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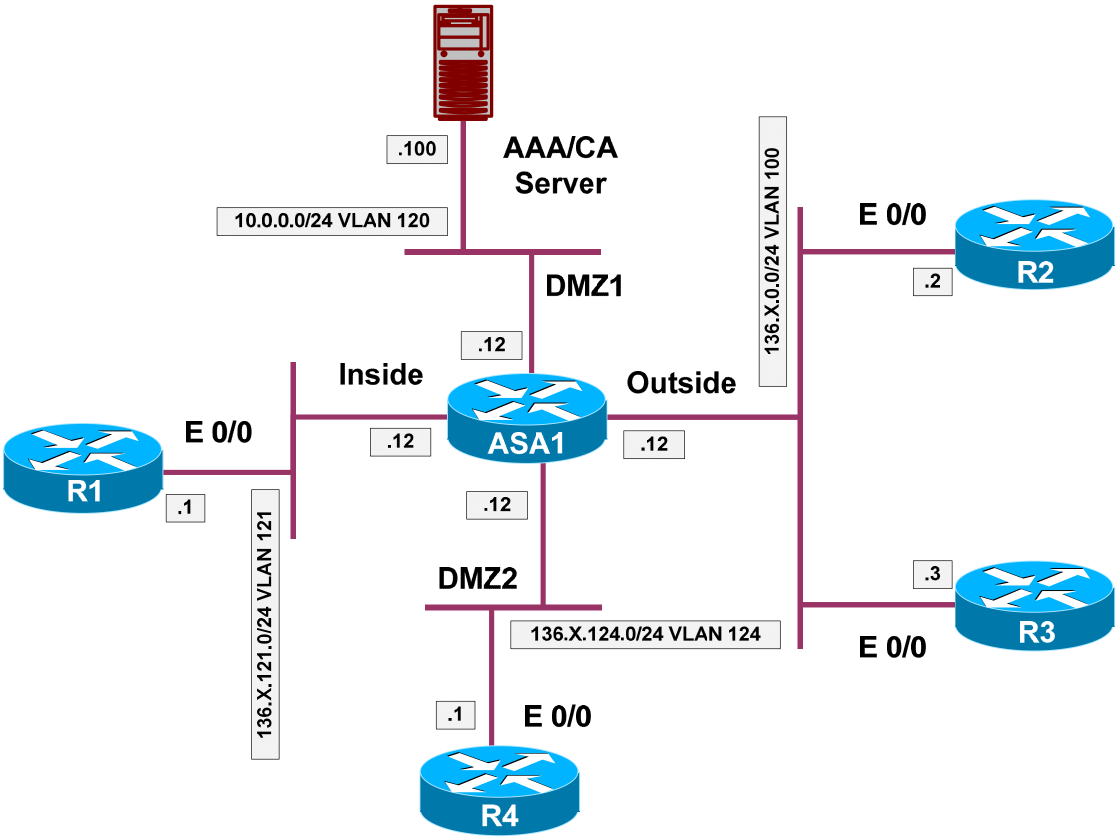
PIX/ASA Firewall

Basic Configuration

Configuring VLANs and IP Addressing

Objective: Perform initial configuration of the ASA firewall.



Directions

- Pre-configure devices as follows:
  - Create VLANs 100,120,121,124 on SW1 and SW2.
  - Configure ports Fa0/21 – 23 between SW1 and SW2 as 802.1q trunks.
  - Configure the switchports for R1, R2, R3, R4, AAA/CA Server in respective VLANs as per the diagram.

  - Configure the switchports for the E0/1 (inside) and E0/0 (outside) interfaces of the ASA1 into respective VLANs.
  - Configure the switchport for the E0/2 interface of the ASA1 as 802.1q trunk.

- Basic ASA initialization includes configuring & activating interfaces/subinterfaces, as well as assigning security-levels and IP addresses.
- Configure the ASA1 interface E 0/0 as follows:

  - User nameif “outside”.
  - Use security-level 0.

- Configure the ASA1 interface E 0/1 as follows:

  - User nameif “inside”.
  - Use security-level 100.

- Configure the ASA1 subinterface E 0/2.120 as follows:

  - Use VLAN id 120.
  - Use nameif “dmz1”.
  - Use security-level 75.

- Configure the ASA1 subinterface E 0/2.124 as follows:

  - Use VLAN id 124.
  - Use nameif “dmz2”.
  - Use security-level 50.

- Configure interface IP addressing as per the diagram.

Final Configuration

SW1:

```
vlan 100,120,121,124
!
interface Fa 0/1
switchport host
switchport access vlan 121
!
interface Fa 0/2
switchport host
switchport access vlan 100
!
interface Fa 0/3
switchport host
switchport access vlan 100
!
interface Fa 0/4
```

```
switchport host
switchport access vlan 124
!
interface Fa 0/13
switchport host
switchport access vlan 121
!
interface Fa 0/20
switchport host
switchport access vlan 120
!
! trunks
!
interface range fa 0/21 - 23
 switchport trunk encapsulation dot1q
 switchport mode dynamic desirable
```

SW2:

```
vlan 100,120,121,124
!
interface Fa 0/12
switchport host
switchport access vlan 100
!
interface Fa 0/13
switchport trunk encapsulation dot1q
switchport mode trunk
!
! trunks
!
interface range fa 0/21 - 23
 switchport trunk encapsulation dot1q
 switchport mode dynamic auto
```

ASA1:

```
interface Ethernet0/0
 nameif outside
 security-level 0
 ip address 136.1.0.12 255.255.255.0
 no shutdown
!
interface Ethernet0/1
 nameif inside
 security-level 100
 ip address 136.1.121.12 255.255.255.0
 no shutdown
!
interface Ethernet0/2
 no nameif
 no security-level
 no ip address
 no shutdown
!
interface Ethernet0/2.120
 vlan 120
 nameif dmz1
 security-level 75
 ip address 10.0.0.12 255.255.255.0
 no shutdown
!
interface Ethernet0/2.124
 vlan 124
 nameif dmz2
 security-level 50
 ip address 136.1.124.12 255.255.255.0
 no shutdown

R1:
interface Eth 0/0
 no shutdown
 ip address 136.1.121.1 255.255.255.0
!
R2:
interface Eth 0/0
 no shutdown
 ip address 136.1.0.2 255.255.255.0

R3:
interface Eth 0/0
 no shutdown
 ip address 136.1.0.3 255.255.255.0

R4:
interface Eth 0/0
 no shutdown
 ip address 136.1.124.4 255.255.255.0
```

Verification

```
SW1#show vlan  brief | ex unsup

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                Fa0/18, Fa0/19, Fa0/24, Gi0/1
                                                Gi0/2
100  VLAN0100                         active    Fa0/2, Fa0/3
120  VLAN0120                         active    Fa0/20
121  VLAN0121                         active    Fa0/1, Fa0/13
124  VLAN0124                         active    Fa0/4

SW1#show int trunk

Port        Mode         Encapsulation  Status        Native vlan
Fa0/21      desirable    802.1q         trunking      1
Fa0/22      desirable    802.1q         trunking      1
Fa0/23      desirable    802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/21      1-4094
Fa0/22      1-4094
Fa0/23      1-4094

Port        Vlans allowed and active in management domain
Fa0/21      1,100,120-121,124
Fa0/22      1,100,120-121,124
Fa0/23      1,100,120-121,124

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/21      1,100,120-121,124
Fa0/22      1,100,120-121,124
Fa0/23      1,100,120-121,124
```

```
SW2#show interfaces trunk

Port        Mode         Encapsulation  Status        Native vlan
Fa0/13      on           802.1q         trunking      1
Fa0/21      auto         802.1q         trunking      1
Fa0/22      auto         802.1q         trunking      1
Fa0/23      auto         802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/13      1-4094
Fa0/21      1-4094
Fa0/22      1-4094
Fa0/23      1-4094

Port        Vlans allowed and active in management domain
Fa0/13      1,100,120-121,124
Fa0/21      1,100,120-121,124
Fa0/22      1,100,120-121,124
Fa0/23      1,100,120-121,124

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/13      1,100,120-121,124
Fa0/21      1,100,120-121,124
Fa0/22      none

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/23      none

ASA1# show nameif
Interface            Name                     Security
Ethernet0/0          outside                    0
Ethernet0/1          inside                   100
Ethernet0/2.120      dmz1                      75
Ethernet0/2.124      dmz2                      50

ASA1# ping 136.1.121.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

ASA1# ping 10.0.0.100
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

ASA1# ping 136.1.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

ASA1# ping 136.1.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

ASA1# ping 136.1.124.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.124.4, timeout is 2 seconds:
```

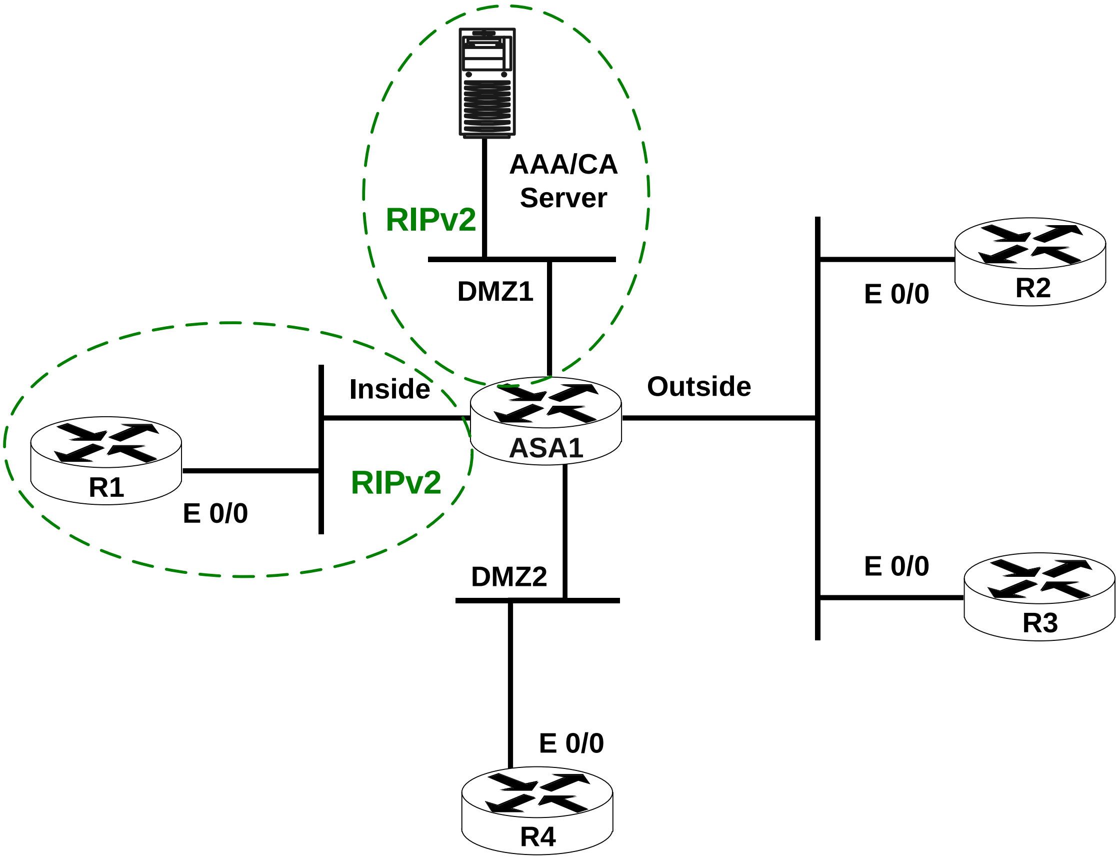
```
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Further Reading

Configuring VLANs: Configuring VLAN Trunks
Configuring Interface Parameters
Configuring Ethernet Settings and Subinterfaces

Configuring and Authenticating RIP

Objective: Configure RIP routing process on the ASA firewall



Directions

- Configure the devices as per the “PIX/ASA Firewall/Basic Configuration” scenario “Configuring VLANs and IP Addressing”.
- ASA has capability to use RIP as routing protocol. Configuration is very similar to IOS RIP configuration process.
- Create RIP routing process on the ASA firewall.
- Enable RIP for networks 10.0.0.0/8 and 136.1.0.0/16.
- Explicitly configure RIP version 2 and disable auto-summary.
- Configure all interfaces except for “Inside” and “DMZ1” as passive.
- Configure RIPv2 on R1, use network 136.1.0.0/16.
- Configure MD5 authentication on interface Inside. Configure R1 respectively. Use key-string “CISCO”.

Final Configuration

```
ASA1:
!
! RIP process configuration
!
router rip
 network 10.0.0.0
 network 136.1.0.0
 passive-interface default
 no passive-interface inside
 no passive-interface dmz1
 version 2
 no auto-summary

!
! MD5 Authentication on Inside
!
interface Ethernet0/1
 rip authentication mode md5
 rip authentication key CISCO key_id 1

R1:
router rip
version 2
no auto-summary
network 136.1.0.0
!
! MD5 Authentication
!
key chain RIP
 key 1
  key-string CISCO
!
interface Ethernet 0/0
 ip rip authentication mode md5
 ip rip authentication key-chain RIP
!
```

Verification

```
R1#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface             Send  Recv  Triggered RIP  Key-chain
    Ethernet0/0           2     2                    RIP
  Automatic network summarization is not in effect
  Maximum path: 4
  Routing for Networks:
    136.1.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 120)
```

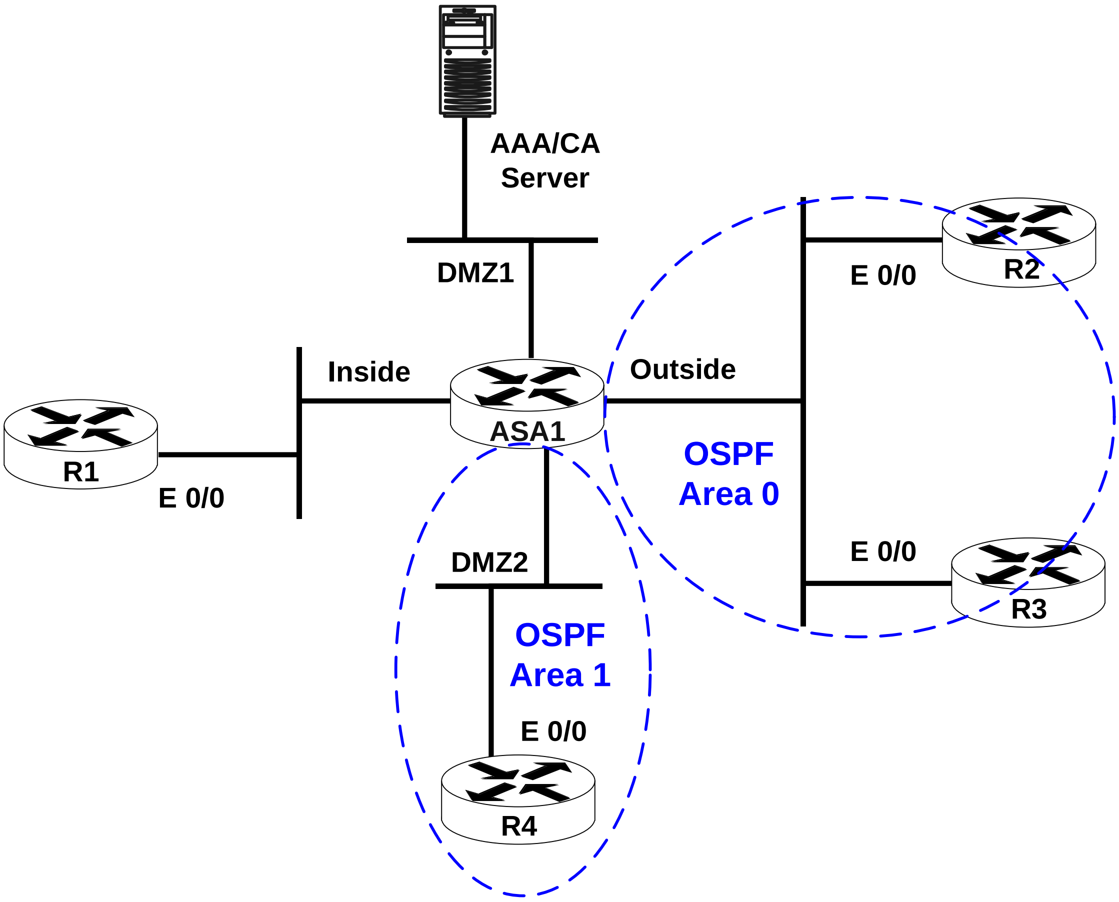
```
ASA1# debug rip
ASA1#
RIP: sending v2 update to 224.0.0.9 via inside (136.1.121.12)
RIP: build update entries
        10.0.0.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
        136.1.0.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
        136.1.124.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
RIP: Update contains 3 routes
RIP: Update queued
RIP: sending v2 update to 224.0.0.9 via dmz1 (10.0.0.12)
RIP: build update entries
        136.1.0.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
        136.1.121.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
        136.1.124.0 255.255.255.0 via 0.0.0.0, metric 1, tag 0
RIP: Update contains 3 routes
RIP: Update queued
RIP: Update sent via inside rip-len:112
RIP: Update sent via dmz1 rip-len:72

R1#debug ip rip
RIP protocol debugging is on
R1#
*Mar 21 11:59:08.454: RIP: sending v2 update to 224.0.0.9 via Ethernet0/0
(136.1.121.1)
*Mar 21 11:59:08.454: RIP: build update entries - suppressing null update
*Mar 21 11:59:11.215: RIP: received packet with MD5 authentication
*Mar 21 11:59:11.215: RIP: received v2 update from 136.1.121.12 on Ethernet0/0
*Mar 21 11:59:11.215:      10.0.0.0/24 via 0.0.0.0 in 1 hops
*Mar 21 11:59:11.215:      136.1.0.0/24 via 0.0.0.0 in 1 hops
*Mar 21 11:59:11.219:      136.1.124.0/24 via 0.0.0.0 in 1 hops

R1#sh ip route rip
     136.1.0.0/24 is subnetted, 3 subnets
R       136.1.0.0 [120/1] via 136.1.121.12, 00:00:23, Ethernet0/0
R       136.1.124.0 [120/1] via 136.1.121.12, 00:00:23, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.0.0.0 [120/1] via 136.1.121.12, 00:00:23, Ethernet0/0
```

📖 Further Reading

ASA Command Line Configuration Guide: Configuring RIP

Configuring and Authenticating OSPF

Objective: Configure RIP routing process on the ASA firewall



Directions

- Configure the devices as per the "PIX/ASA Firewall/Basic Configuration" scenario "Configuring VLANs and IP Addressing".
- PIX/ASA firewalls have capability of using OSPF as routing protocol. The actual implementation and configuration is very similar to OSPF configuration on IOS router.
- Create OSPF routing process on the ASA firewall as follows:
    - Use process-id 1.
    - Use router-id 150.1.12.12.
- Configure network 136.1.0.0/24 (Outside) to be in Area 0. Place network 136.1.124.0/24 (DMZ2) into Area 1.
- Make sure the ASA is never elected as DR on both segments. Configure OSPF priority 0 on outside and DMZ2 interfaces for this purpose.
- Configure OSPF on R2, R3, and R4 respectively.

- Configure OSPF MD5 authentication on interface DMZ2 as follows:
    - Use only interface-level commands.
    - Configure R4 respectively.
    - Use key-string “CISCO”.

- Configure OSPF Text authentication on interface Outside. Enable authentication globally under the routing process for Area 0. Configure R2 and R3 respectively. Use key-string “CISCO”.

Final Configuration

ASA1:

```
!
! OSPF routing process
!
router ospf 1
 network 136.1.0.0 255.255.255.0 area 0
 network 136.1.124.0 255.255.255.0 area 1
 router-id 150.1.12.12
 area 0 authentication
!
! Authentication for area 1 is configured solely on interface
!
interface Ethernet0/2.124
 ospf message-digest-key 1 md5 CISCO
 ospf authentication message-digest
 ospf priority 0
!
! Only the auth key is configured at interface level
!
interface Ethernet0/0
 ospf authentication-key CISCO
 ospf priority 0
```

R2:

```
router ospf 1
router-id 150.1.2.2
network 136.1.0.0 0.0.0.255 area 0
area 0 authentication
!
interface Ethernet 0/0
 ip ospf authentication-key CISCO
```

R3:

```
router ospf 1
router-id 150.1.3.3
network 136.1.0.0 0.0.0.255 area 0
area 0 authentication
!
interface Ethernet 0/0
 ip ospf authentication-key CISCO
```

R4:

```
router ospf 1
router-id 150.1.4.4
network 136.1.124.0 0.0.0.255 area 1
```

```
!
interface Ethernet 0/0
 ip ospf authentication message-digest
 ip ospf message-digest-key 1 md5  CISCO
```

Verification

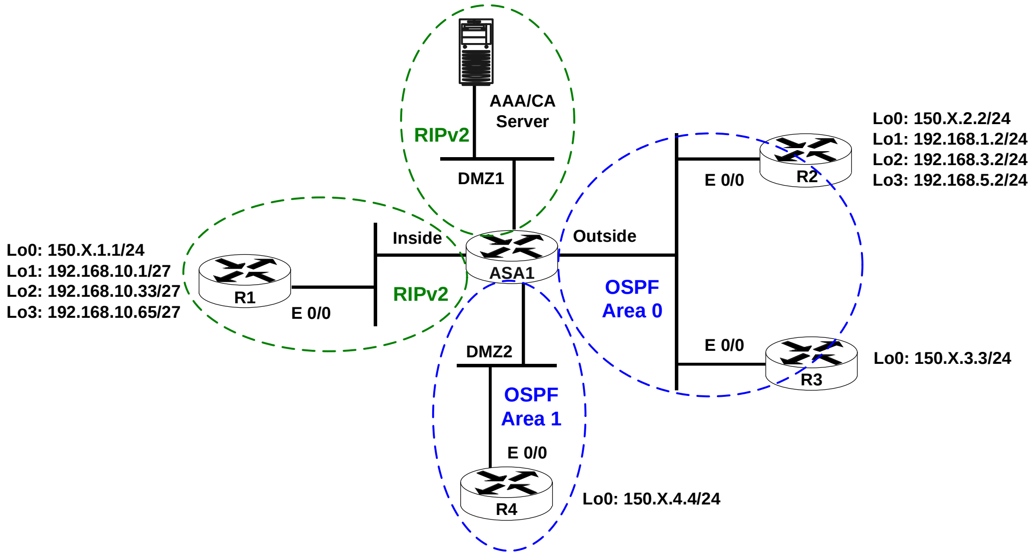
```
ASA1# show ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
150.1.2.2         1   FULL/BDR        0:00:38     136.1.0.2       outside
150.1.3.3         1   FULL/DR         0:00:35     136.1.0.3       outside
150.1.4.4         1   FULL/DR         0:00:39     136.1.124.4     dmz2

ASA1# show ospf interface

outside is up, line protocol is up
  Internet Address 136.1.0.12 mask 255.255.255.0, Area 0
  Process ID 1, Router ID 150.1.12.12, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DROTHER, Priority 0
  Designated Router (ID) 150.1.3.3, Interface address 136.1.0.3
  Backup Designated router (ID) 150.1.2.2, Interface address 136.1.0.2
  Flush timer for old DR LSA due in 0:00:42
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 0:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 3
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 150.1.2.2  (Backup Designated Router)
    Adjacent with neighbor 150.1.3.3  (Designated Router)
  Suppress hello for 0 neighbor(s)
  Simple password authentication enabled
dmz2 is up, line protocol is up
  Internet Address 136.1.124.12 mask 255.255.255.0, Area 1
  Process ID 1, Router ID 150.1.12.12, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DROTHER, Priority 0
  Designated Router (ID) 150.1.4.4, Interface address 136.1.124.4
  No backup designated router on this network
  Flush timer for old DR LSA due in 0:00:31
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 0:00:01
  Index 1/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 3
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 150.1.4.4  (Designated Router)
  Suppress hello for 0 neighbor(s)
  Message digest authentication enabled
    Youngest key id is 1
```

Further Reading

ASA Command Line Configuration Guide: Configuring OSPF

Redistribution, Summarization and Route Filtering

Objective: Redistribute between OSPF and RIP. Summarize and filter routes on redistribution.



Directions

- Configure the devices as per the “PIX/ASA Firewall/Basic Configuration” scenario Configuring and Authenticating RIP.
- Configure the devices as per the “PIX/ASA Firewall/Basic Configuration” scenario Configuring and Authenticating OSPF.
- The goal is to redistribute routes between routing protocols and apply prefix filtering on redistribution.
- Add routing prefixes information as follows:
    - Create Loopback interfaces on R1 as per diagram. Advertise them into RIP.
    - Create Loopback interfaces on R2 as per diagram. Advertise them into OSPF Area 0.

- Create Loopback interfaces on R3 and R4 as per diagram. Advertise them into Area 0 and Area 1 respectively. Do not use redistribution when advertising the Loopback networks.
- Make sure Loopback networks advertised into OSPF have their network mask preserved. Use OSPF network type point-to-point for this task.
- Summarize networks 192.168.1.0/24, 192.168.3.0/24, 192.168.5.0/24 into single prefix, as they are injected into Area 1.
- Filter out networks 150.X.2.0/24 and 150.X.3.0/24 from being advertised into Area 1. Use prefix-list and LSA type 3 filter.
- Redistribute between OSPF and RIP routing processes.

- Make sure that R2, R3 and R4 receive only summary prefix for the 192.168.10.0/27, 192.168.10.32/27, 192.168.10.64/27 networks.

Final Configuration

R1:

```
!
! Create the Loopbacks
!
interface Loopback0
 ip address 150.1.1.1 255.255.255.0
!
interface Loopback1
 ip address 192.168.10.1 255.255.255.224
!
interface Loopback2
 ip address 192.168.10.33 255.255.255.224
!
interface Loopback3
 ip address 192.168.10.65 255.255.255.224
!
! Advertise the Loopbacks
!
router rip
 network 150.1.0.0
 network 192.168.10.0
```

R2:

```
!
! Create the Loopbacks
!
interface Loopback0
 ip address 150.1.2.2 255.255.255.0
 ip ospf network point-to-point
!
interface Loopback1
 ip address 192.168.1.2 255.255.255.0
 ip ospf network point-to-point
!
interface Loopback2
 ip address 192.168.3.2 255.255.255.0
 ip ospf network point-to-point
!
interface Loopback3
 ip address 192.168.5.2 255.255.255.0
 ip ospf network point-to-point
!
! Advertise the Loopbacks
!
router ospf 1
 network 150.1.2.2 0.0.0.0 area 0
 network 192.168.1.2 0.0.0.0 area 0
 network 192.168.3.2 0.0.0.0 area 0
 network 192.168.5.2 0.0.0.0 area 0
```

R3:

```
!
! Create and advertise the Loopback
!
interface Loopback0
 ip address 150.1.3.3 255.255.255.0
 ip ospf network point-to-point
!
router ospf 1
 network 150.1.3.3 0.0.0.0 area 0

R4:
!
! Create and advertise the Loopback
!
interface Loopback0
 ip address 150.1.4.4 255.255.255.0
 ip ospf network point-to-point
!
router ospf 1
 network 150.1.4.4 0.0.0.0 area 1

ASA1:
!
! Summarize Inter-Area routes for R2 Loopbacks 1-3
!
router ospf 1
 area 0 range 192.168.0.0 255.255.248.0
!
! Prefix-list to block the loopbacks of R2 and R3
!
prefix-list R2_R3_LOOPBACKS seq 5 deny 150.1.2.0/24
prefix-list R2_R3_LOOPBACKS seq 10 deny 150.1.3.0/24
prefix-list R2_R3_LOOPBACKS seq 15 permit 0.0.0.0/0 le 32
!
! OSPF:
! Apply area-filter
!
router ospf 1
 area 1 filter-list prefix R2_R3_LOOPBACKS in
!
! Redistribute RIP subnets and apply summarization
!
router ospf 1
 redistribute rip subnets
 summary-address 192.168.10.0 255.255.255.128
!
! RIP:
! Redistribute OSPF
!
router rip
 redistribute ospf 1 metric 1
```

Verification

```
R1#show ip route rip
     136.1.0.0/24 is subnetted, 3 subnets
R       136.1.0.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
R       136.1.124.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
R    192.168.5.0/24 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.0.0.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
R    192.168.1.0/24 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
     150.1.0.0/24 is subnetted, 4 subnets
R       150.1.4.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
R       150.1.3.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
```

```
R       150.1.2.0 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0
R    192.168.3.0/24 [120/1] via 136.1.121.12, 00:00:13, Ethernet0/0

ASA1# show route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    136.1.0.0 255.255.255.0 is directly connected, outside
C    136.1.121.0 255.255.255.0 is directly connected, inside
C    136.1.124.0 255.255.255.0 is directly connected, dmz2
R    192.168.10.64 255.255.255.224 [120/1] via 136.1.121.1, 0:00:06, inside
R    192.168.10.32 255.255.255.224 [120/1] via 136.1.121.1, 0:00:06, inside
O    192.168.10.0 255.255.255.192 is a summary, 0:00:28, OSPF Unknown Type
R    192.168.10.0 255.255.255.224 [120/1] via 136.1.121.1, 0:00:06, inside
O    192.168.5.0 255.255.255.0 [110/11] via 136.1.0.2, 0:04:42, outside
C    10.0.0.0 255.255.255.0 is directly connected, dmz1
O    192.168.1.0 255.255.255.0 [110/11] via 136.1.0.2, 0:04:42, outside
O    150.1.4.0 255.255.255.0 [110/11] via 136.1.124.4, 0:02:10, dmz2
O    150.1.3.0 255.255.255.0 [110/11] via 136.1.0.3, 0:04:42, outside
O    150.1.2.0 255.255.255.0 [110/11] via 136.1.0.2, 0:04:42, outside
R    150.1.1.0 255.255.255.0 [120/1] via 136.1.121.1, 0:00:06, inside
O    192.168.3.0 255.255.255.0 [110/11] via 136.1.0.2, 0:04:45, outside
O    192.168.0.0 255.255.248.0 is a summary, 0:04:45

R2#show ip route ospf
     136.1.0.0/24 is subnetted, 3 subnets
O E2    136.1.121.0 [110/20] via 136.1.0.12, 00:09:29, Ethernet0/0
O IA    136.1.124.0 [110/20] via 136.1.0.12, 00:09:29, Ethernet0/0
     192.168.10.0/25 is subnetted, 1 subnets
O E2    192.168.10.0 [110/20] via 136.1.0.12, 00:00:03, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
O E2    10.0.0.0 [110/20] via 136.1.0.12, 00:09:29, Ethernet0/0
     150.1.0.0/24 is subnetted, 4 subnets
O IA    150.1.4.0 [110/21] via 136.1.0.12, 00:06:57, Ethernet0/0
O       150.1.3.0 [110/11] via 136.1.0.3, 00:09:29, Ethernet0/0
O E2    150.1.1.0 [110/20] via 136.1.0.12, 00:05:02, Ethernet0/0

R4#show ip route ospf
     136.1.0.0/24 is subnetted, 3 subnets
O IA    136.1.0.0 [110/20] via 136.1.124.12, 00:07:49, Ethernet0/0
O E2    136.1.121.0 [110/20] via 136.1.124.12, 00:07:49, Ethernet0/0
     192.168.10.0/25 is subnetted, 1 subnets
O E2    192.168.10.0 [110/20] via 136.1.124.12, 00:00:49, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
O E2    10.0.0.0 [110/20] via 136.1.124.12, 00:07:49, Ethernet0/0
     150.1.0.0/24 is subnetted, 2 subnets
O E2    150.1.1.0 [110/20] via 136.1.124.12, 00:05:54, Ethernet0/0
O IA 192.168.0.0/21 [110/21] via 136.1.124.12, 00:07:49, Ethernet0/0
```

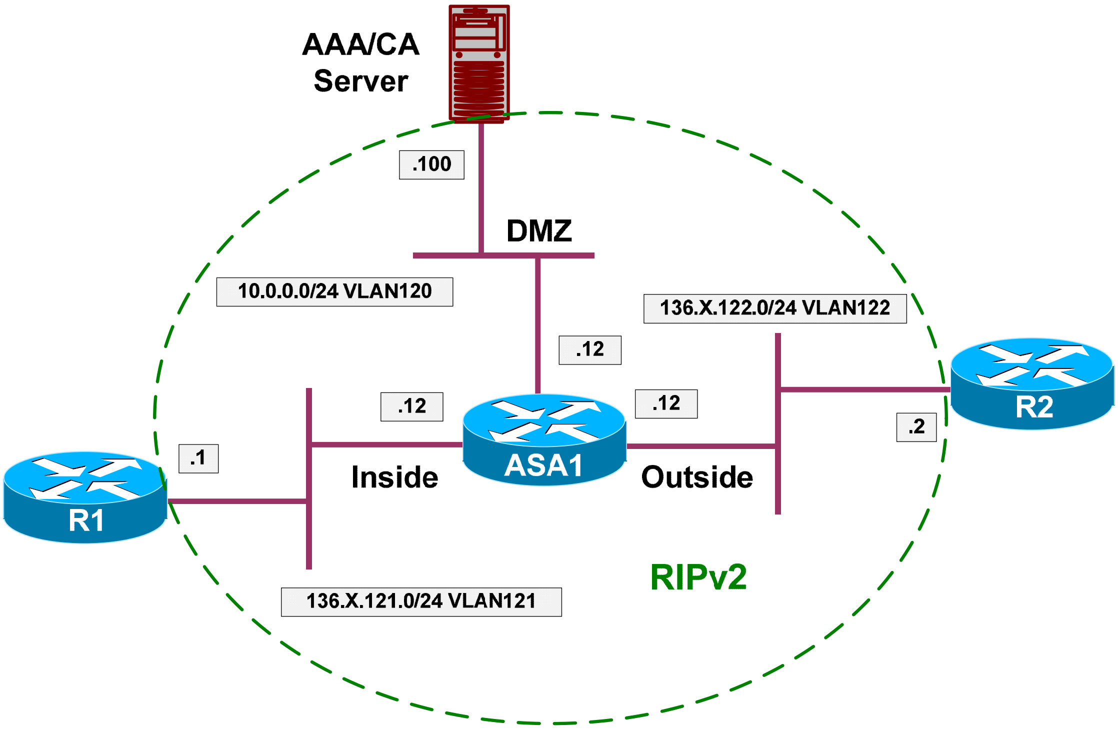
🕮 Further Reading

ASA Command Line Configuration Guide: Configuring IP Routing

Access Control

Common Configuration

Objective: Perform configuration steps common to traffic filtering tasks.



Directions

- Create the necessary VLANs and configure the switch ports respectively as per the diagram.
- Configure IP addressing as per the diagram.
- Configure RIP as routing protocol on all devices.

Final Configuration

```
ASA1:
!
! IP addressing
!
interface Ethernet0/0
 no shut
 nameif outside
 security-level 0
 ip address 136.1.122.12 255.255.255.0
!
```

```
interface Ethernet0/1
 no shut
 nameif inside
 security-level 100
 ip address 136.1.121.12 255.255.255.0
!
interface Ethernet0/2
 no shut
 nameif dmz
 security-level 50
 ip address 10.0.0.12 255.255.255.0
!
! RIP configuration
!
router rip
 version 2
 no auto-summary
 network 10.0.0.0
 network 136.1.0.0

SW1 & SW2:
!
! create VLANs and configure trunk links
!
vlan 120,121,122
!
interface range Fa 0/21 - 23
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shut

SW1:
!
!  Configure switchports
!
interface Fa 0/1
 switchport host
 switchport access vlan 121
!
interface Fa 0/2
 switchport host
 switchport access vlan 122
!
interface Fa 0/13
 switchport host
 switchport access vlan 121
!
interface Fa 0/20
 switchport host
 switchport access vlan 120

SW2:
!
!  Configure switchports
!
interface Fa 0/12
 switchport host
 switchport access vlan 122
!
interface Fa 0/13
 switchport host
 switchport access vlan 120
```

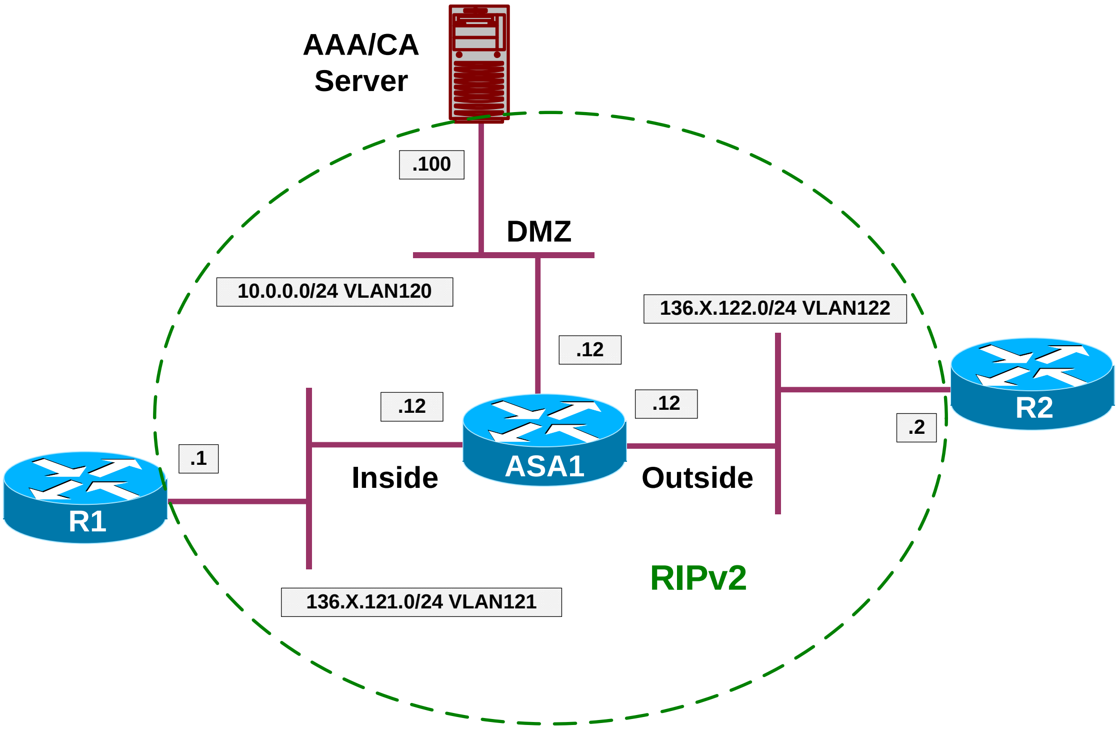
```
R1:
interface E 0/0
 no shut
 ip add 136.1.121.1 255.255.255.0
!
router rip
 ver 2
 no auto
 network 136.1.0.0

R2:
interface E 0/0
 no shut
 ip add 136.1.122.2 255.255.255.0
!
router rip
 ver 2
 no auto
 network 136.1.0.0
```

Verification

```
R1#show ip route rip
     136.1.0.0/24 is subnetted, 2 subnets
R       136.1.122.0 [120/1] via 136.1.121.12, 00:00:12, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.0.0.0 [120/1] via 136.1.121.12, 00:00:12, Ethernet0/0

R2#show ip route rip
     136.1.0.0/24 is subnetted, 2 subnets
R       136.1.121.0 [120/1] via 136.1.122.12, 00:00:19, Ethernet0/0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.0.0.0 [120/1] via 136.1.122.12, 00:00:19, Ethernet0/0
```

Filtering with IP Access Lists

Objective: Configure filtering using an access-list to implement security policy.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Create two access-list to be applied to outside interface – ingress and egress. Name them OUTSIDE_IN and OUTSIDE_OUT.
- Ingress ACL should permit the following:
  - Incoming pings (ICMP echo)
  - Returning pings (ICMP echo-reply)
  - FTP/HTTP/NTP traffic to AAA/CA server
  - Returning UNIX-like Traceroute traffic (ICMP time-exceeded, port-unreachable)
- Egress ACL should permit the following:
  - Outgoing pings (ICMP echo)
  - Returning pings (ICMP echo-reply)
  - Outgoing UNIX-like traceroute (UDP ports 33434 - 33464 by default)
  - Outgoing telnet, FTP, HTTP traffic

Final Configuration

```
ASA1:
!
! Access-Lists definition
!
access-list OUTSIDE_IN extended permit tcp any host 10.0.0.100 eq www
access-list OUTSIDE_IN extended permit tcp any host 10.0.0.100 eq ftp
access-list OUTSIDE_IN extended permit udp any host 10.0.0.100 eq ntp
access-list OUTSIDE_IN extended permit icmp any any echo
access-list OUTSIDE_IN extended permit icmp any any echo-reply
access-list OUTSIDE_IN extended permit icmp any any time-exceeded
access-list OUTSIDE_IN extended permit icmp any any unreachable
!
access-list OUTSIDE_OUT extended permit icmp any any echo
access-list OUTSIDE_OUT extended permit icmp any any echo-reply
access-list OUTSIDE_OUT extended permit udp any any range 33434 33464
access-list OUTSIDE_OUT extended permit tcp any any eq ftp
access-list OUTSIDE_OUT extended permit tcp any any eq telnet
access-list OUTSIDE_OUT extended permit tcp any any eq www
!
! Apply the access-lists
!
access-group OUTSIDE_IN in interface outside
access-group OUTSIDE_OUT out interface outside
```

Verification

```
R2#ping 10.0.0.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/8 ms

R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms

R2#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open
get / http/1.1

HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
Date: Sat, 06 Jan 2007 11:22:27 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
</body></html>
[Connection to 10.0.0.100 closed by foreign host]

R2#telnet 10.0.0.100 21
Trying 10.0.0.100, 21 ... Open
```

```
220 IESERVER1 Microsoft FTP Service (Version 5.0).

R2#disc 1
Closing connection to 10.0.0.100 [confirm]

R2#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open
get / http/1.1

HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
Date: Sat, 06 Jan 2007 11:22:27 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
</body></html>
[Connection to 10.0.0.100 closed by foreign host]
R2#telnet 10.0.0.100 21
Trying 10.0.0.100, 21 ... Open
220 IESERVER1 Microsoft FTP Service (Version 5.0).

R2#disc 1
Closing connection to 10.0.0.100 [confirm]

R2#telnet 10.0.0.100 25
Trying 10.0.0.100, 25 ...
% Connection timed out; remote host not responding

R1#telnet 136.1.122.2
Trying 136.1.122.2 ... Open


User Access Verification

Password:
R2>

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R1#ping 10.0.0.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

R1#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open
get / http/1.1.

HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
Date: Sat, 06 Jan 2007 11:25:59 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
```

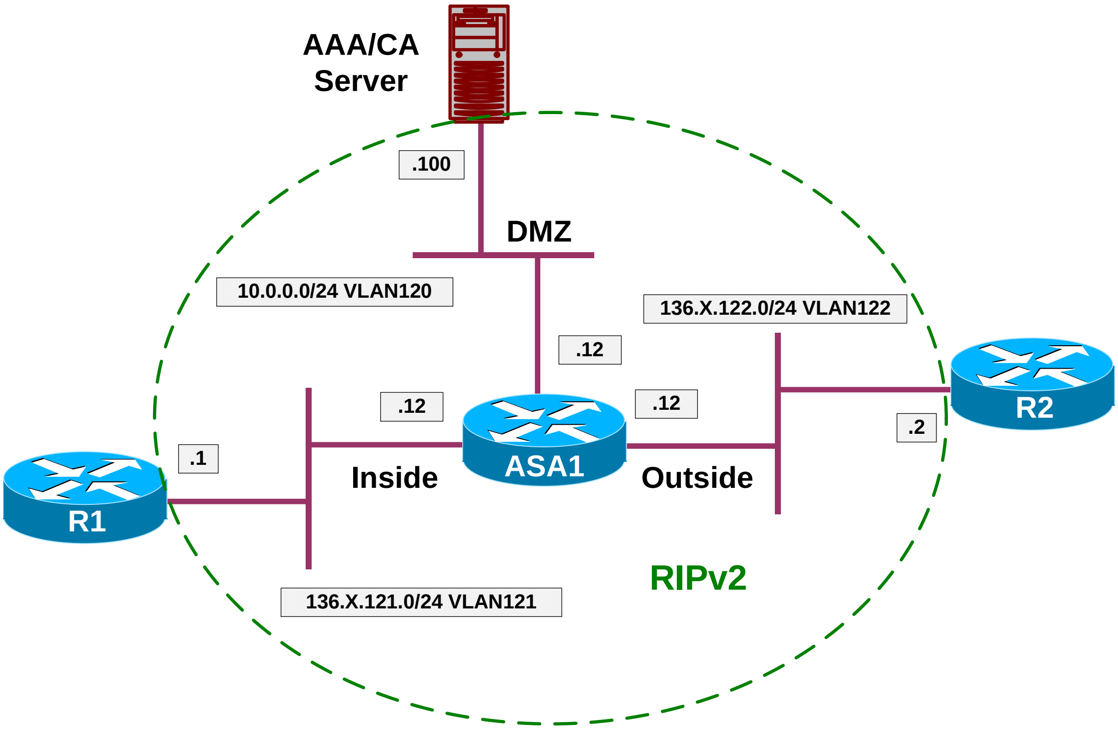
```
</body></html>
[Connection to 10.0.0.100 closed by foreign host]

R1#traceroute 136.1.122.2

Type escape sequence to abort.
Tracing the route to 136.1.122.2

  1 136.1.122.2 0 msec *  0 msec

ASA1# show access-list
access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
            alert-interval 300
access-list OUTSIDE_IN; 7 elements
access-list OUTSIDE_IN line 1 extended permit tcp any host 10.0.0.100 eq www
(hitcnt=1) 0x59f08b76
access-list OUTSIDE_IN line 2 extended permit tcp any host 10.0.0.100 eq ftp
(hitcnt=1) 0x8997bedf
access-list OUTSIDE_IN line 3 extended permit udp any host 10.0.0.100 eq ntp
(hitcnt=0) 0x8189f120
access-list OUTSIDE_IN line 4 extended permit icmp any any echo-reply
(hitcnt=10) 0xc857b49e
access-list OUTSIDE_IN line 5 extended permit icmp any any time-exceeded
(hitcnt=0) 0xc3b80d
access-list OUTSIDE_IN line 6 extended permit icmp any any unreachable
(hitcnt=5) 0xec6c9a23
access-list OUTSIDE_IN line 7 extended permit icmp any any echo (hitcnt=70)
0x869bdf05
access-list OUTSIDE_OUT; 6 elements
access-list OUTSIDE_OUT line 1 extended permit icmp any any echo (hitcnt=10)
0x4006da3f
access-list OUTSIDE_OUT line 2 extended permit udp any any range 33434 33464
(hitcnt=7) 0xde5f72ee
access-list OUTSIDE_OUT line 3 extended permit tcp any any eq ftp (hitcnt=0)
0xf47b788
access-list OUTSIDE_OUT line 4 extended permit tcp any any eq telnet (hitcnt=3)
0x2be5bbfe
access-list OUTSIDE_OUT line 5 extended permit tcp any any eq www (hitcnt=0)
0x8a4b160e
access-list OUTSIDE_OUT line 6 extended permit icmp any any echo-reply
(hitcnt=15) 0xd6d9967
```

Further Reading

Identifying Traffic with Access Lists

Using Object Groups

Objective: Simplify access-control policy using object groups.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- PIX/ASA firewall has concept of object groups. Group is a collection of similar objects (IP addresses, Ports, ICMP types) that could be used in access-list for compact and scalable configuration.
- Create object-group named SERVERS of type network-object. Add host 10.0.0.100 to it.
- Create object-group named ROUTERS of type network-object. Add network 136.1.121.0/24 to it.
- Create object-group named COMMON_ICMP of type icmp. Add the following ICMP types:
    - “echo” and “echo-reply”
    - “time-exceeded” and “unreachable”
- Create object-group named TRC_PORTS of type service. Add a range of UDP ports 33434-33464 to it.
- Create object-group named SERVER_PORTS of type service. Add TCP ports 80, 21 to it.

- Create object-group named ROUTER_PORTS of type service. Add TCP ports 23, 22, 7001 to it.
- Create two access-list to be applied to outside interface – ingress and egress. Name them OUTSIDE_IN and OUTSIDE_OUT.
- Ingress ACL should permit the following:
    - COMMON_ICMP to any host.
    - Access via TRC_PORTS to any host.
    - Access via SERVER_PORTS to SERVERS.
    - Access via ROUTER_PORTS to ROUTERS.
- Egress ACL should permit the following:
    - COMMON_ICMP to any host.
    - Access via TRC_PORTS to any host.
    - Access via ROUTER_PORTS or SERVER_PORTS to any host.

Final Configuration

ASA1:

```
!
! Define object groups
!
object-group network ROUTERS
 network-object 136.1.121.0 255.255.255.0
!
object-group network SERVERS
 network-object host 10.0.0.100
!
object-group icmp-type COMMON_ICMP
 icmp-object echo
 icmp-object echo-reply
 icmp-object time-exceeded
 icmp-object unreachable
!
object-group service TRC_PORTS udp
 port-object range 33434 33464
!
object-group service SERVER_PORTS tcp
 port-object eq www
 port-object eq ftp
!
object-group service ROUTER_PORTS tcp
 port-object eq telnet
 port-object eq ssh
 port-object eq 7001
!
! Define access-lists
!
access-list OUTSIDE_IN ext permit icmp any any obj COMMON_ICMP
access-list OUTSIDE_IN ext permit udp any any obj TRC_PORTS
access-list OUTSIDE_IN ext permit tcp any obj SERVERS obj SERVER_PORTS
access-list OUTSIDE_IN ext permit tcp any obj ROUTERS obj ROUTER_PORTS
!
access-list OUTSIDE_OUT ext permit icmp any any obj COMMON_ICMP
access-list OUTSIDE_OUT ext permit udp any any obj TRC_PORTS
```

```
access-list OUTSIDE_IN ext permit tcp any any obj SERVER_PORTS
access-list OUTSIDE_IN ext permit tcp any any obj ROUTER_PORTS
!
! Apply the access-lists
!
access-group OUTSIDE_IN in interface outside
access-group OUTSIDE_OUT out interface outside
```

Verification

```
R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

R1#trace 136.1.122.2

Type escape sequence to abort.
Tracing the route to 136.1.122.2

  1 136.1.122.2 4 msec *  0 msec
R1#

R2#trace 136.1.121.1

Type escape sequence to abort.
Tracing the route to 136.1.121.1

  1 136.1.121.1 4 msec *  0 msec

R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R2#ping 10.0.0.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R2#telnet 136.1.121.1
Trying 136.1.121.1 ... Open


Password required, but none set

[Connection to 136.1.121.1 closed by foreign host]

R2#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open
get / http/1.1

HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
```

```
Date: Sun, 07 Jan 2007 08:16:32 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
</body></html>
[Connection to 10.0.0.100 closed by foreign host]

R2#telnet 10.0.0.100 21
Trying 10.0.0.100, 21 ... Open
220 IESERVER1 Microsoft FTP Service (Version 5.0).
quit
221

[Connection to 10.0.0.100 closed by foreign host]

ASA1# show access-list
access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
            alert-interval 300
access-list OUTSIDE_IN; 15 elements
access-list OUTSIDE_IN line 1 extended permit icmp any any object-group
COMMON_ICMP 0x8ced5a
access-list OUTSIDE_IN line 1 extended permit icmp any any echo (hitcnt=10)
0x869bdf05
access-list OUTSIDE_IN line 1 extended permit icmp any any echo-reply
(hitcnt=5) 0xc857b49e
access-list OUTSIDE_IN line 1 extended permit icmp any any time-exceeded
(hitcnt=0) 0xc3b80d
access-list OUTSIDE_IN line 1 extended permit icmp any any unreachable
(hitcnt=2) 0xec6c9a23
access-list OUTSIDE_IN line 2 extended permit udp any any object-group
TRC_PORTS 0x2a19bcff
access-list OUTSIDE_IN line 2 extended permit udp any any range 33434 33464
(hitcnt=3) 0x61e01ad
access-list OUTSIDE_IN line 3 extended permit tcp any object-group SERVERS
object-group SERVER_PORTS 0x4f4b05bf
access-list OUTSIDE_IN line 3 extended permit tcp any host 10.0.0.100 eq www
(hitcnt=1) 0x59f08b76
access-list OUTSIDE_IN line 3 extended permit tcp any host 10.0.0.100 eq ftp
(hitcnt=1) 0x8997bedf
access-list OUTSIDE_IN line 4 extended permit tcp any object-group ROUTERS
object-group ROUTER_PORTS 0x93396844
access-list OUTSIDE_IN line 4 extended permit tcp any 136.1.121.0 255.255.255.0
eq telnet (hitcnt=1) 0xa78fa109
access-list OUTSIDE_IN line 4 extended permit tcp any 136.1.121.0 255.255.255.0
eq ssh (hitcnt=0) 0xb9aa2beb
access-list OUTSIDE_IN line 4 extended permit tcp any 136.1.121.0 255.255.255.0
eq 7001 (hitcnt=0) 0x919d2be3
access-list OUTSIDE_IN line 5 extended permit tcp any any object-group
SERVER_PORTS 0x72b1f890
access-list OUTSIDE_IN line 5 extended permit tcp any any eq www (hitcnt=0)
0xcc39c510
access-list OUTSIDE_IN line 5 extended permit tcp any any eq ftp (hitcnt=0)
0xe99d2c75
access-list OUTSIDE_IN line 6 extended permit tcp any any object-group
ROUTER_PORTS 0x6f292abb
access-list OUTSIDE_IN line 6 extended permit tcp any any eq telnet (hitcnt=0)
0x8edfb59
access-list OUTSIDE_IN line 6 extended permit tcp any any eq ssh (hitcnt=0)
0x649d268
access-list OUTSIDE_IN line 6 extended permit tcp any any eq 7001 (hitcnt=0)
0x4c23f901
access-list OUTSIDE_OUT; 5 elements
```

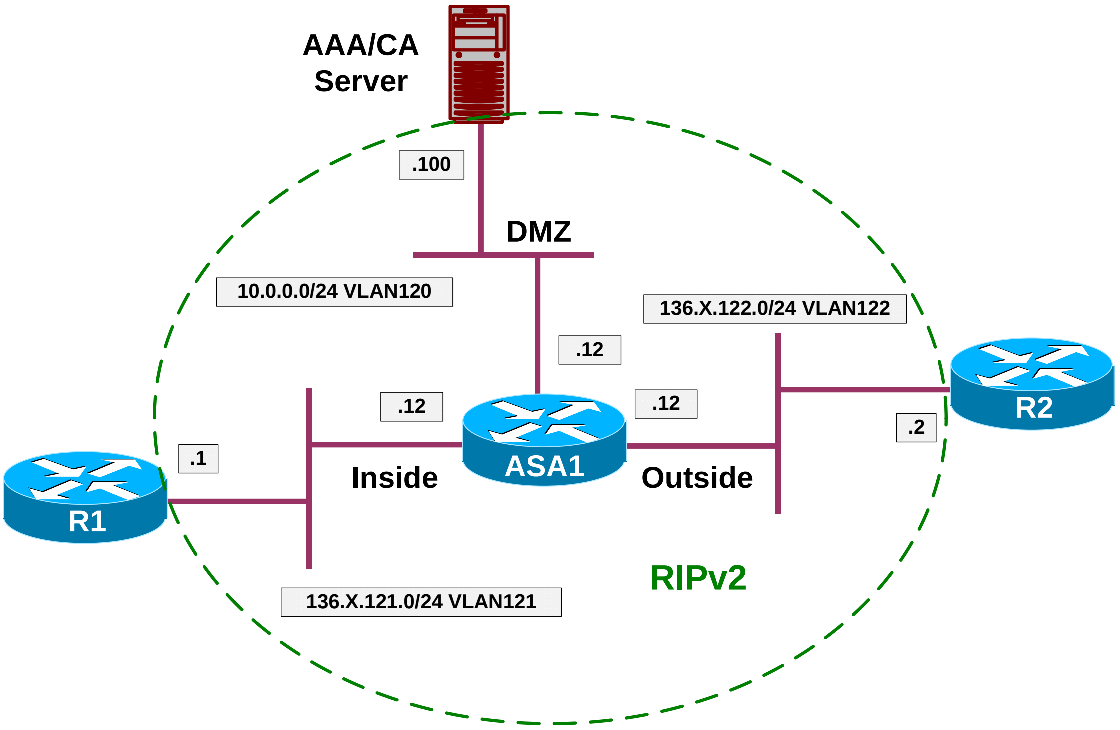
```
access-list OUTSIDE_OUT line 1 extended permit icmp any any object-group
COMMON_ICMP 0x19df4a15
access-list OUTSIDE_OUT line 1 extended permit icmp any any echo (hitcnt=5)
0x4006da3f
access-list OUTSIDE_OUT line 1 extended permit icmp any any echo-reply
(hitcnt=10) 0xd6d9967
access-list OUTSIDE_OUT line 1 extended permit icmp any any time-exceeded
(hitcnt=0) 0x1c223353
access-list OUTSIDE_OUT line 1 extended permit icmp any any unreachable
(hitcnt=4) 0x38ddecbc
access-list OUTSIDE_OUT line 2 extended permit udp any any object-group
TRC_PORTS 0x16015244
access-list OUTSIDE_OUT line 2 extended permit udp any any range 33434 33464
(hitcnt=3) 0xde5f72ee
```

Further Reading

Simplifying Access Lists with Object Grouping

Administrative Access Management

Objective: Configure remote access to the firewall unit.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Permit telnet access to the ASA unit from the inside subnet (136.1.121.0/24).
- Permit ssh access to the ASA unit from the outside subnet (136.1.122.0/24).
- Permit access to ASDM from host 10.0.0.100.

Final Configuration

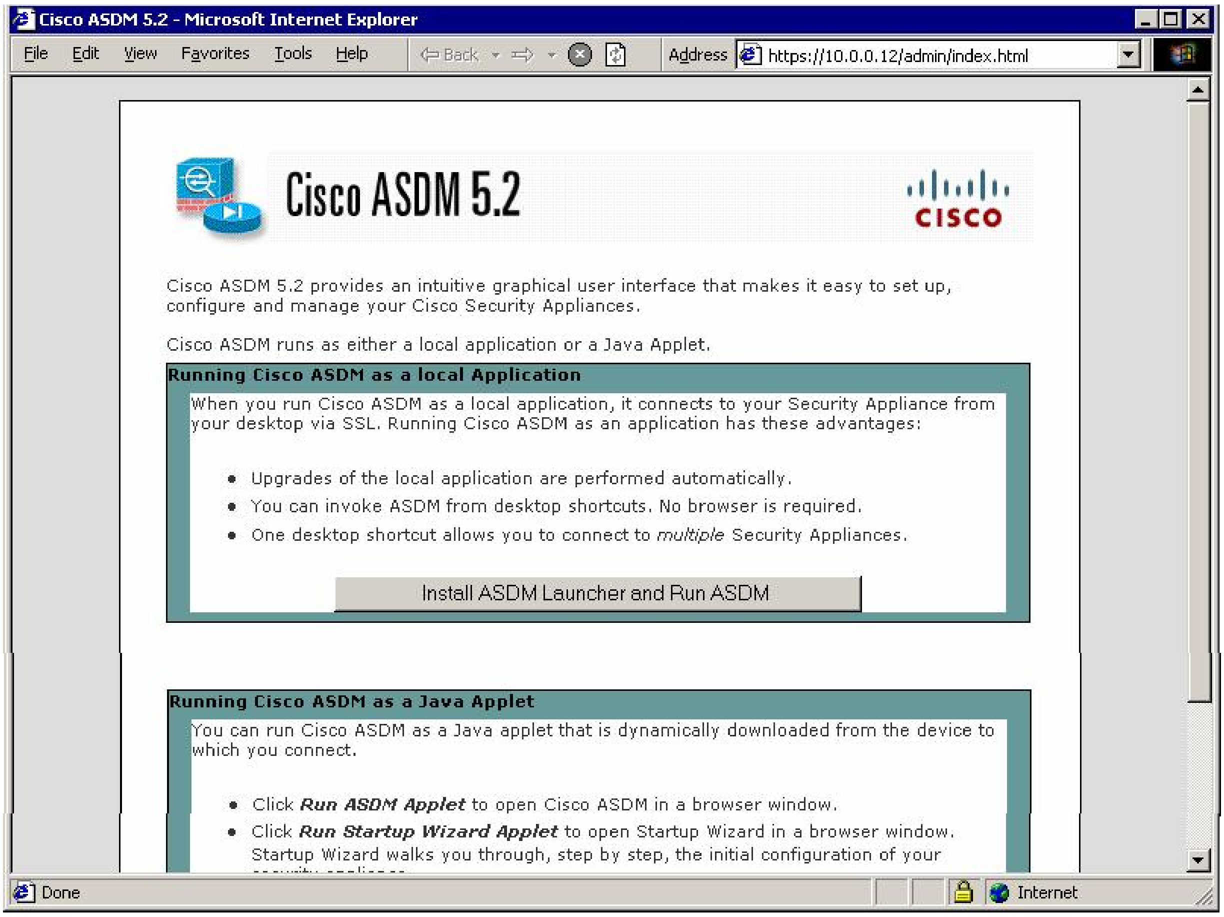
```
SW1:
!
! Generate RSA key to enable SSH
!
domain-name internetworkexpert.com
crypto key generate rsa general-keys modulus 512
!
! Control telnet/ssh access
!
telnet 136.1.121.0 255.255.255.0 inside
ssh 136.1.122.0 255.255.255.0 outside
!
```

```
! Define telnet/ssh password
!
passwd cisco
!
! Enable HTTP server and control HTTP access
!
http server enable
http 10.0.0.100 255.255.255.255 dmz
```

Verification

AAA/CA Server:

Use your browser to connet to the ASA firewall. Enter enable password on authentication, if it's set.


Cisco ASDM 5.2 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Address https://10.0.0.12/admin/index.html
Cisco ASDM 5.2
CISCO
Install ASDM Launcher and Run ASDM
Done
Internet

Cisco ASDM 5.2 provides an intuitive graphical user interface that makes it easy to set up, configure and manage your Cisco Security Appliances.

Cisco ASDM runs as either a local application or a Java Applet.

Running Cisco ASDM as a local Application

When you run Cisco ASDM as a local application, it connects to your Security Appliance from your desktop via SSL. Running Cisco ASDM as an application has these advantages:

- Upgrades of the local application are performed automatically.
- You can invoke ASDM from desktop shortcuts. No browser is required.
- One desktop shortcut allows you to connect to *multiple* Security Appliances.

Running Cisco ASDM as a Java Applet

You can run Cisco ASDM as a Java applet that is dynamically downloaded from the device to which you connect.

- Click ***Run ASDM Applet*** to open Cisco ASDM in a browser window.
- Click ***Run Startup Wizard Applet*** to open Startup Wizard in a browser window. Startup Wizard walks you through, step by step, the initial configuration of your

```
R1>telnet 136.1.121.12
Trying 136.1.121.12 ... Open


User Access Verification

Password:  cisco
Type help or '?' for a list of available commands.
```

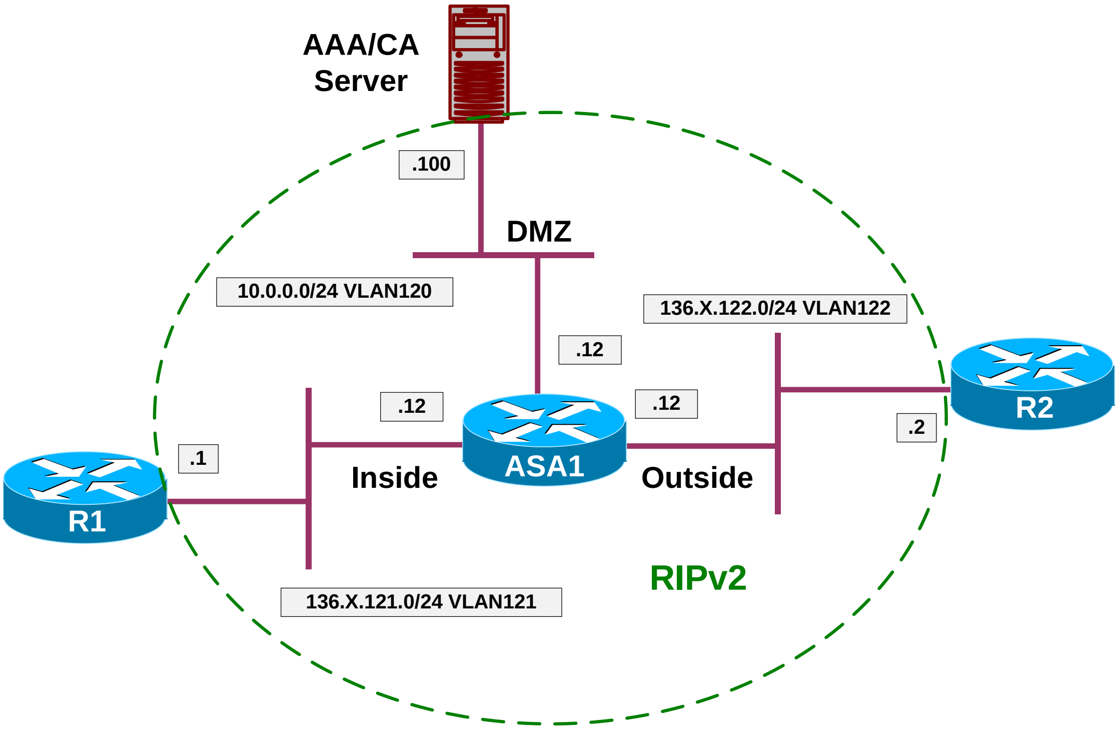
```
ASA1>

R2#ssh -l pix 136.1.122.12

Password: cisco
Type help or '?' for a list of available commands.
ASA1> en
Password:
ASA1# who
        0: 136.1.121.1

ASA1# show ssh sess

SID Client IP       Version Mode Encryption Hmac     State            Username
0   136.1.122.2     1.5     -    3DES       -        SessionStarted   pix
```

Further Reading

Managing System Access

ICMP Traffic Management

Objective: Limit ICMP traffic to/from the firewall unit.



Directions

- Configure devices as per the scenario "PIX/ASA Firewall/Access Control" "Common Configuration".
- Configure the firewall such that no one could ping it. However, make sure firewall itself is able to ping anyone.
- To achieve this task, permit ICMP echo-reply messages to be accepted on any firewall interface.
- Additionally, make sure that pMTU discovery and traceroute work successfully from the firewall.
- To achieve this task, permit ICMP unreachables and time-exceeded messages to be accepted on any firewall interface.
- All other ICMP messages terminating on firewall interfaces should be discarded.

Final Configuration

```
ASA1:
icmp permit any echo-reply outside
icmp permit any echo-reply inside
icmp permit any echo-reply dmz
!
icmp permit any time-exceeded outside
icmp permit any unreachable outside
!
icmp permit any time-exceeded inside
icmp permit any unreachable inside
!
icmp permit any time-exceeded dmz
icmp permit any unreachable dmz
```

Verification

```
ASA1# ping 136.1.122.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

ASA1# ping 136.1.121.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

ASA1# ping 10.0.0.100
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms

ASA1# trace 10.0.0.100

Type escape sequence to abort.
Tracing the route to 10.0.0.100

 1  10.0.0.100 0 msec 0 msec 0 msec

ASA1# trace 136.1.122.2

Type escape sequence to abort.
Tracing the route to 136.1.122.2

 1  136.1.122.2 10 msec *  0 msec

ASA1# trace 136.1.121.1

Type escape sequence to abort.
Tracing the route to 136.1.121.1

 1  136.1.121.1 0 msec *  0 msec

R2#ping 136.1.121.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.12, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

R1#ping 136.1.121.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.12, timeout is 2 seconds:
```

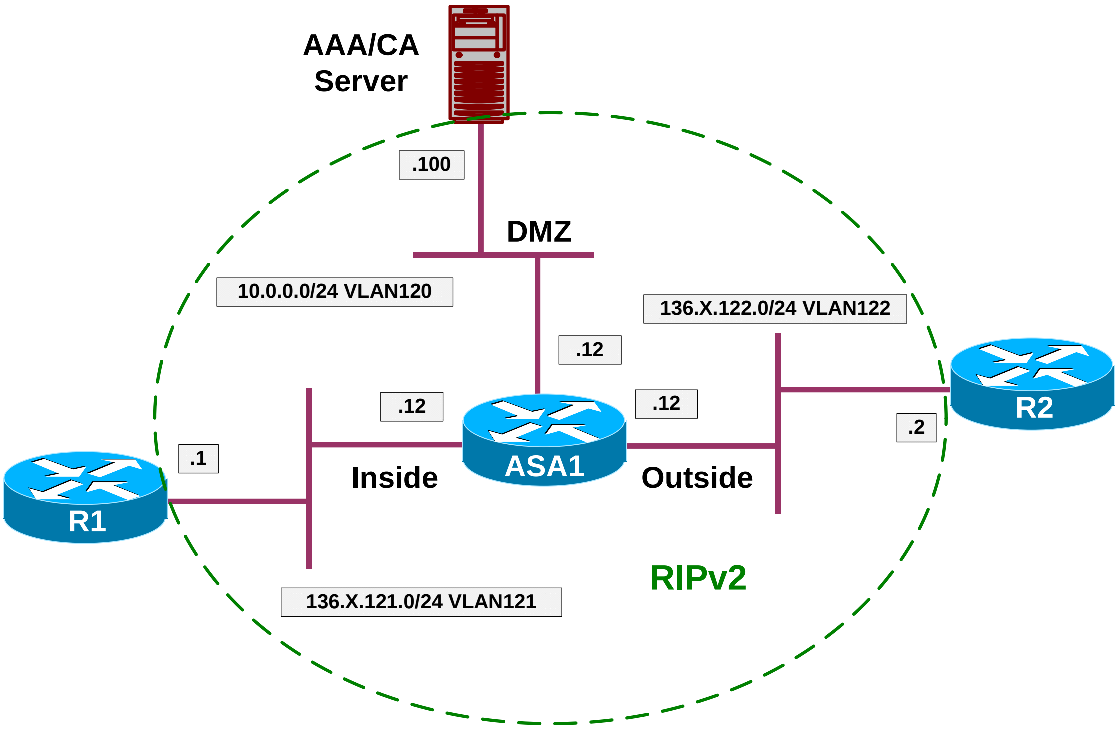
```
.....
Success rate is 0 percent (0/5)
```

Further Reading

Command Reference: ICMP

Configuring Filtering Services

Objective: Configure the firewall for application-level filtering.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Filter ActiveX and JavaScript from all HTTP requests on port 80.
- Configure the ASA to use Websense URL filtering server at 10.0.0.100.
- Filter HTTP URL from 136.1.121.0/24 network on ports 80 and 8080. Block proxy-requests going on port 8080.
- Additionally, configure FTP filtering on port 21 for network 136.1.121.0/24. Deny interactive FTP connections.
- In case if URL server failure, HTTP/FTP requests should be allowed.

Final Configuration

SW1:

```
url-server (dmz) host 10.0.0.100
!
filter activex 80 0 0 0 0
filter java 80 0 0 0 0
filter ftp 21 136.1.121.0 255.255.255.0 0 0 allow interact-block
filter url 8080 136.1.121.0 255.255.255.0 0 0 allow proxy-block
filter url http 136.1.121.0 255.255.255.0 0 0 allow
```

Verification

You can install a trial version of Websense filtering server. Use your Test PC to send a few HTTP requests from inside after that:

```
ASA1# show url-server statistics

Global Statistics:
--------------------
URLs total/allowed/denied          2/2/0
URLs allowed by cache/server       0/2
URLs denied by cache/server        0/0
HTTPSs total/allowed/denied        0/0/0
HTTPSs allowed by cache/server     0/0
HTTPSs denied by cache/server      0/0
FTPs total/allowed/denied          0/0/0
FTPs allowed by cache/server       0/0
FTPs denied by cache/server        0/0
Requests dropped                   0
Server timeouts/retries            0/0
Processed rate average 60s/300s    0/0 requests/second
Denied rate average 60s/300s       0/0 requests/second
Dropped rate average 60s/300s      0/0 requests/second

Server Statistics:
--------------------
10.0.0.100                         UP
  Vendor                           websense
  Port                             15868
  Requests total/allowed/denied    2/2/0
  Server timeouts/retries          0/0
  Responses received               2
  Response time average 60s/300s   0/0

URL Packets Sent and Received Stats:
------------------------------------
Message                 Sent    Received
STATUS_REQUEST          9601    9601
LOOKUP_REQUEST          2       2
LOG_REQUEST             0       NA

Errors:
-------
RFC noncompliant GET method      0
URL buffer update failure        0

ASA1# show running-config filter
filter activex 80 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0
filter java 80 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0
filter ftp 21 136.1.121.0 255.255.255.0 0.0.0.0 0.0.0.0 allow interact-block
filter url 8080 136.1.121.0 255.255.255.0 0.0.0.0 0.0.0.0 allow proxy-block
filter url http 136.1.121.0 255.255.255.0 0.0.0.0 0.0.0.0 allow
```

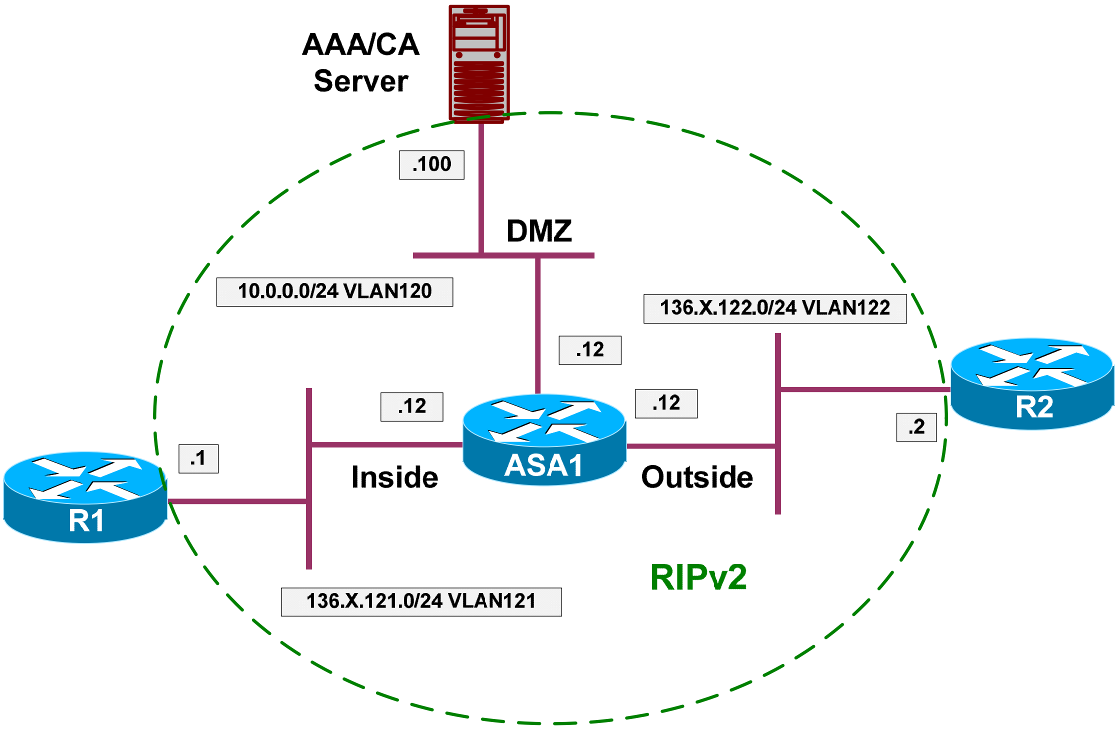
Further Reading

Applying Filtering Services

Configuring NAT

Dynamic NAT and PAT

Objective: Configure dynamic NAT translation rules.



Directions

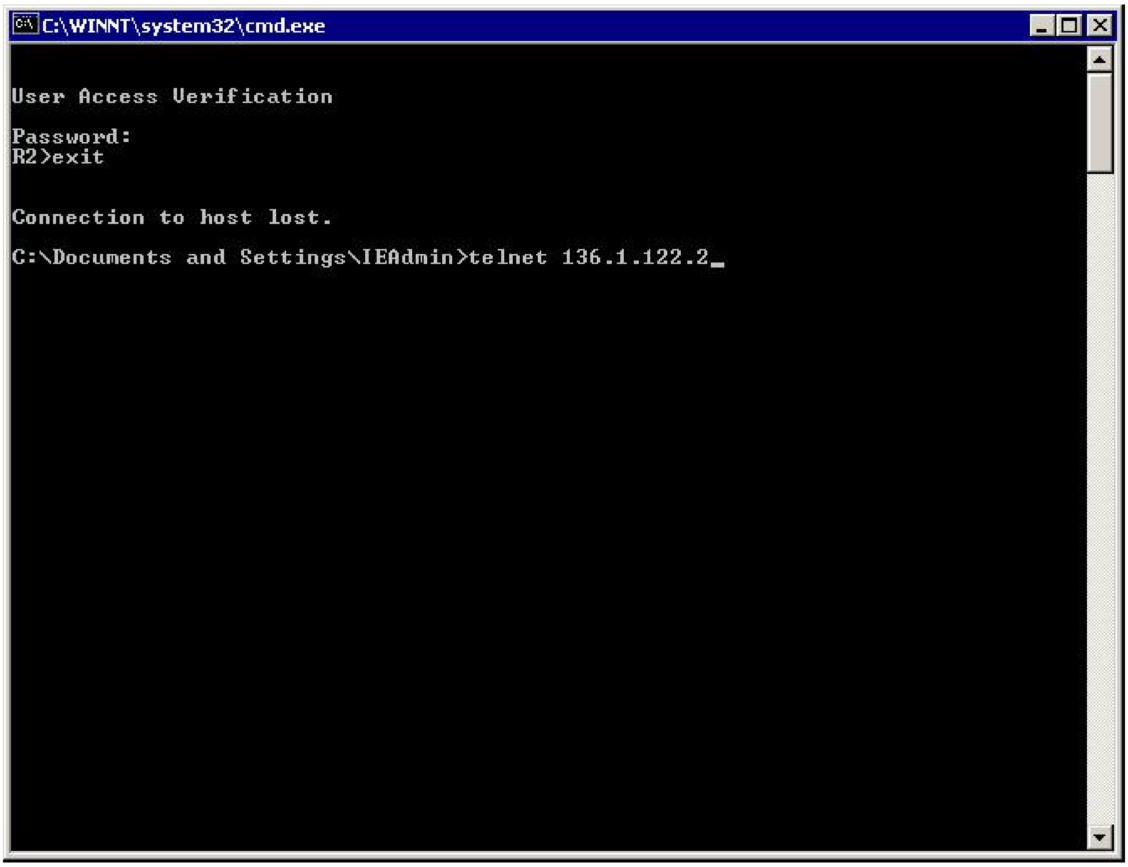
- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- NAT-Control requires every connection to have a NAT entry created before being permitted outbound (just like with PIX OS 6.x).
- Configure NAT such that hosts on the inside going to outside have their addresses translated into address pool 136.1.122.100-110. Use interface IP address as PAT backup.
- Configure NAT such that hosts on the DMZ going to outside have their addresses translated into address pool 136.1.122.200-210. Use the last IP address in the range as PAT backup.
- Configure NAT such that hosts on the inside going into DMZ have their addresses translated into interface IP address via PAT.

Final Configuration

```
ASA1:
nat-control
!
! Configure global address pools
!

!
! Outside Pool for inside hosts
!
global (outside) 1 136.1.122.100-136.1.122.110
global (outside) 1 interface

!
! DMZ pool for inside hosts
!
global (dmz) 1 interface

!
! Outside pool for DMZ hosts
!
global (outside) 2 136.1.122.200-136.1.122.209
global (outside) 2 136.1.122.210

!
! NAT rules
!
nat (inside) 1 136.1.121.0 255.255.255.0
nat (dmz) 2 10.0.0.0 255.255.255.0
```

Verification

```
ASA1(config)# show nat

NAT policies on Interface inside:
  match ip inside 136.1.121.0 255.255.255.0 outside any
    dynamic translation to pool 1 (136.1.122.100 - 136.1.122.110)
    translate_hits = 0, untranslate_hits = 0
  match ip inside 136.1.121.0 255.255.255.0 inside any
    dynamic translation to pool 1 (No matching global)
    translate_hits = 0, untranslate_hits = 0
  match ip inside 136.1.121.0 255.255.255.0 dmz any
    dynamic translation to pool 1 (10.0.0.12 [Interface PAT])
    translate_hits = 0, untranslate_hits = 0
  match ip inside any outside any
    no translation group, implicit deny
    policy_hits = 0
  match ip inside any dmz any
    no translation group, implicit deny
    policy_hits = 0

NAT policies on Interface dmz:
  match ip dmz 10.0.0.0 255.255.255.0 outside any
    dynamic translation to pool 2 (136.1.122.200 - 136.1.122.209)
    translate_hits = 0, untranslate_hits = 0
  match ip dmz 10.0.0.0 255.255.255.0 dmz any
    dynamic translation to pool 2 (No matching global)
    translate_hits = 0, untranslate_hits = 0
  match ip dmz any outside any
    no translation group, implicit deny
    policy_hits = 0

ASA1(config)# show run global
global (outside) 1 136.1.122.100-136.1.122.110
global (outside) 2 136.1.122.200-136.1.122.209
global (outside) 1 interface
global (outside) 2 136.1.122.210
global (dmz) 1 interface

R1#telnet 136.1.122.2
Trying 136.1.122.2 ... Open


User Access Verification

Password:
R2>
Rack1AS>12
[Resuming connection 12 to asa1 ... ]

ASA1(config)# show xlate
1 in use, 1 most used
Global 136.1.122.100 Local 136.1.121.1

R1#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open

ASA1(config)# show x
2 in use, 2 most used
PAT Global 10.0.0.12(1024) Local 136.1.121.1(11006)
Global 136.1.122.100 Local 136.1.121.1

AAA/CA Server:
```



```
User Access Verification

Password:
R2>exit


Connection to host lost.

C:\Documents and Settings\IEAdmin>telnet 136.1.122.2_
```

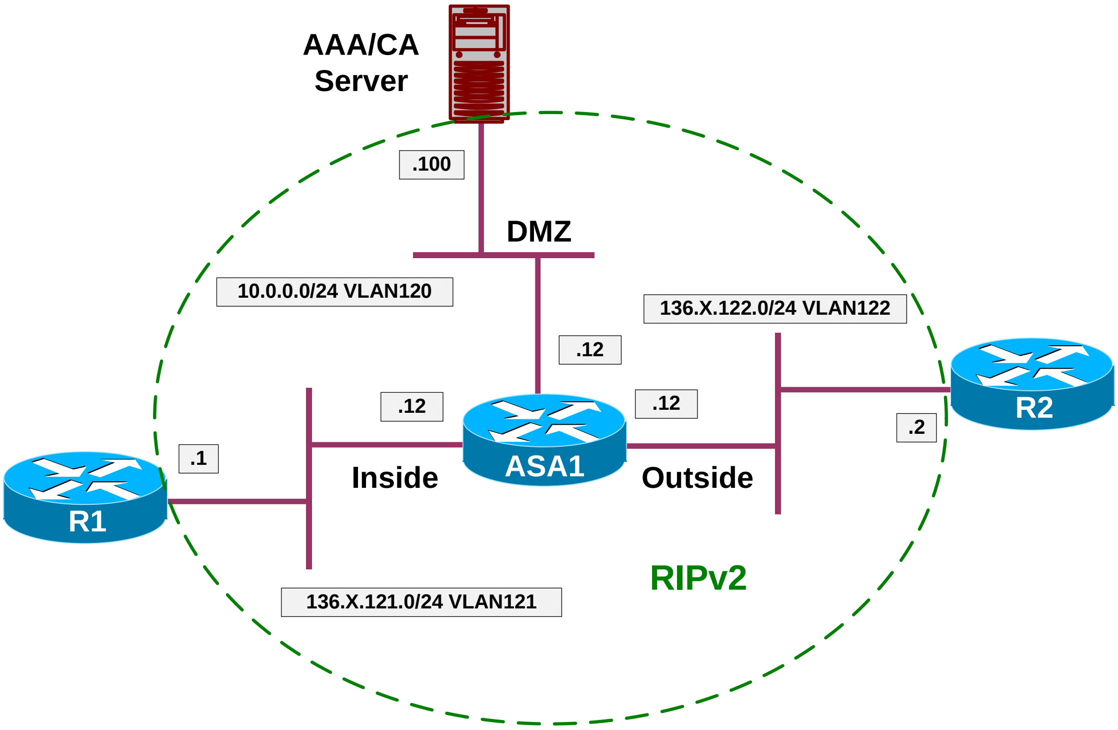
```
ASA1(config)# show x
3 in use, 3 most used
Global 136.1.122.200 Local 10.0.0.100
PAT Global 10.0.0.12(1024) Local 136.1.121.1(11006)
Global 136.1.122.100 Local 136.1.121.1
```

Further Reading

Applying NAT

Static NAT and PAT

Objective: Configure static IP and port mappings on the PIX/ASA firewall.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Make RIP passive on the outside interface of the ASA.
- Map DMZ ip address 10.0.0.100 to outside 136.1.122.100.
- Configure Static PAT such that telnet session to the outside interface are redirected to R1.
- Configure Static PAT such that DNS requests sent to the ASA inside interface are redirected to R2. Make sure inside hosts are translated when they go outside.
- Configure access-list required to satisfy the mentioned connectivity requirements.

Final Configuration

```
ASA1:
nat-control
!
! Prevent R2 from learning inside/DMZ IP addresses
!
router rip
```

```
 passive-interface outside
!
! DMZ host
!
static (dmz,outside) 136.1.122.100 10.0.0.100
!
! Telnet redirection
!
static (inside,outside) tcp interface 23 136.1.121.1 23
!
! DNS redirection
!
static (outside,inside) udp interface 53 136.1.122.2 53
!
! Translate inside->outside for DNS requests
!
nat (inside) 1 0 0
global (outside) 1 interface
!
! Access-list/Group to permit inbound connections
!
access-list OUTSIDE_IN extended permit ip any host 136.1.122.100
access-list OUTSIDE_IN extended permit tcp any host 136.1.122.12 eq telnet
!
access-group OUTSIDE_IN in interface outside
```

Verification

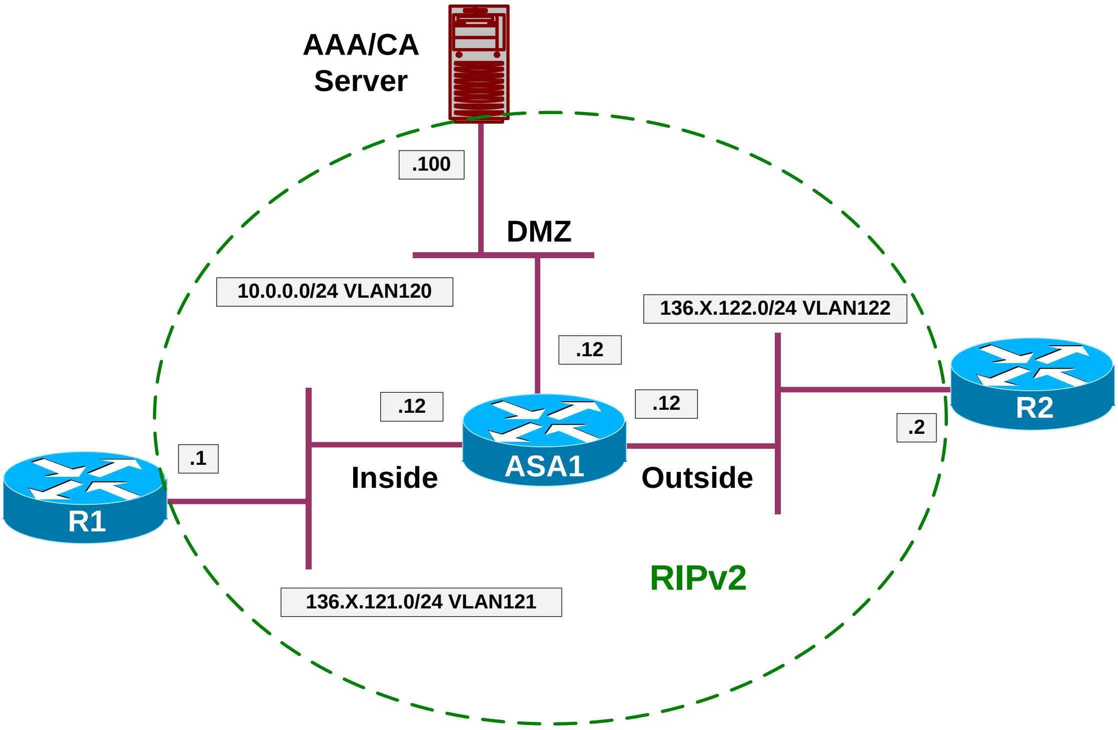
```
R2#telnet 136.1.122.100 80
Trying 136.1.122.100, 80 ... Open

R2#disc 1
Closing connection to 136.1.122.100 [confirm]

R2#telnet 136.1.122.12
Trying 136.1.122.12 ... Open


Password required, but none set

[Connection to 136.1.122.12 closed by foreign host]

R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip dns server
R2(config)#ip host TEST 136.1.122.2

R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip name-server 136.1.121.12
R1(config)#ip domain-lookup
R1#ping TEST
Translating "TEST"...domain server (136.1.121.12) [OK]

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

🕮 Further Reading

Applying NAT

Dynamic Policy NAT

Objective: Select outbound NAT pool based on policy.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Make RIP passive on the ASA outside interface.
- Telnet connections going outside should be PAT translated using the IP address 136.1.122.100
- ICMP packets going outside should be PAT translated using the IP address 136.1.122.101
- Use access-lists TELNET and ICMP to distinguish two types of traffic.
- Configure two NAT pools and set up policy NAT to reflect the requirements.
- Everything else should be PAT translated using the outside interface IP.

Final Configuration

```
ASA1:
nat-control
!
! Prevent R2 from learning inside/DMZ IP addresses
!
router rip
```

```
 passive-interface outside
!
access-list ICMP extended permit icmp any any
access-list TELNET extended permit tcp any any eq telnet
!
nat (inside) 1 access-list ICMP
nat (inside) 2 access-list TELNET
nat (inside) 3 0 0
!
global (outside) 1 136.1.122.100
global (outside) 2 136.1.122.101
global (outside) 3 interface
!
! Permit the returning ping responses
!
access-list OUTSIDE_IN extended permit icmp any any
access-group OUTSIDE_IN in interface outside
```

Verification

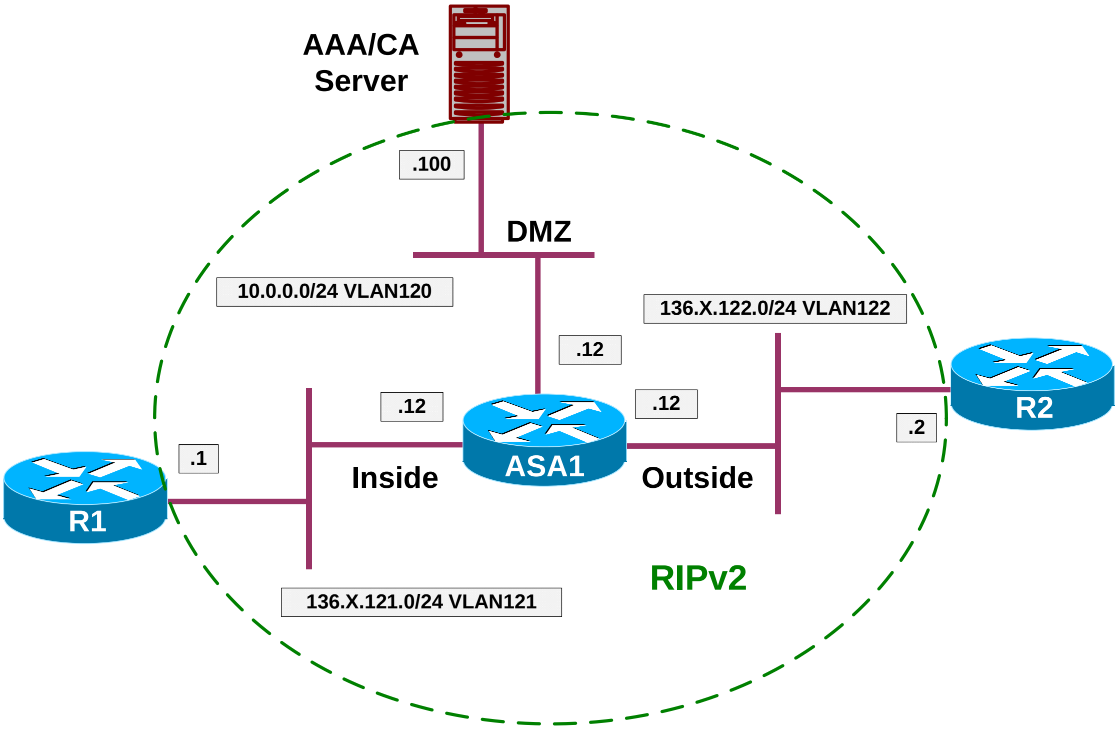
```
R1#telnet 136.1.122.2
Trying 136.1.122.2 ... Open


User Access Verification

Password:
R2>

ASA1(config)# show xlate
1 in use, 10 most used
PAT Global 136.1.122.101(1024) Local 136.1.121.1(11007)

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

R1#

ASA1# show x
5 in use, 10 most used
PAT Global 136.1.122.100(10) Local 136.1.121.1 ICMP id 1842
PAT Global 136.1.122.100(9) Local 136.1.121.1 ICMP id 1841
PAT Global 136.1.122.100(8) Local 136.1.121.1 ICMP id 1840
PAT Global 136.1.122.100(7) Local 136.1.121.1 ICMP id 1839
PAT Global 136.1.122.100(6) Local 136.1.121.1 ICMP id 1838
```

Further Reading

Policy NAT

Static Policy NAT and PAT

Objective: Implement policy decision within static PAT configuration.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Make RIP passive on the ASA outside interface.
- Create Loopback0 interface on R2 with ip address 150.X.2.2/24 and advertise it into RIP.
- Redirect telnet connections going from 136.X.122.0/24 to the firewall outside interface to R1.
- Redirect HTTP connections going from 150.X.2.0/24 to the firewall outside interface to AAA/CA server.
- Create and apply the necessary access-group to the outside interface.

Final Configuration

```
R2:
interface Loopback0
 ip address 150.1.2.2 255.255.255.0
!
router rip
 version 2
 no auto-summary
 network 150.1.0.0
```

```
ASA1:
nat-control
!
! Prevent R2 from learning inside/DMZ IP addresses
!
router rip
 passive-interface outside

!
! Access-list to match Telnet traffic from VLAN122
!
access-list VLAN122 ext per tcp h 136.1.121.1 eq 23 136.1.122.0 255.255.255.0

!
! Access-list to match HTTP traffic from R2’s Lo0
!
access-list LO0 ext permit tcp h 10.0.0.100 eq 80 150.1.2.0 255.255.255.0

!
! Static Policy PAT for VLAN122 Telnet
!
static (i,o) tcp interface 23 access-list VLAN122
!
! Static Policy PAT for LO0 HTTP
!
static (dmz,o) tcp interface 80 access-list LO0
!
! Outside ACL
!
access-list OUTSIDE_IN permit tcp any host 136.1.122.12 eq 80
access-list OUTSIDE_IN permit tcp any host 136.1.122.12 eq 23
!
access-group OUTSIDE_IN in interface outside
```

Verification

```
R2#telnet 136.1.122.12
Trying 136.1.122.12 ... Open


Password required, but none set

[Connection to 136.1.122.12 closed by foreign host]

R2#telnet 136.1.122.12 80 /source-interface loopback 0
Trying 136.1.122.12, 80 ... Open


HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
Date: Mon, 08 Jan 2007 12:10:00 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
</body></html>
[Connection to 136.1.122.12 closed by foreign host]

ASA1(config)# show xlate debug
```

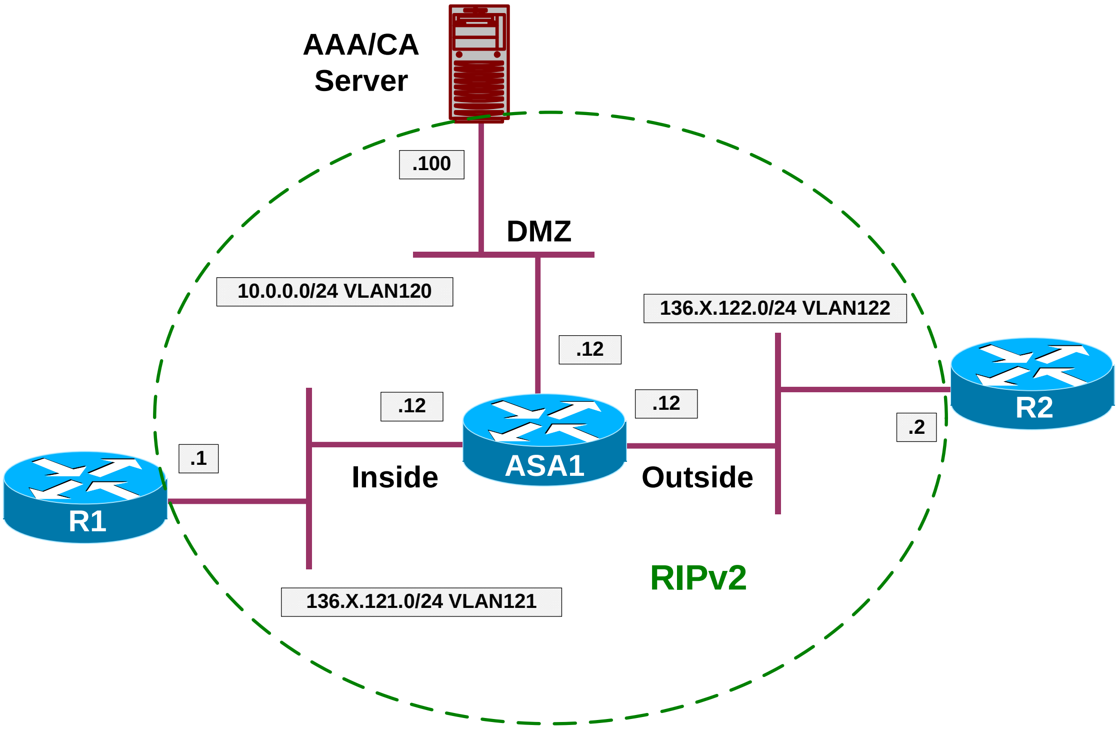
```
2 in use, 10 most used
Flags: D - DNS, d - dump, I - identity, i - dynamic, n - no random,
       r - portmap, s - static
TCP PAT from inside:136.1.121.1/23 to outside(VLAN122):136.1.122.12/23 flags sr
idle 0:00:24 timeout 0:00:00
TCP PAT from dmz:10.0.0.100/80 to outside(LO0):136.1.122.12/80 flags sr idle
0:00:17 timeout 0:00:00
```

Further Reading

Policy NAT

Identity NAT and NAT Exemption

Objective: Configure NAT preserving IP address or disable NAT translations based on policy.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Configure the firewall such that the network 136.X.121.0/24 is translated to itself.
- Configure the firewall such that no NAT is performed for the AAA/CA server 10.0.0.100.

Final Configuration

```
ASA1:
nat-control
!
! Identity NAT
!
nat (inside) 0 136.1.121.0 255.255.255.0

!
! Access-List to match traffic from AAA/CA server
!
access-list SERVER extended permit ip host 10.0.0.100 any
```

```
!
! NAT Exemption
!
nat (dmz) 0 access-list SERVER

!
! Access-List to perform some basic testing
!
access-list OUTSIDE_IN ext permit ip any any
access-group OUTSIDE_IN in interface outside
```

Verification

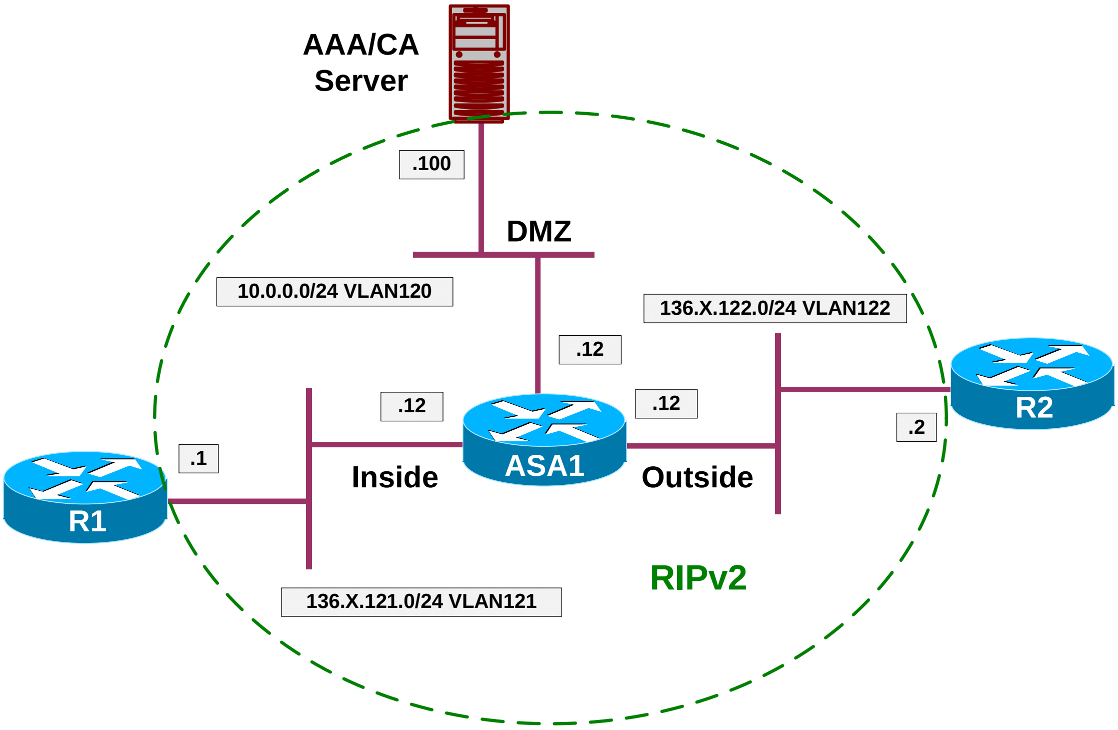
```
R2#ping 10.0.0.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
R1#

R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms
R2#

ASA1(config)# show x
1 in use, 10 most used
Global 136.1.121.1 Local 136.1.121.1
```

Further Reading

Bypassing NAT

Outside Dynamic NAT

Objective: Configure address translation for hosts from lower security level interface.



Directions

- Configure devices as per the scenario "PIX/ASA Firewall/Access Control" "Common Configuration".
- Enable nat-control on the firewall.
- Make RIP passive on the inside interface.
- Configure outside NAT rule to translate network 136.X.122.0/24 on outside interface.
- As soon as you configure dynamic outside NAT, you need to configure static NAT entry for every server on the low-security interface you wish to access from high-security interface.
- Also, any outside host, access the inside should have a NAT entry created in order to create inbound connection.
- Configure NAT pool on inside interface to use inside interface IP address.
- Configure static NAT mapping for AAA/CA server on the inside interface. Use IP address 136.X.121.100.
- Configure dynamic NAT necessary to access the AAA/CA server.

Final Configuration

```
ASA1:
nat-control
!
router rip
 passive-interface inside

!
! Outside NAT config
!
nat (outside) 1 136.1.122.0 255.255.255.0 outside
global (inside) 1 interface

!
! Fixup for DMZ server
!
static (dmz,inside) 136.1.121.100 10.0.0.100

!
! Dynamic NAT to access DMZ from inside.
! Required to reach the static mapping for AAA/CA server.
!
nat (inside) 1 0 0
global (dmz) 1 interface

!
! Access-List to perform some basic testing from outside
!
access-list OUTSIDE_IN ext permit ip any any
access-group OUTSIDE_IN in interface outside
```

Verification

```
R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
R2#

ASA1(config)# show x
7 in use, 10 most used
Global 136.1.121.100 Local 10.0.0.100
PAT Global 136.1.121.12(5) Local 136.1.122.2 ICMP id 3200
PAT Global 136.1.121.12(4) Local 136.1.122.2 ICMP id 3199
PAT Global 136.1.121.12(3) Local 136.1.122.2 ICMP id 3198
PAT Global 136.1.121.12(2) Local 136.1.122.2 ICMP id 3197
PAT Global 136.1.121.12(1) Local 136.1.122.2 ICMP id 3196

R1#ping 136.1.121.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.100, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

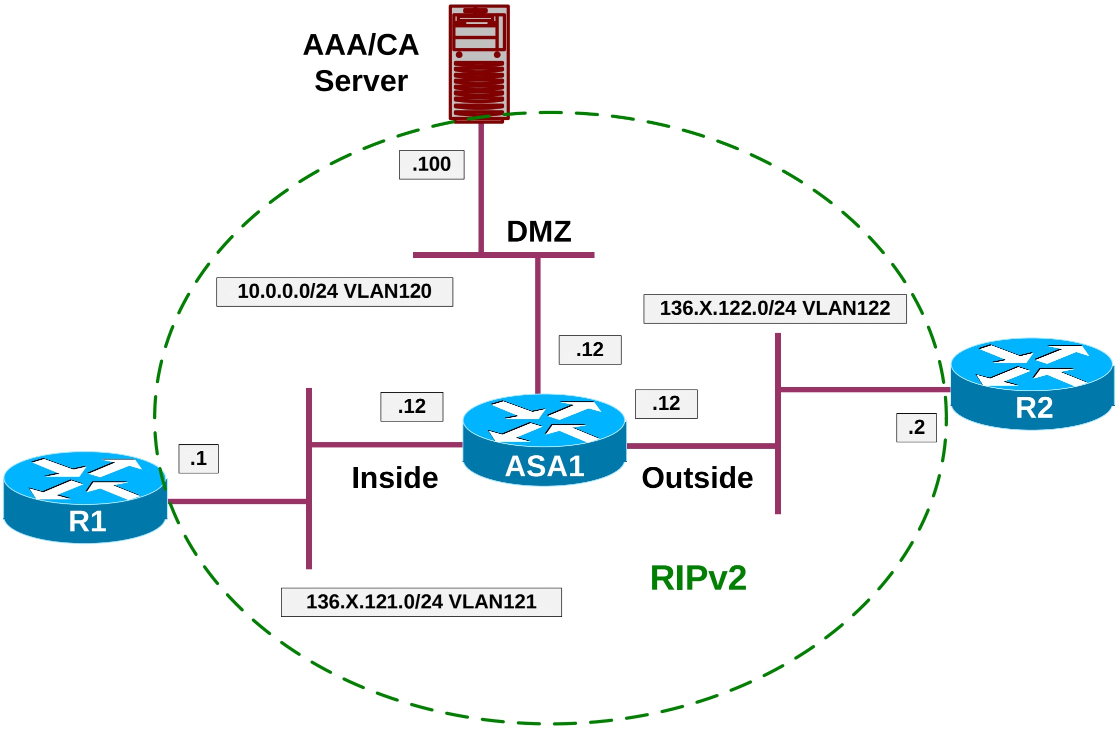
```
R1#telnet 136.1.121.100 80
Trying 136.1.121.100, 80 ... Open


HTTP/1.1 400 Bad Request
Server: Microsoft-IIS/5.0
Date: Mon, 08 Jan 2007 14:06:26 GMT
Content-Type: text/html
Content-Length: 87

<html><head><title>Error</title></head><body>The parameter is incorrect.
</body></html>
[Connection to 136.1.121.100 closed by foreign host]
```

Further Reading

Using Dynamic NAT and PAT

DNS Doctoring with Alias

Objective: Configure DNS doctoring for the server on DMZ.



Directions

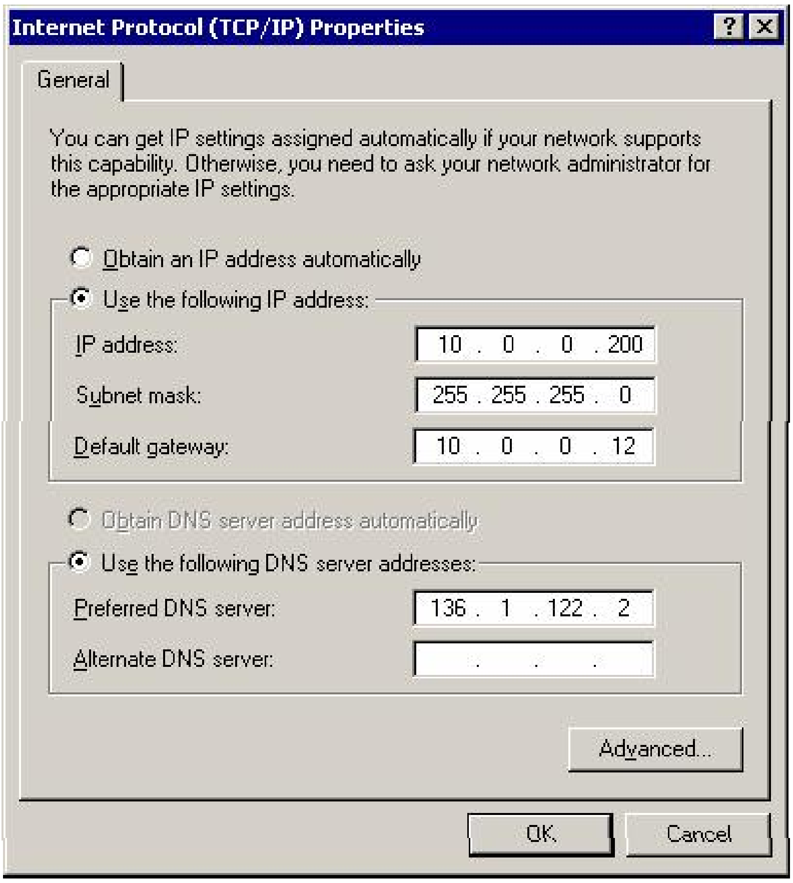
- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Configure R2 to act as DNS server. Configure host entry for name “WWW” with address 136.1.122.100.
- Therefore, DNS server reports an IP address on outside segment for AAA/CA server.
- Configure alias for DMZ interface, mapping 10.0.0.100 to 136.1.122.100.
- This way, DNS response will be fixed, to point at IP 10.0.0.100 for users in DMZ.

Final Configuration

```
ASA1:
nat-control

! DNS doctoring with alias
!
alias (dmz) 10.0.0.100 136.1.122.100 255.255.255.255

!
! The following NAT rules are required for DNS
! request to flow to R2
!
nat (dmz) 1 0 0
global (outside) 1 interface

R2:
ip dns server
ip host WWW 136.1.122.100
```

Verification

Configure Test PC in VLAN120:



You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

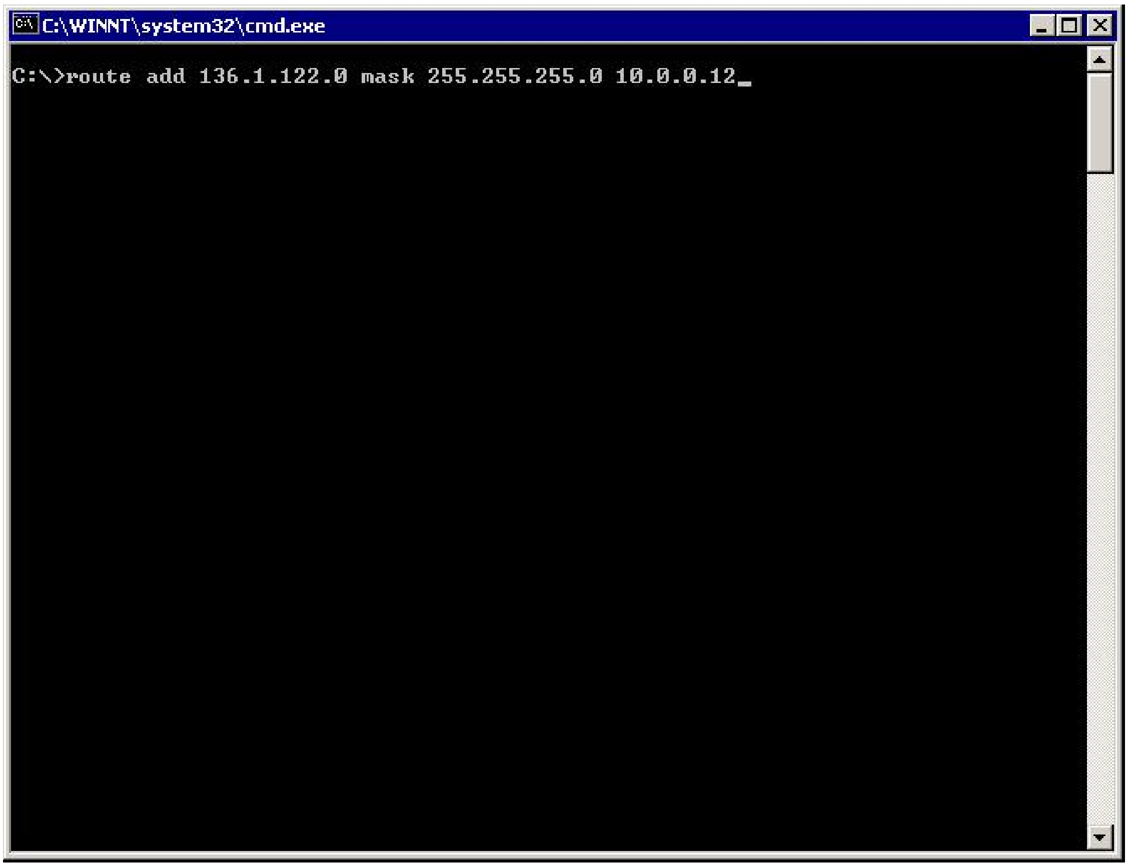
● Use the following IP address:

IP address:	10 . 0 . 0 . 200
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	10 . 0 . 0 . 12

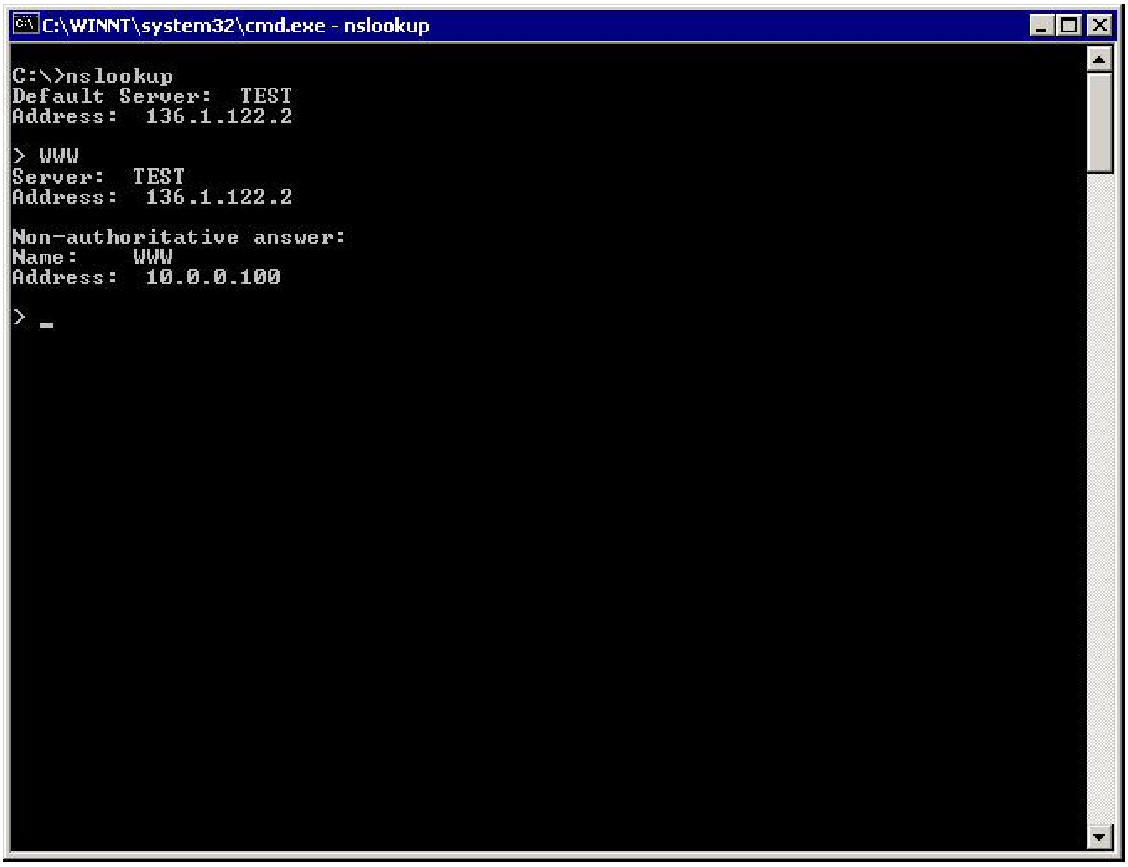
○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server:	136 . 1 . 122 . 2
Alternate DNS server:	. . .



```
C:\>route add 136.1.122.0 mask 255.255.255.0 10.0.0.12_
```



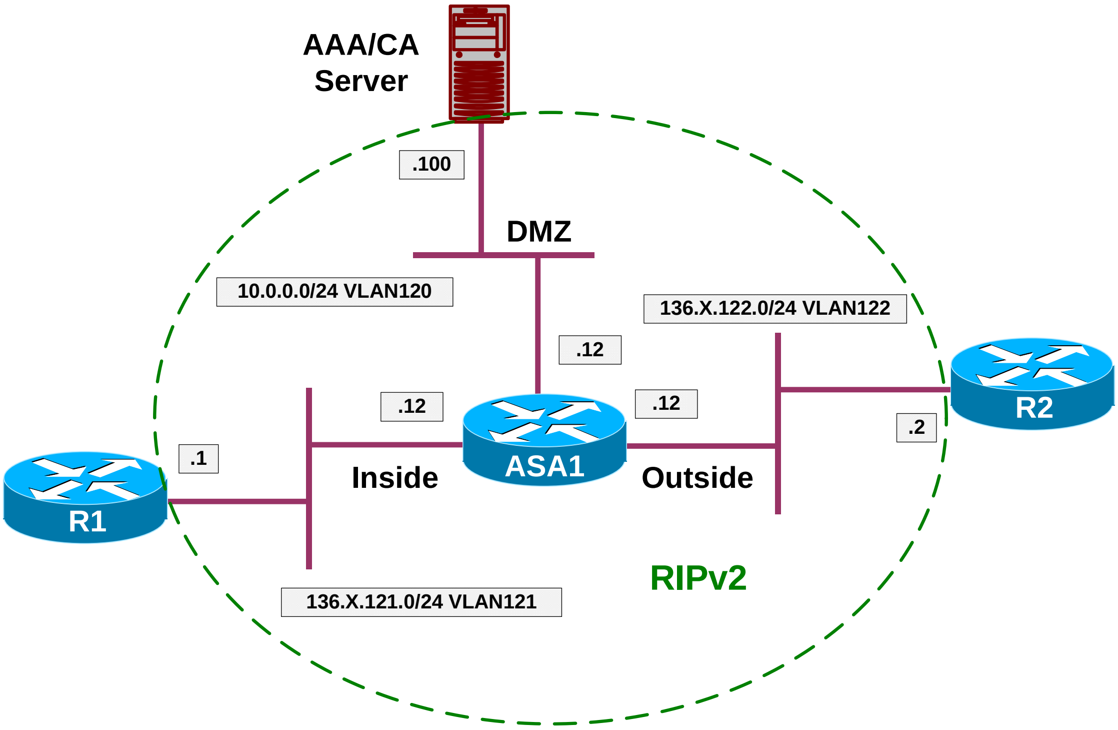
```
C:\>nslookup
Default Server:  TEST
Address:  136.1.122.2

> WWW
Server:  TEST
Address:  136.1.122.2

Non-authoritative answer:
Name:    WWW
Address:  10.0.0.100

> _
```

Further Reading

Command Reference: Alias

DNS Doctoring with Static

Objective: Configure DNS doctoring for the server on DMZ.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Enable nat-control on the firewall.
- Configure R2 to act as DNS server. Configure host entry for name “WWW” with address 136.1.122.100.
- Therefore, DNS server reports an IP address for AAA/CA server on the outside segment.
- Configure static NAT entry mapping 10.0.0.100 to 136.1.122.100. Use keyword “dns” to activate DNS rewrite for this translation rule.
- This way, DNS response will be fixed, to point at IP 10.0.0.100 for users in DMZ.

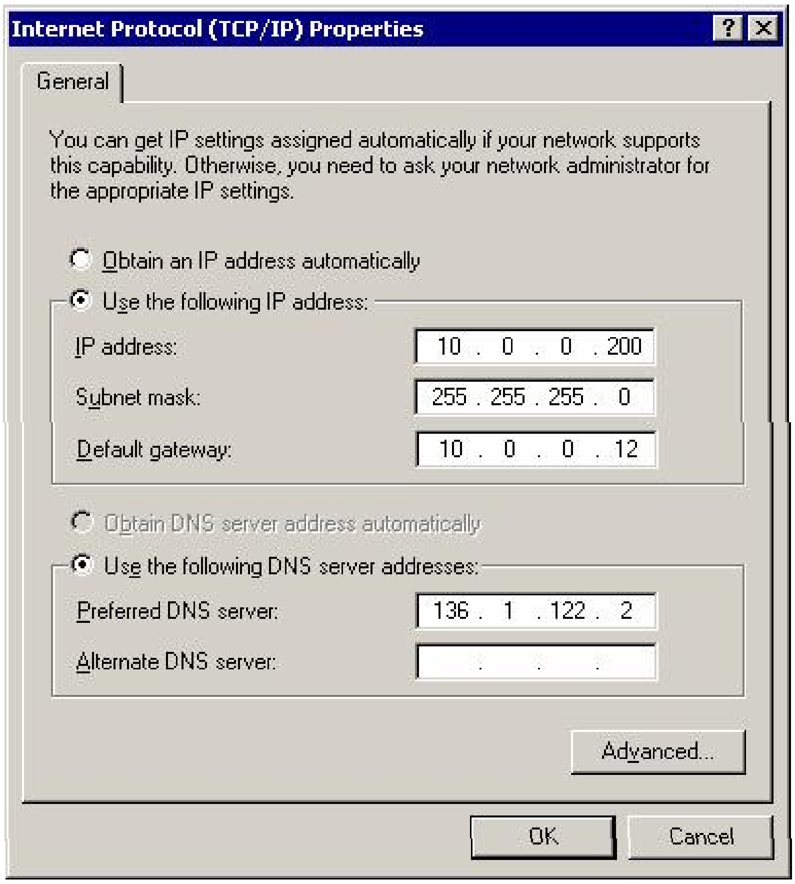
Final Configuration

ASA1:

```
nat-control
!
! DNS doctoring with "static"
!
static (dmz,outside) 136.1.122.100 10.0.0.100 dns
!
! The following NAT rules are required for DNS
! request to flow to R2
!
nat (dmz) 1 0 0
global (outside) 1 interface

R2:
ip dns server
ip host WWW 136.1.122.100
```

Verification

Configure Test PC in VLAN120:



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 10 . 0 . 0 . 200

Subnet mask: 255 . 255 . 255 . 0

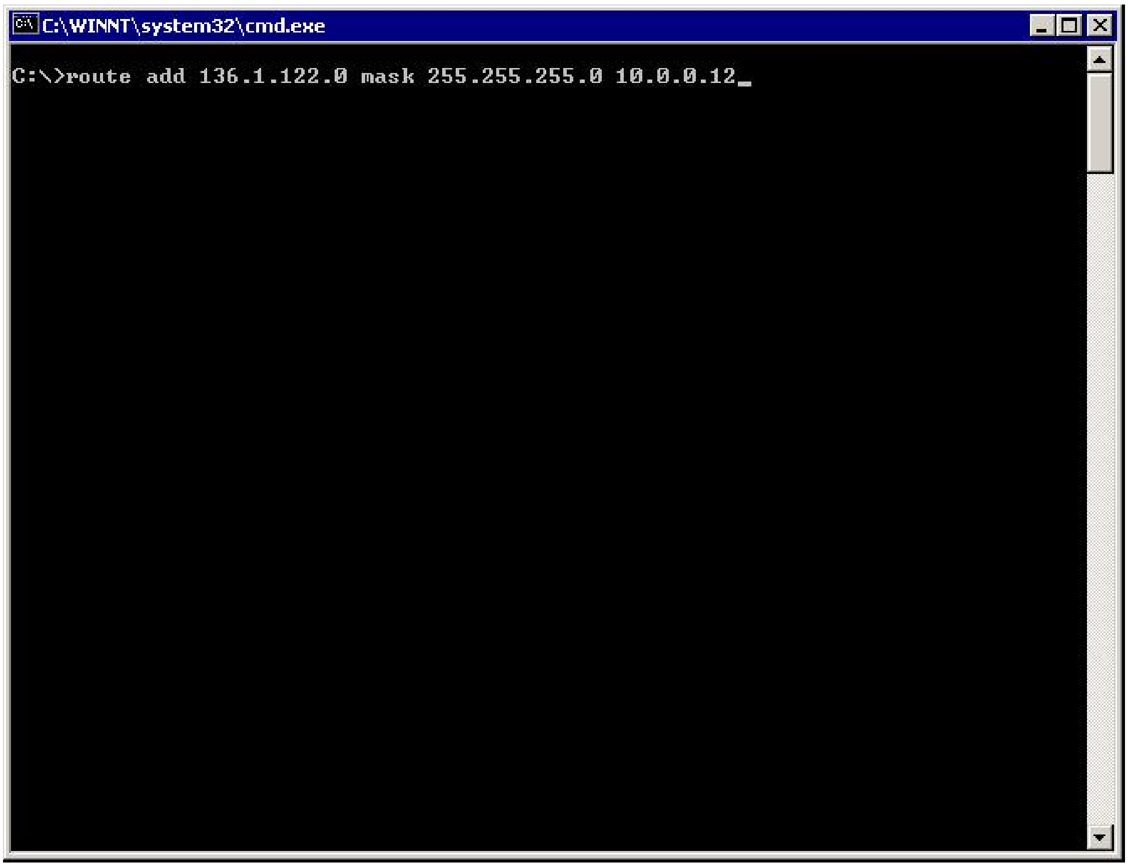
Default gateway: 10 . 0 . 0 . 12

○ Obtain DNS server address automatically

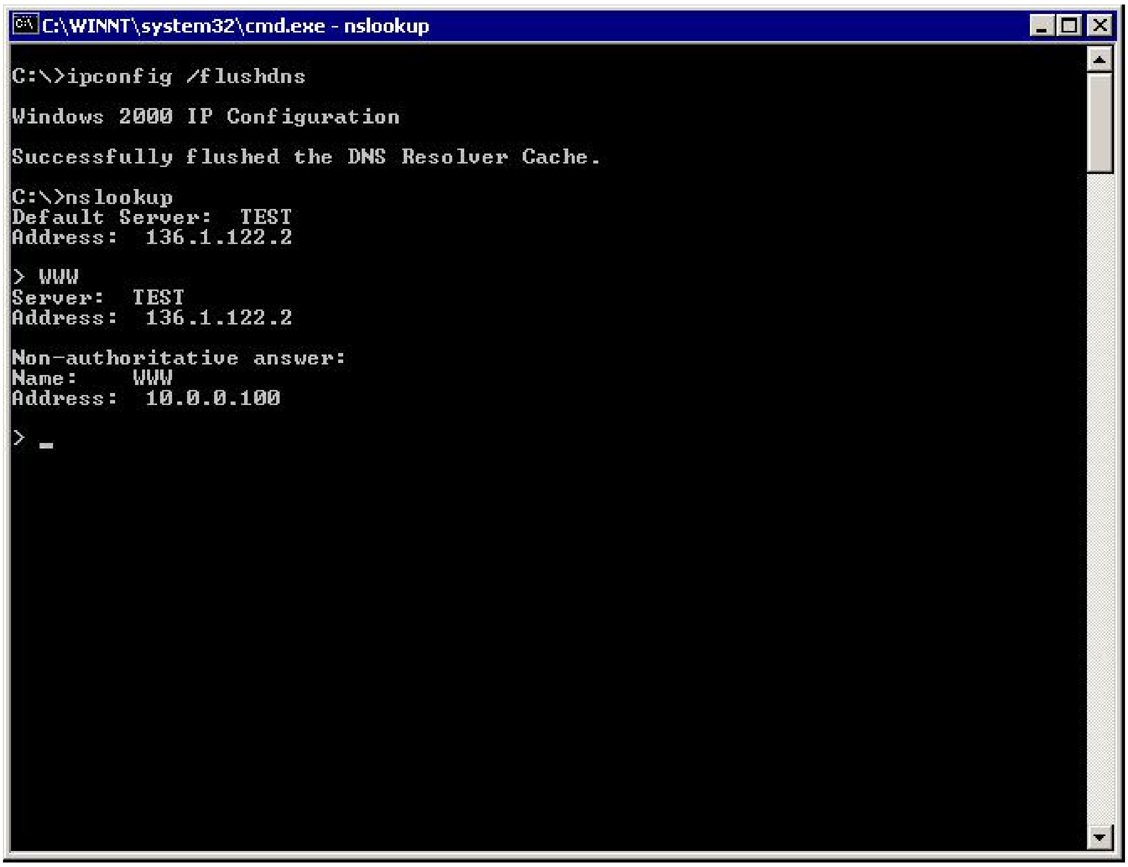
● Use the following DNS server addresses:

Preferred DNS server: 136 . 1 . 122 . 2

Alternate DNS server: . . .



```
C:\>route add 136.1.122.0 mask 255.255.255.0 10.0.0.12
```



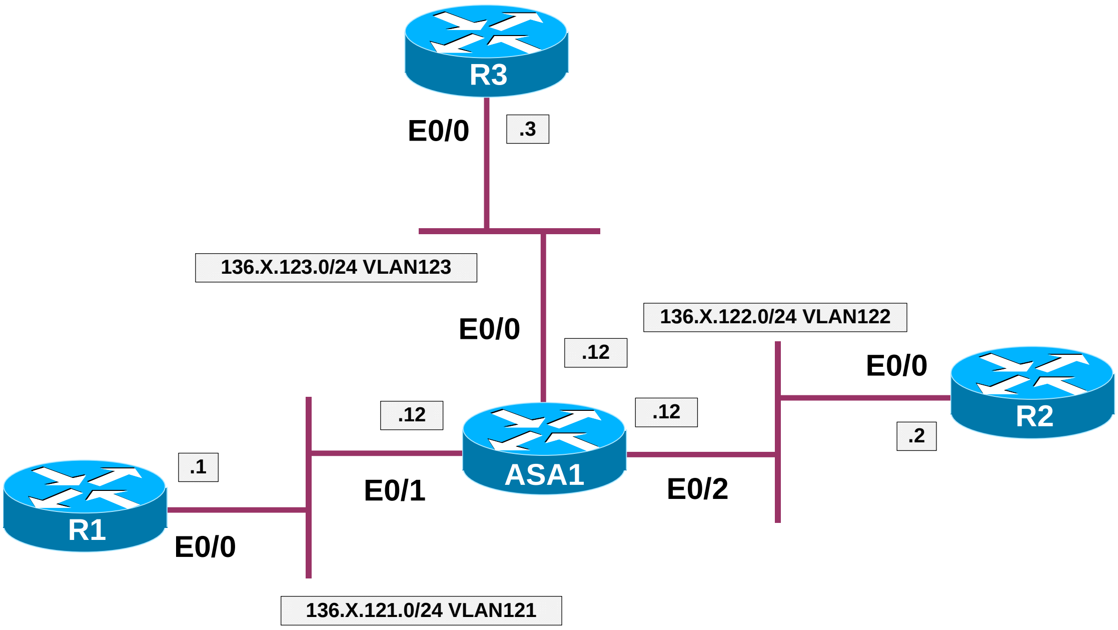
```
C:\>ipconfig /flushdns

Windows 2000 IP Configuration

Successfully flushed the DNS Resolver Cache.

C:\>nslookup
Default Server:  TEST
Address:  136.1.122.2

> www
Server:  TEST
Address:  136.1.122.2

Non-authoritative answer:
Name:    www
Address:  10.0.0.100

> _
```

Further Reading

[DNS and NAT](DNS and NAT)

Same-Security Traffic and NAT

Objective: Configure same-security level interface on the firewall.



Directions

- The goal is to observe how NAT works with same-security level interfaces.
- By default, you do not need to do NAT between same-security level interfaces, even if nat-control is enabled.
- However, you do need to configure NAT rules if you define dynamic NAT for either of the same-security level interfaces.
- Pre-configure as follows:
    - Create necessary VLANs on SW1 an SW2.
    - Configure the respective switchports to reflect the diagram topology.
    - Configure trunking as necessary between SW1 and SW2.
    - Configure the ASA interfaces E 0/1 and E 0/2 to be nameifs: “inside1” and “inside2” with security-level 100. Configure E0/0 as “outside” with default security level.
    - Configure IP addressing on all devices as per the diagram.
    - Configure default routes on R1 and R2 to point at the firewall. Configure default route on the firewall to point at R3.
    - Configure static routes for 136.X.122.0/24 and 136.X.121.0/24 on R3 to point at the firewall.
- Enable NAT control on the firewall and enalbe the same-security traffic to pass between interfaces.

- Enable inspection of ICMP traffic to permit pings across the firewall.
- Configure dynamic NAT rules to translate inside1/inside2 networks as they go outside.
- Configure dynamic NAT rule to translate inside1 as it goes to inside2.

Final Configuration

```
ASA1:
!
! Inspect ICMP globally
!
policy-map global_policy
 class inspection_default
   inspect icmp
!
! IP addressing
!
interface E 0/1
 nameif inside1
 security-level 100
 ip address 136.1.121.12 255.255.255.0
 no shutdown
!
interface E 0/2
 nameif inside2
 security-level 100
 ip address 136.1.122.12 255.255.255.0
 no shutdown
!
interface E 0/0
 nameif outside
 security-level 0
 ip address 136.1.123.12 255.255.255.0
 no shutdown
!
route outside 0 0 136.1.123.3
!
! Test you connectivity right after you apply these commands
!
same-security-traffic permit inter-interface
nat-control

!
! Configure the dynamic NAT rules for the inside->outside direction
! See how it affects same-security level interfaces interaction
!
nat (inside1) 1 0 0
global (outside) 1 interface

! To remedy the situation, you have to "pretend" that one of interfaces
! is "outside". Configure dynamic NAT from inside1->inside2
!
global (inside2) 1 interface

R1:
interface Ethernet 0/0
 no shut
 ip address 136.1.121.1 255.255.255.0
!
ip route 0.0.0.0 0.0.0.0 136.1.121.12
```

```
R2:
interface Ethernet 0/0
 no shut
 ip address 136.1.122.2 255.255.255.0
!
ip route 0.0.0.0 0.0.0.0 136.1.122.12

R3:
interface Ethernet 0/0
 no shut
 ip address 136.1.123.3 255.255.255.0
!
ip route 136.1.122.0 255.255.255.0 136.1.123.12
ip route 136.1.121.0 255.255.255.0 136.1.123.12

SW1 & SW2:
!
! create VLANs and configure trunk links
!
vlan 121,122,123
!
interface range Fa 0/21 - 23
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shut

SW1:
!
!  Configure switchports
!
interface Fa 0/1
 switchport host
 switchport access vlan 121
!
interface Fa 0/2
 switchport host
 switchport access vlan 122
!
interface Fa 0/3
 switchport host
 switchport access vlan 123
!
interface Fa 0/13
 switchport host
 switchport access vlan 121

SW2:
!
!  Configure switchports
!
interface Fa 0/12
 switchport host
 switchport access vlan 123
!
interface Fa 0/13
 switchport host
 switchport access vlan 122
```

Verification

1st case: "no nat-control" & "no same-security permit inter-interface"

```
R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/174/196 ms

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

2nd case: "no nat-control" & "same-security permit inter-interface"

```
R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/174/196 ms

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 105/177/197 ms
```

3rd case: "nat-control" & "same-security permit inter-interface"

```
R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

%ASA-3-305005: No translation group found for icmp src inside1:136.1.121.1 dst
outside:136.1.123.3 (type 8, code 0)

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/178/200 ms
```

4th case: "nat-control" & "same-security permit inter-int" (NAT inside->outside)

```
ASA1(config)# show running-config nat
nat (inside1) 1 0.0.0.0 0.0.0.0

ASA1(config)# show run glob
global (outside) 1 interface
```

```
R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/165/184 ms

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

%ASA-3-305006: portmap translation creation failed for icmp src
inside1:136.1.121.1 dst inside2:136.1.122.2 (type 8, code 0)

ASA1(config)# show x
5 in use, 5 most used
PAT Global 136.1.123.12(5) Local 136.1.121.1 ICMP id 5733
PAT Global 136.1.123.12(4) Local 136.1.121.1 ICMP id 5732
PAT Global 136.1.123.12(3) Local 136.1.121.1 ICMP id 5731
PAT Global 136.1.123.12(2) Local 136.1.121.1 ICMP id 5730
PAT Global 136.1.123.12(1) Local 136.1.121.1 ICMP id 5729
```

5th case: "nat-control" & "same-security permit inter-int" (NAT inside->outside) (NAT inside1->inside2):

```
R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/169/188 ms

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/169/192 ms

ASA1(config)# show x
10 in use, 10 most used
PAT Global 136.1.122.12(25) Local 136.1.121.1 ICMP id 1475
PAT Global 136.1.122.12(24) Local 136.1.121.1 ICMP id 1474
PAT Global 136.1.122.12(23) Local 136.1.121.1 ICMP id 1473
PAT Global 136.1.122.12(22) Local 136.1.121.1 ICMP id 1472
PAT Global 136.1.122.12(21) Local 136.1.121.1 ICMP id 1471
PAT Global 136.1.123.12(15) Local 136.1.121.1 ICMP id 4417
PAT Global 136.1.123.12(14) Local 136.1.121.1 ICMP id 4416
PAT Global 136.1.123.12(13) Local 136.1.121.1 ICMP id 4415
```

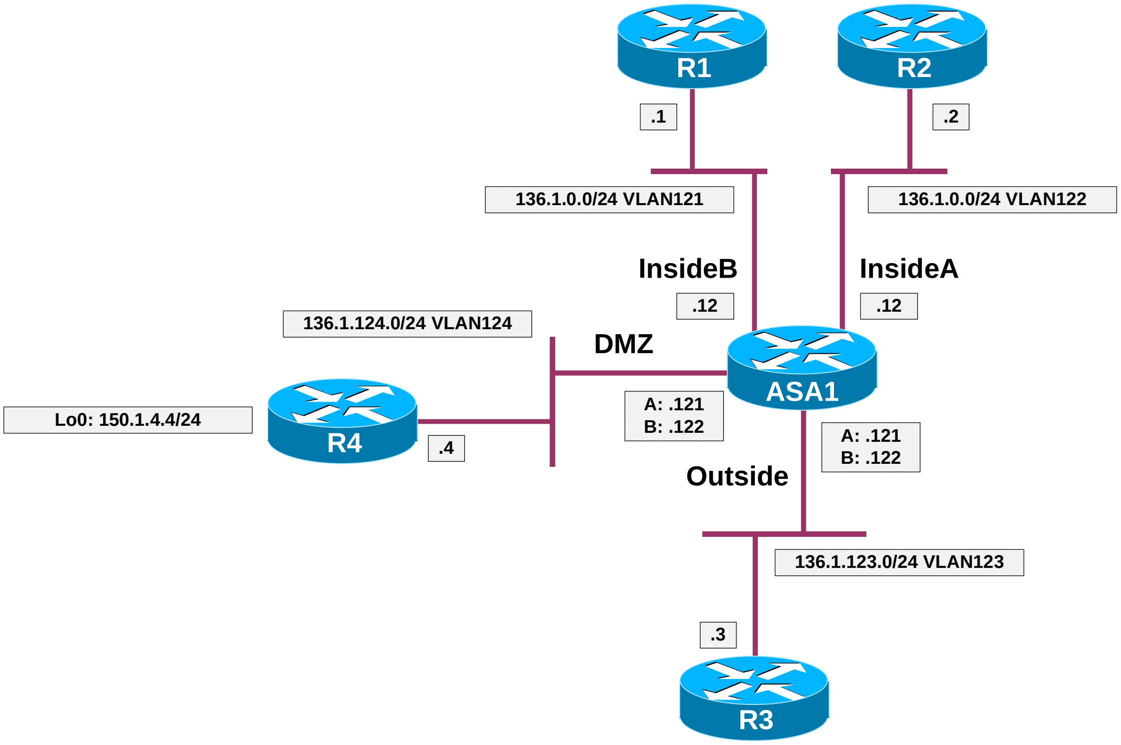
Further Reading

Configuring Interface Parameters
NAT and Same Security Level Interfaces

Advanced Firewall

Firewall Contexts Configuration

Objective: Create firewall contexts and allocate interfaces.



Directions

- The goal of this task is to create two virtual contexts, and configure shared interfaces. The NAT mappings will be used as tie-breakers for context selection.
- Pre-configuration:
  - Create VLANs 121,122,123,124. Assign the respective switchports to these VLANs.
  - Configure the switchport corresponding to the ASA1 inside interface as 802.1q trunk.
  - Configure IP addressing on the routers as per the diagram.
  - Configure static default routes at R1 and R2 to point at ASA1.
- Configure the ASA as follows:
- Enable multiple-context mode and reboot into system context.

- Residing in system context:

  - Configure hardware interfaces as follows:

    - Enable Ethernet 0/0, Ethernet 0/1, Ethernet 0/2.
    - Configure two subinterfaces namely Ethernet0/1.121 and Ethernet0/1.122 for VLANs 121 and 122 respectively on interface Ethernet 0/1.

  - Make sure you have context “admin” created, with config-url “disk0:/admin.cfg”. Enable it as admin-context. The admin context should be initialized before anything else could be configured.
  - Create context named “CustomerA” as follows:

    - Use config-url “disk0:/CustomerA.cfg”
    - Allocate interfaces Ethernet0/1.121, Ethernet0/0 and Ethernet0/2 to it. Map this interfaces to names “insideA”, “outside”, “dmz” respectively.

  - Create context named “CustomerB” as follows:

    - Use config-url “disk0:/CustomerA.cfg”
    - Allocate interfaces Ethernet0/1.122, Ethernet0/0 and Ethernet0/2 to it. Map this interfaces to names “insideB”, “outside”, “dmz” respectively.

- Change to context “CustomerA” and configure as follows:

  - Use config-url “disk0:/CustomerA.cfg”
  - Configure IP addressing as per the diagram, use security levels 100, 50, 0 for the “inside”, “dmz” and “outside” interfaces respectively. Configure “nameifs” respectively.
  - Configure static default route to R3.
  - Configute static route for 150.1.4.0/24 to R4.
  - Configure static PAT to translate 136.X.123.100 port 80 to 136.X.0.1 (R1) port 80.
  - Configure dynamic PAT for all inside users on “dmz” interface using interface IP address.
  - Configure dynamic PAT for all inside users on “outside” interface using interface IP address.
  - Create access-list OUTSIDE_IN as follows:

    - Permit TCP to 136.X.123.100 port 80.
    - Permit ICMP echo-reply packets.

  - Apply access-group OUTSIDE_IN to interface outside.

    - Create access-list DMZ_IN as follows:

        - Permit ICMP echo-reply packets.

    - Apply access-group DMZ_IN to interface “dmz”.

- Change to context “CustomerB” and configure as follows:

    - Configure IP addressing as per the diagram, use security levels 100, 50, 0 for the “inside”, “dmz” and “outside” interfaces respectively.
    - Configure static default route to R3.
    - Configure static route to 150.1.4.0/24 to R4.
    - Configure static PAT to translate 136.X.123.100 port 23 to 136.X.0.2 (R2) port 23.
    - Configure dynamic PAT for all inside users on “dmz” interface using interface IP address.
    - Configure dynamic PAT for all inside users on “outside” interface using interface IP address
    - Create access-list OUTSIDE_IN as follows:

        - Permit TCP to 136.X.123.101 port 23.
        - Permit ICMP echo-reply packets.

    - Apply access-group OUTSIDE_IN to interface outside.
    - Create access-list DMZ_IN as follows:

        - Permit ICMP echo-reply packets.

    - Apply access-group DMZ_IN to interface “dmz”.

Final Configuration

```
Pre-configuration:

SW1:
vlan 121,122,123,124
!
interface Fa0/1
 switchport host
 switchport access vlan 121
!
interface Fa0/2
 switchport host
 switchport access vlan 122
!
interface Fa0/3
 switchport host
 switchport access vlan 123
!
interface Fa0/4
 switchport host
 switchport access vlan 124
!
interface Fa0/13
 switchport trunk encaps dot1q
 switchport mode trunk
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

SW2:

```
vlan 121,122,123,124
!
interface Fa0/12
 switchport host
 switchport access vlan 123
!
interface Fa0/13
 switchport host
 switchport access vlan 124
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

R1:

```
interface E0/0
 ip address 136.1.0.1 255.255.255.0
 no shut
!
ip route 0.0.0.0 0.0.0.0 136.1.0.12
```

R2:

```
interface E0/0
 ip address 136.1.0.2 255.255.255.0
 no shut
!
ip route 0.0.0.0 0.0.0.0 136.1.0.12
```

R3:

```
interface E0/0
 ip address 136.1.123.3 255.255.255.0
 no shut
```

R4:

```
interface E0/0
 ip address 136.1.124.4 255.255.255.0
 no shut
!
interface Loopback0
 ip address 150.1.4.4 255.255.255.0
```

Virtual Contexts Configuration:

```
ASA1:
!
! Configure physical interfaces
!
interface Ethernet0/0
 no shutdown
!
interface Ethernet0/1
 no shutdown
!
interface Ethernet0/1.121
 vlan 121
 no shutdown
!
interface Ethernet0/1.122
 vlan 122
 no shutdown
!
interface Ethernet0/2
 no shutdown
!
! Identify admin context first
!
admin-context admin
context admin
  config-url disk0:/admin.cfg
!
! Create context CustomerA and add interface
! Map interfaces to their "inner" names
!
context CustomerA
  description == CustomerA
  allocate-interface Ethernet0/0 outside
  allocate-interface Ethernet0/1.121 insideA
  allocate-interface Ethernet0/2 dmz
  config-url disk0:/CustomerA.cfg
!
! Create context CustomerB
!
context CustomerB
  description == CustomerB
  allocate-interface Ethernet0/0 outside
  allocate-interface Ethernet0/1.122 insideB
  allocate-interface Ethernet0/2 dmz
  config-url disk0:/CustomerB.cfg
!
! Change to context CustomerA
!
changeto context CustomerA
!
! Configure sec-leves & IP addressing for interfaces
! IP addresses you use at shared interfaces should not overlap
! between contexts
!
interface insideA
 nameif inside
 security-level 100
 ip address 136.1.0.12 255.255.255.0
!
interface dmz
 nameif dmz
 security-level 50
 ip address 136.1.124.121 255.255.255.0
!
interface outside
 nameif outside
 security-level 0
 ip address 136.1.123.121 255.255.255.0
!
! Configure static PAT on outside interface, again no overlaps
! between contexts
!
static (inside,outside) tcp 136.1.123.100 www 136.1.0.1 www
!
! Dynamic PAT on shared interface
!
nat (inside) 1 0 0
global (dmz) 1 interface
global (outside) 1 interface
!
! Static routes since no dynamic routing is possible with contexts
!
route outside 0.0.0.0 0.0.0.0 136.1.123.3 1
route dmz 150.1.4.0 255.255.255.0 136.1.124.4 1
!
! Basic access-list to permit mapped service
!
access-list  OUTSIDE_IN permit tcp any host 136.1.123.100 eq 80
access-list  OUTSIDE_IN permit icmp any any echo-reply
access-group OUTSIDE_IN in interface outside
!
! Basic access-list to permit pings across shared interface
!
access-list DMZ_IN permit icmp any any echo-reply
access-group DMZ_IN in interface dmz

!
! Change to context "CustomerB" and configure similarly
!
changeto context CustomerB
!
 interface insideB
 nameif inside
 security-level 100
 ip address 136.1.0.12 255.255.255.0
!
interface dmz
 nameif dmz
 security-level 50
 ip address 136.1.124.122 255.255.255.0
!
interface outside
 nameif outside
 security-level 0
 ip address 136.1.123.122 255.255.255.0
!
! NAT configs
!
static (inside,outside) tcp 136.1.123.101 23 136.1.0.2 23
nat (inside) 1 0 0
global (dmz) 1 interface
global (outside) 1 interface
!
! Routing
!
route outside 0.0.0.0 0.0.0.0 136.1.123.3 1
route dmz 150.1.4.0 255.255.255.0 136.1.124.4 1
!
! Access-control
!
access-list  OUTSIDE_IN permit tcp any host 136.1.123.101 eq 23
access-list  OUTSIDE_IN permit icmp any any echo-reply
access-group OUTSIDE_IN in interface outside
!
access-list DMZ_IN permit icmp any any echo-reply
access-group DMZ_IN in interface dmz
```

Verification

Change to system context and verify confiruation:

```
ASA1# show context
Context Name      Class      Interfaces           URL
*admin            default                         disk0:/admin.cfg
 CustomerA        default    Ethernet0/0,Ethernet0/1.121, disk0:/CustomerA.cfg
                             Ethernet0/2
 CustomerB        default    Ethernet0/0,Ethernet0/1.122, disk0:/CustomerB.cfg
                             Ethernet0/2

Total active Security Contexts: 3

ASA1# show context detail
Context "system", is a system resource
  Config URL: startup-config
  Real Interfaces:
  Mapped Interfaces: Ethernet0/0, Ethernet0/1, Ethernet0/1.121-122,
     Ethernet0/2, Ethernet0/3, Management0/0
  Class: default, Flags: 0x00000819, ID: 0

Context "admin", has been created
  Config URL: disk0:/admin.cfg
  Real Interfaces:
  Mapped Interfaces:
  Class: default, Flags: 0x00000813, ID: 4

Context "CustomerA", has been created
  Desc: == CustomerA
  Config URL: disk0:/CustomerA.cfg
  Real Interfaces: Ethernet0/0, Ethernet0/1.121, Ethernet0/2
  Mapped Interfaces: dmz, insideA, outside
  Class: default, Flags: 0x00000811, ID: 5
```

```
Context "CustomerB", has been created
  Desc: == CustomerB
  Config URL: disk0:/CustomerB.cfg
  Real Interfaces: Ethernet0/0, Ethernet0/1.122, Ethernet0/2
  Mapped Interfaces: dmz, insideB, outside
  Class: default, Flags: 0x00000811, ID: 6

Context "null", is a system resource
  Config URL: ... null ...
  Real Interfaces:
  Mapped Interfaces:
  Class: default, Flags: 0x00000809, ID: 257
```

Change to context "CustomerA":

```
ASA1(config)# changeto context CustomerA
ASA1/CustomerA(config)#

R1#ping 150.1.4.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.1.4.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms
R1#

ASA1/CustomerA(config)# show x
6 in use, 6 most used
PAT Global 136.1.123.100(80) Local 136.1.0.1(80)
PAT Global 136.1.124.121(10) Local 136.1.0.1 ICMP id 5122
PAT Global 136.1.124.121(9) Local 136.1.0.1 ICMP id 5121
PAT Global 136.1.124.121(8) Local 136.1.0.1 ICMP id 5120
PAT Global 136.1.124.121(7) Local 136.1.0.1 ICMP id 5119
PAT Global 136.1.124.121(6) Local 136.1.0.1 ICMP id 5118

R3#ping 136.1.123.121

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.121, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R1#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/8 ms

ASA1/CustomerA# show x
6 in use, 6 most used
PAT Global 136.1.123.100(80) Local 136.1.0.1(80)
PAT Global 136.1.123.121(5) Local 136.1.0.1 ICMP id 5743
PAT Global 136.1.123.121(4) Local 136.1.0.1 ICMP id 5742
PAT Global 136.1.123.121(3) Local 136.1.0.1 ICMP id 5741
PAT Global 136.1.123.121(2) Local 136.1.0.1 ICMP id 5740
PAT Global 136.1.123.121(1) Local 136.1.0.1 ICMP id 5739
```

Test static mapping:

```
R3#telnet 136.1.123.100 80
Trying 136.1.123.100, 80 ... Open
```

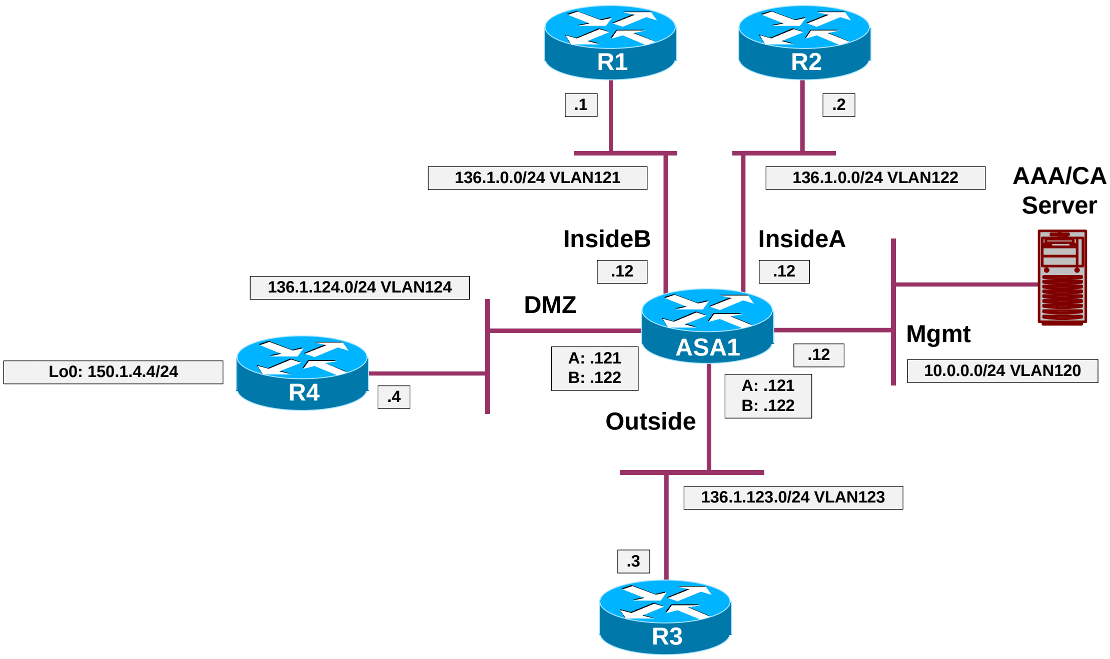
```
GET /
<HTML><HEAD><TITLE>R1 Home Page</TITLE></HEAD>
<BODY BGCOLOR=#FFFFFF><H1>Cisco Systems</H1><H2>Accessing Cisco 2610 "R1"</H2>

Verify context CustomerB now:

ASA1/CustomerA(config)# changeto context CustomerB
ASA1/CustomerB(config)#

R2#ping 150.1.4.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 150.1.4.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms
R2#

ASA1/CustomerB(config)# show x
6 in use, 6 most used
PAT Global 136.1.123.100(23) Local 136.1.0.1(23)
PAT Global 136.1.124.122(5) Local 136.1.0.2 ICMP id 5691
PAT Global 136.1.124.122(4) Local 136.1.0.2 ICMP id 5690
PAT Global 136.1.124.122(3) Local 136.1.0.2 ICMP id 5689
PAT Global 136.1.124.122(2) Local 136.1.0.2 ICMP id 5688
PAT Global 136.1.124.122(1) Local 136.1.0.2 ICMP id 5687

R2#ping 136.1.123.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/8 ms

ASA1/CustomerB# show x
6 in use, 6 most used
PAT Global 136.1.123.101(23) Local 136.1.0.2(23)
PAT Global 136.1.123.122(5) Local 136.1.0.2 ICMP id 9825
PAT Global 136.1.123.122(4) Local 136.1.0.2 ICMP id 9824
PAT Global 136.1.123.122(3) Local 136.1.0.2 ICMP id 9823
PAT Global 136.1.123.122(2) Local 136.1.0.2 ICMP id 9822
PAT Global 136.1.123.122(1) Local 136.1.0.2 ICMP id 9821

R3#ping 136.1.123.122

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.123.122, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms

R3#telnet 136.1.123.101
Trying 136.1.123.101 ... Open

R2>
```

🕮 Further Reading

Enabling Multiple Context Mode
Adding and Managing Security Contexts

Administrative Context and Resource Management

Objective: Configure device management with administrative context and control system resources allocation between contexts.



Directions

- Configure devices as per the scenario "PIX/ASA Firewall/Advanced Firewall" "Firewall Contexts Configuration".
- In order to manage the firewall configured in multiple contexts mode, you need to configure special "admin" context, which has the ability to access "system" context and configure the firewall.
- ASA firewall permits setting limits for certain system resources, and assigning these limits to firewall contexts (virtual firewalls).
- Create VLAN120 and configure the respective switchports.
- From system context do the following:
  - Allocate the Management interface to default context "admin", map it to name "management".
  - Create resource class named "Gold" as follows:
    - Limit number of Hosts and Xlates to 1000.
    - Limit number of Connections to 10000.
  - Create resource class named "Silver" as follows:
    - Limit number of Hosts and Xlates to 500.

        - Limit number of Connections to 5000.

    - Configure admin context to use class “default”.
    - Configure “CustomerA” context to use class “Gold”.
    - Configure “CustomerB” context to use class “Silver”

- Change to context “admin” and configure as follows:

    - Enable interface “management” and configure security-level 100 along with nameif “management”.
    - Make interface management-only and configure IP address 10.0.0.12/24.
    - Configure SSH/Telnet to accept connections from anywhere on management interface.
    - Configure SSH/Telnet to be authenticated locally.
    - Create local user named ADMIN with password CISCO.

Final Configuration

SW1:

```
vlan 120
!
interface Fa0/12
 switchport host
 switchport access vlan 120
!
interface Fa0/20
 switchport host
 switchport access vlan 120
```

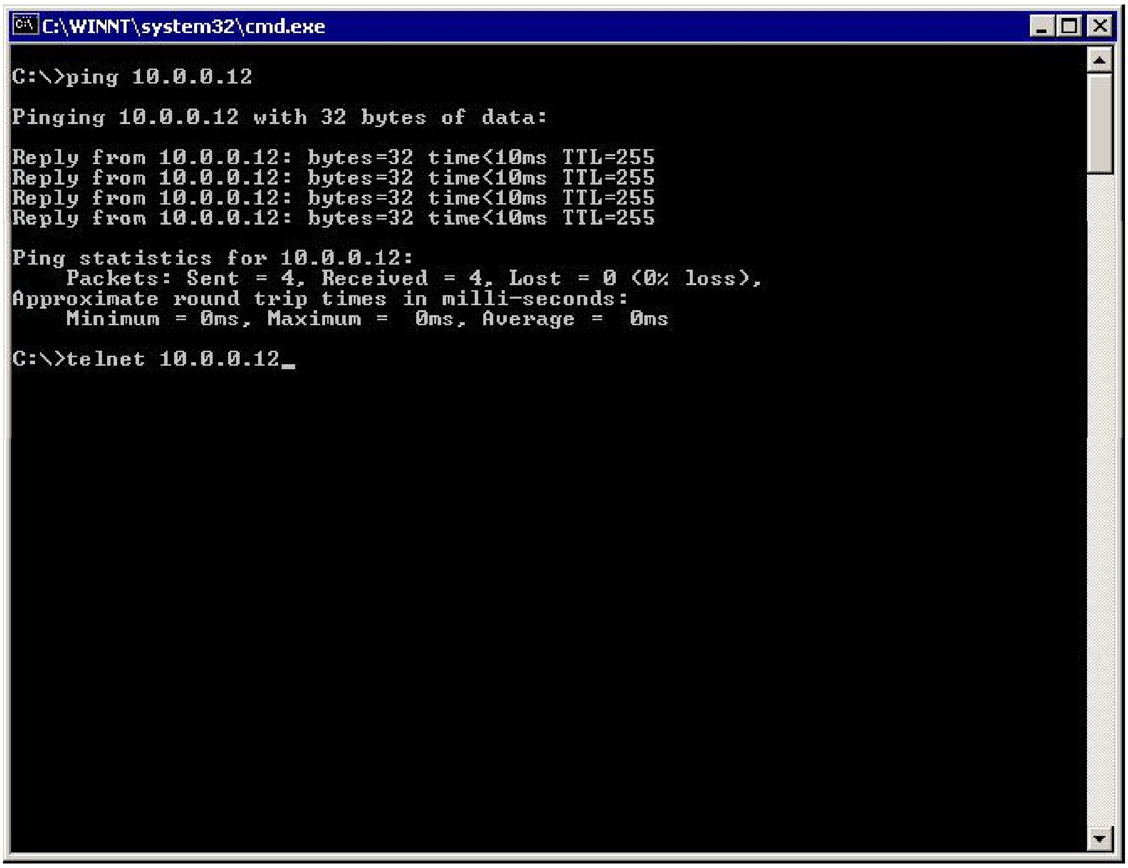
ASA1:

```
admin-context admin
context admin
  allocate-interface Management0/0 management
  config-url disk0:/admin.cfg
!
class Gold
  limit-resource Hosts 1000
  limit-resource Xlates 1000
  limit-resource Conns 10000
!
class Silver
  limit-resource Hosts 500
  limit-resource Conns 5000
  limit-resource Xlates 500
!
context admin
  member default
!
context CustomerA
  member Gold
!
context CustomerB
  member Silver
```

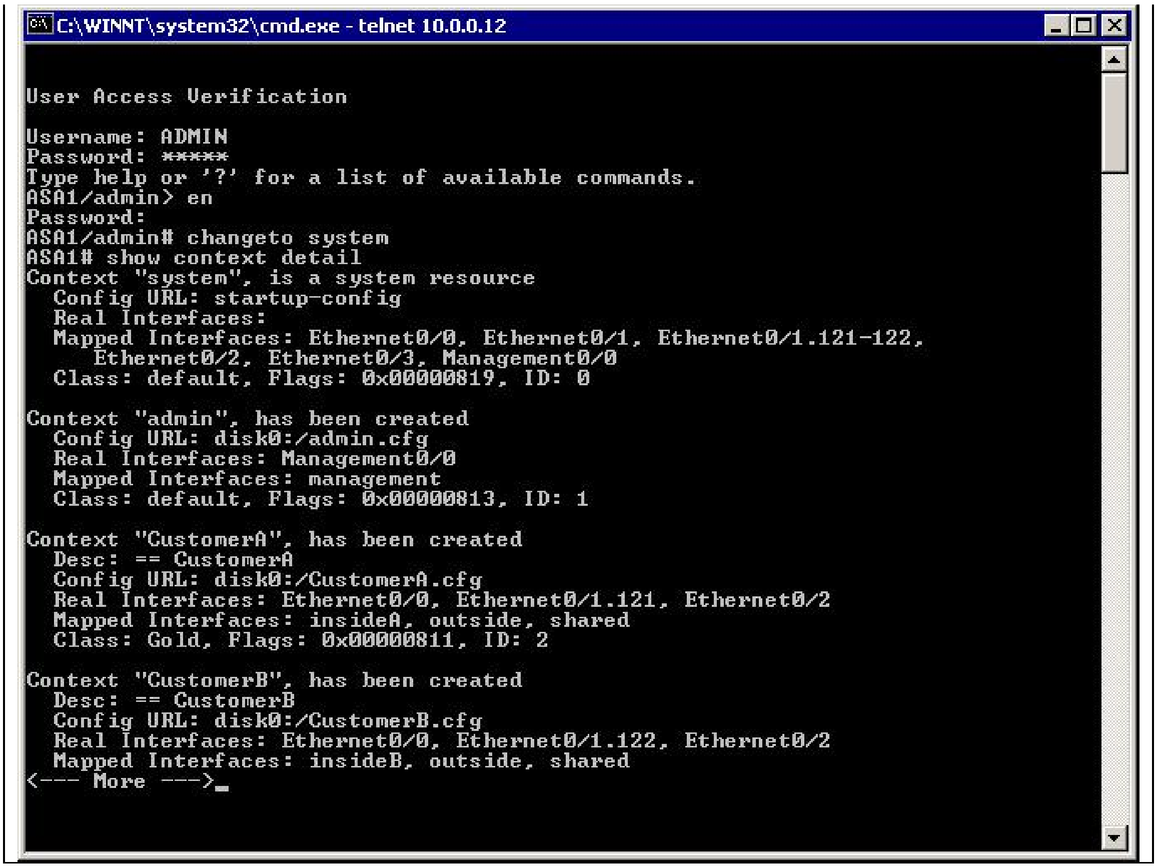
```
!
! Configure admin context
!
changeto context admin

interface management
 nameif management
 security-level 100
 ip address 10.0.0.12 255.255.255.0
 management-only
!
username ADMIN password CISCO encrypted
!
aaa authentication ssh console LOCAL
aaa authentication telnet console LOCAL
!
telnet 0 0 management
ssh 0 0 management
```

Verification

From AAA/CA server test connectivity to the ASA:



```
C:\>ping 10.0.0.12

Pinging 10.0.0.12 with 32 bytes of data:

Reply from 10.0.0.12: bytes=32 time<10ms TTL=255
Reply from 10.0.0.12: bytes=32 time<10ms TTL=255
Reply from 10.0.0.12: bytes=32 time<10ms TTL=255
Reply from 10.0.0.12: bytes=32 time<10ms TTL=255

Ping statistics for 10.0.0.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>telnet 10.0.0.12_
```



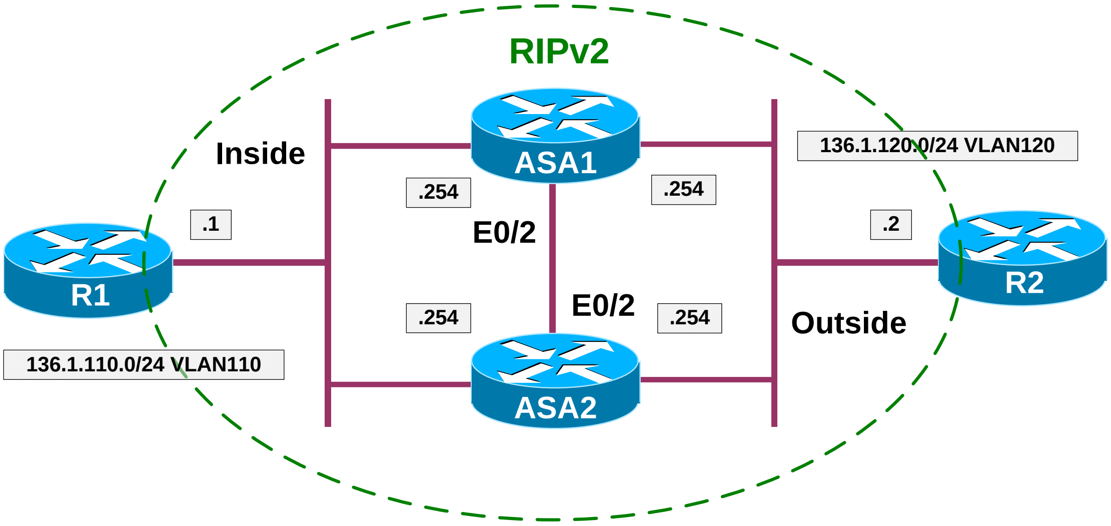
```
User Access Verification

Username: ADMIN
Password: *****
Type help or '?' for a list of available commands.
ASA1/admin> en
Password:
ASA1/admin# changeto system
ASA1# show context detail
Context "system", is a system resource
  Config URL: startup-config
  Real Interfaces:
  Mapped Interfaces: Ethernet0/0, Ethernet0/1, Ethernet0/1.121-122,
     Ethernet0/2, Ethernet0/3, Management0/0
  Class: default, Flags: 0x00000819, ID: 0

Context "admin", has been created
  Config URL: disk0:/admin.cfg
  Real Interfaces: Management0/0
  Mapped Interfaces: management
  Class: default, Flags: 0x00000813, ID: 1

Context "CustomerA", has been created
  Desc: == CustomerA
  Config URL: disk0:/CustomerA.cfg
  Real Interfaces: Ethernet0/0, Ethernet0/1.121, Ethernet0/2
  Mapped Interfaces: insideA, outside, shared
  Class: Gold, Flags: 0x00000811, ID: 2

Context "CustomerB", has been created
  Desc: == CustomerB
  Config URL: disk0:/CustomerB.cfg
  Real Interfaces: Ethernet0/0, Ethernet0/1.122, Ethernet0/2
  Mapped Interfaces: insideB, outside, shared
<--- More --->
```

Further Reading

Enabling Multiple Context Mode
Adding and Managing Security Contexts

Active/Standby Stateful Failover with Failover Interface

Objective: Configure active/standby stateful failover.



Directions

- Pre-configure devices as follows:
  - Create VLANs 110 and 120, and configure the respective switchports.
  - Configure IP addressing on R1 and R2 as per the diagram.

- Configure the ASA1 unit as follows:
  - Use hostname “ASA”.
  - Configure inside and outside interface IP addressing as per the diagram.
  - Configure RIP as routing protocol.
  - Configure PAT for inside hosts going outside, using the outside interface IP address.
  - Configure access-list OUTSIDE_IN to permit ICMP echo-reply packets.
  - Apply access-group OUTSIDE_IN to interface outside.

- Configure failover on the ASA1 as follows:
  - Enable interface Ethernet0/2.
  - Configure unit as primary.
  - Enable LAN-based failover, using interface Ethernet 0/2 and name “failover” for interface.
  - Configure stateful failover link using the same interface.

  - Configure IP addressing for failover link, using IP address 100.100.100.12 for primary and 100.100.100.13 for secondary unit, along with netmask 255.255.255.0.
  - Enable failover, and configure monitoring for interfaces “inside” and “outside”.
  - Set polling and hold timers for interface/unit polling to minimum values.
  - Configure interface-policy to failover upon single interface failure.

- Configure failover on the ASA2 unit as follows:

  - Designate unit as secondary.
  - Enable interface Ethernet 0/2.
  - Enable LAN-based failover, using interface Ethernet 0/2 and name “failover” for interface.
  - Configure stateful failover link using the same interface.
  - Configure IP addressing for failover link, using IP address 100.100.100.12 for primary and 100.100.100.13 for secondary unit, along with netmask 255.255.255.0.
  - Enable failover, the primary unit should replicate it’s configuration.

Final Configuration

Pre-Configuration:

SW1:

```
vlan 110,120,999
!
interface Fa0/1
 switchport host
 switchport access vlan 110
!
interface Fa0/2
 switchport host
 switchport access vlan 120
!
interface Fa0/13
 switchport host
 switchport access vlan 110
!
interface Fa0/15
 switchport host
 switchport access vlan 110
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

SW2:

```
vlan 110,120,999
!
```

```
interface Fa0/12
 switchport host
 switchport access vlan 120
!
interface Fa0/13
 switchport host
 switchport access vlan 999
!
interface Fa0/14
 switchport host
 switchport access vlan 120
!
interface Fa0/15
 switchport host
 switchport access vlan 999
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

R1:

```
interface Ethernet 0/0
 no shut
 ip address 136.1.110.1 255.255.255.0
!
router rip
 ver 2
 no auto
 network 136.1.0.0
```

R2:

```
interface Ethernet 0/0
 no shut
 ip address 136.1.120.2 255.255.255.0
!
router rip
 ver 2
 no auto
 network 136.1.0.0
```

ASA1:

```
!
! Configure  basic interface settings
!
interface Ethernet0/1
  nameif inside
  ip address 136.1.110.254 255.255.255.0
  no shutdown
!
interface Ethernet0/0
  nameif outside
  ip address 136.1.120.254 255.255.255.0
  no shutdown
!
router rip
  version 2
  no auto-summary
  network 136.1.0.0
!
nat-control
nat (inside) 1 0 0
global (outside) 1 interface

!
! Access-control
!
access-list OUTSIDE_IN permit icmp any any echo-reply
access-group OUTSIDE_IN in interface outside

!
! Enable the failover interface
!
interface Ethernet0/2
no shut

!
! Configure failover settings
!
failover lan unit primary
failover lan interface failover Ethernet0/2
failover link failover Ethernet0/2
failover int ip failover 100.100.100.12 255.255.255.0 st 100.100.100.13
failover

!
! Configure interface monitoring and failover policy
!
monitor-interface outside
monitor-interface inside

!
! Unit & interface polling
!
failover polltime unit msec 200 holdtime msec 800
failover polltime interface msec 500 holdtime 5

!
failover interface-policy 1

ASA2:
interface Ethernet0/2
no shut
!
failover lan unit secondary
failover lan interface failover Ethernet0/2
failover link failover Ethernet0/2
failover int ip failover 100.100.100.12 255.255.255.0 st 100.100.100.13
failover
```

Verification

Check the primary unit:

```
ASA(config)# show failover interface
        interface failover Ethernet0/2
                System IP Address: 100.100.100.12 255.255.255.0
                My IP Address    : 100.100.100.12
                Other IP Address : 100.100.100.13

ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 200 milliseconds, holdtime 800 milliseconds
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Last Failover at: 05:58:31 UTC Feb 5 2007
        This host: Primary - Active
                Active time: 3166 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (136.1.110.254): Normal (Waiting)
                  Interface outside (136.1.120.254): Normal (Waiting)
                slot 1: empty
        Other host: Secondary - Standby Ready
                Active time: 331 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (0.0.0.0): Normal (Waiting)
                  Interface outside (0.0.0.0): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         335        0          331        0
        sys cmd         332        0          332        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         4          0          0          0
        Xlate_Timeout   0          0          0          0
        VPN IKE upd     0          0          0          0
        VPN IPSEC upd   0          0          0          0
        VPN CTCP upd    0          0          0          0
        VPN SDI upd     0          0          0          0
        VPN DHCP upd    0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       2       422
        Xmit Q:         0       2       2744
```

Check the standby unit:

```
ASA(config)# show failover
Failover On
Failover unit Secondary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 200 milliseconds, holdtime 800 milliseconds
```

```
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Last Failover at: 05:58:29 UTC Feb 5 2007
        This host: Secondary - Standby Ready
                Active time: 331 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (0.0.0.0): Normal (Waiting)
                  Interface outside (0.0.0.0): Normal (Waiting)
                slot 1: empty
        Other host: Primary - Active
                Active time: 3219 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (136.1.110.254): Normal (Waiting)
                  Interface outside (136.1.120.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         338        0          342        0
        sys cmd         339        0          339        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         0          0          4          0
        Xlate_Timeout   0          0          0          0
        VPN IKE upd     0          0          0          0
        VPN IPSEC upd   0          0          0          0
        VPN CTCP upd    0          0          0          0
        VPN SDI upd     0          0          0          0
        VPN DHCP upd    0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       2805
        Xmit Q:         0       1       429
```

Initiate a session from inside to outside:

```
R1#telnet 136.1.120.2
Trying 136.1.120.2 ... Open

R2>show clock
*06:26:10.444 UTC Fri Mar 5 1993
```

Introduce failure by shutting down switchport for outside interface:

```
SW2#conf t
SW2(config)#int fa 0/12
SW2(config-if)#shut
SW2(config-if)#
```

Check the primary unit:

```
Rack1AS>12
[Resuming connection 12 to asa1 ... ]

        Switching to Standby

ASA(config)#
```

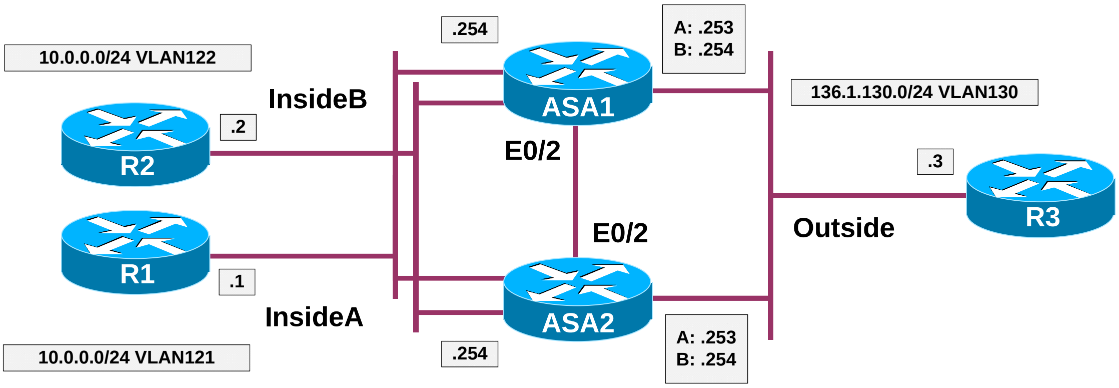
```
Check our connection:

Rack1AS>1
[Resuming connection 1 to r1 ... ]

R2>show clock
*06:26:33.706 UTC Fri Mar 5 1993

ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 200 milliseconds, holdtime 800 milliseconds
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Last Failover at: 06:15:49 UTC Feb 5 2007
        This host: Primary - Failed
                Active time: 3883 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (0.0.0.0): Normal (Waiting)
                  Interface outside (0.0.0.0): No Link (Waiting)
                slot 1: empty
        Other host: Secondary - Active
                Active time: 540 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  Interface inside (136.1.110.254): Normal (Waiting)
                  Interface outside (136.1.120.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         459        0          445        0
        sys cmd         443        0          443        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        8          0          2          0
        UDP conn        0          0          0          0
        ARP tbl         8          0          0          0
        Xlate_Timeout   0          0          0          0
        VPN IKE upd     0          0          0          0
        VPN IPSEC upd   0          0          0          0
        VPN CTCP upd    0          0          0          0
        VPN SDI upd     0          0          0          0
        VPN DHCP upd    0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       2       715
        Xmit Q:         0       2       3541
```

Further Reading

Configuring Failover

Active Stateful Failover with Failover Interface

Objective: Configure active/active failover with two firewall contexts.



Directions

- The goal of this task is to create two virtual contexts, and configure each ASA unit to be active unit for a context, and standby for the other.
- The key idea of Active/Active failover is that one 'physical' firewall unit can act as primary device for a group of contexts (virtual firewalls) and secondary for another group.
- Each firewall unit may have priority configured for a group, along with preemption property. As soon as firewall detects a unit with a higher priority for a group, and preemption is enabled – the higher priority firewall takes the active role.
- Pre-configuration:
  - Create VLANs 121,122,123. Assign the respective switchports to these VLANs.
  - Configure the switchport corresponding to the ASA1/ASA2 inside interfaces as 802.1q trunks.
  - Configure IP addressing on routers as per the diagram.
  - Configure static default routes at R1 and R2 to point at 10.0.0.254.
- Configure the ASA1 for virtual contexts as follows:
  - Enable multiple-context mode and reboot into system context.
  - Residing in system context perform the following:
    - Configure hardware interfaces as follows:
      - Enable Ethernet 0/0, Ethernet 0/1.
      - Configure two subinterfaces namely Ethernet0/1.121 and Ethernet0/1.122 for VLANs 121 and 122

respectively on interface Ethernet 0/1.

- Make sure you have context "admin" created, with config-url "disk0:/admin.cfg". Enable it as admin-context. The admin context should be initialized before anything else could be configured.

- Create context named "CustomerA" as follows:

  - Use config-url "disk0:/CustomerA.cfg"
  - Allocate interfaces Ethernet0/1.121, Ethernet0/0 to this context.

- Create context named "CustomerB" as follows:

  - Use config-url "disk0:/CustomerB.cfg"
  - Allocate interfaces Ethernet0/1.122, Ethernet0/0 to this context.

- Configure the ASA1 to be the primary failover unit as follows:

  - Enable interface Ethernet0/2.
  - Configure unit as failover primary.
  - Enable LAN-based failover, using interface Ethernet 0/2 and name "failover" for interface.
  - Configure stateful failover link using the same interface.
  - Configure IP addressing for failover link, using IP address 100.100.100.12 for primary and 100.100.100.13 for secondary unit, along with netmask 255.255.255.0.
  - Create failover group 1, and configure the ASA1 as primary for the group. This group should preempt.
  - Create failover group 2, and configure the ASA1 as secondary for the group. This group should preempt.
  - Assign context "CustomerA" to failover group 1 and context "Customer B" to failover group 2.
  - Enable failover.

- Configure failover on the ASA2 unit as follows:

  - Reboot unit into multiple context mode.
  - Designate unit as failover secondary.
  - Enable interface Ethernet 0/2.
  - Enable LAN-based failover, using interface Ethernet 0/2 and name "failover" for interface.
  - Configure stateful failover link using the same interface.

- o Configure IP addressing for failover link, using IP address 100.100.100.12 for primary and 100.100.100.13 for secondary unit, along with netmask 255.255.255.0.
- o Enable failover: the primary unit should replicate it's configuration to the secondary.

Final Configuration

Pre-Configuration:

SW1:

```
vlan 121,122,130
!
interface Fa0/1
 switchport host
 switchport access vlan 121
!
interface Fa0/2
 switchport host
 switchport access vlan 122
!
interface Fa0/3
 switchport host
 switchport access vlan 130
!
interface Fa0/13
 desc == ASA1 Inside
 switchport trunk encaps dot1q
 switchport mode trunk
!
interface Fa0/15
 desc == ASA2 Inside
 switchport trunk encaps dot1q
 switchport mode trunk
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

SW2:

```
vlan 121,122,130
!
interface Fa0/12
 desc == ASA1 Outside
 switchport host
 switchport access vlan 130
!
interface Fa0/14
 desc == ASA2 Outside
 switchport host
 switchport access vlan 130
!
interface Fa0/13
 desc == ASA1 DMZ
 switchport host
 switchport access vlan 999
!
interface Fa0/15
 desc == ASA2 DMZ
 switchport host
 switchport access vlan 999
!
interface Fa0/23
 switchport trunk encaps dot1q
 switchport mode trunk
```

R1:

```
interface E0/0
 ip address 10.0.0.1 255.255.255.0
 no shut
!
ip route 0.0.0.0 0.0.0.0 10.0.0.254
```

R2:

```
interface E0/0
 ip address 10.0.0.2 255.255.255.0
 no shut
!
ip route 0.0.0.0 0.0.0.0 10.0.0.254
```

R3:

```
interface E0/0
 ip address 136.1.130.3 255.255.255.0
```

Failover configuration:

ASA1:

```
hostname ASA
!
! Configure physical interfaces
!
interface Ethernet0/0
 no shutdown
!
interface Ethernet0/1
 no shutdown
!
interface Ethernet0/1.121
 vlan 121
 no shutdown
!
interface Ethernet0/1.122
 vlan 122
 no shutdown

!
! Identify admin context first
!
admin-context admin
context admin
  config-url disk0:/admin.cfg

!
! Create context CustomerA and add interface
!
context CustomerA
  description == CustomerA
  allocate-interface Ethernet0/0
  allocate-interface Ethernet0/1.121
  config-url disk0:/CustomerA.cfg

!
! Create context CustomerB
!
context CustomerB
  description == CustomerB
  allocate-interface Ethernet0/0
  allocate-interface Ethernet0/1.122
  config-url disk0:/CustomerB.cfg

!
! Change to context CustomerA
!
changeto context CustomerA

!
! Configure sec-leves & IP addressing for interfaces
! IP addresses you use at shared interfaces should
! not overlap between contexts
!
interface Ethernet0/1.121
 nameif inside
 security-level 100
 ip address 10.0.0.254 255.255.255.0
!
interface Ethernet0/0
 nameif outside
 security-level 0
 ip address 136.1.130.253 255.255.255.0
!
! Configure static PAT on outside interface,
! again no overlaps between contexts
!

!
! Dynamic PAT on shared interface
!
nat (inside) 1 0 0
global (outside) 1 interface
!
! Basic access-list to permit pings from inside
!
access-list  OUTSIDE_IN permit icmp any any echo-reply
access-group OUTSIDE_IN in interface outside

!
! Change to context "CustomerB" and configure similarly
!
changeto context CustomerB
!
 interface Ethernet0/1.122
 nameif inside
 security-level 100
 ip address 10.0.0.254 255.255.255.0
!
interface Ethernet0/0
```

```
 nameif outside
 security-level 0
 ip address 136.1.130.254 255.255.255.0
!
! NAT configs
!
nat (inside) 1 0 0
global (outside) 1 interface
!
! Access-control rules to permit pings
!
access-list  OUTSIDE_IN permit icmp any any echo-reply
access-group OUTSIDE_IN in interface outside

!
! Failover configs follow
!
changeto system
!
! Enable the failover interface
!
interface Ethernet0/2
 no shutdown
!
! Configure failover settings
!
failover lan unit primary
failover lan interface failover Ethernet0/2
failover link failover Ethernet0/2
failover int ip failover 100.100.100.12 255.255.255.0 st 100.100.100.13
!
failover group 1
  primary
  preempt
!
failover group 2
  secondary
  preempt
!
context CustomerA
 join-failover-group 1
!
context CustomerB
 join-failover-group 2
!
failover
```

ASA2:

```
!
! Enable failover interface
!
interface Ethernet0/2
no shut
!
failover lan unit secondary
failover lan interface failover Ethernet0/2
failover link failover Ethernet0/2
failover int ip failover 100.100.100.12 255.255.255.0 st 100.100.100.13
failover
```

Verification

Check the primary unit status:

```
ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 5 seconds, holdtime 25 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Group 1 last failover at: 07:54:53 UTC Feb 5 2007
Group 2 last failover at: 08:01:52 UTC Feb 5 2007

  This host:    Primary
  Group 1       State:          Active
                Active time:    1224 (sec)
  Group 2       State:          Standby Ready
                Active time:    859 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (10.0.0.254): Normal (Not-
Monitored)
                  CustomerA Interface outside (136.1.130.253): Normal (Waiting)
                  CustomerB Interface inside (0.0.0.0): Normal (Not-Monitored)
                  CustomerB Interface outside (0.0.0.0): Normal (Waiting)
                slot 1: empty

  Other host:   Secondary
  Group 1       State:          Standby Ready
                Active time:    1046 (sec)
  Group 2       State:          Active
                Active time:    1411 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (0.0.0.0): Normal (Not-Monitored)
                  CustomerA Interface outside (0.0.0.0): Normal (Waiting)
                  CustomerB Interface inside (10.0.0.254): Normal (Not-
Monitored)
                  CustomerB Interface outside (136.1.130.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         277        0          277        0
        sys cmd         277        0          277        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         0          0          0          0
        Xlate_Timeout   0          0          0          0
        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       277
        Xmit Q:         0       1       277
```

Introduce a link failure:

```
SW2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SW2(config)#int fa 0/12
SW2(config-if)#shut
```

Check the primary unit again:

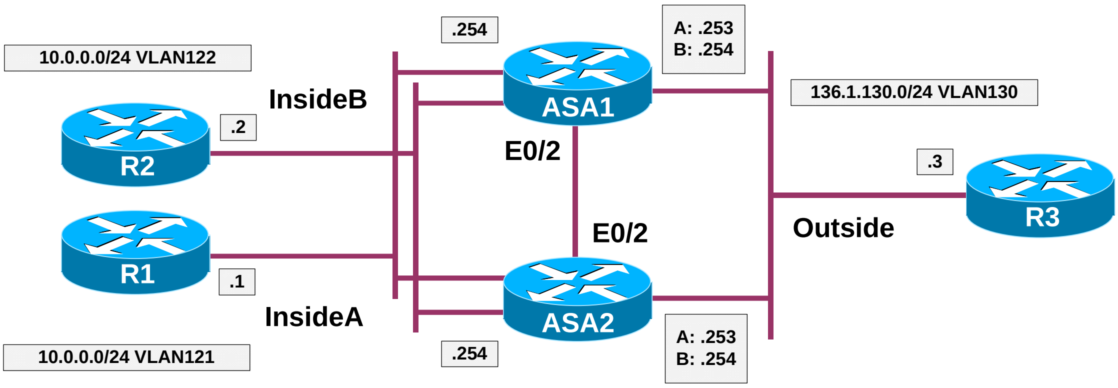
```
ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 5 seconds, holdtime 25 seconds
Interface Policy 1
Monitored Interfaces 2 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Group 1 last failover at: 08:20:08 UTC Feb 5 2007
Group 2 last failover at: 08:01:52 UTC Feb 5 2007

  This host:    Primary
  Group 1       State:          Failed
                Active time:    1956 (sec)
  Group 2       State:          Failed
                Active time:    859 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (0.0.0.0): Normal (Not-Monitored)
                  CustomerA Interface outside (0.0.0.0): No Link (Waiting)
                  CustomerB Interface inside (0.0.0.0): Normal (Not-Monitored)
                  CustomerB Interface outside (0.0.0.0): No Link (Waiting)
                slot 1: empty

  Other host:   Secondary
  Group 1       State:          Active
                Active time:    1099 (sec)
  Group 2       State:          Active
                Active time:    2195 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (10.0.0.254): Normal (Not-
Monitored)
                  CustomerA Interface outside (136.1.130.253): Normal (Waiting)
                  CustomerB Interface inside (10.0.0.254): Normal (Not-
Monitored)
                  CustomerB Interface outside (136.1.130.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         377        0          377        0
        sys cmd         377        0          377        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0           0           0           0
        ARP tbl         0           0           0           0
        Xlate_Timeout   0           0           0           0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       377
        Xmit Q:         0       1       377

Test connectivity:

R3#ping 136.1.130.253

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.130.253, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/2/4 ms

R3#ping 136.1.130.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.130.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R1#ping 136.1.130.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.130.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R2#ping 136.1.130.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.130.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/3/4 ms
```

Further Reading

Configuring Failover

Monitoring Interfaces with Active/Active Failover

Objective: Configure interface monitoring with A/A failover.



Directions

- Configure devices as per the “PIX/ASA Firewall/Advanced Firewall” scenario “Active/Active Stateful Failover with Failover Interface”
- The goal of this task is to tune individual interface/unit monitoring parameters for failover groups.
- Pick up the primary firewall unit for context “CustomerA” and “CustomerB” respectively, and configure as follows:
  - Change to respective context.
  - Monitor both interface “inside” and “outside”.
- Configure the primary failover unit (ASA1) as follows:
  - Change to system context.
  - Change failover group 1 and group 2 interface polling timers to minimum values.
  - Configure both groups interface-policy to failover upon double monitored interface failure.

Final Configuration

```
Primary unit for CustomerA:
changeto context CustomerA
!
monitor-interface inside
monitor-interface outside

Primary unit for CustomerB:
changeto context CustomerB
!
monitor-interface inside
monitor-interface outside
```

ASA1 (the primary failover unit):

```
failover group 1
  interface-policy 2
  polltime interface msec 500 holdtime 5
!
failover group 2
  interface-policy 2
  polltime interface msec 500 holdtime 5
```

Verification

```
ASA(config)# changeto context CustomerA
ASA/CustomerA(config)# show monitor-interface
        This host: Secondary - Active
                Interface inside (10.0.0.254): Normal (Waiting)
                Interface outside (136.1.130.253): Normal (Waiting)
        Other host: Secondary - Standby Ready
                Interface inside (0.0.0.0): Normal (Waiting)
                Interface outside (0.0.0.0): Normal (Waiting)

ASA(config)# changeto context CustomerB
ASA/CustomerB(config)# show monitor-interface
        This host: Secondary - Active
                Interface outside (0.0.0.0): Normal (Waiting)
                Interface inside (0.0.0.0): Normal (Waiting)
        Other host: Secondary - Standby Ready
                Interface outside (136.1.130.254): Normal (Waiting)
                Interface inside (10.0.0.254): Normal (Waiting)

ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 4 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Group 1 last failover at: 08:47:51 UTC Feb 5 2007
Group 2 last failover at: 08:01:52 UTC Feb 5 2007

  This host:    Primary
  Group 1       State:          Active
                Active time:    3810 (sec)
  Group 2       State:          Standby Ready
                Active time:    859 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (10.0.0.254): Normal (Waiting)
                  CustomerA Interface outside (136.1.130.253): Normal (Waiting)
                  CustomerB Interface inside (0.0.0.0): Normal (Waiting)
                  CustomerB Interface outside (0.0.0.0): Normal (Waiting)
                slot 1: empty

  Other host:   Secondary
  Group 1       State:          Standby Ready
                Active time:    2557 (sec)
  Group 2       State:          Active
                Active time:    5507 (sec)
                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (0.0.0.0): Normal (Waiting)
                  CustomerA Interface outside (0.0.0.0): Normal (Waiting)
                  CustomerB Interface inside (10.0.0.254): Normal (Waiting)
                  CustomerB Interface outside (136.1.130.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         821        0          822        0
        sys cmd         819        0          819        0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         2          0          3          0
        Xlate_Timeout   0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       822
        Xmit Q:         0       1       821
```

Introduce interface failure on ASA1 inside interface:

```
SW1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SW1(config)#interface fastEthernet 0/13
SW1(config-if)#shutdown

ASA(config)# show failover
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 4 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Group 1 last failover at: 09:48:28 UTC Feb 5 2007
Group 2 last failover at: 08:01:52 UTC Feb 5 2007

  This host:    Primary
  Group 1       State:          Active
                Active time:    7931 (sec)
  Group 2       State:          Standby Ready
                Active time:    859 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (10.0.0.254): No Link (Waiting)
                  CustomerA Interface outside (136.1.130.253): Normal (Waiting)
                  CustomerB Interface inside (0.0.0.0): No Link (Waiting)
                  CustomerB Interface outside (0.0.0.0): Normal (Waiting)
                slot 1: empty

  Other host:   Secondary
  Group 1       State:          Standby Ready
                Active time:    2610 (sec)
  Group 2       State:          Active
                Active time:    9683 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
```

```
                  CustomerA Interface inside (0.0.0.0): Normal (Waiting)
                  CustomerA Interface outside (0.0.0.0): Normal (Waiting)
                  CustomerB Interface inside (10.0.0.254): Normal (Waiting)
                  CustomerB Interface outside (136.1.130.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         1377       0          1378       0
        sys cmd         1375       0          1375       0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         2          0          3          0
        Xlate_Timeout   0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       1378
        Xmit Q:         0       1       1377

Fail outside interface of the ASA1:

SW2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SW2(config)#int fa 0/12
SW2(config-if)#shut
SW2(config-if)#

ASA(config)# show fail
Failover On
Failover unit Primary
Failover LAN Interface: failover Ethernet0/2 (up)
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 500 milliseconds, holdtime 5 seconds
Interface Policy 1
Monitored Interfaces 4 of 250 maximum
Version: Ours 7.2(2), Mate 7.2(2)
Group 1 last failover at: 10:27:22 UTC Feb 5 2007
Group 2 last failover at: 08:01:52 UTC Feb 5 2007

  This host:    Primary
  Group 1       State:          Failed
                Active time:    8024 (sec)
  Group 2       State:          Failed
                Active time:    859 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
                  CustomerA Interface inside (0.0.0.0): No Link (Waiting)
                  CustomerA Interface outside (0.0.0.0): No Link (Waiting)
                  CustomerB Interface inside (0.0.0.0): No Link (Waiting)
                  CustomerB Interface outside (0.0.0.0): No Link (Waiting)
                slot 1: empty

  Other host:   Secondary
  Group 1       State:          Active
                Active time:    2618 (sec)
  Group 2       State:          Active
                Active time:    9783 (sec)

                slot 0: ASA5510 hw/sw rev (1.1/7.2(2)) status (Up Sys)
```

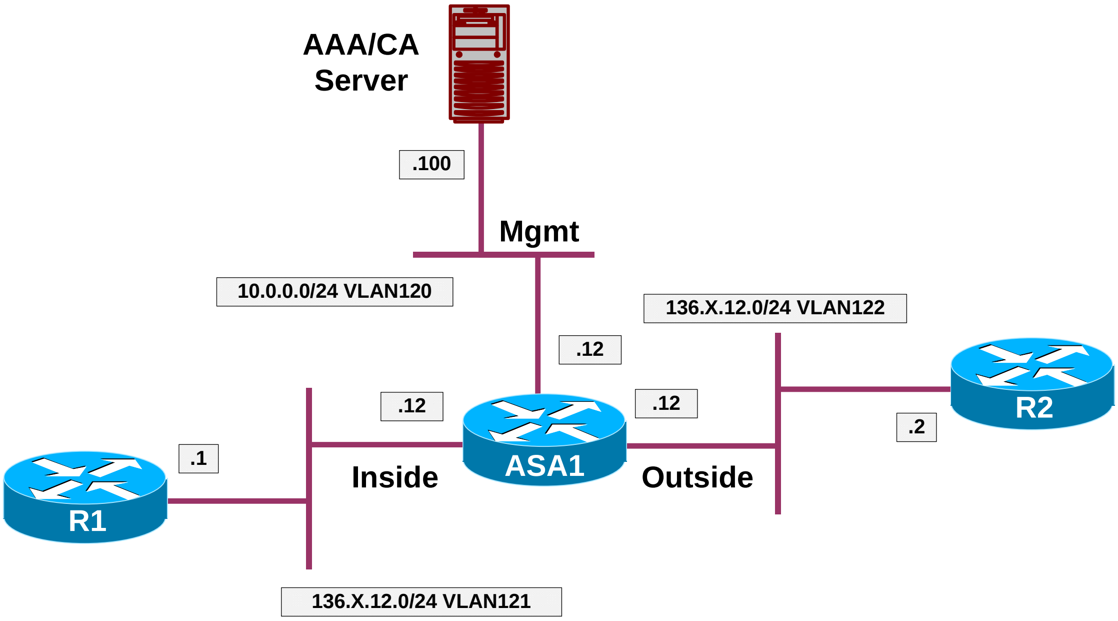
```
                  CustomerA Interface inside (10.0.0.254): Normal (Waiting)
                  CustomerA Interface outside (136.1.130.253): Normal (Waiting)
                  CustomerB Interface inside (10.0.0.254): Normal (Waiting)
                  CustomerB Interface outside (136.1.130.254): Normal (Waiting)
                slot 1: empty

Stateful Failover Logical Update Statistics
        Link : failover Ethernet0/2 (up)
        Stateful Obj    xmit       xerr       rcv        rerr
        General         1391       0          1392       0
        sys cmd         1389       0          1389       0
        up time         0          0          0          0
        RPC services    0          0          0          0
        TCP conn        0          0          0          0
        UDP conn        0          0          0          0
        ARP tbl         2          0          3          0
        Xlate_Timeout   0          0          0          0

        Logical Update Queue Information
                        Cur     Max     Total
        Recv Q:         0       1       1392
        Xmit Q:         0       1       1391
```

🕮 Further Reading

Configuring Failover

Filtering with L2 Transparent Firewall

Objective: Configure Layer 2 transparent firewall



Directions

- Pre-Configuration:
    - Create the required VLANs as per the diagram. Configure the respective switchports.
    - Configure IP addressing on R1 and R2 as per the diagram.

- Enable transparent firewall mode on the ASA unit.
- Configure the IP address 136.X.12.12/24 for the transparent firewall, and configure the management interface.
- Configure the outside and inside interfaces.
- Permit telnet and pings from the lower security interface.

Final Configuration

```
ASA1:
firewall transparent
ip address 136.1.12.12 255.255.255.0
!
interface Management 0/0
 no shutdown
 ip address 10.0.0.12 255.255.255.0
!
interface Ethernet 0/0
```

```
 no shut
 nameif outside
!
interface Ethernet 0/1
 no shut
 nameif inside
!
! Access-List to apply to outside
!
access-list OUTSIDE_IN extended permit icmp any any echo
access-list OUTSIDE_IN extended permit icmp any any echo-reply
access-list OUTSIDE_IN extended permit tcp any any eq telnet
!
! Apply the ACLs
!
access-group OUTSIDE_IN in interface outside

SW1 & SW:
vlan 120,121,122
!
interface range Fa 0/21 - 23
 switchport trunk encapsulation dot1q
 switchport mode trunk

SW1:
!
!  Configure switchports
!
interface Fa 0/1
 switchport host
 switchport access vlan 121
!
interface Fa 0/2
 switchport host
 switchport access vlan 122
!
interface Fa 0/12
 description == ASA Management
 switchport host
 switchport access vlan 120
!
interface Fa 0/13
 switchport host
 switchport access vlan 121
!
interface Fa 0/20
 switchport host
 switchport access vlan 120

SW2:
!
!  Configure switchports
!
interface Fa 0/12
 switchport host
 switchport access vlan 122

R1:
interface Ethernet 0/0
 no shut
 ip address 136.1.12.1 255.255.255.0

R2:
```

```
interface Ethernet 0/0
 no shut
 ip address 136.1.12.2 255.255.255.0
```

Verification

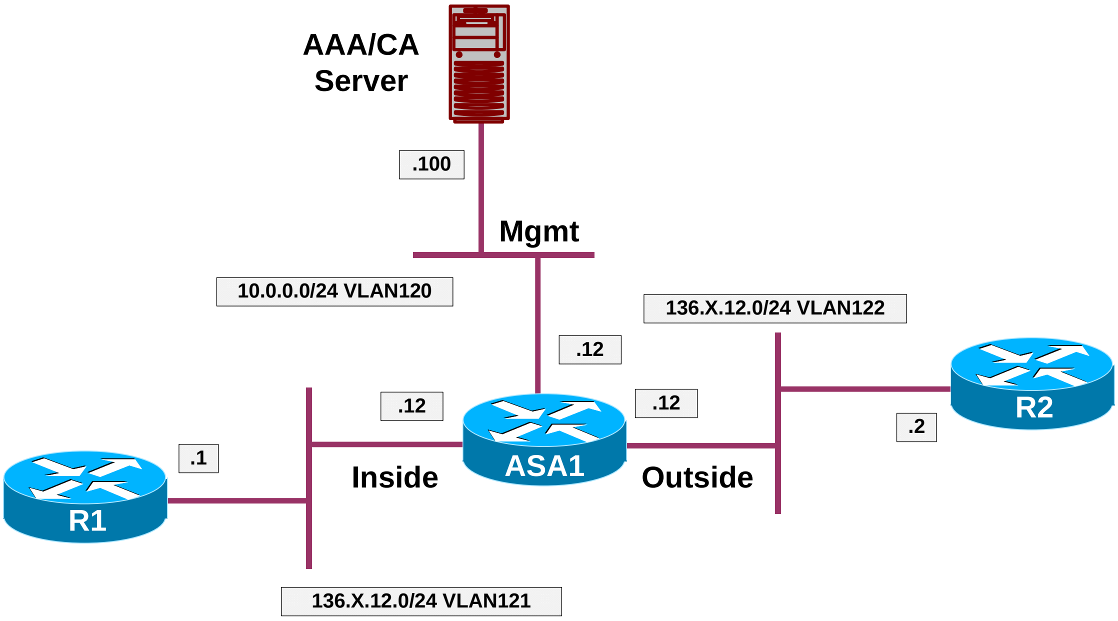
```
ASA1(config)# show mac-address-table
interface                    mac  address          type      Age(min)
------------------------------------------------------------------
outside                     0019.5684.9a0e          dynamic    5
inside                      0019.5684.370f          dynamic    5
outside                     0003.e335.1240          dynamic    2
inside                      0050.73f7.c0c0          dynamic    2

R1#ping 136.1.12.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.12.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms

R1#show ip arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  136.1.12.1              -   0050.73f7.c0c0  ARPA   Ethernet0/0
Internet  136.1.12.2             71   0003.e335.1240  ARPA   Ethernet0/0

R2#telnet 136.1.12.1
Trying 136.1.12.1 ... Open


Password required, but none set

[Connection to 136.1.12.1 closed by foreign host]

R2#ping 136.1.12.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.12.12, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/2/4 ms
```

Further Reading

Firewall Mode Overview

ARP Inspection with Transparent Firewall

Objective: Configure the transparent firewall to inspect ARP responses.



Directions

- Configure the devices as per the “PIX/ASA Firewall/Advanced Firewall” “Filtering with Layer 2 Transparent Firewall” scenario.
- ARP inspection permits the firewall to check ARP responses for compliance, and prevent ARP spoofing.
- Enable ARP inspection with “no-flood” option on the ASA firewall.
- Create two static ARP entries for R1 and R2 routers.

Final Configuration

```
ASA1:
arp outside 136.1.12.2 0003.e335.1240
arp inside 136.1.12.1 0050.73f7.c0c0
!
arp-inspection outside enable no-flood
arp-inspection inside enable no-flood
```

Verification

```
R1#show ip arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  136.1.12.1              -   0050.73f7.c0c0  ARPA   Ethernet0/0
Internet  136.1.12.2             82   0003.e335.1240  ARPA   Ethernet0/0

R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
```

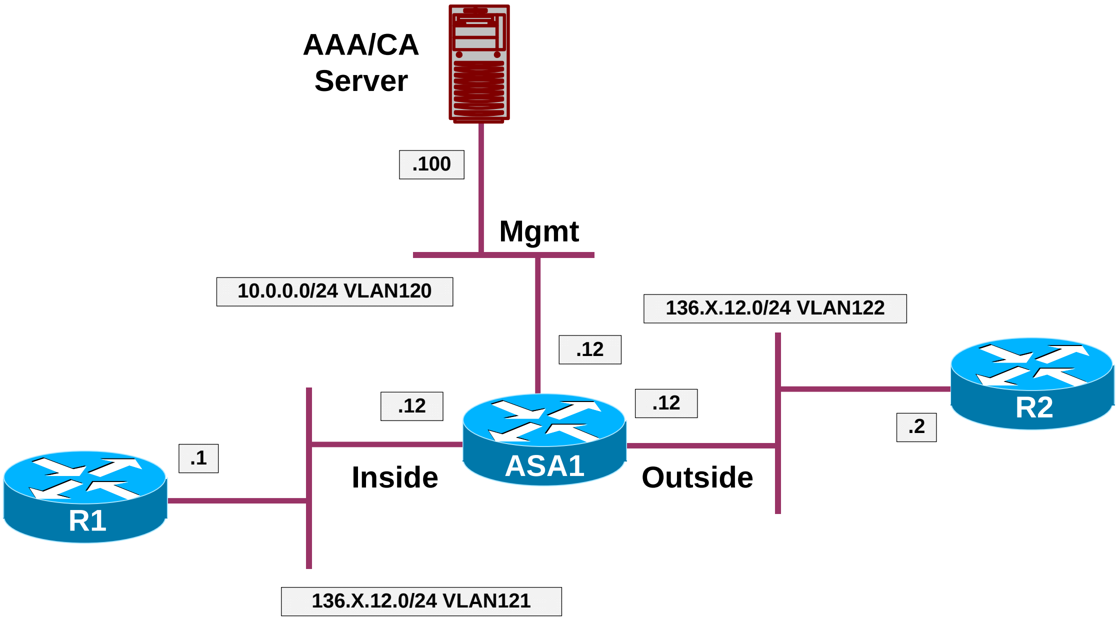
```
R2(config)#int e 0/0
R2(config-if)#mac-address 0003.e335.1241

R1#ping 136.1.12.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.12.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

R2(config-if)#mac-address 0003.e335.1240
R2(config-if)#

R1#ping 136.1.12.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.12.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/4 ms
```

Further Reading

Configuring ARP Inspection

Filtering Non-IP Traffic with L2 Transparent FW

Objective: Configure filtering with ethertype access-lists on the firewall.



Directions

- Configure the devices as per the “PIX/ASA Firewall/Advanced Firewall” “Filtering with Layer 2 Transparent Firewall” scenario.
- In this task we are going to permit STP BPDUs to flow across the firewall.
- Note that PIX/ASA firewall only permits SSTP (PVST+) untagged BPDUs to pass through. That is, it only permits 802.3 LLC frames sent to SSTP multicast address “0100.0ccc.cccd”.
- A Cisco switch sends three types of BPDUs over 802.1q trunk:
  - Classic IEEE BPDU over untagged frame to multicast MAC address “0180.c200.0000” in 802.3 LLC frame format.
  - Untagged SSTP (PVST+) BPDU to MAC address “0100.0ccc.cccd” with 802.3 LLC SNAP encapsulation over the native VLAN of the trunk.
  - Tagged SSTP BPDU to MAC address “0100.0ccc.cccd” over every non-native VLAN of the trunk.
- Note that every SSTP BPDU has embedded TLV that carries SSTP VLAN number, so that a VLAN mismatch could be detected.
- Create Ethertype acess-list BPDU and permit BPDUs with it.
- Apply access-group BPDU to the inside and outside interfaces.
- Configure Fa0/13 of SW1 as 802.1q trunk with native VLAN 121.
- Configure Fa0/12 of SW2 as 802.1q trunk with native VLAN 122.

Final Configuration

```
SW1:
inter Fa0/13
 switchport trunk encaps dot1q
 switchport mode trunk
 switchport trunk native 121

SW2:
inter Fa0/12
 switchport trunk encaps dot1q
 switchport mode trunk
 switchport trunk native 122

ASA1:
access-list BPDU ethertype permit bpdu

access-group BPDU in inter inside
access-group BPDU in inter outside
```

Verification

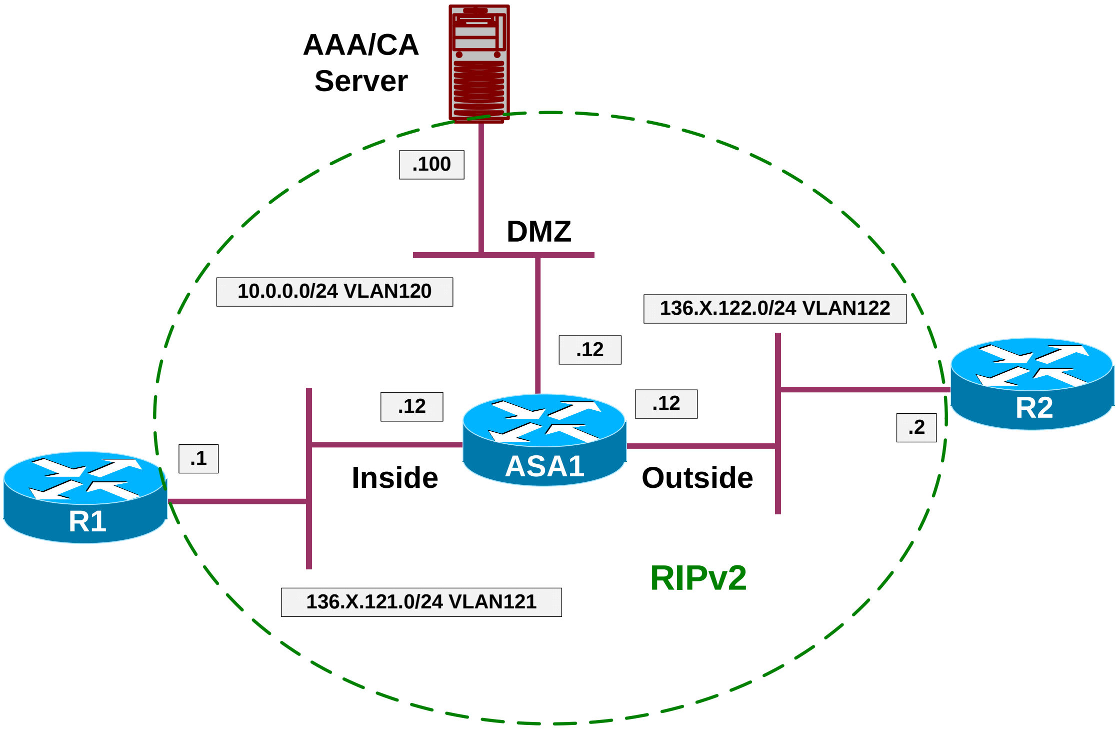
```
ASA1(config)# show access-list BPDU
access-list BPDU; 1 elements
access-list BPDU ethertype permit bpdu (hitcount=98)

SW2:
1d13h: %SPANTREE-2-RECV_PVID_ERR: Received BPDU with inconsistent peer vlan id
121 on FastEthernet0/12 VLAN122.
1d13h: %SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/12 on VLAN0122.
Inconsistent local vlan.

SW1:
1d13h: %SPANTREE-2-BLOCK_PVID_PEER: Blocking FastEthernet0/13 on VLAN0122.
Inconsistent peer vlan.
1d13h: %SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/13 on VLAN0121.
Inconsistent local vlan.
```

Further Reading

Configuring ARP Inspection

Handling Fragmented Traffic

Objective: Tune the firewall fragment inspection parameters.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Permit ICMP traffic through the firewall.
- Disable the fragmented packets on all interfaces.

Final Configuration

ASA1:

```
access-list OUTSIDE_IN permit icmp any any
!
access-group OUTSIDE_IN in interface outside
!
! Disable Fragment reassebly on all interfaces
!
fragment chain 1 inside
fragment chain 1 outside
fragment chain 1 dmz
```

Verification

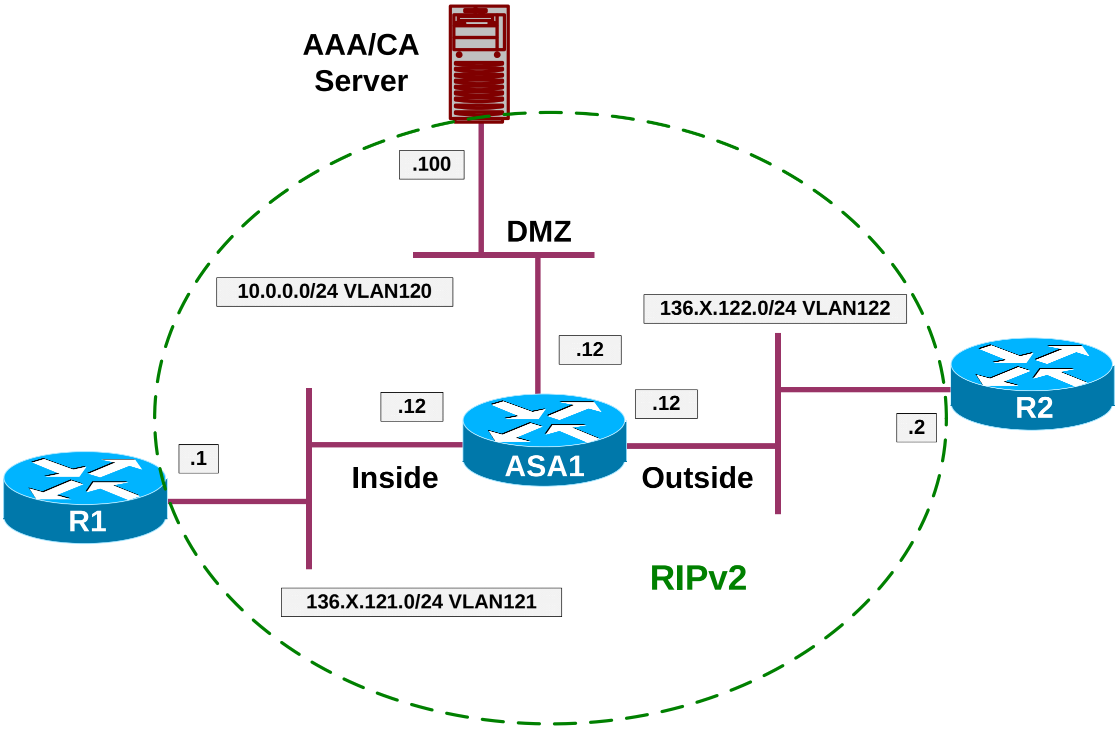
```
R1#ping 136.1.122.2 size 1500

Type escape sequence to abort.
Sending 5, 1500-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/13 ms

R1#ping 136.1.122.2 size 1510

Type escape sequence to abort.
Sending 5, 1510-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

R2#ping 136.1.121.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R2#ping 136.1.121.1 size 1510

Type escape sequence to abort.
Sending 5, 1510-byte ICMP Echos to 136.1.121.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Further Reading

Configuring Fragment Size

Handling Some Application Issues

Objective: Configure the firewall to handle certain application issues.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- The first polular issue usually arise with DNS doctoring scenarios, where the PIX/ASA firewall is configured, for instance, with “alias” command.
- Here is the short description:
  - Consider server on inside with IP 136.1.121.100 mapped with static command to outside IP 136.1.122.100.
  - Consider DNS server on outside, answering DNS queries to server domain name with outside IP 136.1.122.100.
  - Configure “alias (inside) 136.1.121.100 136.1.122.100 255.255.255.255” to perform DNS doctoring.
  - With this configuration PIX will start responding to ARP queries for 136.1.121.100 on inside interface.
  - Configure “sysopt noproxyarp inside” to handle this issue. Note that this cammand disables all proxy ARP replies on mentioned interface.
- The second issue commonly arise when inside users try to send e-mail through the PIX/ASA firewall or connect to external FTP servers. Some

SMTP/FTP servers may send back the IDENT query over new TCP connection, which is blackholed at the firewall outside interface by default.

- This may cause very long wating on connection startup. To remedy such situation you should do the following:

  - For inside users, accessing the outside via dynamic NAT configuration (NAT pool on the firewall) configure “service resetoutside” command.
  - To handle this issue for inside SMTP server (statically mapped, or bypassing NAT), configure “service resetinbound” command.

Final Configuration

ASA1:

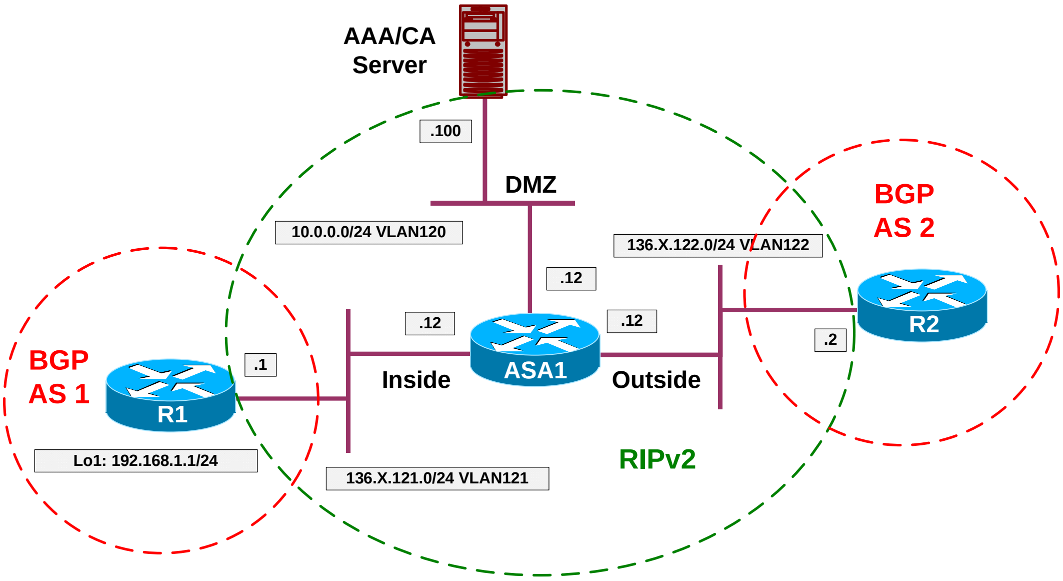
```
static (i,o) 136.1.122.100 136.1.121.100

!
! DNS doctoring with alias
!
alias (inside) 136.1.121.100 136.1.122.100

!
! Disable proxy-ARP on inside
!
sysopt noproxyarp inside

!
! Reset TCP connections denied on outside interface
! or denied inbound.
!
service resetinbound
service resetoutside
```

Further Reading

PIX Performance Issues Caused by IDENT Protocol
Understanding the alias Command for the Cisco Secure PIX Firewall

BGP Through the PIX/ASA Firewall

Objective: Configure BGP session through the PIX/ASA firewall.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Pre-Configure as follows:
    - Create Loopback1 interface on R1.
    - Configure outside interface as RIP passive on the firewall.
    - Configure static NAT mapping of 136.X.121.1 to 136.X.122.1.
- Configure BGP on R1 and R2 as per the diagram, using the following guidelines.
    - Peer R1 and R2 using the ethernet interfaces IP addresses.
    - Use static NAT mapping for R1 to peer from R2.
    - Enable eBGP multihop for peering.
- Adverties Loopback1 of R1 into BGP. To provide the transit connectivty through the firewall, advertise it into RIP as well.
- Create and apply access-list on outside interface to permit pings to 192.168.1.0/24.
- Create and apply route-map NEXT_HOP on R2 to set IP next-hop to 136.X.122.1 for updates received from R1.

Final Configuration

R1:

```
interface Loopback 1
 ip address 192.168.1.1 255.255.255.0
!
! BGP configuration
!
router bgp 1
 neighbor 136.1.122.2 remote-as 2
 neighbor 136.1.122.2 ebgp
 network 192.168.1.0 mask 255.255.255.0
!
! Advertise loopback into RIP
!
router rip
 network 192.168.1.0
```

R2:

```
!
! route-map to change next-hop
!
route-map NEXT_HOP
 set ip next-hop 136.1.122.1
!
router bgp 2
 neighbor 136.1.122.1 remote-as 1
 neighbor 136.1.122.1 ebgp
 neighbor 136.1.122.1 route-map NEXT_HOP in
```

ASA1:

```
!
! Static & ACL to permit inbound pings
!
static (inside,outside) 136.1.122.1 136.1.121.1
access-list OUTSIDE_IN permit icmp any 192.168.1.0 255.255.255.0
access-group OUTSIDE_IN in interface outside
!
! Prevent R2 from learning routes from the ASA
!
router rip
 passive-interface outside
```

Verification

```
R2#show ip bgp summary
BGP router identifier 192.168.5.2, local AS number 2
BGP table version is 2, main routing table version 2
1 network entries using 101 bytes of memory
1 path entries using 48 bytes of memory
1 BGP path attribute entries using 60 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 233 total bytes of memory
BGP activity 3/2 prefixes, 3/2 paths, scan interval 60 secs
```

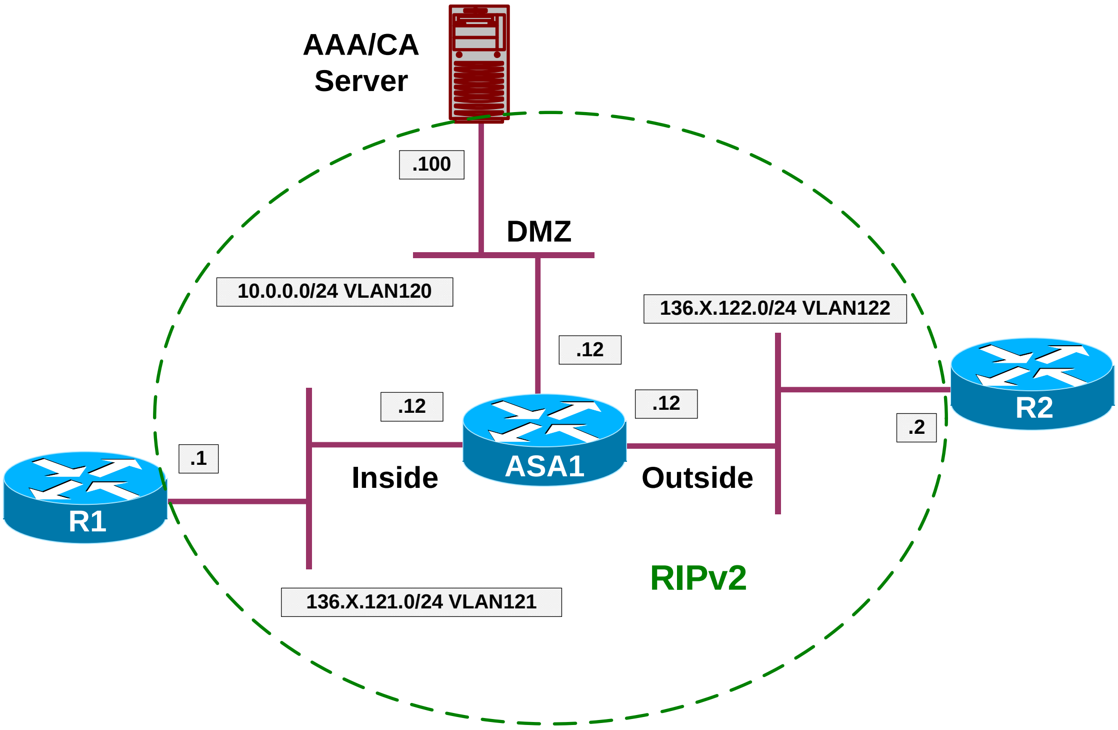
```
Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
136.1.122.1     4     1      19      16        2    0    0 00:02:01        1

R2#sh ip bgp
BGP table version is 2, local router ID is 192.168.5.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      136.1.122.1              0             0 1 i

R2# ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
```

Further Reading

Sample Configurations of BGP Across a PIX Firewall

Multicast Routing across the PIX/ASA Firewall

Objective: Configure stub multicast router feature on the PIX/ASA firewall.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- In this task the goal is to make R1 hear multicast source at R2. We assume that the firewall and R2 are capable of communicating via PIM, therefore allowing for scalable multicast deployment.
- Configure the firewall as follows:
  - Enable multicast routing on the firewall.
  - Enable PIM on outside interface.
  - Configure RP address 150.1.2.2
  - Limit IGMP on inside interface to 100 participants maximum.
  - Permit ICMP packets from the outside.
- Configure R2 as follows:
  - Enable multicast routing.
  - Create new Loopback0 interface with IP address 150.1.2.2/24.
  - Enable PIM Sparse-mode on Loopback0 and Ethernet 0/0.
  - Configure RP address to 150.1.2.2.

- On R1, join Ethernet 0/0 to group 239.0.0.1.

Final Configuration

```
ASA1:
!
! Enable multicast routing and PIM
!
multicast-routing
!
interface E 0/0
 pim
!
! Configure IGMP on the inside
!
interface E0/1
 igmp version 2
 igmp limit 100
!
! Configure the RP
!
pim rp-address 150.1.2.2
!
! Permit ICMP traffic from R2
!
access-list OUTSIDE_IN permit icmp any any
!
access-group OUTSIDE_IN in interface outside

R2:
ip multicat-routing
!
! Enable PIM on ethernet interface
!
interface Ethernet0/0
  ip pim sparse-mode
!
interface Loopback0
 ip address 150.1.2.2 255.255.255.0
 ip pim sparse-mode
!
ip pim rp-address 150.1.2.2
!
router rip
 network 150.1.0.0

R1:
interface Ethernet 0/0
 ip igmp join 239.0.0.1
```

Verification

```
ASA1(config)# show pim neighbor

Neighbor Address  Interface          Uptime    Expires DR pri Bidir

136.1.122.2       outside            00:16:26  00:01:33 1

ASA1(config)# show mroute
```

```
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State

(*, 224.0.1.40), 00:17:52/never, RP 0.0.0.0, flags: DPC
  Incoming interface: Null
  RPF nbr: 0.0.0.0
  Outgoing interface list:
    outside, Null, 00:17:52/never

(*, 239.0.0.1), 00:15:59/never, RP 150.1.2.2, flags: SCJ
  Incoming interface: outside
  RPF nbr: 136.1.122.2
  Outgoing interface list:
    inside, Forward, 00:15:59/never

R2#show ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
       Y - Joined MDT-data group, y - Sending to MDT-data group
Outgoing interface flags: H - Hardware switched
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.1), 00:16:36/00:02:48, RP 150.1.2.2, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Ethernet0/0, Forward/Sparse, 00:16:36/00:02:48

(*, 224.0.1.40), 00:21:07/00:02:29, RP 150.1.2.2, flags: SPL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

R2#ping 239.0.0.1

Type escape sequence to abort.
Sending 1, 100-byte ICMP Echos to 239.0.0.1, timeout is 2 seconds:

Reply to request 0 from 136.1.121.1, 8 ms
Reply to request 0 from 136.1.121.1, 24 ms

There are two response since we have configured two PIM interfaces.

R2#show ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
       Y - Joined MDT-data group, y - Sending to MDT-data group
Outgoing interface flags: H - Hardware switched
 Timers: Uptime/Expires
 Interface state: Interface, Next-Hop or VCD, State/Mode
```

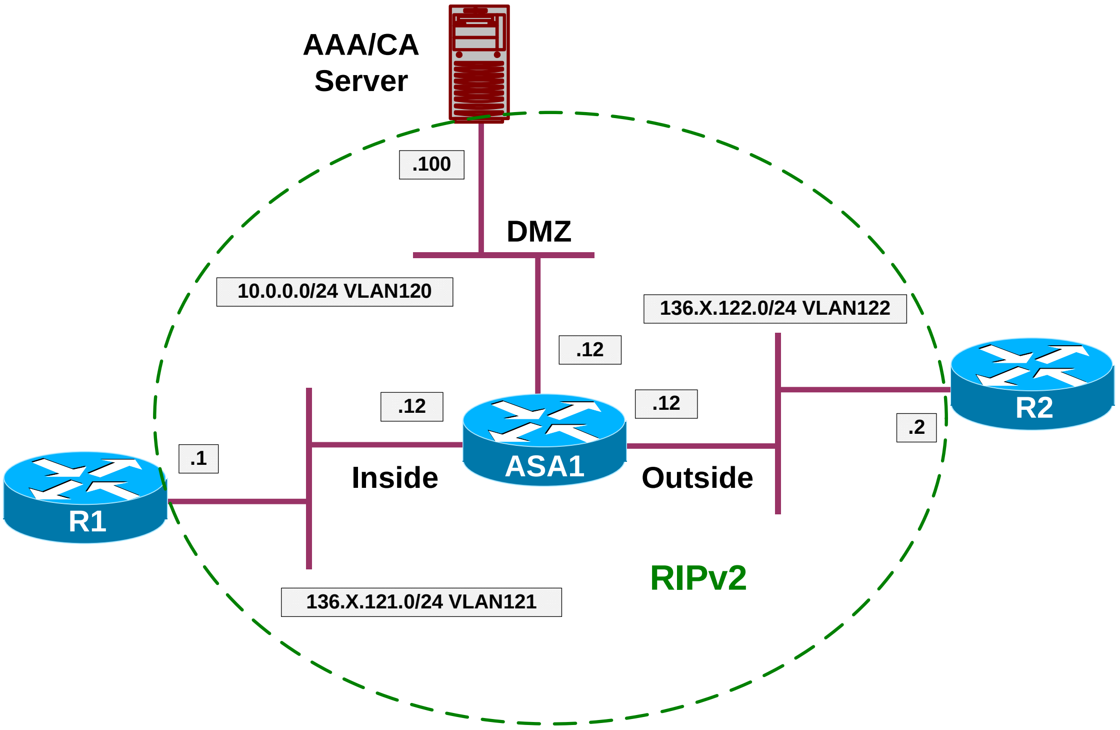
```
(*, 239.0.0.1), 00:17:07/stopped, RP 150.1.2.2, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Ethernet0/0, Forward/Sparse, 00:17:07/00:03:17

(136.1.122.2, 239.0.0.1), 00:00:04/00:02:55, flags: P
  Incoming interface: Ethernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(150.1.2.2, 239.0.0.1), 00:00:04/00:03:29, flags: T
  Incoming interface: Loopback0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Ethernet0/0, Forward/Sparse, 00:00:05/00:03:24

(*, 224.0.1.40), 00:21:39/00:02:58, RP 150.1.2.2, flags: SPL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

R2#

ASA1(config)# show mroute

Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State

(*, 224.0.1.40), 00:19:10/never, RP 0.0.0.0, flags: DPC
  Incoming interface: Null
  RPF nbr: 0.0.0.0
  Outgoing interface list:
    outside, Null, 00:19:10/never

(*, 239.0.0.1), 00:17:17/never, RP 150.1.2.2, flags: SCJ
  Incoming interface: outside
  RPF nbr: 136.1.122.2
  Outgoing interface list:
    inside, Forward, 00:17:17/never

(136.1.122.2, 239.0.0.1), 00:00:14/00:03:15, flags: SFJT
  Incoming interface: outside
  RPF nbr: 136.1.122.2
  Immediate Outgoing interface list: Null

(150.1.2.2, 239.0.0.1), 00:00:14/00:03:15, flags: SJT
  Incoming interface: outside
  RPF nbr: 136.1.122.2
  Immediate Outgoing interface list: Null
```

🕮 Further Reading

Configuring Multicast Routing

System Monitoring

Objective: Configure Syslog and SNMP services on the ASA firewall.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Configure logging on the firewall as follows:
    - o Enable logging timestamps.
    - o Configure logging levels:
        - Debugging for log buffer.
        - Informational for syslog.
        - Critical for telnet monitor.
        - Alerts for Console.
    - o Configure logging buffer-size of 65536.
    - o Configure logging to syslog host:
        - Host IP 10.0.0.100 on DMZ interface.
        - Facility 23.
    - o Enable buffer save on wraps via FTP as follows:

        - Use FTP server 10.0.0.100, root directory.
        - Username anonymous Password ccie@cisco.com

    - Enable logging globally.

- Confiugure SNMP as follows:

    - Deny SNMP version 1. Use snmp-map for this task.
    - Send all SNMP traps to DMZ host 10.0.0.100.
    - Configure SNMP server community to CISCO.
    - Configure SNMP server location to “Reno,NV”.

Final Configuration

ASA1:

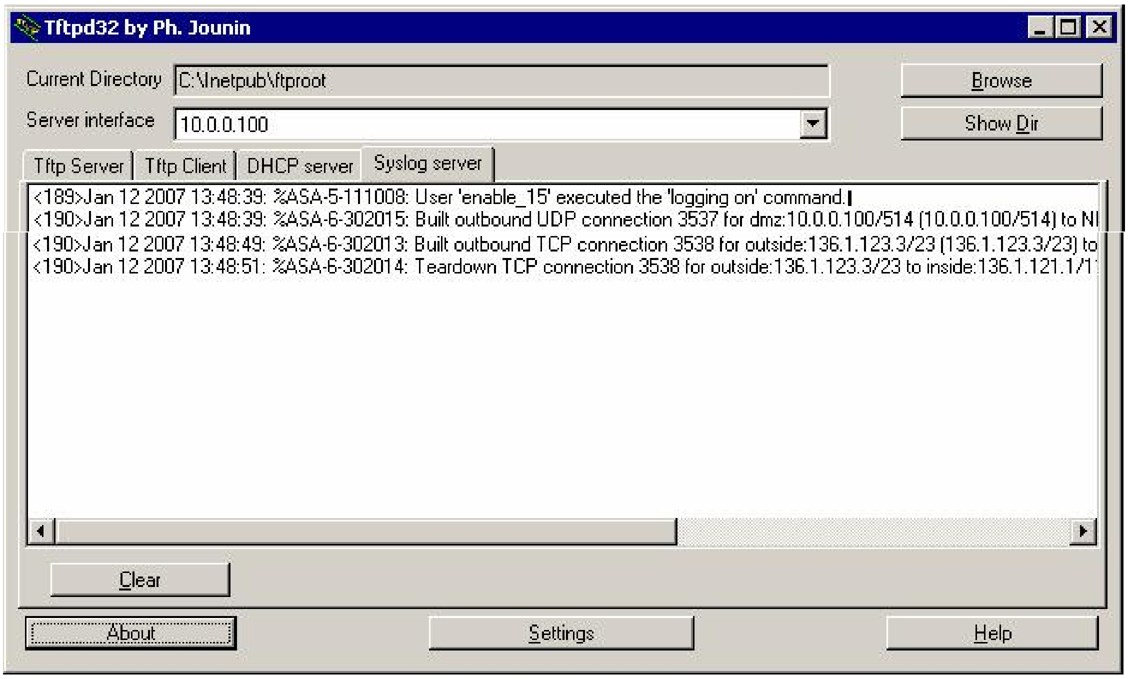
```
!
! Logging Config
!
logging timestamp
logging buffer-size 65536
logging console alerts
logging monitor critical
logging buffered debugging
logging trap informational
logging facility 23
logging host dmz 10.0.0.100
!
logging ftp-bufferwrap
logging ftp-server 10.0.0.100 / anonymous ccie@cisco.com
!
logging on
!
! Configure SNMP
!
snmp-server host dmz 10.0.0.100 trap community CISCO
snmp-server location Reno,NV
snmp-server community CISCO
snmp-server enable traps all
!
! Create snmp-map to deny SNMP version 1
!
snmp-map asa_snmp_map
 deny version 1
!
! Apply the map to the global policy
!
policy-map global_policy
 class inspection_default
   inspect snmp asa_snmp_map
!
! Configure NTP
!
ntp authentication-key 1 md5 CISCO
ntp authenticate
ntp server 136.1.121.1 key 1
```

```
R1:
ntp master
ntp authentication-key 1 md5 CISCO
```

Verification

AAA/CA Server:

Start tftpd32 application to listen to syslog messages:



Current Directory C:\Inetpub\tftproot

Server interface 10.0.0.100

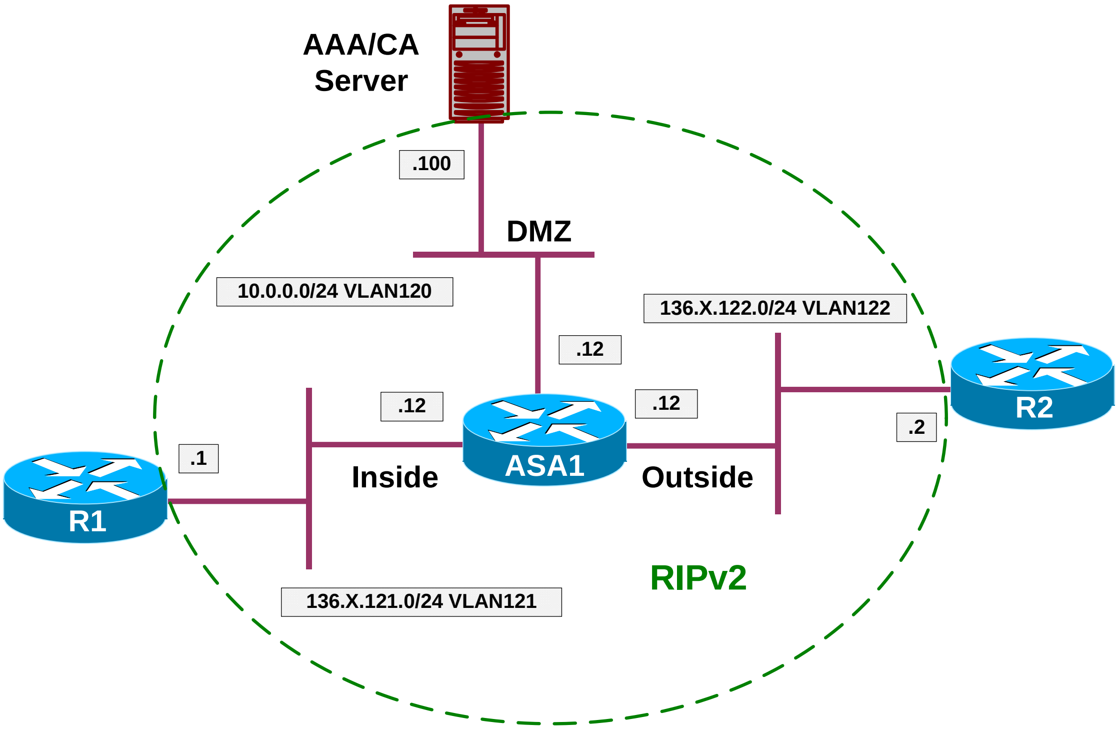
```
<189>Jan 12 2007 13:48:39: %ASA-5-111008: User 'enable_15' executed the 'logging on' command.
<190>Jan 12 2007 13:48:39: %ASA-6-302015: Built outbound UDP connection 3537 for dmz:10.0.0.100/514 (10.0.0.100/514) to NI
<190>Jan 12 2007 13:48:49: %ASA-6-302013: Built outbound TCP connection 3538 for outside:136.1.123.3/23 (136.1.123.3/23) to
<190>Jan 12 2007 13:48:51: %ASA-6-302014: Teardown TCP connection 3538 for outside:136.1.123.3/23 to inside:136.1.121.1/1
```

Further Reading

Monitoring the Security Appliance

DHCP Server

Objective: Configure the PIX/ASA firewall to support dynamic client configuration.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- It is possible to configure the PIX/ASA firewall to function as DHCP server (as well as DHCP relay).
- The configuration steps are as follows:
    - Configure DHCP to use address-range 136.X.121.100-136.X.121.254 on the inside interface.
    - Configure DHCP to assign domain-name “internetworkexpert.com” to clients.
    - Configure DHCP lease duration of 30 minutes (1800 seconds).
    - Enable DHCP process on the inside interface.
- Configure R1 to obtain an IP address via DHCP on its Ethernet interface.

Final Configuration

```
ASA1:
dhcpd address 136.1.121.100-136.1.121.254 inside
dhcpd domain internetworkexpert.com
dhcpd lease 1800
dhcpd enable inside

R1:
interface E0/0
 ip address dhcp
```

Verification

```
R1#debug dhcp detail
DHCP client activity debugging is on (detailed)

R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface E0/0
R1(config-if)# ip address dhcp
R1(config-if)#
*Mar  1 00:13:34.241: DHCP: DHCP client process started: 10
*Mar  1 00:13:34.241: RAC: Starting DHCP discover on Ethernet0/0
*Mar  1 00:13:34.241: DHCP: Try 1 to acquire address for Ethernet0/0
*Mar  1 00:13:39.266: DHCP: allocate request
*Mar  1 00:13:39.266: DHCP: new entry. add to queue
*Mar  1 00:13:39.266: DHCP: SDiscover attempt # 1 for entry:
*Mar  1 00:13:39.266: Temp IP addr: 0.0.0.0  for peer on Interface: Ethernet0/0
*Mar  1 00:13:39.266: Temp  sub net mask: 0.0.0.0
*Mar  1 00:13:39.266:    DHCP Lease server: 0.0.0.0, state: 1 Selecting
*Mar  1 00:13:39.266:    DHCP transaction id: C8B29
*Mar  1 00:13:39.270:    Lease: 0 secs,  Renewal: 0 secs,  Rebind: 0 secs
*Mar  1 00:13:39.270:    Next timer fires after: 00:00:02
*Mar  1 00:13:39.270:    Retry count: 1   Client-ID: cisco-0050.73f7.c0c0-Et0/0
*Mar  1 00:13:39.270:    Hostname: R1
*Mar  1 00:13:39.270: DHCP: SDiscover: sending 294 byte length DHCP packet
*Mar  1 00:13:39.270: DHCP: SDiscover 294 bytes
*Mar  1 00:13:39.270:             B'cast on Ethernet0/0 interface from 0.0.0.0
*Mar  1 00:13:39.370: DHCP: Received a BOOTREP pkt
*Mar  1 00:13:39.370: DHCP: Scan: Message type: DHCP Offer
*Mar  1 00:13:39.370: DHCP: Scan: Server ID Option: 136.1.121.12 = 8801790C
*Mar  1 00:13:39.374: DHCP: Scan: Lease Time: 1800
*Mar  1 00:13:39.374: DHCP: Scan: Renewal time: 900
*Mar  1 00:13:39.374: DHCP: Scan: Rebind time: 1575
*Mar  1 00:13:39.374: DHCP: Scan: Subnet Address Option: 255.255.255.0
*Mar  1 00:13:39.374: DHCP: Scan: Domain Name: internetworkexpert.com
*Mar  1 00:13:39.374: DHCP: Scan: Router Option: 136.1.121.12
*Mar  1 00:13:39.374: DHCP: rcvd pkt source: 136.1.121.12,  destination:
255.255.255.255
*Mar  1 00:13:39.374:    UDP  sport: 43,  dport: 44,  length: 312
*Mar  1 00:13:39.378:    DHCP op: 2, htype: 1, hlen: 6, hops: 0
*Mar  1 00:13:39.378:    DHCP server identifier: 136.1.121.12
*Mar  1 00:13:39.378:         xid: C8B29, secs: 0, flags: 0
*Mar  1 00:13:39.378:         client: 0.0.0.0, your: 136.1.121.100
*Mar  1 00:13:39.378:         srvr:   0.0.0.0, gw: 0.0.0.0
*Mar  1 00:13:39.378:         options block length: 64
```

```
*Mar  1 00:13:39.378: DHCP Offer Message   Offered Address: 136.1.121.100
*Mar  1 00:13:39.378: DHCP: Lease Seconds: 1800    Renewal secs:  900    Rebind
secs:   1575
*Mar  1 00:13:39.382: DHCP: Server ID Option: 136.1.121.12
*Mar  1 00:13:39.382: DHCP: offer received from 136.1.121.12
*Mar  1 00:13:39.382: DHCP: SRequest attempt # 1 for entry:
*Mar  1 00:13:39.382: Temp IP addr: 136.1.121.100  for peer on Interface:
Ethernet0/0
*Mar  1 00:13:39.382: Temp  sub net mask: 255.255.255.0
*Mar  1 00:13:39.382:    DHCP Lease server: 136.1.121.12, state: 2 Requesting
*Mar  1 00:13:39.382:    DHCP transaction id: C8B29
*Mar  1 00:13:39.382:    Lease: 1800 secs,  Renewal: 0 secs,  Rebind: 0 secs
*Mar  1 00:13:39.386:    Next timer fires after: 00:00:01
*Mar  1 00:13:39.386:    Retry count: 1   CInterface Ethernet0/0 assigned DHCP
address 136.1.121.100, mask 255.255.255.0
lient-ID: cisco-0050.73f7.c0c0-Et0/0
*Mar  1 00:13:39.386:    Hostname: R1
*Mar  1 00:13:39.386: DHCP: SRequest- Server ID option: 136.1.121.12
*Mar  1 00:13:39.386: DHCP: SRequest- Requested IP addr option: 136.1.121.100
*Mar  1 00:13:39.386: DHCP: SRequest placed lease len option: 1800
*Mar  1 00:13:39.386: DHCP: SRequest: 312 bytes
*Mar  1 00:13:39.386: DHCP: SRequest: 312 bytes
*Mar  1 00:13:39.390:            B'cast on Ethernet0/0 interface from 0.0.0.0
*Mar  1 00:13:39.390: DHCP: Received a BOOTREP pkt
*Mar  1 00:13:39.394: DHCP: Scan: Message type: DHCP Ack
*Mar  1 00:13:39.394: DHCP: Scan: Server ID Option: 136.1.121.12 = 8801790C
*Mar  1 00:13:39.394: DHCP: Scan: Lease Time: 1800
*Mar  1 00:13:39.394: DHCP: Scan: Renewal time: 900
*Mar  1 00:13:39.394: DHCP: Scan: Rebind time: 1575
*Mar  1 00:13:39.394: DHCP: Scan: Host Name: R1.internetworkexpert.com
*Mar  1 00:13:39.394: DHCP: Scan: Subnet Address Option: 255.255.255.0
*Mar  1 00:13:39.394: DHCP: Scan: Domain Name: internetworkexpert.com
*Mar  1 00:13:39.394: DHCP: Scan: Router Option: 136.1.121.12
*Mar  1 00:13:39.398: DHCP: rcvd pkt source: 136.1.121.12,  destination:
255.255.255.255
*Mar  1 00:13:39.398:    UDP  sport: 43,  dport: 44,  length: 339
*Mar  1 00:13:39.398:    DHCP op: 2, htype: 1, hlen: 6, hops: 0
*Mar  1 00:13:39.398:    DHCP server identifier: 136.1.121.12
*Mar  1 00:13:39.398:         xid: C8B29, secs: 0, flags: 0
*Mar  1 00:13:39.398:         client: 0.0.0.0, your: 136.1.121.100
*Mar  1 00:13:39.398:         srvr:   0.0.0.0, gw: 0.0.0.0
*Mar  1 00:13:39.398:         options block length: 91

*Mar  1 00:13:39.402: DHCP Ack Message
*Mar  1 00:13:39.402: DHCP: Lease Seconds: 1800    Renewal secs:  900    Rebind
secs:   1575
*Mar  1 00:13:39.402: DHCP: Server ID Option: 136.1.121.12
*Mar  1 00:13:39.402: DHCP Host Name Option: R1.internetworkexpert.com
*Mar  1 00:13:42.403: DHCP Client Pooling: ***Allocated IP address:
136.1.121.100
*Mar  1 00:13:42.463: Allocated IP address = 136.1.121.100  255.255.255.0
```

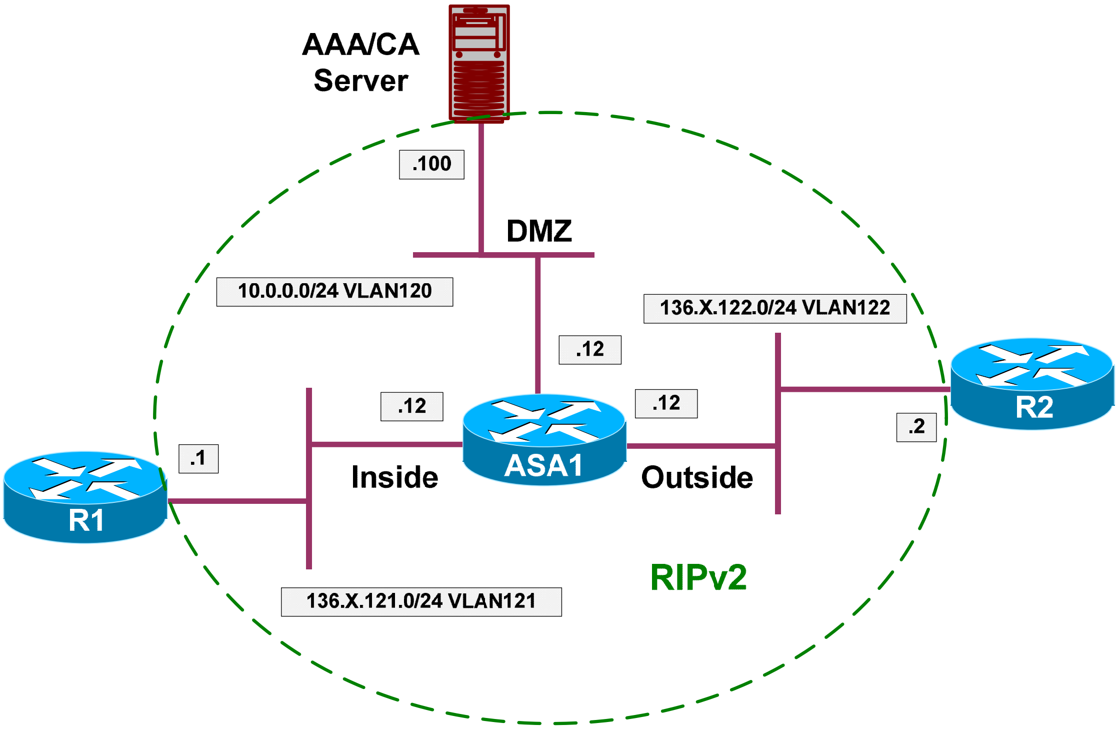
Further Reading

Configuring DHCP, DDNS, and WCCP Services

Modular Policy Framework

HTTP Inspection with MPF

Objective: Configure different inspection policies for HTTP traffic on outside and inside interfaces.



Directions

- Configure devices as per the scenario "PIX/ASA Firewall/Access Control" "Common Configuration".
- MPF configuration is similar to MQC configuration on IOS router. You define the class map to match traffic using L3/L4 criterias and use the policy map to define corresponding action.
- Unlike IOS, the firewall has additional types of class-maps and policy-maps to implement granular traffic-inspection policies.
- Inspection class maps have certain types, and can be used to group classification criterias. Later, they can be configured inside the inspection policy-maps having the same type and associated with inspection policy.
- For example, with FTP inspection policy-map. You may utilize class-maps that group together certain FTP commands or file types.

- The inspection policy-maps may be applied inside L3/L4 policy-maps as inspection rules for selected traffic.
- The firewall also has a default traffic inspection policy, which is applied globally for all traffic passing over any interface.
- Configure the ASA as follows:
    - Statically map the IP 10.0.0.100 to 136.1.122.100.
    - Classify HTTP traffic from inside and outside interfaces as follows:
        - Create class-map HTTP_FROM_INSIDE to match traffic from inside network to host 10.0.0.100 port 80.
        - Create class-map HTTP_FROM_OUTSIDE to match traffic from outside network to host 136.1.122.100 port 80.
        - Use access-lists names HTTP_FROM_INSIDE and HTTP_FROM_OUTSIDE for this tasks.
    - Create and apply access-list OUTSIDE_IN to permit HTTP access to 136.1.122.100.
    - Create policy-map for HTTP traffic inspection as follows:
        - Name it HTTP_INSPECT.
        - Reset on protocol violations.
        - Spoof server header with the “Apache/2.2.0 (Unix)”.
- Create policy-map for outside interface, name it OUTSIDE. For the class HTTP_FROM_INSIDE configure the following:
    - Apply the HTTP inspection with policy-map HTTP_INSPECT.
    - Limit number of embryonic connections to 100 and maximum connections to 200.
- Create policy-map for inside interface, name it INSIDE. For the class HTTP_FROM_OUTSIDE configure the following:
    - Apply the HTTP inspection with policy-map HTTP_INSPECT.
    - Limit number of embryonic connections to 500 and maximum connections to 100.
- Apply the policy-maps to the respective interfaces.

Final Configuration

ASA1:

```
!
! Static mapping
!
static (dmz,outside) 136.1.122.100 10.0.0.100 netmask 255.255.255.255
!
```

```
! Define Access-Lists
!
access-list OUTSIDE_IN permit tcp any host 136.1.122.100 eq www

access-list HTTP_FROM_INSIDE permit tcp 136.1.121.0 255.255.255.0 host
10.0.0.100 eq www

access-list HTTP_FROM_OUTSIDE permit tcp 136.1.122.0 255.255.255.0 host
136.1.122.100 eq www

!
! Apply outside ACL
!
access-group OUTSIDE_IN in interface outside

!
! Define class-maps
!
class-map HTTP_FROM_INSIDE
 match access-list HTTP_FROM_INSIDE

class-map HTTP_FROM_OUTSIDE
 match access-list HTTP_FROM_OUTSIDE

!
! Define HTTP inspection policy
!
policy-map type inspect http HTTP_INSPECT
 parameters
  spoof-server "Apache/2.2.0 (Unix)"
  protocol-violation action reset

!
! Create policy maps
!
policy-map OUTSIDE
 class HTTP_FROM_OUTSIDE
  inspect http HTTP_INSPECT
  set connection conn-max 100 embryonic-conn-max 50

policy-map INSIDE
 class HTTP_FROM_INSIDE
  inspect http HTTP_INSPECT
  set connection conn-max 200 embryonic-conn-max 100

!
! Apply the policies
!
service-policy OUTSIDE interface outside
service-policy INSIDE interface inside
```

Verification

```
R1#telnet 10.0.0.100 80
Trying 10.0.0.100, 80 ... Open
GET / HTTP/1.1

HTTP/1.1 400 Bad Request
Server:Apache/2.2.0 (Unix)
Date: Wed, 10 Jan 2007 11:58:13 GMT
Connection: close
```

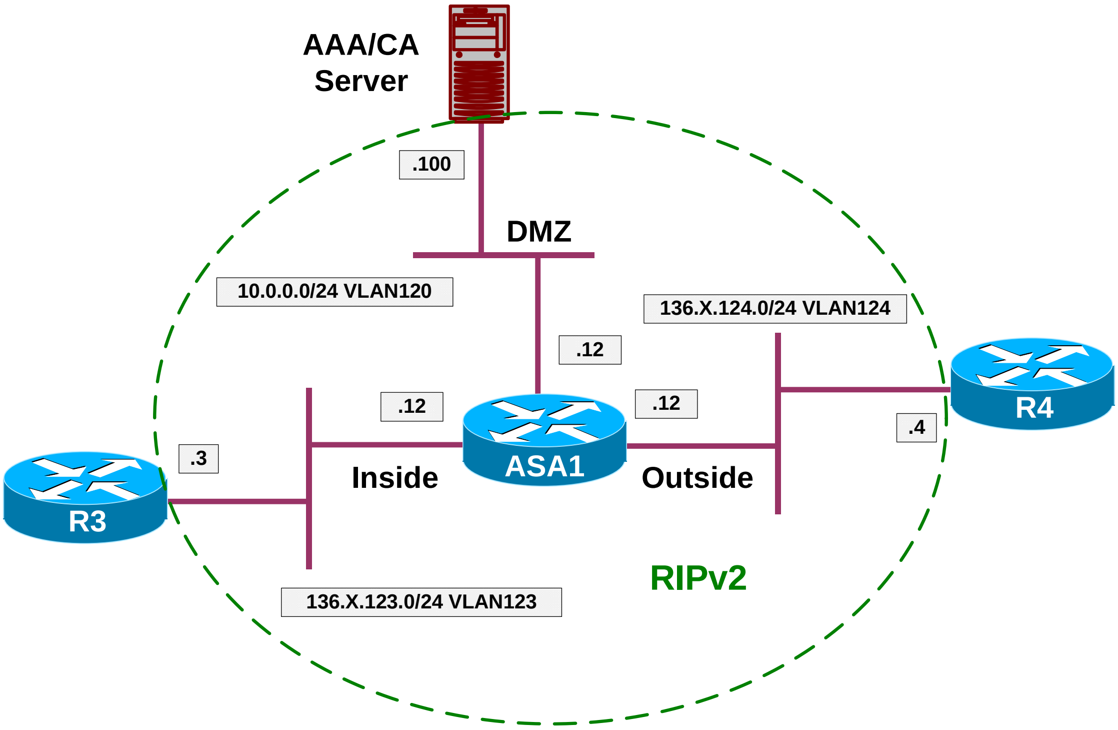
```
Content-Length: 4009
Content-Type: text/html

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">

R2#telnet 136.1.122.100 80
Trying 136.1.122.100, 80 ... Open
GET / HTTP/1.1

HTTP/1.1 400 Bad Request
Server:Apache/2.2.0 (Unix)
Date: Wed, 10 Jan 2007 11:59:27 GMT
Connection: close
Content-Length: 4009
Content-Type: text/html

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
```

Further Reading

Using Modular Policy Framework
Configuring Application Layer Protocol Inspection

Advanced FTP Inspection

Objective: Configure advanced FTP inspection policy.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- The overall goal is to limit permitted FTP commands and prevent certain files download.
- PIX/ASA firewall use flexible inspection configuration via MPF, that permits very granular and configurable protocol inspection.
- Create regexps to match filenames in MPF configuration as follows:
    - REG_26XX to match “^c26.*”
    - REG_36XX to match “^c36.*”
    - REG_28XX to match “^c28.*”
- Create class-map type regexp DENIED_FILES as follows:
    - Match regexps REG_26XX, REG_28XX and REG_36XX.
- Create class-map type “inspect FTP” named DENIED_COMMANDS as follows:

  - match request-command “DELE”.
  - match request-command “SITE” .
  - match request-command “RMD”.

- Create policy-map type “inspect FTP” named FTP_INSPECT as follows:

  - To add some obfuscation, configure parameters “mask-banner” and “mask-syst-reply”.
  - Match files with names in regex of class DENIED_FILES. Reset connection on these events.
  - Match command with names in class DENIED_COMMANDS. Reset such connections.

- Create L3/L4 class-map FTP and match TCP port 21.
- Create policy-map OUTSIDE and configure class FTP within. Inspect FTP and apply FTP inspection policy FTP_INSPECT.
- Apply policy-map OUTSIDE to the outside interface.
- Finally, create static NAT mapping and configure access-list to permit FTP traffic from outside.

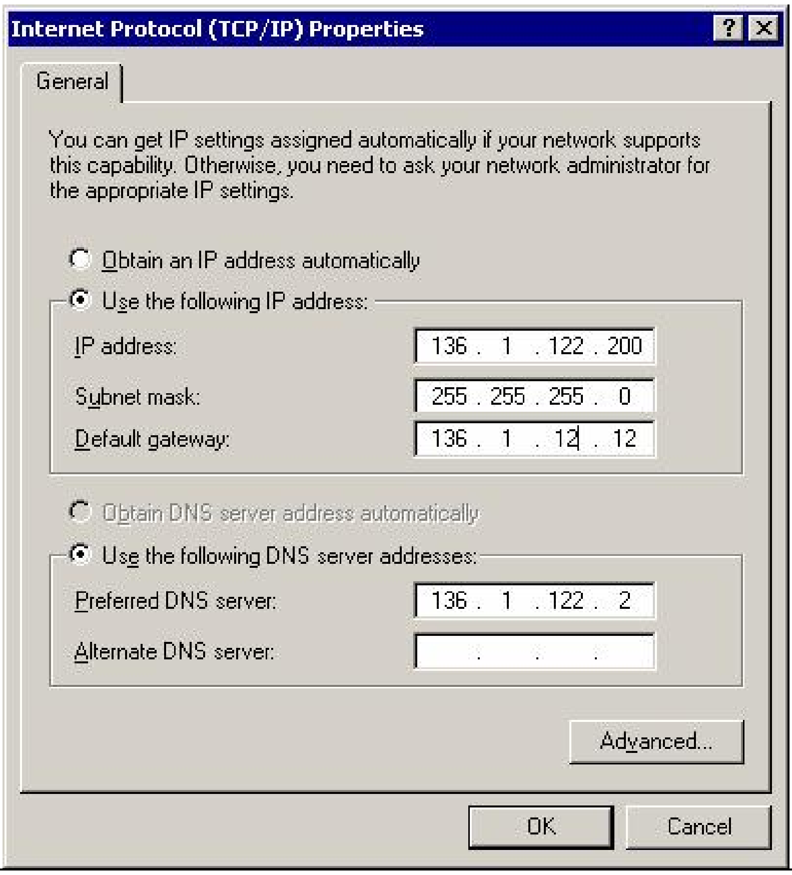
Final Configuration

```
ASA1:
!
! Regexps
!
regex REG_26XX "^c26.*"
regex REG_36XX "^c36.*"
regex REG_28XX "^c28.*"
!
! Class-map to group regexps
!
class-map type regex match-any DENIED_FILES
 match regex REG_26XX
 match regex REG_28XX
 match regex REG_36XX
!
! Class-map to group together the denied commands
!
class-map type inspect ftp match-all DENIED_COMMANDS
 match request-command site dele rmd
!
! FTP inspection policy, not the obfuscation options
!
policy-map type inspect ftp FTP_INSPECT
 parameters
  mask-banner
  mask-syst-reply
 match filename regex class DENIED_FILES
  reset
 class DENIED_COMMANDS
  reset
!
! Class to match FTP port (L3/L4)
!
```

```
class-map FTP
  match port tcp eq 21
!
! Policy map to apply to outside interface
!
policy-map OUTSIDE
class FTP
  inspect ftp strict FTP_INSPECT
!
! Apply policy to outside interface
!
service-policy OUTSIDE interface outside
!
! Static Mapping to simplify routing
!
static (dmz,o) 136.1.122.100 10.0.0.100
!
! Outside ACL to permit FTP traffic
!
access-list OUTSIDE_IN permit tcp any host 136.1.122.100 eq 21
access-group OUTSIDE_IN in interface outside
```

Verification

Test PC:



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 136 . 1 . 122 . 200

Subnet mask: 255 . 255 . 255 . 0

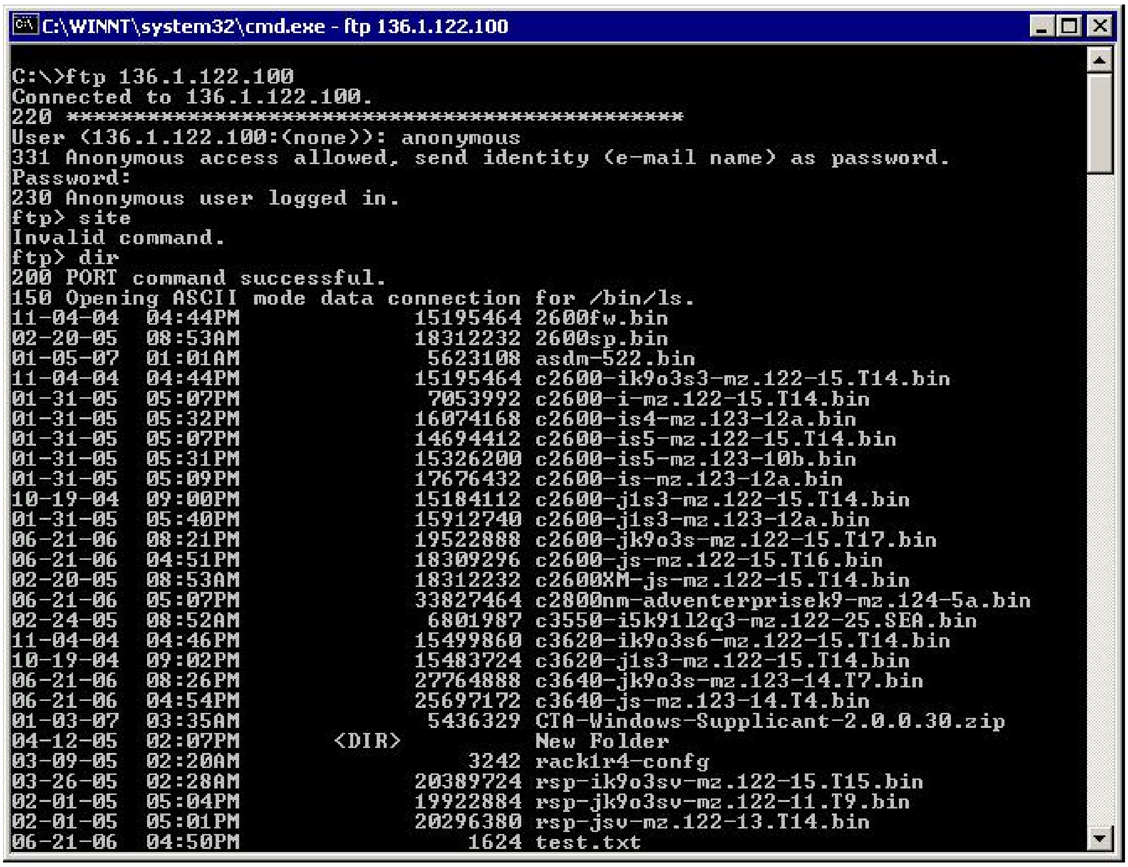
Default gateway: 136 . 1 . 12 . 12

○ Obtain DNS server address automatically

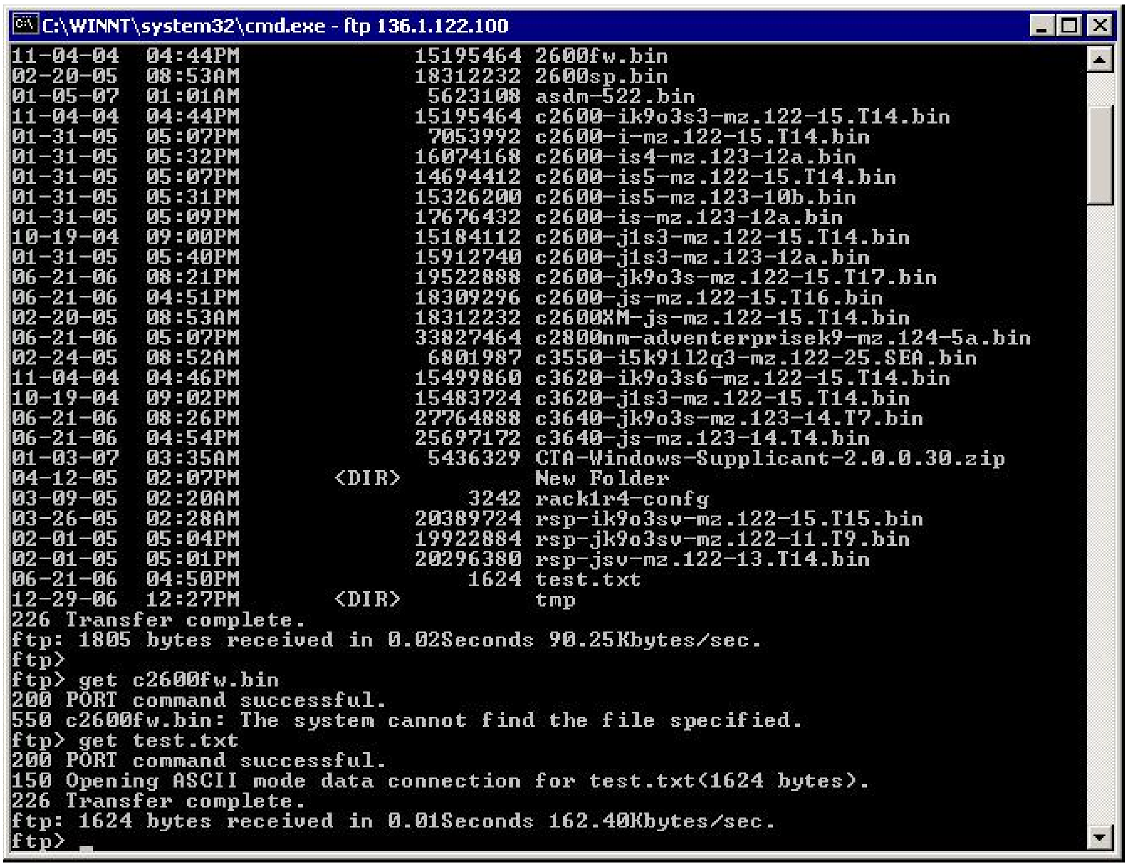
● Use the following DNS server addresses:

Preferred DNS server: 136 . 1 . 122 . 2

Alternate DNS server: . . .



```
C:\>ftp 136.1.122.100
Connected to 136.1.122.100.
220 **********************************************
User (136.1.122.100:(none)): anonymous
331 Anonymous access allowed, send identity (e-mail name) as password.
Password:
230 Anonymous user logged in.
ftp> site
Invalid command.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
11-04-04  04:44PM             15195464 2600fw.bin
02-20-05  08:53AM             18312232 2600sp.bin
01-05-07  01:01AM              5623108 asdm-522.bin
11-04-04  04:44PM             15195464 c2600-ik9o3s3-mz.122-15.T14.bin
01-31-05  05:07PM              7053992 c2600-i-mz.122-15.T14.bin
01-31-05  05:32PM             16074168 c2600-is4-mz.123-12a.bin
01-31-05  05:07PM             14694412 c2600-is5-mz.122-15.T14.bin
01-31-05  05:31PM             15326200 c2600-is5-mz.123-10b.bin
01-31-05  05:09PM             17676432 c2600-is-mz.123-12a.bin
10-19-04  09:00PM             15184112 c2600-j1s3-mz.122-15.T14.bin
01-31-05  05:40PM             15912740 c2600-j1s3-mz.123-12a.bin
06-21-06  08:21PM             19522888 c2600-jk9o3s-mz.122-15.T17.bin
06-21-06  04:51PM             18309296 c2600-js-mz.122-15.T16.bin
02-20-05  08:53AM             18312232 c2600XM-js-mz.122-15.T14.bin
06-21-06  05:07PM             33827464 c2800nm-adventerprisek9-mz.124-5a.bin
02-24-05  08:52AM              6801987 c3550-i5k912q3-mz.122-25.SEA.bin
11-04-04  04:46PM             15499860 c3620-ik9o3s6-mz.122-15.T14.bin
10-19-04  09:02PM             15483724 c3620-j1s3-mz.122-15.T14.bin
06-21-06  08:26PM             27764888 c3640-jk9o3s-mz.123-14.T7.bin
06-21-06  04:54PM             25697172 c3640-js-mz.123-14.T4.bin
01-03-07  03:35AM              5436329 CTA-Windows-Supplicant-2.0.0.30.zip
04-12-05  02:07PM       <DIR>          New Folder
03-09-05  02:20AM                 3242 rack1r4-confg
03-26-05  02:28AM             20389724 rsp-ik9o3sv-mz.122-15.T15.bin
02-01-05  05:04PM             19922884 rsp-jk9o3sv-mz.122-11.T9.bin
02-01-05  05:01PM             20296380 rsp-jsv-mz.122-13.T14.bin
06-21-06  04:50PM                 1624 test.txt
```



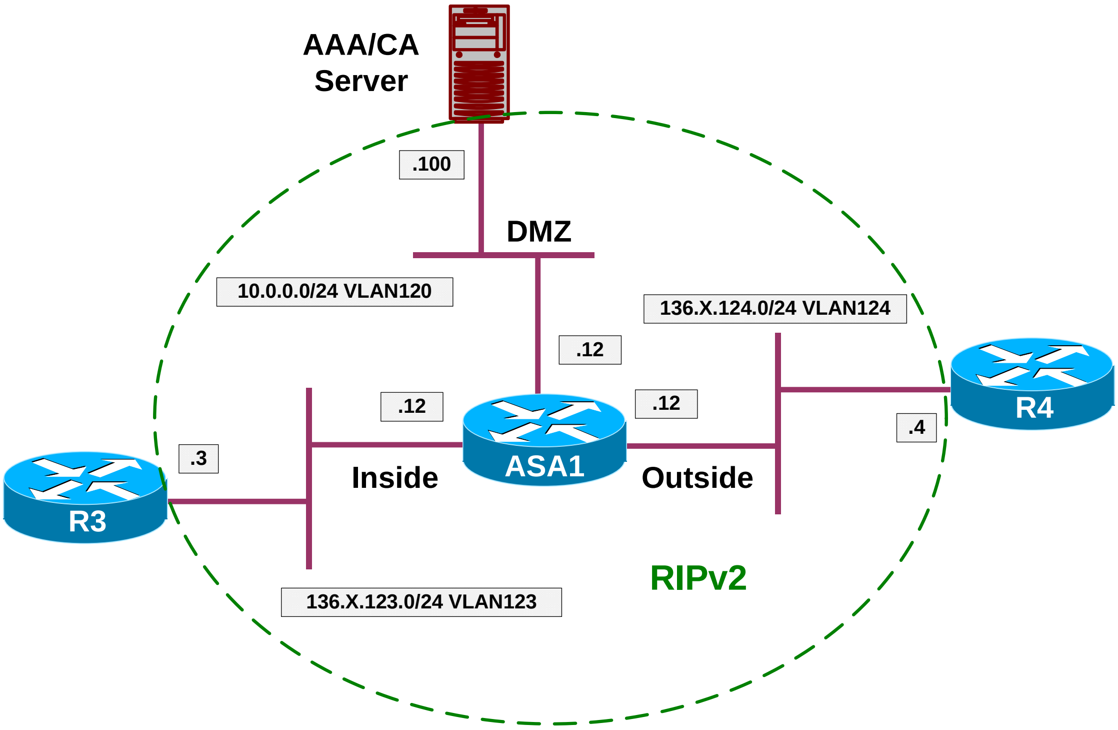
```
11-04-04  04:44PM              15195464 2600fw.bin
02-20-05  08:53AM              18312232 2600sp.bin
01-05-07  01:01AM               5623108 asdm-522.bin
11-04-04  04:44PM              15195464 c2600-ik9o3s3-mz.122-15.T14.bin
01-31-05  05:07PM               7053992 c2600-i-mz.122-15.T14.bin
01-31-05  05:32PM              16074168 c2600-is4-mz.123-12a.bin
01-31-05  05:07PM              14694412 c2600-is5-mz.122-15.T14.bin
01-31-05  05:31PM              15326200 c2600-is5-mz.123-10b.bin
01-31-05  05:09PM              17676432 c2600-is-mz.123-12a.bin
10-19-04  09:00PM              15184112 c2600-j1s3-mz.122-15.T14.bin
01-31-05  05:40PM              15912740 c2600-j1s3-mz.123-12a.bin
06-21-06  08:21PM              19522888 c2600-jk9o3s-mz.122-15.T17.bin
06-21-06  04:51PM              18309296 c2600-js-mz.122-15.T16.bin
02-20-05  08:53AM              18312232 c2600XM-js-mz.122-15.T14.bin
06-21-06  05:07PM              33827464 c2800nm-adventerprisek9-mz.124-5a.bin
02-24-05  08:52AM               6801987 c3550-i5k9l12q3-mz.122-25.SEA.bin
11-04-04  04:46PM              15499860 c3620-ik9o3s6-mz.122-15.T14.bin
10-19-04  09:02PM              15483724 c3620-j1s3-mz.122-15.T14.bin
06-21-06  08:26PM              27764888 c3640-jk9o3s-mz.123-14.T7.bin
06-21-06  04:54PM              25697172 c3640-js-mz.123-14.T4.bin
01-03-07  03:35AM               5436329 CTA-Windows-Supplicant-2.0.0.30.zip
04-12-05  02:07PM       <DIR>          New Folder
03-09-05  02:20AM                  3242 rack1r4-config
03-26-05  02:28AM              20389724 rsp-ik9o3sv-mz.122-15.T15.bin
02-01-05  05:04PM              19922884 rsp-jk9o3sv-mz.122-11.T9.bin
02-01-05  05:01PM              20296380 rsp-jsv-mz.122-13.T14.bin
06-21-06  04:50PM                  1624 test.txt
12-29-06  12:27PM       <DIR>          tmp
226 Transfer complete.
ftp: 1805 bytes received in 0.02Seconds 90.25Kbytes/sec.
ftp>
ftp> get c2600fw.bin
200 PORT command successful.
550 c2600fw.bin: The system cannot find the file specified.
ftp> get test.txt
200 PORT command successful.
150 Opening ASCII mode data connection for test.txt(1624 bytes).
226 Transfer complete.
ftp: 1624 bytes received in 0.01Seconds 162.40Kbytes/sec.
ftp>
```

Further Reading

Using Modular Policy Framework
Configuring Application Layer Protocol Inspection

Advanced ESMTP Inspection

Objective: Configure advanced options for ESMTP inspection.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Configure static mapping for DMZ server 10.0.0.100 to the outside IP 136.X.122.100.
- Create and apply access-list to outside interface to permit connections from outside to DMZ server via SMTP.
- Configure classification criterias as follows:
    - Create access-list SMTP_SERVER to match TCP traffic to 136.X.122.100 port 25.
    - Create L3 class-map SMTP_SERVER and match access-list SMTP_SERVER within.
    - Create regexp SPAMMERS and match the string “(cable|dsl|dialup)”.
- Configure inspection policy. Create policy-map SMTP_INSPECT of type “inspect emstp” as follows.
    - Enable banner obfuscation parameter.

  - Configure relay-domain cisco.com and reset non-conforming connections.
  - Reset the connection if the number of invalid recipients is greater than 3.
  - Reset the connection if sender address match any in regexp SPAMMERS.

- Create policy-map OUTSIDE as follows:

  - For class SMTP_SERVER inspect ESMTP protocol with custom policy SMTP_INSPECT.
  - Sec connection parameters:

    - Number of embryonic connections to 50.
    - Number of maximum allowed connections to 100.

- Apply policy-map to the outside interface.

Final Configuration

SW1:

```
!
! Static mapping and access-list to permit SMTP
!
static (dmz,o) 136.1.122.100 10.0.0.100
access-list OUTSIDE_IN permit tcp any host 136.1.122.100 eq 25
access-group OUTSIDE_IN in interface outside

!
! Access-list and L3/4 class-map
!
access-list SMTP_SERVER permit tcp any host 136.1.122.100 eq 25
class-map SMTP_SERVER
 match access-list SMTP_SERVER

!
! Regexps to catch possible spammers
!
regex SPAMMERS “(cable|dsl|dialup)”

!
! SMTP Inspection Policy
!
policy-map type inspect esmtp SMTP_INSPECT
 parameters
   mask-banner
   mail-relay cisco.com action drop-connection
   exit
 match invalid-recipients count gt 3
   reset
 match sender-address regex SPAMMERS
   reset

!
```

```
! Create and apply outside policy-map
!
policy-map OUTSIDE
  class SMTP_SERVER
    set  connection conn-max 100
    set connection embryonic-conn-max 50
    inspect esmtp SMTP_INSPECT
!
service-policy OUTSIDE interface outside
```

Verification

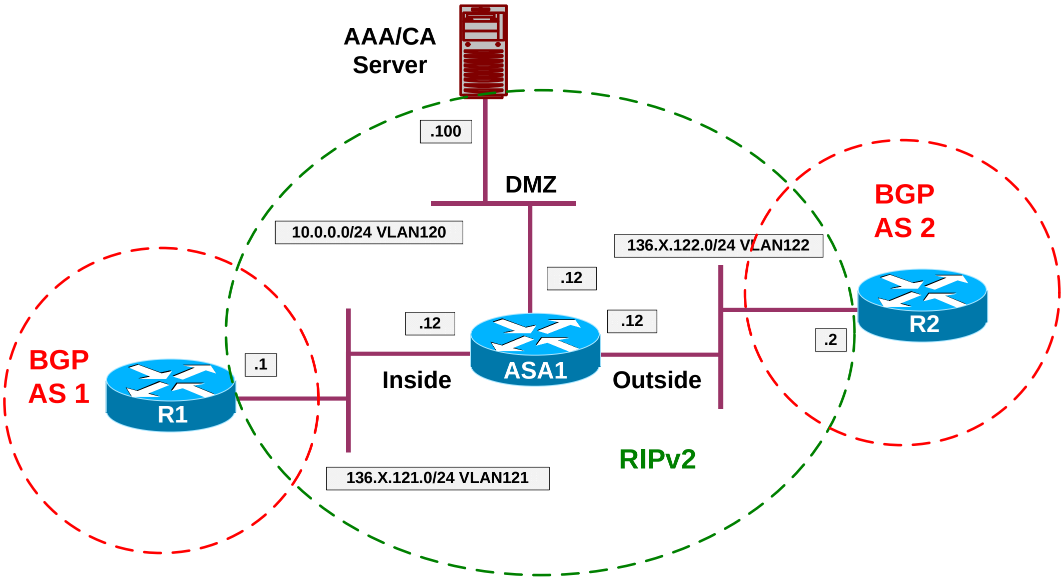
```
ASA1(config)# show service-policy interface outside

Interface outside:
  Service-policy: OUTSIDE
    Class-map: SMTP_SERVER
      Set connection policy: conn-max 100 embryonic-conn-max 50
        current embryonic conns 0, current conns 0, drop 0
      Inspect: esmtp SMTP_INSPECT, packet 0, drop 0, reset-drop 0

R2#telnet 136.1.122.100 25
Trying 136.1.122.100, 25 ... Open
220
********************************************************************************
*************************
EHLO
500 5.3.3 Unrecognized command
EHLO
250-IESERVER1 Hello [136.1.122.2]
250-AUTH GSSAPI NTLM LOGIN
250-AUTH=LOGIN
250-TURN
250-ATRN
250-SIZE 2097152
250-ETRN
250-PIPELINING
250-DSN
250-ENHANCEDSTATUSCODES
250-8bitmime
250-BINARYMIME
250-CHUNKING
250-VRFY
250 OK
```

Further Reading

Using Modular Policy Framework
Configuring Application Layer Protocol Inspection

Authenticating BGP Session Through the Firewall

Objective: Configure authenticated BGP session through the firewall.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Configure BGP on R1 and R2 as per the diagram. Peer R1 and R2 using the ethernet interfaces IP addresses. Enable eBGP multihop for peering.
- Authenticate BGP peering session using the password “CISCO”.
- In order to permit authenticated BGP session through the firewall, you need to tune TCP protocol inspection, and permit TCP option 19 (which is used for authentication) as well as make sure that no TCP sequence number randomization is turned on for BGP connections.
- Configure TCP map AUTH_OPTION and permit TCP option 19.
- Create L3/L4 class-map BGP, and match TCP port 179.
- Add class BGP to the default global_policy policy-map as follows:
    - Disable TCP random sequencing
    - Apply TCP map AUTH_OPTION

Final Configuration

R1:

```
router bgp 1
 neighbor 136.1.122.2 remote-as 2
 neighbor 136.1.122.2 ebgp
 neighbor 136.1.122.2 password CISCO
```

R2:

```
router bgp 2
 neighbor 136.1.121.1 remote-as 1
 neighbor 136.1.121.1 ebgp
 neighbor 136.1.121.1 password CISCO

ASA1:
!
! TCP options
!
tcp-map AUTH_OPTION
  tcp-options range 19 19 allow
!
! Class to match BGP
!
class-map BGP
 match port tcp eq bgp
!
! Global policy config
!
policy-map global_policy
class BGP
  set connection random-sequence-number disable
  set connection advanced-options AUTH_OPTION
```

Verification

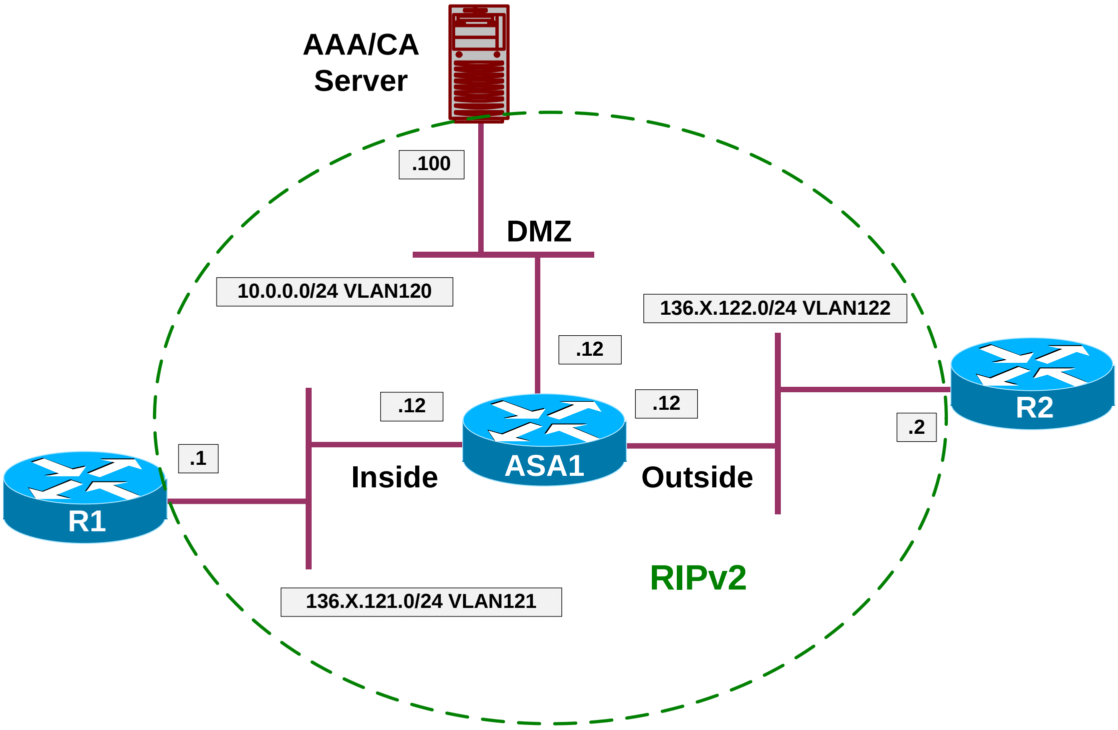
```
R1#show ip bgp summary
BGP router identifier 192.168.10.65, local AS number 1
BGP table version is 1, main routing table version 1

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
136.1.122.2     4     2       5       6        1    0    0 00:00:23        0

ASA1(config-router)# show conn detail
6 in use, 18 most used
Flags: A - awaiting inside ACK to SYN, a - awaiting outside ACK to SYN,
       B - initial SYN from outside, C - CTIQBE media, D - DNS, d - dump,
       E - outside back connection, F - outside FIN, f - inside FIN,
       G - group, g - MGCP, H - H.323, h - H.225.0, I - inbound data,
       i - incomplete, J - GTP, j - GTP data, K - GTP t3-response
       k - Skinny media, M - SMTP data, m - SIP media, O - outbound data,
       P - inside back connection, q - SQL*Net data, R - outside acknowledged
FIN,
       R - UDP SUNRPC, r - inside acknowledged FIN, S - awaiting inside SYN,
       s - awaiting outside SYN, T - SIP, t - SIP transient, U - up
       X - inspected by service module
TCP outside:136.1.122.2/179 inside:136.1.121.1/11019 flags UIO
```

Further Reading

Guide for Cisco PIX 6.2 and 6.3 Users Upgrading to Cisco Security Appliance Software Version 7.0

Implementing Traffic Policing

Objective: Police ingress and egress ICMP traffic on the outside interface.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Create access-list ICMP to match any ICMP traffic.
- Create L3/L4 class-map ICMP to match ICMP access-list.
- Create policy-map OUTSIDE, match class ICMP and policy ingress/egress traffic to 64000.
- Use default burst sizes.
- Configure and appy access-list to permit ICMP traffic through the firewall.

Final Configuration

```
SW1:
access-list ICMP permit icmp any any
!
class-map ICMP
 match access-list ICMP
!
policy-map OUTSIDE
 class ICMP
  police input 64000
  police output 64000
```

```
!
service-policy OUTSIDE interface outside
!
! Access-list to permit ICMP in/out
!
access-list OUTSIDE_IN permit icmp any any
access-group OUTSIDE_IN in interface outside
```

Verification

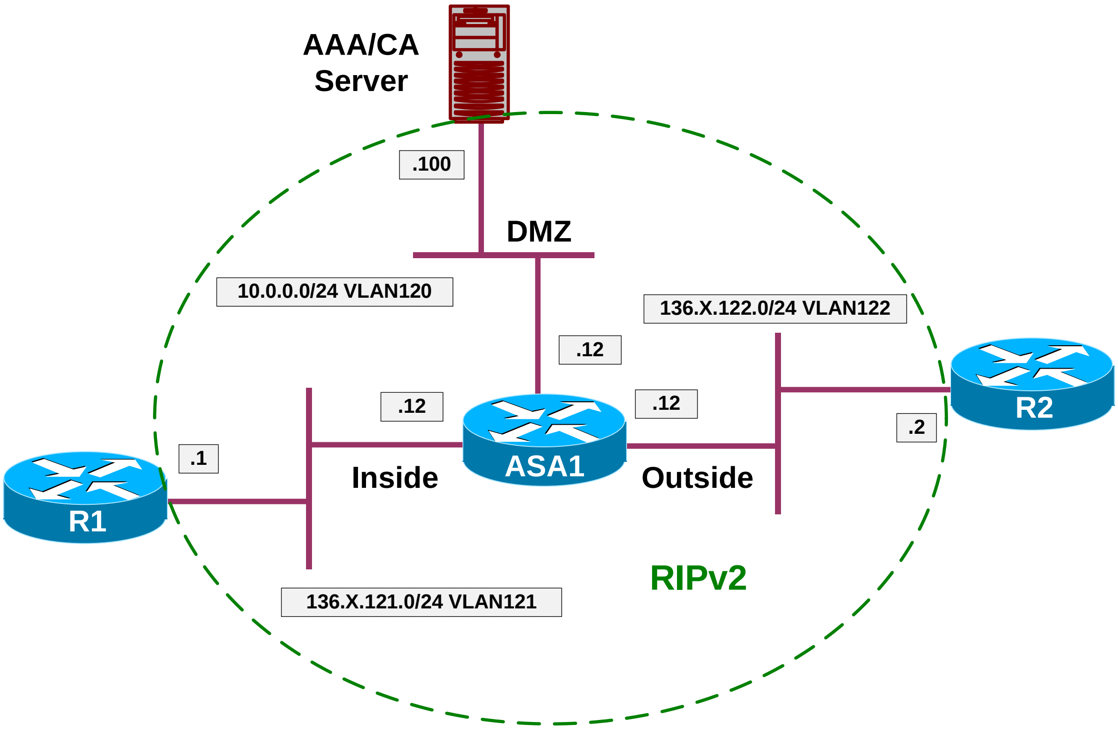
```
R1#ping 136.1.122.2 size 1500 repeat 1000

Type escape sequence to abort.
Sending 1000, 1500-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!!.!!!!!!.!!!!!!.!!!!!!.!!!!!!.!!!!!.
Success rate is 85 percent (35/41), round-trip min/avg/max = 8/9/24 ms

ASA1(config)# show service-policy interface outside

Interface outside:
  Service-policy: OUTSIDE
    Class-map: ICMP
      Input police Interface outside:
        cir 64000 bps, bc 2000 bytes
        conformed 0 packets, 0 bytes; actions:  transmit
        exceeded 0 packets, 0 bytes; actions:  drop
        conformed 0 bps, exceed 0 bps
      Output police Interface outside:
        cir 64000 bps, bc 2000 bytes
        conformed 45 packets, 62530 bytes; actions:  transmit
        exceeded 5 packets, 7570 bytes; actions:  drop
        conformed 24 bps, exceed 0 bps
```

🕮 Further Reading

Using Modular Policy Framework
Applying QoS Policies

Implementing Low Latency Queueing

Objective: Provide LLQ services for delay-sensitive traffic.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- The goal is to provide LLQ services to voice packets from the outside.
- The first task is to classify voice traffic using the most appropriate method.
- Create class-map VOICE to match RTP protocol port range 16384 16383.
- Create policy-map LLQ and assign class VOICE to priority queue.
- Attach policy-map LLQ to inside interface (output interface).
- Tune priority-queue on inside interface to hold up to 5 packets max.

Final Configuration

```
ASA1:
!
! Class-map to match voice traffic
!
class-map VOICE
 match rtp 16384 16383
!
! LLQ policy-map
!
policy-map LLQ
 class VOICE
  priority
```

```
!
service-policy LLQ interface inside
!
! Tune PQ
!
priority-queue inside
  queue-limit   5
```

Verification

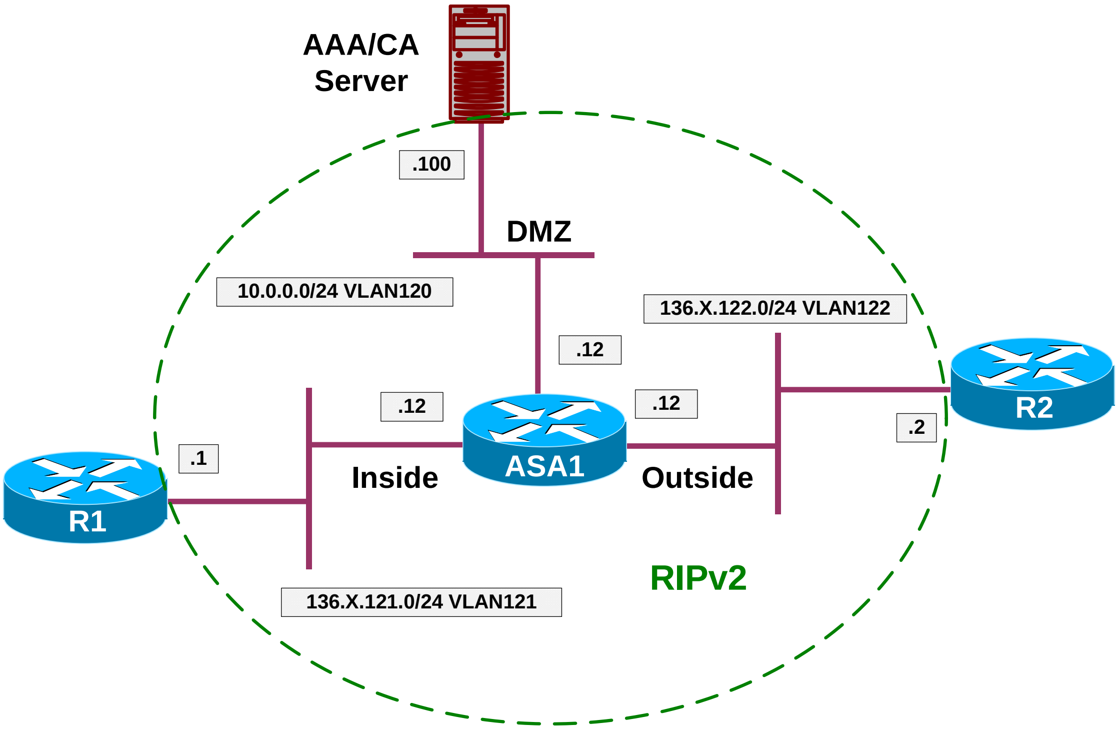
```
ASA1(config)# show priority-queue config

Priority-Queue Config interface outside
                current         default         range
queue-limit     5               2048            0 - 2048
tx-ring-limit   80              80              3 - 256

Priority-Queue Config interface inside
                current         default         range
queue-limit     5               2048            0 - 2048
tx-ring-limit   80              80              3 - 256

Priority-Queue Config interface dmz
                current         default         range
queue-limit     0               2048            0 - 2048
tx-ring-limit   -1              80              3 - 256

ASA1(config)# show priority-queue statistics

Priority-Queue Statistics interface outside

Queue Type      = BE
Packets Dropped   = 0
Packets Transmit  = 26
Packets Enqueued  = 0
Current Q Length  = 0
Max Q Length      = 0

Queue Type      = LLQ
Packets Dropped   = 0
Packets Transmit  = 0
Packets Enqueued  = 0
Current Q Length  = 0
Max Q Length      = 0

Priority-Queue Statistics interface inside

Queue Type      = BE
Packets Dropped   = 0
Packets Transmit  = 23
Packets Enqueued  = 0
Current Q Length  = 0
Max Q Length      = 0

Queue Type      = LLQ
Packets Dropped   = 0
Packets Transmit  = 0
Packets Enqueued  = 0
Current Q Length  = 0
Max Q Length      = 0
```

🕮 Further Reading

Using Modular Policy Framework
Applying QoS Policies

TCP Normalization

Objective: Configure TCP normalization parameters for Telnet sessions.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- TCP normalization permit the firewall to inspect and control certain TCP stream properties, as well as eliminate certain protocol anomalies.
- Create L3/L4 class-map TELNET to match telnet traffic.
- Create TCP map named “TCP” as follows:
    - Check retransmitted packets.
    - Verify TCP checksums.
    - Clear all reserverd bits in TCP headers.
- Configure class TELNET within policy-map “global_policy” and apply TCP map as advanced connection option.

Final Configuration

ASA1:

```
tcp-map TCP
  check-retransmission
  checksum-verification
  reserved-bits clear
```

```
!
class-map TELNET
  match port tcp eq 23
!
policy-map global_policy
 class TELNET
  set connection advanced TCP
```

Verification

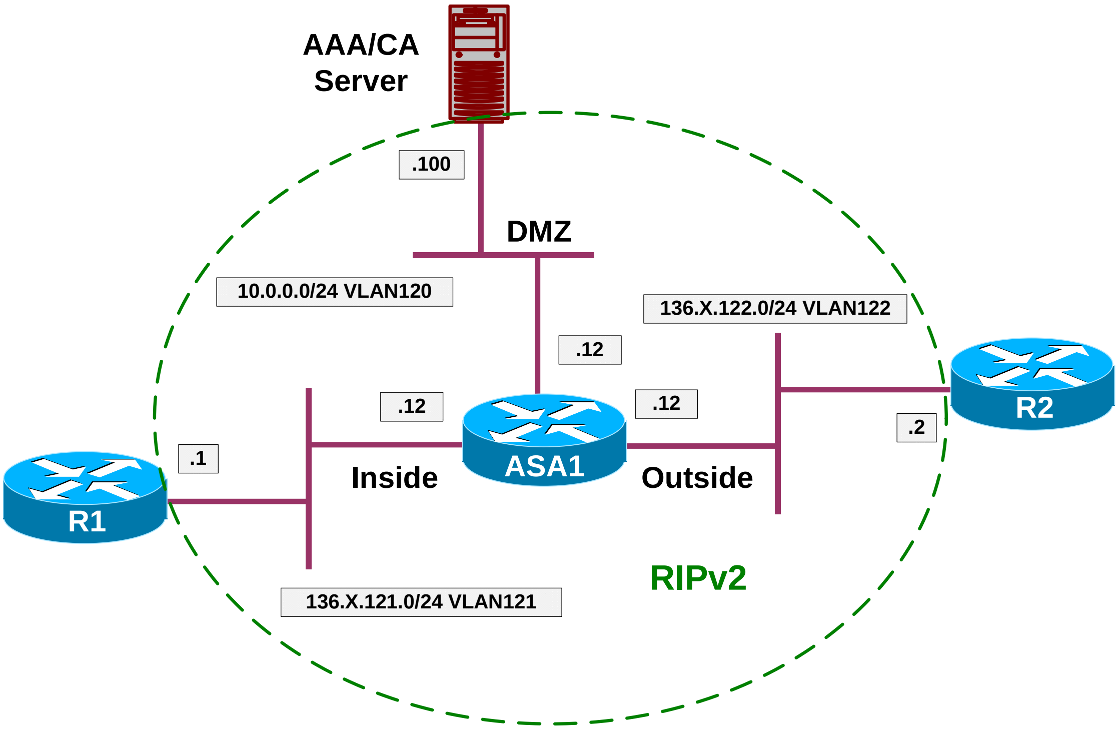
```
ASA1(config)# show service-policy global

Global policy:
  Service-policy: global_policy
    Class-map: inspection_default
      Inspect: dns preset_dns_map, packet 0, drop 0, reset-drop 0
      Inspect: ftp, packet 0, drop 0, reset-drop 0
      Inspect: h323 h225 _default_h323_map, packet 0, drop 0, reset-drop 0
      Inspect: h323 ras _default_h323_map, packet 0, drop 0, reset-drop 0
      Inspect: rsh, packet 0, drop 0, reset-drop 0
      Inspect: rtsp, packet 0, drop 0, reset-drop 0
      Inspect: sqlnet, packet 0, drop 0, reset-drop 0
      Inspect: skinny, packet 0, drop 0, reset-drop 0
      Inspect: sunrpc, packet 0, drop 0, reset-drop 0
      Inspect: xdmcp, packet 0, drop 0, reset-drop 0
      Inspect: sip, packet 0, drop 0, reset-drop 0
      Inspect: netbios, packet 0, drop 0, reset-drop 0
      Inspect: tftp, packet 0, drop 0, reset-drop 0
      Inspect: icmp, packet 10, drop 0, reset-drop 0
    Class-map: TELNET
      Set connection policy:
      Set connection advanced-options: TCP
        Retransmission drops: 0               TCP checksum drops : 0
        Exceeded MSS drops  : 0               SYN with data drops: 0
        Out-of-order packets: 0               No buffer drops    : 0
        Reserved bit cleared: 0               Reserved bit drops : 0
        IP TTL modified     : 0               Urgent flag cleared: 0
        Window varied resets: 0
        TCP-options:
          Selective ACK cleared: 0            Timestamp cleared  : 0
          Window scale cleared : 0
          Other options cleared: 0
          Other options drops: 0
```

Further Reading

Using Modular Policy Framework

Management Traffic and MPF

Objective: Configure the firewall for inspection of RADIUS accounting packets.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Configure AAA RADIUS server on DMZ interface with IP 10.0.0.100 and key CISCO.
- Create class-map named RADIUS of type management and match UDP port range 1645 1646.
- Create policy-map INSPECT_RADIUS of type “inspect radius-accounting”. Apply the following parameters:
  - Validate attribute number 26.
  - Configure host 10.0.0.100 with key CISCO.
  - Send Accounting Response.
- Assign class RADIUS to global_policy and apply RADIUS accounting inspection with policy-map INSPECT_RADIUS.

Final Configuration

```
ASA1:
!
! Configure AAA server
!
aaa-server RADIUS  protocol radius
aaa-server RADIUS (dmz) host 10.0.0.100 CISCO
!
! Configure management class-map to match RADIUS ACC packets
!
class-map type management RADIUS
 match port udp eqradius-acct
!
! RADIUS inspection policy
!
policy-map type inspect radius-accounting RADIUS_INSPECT
 parameters
  send response
  validate-attribute 26
  host 10.0.0.100 key CISCO
!
policy-map global_policy
 class RADIUS
  inspect radius-accounting RADIUS_INSPECT
```

Verification

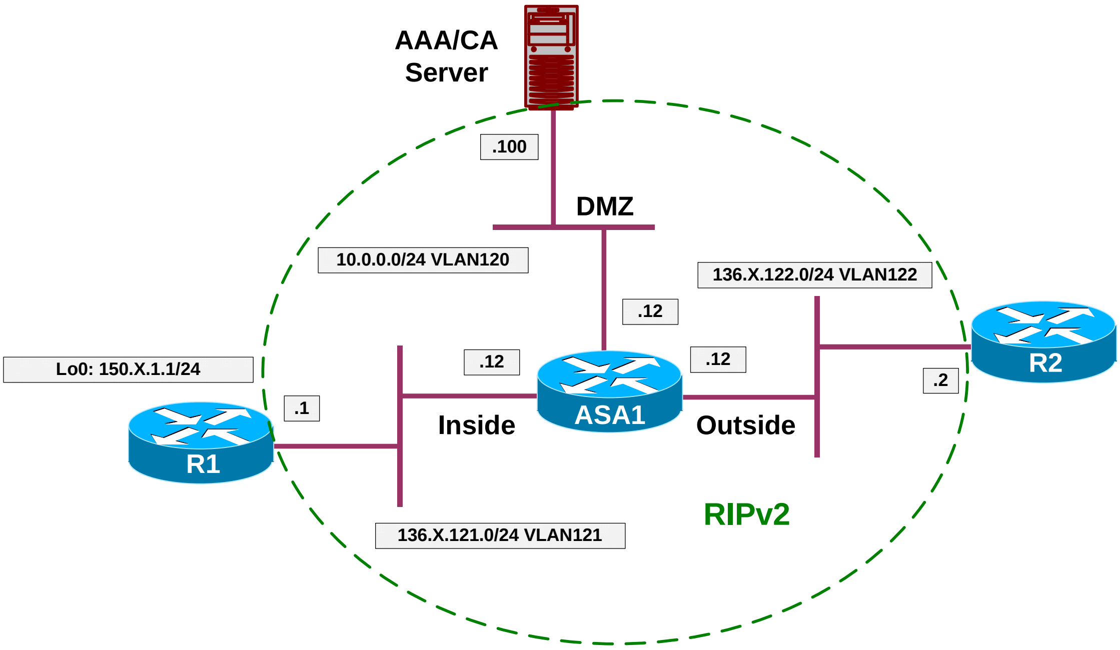
```
ASA1(config)# show service-policy global

Global policy:
  Service-policy: global_policy
    Class-map: inspection_default
      Inspect: dns preset_dns_map, packet 0, drop 0, reset-drop 0
      Inspect: ftp, packet 0, drop 0, reset-drop 0
      Inspect: h323 h225 _default_h323_map, packet 0, drop 0, reset-drop 0
      Inspect: h323 ras _default_h323_map, packet 0, drop 0, reset-drop 0
      Inspect: rsh, packet 0, drop 0, reset-drop 0
      Inspect: rtsp, packet 0, drop 0, reset-drop 0
      Inspect: esmtp _default_esmtp_map, packet 0, drop 0, reset-drop 0
      Inspect: sqlnet, packet 0, drop 0, reset-drop 0
      Inspect: skinny, packet 0, drop 0, reset-drop 0
      Inspect: sunrpc, packet 0, drop 0, reset-drop 0
      Inspect: xdmcp, packet 0, drop 0, reset-drop 0
      Inspect: sip, packet 0, drop 0, reset-drop 0
      Inspect: netbios, packet 0, drop 0, reset-drop 0
      Inspect: tftp, packet 0, drop 0, reset-drop 0
    Class-map: RADIUS
      Inspect: radius-accounting RADIUS_INSPECT, packet 0
```

Further Reading

RADIUS Accounting Inspection

ICMP Inspection Engine

Objective: Configure the firewall for ICMP traffic inspection with NAT.



Directions

- Configure devices as per the scenario “PIX/ASA Firewall/Access Control” ”Common Configuration”.
- Configure static NAT translation 136.X.121.1 to 136.X.122.1.
- Create Loopback0 interface on R1 and advertise it into RIP.
- Create access-list OUTSIDE_IN and permit inbound UDP packets. Apply this access-list to the outside interface.
- Perform a traceroute to 150.1.1.1, note the responding IP address.
- Within “global_policy” and class “inspection_default” enable ICMP inspection along with ICMP errors.
- Perform a traceroute to 150.1.1.1, and see how responding address has changed.
- Additionally, ICMP inspection permits pings across the firewall, without explicit ACL configuration on the outside interface.

Final Configuration

ASA1:

```
!
! Static mapping
!
static (inside,outside) 136.1.122.1 136.1.121.1

!
```

```
! Access-list to permit inboud traceroute
!
access-list OUTSIDE_IN permit udp any any
access-group OUTSIDE_IN in interface outside

!
! Apply ICMP inspection
!
policy-map global_policy
 class inspection_default
   inspect icmp error
   inspect icmp
```

Verification

```
Before the inspection was enabled:

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#

R2#traceroute 150.1.1.1

Type escape sequence to abort.
Tracing the route to 150.1.1.1

  1 136.1.121.1 4 msec *  0 msec

After:

R1#ping 136.1.122.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 136.1.122.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/158/176 ms
R1#

R2#traceroute 150.1.1.1

Type escape sequence to abort.
Tracing the route to 150.1.1.1

  1 136.1.122.1 4 msec *  0 msec
```

Further Reading

ICMP Inspection