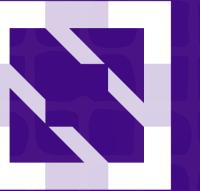




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# Debugging Kubernetes Controllers from IDE

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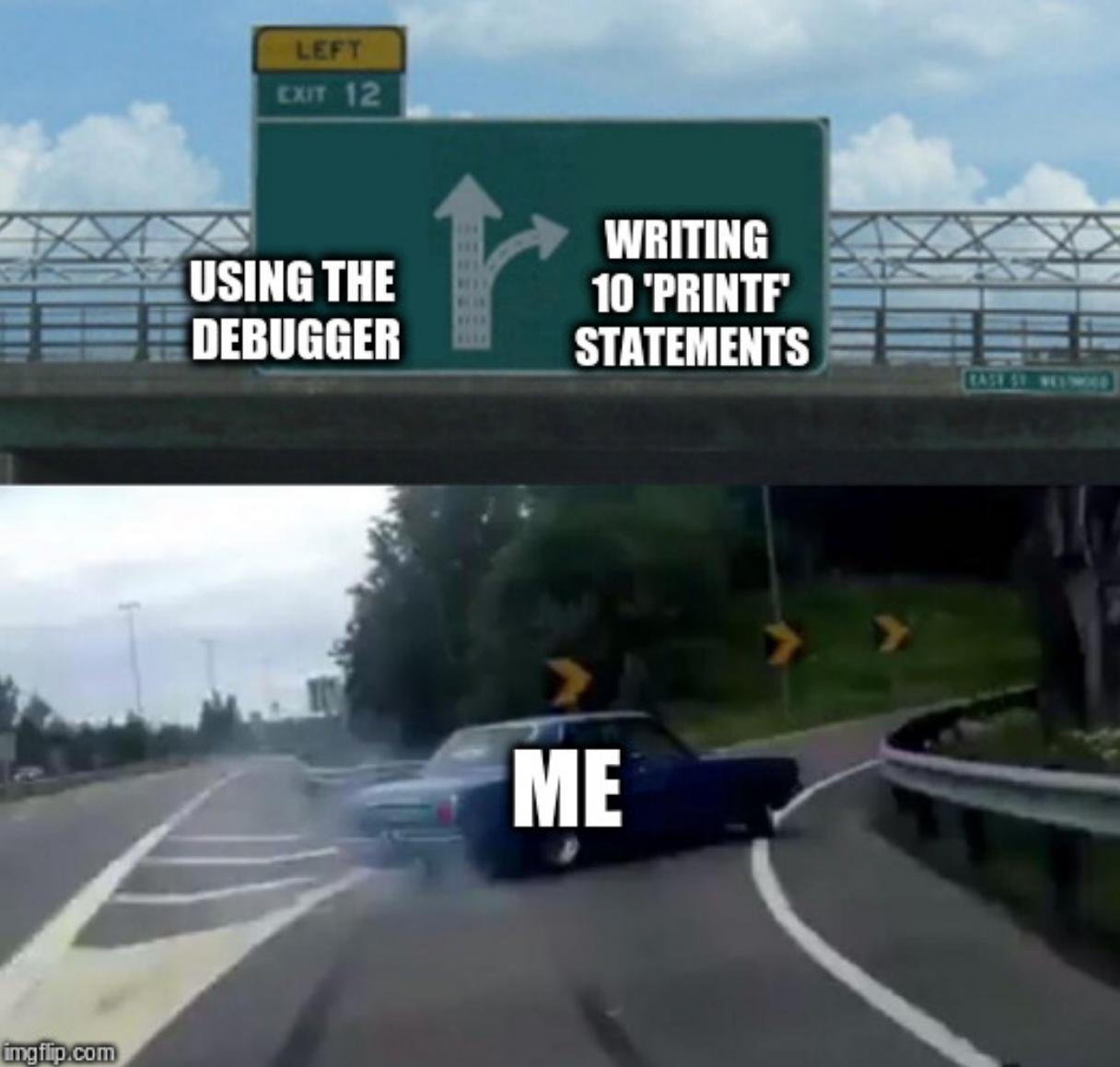
# Agenda

- Background
- Short Introduction to Debugger
- Patterns to debug kubernetes controllers
- Demo
- Summary



# My Controller Journey

- Started working on controllers six months ago
- Extensively used print statements
- People get used to it and move forward
- “New Hires” experience is bad



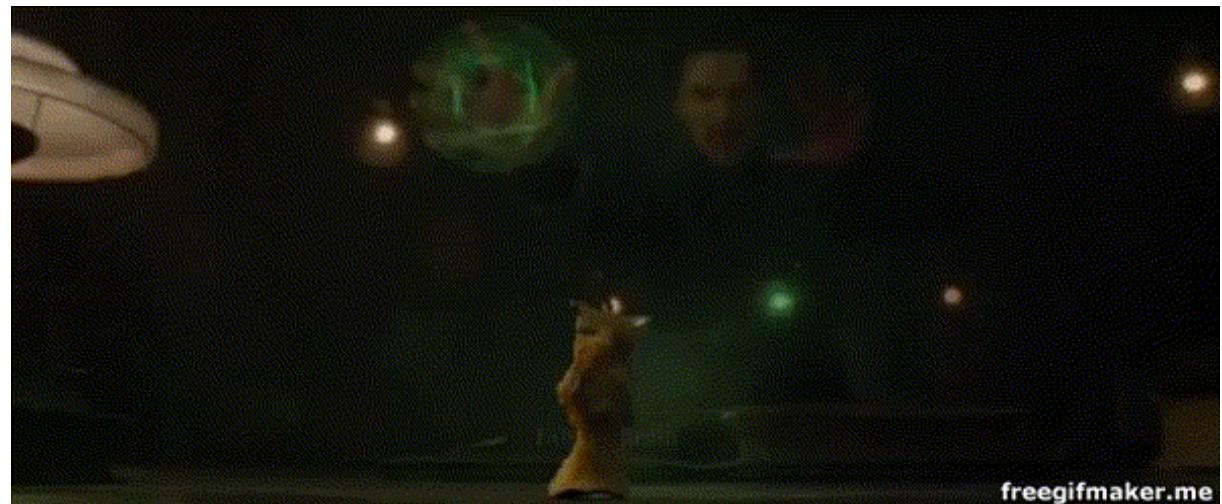
# What's wrong with print statements

- Seems simple at the beginning but silently eats developers time
- Not reliable
- Lacks big picture
- Very little information
- Extremely difficult to understand multi threaded applications
- Only works forward in time
- If not reviewed properly, it will end up in production code

# The Debugger

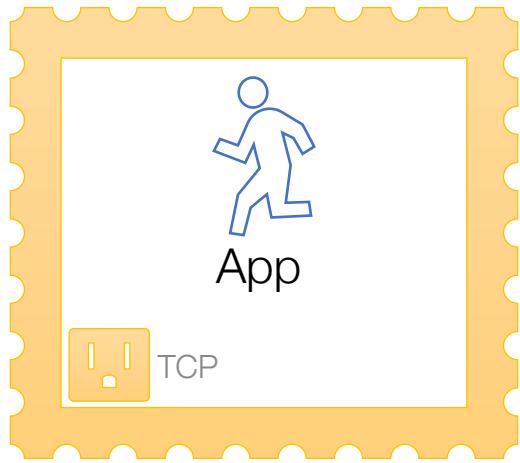
# What is a debugger anyway?

- Debugger is equivalent of Dr. Strange's time stone for Developers
- It allows you to stop a program execution, move forward and backward in time.
- You will have access to all the information about the program sequenced



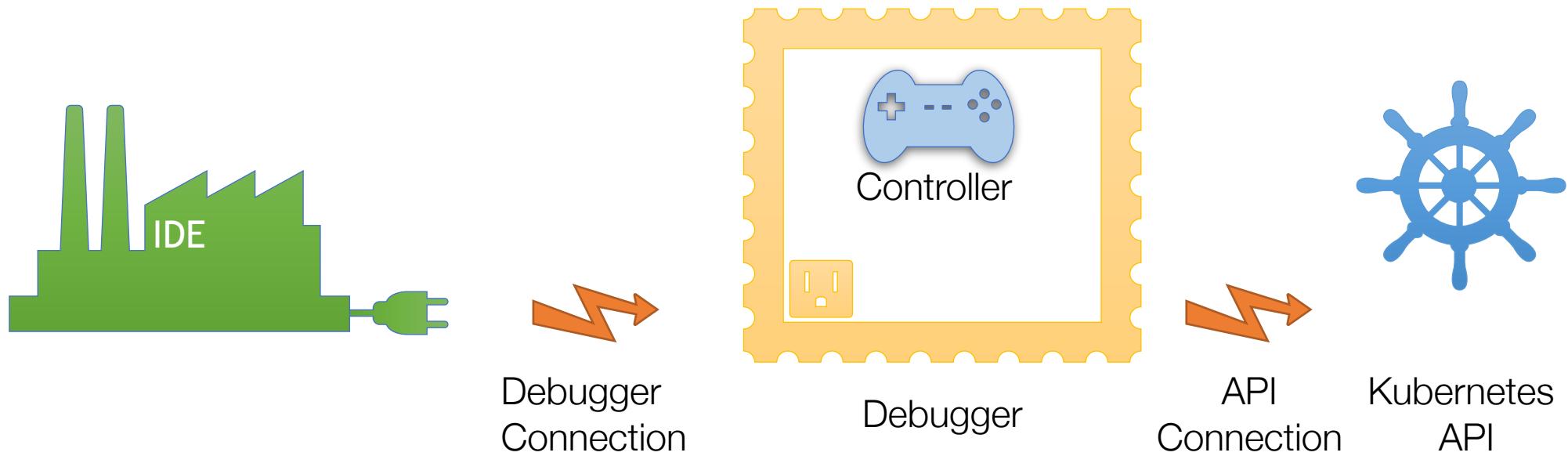
freegifmaker.me

# Debugger Model



Debugger

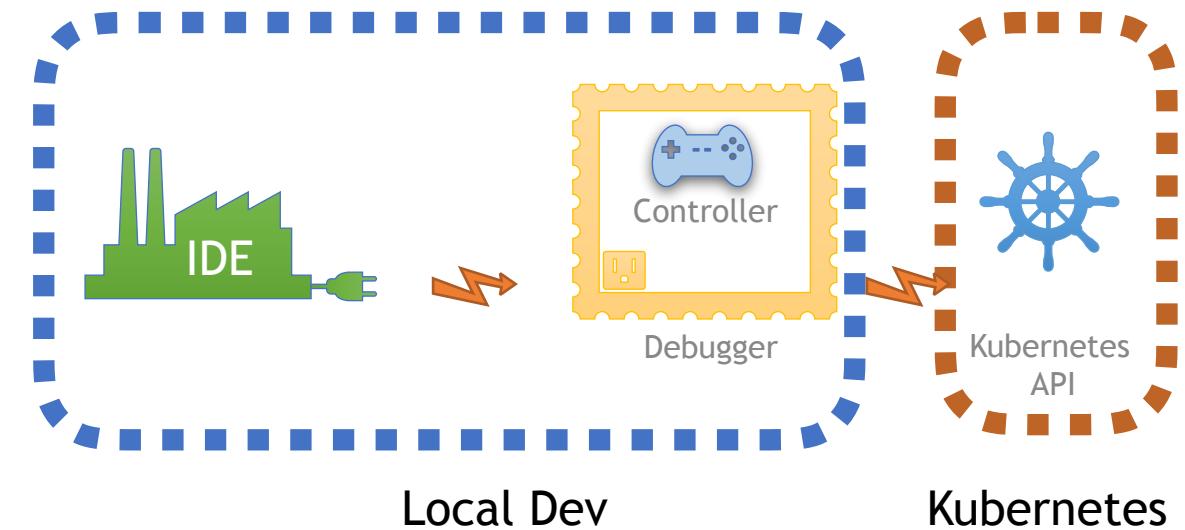
# Debugger Model



# Patterns

# Think out of the box

- Controller doesn't need to run inside a container
- All we need is a connection to the Kubernetes API
- Client-go out-of-cluster configuration example
- Elevated access in your local operating system
- `kubectl` set context
- Controller code fetches kubernetes config from home directory and communicate with the API automatically
- 20% of work; 80% of productivity



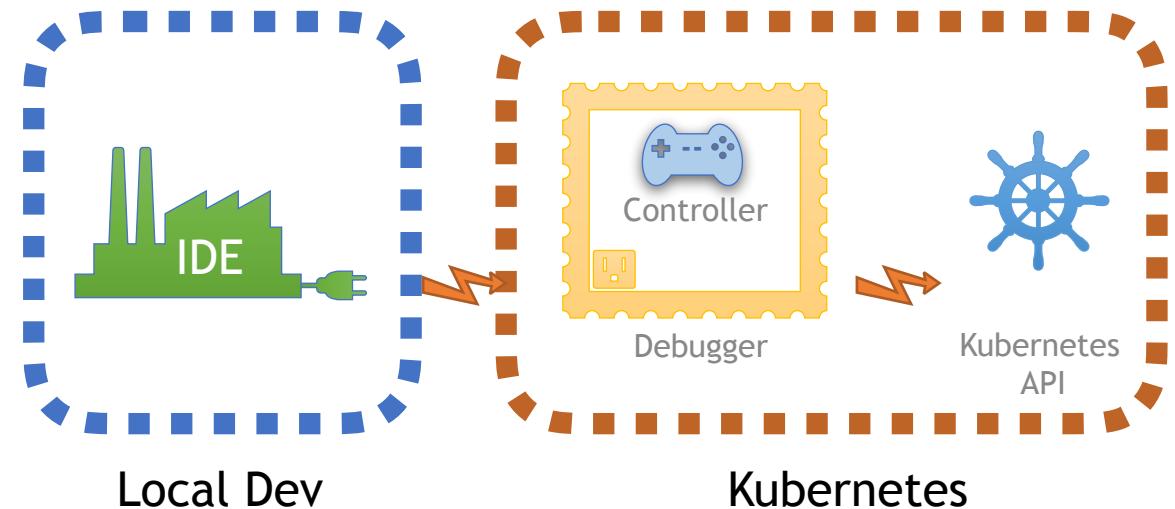
# Demo

# In-Cluster Controllers



# Inside the kubernetes

- You may need to debug in customer's kubernetes
- Your controller needs some resources running inside kubernetes
- Controller communication with Kubernetes API is automatic
- Package Debugger inside your controller image
- Expose Debugger TCP port



# Adding Debugger Support

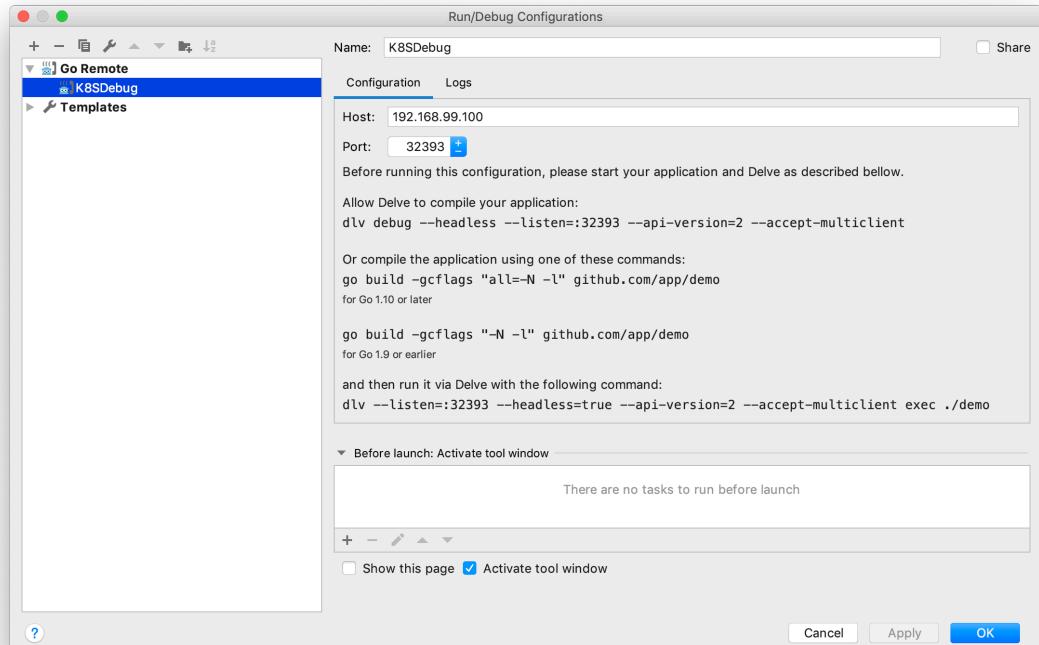
```
FROM golang AS builder
ENV CGO_ENABLED 0
ADD . /go/src/controller
RUN go get k8s.io/apimachinery/pkg/api/errors && \
    go get k8s.io/apimachinery/pkg/apis/meta/v1 && \
    go get k8s.io/client-go/kubernetes && \
    go get k8s.io/client-go/rest
RUN go build -o /controller controller

FROM alpine AS runner
WORKDIR /
COPY --from=builder /controller /
ENTRYPOINT ["/controller"]
```

```
FROM golang AS builder
ENV CGO_ENABLED 0
ADD . /go/src/controller
RUN go get k8s.io/apimachinery/pkg/api/errors && \
    go get k8s.io/apimachinery/pkg/apis/meta/v1 && \
    go get k8s.io/client-go/kubernetes && \
    go get k8s.io/client-go/rest
RUN go get github.com/go-delve/delve/cmd/dlv
RUN go build -gcflags "all=-N -l" -o /controller controller

FROM alpine AS runner
WORKDIR /
COPY --from=builder /controller /
COPY --from=builder /go/bin/dlv /
ENTRYPOINT ["/dlv", \
            "--listen=:40000", \
            "--headless=true", \
            "--api-version=2", \
            "--accept-multipleclients", \
            "exec", "/controller"]
EXPOSE 40000
```

# Adding Debugger Support



Idea

```
{  
  "version": "0.2.0",  
  "configurations": [  
    {  
      "name": "K8SDebug",  
      "type": "go",  
      "request": "launch",  
      "mode": "remote",  
      "program": "${fileDirname}",  
      "port": 32393,  
      "host": "192.168.99.100",  
      "env": {},  
      "args": []  
    }  
  ]  
}
```

VS Code

# Demo

# Useful networking tips

- Proxies
  - SSH Proxy
  - Kubectl proxy
  - Telepresence
- VPN
- VxLAN

# Gotchas

- Some debuggers require you to build the controller from inside the go path to work correctly
- In some debugger, communicating over a remote host is a premium feature
- Create a different work flow for debugging in your CI/CD Build process
  - Create a separate Make file action
  - Keep the debugging Docker file separate

# Summary

- Avoid using printf debugging
- Use a debugger
- Keep controller outside the k8s cluster for debugging
- Create an workflow in-cluster controller
- Keep your production and debugging controllers separate
- Multiple ways to overcome networking issues



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Thank you  
Surendhar

“Happy Controlling”



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