

# IPSec Gateway to Gateway Network Configuration

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## 1 Overview

In our IPSec project, we need to construct a network environment to demonstrate how to use IPSec to implement Virtual Private Network (VPN). In our demonstration, we need to establish an IPSec tunnel between two gateways, so machines in two different networks (connected via the Internet through those two gateways) can communicate securely using the secure tunnel.

In this document, we show how to simulate such an environment using four `Minix` virtual machines. Because setting up two network interface cards on one `Minix` machine is not easy, we use one network interface on each gateway. Although this will cause the gateway to send out `ICMP Redirect` messages, it does not matter. The entire setup is illustrated in Figure 1. In this setup, we want each packet from `HOST1` to `HOST2` to route through `GW1` and `GW2`.

Although there are other ways to set up such an environment, this particular setup is the best that we can come up with (we are open to better solutions). This solution has the following properties:

1. Each `Minix` machine uses only one network card.
2. The network cards in each `Minix` machine use the same `VMWare` network Adapter.
3. We do not have to change the code in `Minix` OS.
4. Different network mask is used so that the network configured by `VMWare` network Adapter can be separated into different subnets.

## 2 Configuration

### 2.1 Configure VMWare Network Adapter

Change the `VMWare` network adapter to use network mask `255.255.0.0`. The adapter could be `VMnet8`, which is used as NAT. In Windows, You can right-click `My Network Places` and choose `Properties`; from there, pick `VMWare Network Adapter VMnet8` → `Properties` → `Internet Protocol (TCP/IP)` → `Properties`. You will finally get to a place where you can set the network mask.

### 2.2 Configure Routing table

Append `add_route` command at the end of `/etc/rc` to add routing information. For example, the routing in Figure 1 is set up using the following commands:

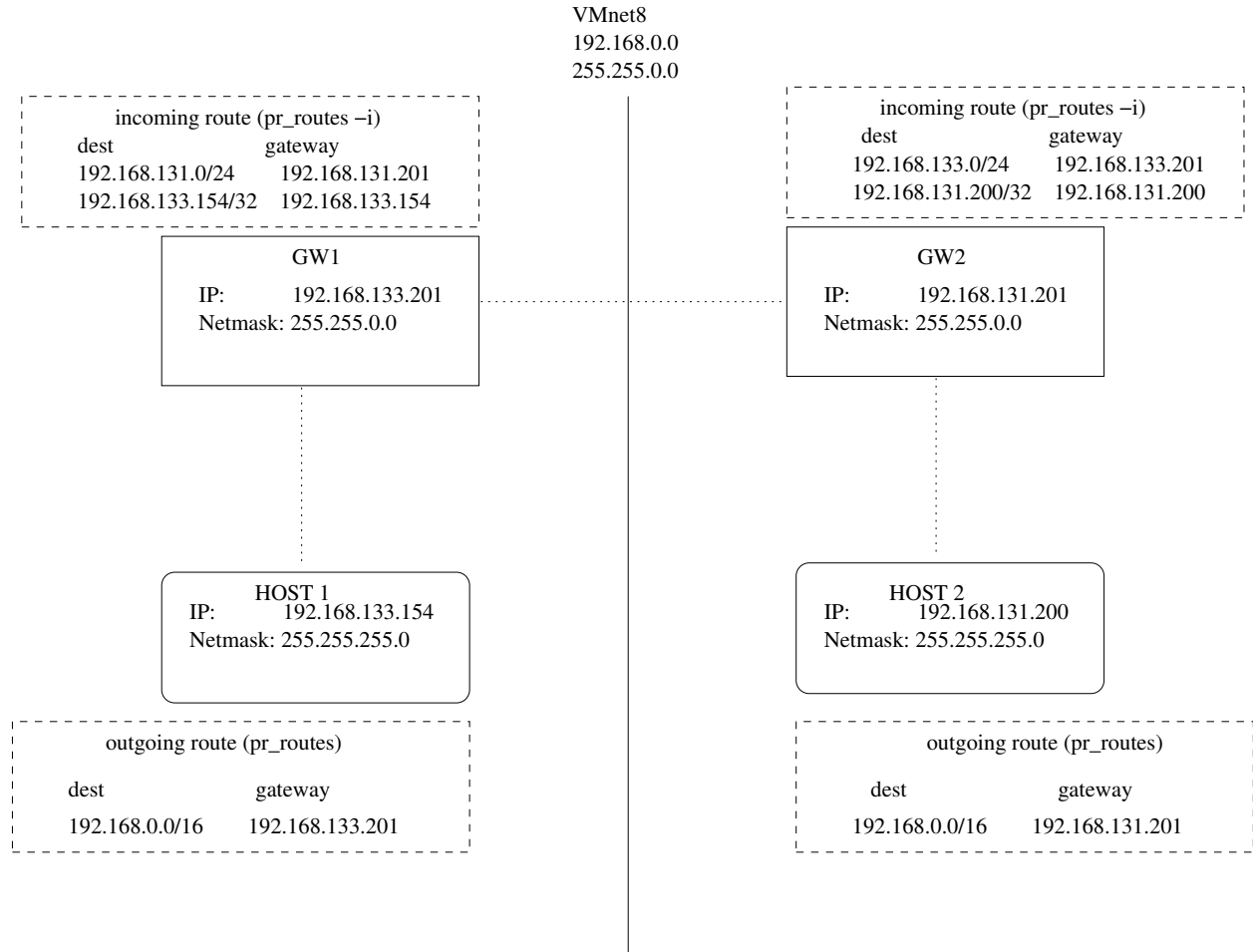


Figure 1: Test Environment Example

**HOST1:** add outgoing route

```
add_route -g 192.168.133.201 -d 192.168.0.0 -n 255.255.0.0
```

**HOST2:** add outgoing route

```
# add_route -g 192.168.131.201 -d 192.168.0.0 -n 255.255.0.0
```

**GW1:** add incoming route

```
# add_route -i -g 192.168.131.201 -d 192.168.131.0 -n 255.255.255.0 -m 25
# add_route -i -g 192.168.133.154 -d 192.168.133.154 -n 255.255.255.255 -m 25
```

**GW2:** add incoming route

```
# add_route -i -g 192.168.133.201 -d 192.168.133.0 -n 255.255.255.0 -m 25
# add_route -i -g 192.168.131.200 -d 192.168.131.200 -n 255.255.255.255 -m 25
```

**Verification.** After the change, reboot the machine, and use the following commands to check the results.

```
# pr_routes
# pr_routes -i
```

### 2.3 Configure IP address and Netmask

Because the routing information in our setup is statically configured, we would like each of our machines to stick to the same IP address and Netmask. Therefore, we cannot use `dhcp`. Instead, we manually configure the IP address and Netmask for each machine. To do this, first use `hostaddr -e` to find out the ethernet address of the network card for each machine, and then add the following to `/etc/dhcp.conf` to set the IP address and Netmask for each machine.

**HOST1:** set IP = 192.168.133.154 and Netmask = 255.255.255.0:

```
# host 192.168.133.0/24 {};
# client 0:c:29:61:ec:8c 192.168.133.154;
```

**HOST2:** set IP = 192.168.131.200, Netmask = 255.255.255.0

```
# host 192.168.131.0/24 {};
# client 0:c:29:77:8c:83 192.168.131.200;
```

**GW1:** set IP = 192.168.133.201, Netmask = 255.255.0.0

```
# host 192.168.0.0/16 {};
# client 0:c:29:d2:d6:dd 192.168.133.201;
```

**GW2:** set IP = 192.168.131.201, Netmask = 255.255.0.0

```
# host 192.168.0.0/16 {};
# client 0:c:29:ab:b5:e4 192.168.131.201;
```

**Verification.** After the change, reboot machine, then use the following command to check the results:

```
# ifconfig
```