Programming in Go

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Static Analysis

Reading culture

"So much has been said, about the importance of readability, not just in Go, but all programming languages. People like me . . . use words like simplicity, readability, clarity, productivity, but ultimately they are all synonyms for one word — *maintainability*."

"Go is not a language that optimises for clever one liners. Go is not a language which optimises for the least number of lines in a program. We're not optimising for the size of the source code on disk. . . . Rather, **we want to optimise our code to be clear to the reader**. Because it's the reader who's going to have to maintain this code." — Dave Cheney

Static analysis

“Static” means the program isn’t running (“compile time”)

Static analysis transfers effort from people to tools

- mental effort while coding
- code review effort

Static analysis improves code hygiene

- correctness
- efficiency
- readability
- maintainability

Start clean, stay clean

Static analysis allows us to find many issues beyond compiler bugs as well as meet community guidelines for “clean code”

If our code compiles & passes static analysis, we can have a lot of confidence in it *even before running unit tests*

I run these tools in my IDE every time I save a file:

- format the code
- fix the imports
- look for issues

Gofmt and Goimports

`gofmt` will put your code in standard form (spacing, indentation)

`goimports` will do that and also update import lists

Having a canonical code format is an important part of good software engineering

The standard practice is to run one or the other on every save in your IDE/editor (as a save file hook)

They can also be run as a pre-commit hook in your local repo

Golint

`golint` will check for non-format style isses, for example:

- exported names should have comments for `godoc`
- names shouldn't have `under_scores` or be in `ALLCAPS`
- `panic` shouldn't be used for normal error handling
- the error flow should be indented, the happy path not
- variable declarations shouldn't have redundant type info

The "rules" are based on Effective Go and Google's Go Code Review Comments

Go vet

`go vet` will find some issues the compiler won't

- suspicious "printf" format strings
- accidentally copying a mutex type
- possibly invalid integer shifts
- possibly invalid atomic assignments
- possibly invalid struct tags
- unreachable code

No static analysis tool can find all possible errors

Other tools

`goconst` finds literals that should be declared with `const`

`gosec` looks for possible security issues

`ineffasign` finds assignments that are “ineffective” (shadowed?)

`gocyclo` reports high cyclomatic complexity in functions

`deadcode`, `unused`, and `varcheck` find unused/dead code

`unconvert` finds redundant type conversions

I treat some of these as **warnings** because there are false positives

Example: ineffassign

The first assignment is ineffective because it's overwritten without being read (which means we missed handling the error)

```
prices, err := r.prices(region, . . . )
regularPrices, err := r.regularPrices(region, . . . )   // probably added later

if err != nil {
    return nil,
        fmt.Errorf("price not available for region %s", region)
}

// ineffectual assignment to err
```

Example: govet

The format string is mismatched

```go
func main() {
    fmt.Printf("%s\n", 20)
}

// Printf format %s has arg 20 of wrong type int
```

Example: golint

The formatting of an error message uses bad style

```go
if !ok {
  return fmt.Errorf("id is not a string: %v\n", idRef)
}

// error strings should not be capitalized or end
// with punctuation or a newline
```

Example: gosimple

The code in question may be simplified

```
// should merge variable declaration with assignment on
// next line, i.e., var responseData = data.Data

var responseData []data
responseData = response.Data
```

```
// should omit comparison to bool constant

if reservation[i].NonExpiring == true {
    . . .
}
```

One tool to rule them all

We run all these tools using `golangci-lint`

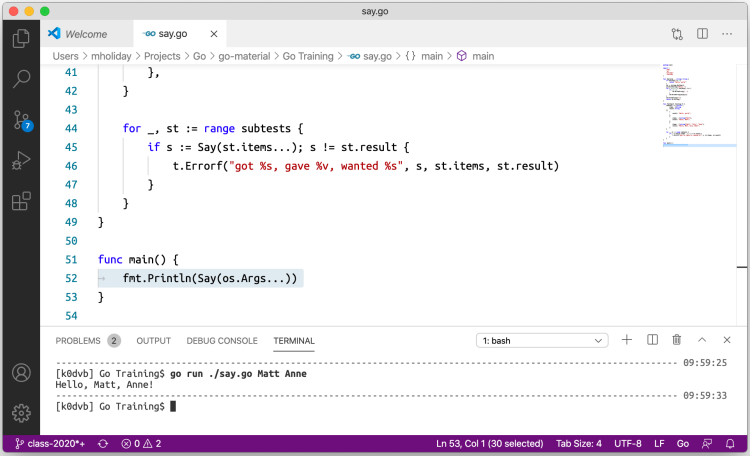
It can be configured with `.golangci.yml`

We use this in our CI/CD pipeline

Issues must be fixed for the build to pass

False positivescan be marked with `//nolint`

Visual Studio Code



Sample VSC settings

```
{
   "go.vetOnSave": "package",
   "go.formatTool": "goimports",
   "go.formatFlags": [
        "-local github.com/xxx,github.com/yyy"
   ],
   "go.lintTool": "golangci-lint",
   "go.lintFlags": [
        "--fast" ]
   "go.lintOnSave": "package"
}
```

Jetbrains GoLand IDE

offers-inventory-management – cache.go

offers-inventory-management › cache.go

make build/lint/test

Project

- offers-inventory-management
  - .github
  - cmd
  - docs
  - offer
  - schema
  - testdata
  - ui
  - .drone-v1.yml
  - .gcloudignore
  - .gitignore
  - .golangci.yml
  - .graphqlconfig
  - api.go
  - api_integration_test.go
  - api_test.go
  - auth.go
  - auth_test.go
  - cache.go
  - cache_test.go
  - coverprofile.out
  - db.go
  - db_test.go
  - editors.go
  - filter.go
  - filter_test.go
  - GetToken.sh
  - go.mod
  - graphql.config.json
  - home.go

auth.go | cache.go

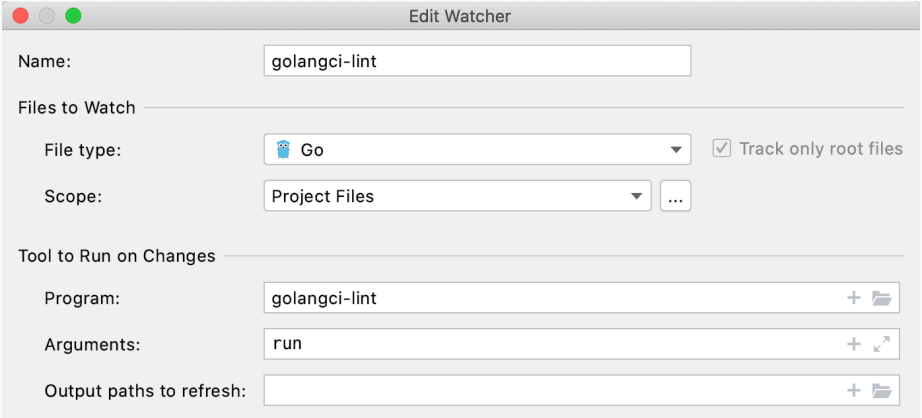
```go
// cachedPlatoClient is a plato client with responses cached.
type cachedPlatoClient struct {
    plato
    logger *leveledLog
}

var (
    defaultCountries = []string{"US", "CA", "GB", "FR", "AU", "IN"}

    // these are variables so we can reduce them in unit tests

    baseLifetime = 5 * time.Hour    // how long a cache entry lives (randomized later)
    reloadTime   = 20 * time.Minute // time considered "soon to expire", i.e., reload it now
    checkTime    = reloadTime / 2   // time between periodic DB/cache checks

    // these are used to create a single connection pool for Redis

    pool *redis.Pool
    once sync.Once
)

func newCachedPlatoClient(logger *leveledLog, client *platoClient) (*cachedPlatoClient, error) {
    // we will start the pool and test our connection
    // before we say we've got a working caching client

    if err := redisTest(getConn()); err != nil {
        return nil, fmt.Errorf( format: "redis failed: %w", err)
```

Git | TODO | Terminal | Event Log

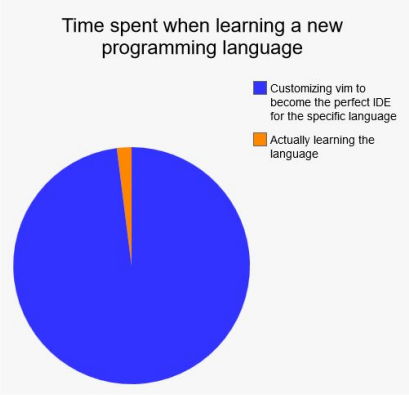
27:1 LF UTF-8 Tab offers-370-error

Sample GoLand settings

The formatting and linting tools are configured as file watchers in GoLand



Vim



Vim setup example