Learn the following:

- ELK components
- Explore different features of ELK
- Search and filter data
- Investigate VPN logs
- Create visualizations and dashboards

Elastic Stack: The Basics

Understand how SOC analysts use Elastic Stack (ELK) for log investigations.

Task 1 Introduction

In this room, we will learn how the Elastic Stack (ELK) can be used for log analysis and investigations. Although ELK is not a traditional SIEM, many SOC teams use it like one because of its data searching and visualizing capability. We will explore the components of ELK and learn how log analysis can be performed through it. We will also explore creating visualizations and dashboards in ELK.

Learning Objectives

This room has the following learning objectives:

- Understand the components of ELK and their use in SOC
- Explore the different features of ELK
- Learn to search and filter data in ELK
- Investigate VPN logs to identify anomalies
- Familiarize with creating visualizations and dashboards in ELK

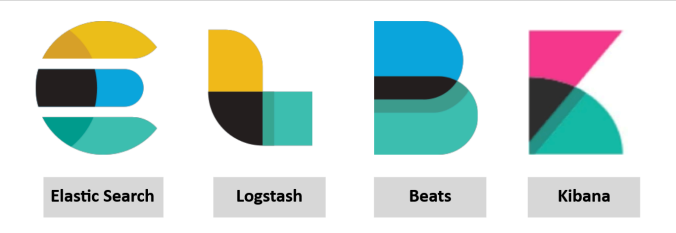
Answer the questions below

No answer needed

Task 2 Elastic Stack Overview

Elastic Stack (ELK) was originally developed to store, search, and visualize large amounts of data. Organizations used it to monitor application performance and perform searches on large datasets. Over time, its features made it popular in security operations as well. Now, many SOC teams use ELK almost as a SIEM solution.

Elastic Stack is a collection of different open-source components that work together to collect data from any source, store and search it, and visualize it in real time.



Before we go on to learning log analysis through ELK, let's first discuss its core components.

Note: As a SOC analyst, your primary responsibility is to work with ELK to perform log analysis and investigations. You do not need to specialize in how each component behind the ELKworks. However, taking a basic understanding of these components is essential.

1. Elasticsearch

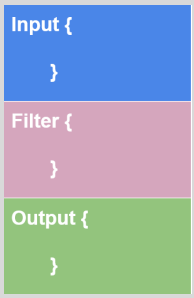
The first component, Elasticsearch, is a full-text search and analytics engine for JSON-formatted documents. It stores, analyzes, and correlates data and supports a RESTful API for interacting with it.

2. Logstash

Logstash is a data processing engine that takes data from different sources, filters it, or normalizes it, and then sends it to the destination, which could be Kibana or a listening port. A Logstash configuration file is divided into three parts, as shown below.

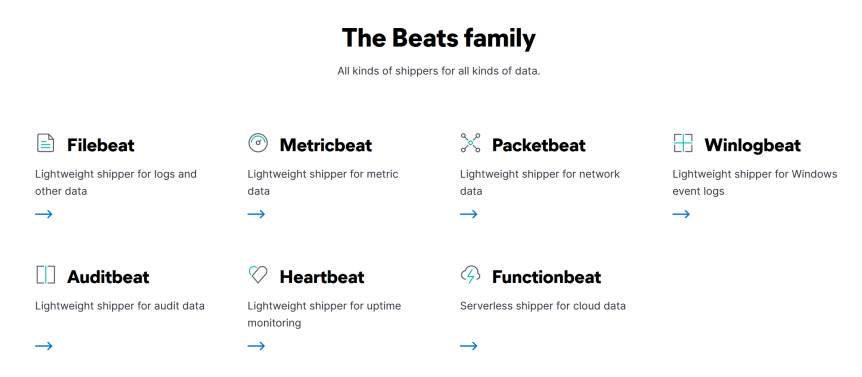
1. The Input part is where the user defines the source from which the data is being ingested.
2. The Filter part is where the user specifies the filter options to normalize the log ingested above.
3. The Output part is where the user wants the filtered data to be sent. It can be a listening port, Kibana Interface, Elasticsearch database, or file.

Logstash supports many Input, Output, and Filter plugins.



3. Beats

Beats are host-based agents known as data-shippers that ship/transfer data from the endpoints to Elasticsearch. Each beat is a single-purpose agent that sends specific data to Elasticsearch. All available beats are shown below.



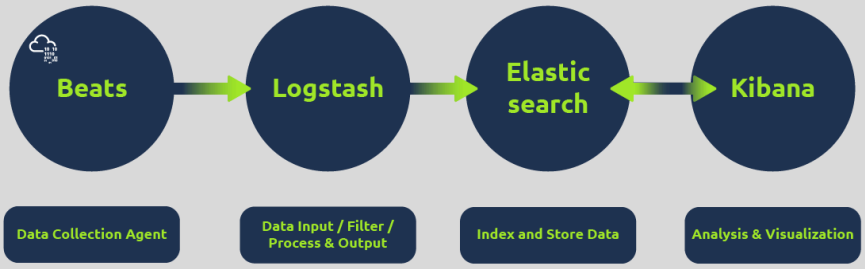
4. **Kibana**

Kibana is a web-based data visualization tool that works with Elasticsearch to analyze, investigate, and visualize data streams in real time. It allows users to create multiple visualizations and dashboards for better visibility. There is more on Kibana in the following tasks.

How they work together:

Now that we have learned about all the components of the Elastic Stack, let's see how these components work together step-by-step:

- Beats collect data from multiple agents. For example, Winlogbeat collects Windows event logs, and Packetbeat collects network traffic flows.
- Logstash collects data from beats, ports, or files, parses/normalizes it into field value pairs, and stores them into Elasticsearch.
- Elasticsearch acts as a database used to search and analyze data.
- Kibana is responsible for displaying and visualizing the data stored in Elasticsearch. The data stored in Elasticsearch can easily be shaped into different visualizations, time charts, infographics, etc., using Kibana.



Answer the questions below

1. Logstash is used to visualize the data. (yay / nay)
   Answer: *nay*

2. Elasticstash supports all data formats apart from JSON. (yay / nay)
   Answer: *nay*

Task 3 Lab Connection

Before proceeding with the following tasks, start the attached virtual machine by clicking the **Start Machine** below.

Start Machine

The machine may take 3-5 minutes to start. After the machine starts, the ELK Instance can be accessed at `http://MACHINE_IP` if you are connected with the TryHackMe VPN. If you are not, you can open AttackBox and access the ELK instance by copying and pasting the `MACHINE_IP` into its web browser.

Credentials

Use the following credentials for the ELK instance.

Username: Analyst

Password: analyst123

When you open the ELK instance through this task, each upcoming task will guide you through the features in detail and ask you some questions. These questions can be comfortably answered if you follow along with the tasks.

Answer the questions below

Move to the next task!

No answer needed

Task 4 Discovery Tab

From this task onwards, we will discuss ELK's front-end interface. These are the main features that a SOC analyst operates on. As discussed in the second task of this room, Kibana is the component of ELK that supports these interactions with the front end.

Discover Tab

The Discover tab is where the SOC analysts spend most of their time. This tab shows the ingested logs, the search bar, normalized fields, and more. Analysts can search for the logs, investigate anomalies, and apply filters based on search terms and time periods.

Let's briefly see what each element (as highlighted in the above screenshot) of the Discover tab does:

1. **Logs**
   Each row shows a single log containing information about the event, along with the fields and values found in that log.
2. **Fields Pane**
   The left panel of the interface shows the list of fields parsed from the logs. We can click on any field to add it to the filter or remove it from the search.
3. **Index Pattern**
   Each type of log is stored in a different index pattern. We can select the index pattern from which we need the logs. For example, for VPN logs, we would need to select the index pattern in which VPN logs are stored.
4. **Search Bar**
   It is a place where the user adds search queries and applies filters to narrow down the results. In the next task, we will learn how to perform searches through queries.
5. **Time Filter**
   We can narrow down results based on any specific time duration.
6. **Time Interval**
   This chart shows the event counts over time.
7. **TOP Bar**
   This bar contains various options to save the search, open the saved searches, share or save the search, etc.
8. **Discover Tab**
   This is the main workspace in Kibana for exploring, searching, and analyzing raw data.
9. **Add Filter**
   We can apply filters to specific fields to narrow down results, rather than manually typing entire queries.

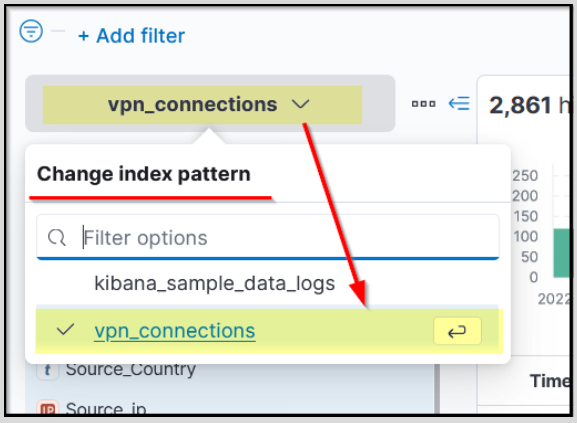
Some of the important elements found in the Discover tab are briefly explained below:

Index Pattern

By default, Kibana requires an index pattern to access the data stored/ingested in Elasticsearch. The i**ndex pattern** tells Kibana which elasticsearch data we want to explore. Each Index pattern corresponds to certain defined properties of the fields. A single index pattern can point to multiple indices.

Each log source has a different log structure; therefore, when logs are ingested into Elasticsearch, they are first normalized into corresponding fields and values by creating a dedicated index pattern for the data source.

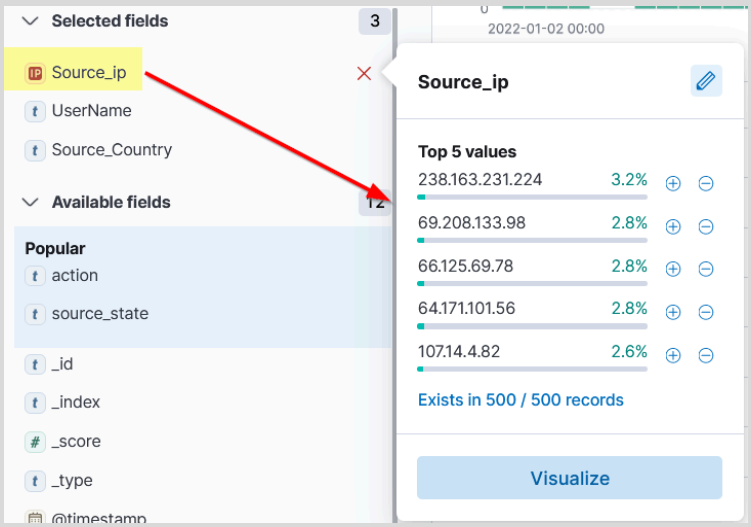
In the attached lab, we will explore the index pattern `vpn_connections` which contains the VPN logs.



Fields Pane

The left panel in the Discover tab shows the list of the normalized fields it finds in the available logs. Click on any field, and it will show the top 5 values and the percentage of occurrence.

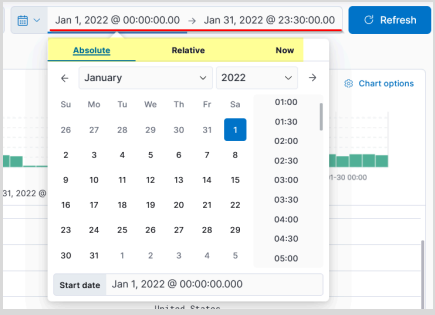
We can use these values to apply filters to them. Clicking on the `+` button will add a filter to show the logs containing this value, and the `-` button will add a filter to show the results that do not have this value.



We can also apply filters to any of the fields shown in the panel on the left. All we have to do is click the `Add filter` option under the search bar, which will allow us to apply a filter to the fields shown below.

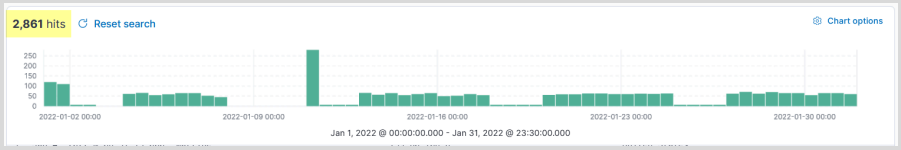
Time Filter

The time filter allows us to apply a log filter based on time. It has many options.



Timeline

The timeline pane provides an overview of the number of events that occurred for the time/date, as shown below. We can only select the bar to show the logs in that period. The count at the top left displays the number of events found in the specified time.



This bar is also helpful in identifying the spike in the logs. In the above screenshot, we can see an unusual log spike on 11th January 2022.

Create Table

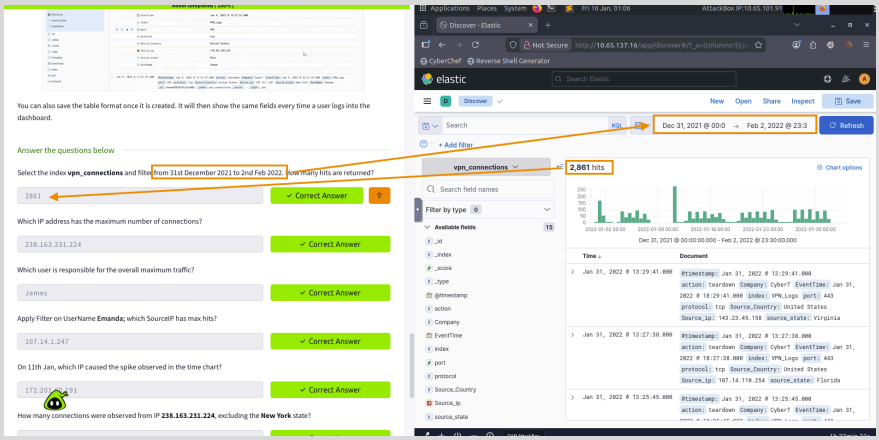
By default, the logs are shown in raw form. We can click on any log and select important fields to create a table showing only those fields. This method reduces the noise and makes it more presentable and meaningful.

You can also save the table format once it is created. It will then show the same fields every time a user logs into the dashboard.

Answer questions below

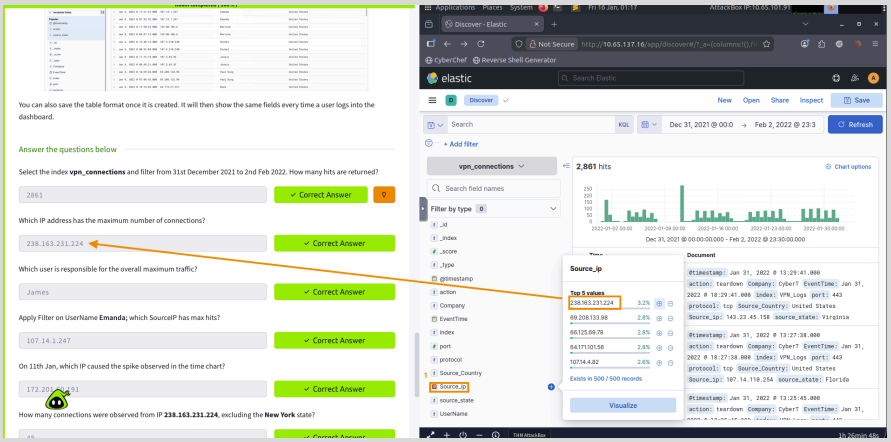
1. Select the index **vpn_connections** and filter from 31st December 2021 to 2nd Feb 2022. How many hits are returned?

   Answer: *2861*



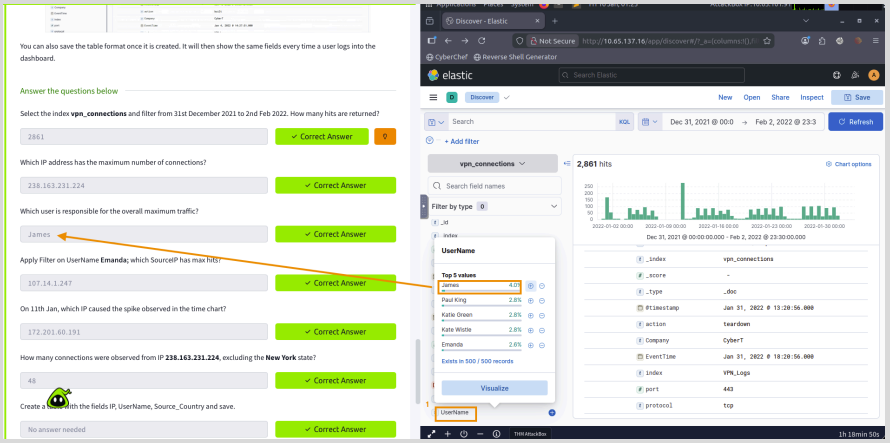
2. Which IP address has the maximum number of connections?

   Answer: *238.163.231.224*



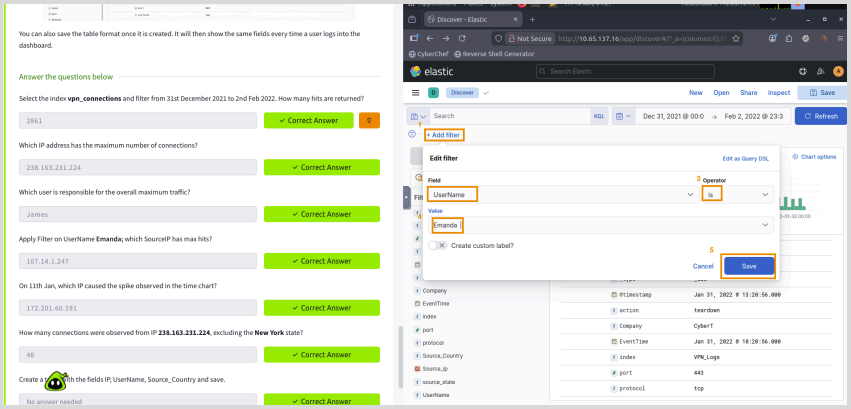
3. Which user is responsible for the overall maximum traffic?

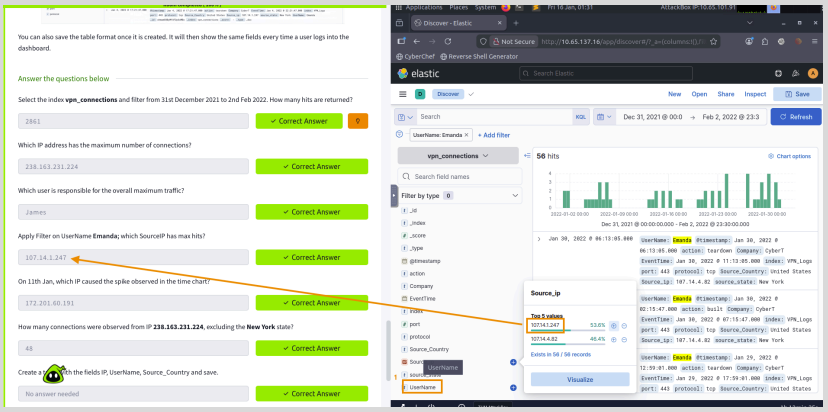
   Answer: *James*



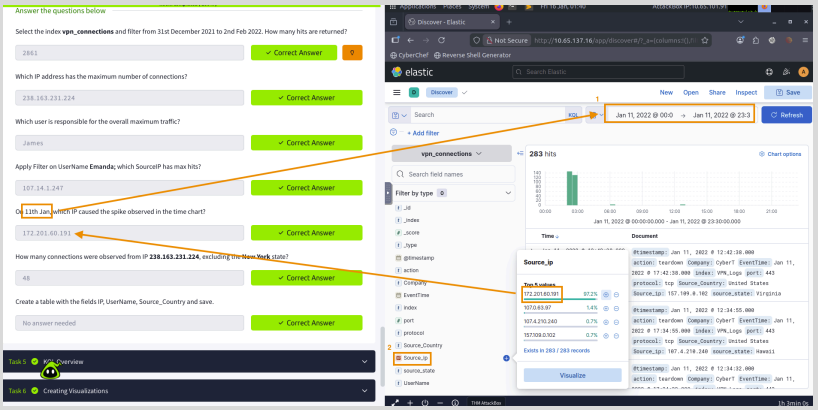
4. Apply Filter on UserName Emanda; which SourceIP has max hits?

   Answer: *107.14.1.247*

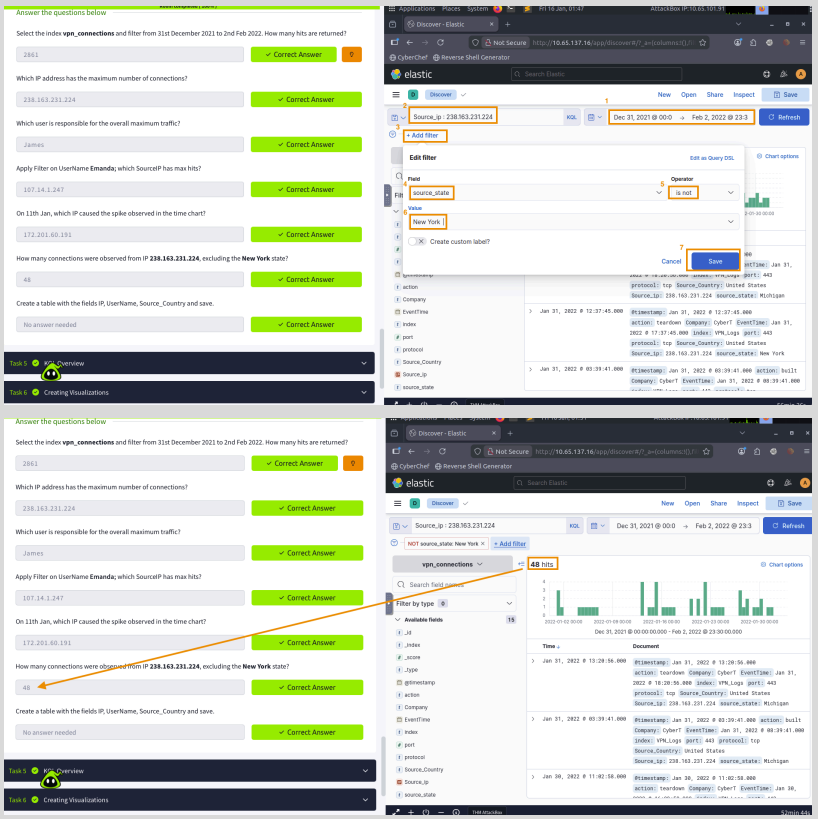




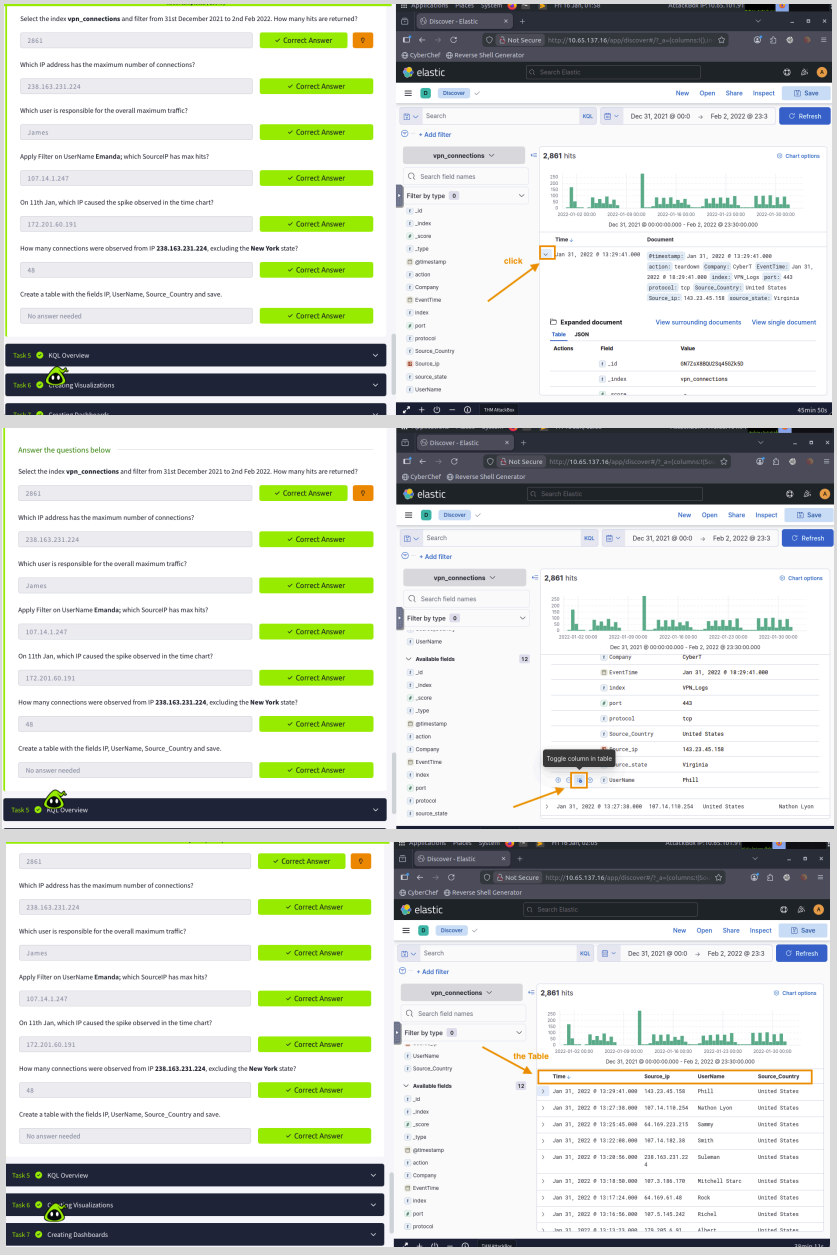
5. On 11th Jan, which IP caused the spike observed in the time chart?
   Answer: *172.201.60.191*



6. How many connections were observed from IP **238.163.231.224**, excluding the **New York** state?
   Answer: 48



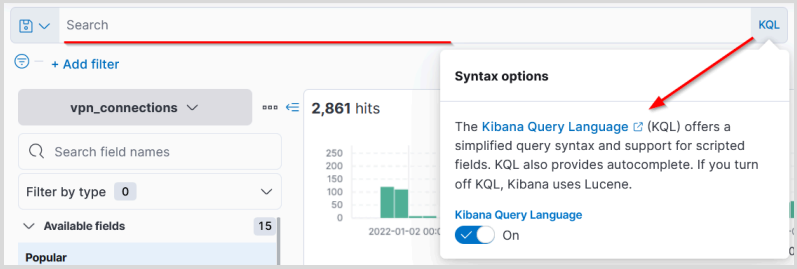
7. Create a table with the fields IP, UserName, Source_Country and save.



Task 5 KQL Overview

Remember the `Search Bar` we saw in the `Discover Tab` in the previous task? We can find anything using this option. Let's see how.

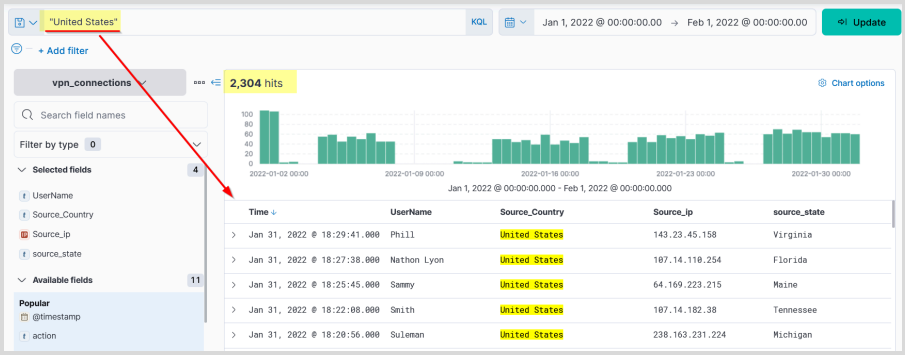
There is a special language that we can use inside this search bar to perform our searches. KQL **(Kibana Query Language)** is a search query language used to search the ingested logs/documents in Elasticsearch.



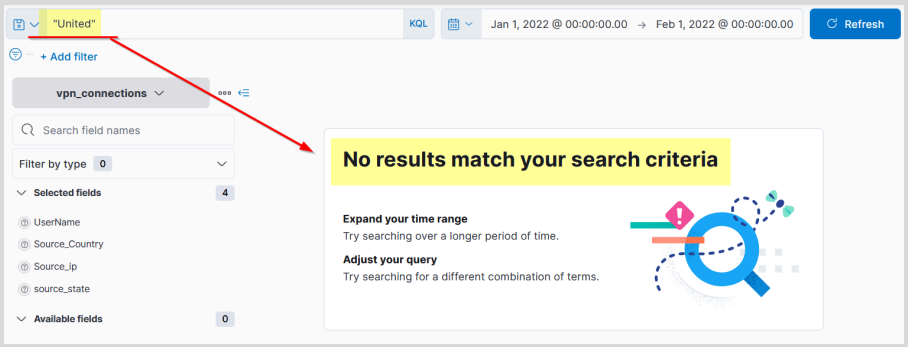
With KQL, we can search for the logs in two different ways.

- Free text search
- Field-based search

Free text Search
Free text search allows users to search for logs based on text only. That means a simple search of the term `security` will return all the documents that contain this term, irrespective of the field. Let's search for the text `United States` in the search bar. It will return all the logs that contain this term, regardless of the place or the field. This search returned 2304 hits, as shown below.



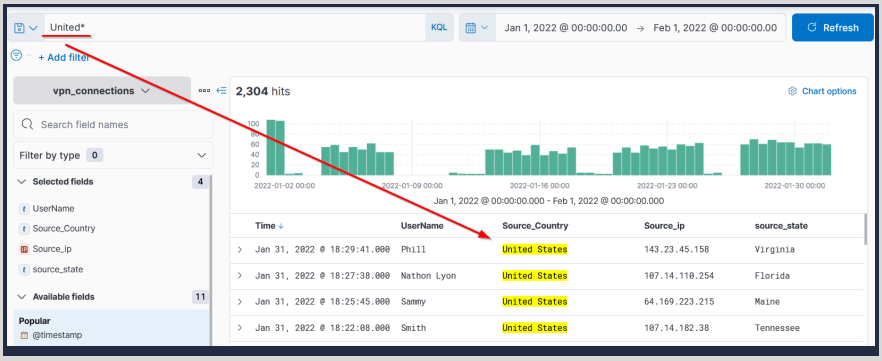
What if we only search for the term `United`? Do you think it will return any results?



It didn't return any results because KQL looks for the whole term/word in the documents.

KQL allows the wildcard `*` to match parts of the word. Let's find out how to use this wild card in the search query.

Search Query: `United*`

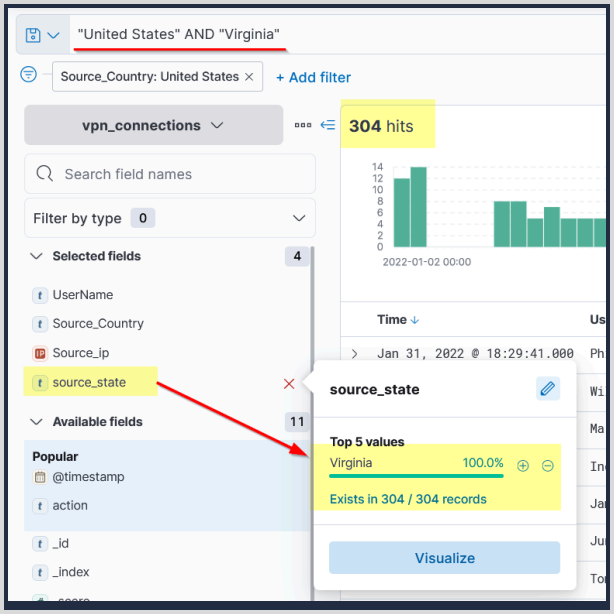


We have used the wildcard with the term `United` to return all the results containing the term United and any other term after it. If we had logs with the term `United Nations`. It would also have returned those as a result of this wildcard.

Logical Operators (AND | OR | NOT)
KQL also allows users to utilize logical operators in the search query. Let's look at the examples below.

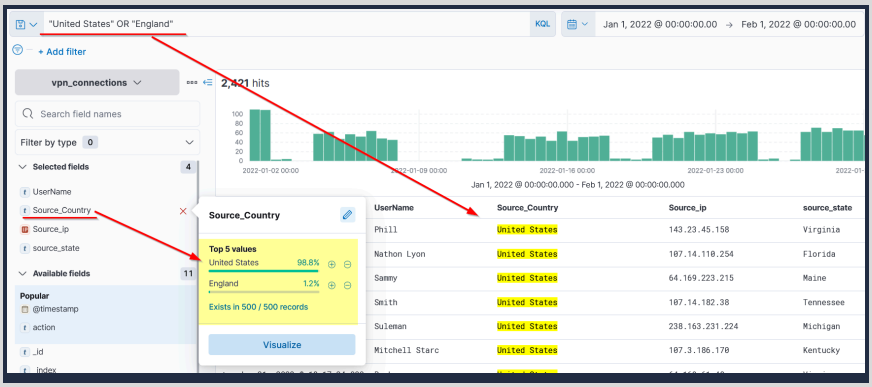
1. AND Operator
Here, we will use the **AND** Operator to create a search that returns the logs containing the terms `"United States"` and `"Virginia"`.

Search Query: `"United States" AND "Virginia"`



2. **OR Operator**
We will use the **OR** operator to show logs that contain either the `United States` or `England`.

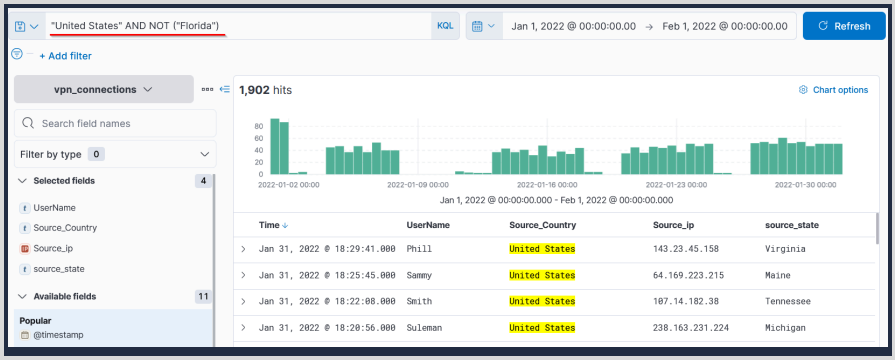
Search Query: `"United States" OR "England"`



3. NOT Operator

Similarly, we can use the **NOT** Operator to remove a particular term from the search results. This search query will show the logs from **the United States**, including all states, but ignoring Florida.

Search Query: `"United States" AND NOT ("Florida")`



Field-based search

In the Field-based search, we will provide the field name and the value we are looking for in the logs. This search has a special syntax as `Field: Value`. It uses a colon as a separator between the field and the value. Let's look at a few examples.

Search Query: `Source_ip : 238.163.231.224 AND UserName : Suleman`

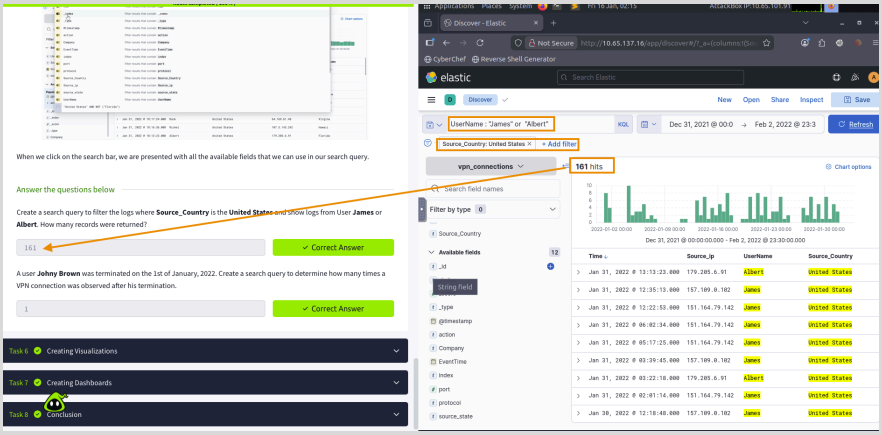
Explanation: We are telling Kibana to display all the logs in which the field `Source_ip` contains the value `238.163.231.224` and `UserName` is `Suleman`, as shown below.

When we click on the search bar, we are presented with all the available fields that we can use in our search query.

Answer the questions below

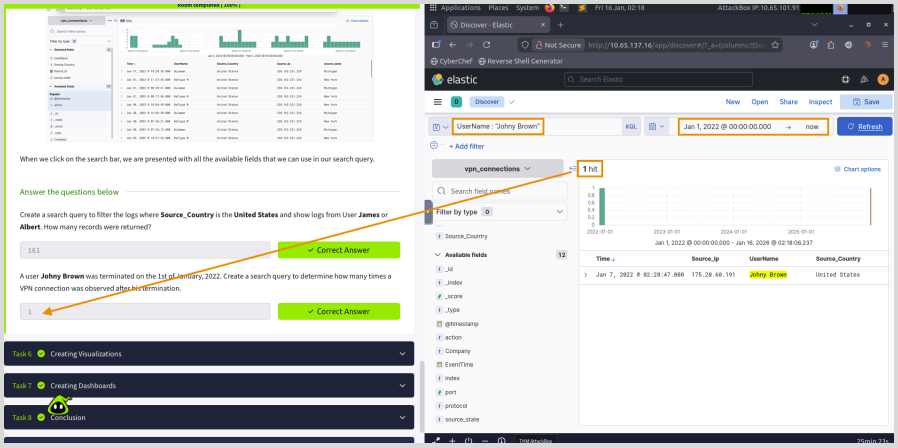
1. Create a search query to filter the logs where **Source_Country** is the **United States** and show logs from User **James** or **Albert**. How many records were returned?

   Answer: *161*



2. A user **Johny Brown** was terminated on the 1st of January, 2022. Create a search query to determine how many times a VPN connection was observed after his termination.

   Answer: *1*



Task 6 Creating Visualizations

The visualization tab allows us to visualize the data in different forms such as tables, pie charts, bar charts, etc. This visualization task will use the multiple options this tab provides to create some simple presentable visualizations.

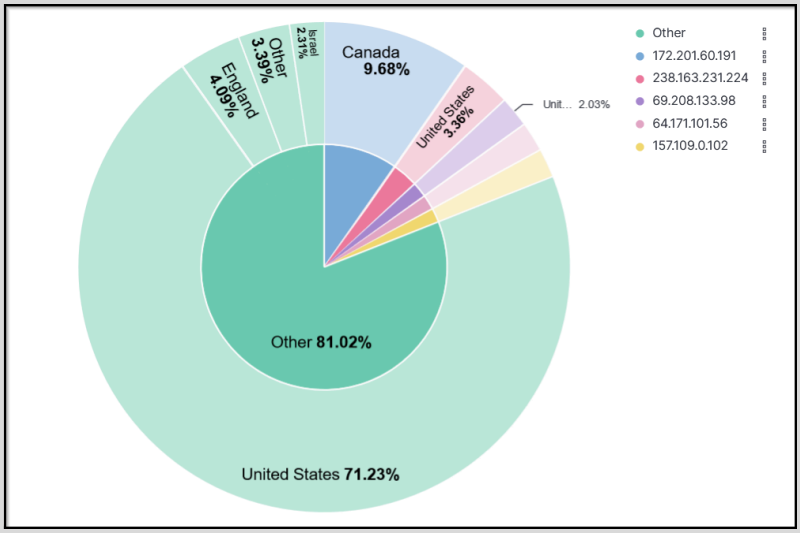
Create Visualization

There are a few ways to navigate to the visualization tab. One way is to click on any field in the discover tab and click on the visualization as shown below.

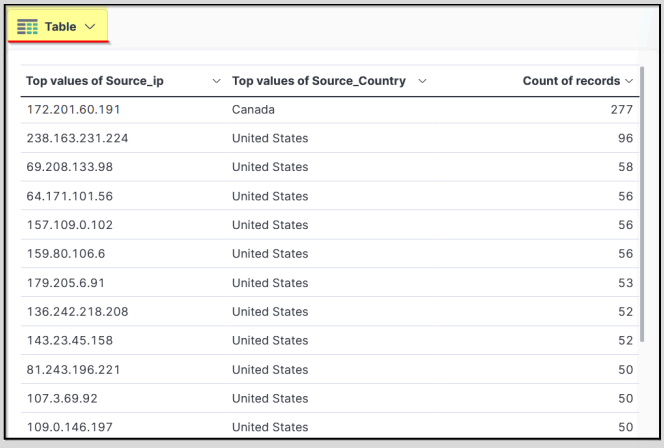
We can create multiple visualizations by selecting options like tables, pie charts, etc.

Correlation Option

Often, we require creating correlations between multiple fields. Dragging the required field in the middle will create a correlation tab in the visualization tab. Here, we selected the `Source_Country` as the second field to show a correlation among the client `Source_IP`.



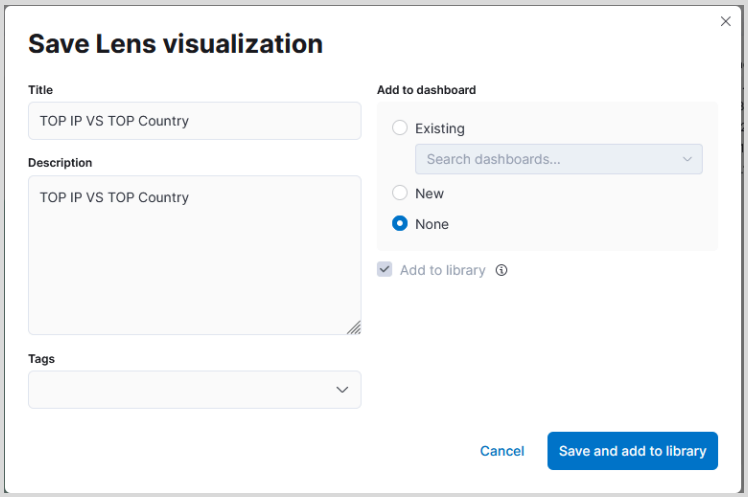
We can also create a table to show the values of the selected fields as columns, as shown below.



Table

Top values of Source_ip	Top values of Source_Country	Count of records
172.201.60.191	Canada	277
238.163.231.224	United States	96
69.208.133.98	United States	58
64.171.101.56	United States	56
157.109.0.102	United States	56
159.80.106.6	United States	56
179.205.6.91	United States	53
136.242.218.208	United States	52
143.23.45.158	United States	52
81.243.196.221	United States	50
107.3.69.92	United States	50
109.0.146.197	United States	50

The most important step in creating these visualizations is saving them. To do so, click on the save Option on the right side and fill in the descriptive values below.



Steps to take after creating Visualizations:

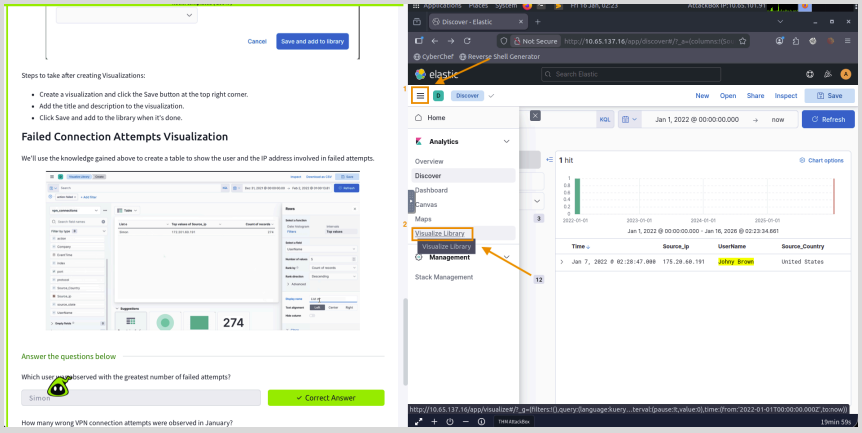
- Create a visualization and click the Save button at the top right corner.
- Add the title and description to the visualization.
- Click Save and add to the library when it's done.

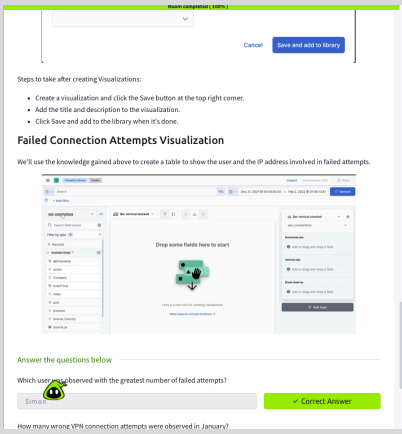
Failed Connection Attempts Visualization
We'll use the knowledge gained above to create a table to show the user and the IP address involved in failed attempts.

Answer the questions below

1. Which user was observed with the greatest number of failed attempts?

   Answer: *Simon*





Steps to take after creating Visualizations:

- Create a visualization and click the Save button at the top right corner.
- Add the title and description to the visualization.
- Click Save and add to the library when it's done.

Failed Connection Attempts Visualization

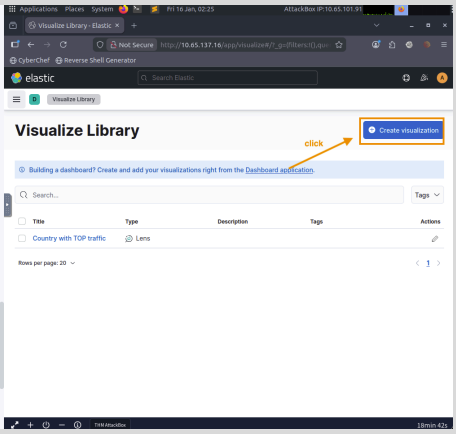
We'll use the knowledge gained above to create a table to show the user and the IP address involved in failed attempts.

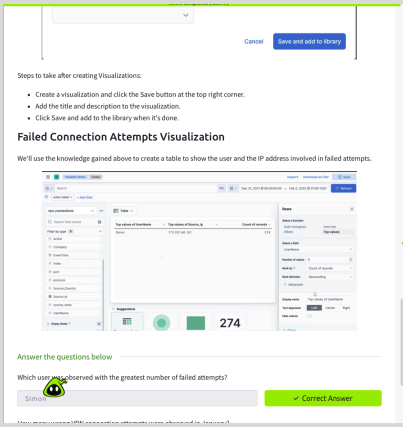
Answer the questions below

Which user was observed with the greatest number of failed attempts?

Simon ✓ Correct Answer

How many wrong VPN connection attempts were observed in January?





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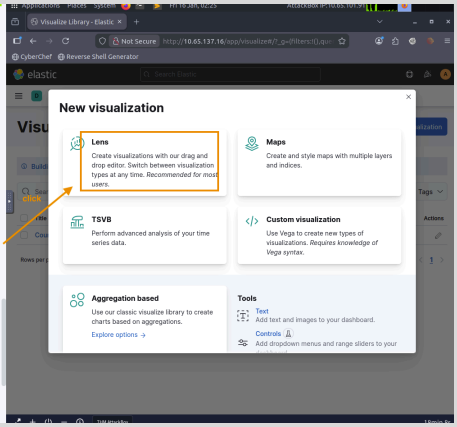
Simon ✓ Correct Answer



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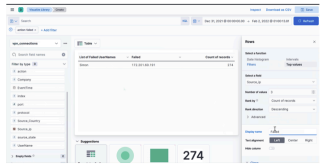


Answer the questions below

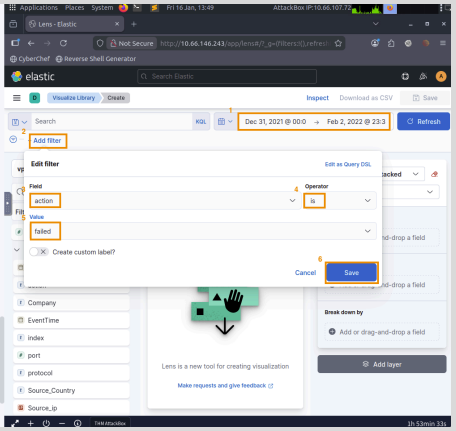
Which user was observed with the greatest number of failed attempts?

Simon ✓ Correct Answer

How many wrong VPN connection attempts were observed in January?

274 ✓ Correct Answer

Task 7 Creating Dashboards



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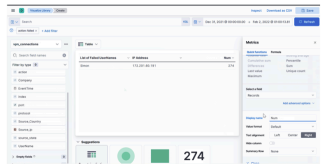

Answer the questions below

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Simon ✓ Correct Answer

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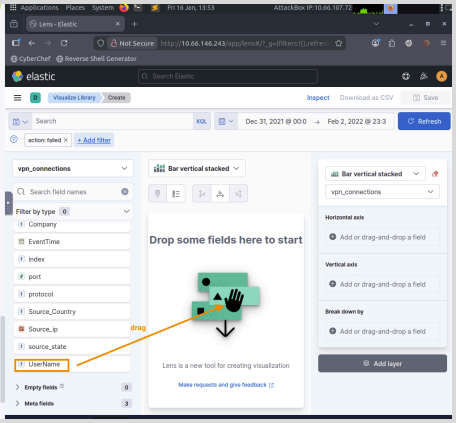
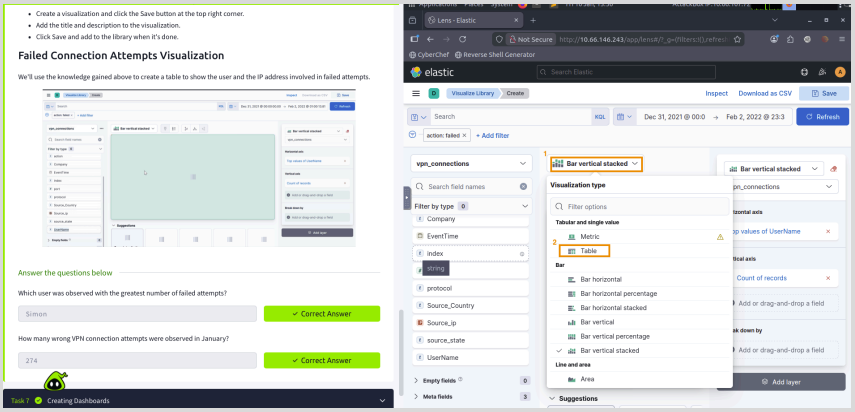
274 ✓ Correct Answer

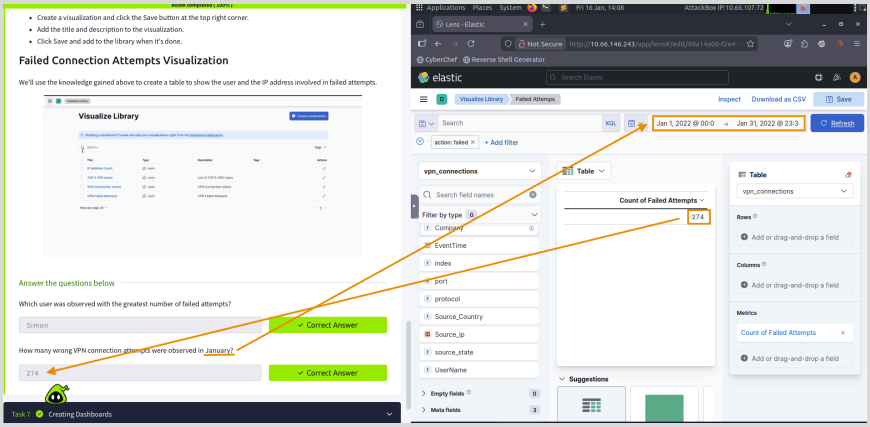
Task 7 Creating Dashboards





2. How many wrong VPN connection attempts were observed in January?

   Answer: *274*



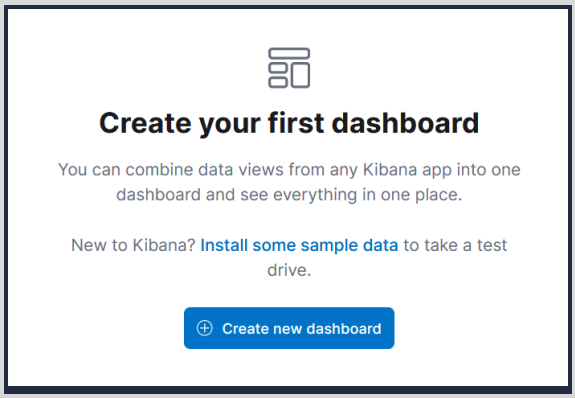
Task 7 Creating Dashboards

Dashboards provide good visibility into log collection. A user can create multiple dashboards to fulfill a specific need. In this task, we can combine different saved searches and visualizations to create a custom dashboard for VPN log visibility.

Creating a Custom Dashboard

By now, we have saved a few `Searches` from the `Discover tab`, created some `Visualizations`, and saved them. It's time to explore the dashboard tab and create a custom dashboard. The steps to create a dashboard are:

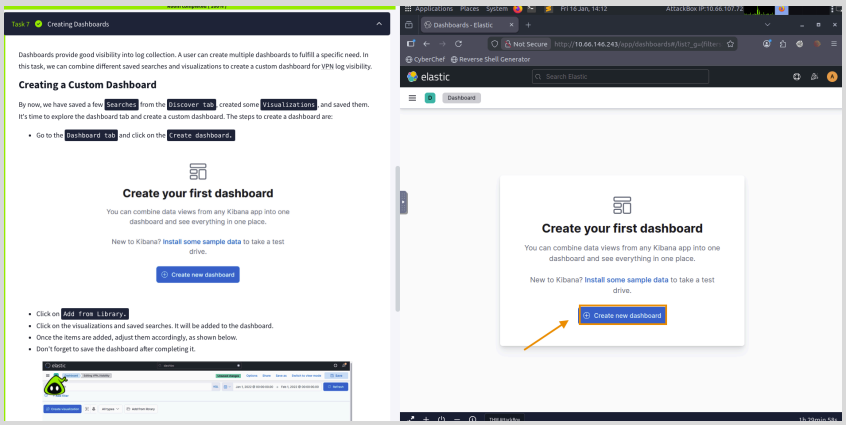
- Go to the `Dashboard tab` and click on the `Create dashboard.`



- Click on `Add from Library.`
- Click on the visualizations and saved searches. It will be added to the dashboard.
- Once the items are added, adjust them accordingly, as shown below.
- Don't forget to save the dashboard after completing it.

Answer the questions below

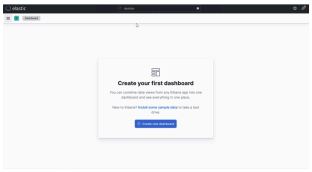
Create the dashboard containing the available visualizations.



New to Kibana? Install some sample data to take a test drive.

Create new dashboard

- Click on `Add from Library.`
- Click on the visualizations and saved searches. It will be added to the dashboard.
- Once the items are added, adjust them accordingly, as shown below.
- Don't forget to save the dashboard after completing it.

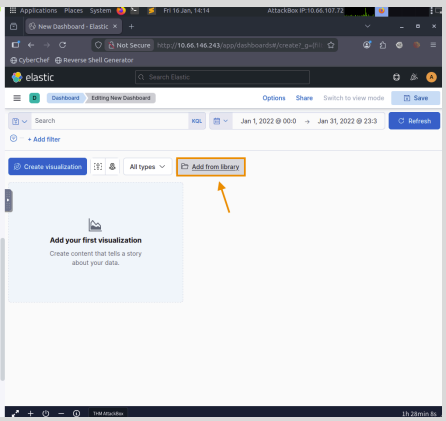


Answer the questions below

Create the dashboard containing the available visualizations.

No answer provided

✓ Correct Answer



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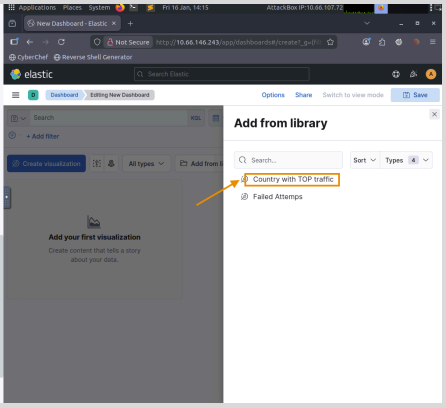

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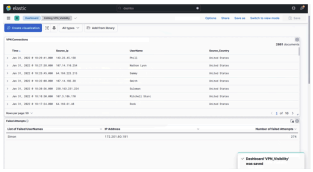
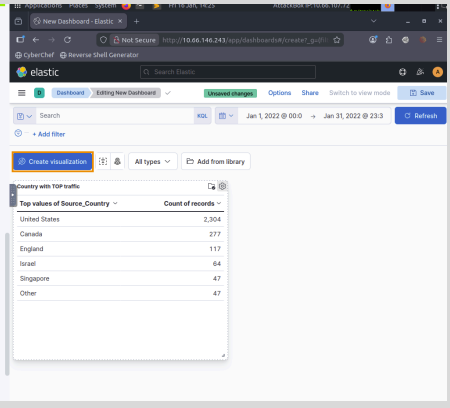


Answer the questions below

Create the dashboard containing the available visualizations.

No answer provided

✓ Correct Answer



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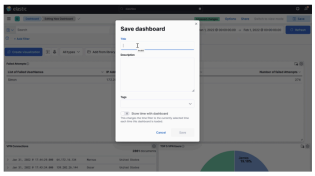

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Create the dashboard containing the available visualizations.

No answer provided

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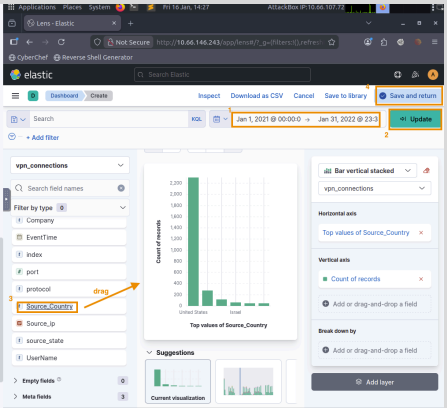

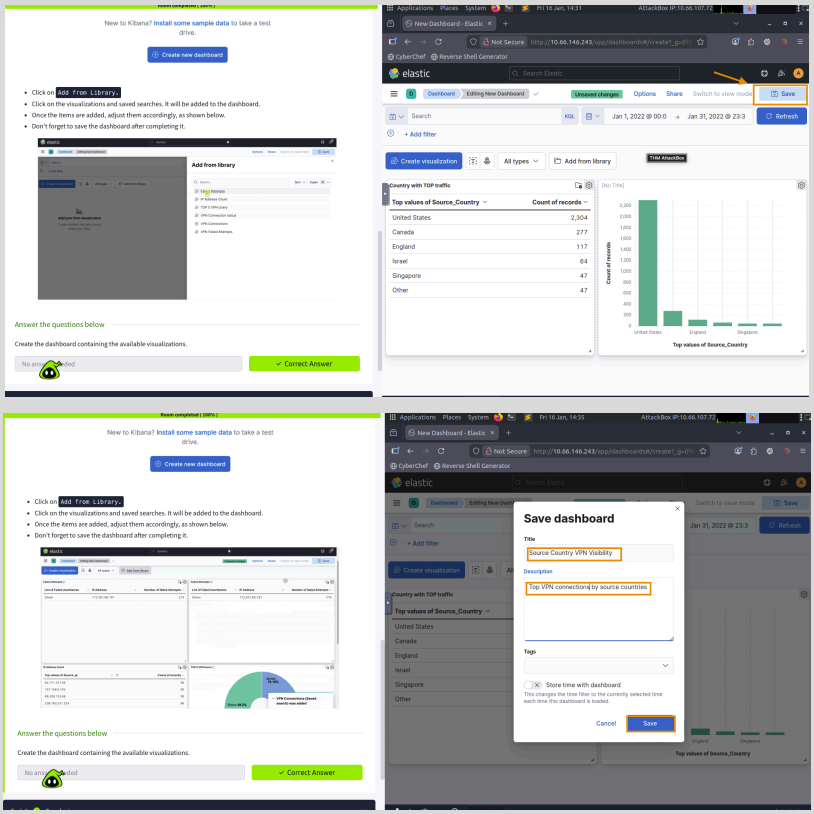

Task 8 Conclusion

Congratulations! We have learned about the Elastic Stack (ELK), a widely used tool in the Security Operations Center (SOC). As a SOC analyst, we now understand the working ELK, which is not a traditional SIEM but is widely used by SOC teams as a SIEM solution.

We explored the key components of ELK, which involve collecting, parsing, searching, and displaying a vast number of logs. We also saw its powerful searching capabilities within logs. We put ourselves in the shoes of an SOC analyst and investigated an organization's VPN logs from within ELK. Lastly, we practiced making visualizations and dashboards within ELK, which gives a single pane of glass for detecting malicious patterns.

Answer the questions below

Complete the room.