HTTP Inspection – STEP 1

The list of regular expression metacharacters and their usages

Metacharacter	Name	Function
.	Dot	Matches any single character. Example: b.d matches bad, bbd, bcd, bdd, bed, and so on
()	Subexpression	Groups the characters inside the parentheses as a single expression for matching with other metacharacters.
|	Or	Matches either expression that | separates. Example: com|net matches whatever.com or whatever.net Example: Ma(r|y) matches Mar or May
?	Question mark	Matches 0 or 1 of the expression just before the ?. Example: e?smtp matches smtp (zero e's) or esmtp (1 e) Example: (12)? matches 4444, 12444, 1212444, and so on
*	Asterisk	Matches 0, 1, or any number of the expression just before the *. Example: w* matches cisco.com and www.cisco.com
+	Plus	Matches at least one of the expressions just before the +. Example: w+ matches www.cisco.com, but not cisco.com

ASA: Application Layer Inspection

Step 1: Application layer protocol inspection class map

```
host(config)# class-map type inspect application [match-all | match-any]
              application_class_map
```

Step 2: Application layer protocol inspection policy map

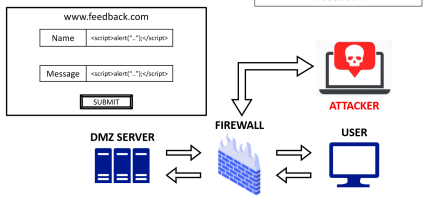
```
host(config)# policy-map type inspect application application_policy_map
```

Step 3: Inspection policy map over MPF layer 3/4 policy map

```
host(config)# policy-map policy_map_name
host(config-pmap)# class class_map_name
host(config-pmap-c)# inspect application application_policy_map
```


Cross-Site Scripting (XSS) Attack

Step 2
Insert HTML/Java Script in the Feedback



ICT2203 Network Security

Attacks and Defense of IP Networks with Firewalls II

Lab 6.2 Notes

Application Layer Protocol Inspection

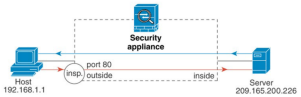
HTTP Inspection – STEP 1

The list of regular expression metacharacters and their usages

Metacharacter	Name	Function
{n}	Repeat	Matches if the expression just before {n} is repeated exactly n times. Example: (test){2} matches testtest but not testtesttest
{n,}	Minimum repeat	Matches if the expression just before {n,} is repeated at least n times. Example: (test){2} matches testtest and also testtesttest
[abc]	Character class	Matches any of the characters listed between the square brackets. Example: [dfhl]og matches dog, fog, hog, and log, but not frog
[^abc]	Not character class	Matches any character that is not listed between the brackets. Example: [^dfhl]og matches cog, but not dog, fog, hog, or log
[a-c]	Character range class	Matches any character in the range from a to c. Example: [a-z] matches any lowercase letter, [A-Z] matches any uppercase letter, [0-9] matches any digit

How to Defend XSS?

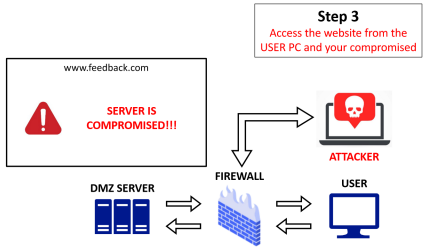
We will use the HTTP Application Layer Protocol Inspection




```
ciscoasa(config)# class-map type inspect http [match-all | match-any] cmap_name
ciscoasa(config-cmap)# match [not] {request | response | req-resp} ...
ciscoasa(config-cmap)# ...
ciscoasa(config-cmap)# exit
ciscoasa(config)# policy-map type inspect http pmap_name
ciscoasa(config-pmap)# class cmap_name
ciscoasa(config-pmap-c)# {drop-connection [log] | log | reset [log]}
ciscoasa(config-pmap-c)# exit
```


Cross-Site Scripting (XSS) Attack

Step 3
Access the website from the USER PC and your compromised



What To Do in This LAB?

- Different Application Layer Attacks: SQL Injection, Cross-Site scripting, Session Hijacking, Remote Code Execution, File Upload Abuse, Distributed Denial of Service and so on….
- In this LAB, we will implement Cross-Site Scripting (XSS) Attack using DVWA
- We will then use ASA to defend the Cross-Site Scripting Attack

HTTP Inspection – STEP 1

The list of regular expression metacharacters and their usages

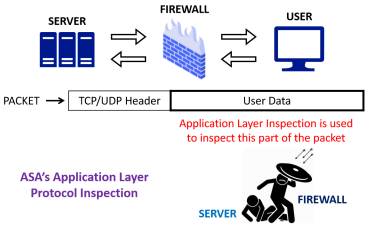
Metacharacter	Name	Function
^	Caret	Matches the beginning of a line; any expression following the caret will be matched only if it appears at the beginning of a line. Example: ^Dear matches "Dear John" but not "John Dear"
\	Escape	The metacharacter following \ will be treated as a literal character; this is useful when you need to match against something that is normally interpreted as a metacharacter. Example: *Test matches "Test"
\r	Carriage return	Matches a carriage return character (ASCII 13 or 0x0d).
\n	Newline	Matches a newline character (ASCII 10 or 0x0a).
\t	Tab	Matches a tab character (ASCII 9 or 0x09).
\f	Form feed	Matches a form feed character (ASCII 12 or 0x0c).
\xNN	Escaped hex number	Matches an ASCII character that has the two-digit hex code NN. Example: \x20 matches a space (ASCII 32)
\NNN	Escaped octal number	Matches an ASCII character that has the three-digit octal code NNN. Example: \040 matches a space (ASCII 32)

HTTP Inspection – STEP 1

HTTP inspection policy map can be configured using the match commands as below

```
ciscoasa(config-cmap)# match [not] request header {[field]
[regex [regex_name | class regex_class_name]] |
[length gt max_length_bytes | count gt max_count_bytes]}

ciscoasa(config-cmap)# match [not] request method {[method] |
[regex [regex_name | class regex_class_name]]

ciscoasa(config-cmap)# match [not] request uri {regex [regex_name | class
regex_class_name] | length gt max_bytes}

ciscoasa(config-cmap)# match [not] request args regex [regex_name | class
regex_class_name]

ciscoasa(config-cmap)# match [not] request body {regex [regex_name | class
regex_class_name] | length gt max_bytes}

ciscoasa(config-cmap)# match [not] req-resp content-type mismatch

ciscoasa(config-cmap)# match [not] response header {[field]
[regex [regex_name | class regex_class_name]] |
[length gt max_length_bytes | count gt max_count]}

ciscoasa(config-cmap)# match [not] response status-line [regex [regex_name | class
regex_class_name]]

ciscoasa(config-cmap)# match [not] response body {[active-x] | [java-applet] |
[regex [regex_name | class regex_class_name]] | length gt max_bytes}
```

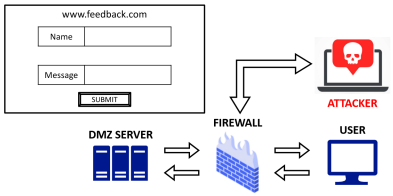

XSS – Defence:



https://www.cisco.com/c/en/us/td/docs/security/asa/asa72/configuration/guide/conf_gd/inspect.html#wp1514315

Cross-Site Scripting (XSS) Attack

- What is XSS?
  - Occurs when an attacker injects code.
  - Types: Reflected, **Stored** and DOM-Based.



HTTP Inspection – STEP 2

Configure HTTP inspection policy map to specify actions to be performed on matched traffic

```
ciscoasa(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]] | mask | reset} [log] |
rate-limit message_rate}
```

- **drop** keyword drops the packets
- **send-protocol-error** keyword sends a protocol error message
- **drop-connection** keyword drops the packet and closes the connection
- **mask** keyword masks out the matching portion of the packet
- **reset** keyword drops the packet, closes the connection, and sends a TCP reset
- **log** keyword sends a system log message
- **rate-limit** *message_rate* argument limits the rate of messages

Note that not all actions are allowed for different match command.

Use CLI ? help for exact options available.

HTTP Inspection – STEP 1

Regular expression (regex) is a powerful way to specify search patterns for matching and can be configured in two ways as follows:

Single **Regular Expression**

```
ciscoasa(config)# regex regex_name regular_expression
ciscoasa(config)# regex ...
```

Group of **Regular Expressions** using class-map

```
ciscoasa(config)# class-map type regex match-any regex_cmap_name
ciscoasa(config-cmap)# match regex regex_name
ciscoasa(config-cmap)# match regex ...
ciscoasa(config-cmap)# exit
```

While formulating your regular expression, you may test it as follows:

```
ciscoasa# test regex input_text regular_expression

ciscoasa# test regex https://shadycontent.com/toolz https?://
INFO: Regular expression match succeeded.
```

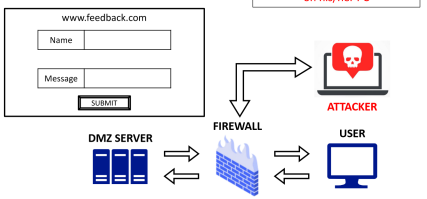

ASA: Application Layer Inspection

Configuration of Application Inspection in ASA

Step 1	Step 2	Step 3
Configure application layer protocol inspection class map	Configure application layer protocol inspection policy map	Apply inspection policy map over MPF layer 3/4 policy map discussed in the last lecture

Cross-Site Scripting (XSS) Attack

Step 1
The attacker opens the website on his/her PC



HTTP Inspection – STEP 2

In addition, HTTP inspection policy map has special parameters option for specifying action to take if HTTP protocol violation occurs.

To enter into **parameters configuration** mode in inspection policy map:

```
ciscoasa(config-pmap)# parameters
ciscoasa(config-pmap-p)#
```

To **configure** action for **HTTP protocol violation**, enter the command:

```
ciscoasa(config-pmap-p)# protocol-violation [action
                         [drop-connection | reset | log]]
```


HTTP Inspection – STEP 1 & 2

To summarise, here is an example of HTTP inspection class map and inspection policy map.

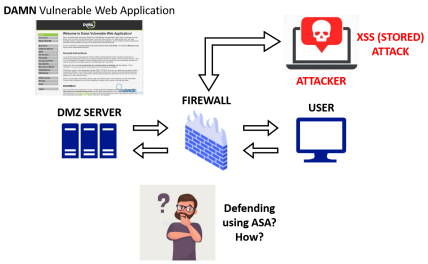
```
ciscoasa(config)# regex url_example example\.com
ciscoasa(config)# regex url_example2 example2\.com
ciscoasa(config)# class-map type regex match-any URLs
ciscoasa(config-cmap)# match regex url_example
ciscoasa(config-cmap)# match regex url_example2

ciscoasa(config)# class-map type inspect http match-all http-traffic
ciscoasa(config-cmap)# match req-resp content-type mismatch
ciscoasa(config-cmap)# match request body length gt 1000
ciscoasa(config-cmap)# match not request uri regex class URLs

ciscoasa(config)# policy-map type inspect http http-map1
ciscoasa(config-pmap)# class http-traffic
ciscoasa(config-pmap-c)# drop-connection log
ciscoasa(config-pmap-c)# match req-resp content-type mismatch
ciscoasa(config-pmap-c)# reset log
ciscoasa(config-pmap)# parameters
ciscoasa(config-pmap-p)# protocol-violation action log
```


HTTP Inspection – STEP 3

```
ciscoasa(config)# policy-map test
ciscoasa(config-pmap)# class test
ciscoasa(config-pmap-c)# inspect http http-map1

ciscoasa(config)# service-policy test interface outside
```

Note: If you modify an in-use HTTP inspection policy map, you must remove and reapply it for the changes to take effect.

```
ciscoasa(config)# policy-map test
ciscoasa(config-pmap)# class http
ciscoasa(config-pmap-c)# no inspect http http-map1
ciscoasa(config-pmap-c)# inspect http http-map1
```


LAB 6.2: What To Do in the LAB?