# Best Practices for Debugging and Monitoring on Kubernetes

Thomas Rampelberg

**Honest Status Page**
@honest_update

Follow

We replaced our monolith with micro services so that every outage could be more like a murder mystery.

4:10 PM - 7 Oct 2015

# 👋 Hello GoSF!

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# What problem needs to be solved?

# Alerting

- Downtime
- Exceptions
- Service Level Agreements

# Forensics

- Memory leaks
- Performance issues
- Environment specific failures

# Monitoring for Alerting

# Downtime

- External monitoring
- livenessProbe/readinessProbe
- kube-state-metrics

Pingdom: https://www.pingdom.com/
Configuring livenessProbe: https://kubernetes.io/docs/tasks/configure-pod-container/configure-liveness-readiness-probes/
Kube-state-metrics: https://github.com/helm/charts/tree/master/stable/kube-state-metrics

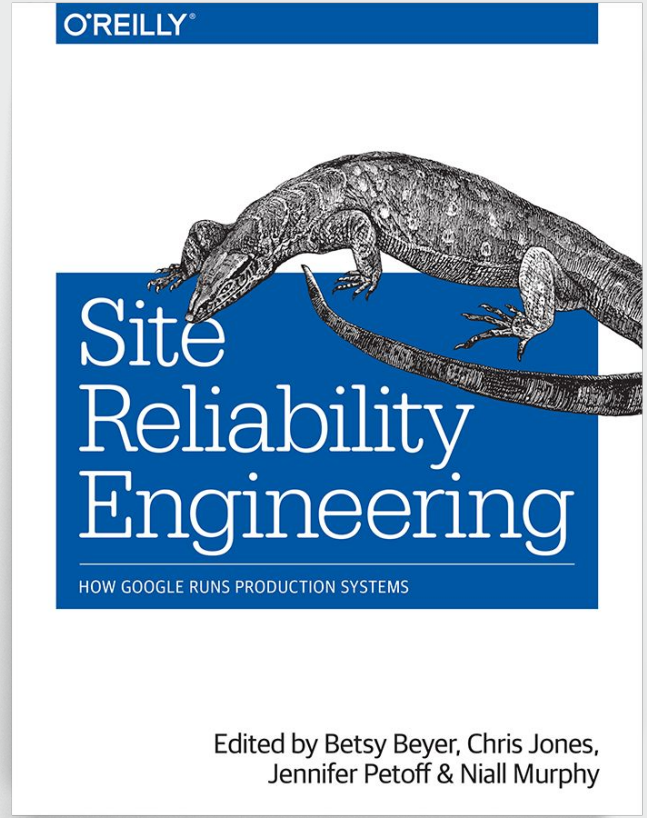
# Exceptions

```go
func readIntoBytes(filename string) ([]byte, error) {
  file, err := static.Templates.Open(filename)
  if err != nil {
    return nil, err
  }
  defer file.Close()

  buf := new(bytes.Buffer)
  buf.ReadFrom(file)

  return buf.Bytes(), nil
}
```

Sentry: https://docs.sentry.io/clients/go/

# Golden Signals

- Latency
- Traffic
- Errors
- Saturation




http://bit.ly/golden-signals

# 🤗 Every request matters

- Tail latency is important
- Users see responses
- Latency is not normally distributed

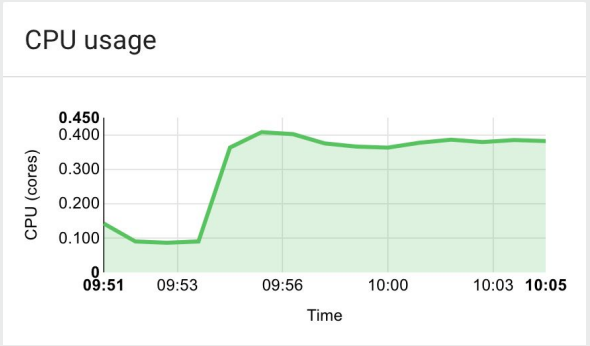
| Site | # of requests | page loads that would experience the 99%'lie [(1 - (.99 ^ N)) * 100%] |
|---|---|---|
| amazon.com | 190 | 85.2% |
| kohls.com | 204 | 87.1% |
| jcrew.com | 112 | 67.6% |
| saksfifthavenue.com | 109 | 66.5% |
| -- | -- | -- |
| nytimes.com | 173 | 82.4% |
| cnn.com | 279 | 93.9% |
| -- | -- | -- |
| twitter.com | 87 | 58.3% |
| pinterest.com | 84 | 57.0% |
| facebook.com | 178 | 83.3% |
| -- | -- | -- |
| google.com (yes, that simple noise-free page) | 31 | 26.7% |
| google.com search for "http requests per page" | 76 | 53.4% |

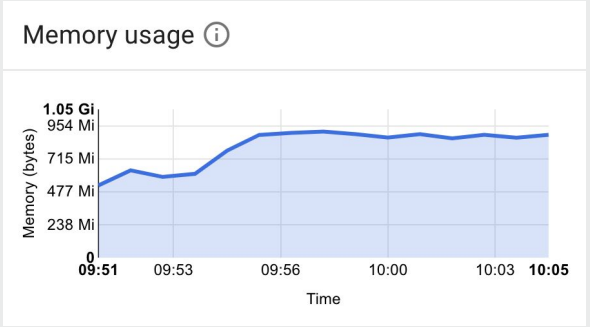
http://bit.ly/latency-wrong

# Monitoring for Forensics

# Kubernetes

- CPU
- Memory



# Prometheus

- Kubernetes Standard
- Time Series
- Alerts
- Extra Metrics

Install: https://github.com/helm/charts/tree/master/stable/prometheus
Tracked metrics: https://github.com/prometheus/node_exporter#enabled-by-default

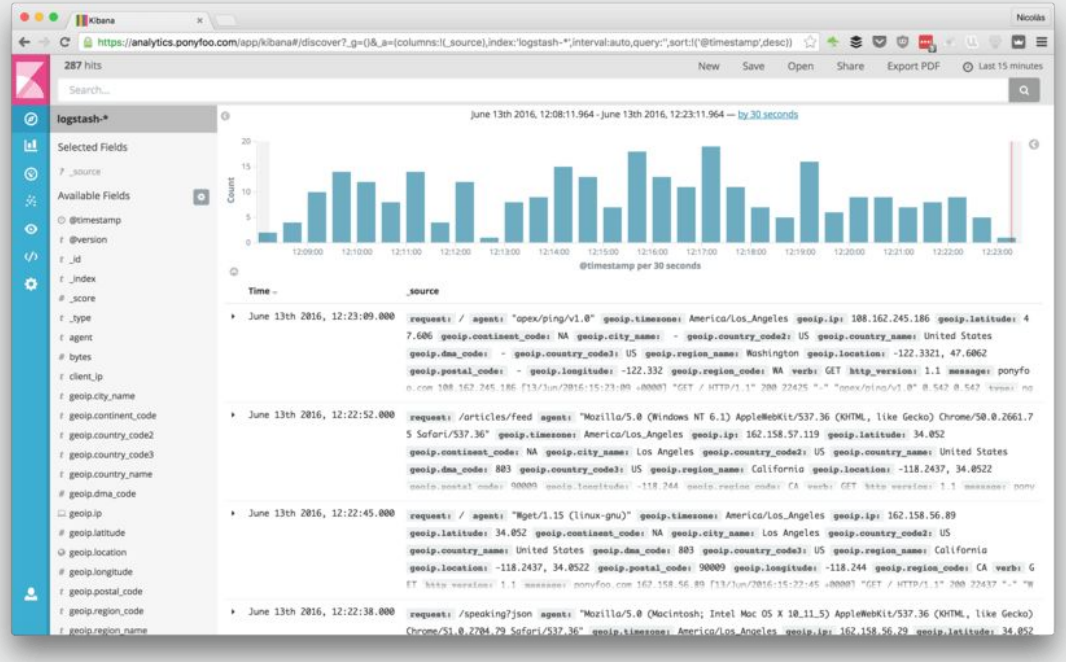
# Application Instrumentation

```
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 1.9864e-05
go_gc_duration_seconds{quantile="0.25"} 5.2299e-05
go_gc_duration_seconds{quantile="0.5"} 7.1593e-05
go_gc_duration_seconds{quantile="0.75"} 0.000151335
go_gc_duration_seconds{quantile="1"} 0.003560545
go_gc_duration_seconds_sum 0.058749902
go_gc_duration_seconds_count 254
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 59
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.10.3"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 6.619704e+06
# HELP go_memstats_alloc_bytes_total Total number of bytes allocated, even if fr
# TYPE go_memstats_alloc_bytes_total counter
go_memstats_alloc_bytes_total 1.465679856e+09
# HELP go_memstats_buck_hash_sys_bytes Number of bytes used by the profiling buc
# TYPE go_memstats_buck_hash_sys_bytes gauge
go_memstats_buck_hash_sys_bytes 1.50257e+06
# HELP go_memstats_frees_total Total number of frees.
# TYPE go_memstats_frees_total counter
go_memstats_frees_total 6.977458e+06
# HELP go_memstats_gc_cpu_fraction The fraction of this program's available CPU
e the program started.
# TYPE go_memstats_gc_cpu_fraction gauge
go_memstats_gc_cpu_fraction 3.924477433282826e-05
```

```
func main() {
        recordMetrics()

        http.Handle("/metrics", promhttp.Handler())
        http.ListenAndServe(":2112", nil)
}
```

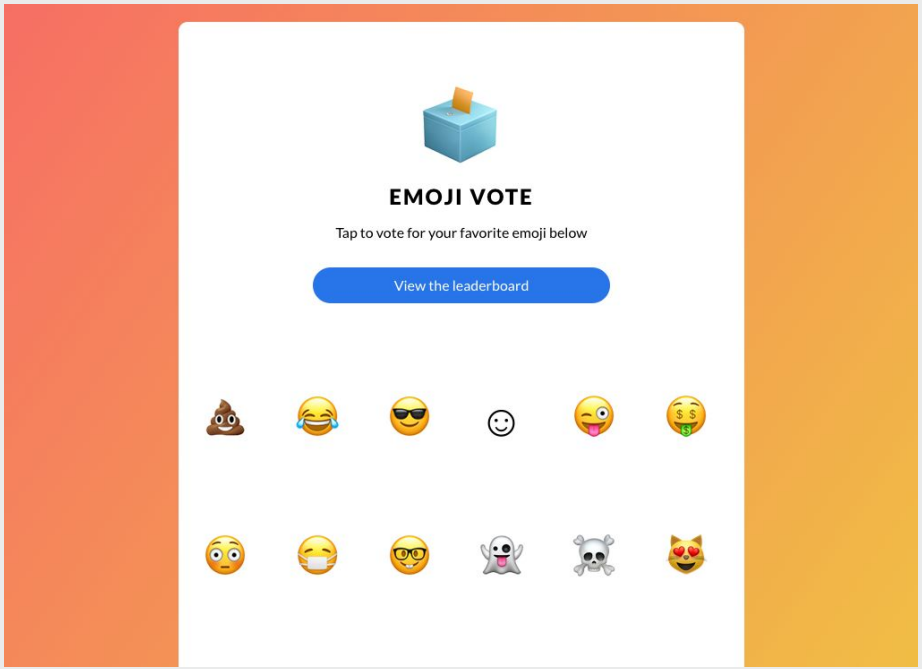
client_golang: https://prometheus.io/docs/guides/go-application/#adding-your-own-metrics

# Log Aggregation



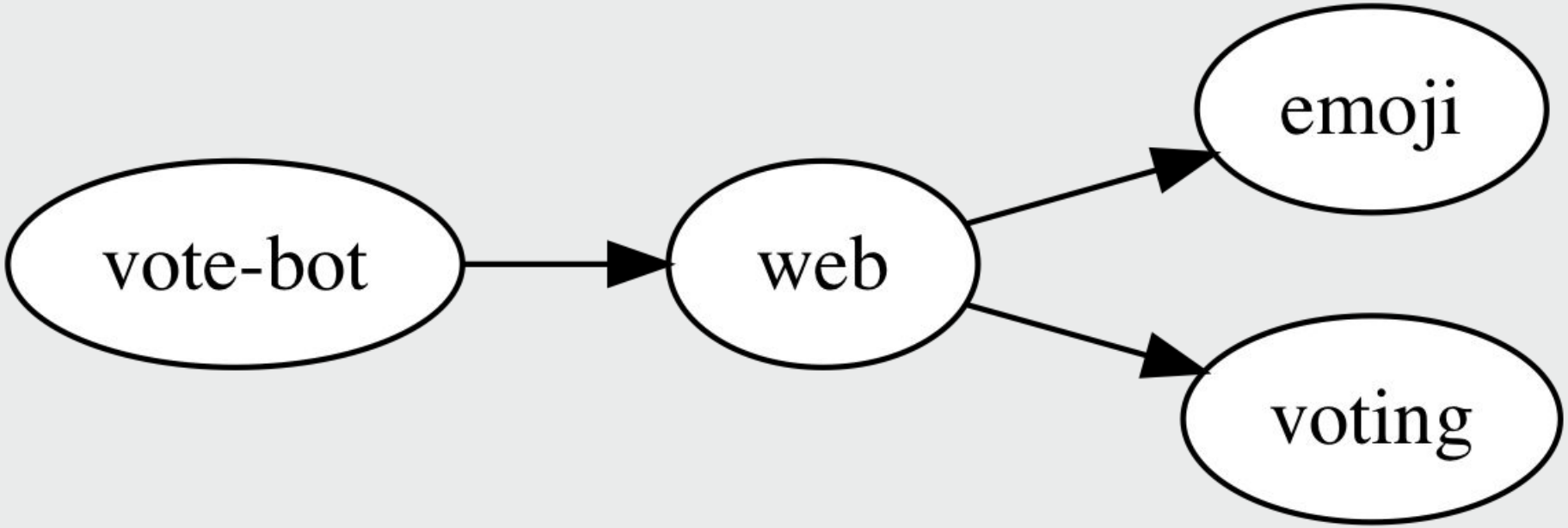

Howto: https://kubernetes.io/docs/tasks/debug-application-cluster/logging-elasticsearch-kibana/

# Get your votes in

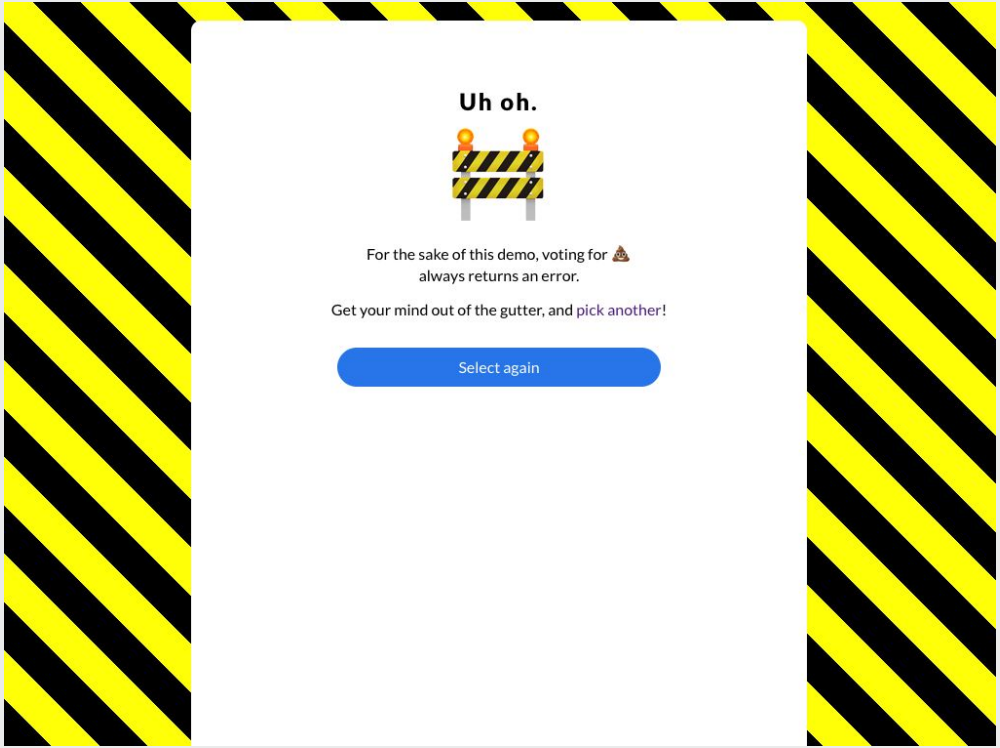



https://emoji.l5d.io

# The Architecture



# The Problem

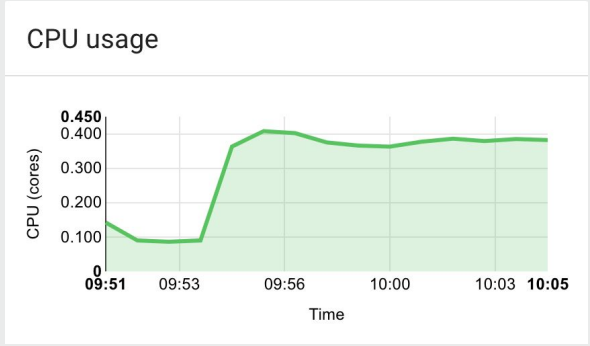

Uh oh.
For the sake of this demo, voting for 💩
always returns an error.
Get your mind out of the gutter, and pick another!
Select again

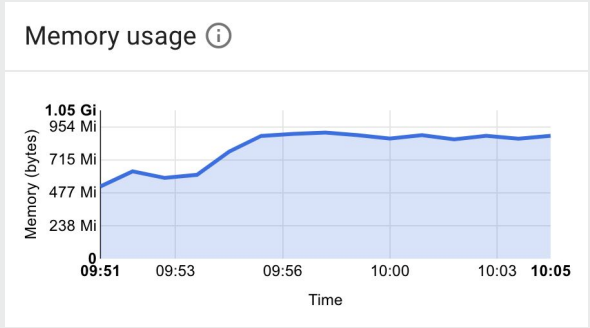
# 🙋 Check the state

- ☐ Service running?
- ☐ Health checks passing?
- ☐ Logs look okay?

# 👌 No problem here!

- ✅ Service running!
- ☐ Health checks passing?
- ☐ Logs look okay?



# Everything is fine

- [x] Service running!
- [x] Health checks passing!
- [ ] Logs look okay?

Deployments

| Name | Labels | Pods |
|---|---|---|
| vote-bot | app: vote-bot | 1 / 1 |
| web | app: web-svc | 1 / 1 |
| emoji | app: emoji-svc | 1 / 1 |
| voting | app: voting-svc | 1 / 1 |

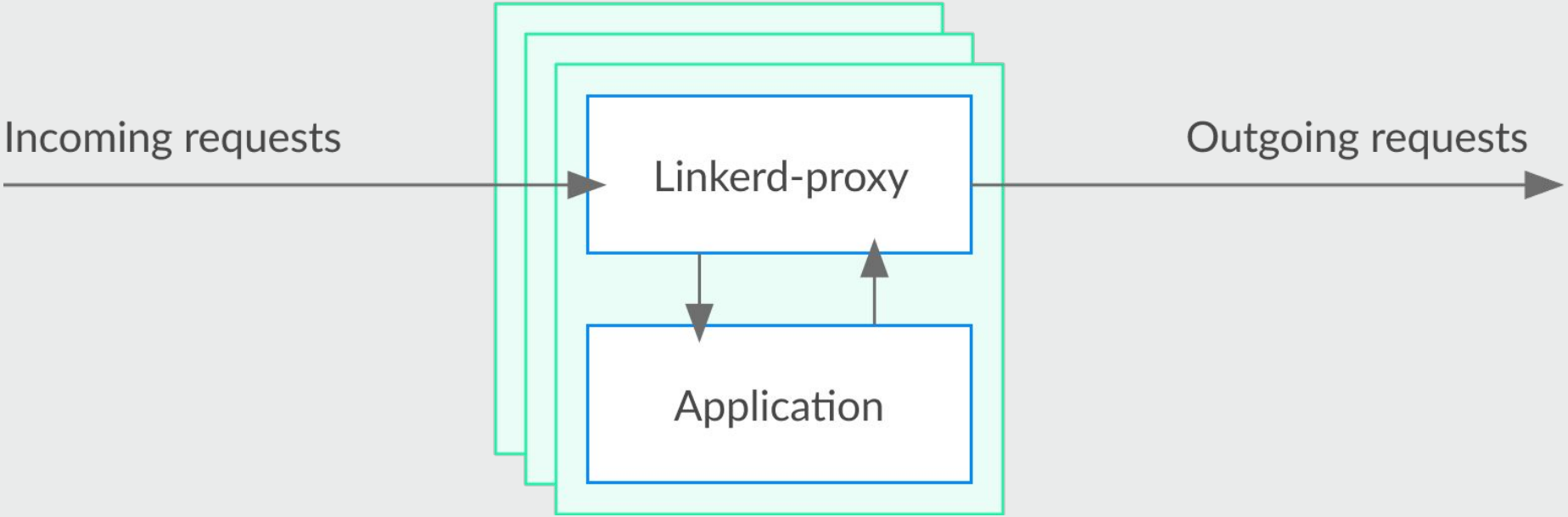
# 🤷 Okay, *something* is fishy

- ✅ Service running!
- ✅ Health checks passing!
- ⁉️ Logs look … something?

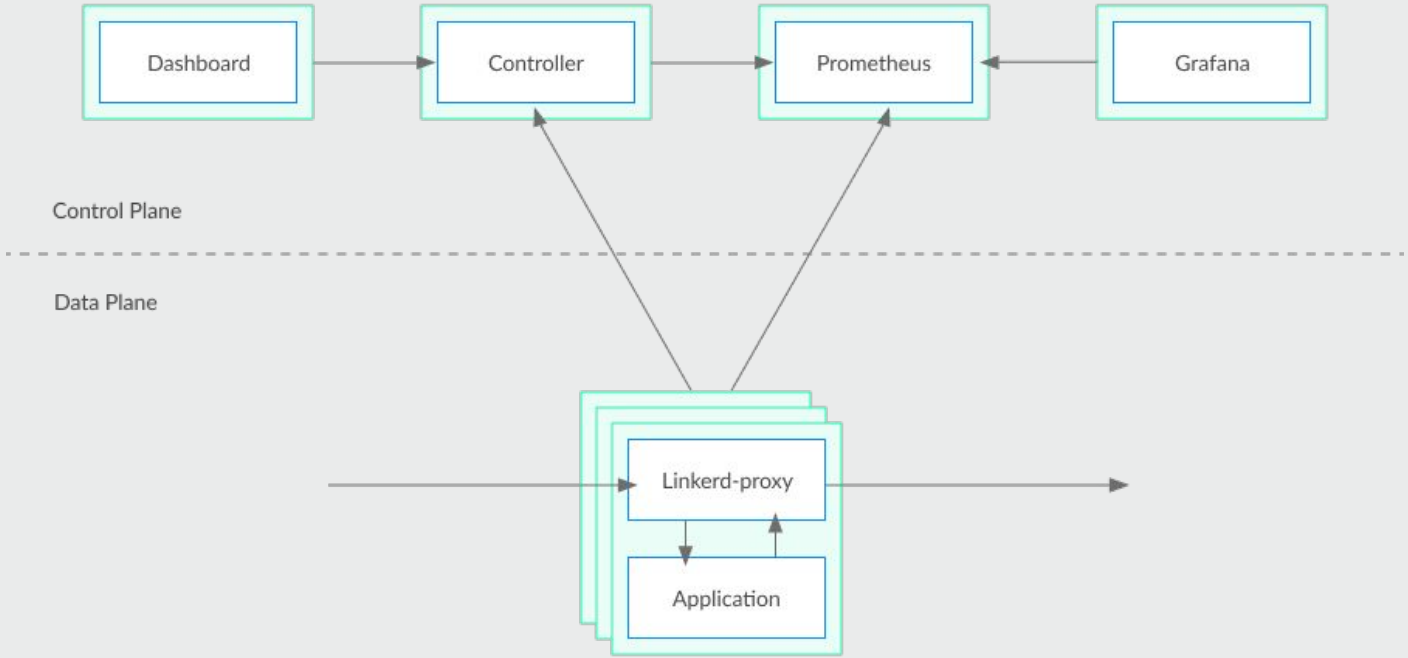
```
2018/11/13 22:26:58 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34560 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420481b80}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:01 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[Accept-Encodin
g:[gzip] User-Agent:[Go-http-client/1.1]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34590 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420481f00}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:15 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[Accept-Encodin
g:[gzip] User-Agent:[Go-http-client/1.1]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34618 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420480f80}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:18 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34730 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420481380}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:19 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34754 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420061280}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:24 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34766 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420061980}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:33 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34798 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420060040}]: rpc error: c
ode = Unknown desc = ERROR
2018/11/13 22:27:38 Error serving request [&{GET /api/vote?choice=:poop: HTTP/1.1 1 1 map[User-Agent:[Go
-http-client/1.1] Accept-Encoding:[gzip]] {} <nil> 0 [] false web-svc.emojivoto:80 map[choice:[:poop:]]
map[] <nil> map[] 10.4.0.31:34864 /api/vote?choice=:poop: <nil> <nil> <nil> 0xc420060880}]: rpc error: c
ode = Unknown desc = ERROR
```

# Linkerd: Microservice Forensics

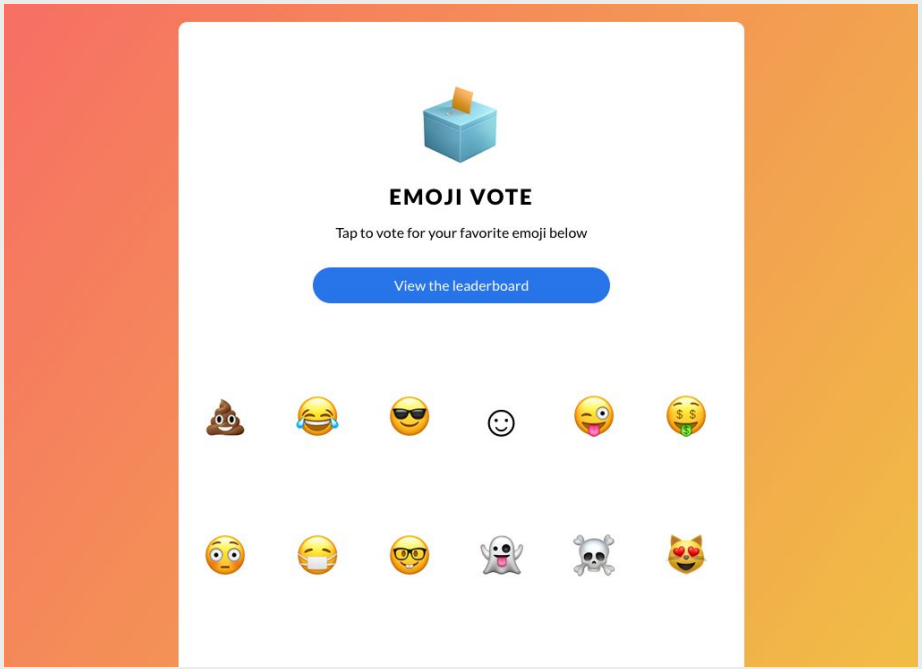
# What is Linkerd?



# Architecture

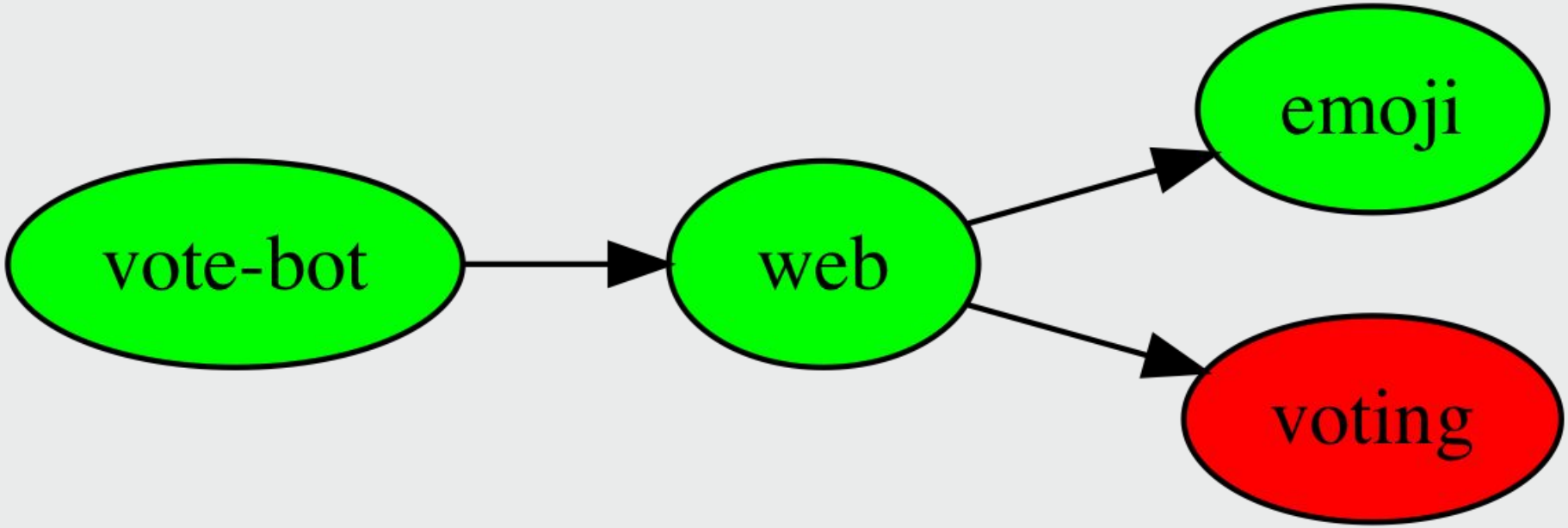


# Get your votes in




https://emoji.l5d.io

# The Culprit



# What is possible?

- Alerting
- Anomaly Detection
- Autoscaling
- Capacity Planning
- Chargeback
- Intelligent Deployments
- SLA Compliance

LINKERD

| | |
|---|---|
| Slides | http://bit.ly/linkerd-gosf |
| Tutorial | http://bit.ly/linkerd-tutorial |
| Get Started! | https://bit.ly/linkerd-get-started |