VSIT

# Security in Computing
# Practical #5

| | | | |
|---|---|---|---|
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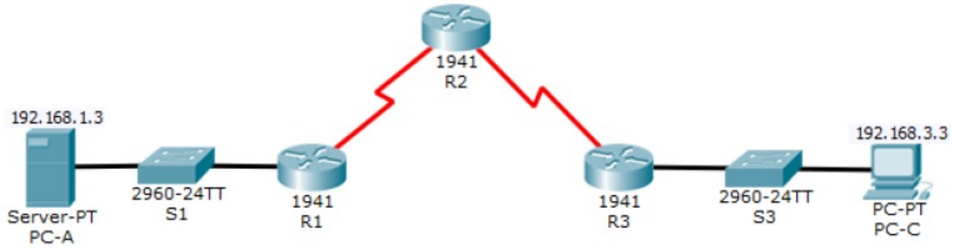
| **Class** | TYBScIT | **Division** | C |
| **Subject/Course** | Security in Computing | | |
| **Topic** | Configuring a Zone-Based Policy Firewall (ZPF) | | |

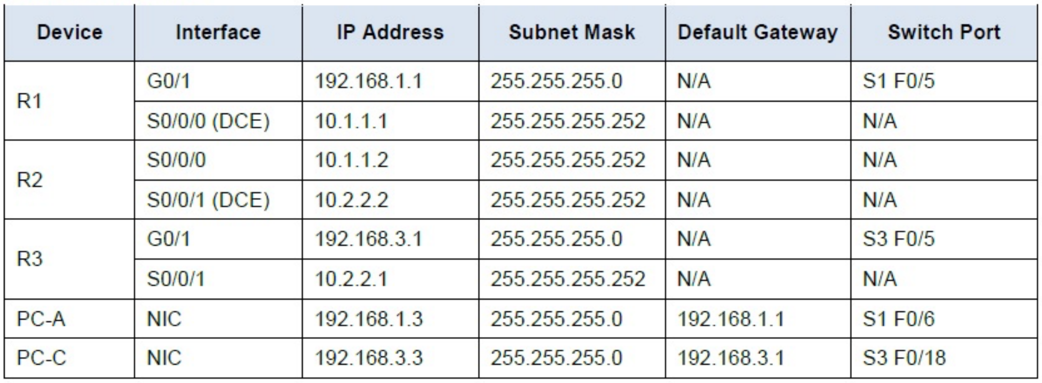
## Topology and Addressing Table for ZPF

Use the pre-configured topology shared as an attachment with this worksheet. Configure this topology for Zone based Policy Firewall

### Topology



### Addressing Table



| Device | Interface | IP Address | Subnet Mask | Default Gateway | Switch Port |
|---|---|---|---|---|---|
| R1 | G0/1 | 192.168.1.1 | 255.255.255.0 | N/A | S1 F0/5 |
| | S0/0/0 (DCE) | 10.1.1.1 | 255.255.255.252 | N/A | N/A |
| R2 | S0/0/0 | 10.1.1.2 | 255.255.255.252 | N/A | N/A |
| | S0/0/1 (DCE) | 10.2.2.2 | 255.255.255.252 | N/A | N/A |
| R3 | G0/1 | 192.168.3.1 | 255.255.255.0 | N/A | S3 F0/5 |
| | S0/0/1 | 10.2.2.1 | 255.255.255.252 | N/A | N/A |
| PC-A | NIC | 192.168.1.3 | 255.255.255.0 | 192.168.1.1 | S1 F0/6 |
| PC-C | NIC | 192.168.3.3 | 255.255.255.0 | 192.168.3.1 | S3 F0/18 |

Background/Scenario

ZPFs are the latest development in the evolution of Cisco firewall technologies. In this activity, you will configure a basic ZPF on an edge router R3 that allows internal hosts access to external resources and blocks external hosts from accessing internal resources. You will then verify firewall functionality from internal and external hosts.

The routers have been pre-configured with the following:

- Console password: ciscoconpa55
- Password for vty lines: ciscovtypa55
- Enable password: ciscoenpa55
- Host names and IP addressing
- Local username and password: Admin / Adminpa55
- Static routing

## Part 1: Verify Basic Network Connectivity

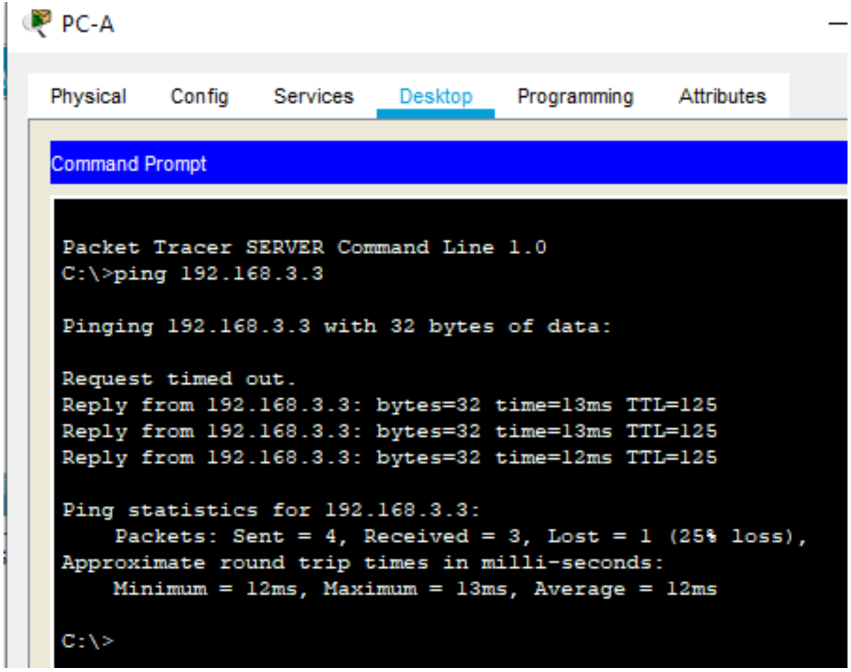
Verify network connectivity prior to configuring the zone-based policy firewall.

Step 1: From the PC-A command prompt, ping PC-C at 192.168.3.3.

Step 2: Access R2 using SSH.
a. From the PC-C command prompt, SSH to the S0/0/1 interface on R2 at 10.2.2.2. Use the username Admin and password Adminpa55 to log in.
PC> ssh -l Admin 10.2.2.2
b. Exit the SSH session.

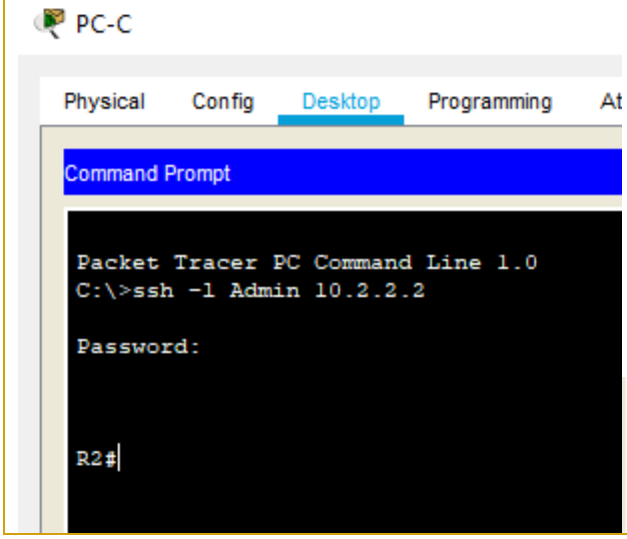
Step 3: From PC-C, open a web browser to the PC-A server.
a. Click the Desktop tab and then click the Web Browser application. Enter the PC-A IP address 192.168.1.3 as the URL. The Packet Tracer welcome page from the web server should be displayed.
b. Close the browser on PC-C.

*Insert screenshot for Step 1*

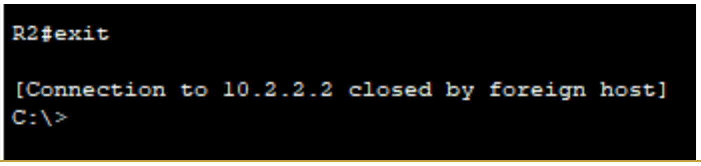


```
Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.3.3

Pinging 192.168.3.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.3.3: bytes=32 time=13ms TTL=125
Reply from 192.168.3.3: bytes=32 time=13ms TTL=125
Reply from 192.168.3.3: bytes=32 time=12ms TTL=125

Ping statistics for 192.168.3.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 12ms, Maximum = 13ms, Average = 12ms

C:\>
```

*Insert screenshot for Step 2a*

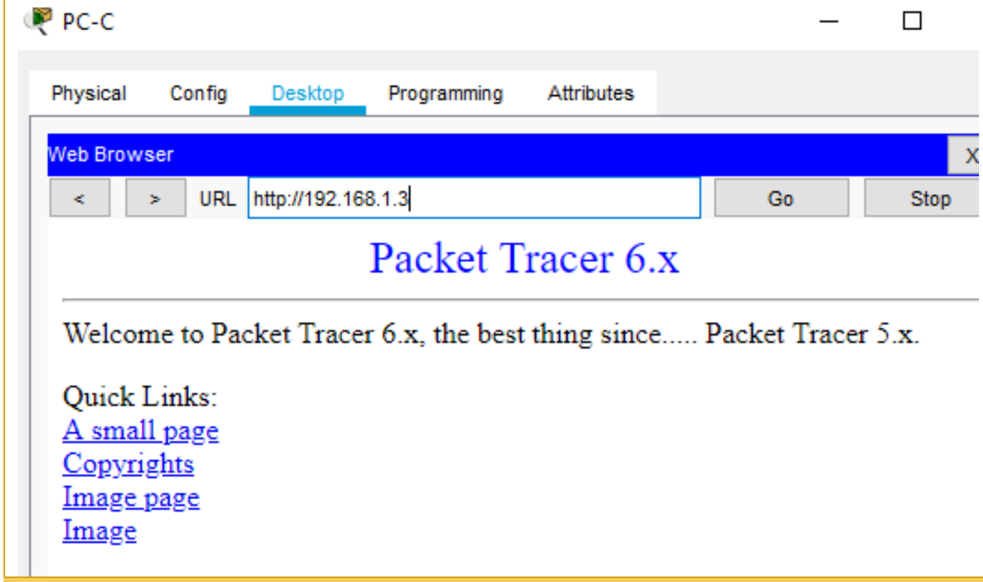


```
Packet Tracer PC Command Line 1.0
C:\>ssh -l Admin 10.2.2.2

Password:


R2#
```



```
R2#exit

[Connection to 10.2.2.2 closed by foreign host]
C:\>
```

*Insert screenshot for Step 3a*



http://192.168.1.3

Packet Tracer 6.x

Welcome to Packet Tracer 6.x, the best thing since..... Packet Tracer 5.x.

Quick Links:
A small page
Copyrights
Image page
Image

## Part 2: Create the Firewall Zones on R3

Note: For all configuration tasks, be sure to use the exact names as specified.

Step 1: Enable the Security Technology package.
a. On R3, issue the show version command to view the Technology Package license information.
b. If the Security Technology package has not been enabled, use the following command to enable the package.

```
R3# show version
R3# config t
R3(config)# license boot module c1900 technology-package securityk9
```

c. Accept the end-user license agreement.

```
R3(config)# exit
```

d. Save the running-config and reload the router to enable the security license **using the reload command**

```
R3# copy running-config startup-config
R3# reload
```

e. Verify that the Security Technology package has been enabled by using the **show version command**.

```
R3# show version
```

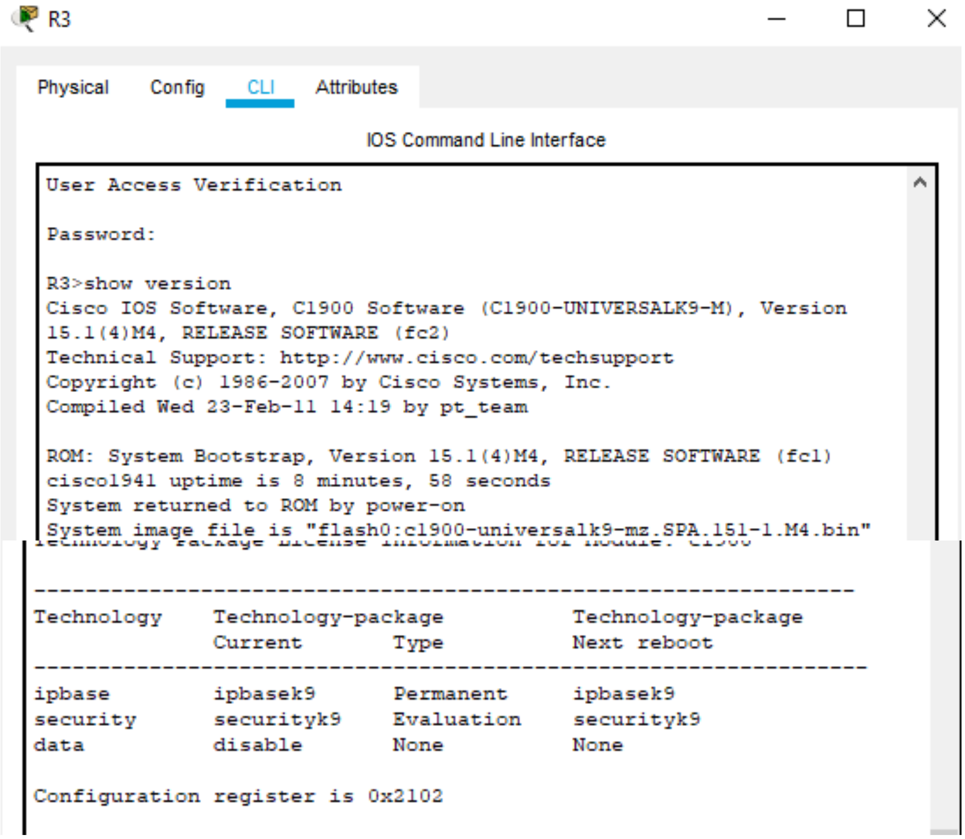
Step 2: Create an internal zone.
Use the zone security command to create a zone named IN-ZONE.

```
R3(config)# zone security IN-ZONE
R3(config-sec-zone) exit
```

Step 3: Create an external zone.
Use the zone security command to create a zone named OUT-ZONE.

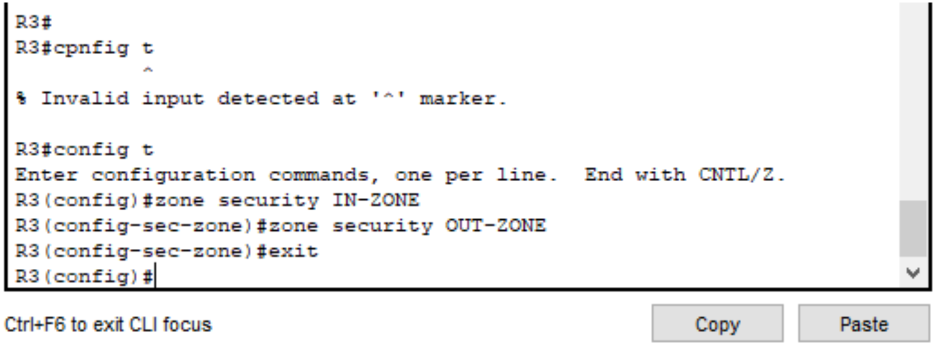
```
R3(config-sec-zone)# zone security OUT-ZONE
R3(config-sec-zone)# exit
```

*Insert screenshot for Step 1a*



```
User Access Verification

Password:

R3>show version
Cisco IOS Software, C1900 Software (C1900-UNIVERSALK9-M), Version
15.1(4)M4, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 23-Feb-11 14:19 by pt_team

ROM: System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
cisco1941 uptime is 8 minutes, 58 seconds
System returned to ROM by power-on
System image file is "flash0:c1900-universalk9-mz.SPA.151-1.M4.bin"
Technology Package License Information for Module: c1900

-----------------------------------------------------------------
Technology    Technology-package          Technology-package
              Current       Type          Next reboot
------------------------------------------------------------------
ipbase        ipbasek9      Permanent     ipbasek9
security      securityk9    Evaluation    securityk9
data          disable       None          None

Configuration register is 0x2102
```

*Insert screenshot for Step 1e*

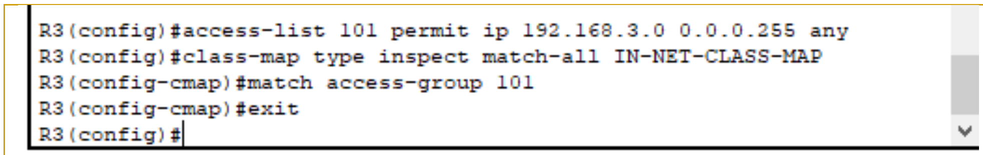


```
R3#
R3#cpnfig t
     ^
% Invalid input detected at '^' marker.

R3#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#zone security IN-ZONE
R3(config-sec-zone)#zone security OUT-ZONE
R3(config-sec-zone)#exit
R3(config)#
```

## Part 3: Identify Traffic Using a Class-Map

Step 1: Create an ACL that defines internal traffic.
Use the access-list command to create extended ACL 101 to permit all IP protocols from the 192.168.3.0/24 source network to any destination.
R3(config)# access-list 101 permit ip 192.168.3.0 0.0.0.255 any

Step 2: Create a class map referencing the internal traffic ACL. Use the class-map type inspect command with the match-all option to create a class map named IN-NETCLASS-MAP. Use the match access-group command to match ACL 101.
R3(config)# class-map type inspect match-all IN-NET-CLASS-MAP
R3(config-cmap)# match access-group 101
R3(config-cmap)# exit



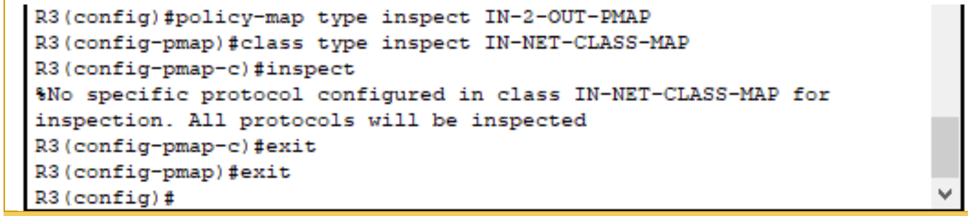
```
R3(config)#access-list 101 permit ip 192.168.3.0 0.0.0.255 any
R3(config)#class-map type inspect match-all IN-NET-CLASS-MAP
R3(config-cmap)#match access-group 101
R3(config-cmap)#exit
R3(config)#
```

## Part 4: Specify Firewall Policies

Step 1: Create a policy map to determine what to do with matched traffic.
Use the policy-map type inspect command and create a policy map named IN-2-OUT-PMAP.
R3(config)# policy-map type inspect IN-2-OUT-PMAP

Step 2: Specify a class type of inspect and reference class map IN-NET-CLASS-MAP.
R3(config-pmap)# class type inspect IN-NET-CLASS-MAP

Step 3: Specify the action of inspect for this policy map.
The use of the inspect command invokes context-based access control (other options include pass and drop).
R3(config-pmap-c)# inspect
%No specific protocol configured in class IN-NET-CLASS-MAP for inspection. All protocols will be inspected.
Issue the exit command twice to leave config-pmap-c mode and return to config mode.
R3(config-pmap-c)# exit
R3(config-pmap)# exit



```
R3(config)#policy-map type inspect IN-2-OUT-PMAP
R3(config-pmap)#class type inspect IN-NET-CLASS-MAP
R3(config-pmap-c)#inspect
%No specific protocol configured in class IN-NET-CLASS-MAP for
inspection. All protocols will be inspected
R3(config-pmap-c)#exit
R3(config-pmap)#exit
R3(config)#
```

## Part 5: Apply Firewall Policies

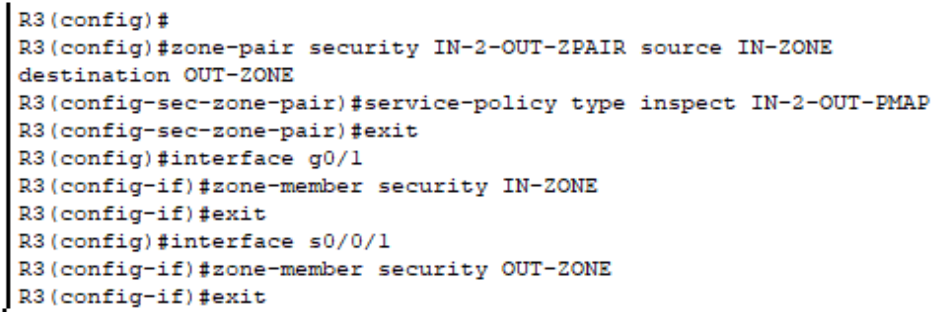
Step 1: Create a pair of zones.
Using the zone-pair security command, create a zone pair named IN-2-OUT-ZPAIR. Specify the source and destination zones that were created in Task 1.
R3(config)# zone-pair security IN-2-OUT-ZPAIR source IN-ZONE destination OUT-ZONE

Step 2: Specify the policy map for handling the traffic between the two zones. Attach a policy-map and its associated actions to the zone pair using the service-policy type inspect command and reference the policy map previously created, IN-2-OUT-PMAP
R3(config-sec-zone-pair)# service-policy type inspect IN-2-OUT-PMAP
R3(config-sec-zone-pair)# exit
R3(config)#

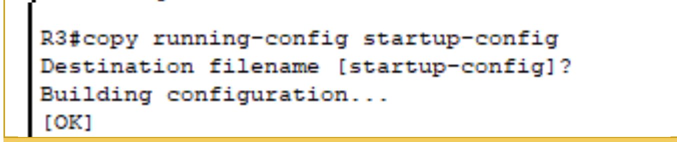
Step 3: Assign interfaces to the appropriate security zones.
Use the zone-member security command in interface configuration mode to assign G0/1 to IN-ZONE and S0/0/1 to OUT-ZONE.
R3(config)# interface g0/1
R3(config-if)# zone-member security IN-ZONE
R3(config-if)# exit
R3(config)# interface s0/0/1

R3(config-if)# zone-member security OUT-ZONE
R3(config-if)# exit

Step 4: Copy the running configuration to the startup configuration.



```
R3(config)#
R3(config)#zone-pair security IN-2-OUT-ZPAIR source IN-ZONE
destination OUT-ZONE
R3(config-sec-zone-pair)#service-policy type inspect IN-2-OUT-PMAP
R3(config-sec-zone-pair)#exit
R3(config)#interface g0/1
R3(config-if)#zone-member security IN-ZONE
R3(config-if)#exit
R3(config)#interface s0/0/1
R3(config-if)#zone-member security OUT-ZONE
R3(config-if)#exit
```



```
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

## Part 6: Test Firewall Functionality from IN-ZONE to OUT-ZONE

Verify that internal hosts can still access external resources after configuring the ZPF.

Step 1: From internal PC-C, ping the external PC-A server.
From the PC-C command prompt, ping PC-A at 192.168.1.3. **The ping should succeed.**

Step 2: From internal PC-C, SSH to the R2 S0/0/1 interface.
a. From the PC-C command prompt, SSH to R2 at 10.2.2.2. Use the username Admin and the password Adminpa55 to access R2. **The SSH session should succeed.**
PC> > ssh -l Admin 10.2.2.2

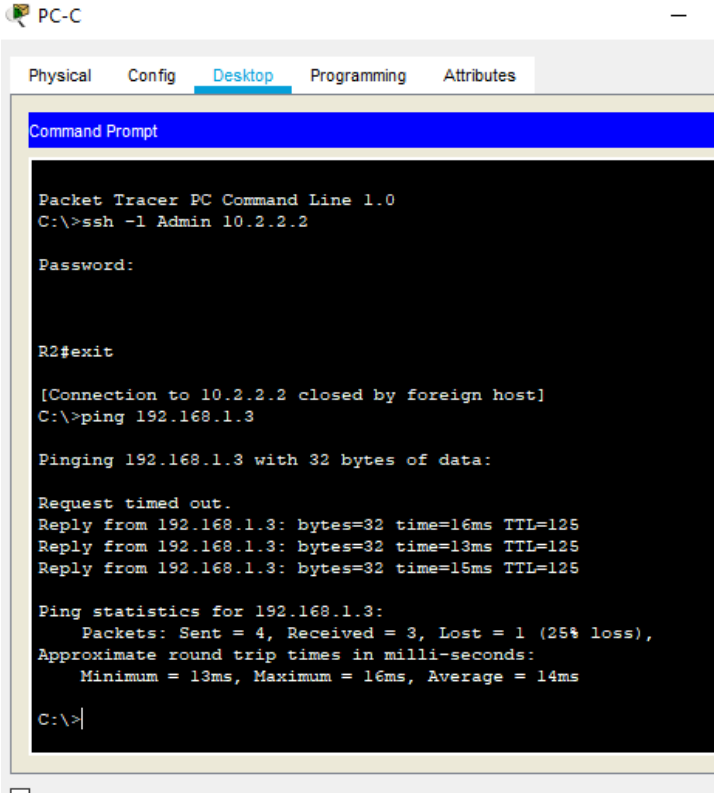
b. While the SSH session is active, issue the command show policy-map type inspect zone-pair sessions on R3 to **view established sessions**.
R3# show policy-map type inspect zone-pair sessions

Step 3: From PC-C, exit the SSH session on R2 and close the command prompt window.

Step 4: From internal PC-C, open a web browser to the PC-A server web page.
Enter the server IP address 192.168.1.3 in the browser URL field, and click Go. **The HTTP session should succeed.** While the HTTP session is active, issue the command show policy-map type inspect zone-pair sessions on R3 to view established sessions.
Note: If the HTTP session times out before you execute the command on R3, you will have to click the Go button on PC-C to generate a session between PC-C and PC-A.
R3# show policy-map type inspect zone-pair sessions

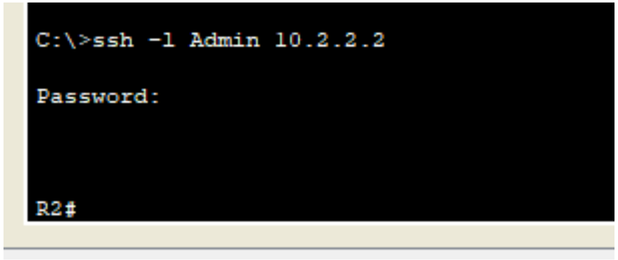
Step 5: Close the browser on PC-C.

*Insert screenshot for Step 1*



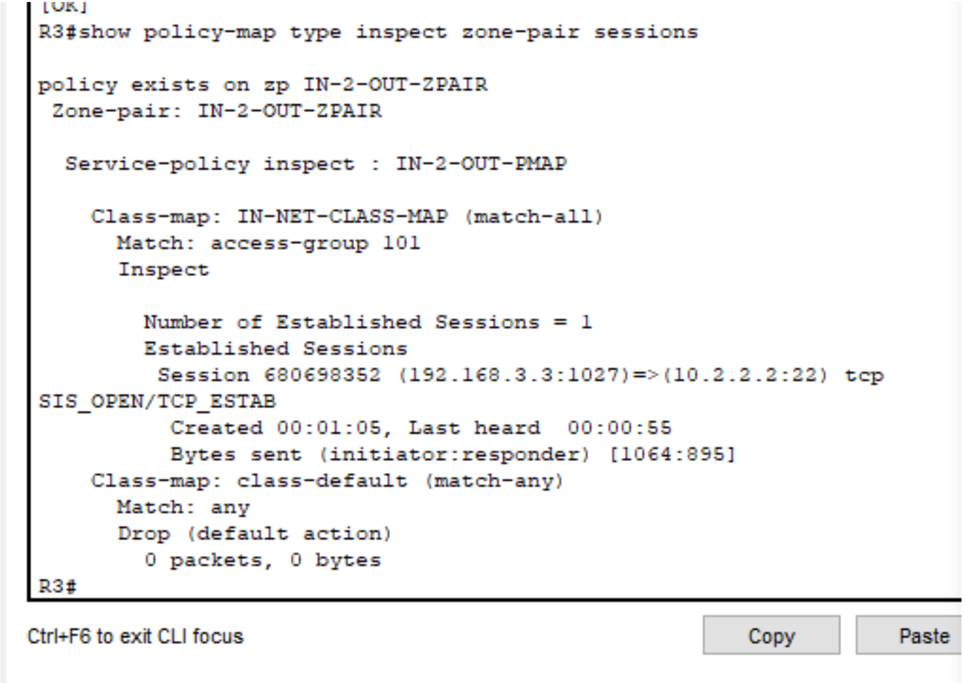
```
Packet Tracer PC Command Line 1.0
C:\>ssh -l Admin 10.2.2.2

Password:



R2#exit

[Connection to 10.2.2.2 closed by foreign host]
C:\>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.3: bytes=32 time=16ms TTL=125
Reply from 192.168.1.3: bytes=32 time=13ms TTL=125
Reply from 192.168.1.3: bytes=32 time=15ms TTL=125

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 13ms, Maximum = 16ms, Average = 14ms

C:\>
```

*Insert screenshot for Step 2a*



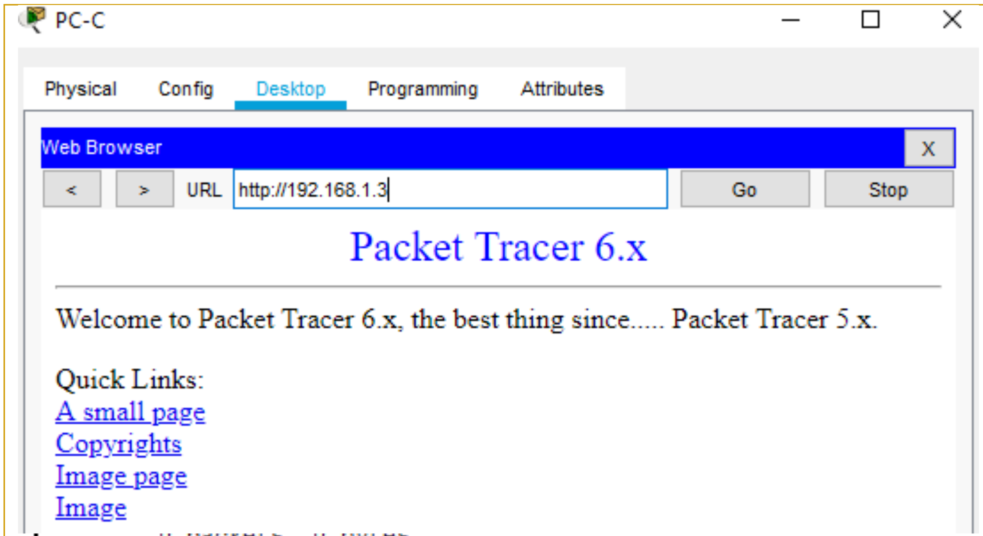
```
C:\>ssh -l Admin 10.2.2.2

Password:



R2#
```

*Insert screenshot for Step 2b*



```
[OK]
R3#show policy-map type inspect zone-pair sessions

policy exists on zp IN-2-OUT-ZPAIR
 Zone-pair: IN-2-OUT-ZPAIR

  Service-policy inspect : IN-2-OUT-PMAP

    Class-map: IN-NET-CLASS-MAP (match-all)
      Match: access-group 101
      Inspect

        Number of Established Sessions = 1
        Established Sessions
         Session 680698352 (192.168.3.3:1027)=>(10.2.2.2:22) tcp
SIS_OPEN/TCP_ESTAB
          Created 00:01:05, Last heard  00:00:55
          Bytes sent (initiator:responder) [1064:895]
    Class-map: class-default (match-any)
      Match: any
      Drop (default action)
        0 packets, 0 bytes
R3#
```

*Insert screenshot for Step 4*



http://192.168.1.3

Packet Tracer 6.x

Welcome to Packet Tracer 6.x, the best thing since..... Packet Tracer 5.x.

Quick Links:
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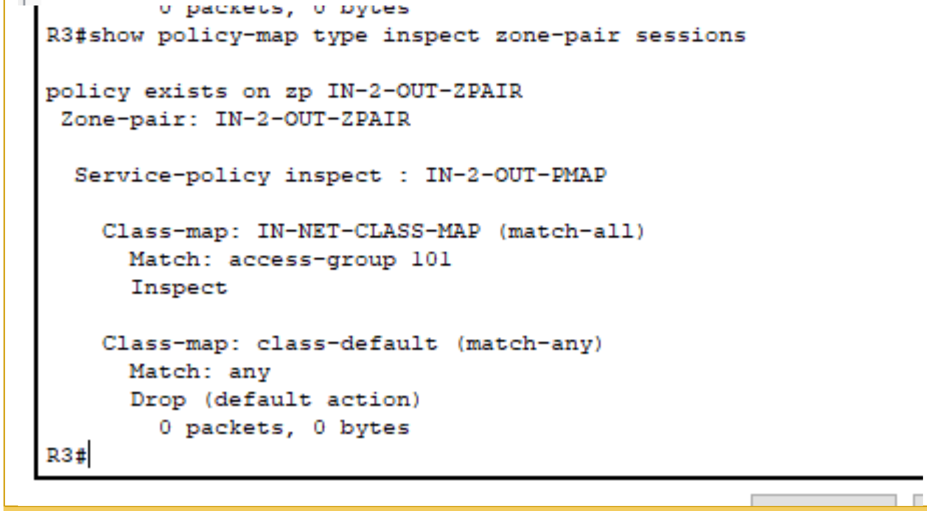
Image



```
      0 packets, 0 bytes
R3#show policy-map type inspect zone-pair sessions

policy exists on zp IN-2-OUT-ZPAIR
 Zone-pair: IN-2-OUT-ZPAIR

  Service-policy inspect : IN-2-OUT-PMAP

    Class-map: IN-NET-CLASS-MAP (match-all)
      Match: access-group 101
      Inspect

    Class-map: class-default (match-any)
      Match: any
      Drop (default action)
        0 packets, 0 bytes
R3#
```

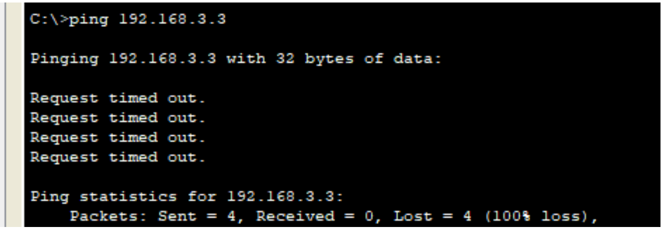
## Part 7: Test Firewall Functionality from OUT-ZONE to IN-ZONE

Verify that external hosts CANNOT access internal resources after configuring the ZPF.

Step 1: From the PC-A server command prompt, ping PC-C.
From the PC-A command prompt, ping PC-C at 192.168.3.3. **The ping should fail.**

Step 2: From R2, ping PC-C.
From R2, ping PC-C at 192.168.3.3. **The ping should fail.**

*Insert screenshot for Step 1*



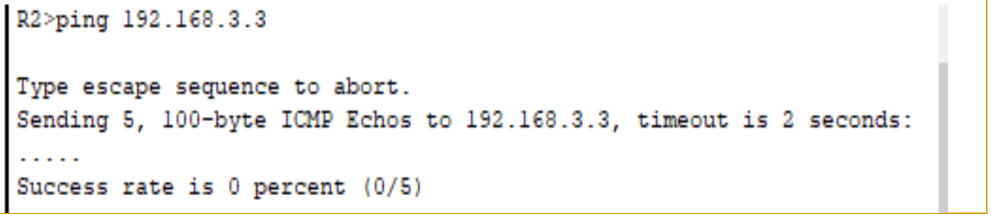
```
C:\>ping 192.168.3.3

Pinging 192.168.3.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.3.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

*Insert screenshot for Step 2*



```
R2>ping 192.168.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```