
KubeCon
CloudNativeCon
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Debugging Kubernetes Controllers from IDE

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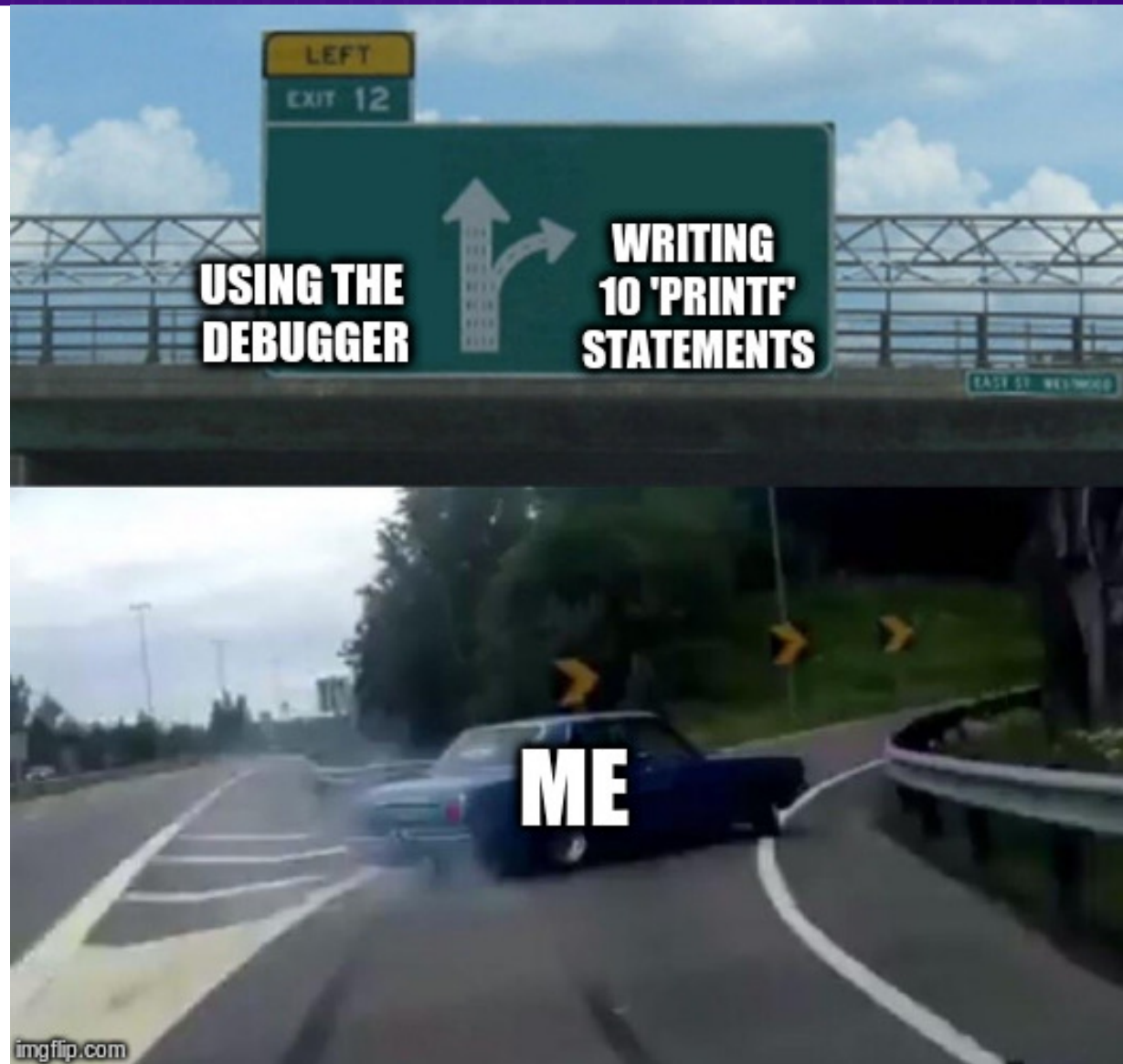
Agenda

- 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

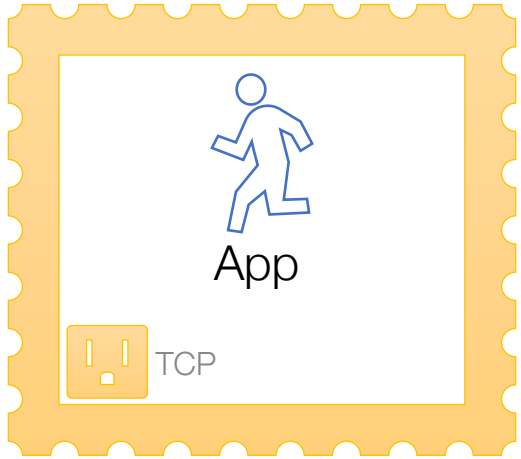
- Seems simple at the beginning but silently eats developers time
- Not reliable
- Lacks big picture
- Very little information
- Extremely difficult to understand multi threaded applications
- Only works forward in time
- If not reviewed properly, it will end up in production code

The Debugger

What is a debugger anyway?

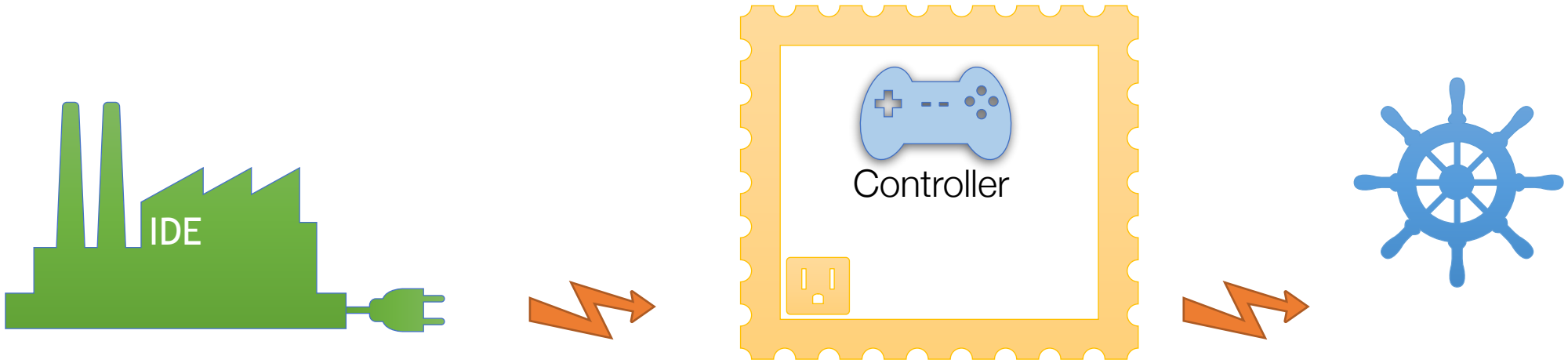
- Debugger is equivalent of Dr. Strange’s time stone for Developers
- It allows you to stop a program execution, move forward and backward in time.
- You will have access to all the information about the program sequenced

Debugger Model



Debugger

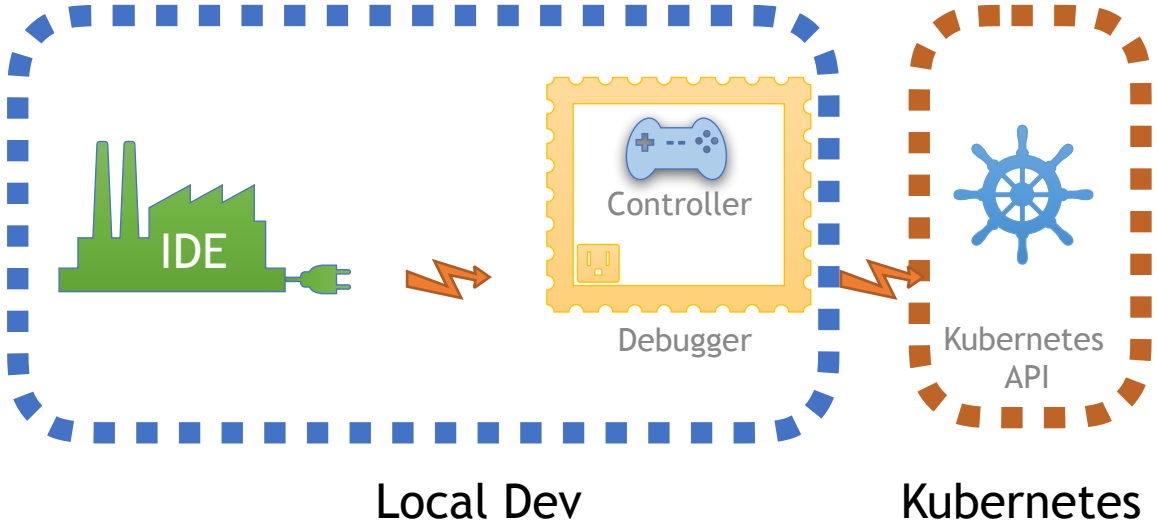
Debugger Model



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

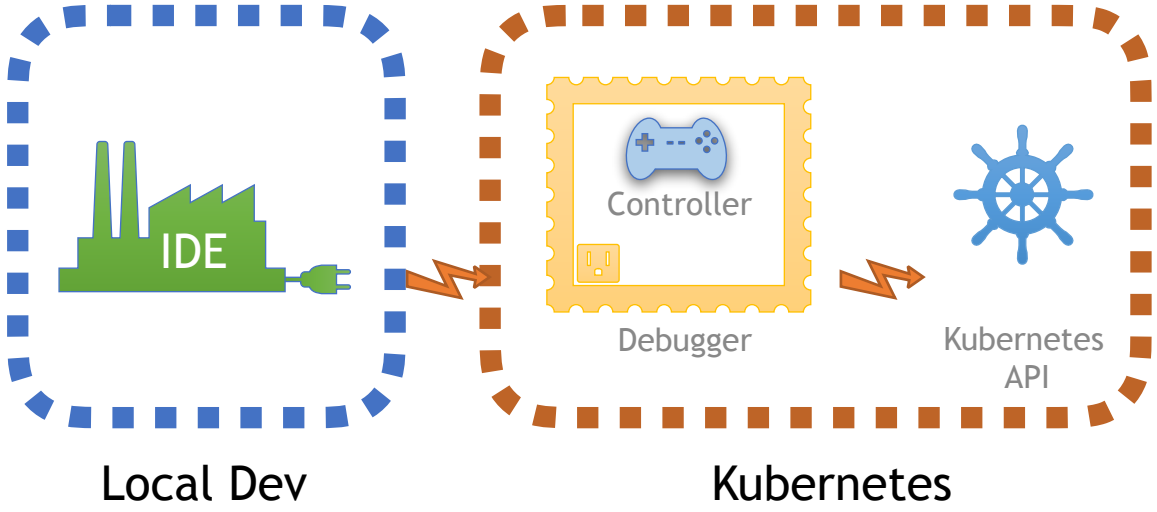


Demo

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

Production Dockerfile

```
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"]
```

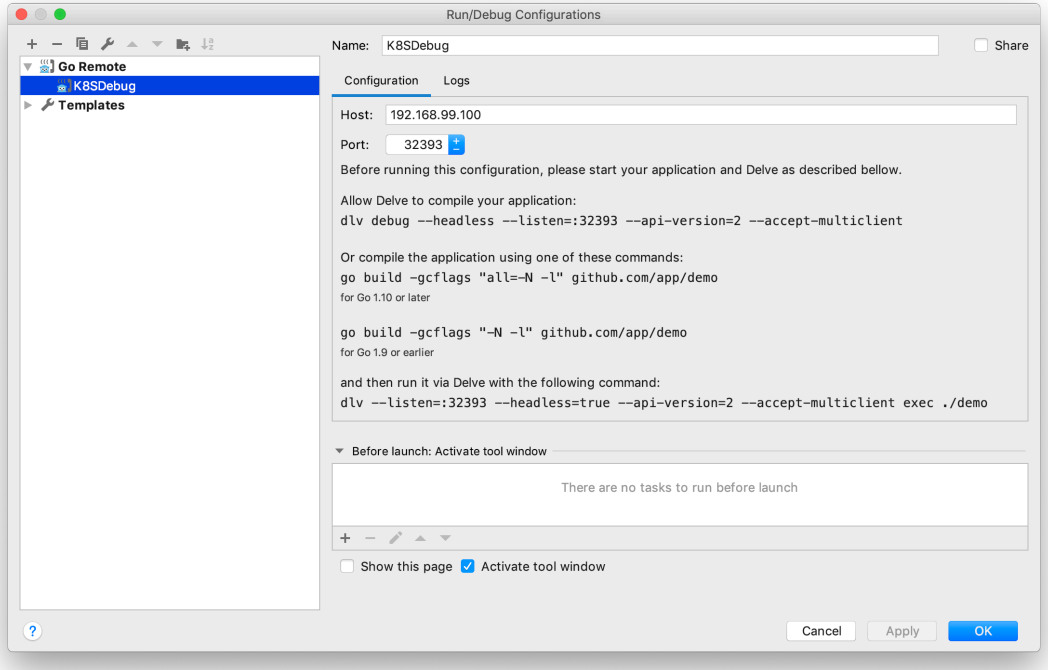
Debug Dockerfile

```
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-multiclient",\
            "exec", "/controller"]
EXPOSE 40000
```

Expose Debugger Port


```
kubectl run controller-debug --image=ssurenr/samplecontroller:debug

kubectl expose deployment controller-debug --type="NodePort" --port 40000
```

Adding Debugger Support



Idea

.vscode/launch.json

```
{
  "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 IDE, communicating over a remote host is a premium feature
- Create a different work flow for debugging in you 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 for in-cluster controller
- Keep your production and debugging controllers separate
- Multiple ways to overcome networking issues

Links

https://github.com/ssurenr/controller

https://github.com/kubernetes/client-go

Thank you
Surendhar

"Happy Controlling"

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