

Threat Hunting: Log Monitoring Lab Setup with ELK

August 13, 2020 By Raj Chandel

Elastic Stack is formerly known as the ELK Stack.

Elk Stack is a collection of free opensource software from Elastic Company which is specially designed for centralized logging. It allows the searching, analyzing, and visualization of logs from different sources. in this guide, we will learn to install Elastic Stack on ubuntu.

To configure ELK Stack in your Ubuntu platform, there are some prerequisites required for installation.

- Ubuntu 20.04
- Root Privileges

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ELK Stack components

1. **Elasticsearch:** It is a restful search engine that stores or holds all of the collected Data.
2. **Logstash:** It is the Data processing component that sends incoming Data to Elasticsearch.
3. **Kibana:** A web interface for searching and visualizing logs.
4. **Filebeat:** A lightweight Single-purpose Data forwarder that can send data from thousands of machines to either Logstash or Elasticsearch.



Beats



Logstash



Elasticsearch



Kibana

Collect &
Ship Logs

Parse Logs

Store & Search Logs

Visualize Logs

Install Java and All Dependencies

Elasticsearch requires OpenJDK available in our machine. Install Java using the below command along with the HTTPS support and wget packages for APT.

```
apt install -y openjdk-11-jdk wget apt-transport-https curl
```

```
root@ubuntu:~# apt install -y openjdk-11-jdk wget apt-transport-https curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
wget is already the newest version (1.20.3-1ubuntu1).
wget set to manually installed.
curl is already the newest version (7.68.0-1ubuntu2.1).
The following package was automatically installed and is no longer required:
  libllvm9
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
```

Now, we are going to import Elasticsearch public key into APT. To import the GPG key enter the following command:

```
wget -qO - https://artifacts.elastic.co/GPG-KEY-elasticsearch | sudo apt-key add -
```

```
root@ubuntu:~# wget -qO - https://artifacts.elastic.co/GPG-KEY-elasticsearch | sudo apt-key add -
OK
```

Add Elastic repository to the directory sources.list.d by using the following command :

```
echo "deb https://artifacts.elastic.co/packages/6.x/apt stable main" | sudo tee -a
```

```
root@ubuntu:~# echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main" | sudo tee
-a /etc/apt/sources.list.d/elastic-7.x.list
deb https://artifacts.elastic.co/packages/7.x/apt stable main
```

Install and configure Elasticsearch

Update the system repository

```
apt update
```

Install Elasticsearch by using the following command:

```
apt install elasticsearch
```

```
root@ubuntu:~# apt update
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Get:2 https://artifacts.elastic.co/packages/6.x/apt stable InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://security.ubuntu.com/ubuntu focal-security InRelease
Get:5 https://artifacts.elastic.co/packages/6.x/apt stable/main amd64 Packages
Hit:6 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease
Get:7 https://artifacts.elastic.co/packages/6.x/apt stable/main i386 Packages
Fetched 133 kB in 3s (45.6 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
123 packages can be upgraded. Run 'apt list --upgradable' to
root@ubuntu:~# apt install elasticsearch
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no
liblvm9
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
```

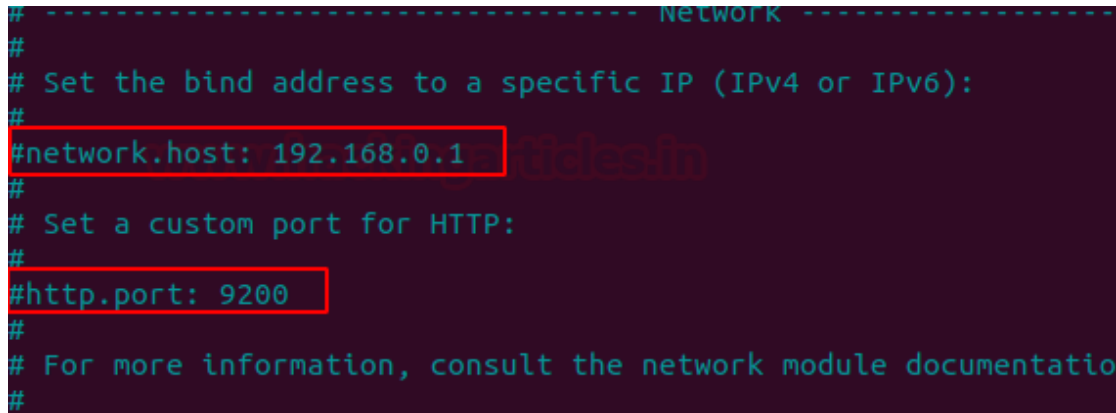
Next, we configure Elasticsearch.

Elasticsearch listens for traffic on port 9200. We are going to restrict outside access to our Elasticsearch instance so that outside parties cannot access data or shut down the elastic cluster through the REST API. Now we're going to

do some modifications to the Elasticsearch configuration file – elasticsearch.yml.

Enter the following command:

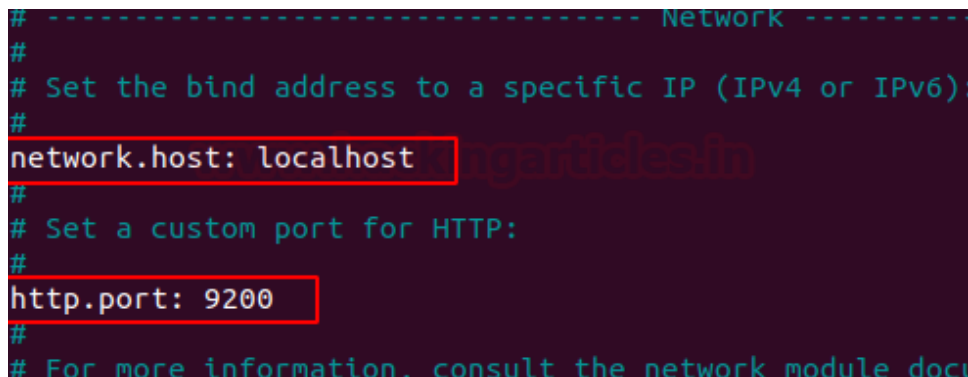
```
nano /etc/elasticsearch/elasticsearch.yml
```



```
# ----- Network -----  
#  
# Set the bind address to a specific IP (IPv4 or IPv6):  
#  
#network.host: 192.168.0.1  
#  
# Set a custom port for HTTP:  
#  
#http.port: 9200  
#  
# For more information, consult the network module documentation  
#
```

Find the line that specifies network.host attribute and uncomment it and add localhost as its value and also uncomment http.port attribute.

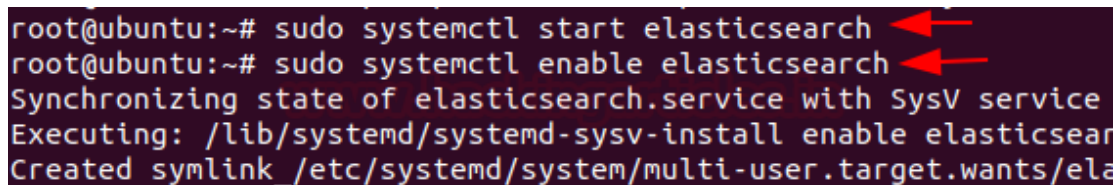
```
network.host: localhost  
http.port: 9200
```



```
# ----- Network -----  
#  
# Set the bind address to a specific IP (IPv4 or IPv6):  
#  
network.host: localhost  
#  
# Set a custom port for HTTP:  
#  
http.port: 9200  
#  
# For more information, consult the network module documentation  
#
```

Now, start and enable Elasticsearch services.

```
systemctl start elasticsearch  
systemctl enable elasticsearch
```



```
root@ubuntu:~# sudo systemctl start elasticsearch  
root@ubuntu:~# sudo systemctl enable elasticsearch  
Synchronizing state of elasticsearch.service with SysV service  
Executing: /lib/systemd/systemd-sysv-install enable elasticsearch  
Created symlink /etc/systemd/system/multi-user.target.wants/elasticsearch.service to /usr/lib/systemd/system/elasticsearch.service
```

Let's verify the status if Elasticsearch.

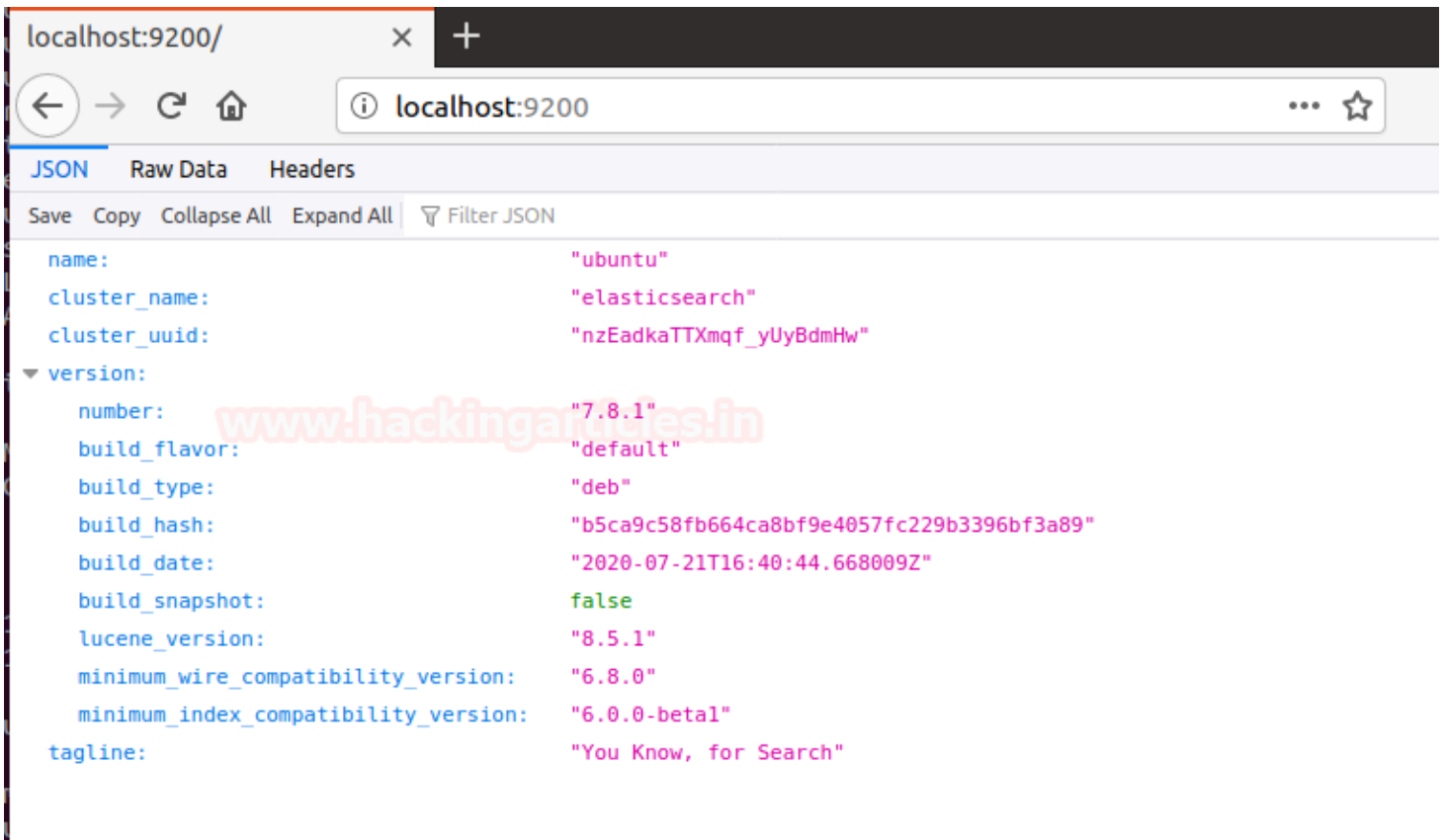
```
systemctl status elasticsearch
curl -X GET "localhost:9200"
```

```
root@ubuntu:~# systemctl status elasticsearch
● elasticsearch.service - Elasticsearch
   Loaded: loaded (/lib/systemd/system/elasticsearch.service; e
   Active: active (running) since Fri 2020-07-31 06:31:50 PDT;
     Docs: https://www.elastic.co
  Main PID: 5867 (java)
    Tasks: 77 (limit: 4624)
   Memory: 1.2G
    CGroup: /system.slice/elasticsearch.service
            └─5867 /usr/share/elasticsearch/jdk/bin/java -Xshare
              6063 /usr/share/elasticsearch/modules/x-pack-ml/pl

Jul 31 06:31:37 ubuntu systemd[1]: Starting Elasticsearch...
Jul 31 06:31:50 ubuntu systemd[1]: Started Elasticsearch.

root@ubuntu:~# curl -X GET "localhost:9200"
{
  "name" : "ubuntu",
  "cluster_name" : "elasticsearch",
  "cluster_uuid" : "nzEadkaTTXmqf_yUyBdmHw",
  "version" : {
    "number" : "7.8.1",
    "build_flavor" : "default",
    "build_type" : "deb",
    "build_hash" : "b5ca9c58fb664ca8bf9e4057fc229b3396bf3a89",
    "build_date" : "2020-07-21T16:40:44.668009Z",
    "build_snapshot" : false,
    "lucene_version" : "8.5.1",
    "minimum_wire_compatibility_version" : "6.8.0",
    "minimum_index_compatibility_version" : "6.0.0-beta1"
  },
  "tagline" : "You Know, for Search"
}
root@ubuntu:~#
```

By default Elasticsearch is listening on the port 9200 you can also verify it on your web browser by pinging <https://localhost:9200>



Now Elasticsearch is up and running.

Install and configure Logstash

Logstash used to collect and centralizing logs from different servers using filebeat

First Let's confirm OpenSSL is running and then install Logstash by running following command:

```
openssl version -a  
apt install logstash -y
```

```
root@ubuntu:~# openssl version -a
OpenSSL 1.1.1f  31 Mar 2020
built on: Mon Apr 20 11:53:50 2020 UTC
platform: debian-amd64
options: bn(64,64) rc4(16x,int) des(int) blowfish(ptr)
compiler: gcc -fPIC -pthread -m64 -Wa,--noexecstack -Wall
ENSSL_TLS_SECURITY_LEVEL=2 -DOPENSSL_USE_NODELETE -DL_ENDIAN
SM -DSHA512_ASM -DKECCAK1600_ASM -DRFC4086_ASM -DMD5_ASM -DAESNI
OPENSSLDIR: "/usr/lib/ssl"
ENGINESDIR: "/usr/lib/x86_64-linux-gnu/engines-1.1"
Seeding source: os-specific
root@ubuntu:~# apt install logstash -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is
liblvm9
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
```

Edit the `/etc/hosts` file and add the following line

```
nano /etc/hosts
```

```
root@ubuntu:~# cat /etc/hosts
127.0.0.1    localhost
127.0.1.1    ubuntu
18.224.44.11 elk-master
```

Where 18.224.44.11 is ip address of server elk-master.

Let's generate an SSL certificate to secure the log data transfer from the client Rsyslog & Filebeat to the Logstash server.

To do this create a new SSL directory under Logstash configuration directory and navigate into that directory generate an SSL certificate by running following command:

```
mkdir -p /etc/logstash/ssl
cd /etc/logstash/
openssl req -subj '/CN=elk-master/' -x509 -days 3650 -batch -nodes -newkey rsa:2048
```




```

root@ubuntu:~# mkdir -p /etc/logstash/ssl
root@ubuntu:~# cd /etc/logstash/
root@ubuntu:/etc/logstash# openssl req -subj '/CN=elk-master/' -x509 -days 3650 -batch -nodes -newkey rsa:2048 -keyout ssl/logstash-forwarder.key -out ssl/logstash-forwarder.crt
Generating a RSA private key
.....+++++
.....+++++
writing new private key to 'ssl/logstash-forwarder.key'
-----

```

Now, we are going to create new configuration files for Logstash named ‘filebeat-input.conf’ as input file from filebeat ‘syslog-filter.conf’ for system logs processing, and ‘output-elasticsearch.conf’ file to define Elasticsearch output.

Navigate to Logstash directory create a file ‘filebeat-input.conf’ in conf.d directory by running command

```

cd /etc/logstash/
nano conf.d/filebeat-input.conf

```

and paste the following configuration

```

input {
  beats {
    port => 5443
    type => syslog
    ssl => true
    ssl_certificate => "/etc/logstash/ssl/logstash-forwarder.crt"
    ssl_key => "/etc/logstash/ssl/logstash-forwarder.key"
  }
}

```

```

input {
  beats {
    port => 5443
    type => syslog
    ssl => true
    ssl_certificate => "/etc/logstash/ssl/logstash-forwarder.crt"
    ssl_key => "/etc/logstash/ssl/logstash-forwarder.key"
  }
}

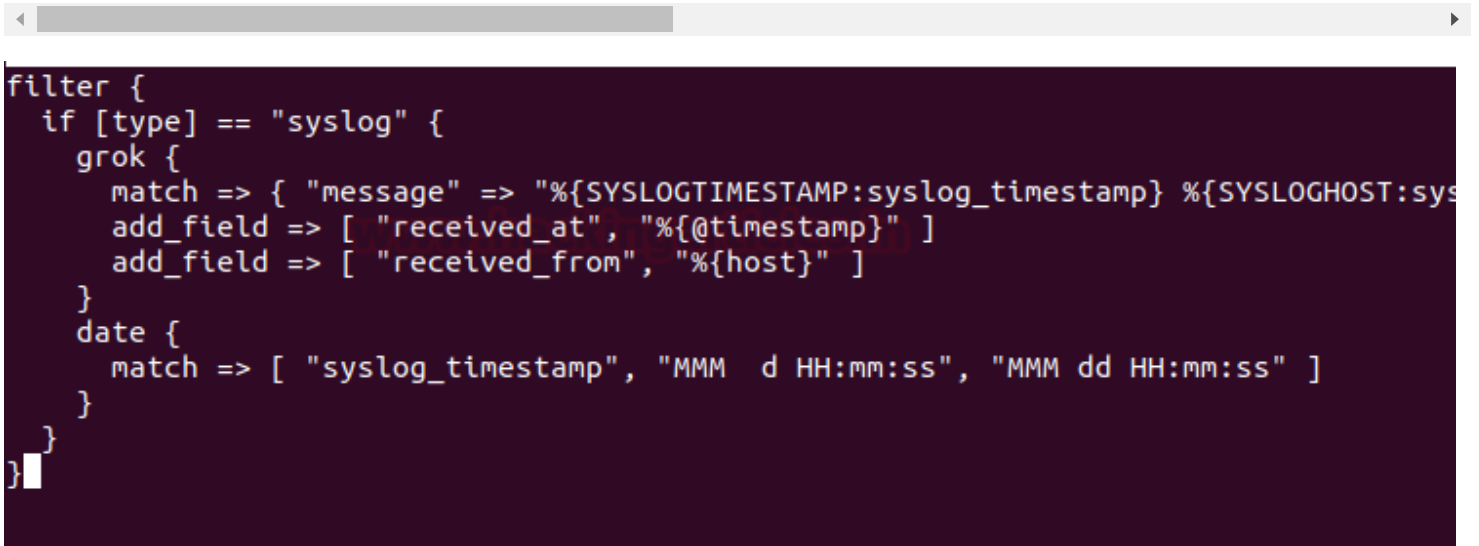
```

For the system log data processing, we are going to use a filter plugin named ‘grok’. Create a new conf. file ‘syslog-filter.conf’ in the same directory


```
nano conf.d/syslog-filter.conf
```

and paste the following configuration lines

```
filter {
  if [type] == "syslog" {
    grok {
      match => { "message" => "%{SYSLOGTIMESTAMP:syslog_timestamp} %{SYSLOGHOST:sy"
      add_field => [ "received_at", "%{@timestamp}" ]
      add_field => [ "received_from", "%{host}" ]
    }
    date {
      match => [ "syslog_timestamp", "MMM d HH:mm:ss", "MMM dd HH:mm:ss" ]
    }
  }
}
```

A screenshot of a terminal window with a dark background. It shows the same configuration code as the previous block, but with a cursor at the end of the last line. The code is:

```
filter {
  if [type] == "syslog" {
    grok {
      match => { "message" => "%{SYSLOGTIMESTAMP:syslog_timestamp} %{SYSLOGHOST:sy"
      add_field => [ "received_at", "%{@timestamp}" ]
      add_field => [ "received_from", "%{host}" ]
    }
    date {
      match => [ "syslog_timestamp", "MMM d HH:mm:ss", "MMM dd HH:mm:ss" ]
    }
  }
}
```

And at last create a configuration file ‘output-elasticsearch.conf’ for the output of elasticsearch.

```
nano conf.d/output-elasticsearch.conf
```

and paste the following configuration

```

output {
  elasticsearch { hosts => ["localhost:9200"]
    hosts => "localhost:9200"
    manage_template => false
    index => "%{[@metadata][beat]}-%{+YYYY.MM.dd}"
    document_type => "%{[@metadata][type]}"
  }
}

```

```

output {
  elasticsearch { hosts => ["localhost:9200"]
    hosts => "localhost:9200"
    manage_template => false
    index => "%{[@metadata][beat]}-%{+YYYY.MM.dd}"
    document_type => "%{[@metadata][type]}"
  }
}

```

And at last, save and exit.

Now start, enable & verify the status of Logstash service.

```

systemctl start logstash
systemctl enable logstash
systemctl status logstash

```

```

root@ubuntu:~# sudo systemctl enable logstash
Created symlink /etc/systemd/system/multi-user.target.wants/logstash.service to /usr/lib/systemd/system/logstash.service.
root@ubuntu:~# sudo systemctl start logstash
root@ubuntu:~# sudo systemctl status logstash
● logstash.service - logstash
   Loaded: loaded (/etc/systemd/system/logstash.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2020-07-31 07:04:21 PDT; 9s
 Main PID: 3993 (java)
    Tasks: 18 (limit: 4624)
   Memory: 526.4M
    CGroup: /system.slice/logstash.service
            └─3993 /bin/java -Xms1g -Xmx1g -XX:+UseConcMarkSweepGC

```

Install and configure Kibana

Install Kibana by using the following command

```
apt install kibana
```

```
root@ubuntu:~# apt install kibana
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed a
  libllvm9 linux-headers-5.4.0-26 linux-headers-5.4.0
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  kibana
0 upgraded, 1 newly installed, 0 to remove and 0 not
Need to get 346 MB of archives.
```

We are going to do some modifications to the kibana configuration file.

```
nano /etc/kibana/kibana.yml
```

```
# Kibana is served by a back end server. This setting spe
#server.port: 5601

# Specifies the address to which the Kibana server will b
# The default is 'localhost', which usually means remote
# To allow connections from remote users, set this parame
#server.host: "localhost"

# Enables you to specify a path to mount Kibana at if you
# Use the `server.rewriteBasePath` setting to tell Kibana
# from requests it receives, and to prevent a deprecation
# This setting cannot end in a slash.
```

Locate and uncomment the following Attributes

```
server.port: 5601
```

```
# Specifies the address to which the Kibana server will bind.  
# The default is 'localhost', which usually means remote machine.  
# To allow connections from remote users, set this parameter to a non-loopback address.
```

```
server.host: "localhost"
```

```
# Enables you to specify a path to mount Kibana at if you are running behind a proxy.  
# Use the `server.rewriteBasePath` setting to tell Kibana if it should  
# from requests it receives, and to prevent a deprecation warning in older  
# This setting cannot end in a slash.  
#server.basePath: ""
```

```
# Specifies whether Kibana should rewrite requests that are prefixed with  
# `server.basePath` or require that they are rewritten by your front-end  
# This setting was effectively always `false` before Kibana 6.0.0. It is now  
# default to `true` starting in Kibana 7.0.0.  
#server.rewriteBasePath: false
```

```
# The maximum payload size in bytes for incoming server requests.  
#server.maxPayloadBytes: 1048576
```

```
# The Kibana server's name. This is used for display purposes.  
#server.name: "your-hostname"
```

```
# The URLs of the Elasticsearch instances to use for all your queries.  
elasticsearch.hosts: "http://localhost:9200"
```

Now start & enable the kibana service:

```
systemctl enable kibana  
systemctl start kibana
```

```
root@ubuntu:~# sudo systemctl enable kibana  
Synchronizing state of kibana.service with SysV service script  
Executing: /lib/systemd/systemd-sysv-install enable kibana  
Created symlink /etc/systemd/system/multi-user.target.wants/kibana.service.  
root@ubuntu:~# sudo systemctl start kibana
```

Install and configure NGINX

Install Nginx and 'Apache2-utils'

```
apt install nginx apache2-utils -y
```

```
root@ubuntu:~# apt install nginx apache2-utils -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
apache2-utils is already the newest version (2.4.41-4ubuntu3)
apache2-utils set to manually installed.
The following packages were automatically installed and are n
  libllvm9 linux-headers-5.4.0-26 linux-headers-5.4.0-26-gene
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libnginx-mod-http-image-filter libnginx-mod-http-xslt-filte
Suggested packages:
  fcgiwrap nginx-doc
The following NEW packages will be installed:
  libnginx-mod-http-image-filter libnginx-mod-http-xslt-filte
0 upgraded, 7 newly installed, 0 to remove and 0 not upgraded
Need to get 602 kB of archives.
```

Now, create a new virtual host file named Kibana.

```
nano /etc/nginx/sites-available/kibana
```

and paste the following configuration Into the file.

```
server {
    listen 80;
    server_name localhost;
    auth_basic "Restricted Access";
    auth_basic_user_file /etc/nginx/.kibana-user;
    location / {
        proxy_pass https://localhost:5601;
        proxy_http_version 1.1;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection 'upgrade';
        proxy_set_header Host $host;
        proxy_cache_bypass $http_upgrade;
    }
}
```

```
server {
    listen 80;

    server_name localhost;

    auth_basic "Restricted Access";
    auth_basic_user_file /etc/nginx/.kibana-user;

    location / {
        proxy_pass https://localhost:5601;
        proxy_http_version 1.1;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection 'upgrade';
        proxy_set_header Host $host;
        proxy_cache_bypass $http_upgrade;
    }
}
```

Let's create authentication for the Kibana Dashboard and activate the Kibana virtual host configuration and test Nginx configuration after that enable & restart the Nginx service by using the following command.

```
sudo htpasswd -c /etc/nginx/.kibana-user elastic
ln -s /etc/nginx/sites-available/kibana /etc/nginx/sites-enabled/
nginx -t
systemctl enable nginx
systemctl restart nginx
```

```
root@ubuntu:~# sudo htpasswd -c /etc/nginx/.kibana-user elastic
New password:
Re-type new password:
Adding password for user elastic
root@ubuntu:~# ln -s /etc/nginx/sites-available/kibana /etc/nginx/sites-enabled/
root@ubuntu:~# nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
root@ubuntu:~# systemctl enable nginx
Synchronizing state of nginx.service with SysV service script with /lib/systemd/systemd-sysv-install
Executing: /lib/systemd/systemd-sysv-install enable nginx
```

Install and configure Filebeat

We're going to configure filebeat data shippers on our elk-master server. This will be used to collect data from various sources and transport them to Logstash and Elasticsearch.

Download & Install filebeat by running the following command.

```
curl -L -O https://artifacts.elastic.co/downloads/beats/filebeat/filebeat-6.8.11-a
```

```
root@ubuntu:~# curl -L -O https://artifacts.elastic.co/downloads/beats/filebeat/filebeat-6.8.11-amd64.deb
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total      Spent      Left   Speed
100 11.5M  100 11.5M    0     0  745k      0  0:00:15  0:00:15 --:--:-- 1217k
```

Let's repack the downloaded file by using the following command:

```
sudo dpkg -i filebeat-6.8.11-amd64.deb
```

```
root@ubuntu:~# sudo dpkg -i filebeat-6.8.11-amd64.deb
Selecting previously unselected package filebeat.
(Reading database ... 267530 files and directories currently installed.)
Preparing to unpack filebeat-6.8.11-amd64.deb ...
Unpacking filebeat (6.8.11) ...
Setting up filebeat (6.8.11) ...
Processing triggers for systemd (245.4-4ubuntu3.2) ...
root@ubuntu:~#
```

Next, open the filebeat configuration file named 'filebeat.yml'

```
nano /etc/filebeat/filebeat.yml
```

Edit the configuration file:

we're going to use Elasticsearch to perform additional processing on data collected by filebeat. Therefore, Enable the filebeat prospectors by changing the 'enabled' line value to 'true'.

```
# Change to true to enable this input configuration.
enabled: true

# Paths that should be crawled and fetched. Glob based paths
paths:
  - /var/log/*.log
  #- c:\programdata\elasticsearch\logs\*.log

# Exclude lines. A list of regular expressions to match. It
# matching any regular expression from the list.
#exclude_lines: ['^DBG']

# Include lines. A list of regular expressions to match. It
# matching any regular expression from the list.
#include_lines: ['^ERR', '^WARN']

# Exclude files. A list of regular expressions to match. Fil
```

Next head to the Elasticsearch output section and add the following lines

```
output.elasticsearch:
```



```
hosts: ["192.168.0.156:9200"]
username: "elastic"
password: "123"
setup.kibana:
host: "192.168.0.156:5601"
```

```
# Configure what output to use when sending the data collected by the beat.
#----- Elasticsearch output -----
output.elasticsearch:
  output.elasticsearch:
    hosts: ["192.168.0.156:9200"]
    username: "elastic"
    password: "admin"
setup.kibana:
  host: "192.168.0.156:5601"

# Array of hosts to connect to.
```

Enable and configure the Elasticsearch module by running following command

```
sudo filebeat modules enable elasticsearch
```

Let's start filebeat

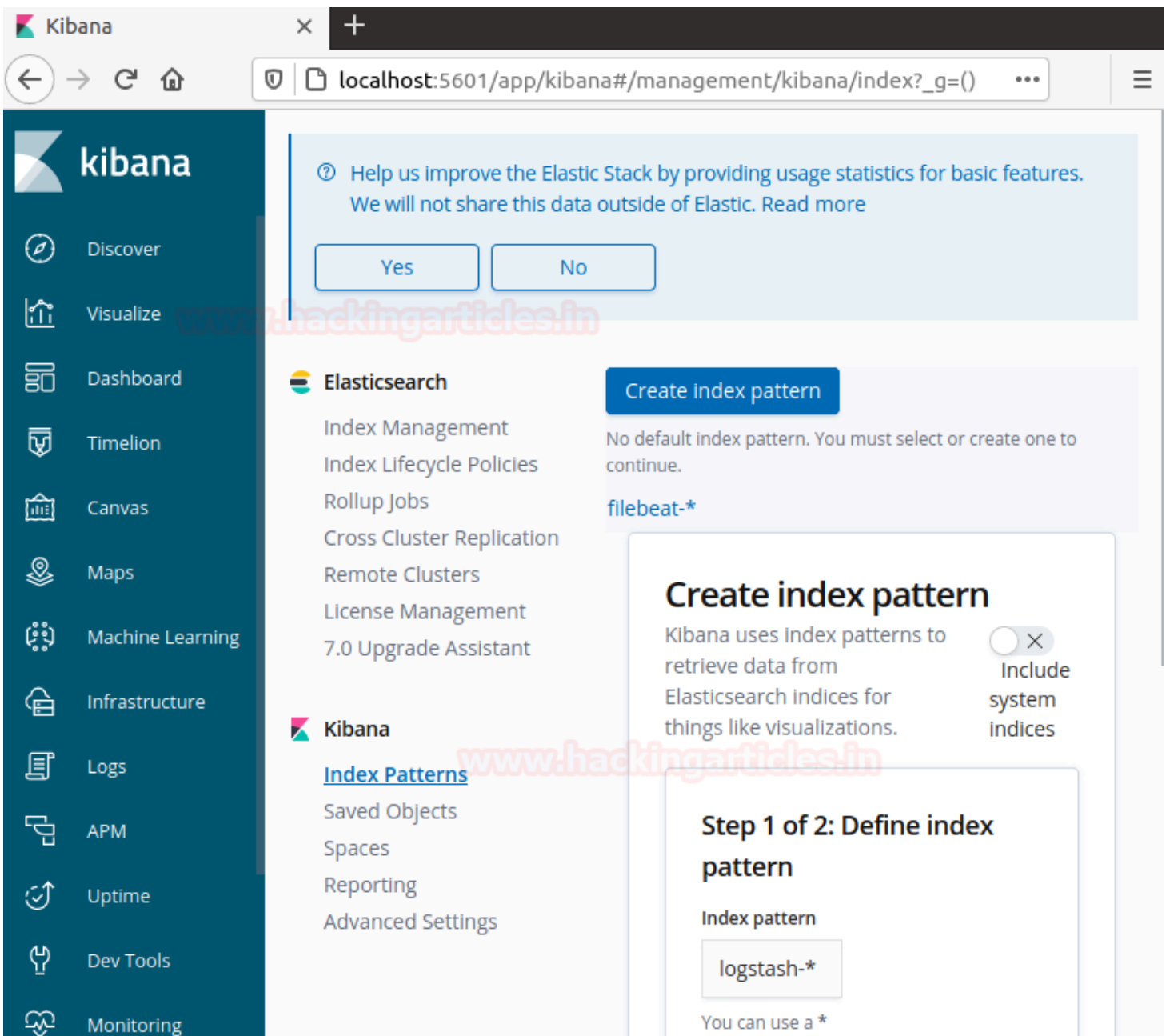
```
sudo filebeat setup
sudo service filebeat start
```

And at last copy the Logstash certificate file – logstash-forwarder.crt – to /etc/filebeat directory by running following command:

```
cp /etc/logstash/ssl/logstash-forwarder.crt /etc/filebeat/
sudo service filebeat restart
```

To test ELK stack open your browser and browse your server ip address followed by port 5601

```
https://localhost:5601
```



Routing Linux Logs to Elasticsearch

We're routing logs from rsyslog to Logstash and these logs transferred to Elasticsearch automatically

Routing From Logstash To Elasticsearch

Before routing logs from rsyslog to Logstash firstly we need to set up log forwarding between Logstash and Elasticsearch.

To do this we're going to create a configuration file for Logstash. To create configuration file head over towards the directory /etc/logstash/conf.d and create a logstash.conf file

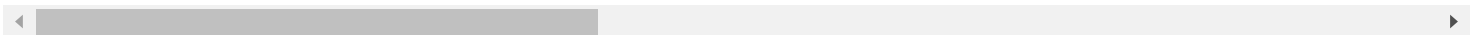
```
cd /etc/logstash/conf.d
nano logstash.conf
```

paste the following configuration into the logstash.conf file

```
input {
  udp {
    host => "127.0.0.1"
    port => 10514
    codec => "json"
    type => "rsyslog"
  }
}

# The Filter pipeline stays empty here, no formatting is done.
filter { }

# Every single log will be forwarded to ElasticSearch. If you are using another po
output {
  if [type] == "rsyslog" {
    elasticsearch {
      hosts => [ "127.0.0.1:9200" ]
    }
  }
}
```



```

root@ubuntu:~# cd /etc/logstash/conf.d
root@ubuntu:/etc/logstash/conf.d# cat logstash.conf
input {
  udp {
    host => "127.0.0.1"
    port => 10514
    codec => "json"
    type => "rsyslog"
  }
}

# The Filter pipeline stays empty here, no formatting is done.
filter { }

# Every single log will be forwarded to ElasticSearch. If you are using
output {
  if [type] == "rsyslog" {
    elasticsearch {
      hosts => [ "127.0.0.1:9200" ]
    }
  }
}
root@ubuntu:/etc/logstash/conf.d# systemctl restart logstash

```

Restart the Logstash service.

```
systemctl restart logstash
```

Let's check that everything is running correctly issue the following command:

```
netstat -na | grep 10514
```

```

root@ubuntu:~# systemctl restart logstash
root@ubuntu:~# netstat -na | grep 10514
tcp6      0      0 127.0.0.1:10514        :::*        LISTEN

```

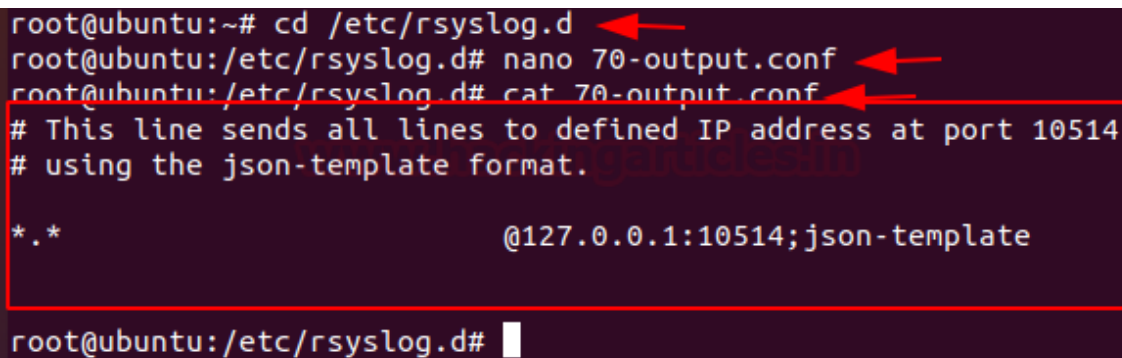
Routing from rsyslog to Logstash

Rsyslog has the capacity to transform logs using templates in order to forward logs in rsyslog, head over to the directory /etc/rsyslog.d and create a new file named 70-output.conf

```
cd /etc/rsyslog.d
nano 70-output.conf
```

And paste the following configuration into the 70-output.conf file

```
# This line sends all lines to defined IP address at port 10514
# using the json-template format.
*.* @127.0.0.1:10514;json-template
```

A terminal window with a dark background. The prompt is root@ubuntu:~#. The user enters 'cd /etc/rsyslog.d' and presses enter. The prompt changes to root@ubuntu:/etc/rsyslog.d#. The user enters 'nano 70-output.conf' and presses enter. The prompt changes to root@ubuntu:/etc/rsyslog.d#. The user enters 'cat 70-output.conf' and presses enter. The terminal displays the contents of the file: '# This line sends all lines to defined IP address at port 10514', '# using the json-template format.', and '*.* @127.0.0.1:10514;json-template'. A red rectangle highlights the last two lines of the file content. The user then presses enter, and the prompt returns to root@ubuntu:/etc/rsyslog.d#. Red arrows point to the commands 'cd /etc/rsyslog.d', 'nano 70-output.conf', and 'cat 70-output.conf'.

```
root@ubuntu:~# cd /etc/rsyslog.d
root@ubuntu:/etc/rsyslog.d# nano 70-output.conf
root@ubuntu:/etc/rsyslog.d# cat 70-output.conf
# This line sends all lines to defined IP address at port 10514
# using the json-template format.
*.* @127.0.0.1:10514;json-template
root@ubuntu:/etc/rsyslog.d#
```

Now we have log forwarding, create a 01-json-template.conf file in the same folder

```
nano 01-json-template.conf
```

And paste the following configuration into the 01-json-template.conf file

```
template(name="json-template"
  type="list") {
  constant(value="{")
    constant(value="\">@timestamp\":"\")
    constant(value="\",\">@version\":"\@1")
    constant(value="\",\@message\":"\@")
    constant(value="\",\@sysloghost\":"\@")
    constant(value="\",\@severity\":"\@")
    constant(value="\",\@facility\":"\@")
    constant(value="\",\@programname\":"\@")
    constant(value="\",\@procid\":"\@")
    constant(value="\"}\n")
  property(name="timereported" dateFor
  property(name="msg" format="json")
  property(name="hostname")
  property(name="syslogseverity-text")
  property(name="syslogfacility-text")
  property(name="programname")
  property(name="procid")
}
```

Restart rsyslog service and verify that logs are correctly forwarded into Elasticsearch.

```
systemctl restart rsyslog
curl -XGET 'http://localhost:9200/logstash-*/_search?q=*&pretty'
```

```
root@ubuntu:~# cd /etc/rsyslog.d
root@ubuntu:/etc/rsyslog.d# nano 01-json-template.conf
root@ubuntu:/etc/rsyslog.d# systemctl restart rsyslog
root@ubuntu:/etc/rsyslog.d# cat 01-json-template.conf
template(name="json-template"
  type="list") {
    constant(value="{")
    constant(value="\",\"@timestamp\":"")      property(name="timereported" dateFormat="rfc3339")
    constant(value="\",\"@version\":"1")
    constant(value="\",\"message\":"")          property(name="msg" format="json")
    constant(value="\",\"sysloghost\":"")        property(name="hostname")
    constant(value="\",\"severity\":"")          property(name="syslogseverity-text")
    constant(value="\",\"facility\":"")          property(name="syslogfacility-text")
    constant(value="\",\"programname\":"")       property(name="programname")
    constant(value="\",\"procid\":"")           property(name="procid")
    constant(value="\"}\n")
  }
root@ubuntu:/etc/rsyslog.d# systemctl restart rsyslog
root@ubuntu:/etc/rsyslog.d#
```

Note:- Logs will be forwarded in an index named logstash-*.

Create a Log Dashboard in Kibana

Open your browser and head over to <https://localhost:5601> and you should see the following screen.

Go to the management section and create an index pattern called logstash-* and proceed for the next step.

Kibana

localhost:5601/app/kibana#/management/kibana/index?_g=()

Cross Cluster Replication
Remote Clusters
License Management
7.0 Upgrade Assistant

Kibana

- Index Patterns
- Saved Objects
- Spaces
- Reporting
- Advanced Settings

Create index pattern

Kibana uses Index patterns to retrieve data from Elasticsearch indices for things like visualizations.

☐ Include system indices

Step 1 of 2: Define index pattern

Index pattern

logstash-*

You can use a * as a wildcard in your index pattern.
You can't use spaces or the characters \, /, ?, ", <, >, |.

> Next step

✓ Success! Your index pattern matches 1 index.

logstash-2020.08.08

Rows per page: 10

we've defined logstash-* as our index pattern. Now we can specify some settings before we create it. In the field of time filter field name choose @timestamp and create an index pattern

Create index pattern

Kibana uses Index patterns to retrieve data from Elasticsearch indices for things like visualizations.

☐ Include system indices

Step 2 of 2: Configure settings

You've defined **logstash-*** as your index pattern. Now you can specify some settings before we create it.

Time Filter field name

Refresh

@timestamp

The Time Filter will use this field to filter your data by time.
You can choose not to have a time field, but you will not be able to narrow down your data by a time range.

> Show advanced options

< Back

Create index pattern

Monitoring SSH entries

This one is a little bit special, as we can go into the “Discover” tab in order to build our panel.

When entering the discover tab, select logstash-*

From there, in the filterbar, put a query filter “programename:ssh*”.

Now we can see every log related to the SSHd service in our machine.

The screenshot shows the Kibana web interface. The left sidebar contains navigation links: Discover, Visualize, Dashboard, Timelion, Canvas, Maps, Machine Learning, Infrastructure, Logs (highlighted with a red box), APM, Uptime, Dev Tools, and Monitoring. The main content area is titled 'Logs' and displays a list of log entries. The first entry is highlighted with a red box and contains the text: 'Accepted password for elk from 192.168.0.110 port 58214 ssh2'. The second entry shows 'pam_unix(sshd:session): session opened for user elk by (uid=0)'. The third entry shows 'New session 6 of user elk.' and the fourth entry shows 'Started Session 6 of user elk.' The right side of the interface shows the log details for the selected entry, including the full log message and metadata.

As we can see, now we have direct access to every log related to the SSHd service. we can for example track illegal access attempts or wrong logins.

Similarly, we can monitor various illegal access attempts or wrong logins like ftp, telnet etc...

For example, I took Telnet access to my server from a different machine.

```

root@kali:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.102 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::20c:29ff:fe7b:ddc6 prefixlen 64 scopeid 0x20<link>
    ether 00:0c:29:7b:dd:c6 txqueuelen 1000 (Ethernet)
    RX packets 106 bytes 13897 (13.5 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 95 bytes 7296 (7.1 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 16 bytes 796 (796.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 16 bytes 796 (796.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@kali:~# telnet 192.168.0.156
Trying 192.168.0.156 ...
Connected to 192.168.0.156.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
ubuntu login: elk
Password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-42-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 * Are you ready for Kubernetes 1.19? It's nearly here! Try RC3 with
   sudo snap install microk8s --channel=1.19/candidate --classic

   https://microk8s.io/ has docs and details.

0 updates can be installed immediately.
0 of these updates are security updates.

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Sat Aug  8 14:12:42 PDT 2020 from 192.168.0.102 on pts/2
elk@ubuntu:~$

```

Let's check what happens on the Kibana dashboard.

Hold tight!

2020-08-08 14:12:37.288	- 9.0B"} connect from 192.168.0.102 (192.168.0.102)
2020-08-08 14:12:37.366	Server returned error NXDOMAIN, mitigating potential DNS
2020-08-08 14:12:40.936	pam_unix(login:auth): Couldn't open /etc/securetty: No s
2020-08-08 14:12:42.088	pam_unix(login:auth): Couldn't open /etc/securetty: No s
2020-08-08 14:12:42.212	pam_unix(login:session): session opened for user elk by
2020-08-08 14:12:42.223	New session 8 of user elk.
2020-08-08 14:12:42.226	Started Session 8 of user elk.

Nice! Now your panel is included in your dashboard.