Introduction to Firewalls through

Linux **iptables**

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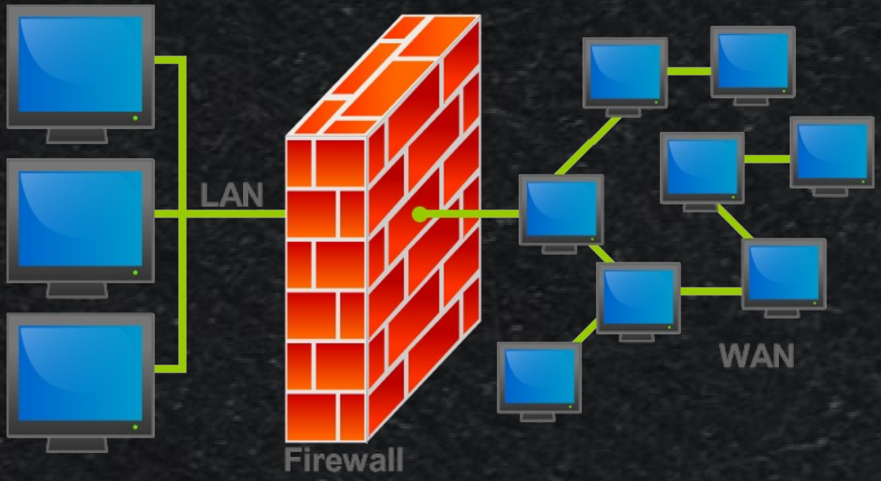
What is a firewall?



- Network barrier
- Packet filtering
- Packet Mangling (NAT)

Firewall Usage

- Personal Firewall
- Multi-homed (DMZ) Firewall
- Router Firewall
- Internet connection sharing (NAT)
- Transparent Proxying
- Content filtering
- Poor-mans load balancer
- Internet Hotspots

What is iptables?

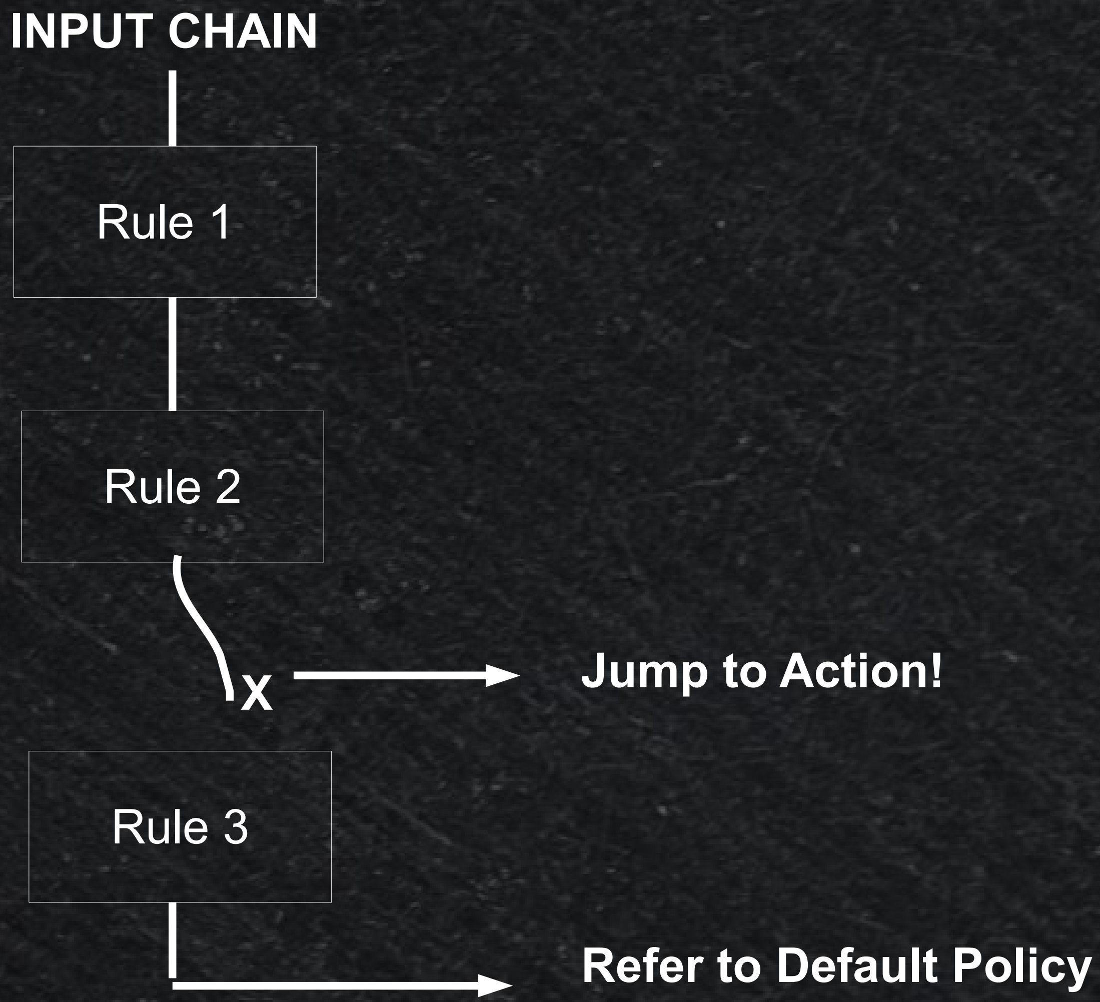
- Linux's built in firewall
- Successor to ipchains
- Organizes several chains into tables, hence iptables
- Consists of Userspace tool (iptables) and kernel drivers

A table of Chains

<table>
<tr><td colspan="5"><b>Filter Table (default)</b></td></tr>
<tr><td colspan="3">INPUT</td><td>FORWARD</td><td>OUTPUT</td></tr>
<tr><td colspan="5"><b>NAT Table</b></td></tr>
<tr><td colspan="2">PREROUTING</td><td>INPUT</td><td>OUTPUT</td><td>POSTROUTING</td></tr>
<tr><td colspan="5"><b>Mangle Table</b></td></tr>
<tr><td>PREROUTING</td><td>INPUT</td><td>OUTPUT</td><td>FORWARD</td><td>POSTROUTING</td></tr>
<tr><td colspan="5"><b>X Table (user defined)</b></td></tr>
</table>

- INPUT – Packets entering an interface and destined to a local process.
- FORWARD – Only packets routed from one interface to another.
- OUTPUT – Packets leaving an interface which originated from a local process.
- PREROUTING – Before deciding to use INPUT or FORWARD. DNAT is configured here.
- POSTROUTING – After OUTPUT or FORWARD but before leaving interface. SNAT is configured here.

A Chain of Rules



INPUT CHAIN

Rule 1

Rule 2

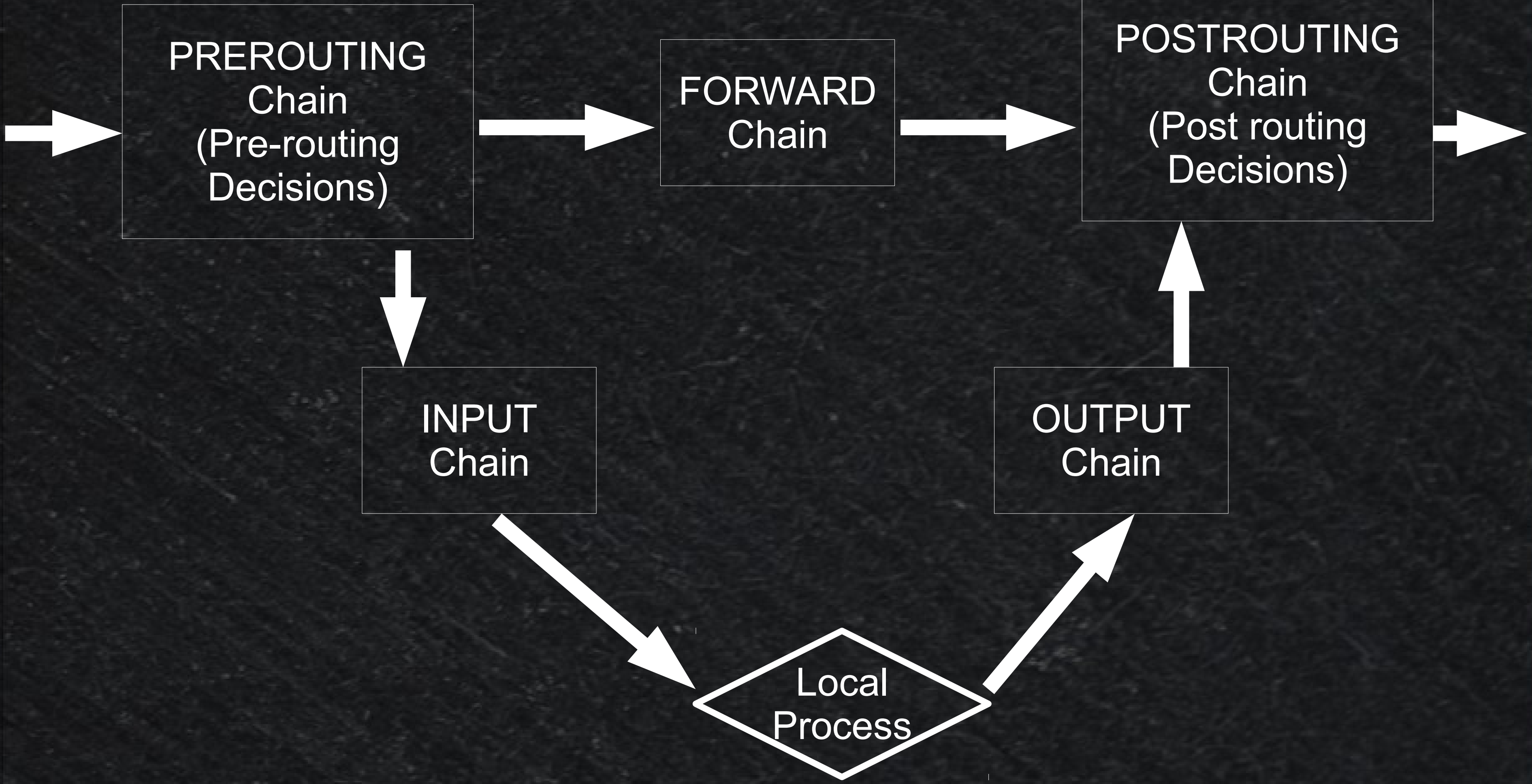
X

Jump to Action!

Rule 3

Refer to Default Policy

Chain Order



PREROUTING Chain (Pre-routing Decisions)

FORWARD Chain

POSTROUTING Chain (Post routing Decisions)

INPUT Chain

OUTPUT Chain

Local Process

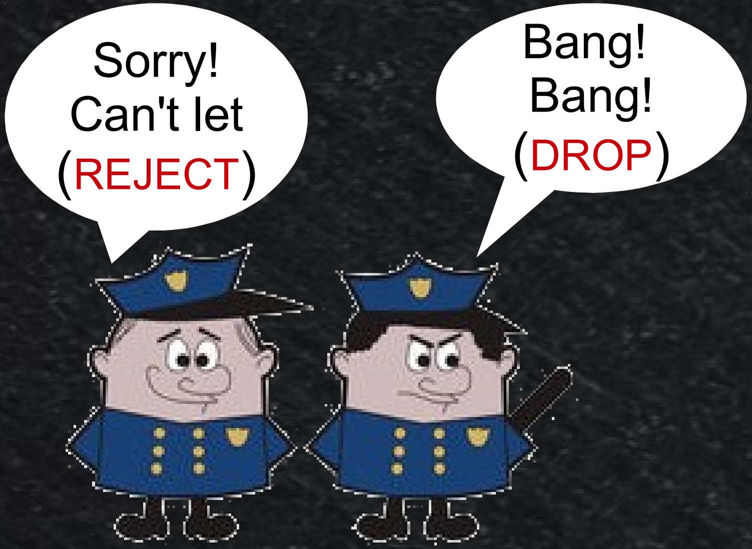
Security Policy

White Listing

Block everyone by default (default policy:DROP)

Black Listing

Allow everyone by default (default policy:ACCEPT)



Best security is when you..

- Trust no one
- Make it un economical

Using iptables

Synopsis

iptables [table] [action] [chain] [option] [target]

table – {filter, nat, mangle}

action – {-A (add), -D (delete), -R (replace)}

chain – {INPUT, FORWARD, OUTPUT etc.}

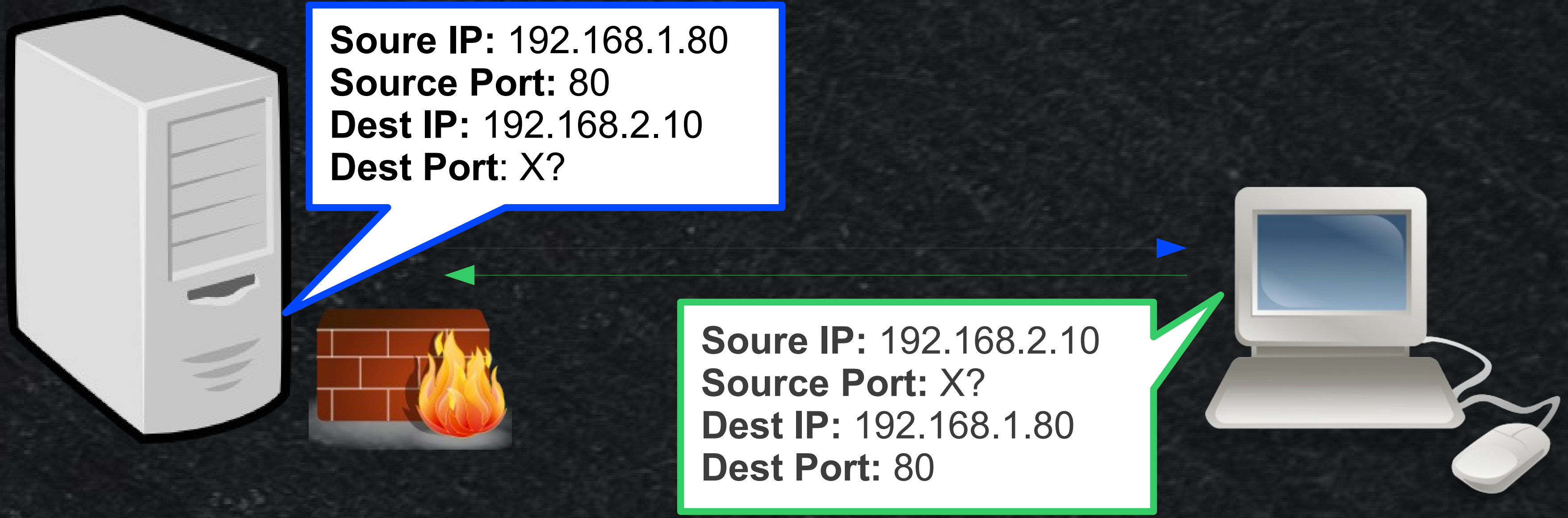
options - {-s(source), -d(destination), --sport(source port, --dport(destination port), -m (module), --sync (sync packed) etc.}

target – {ACCEPT, DROP, REJECT, MASQUERADE, DNAT etc.}

Basic Usage

```
iptables -L        // List all rules for filter table

iptables -t nat -L  // List all rules for nat table

iptables -F       // Flush (clear)  all rules of all chains

iptables -F INPUT    // Flush  all rules for INPUT chain

iptables -P INPUT DROP  // Set default policy of INPUT
```

Filtering



Soure IP: 192.168.1.80
Source Port: 80
Dest IP: 192.168.2.10
Dest Port: X?

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```
iptables -P INPUT DROP       // Drop (block) everything
iptables -P OUTPUT DROP
iptables -A INPUT -p tcp --dport 80 -j ACCEPT // Only allow http
iptables -A OUTPUT -p tcp --sport 80 -j ACCEPT // allow packet to go out
```

Filtering Examples

// Allow ping

```
iptables -A INPUT -p icmp -j ACCEPT
```

// Allow all incoming tcp connections on interface eth0 to port 80 (www)

```
iptables -A INPUT -i eth0 -p tcp  --sport 1024: --dport
80 -j ACCEPT
```

// Allow DNS

```
iptables -A INPUT -p udp --dport 53 -j ACCEPT
```

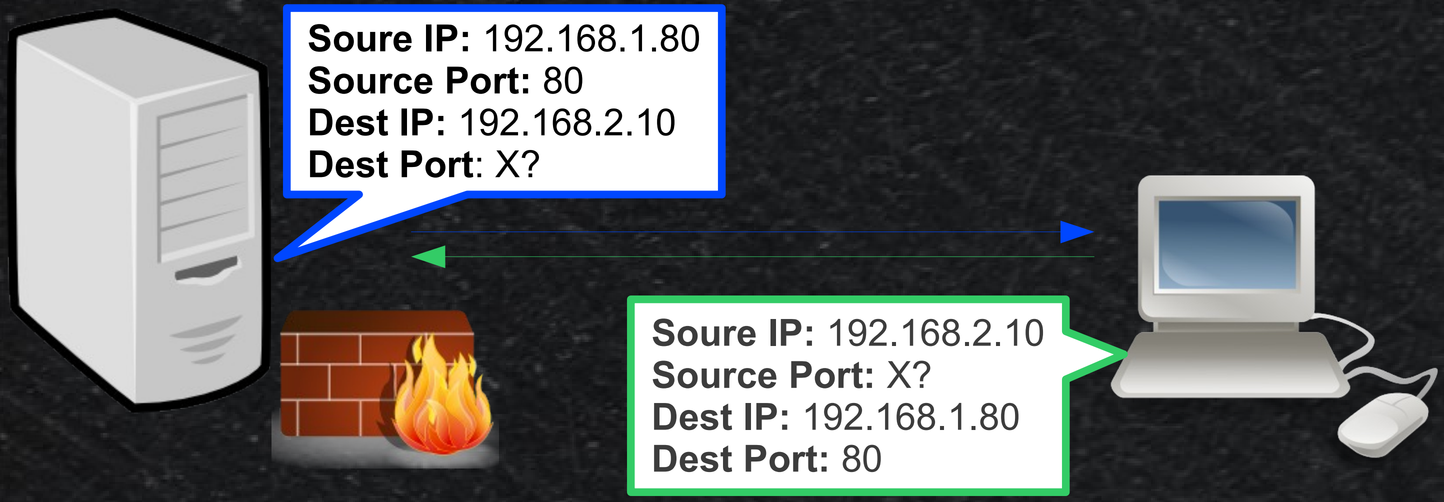
// Allow multiple ports for Email

```
iptables -A INPUT -p tcp -m multiport --dport 25,110,143 -j ACCEPT
```

// Allow a MAC

```
iptables -A INPUT -m mac --mac-source  00:02:8A:A1:71:71 -j ACCEPT
```

Connection Tracking



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Dest Port: X?

Soure IP: 192.168.2.10
Source Port: X?
Dest IP: 192.168.1.80
Dest Port: 80

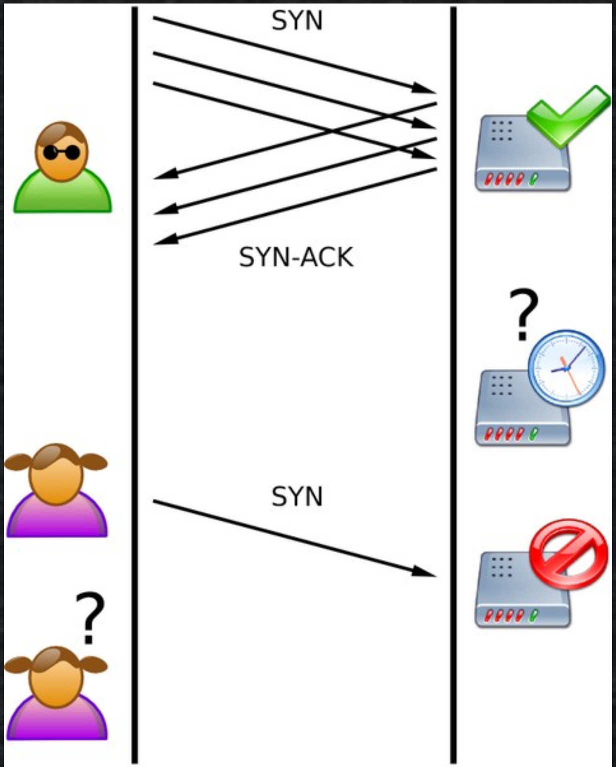
```
// Allow http new and existing connections
iptables -A INPUT -p tcp -m state --state
NEW,ESTABLISHED,RELATED --dport 80 -j ACCEPT

// Allow only existing connections to go out
iptables -A OUTPUT -p tcp -m state --state
ESTABLISHED,RELATED --sport 80 -j ACCEPT
```

No Action, Log only

// Log Syn flooding

```
iptables -A INPUT -p tcp --syn  -m limit
--limit 1/s --limit-burst 3 -j LOG --log-prefix
“SYN flood: ”
```



Network Address Translation

SNAT (Source)

Change source from private to public IP

- Your ADSL Router
- Internet Connection Sharing
- WiFi hotspots
- IP Spoofing

DNAT (Dest)

Change destination from public to pirvate IP

- DMZ setups
- Transparent Proxies
- Load balancers
- High availability

NATing Examples

```
// First enable ip forwarding
echo 1 > /proc/sys/net/ipv4/ip_forward

// Sharing internet (3G)
iptables -t nat -A POSTROUTING -o ppp0 -j MASQUERADE

// Poor man's http load balancer
iptables -t nat -A PREROUTING -p tcp --dport 80 -j DNAT --to 192.168.1.80:8080

// Transparent Proxy
iptables -t nat -A PREROUTING  -i eth0 -p tcp --dport 80 -j REDIRECT --to-port 3128
```

Persistence

```
// Save rules
iptables-save > /etc/iptables.conf

// Restore rules
iptables-restore < /etc/iptables.conf

// If you have virtual service
/etc/init.d/iptables [stop|start|save]

// If you don't have virtual service to auto start add restore
command to /etc/rc.local or any other bootup script
```

Thank You!