TryHackMe – Burp Suite: Other Modules

Take a dive into some of Burp Suite's lesser-known modules.

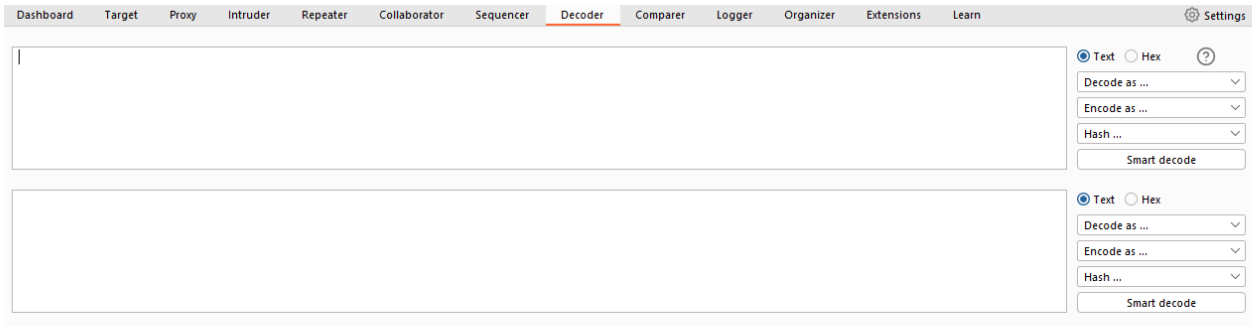
Task 1: Introduction

The spotlight will be on the Decoder, Comparer, Sequencer, and Organizer tools. They facilitate operations with encoded text, enable comparison of data sets, allow the analysis of randomness within captured tokens, and help you store and annotate copies of HTTP messages that you may want to revisit later. Although these tasks appear straightforward, accomplishing them within Burp Suite can substantially save time, thus emphasizing the importance of learning to use these modules effectively.

Task 2: Decoder (Overview)

The Decoder module of Burp Suite gives user data manipulation capabilities. As implied by its name, it not only decodes data intercepted during an attack but also provides the function to encode our own data, prepping it for transmission to the target. Decoder also allows us to create hashsums of data, as well as providing a Smart Decode feature, which attempts to decode provided data recursively until it is back to being plaintext (like the "Magic" function of Cyberchef).

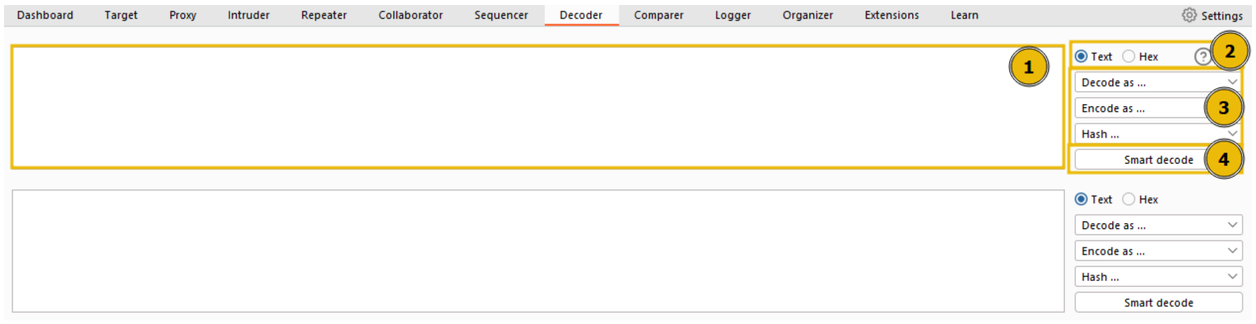
To access the Decoder, navigate to the Decoder tab from the top menu to view the available options:



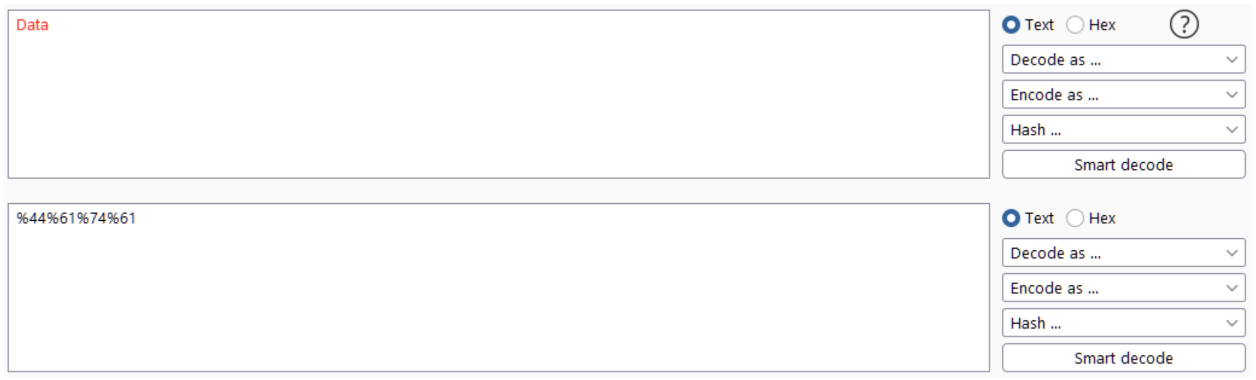
This interface lays out a multitude of options.

1. This box serves as the workspace for entering or pasting data that requires encoding or decoding. Consistent with other modules of Burp Suite, data can be moved to this area from different parts of the framework via the **Send to Decoder** option upon right-clicking.

2. At the top of the list on the right, there's an option to treat the input as either text or hexadecimal byte values.
3. As we move down the list, dropdown menus are present to encode, decode, or hash the input.
4. The **Smart Decode** feature, located at the end, attempts to auto-decode the input.



Upon entering data into the input field, the interface replicates itself to present the output of our operation. We can then choose to apply further transformations using the same options:


Data

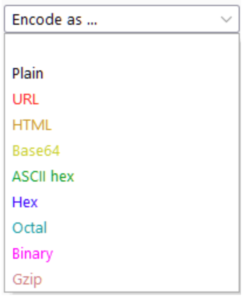
```
%44%61%74%61
```

Question 1: Which feature attempts auto-decode of the input?

Answer: *Smart Decode*

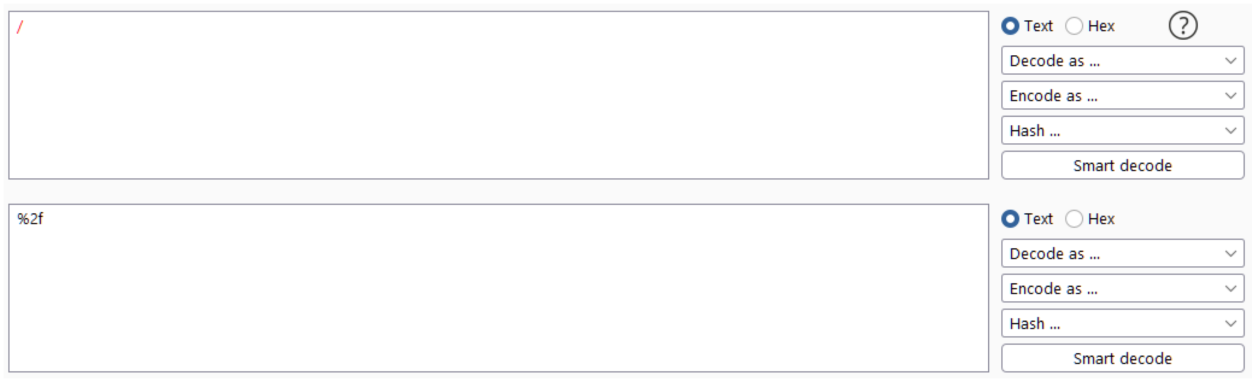
Task 3: Decoder (Encoding/Decoding)

Now, let's examine the manual encoding and decoding options in detail. These are identical whether the decoding or encoding menu is chosen:



- **Plain**: This refers to the raw text before any transformations are applied.
- **URL**: URL encoding is utilized to ensure the safe transfer of data in the URL of a web request. It involves substituting characters for their ASCII character code in hexadecimal format, preceded by a percentage symbol (%). This method is vital for any type of web application testing.

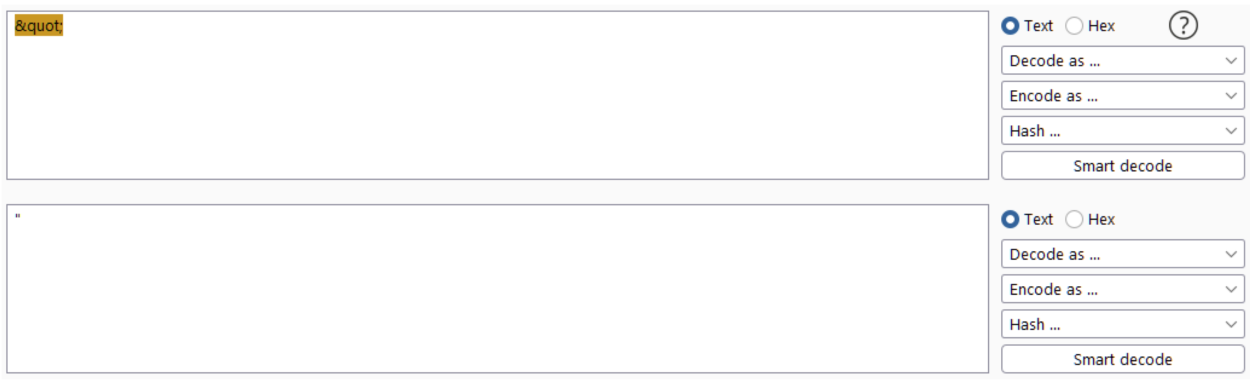
  For instance, encoding the forward-slash character (/), whose ASCII character code is 47, converts it to **2F** in hexadecimal, thus becoming **%2F** in URL encoding. The Decoder can be used to verify this by typing a forward slash in the input box, then selecting Encode as -> URL :



```
/
```

```
%2f
```

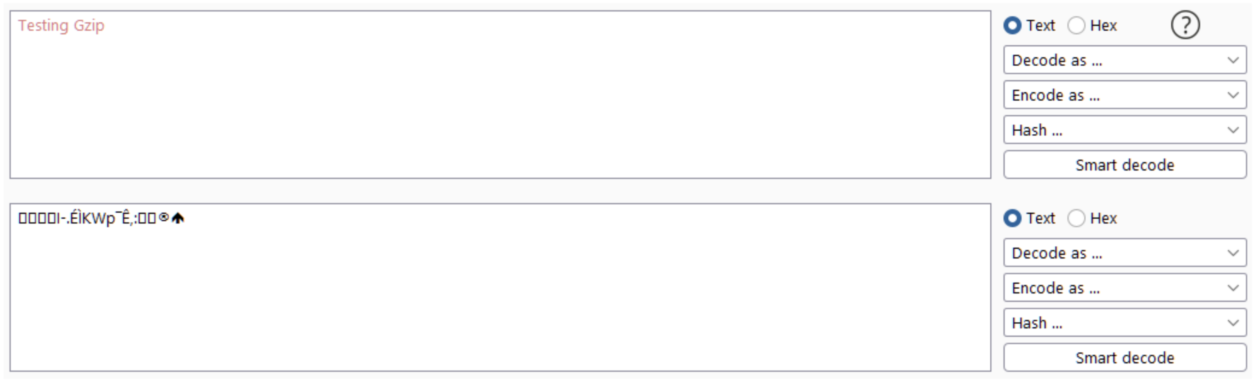
- **HTML**: HTML Entities encoding replaces special characters with an ampersand (&), followed by either a hexadecimal number or a reference to the character being escaped, and ending with a semicolon (;). This method ensures the safe rendering of special characters in HTML and helps prevent attacks such as XSS. The HTML option in Decoder allows any character to be encoded into its HTML escaped format or decode captured HTML entities. For instance, to decode a previously discussed quotation mark, input the encoded version and choose Decode as -> HTML:



```
&quot;
```

```
"
```

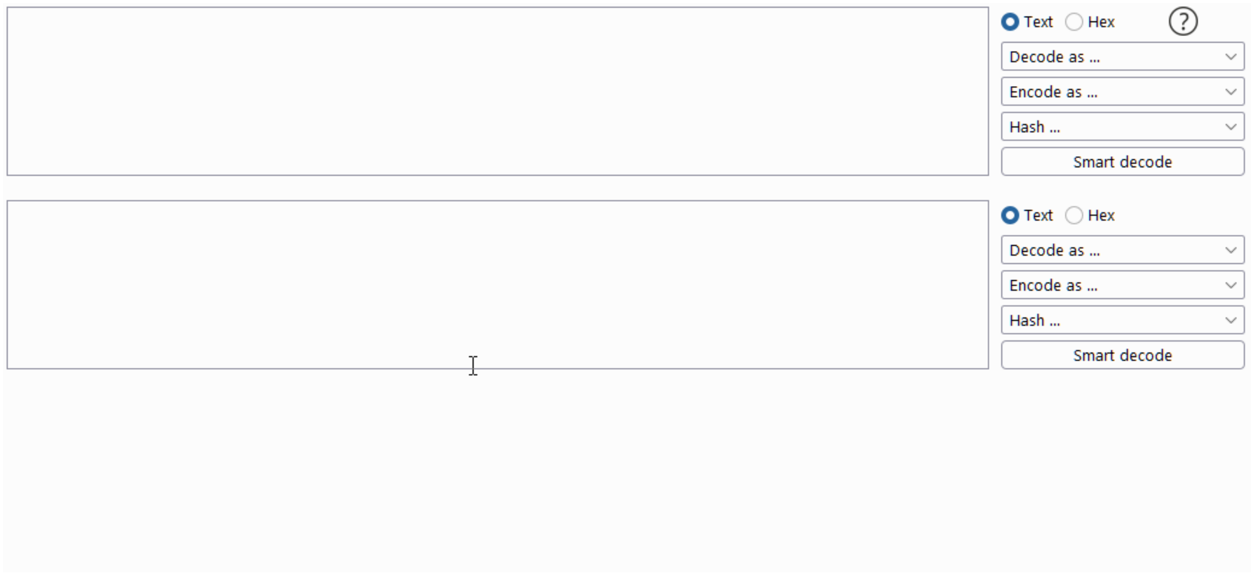
- **Base64**: Base64, a commonly used encoding method, converts any data into an ASCII-compatible format. The under-the-hood functioning isn't crucial at this stage; however, interested individuals can find the underlying mathematics here.
- **ASCII Hex**: This option transitions data between ASCII and hexadecimal representations. For instance, the word "ASCII" can be converted into the hexadecimal number "4153434949". Each character is converted from its numeric ASCII representation into hexadecimal.
- **Hex, Octal, and Binary**: These encoding methods apply solely to numeric inputs, converting between decimal, hexadecimal, octal (base eight), and binary representations.
- **Gzip**: Gzip compresses data, reducing file and page sizes before browser transmission. Faster load times are highly desirable for developers looking to enhance their SEO score and avoid user inconvenience. Decoder facilitates the manual encoding and decoding of gzip data, although it often isn't valid ASCII/Unicode. For instance:



```
Testing Gzip
```

```
□□□□I-.ÉÌKWp¯Ê,:□□®🡅
```

These methods can be stacked. For example, a phrase ("Burp Suite Decoder") could be converted to ASCII Hex and then to octal:

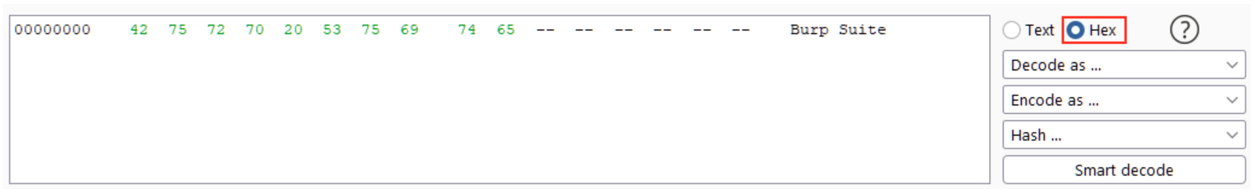


In combination, these methods grant us substantial control over the data we are encoding or decoding.

Each encoding/decoding method is color-coded, enabling swift identification of the applied transformation.

Hex Format

While inputting data in ASCII format is beneficial, there are times when byte-by-byte input editing is necessary. This is where "Hex View" proves useful, selectable above the decoding options:

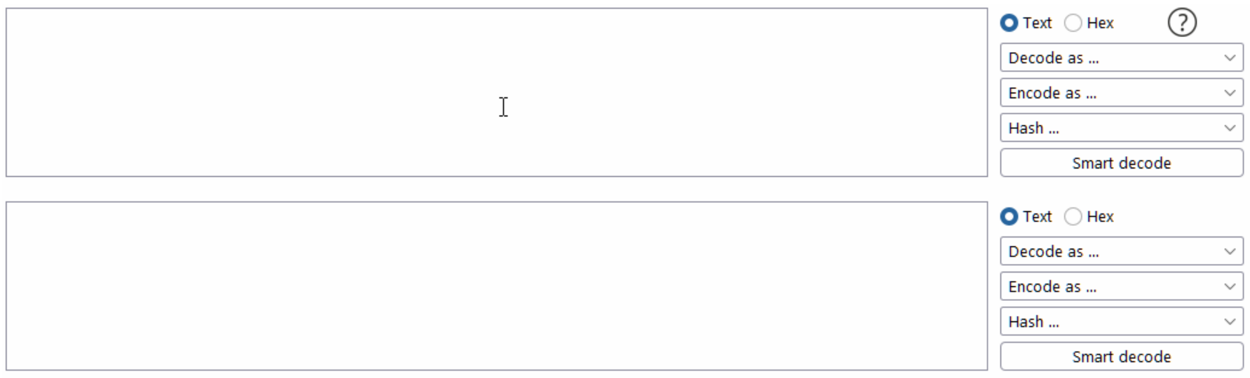


```
00000000    42  75  72  70  20  53  75  69   74  65  --  --  --  --  --  --    Burp Suite
```

This feature enables us to view and alter our data in hexadecimal byte format, a vital tool when working with binary files or other non-ASCII data.

Smart Decode

Lastly, we have the **Smart decode** option. This feature tries to auto-decode encoded text. For instance, &#x42;&#x75;&#x72;&#x70;&#x20;&#x53;&#x75;&#x69;&#x74;&#x65; is automatically recognized as HTML encoded and is accordingly decoded:



While not perfect, this feature can be a quick solution for decoding unknown data chunks.

Question 2: Base64 encode the phrase: *Let's Start Simple*. What is the base64 encoded version of this text?

Answer: *TGV0J3MgU3RhcnQgU2ltcGxl*

Question 3: URL Decode this data: *%4e%65%78%74%3a%20%44%65%63%6f%64%69%6e%67*. What is the plaintext returned?

Answer: *Next:Decoding*

Question 4: Use Smart decode to decode this data: *&#x25;&#x33;&#x34;&#x25;&#x33;&#x37;*. What is the decoded text?

Answer: *47*

Question 5: Encode this phrase: *Encoding Challenge*. Start with base64 encoding. Take the output of this and convert it into ASCII Hex. Finally, encode the hex string into octal. What is the final string?

Answer: *24034214a720270024142d541357471232250253552c1162d1206c*

Task 4: Decoder (Hashing)

Hash In addition to its Encoding/Decoding functionality, Decoder also offers the ability to generate hashsums for our data.

Theory

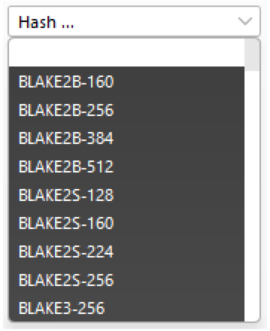
Hashing is a one-way process that transforms data into a unique signature. For a function to qualify as a hashing algorithm, the output it generates must be irreversible. A proficient hashing algorithm ensures that every data input will generate a completely unique hash. For instance, using the MD5 algorithm to produce a hashsum for the text "MD5sum" returns 4ae1a02de5bd02a5515f583f4fca5e8c. Using the same algorithm for "MD5SUM" yields an entirely different hash despite the close resemblance of the input: 13b436b09172400c9eb2f69fbd20adad. Therefore, hashes are commonly used to verify the integrity of files and documents, as even a tiny alteration to the file significantly changes the hashsum.

Note: The MD5 algorithm is deprecated and should not be used for contemporary applications.

Moreover, hashes are used to securely store passwords since the one-way hashing process makes the passwords relatively secure, even if the database is compromised. When a user creates a password, the application hashes and stores it. During login, the application hashes the submitted password and compares it against the stored hash; if they match, the password is correct. Using this method, an application never needs to store the original (plaintext) password.

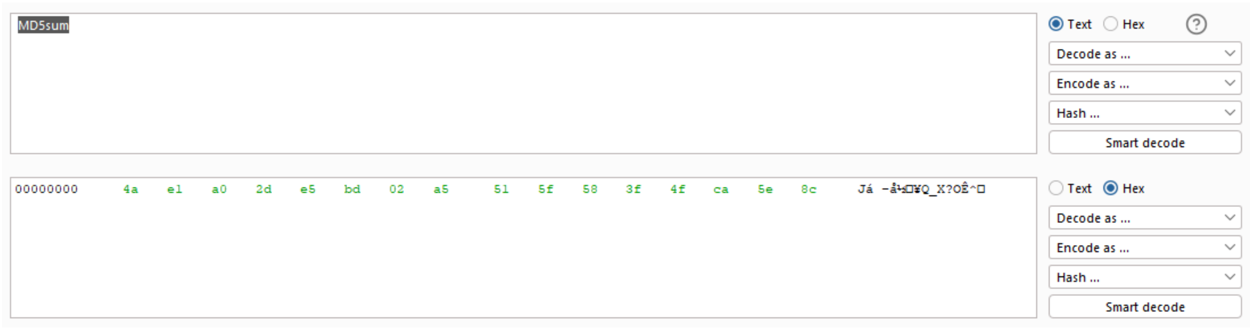
<u>Hashing in Decoder</u>

Decoder allows us to create hashsums for data directly within Burp Suite; it operates similarly to the encoding/decoding options we discussed earlier. Specifically, we click on the **Hash** dropdown menu and select an algorithm from the list:



Note: This list is significantly longer than the encoding/decoding algorithms – it's worth scrolling through to see the many available hashing algorithms.

Continuing with our earlier example, let's enter "MD5sum" into the input box, then scroll down the list until we find "MD5". Applying this automatically takes us into the Hex view:



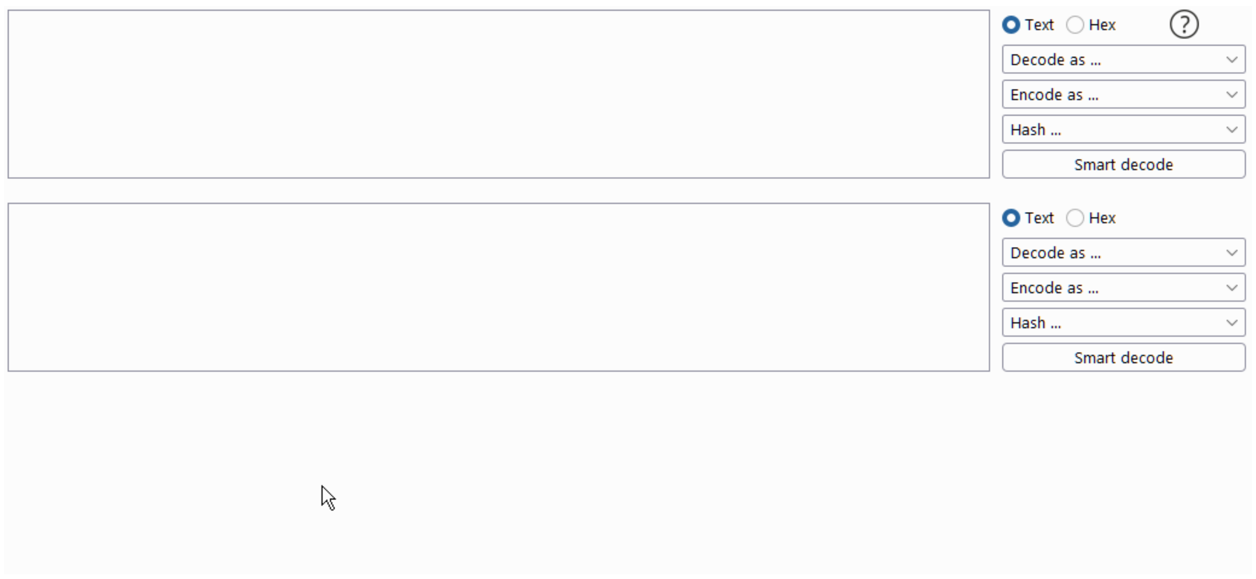
```
MD5sum
```

```
00000000    4a  e1  a0  2d  e5  bd  02  a5   51  5f  58  3f  4f  ca  5e  8c    Já -å½□¥Q_X?OÊ^□
```

A hashing algorithm's output does not yield pure ASCII/Unicode text. Hence, it's customary to convert the algorithm's output into a hexadecimal string; this is the "hash" form you might be familiar with.

Let's complete this by applying an "ASCII Hex" encoding to the hashsum to create the neat hex string from our initial example.

Here's the full process:



Question 6: Using Decoder, what is the SHA-256 hashsum of the phrase: *Let's get Hashing!*? Convert this into an ASCII Hex string for the answer to this question.

Answer: *6b72350e719a8ef5af560830164b13596cb582757437e21d1879502072238abe*

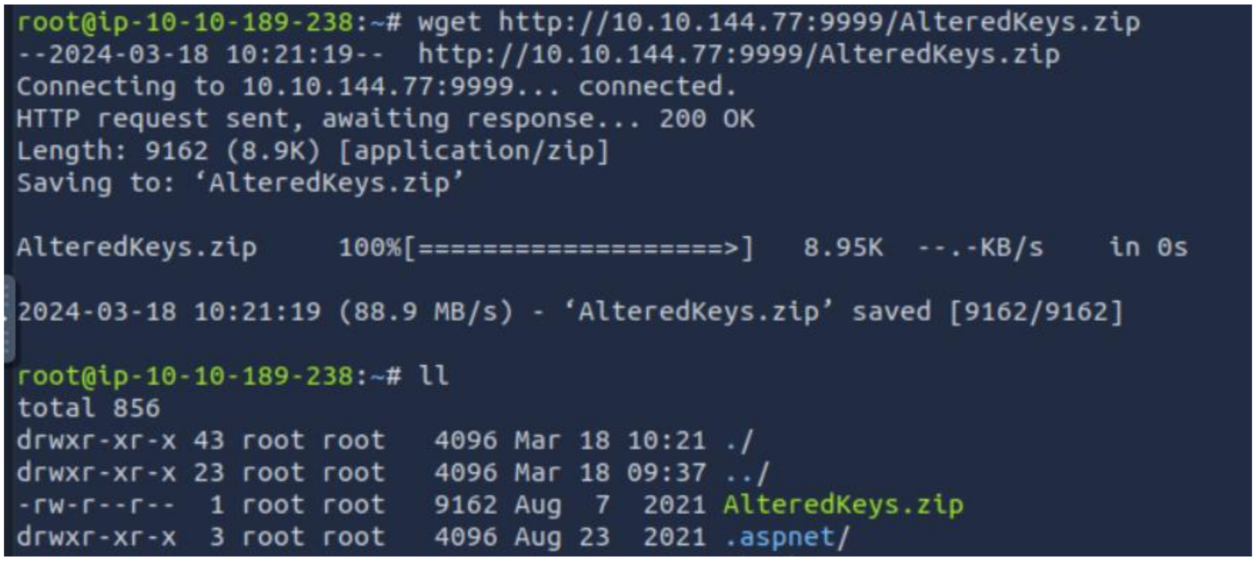
Question 7: Generate an MD4 hashsum of the phrase: *Insecure Algorithms*. Encode this as base64 (not ASCII Hex) before submitting.

Answer: *TcV4QGZZN7y7lwYFRMMoeA==*

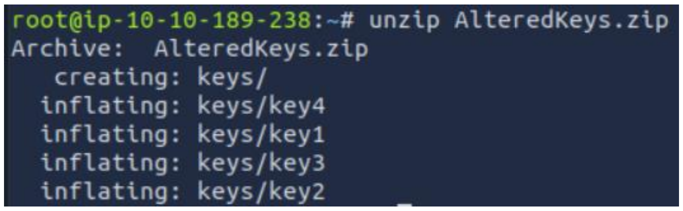
Let's look at an in-context example:

First, download the file attached to this task.

Note: This file can also be downloaded from the deployed VM with **wget http://10.10.144.77:9999/AlteredKeys.zip** — you may find this helpful if you are using the AttackBox.



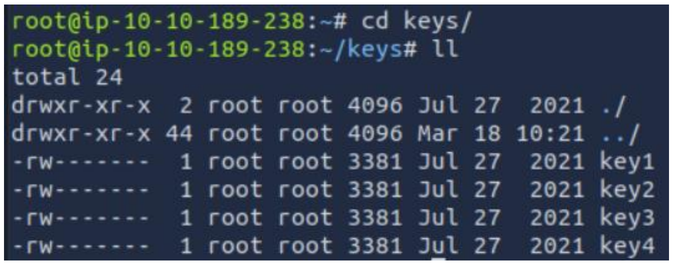
```
root@ip-10-10-189-238:~# wget http://10.10.144.77:9999/AlteredKeys.zip
--2024-03-18 10:21:19--  http://10.10.144.77:9999/AlteredKeys.zip
Connecting to 10.10.144.77:9999... connected.
HTTP request sent, awaiting response... 200 OK
Length: 9162 (8.9K) [application/zip]
Saving to: ‘AlteredKeys.zip’

AlteredKeys.zip     100%[===================>]   8.95K  --.-KB/s    in 0s

2024-03-18 10:21:19 (88.9 MB/s) - ‘AlteredKeys.zip’ saved [9162/9162]

root@ip-10-10-189-238:~# ll
total 856
drwxr-xr-x 43 root root   4096 Mar 18 10:21 ./
drwxr-xr-x 23 root root   4096 Mar 18 09:37 ../
-rw-r--r--  1 root root   9162 Aug  7  2021 AlteredKeys.zip
drwxr-xr-x  3 root root   4096 Aug 23  2021 .aspnet/
```



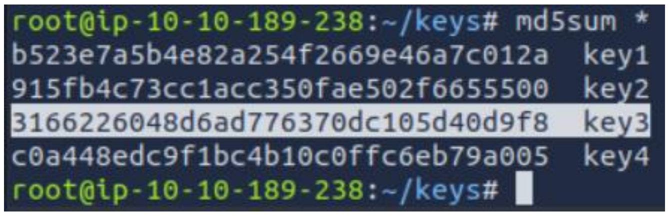
```
root@ip-10-10-189-238:~# unzip AlteredKeys.zip
Archive:  AlteredKeys.zip
   creating: keys/
  inflating: keys/key4
  inflating: keys/key1
  inflating: keys/key3
  inflating: keys/key2
```

Now read the problem specification below:

"Some joker has messed with my SSH key! There are four keys in the directory, and I have no idea which is the real one. The MD5 hashsum for my key is **3166226048d6ad776370dc105d40d9f8** — could you find it for me?"



```
root@ip-10-10-189-238:~# cd keys/
root@ip-10-10-189-238:~/keys# ll
total 24
drwxr-xr-x  2 root root 4096 Jul 27  2021 ./
drwxr-xr-x 44 root root 4096 Mar 18 10:21 ../
-rw-------  1 root root 3381 Jul 27  2021 key1
-rw-------  1 root root 3381 Jul 27  2021 key2
-rw-------  1 root root 3381 Jul 27  2021 key3
-rw-------  1 root root 3381 Jul 27  2021 key4
```



```
root@ip-10-10-189-238:~/keys# md5sum *
b523e7a5b4e82a254f2669e46a7c012a  key1
915fb4c73cc1acc350fae502f6655500  key2
3166226048d6ad776370dc105d40d9f8  key3
c0a448edc9f1bc4b10c0ffc6eb79a005  key4
root@ip-10-10-189-238:~/keys#
```

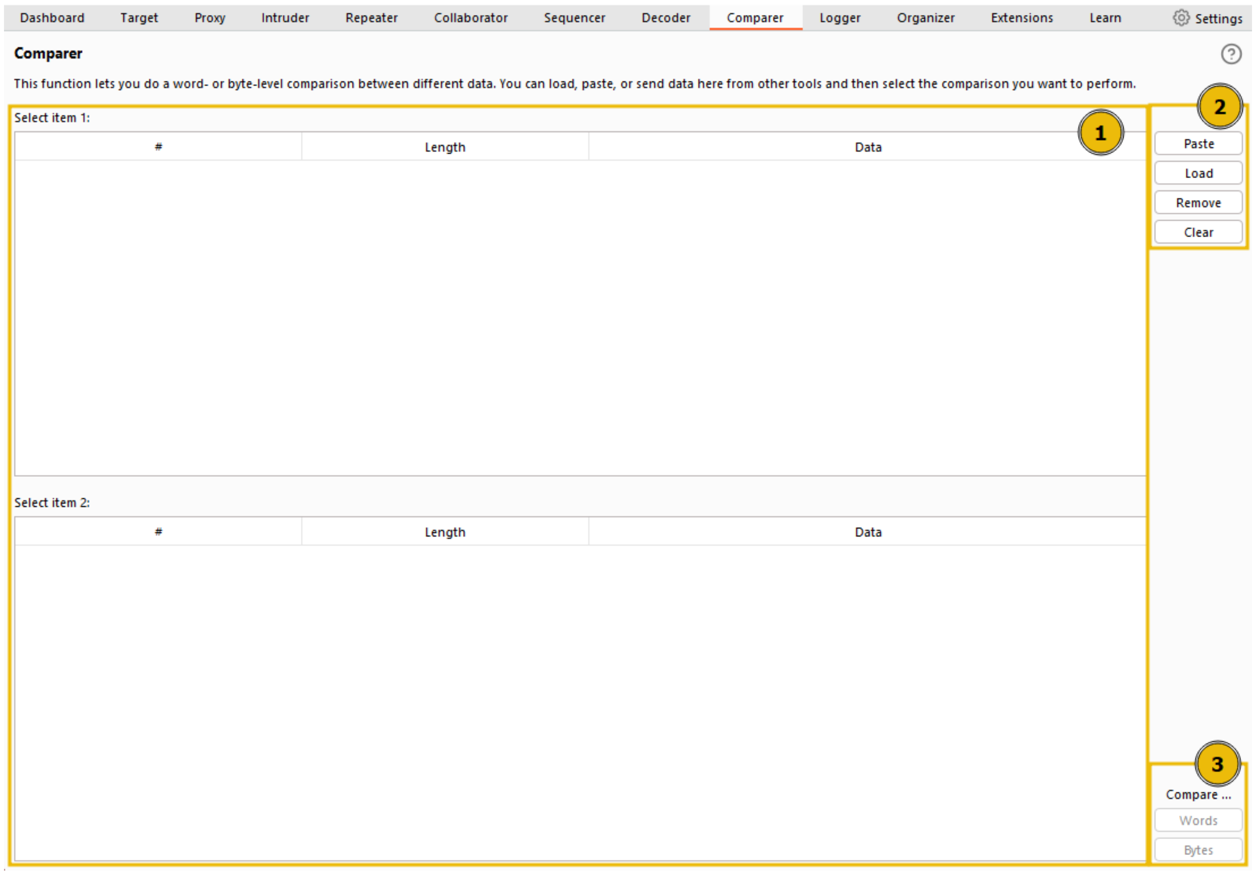
Question 7: What is the correct key name?

Answer: *key3*

Task 5: Comparer (Overview)

Comparer, as the name implies, lets us compare two pieces of data, either by ASCII words or by bytes.

Let's first check out the interface:

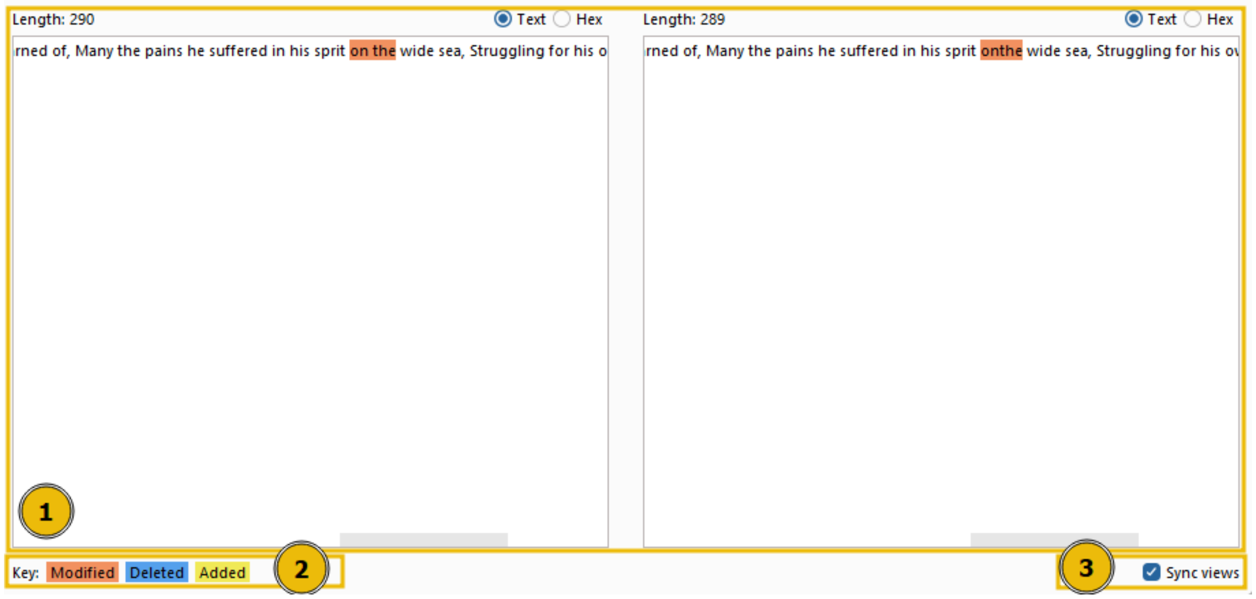


The interface can be divided into three main sections:

1. On the left, we see the items to be compared. When we load data into Comparer, it appears as rows in these tables. We select two datasets to compare.
2. On the upper right, we have options for pasting data from the clipboard (Paste), loading data from a file (Load), removing the current row (Remove), and clearing all datasets (Clear).
3. Lastly, on the lower right, we can choose to compare our datasets by either words or bytes. It doesn't matter which of these buttons you select initially because this can be changed later. These are the buttons we click when we're ready to compare the selected data.

Just like most Burp Suite modules, we can also load data into Comparer from other modules by right-clicking and choosing **Send to Comparer**.

Once we've added at least 2 datasets to compare and press on either **Words** or **Bytes**, a pop-up window shows us the comparison:



Length: 290
Text
Hex
rned of, Many the pains he suffered in his sprit on the wide sea, Struggling for his o
Length: 289
Text
Hex
rned of, Many the pains he suffered in his sprit onthe wide sea, Struggling for his ov
1
Key: Modified Deleted Added
2
3
Sync views

This window also has three distinct sections:

1. The compared data occupies most of the window; it can be viewed in either text or hex format. The initial format depends on whether we chose to compare by words or bytes in the previous window, but this can be overridden by using the buttons above the comparison boxes.
2. The comparison key is at the bottom left, showing which colors represent modified, deleted, and added data between the two datasets.
3. The **Sync views** checkbox is at the bottom right of the window. When selected, it ensures that both sets of data will sync formats. In other words, if you change one of them into Hex view, the other will adjust to match.

The window title displays the total number of differences found.

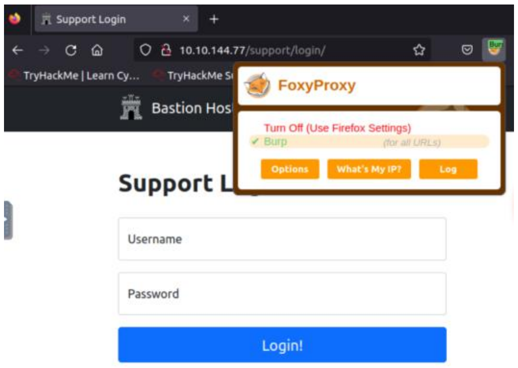
Task 6: Comparer (Example)

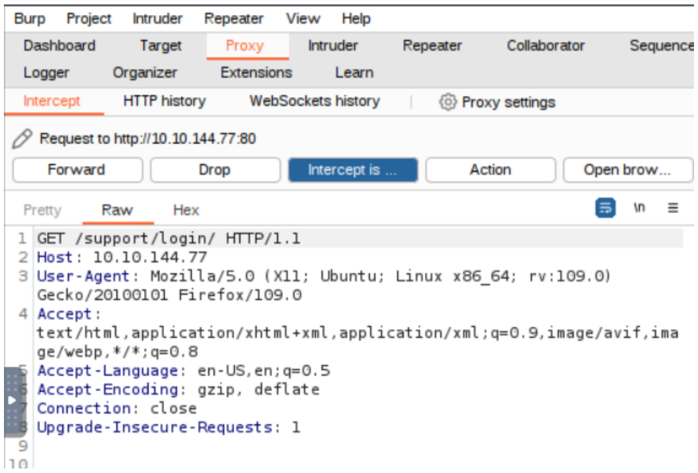
There are many situations where being able to quickly compare two (potentially very large) pieces of data can come in handy.

For example, when performing a login bruteforce or credential stuffing attack with Intruder, you may wish to compare two responses with different lengths to see where the differences lie and whether the differences indicate a successful login.

Practical Example

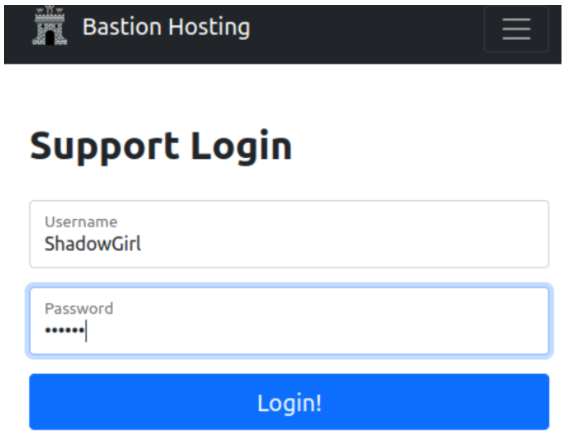
1. Navigate to http://10.10.144.77/support/login




Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequence
Logger Organizer Extensions Learn
Intercept HTTP history WebSockets history Proxy settings
Request to http://10.10.144.77:80
Forward Drop Intercept is ... Action Open brow...
Pretty Raw Hex

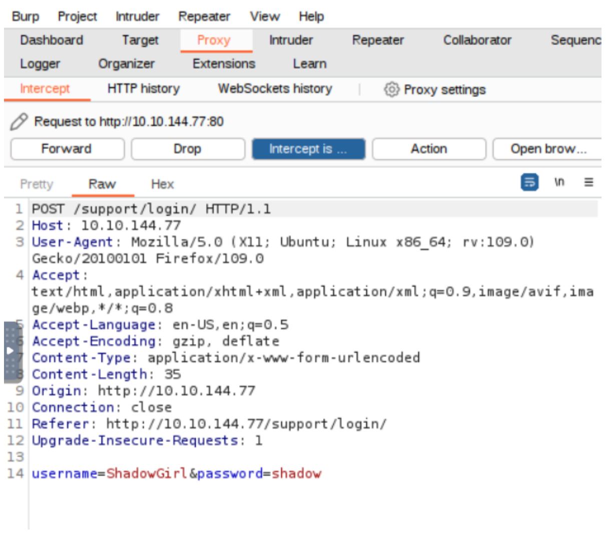
```
GET /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0)
Gecko/20100101 Firefox/109.0
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,ima
ge/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: close
Upgrade-Insecure-Requests: 1
```

Try to log in with an invalid username and password – capture the request in the Burp Proxy.



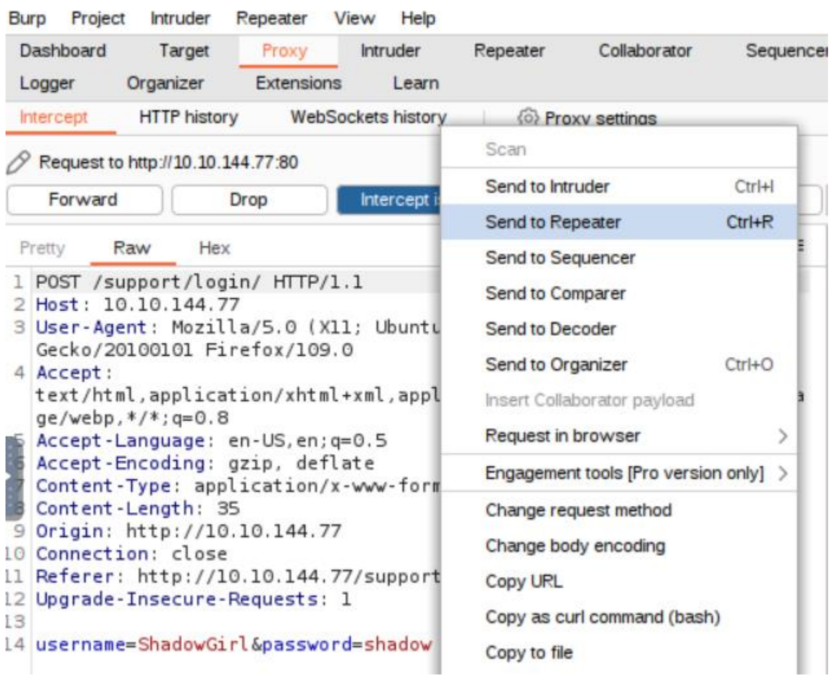
Username: ShadowGirl

Password: ••••••


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequenc
Logger Organizer Extensions Learn
Intercept HTTP history WebSockets history Proxy settings
Request to http://10.10.144.77:80
Forward Drop Intercept is ... Action Open brow...
Pretty Raw Hex

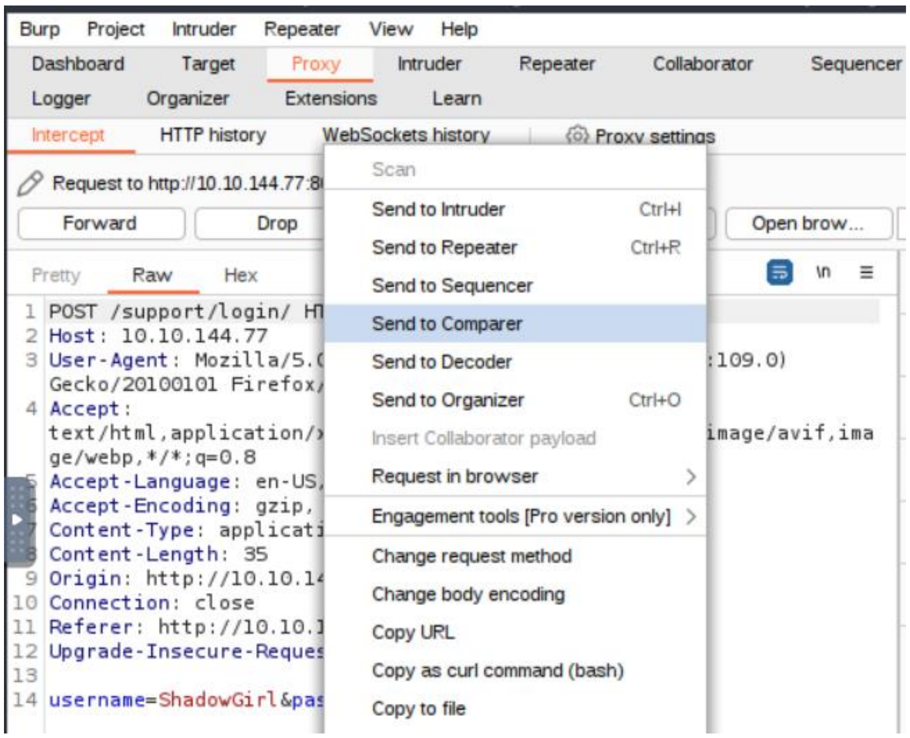
```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0)
Gecko/20100101 Firefox/109.0
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,ima
ge/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 35
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support/login/
Upgrade-Insecure-Requests: 1

username=ShadowGirl&password=shadow
```

2. Send the request to Repeater with Ctrl + R (or Mac equivalent) or by right-clicking on the request in the Proxy module and choosing **Send to Repeater**.


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequencer
Logger Organizer Extensions Learn
Intercept HTTP history WebSockets history Proxy settings
Request to http://10.10.144.77:80
Forward Drop Intercept i
Pretty Raw Hex
Scan
Send to Intruder Ctrl+I
Send to Repeater Ctrl+R
Send to Sequencer
Send to Comparer
Send to Decoder
Send to Organizer Ctrl+O
Insert Collaborator payload
Request in browser
Engagement tools [Pro version only]
Change request method
Change body encoding
Copy URL
Copy as curl command (bash)
Copy to file

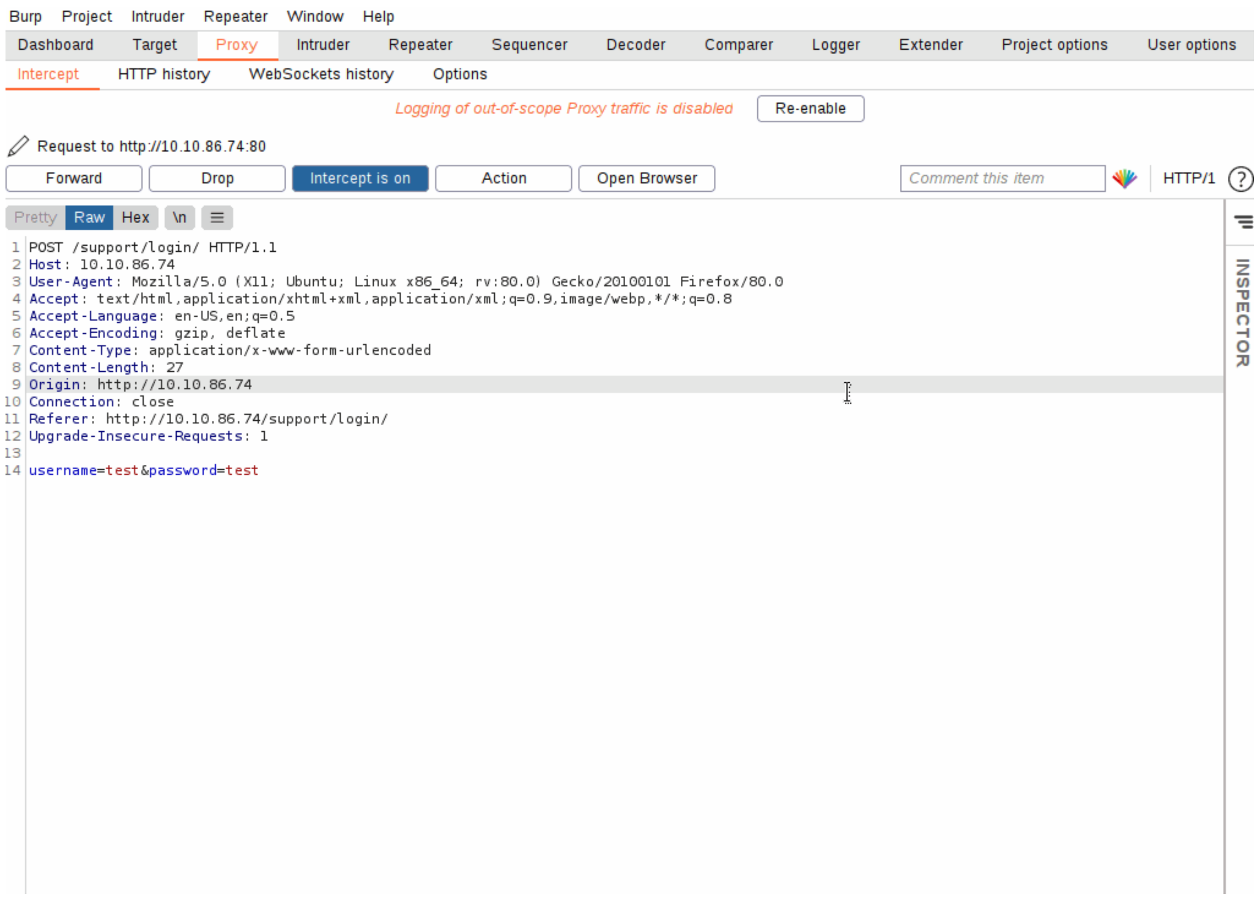
```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu
Gecko/20100101 Firefox/109.0
Accept:
text/html,application/xhtml+xml,appl
ge/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form
Content-Length: 35
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support
Upgrade-Insecure-Requests: 1

username=ShadowGirl&password=shadow
```

3. Send the request, then right-click on the response and choose **Send to Comparer**.


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequencer
Logger Organizer Extensions Learn
Intercept HTTP history WebSockets history Proxy settings
Request to http://10.10.144.77:8
Forward Drop Open brow...
Pretty Raw Hex \n
Scan
Send to Intruder Ctrl+I
Send to Repeater Ctrl+R
Send to Sequencer
Send to Comparer
Send to Decoder
Send to Organizer Ctrl+O
Insert Collaborator payload
Request in browser
Engagement tools [Pro version only]
Change request method
Change body encoding
Copy URL
Copy as curl command (bash)
Copy to file

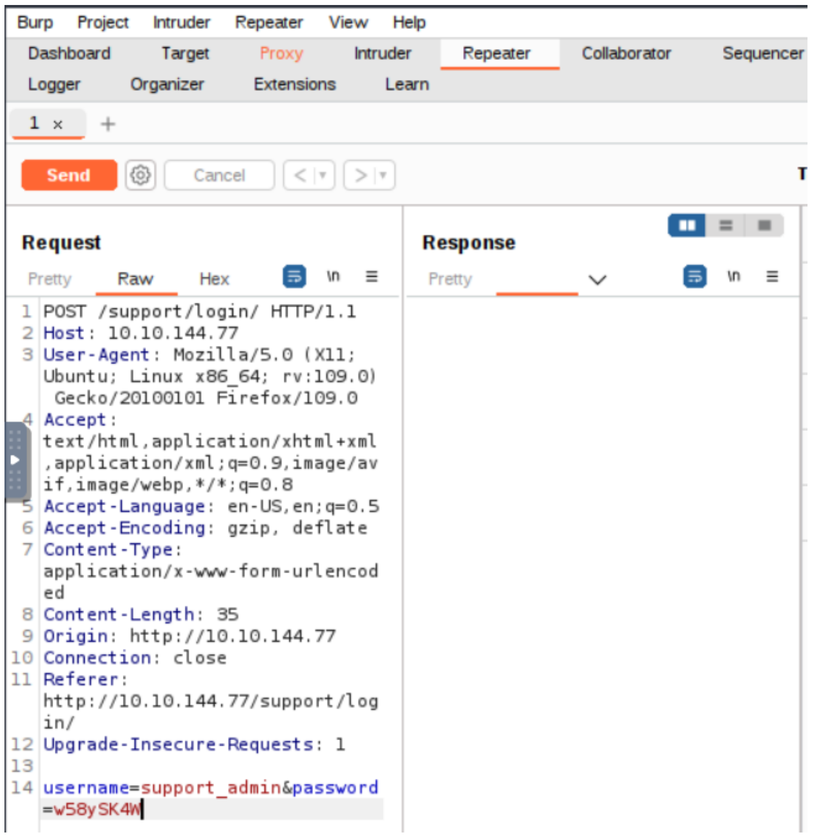
```
POST /support/login/ HT
Host: 10.10.144.77
User-Agent: Mozilla/5.(                                    :109.0)
Gecko/20100101 Firefox/
Accept:
text/html,application/x                                    image/avif,ima
ge/webp,*/*;q=0.8
Accept-Language: en-US,
Accept-Encoding: gzip,
Content-Type: applicati
Content-Length: 35
Origin: http://10.10.14
Connection: close
Referer: http://10.10.1
Upgrade-Insecure-Reques

username=ShadowGirl&pas
```

GIF Demo from THM:


Burp Project Intruder Repeater Window Help
Dashboard Target Proxy Intruder Repeater Sequencer Decoder Comparer Logger Extender Project options User options
Intercept HTTP history WebSockets history Options
Logging of out-of-scope Proxy traffic is disabled
Re-enable
Request to http://10.10.86.74:80
Forward Drop Intercept is on Action Open Browser
Comment this item
HTTP/1
Pretty Raw Hex \n
INSPECTOR

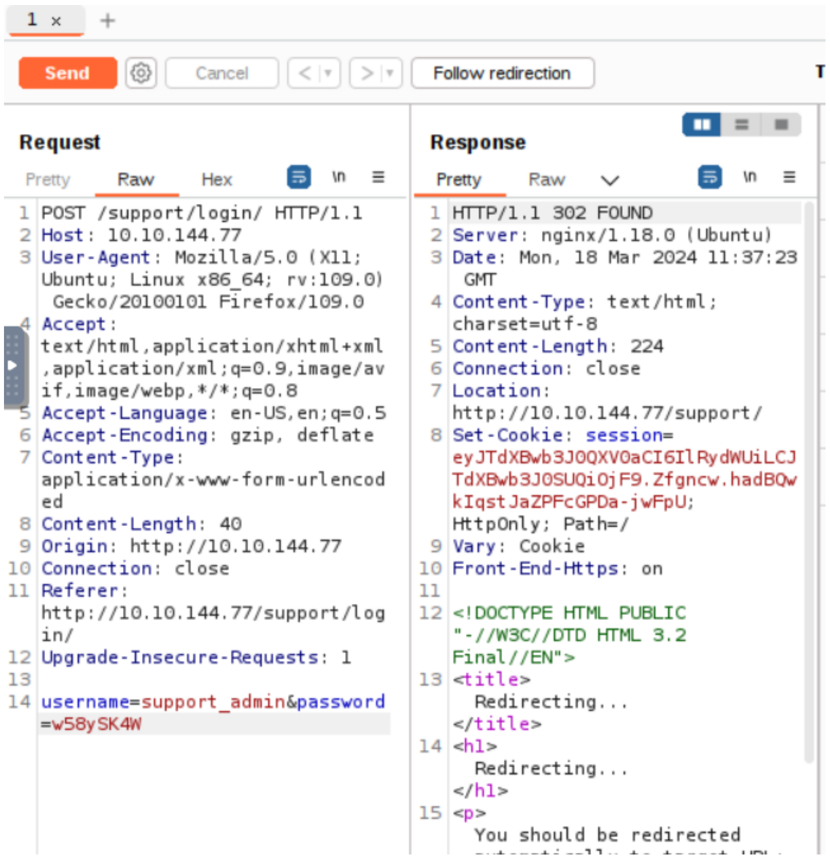
```
POST /support/login/ HTTP/1.1
Host: 10.10.86.74
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:80.0) Gecko/20100101 Firefox/80.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 27
Origin: http://10.10.86.74
Connection: close
Referer: http://10.10.86.74/support/login/
Upgrade-Insecure-Requests: 1

username=test&password=test
```

4. In the Repeater tab, change the credentials to:
   - Username: support_admin
   - Password: w58ySK4W


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequencer
Logger Organizer Extensions Learn
Send
Cancel
Request
Pretty Raw Hex
Response
Pretty

```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0) Gecko/20100101 Firefox/109.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 35
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support/login/
Upgrade-Insecure-Requests: 1

username=support_admin&password=w58ySK4W
```

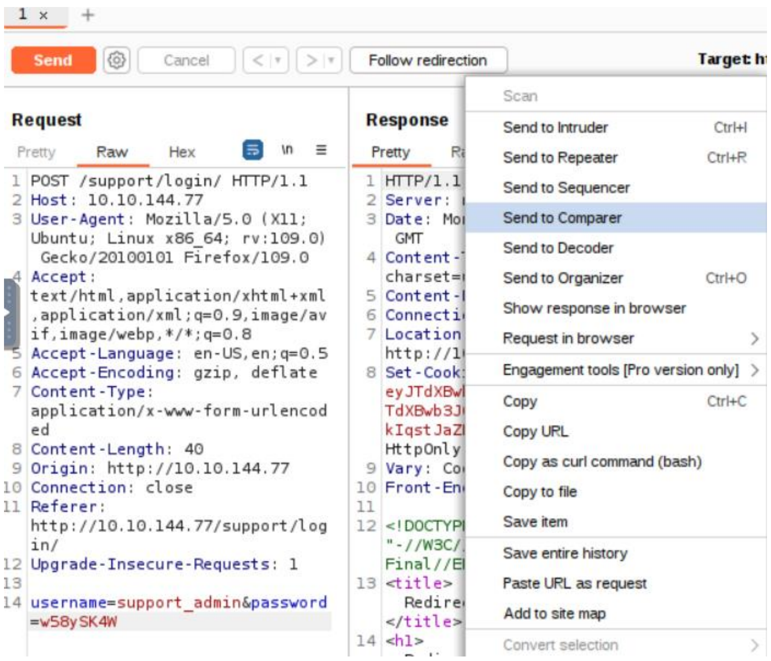
Click Send.



```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0) Gecko/20100101 Firefox/109.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 40
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support/login/
Upgrade-Insecure-Requests: 1

username=support_admin&password=w58ySK4W
```

```
HTTP/1.1 302 FOUND
Server: nginx/1.18.0 (Ubuntu)
Date: Mon, 18 Mar 2024 11:37:23 GMT
Content-Type: text/html; charset=utf-8
Content-Length: 224
Connection: close
Location: http://10.10.144.77/support/
Set-Cookie: session=eyJTdXBwb3J0QXV0aCI6IlRydWUiLCJTdXBwb3J0SUQiOjF9.Zfgncw.hadBQwkIqstJaZPFcGPDa-jwFpU; HttpOnly; Path=/
Vary: Cookie
Front-End-Https: on

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
<title>
  Redirecting...
</title>
<h1>
  Redirecting...
</h1>
<p>
  You should be redirected
```

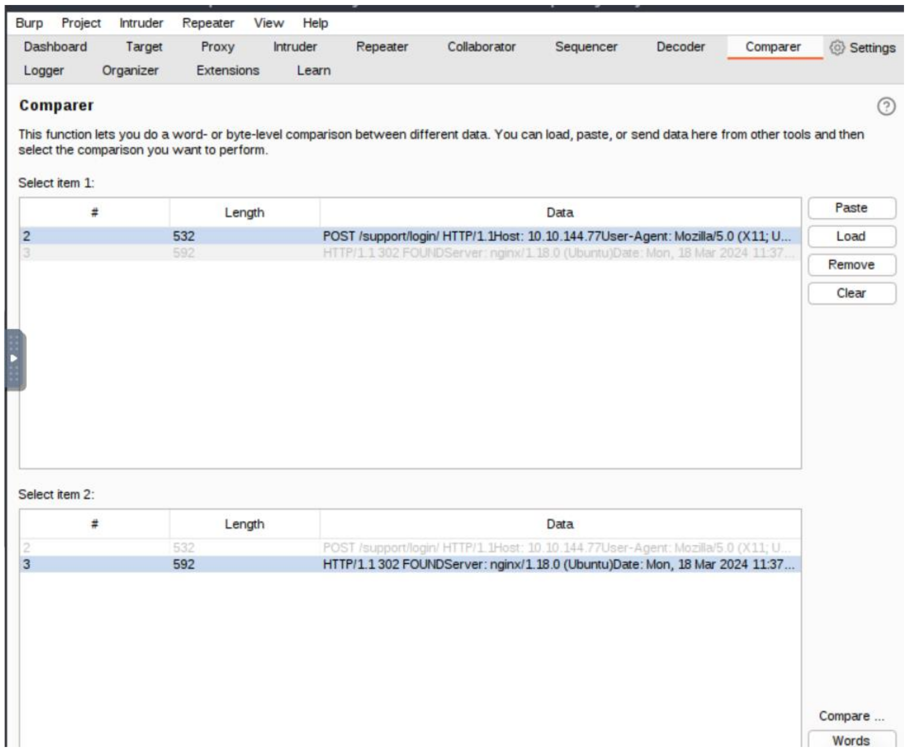
Send the request again, then pass the new response to Comparer.



```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0) Gecko/20100101 Firefox/109.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 40
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support/login/
Upgrade-Insecure-Requests: 1

username=support_admin&password=w58ySK4W
```

```
HTTP/1.1
Server:
Date: Mo
GMT
Content-
charset=
Content-
Connecti
Location
http://1
Set-Cook
eyJTdXBw
TdXBwb3J
kIqstJaZ
HttpOnly
Vary: Co
Front-En

<!DOCTYP
"-//W3C/
Final//E
<title>
  Redire
</title>
<h1>
```

We can see two sets of responses here.


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequencer Decoder Comparer Settings
Logger Organizer Extensions Learn
Paste
Load
Remove
Clear
Compare ...
Words

Comparer

This function lets you do a word- or byte-level comparison between different data. You can load, paste, or send data here from other tools and then select the comparison you want to perform.

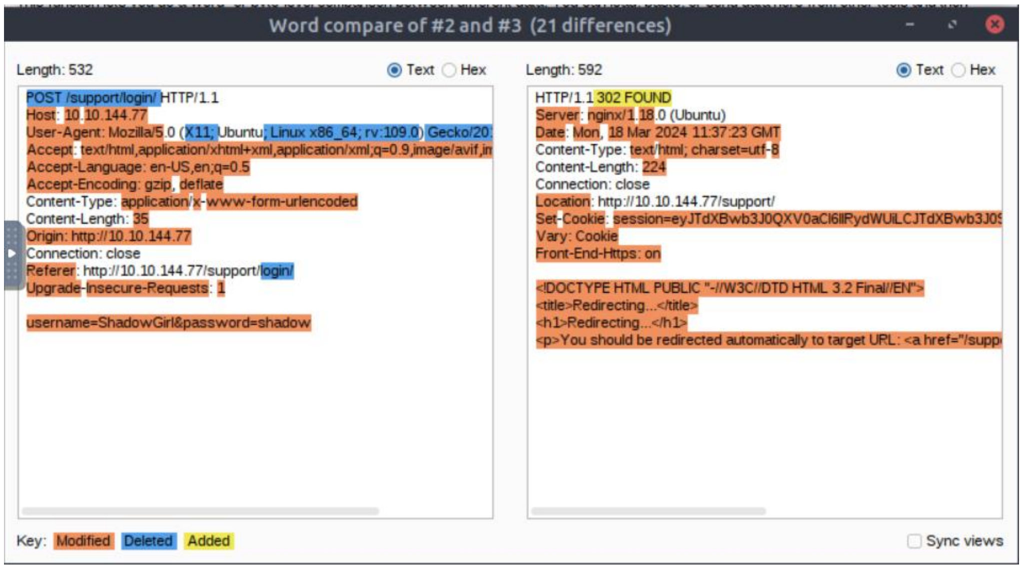
Select item 1:

#	Length	Data
2	532	POST /support/login/ HTTP/1.1Host: 10.10.144.77User-Agent: Mozilla/5.0 (X11; U...
3	592	HTTP/1.1 302 FOUNDServer: nginx/1.18.0 (Ubuntu)Date: Mon, 18 Mar 2024 11:37...

Select item 2:

#	Length	Data
2	532	POST /support/login/ HTTP/1.1Host: 10.10.144.77User-Agent: Mozilla/5.0 (X11; U...
3	592	HTTP/1.1 302 FOUNDServer: nginx/1.18.0 (Ubuntu)Date: Mon, 18 Mar 2024 11:37...

Click “Compare by words”.


Word compare of #2 and #3 (21 differences)
Key: Modified Deleted Added
Sync views

Length: 532 ● Text ○ Hex

```
POST /support/login/ HTTP/1.1
Host: 10.10.144.77
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:109.0) Gecko/20
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,in
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded
Content-Length: 35
Origin: http://10.10.144.77
Connection: close
Referer: http://10.10.144.77/support/login/
Upgrade-Insecure-Requests: 1

username=ShadowGirl&password=shadow
```

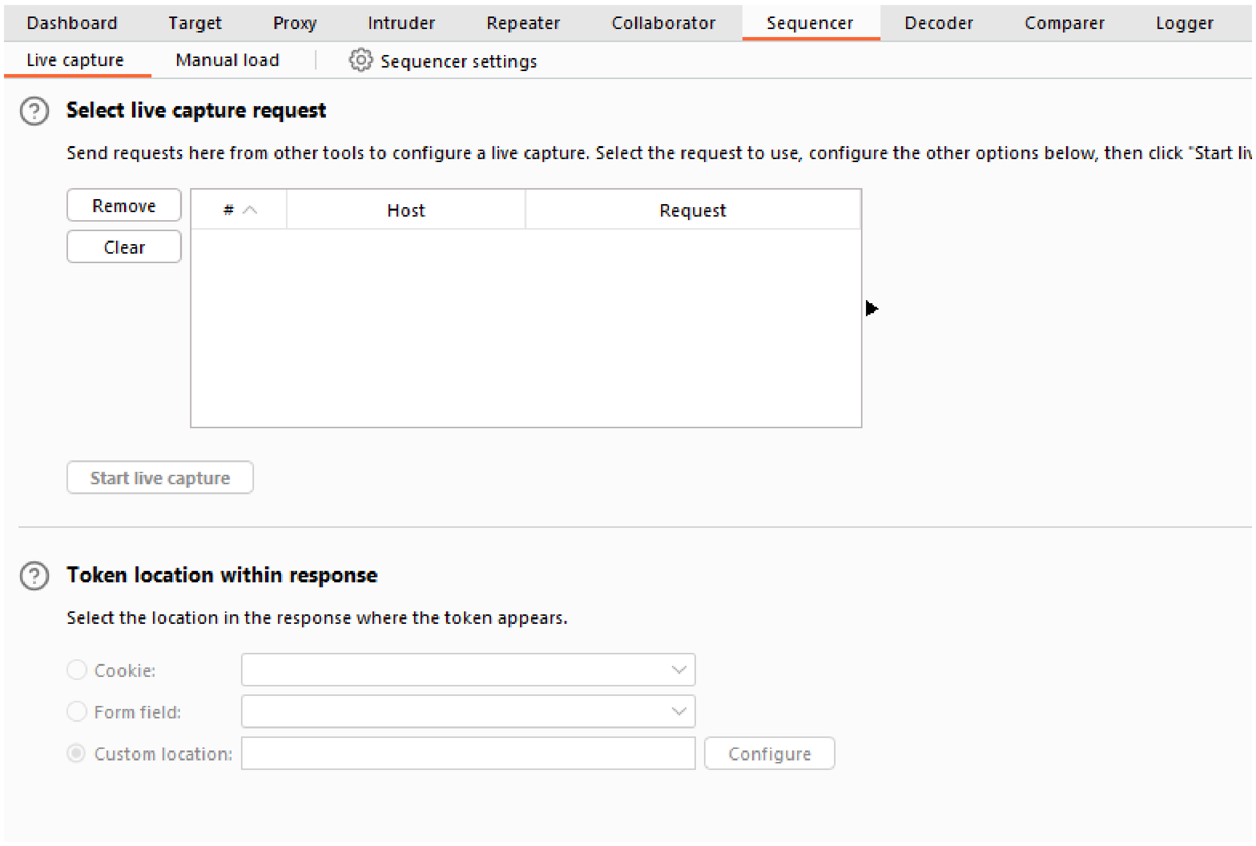
Length: 592 ● Text ○ Hex

```
HTTP/1.1 302 FOUND
Server: nginx/1.18.0 (Ubuntu)
Date: Mon, 18 Mar 2024 11:37:23 GMT
Content-Type: text/html; charset=utf-8
Content-Length: 224
Connection: close
Location: http://10.10.144.77/support/
Set-Cookie: session=eyJTdXBwb3J0QXV0aCI6IlRydWUiLCJTdXBwb3J0
Vary: Cookie
Front-End-Https: on

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
<title>Redirecting...</title>
<h1>Redirecting...</h1>
<p>You should be redirected automatically to target URL: <a href="/supp
```

Task 7: Sequencer (Overview)

Sequencer allows us to evaluate the entropy, or randomness, of "tokens". Tokens are strings used to identify something and should ideally be generated in a cryptographically secure manner. These tokens could be session cookies or **C**ross-**S**ite **R**equest **F**orgery (CSRF) tokens used to protect form submissions. If these tokens aren't generated securely, then, in theory, we could predict upcoming token values. The implications could be substantial, for instance, if the token in question is used for password resets.

Let's start by looking at the Sequencer interface:



Select live capture request

Send requests here from other tools to configure a live capture. Select the request to use, configure the other options below, then click "Start li

Token location within response

Select the location in the response where the token appears.

We have two main ways to perform token analysis with Sequencer:

- **Live Capture**: This is the more common method and is the default sub-tab for Sequencer. Live capture lets us pass a request that will generate a token to Sequencer for analysis. For instance, we might want to pass a POST request to a login endpoint to Sequencer, knowing that the server will respond with a cookie. With the request passed in, we can instruct Sequencer to start a live capture. It will then automatically make the same request thousands of times, storing the generated token samples for analysis. After collecting enough samples, we stop the Sequencer and allow it to analyze the captured tokens.
- **Manual Load**: This allows us to load a list of pre-generated token samples directly into Sequencer for analysis. Using Manual Load means we don't need to make thousands of requests to our target, which can be noisy and resource-intensive. However, it does require that we have a large list of pre-generated tokens.

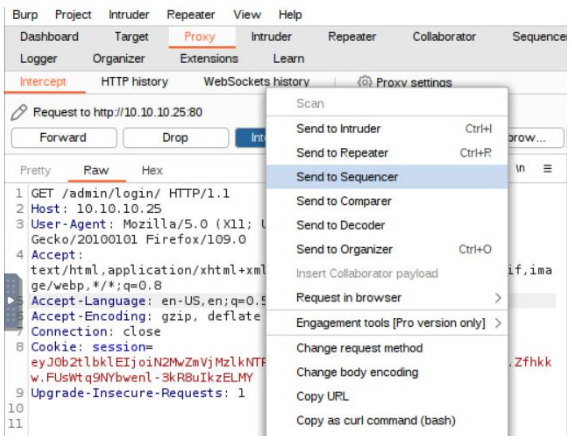
Question 8: What does Sequencer allow us to evaluate?

Answer: ***entropy***

Task 8: Sequencer (Live Capture)

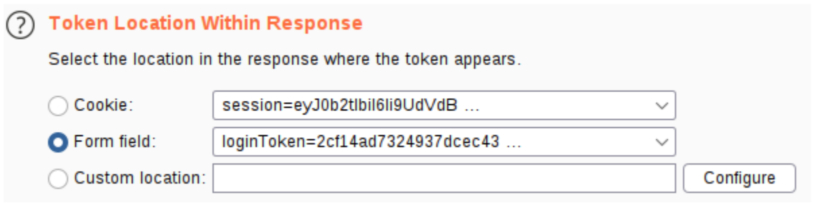
Great, let's dive into the process of using the Sequencer's live capture for entropy analysis on the anti-brute force token used in the admin login form.

First, capture a request to http://10.10.10.25/admin/login/ in the Proxy. Right-click on the request and select **Send to Sequencer**.



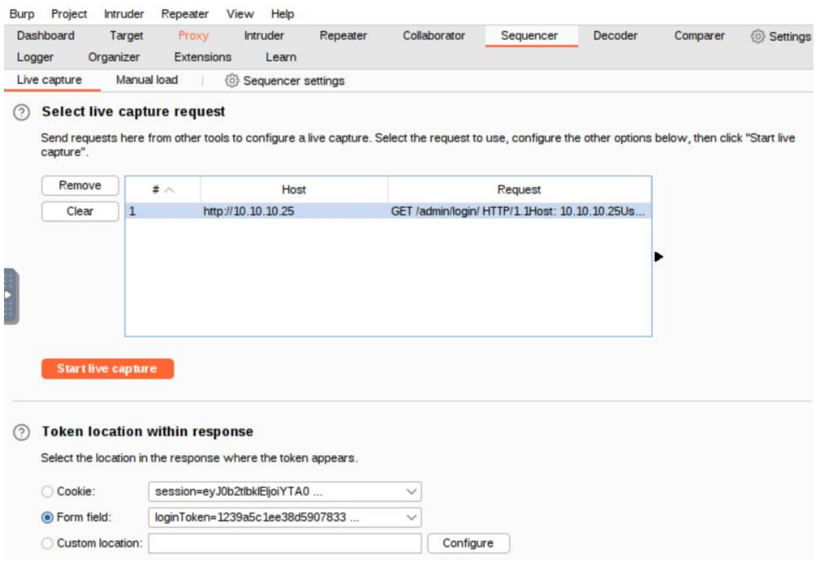
```
GET /admin/login/ HTTP/1.1
Host: 10.10.10.25
User-Agent: Mozilla/5.0 (X11; 
Gecko/20100101 Firefox/109.0
Accept:
text/html,application/xhtml+xml                              if,ima
ge/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: close
Cookie: session=
eyJ0b2tlbklEIjoiN2MwZmVjMzlkNTF                              .Zfhkk
w.FUsWtq9NYbwenl-3kR8uIkzELMY
Upgrade-Insecure-Requests: 1
```

In the "Token Location Within Response" section, we can select between **Cookie**, **Form field**, and **Custom location**. Since we're testing the loginToken in this case, select the "Form field" radio button and choose the loginToken from the dropdown menu:


Token Location Within Response
Select the location in the response where the token appears.
Configure

Cookie:	session=eyJ0b2tlbil6li9UdVdB ...
[✓ Form field:]	loginToken=2cf14ad7324937dcec43 ...
Custom location:	

In this situation, we can safely leave all other options at their default values. So, click on the **Start live capture** button.


Burp Project Intruder Repeater View Help
Dashboard Target Proxy Intruder Repeater Collaborator Sequencer Decoder Comparer Settings
Logger Organizer Extensions Learn
Live capture Manual load Sequencer settings

Select live capture request

Send requests here from other tools to configure a live capture. Select the request to use, configure the other options below, then click "Start live capture".

#	Host	Request
1	http://10.10.10.25	GET /admin/login/ HTTP/1.1Host: 10.10.10.25Us...

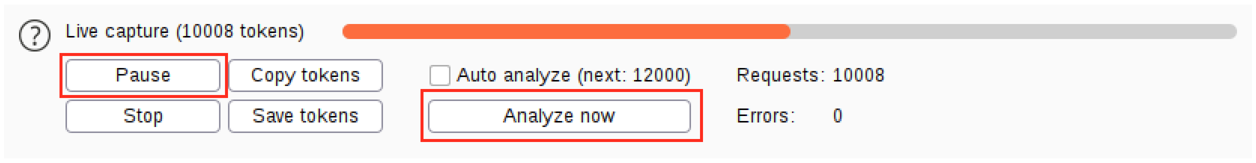
Token location within response

Select the location in the response where the token appears.

Cookie: session=eyJ0b2tlbklEljoiYTA0 ...
[✓ Form field:] loginToken=1239a5c1ee38d5907833 ...
Custom location:

A new window will pop up indicating that a live capture is in progress and displaying the number of tokens captured so far. Wait until a sufficient number of tokens are captured (approximately 10,000 should suffice); the more tokens we have, the more precise our analysis will be.

Once around 10,000 tokens are captured, click on **Pause** and then select the **Analyze now** button:



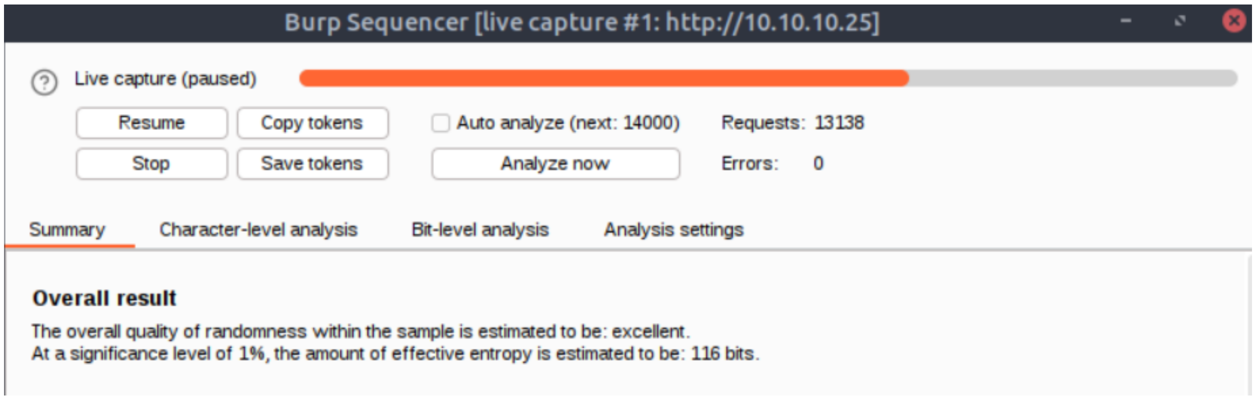
Requests: 10008
Errors: 0

It's important to note that we could have also chosen to **Stop** the capture. However, by opting to pause, we keep the option to resume the capture later if the report doesn't have enough samples to accurately calculate the token's entropy.

If we wished for periodic updates on the analysis, we could have also selected the "Auto analyze" checkbox. This option tells Burp to perform the entropy analysis after every 2000 requests, providing frequent updates that will become increasingly accurate as more samples are loaded into Sequencer.

At this point, it's also worth noting that we could choose to copy or save the captured tokens for further analysis at a later time.

Upon clicking the **Analyze now** button, Burp will analyze the token's entropy and generate a report.



Burp Sequencer [live capture #1: http://10.10.10.25]

Live capture (paused)

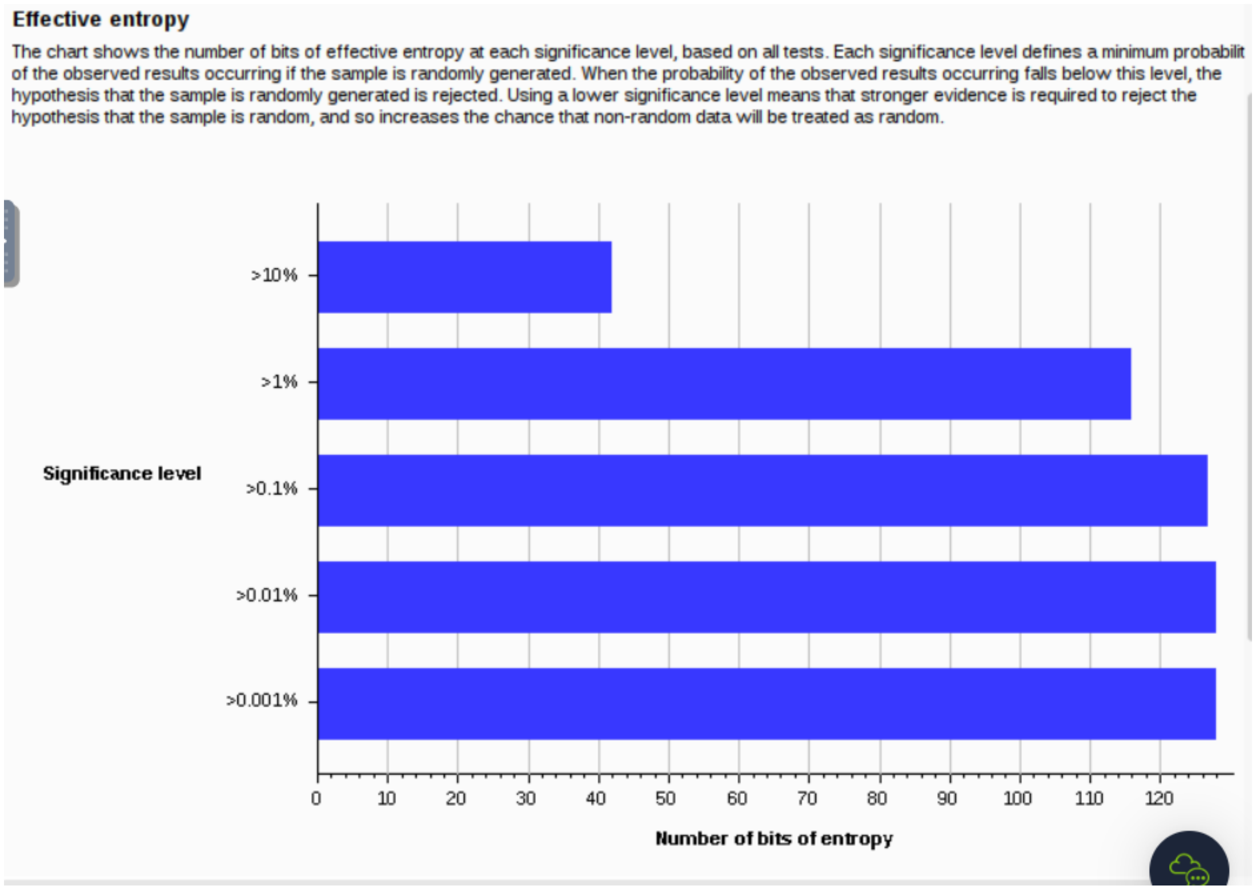
Resume | Copy tokens | Auto analyze (next: 14000) | Requests: 13138

Stop | Save tokens | Analyze now | Errors: 0

Summary | Character-level analysis | Bit-level analysis | Analysis settings

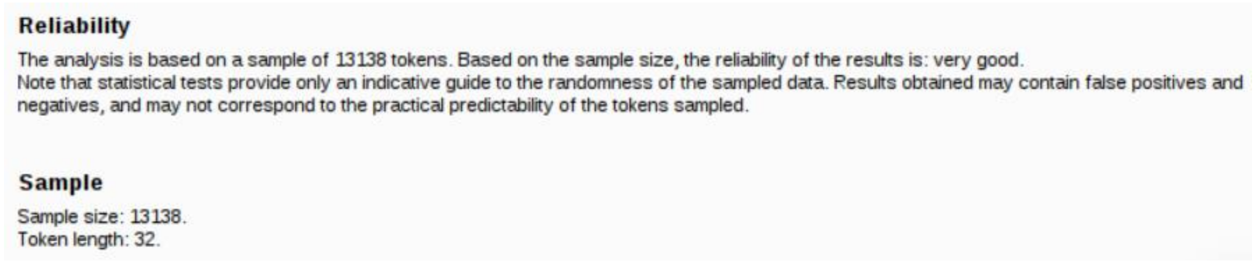
Overall result

The overall quality of randomness within the sample is estimated to be: excellent.
At a significance level of 1%, the amount of effective entropy is estimated to be: 116 bits.



Effective entropy

The chart shows the number of bits of effective entropy at each significance level, based on all tests. Each significance level defines a minimum probabilit of the observed results occurring if the sample is randomly generated. When the probability of the observed results occurring falls below this level, the hypothesis that the sample is randomly generated is rejected. Using a lower significance level means that stronger evidence is required to reject the hypothesis that the sample is random, and so increases the chance that non-random data will be treated as random.



Reliability

The analysis is based on a sample of 13138 tokens. Based on the sample size, the reliability of the results is: very good.
Note that statistical tests provide only an indicative guide to the randomness of the sampled data. Results obtained may contain false positives and negatives, and may not correspond to the practical predictability of the tokens sampled.

Sample

Sample size: 13138.
Token length: 32.

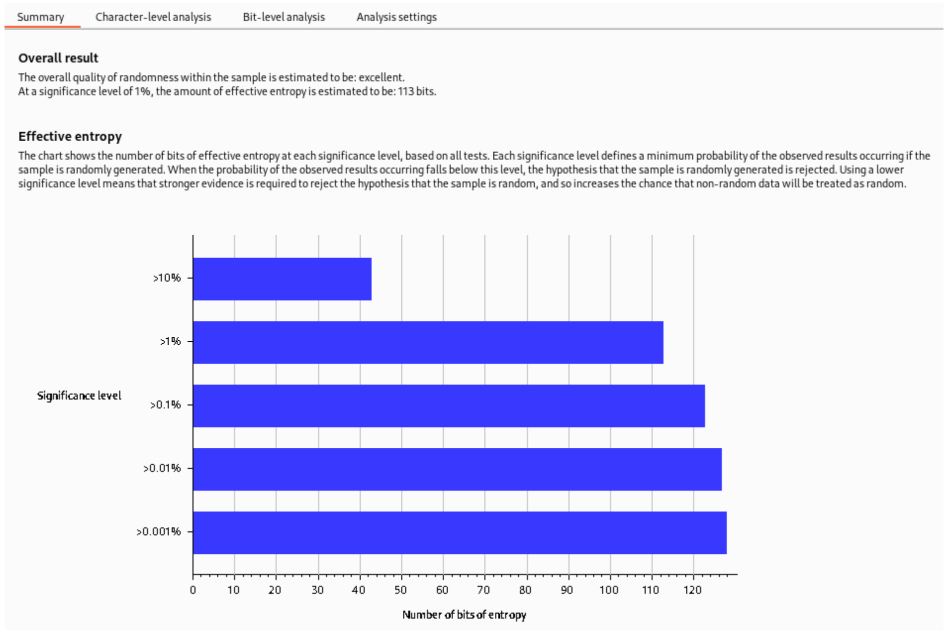
Question 9: What is the overall quality of randomness estimated to be?

Answer: ***excellent***

Task 9: Sequencer (Analysis)

Now that we have a report for the entropy analysis of our token, it's time to analyze it!

The generated entropy analysis report is split into four primary sections. The first of these is the **Summary** of the results. The summary gives us the following:



Overall result

The overall quality of randomness within the sample is estimated to be: excellent.
At a significance level of 1%, the amount of effective entropy is estimated to be: 113 bits.

Effective entropy

The chart shows the number of bits of effective entropy at each significance level, based on all tests. Each significance level defines a minimum probability of the observed results occurring if the sample is randomly generated. When the probability of the observed results occurring falls below this level, the hypothesis that the sample is randomly generated is rejected. Using a lower significance level means that stronger evidence is required to reject the hypothesis that the sample is random, and so increases the chance that non-random data will be treated as random.

- **Overall result**: This gives a broad assessment of the security of the token generation mechanism. In this case, the level of entropy indicates that the tokens are likely securely generated.
- **Effective entropy**: This measures the randomness of the tokens. The effective entropy of 117 bits is relatively high, indicating that the tokens are sufficiently random and, therefore, secure against prediction or brute force attacks.
- **Reliability**: The significance level of 1% implies that there is 99% confidence in the accuracy of the results. This level of confidence is quite high, providing assurance in the accuracy of the effective entropy estimation.
- **Sample**: This provides details about the token samples analyzed during the entropy testing process, including the number of tokens and their characteristics.

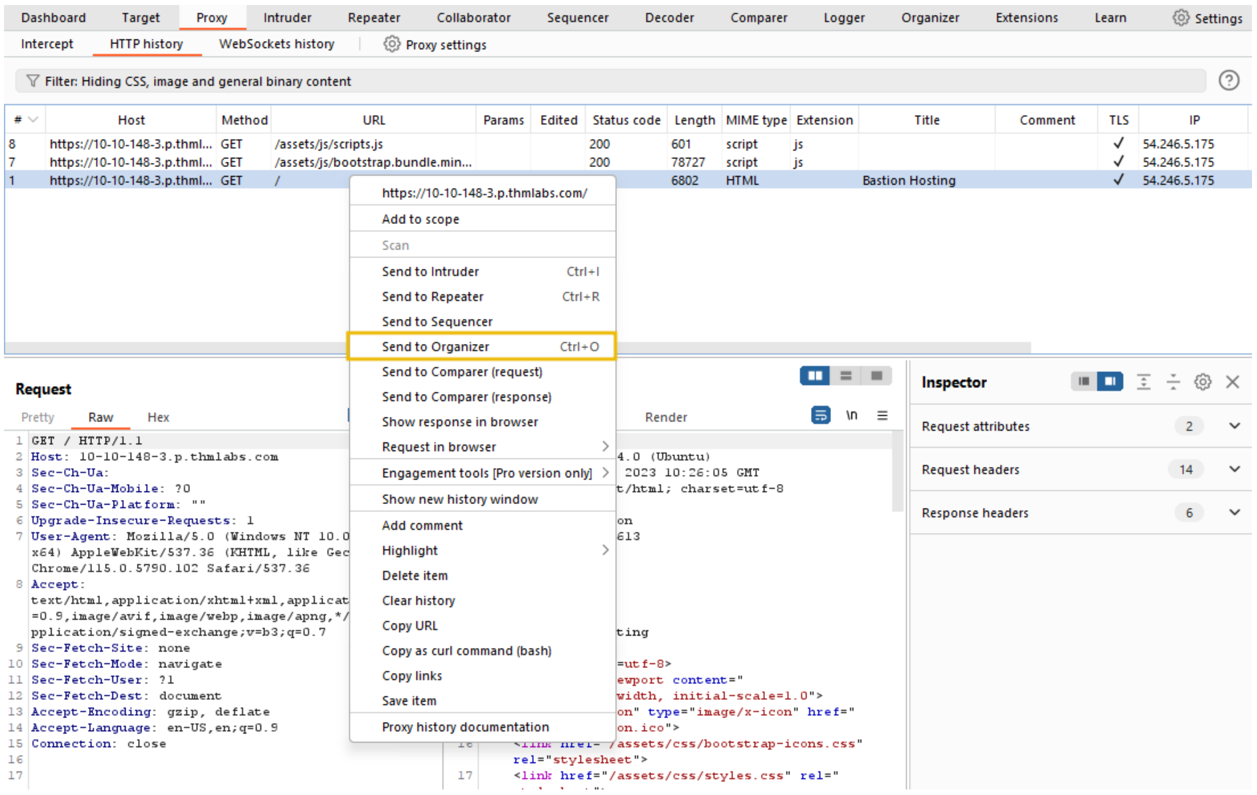
While the summary report often provides enough information to assess the security of the token generation process, it's important to remember that further investigation may be necessary in some cases. The character-level and bit-level analysis can provide more detailed insights into the randomness of the tokens, especially when the summary results raise potential concerns.

While the entropy report can provide a strong indicator of the security of the token generation mechanism, there needs to be more definitive proof. Other factors could also impact the security of the tokens, and the nature of probability and statistics means there's always a degree of uncertainty. That said, an effective entropy of 117 bits with a significance level of 1% suggests a robustly secure token generation process.

Task 10: Organizer (Overview)

The Organizer module of Burp Suite is designed to help you store and annotate copies of HTTP requests that you may want to revisit later. This tool can be particularly useful for organizing your penetration testing workflow. Here are some of its key features:

- You can store requests that you want to investigate later, save requests that you've already identified as interesting, or save requests that you want to add to a report later.
- You can send HTTP requests to Burp Organizer from other Burp Modules such as **Proxy** or **Repeater**. You can do this by right-clicking the request and selecting **Send to Organizer** or using the default hotkey Ctrl + O. Each HTTP request that you send to Organizer is a read-only copy of the original request saved at the point you sent it to Organizer.



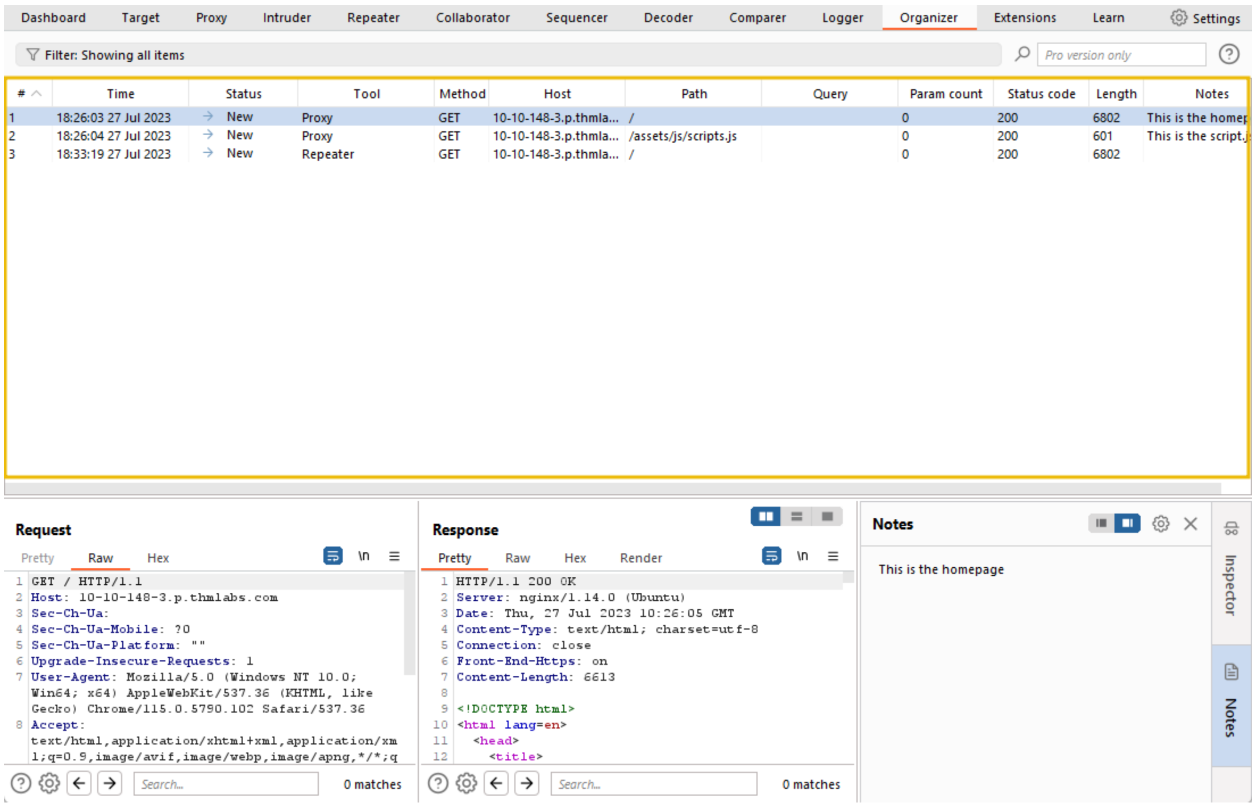
Filter: Hiding CSS, image and general binary content

#	Host	Method	URL	Params	Edited	Status code	Length	MIME type	Extension	Title	Comment	TLS	IP
8	https://10-10-148-3.p.thml...	GET	/assets/js/scripts.js			200	601	script	js			✓	54.246.5.175
7	https://10-10-148-3.p.thml...	GET	/assets/js/bootstrap.bundle.min...			200	78727	script	js			✓	54.246.5.175
1	https://10-10-148-3.p.thml...	GET	/				6802	HTML		Bastion Hosting		✓	54.246.5.175

```
GET / HTTP/1.1
Host: 10-10-148-3.p.thmlabs.com
Sec-Ch-Ua:
Sec-Ch-Ua-Mobile: ?0
Sec-Ch-Ua-Platform: ""
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0
x64) AppleWebKit/537.36 (KHTML, like Gec
Chrome/115.0.5790.102 Safari/537.36
Accept:
text/html,application/xhtml+xml,applicat
=0.9,image/avif,image/webp,image/apng,*/
pplication/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9
Connection: close
```

```
4.0 (Ubuntu)
 2023 10:26:05 GMT
t/html; charset=utf-8

on
613

ting

=utf-8>
ewport content="
width, initial-scale=1.0">
on" type="image/x-icon" href="
on.ico">
/assets/css/bootstrap-icons.css"
rel="stylesheet">
<link href="/assets/css/styles.css" rel="
```

- Requests are stored in a table, which contains columns such as the request index number, the time the request was made, workflow status, Burp tool that the request was sent from, HTTP method, server hostname, URL file path, URL query string, number of parameters in the request, HTTP status code of the response, length of the response in bytes, and any notes that you have made.



#	Time	Status	Tool	Method	Host	Path	Query	Param count	Status code	Length	Notes
1	18:26:03 27 Jul 2023	New	Proxy	GET	10-10-148-3.p.thmla...	/		0	200	6802	This is the homep
2	18:26:04 27 Jul 2023	New	Proxy	GET	10-10-148-3.p.thmla...	/assets/js/scripts.js		0	200	601	This is the script.j
3	18:33:19 27 Jul 2023	New	Repeater	GET	10-10-148-3.p.thmla...	/		0	200	6802	

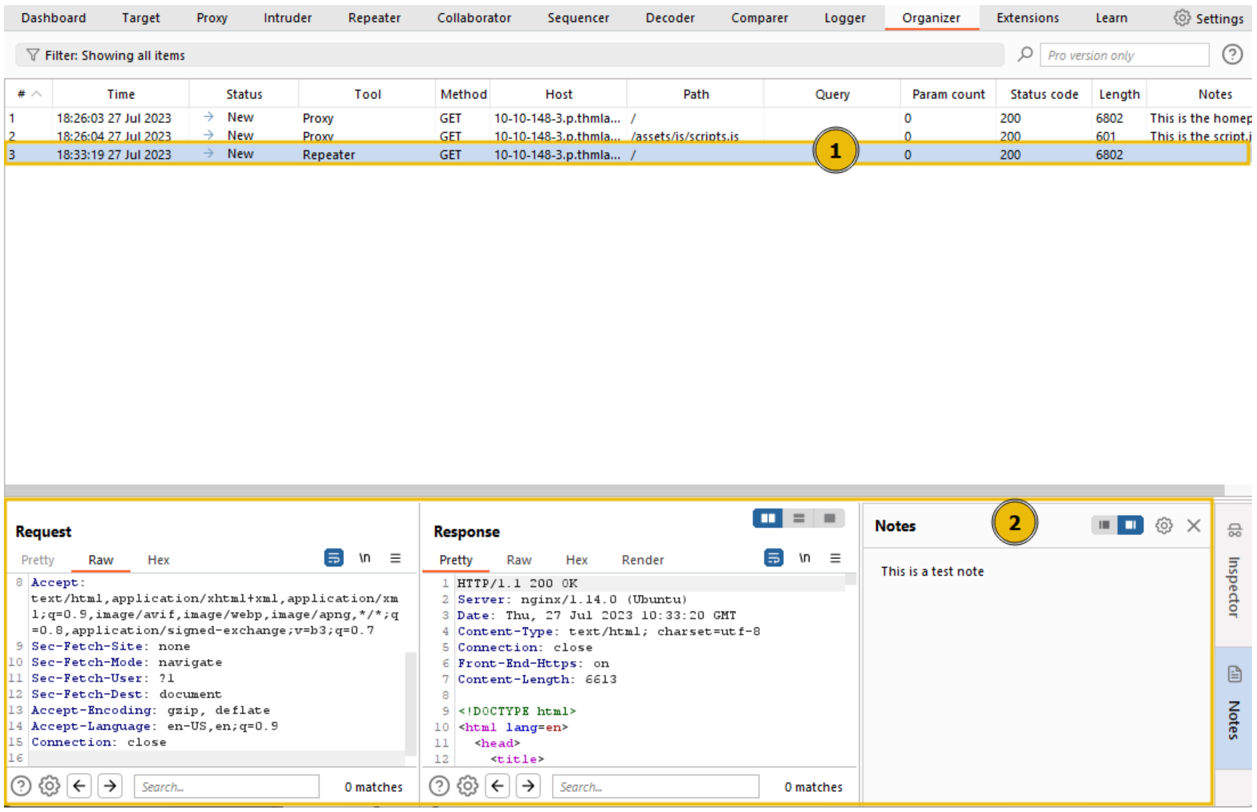
```
GET / HTTP/1.1
Host: 10-10-148-3.p.thmlabs.com
Sec-Ch-Ua:
Sec-Ch-Ua-Mobile: ?0
Sec-Ch-Ua-Platform: ""
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0;
Win64; x64) AppleWebKit/537.36 (KHTML, like
Gecko) Chrome/115.0.5790.102 Safari/537.36
Accept:
text/html,application/xhtml+xml,application/xm
l;q=0.9,image/avif,image/webp,image/apng,*/*;q
```

```
HTTP/1.1 200 OK
Server: nginx/1.14.0 (Ubuntu)
Date: Thu, 27 Jul 2023 10:26:05 GMT
Content-Type: text/html; charset=utf-8
Connection: close
Front-End-Https: on
Content-Length: 6613

<!DOCTYPE html>
<html lang=en>
  <head>
    <title>
```

This is the homepage

To view the request and response:

1. Click on any Organizer item.
2. The request and response are both read-only. You can search within the request or response, select the request, and then use the search bar below the request.



#	Time	Status	Tool	Method	Host	Path	Query	Param count	Status code	Length	Notes
1	18:26:03 27 Jul 2023	→ New	Proxy	GET	10-10-148-3.p.thmla...	/		0	200	6802	This is the homep
2	18:26:04 27 Jul 2023	→ New	Proxy	GET	10-10-148-3.p.thmla...	/assets/js/scripts.js		0	200	601	This is the script.j
3	18:33:19 27 Jul 2023	→ New	Repeater	GET	10-10-148-3.p.thmla...	/		0	200	6802	

Request

```
Accept:
text/html,application/xhtml+xml,application/xm
l;q=0.9,image/avif,image/webp,image/apng,*/*;q
=0.8,application/signed-exchange;v=b3;q=0.7
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9
Connection: close
```

Response

```
HTTP/1.1 200 OK
Server: nginx/1.14.0 (Ubuntu)
Date: Thu, 27 Jul 2023 10:33:20 GMT
Content-Type: text/html; charset=utf-8
Connection: close
Front-End-Https: on
Content-Length: 6613

<!DOCTYPE html>
<html lang=en>
  <head>
    <title>
```

Notes

This is a test note

Question 10: Are saved requests read-only? (yea/nay)

Answer: ***yea***

To summarize:

- **Decoder** allows you to encode and decode data, making it easier to read and understand the information being transferred.
- **Comparer** enables you to spot differences between two datasets, which can be pivotal in identifying vulnerabilities or anomalies.
- **Sequencer** helps in performing entropy analysis on tokens, providing insights into the randomness of their generation and, consequently, their security level.
- **Organizer** enables you to store and annotate copies of HTTP requests that you may want to revisit later.

Happy Hacking! 😸

> *Thanks and Regards,*
>
> *ShadowGirl* 🕵️‍♀️ 😉