
# Amazon Elasticsearch Service

**Fully managed, reliable, and scalable Elasticsearch service.**

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## Easy and Scalable Log Analytics

## Inside a VPC

## Lab Instructions

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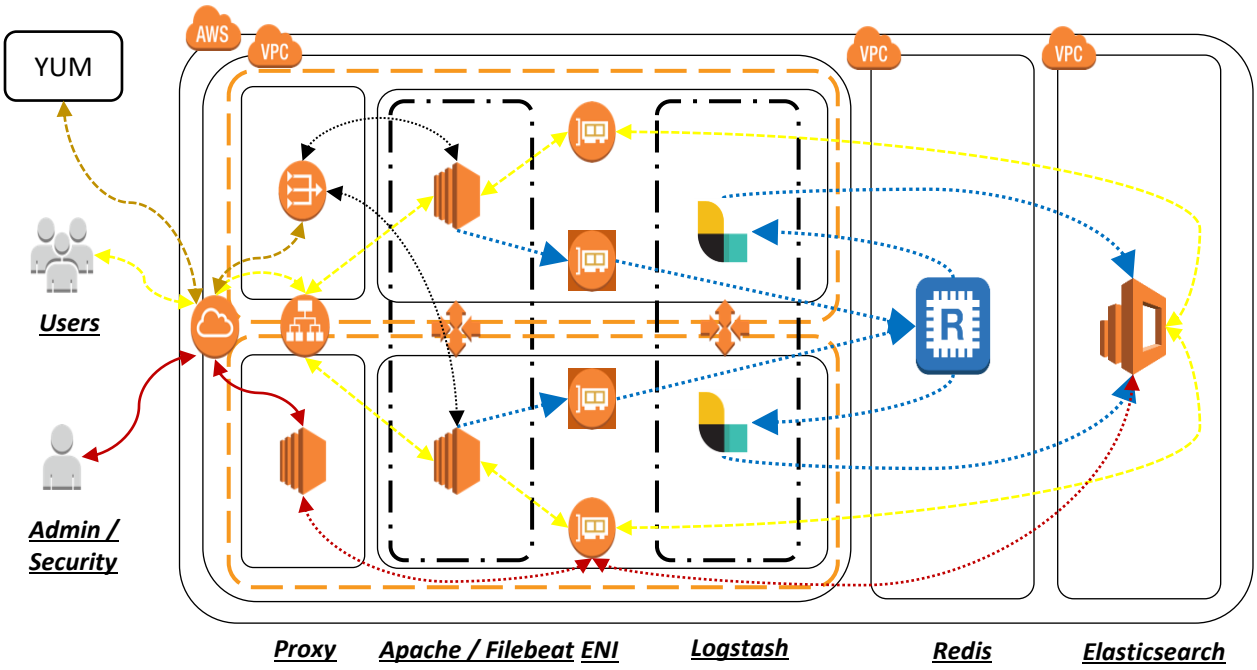
## Lab Overview




In this lab, you will build a working web application, served from within your VPC and complete with a logging back end provided by Amazon Elasticsearch Service and with real-time monitoring with Kibana. The application provides a movie search experience across 5,000 movies, powered by Amazon ES and served with Apache httpd and PHP. The logging infrastructure sends the httpd web logs to Amazon ES via Amazon ElastiCache for Redis, which we use to buffer the log lines, and Logstash, which transforms and delivers records to Amazon ES.

All components of the solution reside in a VPC. In this lab, we explore how to use Amazon ES in a VPC for scalable log handing as well as for full text search. In addition to the application and logging infrastructure, you will deploy an internet gateway to allow traffic to flow to your application via an Application Load Balancer, and a proxy/bastion instance to allow administrative and Kibana access.

For the logging infrastructure, we use Filebeat and Logstash on EC2, Amazon ElastiCache for Redis and of course Amazon Elasticsearch Service. Filebeat is a host-based log shipper that remembers its location if interrupted. Logstash collects, transforms and pushes your data to your desired store which in this case is an Amazon Elasticsearch Service Domain. The combination of these items gives a flexible, configurable, private networked option within VPC that will allow you to scale as your volume increases.

## Lab Goals

- Deploy a secure end to end solution within VPC Private Networking
- Host two indexes (movies and logs) with which the solution interacts
- Leverage managed services from AWS and popular tools from the Elasticsearch ecosystem
- Visualize the log interactions with Kibana

## Lab Materials

The majority of this lab will be controlled with nested CloudFormation templates. The templates will enable you to create the necessary resources needed to achieve the goals of the lab without worrying about the details of getting the components set up to create the solution.

The organization of the templates are as follows:

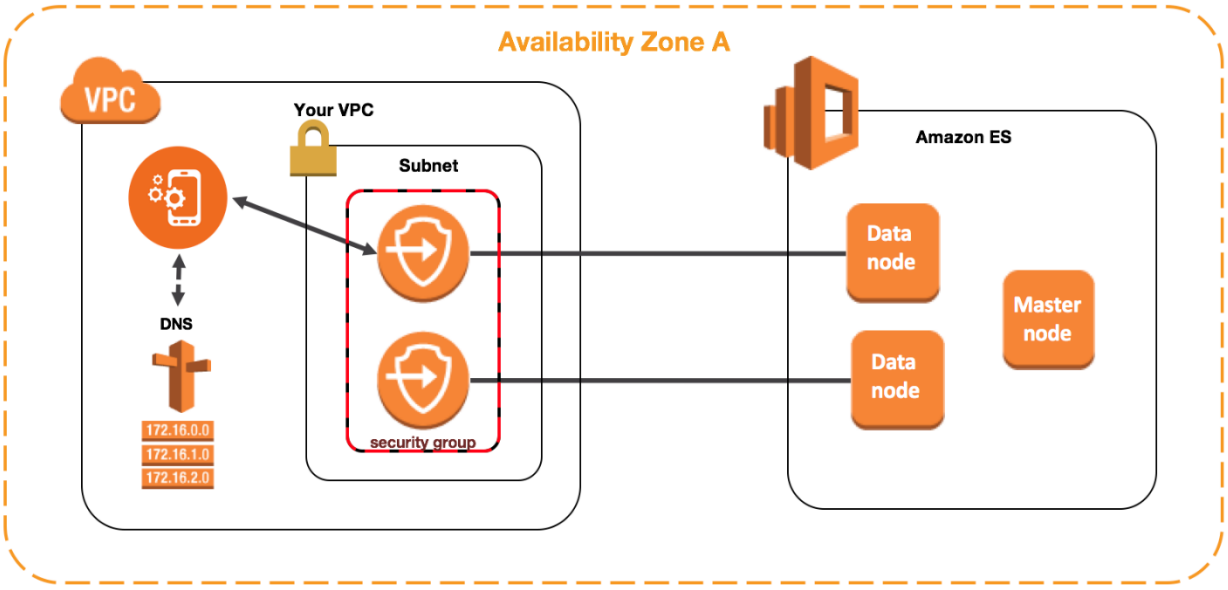
1) **bootcamp-aes-moas** – This template wraps the other templates below to provide a single template that you can execute to deliver all of the infrastructure.
2) **bootcamp-aes-network** – builds the VPC, subnets, and NAT gateway and bastion used for the lab activities and hosting the SSH Tunnel and proxy to the Amazon ES domain.
3) **bootcamp-aes-redis** – builds the Amazon ElastiCache for Redis cluster.
4) **bootcamp-aes-domain** – builds the Amazon Elasticsearch Service domain
5) **bootcamp-aes-logstash** – builds a logstash deployment behind an Auto Scaling Group that pulls from Redis and pushes into the Amazon Elasticsearch Domain.
6) **bootcamp-aes-servers** – builds the final layer, the web application. From this layer, requests are logged each time the user interacts with the website; an IMDB search engine.

## Amazon Elasticsearch Service Feature Details

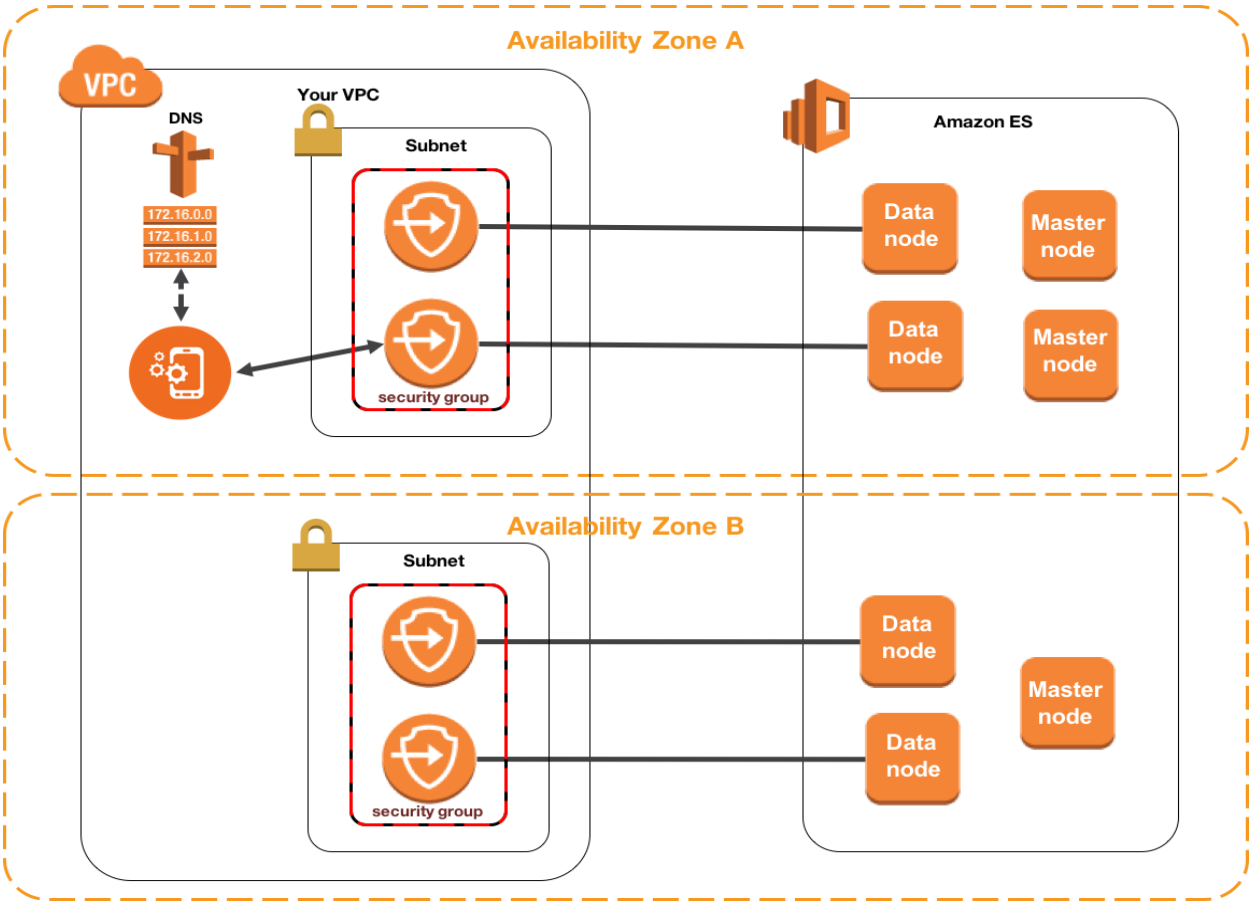
Placing an Amazon ES domain within a VPC enables secure communication between Amazon ES and other services without the need for an Internet gateway, NAT device, or VPN connection. All traffic remains securely within the AWS Cloud. Domains that reside within a VPC have an extra layer of security when compared to domains that use public endpoints: you can use security groups as well as IAM policies to control access to the domain.

To support VPCs, Amazon ES places an endpoint into either one or two subnets of your VPC. A subnet is a range of IP addresses in your VPC. If you enable zone awareness for your domain, Amazon ES places an endpoint into two subnets. The subnets must be in different Availability Zones in the same region. If you don't enable zone awareness, Amazon ES places an endpoint into only one subnet.

The following illustration shows the VPC architecture if zone awareness is not enabled.




The following illustration shows the VPC architecture if zone awareness is enabled.




Amazon ES also places elastic network interfaces (ENIs) in the VPC for each of your data nodes. Amazon ES assigns each ENI a private IP address from the IPv4 address range of your subnet and also assigns a public DNS hostname (which is the domain endpoint) for the IP addresses. You must use a public DNS service to resolve the endpoint (which is a DNS hostname) to the appropriate IP addresses for the data nodes:

- If your VPC uses the Amazon-provided DNS server by setting the enableDnsSupport option to true (the default value), resolution for the Amazon ES endpoint will succeed.
- If your VPC uses a private DNS server and the server can reach the pubic authoritative DNS servers to resolve DNS hostnames, resolution for the Amazon ES endpoint will also succeed.

# Getting Setup

## Key Pairs

In order to access the EC2 instances deployed by the lab, you need an SSH key pair. You can generate a key pair by following the instructions below.

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-key-pairs.html#how-to-generate-your-own-key-and-import-it-to-aws

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-key-pairs.html#having-ec2-create-your-key-pair

Windows - http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/putty.html#putty-private-key

## Connection to the bastion / proxy server

Depending on your operating system, there are two paths you can take. They are Windows via Putty or some other terminal service or through an SSH client. Follow the instructions based on your OS.

### Windows

#### *Have Your Favorite SSH Client Ready*

To complete this lab, you will need to be connect to the EC2 instance that is the bastion/portal. Make sure you have the necessary software.

https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

#### *Connect to the server*

http://docs.aws.amazon.com/quickstarts/latest/vmlaunch/step-2-connect-to-instance.html#putty

### Mac / Linux

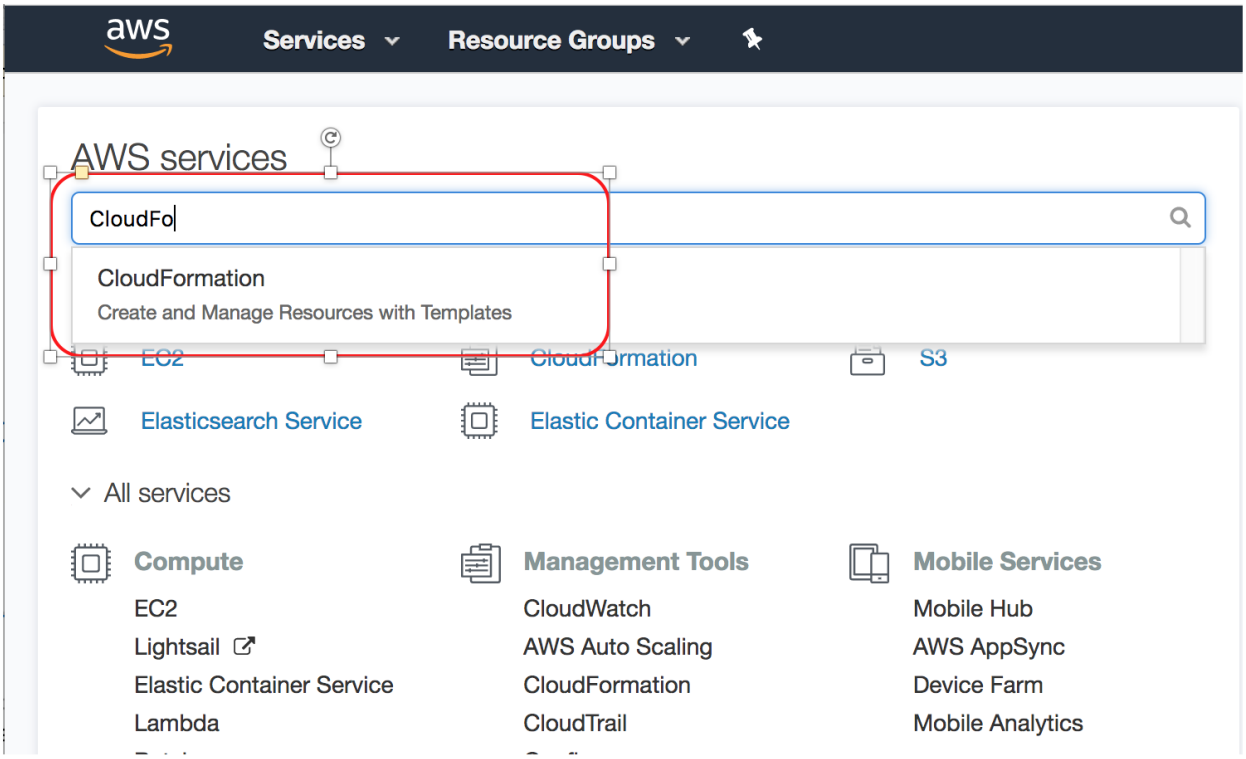
Your OS should already have a built in OpenSSH client. If not please install it with these directions (https://www.openssh.com/) and connect to your instance based on these following instructions.

http://docs.aws.amazon.com/quickstarts/latest/vmlaunch/step-2-connect-to-instance.html#sshclient

# Building the solution

## Install the CloudFormation template

### Sign into your AWS account and navigate to the CloudFormation service

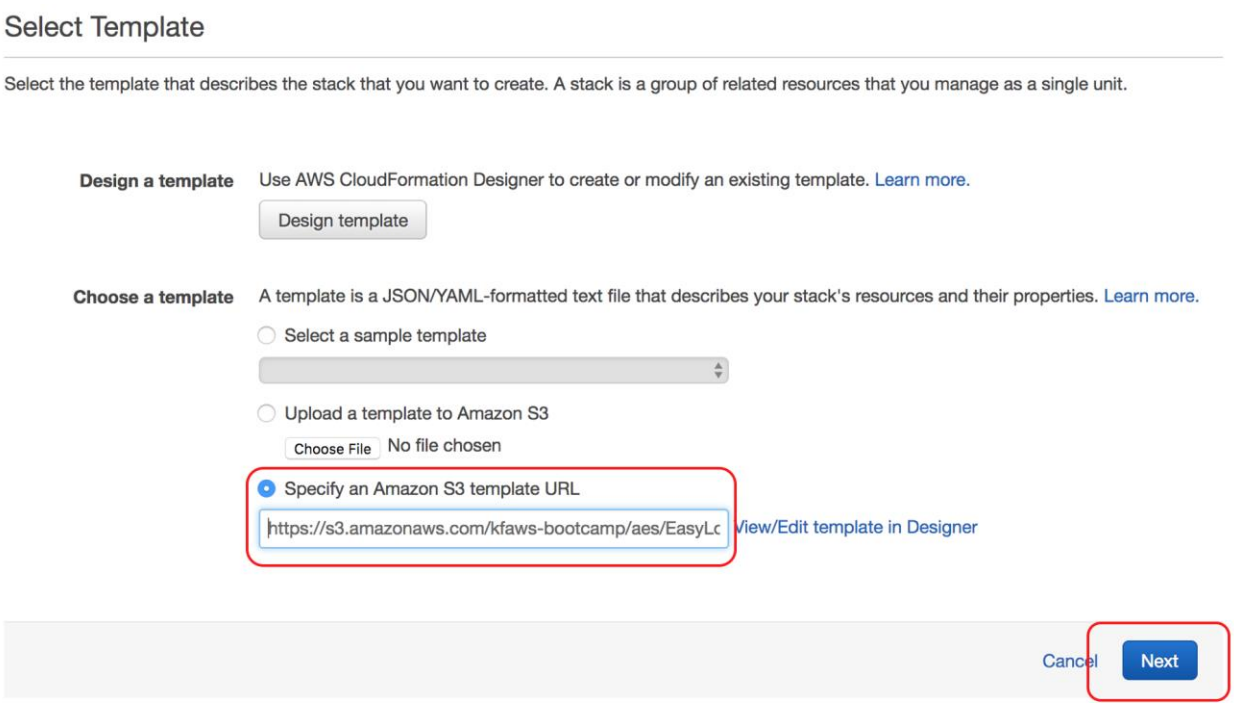



Click on the CloudFormation service to get into the service console.

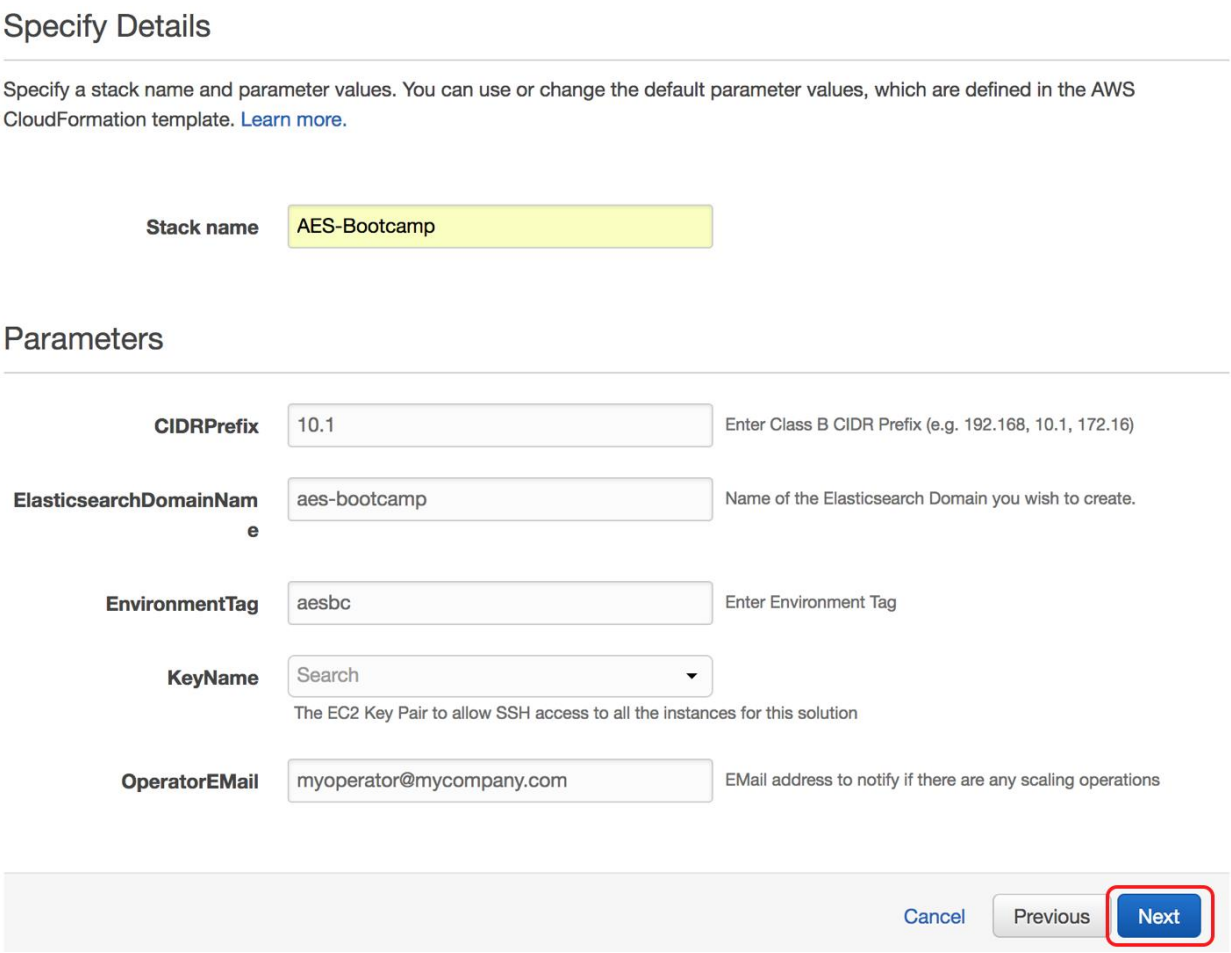
### Navigate to the Create Stack button to create the network stack

Once you click on the Create Stack button, you will be presented with the following options set.

Select the "Specify an Amazon S3 template URL" and enter the following path: https://s3.amazonaws.com/kfaws-bootcamp/aes/EasyLogAnalyticsPrivateVPC/nested/bootcamp-aes-moas. Click on the next button to navigate to the parameters needed to enact the CloudFormation template.



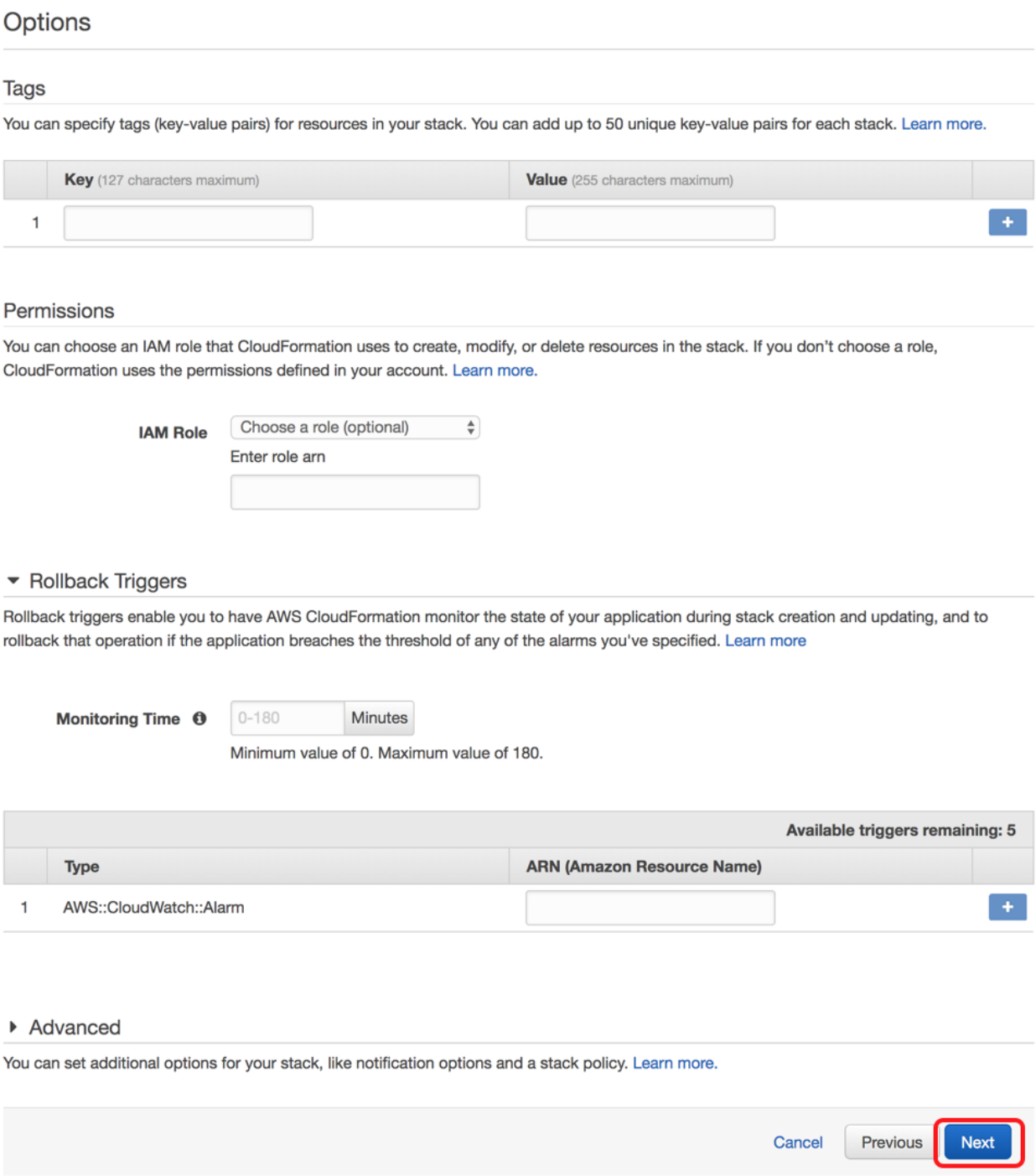

Populate the parameters needed to create the stack



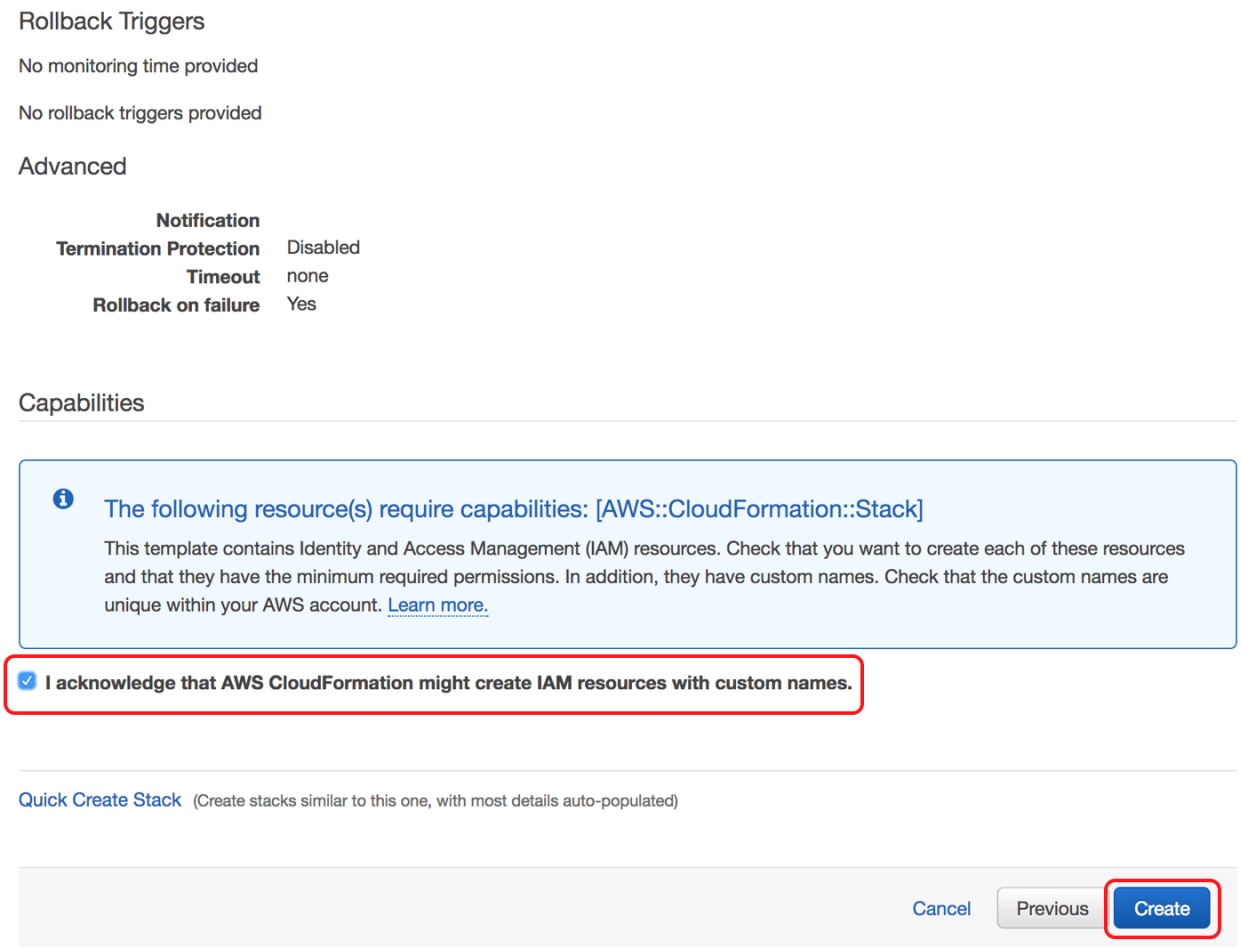

Let's review the inputs and their meaning:

1) Stack Name – The name for this CloudFormation stack. You will find the details on the Amazon ES domain, The IP address for the bastion, and the URL for the web server in the **Outputs** section of this stack.
2) CIDRPrefix – this B block is used for the seed to create a /21 VPC with 2 - /24 public and 2 - /24 private subnets across 2 AZs.
3) ElasticsearchDomainName – the name for your Amazon ES domain.
4) EnvironmentTag – this can be any name you like as it will differentiate your solution in the console and allow you to filter. Choose a name shorter than 12 characters.
5) KeyName – will be used for access to the bastion / portal and all other EC2 instances that will be spun up in this lab. Subsequent stacks will use these parameters.
6) OperatorEMail – Email address to receive autoscaling notifications

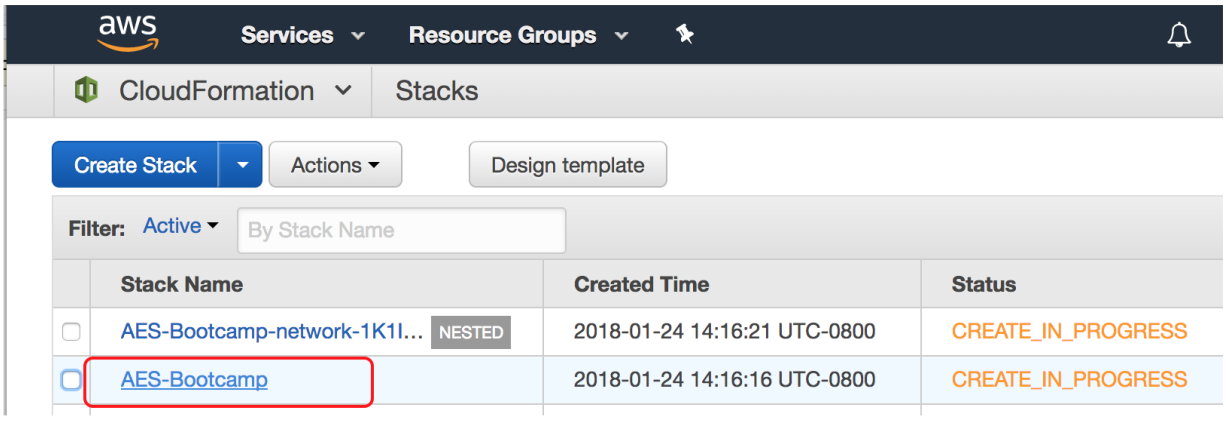
Click **Next**. Leave the options blank on the next screen and click **Next**.




Click the check box by I acknowledge that AWS CloudFormation might create IAM resources with custom names and then click Create.

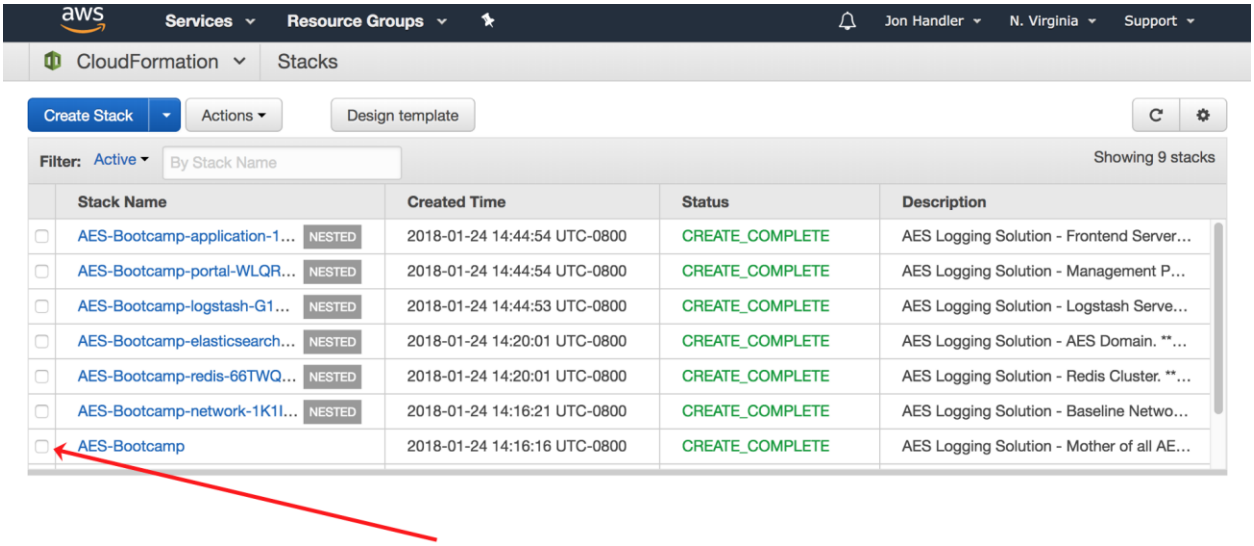



CloudFormation will kick off the deployment of the other templates to their own stacks. It can take up to 30 minutes for the whole process to complete. Click the name of your stack (**AES-Bootcamp** in my case) to see the details of the creation.

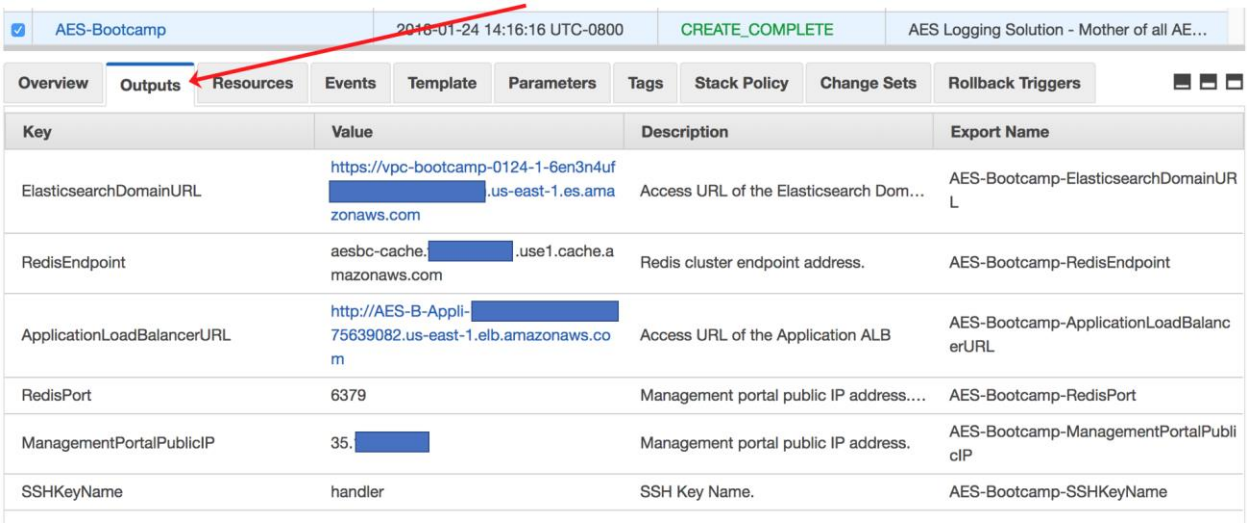



When the AES-Bootcamp stack is done, you will see it marked **CREATE_COMPLETE**.

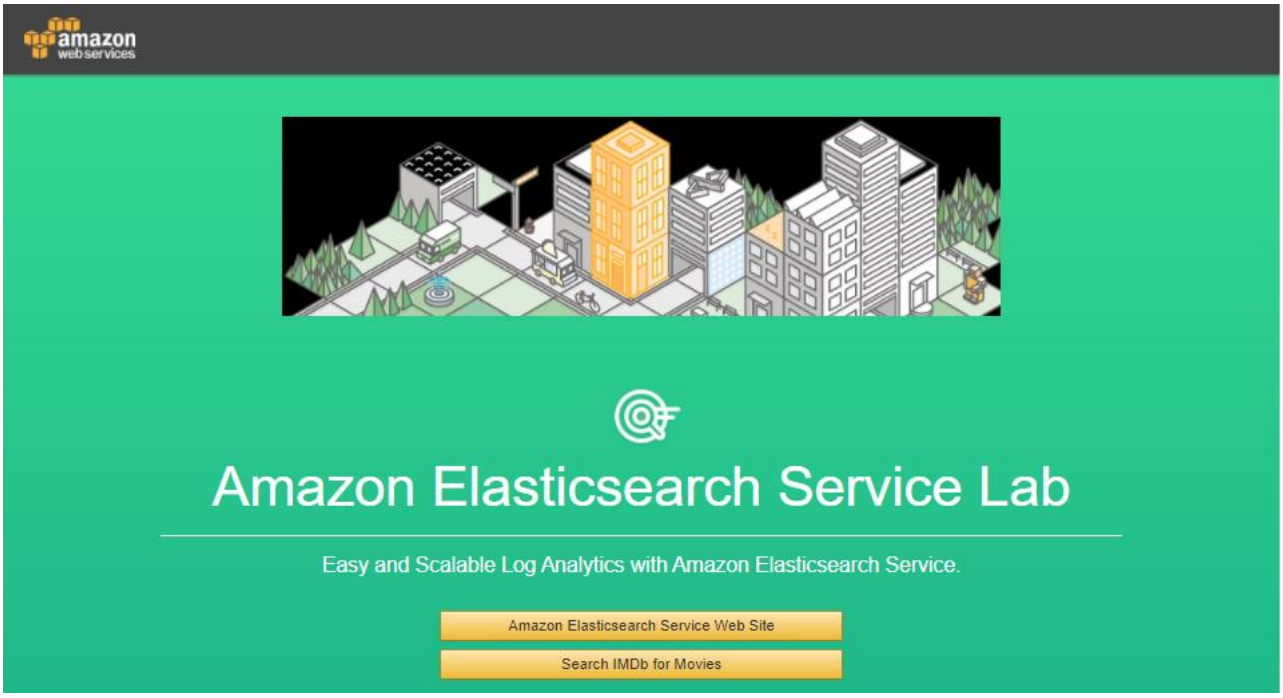
Click the check box next to **AES-Bootcamp** to reveal details.



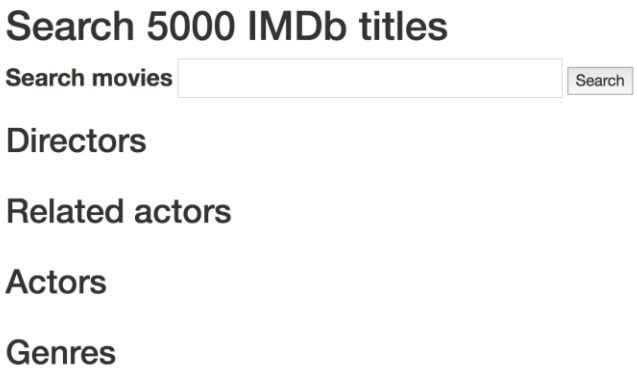

Then click the **Outputs** tab.




Here you can find all of the relevant details of your deployment. Click the ApplicationLoadBalancerURL, and you will see the introduction page for your application.




Click **Search IMDb for Movies** to hit the application




Type in a couple of words, click **Search**, and to get some search results.

# Search 5000 IMDb titles

**Search movies** Tim Burton Search

## Directors

| | |
|---|---|
| Tim Burton | 17 |
| Mike Johnson | 1 |

## Related actors

| | |
|---|---|
| Johnny Depp | 8 |
| Helena Bonham Carter | 4 |
| Michael Keaton | 3 |

## Actors

| | |
|---|---|
| Johnny Depp | 8 |
| Helena Bonham Carter | 4 |
| Michael Keaton | 3 |
| Jack Nicholson | 2 |
| Michelle Pfeiffer | 2 |

## Genres

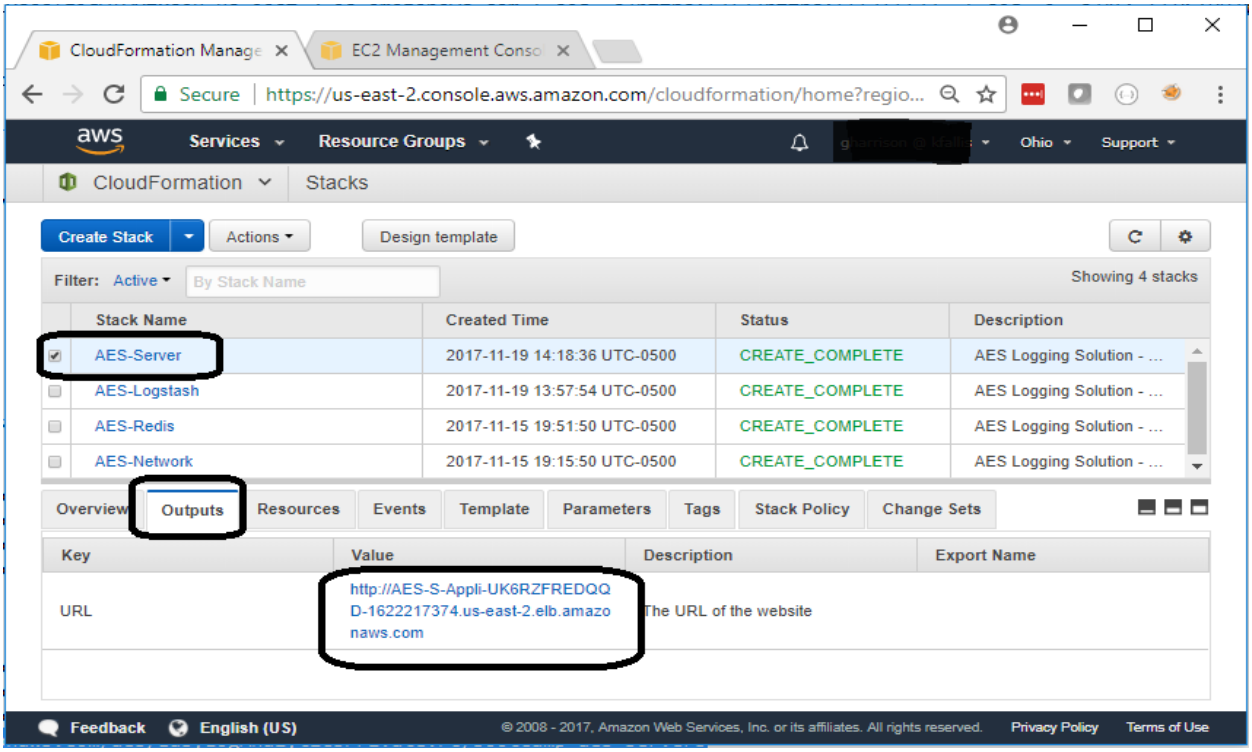
| | |
|---|---|
| Fantasy | 9 |
| Comedy | 7 |
| Adventure | 6 |
| Drama | 5 |
| Family | 4 |

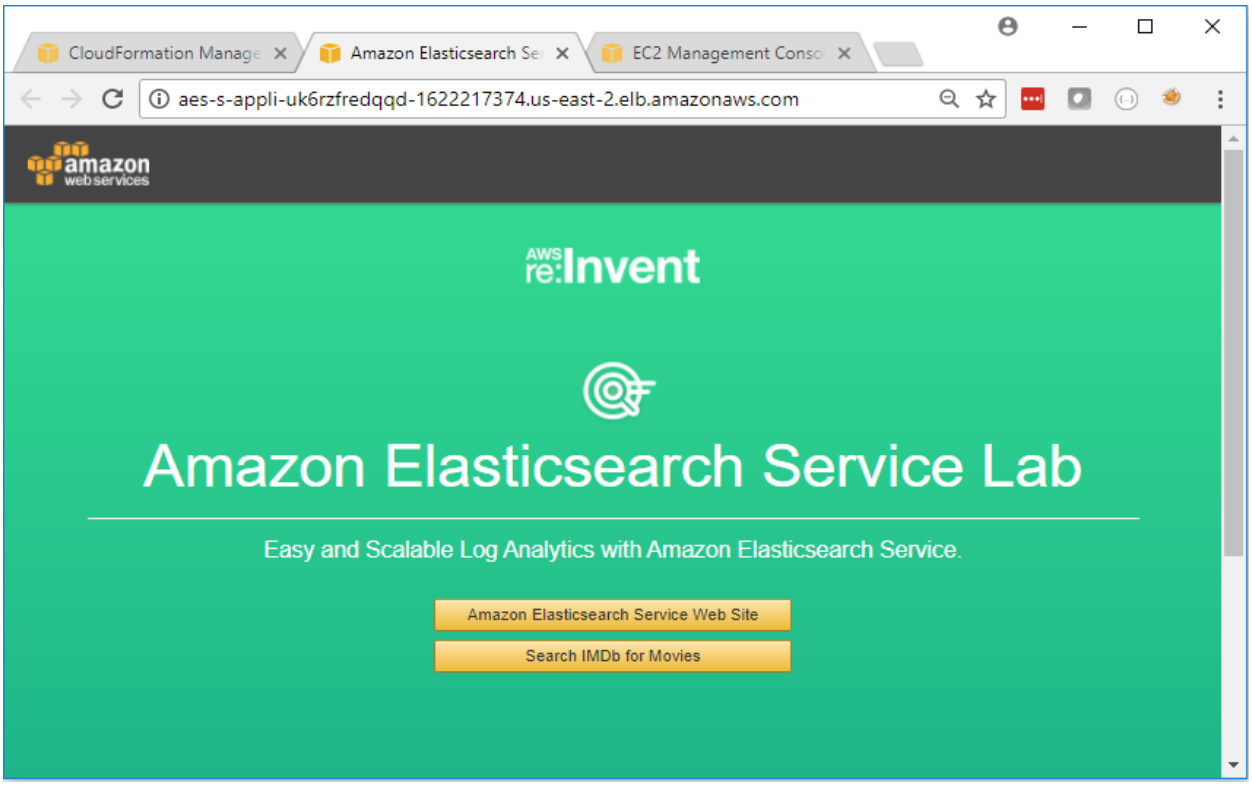

**Title:** Planet of the Apes **ID:** qEBaKmEBBlSaC1NzBcIN
*Score:* 15.323165
*Rating:* 5.6
**Plot:** An Air Force astronaut crash lands on a mysterious planet where evolved, talking apes dominant a race of primitive humans.


**Title:** Pee-wee's Big Adventure **ID:** 9b1ZKmEBnmxklk4g_0ft
*Score:* 10.91084
*Rating:* 6.8
**Plot:** When eccentric man-child Pee-Wee Herman gets his beloved bike stolen in broad daylight, he sets out across the U.S. on the adventure of his life.

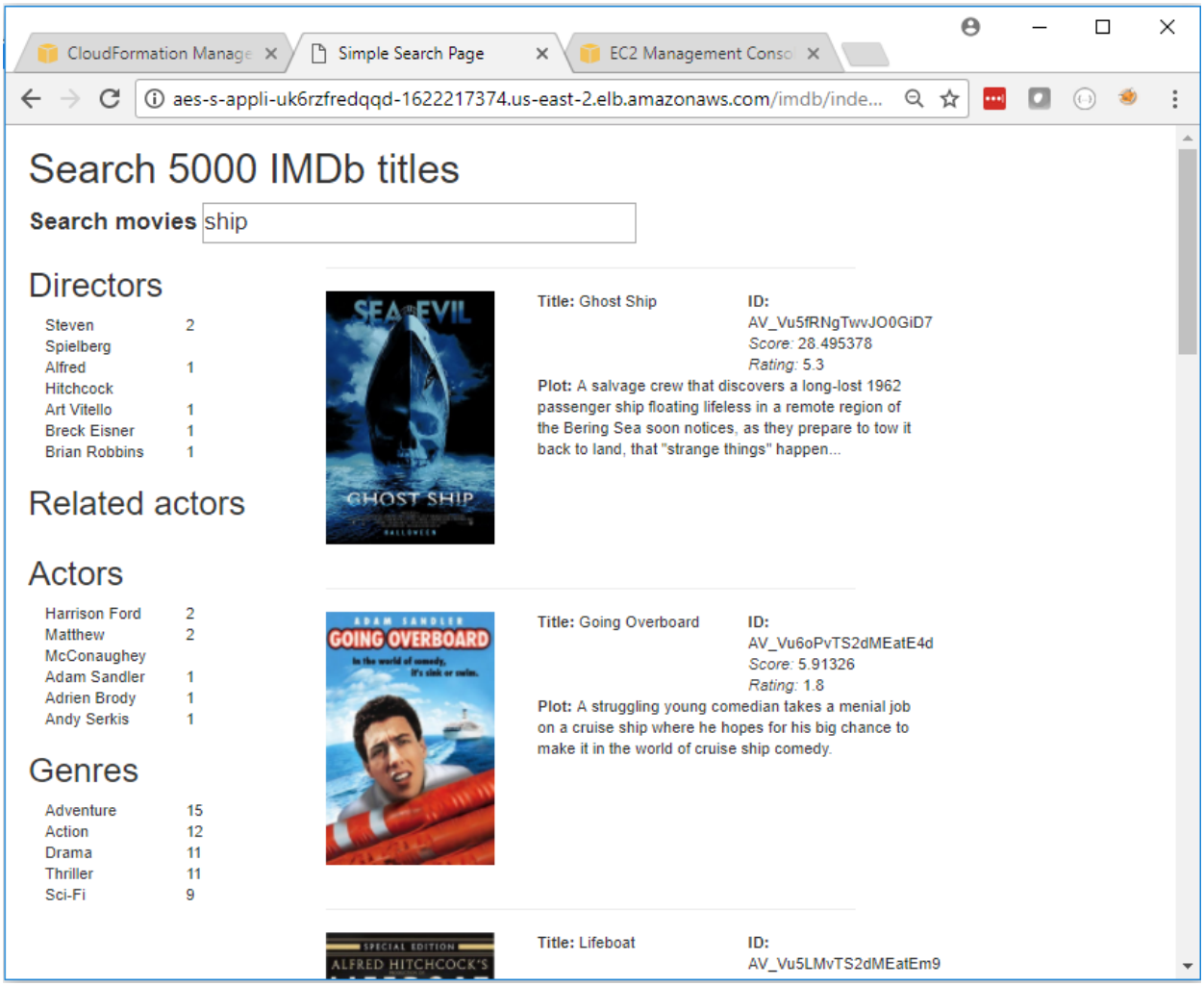
## Launch the Application

Let's go ahead and hit the website. Using the URL from the outputs section of the web server stack, navigate to the home page.



If you then navigate to the “Search IMDb for Movies” button and click on it, you will be presented with the search page. In the search box for “Search movies”, enter in something like “ship”, “car”, etc.




Now that we have the solution up and running, let’s start visualizing our data.

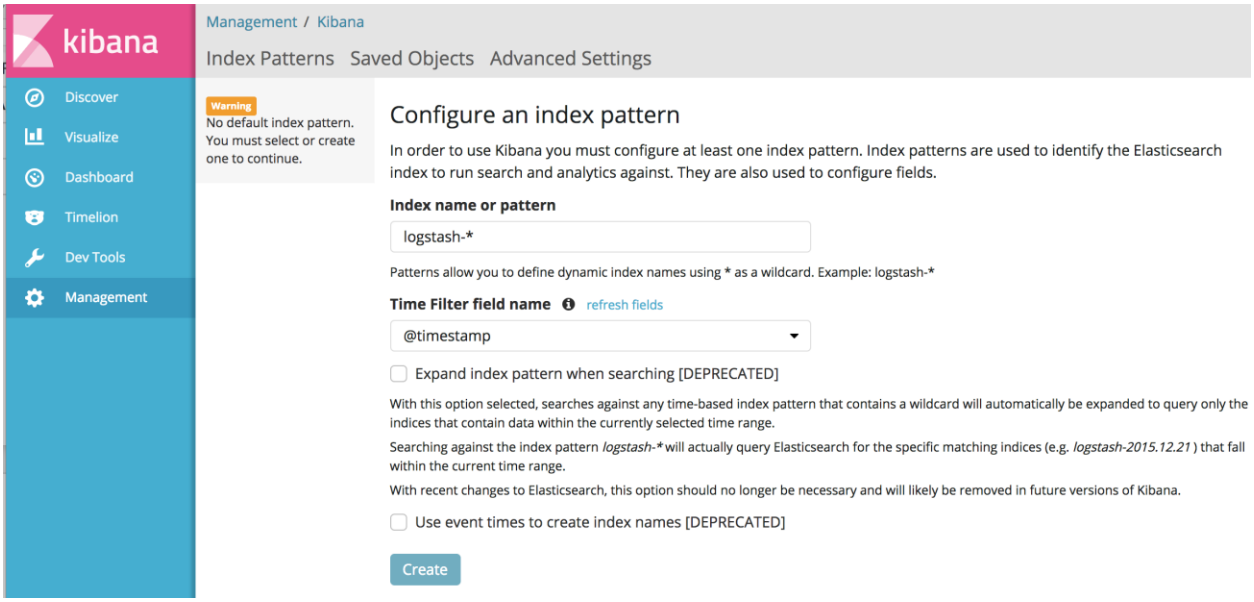
If you have not done so already, please use the instructions for creating a tunnel and a proxy to the Amazon Elasticsearch Domain.

Windows: https://kfaws-bootcamp.s3.amazonaws.com/aes/EasyLogAnalyticsPrivateVPC/Kibana_Proxy_SSH_Tunneling_Windows.pdf

Linux / Mac: https://kfaws-bootcamp.s3.amazonaws.com/aes/EasyLogAnalyticsPrivateVPC/Kibana_Proxy_SSH_Tunneling_Mac_Linux.pdf

## Visualizing your data

Open your browser and hit http://localhost:9200/_plugin/kibana. You will see a splash screen, followed by



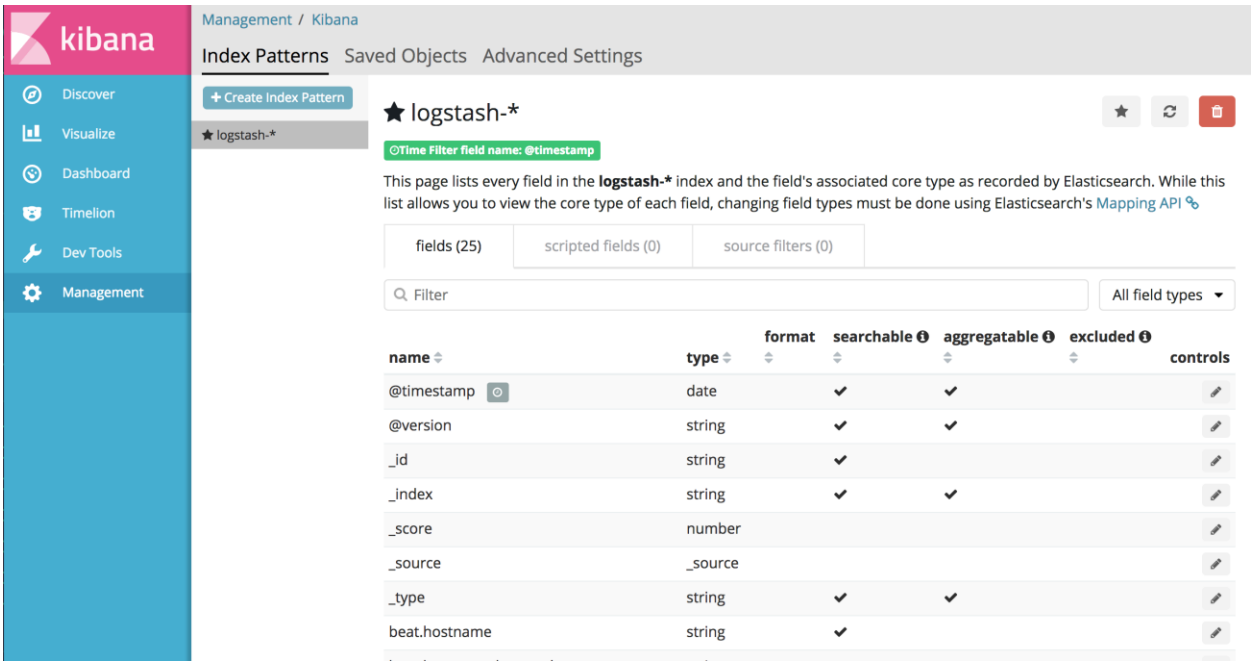

### Configure your index pattern

Kibana enables seamless access to data in your indexes through an index pattern. You specify the index pattern on the start page, and Kibana automatically figures out which indexes to hit for the time range you are displaying. You tell Kibana where to look by specifying an index pattern.

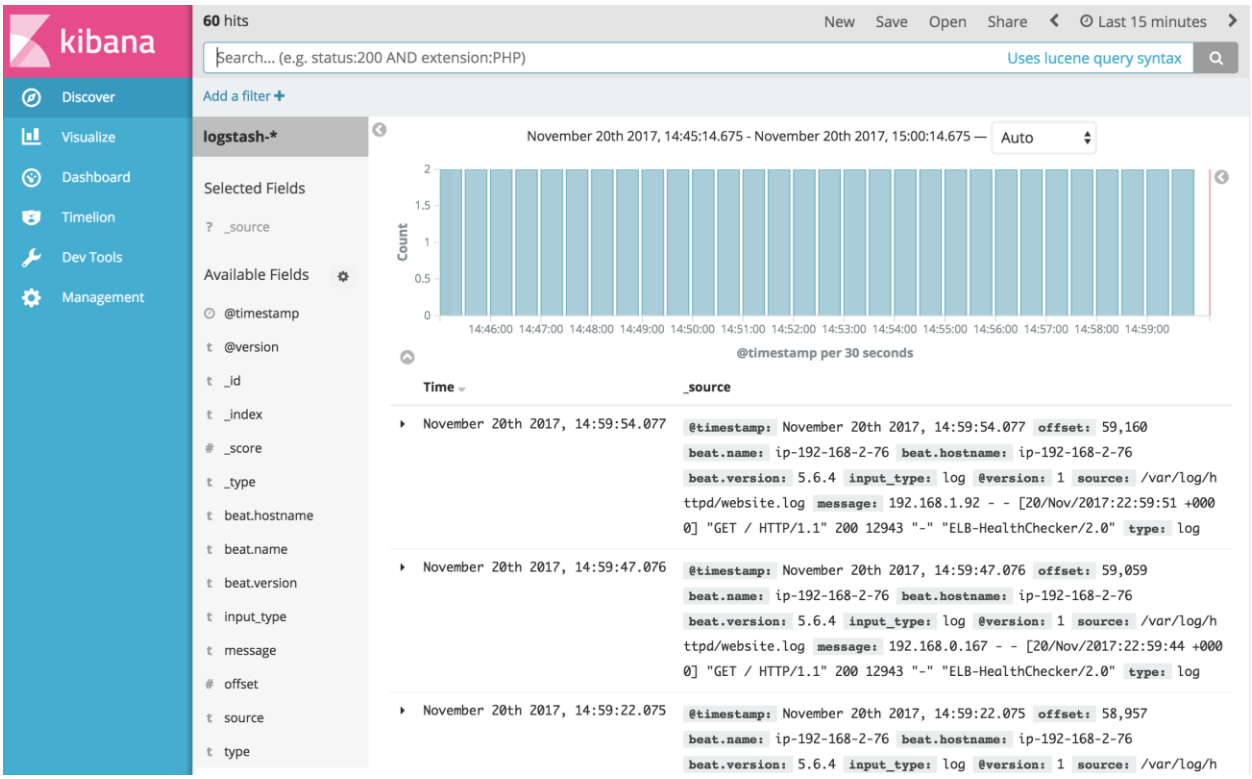
Logstash creates one index per day by default, named “Logstash-YYYY.MM.DD”. You use a wildcard to specify the pattern of these indexes, specified in the **Index name or pattern** text box. Since Kibana is designed to work with Logstash indices, the correct pattern is already filled in for you.

Kibana also uses a date field to filter to a particular time frame. This is already filled in for you in the **Time Filter field name** drop down.

Click **Create**. Kibana will show you the fields that are in your index



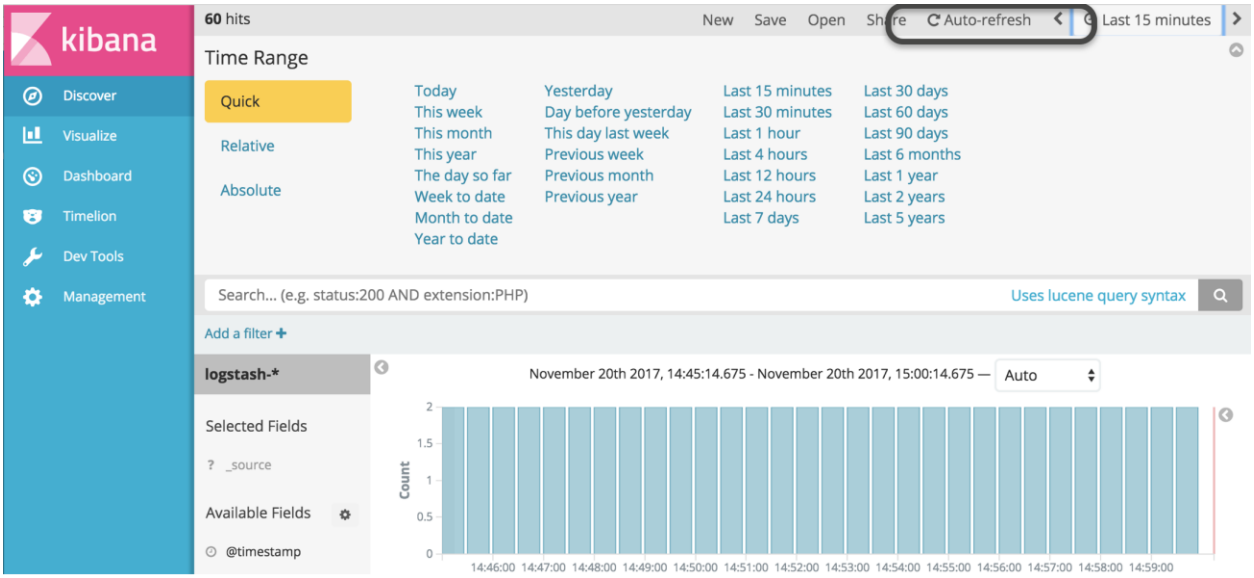

Switch to the **Discover** pane.



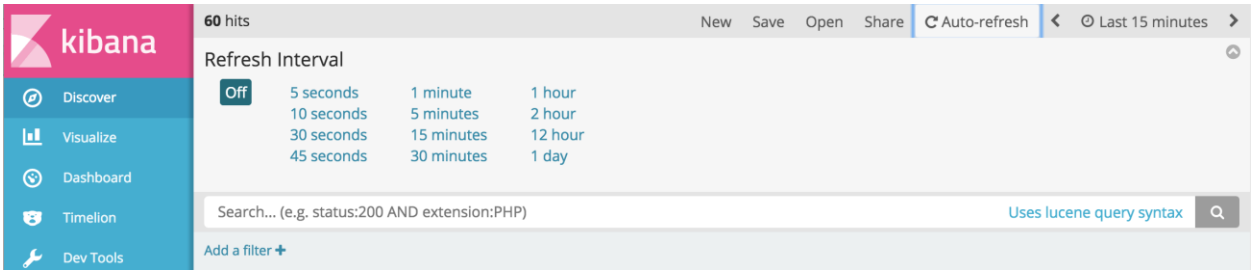

Kibana shows you a graph of the traffic, and below it a sample set of results. You can see in the top right the current time frame that you are viewing (**Last 15 minutes**). You can examine some of the log data by clicking the **disclosure triangle** next to one of the documents (log lines) below the traffic histogram.


Most or all of your data will be the same at this point.

We want to keep our visualizations up to date and Kibana will do that automatically. Click **Last 15 minutes** at the top/right of the screen to reveal the time selector. You can adjust the time range and all of Kibana's panels will update to show data from that time frame. For now, leave that set to **Last 15** minutes, and click **Auto-refresh**.




Choose 30 seconds as the Refresh interval.

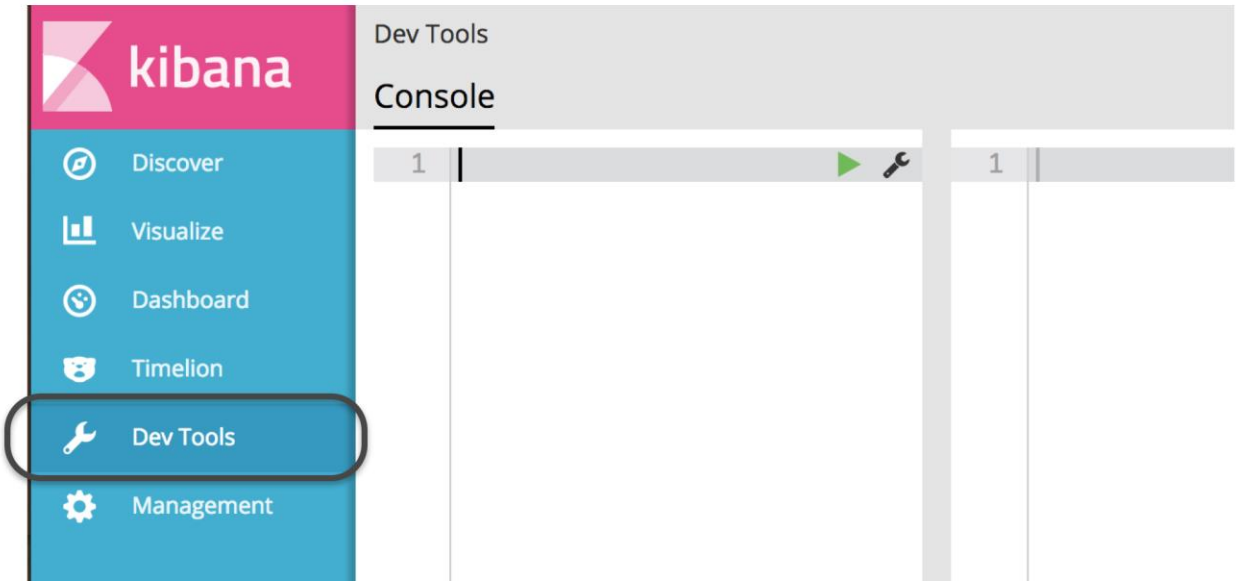



Kibana will now update every 30 seconds.

## Add a template to make your data more accessible

Elasticsearch templates let you specify settings and schema for all new indexes created in your Amazon ES domain. You use a wildcard to specify which index names should get the settings and mapping. You send your template with an HTTP PUT to the Elasticsearch _template API.

When you send log lines with Logstash to an Elasticsearch output, Logstash automatically loads a template into your cluster that matches all indexes created with the prefix “logstash-*”. To view this template, Click the “Dev Tools” tab in your Kibana UI.




Type **GET _template** and press the green arrow (notice that Kibana helps auto-complete as you type). In the right pane, you will see the default template that Logstash loads into your Amazon ES domain.

You will add a new template that stores the field data (values) for the keywords field, which records the search terms that users have typed. You can use that field data to build more complex visualizations to follow the way that people are using the movie search application.

Erase what you've typed in the left pane of the **Dev Tools** Kibana tab. Copy paste this text

```
PUT _template/template1

{

  "order": 0,

  "version": 1,

  "template": "logstash-*",

  "mappings": {

    "log": {

      "properties": {
```

```
        "keywords": {
          "type": "text",
          "include_in_all": true,
          "fielddata": true
        }
      }
    }
  }
}
```

Push the green arrow to send the command. Elasticsearch will acknowledge in the right pane.

This template and its settings will be applied to all **new** indexes you create. However, Logstash has already created an index and loaded in some log files. We can make sure the template is defined by deleting the existing index. When Logstash sends the next batch, Elasticsearch will automatically recreate the index. Type **DELETE logstash*** in the left pane and press the green arrow. Elastisearch will acknowledge in the right pane.

## Build a Kibana dashboard

Kibana has a set of visualizations that you can configure and deploy into a dashboard. When you enable **Auto-refresh**, you get near-real-time monitoring for your web server. In the following sections, you'll set up a number of visualizations and create a dashboard from those visualizations.

### A word on Elasticsearch aggregations

Kibana builds visualizations based on the Elasticsearch aggregations feature. To understand how to build visualizations, you need to understand aggregations.

Elasticsearch is a search engine first, and an analytics engine second. When you send log data into an Elasticsearch cluster, you, or the ingest technology you are using, parse each log line and build structured JSON documents from the values in it. Here's an example log line

192.168.0.167 - - [21/Nov/2017:00:15:18 +0000] "GET / HTTP/1.1" 200 12943 "-" "ELB-HealthChecker/2.0"

When Filebeat sends that line to Logstash, Logstash parses the full string, and assigns the values to JSON elements. Each element represents a single *field*, whose value is the value from the log line. Logstash parses and structures the above log line to produce


```
{
        "request": "/",
        "agent": """"ELB-HealthChecker/2.0""""",
        "auth": "-",
        "ident": "-",
        "verb": "GET",
        "referrer": """"-""""",
        "@timestamp": "2017-11-21T00:15:18.949Z",
        "response": "200",
        "bytes": "12943",
        "clientip": "192.168.0.167",
        "beat": {
                "name": "ip-192-168-2-76",
                "hostname": "ip-192-168-2-76",
                "version": "5.6.4"
        },
        "httpversion": "1.1",
        "timestamp": "21/Nov/2017:00:15:18 +0000"
```

}

When you perform a search, you specify fields (explicitly or implicitly), and values to match against those fields. Elasticsearch retrieves documents from its index whose field values match the fields you specified in the query. The result of this retrieval is called a *match set*.

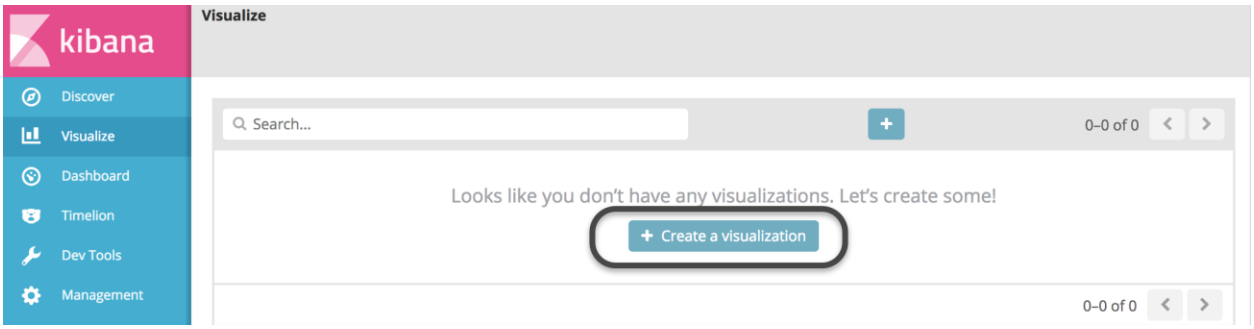
Elasticsearch then creates an aggregation by iterating over the match set. It creates buckets according to the aggregation (e.g., time slices) and calculating a numeric value (e.g., a *count*) placing each value from the document's field into the appropriate bucket. For example, a search for documents with a `@timestamp` in the range of 15 minutes ago to now might yield 60 matches. An aggregation for those values with 1 minute buckets would increment the count in the newest bucket (1 minute ago to now) for each document with a `@timestamp` in that range.

Aggregations nest. Elasticsearch can take all of the documents in a bucket and create sub-buckets based on a second field. For example, if the top-level bucket is time slices, a useful sub-bucket is the `response`. Continuing the example, Elasticsearch will create sub-buckets for each value of the `response` field present in one of the documents in that bucket. It increments a counter in the sub-bucket for each document with that sub-bucket's value. This analysis of the data can be displayed as a stacked, bar chart with one bar per time slice and height of the sub-bars proportional to the count.

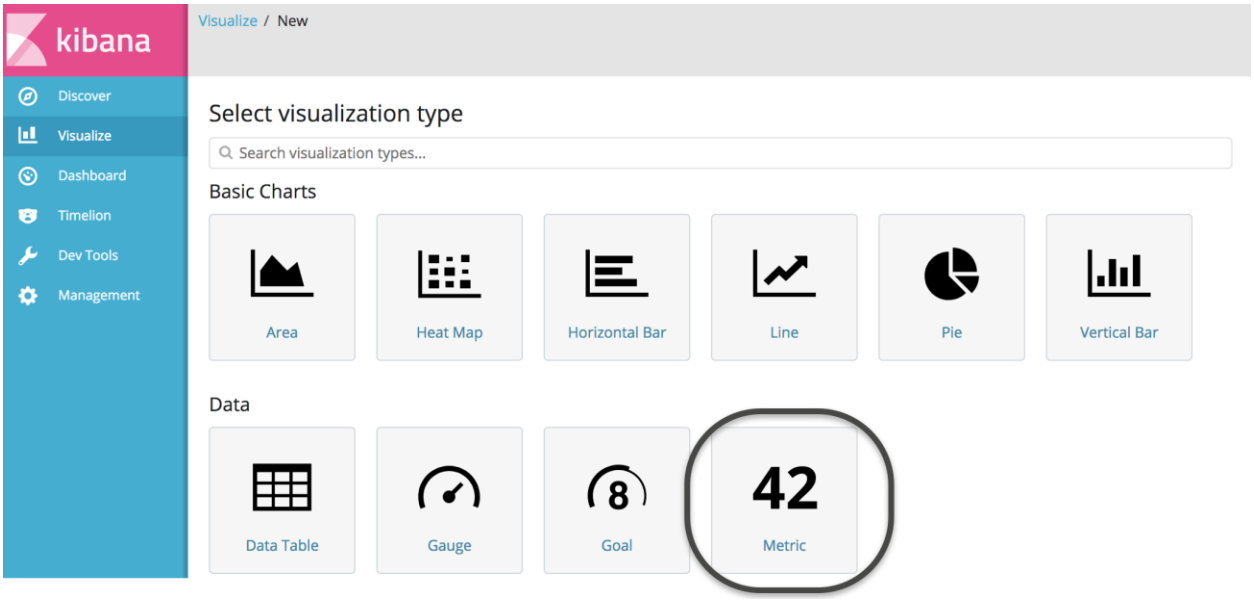
Count is not the only function that Elasticsearch can perform. It can compute sums, averages, mins, maxes, standard deviations and more. This provides a rich set of combinable functions to be the basis for Kibana to display.

## Simple metrics

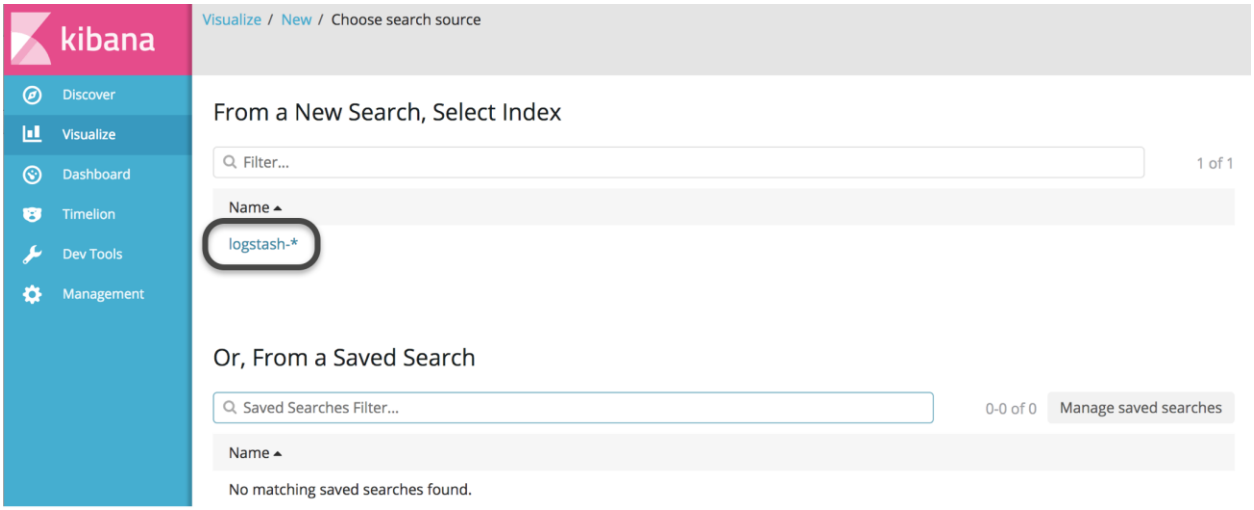
The simplest thing you can do is to count the requests to your web server and display that count as a number. Click the **Visualize** tab at the left of the Kibana page, then click **Create a visualization**.



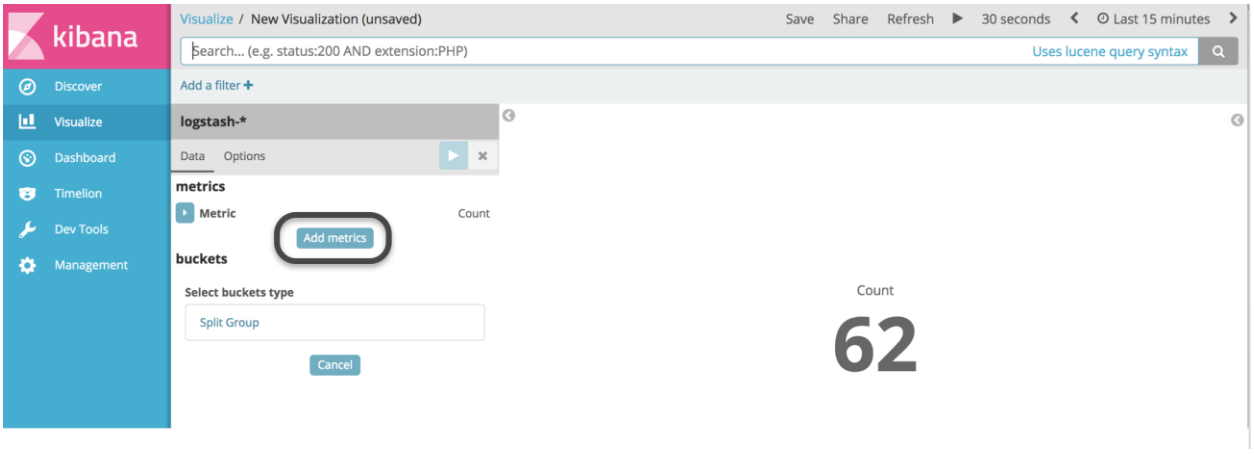

You can select from among 16 different visualizations (as of Amazon Elasticsearch Service's support for Kibana 5.5). Under **Data**, click **Metric**.



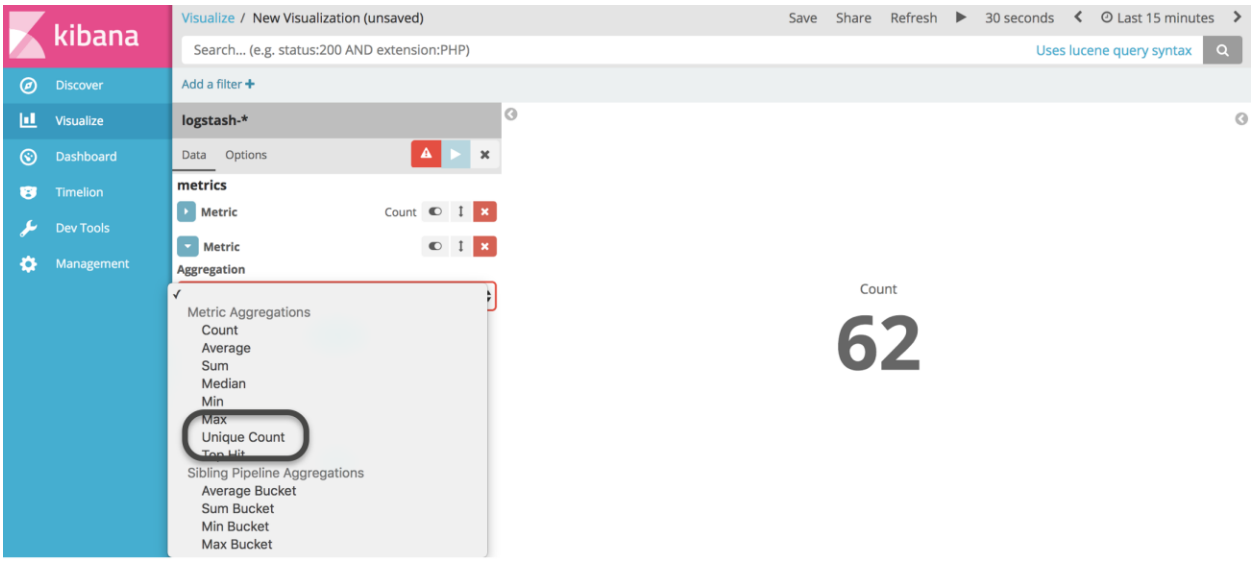

You need to tell Kibana which indexes to search, and you do that by specifying the index pattern that you want to use. Click **Logstash-***.




You'll immediately get a metric, named **Count**, that sums the total number of documents (web log lines) the domain has ingested in the last 15 minutes. Let's add to that by creating another metric that reports the unique number of hosts that have sent requests to the domain. Click **Add metrics**.

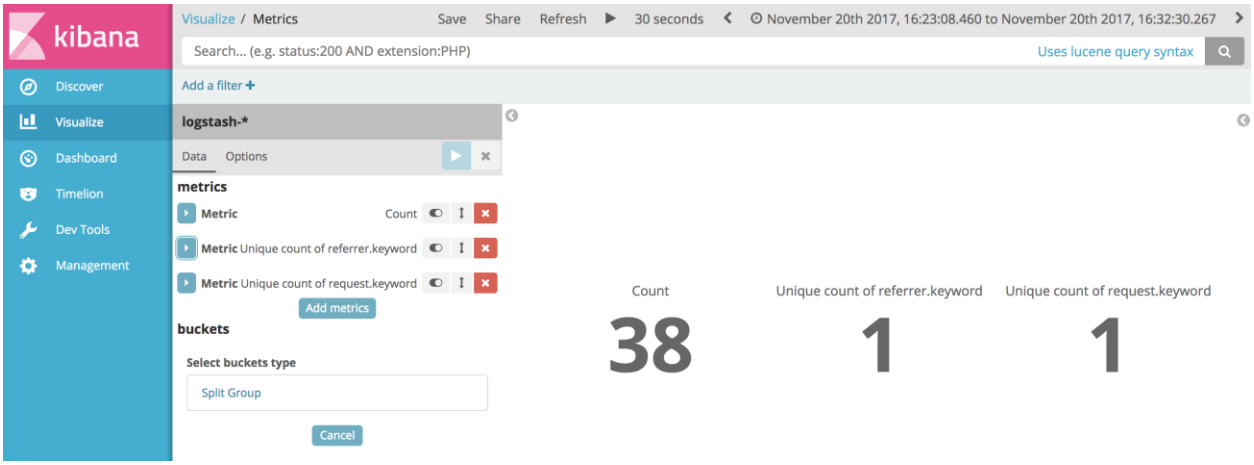



Under **Select metrics type**, click **Metric**. Open the menu under **Aggregation**, and select **Unique Count**.



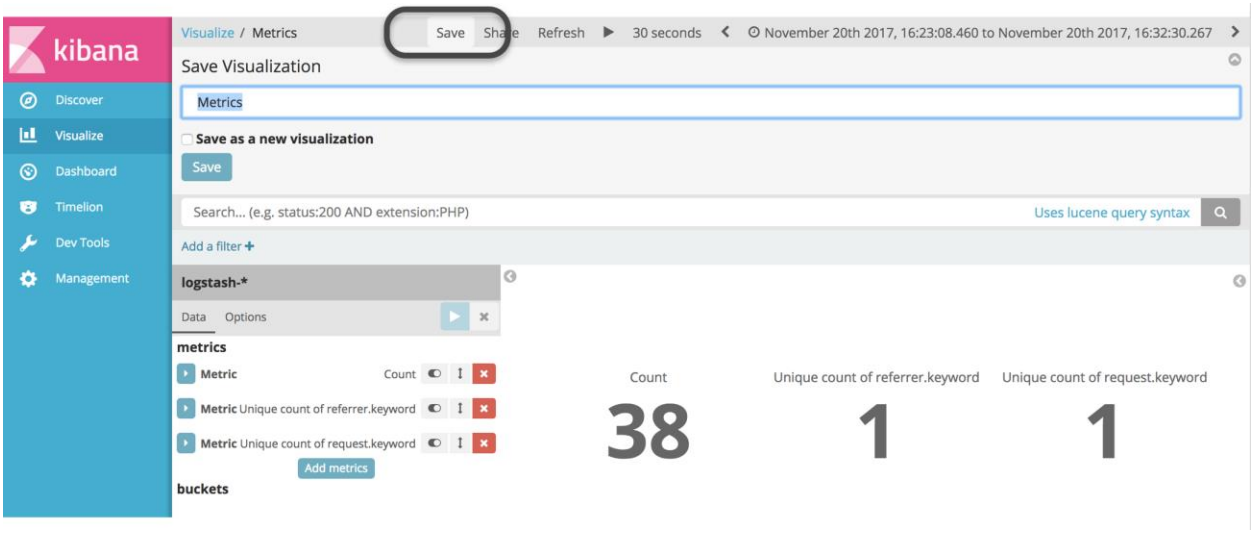

This will reveal another menu: **Field**. Select **referrer.keyword**. Click ▶ at the top of the entry panel to show the second metric in the visualization.

Repeat this process to add a **Unique Count** for the **request.keyword** field. This will let you know how many different requests are coming to your web servers. Your visualization should look like this:




At this point, all of my traffic is heartbeats from ELB, so I have only 1 source and 1 request. If you've run a couple of searches, you may have different counts.

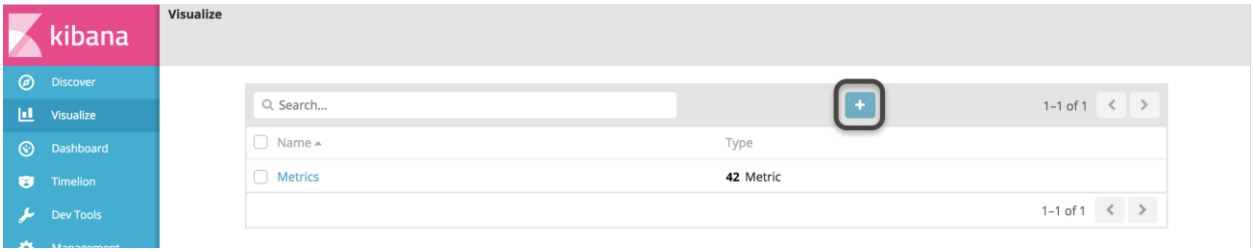
Save your visualization for later use in your dashboard. At the top of the screen, click **Save**.



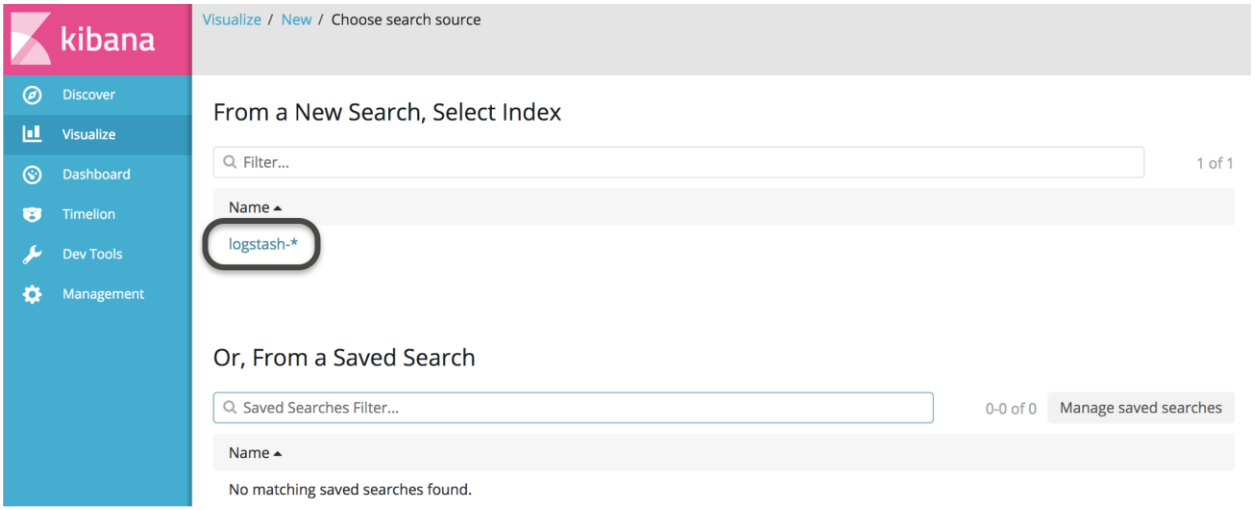

Name the visualization **Metrics**, and click the **Save** button. Navigate to the **Simple Search Page** in your browser and run a few searches. Come back to Kibana and you should see the counts increase.

## Track result codes

To make sure that your website is functioning, you need to track result codes. You can build a simple visualization to see result codes over time. Click the **Visualize** tab once, and if you see a visualization instead of the below screen, click **Visualize** again to clear it. Click the + to create a new visualization.

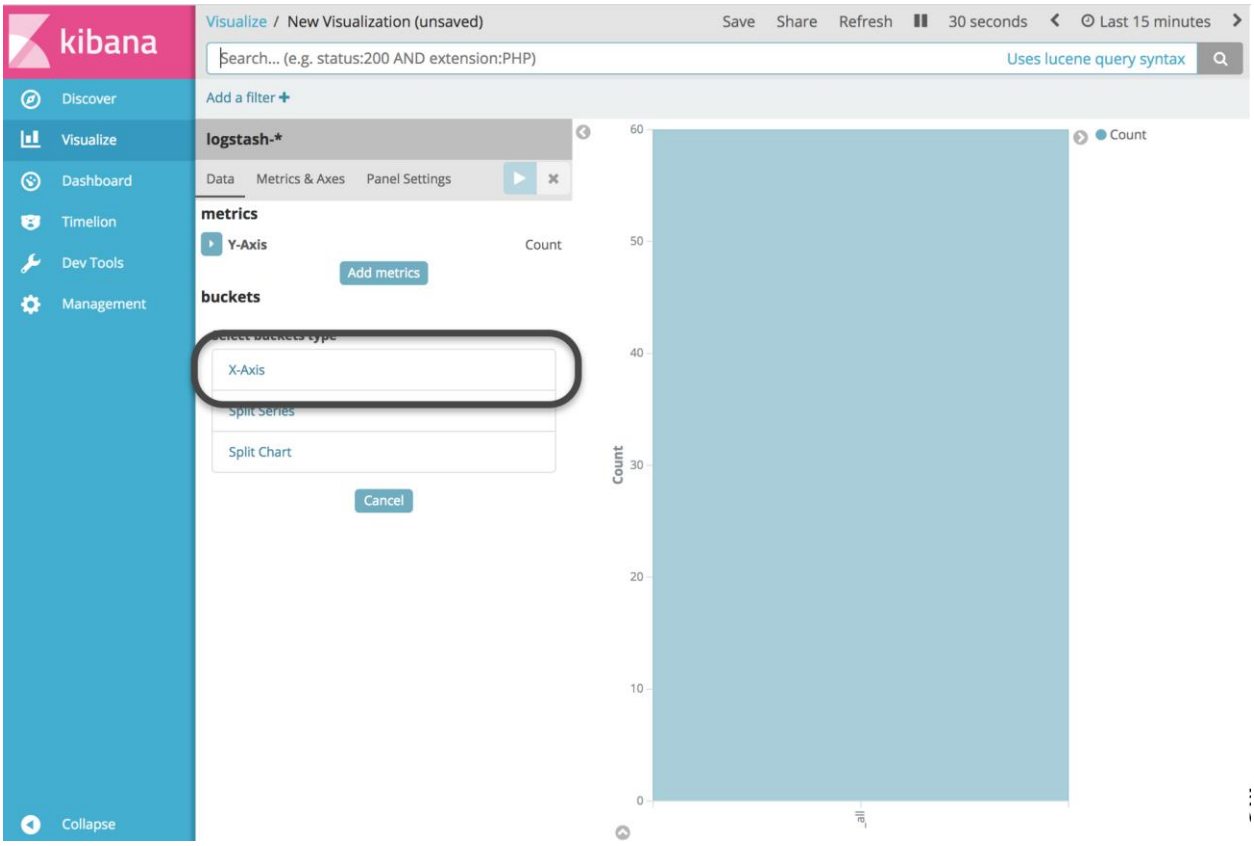


Click **Logstsah-*** under **Name** as the index pattern

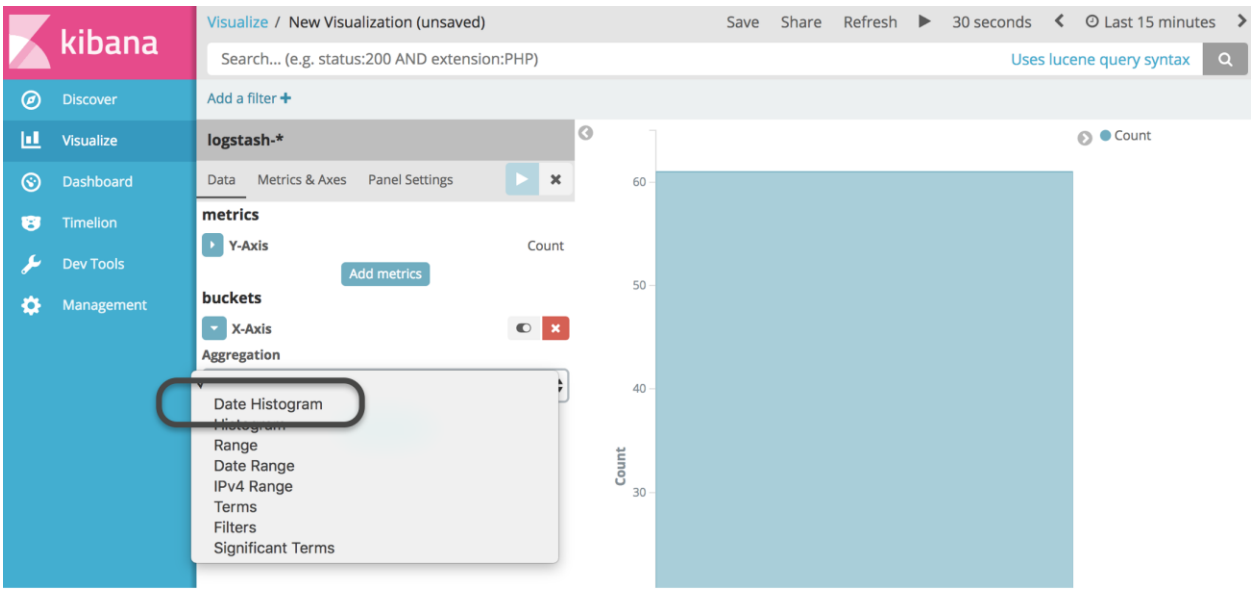



Many of the Kibana's visualizations work with both an **X** and a **Y** axis. When you build these visualizations, you'll usually start by dividing the **X** axis into time slices (a **Date Histogram** aggregation) and then further sub-dividing for the value you want to graph.

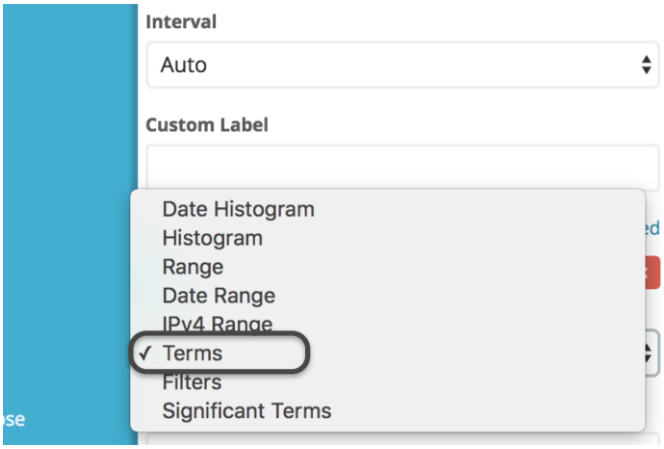
Under **Buckets**, click **X-Axis**.



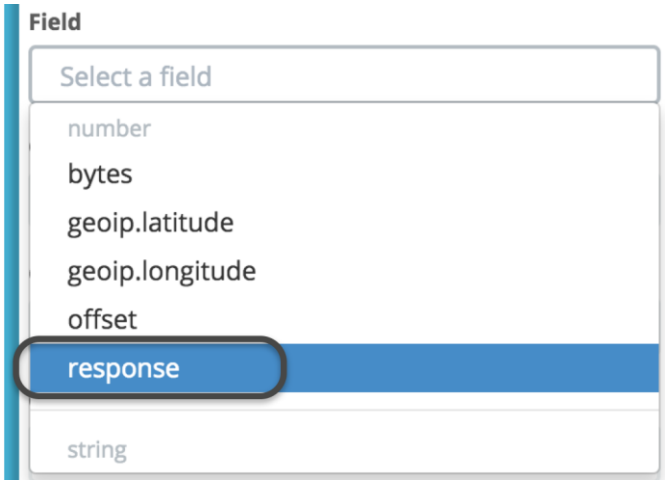

Then, select **Date Histogram** from the **Aggregation** menu.



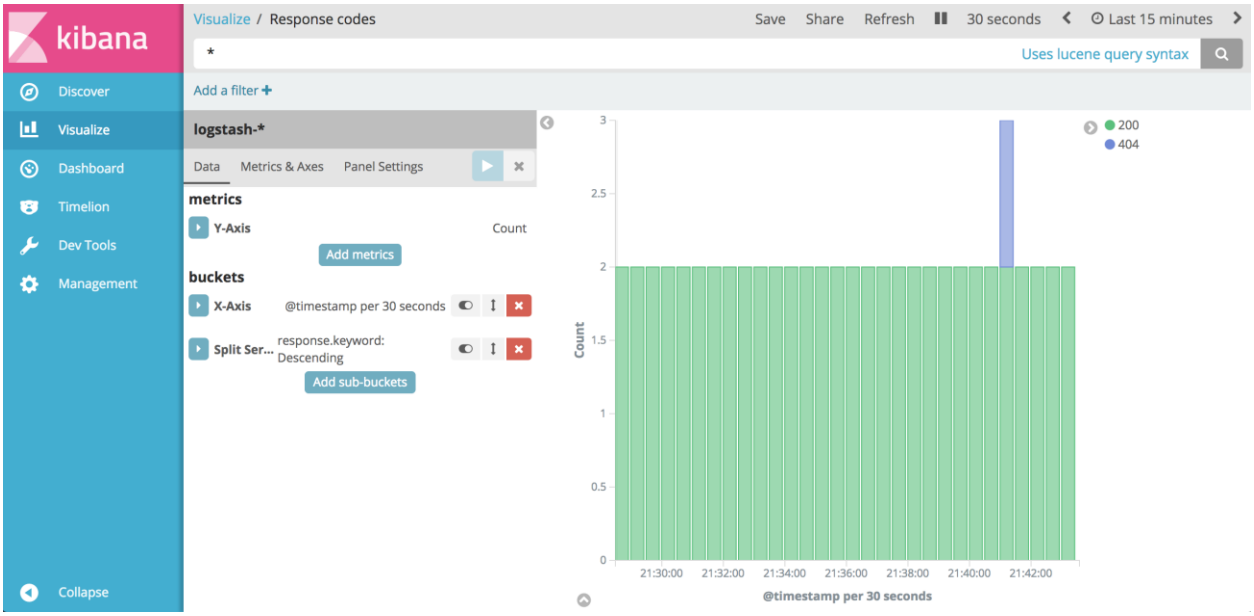
Kibana automatically selects the `@timestamp` field. If you click ▶ now, you'll see a duplicate of the **Discover** pane, with a histogram of traffic in time slices. We'll subdivide the time slices by the values in the `response` field. Click the **Add sub-buckets** button. Then click **Split Series** under **Select Buckets Type**. Select **Terms** from the **Sub Aggregation** menu.




Then select **response** from the **Field** menu.

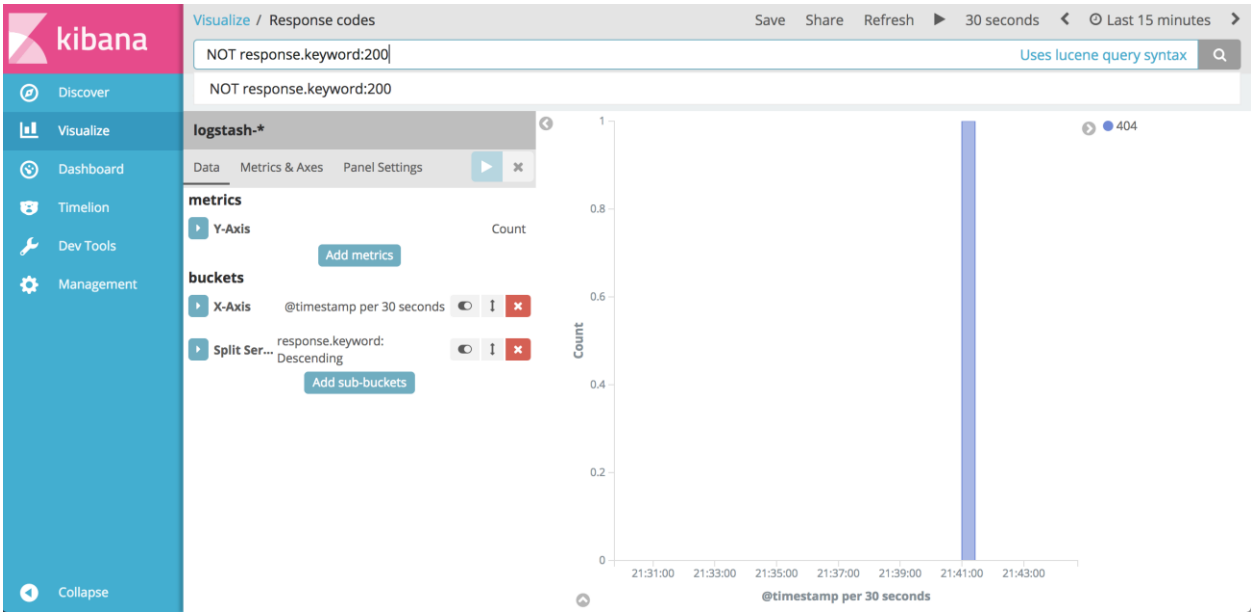



Click ▶ and you will see something like this

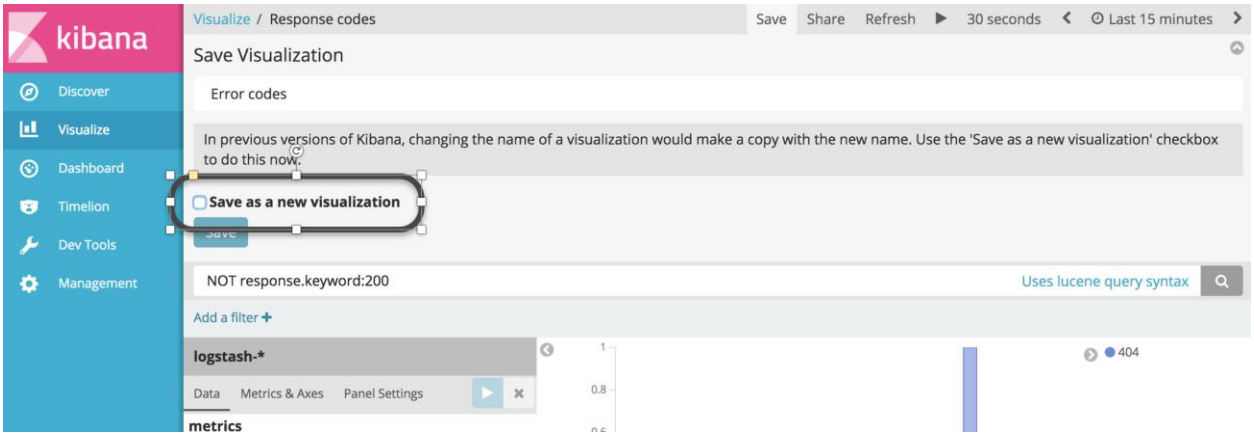



Now **Save** this visualization as **Response codes**. You can see I have all 200 responses, along with one 404.

That's somewhat interesting, but it's more interesting to monitor for error codes. Remember, Elasticsearch is a search engine. We can modify the results by adding a search in the search bar. Replace the ***** in the large text box with **NOT response:200** and hit enter. This will filter the data for this visualization to only those documents that do not have HTTP 200 responses; that is, errors (if you don't have any error responses, the visualization may be empty).



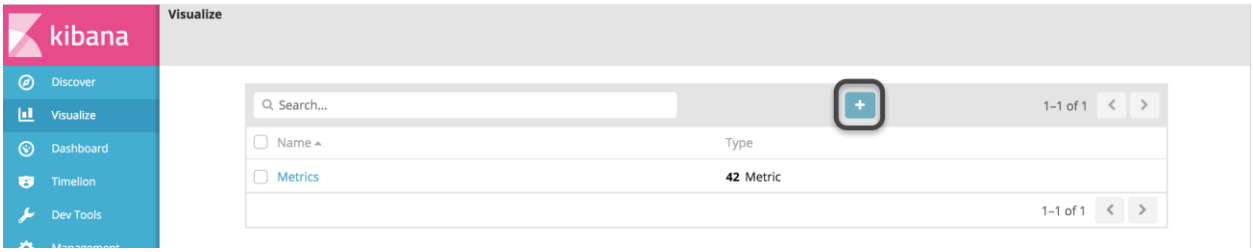

When you change the parameters of a visualization in Kibana, it will overwrite your existing visualization even if you give it a different name. Save this visualization as **Error codes**, but be sure to check the **Save as a new visualization** check box.



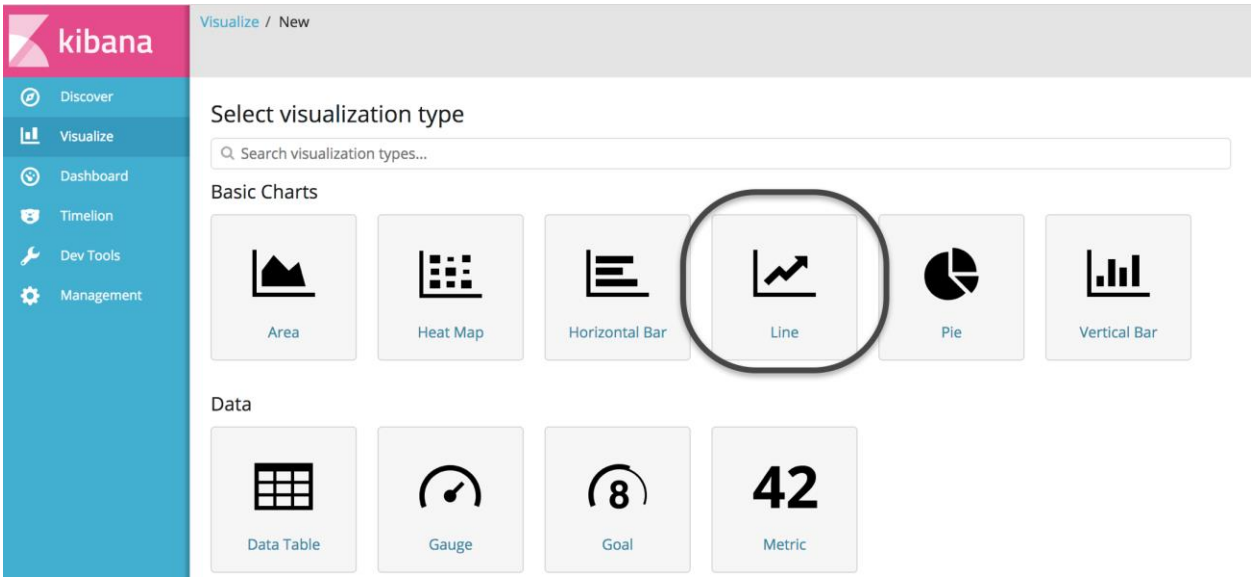

## Visualize your traffic, separating ELB traffic from web traffic

You can further exploit Elasticsearch's search capabilities to build visualizations that combine different data series. Well use **Filter aggregations** to create a line chart with ELB traffic (heartbeats) separated from other traffic.

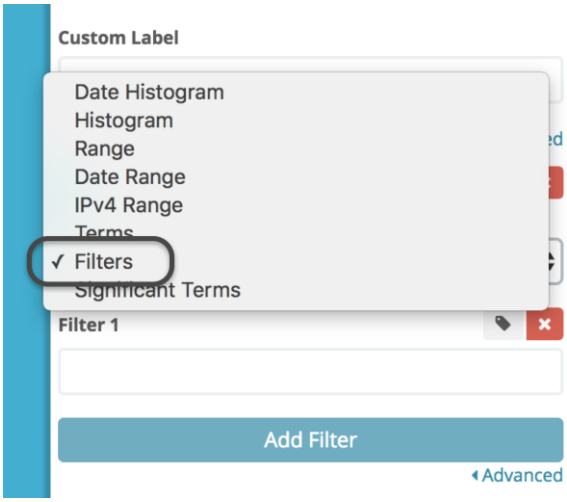
Click the **Visualize** tab, and if there's a stored visualization, click **Visualize** again to clear it. Click the + to create a new visualization.



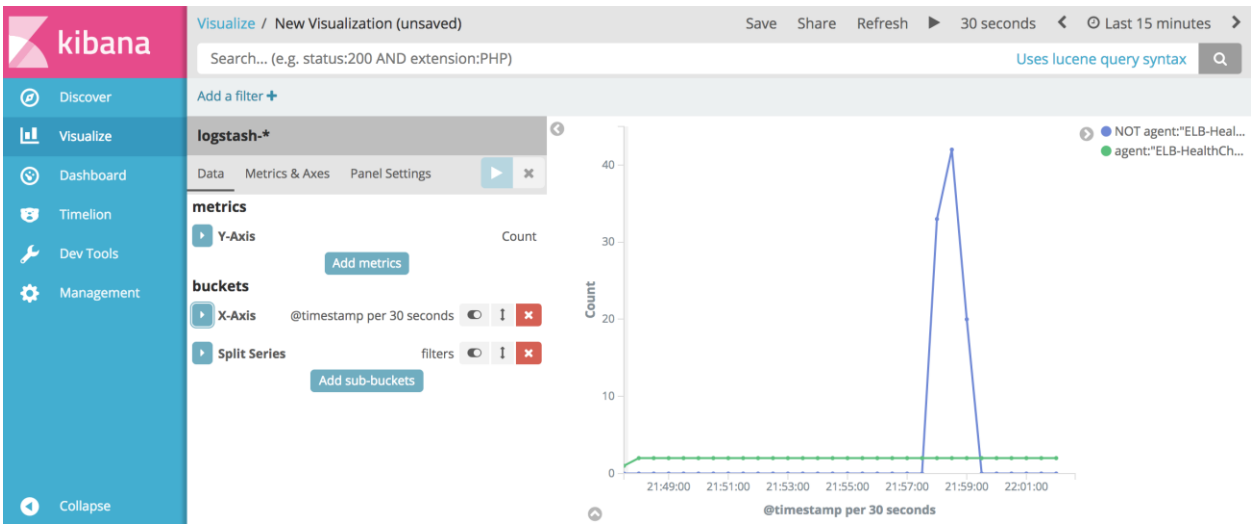

Select **Line** from the visualization types.




Create a **Date Histogram, X-Axis** aggregation (see the previous section if you don't remember how to do that). Then, click **Add sub-buckets** and **Split series**. For the **Sub aggregation**, select **Filters**




In the **Filter 1** box, type `agent:"ELB-HealthChecker"`. Be sure to include the double-quote. Click **Add Filter**, and type `NOT agent:"ELB-HealthChecker"` in the **Filter 2** box. Go back to the Simple Search page, run a few searches, return to the Kibana page, click ▶ and you should see something like this:



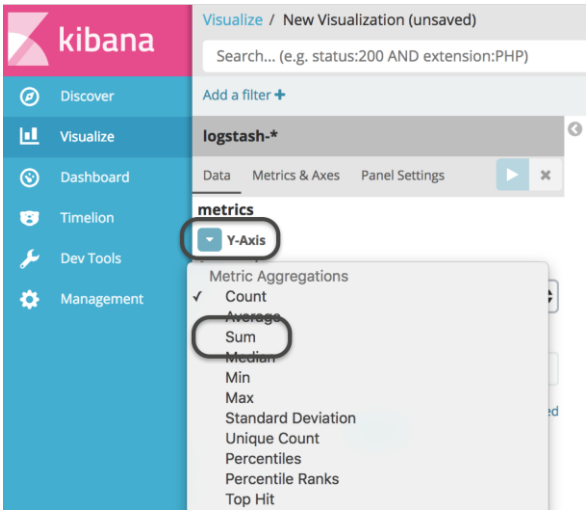

Save this visualization as **Traffic**.

## Monitor bytes transmitted

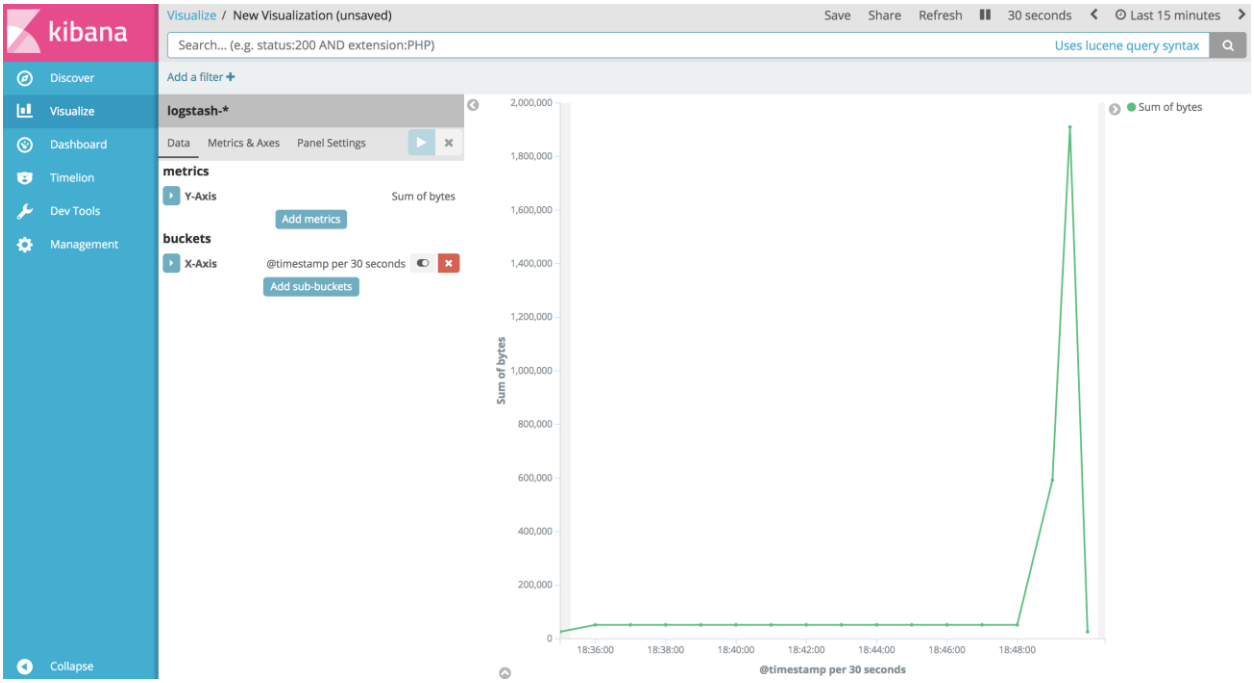
To this point, we have use a date histogram on the X axis and a count on the Y axis. You can also apply functions to the underlying data. Let's build a line graph that sums bytes sent from the web servers over time.

Click **Visualize** (and click it again to get to the new visualization panel). Click the + button to create a new visualization, and choose **Line**. Select the **Logstash-*** pattern.

Now, click the disclosure triangle next to **Y-Axis** to reveal the parameters for the Y axis. Drop the **Aggregation** menu and choose **Sum**.




Now set the **X-Axis** for a **Date Histogram**, click ▶ and you should see something like this (you may have to hit the website to generate some outbound traffic).

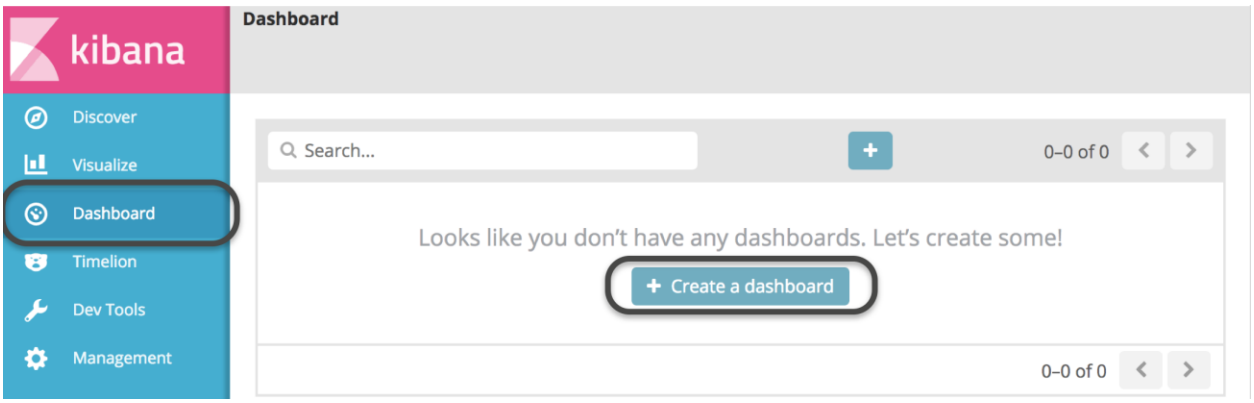



## Visualize query terms

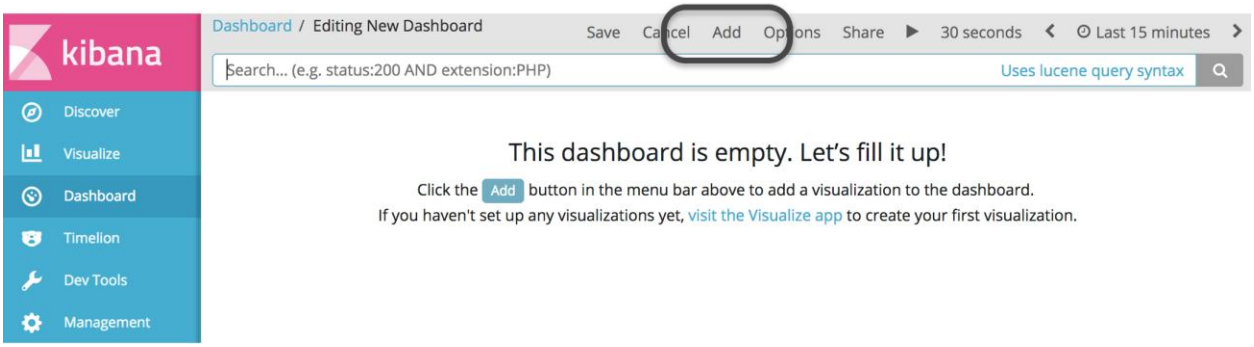
When you use the search interface, the keywords you're searching are in the URL that you send. Logstash splits those out into a "keywords" field. You can build a visualization to show common query terms. **Create a new visualization** and scroll down to select **Tag Cloud**. Select **Tags** under **Select bucket type**. Select **keywords** under **Fields**. Click ▶ to see the visualization. Save this visualization as **Keywords cloud**.

## Create a dashboard for monitoring

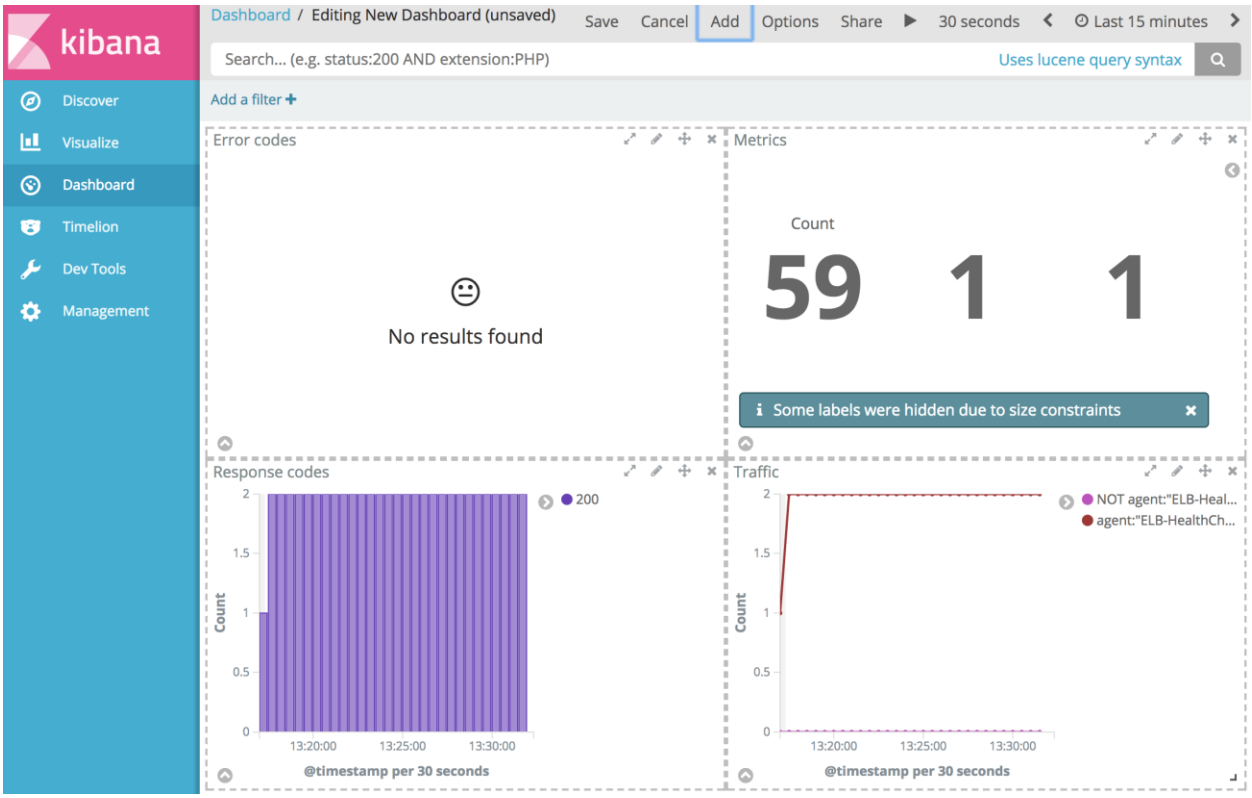
You can gather all of your visualizations into a dashboard. With **Auto-repeat** on, you can monitor the key metrics of your website, in near real time. Click on the **Dashboard** tab, then **Create a dashboard**.



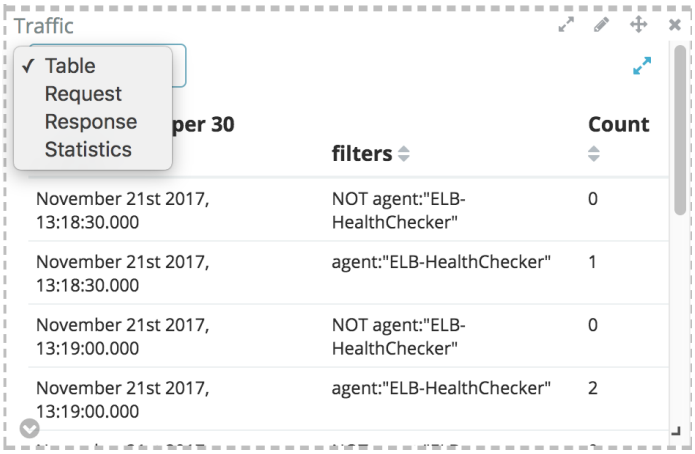

Click the **Add** button




You'll see all of your saved visualizations. Click each one once to add it to the page, and then click **Add** again to collapse the panels drop down.




You can use the ✣ handle to drag the panels around, and the lower, right corner to resize the panels. The ⌃ control in the lower left corner reveals a data table view.




You can choose **Request** to view the Elasticsearch query that powers the table, **Response** to view Elasticsearch's response to the query, and **Statistics** to see timing and result information.

You can save your dashboard, by clicking **Save** at the top of the screen. Data for visualizations and dashboards is saved in Elasticsearch itself. Any time you connect Kibana to this cluster, you can retrieve your saved dashboard and visualizations.

## Run queries from Kibana

We'll close our discussion with a walk through the **Dev Tools** tab of Kibana. Through the dev tools, you can send HTTP requests directly to Elasticsearch. You can access both query and administrative functions.

### Explore the _cat API

When you want to know summary details on various elements of the Elasticsearch cluster, the _cat API is your first place to look. Click the **Dev Tools** tab in Kibana. Type **GET _cat** in the left half of the split pane, then the ▶ to run the query. Notice that Kibana helps out with auto-complete.


Kibana shows the response in the right half of the split pane. The _cat API has many sub-APIs that you can call. Try **GET _cat/indices?v** (the **v** parameter adds table headers). This gives you a list of all of the indices in your Amazon ES domain, along with their sizes and shard counts. You'll see the **logstash-*** index, where Logstash is sending the web logs, the **.kibana** index, which holds the visualizations and dashboards, and the **movies** index, which is serving queries from the web page. **GET _cat/nodes?v** gives an overview of the nodes in your cluster. **GET _cat/shards?v** shows the location of all of the shards in the cluster, along with their size and state.

### Explore the search API

Let's explore the search that powers the **Simple Search Page**. The page takes the keywords from the text box and inserts them into the following query:

```
GET movies/_search
{
 "query": {
  "simple_query_string": {
    "query": "iron man",
    "fields": ["title^3", "plot", "actors", "directors"],
    "default_operator": "AND"
   }
 },
 "aggs": {
  "Genres": {
   "terms": {
    "field": "genres.keyword",
    "size": 5
   }
 },
 "Actors": {
  "terms": {
   "field": "actors.keyword",
   "size": 5
  }
 },
 "Directors": {
  "terms": {
```

```
   "field": "directors.keyword",
   "size": 5
  }
 },
 "Related actors" : {
  "significant_terms": {
   "field": "actors.keyword"
  }
 }
}
}
```

Let’s take this a piece at a time. To send a query to Amazon Elasticsearch Service, you issue an HTTP GET request. The URL specifies the endpoint, and the path specifies the index and action (_**search** in the **movies** index).

At the top level, there are two elements: the **query** and the aggregations (**aggs**).

The query is a **simple_query_string** query – the keywords are matched against the **title**, **plot**, **actors**, and **directors** fields. The query includes a relevance boost of 3 for the title field (**title^3**) – matches in this field count three times as much to the score as matches in other fields.

The query specifies four aggregations – **genres**, **actors**, **directors**, and a special **significant_terms** aggregation for the actors field. For actors, directors, and genres, the results will contain the top five buckets based on their counts. The **Related actors** aggregation will show any actors that have a different match pattern for this result set than their distribution across all documents would suggest.

Copy-paste, and run the query. You can change the keywords, change the default operator, or even change the query type to something different.

## What next?

In this lab, you deployed a working web page served through an internet gateway in your VPC. You sent log data to Amazon Elasticsearch Service via Filebeat, Amazon Redis, and Logstash, all within your VPC. You set up administrative and Kibana access to the Amazon ES domain, then built a working dashboard and visualizations.

Continue to explore the different visualizations in Kibana. Can you create a panel to display a pie chart of requests subdivided into the hosts that sent them? How about a heat map for the request URLs?