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Ephemeral Containers in Action

Running a Go Debugger in Kubernetes

Cloud_Native Rejekts [EU'23]

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Agenda

1. A Primer on Ephemeral Containers
    a. Command Line Tools
2. Basics of Debugging Go
3. Remote Debugging
4. Delve as Ephemeral Container
5. Remote Debugging in VS Code
6. Live Demo

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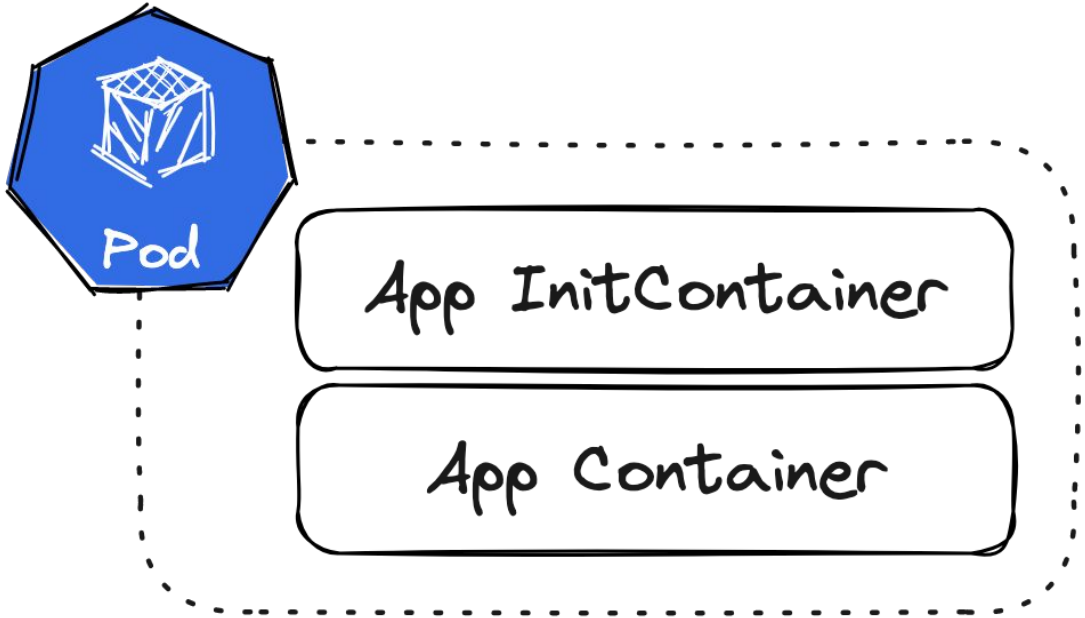
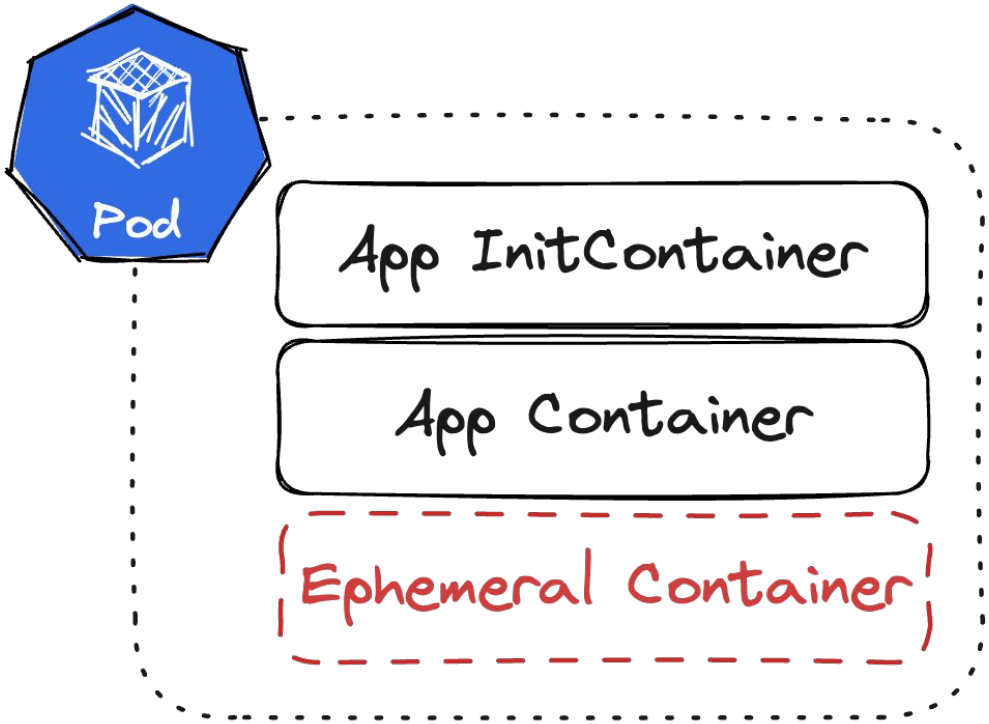
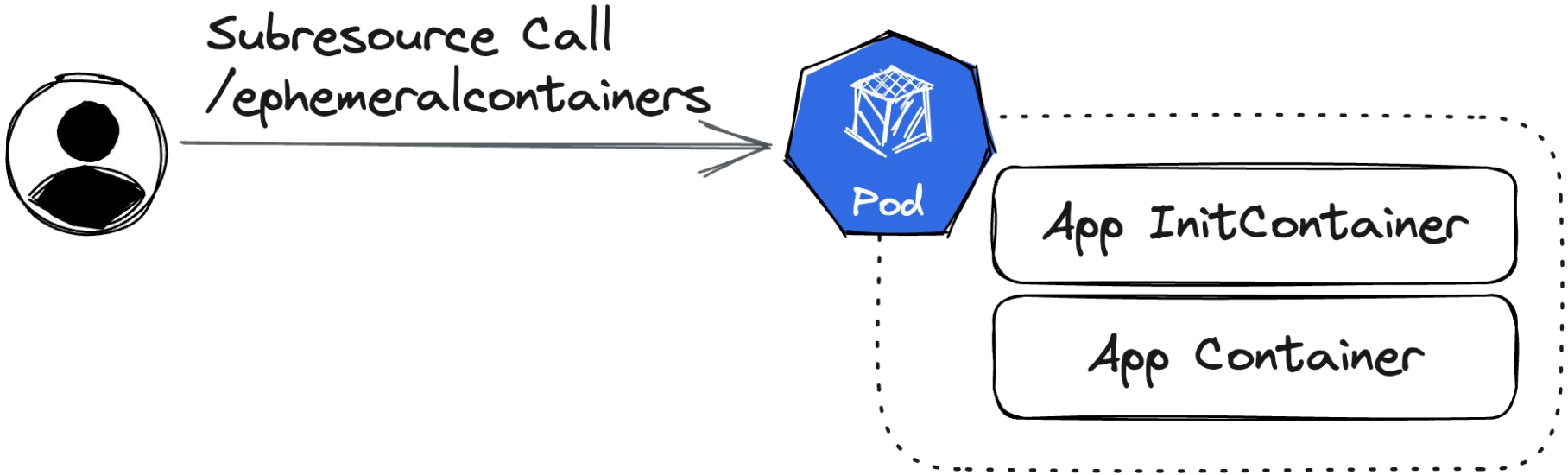
A Primer on Ephemeral Containers


Pod
App InitContainer
App Container



With Kubernetes 1.25+




```
client.Pods(namespace).UpdateEphemeralContainers(...)
```

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Command Line Tools

```
$ kubectl debug <pod> -it \
    --image=busybox \
    --target=<container>
```

```
Defaulting debug container name to debugger-jwl89.
If you don't see a command prompt, try pressing enter.
/ #
/ #
/ # ps waux
PID   USER     TIME  COMMAND
    1 root      0:00 /bin/app
   30 root      0:00 sh
   36 root      0:00 ps waux
```

kubectl-ephemeral

- Simple custom kubectl plugin to pass YAML directly
- https://github.com/embik/kubectl-ephemeral

```
$ kubectl ephemeral <target pod name> \
  -f <path to ephemeral container>.yaml
  -c <target container name>
```

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Basics of Debugging Go

DELVE

A Debugger for the Go Programming Language

Compile Flags

```
$ go build -gcflags="all=-N -l"
```

```
-gcflags '[pattern=]arg list'
    arguments to pass on each go tool compile invocation.
```

```
-N disable optimizations
-l disable inlining
```

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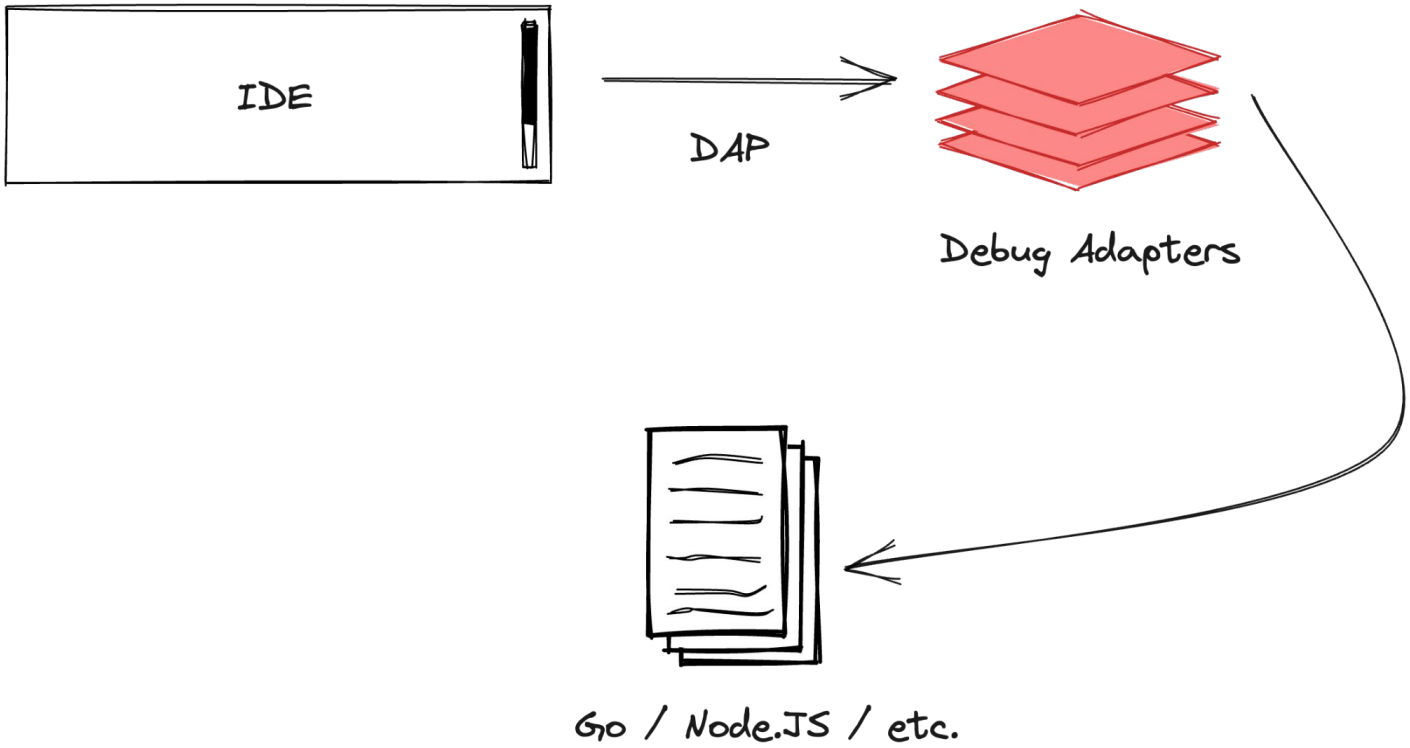
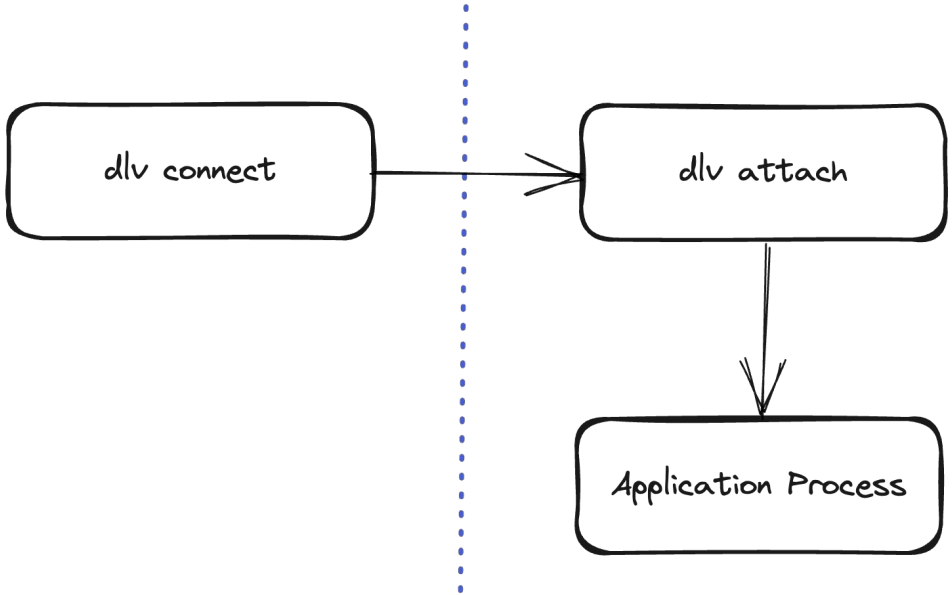
Remote Debugging

DAP - Debug Adapter Protocol



Headless Delve Instance




```
$ dlv attach <Target PID> --listen=:2345 --headless=true
```

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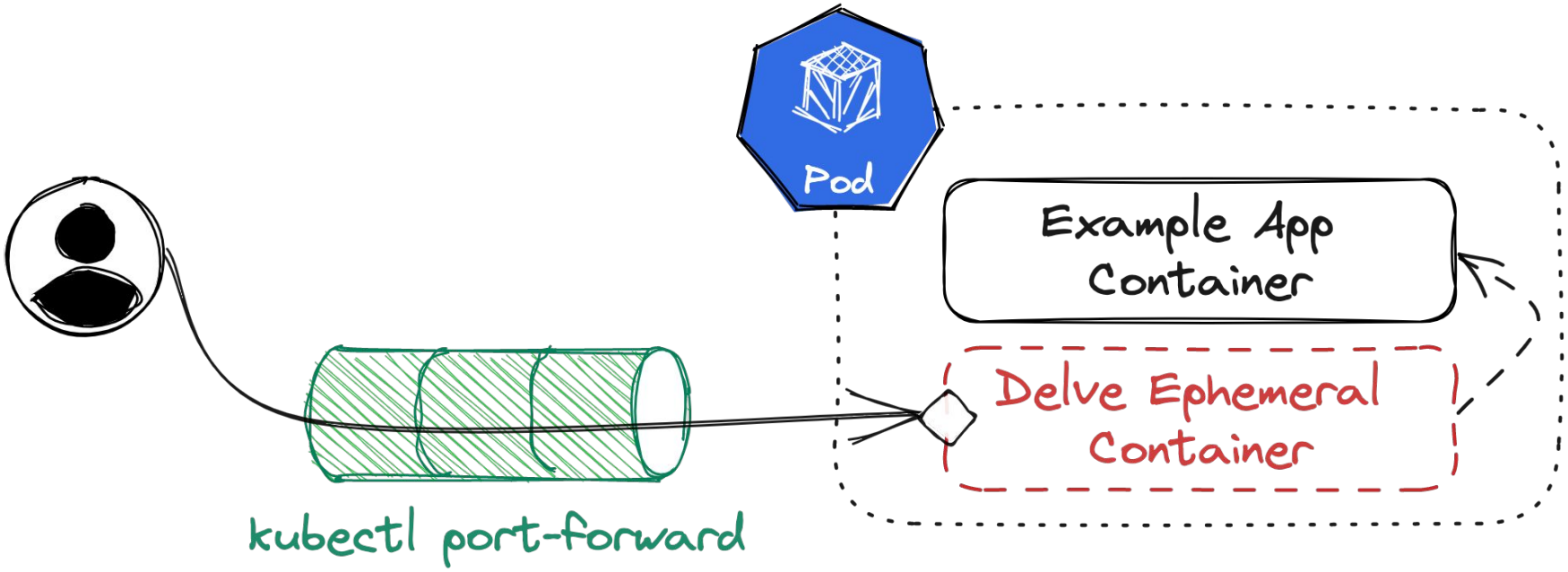
Delve as Ephemeral Container

EphemeralContainer YAML

```yaml
name: delve
image: quay.io/embik/dlv:v1.20.1
securityContext:
  privileged: true
command:
  - dlv
  - --listen=127.0.0.1:2345
  - --headless=true
  - --accept-multiclient
  - --api-version=2
  - attach
  - '1'
```




```
$ dlv connect localhost:2345
```

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Remote Debugging in VS Code

... or neovim (via nvim-dap)!

.vscode/launch.json

```
{
    "name": "Remote Attach",
    "type": "go",
    "request": "attach",
    "debugAdapter": "dlv-dap",
    "mode": "remote",
    "substitutePath": [
      { "from": "${workspaceFolder}", "to": "/build" }
    ],
    "port": 2345,
    "host": "127.0.0.1"
}
```

Application Dockerfile

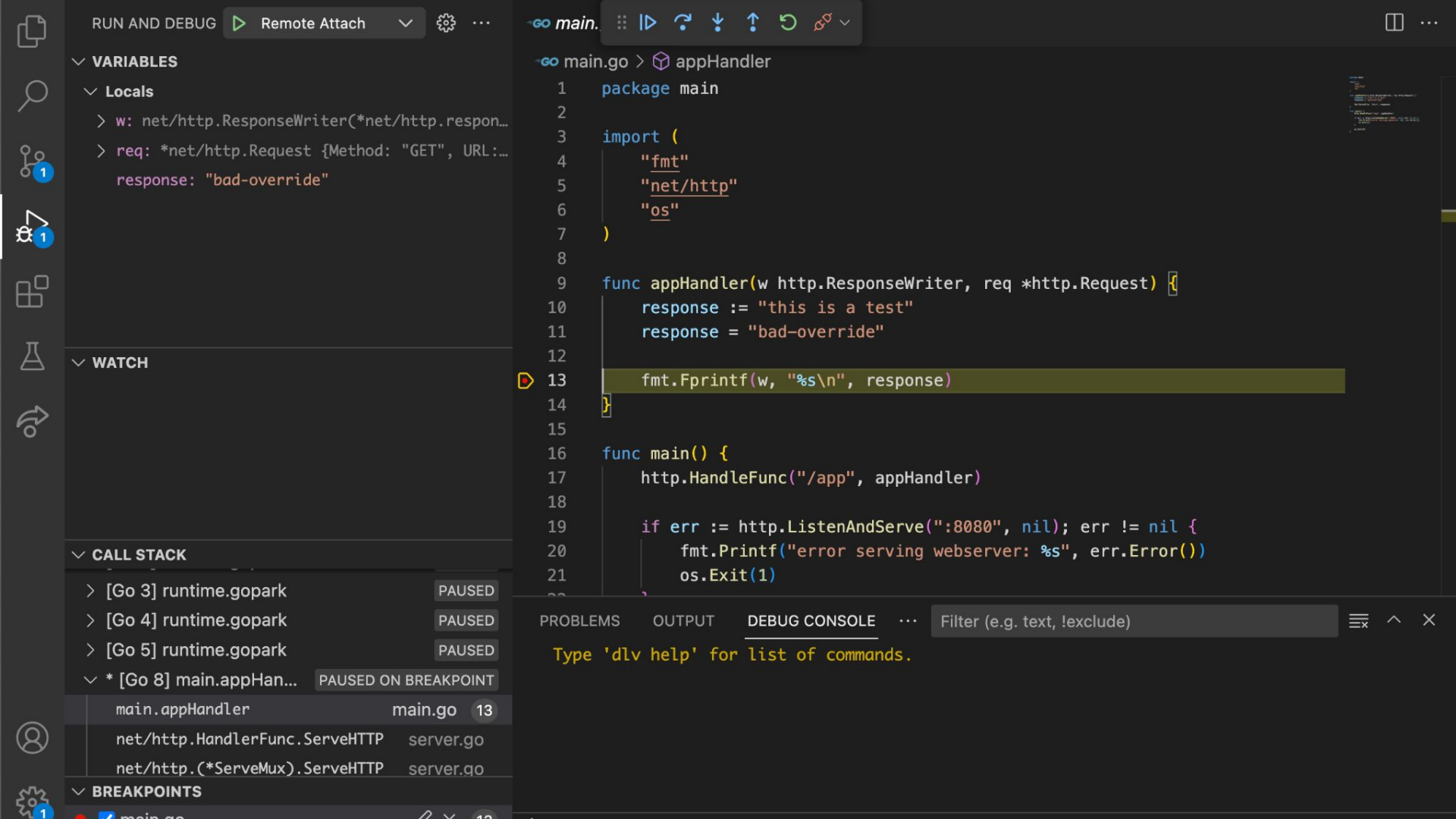
```
FROM golang:1.19.8 as builder

WORKDIR /build
COPY . .
RUN CGO_ENABLED=0 go build -gcflags="all=-N -l" -o app .

FROM alpine:3.16
LABEL maintainer="marvin@kubermatic.com"

COPY --from=builder /build/app /bin/app

ENTRYPOINT ["/bin/app"]
```


RUN AND DEBUG
Remote Attach
VARIABLES
Locals
w: net/http.ResponseWriter(*net/http.respon…
req: *net/http.Request {Method: "GET", URL:…
response: "bad-override"
WATCH
CALL STACK
[Go 3] runtime.gopark PAUSED
[Go 4] runtime.gopark PAUSED
[Go 5] runtime.gopark PAUSED
* [Go 8] main.appHan… PAUSED ON BREAKPOINT
main.appHandler main.go 13
net/http.HandlerFunc.ServeHTTP server.go
net/http.(*ServeMux).ServeHTTP server.go
BREAKPOINTS
main.go
main.go > appHandler
1 package main
2
3 import (
4 "fmt"
5 "net/http"
6 "os"
7)
8
9 func appHandler(w http.ResponseWriter, req *http.Request) {
10 response := "this is a test"
11 response = "bad-override"
12
13 fmt.Fprintf(w, "%s\n", response)
14 }
15
16 func main() {
17 http.HandleFunc("/app", appHandler)
18
19 if err := http.ListenAndServe(":8080", nil); err != nil {
20 fmt.Printf("error serving webserver: %s", err.Error())
21 os.Exit(1)
PROBLEMS
OUTPUT
DEBUG CONSOLE
Filter (e.g. text, !exclude)
Type 'dlv help' for list of commands.

```
Locals:
 ▶ w net/http.ResponseWriter = net/http.
 ▶ req *net/http.Request = *net/http.Req
   response string = "bad-override"
```

```
main.go:
 13 fmt.Fprintf(w, "%s\n", response)
```

```
* [Go 33] main.appHandler (Thread 10):
 main.appHandler main.go:13
 net/http.HandlerFunc.ServeHTTP server.g
 net/http.(*ServeMux).ServeHTTP server.g
 net/http.serverHandler.ServeHTTP server
 net/http.(*conn).serve server.go:1991
 net/http.(*Server).Serve.func3 server.g
```

```
No Expressions
```

```go
    "os"
)

func appHandler(w http.ResponseWriter, req *http.Request) {
    response := "this is a test"
    response = "bad-override"

    fmt.Fprintf(w, "%s\n", response)
}

func main() {
    http.HandleFunc("/app", appHandler)

    if err := http.ListenAndServe(":8080", nil); err != nil {
        fmt.Printf("error serving webserver: %s", err.Error())
        os.Exit(1)
    }
```

```
Type 'dlv help' for list of commands.
```

```
NORMAL  main  main.go                         utf-8 < unix < go  68%  17:5
```

GitHub Repositories

- https://github.com/embik/ephemeral-debugger-talk
- https://github.com/embik/kubectl-ephemeral

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Let’s see this in practice

Quick Live Demo

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Thank You!