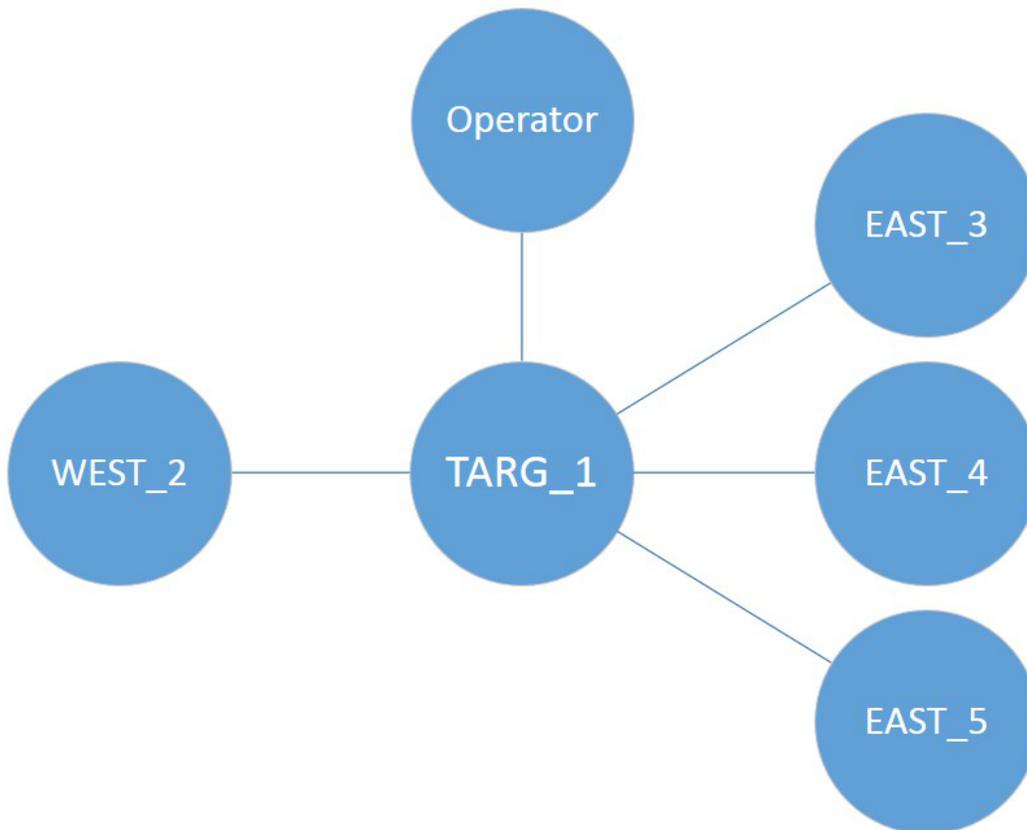


# OutlawCountry Test Plan

## 1) Test Environment

This test requires 2 networks (WEST and EAST) and 5 hosts (TARG\_1, WEST\_2, EAST\_3, EAST\_4, and EAST\_5):



TARG\_A must have interfaces on both the WEST and EAST networks, and shell access to TARG\_A is assumed. The following are example IP addresses that could be used for this test plan:

WEST: 192.168.1.0/24

- TARG\_1W: 192.168.1.1

- WEST\_2: 192.168.1.2

EAST: 192.168.2.0/24

- TARG\_1E: 192.168.2.1

- EAST\_3: 192.168.2.3
- EAST\_4: 192.168.2.4
- EAST\_5: 192.168.2.5

## **2) Environment Configuration**

NOTE: On some OS versions, iptables, route, insmod, lsmod, and/or rmmod may be in /sbin, which may not be in the default path. In that case, use the absolute path (e.g. "/sbin/iptables") when running those commands. All commands should be executed as root.

TARG\_1 must be configured to route traffic between the networks. This can be done by adding FORWARD rules:

```
TARG_1# echo "1" > /proc/sys/net/ipv4/ip_forward  
  
TARG_1# iptables -I FORWARD -s 192.168.1.0/24 \  
-d 192.168.2.0/24 -j ACCEPT  
  
TARG_1# iptables -I FORWARD -s 192.168.2.0/24 \  
-d 192.168.1.0/24 -j ACCEPT
```

WEST\_2 must have a route for the EAST network, and should not be blocking incoming connections from that network:

```
WEST_2# route add -net 192.168.2.0/24 gw 192.168.1.1  
  
WEST_2# iptables -I INPUT -s 192.168.2.0/24 -j ACCEPT
```

Similarly, each EAST hosts must have a route for the WEST network:

```
EAST_3# route add -net 192.168.1.0/24 gw 192.168.2.1  
  
EAST_3# iptables -I INPUT -s 192.168.1.0/24 -j ACCEPT
```

Repeat the above commands for EAST\_4 and EAST\_5.

## **3) Baseline Test**

First, confirm that forwarding works by running ping, netcat (udp), and netcat (tcp) tests (see Appendix A) in both directions (WEST->EAST and EAST->WEST).

Next, create a DNAT rule in the “nat” table to redirect traffic bound for EAST\_3 and send it to EAST\_4:

```
TARG_1# iptables -t nat -I PREROUTING \
-s 192.168.1.2 -d 192.168.2.3 \
-j DNAT --to-destination 192.168.2.4

TARG_1# iptables -t nat -L PREROUTING -nv
```

Verify that the new rule appears in the output of the “iptables -L” command. Confirm that the DNAT rule works by running netcat (udp) and netcat (tcp) tests. Verify that the traffic is sent to EAST\_4 and \*not\* EAST\_3.

Before proceeding, remove the DNAT rule:

```
TARG_1# iptables -t nat -D PREROUTING 1

TARG_1# iptables -t nat -L PREROUTING -nv
```

Verify that the new rule no longer appears in the output of the “iptables -L” command.

## **4) Tool Installation**

Copy the nf\_table kernel module to TARG\_1. For CentOS/RHEL 5.x i386 kernels, use the nf\_table\_5\_32.ko module. For CentOS/RHEL 6.x x86\_64 kernels, use the nf\_table\_6\_64.ko module. For simplicity, it is assumed that the module is renamed to nf\_table.ko prior to deployment. Install the kernel module using insmod:

```
TARG_1# insmod nf_table.ko
```

Then, look for evidence that the installation succeeded:

```
TARG_1# lsmod

TARG_1# iptables -t dpxvke8h18 -L -nv
```

Verify that “nf\_table” appears in the output for lsmod. Verify that an empty PREROUTING chain exists in the “dpxvke8h18” table.

Finally, see if the new table appears in “/proc/net/ip\_tables\_names” or in the output of “iptables-save”:

```
TARG_1# cat /proc/net/ip_tables_names
TARG_1# iptables-save
```

Verify that the “dpxvke8h18” table is not present in the output of either command.

## **5) Capability Tests**

### **5.1) Redirection Test**

Create a DNAT rule in the “dpxvke8h18” table to redirect traffic bound for EAST\_3 and send it to EAST\_5:

```
TARG_1# iptables -t dpxvke8h18 -I PREROUTING \
-s 192.168.1.2 -d 192.168.2.3 \
-j DNAT --to-destination 192.168.2.5
TARG_1# iptables -t dpxvke8h18 -L PREROUTING -nv
```

Verify that the new rule appears in the output of the “iptables -L” command. Confirm that the DNAT rule works by running netcat (udp) and netcat (tcp) tests. Verify that the traffic is sent to EAST\_5 and \*not\* EAST\_3.

Before proceeding, flush the PREROUTING chain in the “dpxvke8h18” table:

```
TARG_1# iptables -t dpxvke8h18 -F PREROUTING
TARG_1# iptables -t dpxvke8h18 -L PREROUTING -nv
```

Verify that the new rule no longer appears in the output of the “iptables -L” command.

### **5.2) Precedence Test**

To test if the “dpxvke8h18” table has precedence over the “nat” table, create a DNAT rule in the “nat” table to redirect traffic to EAST\_4, then create a DNAT rule in the “dpxvke8h18” table to redirect traffic to EAST\_5:

```
TARG_1# iptables -t nat -I PREROUTING \
-s 192.168.1.2 -d 192.168.2.3 \
-j DNAT --to-destination 192.168.2.4

TARG_1# iptables -t dpxvke8h18 -I PREROUTING \
-s 192.168.1.2 -d 192.168.2.3 \
-j DNAT --to-destination 192.168.2.5
```

Confirm that the precedence is correct by running netcat (udp) and netcat (tcp) tests. Verify that the traffic is sent to EAST\_5 and \*not\* EAST\_3 or EAST\_4.

Before proceeding, flush the PREROUTING chain in the “dpxvke8h18” table and remove the new rule from the “nat” table:

```
TARG_1# iptables -t dpxvke8h18 -F PREROUTING

TARG_1# iptables -t nat -D PREROUTING 1
```

### **5.3) Port Test**

To test if redirection works for specific ports, create a DNAT rule to redirect one specific UDP port to EAST\_5 with port translation, and then create a DNAT rule to redirect a different TCP port to EAST\_5, also with port translation:

```
TARG_1# iptables -t dpxvke8h18 -I PREROUTING -p udp \
-s 192.168.1.2 -d 192.168.2.3 --dport 23456 \
-j DNAT --to-destination 192.168.2.5:34567

TARG_1# iptables -t dpxvke8h18 -I PREROUTING -p tcp \
-s 192.168.1.2 -d 192.168.2.3 --dport 45678 \
-j DNAT --to-destination 192.168.2.5:56789

TARG_1# iptables -t dpxvke8h18 -L PREROUTING -nv
```

Verify that the new rules appear in the output of the “iptables -L” command.

Confirm that the UDP rule works by running netcat (udp) tests. Verify that sending traffic to port 23456 on EAST\_3 results in redirection to port 34567 on EAST\_5. Verify that sending traffic to other ports on EAST\_3 does not result in redirection.

Confirm that the TCP rule works by running netcat (tcp) tests. Verify that sending traffic to port 45678 on EAST\_3 results in redirection to port 56789

on EAST\_5. Verify that sending traffic to other ports on EAST\_3 does not result in redirection.

Before proceeding, flush the PREROUTING chain in the “dpxvke8h18” table:

```
TARG_1# iptables -t dpxvke8h18 -F PREROUTING
```

## **6) Tool Removal**

Remove the kernel module using rmmod:

```
TARG_1# rmmod nf_table
```

Then, look for evidence that the removal succeeded:

```
TARG_1# lsmod  
TARG_1# iptables -t dpxvke8h18 -L -nv
```

Verify that “nf\_table” does *\*not\** appear in the output for lsmod. Verify that the “iptables -L” command result in an error.

Finally, see if the table appears in “/proc/net/ip\_tables\_names”:

```
TARG_1# cat /proc/net/ip_tables_names
```

Verify that the “dpxvke8h18” table *\*still\** is not present in the command output.

## **Appendix A: Connectivity Tests**

These examples show how to test the connectivity between WEST\_2 and EAST\_3. For individual test steps, a successful result may require traffic bound for EAST\_3 to be redirected to EAST\_4 or EAST\_5.

### **A.1) Ping Test**

From WEST\_2, ping EAST\_3:

```
WEST_2# ping 192.168.2.3
```

Confirm that ping replies are received.

### **A.2) Netcat (UDP) Test**

On EAST\_3, create a listening UDP socket using netcat, preferably with a high port:

```
EAST_3# nc -l -u -p 12345
```

On WEST\_2, connect to the listening port using netcat:

```
WEST_2# nc -u 192.168.2.3 12345
```

Type text into the WEST\_2 terminal and confirm that it shows up on the EAST\_3 terminal. Then, type text into the EAST\_3 terminal and confirm that it shows up on the WEST\_2 terminal.

### **A.3) Netcat (TCP) Test**

On EAST\_3, create a listening TCP socket using netcat, preferably with a high port:

```
EAST_3# nc -l -t -p 12345
```

On WEST\_2, connect to the listening port using netcat:

```
WEST_2# nc -t 192.168.2.3 12345
```

Type text into the WEST\_2 terminal and confirm that it shows up on the EAST\_3 terminal. Then, type text into the EAST\_3 terminal and confirm that it shows up on the WEST\_2 terminal.