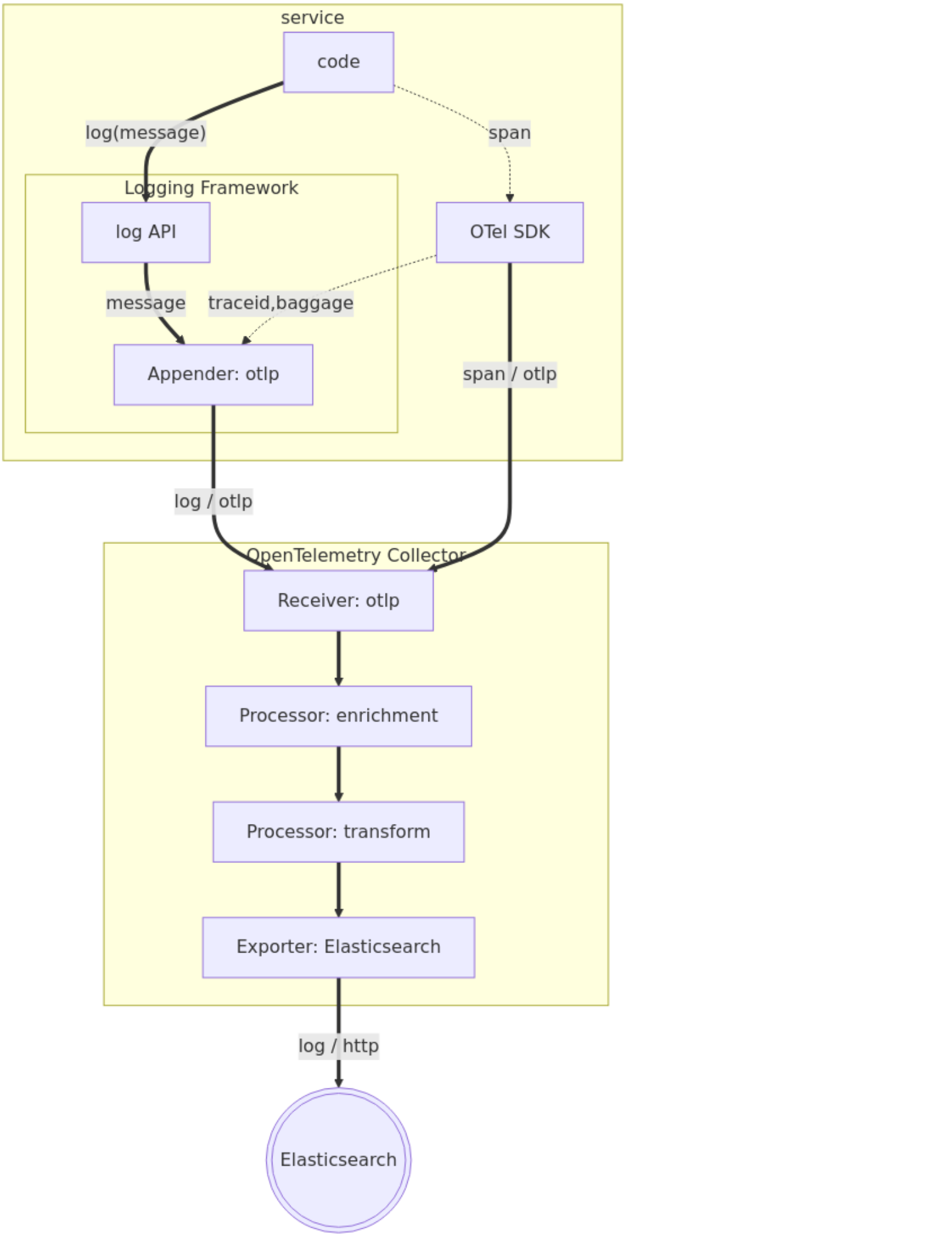
Observability 200: Logging with OpenTelemetry

The advent of OpenTelemetry has forever changed how we capture observability signals. While OTel initially focused on delivering traces and metrics, support for collection of logs is now stable and gaining adoption, particularly in Kubernetes environments.

In this lab, we will explore several models for using OpenTelemetry to collect log signals.

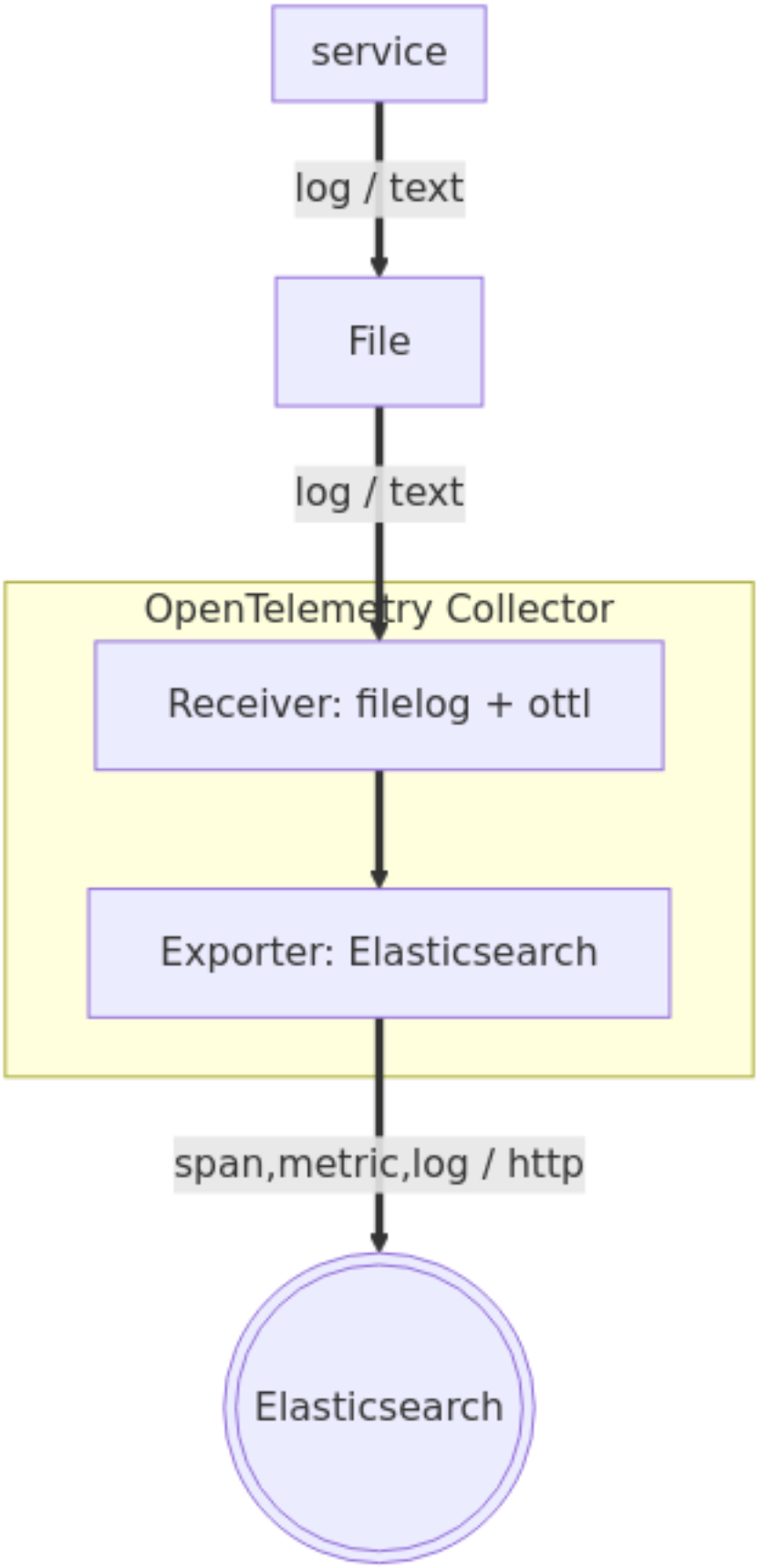
1) Service to Collector via OTLP

In this model, we forgo log files entirely, routing log messages directly via the network (OTLP) from services to a Collector.


service
code
log(message)
span
Logging Framework
log API
OTel SDK
message
traceid,baggage
Appender: otlp
span / otlp
log / otlp
OpenTelemetry Collector
Receiver: otlp
Processor: enrichment
Processor: transform
Exporter: Elasticsearch
log / http
Elasticsearch

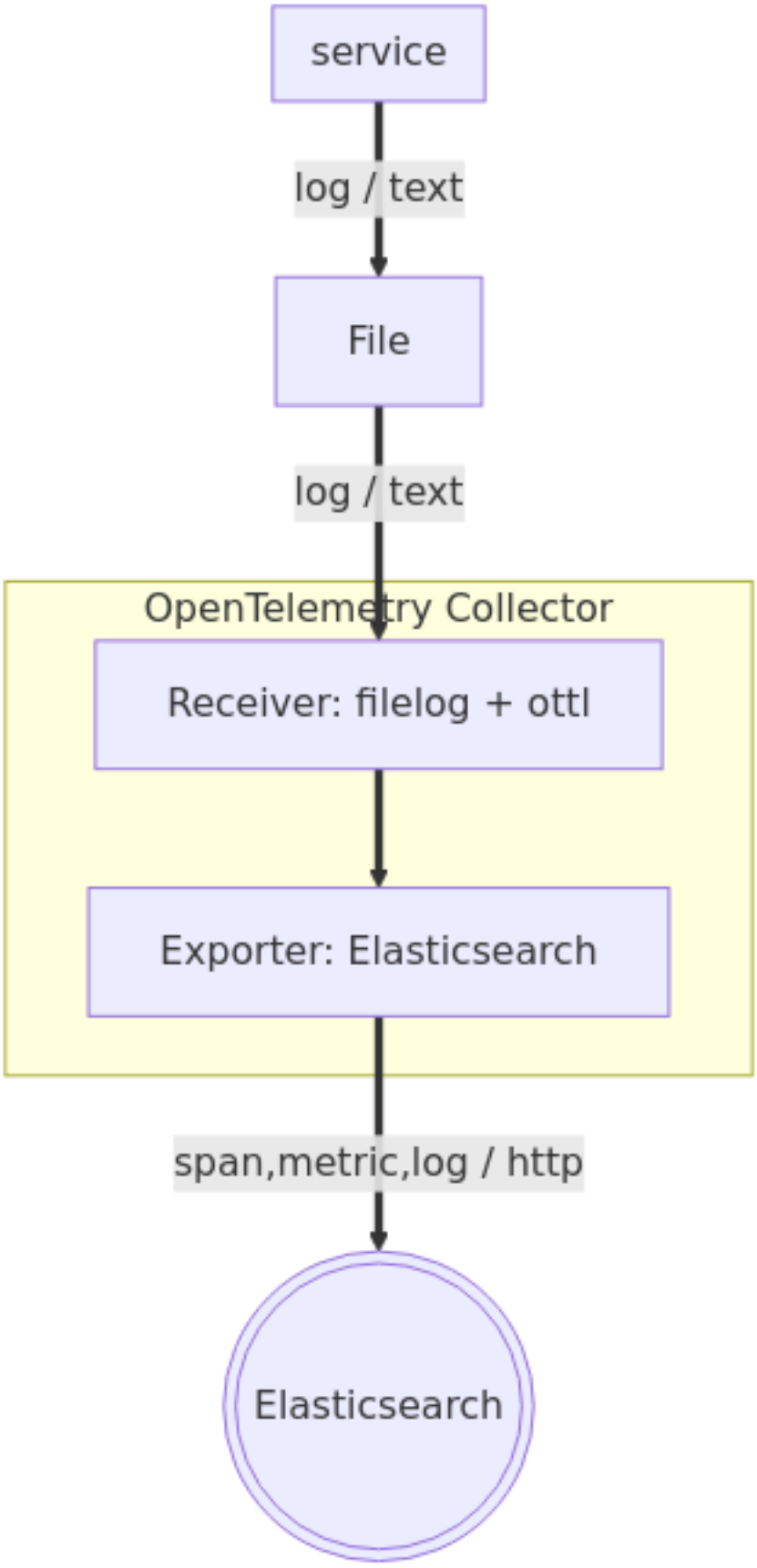
2) Service to Collector via log files captured with the filelogreceiver

In this model, we output logs from services to a log file written with OTel Semantic Conventions (`otlpjson`), which we then collect via a Collector.



3) Service to Collector via log files captured with the receivercreator

In this model, we output logs from select services to a log file written in an arbitrary format, which we then collect via a



Collector.

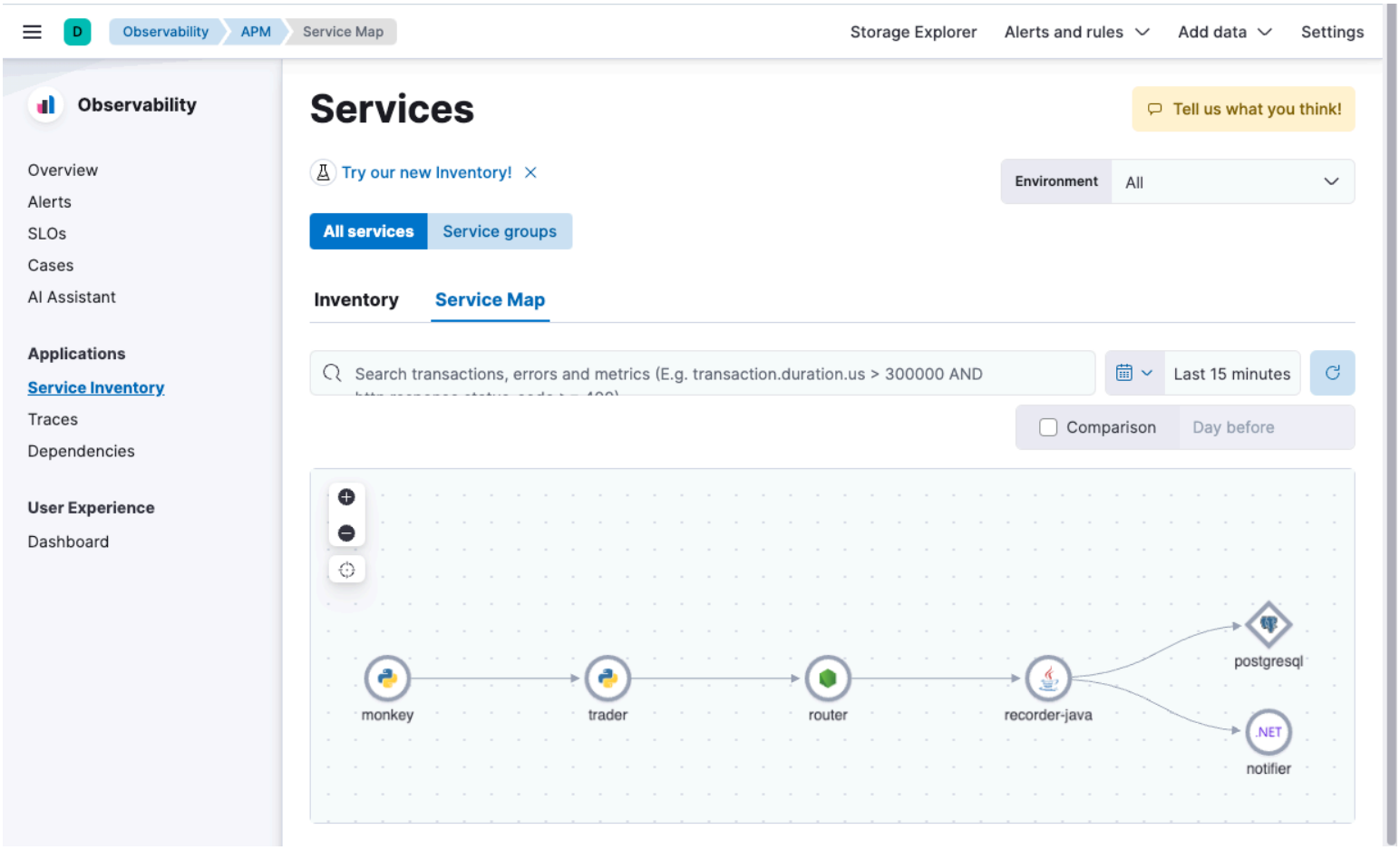
Additionally, for each model considered, we discuss how to add attributes to log messages and how to parse logs (both at the edge and in Elastic).

Getting Our Bearings

In this lab, we will be working with an exemplary stock trading system, comprised of several services and their dependencies, all instrumented using OpenTelemetry.

Elasticsearch

We will be working with a live Elasticsearch instance, displayed in the browser tab to the left. We are currently looking at Elastic's dynamically generated Service Map. It shows all of the services that comprise our system, and how they interact with one another.



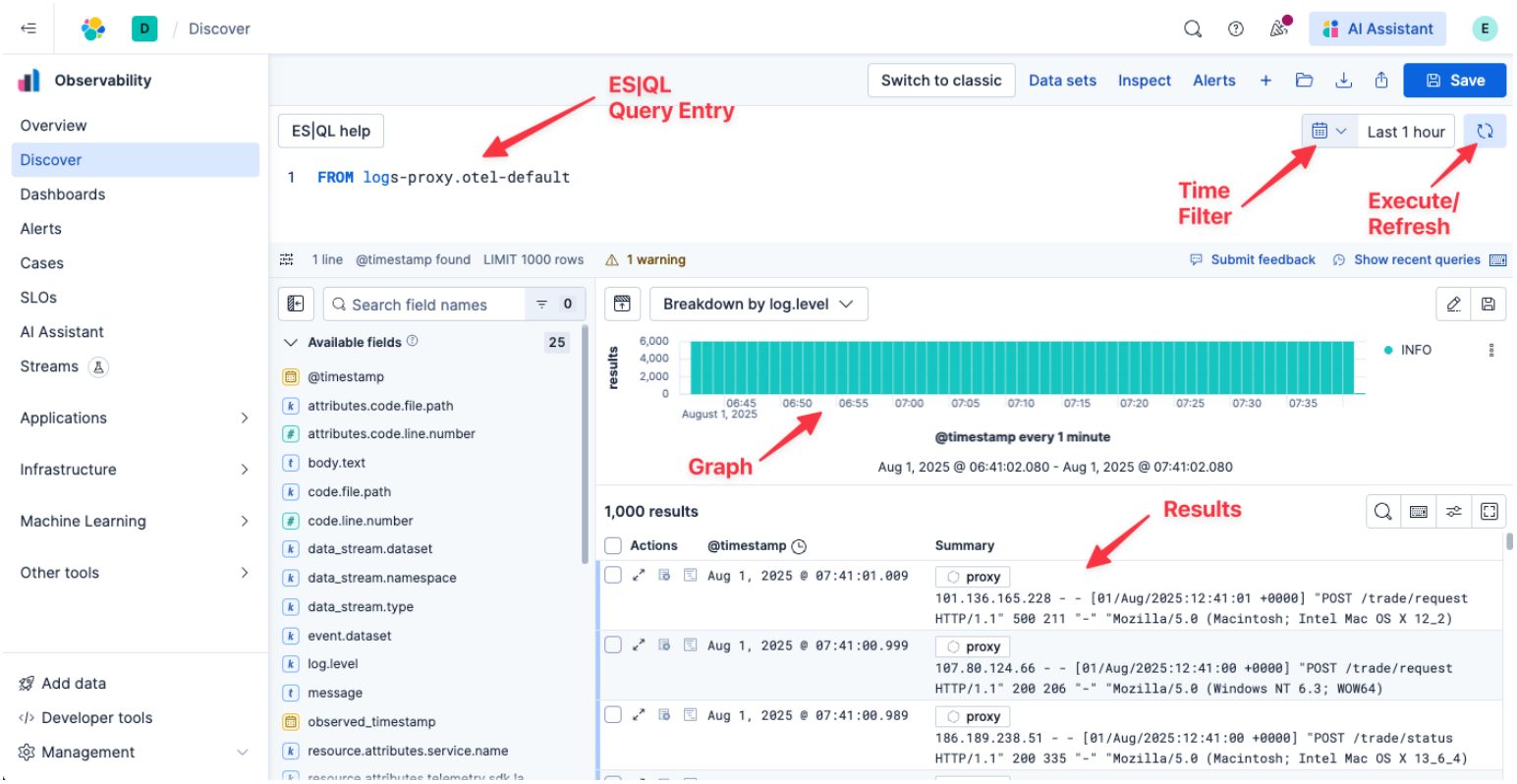
Our trading system is composed of: * `trader`: a python application that trades stocks on orders from customers * `router`: a node.js application that routes committed trade records * `recorder-java`: a Java application that records trades to a PostgreSQL database * `notifier`: a .NET application that notifies an external system of completed trades

Finally, we have `monkey`, a python application we use for testing our system that makes periodic, automated trade requests on behalf of fictional customers.

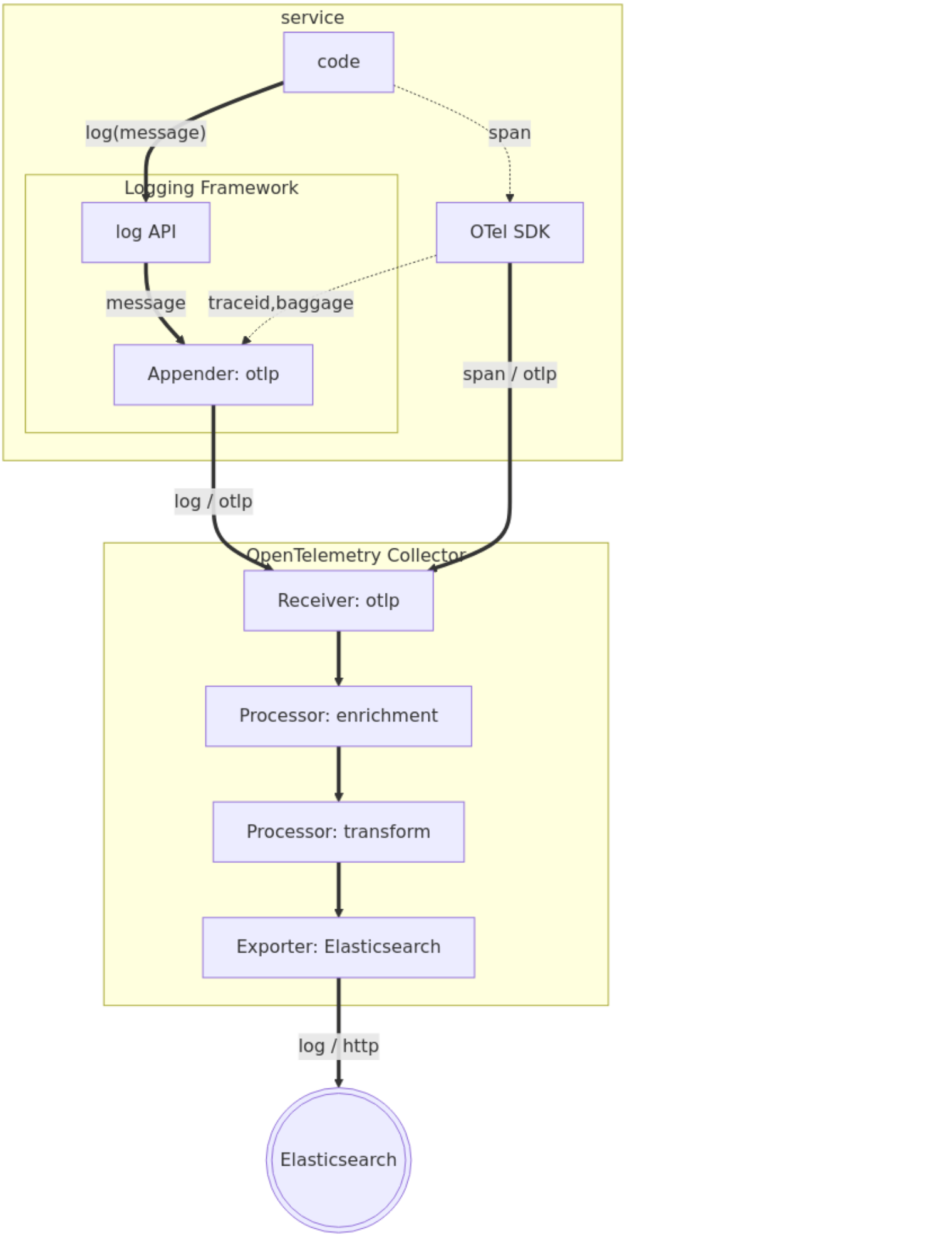
> [!NOTE] You are welcome to explore each service and our APM solution by clicking on each service icon in the Service Map and selecting `Service Details`

When you are ready, click the `Next` button to continue.

This workshop will heavily leverage ES|QL, Elastic's query-time language, to analyze our nginx reverse proxy logs. You can enter your queries in the pane at the top of the Elasticsearch tab. You can change the time window of your search using the Time Filter. To execute a search, click the Play/Refresh icon.



In this model, we will be sending logs directly from a service to an OpenTelemetry Collector over the network using the OTLP protocol. This is the default mechanism most OpenTelemetry SDKs use for exporting logs from a service.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OpenTelemetry Collector
Receiver: otlp
Processor: enrichment
Processor: transform
Exporter: Elasticsearch
log / http
Elasticsearch

Looking at the diagram: 1) a service leverages an existing logging framework (e.g., logback in Java) to generate log statements 2) on service startup, the OTel SDK injects a new Appender module into the logging framework. This module formats the log metadata to appropriate OTel semantic conventions (e.g., log.level), adds appropriate contextual metadata (e.g., trace.id), and outputs the log lines via OTLP (typically buffered) to a configured OTel Collector 3) an OTel Collector (typically, but not necessarily) on the same node as the service receives the log lines via the `otlp` receiver 4) the Collector enriches the log line with additional metadata and optionally parses or otherwise transforms the message 5) the Collector then outputs the logs downstream (either directly to Elasticsearch, or more typically through a gateway Collector, and then to Elasticsearch)

Assumptions

While this model is relatively simple to implement, it assumes several things: 1) The service can be instrumented with OpenTelemetry (either through runtime zero-configuration instrumentation, or through explicit instrumentation). This essentially rules out use of this method for most opaque, third-party applications and services. 2) Your OTel pipelines are robust enough to forgo file-based logging. Traditional logging relied on services writing to files and agents reading or "tailing" those log files. File-based logging inherently adds a semi-reliable, FIFO, disk-based queue between services and the Collector. If there is a downstream failure in the telemetry pipeline (e.g., a failure in the Collector or downstream of the Collector) or back-pressure from Elasticsearch, the file will serve as a temporary, reasonably robust buffer. Notably, this concern can be mitigated with Collector-based disk queues and/or the use of a Kafka-like queue somewhere in-between the first Collector and Elasticsearch.

Advantages

There are, of course, many advantages to using OTLP as a logging protocol where possible: 1) you don't have to deal with file rotation or disk overflow due to logs 2) there is less io overhead (no file operations) on the node 3) the Collector need not be local to the node running the applications (though you would typically want a Collector per node for other reasons)

Additionally, exporting logs from a service using the OTel SDK offers the following general benefits: 1) logs are automatically formatted with OTel Semantic Conventions 2) key/values applied to log statements are automatically emitted as attributes 3) traceid and spanid are automatically added when appropriate 4) contextual metadata (e.g., service.name) are automatically emitted as attributes 5) custom metadata in baggage can be automatically applied as attributes to each log line

All of the above leads to logs with rich context and metadata with little to no additional work. It is worth noting that the Collector now supports a disk-based buffer between the receivers and the exporters.

Configuration

Most of the languages supported by OpenTelemetry are automatically instrumented for logging via OTLP by default. In the case of Java, for example, the OTel SDK, when in zero-code instrumentation, will automatically attach an OTLP appender to either Logback or Log4j.

In this example, we are leveraging the OpenTelemetry Operator for Kubernetes to automatically inject the OTel SDK into our services, including the `recorder-java` service. Our `recorder-java` service is using Logback as a logging framework with a slf4j facade.

Let's first validate we have logs coming in from our `recorder-java` service:

1. Open the button label="Elasticsearch" tab
2. Execute the following query:

```
FROM logs-*
| WHERE service.name == "recorder-java"
```

3. Open the first log record by clicking on the double arrow icon under `Actions`
4. Click on the `Attributes` tab

You note that the `log.file.path` attribute is empty, in this case indicating this log line was delivered via OTLP without having been written to a log file.

Checking the Source

Let's have a look at the configuration of our `recorder-java` service.

1. Open the button label="recorder-java Source" tab

2. Navigate to `src/main/resources/logback.xml`
3. Note that no appenders are specified in the logback configuration (they are automatically injected by the OTel SDK on startup)

Let's further validate that no logs are being written to stdout (which would be picked up and dumped to a log file by Kubernetes):

1. Open the button label="Terminal" tab
2. Execute the following to get a list of the active Kubernetes pods that comprise our trading system:

```
kubectl -n trading get pods
```

3. Find the active `recorder-java-...` pod in the list
4. Get stdout logs from the active `recorder-java` pod:

```
kubectl -n trading logs <recorder-java-...>
```

(replace ... with the pod instance id)

Note that there are no logs being written to stdout from `recorder-java` because we have not configured any appenders in the logback configuration.

This confirms that logs coming from the `recorder-java` application to our OTel Collector via OTLP, and not by way of a log file.

> [!NOTE] It is possible to leave a console appender in your logback configuration such that you can still view the logs locally (with `kubectl logs` or by tailing the log file itself). In this case, you would want to be sure you are explicitly excluding this log file from also being scrapped by your OTel Collector to avoid duplicative log input into Elasticsearch. We will show a straightforward way of doing this in a future challenge.

Correlation

One major advantage of using OTLP for logging is the ability to very easily append the active `trace.id` and `span.id` if the log is emitted during an active APM span.

1. Open the button label="Elasticsearch" tab
2. Click `Applications` > `Service Inventory` in the left-hand navigation pane
3. Click on the `recorder-java` service
4. Click on the `Transactions` tab
5. Click on the `POST /record` tab
6. Scroll down to `Trace sample`
7. Click on the `Logs` tab

These are all the logs associated with this specific transaction.

Attributes via Structured Logging

Let's say that we think we might have a problem with the Garbage Collector in our Java Virtual Machine (JVM) running too often, possibly affecting database performance. As a developer, you might think to sample the amount of time spent in GC and then report that in a log file.

Say we wanted to graph GC time by region to see if perhaps the issue is localized. To do that, we need GC time as a metric value. While we could just encode it into the log message as text and parse it out, that's unneccessary with modern structured logging APIs and OpenTelemetry.

OTLP logging allows us to easily add attributes to our log lines by using key/value mechanisms present in your existing logging API. In this case, we can use the `addKeyValue()` API exposed by our logging facade, slf4j.

1. Open the button label="recorder-java Source" tab
2. Navigate to `src/main/java/com/example/recorder/TradeRecorder.java`
3. Find the following line:

```
log.atInfo().log("trade committed for " + trade.customerId);
```

and change it to:

```
log.atInfo().addKeyValue(Main.ATTRIBUTE_PREFIX + ".gc_time", utilities.getGarbageCollectorDeltaTime()).log("trade committed for " + trade.cus
```

[!NOTE] It is generally considered best practice to prepend any custom attributes with a prefix scoped to your enterprise, like `com.example`

Now let's recompile and redeploy our `recorder-java` service. 1. Open the button label="Terminal" tab 2. Execute the following:

```
./builddeploy.sh -s recorder-java
```

Now let's see what our logs look like in Elasticsearch. 1. Open the button label="Elasticsearch" tab 2. Click `Discover` in the left-hand navigation pane 3. Execute the following query:

```
FROM logs-* WHERE service.name == "recorder-java" and message LIKE "trade committed"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Attributes` tab

Note the added attribute `attributes.com.example.gc_time`!

[!NOTE] if `gc_time` is not yet present as an attribute, close the log line flyout, refresh the view in Discover, and try again.

Now let's graph `gc_time` to answer our question.

Execute the following query:

```
FROM logs-*
| WHERE service.name == "recorder-java"
| STATS count = MAX(attributes.com.example.gc_time)  BY attributes.com.example.region, BUCKET(@timestamp, 1 minute)
```

Indeed, it looks like only the "recorder-java" service deployed to the "NA" region is exhibiting this problem.

Attributes via Baggage

Note that the log record has other custom attributes like `attributes.com.example.customer_id`. We didn't add that in our logging statement in `recorder-java`. How did it get there?

1. Click `Applications` > `Service Inventory` in the left-hand navigation pane
2. Click on the `Service Map` tab
3. Click on the `trader` service
4. Click on `Service Details`
5. Click on the `Transactions` tab
6. Scroll down and click on the `POST /trade/request` transaction under `Transactions`
7. Scroll down to the waterfall graph under `Trace sample`
8. Click on the first span `POST /trade/request` to open the flyout

Note that `attributes.com.example.customer_id` exists in this span too!

1. Close the `Transaction details` flyout
2. Click on the `Logs` tab under `Trace sample`
3. Click on the log line that looks like `traded <stock.symbol> on day <day> for <customer.id>`

Note that `attributes.com.example.customer_id` exists here too!

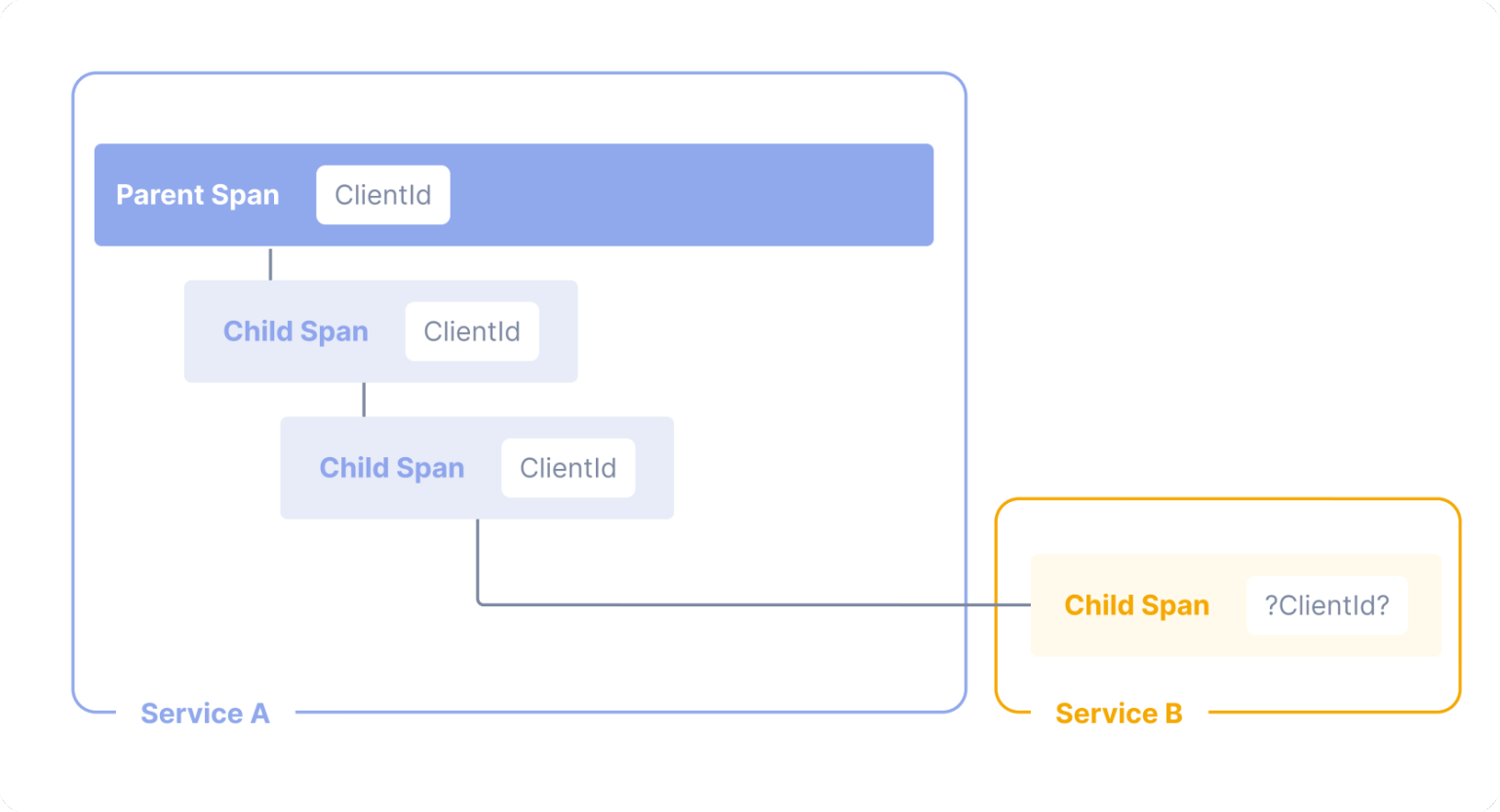
This is a great example of the power of using OpenTelemetry Baggage. Baggage lets us inject attributes early on in our distributed service mesh and then automatically distribute and apply them downstream to every span and log message emitted in context!

Imagine how easy this will make the life of your SREs and analysts to easily search across all of your observability signals using the inputs they are accustomed to: namely, `customer_id`, for example.

Let's look at the code which initially stuck `customer_id` into OTel baggage:

1. Open the button label="recorder-java Source" tab
2. Navigate to `app.py`
3. Look for calls to `set_attribute_and_baggage()` inside the `decode_common_args()` function

Here, we are pushing attributes into OTel Baggage. OTel is propagating that baggage with every call to a distributed surface. The baggage follows the context of a given span through all dependent services. Within a given service, we can leverage BaggageProcessor extensions to automatically apply metadata in baggage as attributes to the active span (including logs).



Let's add an additional attribute in our trader service.

1. Find the following line in the `decode_common_args()` function:

```
    subscription = params.get('subscription', None)
```

2. Add the following to push `subscription` into baggage:

```
    if subscription is not None:
        set_attribute_and_baggage(f"{ATTRIBUTE_PREFIX}.subscription", subscription)
```

Now let's recompile and redeploy our `trader` service. 1. Open the button label="Terminal" tab 2. Execute the following:

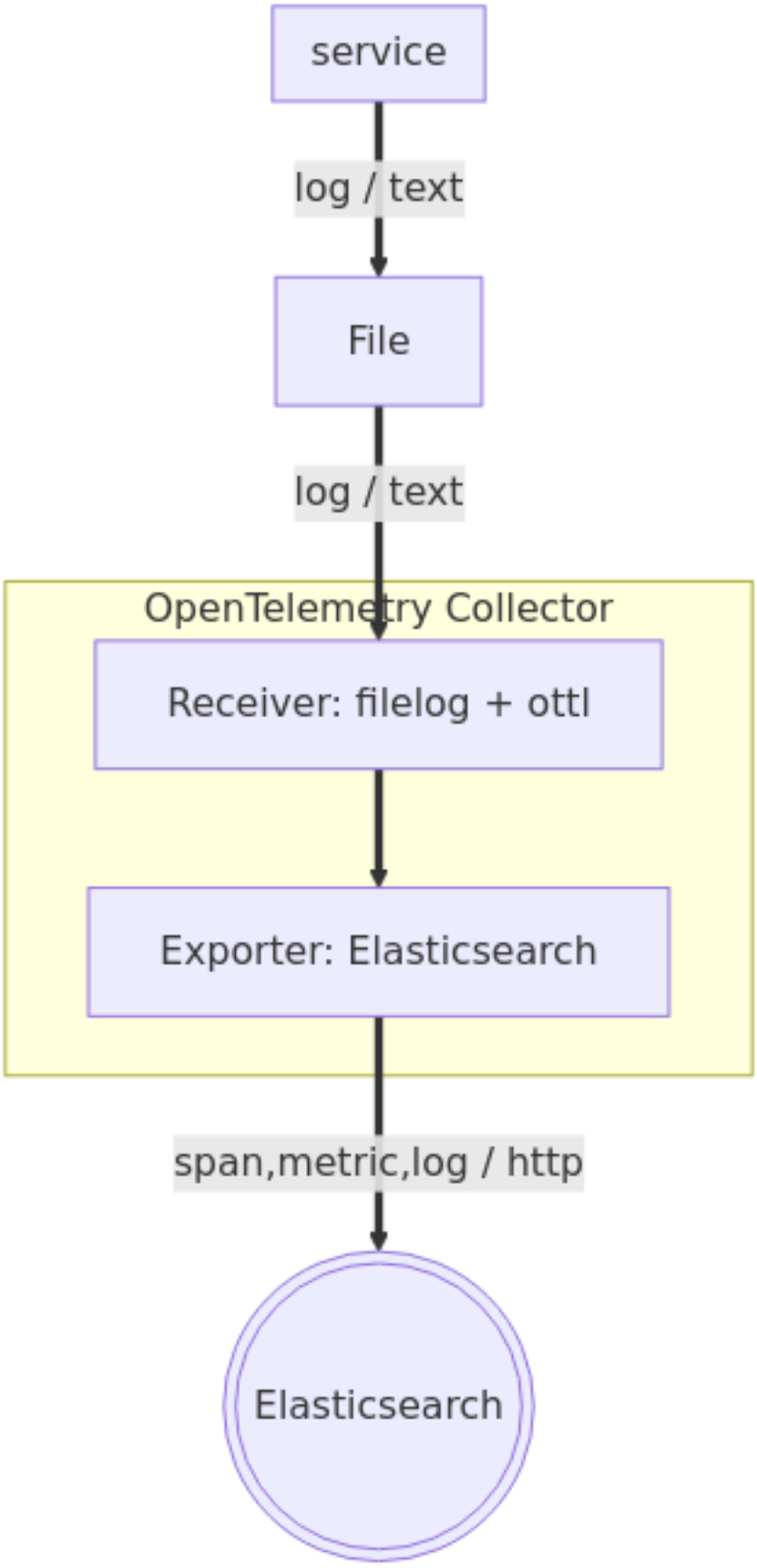
```
./builddeploy.sh -s trader
```

And now let's check our work in Elasticsearch:

1. Click `Applications` > `Service Inventory` in the left-hand navigation pane
2. Click on the `Service Map` tab
3. Click on the `trader` service
4. Click on `Service Details`
5. Click on the `Transactions` tab
6. Scroll down and click on the `POST /trade/request` transaction under `Transactions`
7. Scroll down to the waterfall graph under `Trace sample`
8. Click on the `Logs` tab
9. Click on the `trade committed for <customer_id>` log line emitted by the `recorder-java` service
10. Note the presence of the `subscription` attribute!

As noted, there are many reasons why use of OTLP logging may be impractical. Chief among them is accommodating services which cannot be instrumented with OpenTelemetry (e.g., third-party services). These services simply write their logs to disk directly, or more commonly to stdout, which is then written to disk by the Kubernetes or Docker logging framework, for example.

To accommodate such services, we can use the filelog receiver in the OTel Collector. In many regards, the `filelog` receiver is the OTel equivalent of Elastic's filebeat (often running as a module inside Elastic Agent).



In this example, we will be working with a service which outputs logs to stdout in a custom JSON format.

Now let's see what our logs look like in Elasticsearch. 1. Open the button label="Elasticsearch" tab 2. Click `Discover` in the left-hand navigation pane 3. Execute the following query:

```
FROM logs-* WHERE service.name == "router"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`

5. Click on the `Log overview` tab

Note that the body of the message is JSON-formatted.

Checking the Source

Now let's validate that these logs are being emitted to stdout, and written to disk:

1. Open the button label="Terminal" tab
2. Execute the following to get a list of the active Kubernetes pods that comprise our trading system:

```
kubectl -n trading get pods
```

3. Find the active `router-...` pod in the list
4. Get stdout logs from the active `router` pod:

```
kubectl -n trading logs <router-...>
```

(replace ... with the pod instance id)

Note that logs are written to stdout.

Now let's validate that Kubernetes is picking up stdout and written to disk:

1. Open the button label="Terminal" tab
2. Let's peek on the logs being written to disk by Kubernetes

```
cd /var/log/pods/
ls
```

3. Get logs for current instant of the `router` pod

```
cd trading_router*
ls
cd router
```

4. Look at the logs:

```
cat 0.log
```

Making Sense of JSON Logs

Many custom applications log to a JSON format to provide some structure to the log line. To fully appreciate this benefit in a logging backend, however, you need to parse that JSON (embedded in the log line) and extract fields fo interest.

While you could do this with Elasticsearch using Streams (as we will see in the future challenge), with OpenTelemetry, this can also be done in the Collector using OTTL.

OTTL Playground

It is pretty tricky to craft OTTL in your Collector config, test, possibly fail, and fix. Fortunately, Elastic has made a great tool to let you interactively refine your OTTL before putting it in production.

1. Open the button label="OTTL Playground" tab
2. Paste into the `OTLP Payload` pane an example of our JSON-ified `router` logs:


```
{
  "resourceLogs": [
    {
      "resource": {},
      "scopeLogs": [
        {
          "scope": {},
          "logRecords": [
            {
              "timeUnixNano": "1544712660300000000",
              "observedTimeUnixNano": "1544712660300000000",
              "severityNumber": 10,
              "severityText": "Information",
              "traceId": "5b8efff798038103d269b633813fc60c",
              "spanId": "eee19b7ec3c1b174",
              "body": {
```

```
              "stringValue": "{\"0\": \"routing request to http://recorder-java:9003\",  \"_meta\": {    \"runtime\": \"Nodejs\",    \"runt
            }
          }
        ]
      }
    ]
  }
]
}
```

3. Pase into the `Configuration` pane the following starter configuration:

```
log_statements:
  - context: log
    conditions:
      - body != nil and Substring(body, 0, 2) == "{\""
    statements:
      - set(cache, ParseJSON(body))
      - flatten(cache, "")
      - merge_maps(attributes, cache, "upsert")
```

Those initial set of log statements: 1. checks if the message body is JSON formatted 2. if so, parses the body as json, flattens the key names (to prevent nesting), and merges the results to `attributes`

Click on the `Run >` button. In the `Result` pane, you can see the diff of what this OTTL would do, and it kind of matches what we expect.

It is far from ideal: * it does not conform to OTel semantic conventions (e.g., `_meta.logLevelName`, `_meta.date`) * the message body is now stored as an attribute with key `0`

Let's clean that up. 1. Paste the following into the `Configuration` pane:

```
          log_statements:
            - context: log
              conditions:
                - body != nil and Substring(body, 0, 2) == "{\""
              statements:
                - set(cache, ParseJSON(body))
                - flatten(cache, "")
                - merge_maps(attributes, cache, "upsert")

                - set(time, Time(attributes["_meta.date"], "%Y-%m-%dT%H:%M:%SZ"))
                - set(severity_text, attributes["_meta.logLevelName"])
                - set(severity_number, attributes["_meta.logLevelId"])
                - delete_matching_keys(attributes, "_meta\\..*")

                - set(body, attributes["0"])
                - delete_key(attributes, "0")
```

2. Click on the `Run >` button

Ah, that looks better. We: * converted the date from a string to an epoch timestamp and copied it into the proper field * copied the log level into the proper fields * deleted the remaining `_meta.*` fields * copied the body from `attributes.0` to the proper field * deleted the body from `attributes.0`

This looks great. Let's put it into production!

Modifying values.yaml

1. Open the button label="collector Config" tab
2. Search for the comment `# WORKSHOP CONTENT GOES HERE`
3. Replace it with the OTTL we developed above:

```
          log_statements:
            - context: log
              conditions:
                - body != nil and Substring(body, 0, 2) == "{\""
              statements:
                - set(cache, ParseJSON(body))
                - flatten(cache, "")
                - merge_maps(attributes, cache, "upsert")

                - set(time, Time(attributes["_meta.date"], "%Y-%m-%dT%H:%M:%SZ"))
                - set(severity_text, attributes["_meta.logLevelName"])
                - set(severity_number, attributes["_meta.logLevelId"])
                - delete_matching_keys(attributes, "_meta\\..*")
```

```
            - set(body, attributes["0"])
            - delete_key(attributes, "0")
```

Now let's redeploy the OTel Operator with our updated config:

1. Open the button label="Terminal" tab
2. Execute the following:

```
helm upgrade --install opentelemetry-kube-stack open-telemetry/opentelemetry-kube-stack --force \
  --namespace opentelemetry-operator-system \
  --values 'collector/values.yaml' \
  --version '0.9.1'
```

Wait for a minute or so. We can check when the config has taken affect by looking for the daemonset collectors to restart.

1. Open the button label="Terminal" tab
2. Execute the following:

```
kubectl -n opentelemetry-operator-system get pods
```

Once the daemonset collectors have restarted, let's check the logs coming into Elastic:

1. Open the button label="Elasticsearch" tab
2. Click `Discover` in the left-hand navigation pane
3. Execute the following query:

```
FROM logs-* WHERE service.name == "router"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Log overview` tab

Note the parsed JSON logs.

Let's do structured logging

1. Open the button label="router Source" tab
2. Navigate to `app.ts`
3. Find the line in the function `customRouter()`

```
logger.info(`routing request to ${host}`);
```

4. Modify it to

```
logger.info(`routing request to ${host}`, {method: method});
```

Now let's recompile and redeploy our `router` service. 1. Open the button label="Terminal" tab 2. Execute the following:

```
./builddeploy.sh -s router
```

Now let's see how that looks in Elasticsearch: 1. Open the button label="Elasticsearch" tab 2. Click `Discover` in the left-hand navigation pane 3. Execute the following query:

```
FROM logs-* WHERE service.name == "router"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Log overview` tab

ugh, `1.method` is ugly. Let's fix it!

1. Open the button label="OTTL Playground" tab
2. Pase into the `Configuration` pane the following starter configuration:

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            - context: log
              conditions:
                - body != nil and Substring(body, 0, 2) == "{\""
              statements:
                - set(cache, ParseJSON(body))
                - flatten(cache, "")
                - merge_maps(attributes, cache, "upsert")

                - set(time, Time(attributes["_meta.date"], "%Y-%m-%dT%H:%M:%SZ"))
                - set(severity_text, attributes["_meta.logLevelName"])
                - set(severity_number, attributes["_meta.logLevelId"])
                - delete_matching_keys(attributes, "_meta\\..*")
```

```
                - set(body, attributes["0"])
                - delete_key(attributes, "0")

                - replace_all_patterns(attributes, "key", "\\d+\\.", "")
```

Note the addition of `replace_all_patterns(attributes, "key", "\\d+\\.", "")` which will remove the numerical prefix from attributes.

Now let's redeploy the OTel Operator with our updated config:

1. Open the button label="Terminal" tab
2. Execute the following:

```
helm upgrade --install opentelemetry-kube-stack open-telemetry/opentelemetry-kube-stack --force \
  --namespace opentelemetry-operator-system \
  --values 'collector/values.yaml' \
  --version '0.9.1'
```

Wait for a minute or so. We can check when the config has taken affect by looking for the daemonset collectors to restart.

1. Open the button label="Terminal" tab
2. Execute the following:

```
kubectl -n opentelemetry-operator-system get pods
```

Now let's see how that looks in Elasticsearch: 1. Open the button label="Elasticsearch" tab 2. Click `Discover` in the left-hand navigation pane 3. Execute the following query:

```
FROM logs-* WHERE service.name == "router"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Log overview` tab

Yeah! we've parsed our JSON logs! ___

Modifying the collector config to parse specific logs feels awkward. it might make sense if most of your custom logs follow a common format, but typcially the format is unique and bespoke to specific apps. If your apps are deployed on k8s, we can use the Receiver Creator to move the parsing config to the app yaml rather than values.yaml.

Let's have a look at our postgresql logs.

1. Open the button label="Elasticsearch" tab
2. Click `Discover` in the left-hand navigation pane
3. Execute the following query:

```
FROM logs-* WHERE service.name == "postgresql"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Log overview` tab

Note the unstructured nature of these logs. One kind of neat aspect is the present of `traceparent` on some of the logs. Recall that these logs are generated from postgresql directly. Postgresql at present is not OpenTelemetry enabled, and thus has no native provisions for accepting a `traceparent` via distributed tracing. How did this line get there?

SQL Commentor. SQL comments is an extension (available for at least the Java language) which can append `traceparent`as a comment to SQL queries. Most databases (including postgresql) will output the comment as part of the audit log.

Let's parse these logs using the Receiver Creator.

Let's have a look at the Receiver Creator config 1. Open the button label="Collector Config" tab

Now we need to modify our `postgresql.yaml` to include our directives.

1. Open the button label="postgresql Config" tab
2. Search for the comment `# WORKSHOP CONTENT GOES HERE`
3. Replace it with the following:

```
        io.opentelemetry.discovery.logs/config: |
          operators:
          - type: container
          - type: regex_parser
            on_error: send_quiet
            parse_from: body
            regex: '^(?P<timestamp_field>\d{4}-\d{2}-\d{2}\s\d{2}:\d{2}:\d{2}.\d{3}\s[A-z]+)\s\[\d+\]\s(?P<severity_field>[A-Z]+):\s*(?<msg_
            timestamp:
              parse_from: attributes.timestamp_field
```

```
            on_error: send_quiet
            layout_type: strptime
            layout: '%Y-%m-%d %H:%M:%S.%L %Z'
          trace:
            trace_id:
              parse_from: attributes.trace_id
              on_error: send_quiet
            span_id:
              parse_from: attributes.span_id
              on_error: send_quiet
            trace_flags:
              parse_from: attributes.trace_flags
              on_error: send_quiet
          severity:
            parse_from: attributes.severity_field
            on_error: send_quiet
            mapping:
              warn:
                - WARNING
                - NOTICE
              error:
                - ERROR
              info:
                - LOG
                - INFO
                - STATEMENT
              debug1:
                - DEBUG1
              debug2:
                - DEBUG2
              debug3:
                - DEBUG3
              debug4:
                - DEBUG4
              debug5:
                - DEBUG5
              fatal:
                - FATAL
                - PANIC
        - type: move
          on_error: send_quiet
          from: attributes.msg_field
          to: body
        - type: remove
          on_error: send_quiet
          field: attributes.timestamp_field
        - type: remove
          on_error: send_quiet
          field: attributes.severity_field
        - type: remove
          on_error: send_quiet
          field: attributes.trace_version
        - type: remove
          on_error: send_quiet
          field: attributes.trace_id
        - type: remove
          on_error: send_quiet
          field: attributes.span_id
        - type: remove
          on_error: send_quiet
          field: attributes.trace_flags
```

This blog applies a regex.

Now apply it: 1. Open the button label=“Terminal” tab 2. Execute the following:

```
./deploy.sh -s postgresql
```

Check Elasticsearch: 1. Open the button label=“Elasticsearch” tab 2. Click `Discover` in the left-hand navigation pane 3. Execute the following query:

```
FROM logs-* WHERE service.name == "postgresql"
```

4. Open the first log record by clicking on the double arrow icon under `Actions`
5. Click on the `Log overview` tab

Check logs:

1. Click `Applications` > `Service Inventory` in the left-hand navigation pane

2. Click on the `Service Map` tab
3. Click on the `trader` service
4. Click on `Service Details`
5. Click on the `Transactions` tab
6. Scroll down and click on the `POST /trade/request` transaction under `Transactions`
7. Scroll down to the waterfall graph under `Trace sample`
8. Click on the `Logs` tab
9. Click on the `execute <unnamed>: ...` log line emitted by the `postgresql` service
10. Click on the `Table` tab
11. Search for the attribute `trace.id`

Note how with SQL Commentor, OpenTelemetry, and Elastic, we can correlate our postgresql audit logs with our traces!

In many cases, you might be ok to parse your logs on-demand. As an example, i can use ES|QL to parse my nginx proxy logs as needed.

ES|QL

Let's first try query-time parsing using ES|QL:

1. Open the button label="Elasticsearch" tab
2. Execute the following query:

```
FROM logs-proxy.otel-default
| GROK body.text "%{IPORHOST:client_ip} %{USER:ident} %{USER:auth} \\[%{HTTPDATE:timestamp}\\] \"%{WORD:http_method} %{NOTSPACE:request_path
| WHERE status_code IS NOT NULL
| EVAL @timestamp = DATE_PARSE("dd/MMM/yyyy:HH:mm:ss Z", timestamp) // use embedded timestamp as record timestamp
| KEEP @timestamp, client_ip, http_method, request_path, status_code, user_agent
```

So far, we've been using ES|QL to parse our proxy logs at query-time. While incredibly powerful for quick analysis, we can do even more with our logs if we parse them at ingest-time.

While you could use our OOTB integration to parse nginx logs, we've customized our nginx logs with a duration. Streams is really good at working with this.

Parsing with Streams

We will be working with Elastic Streams which makes it easy to setup log parsing pipelines.

1. Select `logs-proxy.otel-default` from the list of data streams (if you start typing, Elasticsearch will help you find it)
2. Select the `Processing` tab

Parsing the log message

We can parse our nginx log messages at ingest-time using the Elastic Grok processor.

1. Click `Add a processor`
2. Select the `Grok` Processor (if not already selected)
3. Set the `Field` to

```
body.text
```

4. Click `Generate pattern`. Elasticsearch will analyze your log lines and determine a suitable grok pattern.
5. To ensure a consistent lab experience, copy the following grok expression and paste it into the `Grok patterns` field (*do not* click the `Accept` button next to the generated pattern)

```
%{IPV4:client.ip} - %{NOTSPACE:client.user} \[%{HTTPDATE:timestamp}\] "%{WORD:http.request.method} %{URIPATH:http.request.url.path} HTTP/%{NU
```

6. Wait until the sample `body.text` on the right shows highlighting, then click `Add processor`

Parsing the timestamp

The nginx log line includes a timestamp; let's use that as our record timestamp.

1. Click `Add a processor`

2. Select `Date`
3. Set `Field` to `timestamp`
4. Elastic should auto-recognize the format: `dd/MMM/yyyy:HH:mm:ss XX`
5. Click `Add processor`

Now save the Processing by clicking `Save changes` in the bottom-right.

A faster way to query

Now let's jump back to Discover by clicking `Discover` in the left-hand navigation pane.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE http.response.status_code IS NOT NULL
| KEEP @timestamp, client.ip, http.request.method, http.request.url.path, http.response.status_code, user_agent.original
```

In this lab, we presented several different ways of capturing and parsing logs using OpenTelemetry.

In reality, you will likely use a combination of these techniques, depending on your system:

- you might use OTLP for greenfield applications
- you might use Receiver Creator for k8s applications
- you might use file receiver for VMs
- you might rely on ES|QL parsing for on-demand parsing
- for permanent parsing, you might use edge parsing for well-known log formats (postgresql), but rely on Streams for more flexible formats (custom apps)
