Invisible Insight: Strategies for Auto-Instrumenting Go Applications Without Code Changes

Invisible

Au ations

Changes

WHAT IS

AUTO-INSTRUMENTATION

About me

- Hannah Kim
- Graduated undergrad in 2024
- SWE I at Datadog
- Approx 1.008 years of experience

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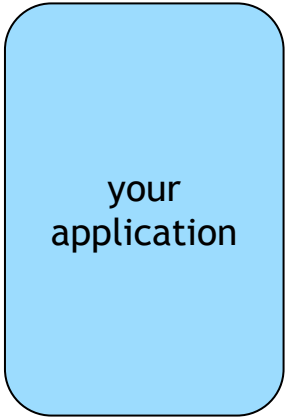

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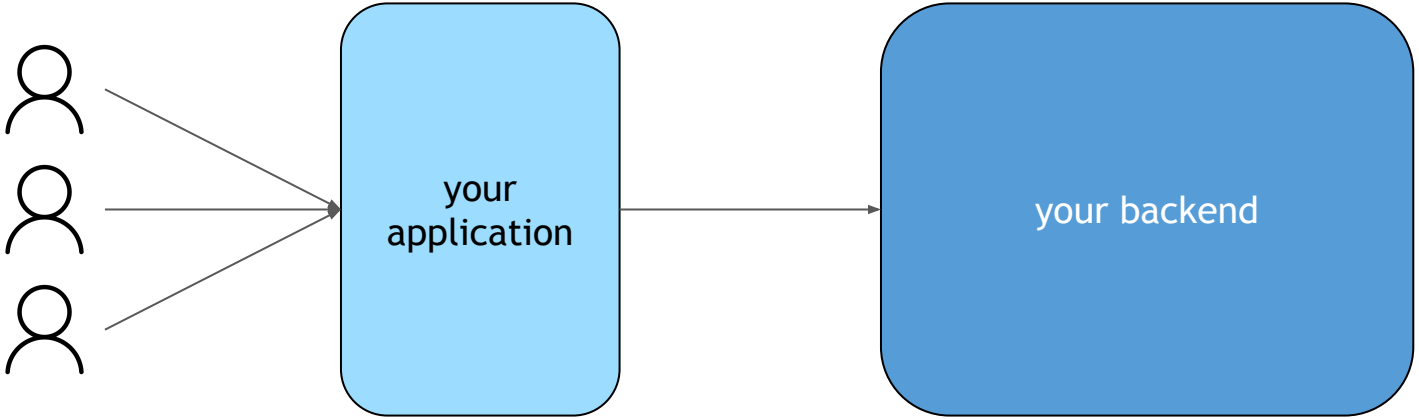

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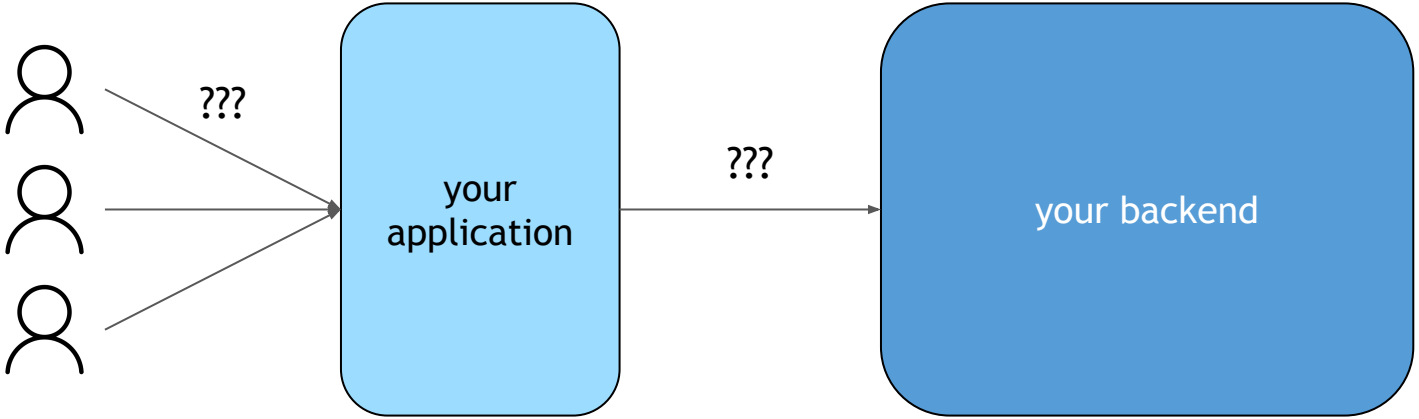

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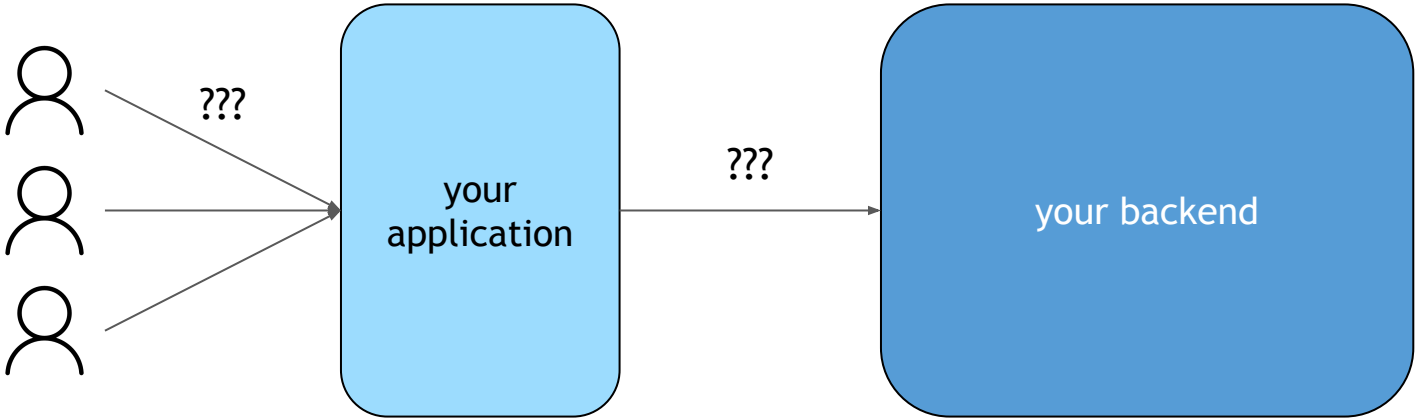

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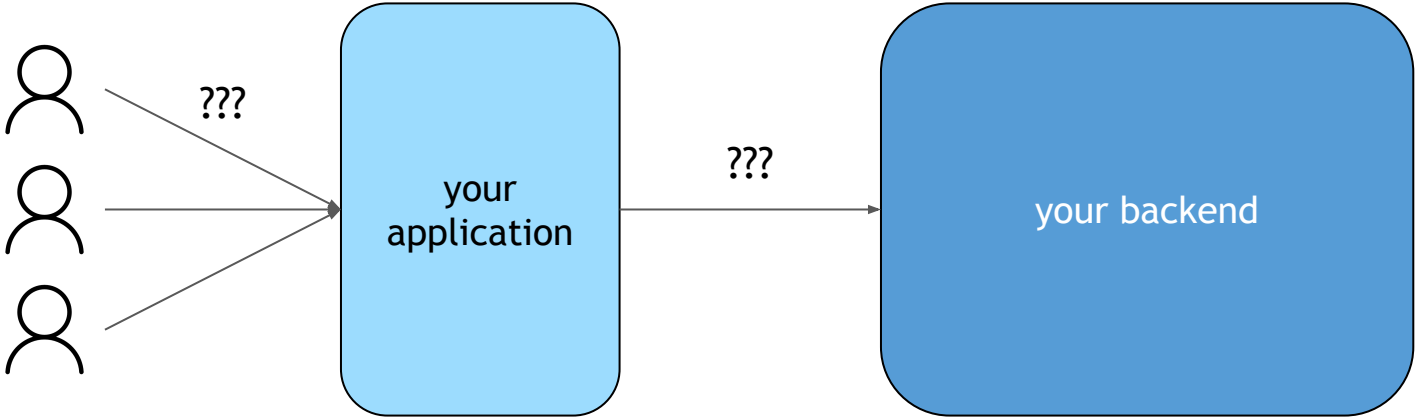

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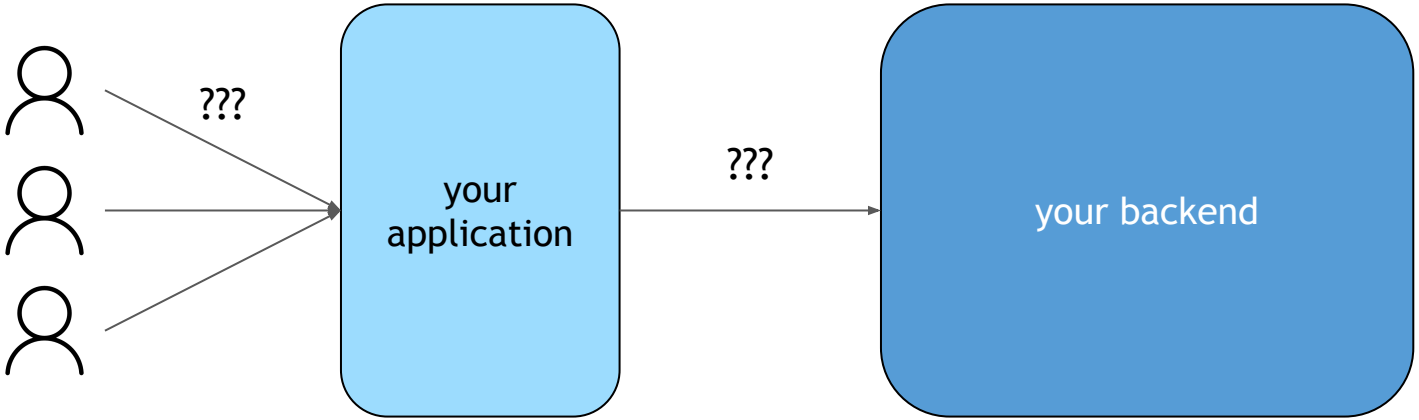

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(what happened)

METRICS
(how much/fast things happened)

TRACES
(*how* things happened)

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COMPILE TIME

- Happens at… compile time
- (Before run time)
- Works great with compiler languages like Go

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RUN TIME

- iovisor/gobpf
- cilium/eBPF
- OpenTelemetry Auto-Instrumentation
- Hooking
  - Shared library injection
  - Binary trampolining

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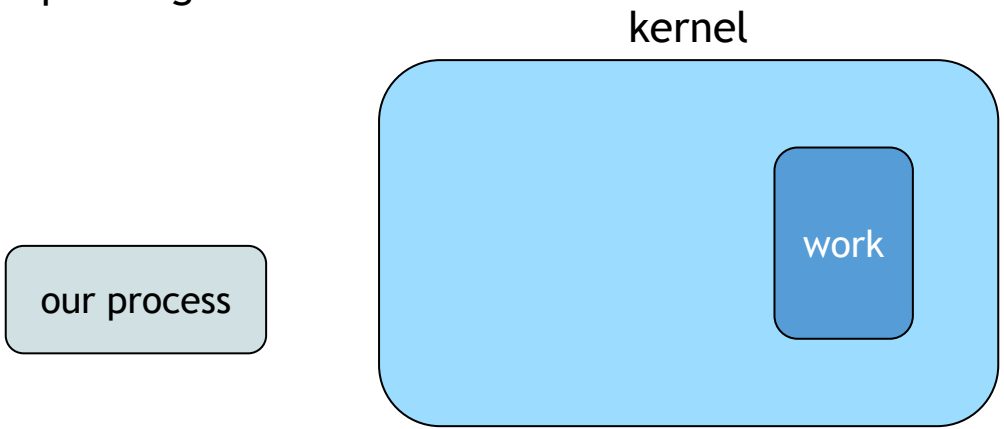

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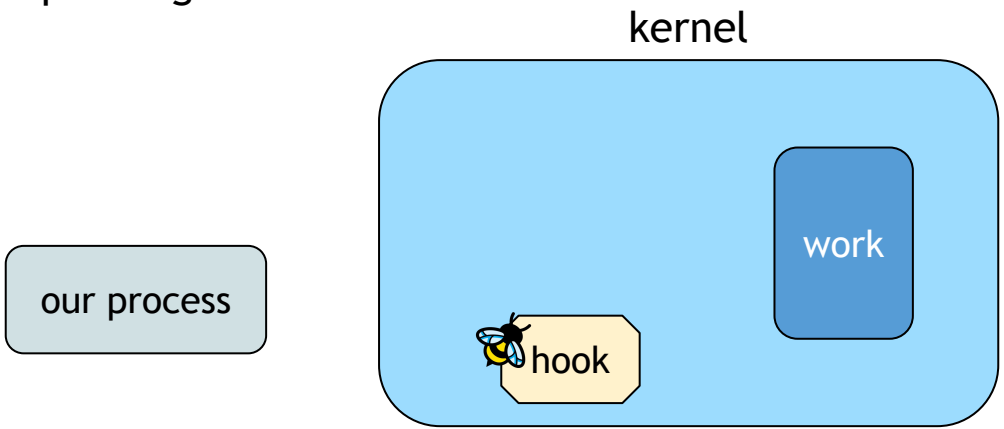

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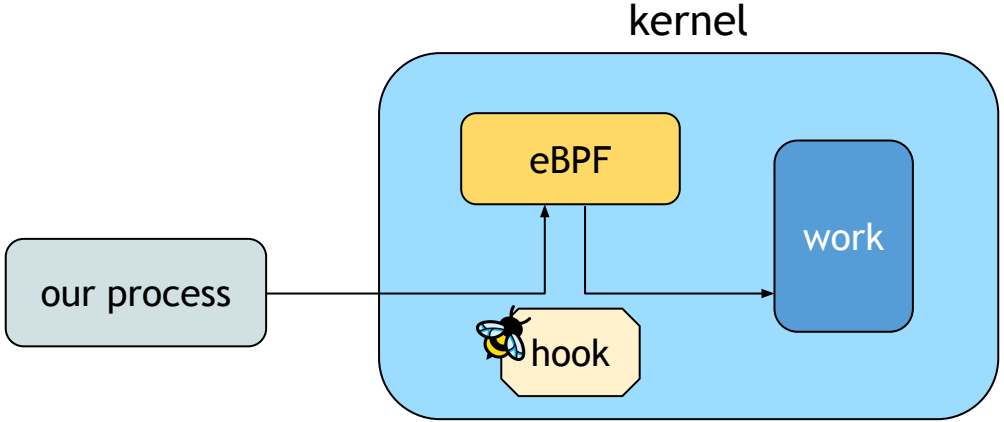

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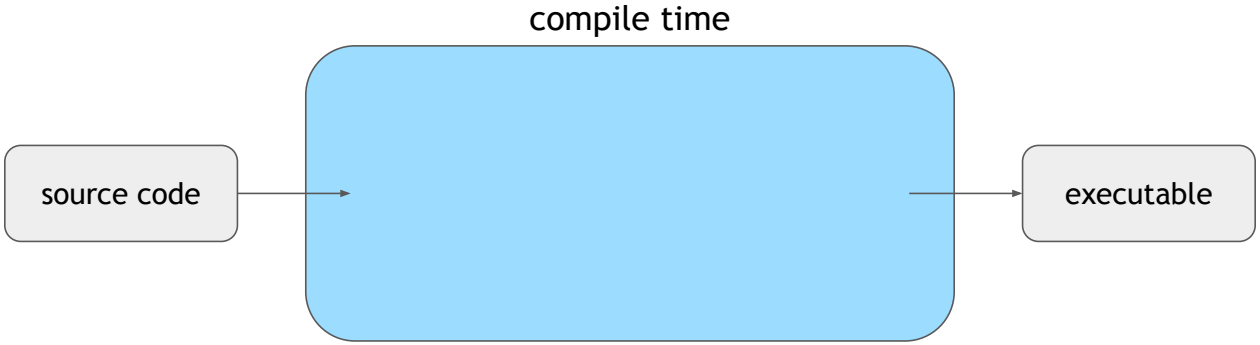

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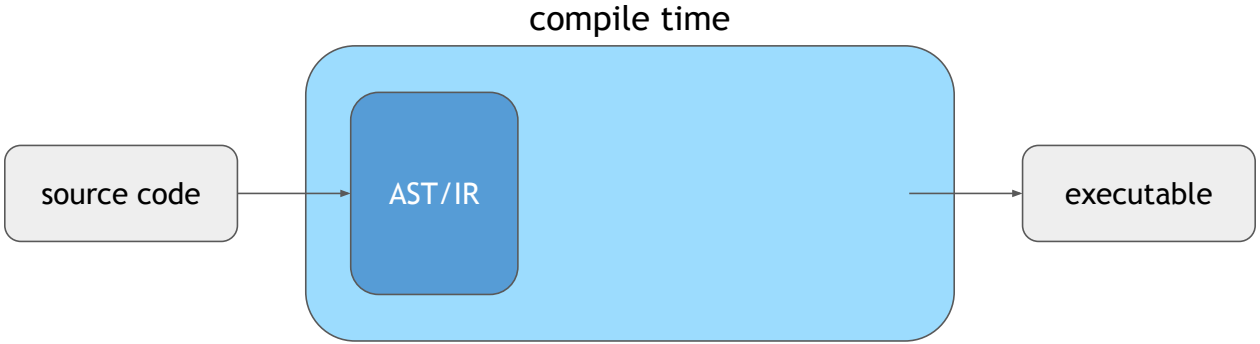

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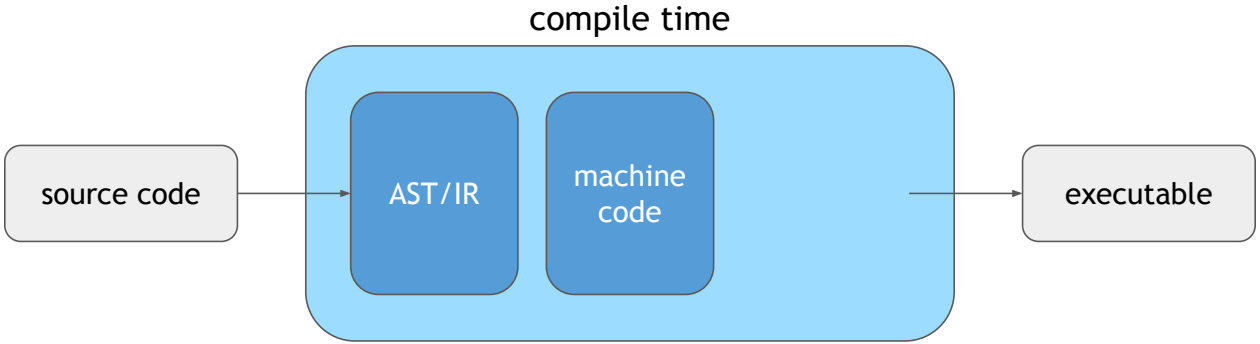

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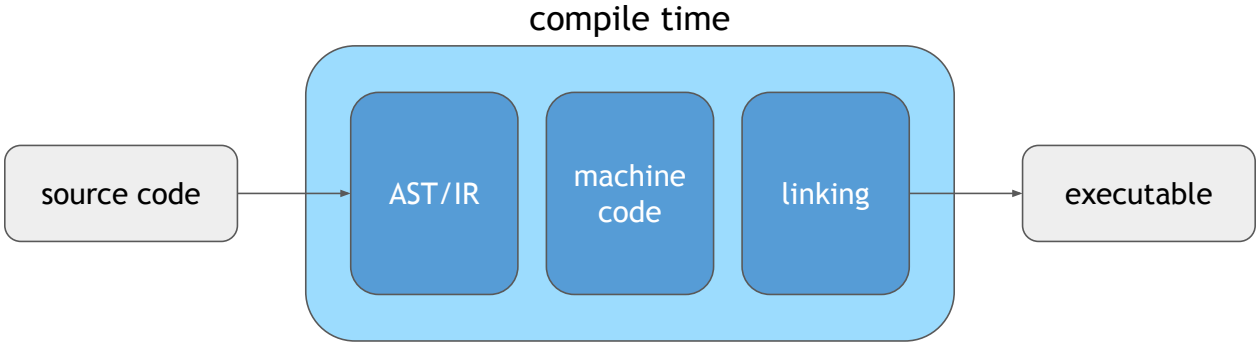

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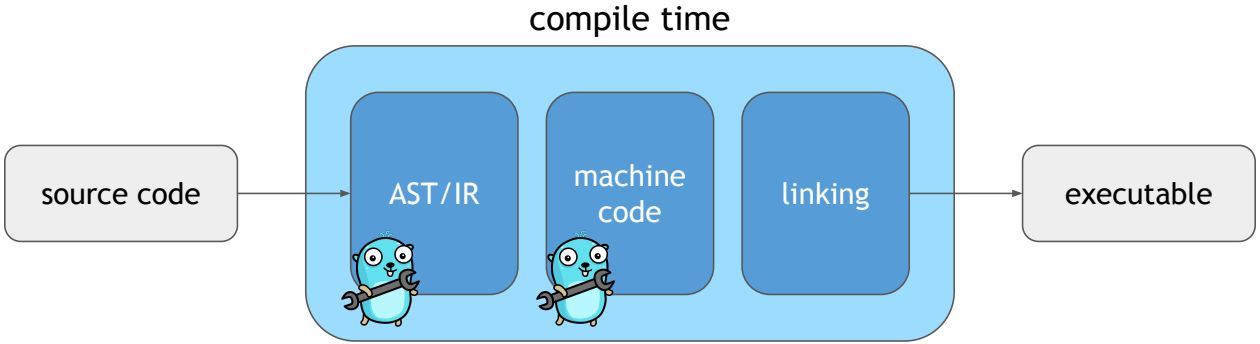


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go run -toolexec 'orchestrion toolexec' .
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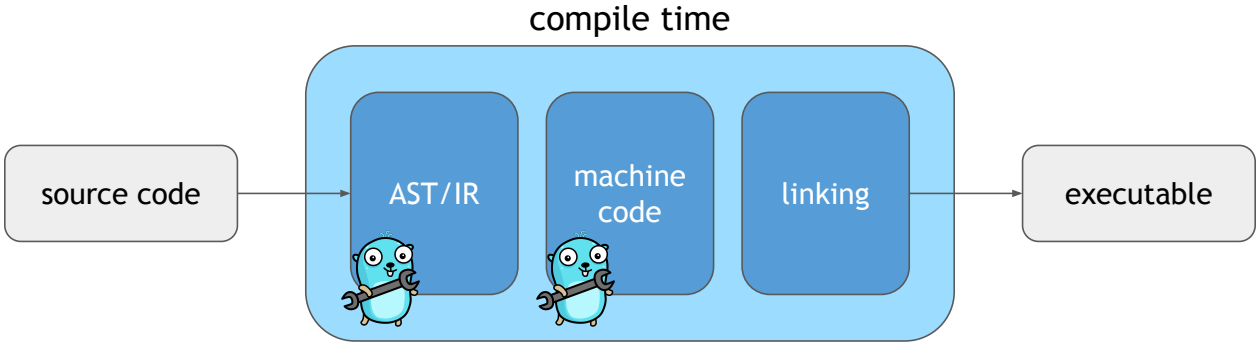


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How do they perform?

Check out the code

```
mux := http.NewServeMux()
mux.HandleFunc("/hello", func(w http.ResponseWriter, r *http.Request) {
    handlers.HelloHandler(w, r)
})

func POST(db *sql.DB, instrumentationType string, hasError bool) error {
   query := `INSERT INTO instrumentation_logs (instrumentation,
error_status) VALUES ($1, $2)`
   _, err := db.Exec(query, instrumentationType, hasError)
   return err
}
```

How do they perform?

Check out the code

```
stages: [
    // avg load-testing
    { duration: '15s', target: 100 }, // traffic ramp-up
    { duration: '30s', target: 100 }, // hold steady
    { duration: '15s', target: 0 }, // ramp-down to 0 users

    // spike-testing
    { duration: '2s', target: 1000 }, // sudden jump to 1000 users
    { duration: '2s', target: 0 }, // drop down to 0 users
]
```

How do they perform?

Check out the code

github.com/mackerelio/go-osstat

```
type CPUStats struct {
   User   uint64 `json:"user"`
   System uint64 `json:"system"`
   Idle   uint64 `json:"idle"`
   Total  uint64 `json:"total"`
}
type MemoryStats struct {
   Total uint64 `json:"total"`
   Used  uint64 `json:"used"`
}
type UptimeStats struct {
   Milliseconds uint64 `json:"milliseconds"`
}
```

How do they perform?

Check out the code

No Instrumentation

Manual Instrumentation
(OpenTelemetry SDK)

Auto Instrumentation
(OpenTelemetry eBPF)

Auto Instrumentation
(Orchestrion using OpenTelemetry)

Who wins?

Approach	Performance	Stability	Security	Portability
Auto (eBPF)				
Auto (toolchain)				

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The future

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  - golang/go#63185 – Flight recording (released in Go 1.25!)

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Final thoughts

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1. Instrumentation is helpful and *important*
2. Auto-instrumentation is EASY
3. What are you (👉) going to do next?

Thanks :)

@hannahkm

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hannahs.kim@datadoghq.com

Gopher Icons: github.com/MariaLetta/free-gophers-pack