ASA/PIX 8.x: Block Certain Websites (URLs) Using Regular Expressions With MPF Configuration Example

Contents

Introduction

This document describes how to configure the Cisco Security Appliances ASA/PIX 8.x that uses Regular Expressions with Modular Policy Framework (MPF) in order to block the certain websites (URLs).

Note: This configuration does not block all application downloads. For reliable file blocking, a dedicated appliance such as Ironport S Series or a module such as the CSC module for the ASA should be used.

Note: HTTPS filtering is not supported on ASA. ASA cannot do deep packet inspection or inspection based on regular expression for HTTPS traffic, because in HTTPS, content of packet is encrypted (SSL).

Prerequisites

Requirements

This document assumes that Cisco Security Appliance is configured and works properly.

Components Used

- Cisco 5500 Series Adaptive Security Appliance (ASA) that runs the software version 8.0(x) and later
- Cisco Adaptive Security Device Manager (ASDM) version 6.x for ASA 8.x

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Related Products

This configuration can also be used with the Cisco 500 Series PIX that runs the software version 8.0(x) and later.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Background Information

Modular Policy Framework Overview

MPF provides a consistent and flexible way to configure security appliance features. For example, you can use MPF to create a timeout configuration that is specific to a particular TCP application, as opposed to one that applies to all TCP applications.

MPF supports these features:

- TCP normalization, TCP and UDP connection limits and timeouts, and TCP sequence number randomization
- CSC
- Application inspection
- IPS
- QoS input policing
- QoS output policing
- QoS priority queue

The configuration of the MPF consists of four tasks:

1. Identify the Layer 3 and 4 traffic to which you want to apply actions. Refer to Identifying Traffic Using a Layer 3/4 Class Map for more information.
2. (Application inspection only) Define special actions for application inspection traffic. Refer to Configuring Special Actions for Application Inspections for more information.
3. Apply actions to the Layer 3 and 4 traffic. Refer to Defining Actions Using a Layer 3/4 Policy Map for more information.
4. Activate the actions on an interface. Refer to Applying a Layer 3/4 Policy to an Interface Using a Service Policy for more information.

Regular Expression

A regular expression matches text strings either literally as an exact string, or by the use of metacharacters so you can match multiple variants of a text string. You can use a regular expression to match the content of certain application traffic; for example, you can match a URL string inside an HTTP packet.

Note: Use **Ctrl+V** in order to escape all of the special characters in the CLI, such as question mark (?) or a tab. For example, type **d[Ctrl+V]?g** in order to enter **d?g** in the configuration.

For the creation of a regular expression, use the **regex** command, which can be used for various features that require text matching. For example, you can configure special actions for application inspection with the use of the Modular Policy Framework that uses an inspection policy map. Refer to the **policy map type inspect** command for more information. In the inspection policy map, you can identify the traffic you want to act upon if you create an inspection class map that contains one or more **match** commands or you can use **match** commands directly in the inspection policy map. Some **match** commands let you identify text in a packet using a regular expression; for example, you can match URL strings inside HTTP packets. You can group regular expressions in a regular expression class map. Refer to the **class-map type regex** command for more information.

This table lists the metacharacters that have special meanings.

Character	Description	Notes
.	Dot	Matches any single character. For example, **d.g** matches dog, dag, dtg, and any word that contains those characters, such as doggonnit.
(exp)	Subexpression	A subexpression segregates characters from surrounding characters, so that you can use other metacharacters on the subexpression. For example, **d(o|a)g** matches dog and dag, but **do|ag** matches do and ag. A subexpression can also be used with repeat quantifiers to differentiate the characters meant for repetition. For example, **ab(xy){3}z** matches abxyxyxyz.
|	Alternation	Matches either expression it separates. For example, **dog|cat** matches dog or cat.
?	Question mark	A quantifier that indicates that there are 0 or 1 of the previous expression. For example, **lo?se** matches lse or lose. **Note:** You must enter **Ctrl+V** and then the question mark or else the help function is invoked.
*	Asterisk	A quantifier that indicates that there are 0, 1 or any number of the previous expression. For example, **lo*se** matches

		lse, lose, loose, and so forth.
{x}	Repeat quantifier	Repeat exactly x times. For example, **ab(xy){3}z** matches abxyxyxyz.
{x,}	Minimum repeat quantifier	Repeat at least x times. For example, **ab(xy){2,}z** matches abxyxyz, abxyxyxyz, and so forth.
[abc]	Character class	Matches any character in the brackets. For example, **[abc]** matches a, b, or c.
[^abc]	Negated character class	Matches a single character that is not contained within the brackets. For example, **[^abc]** matches any character other than a, b, or c. **[^A-Z]** matches any single character that is not an uppercase letter.
[a-c]	Character range class	Matches any character in the range. **[a-z]** matches any lowercase letter. You can mix characters and ranges: **[abcq-z]** matches a, b, c, q, r, s, t, u, v, w, x, y, z, and so does **[a-cq-z]**. The dash (-) character is literal only if it is the last or the first character within the brackets: **[abc-]** or **[-abc]**.
""	Quotation marks	Preserves trailing or leading spaces in the string. For example, **" test"** preserves the leading space when it looks for a match.
^	Caret	Specifies the beginning of a line
\	Escape character	When used with a metacharacter, matches a literal character. For example, **\[** matches the left square bracket.
char	Character	When character is not a metacharacter, matches the literal character.
\r	Carriage return	Matches a carriage return 0x0d
\n	Newline	Matches a new line 0x0a
\t	Tab	Matches a tab 0x09
\f	Formfeed	Matches a form feed 0x0c
\xNN	Escaped hexadecimal number	Matches an ASCII character that uses a hexadecimal that is exactly two digits

\NNN	Escaped octal number	Matches an ASCII character as octal that is exactly three digits. For example, the character 040 represents a space.

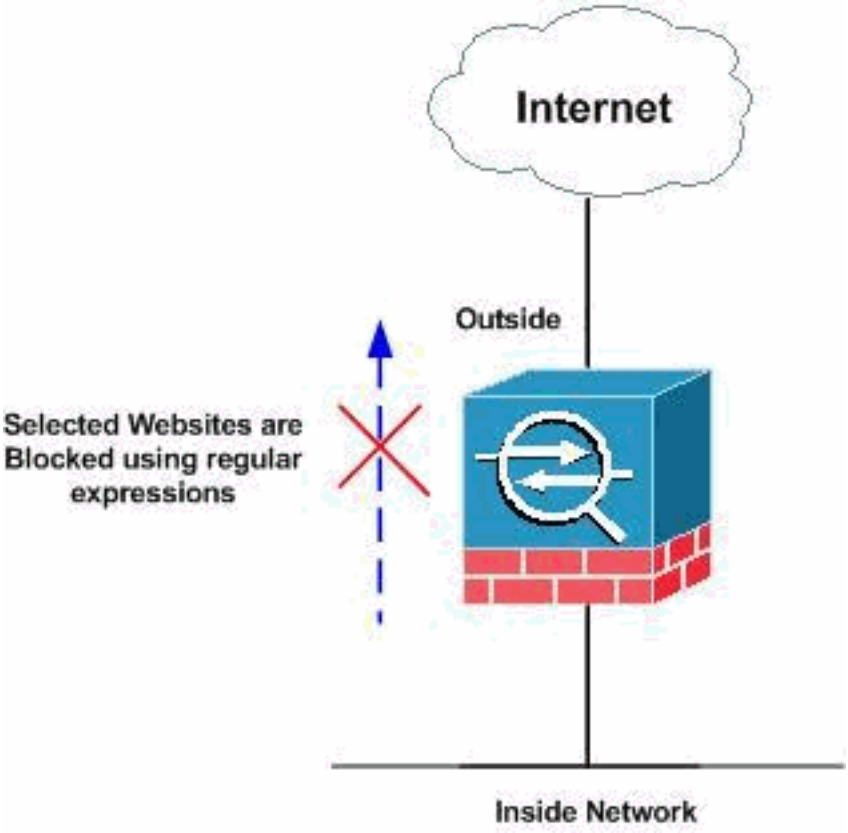
Configure

In this section, you are presented with the information to configure the features described in this document.

Note: Use the Command Lookup Tool (registered customers only) in order to obtain more information on the commands used in this section.

Network Diagram

This document uses this network setup:



Configurations

This document uses these configurations:

- ASA CLI Configuration
- ASA Configuration 8.x with ASDM 6.x

ASA CLI Configuration

ASA CLI Configuration

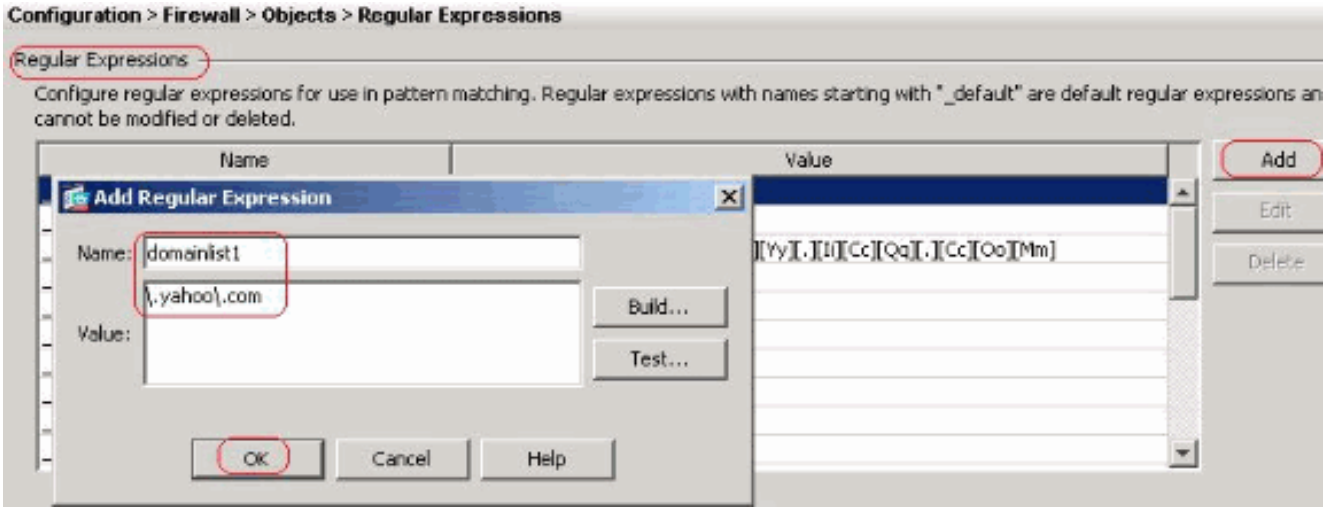
```
ciscoasa#show running-config : Saved : ASA Version
8.0(2) ! hostname ciscoasa domain-name
default.domain.invalid enable password 8Ry2YjIyt7RRXU24
encrypted names ! interface Ethernet0/0 nameif inside
security-level 100 ip address 10.1.1.1 255.255.255.0 !
interface Ethernet0/1 nameif outside security-level 0 ip
address 192.168.1.5 255.255.255.0 ! interface
Ethernet0/2 nameif DMZ security-level 90 ip address
10.77.241.142 255.255.255.192 ! interface Ethernet0/3
shutdown no nameif no security-level no ip address !
interface Management0/0 shutdown no nameif no security-
level no ip address ! passwd 2KFQnbNIdI.2KYOU encrypted
regex urllist1
".*\.([Ee][Xx][Ee]|[Cc][Oo][Mm]|[Bb][Aa][Tt])
HTTP/1.[01]" !--- Extensions such as .exe, .com, .bat to
be captured and !--- provided the http version being
used by web browser must be either 1.0 or 1.1 regex
urllist2 ".*\.([Pp][Ii][Ff]|[Vv][Bb][Ss]|[Ww][Ss][Hh])
HTTP/1.[01]" !--- Extensions such as .pif, .vbs, .wsh to
be captured !--- and provided the http version being
used by web browser must be either !--- 1.0 or 1.1 regex
urllist3 ".*\.([Dd][Oo][Cc]|[Xx][Ll][Ss]|[Pp][Pp][Tt])
HTTP/1.[01]" !--- Extensions such as .doc(word),
.xls(ms-excel), .ppt to be captured and provided !---
the http version being used by web browser must be
either 1.0 or 1.1 regex urllist4
".*\.([Zz][Ii][Pp]|[Tt][Aa][Rr]|[Tt][Gg][Zz])
HTTP/1.[01]" !--- Extensions such as .zip, .tar, .tgz to
be captured and provided !--- the http version being
used by web browser must be either 1.0 or 1.1 regex
domainlist1 "\.yahoo\.com" regex domainlist2
"\.myspace\.com" regex domainlist3 "\.youtube\.com" !---
Captures the URLs with domain name like yahoo.com, !---
youtube.com and myspace.com regex contenttype "Content-
Type" regex applicationheader "application/.*" !---
Captures the application header and type of !--- content
in order for analysis boot system disk0:/asa802-k8.bin
ftp mode passive dns server-group DefaultDNS domain-name
default.domain.invalid access-list inside_mpc extended
permit tcp any any eq www access-list inside_mpc
extended permit tcp any any eq 8080 !--- Filters the
http and port 8080 !--- traffic in order to block the
specific traffic with regular !--- expressions pager
lines 24 mtu inside 1500 mtu outside 1500 mtu DMZ 1500
no failover icmp unreachable rate-limit 1 burst-size 1
asdm image disk0:/asdm-602.bin no asdm history enable
arp timeout 14400 route DMZ 0.0.0.0 0.0.0.0
10.77.241.129 1 timeout xlate 3:00:00 timeout conn
1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
timeout sunrpc 0:10:00 h323 0:05:00 h225 1:00:00 mgcp
0:05:00 mgcp-pat 0:05:00 timeout sip 0:30:00 sip_media
0:02:00 sip-invite 0:03:00 sip-disconnect 0:02:00
timeout uauth 0:05:00 absolute dynamic-access-policy-
record DfltAccessPolicy http server enable http 0.0.0.0
0.0.0.0 DMZ no snmp-server location no snmp-server
contact snmp-server enable traps snmp authentication
linkup linkdown coldstart no crypto isakmp nat-traversal
telnet timeout 5 ssh timeout 5 console timeout 0 threat-
detection basic-threat threat-detection statistics
access-list ! class-map type regex match-any
DomainBlockList match regex domainlist1 match regex
domainlist2 match regex domainlist3 !--- Class map
created in order to match the domain names !--- to be
blocked class-map type inspect http match-all
```

```
BlockDomainsClass match request header host regex class
DomainBlockList !--- Inspect the identified traffic by
class !--- "DomainBlockList". class-map type regex
match-any URLBlockList match regex urllist1 match regex
urllist2 match regex urllist3 match regex urllist4 !---
Class map created in order to match the URLs !--- to be
blocked class-map inspection_default match default-
inspection-traffic class-map type inspect http match-all
AppHeaderClass match response header regex contenttype
regex applicationheader !--- Inspect the captured
traffic by regular !--- expressions "content-type" and
"applicationheader". class-map httptraffic match access-
list inside_mpc !--- Class map created in order to match
the !--- filtered traffic by ACL class-map type inspect
http match-all BlockURLsClass match request uri regex
class URLBlockList ! !--- Inspect the identified traffic
by class !--- "URLBlockList". ! policy-map type inspect
dns preset_dns_map parameters message-length maximum 512
policy-map type inspect http http_inspection_policy
parameters protocol-violation action drop-connection
class AppHeaderClass drop-connection log match request
method connect drop-connection log class
BlockDomainsClass reset log class BlockURLsClass reset
log !--- Define the actions such as drop, reset or log
!--- in the inspection policy map. policy-map
global_policy class inspection_default inspect dns
preset_dns_map inspect ftp inspect h323 h225 inspect
h323 ras inspect netbios inspect rsh inspect rtsp
inspect skinny inspect esmtp inspect sqlnet inspect
sunrpc inspect tftp inspect sip inspect xdmcp policy-map
inside-policy class httptraffic inspect http
http_inspection_policy !--- Map the inspection policy
map to the class !--- "httptraffic" under the policy map
created for the !--- inside network traffic. ! service-
policy global_policy global service-policy inside-policy
interface inside !--- Apply the policy to the interface
inside where the websites are blocked. prompt hostname
context Cryptochecksum:e629251a7c37af205c289cf78629fc11
: end ciscoasa#
```

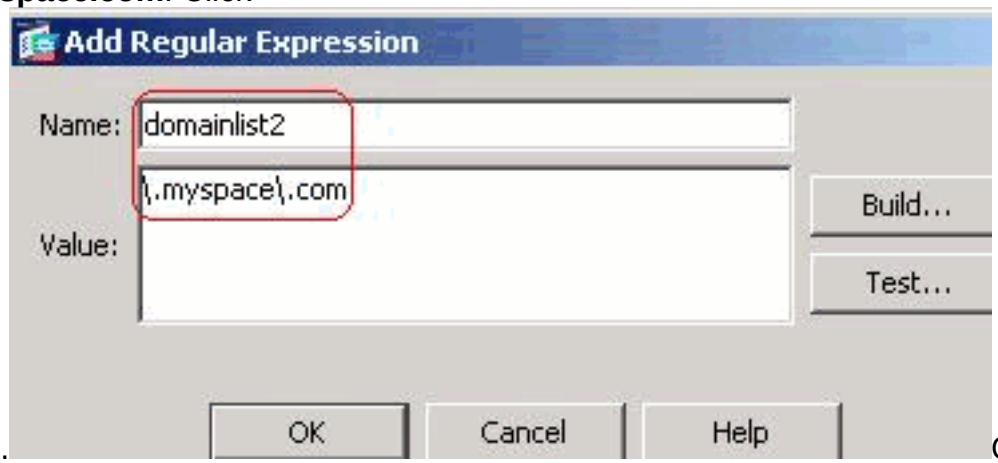
ASA Configuration 8.x with ASDM 6.x

Complete these steps in order to configure the regular expressions and apply them into MPF to block the specific websites as shown.

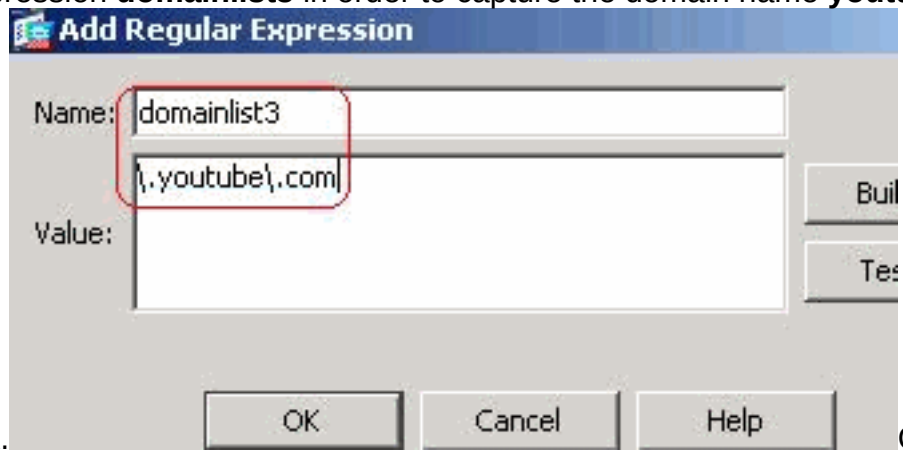
1. **Create Regular Expressions**Choose **Configuration > Firewall> Objects > Regular Expressions** and click **Add** under the tab **Regular Expression** in order to create regular expressions as shown.Create a regular expression **domainlist1** in order to capture the domain name **yahoo.com**. Click
   OK.



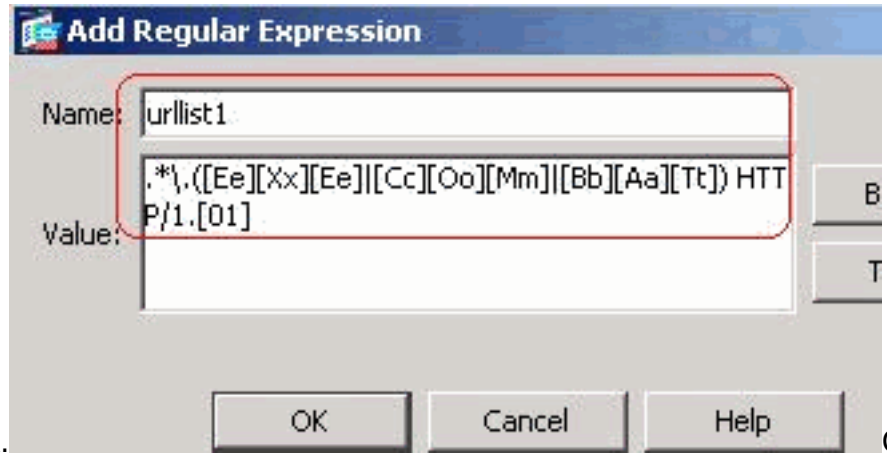
Create a regular expression **domainlist2** in order to capture the domain name **myspace.com**. Click



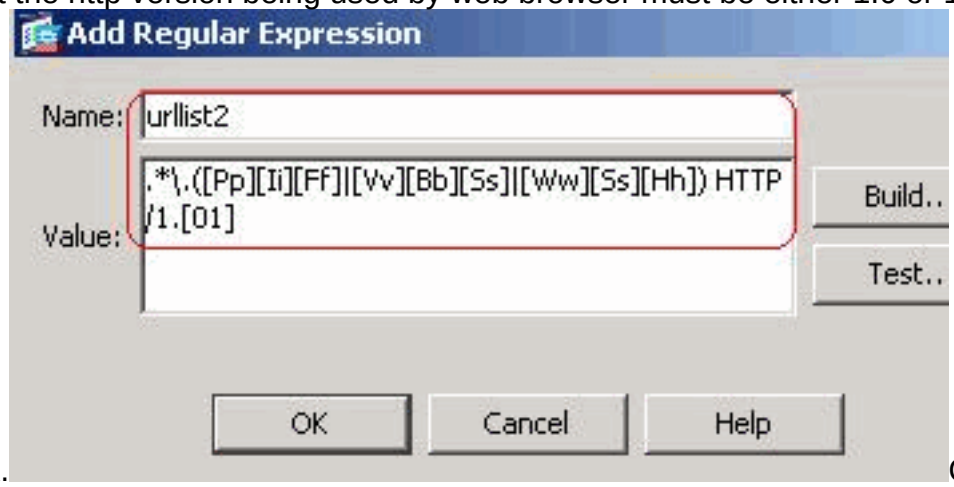
OK. Create a regular expression **domainlist3** in order to capture the domain name **youtube.com**. Click



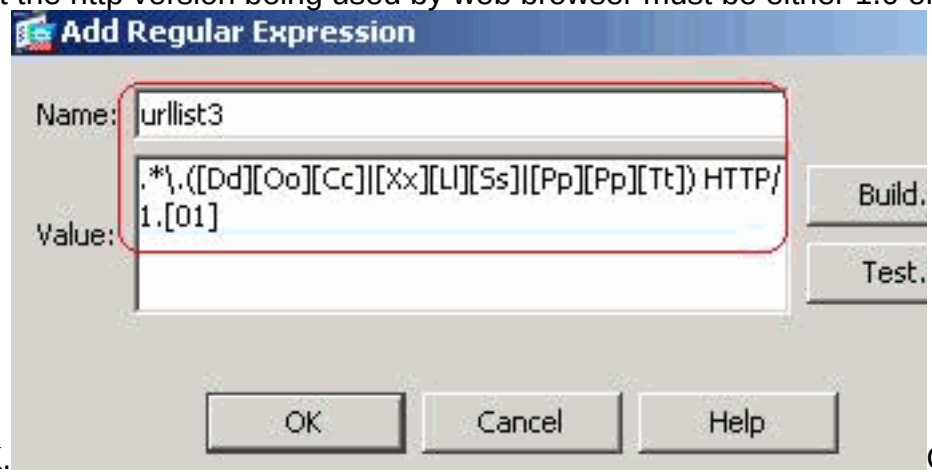
OK. Create a regular expression **urllist1** in order to capture the file extensions such as **exe**, **com** and **bat** provided that the http version being used by web browser must be either 1.0 or 1.1. Click



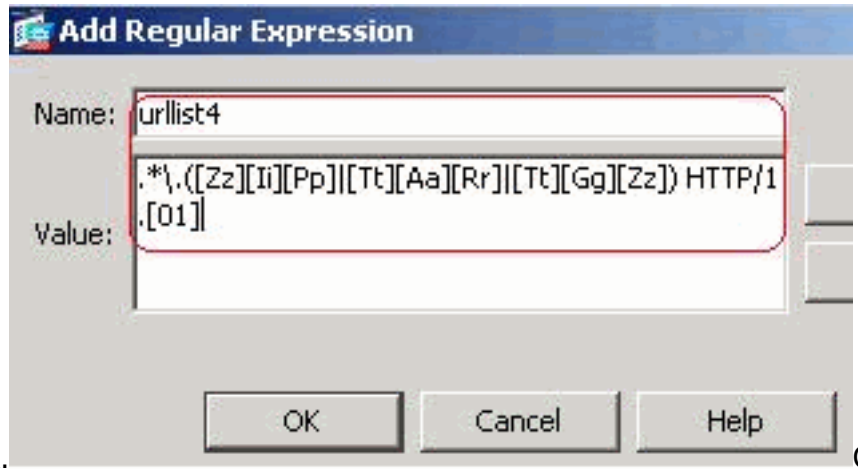
OK. Create a regular expression **urllist2** in order to capture the file extensions such as **pif**, **vbs** and **wsh** provided that the http version being used by web browser must be either 1.0 or 1.1. Click



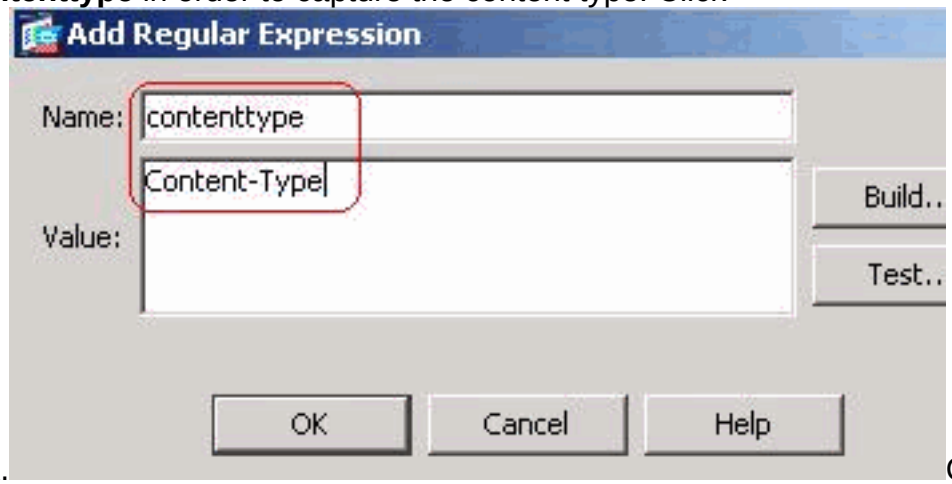
OK. Create a regular expression **urllist3** in order to capture the file extensions such as **doc**, **xls** and **ppt** provided that the http version being used by web browser must be either 1.0 or 1.1. Click



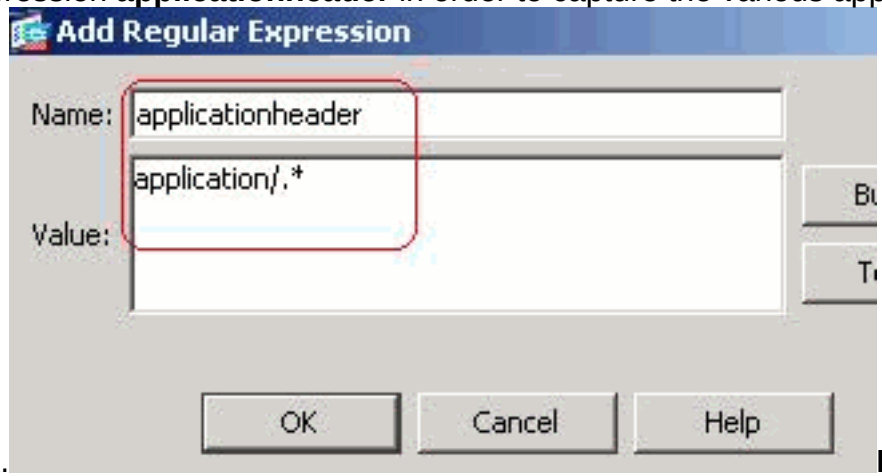
OK. Create a regular expression **urllist4** in order to capture the file extensions such as **zip**, **tar** and **tgz** provided that the http version being used by web browser must be either 1.0 or 1.1. Click



OK.Create a regular expression **contenttype** in order to capture the content type. Click

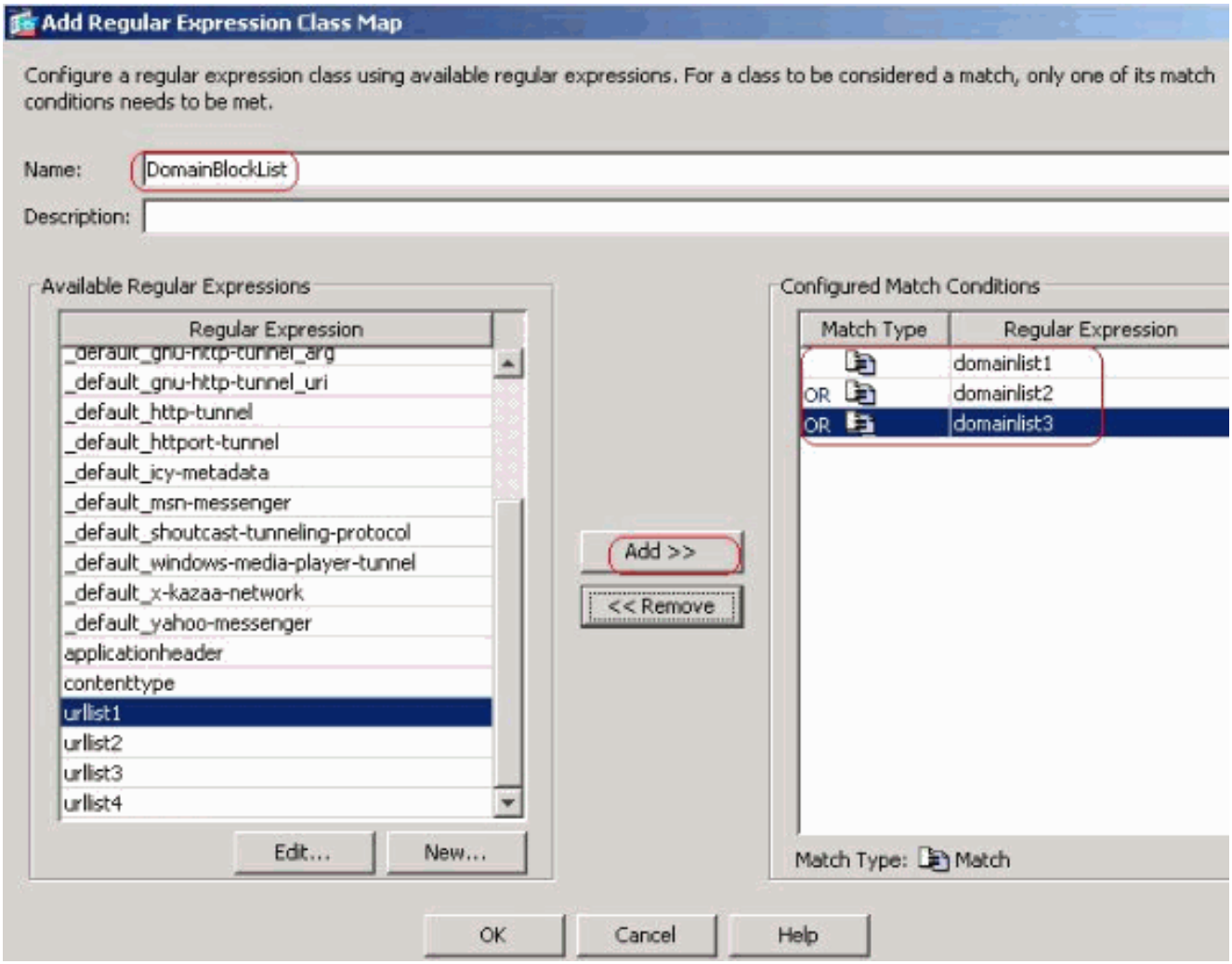


OK.Create a regular expression **applicationheader** in order to capture the various application header. Click

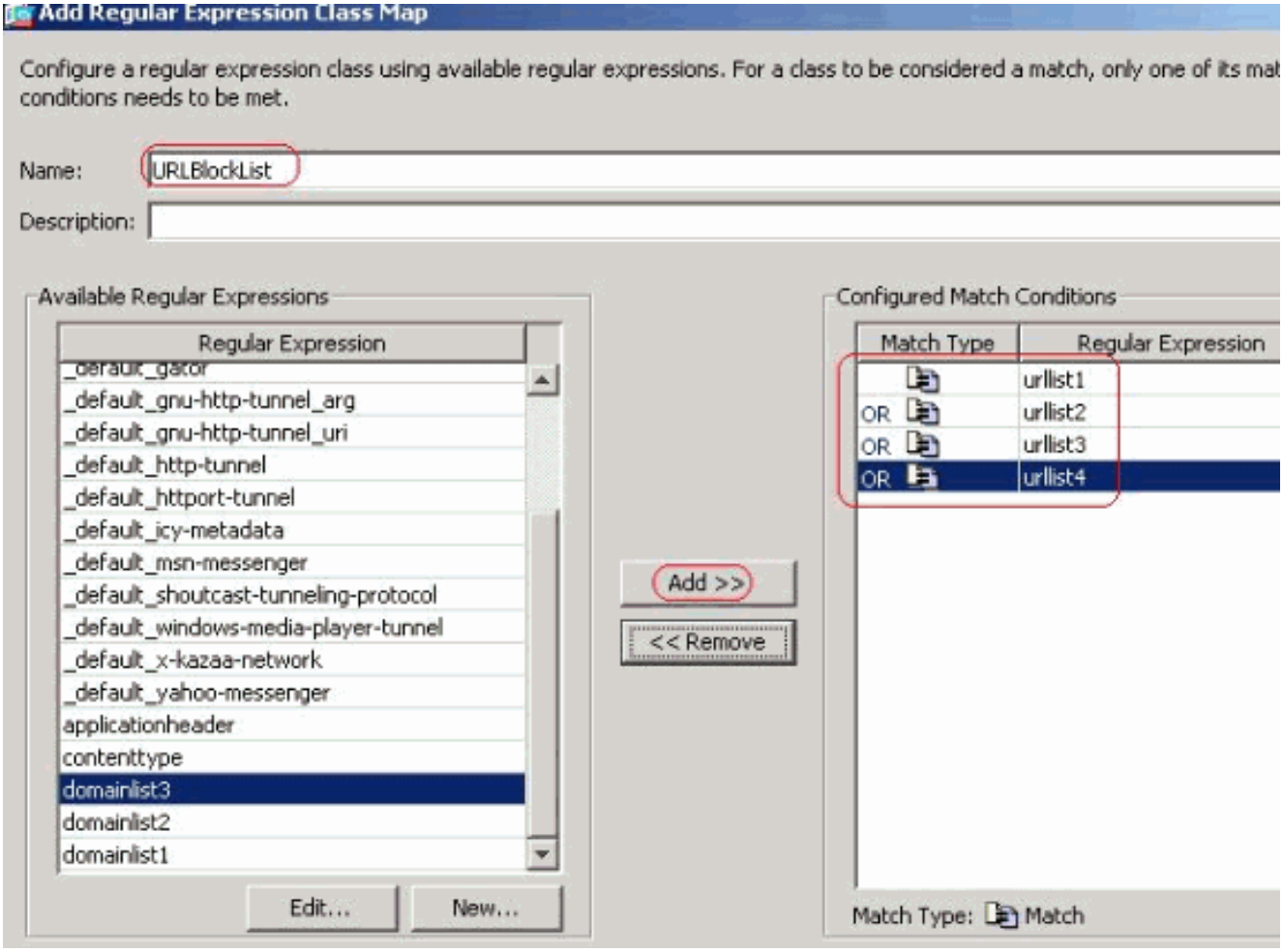


OK.**Equivalent CLI Configuration**

2. **Create Regular Expression Classes**Choose **Configuration > Firewall > Objects > Regular Expressions** and click **Add** under the tab **Regular Expression Classes** in order to create the various classes as shown.Create a regular expression class **DomainBlockList** in order to match any of the regular expressions domainlist1, domainlist2 and domainlist3. Click **OK**.

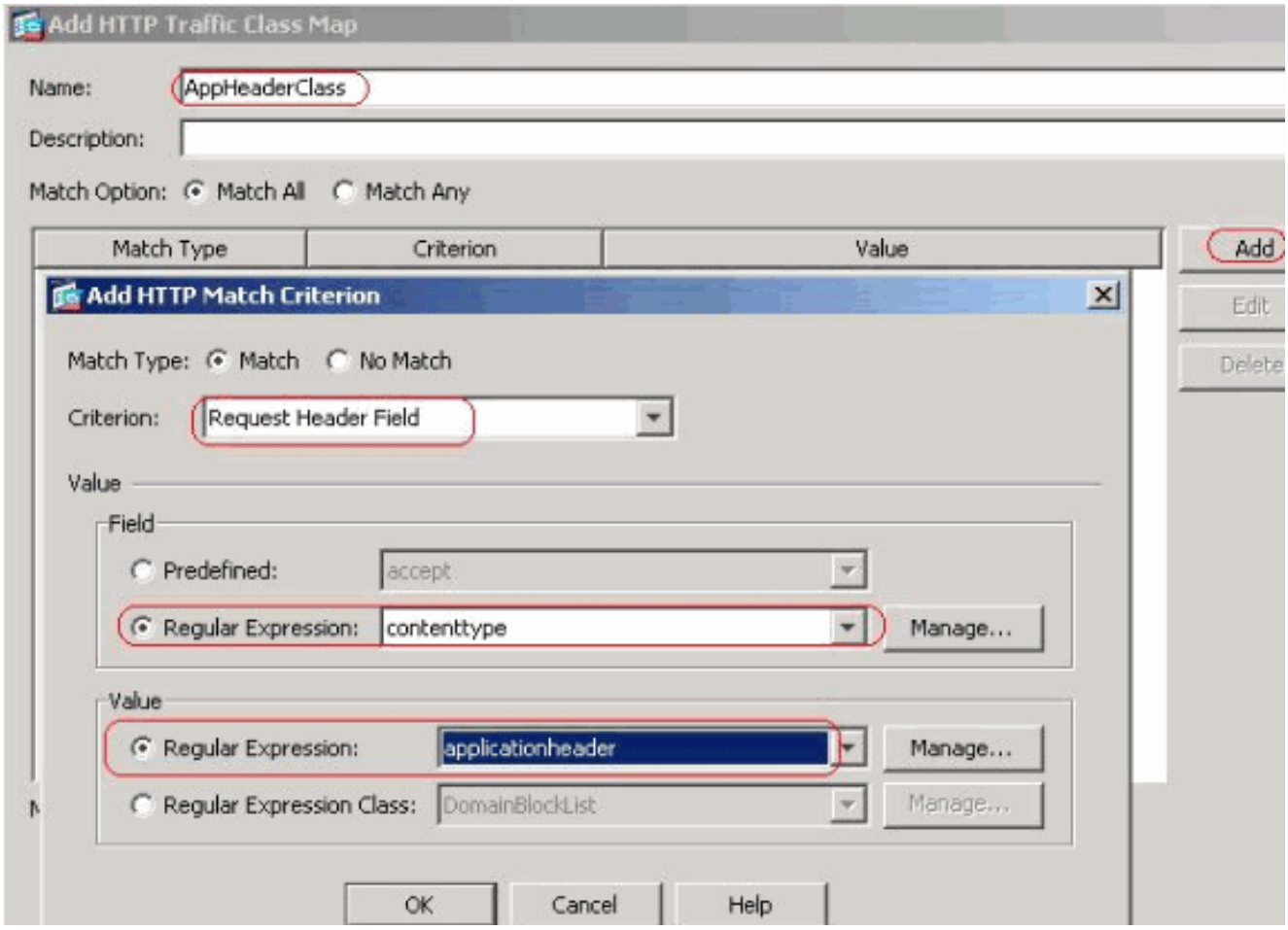


Create a regular expression class **URLBlockList** in order to match any of the regular expressions urllist1, urllist2, urllist3 and urllist4. Click **OK**.

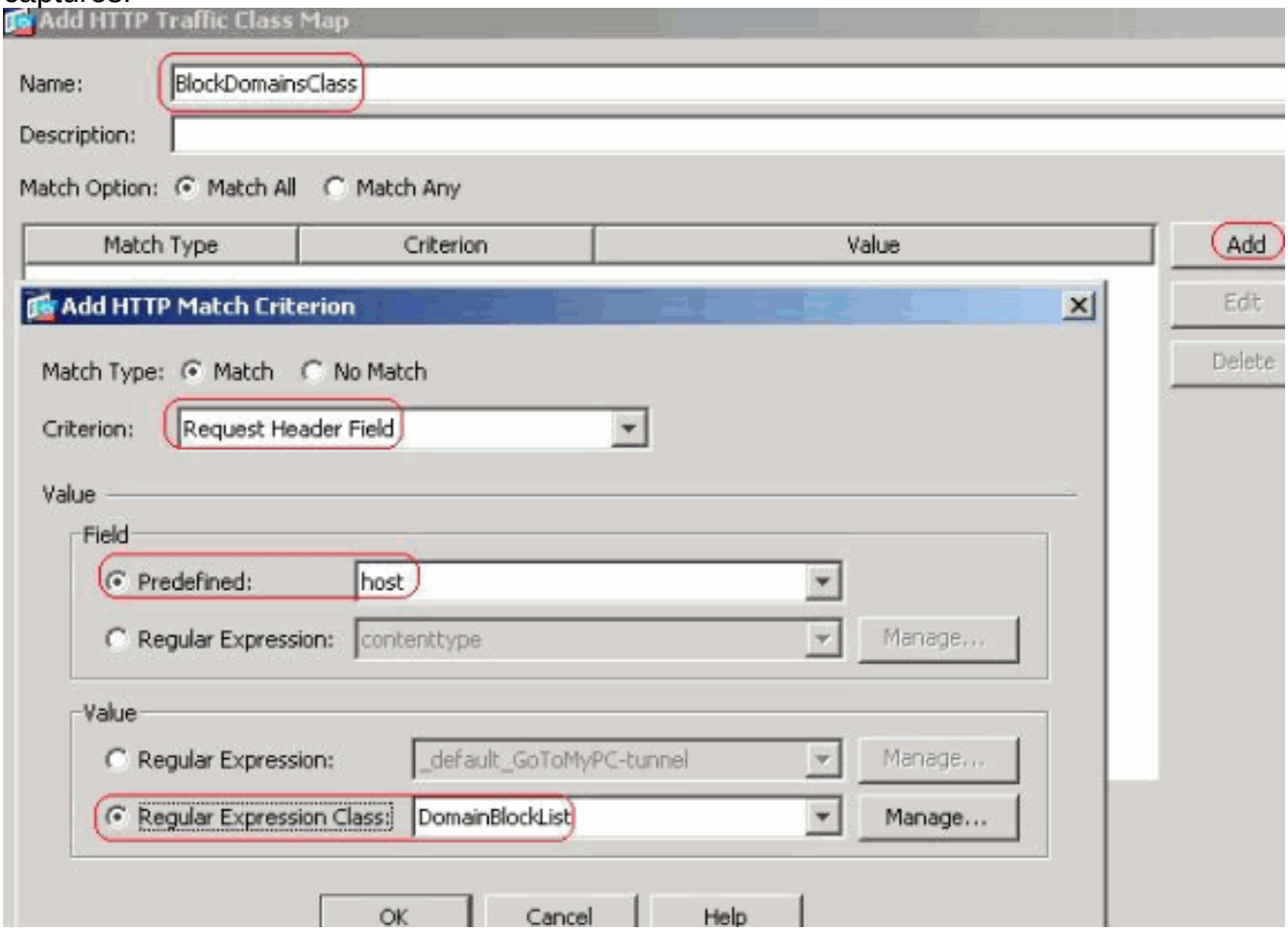


Equivalent CLI Configuration

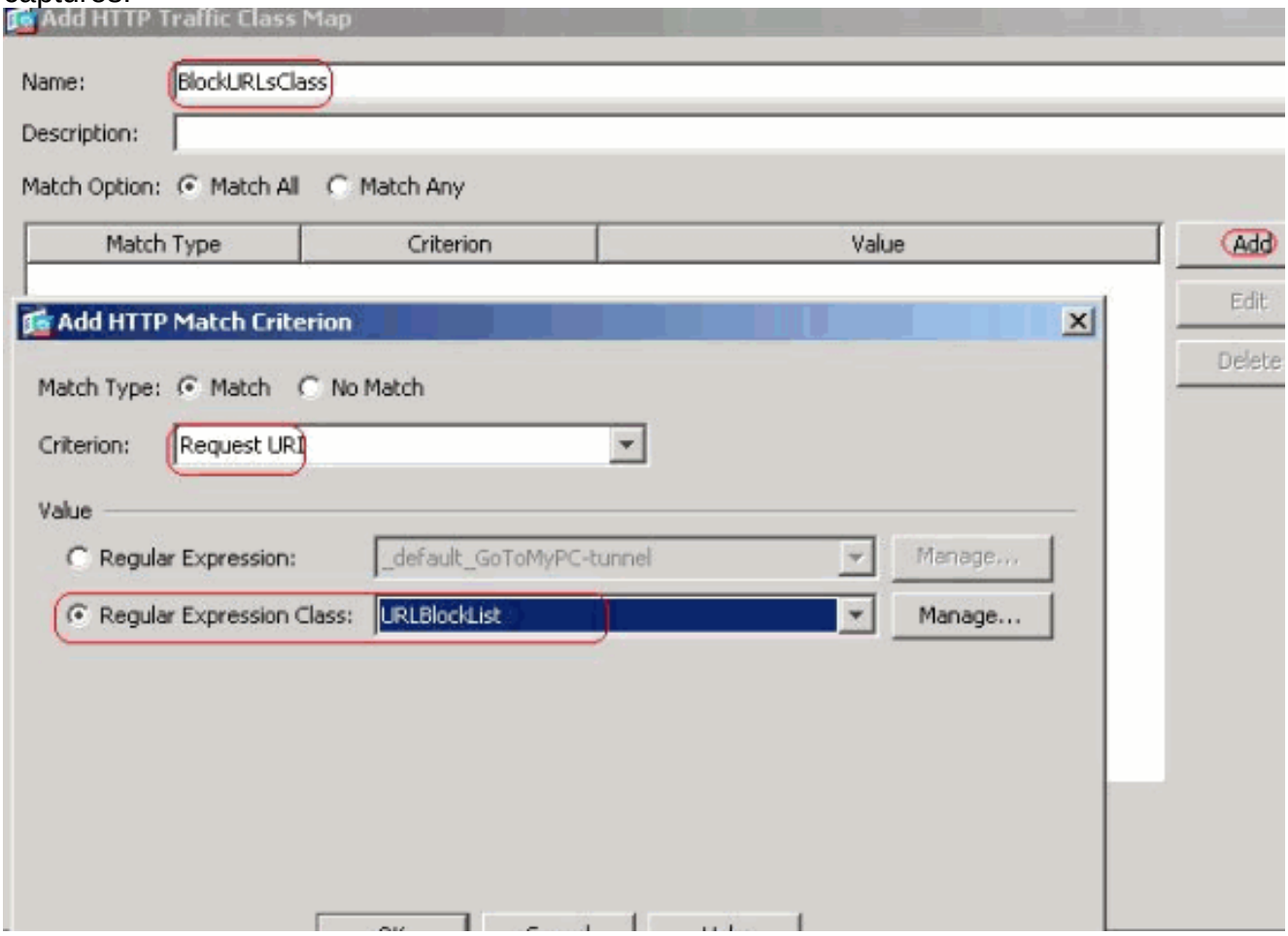
3. **Inspect the identified traffic with Class maps**Choose **Configuration > Firewall > Objects > Class Maps > HTTP > Add** in order to create a class map to inspect the http traffic identified by various regular expressions as shown.Create a class map **AppHeaderClass** in order to match the response header with regular expressions captures.



Click **OK**Create a class map **BlockDomainsClass** in order to match the request header with regular expressions
captures.

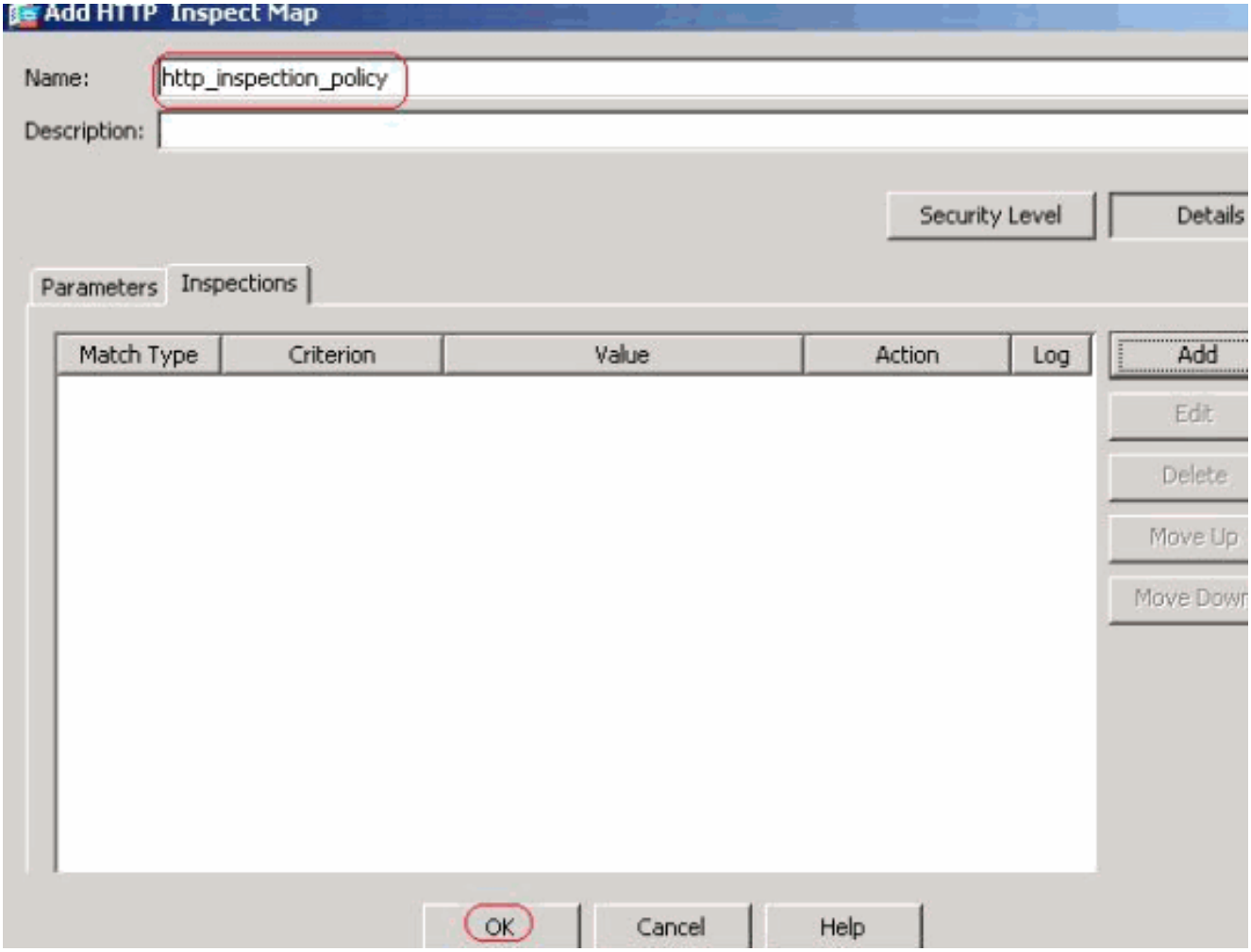


Click **OK**.Create a class map **BlockURLsClass** in order to match the request uri with regular expressions
captures.

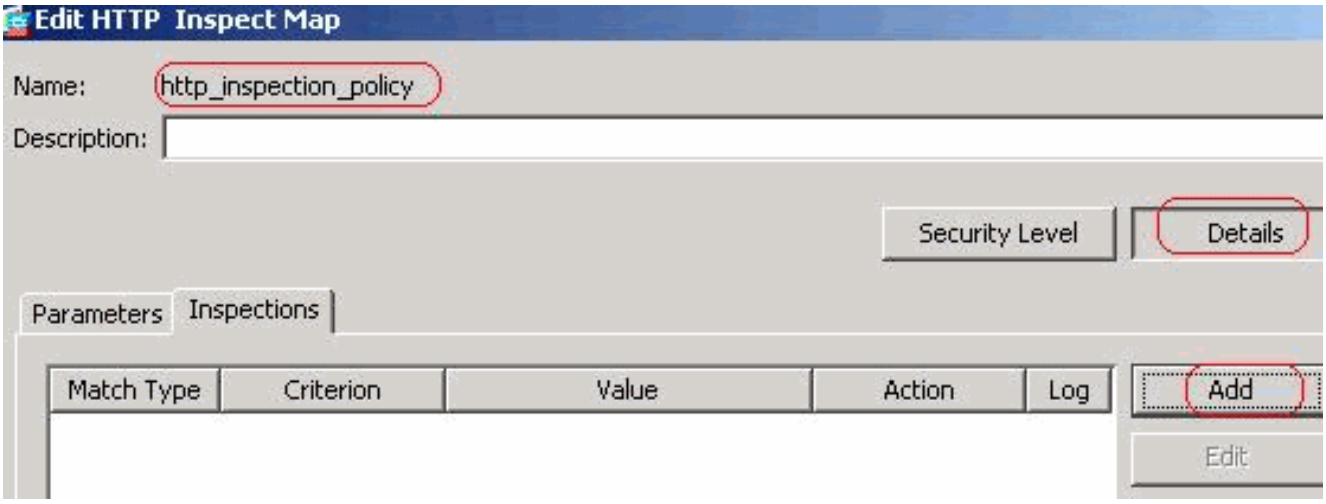


Click **OK**.**Equivalent CLI Configuration**

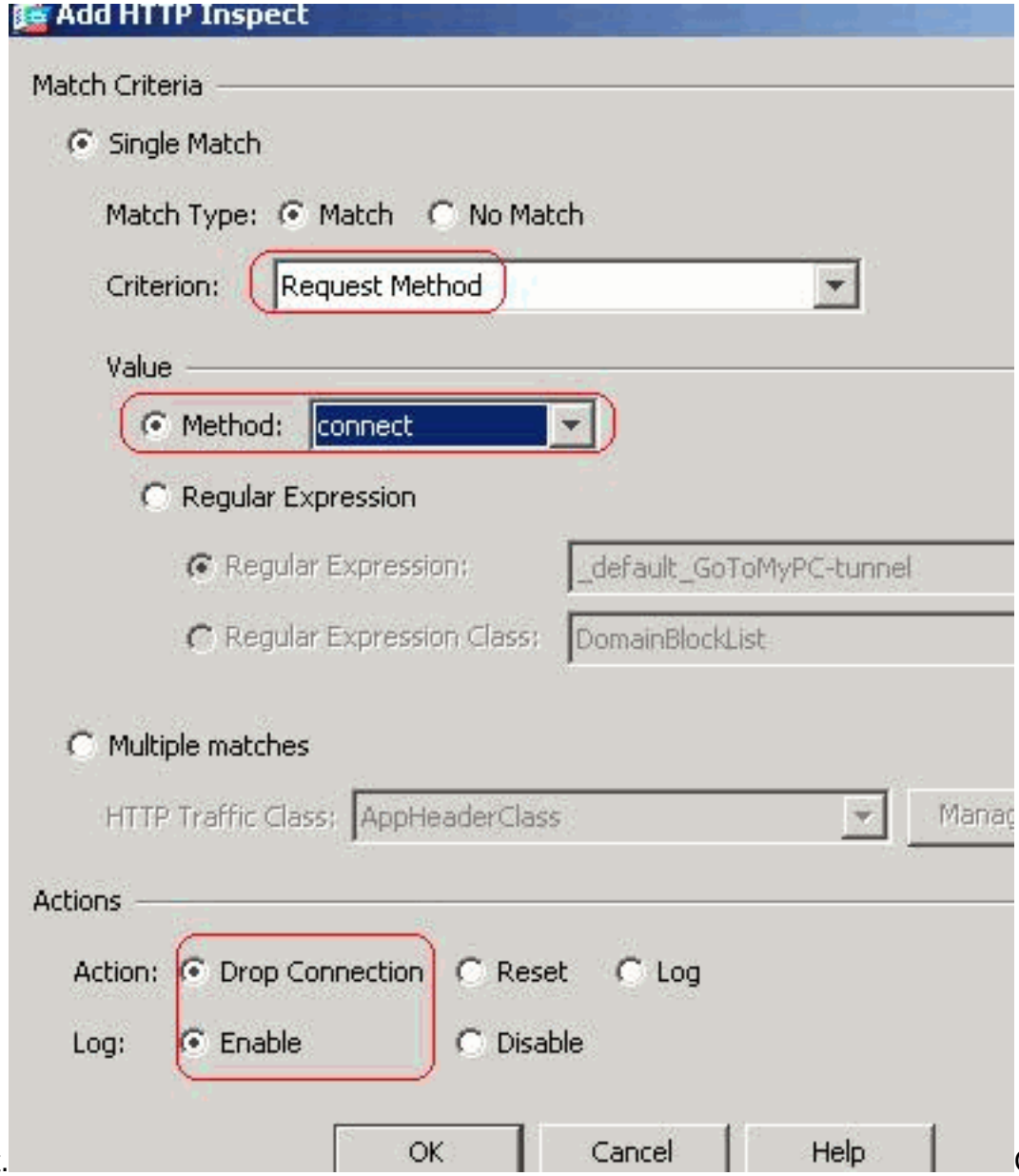
4. **Set the actions for the matched traffic in the inspection policy**Choose **Configuration > Firewall > Objects > Inspect Maps > HTTP** in order to create a **http_inspection_policy** to set the action for the matched traffic as shown. Click
OK.



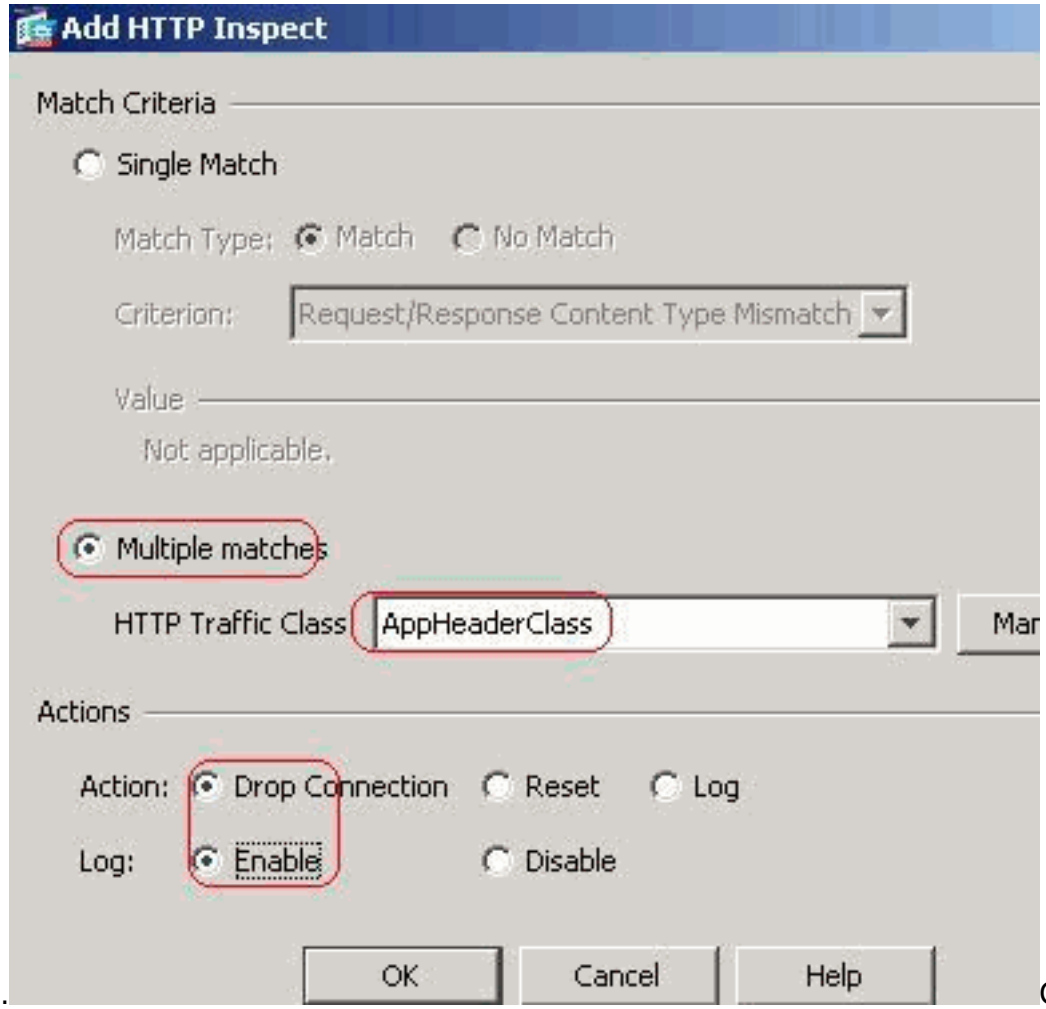
Choose **Configuration > Firewall > Objects > Inspect Maps > HTTP > http_inspection_policy (double click)** and click **Details > Add** in order to set the actions for the various Classes created so
far.



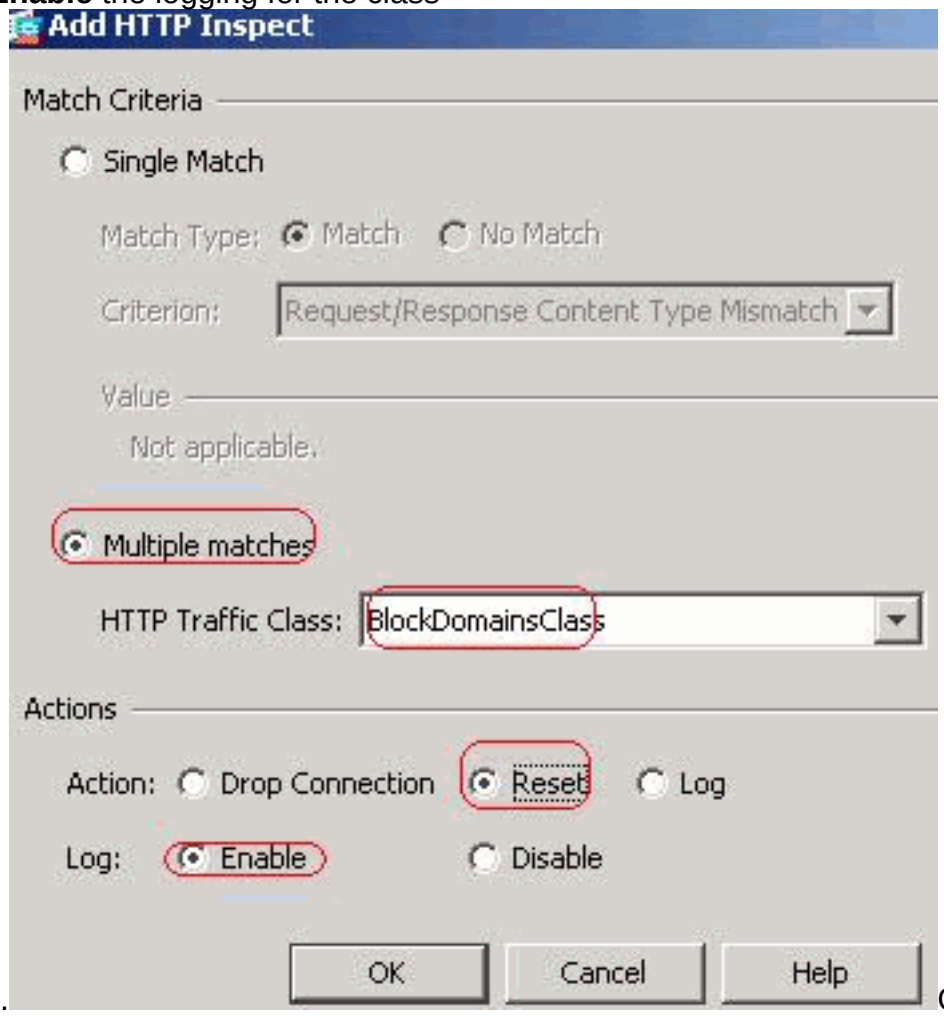
Set the action as **Drop Connection** and **Enable** the logging for the Criterion as Request Method and Value as



connect. Click **OK**Set the action as **Drop Connection** and **Enable** the logging for the class **AppHeaderClass**

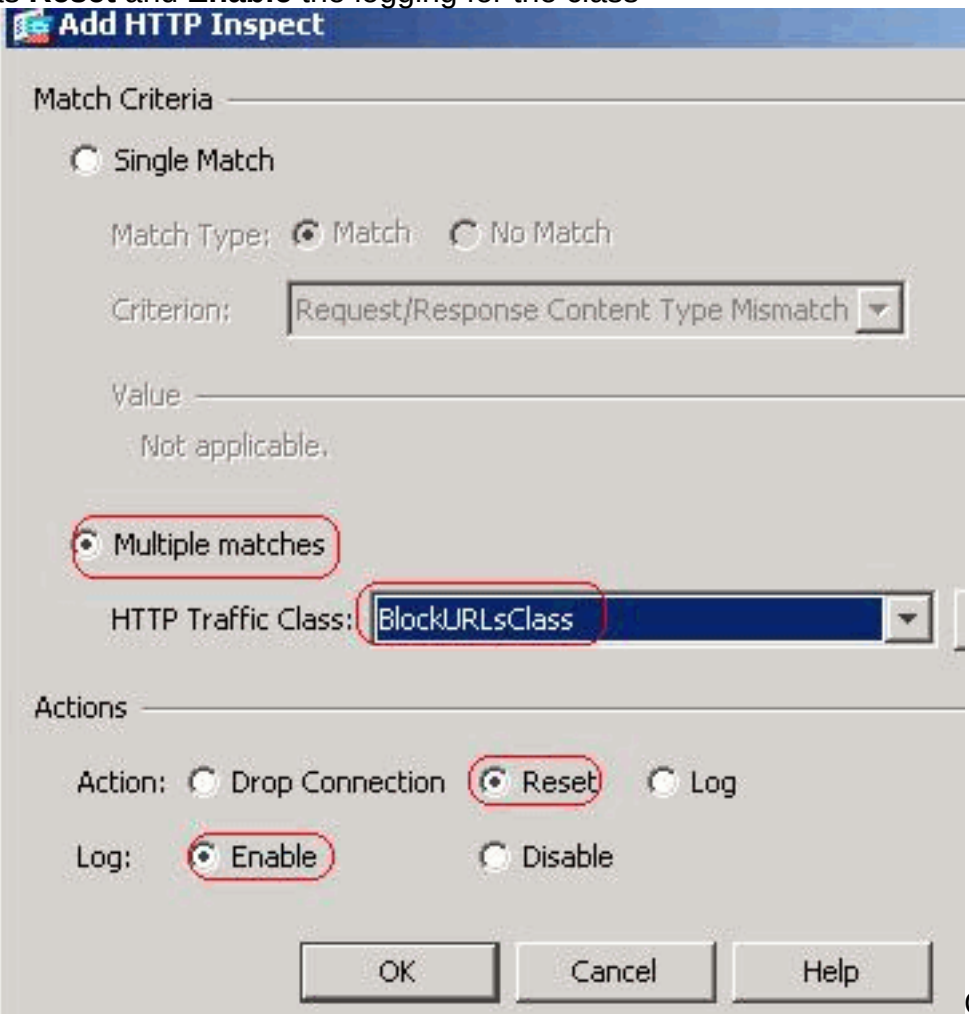


. Click **OK**.Set the action as **Reset** and **Enable** the logging for the class



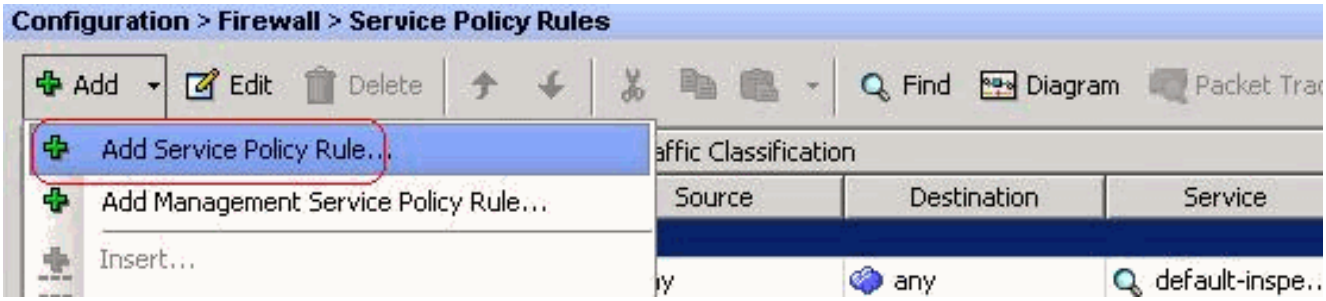
BlockDomainsClass. Click

OKSet the action as **Reset** and **Enable** the logging for the class

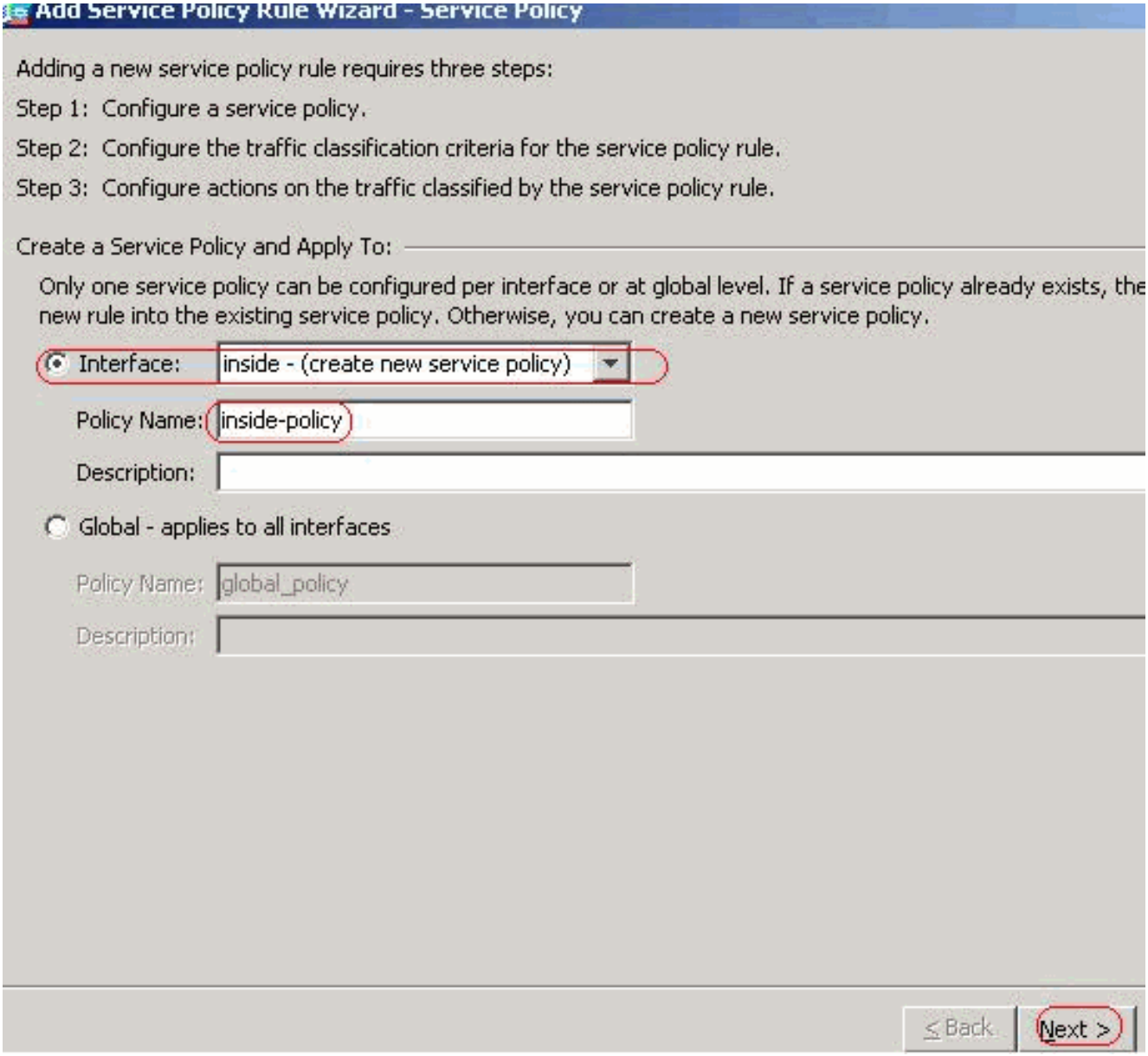


BlockURLsClass. Click **OK**.Click **Apply**.**Equivalent CLI Configuration**

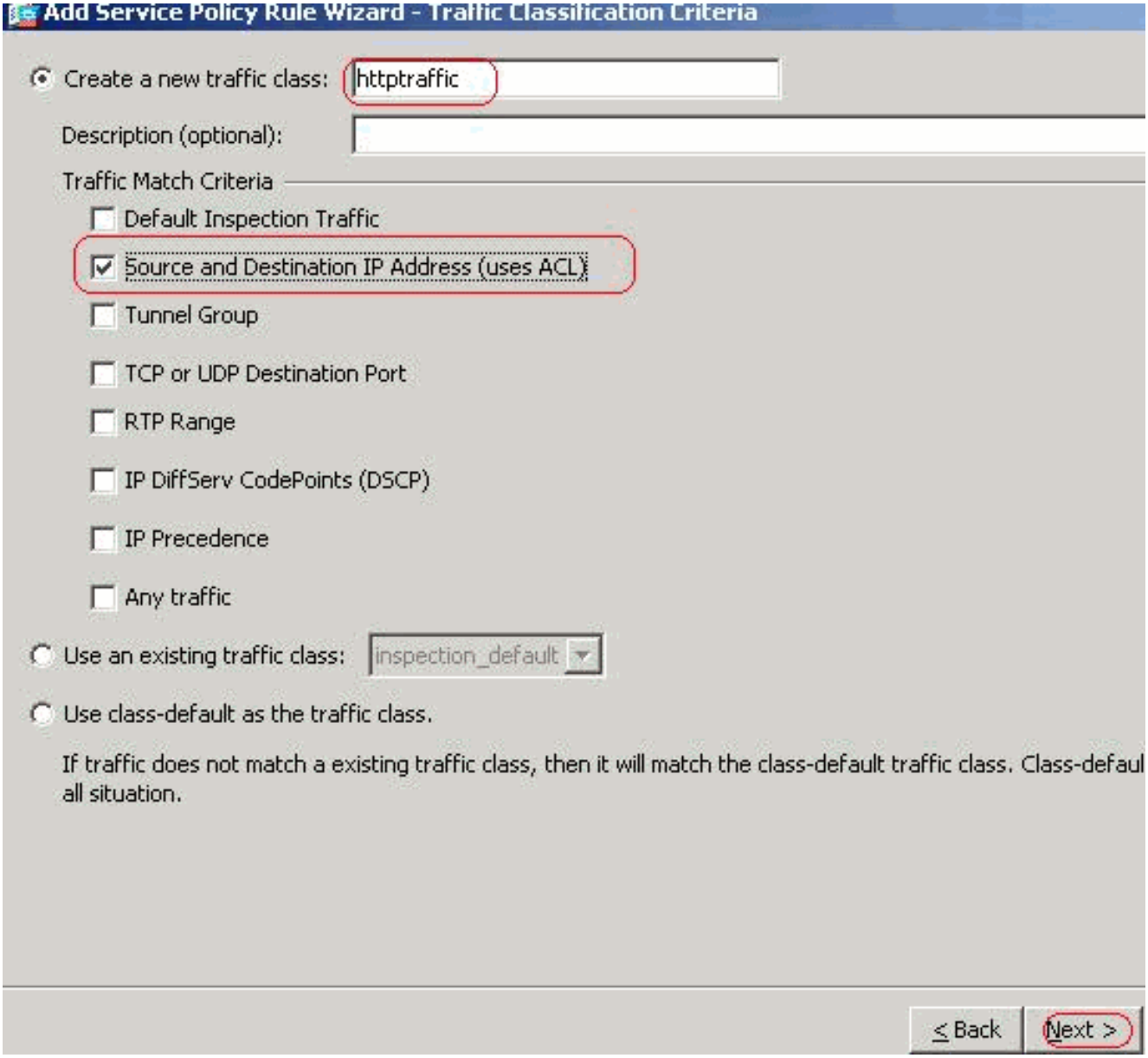
5. **Apply the inspection http policy to the interface**Choose **Configuration > Firewall > Service Policy Rules > Add > Add Service Policy Rule**.



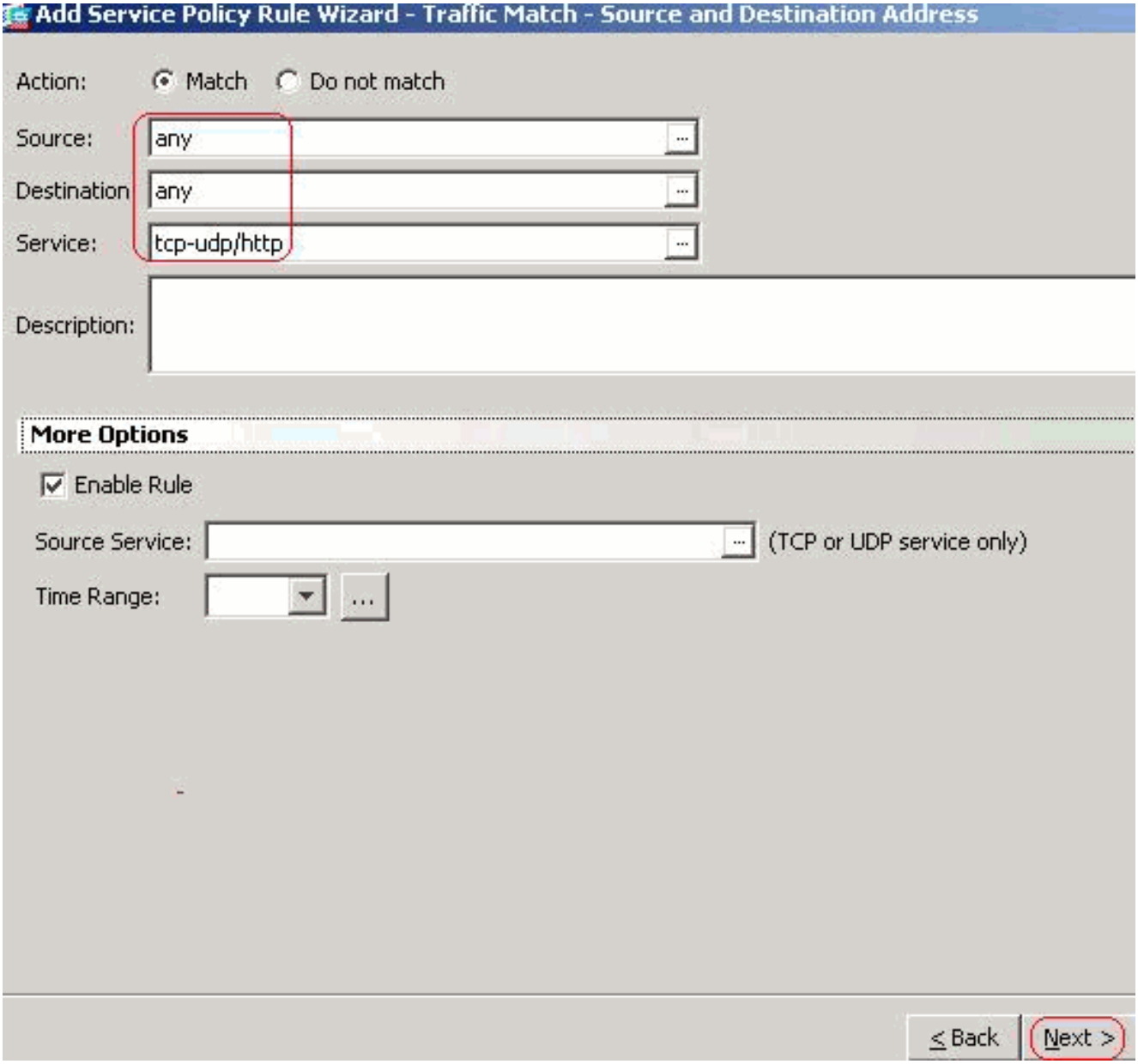
HTTP Traffic Choose the **Interface** radio button with inside interface from the drop down menu and Policy Name as **inside-policy**. Click **Next**.



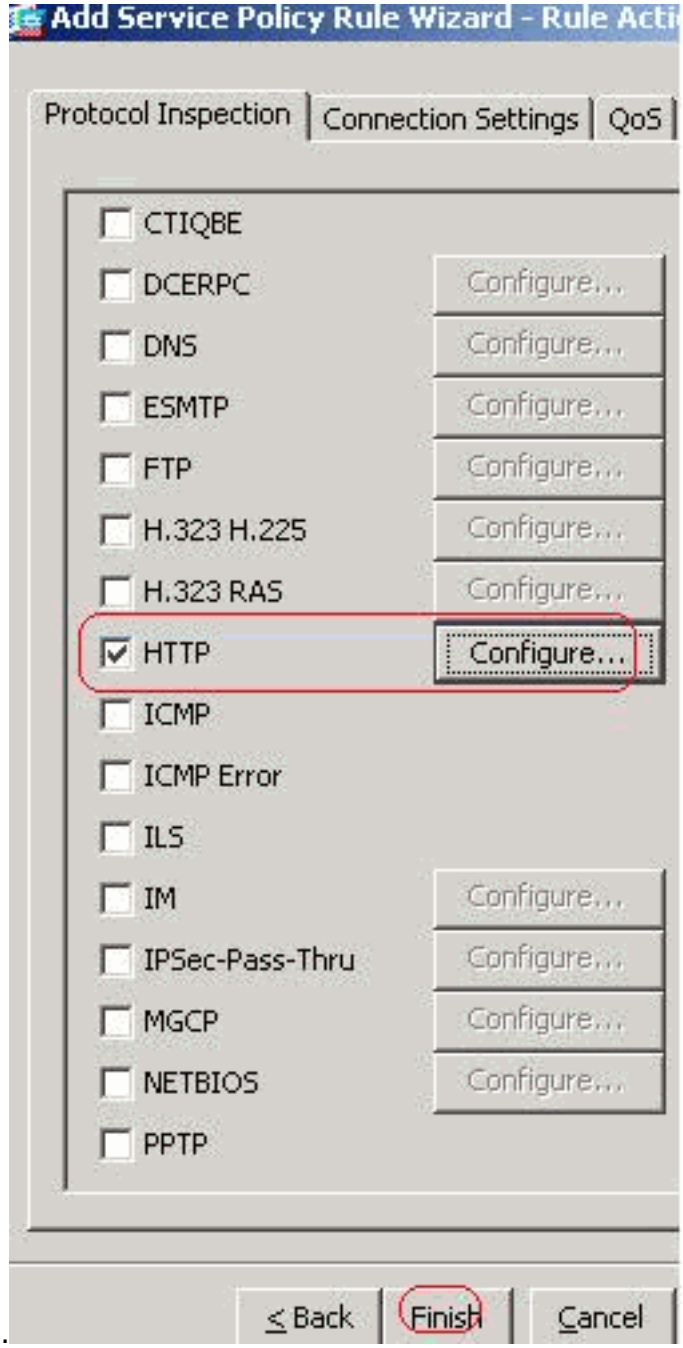
Create a class map **httptraffic** and check the **Source** and **Destination IP Address (uses ACL)**. Click
Next.



Choose the Source and Destination as any with service as **tcp-udp/http**. Click **Next**.

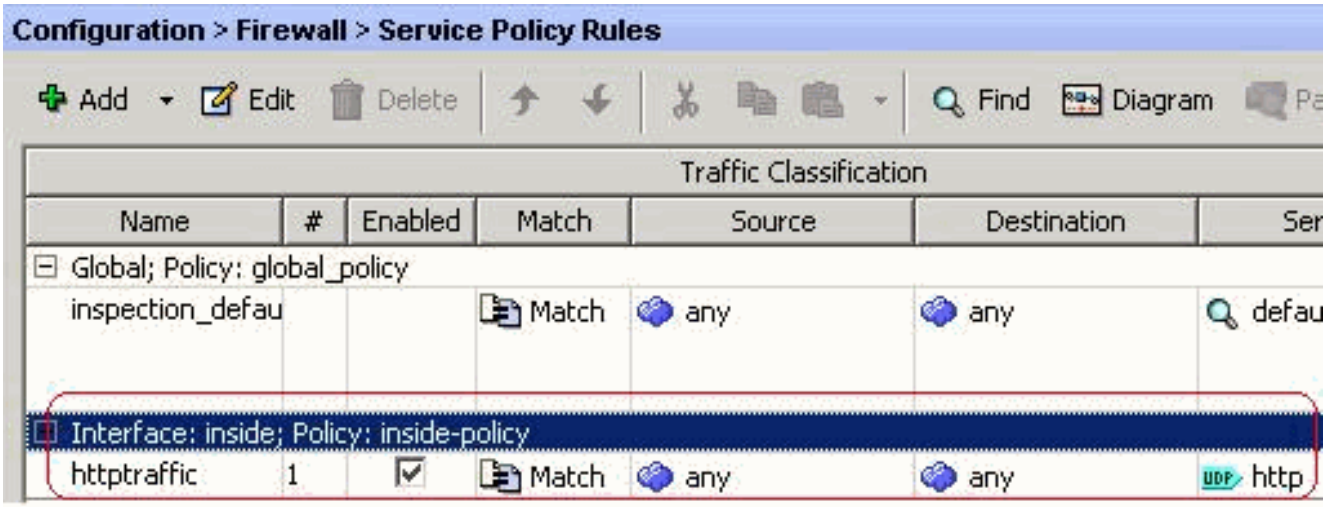


Check the **HTTP** radio button and click

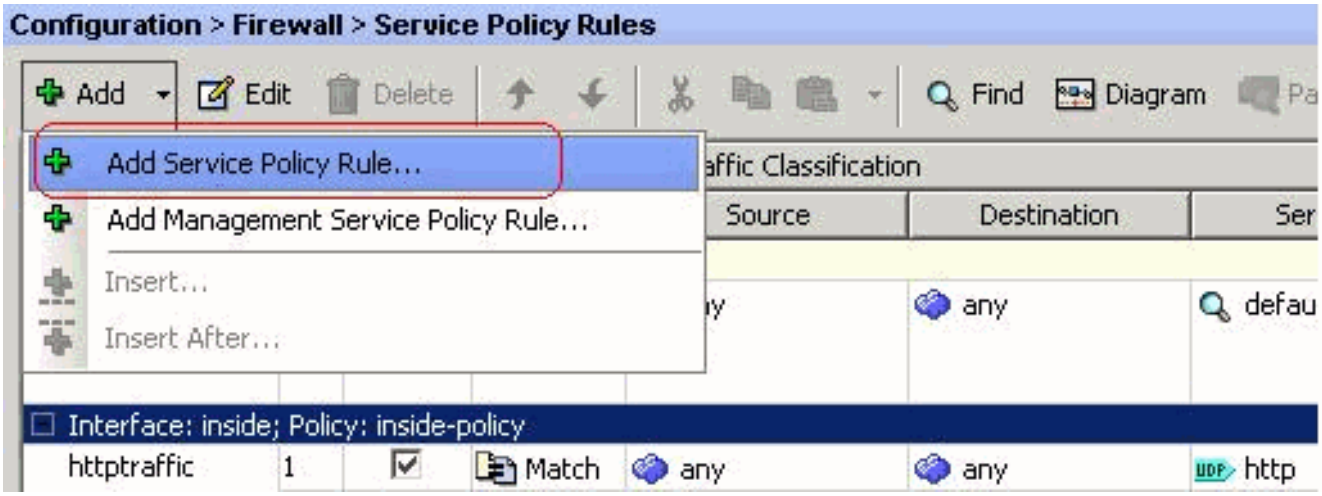


Configure. Check the radio button **Select a HTTP inspect map for the control over inspection** as shown. Click

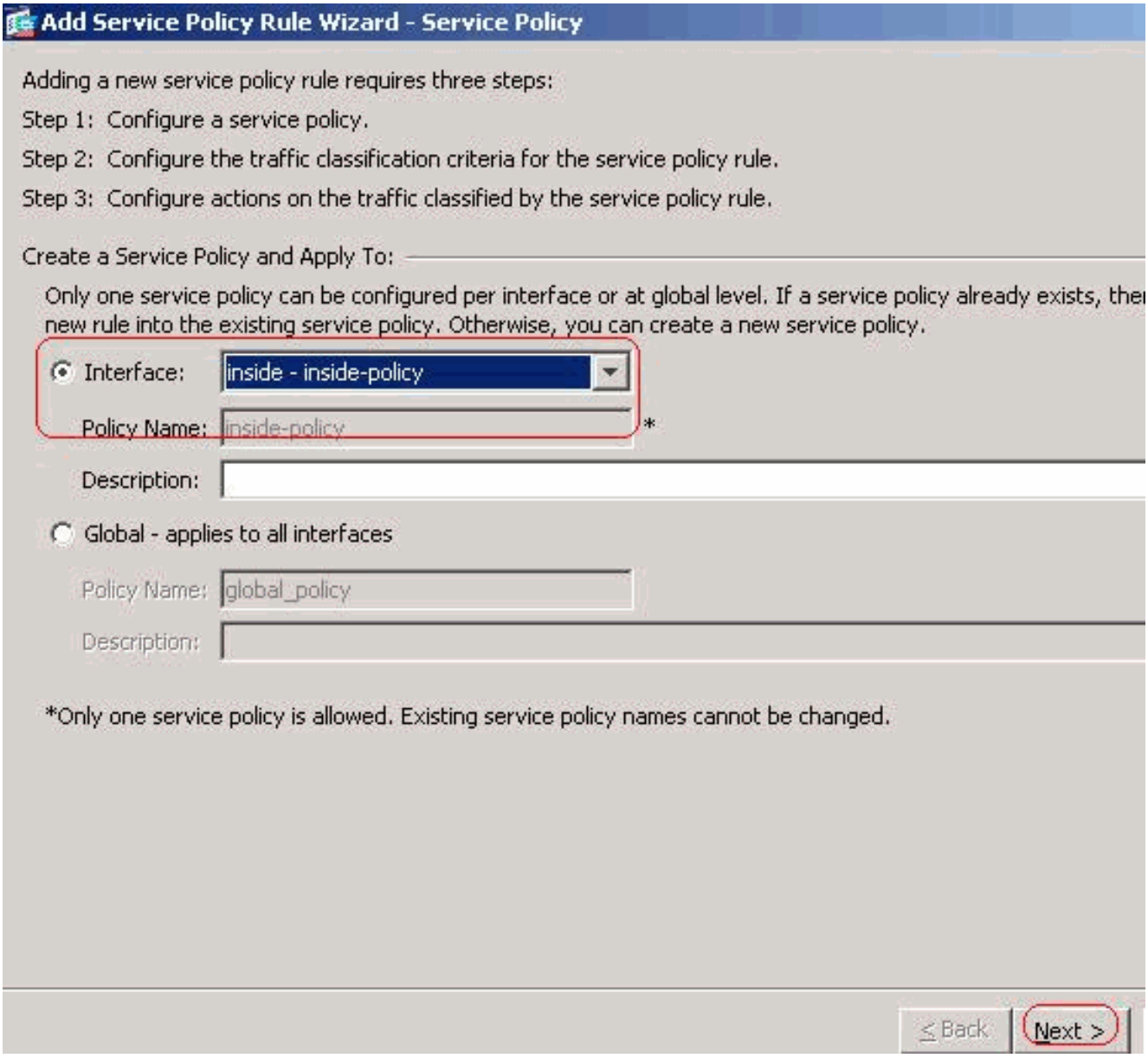
OK.Click **Finish**.



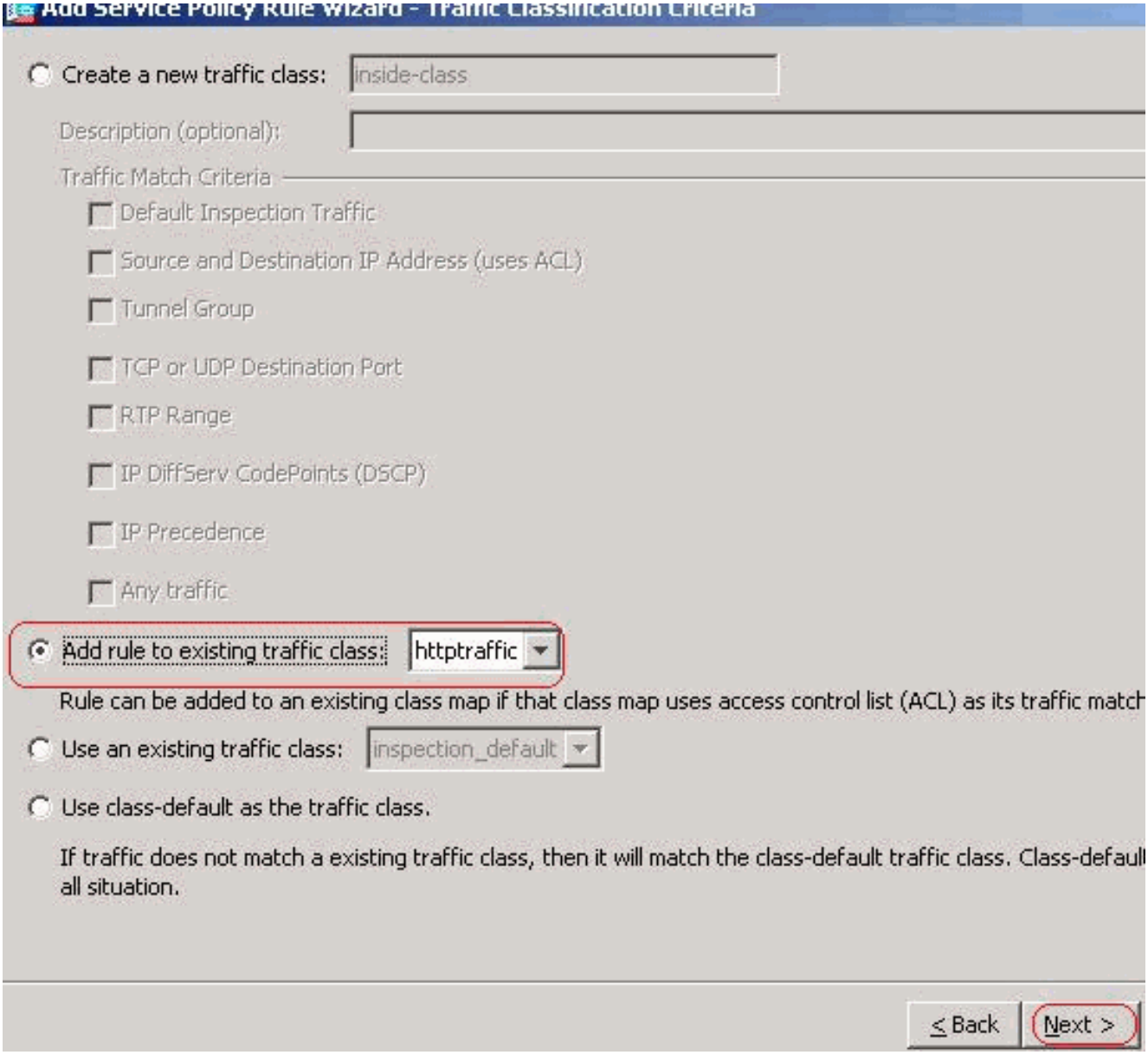
Port 8080 Traffic Again, choose **Add > Add Service Policy Rule**.



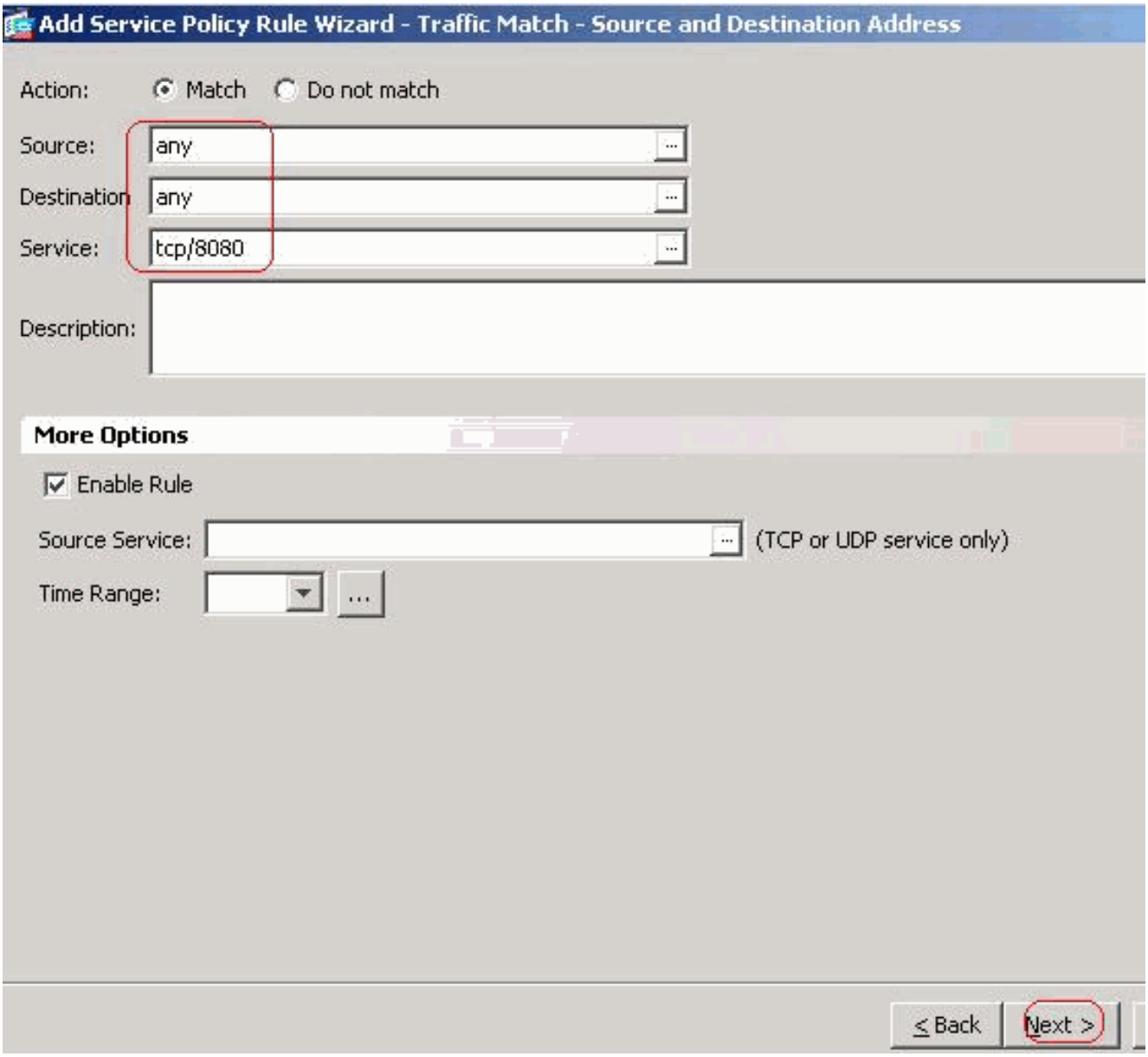
Click
Next.



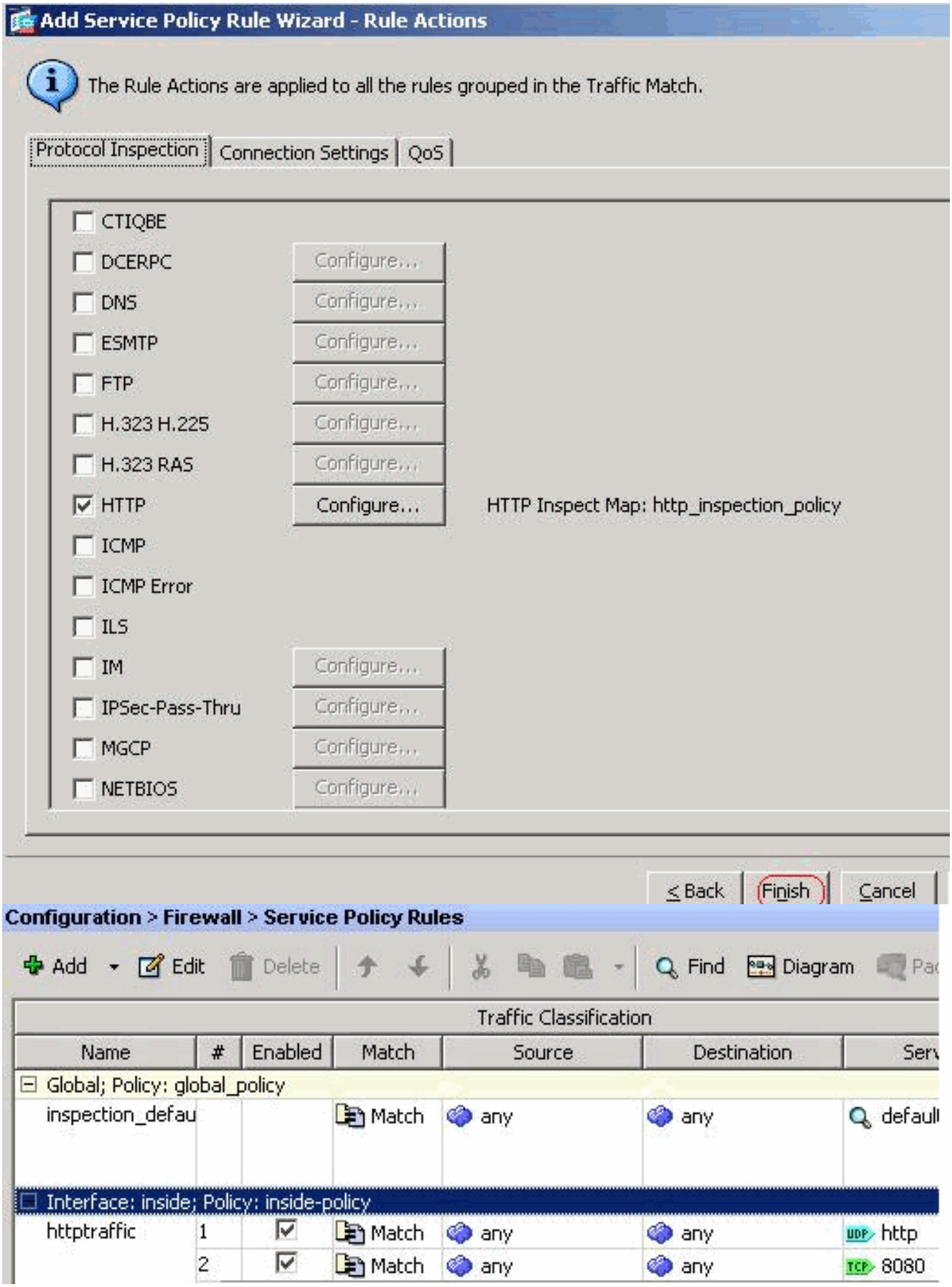
Choose the radio button **Add rule to existing traffic class** and choose **httptraffic** from the drop down menu. Click
Next.



Choose the Source and Destination as any with **tcp/8080**. Click **Next**.



Click
Finish.



Click **Apply**.**Equivalent CLI Configuration**

Verify

Use this section in order to confirm that your configuration works properly.

The Output Interpreter Tool (registered customers only) (OIT) supports certain **show** commands. Use the OIT to view an analysis of **show** command output.

- **show running-config regex**—Shows the regular expressions that have been configured
```
ciscoasa#show running-config regex regex urllist1
".*\.([Ee][Xx][Ee]|[Cc][Oo][Mm]|[Bb][Aa][Tt]) HTTP/1.[01]" regex urllist2
".*\.([Pp][Ii][Ff]|[Vv][Bb][Ss]|[Ww][Ss][Hh]) HTTP/1.[01]" regex urllist3
".*\.([Dd][Oo][Cc]|[Xx][Ll][Ss]|[Pp][Pp][Tt]) HTTP/1.[01]" regex urllist4
".*\.([Zz][Ii][Pp]|[Tt][Aa][Rr]|[Tt][Gg][Zz]) HTTP/1.[01]" regex domainlist1 "\.yahoo\.com"
regex domainlist2 "\.myspace\.com" regex domainlist3 "\.youtube\.com" regex contenttype
"Content-Type" regex applicationheader "application/.*" ciscoasa#
```
- **show running-config class-map**—Shows the class maps that have been configured
```
ciscoasa#show running-config class-map ! class-map type regex match-any
DomainBlockList match regex domainlist1 match regex domainlist2 match regex domainlist3
class-map type inspect http match-all BlockDomainsClass match request header host regex
class DomainBlockList class-map type regex match-any URLBlockList match regex urllist1 match
regex urllist2 match regex urllist3 match regex urllist4 class-map inspection_default match
default-inspection-traffic class-map type inspect http match-all AppHeaderClass match
response header regex contenttype regex applicationheader class-map httptraffic match
access-list inside_mpc class-map type inspect http match-all BlockURLsClass match request
uri regex class URLBlockList ! ciscoasa#
```
- **show running-config policy-map type inspect http**—Shows the policy maps that inspects the http traffic that have been configured
```
ciscoasa#show running-config policy-map type inspect
http ! policy-map type inspect http http_inspection_policy parameters protocol-violation
action drop-connection class AppHeaderClass drop-connection log match request method connect
drop-connection log class BlockDomainsClass reset log class BlockURLsClass reset log !
ciscoasa#
```
- **show running-config policy-map**—Displays all the policy-map configurations as well as the default policy-map configuration
```
ciscoasa#show running-config policy-map ! policy-map type
inspect dns preset_dns_map parameters message-length maximum 512 policy-map type inspect
http http_inspection_policy parameters protocol-violation action drop-connection class
AppHeaderClass drop-connection log match request method connect drop-connection log class
BlockDomainsClass reset log class BlockURLsClass reset log policy-map global_policy class
inspection_default inspect dns preset_dns_map inspect ftp inspect h323 h225 inspect h323 ras
inspect netbios inspect rsh inspect rtsp inspect skinny inspect esmtp inspect sqlnet inspect
sunrpc inspect tftp inspect sip inspect xdmcp policy-map inside-policy class httptraffic
inspect http http_inspection_policy ! ciscoasa#
```
- **show running-config service-policy**—Displays all currently running service policy configurations
```
ciscoasa#show running-config service-policy service-policy global_policy
global service-policy inside-policy interface inside
```
- **show running-config access-list**—Displays the access-list configuration that runs on the security appliance
```
ciscoasa#show running-config access-list access-list inside_mpc extended
permit tcp any any eq www access-list inside_mpc extended permit tcp any any eq 8080
ciscoasa#
```

Troubleshoot

This section provides information you can use to troubleshoot your configuration.

Note: Refer to Important Information on Debug Commands before you use **debug** commands.

- **debug http**—Shows the debug messages for HTTP traffic

Related Information

- Cisco ASA 5500 Series Adaptive Security Appliances Support
- Cisco Adaptive Security Device Manager (ASDM) Support
- Cisco PIX 500 Series Security Appliances Support
- Cisco PIX Firewall Software
- Cisco Secure PIX Firewall Command References
- Security Product Field Notices (including PIX)
- Requests for Comments (RFCs)
- Technical Support & Documentation - Cisco Systems