Project 4 - Linux iptables

CSE497b - Spring 2007

Introduction Computer and Network Security

Professor Jaeger

www.cse.psu.edu/~tjaeger/cse497b-s07/

Project Goals

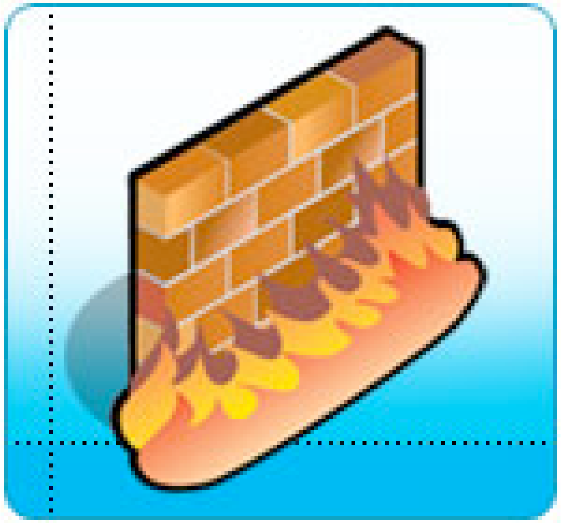
- Specify iptables rules for your Playpen VM
  - for the INPUT chain only
- Sources
  - Write rules for interaction with 2 machines
    - 130.203.83.76
    - 130.203.83.75
- Rules
  - Prevent all UDP
  - Permit ICMP (ping), but limit message size
    - 1000 bytes from 75 and 10000 bytes from 76
  - TCP
    - 130.203.83.75 sends to specific ports (no one else can use)
    - 130.203.83.76 sends to specific ports (no one else can use)
    - Also, some content filtering of packets

Project environment

- ICMP via ping
  - We will submit ping requests to your Playpen
  - Only allowed ones should result in a response
- TCP via nc
  - nc for netcat
  - nc -l -p <*port*> creates a server
  - nc -p <clientport> <*addr*> <*port*> connects a client
  - We supply the server program, client program
    - and expected output
- Due April 20 at 5:00
  - A bash script containing a sequence of iptables rules
  - Need to have the server program running at this time, so we can test!

Practical Firewall Implementations

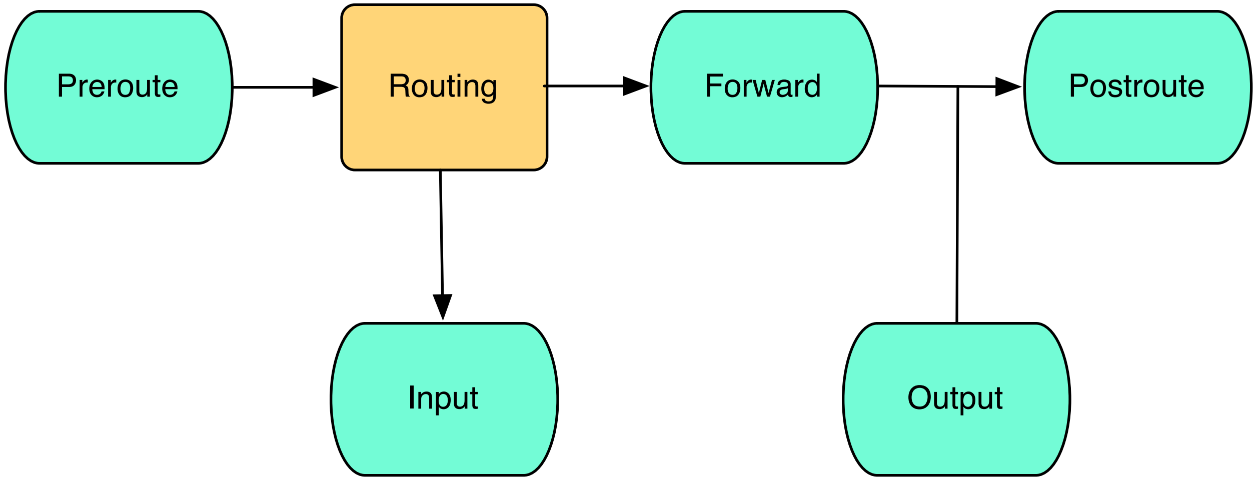
- Primary task is to filter packets
  - But systems and requirements are complex
- Consider
  - All the protocols and services
  - Stateless vs. stateful firewalls
  - Network function: NAT, forwarding, etc.



- Practical implementation: Linux iptables
  - http://www.netfilter.org/documentation/HOWTO/packet-filtering-HOWTO.html
  - http://linux.web.cern.ch/linux/scientific3/docs/rhel-rg-en-3/ch-iptables.html

Netfilter hooks

- Series of hooks in Linux network protocol stack
- At each Netfilter hook
  - An iptable rule set is evaluated
- Hook placements



iptables Concepts

- Table
  - All the firewall rules
- Chain
  - List of rules associated with the chain identifier
  - E.g., hook name
- Match
  - When all a rule’s field match the packet (protocol-specific)
- Target
  - Operation to execute on a packet given a match

iptables Commands

- iptables [-t <table_name>] <cmd> <chain> <plist>
- Commands
  - Append rule to end or specific location in chain
  - Delete a specific rule in a chain
  - Flush a chain
  - List a chain
  - Create a new user-specified chain
  - Replace a rule

Test it out

- PING on localhost
  - *ping -c 1 127.0.0.1*
- Add iptables rule to block
  - *iptables -A INPUT -s 127.0.0.1 -p icmp -j DROP*
- Try ping
- Delete the rule
  - *iptables -D INPUT 1*
  - *iptables -D INPUT -s 127.0.0.1 -p icmp -j DROP*
  - *iptables -F INPUT*

Testing

- Use loopback to test the rules locally on your Playpen
  - IP address 127.0.0.1
- ICMP
  - submit ping requests to 127.0.0.1 as above
- TCP
  - submit requests to 127.0.0.1 at specific port
  - server
    - nc -l -p 3750
    - listen at port 3750
  - client
    - nc -p 3000 localhost 3750
    - send from port 3000 to localhost at port 3750

WARNING!

- Be careful!
  - You can lock yourself out of your Playpen
- Only write rules for the target IP addresses
  - localhost, 130.203.83.75, and 130.203.83.76
- Do not write any rules containing ssh
- We will have to restart your Playpen if you lock yourself out (not available 24/7)

Targets

- Define what to do with the packet at this time
- ACCEPT/DROP
- QUEUE for user-space application
- LOG any packet that matches
- REJECT drops and returns error packet
- RETURN enables packet to return to previous chain
- <user-specified> passes packet to that chain

iptables Rule Parameters

- Destination/Source
  - IP address range and netmask
- Protocol of packet
  - ICMP, TCP, etc
- Fragmented only
- Incoming/outgoing interface
- Target on rule match

Per Protocol Options

- Specialized matching options for rules
  - Specific to protocol
- TCP
  - Source/destination ports
  - SYN
  - TCP flags

Examples

- *iptables -A INPUT -s 200.200.200.2 -j ACCEPT*
- *iptables -A INPUT -s 200.200.200.1 -j DROP*
- *iptables -A INPUT -s 200.200.200.1 -p tcp -j DROP*
- *iptables -A INPUT -s 200.200.200.1 -p tcp --dport telnet -j DROP*
- *iptables -A INPUT -p tcp --destination-port telnet -i ppp0 -j DROP*

Match

- Different means for matching packet content
- Lots of different modules
  - Only a few supported on your Playpen (lucky you)
- To specify a match
  - iptables -A INPUT -p tcp -m string --algo bm --string ‘exe’
    - matches to packet with content containing ‘exe’
  - iptables -A INPUT -p tcp -m length --length 10:100
    - matches to packet with length between 10 and 100 bytes
    - Also, can specify ‘greater than 10’ by 10:
- There are many others, but these are what you’ll need to know