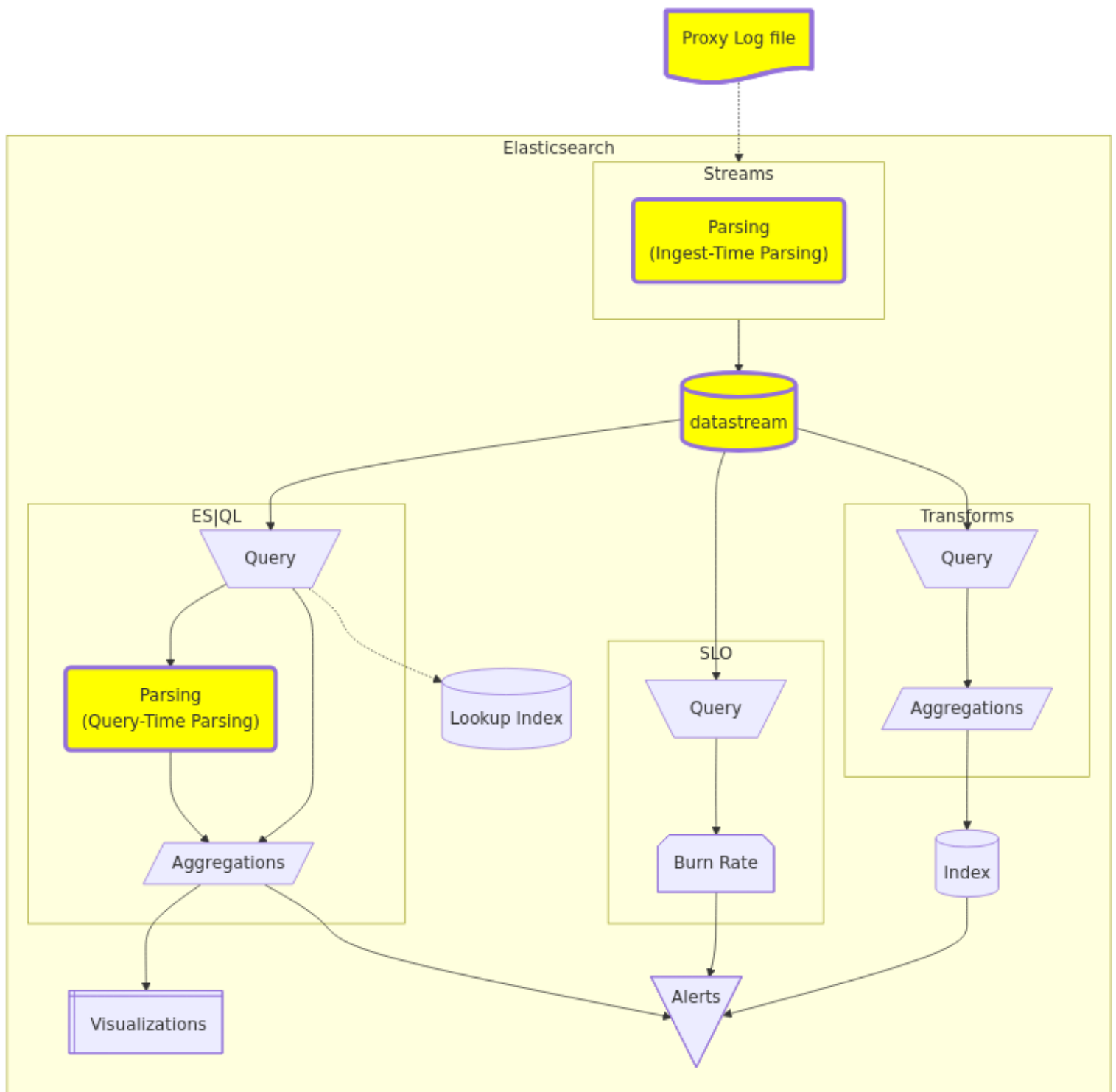


Observability 100: A Modern Logging Workflow

We've gotten word from our customer service department that some users are receiving an error when trying to use our web-based application. We will use this workshop to showcase Elastic's state-of-the-art logging workflow to get to the root cause of these errors.

Ingest vs. query-time parsing

Throughout this workshop, we will be pivoting back and forth between query-time parsing using ES|QL and ingest-time parsing using Streams. ES|QL lets us quickly test theories and look for possible tells in our log data. Once we've determined value in parsing our logs using ES|QL at query-time, we can shift that parsing to ingest-time using Streams. As we will see in this lab, ingest-time parsing allows for more advanced and complex workflows. Moving parsing to ingest-time also facilitates faster search results. Regardless of where the parsing is done, we will leverage ES|QL to perform aggregations, analysis, and visualization.

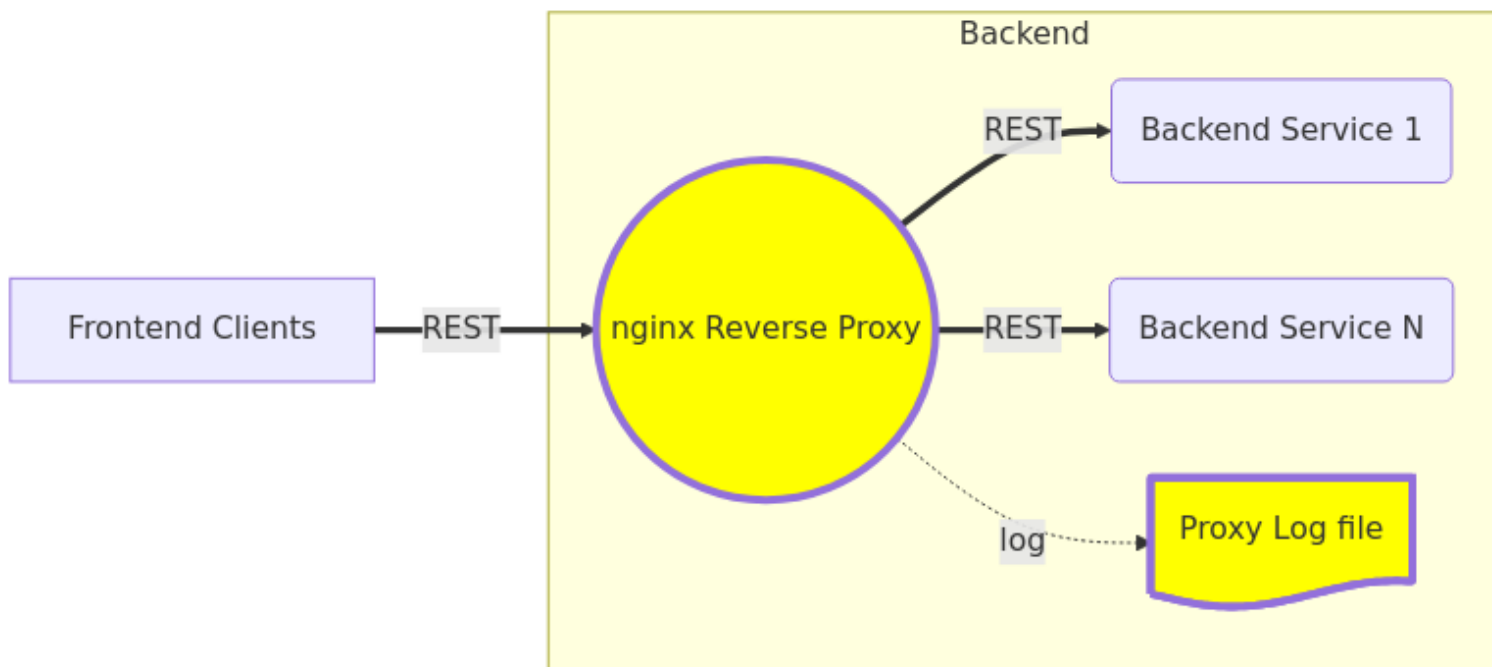


This workshop will heavily leverage ES|QL, Elastic's query-time language, to analyze our nginx reverse proxy logs. You can enter your queries in the pane at the top of the Elasticsearch tab. You can change the time window of your search using the Time Filter. To execute a search, click the Play/Refresh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

The screenshot shows the Elasticsearch Observability interface. On the left is a sidebar with navigation options: Overview, Discover (selected), Dashboards, Alerts, Cases, SLOs, AI Assistant, Streams, Applications, Infrastructure, Machine Learning, and Other tools. The main area displays an ES|QL query: `1 FROM logs-proxy.otel-default`. Above the query is a red arrow pointing to the 'ES|QL Query Entry' label. To the right of the query is a 'Time Filter' set to 'Last 1 hour' and an 'Execute/Refresh' button. Below the query is a 'Breakdown by log.level' graph showing a bar chart of results over time. A red arrow points to the graph with the label 'Graph'. Below the graph is a table of '1,000 results' showing log entries with timestamps and details. A red arrow points to the results table with the label 'Results'.

Getting started

We know that all of the REST API calls from our frontend web app flow through a nginx reverse proxy en route to our backend services; that seems like a good place to start our investigation.



Finding errors

Execute the following query:

```
FROM logs-proxy.otel-default
```

We can see that there are still transactions occurring, but we don't know if they are successful or failing. Before we spend time parsing our logs, let's just quickly search for common HTTP "500" errors in our nginx logs.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE body.text LIKE "* 500 *" // look for messages containing " 500 " in the body
```

If we didn't find any 500 errors, we could of course add additional LIKE criteria to our WHERE clause, like WHERE body.text LIKE "* 500 *" OR body.text LIKE "* 404 *". We will do a better job of implicitly handling more types of errors once we start parsing our logs. For now, though, we got lucky: indeed, we are clearly returning 500 errors for some users.

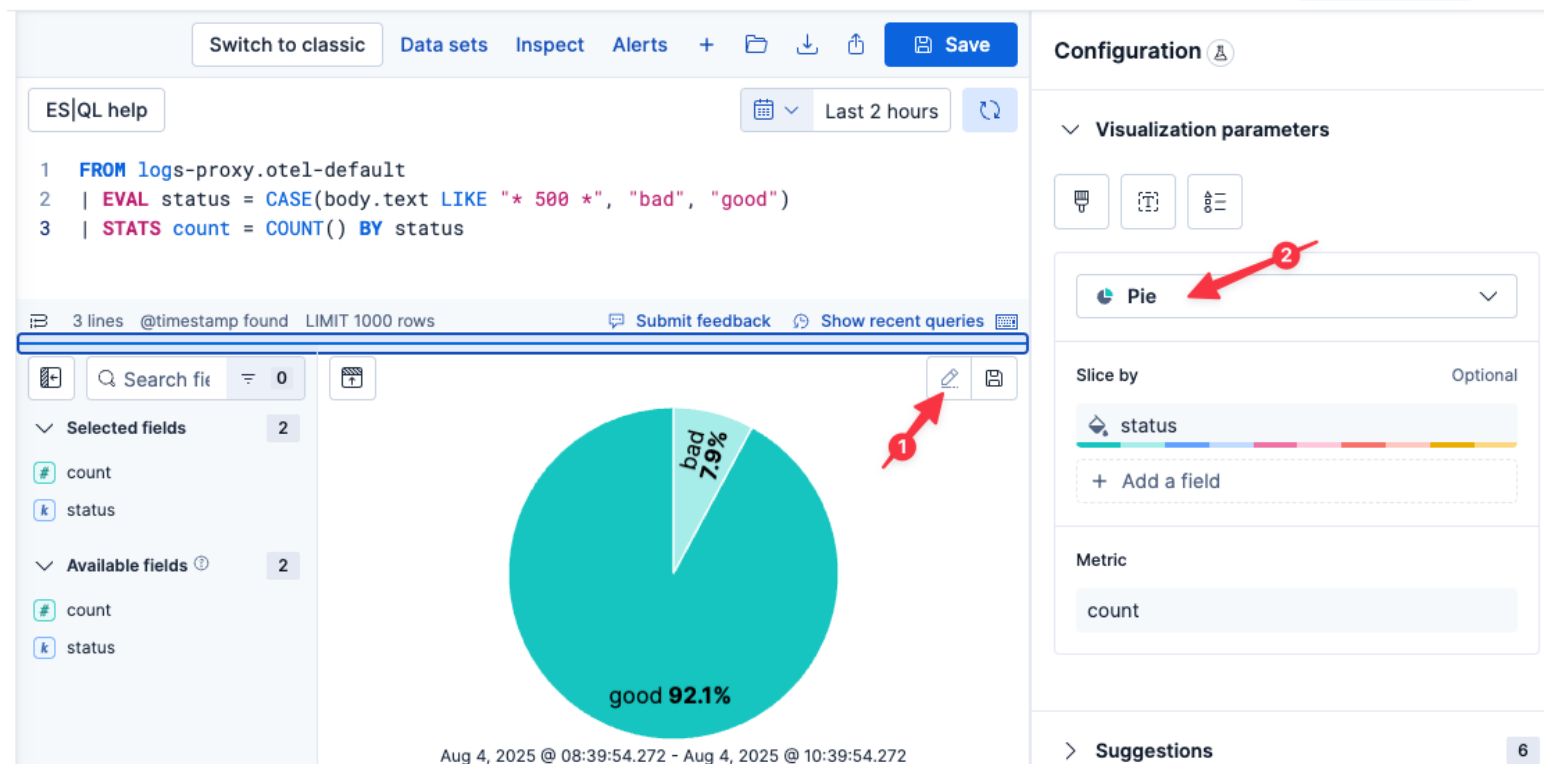
Are the errors affecting all requests?

The next thing we quickly want to understand is what percentage of requests to our backend services are resulting in 500 errors?

Execute the following query:

```
FROM logs-proxy.otel-default
| EVAL status = CASE(body.text LIKE "* 500 *", "bad", "good") // label messages containing " 500 " as "bad", else "good"
| STATS count = COUNT() BY status // count good and bad
```

Let's visualize this as a pie graph to make it a little easier to understand.



1. Click on the pencil icon to the right of the existing graph
2. Select Pie from the visualizations drop-down menu
3. Click Apply and close

This error appears to only be affecting a percentage of our overall requests. We don't yet have the tools to break this down by customer or client, but we will in a future exercise.

Are the errors still occurring?

Let's confirm that we are still seeing a mix of 500 and 200 errors (e.g., the problem wasn't transitory and somehow fixed itself).

Execute the following query:

```
FROM logs-proxy.otel-default
| EVAL status = CASE(body.text LIKE "* 500 *", "bad", "good") // label messages containing " 500 " as "bad", else "good"
| STATS COUNT() BY minute = BUCKET(@timestamp, "1 min"), status
```

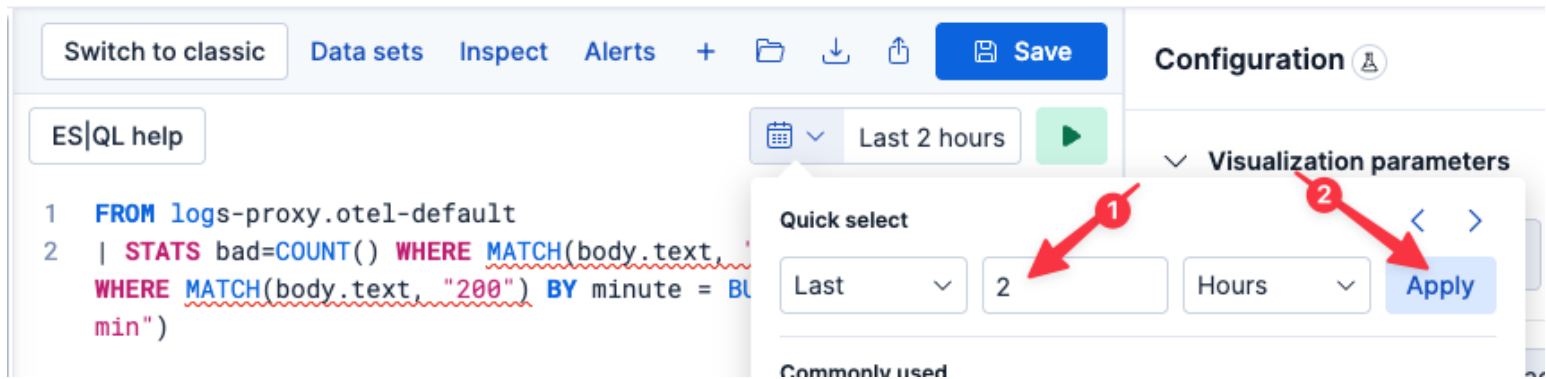
Then change the resulting graph to a bar graph over time:

1. Click on the pencil icon to the right of the existing graph
2. Select Bar from the visualizations drop-down menu
3. Click Apply and close

Indeed, we are still seeing a mix of 500 and 200 errors.

When did the errors start?

Let's see if we can find when the errors started occurring. Use the Time Filter to show the last 3 hours of data; this should automatically rerun the last query.



Ok, it looks like this issue first started happening roughly in the last 2 hours. We can use ES|QL's `CHANGE_POINT` to narrow it down to a specific minute:

Execute the following query:

```
FROM logs-proxy.otel-default
| EVAL status = CASE(body.text LIKE "* 500 *", "bad", "good") // label messages containing " 500 " as "bad", else "good"
| STATS count = COUNT() BY minute = BUCKET(@timestamp, "1 min"), status
| CHANGE_POINT count ON minute AS type, pval // look for distribution change
| WHERE type IS NOT NULL
| KEEP type, minute
| EVAL minutes_ago = DATE_DIFF("minute", minute, NOW())
```

A-ha! Using `CHANGE_POINT`, we can say that these errors clearly started occurring 60-80 minutes ago.

Parsing logs with ES|QL

As you can see, simply searching for known error codes in our log lines will only get us so far. Maybe the error code isn't just 500, or maybe we want to analyze status code vs. request URL, for example.

Fortunately, nginx logs are semi-structured which makes them (relatively) easy to parse.

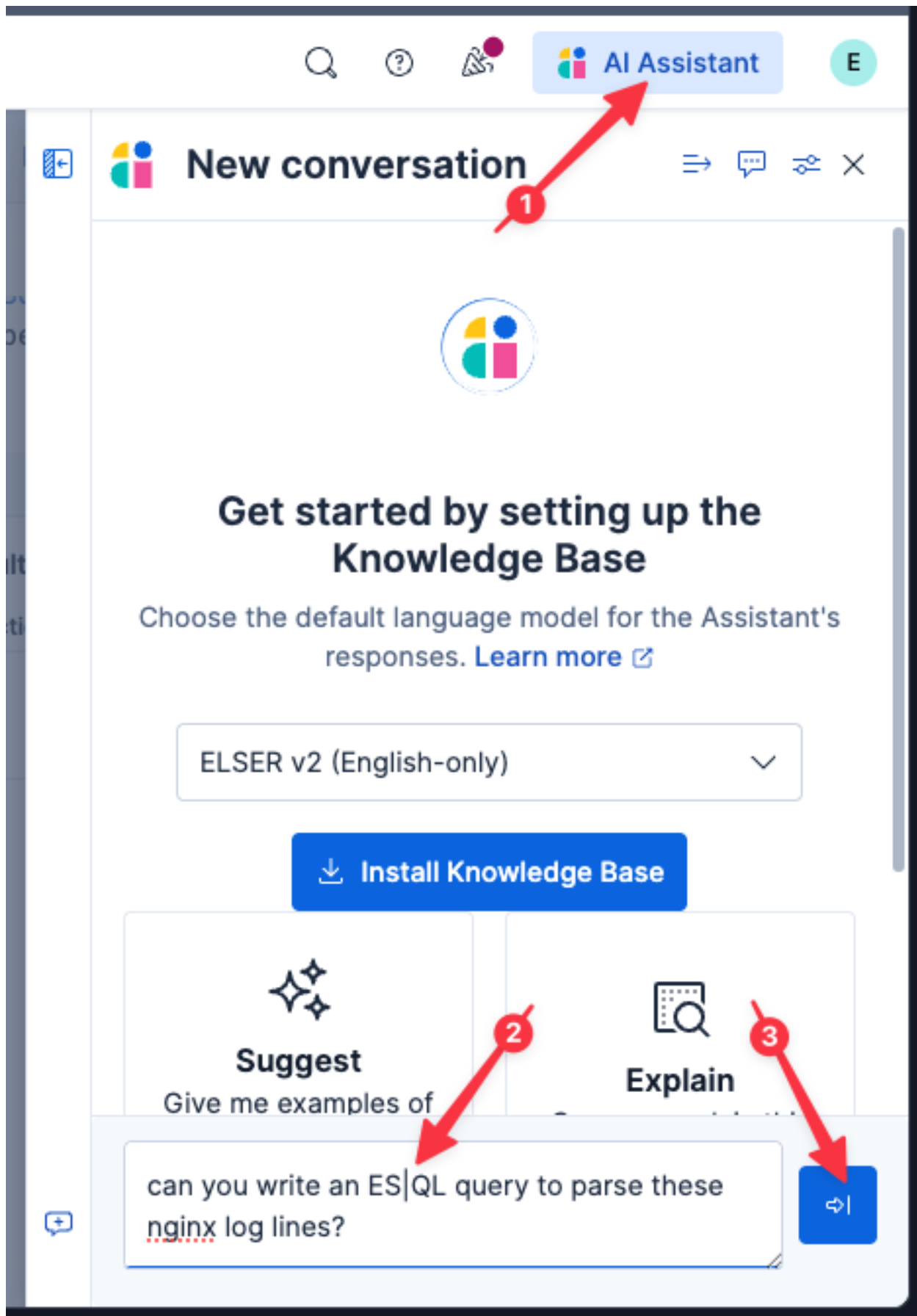
Some of you may already be familiar with grok expressions which provides a higher-level interface on top of regex; namely, grok allows you define patterns. If you are well versed in grok, you may be able to write a parsing pattern yourself for nginx logs, possibly using tools like Grok Debugger to help.

If you aren't well versed in grok expressions, or you don't want to spend the time to debug an expression yourself, you can leverage our AI Assistant to help!

1. Click on the AI Assistant button in the upper-right.
2. Enter the following prompt in the Send a message to the Assistant field at the bottom of the fly-out.

can you write an ES|QL query to parse these nginx log lines?

3. Click the execute button



[!NOTE] The output should look something like the following. Notably, the AI Assistant may generate slightly different field names on each generating. Because we rely on those field names in subsequent analysis, please close the flyout and copy and paste the following ES|QL expression into the ES|QL query entry box.

```
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
```

Is this affecting several or just one backend API?

Let's make use of these parsed fields to break down `status_code` by `request_path` to see if this is affecting only a specific API, or several APIs?

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
| STATS COUNT() BY status_code, request_path
```

Ok, it seems these errors are affecting all of the APIs (2) exposed by our simple backend.

[!NOTE] You may notice that our search has gotten a little slower when we added query-time grok parsing. This is because Elasticsearch is now applying our grok pattern to *every* log line in the selected time window. In our next challenge, we will show you how we can retain fast-search over long time windows **WITH** parsing using ingest-time parsing!

Is this affecting all User Agents?

Our nginx access logs also include a User Agent field, which is a semi-structured field containing some information about the requesting browser. Ideally, we could also cross-reference the errors against this field to understand if it is affecting all browsers, or only some types of browsers.

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
| WHERE TO_INT(status_code) == 500
| STATS bad = COUNT() BY user_agent
```

Unfortunately, the unparsed `user_agent` field is too unstructured to really be useful for this kind of analysis. We could try to write a grok expression to further parse `user_agent`, but in practice, it is too complicated (it requires translations and lookups in addition to parsing). Let's put a pin in this topic and revisit it in a bit when we have more tools at our disposal.

Making use of our parsed fields

Let's redraw the time graph we drew before, but this time using `status_code` instead of looking for specific error codes.

Execute the following query:

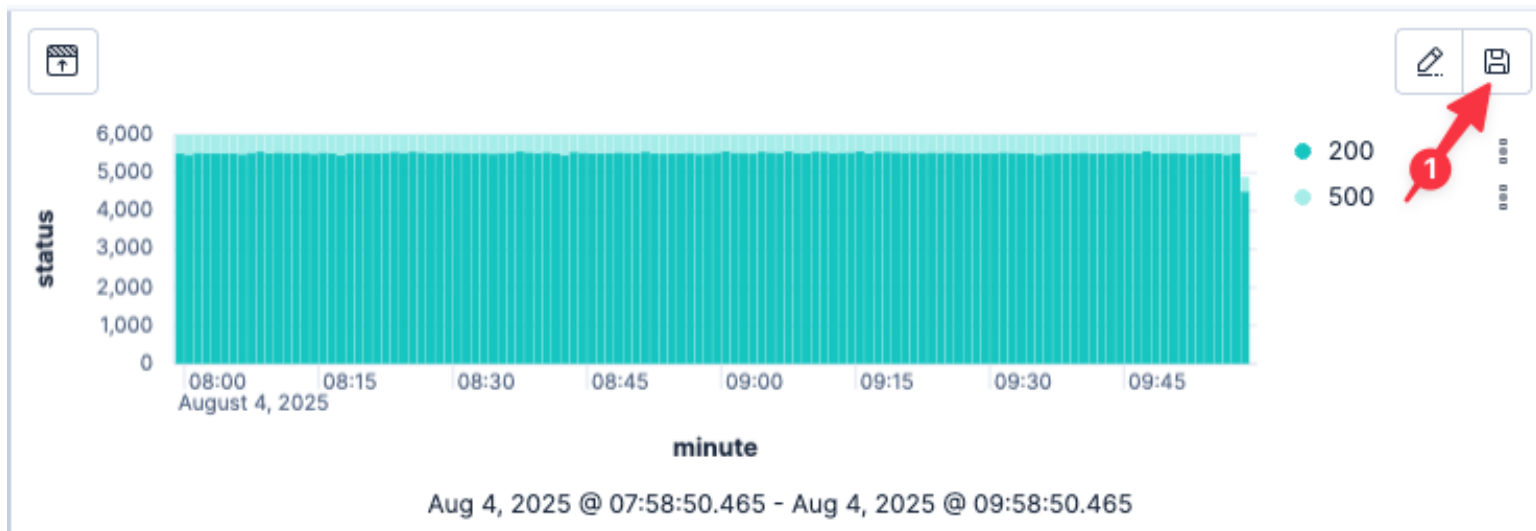
```
FROM logs-proxy.otel-default
| GROK body.text "%{IPORHOST:client_ip} %{USER:ident} %{USER:auth} \[%{HTTPDATE:timestamp}\] \" %{WORD:http_method} %{NOTSPACE:request_path}\""
| WHERE status_code IS NOT NULL
| EVAL @timestamp = DATE_PARSE("dd/MMM/yyyy:HH:mm:ss Z", timestamp)
| STATS status_count = COUNT() BY status_code, minute = BUCKET(@timestamp, "1 min")
```

[!NOTE] If the resulting graph does not default to a bar graph plotted over time, click on the Pencil icon in the upper-right of the graph and change the graph type to Bar

Now that we are graphing by `status_code`, we know definitively that we're returning only 200 and 500 status codes.

Saving our visualization to a dashboard

Let's save this graph to a dashboard for future use.



1. Click on the Disk icon in the upper-left of the resulting graph
2. Name the visualization

Status Code Over Time (ESQL)

3. Select New under Add to dashboard
4. Click Save and go to Dashboard

You will be taken to a new dashboard. Let's save it for future reference.

1. Click the Save button in the upper-right
2. Enter the title of the new dashboard as

Ingress Proxy

3. Click Save

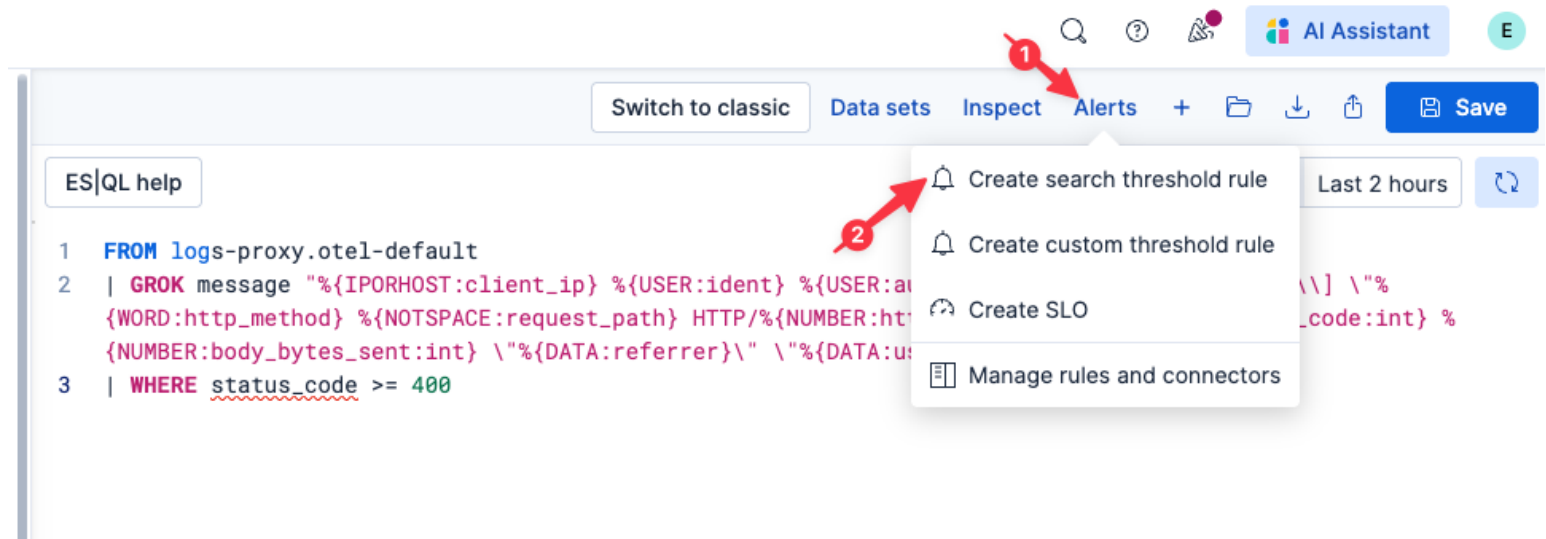
Setting up a simple alert

Go back to *Discover* using the left-hand navigation pane.

Let's create a simple alert to notify us whenever a `status_code >= 400` is received:

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 >= 400
```



1. Click Alerts in the taskbar
2. Select Create search threshold rule
3. Click Test query
4. Leave the defaults and click Next
5. Click Next on Actions tab
6. Set Rule name to

`status_code >= 400`

7. Set Tags to

`ingress`

8. Click Create rule on Details tab
9. Click Save rule on the pop-up dialog

In practice, this alert is too simple. We probably are okay with a small percentage of non-200 errors for any large scale infrastructure. What we really want is to alert when we violate a SLO. We will revisit this topic in a bit.

Summary

Let's take stock of what we know:

- a percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
- the only error type seen is 500
- the errors occur over all APIs

And what we've done:

- Created a dashboard to monitor our ingress proxy
- Created graphs to monitor status codes over time
- Created a simple alert to let us know if we ever return non-200 error codes

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.

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

[Streams](#) / logs-proxy.otel-default


< Streams

Manage stream logs-proxy.otel-default

Data retention **Processing** Advanced

Processors for field extraction
Drag and drop existing processors to update their execution order.

+ Add a processor

Data preview  **Detected field**

All samples **Parsed** Partially

Columns 15 Sort fields

@timestamp	observed	source

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 try to 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 (rather than clicking on the Accept button)

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

6. Click Add processor

Processors for field extraction

Drag and drop existing processors to update their execution order.

The screenshot shows the 'Adding processor' dialog box. It has a title bar with 'Adding processor', a 'Cancel' button, and an 'Add processor' button (labeled 6). Below the title bar, there are two input fields: a checkbox labeled '✓ 100%' and a text box labeled '10 fields'. The 'Processor' section has a dropdown menu showing 'Grok' (labeled 2). Below this, a description states: 'Uses [grok](#) expressions to extract matches from a field.' The 'Field' section has a text box containing 'body.text' (labeled 3). Below this, a description states: 'Field to search for matches.' The 'Grok patterns' section has a text area containing a pattern: '1 %{IPV4:client.ip} - %{NOTSPACE:client.user} \[%{HTTPDATE:timestamp} \] "%{WORD:http.' (labeled 4). Below the text area, there are two buttons: 'Generate pattern' (labeled 5) and 'Add pattern'.

Adding processor Cancel Add processor

✓ 100% 10 fields

Processor

Grok

Uses [grok](#) expressions to extract matches from a field.

Field

body.text

Field to search for matches.

Grok patterns

```
1  %{IPV4:client.ip} - %  
    {NOTSPACE:client.  
user} \[%  
    {HTTPDATE:timestamp}  
    \] "%{WORD:http.
```

Generate pattern Add pattern

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

Processors for field extraction

Drag and drop existing processors to update their execution order.

= **GROK** %{l... ☒ 100% 10 fields Unsaved 

Adding processor

Cancel

Add processor

☒ 100% 1 field

Processor

Date

Converts a date to a document timestamp.

Field

timestamp

Field to search for matches.

Format

 Generate suggestions

dd/MMM/yyyy:HH:mm:ss XX ×

Expected date format. Accepts a Java time pattern, ISO8601, UNIX, UNIX_MS, or TAI64N format.

> Optional fields



Ignore failures for this 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
```

[!NOTE] If you get back 1,000 results but the resulting columns are empty, remove the Selected fields (by clicking the X next to each), and then add each Available field (by clicking the + next to each).

Let's redraw our status code graph using our newly parsed field:

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE http.response.status_code IS NOT NULL
| STATS COUNT() BY TO_STRING(http.response.status_code), minute = BUCKET(@timestamp, "1 min")
```

Note that this graph, unlike the one we drew before, currently shows only a few minutes of data. That is because it relies upon the fields we parsed in the Processing we just setup. Prior to that time, those fields didn't exist. Change the time field to **Last 5 Minutes** to zoom in on the newly parsed data.

Saving our visualization to a dashboard

This is a useful graph! Let's save it to our dashboard for future use.

1. Click on the Disk icon in the upper-left of the resulting graph
2. Name the visualization

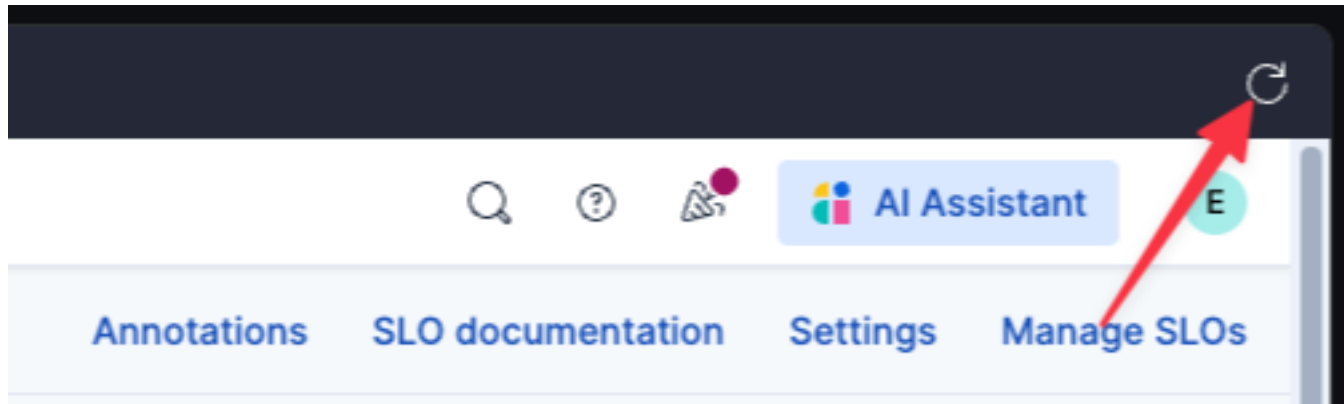
Status Code Over Time (Streams)

3. Select **Existing** under **Add to dashboard**
4. Select the existing dashboard **Ingress Proxy** (you will need to start typing **Ingress** in the **Search dashboards...** field)
5. Click **Save** and go to Dashboard
6. Once the dashboard has loaded, click the **Save** button in the upper-right

The screenshot shows the 'Save Lens visualization' dialog box. It has a title field, a description field, and an 'Add to dashboard' section. The 'Add to dashboard' section has a radio button for 'Existing' and a search bar. The search bar contains the text 'In' and shows a dropdown list with 'Ingress Proxy' selected. Below the search bar are buttons for 'Add to library' and 'Ingress Proxy'. At the bottom are 'Cancel' and 'Save and go to Dashboard' buttons. Red arrows with numbers 1 through 5 point to the following elements: 1. The disk icon in the top right corner of the dialog. 2. The title field containing 'Status Code Over Time (Streams)'. 3. The 'Existing' radio button. 4. The search bar containing 'In'. 5. The 'Save and go to Dashboard' button.

Creating a SLO

[!NOTE] Because we are moving quickly, Elasticsearch may take some time to update field lists in the UI. If you encounter a situation where Elasticsearch doesn't recognize one of the fields we just parsed, click the Refresh icon in the upper-right of the Instruct tab and try again to create the SLO.



Remember that simple alert we created? Now that we are parsing these fields at ingest-time, we can create a proper SLO instead of a simple binary alert. With a SLO, we can allow for some percentage of errors over time (common in a complex system) before we get our support staff out of bed.

1. Click SLOs in the left-hand navigation pane
2. Click Create SLO
3. Select Custom Query (if not already selected)
4. Set Data view to logs-proxy.otel-default
5. Set Timestamp field to @timestamp (if not already selected)
6. Set Good query to

```
http.response.status_code < 400
```

7. Set Total query to

```
http.response.status_code : *
```

8. Set Group by to

```
http.request.url.path
```



Define SLI

Choose the SLI type

Custom Query

Index

Data view

logs-proxy.otel-default

Timestamp field

@timestamp

Query filter ?

Optional



Custom filter to apply on the index



Good query ?



http.response.status_code < 400



Total query ?

Optional



http.response.status_code : *



Group by ?

Optional

http.request.url.path



9. Set SLO Name to

Ingress Status

10. Set Tags to

ingress

11. Click Create SLO



Describe SLO

SLO Name

Ingress Status

Description

Optional

A short description of the SLO

Tags

ingress X



Create SLO

Cancel



Equivalent API request



SLO Inspect

Alerting on a SLO

Now let's setup an alert that triggers when this SLO is breached.

1. Click on your newly created SLO `Ingress Status`
2. Under the `Actions` menu in the upper-right, select `Manage burn rate rule`

With burn rates, we can have Elastic dynamically adjust the escalation of a potential issue depending on how quickly it appears we will breach our SLO.

3. On the `Details` tab of the fly-out, set the `Rule name` to :

`Ingress Status SLO`

4. Set `Tags` to

`ingress`

5. Click `Save changes`
6. Click `Save rule` on the pop-up dialog

Adding SLO monitors to our dashboard

Now let's add the SLO monitor to our dashboard to help us find it in the future.

1. Click `Dashboards` in the left-hand navigation pane
2. Open the `Ingress Status` dashboard (if not already open)
3. Click `Add panel`
4. Select `SLO Overview`
5. Select `Grouped SLOs`
6. Set `Group by` to `Tags`
7. Set `Tags` to `ingress`
8. Click `Save`

×

Overview configuration

View type

Single SLO

Grouped SLOs

Group by

Tags

Tags

Optional

ingress ×

Custom filter

Optional

≡

+

Custom filter

Cancel

Save

Note that we are dynamically adding SLOs by tag. Any additional SLOs tagged with `ingress` will also appear here.

Adding alerts to our dashboard

Let's also add our growing list of alerts to our dashboard.

1. Click Add panel
2. Select Alerts
3. Set Filter by to Rule tags
4. Set Rule tags to ingress
5. Click Save

Note that we are dynamically adding alerts by tag. Any additional alerts tagged with `ingress` will also appear here. Now save the changes to our dashboard by clicking the `Save` button in the upper-right.

Summary

Let's take stock of what we know:

- a small percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
- the only error type seen is 500
- the errors occur over all APIs

And what we've done:

- Created a dashboard to monitor our ingress proxy
- Created graphs to monitor status codes over time
- Created a simple alert to let us know if we ever return non-200 error codes
- Parsed the logs at ingest-time for quicker and more powerful analysis
- Create a SLO (with alert) to let us know if we ever return a significant number of non-200 error codes over time

We still don't know why some requests are failing. Now that we are parsing the logs, however, we have access to a lot more information.

Is this affecting every region?

Let's analyze our clients by `client.ip` to look for possibly geographic patterns.

Adding the GeoIP processor

We can add the Elastic GeoIP processor to geo-locate our clients based on their client IP address.

1. Select `logs-proxy.otel-default` from the list of Streams.
2. Select the `Processing` tab
3. Click `Add a processor`
4. Select the `GeoIP Processor`
5. Set the `Field` to

`client.ip`

6. Open `Optional fields`
7. Set `Target field` to

`client.geo`

8. Set `Ignore missing` to `true`
9. Click `Add processor`
10. Click `Save changes` in the bottom-right

Adding processor Cancel Add processor

✓ 100% 8 fields

Processor

GeoIP

Adds information about the geographical location of an IPv4 or IPv6 address. [?](#)

Field

client.ip

The field to get the IP address from for the geographical lookup.

Optional fields

Target field

client.geo

The field that will hold the geographical information looked up from the database.

Database file

The database filename referring to one of the automatically downloaded GeoLite2 databases (GeoLite2-City.mmdb, GeoLite2-Country.mmdb, or GeoLite2-ASN.mmdb), or the name of a supported database file in the ingest-geoip config directory, or the name of a configured database (with the .mmdb suffix appended).

Properties

Type and then hit "ENTER"

Controls what properties are added to the `target_field` based on the ip geolocation lookup.

☒ First only
If true only the first found ip geolocation data will be returned.

☒ Ignore missing
Ignore documents with a missing field.

Analyzing with Discover

Jump back to Discover by clicking *Discover* in the left-hand navigation pane.

Adjust the time field to show the last 3 hours of data.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE client.geo.country_iso_code IS NOT NULL AND http.response.status_code IS NOT NULL
| STATS COUNT() BY http.response.status_code, client.geo.country_iso_code
| SORT http.response.status_code DESC
```

Let's make this a pie chart to allow for more intuitive visualization.

1. Click the pencil icon to the right of the graph
2. Select *Pie* from the dropdown menu
3. Click *Apply* and close

Wow! It looks like all of our 500 errors are occurring in the TH (Thailand) region. That is really interesting; without more information, we might be tempted to stop our RCA analysis here. However, there is often more to the story, as we will see.

Saving our visualization to a dashboard

In the meantime, this is a useful graph! Let's save it to our dashboard for future use.

1. Click on the Disk icon in the upper-left of the resulting graph
2. Name the visualization

Status by Region

3. Select Existing under Add to dashboard
4. Select the existing dashboard Ingress Proxy (you will need to start typing Ingress in the Search dashboards... field)
5. Click Save and go to Dashboard
6. Once the dashboard has loaded, click the Save button in the upper-right

Visualizing with Maps

[!NOTE] Because we are moving quickly, Elasticsearch may take some time to update field lists in the UI. If you encounter a situation where Elasticsearch doesn't recognize one of the fields we just parsed, click the Refresh icon in the upper-right of the Instruqt tab and try again to create the Map.

Sometimes it is helpful to visualize client geography on a map. Fortunately, Elastic has a built-in Map visualization we can readily use!

1. Go to Other tools > Maps using the left-hand navigation pane
2. Click Add layer
3. Select Documents
4. Select Data view to logs-proxy.otel-default
5. Set Geospatial field to client.geo.location (if this field isn't available, refresh the Instruqt virtual browser tab)
6. Click Add and continue
7. Scroll down to Layer style
8. Set Fill color to By value
9. Set Select a field to http.response.status_code
10. Select Custom color ramp in the field next to As number
11. Select a greenish color for the first number row (if not already selected)
12. Click the + button to the right of the first number row
13. Enter 400 in the second number row
14. Select a reddish color for the 400 number row
15. Set Symbol Size to By value
16. Set Select a field to http.response.status_code
17. Click Keep changes

Layer style

Symbol type

marker

icon

Fill color

By value

http.response.status_code

As number

Custom color ramp

#16C5C0

#F6726A

400

Border color

Solid

Border width

Fixed

0

px

Symbol size

By value

http.response.status_code

7

→

32

px

☐ Reverse size

[Data mapping](#)

Label

[Discard changes](#)

[Remove layer](#)

✓ [Keep changes](#)

Feel free to scroll around the globe and note the intuitive visualization of client locations and status codes.

Saving our map to a dashboard

Let's add our map to our dashboard for future reference.

1. Click the `Save` button in the upper-right
2. Set `Title` to

`Status Code by Location`

3. Select existing dashboard `Ingress Status` (you will need to start typing `Ingress` in the `Search dashboards...` field)
4. Click `Save` and go to dashboard

Now save the dashboard by clicking on the `Save` button in the upper-right.

Summary

Let's take stock of what we know:

- a small percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
- the only error type seen is 500
- the errors occur over all APIs
- the errors occur only in the `TH` (Thailand) region

And what we've done:

- Created a dashboard to monitor our ingress proxy
- Created graphs to monitor status codes over time
- Created a simple alert to let us know if we ever return non-200 error codes
- Parsed the logs at ingest-time for quicker and more powerful analysis
- Create a SLO (with alert) to let us know if we ever return a significant number of non-200 error codes over time
- Created visualizations to help us visually locate clients and errors

We know that errors appear to be localized to a specific region. But maybe there is more to the story?

Is this affecting every type of browser?

Remember the User Agent string we tried to group by and failed using `ES|QL`? While nearly impossible to parse with a simple `grok` expression, we can easily parse the User Agent string using the Elastic User agent processor.

Adding the User Agent processor

1. Select `logs-proxy.otel-default` from the list of Streams.
2. Select the `Processing` tab
3. Select `Add a processor`
4. Select the `User agent Processor`
5. Set the `Field` to

`user_agent.original`

6. Set `Ignore missing` to `true`
7. Click `Add processor`

Processors for field extraction

Drag and drop existing processors to update their execution order.

= **DATE** timestamp • dd/MMM/yyyy:HH:m... 

= **GEOIP** 

Adding processor

Cancel


Add processor

✓ 100%

6 fields

Processor

User agent

The [user_agent processor](#)  extracts details from the user agent string a browser sends with its web requests. This processor adds this information by default under the **user_agent** field.

Field

user_agent.original

The field containing the user agent string.

> Optional fields

☒ Ignore missing

Ignore documents with a missing field.

Adding the Set processor

In addition to the fields produced by the User Agent processor, we also want a simplified combination of browser name and version. We can easily craft one using the Set processor.

1. Click Add a processor
2. Select the Set Processor
3. Set Field to

`user_agent.full`

4. Set Value to

`{{user_agent.name}} {{user_agent.version}}`

5. Click Ignore failures for this processor
6. Click Add processor
7. Click Save changes in the bottom-right

Processors for field extraction

Drag and drop existing processors to update their execution order.

= USER_AGEN ✓ 100% 6 fields Unsaved 

Adding processor

Cancel

Add processor

✓ 100%

1 field

Processor

Set

Sets one field and associates it with the specified value. 

If the field already exists, its value will be replaced with the provided one.

Field

user_agent.full

The field to insert, upsert, or update.

Value

{{user_agent.name}} {{user_agent.version}}

The value to be set for the field. Supports template snippets.

> Optional fields



Ignore failures for this processor

This processor will add a new field `user_agent.full` to each document composed the `user_agent.name` and `user_agent.version` fields concatenated together.

Analyzing with Discover

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 user_agent.full IS NOT NULL
| STATS good = COUNT(http.response.status_code < 400 OR NULL), bad = COUNT(http.response.status_code >= 400 OR NULL) BY user_agent.full
| SORT bad DESC
```

Ah-ha, there is more to the story! It appears our errors may be isolated to a specific browser version. Let's break this down by `user_agent.version`.

```
FROM logs-proxy.otel-default
| WHERE user_agent.full IS NOT NULL
| STATS good = COUNT(http.response.status_code < 400 OR NULL), bad = COUNT(http.response.status_code >= 400 OR NULL) BY user_agent.version
| SORT bad DESC
```

Indeed, it appears we might have a problem with version 136 of the Chrome browser!

Correlating with region

So what's the correlation with the geographic area we previously identified as being associated with the errors we saw?

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE client.geo.country_iso_code IS NOT NULL AND user_agent.version IS NOT NULL AND http.response.status_code IS NOT NULL
| EVAL version_major = SUBSTRING(user_agent.version,0,LOCATE(user_agent.version, ".")-1)
| WHERE user_agent.name == "Chrome" AND TO_INT(version_major) == 136
| STATS COUNT() BY client.geo.country_iso_code
```

A-ha! It appears that this specific version of the Chrome browser (v136) has only been seen in the TH region! Quite possibly, Google has rolled out a specialized or canary version of their browser first in the TH region. That would explain why we saw errors only in the TH region.

Congratulations! We found our problem! In the next challenge, we will setup a way to catch new User Agents in the future.

Summary

Let's take stock of what we know:

- a small percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
- the only error type seen is 500
- the errors occur over all APIs
- the errors occur only in the TH region
- the errors occur only with browsers based on Chrome v136

And what we've done:

- Created a dashboard to monitor our ingress proxy
- Created graphs to monitor status codes over time
- Created a simple alert to let us know if we ever return non-200 error codes
- Parsed the logs at ingest-time for quicker and more powerful analysis
- Create a SLO (with alert) to let us know if we ever return a significant number of non-200 error codes over time
- Created visualizations to help us visually locate clients and errors ____

Now that we know what happened, let's try to be sure this never happens again by building out more reporting and alerting.

Generating a breakdown of user agents

As long as we are parsing our User Agent string, let's build some visualizations of the makeup of our browser clients. We can accomplish this using our parsed User Agent string and ES|QL.

Breakdown by OS

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.os.name IS NOT NULL
| STATS COUNT() by user_agent.os.name, user_agent.os.version
```

1. Click on the pencil icon to the right of the existing graph
2. Select Treemap from the visualizations drop-down menu
3. Click Apply and close

Saving our visualization to a dashboard

Let's save it to our dashboard for future use.

1. Click on the Disk icon in the upper-left of the resulting graph
2. Name the visualization

Client OSs

3. Select Existing under Add to dashboard
4. Select the existing dashboard Ingress Proxy (you will need to start typing Ingress in the Search dashboards... field)
5. Click Save and go to Dashboard
6. Once the dashboard has loaded, click the Save button in the upper-right

Breakdown by Browser

Let's also create a chart depicting the overall breakdown of browsers.

Jump back to Discover by clicking Discover in the left-hand navigation pane.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.name IS NOT NULL
| STATS COUNT() by user_agent.name
```

1. Click on the pencil icon to the right of the existing graph
2. Select Pie from the visualizations drop-down menu
3. Click Apply and close

Adding our visualization to a dashboard

Let's save it to our dashboard for future use.

1. Click on the Disk icon in the upper-left of the resulting graph
2. Name the visualization

Client Browsers

3. Select Existing under Add to dashboard
4. Select the existing dashboard Ingress Proxy (you will need to start typing Ingress in the Search dashboards... field)
5. Click Save and go to Dashboard
6. Once the dashboard has loaded, click the Save button in the upper-right

Generating a table of user agents

It would also be helpful is to keep track of new User Agents as they appear in the wild.

Jump back to Discover by clicking Discover in the left-hand navigation pane.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.full IS NOT NULL
| STATS @timestamp.min = MIN(@timestamp), @timestamp.max = MAX(@timestamp) BY user_agent.full
```

This is good, but it would also be helpful, based on our experience here, to know the first country that a given User Agent appeared in.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.full IS NOT NULL
| STATS @timestamp.min = MIN(@timestamp), @timestamp.max = MAX(@timestamp) BY user_agent.full, client.geo.country_iso_code
| SORT @timestamp.min ASC // sort first seen to last seen
| STATS first_country_iso_code = TOP(client.geo.country_iso_code , 1, "asc"), first_seen = MIN(@timestamp.min), last_seen = MAX(@timestamp.max)
| SORT user_agent.full, first_seen, last_seen, first_country_iso_code
```

Fabulous! Now we can see every User Agent we encounter, when we first encountered it, and in what region it was first seen.

Using LOOKUP JOIN to determine release date

Say you also wanted to know when a given User Agent was released to the wild by the developer?

We could try to maintain our own User Agent lookup table and use ES|QL LOOKUP JOIN to match browser versions to release dates:

Execute the following query:

```
FROM ua_lookup
```

We built this table by hand; it is far from comprehensive. Now let's use LOOKUP JOIN to do a real-time lookup for each row:

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.full IS NOT NULL
| EVAL user_agent.name_and_vmajor = SUBSTRING(user_agent.full, 0, LOCATE(user_agent.full, ".")-1) // simplify user_agent
| STATS @timestamp.min = MIN(@timestamp), @timestamp.max = MAX(@timestamp) BY user_agent.name_and_vmajor, client.geo.country_iso_code
| SORT @timestamp.min ASC // sort first seen to last seen
| STATS first_country_iso_code = TOP(client.geo.country_iso_code , 1, "asc"), first_seen = MIN(@timestamp.min), last_seen = MAX(@timestamp.max)
| SORT user_agent.name_and_vmajor, first_seen, last_seen, first_country_iso_code
| LOOKUP JOIN ua_lookup ON user_agent.name_and_vmajor // lookup release_date from ua_lookup using user_agent.name_and_vmajor key
| KEEP release_date, user_agent.name_and_vmajor, first_country_iso_code, first_seen, last_seen
```

We can quickly see the problem with maintaining our own ua_lookup index. It would take a lot of work to truly track the release date of every Browser version in the wild.

Using COMPLETION to determine release date

Fortunately, Elastic makes it possible to leverage an external Large Language Model (LLM) as part of an ES|QL query using the COMPLETION command. In this case, we can pipe each browser to the LLM and ask it to return the release date.

Execute the following query:

```
FROM logs-proxy.otel-default
| WHERE user_agent.full IS NOT NULL
| STATS @timestamp.min = MIN(@timestamp), @timestamp.max = MAX(@timestamp) BY user_agent.full, client.geo.country_iso_code
| SORT @timestamp.min ASC // sort first seen to last seen
| STATS first_country_iso_code = TOP(client.geo.country_iso_code , 1, "asc"), first_seen = MIN(@timestamp.min), last_seen = MAX(@timestamp.max)
| SORT first_seen DESC
| LIMIT 10 // intentionally limit to top 10 first_seen to limit LLM completions
| EVAL prompt = CONCAT(
  "when did this version of this browser come out? output only a version of the format mm/dd/yyyy",
  "browser: ", user_agent.full
) | COMPLETION release_date = prompt WITH openai_completion // call out to LLM for each record
| EVAL release_date = DATE_PARSE("MM/dd/YYYY", release_date)
| KEEP release_date, first_country_iso_code, user_agent.full, first_seen, last_seen
```

[!NOTE] If this encounters a timeout, try executing the query again.

You'll note that we are limiting our results to only the top 10 last seen User Agents. This is intentional to limit the number of COMPLETION commands executed, as each one will result in a call to our configured external Large Language Model (LLM). Notably, the use of the COMPLETION command is in Tech Preview; future revisions of ES|QL may include a means to more practically scale the use of the COMPLETION command.

Let's save this search for future reference:

1. Click the Save button in the upper-right
2. Set Title to

ua_release_dates

3. Click Save

Saving an ES|QL query allows others on our team to easily re-run it on demand. By saving the query, we can also add it to our dashboard!

Adding our table to a dashboard

1. Click Dashboards in the left-hand navigation pane
2. Open the Ingress Status dashboard (if it isn't already open)
3. Click Add from library
4. Find and select ua_release_dates
5. Close the fly-out
6. Click Save to save the dashboard

Organizing our dashboard

As we are adding panels to our dashboard, we can group them into collapsible sections.

1. Click on Add panel
2. Select Collapsible Section
3. Click on the Pencil icon to the right of the name of the new collapsible section
4. Name the collapsible section

User Agent

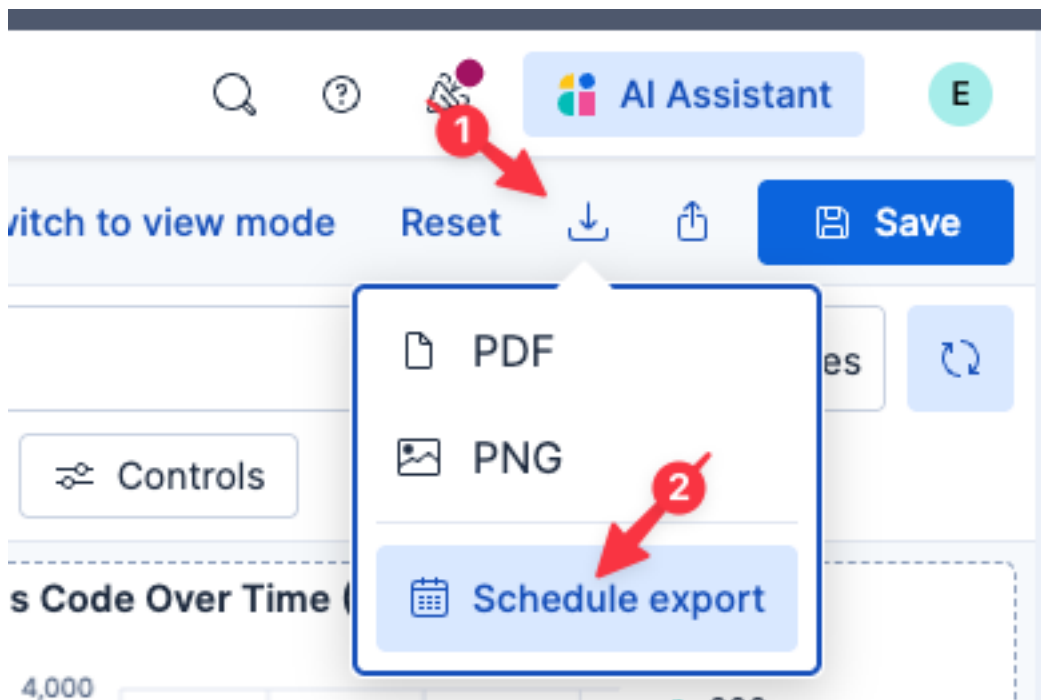
5. Click the green check box next to the name of the collapsible section
6. Open the collapsible section (if it isn't already) by clicking on the open/close arrow to the left of the collapsible section name
7. Drag the ua_release_dates table, the Client Browsers pie chart, and the Client OSs treemap into the body below the User Agent collapsible section
8. Click Save to save the dashboard

Feel free to create additional collapsible sections to group and organize other visualizations on our dashboard.

Scheduling a report

The CIO is concerned about us not testing new browsers sufficiently, and for some time wants a nightly report of our dashboard. No problem!

1. Click on Export icon
2. Select Schedule exports
3. Click Schedule exports at the bottom-right of the resulting fly-out



Alert when a new UA is seen

Ideally, we can send an alert whenever a new User Agent is seen. To do that, we need to keep state of what User Agents we've already seen. Fortunately, Elastic Transforms makes this easy!

Transforms run asynchronously in the background, querying data, aggregating it, and writing the results to a new index. In this case, we can use a Pivot transform to read from our parsed proxy logs and pivot based on `user_agent.full`. This will create a new index with one record per `user_agent.full`. We can then alert whenever a new record is added to this index, indicating a new User Agent!

Creating a transform

[!NOTE] Because we are moving quickly, Elasticsearch may take some time to update field lists in the UI. If you encounter a situation where Elasticsearch doesn't recognize one of the fields we just parsed, click the Refresh icon in the upper-right of the Instruqt tab and try again to create the Transform.

1. Go to Management > Stack Management > Transforms using the left-hand navigation pane
2. Click Create your first transform
3. Select `logs-proxy.otel-default`
4. Select Pivot (if not already selected)
5. Set Search filter to

```
user_agent.full :*
```

6. Set Group by to `terms(user_agent.full)`
7. Add an aggregation for `@timestamp.min`
8. Click > Next

Time range ?

 Last 1 hour

Use full data



Search filter

 user_agent.full :*

Edit JSON query



Runtime fields

No runtime field



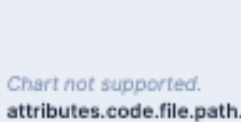

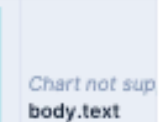


Edit runtime fields



Source documents

Results are limited to a maximum of 10000 for preview purposes

Columns	10/57	Sort fields	Histogram charts	
				
1755095800000 - 175...	1 category	attributes.code.file.path...	0	body.text
@timestamp	attributes.code.file.path		attributes.code.line.num...	
Aug 13, 2025 @ 09:37:5...	proxy.py	proxy.py	0	107.80.111.1
Aug 13, 2025 @ 09:37:5...	proxy.py	proxy.py	0	103.107.52.5
Aug 13, 2025 @ 09:37:5...	proxy.py	proxy.py	0	102.65.25.10
Aug 13, 2025 @ 09:37:5...	proxy.py	proxy.py	0	103.107.52.2
Aug 13, 2025 @ 09:37:5...	proxy.py	proxy.py	0	149.254.212

Rows per page: 5

< 1 2 3 4 5 ... 2000 >

Transform configuration

Group by

user_agent.full



Edit JSON config



Add a group by field ...

Aggregations

@timestamp.min



Add an aggregation ...

Preview

Columns	2	Sort fields	
user_agent.full	@timestamp.min		
Chrome 126.0.6478.222	August 13th 2025, 09:3...		
Chrome 127.0.6533.37	August 13th 2025, 09:3...		
Chrome 128.0.6613.59	August 13th 2025, 09:3...		
Chrome 131.0.6778.27	August 13th 2025, 09:3...		
Chrome 133.0.6943.116	August 13th 2025, 09:3...		

Rows per page: 5

< 1 2 3 4 5 6 7 >

> Next

9. Set the Transform ID to

`user_agents`

10. Set Time field to `@timestamp.min` (if not already selected)
11. Set Continuous mode On
12. Set Delay under Continuous mode to 0s
13. Open Advanced settings
14. Set the Frequency to 1s under Advanced Settings
15. Click Next

Transform ID

user_agents

9

Transform description

Description (optional)

☒ Use transform ID as destination index name

Destination ingest pipeline

Select an ingest pipeline (optional)

☒ Create data view

Time field for data view

@timestamp.min

10

Select a primary time field for use with the global time filter.

☒ Continuous mode

Date field for continuous mode

@timestamp

Select the date field that can be used to identify new documents.

Delay

0s

12

Time delay between current time and latest input data time.

☐ Retention policy

Advanced settings

Frequency

1s

14

The interval to check for changes in source indices when the transform runs continuously.

Maximum page search size

500

The initial page size to use for the composite aggregation for each checkpoint.

Number of failure retries

The number of retries on a recoverable failure before the transform task is marked as failed. Set it to -1 for infinite retries.

15

< Previous

> Next

16. Click `Create` and start

3

Create

16

Create and start

Create

Creates and starts the transform. A transform will increase search and indexing load in your cluster. Please stop the transform if excessive load is experienced. After the transform is started, you will be offered options to continue exploring the transform.

Create

Creates the transform without starting it. You will be able to start the transform later by returning to the transforms list.

Copy to clipboard

Copies to the clipboard the Kibana Dev Console command for creating the transform.

< Previous

[!NOTE] We are intentionally choosing very aggressive settings here strictly for demonstration purposes (e.g., to quickly trigger an alert). In practice, you would use more a more practical frequency, for example.

Our transform is now running every second looking for new User Agents in the `logs-proxy.otel-default` datastream. It is smart enough to only look for new User Agents across log records which have arrived since the last run of the transform. When a new User Agent is seen, a corresponding record is written to the `user_agents` index.

Creating an alert

Let's create a new alert which will fire whenever a new User Agent is seen. We specifically want to alert whenever a new record is written to the `user_agents` index, which in turn is maintained by the transform we just created.

1. Go to `Alerts` using the left-hand navigation pane
2. Click `Manage Rules`
3. Click `Create Rule`
4. Select `Custom threshold`
5. Set `DATA VIEW` to `user_agents`
6. Change `IS ABOVE` to `IS ABOVE OR EQUALS`
7. Set `IS ABOVE OR EQUALS` to `1`
8. Set `FOR THE LAST` to `1 minute`
9. Set `Group alerts by` (optional) to

`user_agent.full`

10. Set `Rule schedule` to `1 seconds`

Select a data view

DATA VIEW user_agents

Define query filter (optional)

Search for observability data... (e.g. host.name:host-1)

Set rule conditions

Aggregation A

COUNT all documents

+ Add aggregation/field

Equation and threshold

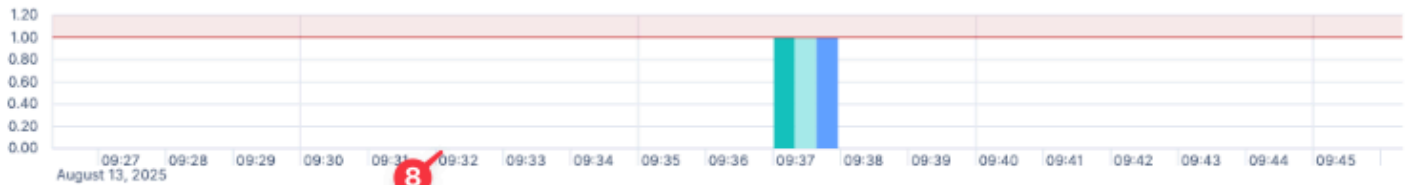
EQUATION A

IS ABOVE OR EQUALS 1

Label (optional)

Custom equation

Custom label will show on the alert chart and in reason



FOR THE LAST 1 minute

+ Add condition

Group alerts by (optional)

user_agent.full

Create an alert for every unique value. For example: "host.id" or "cloud.region".

☐ Alert me if there's no data

Rule schedule

Set the frequency to check the alert conditions

Every

1

second

Intervals less than 1 minute are not recommended due to performance considerations.

11. Set Rule name to

New UA Detected

12. Set Tags to

ingress

13. Set Related dashboards to Ingress Proxy

14. Click Create rule

15. Click Save rule in the resulting pop-up

3

Details

Rule name

New UA Detected

Tags

ingress ×

Optional

Investigation guide ⓘ

Optional

B I [List Icons] [Quote Icon] [Code Icon] [Link Icon] [Comment Icon]

Preview

Add guidelines for addressing alerts created by this rule

Related dashboards ⓘ

Optional

Ingress Proxy ×

Cancel

Show request

Create rule

[!NOTE] We are intentionally choosing very aggressive settings here strictly for demonstration purposes (e.g., to quickly trigger an alert). In practice, you would use more a more practical frequency, for example.

Testing our alert

1. Open the button label="Terminal" Instruqt tab
2. Run the following command:

```
curl -X POST http://kubernetes-vm:32003/err/browser/chrome
```

This will create a new Chrome UA v137. Let's go to our dashboard and see if we can spot it.

1. Open the button label="Elasticsearch" Instruqt tab
2. Go to Dashboards using the left-hand navigation pane
3. Open Ingress Proxy (if it isn't already open)

Look at the table of UAs that we added and note the addition of Chrome v137! You'll also note a new active alert New UA Detected!

Summary

Let's take stock of what we know:

- a small percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
- the only error type seen is 500
- the errors occur over all APIs
- the errors occur only in the TH region
- the errors occur only with browsers based on Chrome v136

And what we've done:

- Created a dashboard to monitor our ingress proxy
- Created graphs to monitor status codes over time
- Created a simple alert to let us know if we ever return non-200 error codes

- Parsed the logs at ingest-time for quicker and more powerful analysis
- Create a SLO (with alert) to let us know if we ever return a significant number of non-200 error codes over time
- Created visualizations to help us visually locate clients and errors
- Created graphs in our dashboard showing the breakdown of User Agents
- Created a table in our dashboard iterating seen User Agents
- Created a nightly report to snapshot our dashboard
- Created an alert to let us know when a new User Agent string appears ____

Sometimes our data contains PII information which needs to be restricted to a need-to-know basis and kept only for a limited time.

Limiting access

With Elastic's in-built support for RBAC, we can limit access at the index, document, or field level.

In this example, we've created a `limited_user` with a `limited_role` which restricts access to the `client.ip` and `body.text` fields (to avoid implicitly leaking the `client.ip`).

In the Elasticsearch tab, we are logged in as a user with full privileges. Let's check our access. 1. Open the button label="Elasticsearch" tab 2. Open a log record and click on the `Table` tab in the flyout 3. Note access to the `client.ip` and `body.text` fields

In the Elasticsearch (Limited) tab, we are logged in as a user with limited privileges. Let's check our access.

1. Open the button label="Elasticsearch (Limited)" tab
2. Open a log record and click on the `Table` tab in the flyout
3. Note that `client.ip` and `body.text` fields don't exist

Let's change permissions and see what happens:

1. Open the button label="Elasticsearch" tab
2. Go to Management > Stack Management > Security > Roles using the left-hand navigation pane
3. Select `limited_viewer`
4. For Indices `logs-proxy.otel-default`, update Denied fields to remove `body.text` (it should only contain `client.ip`)
5. Click Update role

Now let's ensure our limited user has access to `body.text`.

1. Open the button label="Elasticsearch (Limited)" Instruqt tab
2. Close the open log record flyout
3. Run the search query again
4. Open a log record
5. Note that `client.ip` doesn't exist, but `body.text` now does!

Limiting retention

Say your records department requires you to keep these logs generally accessible only for a very specific period of time. We can ask Elasticsearch to automatically delete them after some number of days.

1. Open the button label="Elasticsearch" Instruqt tab
2. Go to Streams using the left-hand navigation pane
3. Select `logs-proxy.otel-default` from the list of Streams
4. Click on the Data retention tab
5. Click Edit data retention
6. Select Set specific retention days
7. Set to 30 days

Elasticsearch will now remove this data from its online indices after 30 days. At that time, it will only be available in backups.

Summary

Let's take stock of what we know:

- a small percentage of requests are experiencing 500 errors
- the errors started occurring around 80 minutes ago
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- Create a SLO (with alert) to let us know if we ever return a significant number of non-200 error codes over time
- Created visualizations to help us visually locate clients and errors
- Created graphs in our dashboard showing the breakdown of User Agents
- Created a table in our dashboard iterating seen User Agents
- Created a nightly report to snapshot our dashboard
- Created an alert to let us know when a new User Agent string appears
- Setup RBAC to restrict access to `client.ip`
- Setup retention to keep the logs online for only 30 days

Wrap-Up

Over the course of this lab, we learned about:

- Using ES|QL to search logs
- Using ES|QL to parse logs at query-time
- Using ES|QL to do advanced aggregations, analytics, and visualizations
- Creating a dashboard
- Using ES|QL to create Alerts
- Using AI Assistant to help write ES|QL queries
- Using Streams to setup ingest-time log processing pipeline (GROK parsing, geo-location, User Agent parsing)
- Setting up SLOs
- Using Maps to visualize geographic information
- Scheduling dashboard reports
- Setting up a Pivot Transform and Alert
- Setting up RBAC
- Setting up data retention

We put these technologies to use in a practical workflow which quickly took us from an unknown problem to a definitive Root Cause. Furthermore, we've setup alerts to ensure we aren't caught off-guard in the future. Finally, we built a really nice custom dashboard to help us monitor the health of our Ingress Proxy.

All of this from just a lowly nginx access file. That's the power of your logs unlocked by Elastic.
