Status < 500 {
        fr.Logger.Warn().
            Err(err).
            Int("status", exterr.Status).
            Msg("user error reported")
    } else {
        fr.Logger.Error().
            Err(err).
            Int("status", exterr.Status).
            Msg("server error reported")
    }
    ...
}
```

own your own middleware

- ▶ github.com/google/uuid 868
- ▶ github.com/go-stack/stack 400
- ▶ github.com/ianschenck/envflag 192
- ▶ github.com/jonbodner/multierr 63
- ▶ github.com/julienschmidt/httprouter 1232
- ▶ github.com/justinas/alice 112
- ▶ github.com/rs/zerolog 5055

revisiting assumptions

- ▶ we optimized for lines of code
- ▶ proxy for understanding the entire application
- ▶ what is highest priority for your application?
- ▶ is it understanding?

revisiting assumptions

- ▶ we optimized for lines of code
- ▶ proxy for understanding the entire application
- ▶ what is highest priority for your application?
- ▶ is it understanding?
- ▶ delivering features, security, performance
- ▶ whatever works for you

thank you

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