Lab 2.1.6 Configure a Router with the IOS Intrusion Prevention System

Objective

In this lab, the students will complete the following tasks:

Initialize the Intrusion Protection System (IPS) on the router.

Disable signatures.

Merge signature definition files.

Verify the IPS configuration.

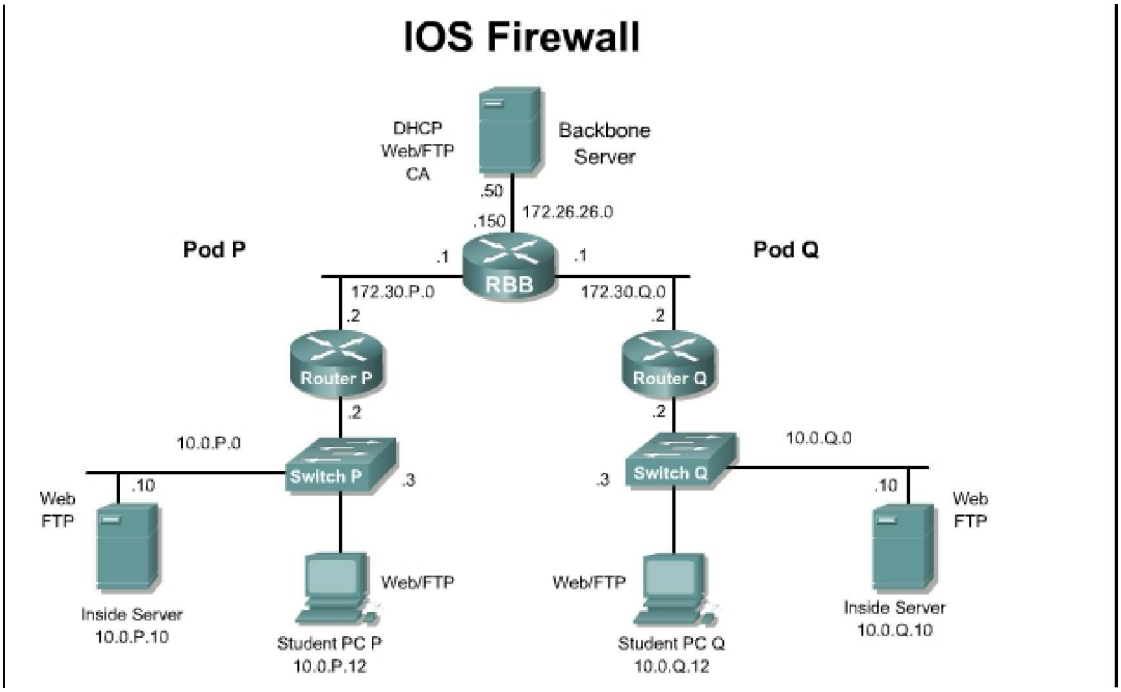
Generate a test message.

Scenario

A company wants additional network protection beyond stateful inspection at the perimeter. The security policy has been updated to require basic intrusion prevention at the perimeter of the network. This will allow the perimeter router to take appropriate action on packets and flows that violate the security policy or represent malicious network activity.

Topology

This figure illustrates the lab network environment.



Preparation

Begin with the standard lab topology and verify the starting configuration on the pod router. Test the connectivity between the pod routers. Access the perimeter router console port using the terminal emulator on the Windows 2000 server. If desired, save the router configuration to a text file for later analysis. Refer back to the Student Lab Orientation if more help is needed.

Tools and resources

In order to complete the lab, the following is required:

Standard IOS Firewall lab topology

Console cable

HyperTerminal

The signature definition file, attack-drop.sdf

Additional materials

The latest attack-drop.sdf file can be downloaded from the following URL. A valid CCO login is required to access the site.

http://www.cisco.com/cgi-bin/tablebuild.pl/ios-sigup

Command List

In this lab exercise, the following switch commands will be used. Refer to this list if assistance or help is needed during the lab exercise.

Router Commands

Command	Description
ip ips *ips-name* **{in | out} [list** *acl***]**	To apply an IPS rule to an interface, use the **ip ips** command in interface configuration mode.
ip ips fail closed	To instruct the router to drop all packets until the signature engine is built and ready to scan traffic, use the **ip ips fail closed** command in global configuration mode.
ip ips name *ips-name*	To specify an IPS rule, use **the ip ips name** command in global configuration mode.
ip ips signature *signature-id*[**:***sub-signature-id*] **{delete | disable | list** *acl-list***}**	To attach a policy to a signature, use the **ip ips signature** command in global configuration mode.
ip ips sdf location *url*	To specify the location in which the router will load the signature definition file (SDF), use the **ip ips sdf** location command in global configuration mode.

show ip ips {[all] [configuration] [interfaces] [name *name***] [statistics [reset]] [sessions [details]] [signatures [details]]}**	To display IPS information such as configured sessions and signatures, use the **show ip ips** command in privileged EXEC mode.

Step 1 Initialize the IPS on the Router

Complete the following steps to initialize IPS on the router:

a. From the student PC, access the router console.

b. Switch to privileged-EXEC mode:

```
RouterP>  enable
```

(Where P = pod number)

```
Password:  cisco
```

c. Switch to global configuration mode:

```
RouterP#  configure  terminal
```

```
RouterP(config)#
```

d. Configure the router to use the built in signature definition file (SDF).

```
RouterP(config)#  ip  ips  sdf  builtin
```

e. Create an IPS rule named **SECURIPS**.

```
RouterP(config)#  ip  ips  name  SECURIPS
```

f. Enter interface configuration mode for Fa 0/1.

```
RouterP(config)#  interface  fastEhternet  0/1
```

g. Apply the IPS rule at an interface. This command automatically loads the signatures and builds the signature engines.

```
RouterP(config-if)#  ip  ips  SECURIPS  in
```

Note	The router prompt is suspended while the signature engines are being built. The router prompt will be available again after the engines are built.

h. If the NetBIOS name service is running on the student PC, it may trigger an IPS signature in the router. The debug message for the signature will be similar to the following example:

```
*May 19 22:56:40.884: %IPS-4-SIGNATURE: Sig:4050 Subsig:0 Sev:3
UDP Bomb [10.0.P.12:137 -> 10.0.P.255:137]
```

Disable this signature with the **ip ips signature 4050 disable** command in global configuration mode.

i. Exit to global configuration mode.

```
RouterP(config-if)#  exit
```

j. Configure logging to the student PC.

```
RouterP(config)#  logging  10.0.P.12
```

k. Configure a trap level to log messages at the level of 4 or lower.

```
RouterP(config)#  logging  trap  warnings
```

l. Turn on logging.

```
RouterP(config)#  logging  on
```

m. Exit to privileged mode using **Ctrl+Z** or the **end** command.

```
RouterP(config)#  ^Z
```

n. Display the IPS configuration.

```
RouterP#  show  ip  ips  configuration
```



```
Configured SDF Locations: none
Builtin signatures are enabled and loaded
Last successful SDF load time: 22:30:12 UTC May 19 2005
IPS fail closed is disabled
Fastpath ips is enabled
Quick run mode is enabled
Event notification through syslog is enabled
Event notification through SDEE is disabled
Total Active Signatures: 132
Total Inactive Signatures: 0
Signature 4050:0 disable
Signature 1107:0 disable
IPS Rule Configuration
 IPS name SECURIPS
Interface Configuration
 Interface FastEthernet0/1
  Inbound IPS rule is SECURIPS
  Outgoing IPS rule is not set
```

1. How many active signatures are configured?

   _____

2. What IPS signatures are disabled?

   _____

Step 2 Load Signatures

Complete the following steps to replace the existing signatures in the router with the latest IPS signature file, attack-drop.sdf.

a. Verify that the attack-drop.sdf file is present in the flash memory of the pod router. If the file is present, proceed to sub-step c.

```
RouterP# show flash
System flash directory:
 File Length   Name/status
   1  16077820  c2600-advsecurityk9-mz.123-14.T1.bin
   2  1038      home.shtml
   3  1654      sdmconfig-26xx.cfg
   4  113152    home.tar
   5  820224    common.tar
  6   3085312     sdm.tar
  7   93095 attack-drop.sdf
[20192748 bytes used, 12837392 available, 33030140 total]
32768K bytes of processor board System flash (Read/Write)
```


b. If necessary, load the SDF file into the flash memory of the router.

```
RouterP# copy tftp://10.0.P.12/attack-drop.sdf flash:attack-drop.sdf

Destination filename [attack-drop.sdf]?<Enter>
Accessing tftp://10.0.P.12/attack-drop.sdf...
Erase flash: before copying? [confirm]n
Loading attack-drop.sdf from 10.0.P.12 (via FastEthernet0/0):
!!!!!!!!!!!!!!!!!!!
[OK - 93095 bytes]
```

c. Enter global configuration mode and create an IPS rule

```
RouterP# configure terminal

RouterP(config)# ip ips name SECURIPS
```

d. Specify the location where the router will load the SDF. If this command is not issued, the router will load the default SDF.

```
RouterP(config)# ip ips sdf location flash:attack-drop.sdf
```

e. View the IPS configuration and answer the following questions.

```
RouterP# show ip ips configuration
```

1. What are the configured SDF locations?

   _____

2. What information is provided about the built in signatures?

   _____

f. Configure the router to drop all packets until the signature engine is built and ready to scan traffic with the **ip ips fail closed** comamnd. If this command is issued, one of the following scenarios will occur:

   If IPS fails to load the SDF, all packets will be dropped unless the user specifies an ACL for packets to send to IPS.

   If IPS successfully loads the SDF but fails to build a signature engine, all packets that are destined for that engine will be dropped.

If this command is not issued, all packets will be passed without scanning if the signature engine fails to build.

```
RouterP(config)# ip ips fail closed
```

g. Enter interface configuration mode for Fa 0/1.

```
RouterP(config)# interface fastEthernet 0/1
```

h. Remove the existing IPS rule at the interface.

```
RouterP(config-if)# no ip ips SECURIPS in
```

i. Apply an IPS rule at an interface. This command automatically loads the signatures and builds the signature engines.

```
RouterP(config-if)# ip ips SECURIPS in
```

Note	Whenever signatures are replaced or merged, the router prompt is suspended while the signature engines for the newly added or merged signatures are being built. The router prompt will be available again after the engines are built.

j. Exit configuration mode.

```
RouterP(config-if)#  ^Z
```

k. View the IPS configuration and answer the following questions.

```
RouterP#  show  ip  ips  configuration
Configured  SDF  Locations:
 flash:attack-drop.sdf
Builtin  signatures  are  enabled  but  not  loaded
Last  successful  SDF  load  time:  00:20:07  UTC  May  20  2005
IPS  fail  closed  is  enabled
Fastpath  ips  is  enabled
Quick  run  mode  is  enabled
Event  notification  through  syslog  is  enabled
Event  notification  through  SDEE  is  disabled
Total  Active  Signatures:  82
Total  Inactive  Signatures:  0
IPS  Rule  Configuration
 IPS  name  SECURIPS
Interface  Configuration
 Interface  FastEthernet0/1
  Inbound  IPS  rule  is  SECURIPS
  Outgoing  IPS  rule  is  not  set
```

1. What are the configured SDF locations?

   _____

2. What information is provided about the built in signatures?

   _____

3. What is the total number of active signatures?

   _____

l. Review the IPS signature engine configuration.

```
RouterP#  show  ip  ips  signatures
```

Step 3 Merge the attack-drop.sdf File with the Default, Built-in Signatures

It may be necessary to merge the built-in signatures with the attack-drop.sdf file if the built-in signatures are not providing the network with adequate protection from security threats. Complete the following steps to add the SDF and to change default parameters for a specific signature within the SDF or signature engine.

a. Reload the built-in signatures.

```
RouterP(config)# no ip ips sdf location flash:attack-
drop.sdf RouterP(config)# int fastEthernet 0/1
RouterP(config-if)# no ip ips SECURIPS in

RouterP(config-if)# ip ips SECURIPS in
```


b. From privileged EXEC mode, merge the flash-based SDF file, attack-drop.sdf, with the built-in signatures.

```
RouterP(config-if)#  end

RouterP#  copy  flash:attack-drop.sdf  ips-sdf
```

This command is used to merge the SDF with the signatures that are already loaded in the router, unless the **/erase** keyword is issued.

c. Save the newly merged signatures in a new file.

```
RouterP#  copy  ips-sdf  flash:my-signatures.sdf
```

d. Configure the router to use new file.

```
RouterP(config)#  ip  ips  sdf  location  flash:my-signatures.sdf
```

e. Reinitialize the IPS by removing the IPS rule set and reapplying the rule set.

```
RouterP(config)#  interface  fastEthernet  0/1

RouterP(config-if)#  no  ip  ips  SECURIPS  in
```

f. Reapply the rule set to interface.

```
RouterP(config-if)#  ip  ips  SECURIPS  in
```

g. Leave interface configuration mode:

```
RouterP(config-if)#  exit
```

h. Leave global configuration mode:

```
RouterP(config)#  exit
```

i. View the IPS configuration and answer the following questions.

```
RouterP#  show  ip  ips  configuration

Configured  SDF  Locations:
 flash:my-signatures.sdf
Builtin  signatures  are  enabled  but  not  loaded
Last successful SDF load time: 00:31:50 UTC May 20
2005 IPS fail closed is enabled
Fastpath ips is enabled
Quick run mode is enabled
Event   notification   through   syslog   is
enabled Event notification through SDEE is
disabled Total Active Signatures: 183
Total Inactive Signatures:
0 Signature 4050:0 disable
Signature 1107:0 disable
IPS Rule Configuration
 IPS name SECURIPS
Interface Configuration
Interface FastEthernet0/1
  Inbound IPS rule is SECURIPS

  Outgoing IPS rule is not set
```


1. What are the configured SDF locations?

   _____

2. What information is provided about the built in signatures?

   _____

3. What is the total number of active signatures?

   _____

Step 4 Verify the Configuration

Complete the following steps to verify the configuration. a. Display the IPS configuration:

```
RouterP#  show  ip  ips  configuration
```

The parameters that were just configured along with several default settings are displayed. b. Display the IPS interface configuration:

```
RouterP#  show  ip  ips  interface

Interface  Configuration
 Interface  FastEthernet0/1
  Inbound  IPS  rule  is  SECURIPS
  Outgoing  IPS  rule  is  not  set
```

Step 5 Generate a Test Message

Complete the following steps to generate a test message.

a. Start the Syslog server on the Student PC.

b. Send multiple fragmented packets to the perimeter router of the peer pod using the following special technique:

```
RouterP#  ping

Protocol  [IP]  <Enter>

Target  IP  address:  172.30.Q.2

Repeat  count  [5]:  20

Datagram  size  [100]:  2000

Timeout  in  seconds  [2]:  <Enter>

Extended  commands  [n]:  <Enter>

Sweep  range  of  sizes  [n]:  <Enter>
```

(Where Q = peer pod number)

The router will now send multiple fragmented packets to the peer router. This will cause the audit rules to generate events to the Syslog server.

c. Analyze the Syslog messages on the Syslog server. The following messages should also appear on the router console session:

1. What signatures are shown in the Syslog server messages?

   _____

