

# IP Masquerading using iptables

Eli Billauer

`eli.billauer@yahoo.com`

# Talk's outline

- `iptables` versus `ipchains`
- The goal (or: my goal)
- The packet's way through `iptables`
- “Classic” masquerading (SNAT)
- DNS faking (with DNAT)
- Other things
- Firewalling with `iptables` (If we have time)
- Questions I'll hopefully answer

Not covered: packet mangling (change TOS, TTL and flags)

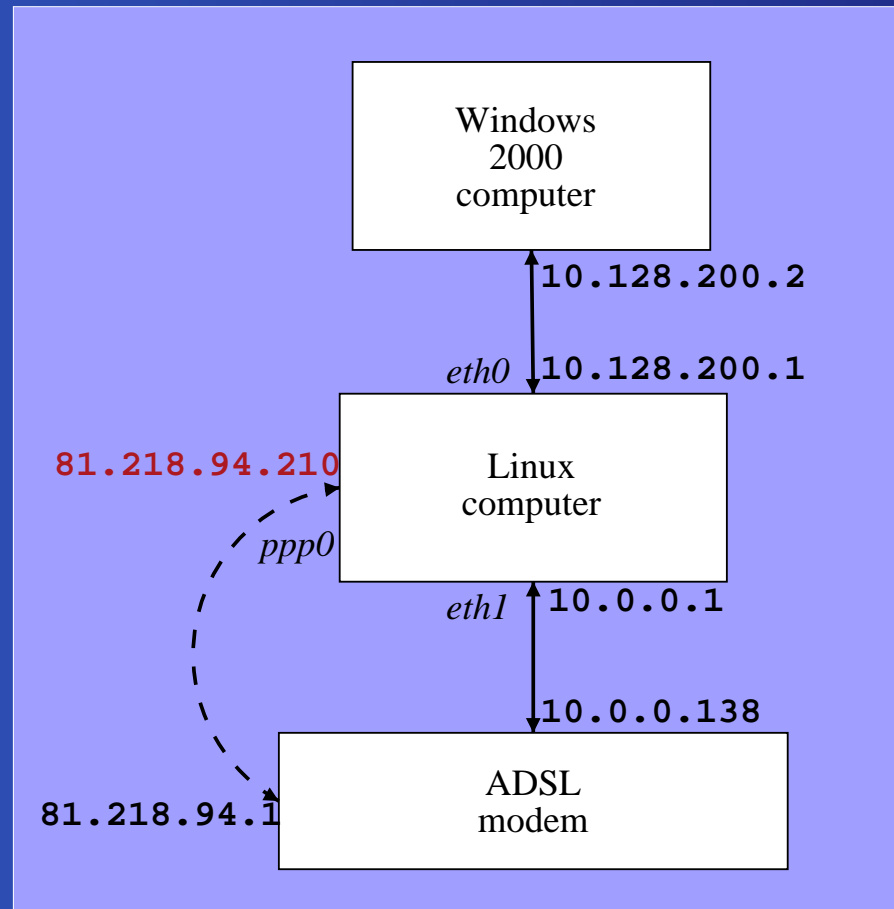
# Differences between iptables and ipchains

- Same author (Rusty Russell), and basically smells the same
- Most important: FORWARD taken apart from INPUT and OUTPUT
- Changes in syntax
- Masquerading is handled “separately”

# ipchains and iptables don't live together

- If the `ipchains` module is resident in the kernel, `iptables` won't `insmod`
- And vice versa
- Typical error message is misleading: "No kernel support"
- Red Hat 7.3 boots up with `ipchains` as default

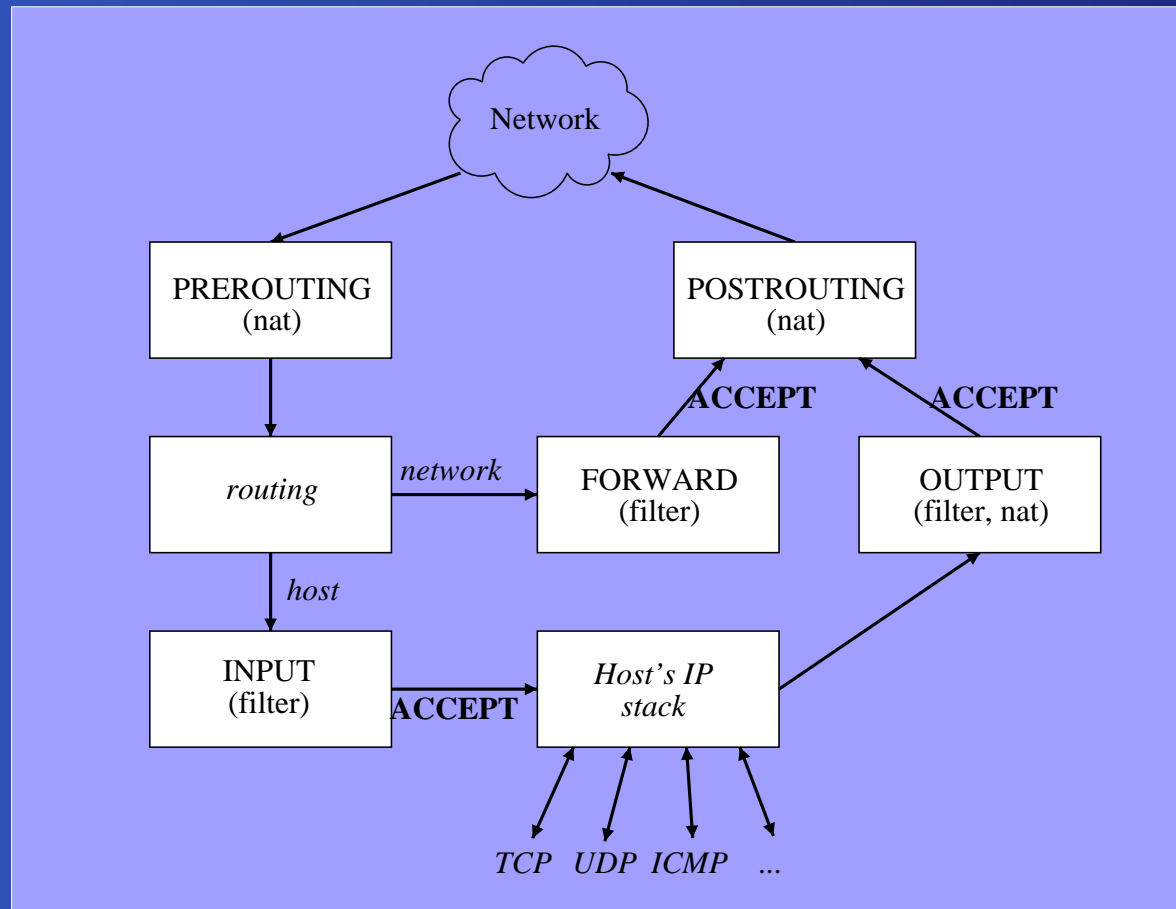
# What I wanted in the first place



# Requirements

- Windows computer should have a gateway
- DNS issue solved elegantly
- Both computers have access to network at the same time
- Network between computers is trustful
- Proper firewalling
- ADSL modem is considered hostile

# iptables: The IP packet's flow



# iptables: How to swallow this

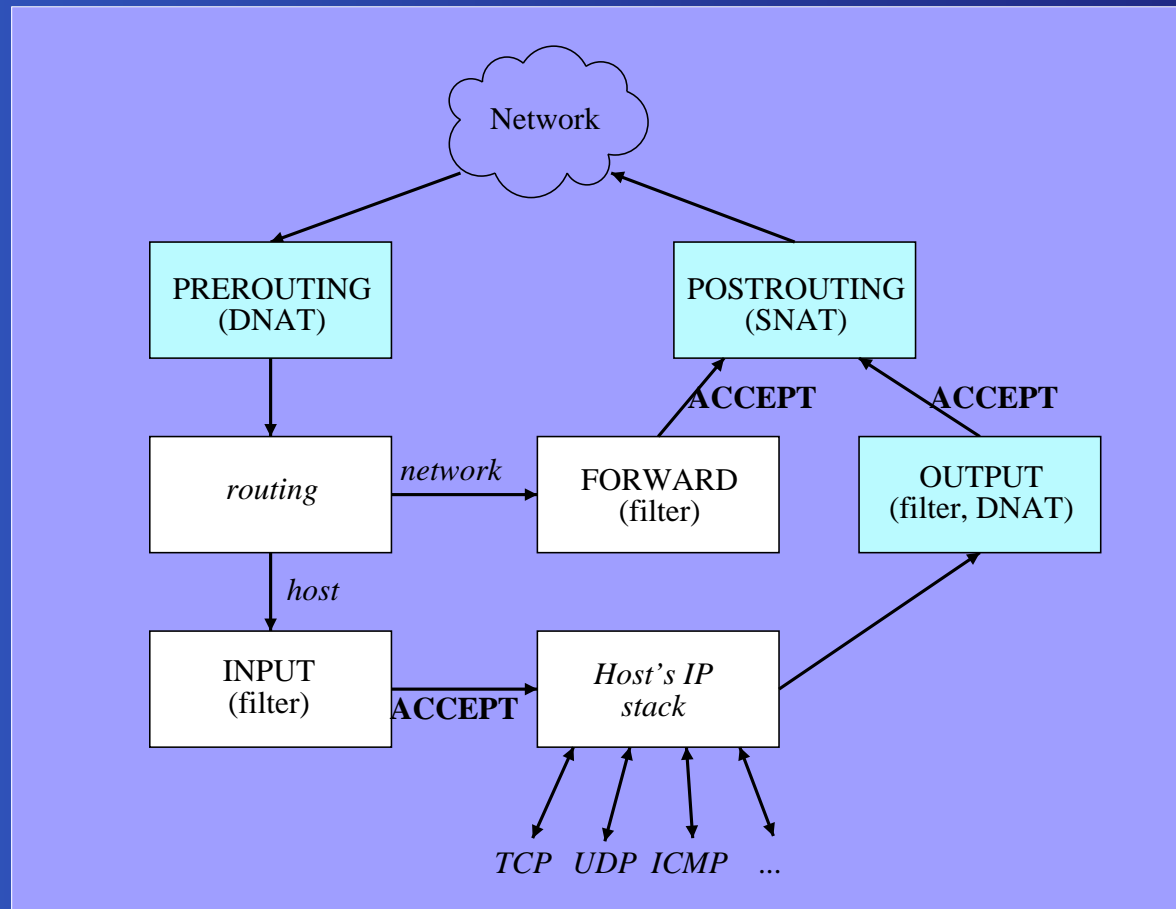
- Packet filtering (firewalls) and manipulation (masquerading) are neighbours
- Therefore, the same tools are used
- Think routing tables
- Chains: Think subroutines
- Each chain is terminated with a *target*, or next line taken
- Subchains work exactly like subroutines
- Tables: Group of chains: `filter` and `nat`
- Each chain has a policy – the default target



# What is Masquerading?

- All computers appear to have the same IP
- This is done with Network Address Translation
- It's easy to fake the "outgoing packet"
- "Incoming packets" must be translated too
- Port translation – a must

# iptables: The IP packet's flow



# Source Network Address Translation (SNAT)

- On ADSL: catch packets going out on `ppp0`
- The *source* IP is changed
- Source port numbers may be changed
- Easiest rule: Do SNAT on all packets going out on `ppp0`
- Will include OUTPUT packets by accident, but who cares?
- Remember: Every SNAT produces an implicit DNAT
- And vice versa

# “Incoming” packets

- The problem: Where should the packet go?
- Simple TCP connection: `iptables` remembers the port numbers
- UDP: Tricky
- DNS: Return the answer to whoever asked
- ICMP: Ping answers go the right way (!)
- FTP, ICQ and friends: Requires special treatment (they work for me as a basic client)
- When the other side opens a connection, that has to be treated specially
- `iptables` has application-based modules

# Defining SNAT iptables commands

The strict way:

```
iptables -t nat -A POSTROUTING -o ppp0 -j SNAT \  
--to $PPPIP
```

The liberal way:

```
iptables -t nat -A POSTROUTING -o ppp0 -j MASQUERADE
```

- The “liberal” form is better for temporary connections:
- MASQUERADE automatically chooses address
- MASQUERADE forgets old connections when interface goes down
- For dial-up, cable modems and ADSL: MASQUERADE wins

# POSTROUTE is just another chain

- Selective rules can be used
- Different manipulations are possible
- Use `-j ACCEPT` to let the packet through untouched

# The wrong way to masquerade

```
iptables -t nat -A POSTROUTING -j MASQUERADE
```

- This makes masquerading the default policy for any outgoing packet
- ... including any forwarded packet.
- All forwarded packets will appear to come from the masquerading host.
- May confuse firewalls
- Even worse, may confuse service applications to compromise security

# Masquerading and firewalling

- The internal computers are implicitly firewalled
- The main computer gets all the unrelated packets
- Main computer must be protected
- Main computer protected with INPUT and OUTPUT chains
- Other computers protected with FORWARD chains
- Note that FORWARD chains also apply to the intranet connection



# DNS faking with DNAT

- The other computers have constant DNS addresses
- The address is translated with DNAT

```
iptables -t nat -A PREROUTING -d 10.2.0.1 \  
-j DNAT --to-destination 192.115.106.31  
iptables -t nat -A PREROUTING -d 10.2.0.2 \  
-j DNAT --to-destination 192.115.106.35
```

# Automatic DNS DNAT setup

- In an ADSL connection, the DNS addresses are given on connection
- An `ip-up.local` script writes these addresses in the `resolv.conf` file

```
DNScount=1
for nameserver in \
  `perl -nle "/nameserver\D*(\d*\.\d*\.\d*\.\d*)/i && \
    (\\$1=~/^127/ || print \\$1)" /etc/resolv.conf`;
do iptables -t nat -A PREROUTING -d 10.2.0.$DNScount \
  -j DNAT --to-destination $nameserver
  let DNScount=DNScount+1;
done;
```

- The perl statement above extracts the two addresses

# The MTU on the Windows computer

- ADSL ppp connection has MTU of 1452
- Normal Ethernet has MTU 1500
- Windows computer doesn't know it goes through ADSL
- Fragmentation
- Fixed by adding an entry in Window's registry

# Other tricks

- Server on masqueraded host (DNAT)
- Port remapping (redirection)
- Load balancing (One-to-many forward DNAT)
- Packet mangling

# The `filter` chains

- INPUT, OUTPUT and FORWARD
- Targets with ACCEPT, DROP, REJECT or QUEUE
- A set of selective rules makes a firewall

# Example: A firewall

Close everything and flush chains

```
iptables -P INPUT DROP
```

```
iptables -P OUTPUT DROP
```

```
iptables -P FORWARD DROP
```

```
iptables -F -t nat
```

```
iptables -F -t filter
```

```
iptables -X
```

## Example: A firewall (cont.)

Allow everything on loopback interface

```
iptables -A INPUT -i lo -j ACCEPT  
iptables -A OUTPUT -o lo -j ACCEPT
```

## Example: A firewall (cont.)

Keep ADSL modem short

```
iptables -A INPUT -i eth1 -s 10.0.0.138/32 \  
        -d 10.0.0.0/8 -p tcp \  
        --sport 1723 -m state \  
        --state ESTABLISHED,RELATED -j ACCEPT
```

```
iptables -A INPUT -i eth1 -s 10.0.0.138/32 \  
        -d 10.0.0.0/8 -p gre -j ACCEPT
```

```
iptables -A INPUT -i eth1 -j DROP
```

```
iptables -A OUTPUT -o eth1 -s 10.0.0.0/8 \  
        -d 10.0.0.138/32 -p tcp --dport 1723 \  
        -j ACCEPT
```

```
iptables -A OUTPUT -o eth1 -s 10.0.0.0/8 \  
        -d 10.0.0.138/32 -p gre -j ACCEPT
```

```
iptables -A OUTPUT -o eth1 -j DROP
```



## Example: A firewall (cont.)

Linux computer with network rules:

```
iptables -A OUTPUT -o ppp0 -s $PPPIP -j ACCEPT
iptables -A INPUT -s ! 10.128.0.0/16 -p tcp \
    --dport 0:1023 -j DROP
iptables -A INPUT -i ppp0 -d $PPPIP -m state \
    --state ESTABLISHED,RELATED -j ACCEPT
```

## Example: A firewall (cont.)

Everything is allowed on internal network

```
iptables -A INPUT -s 10.128.0.0/16 \  
        -d 10.128.0.0/16 -j ACCEPT  
iptables -A OUTPUT -s 10.128.0.0/16 \  
        -d 10.128.0.0/16 -j ACCEPT
```

## Example: A firewall (cont.)

Forwarding....

```
iptables -A FORWARD -i ppp0 -o eth0 -m state \  
        --state ESTABLISHED,RELATED -j ACCEPT  
iptables -A FORWARD -i eth0 -o ppp0 -j ACCEPT  
iptables -A FORWARD -j DROP
```

Note that there is no forwarding in internal network

# iptables script finale

- Make sure that the main chains end with DROP
- Zero counters

```
iptables -A INPUT -j DROP
iptables -A OUTPUT -j DROP
iptables -A FORWARD -j DROP
iptables -Z
```

# Summary

- It works really well
- It's not difficult to set up if you know what you're doing

# References

- Linux IP Masquerade HOWTO (a version written in Jan 2003 is available)
- `man iptables`

# The End

Questions?

Slides were made with  $\text{\LaTeX}$ , using the `prospcr` document class