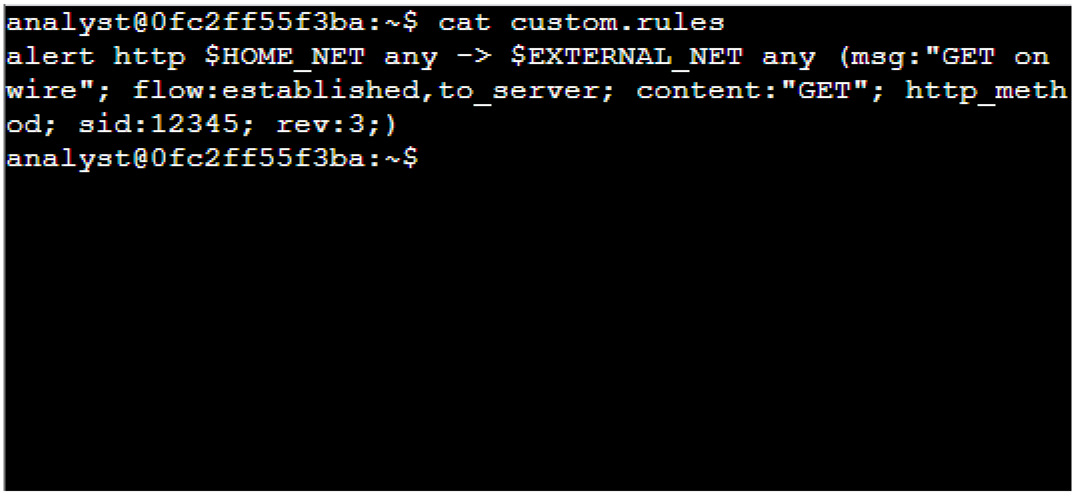
Task 1. Examine a custom rule in Suricata

The `/home/analyst` directory contains a `custom.rules` file that defines the network traffic rules, which Suricata captures.

In this task, you'll explore the composition of the Suricata rule defined in the `custom.rules` file.

- Use the `cat` command to display the rule in the `custom.rules` file:

```
cat custom.rules
```



```
analyst@0fc2ff55f3ba:~$ cat custom.rules
alert http $HOME_NET any -> $EXTERNAL_NET any (msg:"GET on
wire"; flow:established,to_server; content:"GET"; http_meth
od; sid:12345; rev:3;)
analyst@0fc2ff55f3ba:~$
```

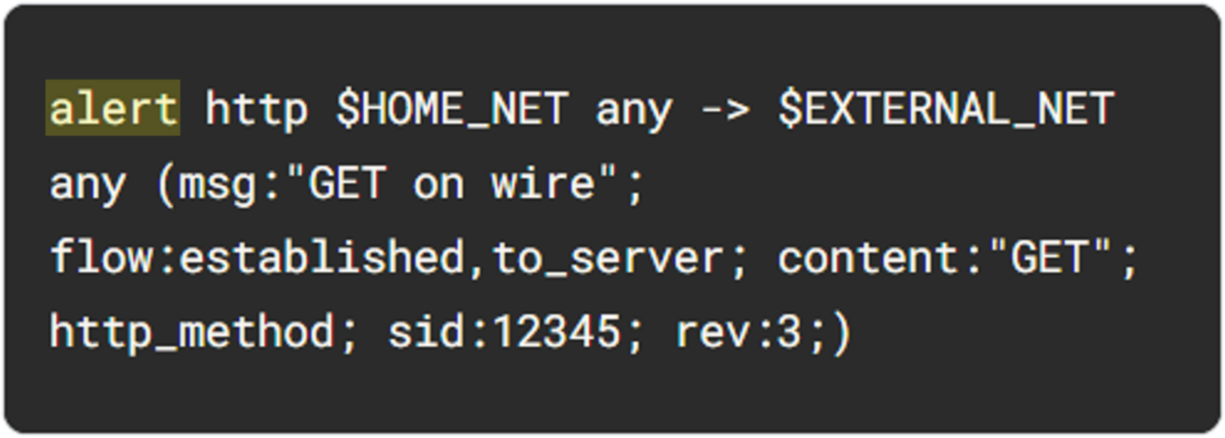
Note: *The `less` command can also be used to read file content one page at a time, making it useful for reading lengthy output.*

The command returns the rule as the output in the shell:

This rule consists of three components: an **action**, a **header**, and **rule options**.

Let's examine each component in more detail.

Action



```
alert http $HOME_NET any -> $EXTERNAL_NET
any (msg:"GET on wire";
flow:established,to_server; content:"GET";
http_method; sid:12345; rev:3;)
```

The **action** is the first part of the signature. It determines the action to take if all conditions are met.

Actions differ across network intrusion detection system (NIDS) rule languages, but some common actions are `alert`, `drop`, `pass`, and `reject`.

Using our example, the file contains a single `alert` as the action. The `alert` keyword instructs to alert on selected network traffic. The IDS will inspect the traffic packets and send out an alert in case it matches.

Note that the `drop` action also generates an alert, but it drops the traffic. A `drop` action only occurs when Suricata runs in IPS mode.

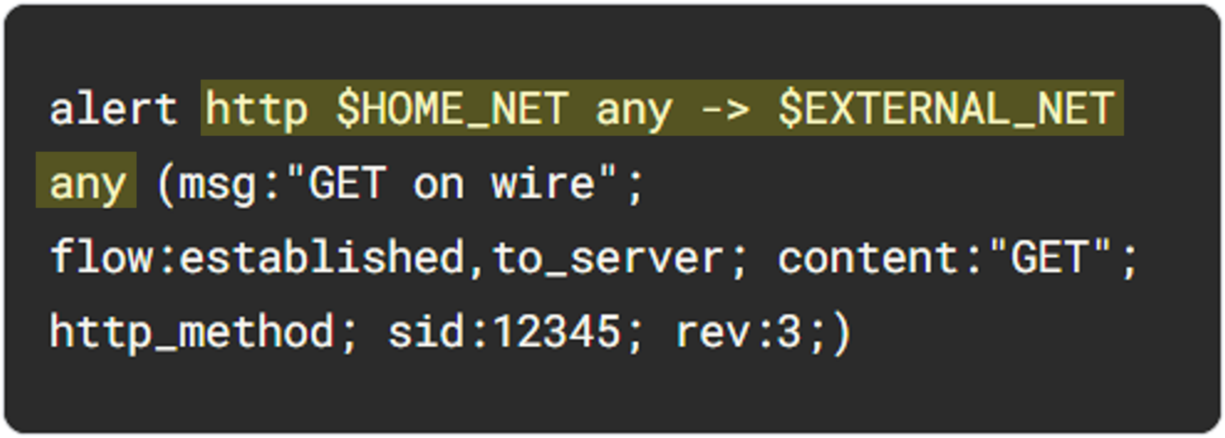
The `pass` action allows the traffic to pass through the network interface. The pass rule can be used to override other rules. An exception to a drop rule can be made with a pass rule. For example, the following rule has an identical signature to the previous example, except that it singles out a specific IP address to allow only traffic from that address to pass:

The `reject` action does not allow the traffic to pass. Instead, a TCP reset packet will be sent, and Suricata will drop the matching packet. A TCP reset packet tells computers to stop sending messages to each other.

You'll most often use the `alert` rule in this lab activity.

Note: *Rule order refers to the order in which rules are evaluated by Suricata. Rules are loaded in the order in which they are defined in the configuration file. However, Suricata processes rules in a different default order: pass, drop, reject, and alert. Rule order affects the final verdict of a packet.*

Header



```
alert http $HOME_NET any -> $EXTERNAL_NET
any (msg:"GET on wire";
flow:established,to_server; content:"GET";
http_method; sid:12345; rev:3;)
```

The next part of the signature is the **header**. The header defines the signature’s network traffic, which includes attributes such as protocols, source and destination IP addresses, source and destination ports, and traffic direction.

The next field after the action keyword is the protocol field. In our example, the protocol is `http`, which determines that the rule applies only to HTTP traffic.

The parameters to the protocol `http` field are `$HOME_NET any -> $EXTERNAL_NET any`. The arrow indicates the direction of the traffic coming from the `$HOME_NET` and going to the destination IP address `$EXTERNAL_NET`.

`$HOME_NET` is a Suricata variable defined in `/etc/suricata/suricata.yaml` that you can use in your rule definitions as a placeholder for your local or home network to identify traffic that connects to or from systems within your organization.

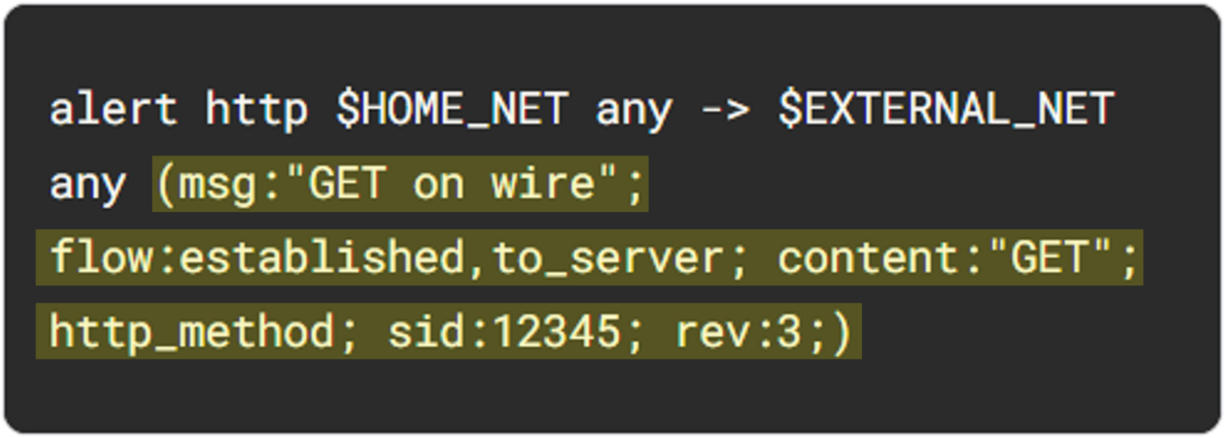
In this lab `$HOME_NET` is defined as the 172.21.224.0/20 subnet.

The word any means that Suricata catches traffic from any port defined in the $HOME_NET network.

Note: *The $ symbol indicates the start of a variable. Variables are used as placeholders to store values.*

So far, we know that this signature triggers an alert when it detects any http traffic leaving the home network and going to the external network.

Rule options



```
alert http $HOME_NET any -> $EXTERNAL_NET
any (msg:"GET on wire";
flow:established,to_server; content:"GET";
http_method; sid:12345; rev:3;)
```

The many available **rule options** allow you to customize signatures with additional parameters. Configuring rule options helps narrow down network traffic so you can find exactly what you’re looking for. As in our example, rule options are typically enclosed in a pair of parentheses and separated by semicolons.

Let's further examine the rule options in our example:

- The `msg:` option provides the alert text. In this case, the alert will print out the text `“GET on wire”`, which specifies why the alert was triggered.
- The `flow:established,to_server` option determines that packets from the client to the server should be matched. (In this instance, a server is defined as the device responding to the initial SYN packet with a SYN-ACK packet.)
- The `content:"GET"` option tells Suricata to look for the word `GET` in the content of the `http.method` portion of the packet.
- The `sid:12345` (signature ID) option is a unique numerical value that identifies the rule.
- The `rev:3` option indicates the signature's revision which is used to identify the signature's version. Here, the revision version is 3.

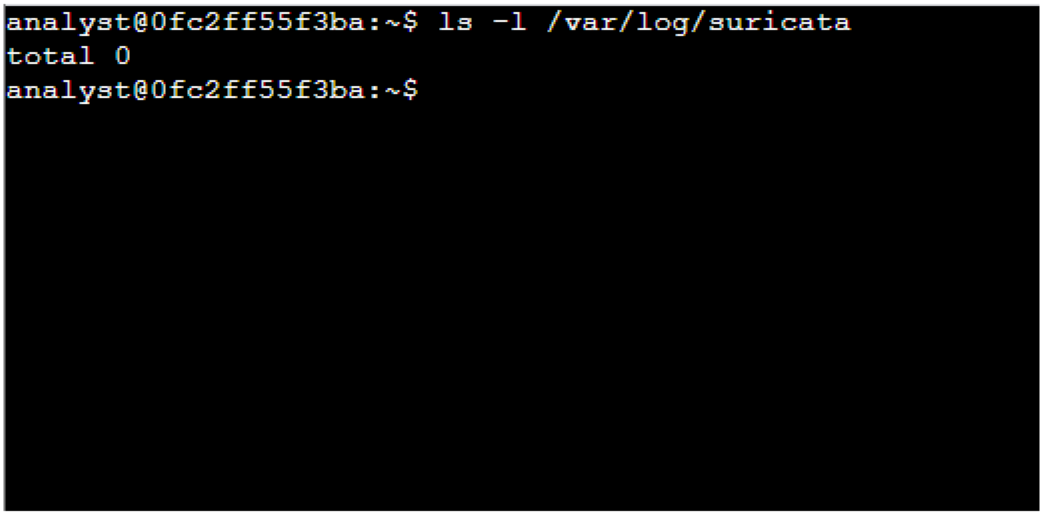
To summarize, this signature triggers an alert whenever Suricata observes the text `GET` as the HTTP method in an HTTP packet from the home network going to the external network.

Task 2. Trigger a custom rule in Suricata

Now that you are familiar with the composition of the custom Suricata rule, you must trigger this rule and examine the alert logs that Suricata generates.

1. List the files in the `/var/log/suricata` folder:

```
ls -l /var/log/suricata
```

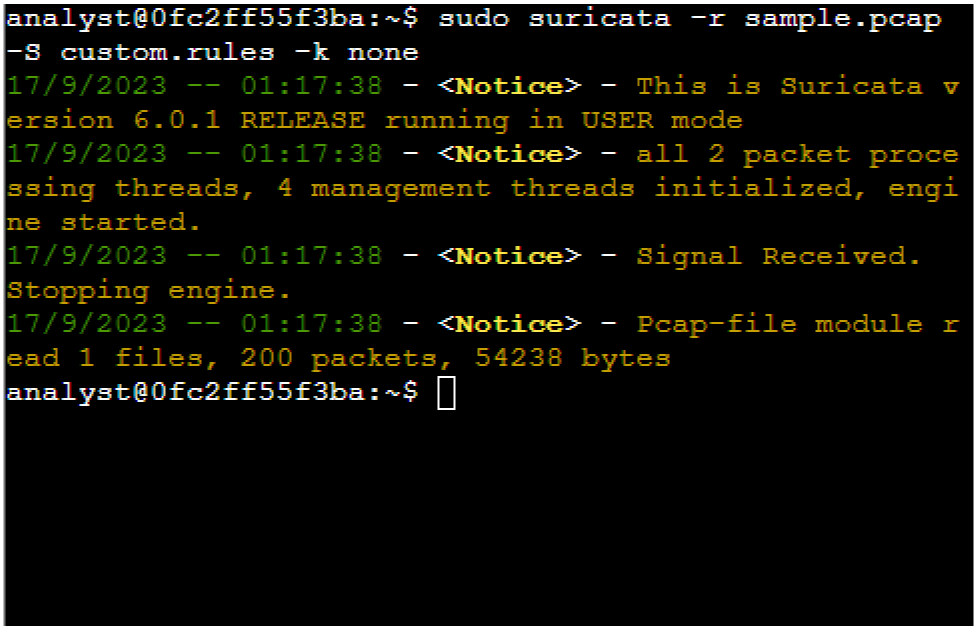


```
analyst@0fc2ff55f3ba:~$ ls -l /var/log/suricata
total 0
analyst@0fc2ff55f3ba:~$
```

Note that before running Suricata, there are no files in the `/var/log/suricata` directory.

2. Run `suricata` using the `custom.rules` and `sample.pcap` files:

```
sudo suricata -r sample.pcap -S custom.rules -k none
```



```
analyst@0fc2ff55f3ba:~$ sudo suricata -r sample.pcap
-S custom.rules -k none
17/9/2023 -- 01:17:38 - <Notice> - This is Suricata v
ersion 6.0.1 RELEASE running in USER mode
17/9/2023 -- 01:17:38 - <Notice> - all 2 packet proce
ssing threads, 4 management threads initialized, engi
ne started.
17/9/2023 -- 01:17:38 - <Notice> - Signal Received.
Stopping engine.
17/9/2023 -- 01:17:38 - <Notice> - Pcap-file module r
ead 1 files, 200 packets, 54238 bytes
analyst@0fc2ff55f3ba:~$ 
```

This command starts the Suricata application and processes the `sample.pcap` file using the rules in the `custom.rules` file. It returns an output stating how many packets were processed by Suricata.

Note: *In this lab, using `sudo` is required to process packet capture files with Suricata, although it may not be required in a real-world environment.*

Now you'll further examine the options in the command:

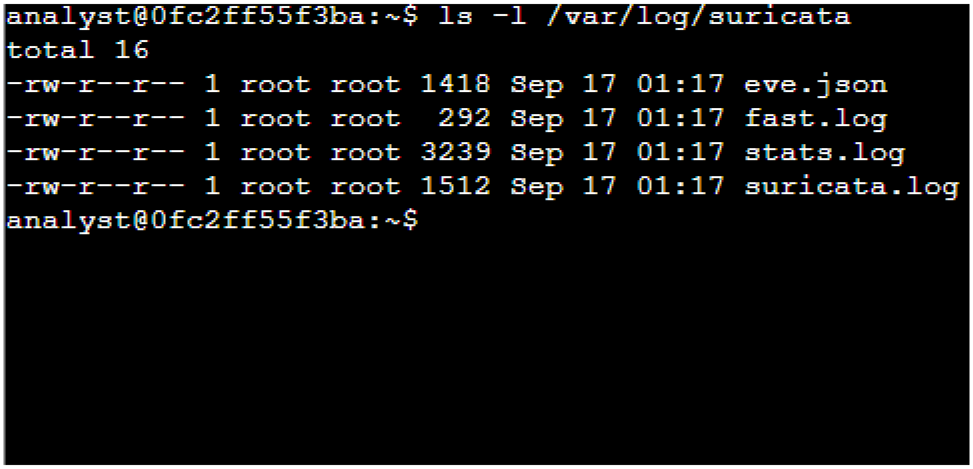
- The `-r sample.pcap` option specifies an input file to mimic network traffic. In this case, the `sample.pcap` file.
- The `-S custom.rules` option instructs Suricata to use the rules defined in the `custom.rules` file.
- The `-k none` option instructs Suricata to disable all checksum checks.

As a refresher, checksums are a way to detect if a packet has been modified in transit. Because you are using network traffic from a sample packet capture file, you won't need Suricata to check the integrity of the checksum.

Suricata adds a new alert line to the `/var/log/suricata/fast.log` file when all the conditions in any of the rules are met.

3. List the files in the `/var/log/suricata` folder again:

```
ls -l /var/log/suricata
```

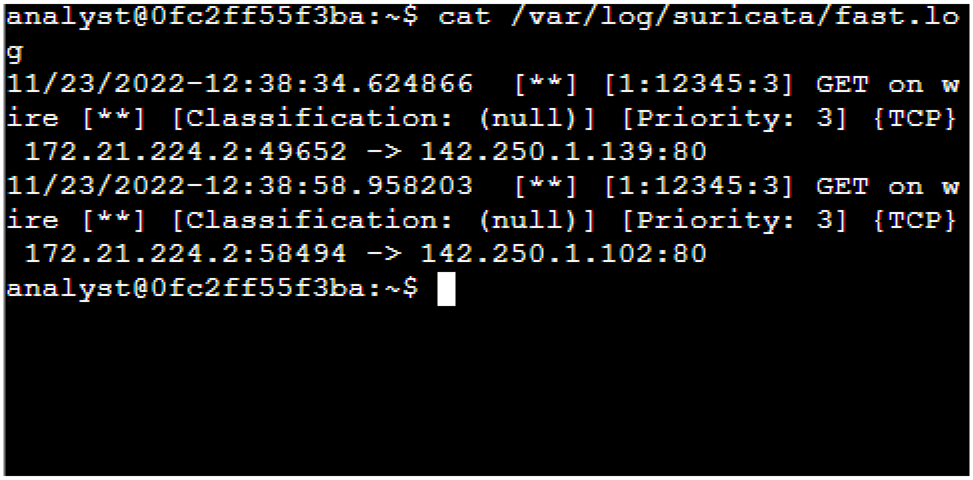


```
analyst@0fc2ff55f3ba:~$ ls -l /var/log/suricata
total 16
-rw-r--r-- 1 root root 1418 Sep 17 01:17 eve.json
-rw-r--r-- 1 root root  292 Sep 17 01:17 fast.log
-rw-r--r-- 1 root root 3239 Sep 17 01:17 stats.log
-rw-r--r-- 1 root root 1512 Sep 17 01:17 suricata.log
analyst@0fc2ff55f3ba:~$
```

Note that after running Suricata, there are now four files in the `/var/log/suricata` directory, including the `fast.log` and `eve.json` files. You'll examine these files in more detail.

4. Use the `cat` command to display the `fast.log` file generated by Suricata:

```
cat /var/log/suricata/fast.log
```



```
analyst@0fc2ff55f3ba:~$ cat /var/log/suricata/fast.lo
g
11/23/2022-12:38:34.624866  [**] [1:12345:3] GET on w
ire [**] [Classification: (null)] [Priority: 3] {TCP}
 172.21.224.2:49652 -> 142.250.1.139:80
11/23/2022-12:38:58.958203  [**] [1:12345:3] GET on w
ire [**] [Classification: (null)] [Priority: 3] {TCP}
 172.21.224.2:58494 -> 142.250.1.102:80
analyst@0fc2ff55f3ba:~$ 
```

The output returns alert entries in the log:

Each line or entry in the `fast.log` file corresponds to an alert generated by Suricata when it processes a packet that meets the conditions of an alert generating rule. Each alert line includes the message that identifies the rule that triggered the alert, as well as the source, destination, and direction of the traffic.

Task 3. Examine eve.json output

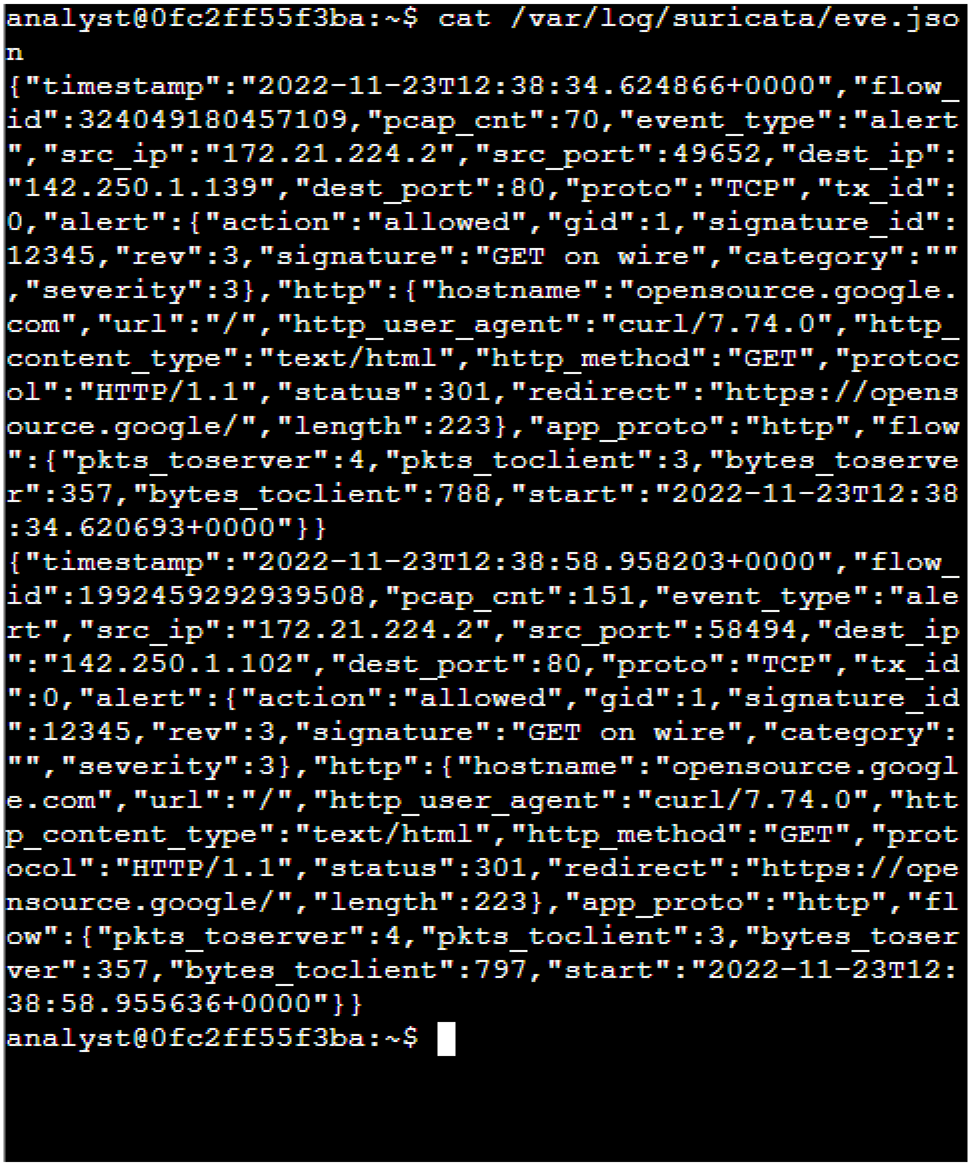
In this task, you must examine the additional output that Suricata generates in the `eve.json` file.

As previously mentioned, this file is located in the `/var/log/suricata/` directory.

The `eve.json` file is the standard and main Suricata log file and contains a lot more data than the `fast.log` file. This data is stored in a JSON format, which makes it much more useful for analysis and processing by other applications.

1. Use the `cat` command to display the entries in the `eve.json` file:

```
cat /var/log/suricata/eve.json
```

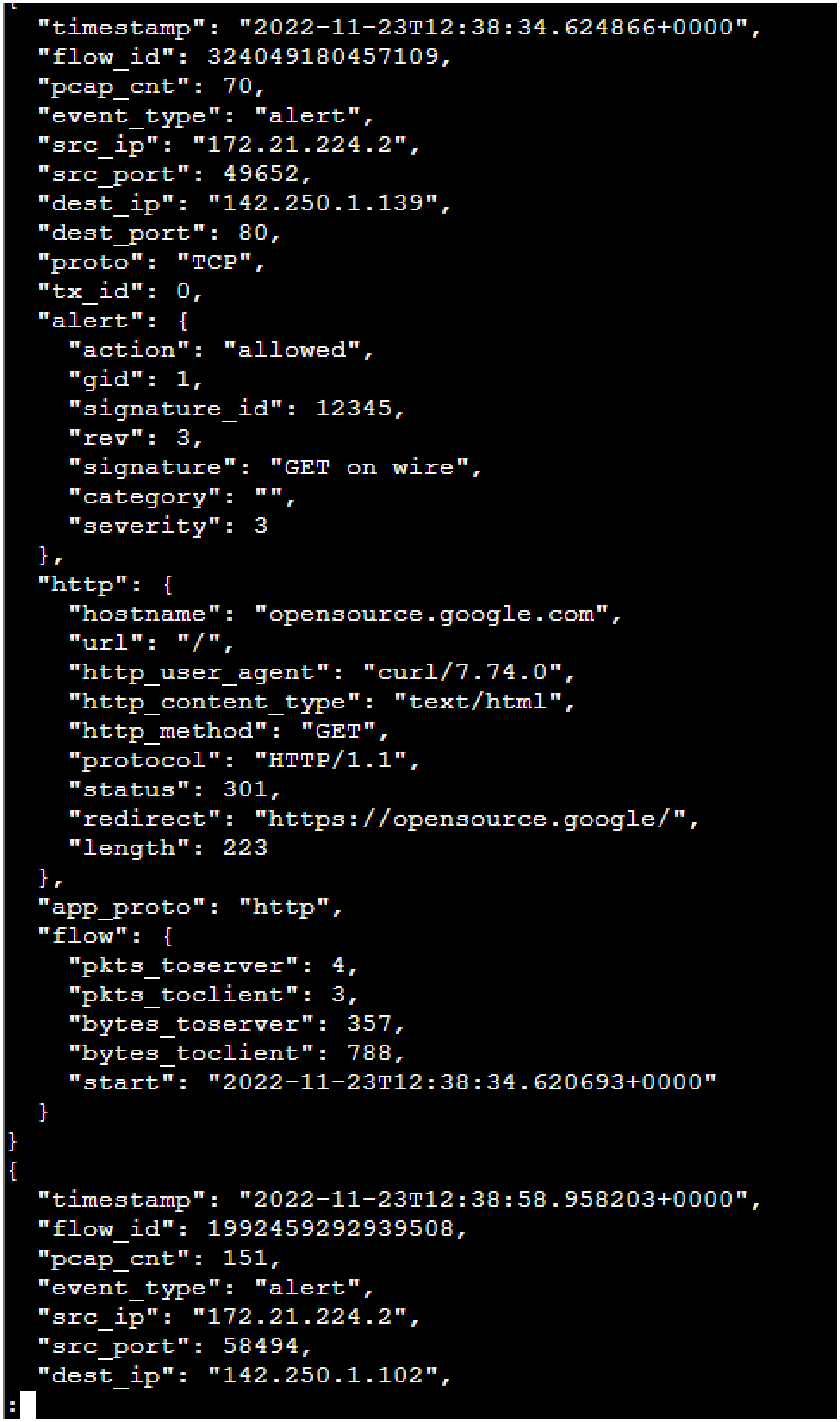


```
analyst@0fc2ff55f3ba:~$ cat /var/log/suricata/eve.jso
n
{"timestamp":"2022-11-23T12:38:34.624866+0000","flow_
id":324049180457109,"pcap_cnt":70,"event_type":"alert
","src_ip":"172.21.224.2","src_port":49652,"dest_ip":
"142.250.1.139","dest_port":80,"proto":"TCP","tx_id":
0,"alert":{"action":"allowed","gid":1,"signature_id":
12345,"rev":3,"signature":"GET on wire","category":""
,"severity":3},"http":{"hostname":"opensource.google.
com","url":"/","http_user_agent":"curl/7.74.0","http_
content_type":"text/html","http_method":"GET","protoc
ol":"HTTP/1.1","status":301,"redirect":"https://opens
ource.google/","length":223},"app_proto":"http","flow
":{"pkts_toserver":4,"pkts_toclient":3,"bytes_toserve
r":357,"bytes_toclient":788,"start":"2022-11-23T12:38
:34.620693+0000"}}
{"timestamp":"2022-11-23T12:38:58.958203+0000","flow_
id":1992459292939508,"pcap_cnt":151,"event_type":"ale
rt","src_ip":"172.21.224.2","src_port":58494,"dest_ip
":"142.250.1.102","dest_port":80,"proto":"TCP","tx_id
":0,"alert":{"action":"allowed","gid":1,"signature_id
":12345,"rev":3,"signature":"GET on wire","category":
"","severity":3},"http":{"hostname":"opensource.googl
e.com","url":"/","http_user_agent":"curl/7.74.0","htt
p_content_type":"text/html","http_method":"GET","prot
ocol":"HTTP/1.1","status":301,"redirect":"https://ope
nsource.google/","length":223},"app_proto":"http","fl
ow":{"pkts_toserver":4,"pkts_toclient":3,"bytes_toser
ver":357,"bytes_toclient":797,"start":"2022-11-23T12:
38:58.955636+0000"}}
analyst@0fc2ff55f3ba:~$ 
```

The output returns the raw content of the file. You'll notice that there is a lot of data returned that is not easy to understand in this format.

2. Use the `jq` command to display the entries in an improved format:

```
jq . /var/log/suricata/eve.json | less
```



```
{
  "timestamp": "2022-11-23T12:38:34.624866+0000",
  "flow_id": 324049180457109,
  "pcap_cnt": 70,
  "event_type": "alert",
  "src_ip": "172.21.224.2",
  "src_port": 49652,
  "dest_ip": "142.250.1.139",
  "dest_port": 80,
  "proto": "TCP",
  "tx_id": 0,
  "alert": {
    "action": "allowed",
    "gid": 1,
    "signature_id": 12345,
    "rev": 3,
    "signature": "GET on wire",
    "category": "",
    "severity": 3
  },
  "http": {
    "hostname": "opensource.google.com",
    "url": "/",
    "http_user_agent": "curl/7.74.0",
    "http_content_type": "text/html",
    "http_method": "GET",
    "protocol": "HTTP/1.1",
    "status": 301,
    "redirect": "https://opensource.google/",
    "length": 223
  },
  "app_proto": "http",
  "flow": {
    "pkts_toserver": 4,
    "pkts_toclient": 3,
    "bytes_toserver": 357,
    "bytes_toclient": 788,
    "start": "2022-11-23T12:38:34.620693+0000"
  }
}
{
  "timestamp": "2022-11-23T12:38:58.958203+0000",
  "flow_id": 1992459292939508,
  "pcap_cnt": 151,
  "event_type": "alert",
  "src_ip": "172.21.224.2",
  "src_port": 58494,
  "dest_ip": "142.250.1.102",
:
```

***Note:** You can use the lowercase **f** and **b** keys to move forward or backward through the output. Also, if you enter a command incorrectly and it fails to return to the command-line prompt, you can press **CTRL+C** to stop the process and force the shell to return to the command-line prompt.*

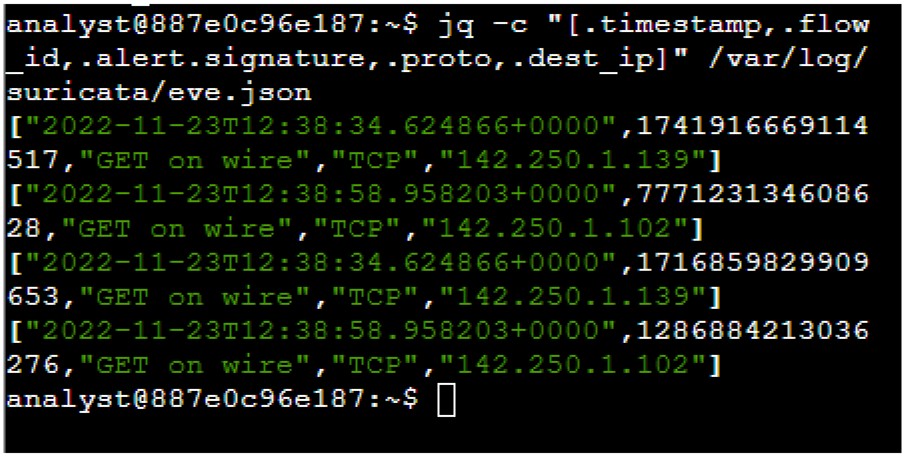
3. Press **Q** to exit the `less` command and to return to the command-line prompt.

Note how much easier it is to read the output now as opposed to the `cat` command output.

***Note:** The `jq` tool is very useful for processing JSON data, however, a full explanation of its capabilities is outside of the scope of this lab.*

4. Use the `jq` command to extract specific event data from the `eve.json` file:

```
jq -c "[.timestamp,.flow_id,.alert.signature,.proto,.dest_ip]"
/var/log/suricata/eve.json
```



```
analyst@887e0c96e187:~$ jq -c "[.timestamp,.flow
_id,.alert.signature,.proto,.dest_ip]" /var/log/
suricata/eve.json
["2022-11-23T12:38:34.624866+0000",1741916669114
517,"GET on wire","TCP","142.250.1.139"]
["2022-11-23T12:38:58.958203+0000",7771231346086
28,"GET on wire","TCP","142.250.1.102"]
["2022-11-23T12:38:34.624866+0000",1716859829909
653,"GET on wire","TCP","142.250.1.139"]
["2022-11-23T12:38:58.958203+0000",1286884213036
276,"GET on wire","TCP","142.250.1.102"]
analyst@887e0c96e187:~$ 
```

***Note:** The `jq` command above extracts the fields specified in the list in the square brackets from the JSON payload. The fields selected are the timestamp (`.timestamp`),* *the flow id (`.flow_id`), the alert signature or msg (`.alert.signature`), the protocol (`.proto`), and the destination IP address (`.dest_ip`).*

The following is and example of the output of the command above. The `flow_id` is the long numeric field highlighted in orange in each row returned.

5. Use the `jq` command to display all event logs related to a specific `flow_id` from the `eve.json` file. The `flow_id` value is a 16-digit number and will vary for each of the log entries. Replace `X` with any of the `flow_id` values returned by the previous query:

```
jq "select(.flow_id==X)" /var/log/suricata/eve.json
```

***Note:** A network flow refers to a sequence of packets between a source and destination that share common characteristics such as IP addresses, protocols, and more. In cybersecurity, network traffic flows help analysts understand the behavior of network traffic to identify and analyze threats. Suricata assigns a unique `flow_id` to each network flow. All logs from a network flow share the same `flow_id`. This makes the `flow_id` field a useful field for correlating network traffic that belongs to the same network flows.*