



EnableResponseStatePatterns

Introduction

EnableResponseStatePatterns is a hidden feature in WebInspect which can be used to handle a specific type of state management scheme, examples of which have been encountered in web applications and RESTful web services.

The original example that led to this feature being added was a case where an application had a state value that shows up on a redirect in the query part of a URL: example: `f?p=7700:LOGIN:999999999:::`, the 999999999 is some kind of identifier that appears to be some kind of state.

That state value is used later in a post parameter called `p_instance`.

Configuration

The first thing is to set the EnableResponseStatePatterns to true (default is false). You will find that setting in the scan settings XML files (normally in `C:\ProgramData\HP\HP WebInspect\Settings`).

Then add a ResponseStateElement for each variable being tracked.

Each response state element (under ResponseStatePatterns) represents a single state value. Search regexes allow us to determine where we collect state from in HTTP Responses. The Named Group is important as it tells us which part of the match in the regex is the actual state value. Replace regexes tell WebInspect where to apply that state on HTTP Requests. Again, the Named Group (name must match the name of the response state element, in this case "Oracle") is required to tell us where in the match the actual state value goes.

```
<EnableResponseStatePatterns>true</EnableResponseStatePatterns>
<ResponseStatePatterns>
  <ResponseStateElement>
    <name>Oracle</name>
    <SearchRegexes>
      <string> Location:.*f\?p=[0-9]+:[A-Za-z]+:(?<Oracle>[0-9]+):::</string>
    </SearchRegexes>
    <ReplaceRegexes>
      <string>&p_instance=(?<Oracle>[0-9]+) &</string>
    </ReplaceRegexes>
  </ResponseStateElement>
</ResponseStatePatterns>
```

You will find a self-closed element that looks like `<ResponseStatePatterns />`.

Expand this element and fill it in as needed to look as follows:

```
<EnableResponseStatePatterns>true</EnableResponseStatePatterns>
```

```

<ResponseStatePatterns>
  <ResponseStateElement>
    <name>CaptureGroupName</name>
    <ReplaceRegexes>
      <string>RegexWithCaptureGroupToApplyStateToRequest</string>
    </ReplaceRegexes>
    <SearchRegexes>
      <string>RegexWithCaptureGroupToCollectStateFromResponse</string>
    </SearchRegexes>
  </ResponseStateElement>
</ResponseStatePatterns>

```

The **SearchRegexes** are applied on the entire HTTP Response and the **ReplaceRegexes** are applied on the entire request. The capture group would represent the exact token that needs to be transferred from the HTTP Response to the following HTTP Request. So, there is no need to worry about a parameter name in this technique. All that matters is the exact value that represents the state.

Example 1

Given that the HTTP Response Body returns something like this:

```
... {"Token":"2bfcf7e0-5b31-46e8-aabf-007e26a36177","Overlayreqd":1,"Disabled":0,"Downloadpriv ...
```

And that subsequent HTTP Requests must contain this header:

```
Authorization-Token: 2bfcf7e0-5b31-46e8-aabf-007e26a36177
```

Then a response state pattern like this would be required:

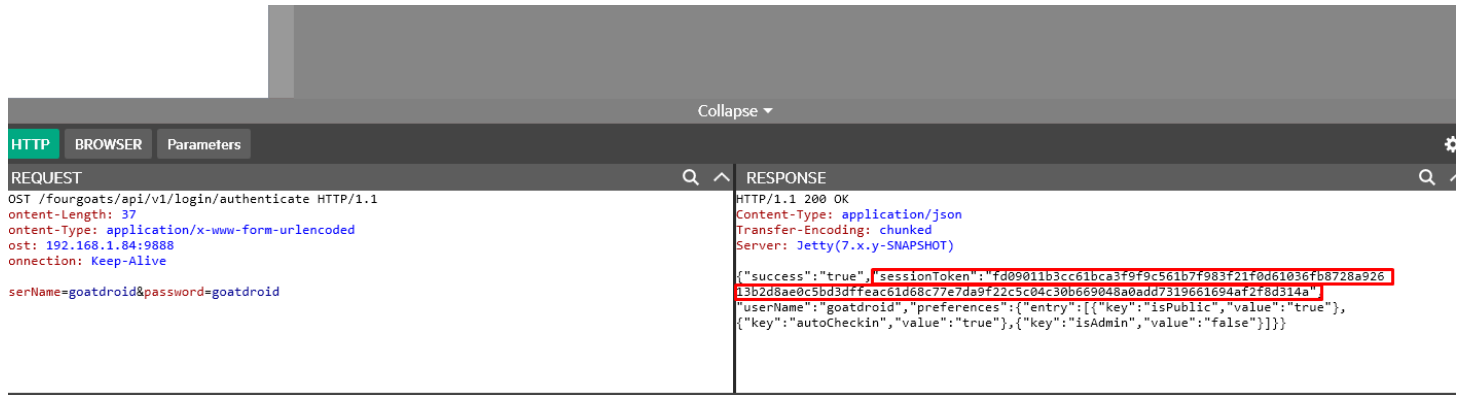
```

<EnableResponseStatePatterns>true</EnableResponseStatePatterns>
<ResponseStatePatterns>
  <ResponseStateElement>
    <name>Token</name>
    <ReplaceRegexes>
      <string> Authorization-Token:\s(?:'Token' [a-fA-F0-9]{8}-[a-fA-F0-9]{4}-[a-fA-F0-9]{4}-[a-fA-F0-9]{4}-[a-fA-F0-9]{12})</string>
    </ReplaceRegexes>
    <SearchRegexes>
      <string>"Token": "(?:'Token' [a-fA-F0-9]{8}-[a-fA-F0-9]{4}-[a-fA-F0-9]{4}-[a-fA-F0-9]{4}-[a-fA-F0-9]{12}) "</string>
    </SearchRegexes>
  </ResponseStateElement>
</ResponseStatePatterns>

```

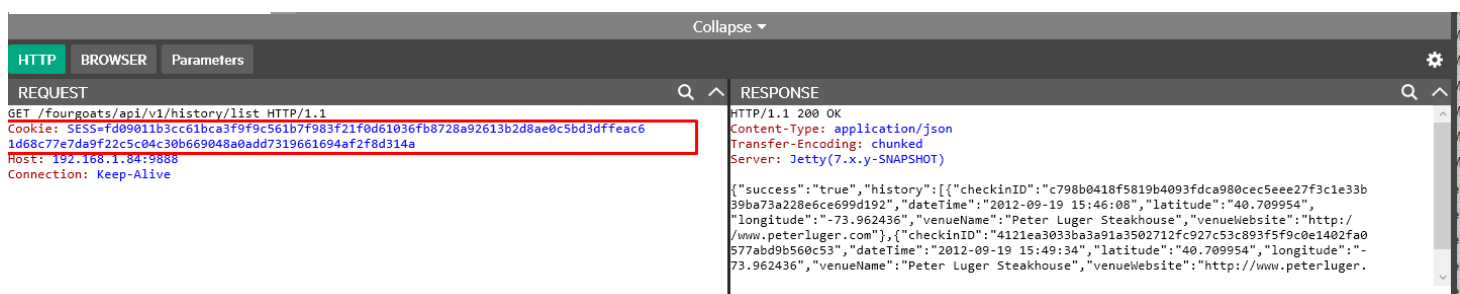
Example 2

This example is from the native Android web application “Fourgoats”. After authenticating (POSTing the credentials), the backend web service returns a response like this:

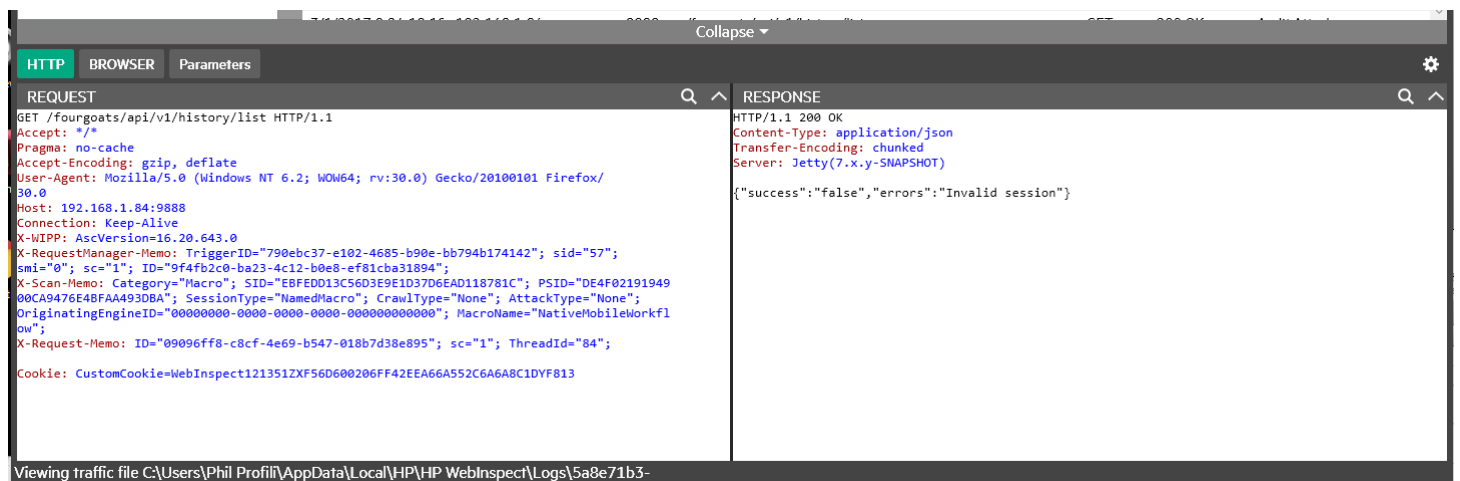


Notice the sessionToken included in the json response body.

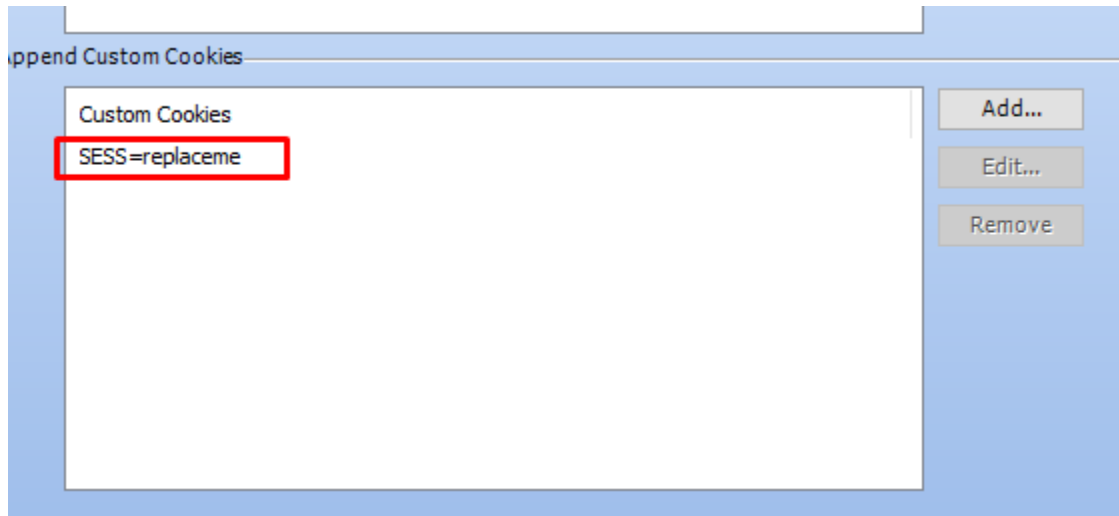
The client application contains logic that understands that each subsequent request should set the cookie “SESS” to that value, like this:



But at scan time WebInspect doesn't recognize that need so sessions are mostly invalid. This is from a scan. Notice there is no SESS cookie because WebInspect does not by default have any knowledge of the logic that is needed to maintain state with this particular application:



To address this, add a custom cookie into the scan settings like this:



And enable response state patterns in the scan settings file, configured in such a way to assign to the capture group "Token" the value of sessToken seen in the initial authentication response, and then use that to replace the "replaceme" portion of the cookie header with that value.

The settings look like this:

```
<EnableResponseStatePatterns>true</EnableResponseStatePatterns>
<ResponseStatePatterns>
  <ResponseStateElement>
    <name>Token</name>
    <ReplaceRegexes>
      <string>Cookie:\sSESS=(?'Token'replaceme)</string>
    </ReplaceRegexes>
    <SearchRegexes>
      <string>"sessionToken":"(?'Token'[a-f0-9]{1,128})"</string>
    </SearchRegexes>
  </ResponseStateElement>
</ResponseStatePatterns>
```

So what you see now in the initial requests is that the headers have the raw (un-replaced) cookie header:

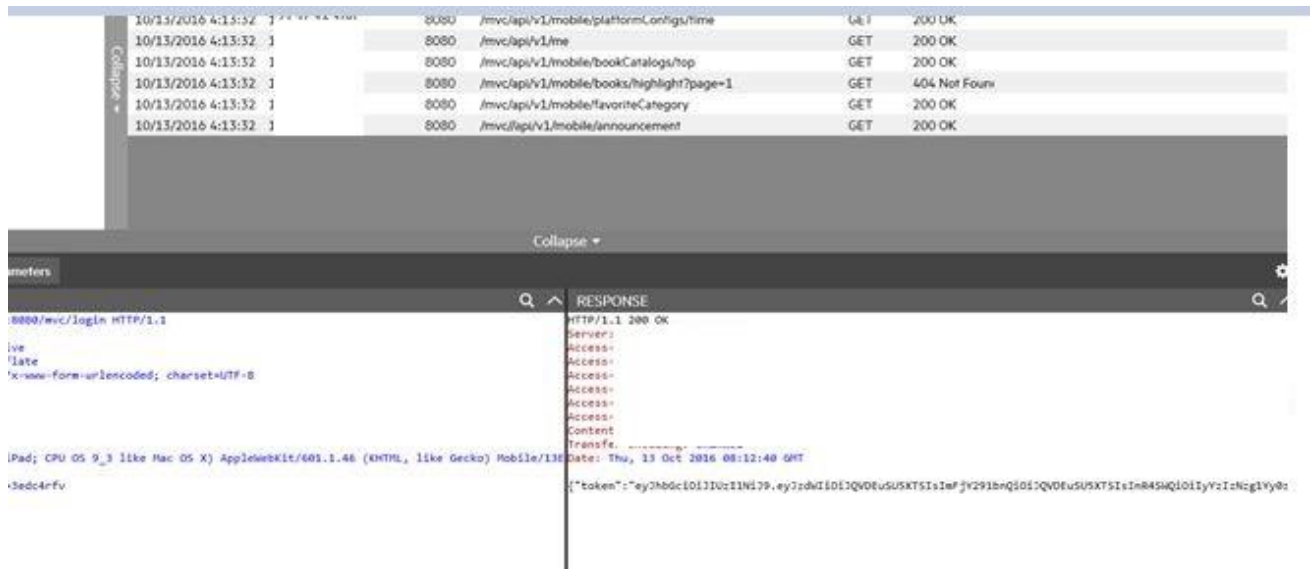
```
HTTP BROWSER Parameters
REQUEST
User-Agent: Mozilla/5.0 (Windows NT 6.2; WOW64; rv:30.0) Gecko/20100101 Firefox/30.0
X-WIPP: AscVersion=16.20.643.0; SecureCapability=B
Connection: Keep-Alive
X-Scan-Memo: Category="SecurityScope.SecureCapability%3dB"; ThreadId="31"; ThreadType="Scanner";
X-RequestManager-Memo: sc="1"; ID="675d06c0-b237-404c-ace8-a700c017f1cf";
X-Request-Memo: ID="dac9d012-cb9d-4acf-86a8-5694ff3a25f9"; sc="1"; ThreadId="31";
Cookie: SESS=replaceme
```

But once a match is made in the response containing the token, subsequent requests look like this:

```
REQUEST
X-WIPP: AscVersion=16.20.643.0
X-RequestManager-Memo: TriggerID="f8fdf666-4ea5-415f-ba97-7b79aa95f55c"; sid="15"; smi="0"; sc="1"; ID="028abdb2-368e-4e46-8c10-65e2d95063ed";
X-Scan-Memo: Category="Macro"; SID="EBFEDD13C56D3E9E1D37D6EAD118781C"; PSID="DE4F0219194900CA9476E4BFAA493DBA"; SessionType="NamedMacro"; CrawlType="None"; AttackType="None"; OriginatingEngineID="00000000-0000-0000-0000-000000000000"; MacroName="NativeMobileWorkflow";
X-Request-Memo: ID="da82fcec-5979-4986-bebc-9eaf53eec5b1"; sc="1"; ThreadId="31";
Cookie: SESS=0d7bf4e83c0596004c5b1a96e49bfba759861db5c372c1b79864e33acf5538713b0c98379d3533cea9c4507794ce68cefe3f4159bd7167dc17ecde37651e123c
Viewing traffic file c:\users\phil profil\appdata\local\hp\hp webinspect\logs\40ed7f29-f60a-4761-
```

Example 3

A token is generated by POST request:



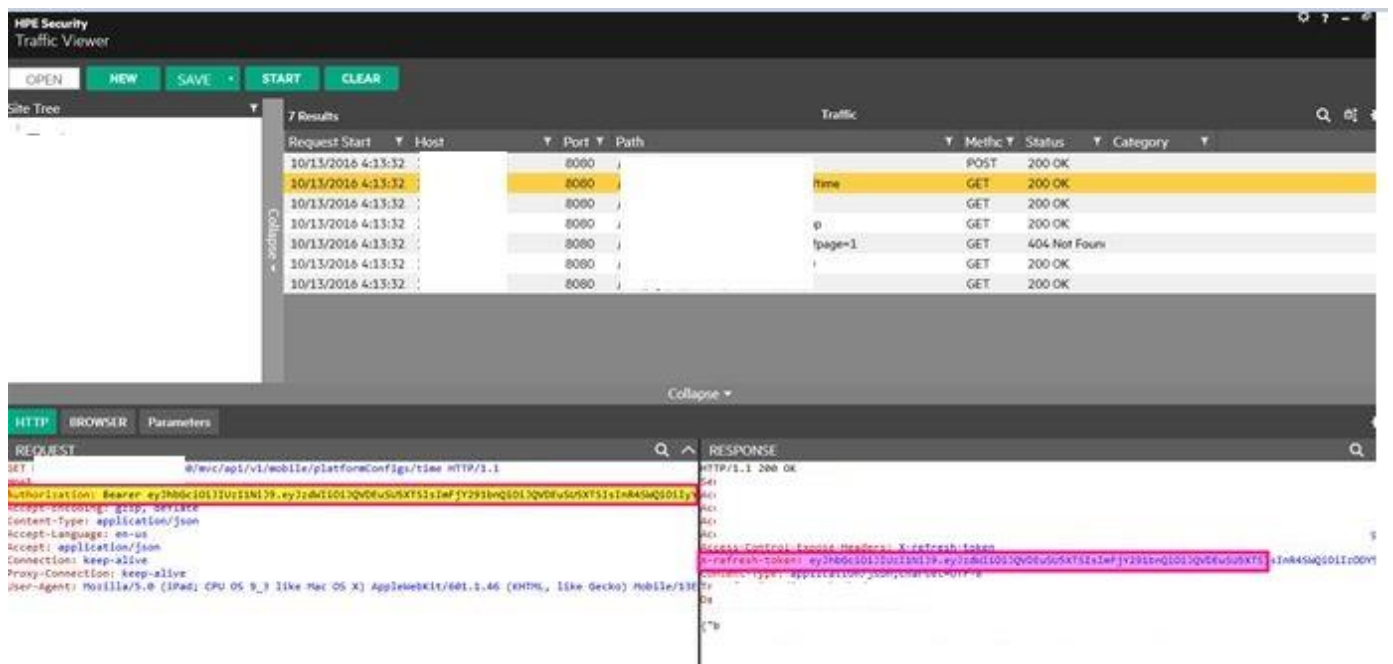
The screenshot shows a REST client interface with a list of requests at the top and a detailed view of a response below. The response is an HTTP 200 OK with headers and a JSON body containing a token.

Request Start	Host	Port	Path	Method	Status	Category
10/13/2016 4:13:32	8080	/mvc/api/v1/mobile/platform/config/time	GET	200 OK		
10/13/2016 4:13:32	8080	/mvc/api/v1/time	GET	200 OK		
10/13/2016 4:13:32	8080	/mvc/api/v1/mobile/bookCatalogs/top	GET	200 OK		
10/13/2016 4:13:32	8080	/mvc/api/v1/mobile/books/highlight?page=1	GET	404 Not Found		
10/13/2016 4:13:32	8080	/mvc/api/v1/mobile/favoriteCategory	GET	200 OK		
10/13/2016 4:13:32	8080	/mvc/api/v1/mobile/announcement	GET	200 OK		

```
RESPONSE
HTTP/1.1 200 OK
Server:
Access:
Access:
Access:
Access:
Access:
Access:
Content-Type: application/json
Date: Thu, 13 Oct 2016 08:12:40 GMT
{"token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXLTQwYVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5Sjki"}

Request:
POST /mvc/api/login HTTP/1.1
Host: 8080
Content-Type: application/json
Accept-Language: en-us
Connection: keep-alive
Proxy-Connection: keep-alive
User-Agent: Mozilla/5.0 (iPad; CPU OS 9_3 like Mac OS X) AppleWebKit/601.1.46 (KHTML, like Gecko) Mobile/13I100
```

Then the token from the above step is sent and a new token (X-refresh token) is generated.



The screenshot shows HPE Security Traffic Viewer with a traffic table and a detailed view of a request and response. The request includes an Authorization: Bearer header, and the response includes an X-Refresh-Token header.

Request Start	Host	Port	Path	Method	Status	Category
10/13/2016 4:13:32	8080			POST	200 OK	
10/13/2016 4:13:32	8080			GET	200 OK	
10/13/2016 4:13:32	8080			GET	200 OK	
10/13/2016 4:13:32	8080			GET	200 OK	
10/13/2016 4:13:32	8080			GET	404 Not Found	
10/13/2016 4:13:32	8080			GET	200 OK	
10/13/2016 4:13:32	8080			GET	200 OK	

```
REQUEST
Host: 8080
Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXLTQwYVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5Sjki"}
Content-Type: application/json
Accept-Language: en-us
Connection: keep-alive
Proxy-Connection: keep-alive
User-Agent: Mozilla/5.0 (iPad; CPU OS 9_3 like Mac OS X) AppleWebKit/601.1.46 (KHTML, like Gecko) Mobile/13I100

RESPONSE
HTTP/1.1 200 OK
Access-Control-Expose-Headers: X-Refresh-Token
X-Refresh-Token: eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXLTQwYVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5SjkiLCJ1eWUiOiJyZ291bnQ1QVU5Sjki"}

Request:
POST /mvc/api/v1/mobile/platform/config/time HTTP/1.1
```

The token from the previous response is used as **“Authorization: Bearer”** header in the next request. Another refresh token is generated. And so on.

The screenshot shows the HPE Security Traffic Viewer interface. At the top, there are buttons for OPEN, NEW, SAVE, START, and CLEAR. Below is a Site Tree on the left and a Traffic table with 7 results. The selected row is highlighted in yellow. Below the table, there are tabs for HTTP, BROWSER, and Parameters. The HTTP tab is active, showing a detailed view of the selected request. The REQUEST pane shows the following details:

```
GET /api/v1/me HTTP/1.1
Host: 192.34.54.100:8080
Accept-Encoding: gzip, deflate
Content-Type: application/json
Accept-Language: en-us
Accept: application/json
Connection: keep-alive
Proxy-Connection: keep-alive
User-Agent: Mozilla/5.0 (iPad; CPU OS 9_1 like Mac OS X) AppleWebKit/605.1.46 (KHTML, like Gecko) Mobile/12H143
```

The RESPONSE pane shows the following details:

```
HTTP/1.1 200 OK
Server: Apache/2.4.18 (Ubuntu)
Access-Control-Allow-Origin: *
Access-Control-Allow-Headers: X-Requested-With
Content-Type: application/json; charset=utf-8
Transfer-Encoding: chunked
Date: Thu, 13 Oct 2016 08:32:48 GMT
```

The screenshot shows the HPE Security Traffic Viewer interface. At the top, there are buttons for OPEN, NEW, SAVE, START, and CLEAR. Below is a Site Tree on the left and a Traffic table with 7 results. The selected row is highlighted in yellow. Below the table, there are tabs for HTTP, BROWSER, and Parameters. The HTTP tab is active, showing a detailed view of the selected request. The REQUEST pane shows the following details:

```
GET /api/v1/mobile/bookCatalogs/top HTTP/1.1
Host: 192.34.54.100:8080
Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6Ii9udG8iLCJ1bmwiOiJ1cm9udG8iLCJqdGkiOiJ1cm9udG8iLCJ1b3R0IjoiIn0=
Accept-Encoding: gzip, deflate
Content-Type: application/json
Accept-Language: en-us
Accept: application/json
Connection: keep-alive
Proxy-Connection: keep-alive
User-Agent: Mozilla/5.0 (iPad; CPU OS 9_1 like Mac OS X) AppleWebKit/605.1.46 (KHTML, like Gecko) Mobile/12H143
```

The RESPONSE pane shows the following details:

```
HTTP/1.1 200 OK
Server: Apache/2.4.18 (Ubuntu)
Access-Control-Allow-Origin: *
Access-Control-Allow-Headers: X-Requested-With
Content-Type: application/json; charset=utf-8
Transfer-Encoding: chunked
Date: Thu, 13 Oct 2016 08:32:48 GMT
```

To handle this state management scheme the following response state pattern is used:

```
<ResponseStatePatterns>
  <ResponseStateElement>
    <name>myToken</name>
    <ReplaceRegexes>
      <string>Authorization:\sBearer\s(?'myToken'eyJhbGciOiJIUzI1NiJ9\.[a-zA-Z0-9]{1,140})\.[a-zA-Z0-9_-]{1,45}</string>
    </ReplaceRegexes>
    <SearchRegexes>
      <string>token:"(?:'myToken'eyJhbGciOiJIUzI1NiJ9\.[a-zA-Z0-9]{1,140})\.[a-zA-Z0-9_-]{1,45}</string>
      <string>X-refresh-token:\s(?:'myToken'eyJhbGciOiJIUzI1NiJ9\.[a-zA-Z0-9]{1,140})\.[a-zA-Z0-9_-]{1,45}</string>
    </SearchRegexes>
  </ResponseStateElement>
</ResponseStatePatterns>
```

An explanation of the above is as follows:

There are 2 patterns we need to parse in the HTTP Response, a “token” value in a json response body:

```
{"token":"eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJQVDEuSU5XTSIsImFjY291bnQiOiJQVDEuSU5XTSIsInR4SWQiOiIyYzljZDgzLTRhOjY5ZS00M2E5ZjFhODk4MDYiLCJpYXQiOiJlZDY5NDZyZjB9.p_U-EavAS8unQewF5Q7i0Bb5iBfzJLvGikVjWJrpIIA","passwordChangedDays":null,"shouldNoticeChangePassword":null,"racfLoginSuccess":false,"racfLoginCode":null,"racfLoginMessage":null}
```

And an “X-Refresh-Token” in a response header:

```
X-refresh-token:
eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJQVDEuSU5XTSIsImFjY291bnQiOiJQVDEuSU5XTSIsInR4SWQiOiIyZDY5NDZyZjB9.zn-tDPMrrp0ep-7qFpYYqGQleMrk7hjhBgxUlszQirs
```

The following two Search Regexes will look for these patterns in every response and assign the matched string to the “myToken” capture group.

```
<SearchRegexes>
  <string>token:"(?:'myToken'eyJhbGciOiJIUzI1NiJ9\.[a-zA-Z0-9]{1,140})\.[a-zA-Z0-9_-]{1,45}</string>
  <string>X-refresh-token:\s(?:'myToken'eyJhbGciOiJIUzI1NiJ9\.[a-zA-Z0-9]{1,140})\.[a-zA-Z0-9_-]{1,45}</string>
</SearchRegexes>
```

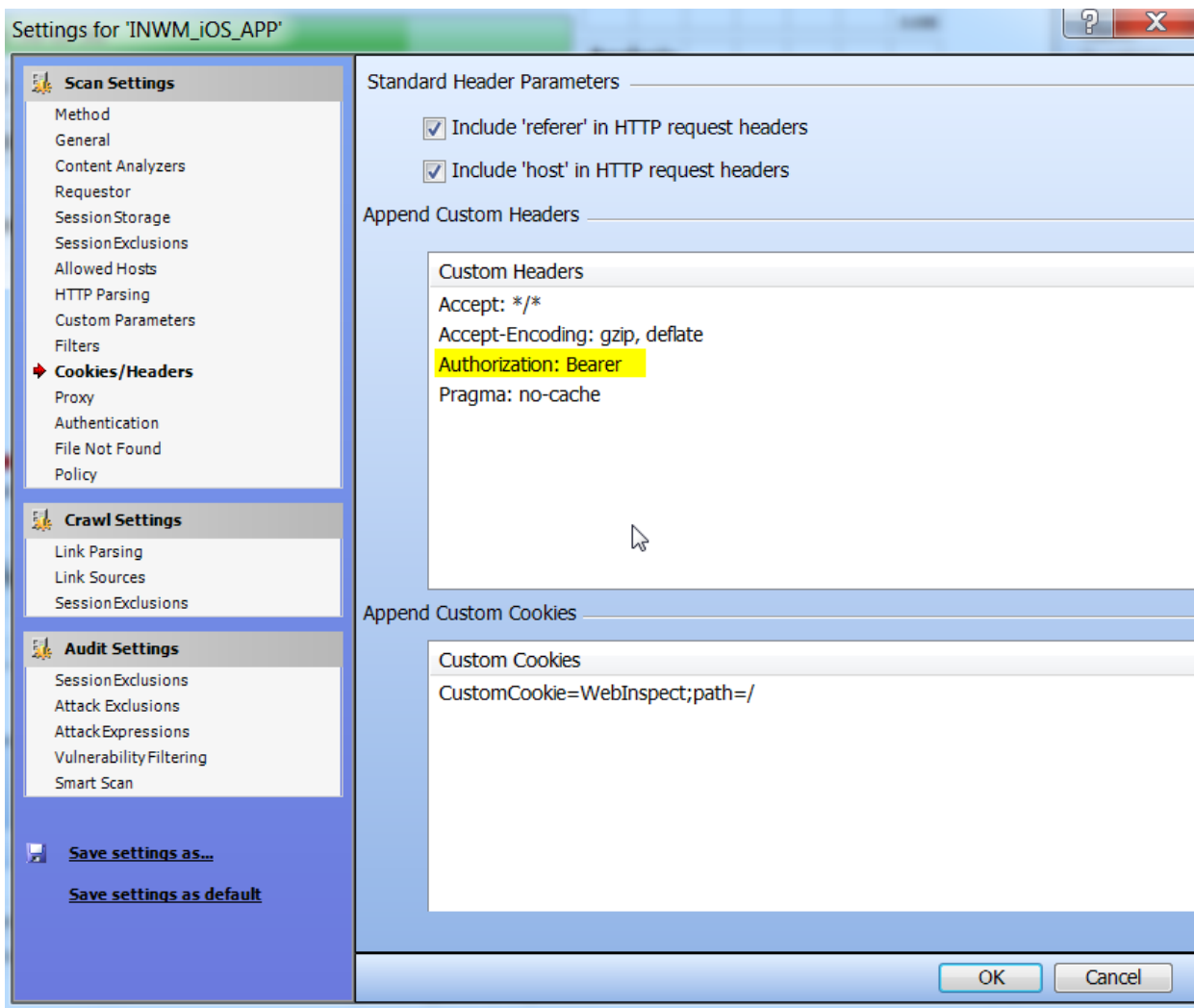

In each request, we want to replace the following header, for example, with one containing the string we matched in the responses:

```
Authorization: Bearer  
eyJhbGciOiJIUzI1NiJ9.eyJzdWIiOiJQVDEuSU5XTSIsImFjY291bnQiOiJQVDEuSU5XTSIsInR4SWQiOiIyZlZnZg1Yy0zZWRkLTQzYTMTYjg2NC1iMzEzZmMkNjg5YzkiLCJpYXQiOiE0NzYzNDYzNjB9.p_U-  
EavAS8unQewF5Q7i0Bb5iBfzJLvGIKVJWJrplIA
```

To accomplish that we use the following Replace Regex:

```
<ReplaceRegexes>  
  <string>Authorization:\sBearer\s(?'myToken'eyJhbGciOiJIUzI1NiJ9\.([a-zA-Z0-9]{1,140})\.([a-zA-Z0-9_-]{1,45}))</string>  
</ReplaceRegexes>
```

And since it's non-standard, we also need to add a custom header "Authorization: Bearer" to every request:



The resulting traffic looks like this:

The screenshot displays the HPE Security Traffic Viewer interface. At the top, there are buttons for 'OPEN', 'NEW', and 'SAVE'. Below these, a 'Site Tree' is visible on the left, and a 'Traffic' table shows 2803 results. The table columns include Request Start, Host, Port, Path, Method, Status, and Category. One entry is highlighted in yellow: a POST request to /mvc/login on port 8080, which returned a 200 OK status.

Request Start	Host	Port	Path	Method	Status	Category
11/18/2016 2:44:42		8080	/mvc/api/v1/mobile/books/highlight?page=1	GET	404 Not Found	Sec
11/18/2016 2:44:42		8080	/mvc/api/v1/mobile/books/highlight?page=1	GET	404 Not Found	Mar
11/18/2016 2:44:51		8080	/mvc/login	POST	200 OK	Mar
11/18/2016 2:44:51		8080	http://www.google.com/	GET	200 OK	Sec
11/18/2016 2:44:51		8080	http://www.google.com/	GET	200 OK	Auc
11/18/2016 2:44:51		8080	/mvc/api/v1/mobile/platformConfigs/time	GET	200 OK	Mar
11/18/2016 2:44:51		8080	/mvc/api/v1/me	GET	200 OK	Mar
11/18/2016 2:44:51		8080	/mvc/api/v1/mobile/bookCatalogs/top	GET	200 OK	Mar
11/18/2016 2:44:52		8080	/mvc/api/v1/mobile/books/highlight?page=1	GET	404 Not Found	Mar

Below the traffic list, the 'REQUEST' and 'RESPONSE' details are shown. The request is a POST to /mvc/login with various headers including User-Agent, Pragma, Authorization, and X-Request-Memo. The response is a 200 OK with a JSON body containing a token.

```
REQUEST
POST /mvc/login HTTP/1.1
Host: 
Accept-encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded; charset=UTF-8
Accept-Language: en-us
Accept: application/json
Origin: file://
Content-Length: 33
User-Agent: Mozilla/5.0 (iPad; CPU OS 9_3 like Mac OS X) AppleWebKit/601.1.46 (KHTML
Pragma: no-cache
Authorization: Bearer
Connection: Keep-Alive
X-WIPP: AscVersion=16.20.608.0
X-RequestManager-Memo: TriggerID="5815d3d5-2c75-4f20-b75a-1d8a60323893"; sid="178"
X-Scan-Memo: Category="Macro"; SID="6AA27E80A390A240541A6CE5A154C7EA"; PSID="064CF
X-Request-Memo: ID="acd27d97-21b8-43f4-90f1-8f0d3401a5b4"; sc="1"; ThreadId="447";

RESPONSE
HTTP/1.1 200 OK
Se
Ac
Ac
Ac
Ac
Ac
Ac
Cc
Tr
Date: 
{"token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IWRXbWVudCI6IklkZWVudC16Ij09"}

```

