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# The Fourth Pillar Arrives: OpenTelemetry Profiles Alpha in Action

Florian Lehner, Felix Geisendörfer



# What are profiles?



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Collection of stack traces (typically aggregated by count, or with timestamps):

```
30  db_select;get_balance;serve_requests;main
20  get_balance;serve_requests;main
5   serve_requests;main
15  report_to_irs;main
10  make_deposit;serve_requests;main
20  db_insert;make_deposit;serve_requests;main
```

# Use Cases for Profiling



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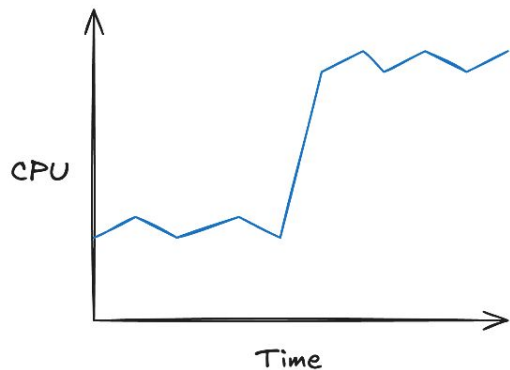


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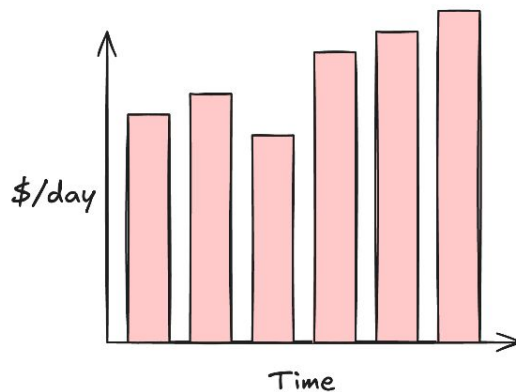
## Incidents

### Sudden CPU Increase



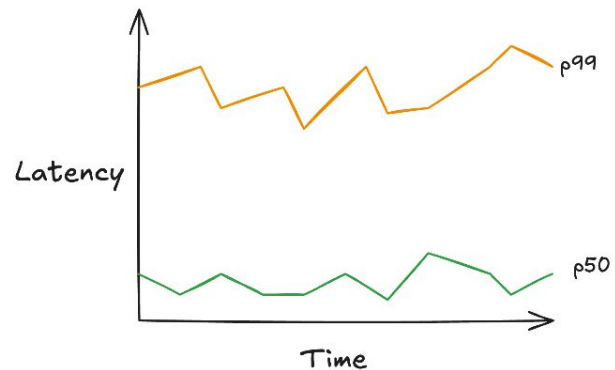
## Costs

### High Compute Cost

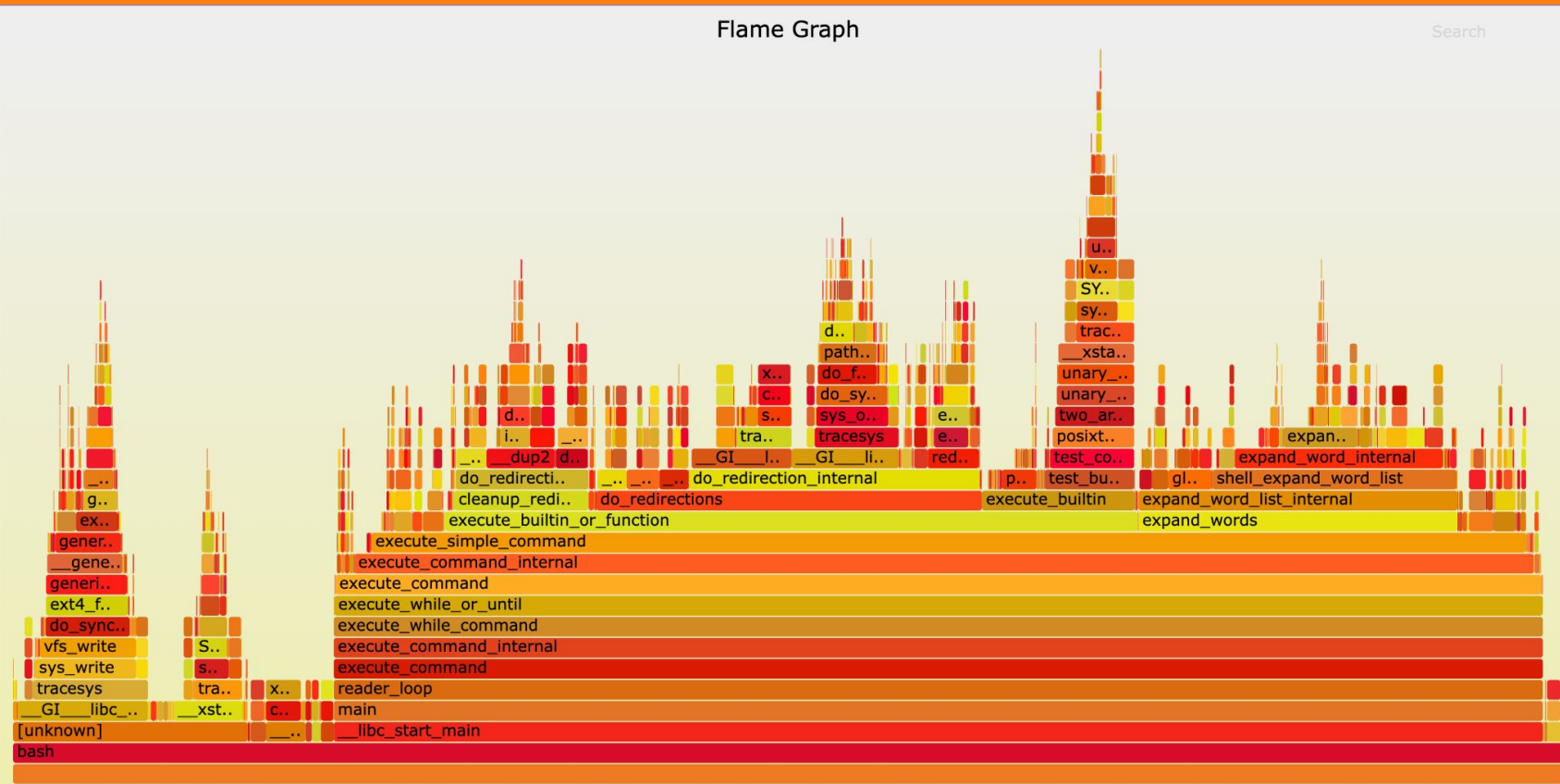


## Performance

### High Tail Latencies



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# Thread Timelines & FlameScope

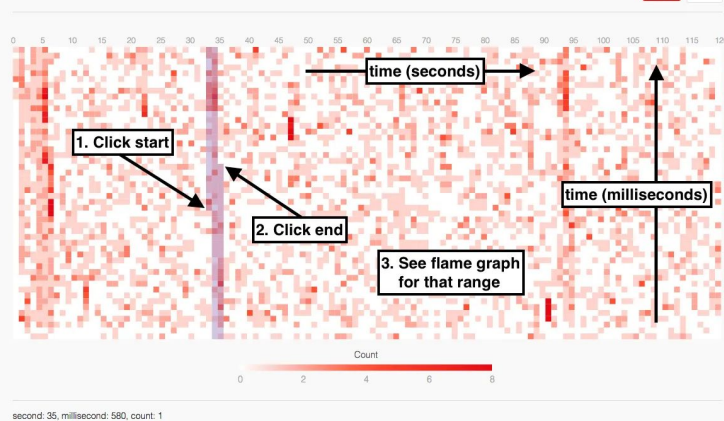
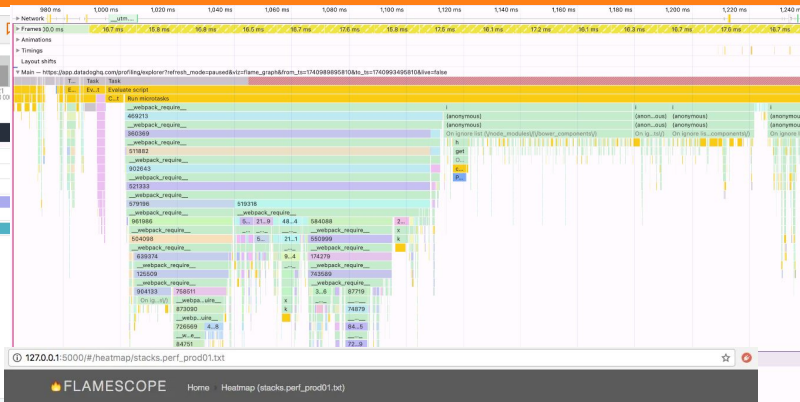
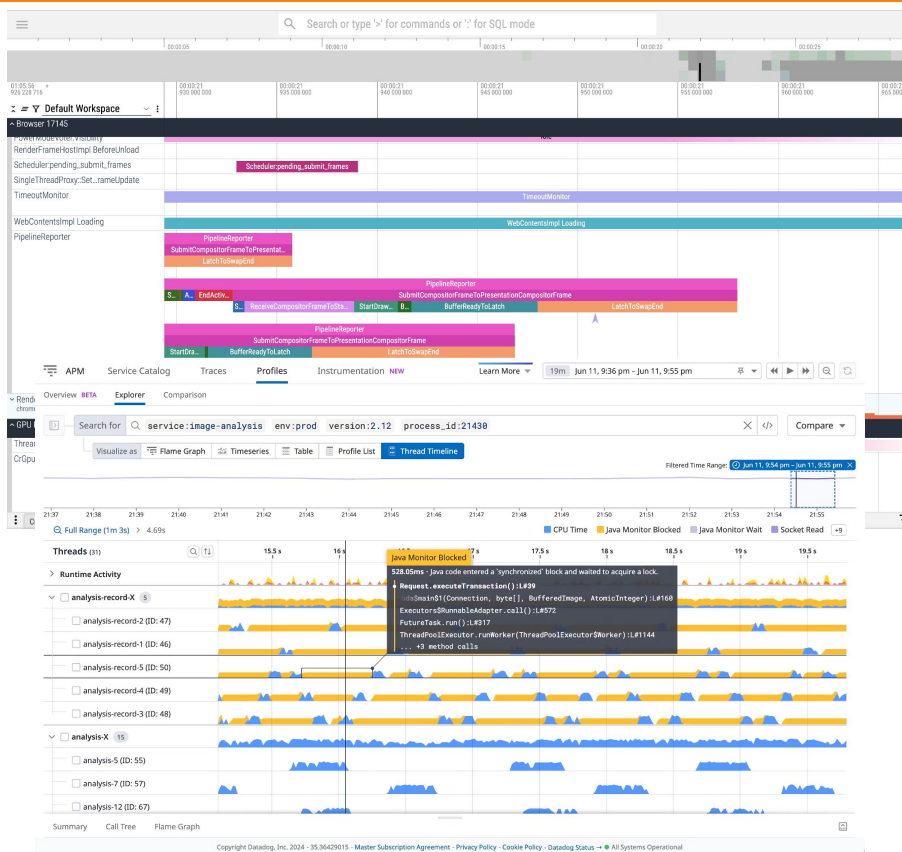


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# History & Milestones



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- Oct 2020: Proposed the addition of profiling as a signal – [#139](#)
- Jun 2022: Organized the first SIG meeting – [notes](#)
- Sep 2022: Outlined the initial vision in OTEP – [#212](#)
- Feb 2024: Defined the initial data model in OTEP – [#239](#)
- Jun 2024: Finalized the eBPF full host profiler donation from Elastic – [#1918](#).
- Aug 2024: Decided that pprof should remain independent – [#567](#)
- Oct 2024: Landed initially OTLP support in the collector – [v0.112.0](#)
- Jan 2025: Merged collector receiver for eBPF profiler – [#160](#)
- Apr 2025: Presented The State of OpenTelemetry Profiling at KubeCon in London.

# History & Milestones



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- Apr 2025: Improved resource semantics and move dictionary – [#628](#)
- July 2025: Clarified the correct usage of timestamps – [#649](#)
- Aug 2025: Simplified stack trace representation – [#708](#)
- Feb 2026: Added dictionary support to resource attributes in OTLP – [#733](#)  
Up to *40% wire size reduction*
- Mar 2026: Announced profiling alpha graduation at KubeCon Amsterdam 🎉

30 OTLP PRs merged and many more commits to the collector, ebpf-profiler and more.

# Launching the Profiles Alpha



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# Thanks to many contributors



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- [Alexey Alexandrov](#) (Google)
  - [Ivo Anjo](#) (Datadog)
  - [Frederic Branczyk](#) (Polar Signals)
  - [Roger Coll](#) (Elastic)
  - [Dmitry Filimonov](#) (Grafana Labs)
  - [Felix Geisendörfer](#) (Datadog)
  - [Nayef Ghattas](#) (Datadog)
  - [Jonathan Halliday](#) (IBM)
  - [Dale Hamel](#) (Shopify)
  - [Joel Höner](#) (Zymtrace)
  - [Bogdan Drutu](#) (Snowflake)
  - [Christos Kalkanis](#) (Elastic)
  - [Florian Lehner](#) (Elastic)
  - [Damien Mathieu](#) (Elastic)
  - [Greg Mefford](#) (Adobe)
  - [Tigran Najaryan](#) (Splunk)
  - [Tommy Reilly](#) (Polar Signals)
  - [Tim Rühsen](#) (Zymtrace)
  - [Josh Suereth](#) (Google)
  - [Timo Teräs](#) (Elastic)
  - [Brennan Vincent](#) (Polar Signals)
- + many others

# And their employers



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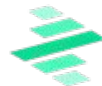
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**Red Hat**



**Grafana Labs**



**zymtrace**

**splunk**>



**elastic**

**Google**



**DATADOG**



**Polar Signals**



**Adobe**

**aws**



**snowflake**



**shopify**



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# OpenTelemetry Profiles Signal



# OpenTelemetry Profiles Signal

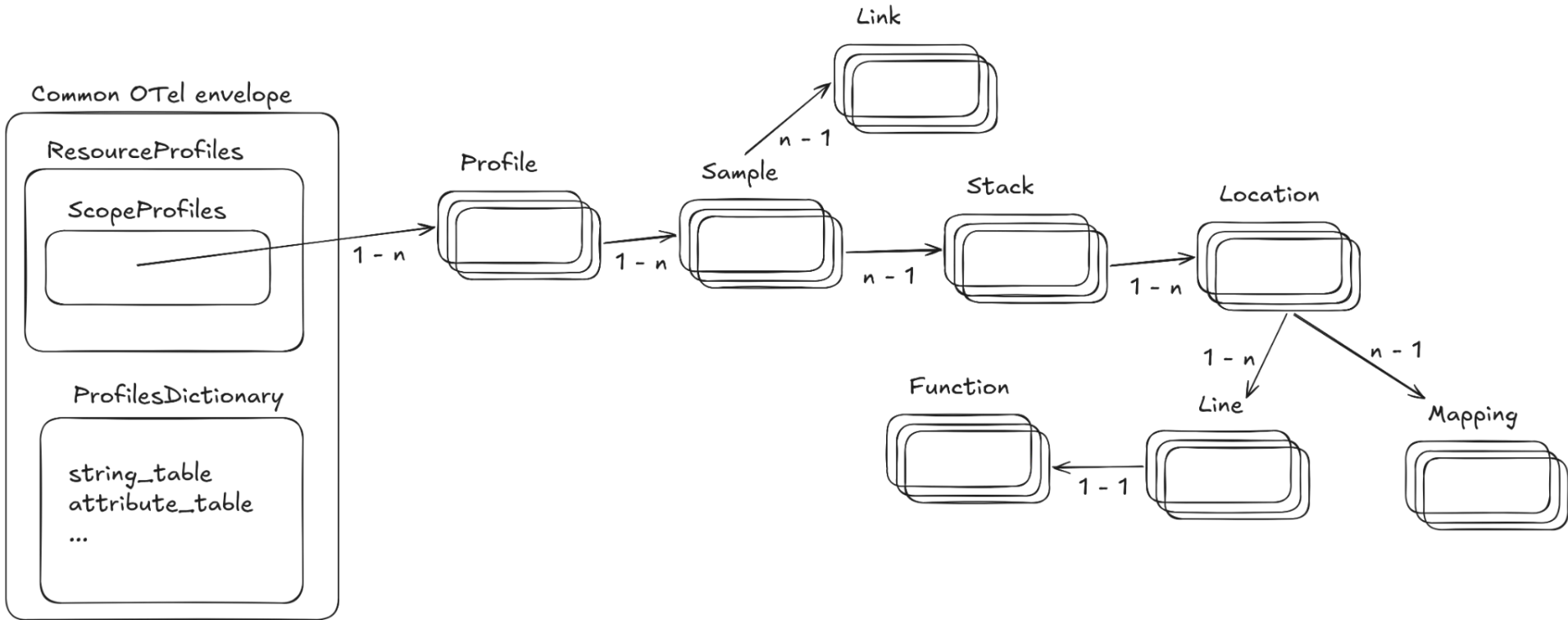


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# OpenTelemetry Profiles Signal

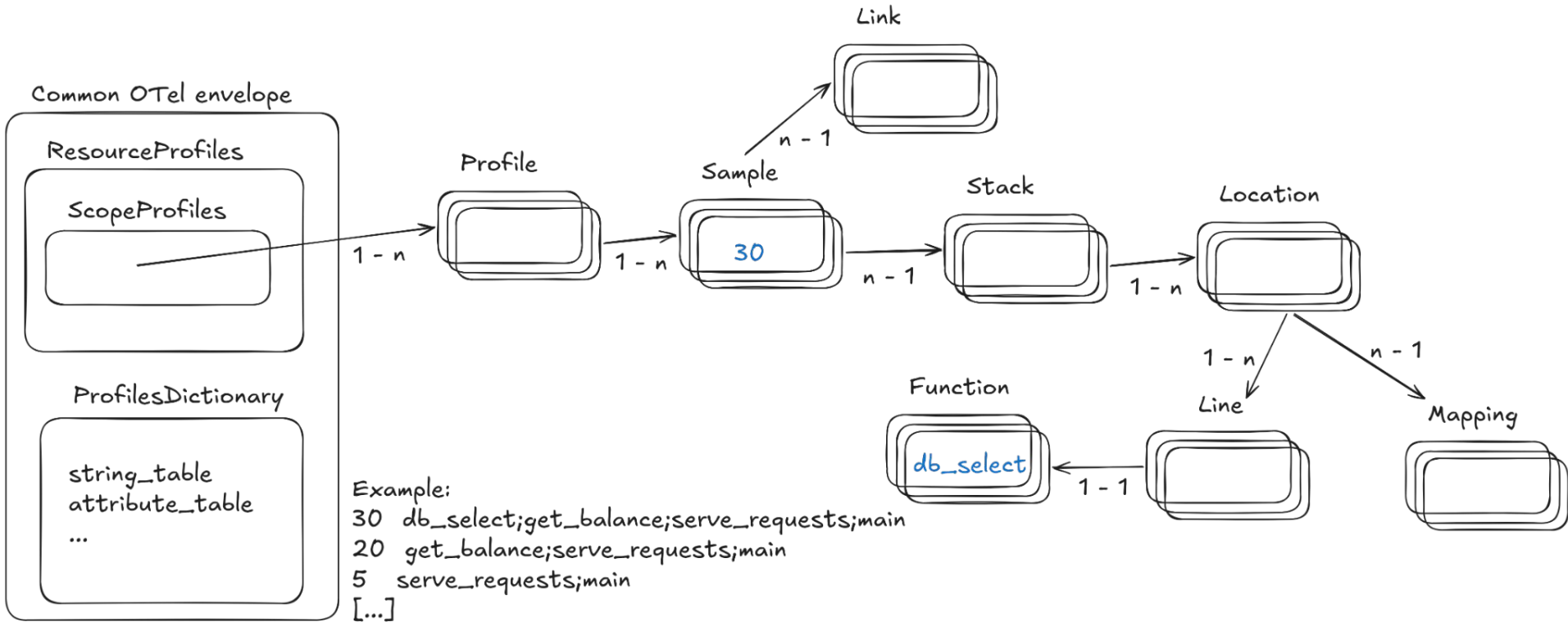


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# OpenTelemetry Profiles Signal

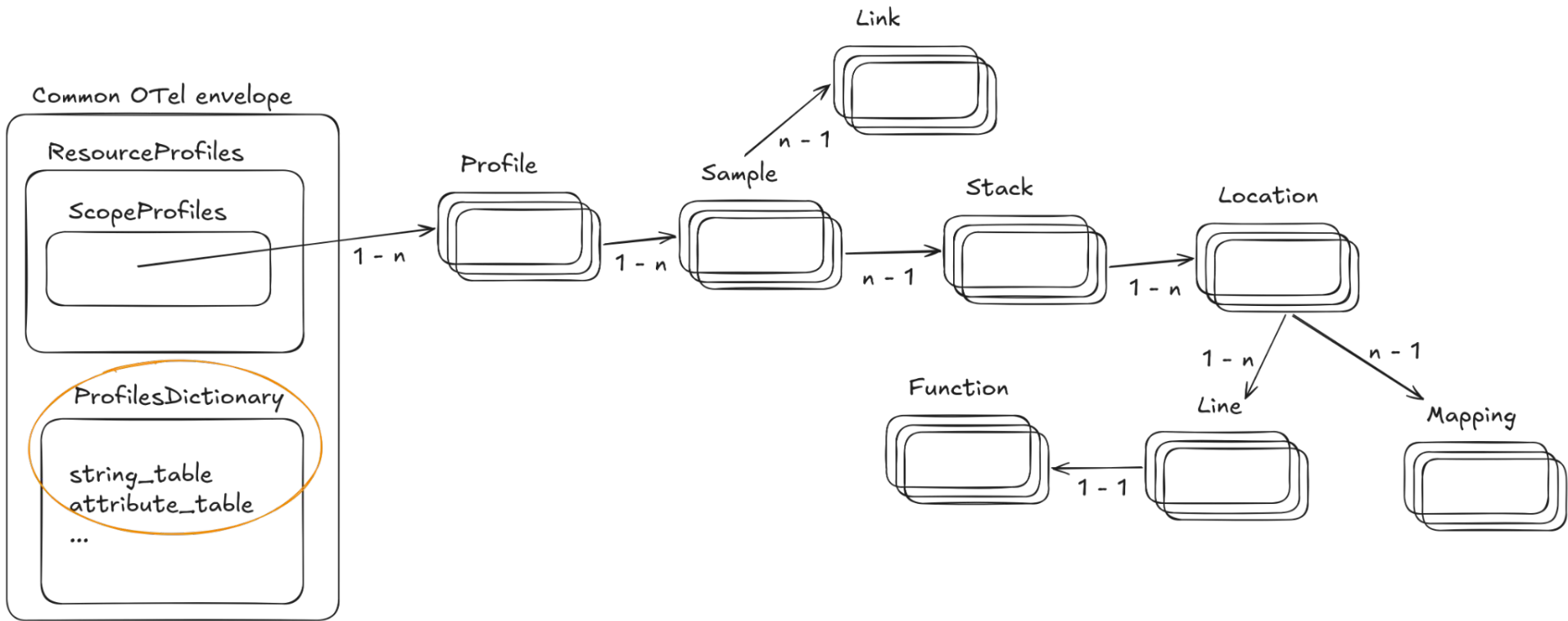


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# OpenTelemetry Profiles Signal

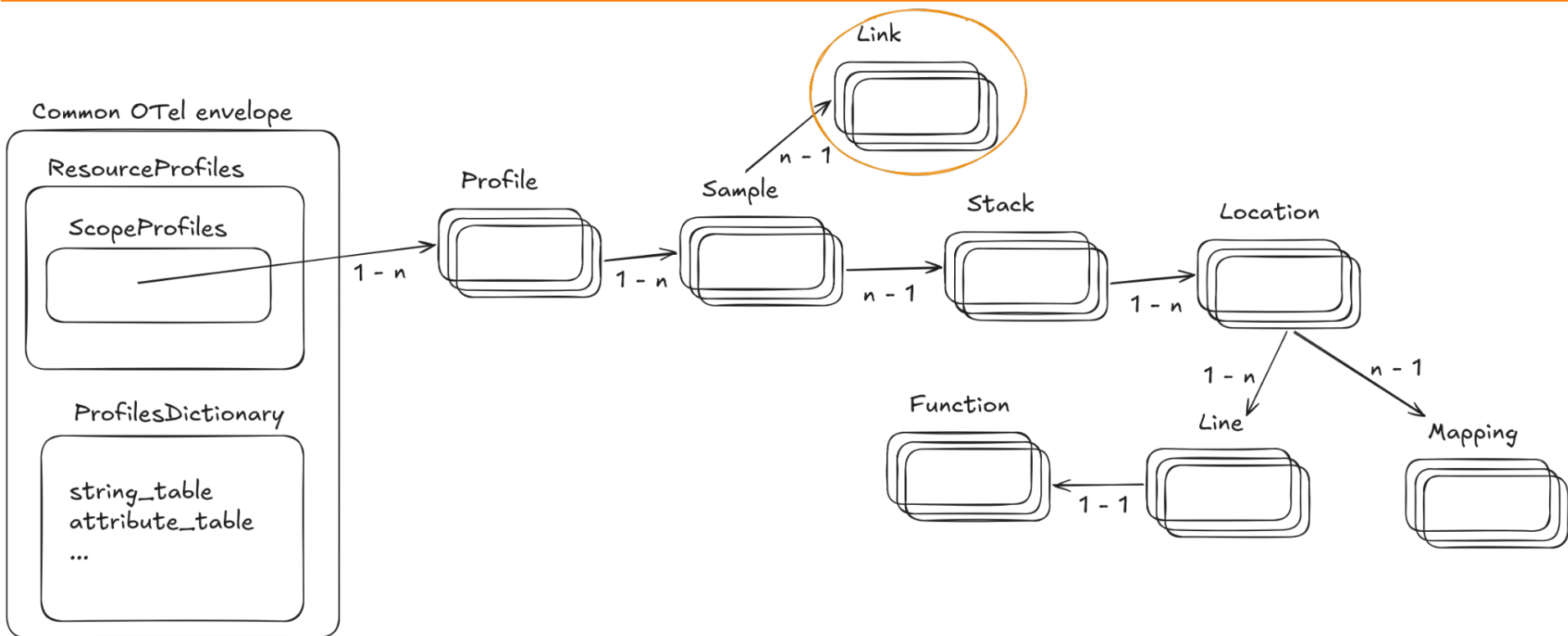


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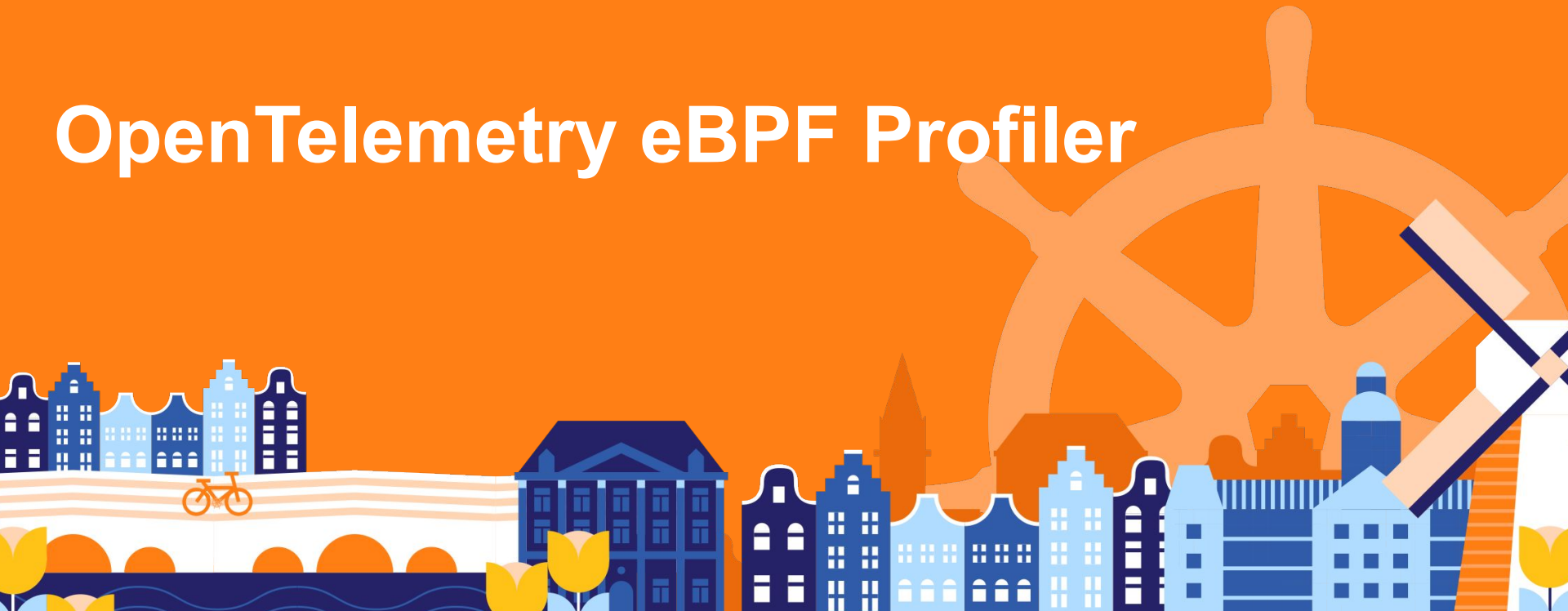
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# OpenTelemetry eBPF Profiler



# OpenTelemetry eBPF Profiler

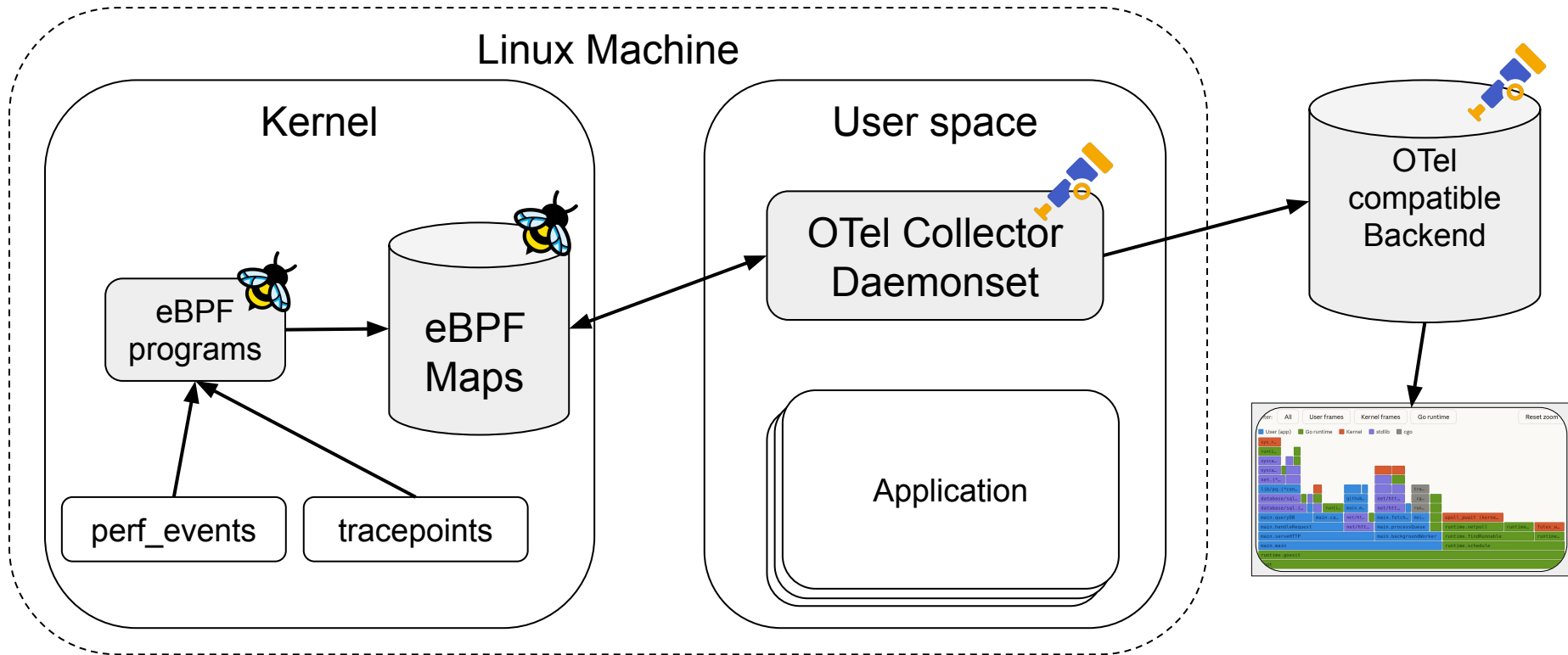


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# OpenTelemetry eBPF Profiler

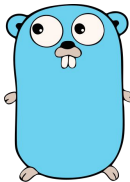


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- **Frictionless Deployment**

Zero-instrumentation, no code changes or application restarts

- **Whole-System Visibility**

Surface bottlenecks in any part of the system, not just the code you own

- **Low Overhead**

Continuous sampling with negligible overhead

# Next for OpenTelemetry eBPF Profiler



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- Context sharing

Strengthen process and thread context sharing with OTel SDKs

- Interoperability

Improve information sharing with other eBPF solutions, such as [OBI](#)

- Language Support

Expand support for additional interpreted languages



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# Demo



# The Bug: Before



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```
func processOrders(ctx context.Context, orders []Order) error {
    for _, order := range orders {
        itemIdx := 0
        for itemIdx < len(order.Items) {
            item := order.Items[itemIdx]
            if err := reserveInventory(ctx, item); err != nil {
                captureErrorContext(ctx, order.OrderID, item.SKU, err)
                // Continue with the next order
                break
            }
            itemIdx++
        }
    }
}
```

# The Bug: After (AI Refactored)



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```
func processOrders(ctx context.Context, orders []Order) error {
    for _, order := range orders {
        itemIdx := 0
        for itemIdx < len(order.Items) {
            item := order.Items[itemIdx]
            if err := reserveInventory(ctx, item); err != nil {
                captureErrorContext(ctx, order.OrderID, item.SKU, err)
                // Continue with the next order
                continue
            }
            itemIdx++
        }
    }
}
```

# The Diff



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```
func processOrders(ctx context.Context, orders []Order) error {
    for _, order := range orders {
        itemIdx := 0
        for itemIdx < len(order.Items) {
            item := order.Items[itemIdx]
            if err := reserveInventory(ctx, item); err != nil {
                captureErrorContext(ctx, order.OrderID, item.SKU, err)
                // Continue with the next order
                - break
                + continue
            }
            itemIdx++
        }
    }
}
```

# Based on a real incident



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[sketch.dev/blog/our-first-outage-from-llm-written-code](https://sketch.dev/blog/our-first-outage-from-llm-written-code)

## Diagnosed with profiling

## Our first outage from LLM-written code

*2025-07-31 by Josh Bleacher Snyder and Sean McCullough*

---

We had a series of mini-outages at sketch.dev on July 15th, caused by LLM-written code.

### Timeline

A deployment appeared initially stable. Some time afterwards, CPU spiked, and service incrementally slowed to a crawl.

Profiles pointed to some absurdly complicated SQL queries that were doing multiple full table scans. The hypothesis was that they had reached a tipping point at which the database could no longer keep up. Either way, those queries needed reform.

We fixed the queries and deployed. The same thing happened: initial stability followed by a downward spiral.

# What's next?

- Get the profiling signal to beta, then stable.
- Design OTLP protocol for symbolication.



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- Try out the profiling alpha
- Send feedback on GitHub or #otel-profiles
- Contribute code or ideas.



Talk Feedback