Simplifying OpenTelemetry with Configuration

Observability Day
NORTH AMERICA

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Why is it complicated to configure OpenTelemetry?

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Why is OpenTelemetry Configuration needed?

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```go
endpoint := "api.honeycomb.io:443"
headers := map[string]string{
    "x-honeycomb-team": os.Getenv("HONEYCOMB_API_KEY"),
}

// Set up trace provider.
traceExporter, err := stdouttrace.New(
    stdouttrace.WithPrettyPrint())
if err != nil {
    handleErr(err)
    return
}

otlptracehttpExporter, err := otlptracehttp.New(ctx,
    otlptracehttp.WithEndpoint(endpoint),
    otlptracehttp.WithHeaders(headers),
    otlptracehttp.WithCompression(otlptracehttp.GzipCompression),
    otlptracehttp.WithTimeout(10000*time.Millisecond),
)
if err != nil {
    handleErr(err)
    return
}

tracerProvider := trace.NewTracerProvider(
    trace.WithBatcher(traceExporter,
        // Default is 5s. Set to 1s for demonstrative purposes.
        trace.WithBatchTimeout(time.Second)),
    trace.WithBatcher(otlptracehttpExporter),
)

shutdownFuncs = append(shutdownFuncs, tracerProvider.Shutdown)
otel.SetTracerProvider(tracerProvider)

// Set up meter provider.      You, 2 days ago • initial commit …
metricExporter, err := prometheus.New()
if err != nil {
    handleErr(err)
    return
}

otlpmetrichttpExporter, err := otlpmetrichttp.New(ctx,
    otlpmetrichttp.WithEndpoint(endpoint),
    otlpmetrichttp.WithHeaders(headers),
    otlpmetrichttp.WithCompression(otlpmetrichttp.GzipCompression),
    otlpmetrichttp.WithTimeout(10000*time.Millisecond))
if err != nil {
    handleErr(err)
    return
}

meterProvider := metric.NewMeterProvider(
    metric.WithReader(metricExporter),
    metric.WithReader(metric.NewPeriodicReader(otlpmetrichttpExporter)),
```

```python
import os
from opentelemetry.sdk.resources import SERVICE_NAME, Resource

from opentelemetry import trace
from opentelemetry.exporter.otlp.proto.http.trace_exporter import OTLPSpanExporter
from opentelemetry.sdk.trace import TracerProvider
from opentelemetry.sdk.trace.export import BatchSpanProcessor, ConsoleSpanExporter

from opentelemetry import metrics
from opentelemetry.exporter.otlp.proto.http.metric_exporter import OTLPMetricExporter
from opentelemetry.sdk.metrics import MeterProvider
from opentelemetry.sdk.metrics.export import PeriodicExportingMetricReader, ConsoleMetricExporter

resource = Resource(attributes={
    SERVICE_NAME: "your-service-name"
})

traceProvider = TracerProvider(resource=resource)
headers = {"x-honeycomb-team":os.environ["HONEYCOMB_API_KEY"]}
processor = BatchSpanProcessor(OTLPSpanExporter(endpoint="<traces-endpoint>/v1/traces", headers=headers))
traceProvider.add_span_processor(BatchSpanProcessor(ConsoleSpanExporter()))
traceProvider.add_span_processor(processor)
trace.set_tracer_provider(traceProvider)

readers = [
    PeriodicExportingMetricReader(OTLPMetricExporter(endpoint="<traces-endpoint>/v1/metrics")),
    PeriodicExportingMetricReader(ConsoleMetricExporter())
]
meterProvider = MeterProvider(resource=resource, metric_readers=[readers])
metrics.set_meter_provider(meterProvider)
```

Why is OpenTelemetry Configuration needed?

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```javascript
const opentelemetry = require('@opentelemetry/sdk-node');
const {
  getNodeAutoInstrumentations,
} = require('@opentelemetry/auto-instrumentations-node');
const {
  OTLPTraceExporter,
} = require('@opentelemetry/exporter-trace-otlp-proto');
const {
  OTLPMetricExporter,
} = require('@opentelemetry/exporter-metrics-otlp-proto');
const { PeriodicExportingMetricReader } = require('@opentelemetry/sdk-metrics');

const sdk = new opentelemetry.NodeSDK({
  traceExporter: new OTLPTraceExporter({
    // optional - default url is http://localhost:4318/v1/traces
    url: '<your-otlp-endpoint>/v1/traces',
    // optional - collection of custom headers to be sent with each request, empty by default
    headers: {},
  }),
  metricReader: new PeriodicExportingMetricReader({
    exporter: new OTLPMetricExporter({
      url: '<your-otlp-endpoint>/v1/metrics',
      headers: {},
      concurrencyLimit: 1,
    }),
  }),
  instrumentations: [getNodeAutoInstrumentations()],
});
sdk.start();
```

```java
package otel;

import io.opentelemetry.exporter.logging.LoggingSpanExporter;
import io.opentelemetry.exporter.logging.otlp.OtlpJsonLoggingSpanExporter;
import io.opentelemetry.exporter.otlp.http.trace.OtlpHttpSpanExporter;
import io.opentelemetry.exporter.otlp.trace.OtlpGrpcSpanExporter;
import io.opentelemetry.sdk.trace.export.SpanExporter;
import java.time.Duration;

public class SpanExporterConfig {
  public static SpanExporter otlpHttpSpanExporter(String endpoint) {
    return OtlpHttpSpanExporter.builder()
        .setEndpoint(endpoint)
        .addHeader("api-key", "value")
        .setTimeout(Duration.ofSeconds(10))
        .build();
  }

  public static SpanExporter otlpGrpcSpanExporter(String endpoint) {
    return OtlpGrpcSpanExporter.builder()
        .setEndpoint(endpoint)
        .addHeader("api-key", "value")
        .setTimeout(Duration.ofSeconds(10))
        .build();
  }

  public static SpanExporter logginSpanExporter() {
    return LoggingSpanExporter.create();
  }

  public static SpanExporter otlpJsonLoggingSpanExporter() {
    return OtlpJsonLoggingSpanExporter.create();
  }
}
```

“authors MAY decide
what is the idiomatic approach”

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Environment variables to the rescue!

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Environment Variables

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- familiar
- already supported in many language implementations

Note: Support for environment variables is optional.

Feature	Go	Java	JS	Python	Ruby	Erlang	PHP
OTEL_SDK_DISABLED	-	+	-	+	-	-	+
OTEL_RESOURCE_ATTRIBUTES	+	+	+	+	+	+	+
OTEL_SERVICE_NAME	+	+	+	+	+	+	+
OTEL_LOG_LEVEL	-	-	+	-	+	-	+
OTEL_PROPAGATORS	-	+		+	+	+	+
OTEL_BSP_*	+	+	+	+	+	+	+
OTEL_BLRP_*		+					
OTEL_EXPORTER_OTLP_*	+	+		+	+	+	+
OTEL_EXPORTER_ZIPKIN_*	-	+		+	+	-	+
OTEL_TRACES_EXPORTER	-	+	+	+	+	+	+
OTEL_METRICS_EXPORTER	-	+		+	-	-	+
OTEL_LOGS_EXPORTER	-	+		+			+
OTEL_SPAN_ATTRIBUTE_COUNT_LIMIT	+	+	+	+	+	+	+
OTEL_SPAN_ATTRIBUTE_VALUE_LENGTH_LIMIT	+	+	+	+	+	+	+
OTEL_SPAN_EVENT_COUNT_LIMIT	+	+	+	+	+	+	+
OTEL_SPAN_LINK_COUNT_LIMIT	+	+	+	+	+	+	+
OTEL_EVENT_ATTRIBUTE_COUNT_LIMIT	+	-		+	+	+	+
OTEL_LINK_ATTRIBUTE_COUNT_LIMIT	+	-		+	+	+	+
OTEL_LOGRECORD_ATTRIBUTE_COUNT_LIMIT							+
OTEL_LOGRECORD_ATTRIBUTE_VALUE_LENGTH_LIMIT							+
OTEL_TRACES_SAMPLER	+	+	+	+	+	+	+
OTEL_TRACES_SAMPLER_ARG	+	+	+	+	+	+	+
OTEL_ATTRIBUTE_VALUE_LENGTH_LIMIT	+	+	+	+	+	-	+
OTEL_ATTRIBUTE_COUNT_LIMIT	+	+	+	+	+	-	+
OTEL_METRIC_EXPORT_INTERVAL	-	+		+			+
OTEL_METRIC_EXPORT_TIMEOUT	-	-		+			+
OTEL_METRICS_EXEMPLAR_FILTER	-	+					+
OTEL_EXPORTER_OTLP_METRICS_TEMPORALITY_PREFERENCE	+	+	+	+			+
OTEL_EXPORTER_OTLP_METRICS_DEFAULT_HISTOGRAM_AGGREGATION		+		+			
OTEL_EXPERIMENTAL_CONFIG_FILE							

Environment Variables limitations

- hard to express complex structured data
  - views (disable instruments, configure histogram buckets, etc)
  - custom processors, with order
  - multiple exporters, with independent batch processor config
  - prometheus exporter options
  - instrumentation
- lacks versioning
- limited values and validation
  - resource attributes with explicit types

Declarative configuration

Declarative config **very** high level overview

- Alternative mechanism for configuring OTel
- Simplifies configuration
- Language agnostic
- Structured data model
- YAML file format
- Support for
  - environment variables expansion
  - complex configuration
  - instrumentation config
  - custom extension components

DEMO

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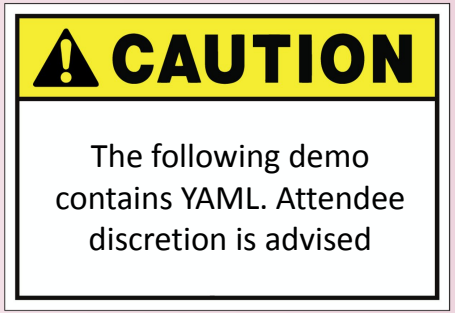
CAUTION
The following demo contains YAML. Attendee discretion is advised

Declarative Configuration Spec: Data Model, SDK, API

Reference Workflow

Input:

I want to export batches of spans over OTLP to some endpoint, with a “api-key” header set to a secret value.

Output:

```
OpenTelemetrySdk.builder()
  .setTracerProvider(SdkTracerProvider.builder()
    .addSpanProcessor(BatchSpanProcessor.builder(
      OtlpHttpSpanExporter.builder()
          .setEndpoint(System.getenv("OTLP_ENDPOINT"))
          .addHeader("api-key", System.getenv("API_KEY"))
          .build())
      .build())
    .build())
  .setMeterProvider(SdkMeterProvider.builder().build())
  .setLoggerProvider(SdkLoggerProvider.builder().build())
  .build();
```

Declarative Config Data Model

```yaml
file_format: "0.3"
disabled: ${OTEL_SDK_DISABLED:-false}
tracer_provider:
  processors:
    - batch:
        exporter:
          otlp:
            endpoint: ${OTLP_ENDPOINT}
            headers:
              - name: api-key
                value: ${API_KEY}
meter_provider: ...
logger_provider: ...
instrumentation: ...
```

- Types, properties, and semantics
- Defined using JSON Schema
- YAML file format
- Env var substitution

Declarative Config SDK

- Philosophy: common case should be easy, advanced case should be possible
- Primitives
  - `Parse`: accepts file, returns model
  - `Create`: accepts model, returns SDK
  - `ComponentProvider`: custom SDK extension points
- Typical use case:

```
OTEL_EXPERIMENTAL_CONFIG_FILE=/app/config.yaml
```

Output:

```
var sdk = create(parse(new File("/app/config.yaml")));

var tracerProvider = sdk.getTracerProvider();
var meterProvider = sdk.getMeterProvider();
var loggerProvider = sdk.getLoggerProvider();
```

Instrumentation Config API

```yaml
file_format: "0.3"
tracer_provider: ...
meter_provider: ...
logger_provider: ...
instrumentation:
  general:
    http:
      client:
        request_captured_headers:
          - Content-Type
          - Accept
  java:
    logback-appender:
      experimental-log-attributes: true
```

- All instrumentation can participate
- ConfigProvider

```java
configProvider.getInstrumentationConfig()
    .getStructured("java")
    .getStructured("logback-appender")
    .getBoolean("experimental-log-attributes");
```

- Standard config
- Domain-specific config

DEMO

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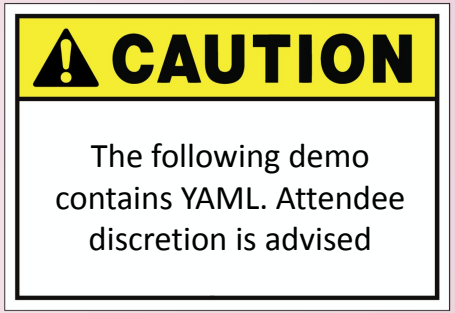
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Conclusion

- Declarative config is **language agnostic** and **highly expressive**
- Available today in a variety of languages
  - Some limitations, but users should give it a try
  - Contributors / maintainers should consider implementing
- Current / future config work is centered around declarative config
- Working towards stability, targeting 2025

Thanks

Config repo

Session feedback

Demo repo

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Appendix: resources

- open-telemetry/opentelemetry-configuration: JSON schema model definition
  - Schema
  - Examples: starter YAML templates
- Configuration OTEP #225: Initial enhancement proposal
- Declarative configuration specification: Specification for declarative configuration, including data model, API, and SDK
- Implementation tracker: Tracking status of language implementations

Appendix: configuration interfaces compared

	Configuration Interface		
Characteristic	Programmatic	Env Vars	Declarative Config
Zero-code	🔴	🟢	🟢
Language Agnostic	🔴	🟢	🟢
Expressiveness	🟢	🔴	🟢
Instrumentation config	🟢	🟡	🟢

Appendix: “not possible with env vars”

Use cases enabled by declarative config, and not possible with env var config.

- Export to multiple OTLP destinations
- Independently configure multiple batch processors
- Non-trivial sampler configs
- Configure views (disable instruments, configure explicit bucket bounds)
- Specify resource attribute types
- Configure advanced prometheus options (units, type suffix, scope info, resource labels)
- Configure custom extension components
- Configure instrumentation