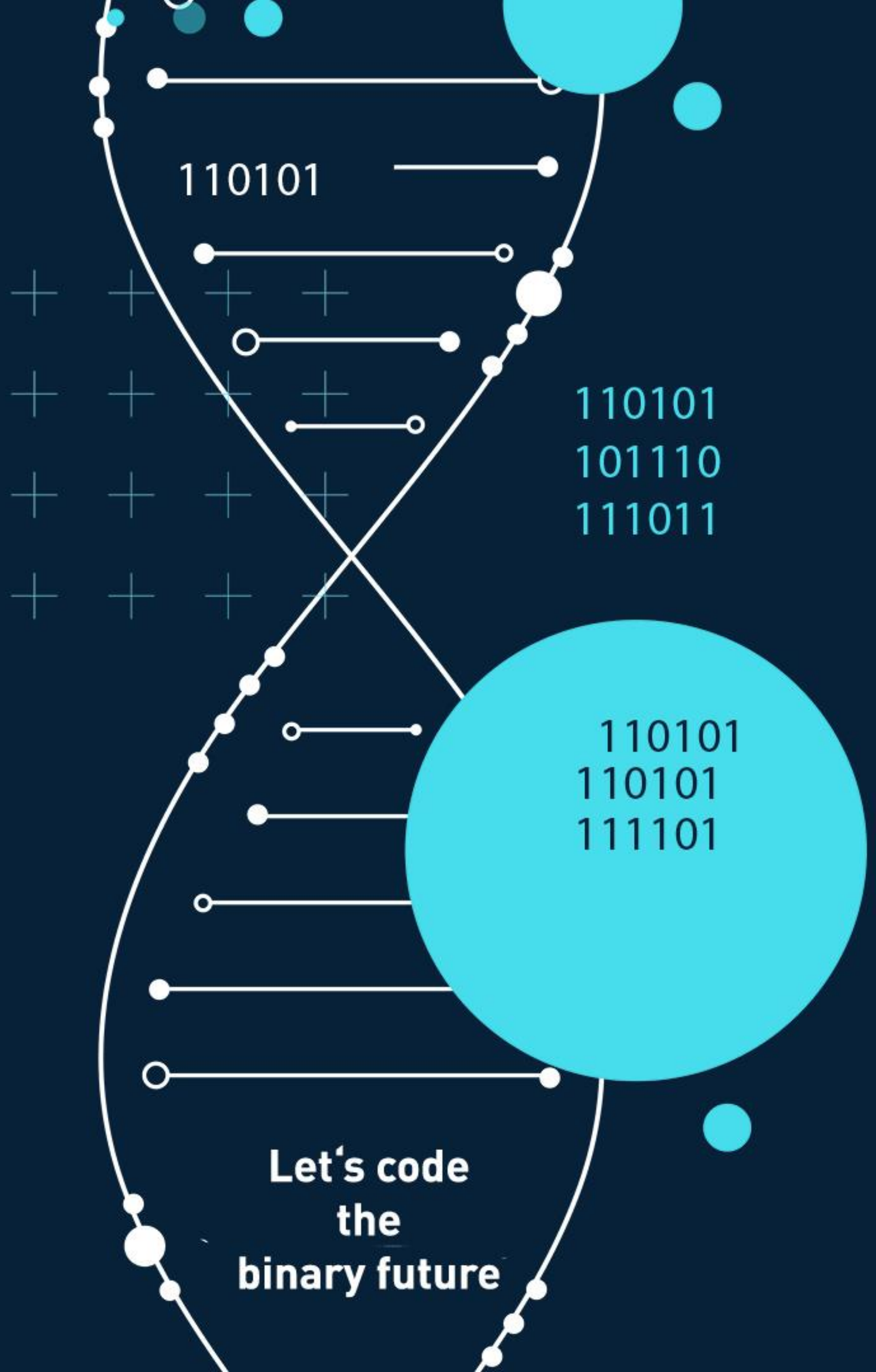
Tech Ed

Největší československá **konference o IT**

21. - 23. 5. 2024 | PRAHA / ONLINE

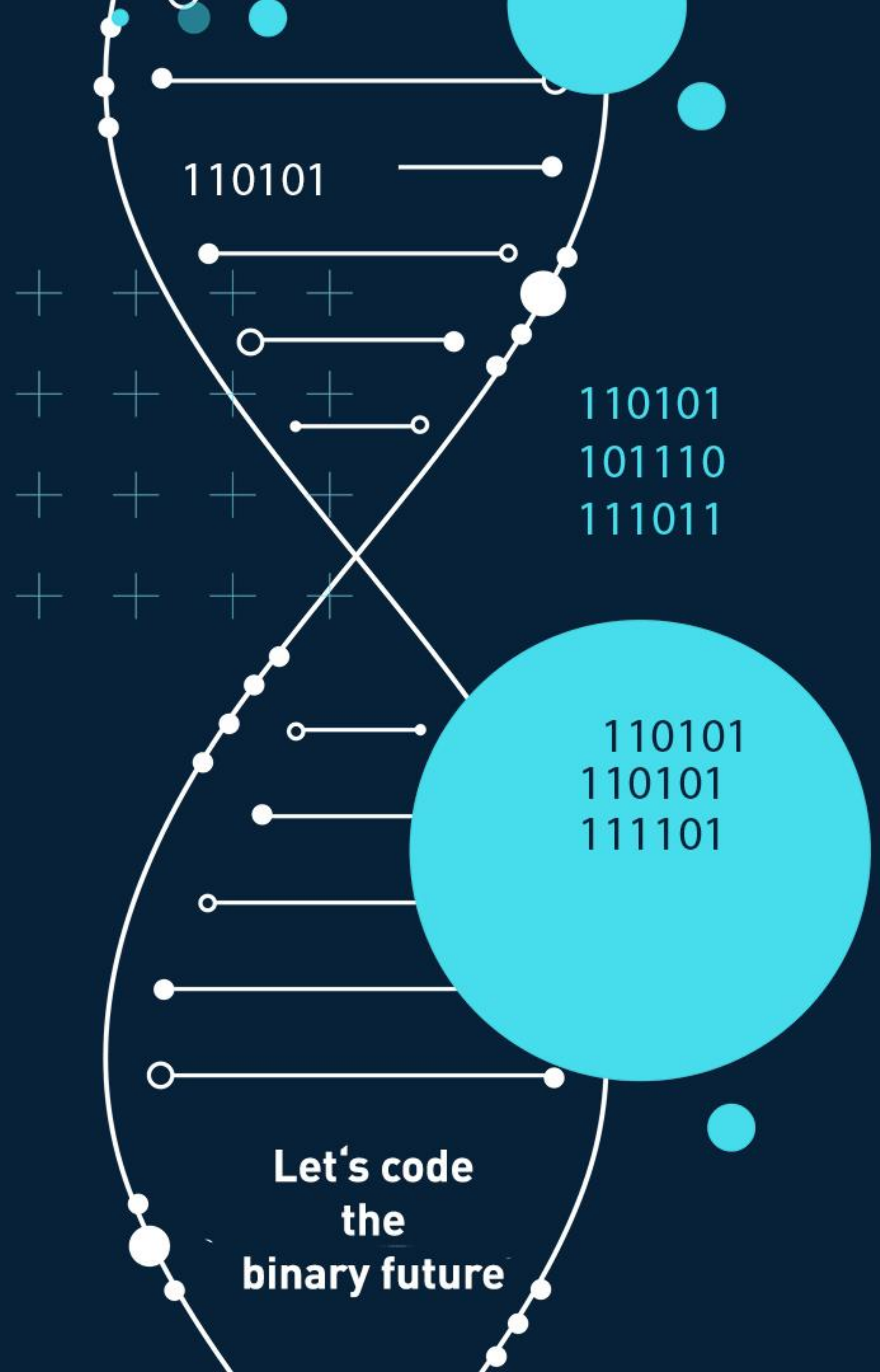
GOPAS www.**teched**.cz www.**techedsr**.sk



Let's code the binary future

Observability v .NET pomocí OpenTelemetry

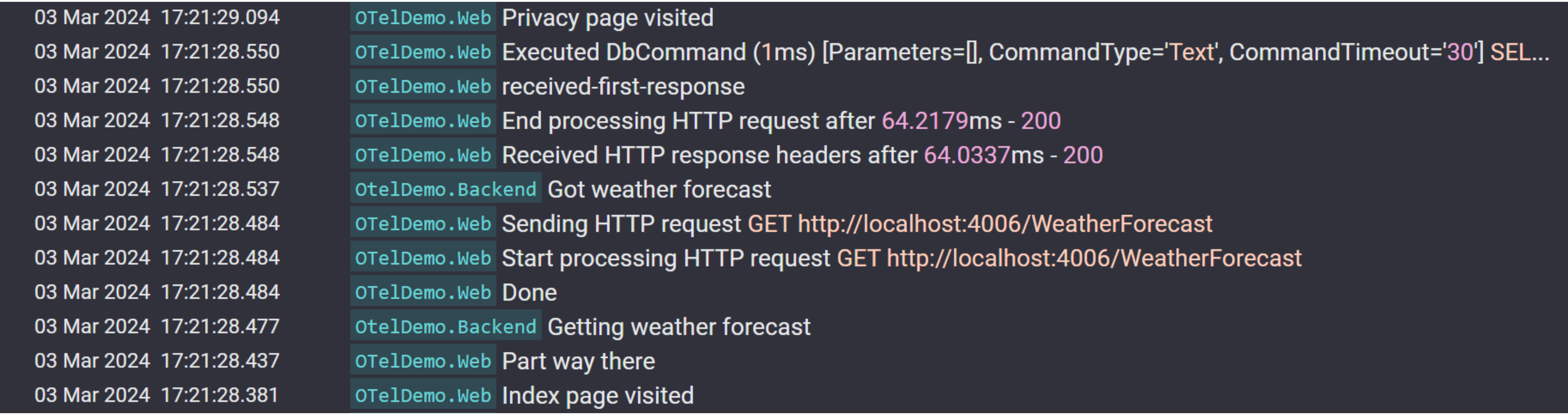
Tomáš Jecha | **Teched 2024**



Observability Signals

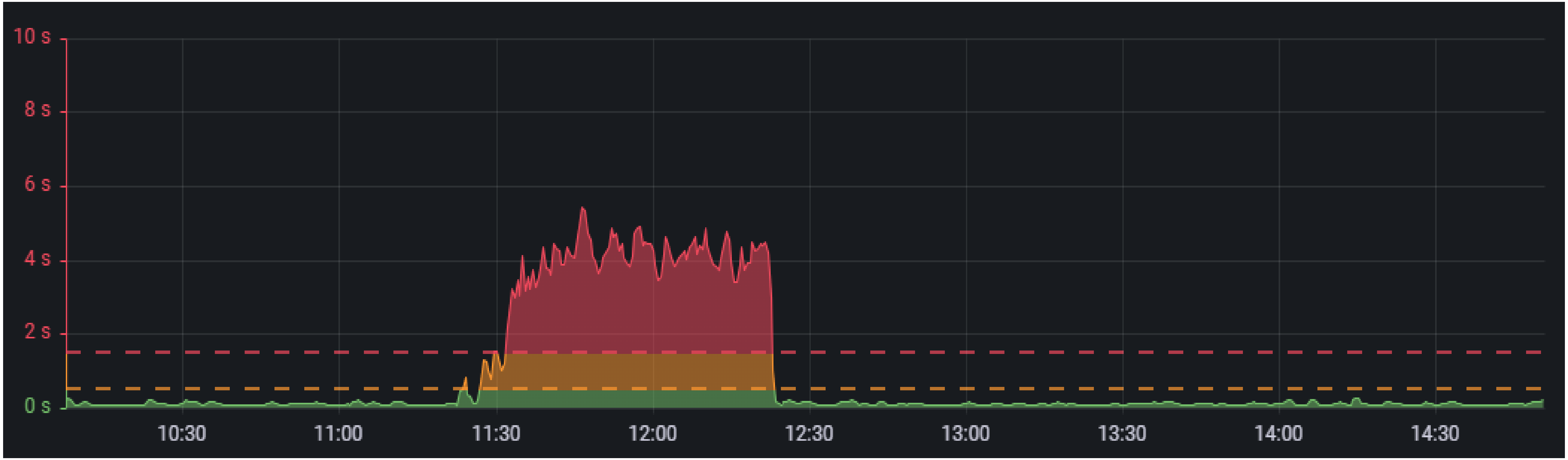
- Logs
- Metrics
- Tracing

Observability Signals – Logs

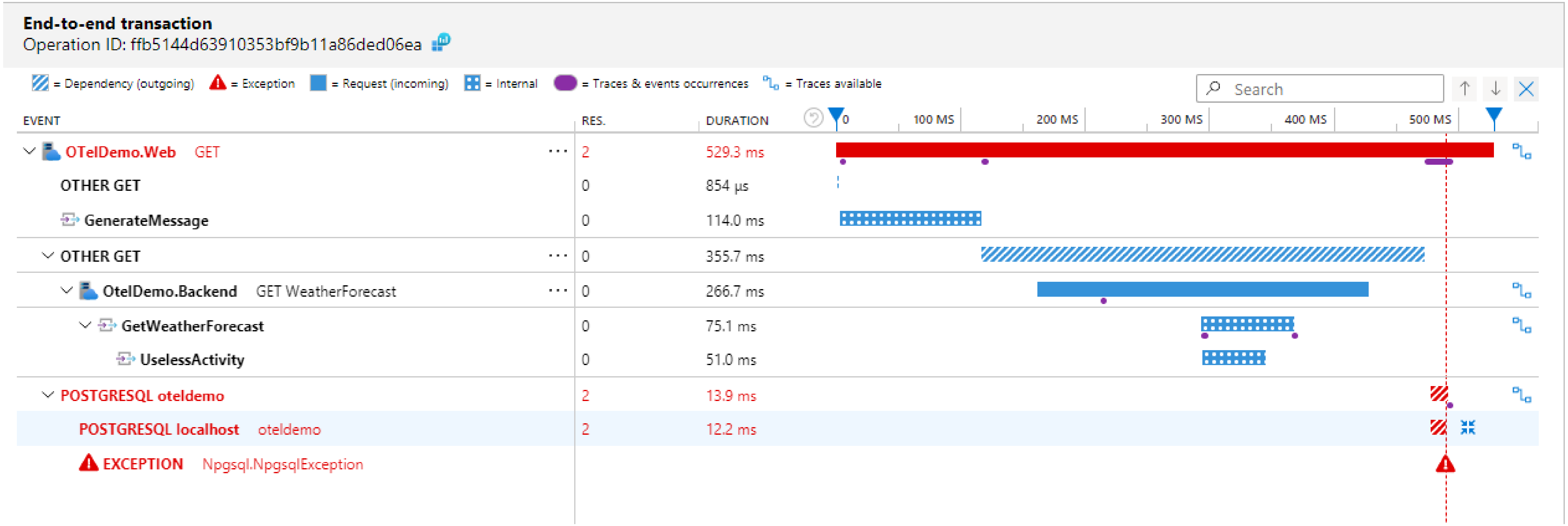


```
03 Mar 2024  17:21:29.094   OTelDemo.Web Privacy page visited
03 Mar 2024  17:21:28.550   OTelDemo.Web Executed DbCommand (1ms) [Parameters=[], CommandType='Text', CommandTimeout='30'] SEL...
03 Mar 2024  17:21:28.550   OTelDemo.Web received-first-response
03 Mar 2024  17:21:28.548   OTelDemo.Web End processing HTTP request after 64.2179ms - 200
03 Mar 2024  17:21:28.548   OTelDemo.Web Received HTTP response headers after 64.0337ms - 200
03 Mar 2024  17:21:28.537   OtelDemo.Backend Got weather forecast
03 Mar 2024  17:21:28.484   OTelDemo.Web Sending HTTP request GET http://localhost:4006/WeatherForecast
03 Mar 2024  17:21:28.484   OTelDemo.Web Start processing HTTP request GET http://localhost:4006/WeatherForecast
03 Mar 2024  17:21:28.484   OTelDemo.Web Done
03 Mar 2024  17:21:28.477   OtelDemo.Backend Getting weather forecast
03 Mar 2024  17:21:28.437   OTelDemo.Web Part way there
03 Mar 2024  17:21:28.381   OTelDemo.Web Index page visited
```

Observability Signals – Metrics



Observability Signals – Tracing



End-to-end transaction
Operation ID: ffb5144d63910353bf9b11a86ded06ea

▨ = Dependency (outgoing) ⚠ = Exception 🟦 = Request (incoming) ⊞ = Internal ● = Traces & events occurrences ⊏ = Traces available

EVENT	RES.	DURATION
OTelDemo.Web GET	2	529.3 ms
OTHER GET	0	854 µs
GenerateMessage	0	114.0 ms
OTHER GET	0	355.7 ms
OtelDemo.Backend GET WeatherForecast	0	266.7 ms
GetWeatherForecast	0	75.1 ms
UselessActivity	0	51.0 ms
POSTGRESQL oteldemo	2	13.9 ms
POSTGRESQL localhost oteldemo	2	12.2 ms
⚠ EXCEPTION Npgsql.NpgsqlException		

What to Choose for Your Observability Stack?

Prometheus	Azure Monitor	DynaTrace	DataDog	Seq	Grafana	ElasticStack
Jaeger	Zipkin	Splunk	New Relic	Logstash	Fluentd	AWS CloudWatch
Google Cloud Ops	Betterstack Logs	Telegraf	Sentry	Loggly	Honeycomb	Rollbar
Loki	Graphite	InfluxDB	Tempo	OpenTSDB	Graylog	…..

What is OpenTelemetry?

- Protocol – serialization and transport (metrics, logs, tracing)
- APIs – interfaces for instrumentation
- SDKs – implementation of the APIs that are used to configure and operate the telemetry collection
- Ecosystem of libraries – instrumentation, exporters, ...
- Semantic rules – naming and well known attributes
- Supported by the industry
  – see https://opentelemetry.io/ecosystem/vendors/

OpenTelemetry Protocol (OTLP)

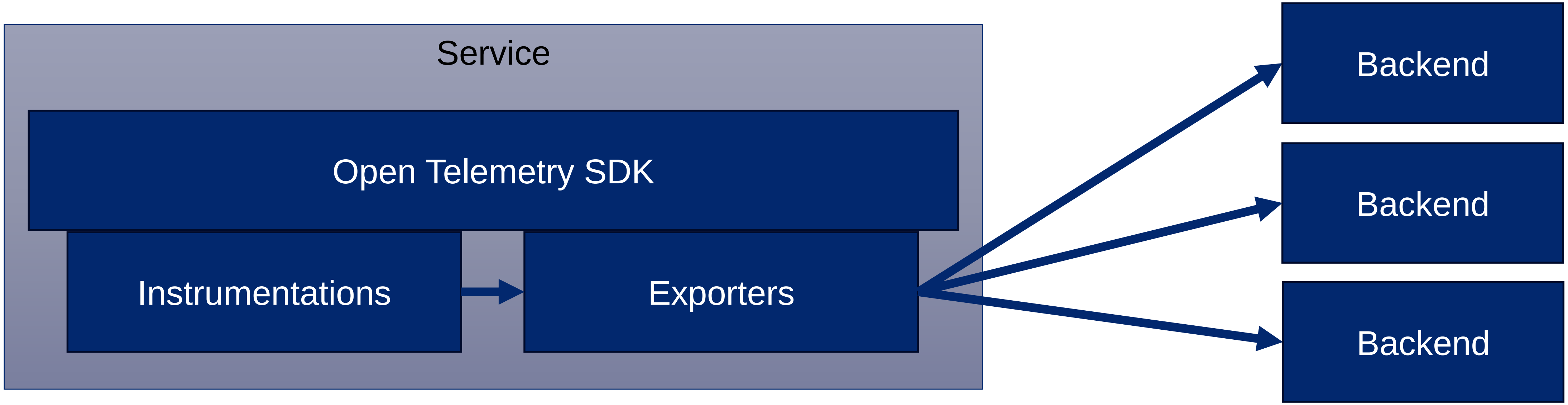
- OTLP/gRPC (Protobuf) or OTLP/HTTP (JSON)
- Protocol specs and protobuf definitions at https://github.com/open-telemetry/opentelemetry-proto
- Defines services:
  - Logs collector
  - Metrics collector
  - Trace collector

DEMO
Open Telemetry Protocol (OTLP)

OpenTelemetry API & .NET

- Logs: Connects to Microsoft.Extensions.Logging
  - ✅ Widely used and integrates well with OpenTelemetry
- Metrics: Subscribes to System.Diagnostics.Metrics
  - ✅ Since .NET6, designed to integrate well with OpenTelemetry
  - Replaces EventCounters (since .NET Core 3) and PerformanceCounters (Win only) – see https://learn.microsoft.com/en-us/dotnet/core/diagnostics/compare-metric-apis
- Traces: Integrates System.Diagnostics.Activity
  - ✅ Widely used and integrated directly to OpenTelemetry
  - W3C Trace Context HTTP headers – already implemented in .NET – see https://learn.microsoft.com/en-us/dotnet/core/diagnostics/distributed-tracing-concepts

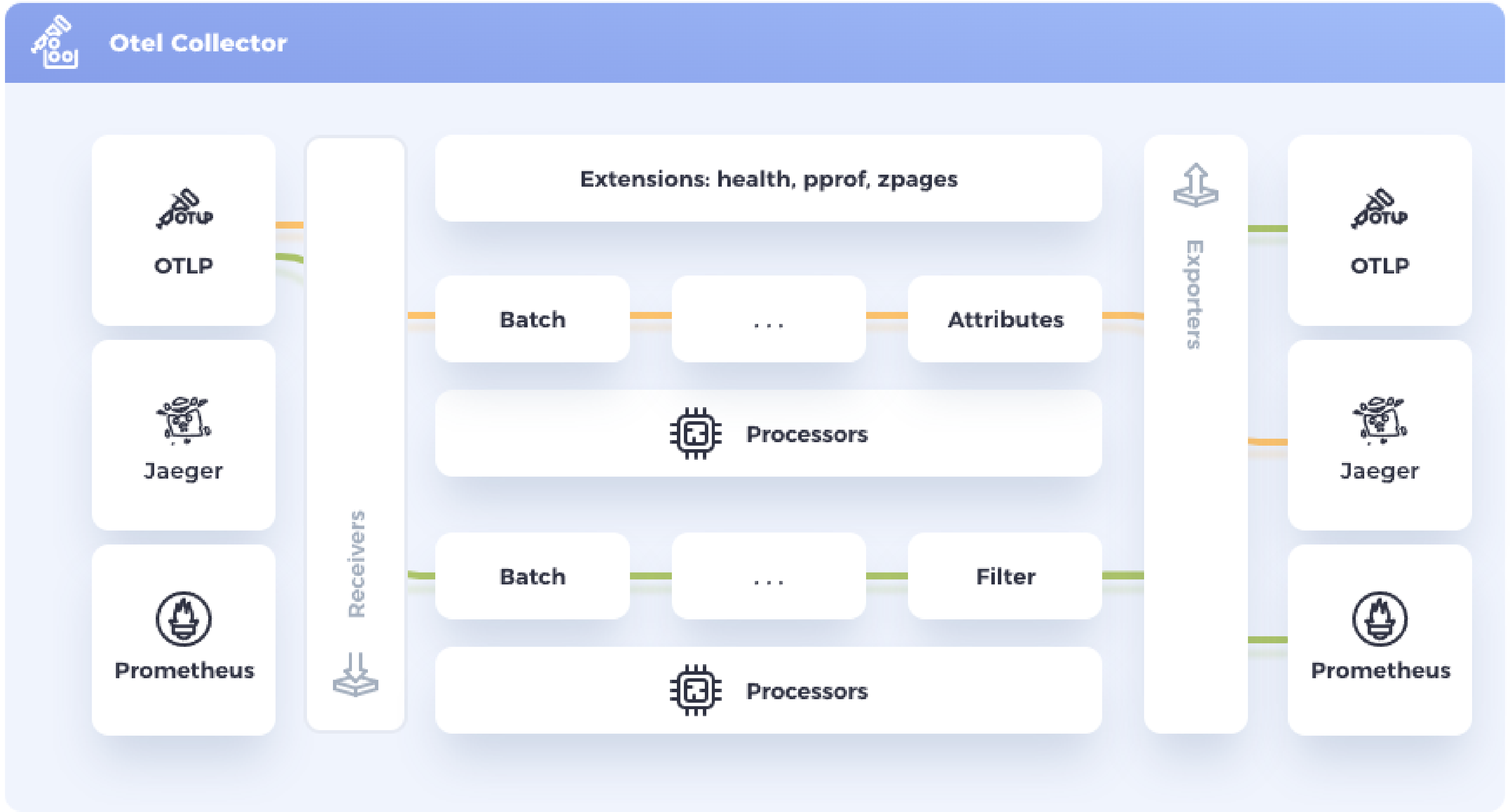
OpenTelemetry Libraries



- Registry: https://opentelemetry.io/ecosystem/registry
- Instrumentation libraries – generates relevant telemetry data
- Exporter libraries – sends telemetry (via OTLP or other protocols)

DEMO
OpenTelemetry SDK: Configuration, Instrumentation, Exporters

OpenTelemetry Collector



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OpenTelemetry Collector

- Receive, process and export telemetry data
- https://opentelemetry.io/docs/collector/
- Alternatives: Logstash, Fluentd, Telegraf (InfluxDB), …
- Built-in receivers/processors/exporters/connectors:
  - Core: https://github.com/open-telemetry/opentelemetry-collector
  - Contrib: https://github.com/open-telemetry/opentelemetry-collector-contrib

DEMO
OpenTelemetry Collector

Zero-code Instrumentation for .NET

- https://opentelemetry.io/docs/languages/net/automatic/
- Steps:
  1. Install auto-instrumentation (once)
  2. Run `.otel-dotnet-auto/instrument.sh`
  3. Configure with env variables (OTEL_EXPORTER_OTLP_ENDPOINT, etc.)
  4. Run your app/service

- Works like *magic** 🦄 🌈

**magic* is limited to .NET 6+

DEMO
Zero Code Instrumentation

Pros and Cons

😊 Vendor agnostic single-wire telemetry protocol

😊 Progress and adoption

😊/😔 Broad scope of SDKs and libraries

😔 Some features are experimental/preview

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Dema:

https://github.com/jechtom/demo-2024-open-telemetry