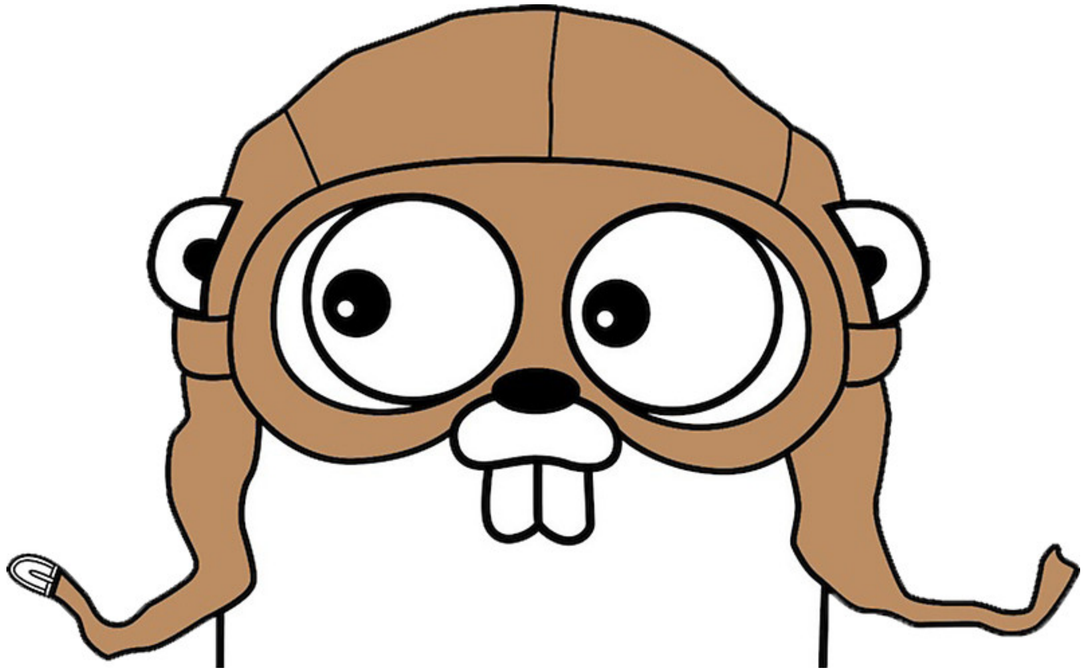
Going serverless with Go on DigitalOcean

An overview of a serverless implementation and some learning points

jonasbn / 2023-04-18

- A disclaimer
- I am still learning Go
- I am not a professional programmer
  - I am actually a Product Manager
- I am not a lawyer



- I *maintain* two Perl packages with C-bindings
- Often I have to navigate in all of the available command line flags for Clang
- Not being a C-programmer and working with C on a daily basis, means that this does not come easy

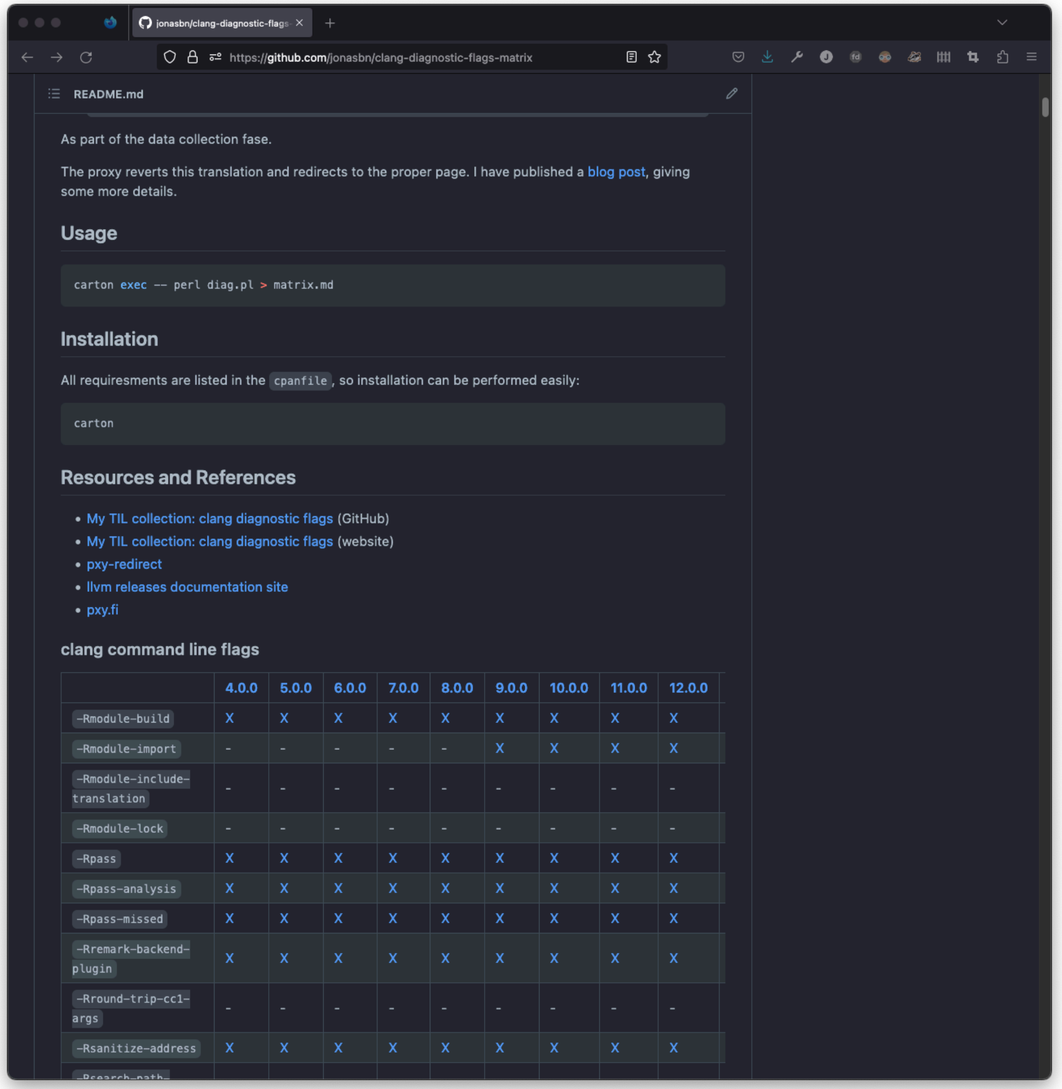
REF:
- https://github.com/dsully/perl-crypt-openssl-pkcs12
- https://github.com/dsully/perl-crypt-openssl-x509

- The documentation is fairly easy to navigate and I found out that I was able to jump between the different versions easily
- And the versions 4.0.0 to 14.0.0 was pretty uniform
- But instead of opening tabs and comparing the different versions, I decided to make a matrix of the command line flags and versions

REF:
- https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html
- https://releases.llvm.org/N.0.0/tools/clang/docs/DiagnosticsReference.html

- I implemented a small web scraper in Perl and Mojolicious* to parse the pages and generate the matrix
- The matrix is in Markdown and is served via GitHub pages
- And everything looked good, until I noticed that the rendering ***broke*** and the Matrix was not completed
- So I reached out to GitHub support

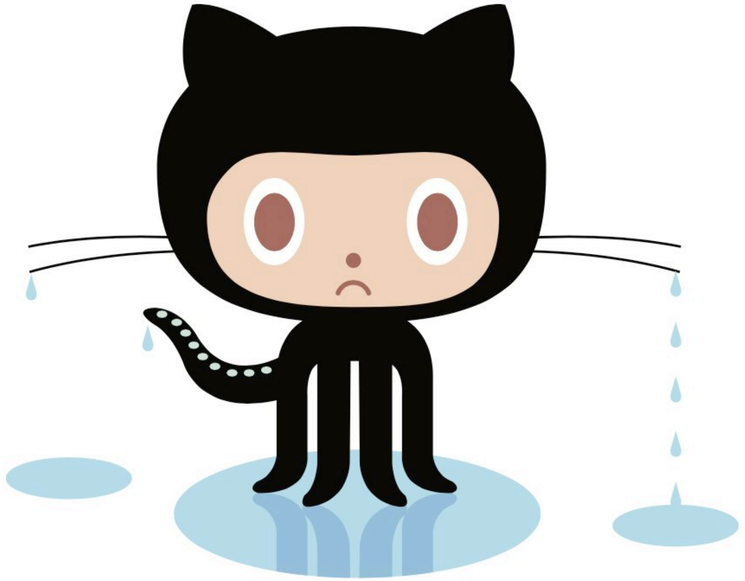
* this is my boring stack



REF: https://github.com/jonasbn/clang-diagnostic-flags-matrix

- *Text files over 512 KB are always displayed as plain text. Code is not syntax highlighted, and prose files are not converted to HTML (such as Markdown, AsciiDoc, etc.).*

REF: https://docs.github.com/en/repositories/creating-and-managing-repositories/about-repositories#text-limits



Mission: Compress the Contents

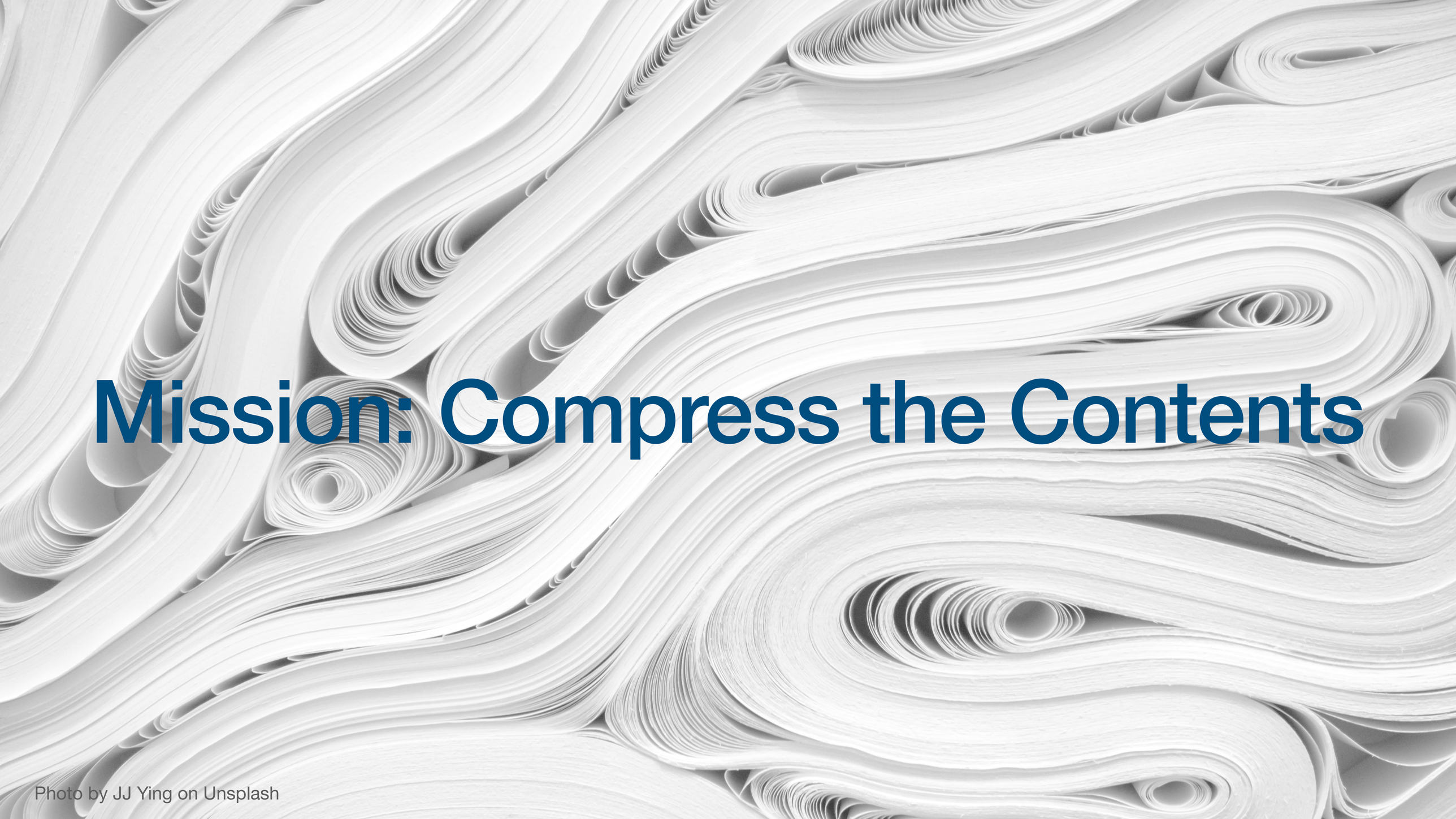


Photo by JJ Ying on Unsplash

- Most of the contents are links, so I did a comparison

  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wall
  https://releases.llvm.org/5.0.0/tools/clang/docs/DiagnosticsReference.html#wall
  https://releases.llvm.org/6.0.0/tools/clang/docs/DiagnosticsReference.html#wall
  https://releases.llvm.org/12.0.0/tools/clang/docs/DiagnosticsReference.html#wall
  https://releases.llvm.org/14.0.0/tools/clang/docs/DiagnosticsReference.html#wall

- As you can see the version part of links are uniform

- And only major versions have documentation

  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wall

- And I did a second comparison

  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wall
  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wformat
  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#id200
  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wimplicit-int
  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#id265

- Only variants are the anchors

- And the major versions

  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wall

- This mean I can boil this down to

  https://<domain name>/<major version>/#<anchor>

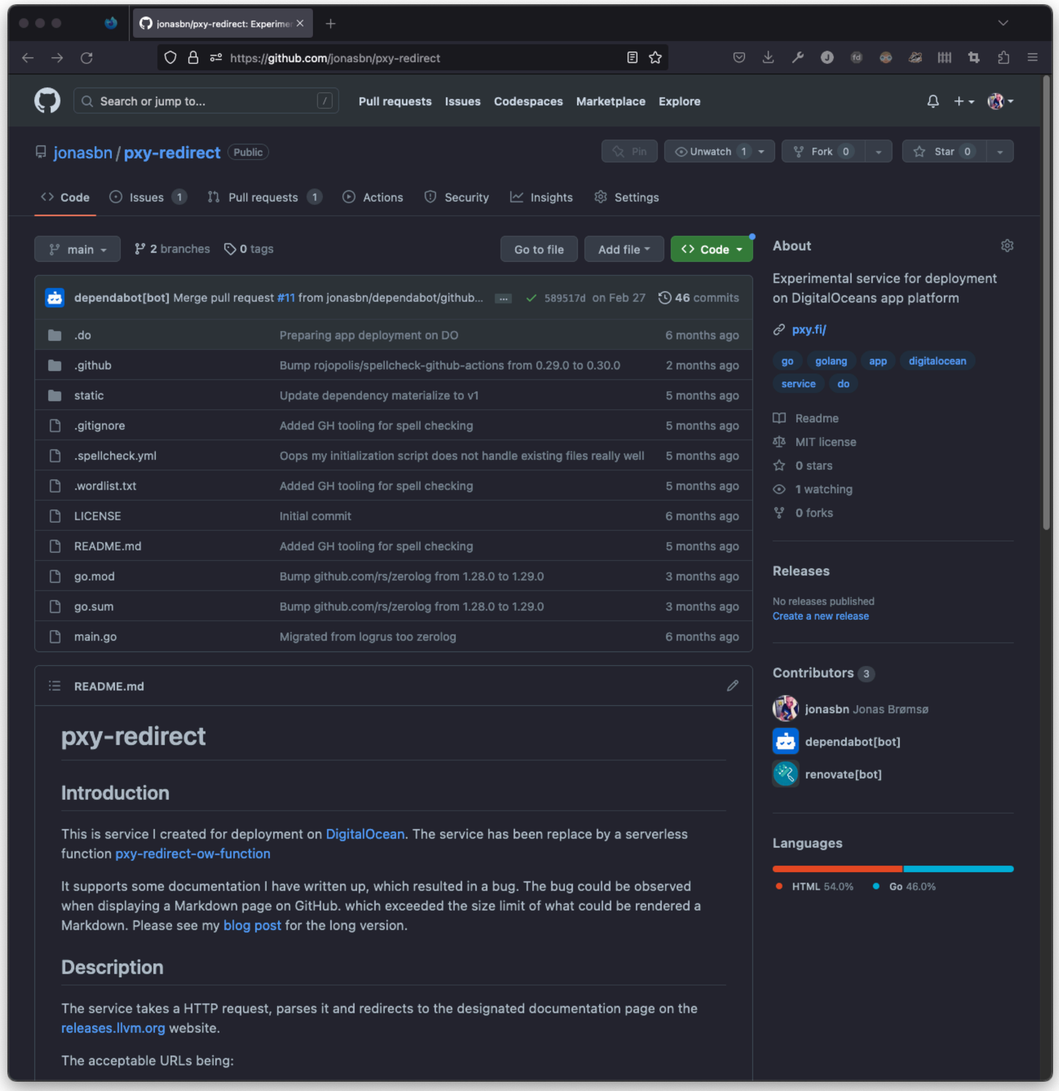
- With a *short* domain name and a single digit major version
- I could redirect from:

  https://<domain name>/4/#wall

- To:

  https://releases.llvm.org/4.0.0/tools/clang/docs/DiagnosticsReference.html#wall

- First up I implemented a service and deployed on DigitalOcean - it then struck me
  - *Nobody* is going to use this service, I do not want to pay to have a service running continuously
  - What if we could just pay for used compute and not idle compute?

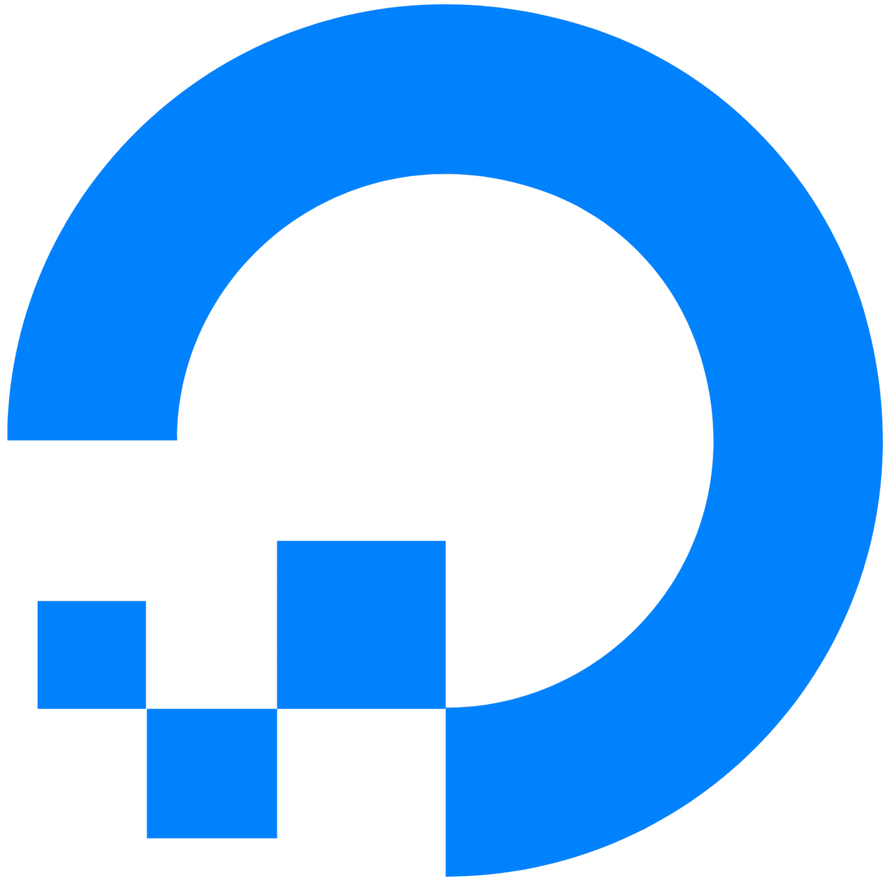


REF: https://github.com/jonasbn/pxy-redirect

Photo by Pero Kalimero on Unsplash

- I was already on DigitalOcean (DO), so I decided to check out their serverless function offering
- Requirements:
  - A DigitalOcean account
  - The CLI tool: “doctl” installed

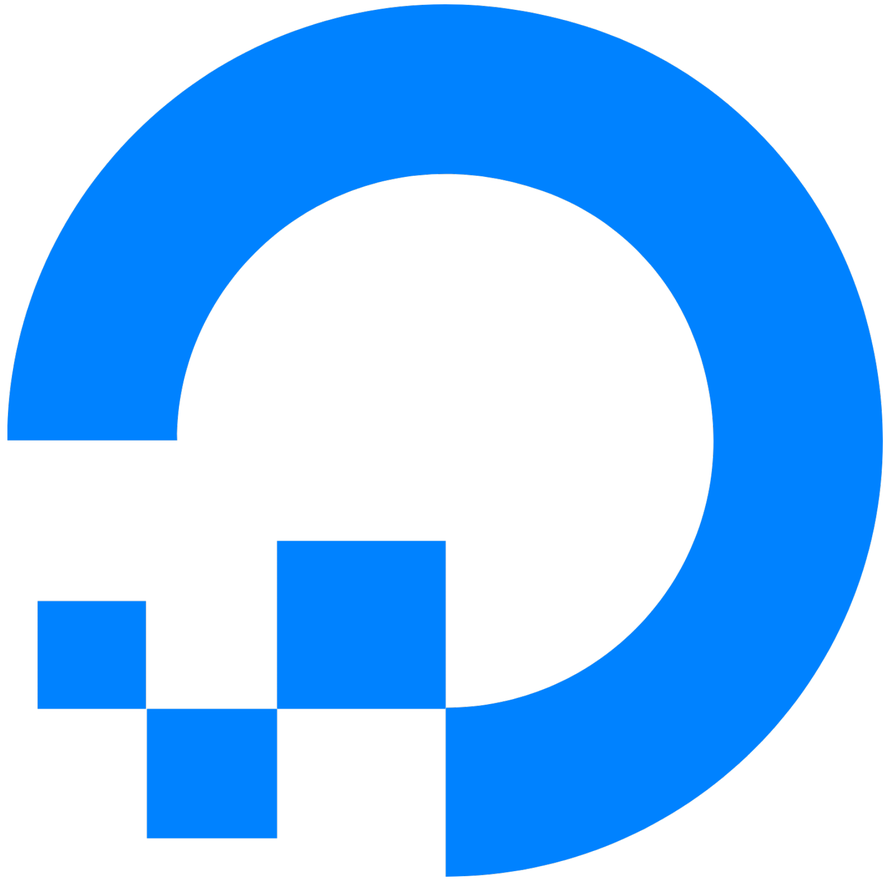
REF: https://docs.digitalocean.com/products/functions/



- Repository structure

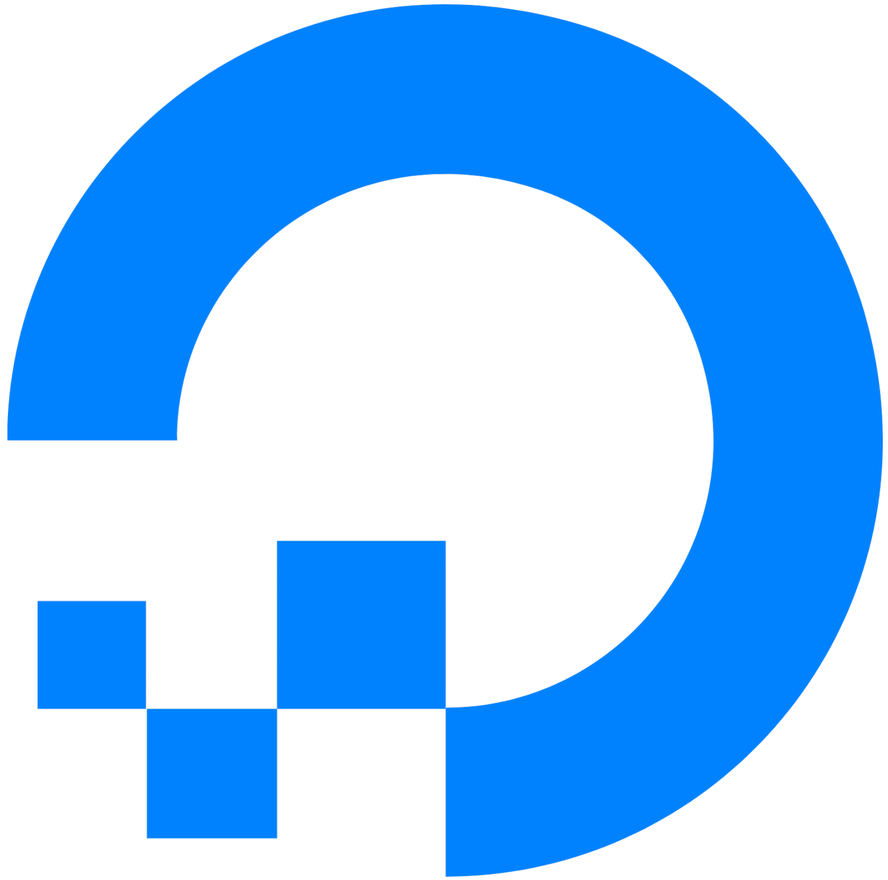
```
sample-functions-golang-helloworld
├── project.yml
└── packages
    └── sample
        └── hello.go
```

REF: https://github.com/digitalocean/sample-functions-golang-helloworld



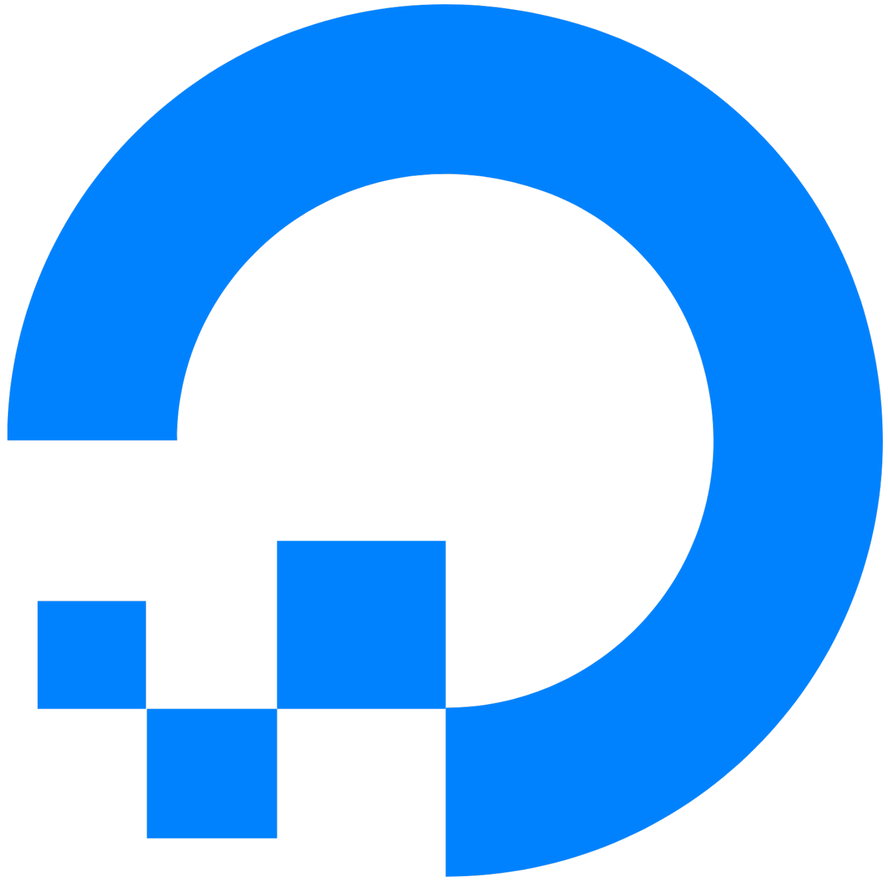
- Configuration file (project.yml)

```
parameters: {}
environment: {}
packages:
  - name: sample
    environment: {}
    parameters: {}
    actions:
      - name: hello
        main: ''
        runtime: 'go:default'
        environment: {}
        parameters: {}
```



REF: https://raw.githubusercontent.com/digitalocean/sample-functions-golang-helloworld/master/project.yml

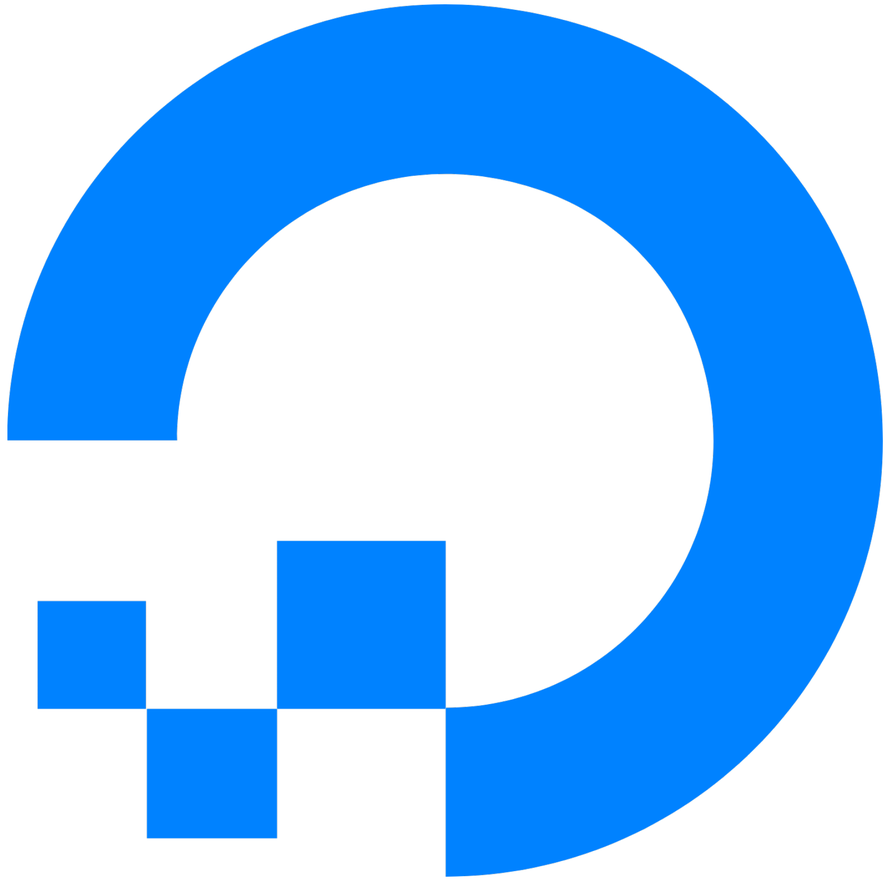
```
package main

import (
   "fmt"
)

type Request struct {
   Name string `json:"name"`
}

type Response struct {
   StatusCode int                 `json:"statusCode,omitempty"`
   Headers    map[string]string `json:"headers,omitempty"`
   Body       string              `json:"body,omitempty"`
}

func Main(in Request) (*Response, error) {
   if in.Name == "" {
      in.Name = "stranger"
   }

   return &Response{
      Body: fmt.Sprintf("Hello %s", in.Name),
   }, nil
}
```



REF: https://raw.githubusercontent.com/digitalocean/sample-functions-golang-helloworld/master/packages/sample/hello/hello.go

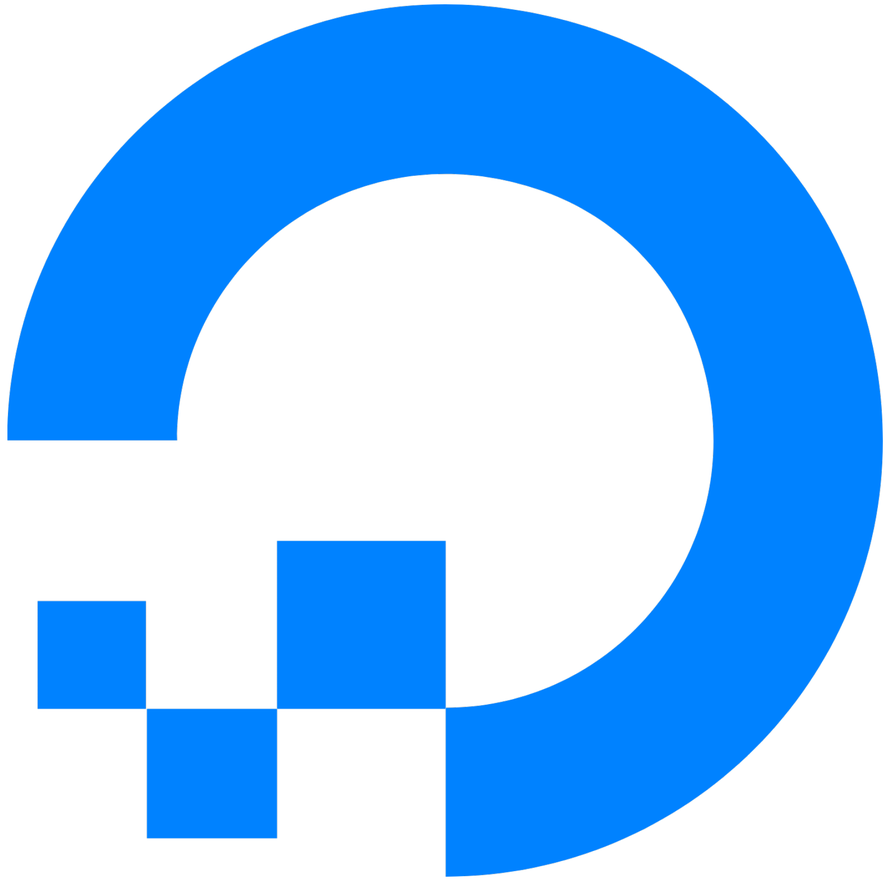
```
$ doctl serverless init --language go sample-hello
```

```
package main

import "fmt"

func Main(args map[string]interface{}) map[string]interface{}
{
    name, ok := args["name"].(string)
    if !ok {
        name = "stranger"
    }
    msg := make(map[string]interface{})
    msg["body"] = "Hello " + name + "!"
    return msg
}
```



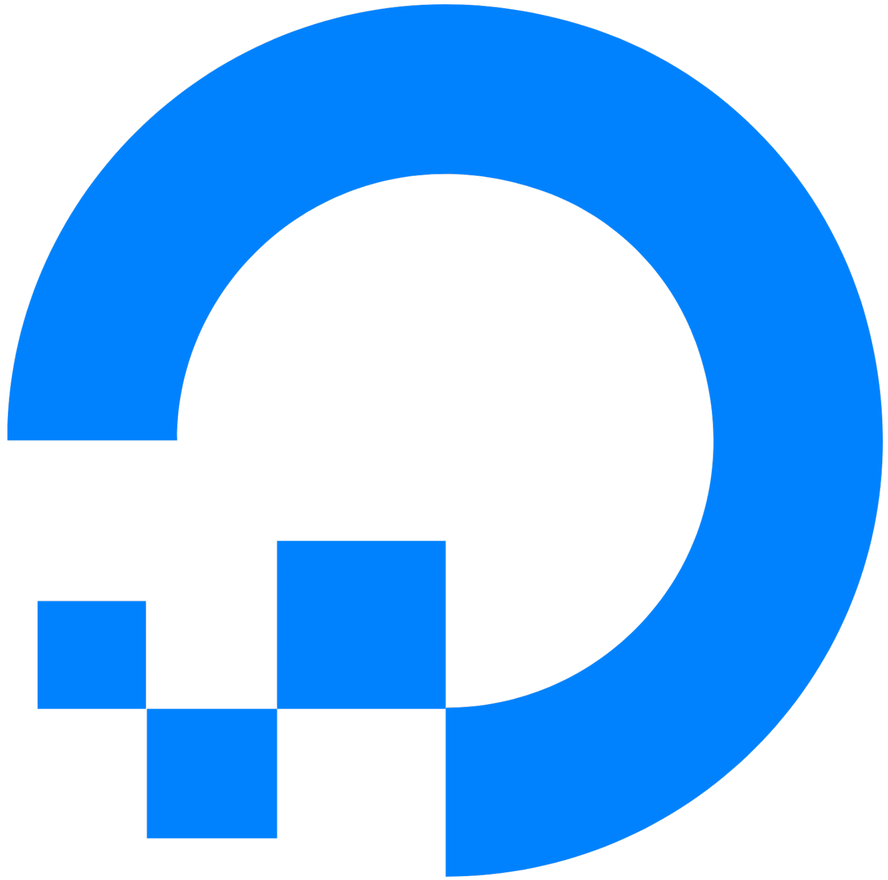
REF: https://docs.digitalocean.com/products/functions/how-to/create-functions/

```
$ go run sample/hello/hello.go

package main

import "fmt"

func Main(args map[string]interface{}) map[string]interface{}
{
    name, ok := args["name"].(string)
    if !ok {
        name = "stranger"
    }
    msg := make(map[string]interface{})
    msg["body"] = "Hello " + name + "!"
    return msg
}

func main() {
    args := make(map[string]interface{})
    r := Main(args)
    fmt.Printf("%+v", r)
}
```

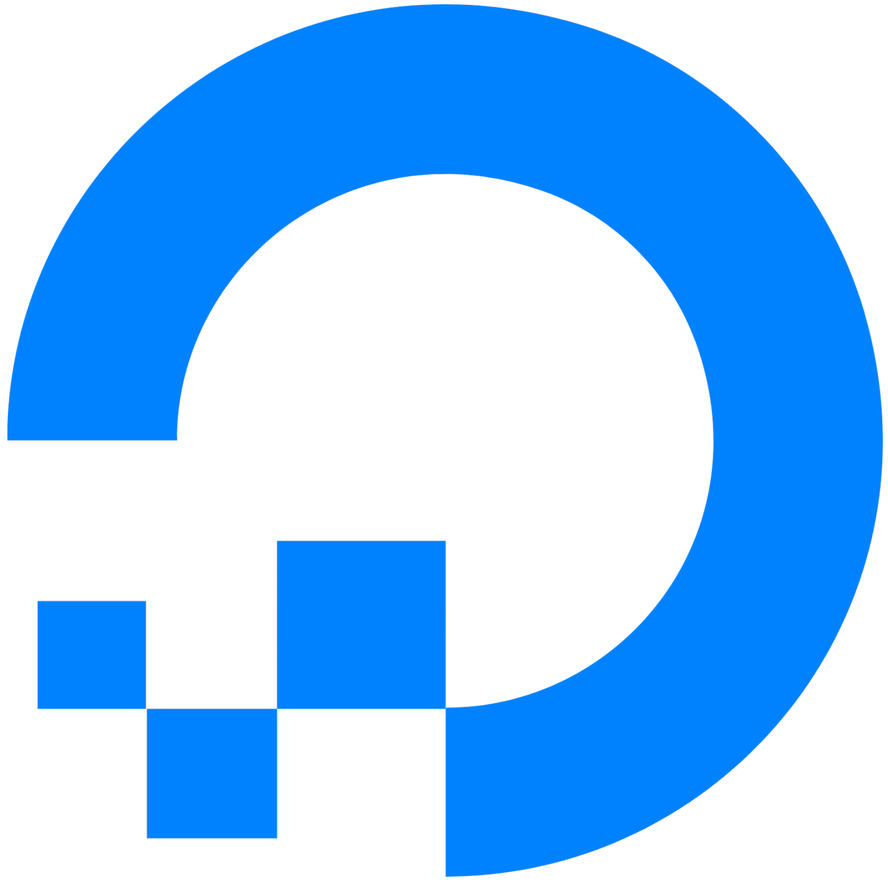


REF: https://docs.digitalocean.com/products/functions/how-to/create-functions/

- Demo



- DO functions seemed like a good fit for solving my problem
  - It does not require state
  - It only has to parse and transform received data
  - And finally inform the client of the new location, this by setting the headers to redirect the request
  - All can be lifted from the service



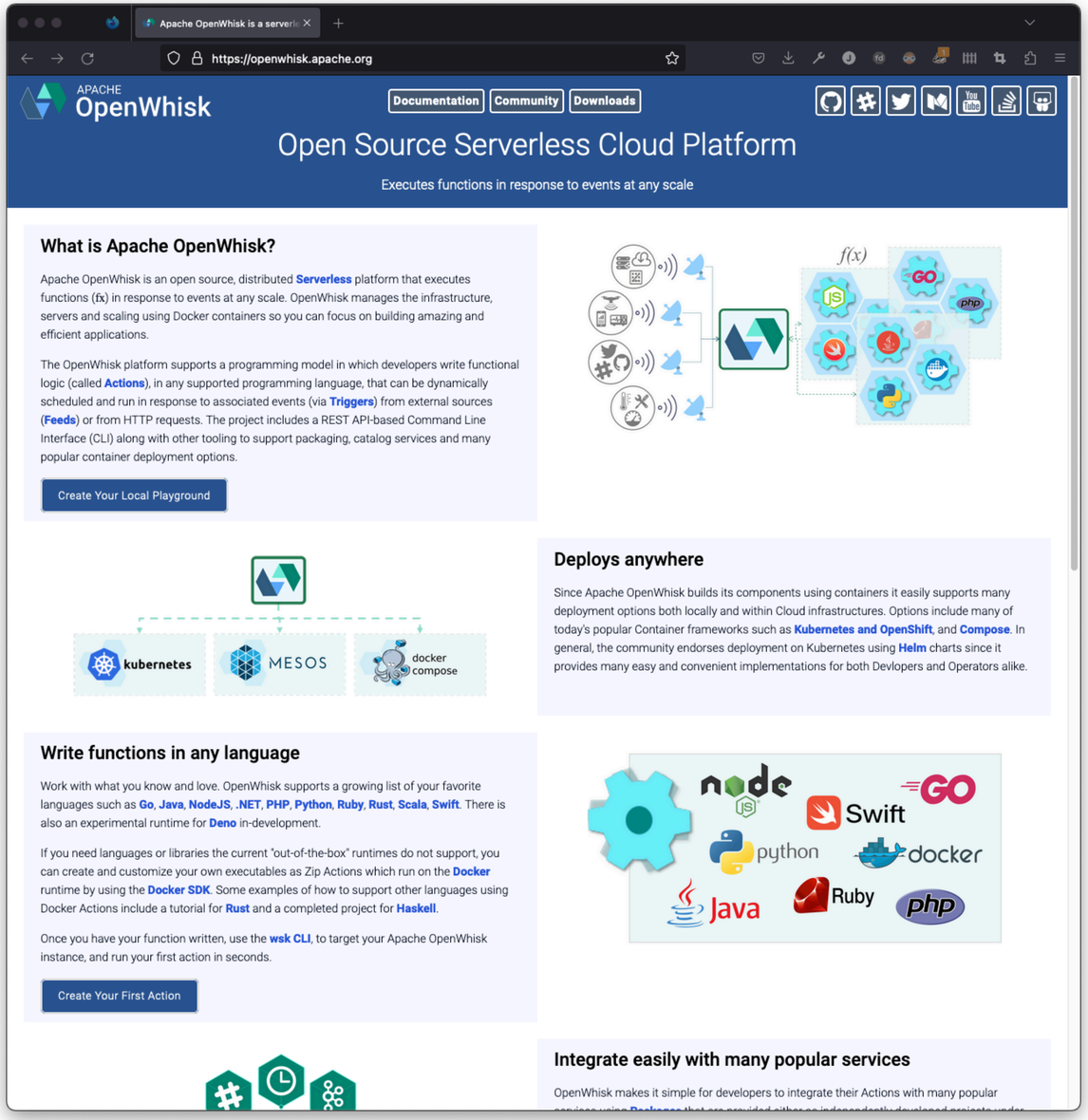
REF: https://github.com/jonasbn/pxy-redirect

Mission: Migrate to serverless

Photo by Félix Besombes on Unsplash

- After I did a lot of reading and experimenting - I found out that the DO functions platform is based on Apache Open Whisk
- It is so much easier to find resources on the Internet, if you know what to look for

REF: https://openwhisk.apache.org/



- The DO functions solution seem to be aimed at receiving and returning JSON, which is fine, but not for my problem

    1. I wanted to parse the path

    2. I wanted to return HTTP headers, so I could redirect the request

```
if args["__ow_path"].(string) ≠ "" {
    path = args["__ow_path"].(string)
}

requestHeaders := args["__ow_headers"]
val, _ := requestHeaders.(map[string]interface{})


//
// path deconstruction and
// location construction happening here
//


headers := make(map[string]string)
    headers["location"] = targetURL

return &Response{
    Headers:    headers,
    StatusCode: http.StatusTemporaryRedirect, // 307
}
```

REF: https://github.com/jonasbn/pxy-redirect-ow-function

```
func parseRedirectURL(path) (*url.URL, error) {

    redirectURL, parseErr := url.Parse(path)

    if parseErr ≠ nil {
       return nil, fmt.Errorf("Unable to parse received URL: >%s<", path)
    }

    return redirectURL, nil
}
```

REF: https://github.com/jonasbn/pxy-redirect-ow-function

```
func assembleTargetURL(url *url.URL) (string, error) {

    s := strings.SplitN(url.Path, "/", 3)

    // 0 is empty because we split on "/" and the URL begins with "/"
    // 1 == version
    // 2 == fragment

    if len(s) < 3 {
        err := fmt.Errorf("insufficient parts in provided url: >%s<", url.String())
        return "", err
    }

    _, err := strconv.Atoi(s[1])
    if err ≠ nil {
       err := fmt.Errorf("first part of url: >%s< is not a number: %q", url.String(), s)
       return "", err
    }

    if s[2] == "" {
        err := fmt.Errorf("second part of url: >%s< is not a string: %q", url.String(), s)
        return "", err
    }

    return fmt.Sprintf("https://releases.llvm.org/%s.0.0/tools/clang/docs/DiagnosticsReference.html#%s", s[1], s[2]), nil
}
```

REF: https://github.com/jonasbn/pxy-redirect-ow-function

- Demo

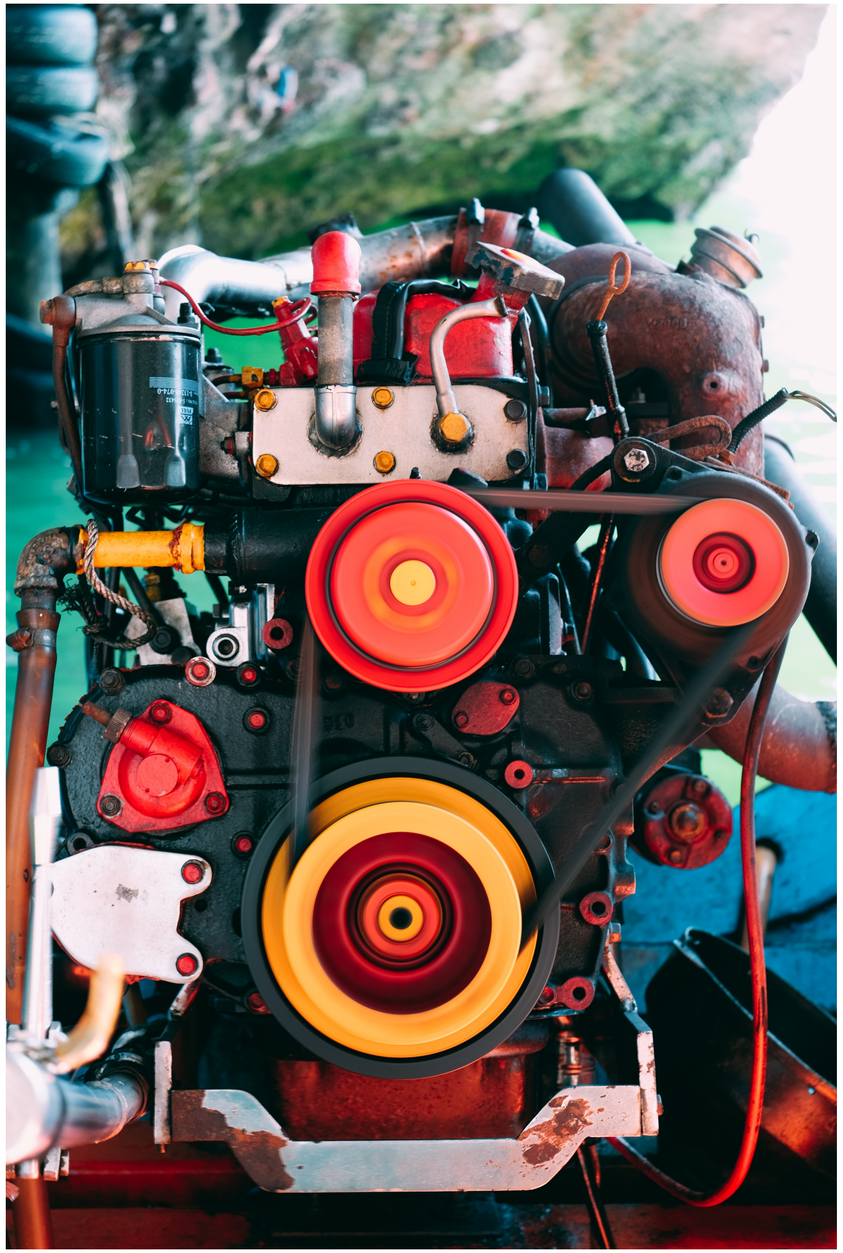


Photo by Ciprian Boiciuc on Unsplash

Mission: Take it to the next level

Photo by Félix Besombes on Unsplash

- I attempted to do some establish some remote logging
- Due to the way the functions are arranged I felt I was loosing out on some information, so I decided to put a reverse proxy in front of the function platform
- DO has a load-balancer offering, but it was above my budget
- So I spun up a droplet and installed NGINX
- Now I have standardised remote logging using Logtail, alternatives are:
  - Papertrail
  - Datadog

- Next up is getting the error handling/communication to work better
- And I want a *cool* log Dashboard
- Implementing a reverse proxy mad me think this can actually be solved using NGINX
- The current compression might not be suffice over time
- Adding links to the matrix for a new version cost about 44.000 KB
- With the addition of version 16 the matrix has a size of: 507 KB