Telecommunications Network

Practice 7

Mininet VM installation

- Download VDI: http://oktnb16.inf.elte.hu/ggombos/mininetVM/
- Install VirtualBox (or Hyper-V)
- Create VM with default options, with the downloaded VDI attached
- username / password: mininet

> **Note**
>
> Change keyboard layout to english: `sudo loadkeys us`

SSH

- VM network settings: e.g Bridged adapter
- Check the VM's address: `ip address show`
- Usage of X11 forwarding for graphical interface:
  - `ssh -X` flag
  - MobaXterm default settings

Mininet

- In the following example there are three linked hosts:
  - h1 – h2 - h3
  - h2 will act as a router
- The basis of the example: http://csie.nqu.edu.tw/smallko/sdn/mininet-operations.htm

Miniedit

- Run: python ~/mininet/examples/miniedit.py
- Add 3 hosts and set the following ip addresses:
  - h1: 10.0.10.2/24
  - h2: 10.0.10.1/24
  - h3: 10.0.20.2/24
- Connect them in the code, because the host does not act as a router by default
- File -> Export Level 2 Script

test.py

- Let’s see what was generated and extend it with linking the hosts

```
info( '*** Add links\n')
net.addLink(h1, h2)
net.addLink(h2, h3)
```

test.py

- Run: `sudo -E python test.py`
- Useful commands:
  - nodes
  - links
  - net
  - pingall (with multiple interafaces/ip addresses, it may not use the correct one)

> **Note**
>
> With the `-E` switch we keep the environment variables, without this X11 forwarding will not work

test.py

- Initial pingall result: 2/6
- Let’s get to 6/6
- Let’s look at the ip addresses of the interfaces:
  - from mininet console: `<host> <command>`, eg `h1 ip a s`
  - open terminal per host: `xterm h1 h2 h3`

test.py

- h2-eth1 does not have an IP address, let’s give it one inside the subnet of h3:
    - `h2 ip a add 10.0.20.1/24 dev h2-eth1`
- `h3 ping h2` vs `h3 ping 10.0.20.1`
- pingall: 4/6

test.py

- h1 and h3 do not reach each other
  - ping: connect: Network is unreachable
- Let’s look at their routing tables
  - route -n
- They don’t know which interface to go to the other’s subnet
- Add a default route:
  - h1 ip route add default via 10.0.10.1 dev h1-eth0
- h1 ping 10.0.20.2
- We do not receive reply for the ping, but we can send them now

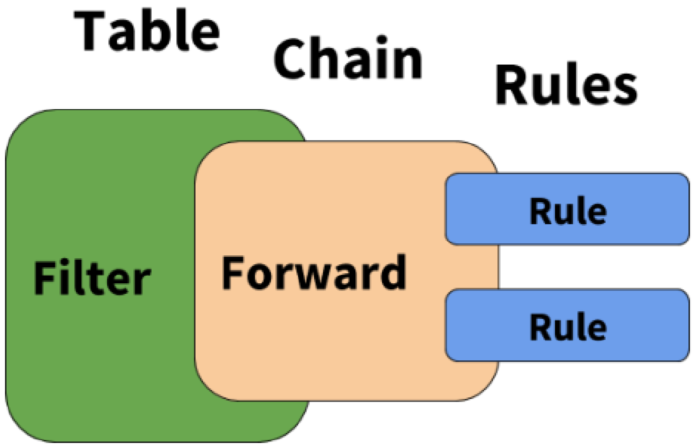
test.py

- Packages are now being sent, but not arriving
- h2 drops packets of which it is not the destination
  - `h2 sysctl net.ipv4.ip_forward`
- Set IP forwarding:
  - `sysctl -w net.ipv4.ip_forward=1`
- pingall: 6/6

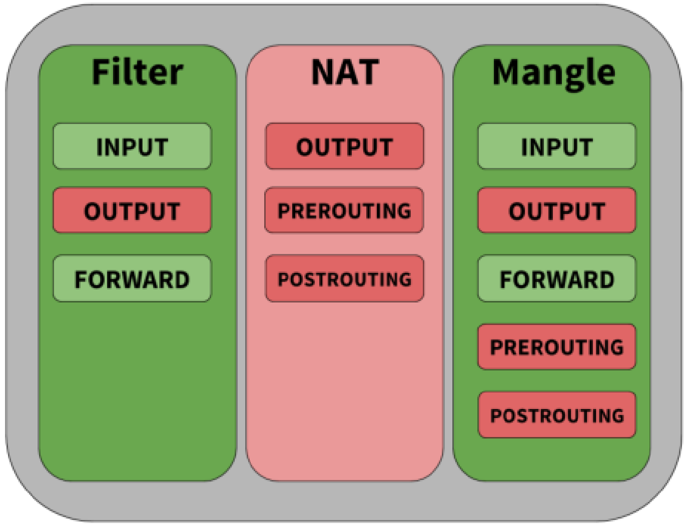
> **Note**
>
> We can look at the packets: `h2 tcpdump -v -i any`

IPtables

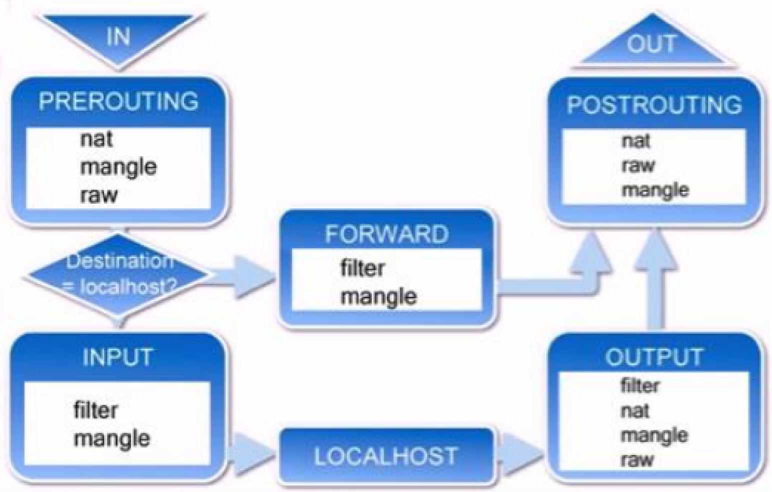
http://linux-training.be/networking/ch14.html



IPtables/IP6tables Table Support



Filter	NAT	Mangle
INPUT	OUTPUT	INPUT
OUTPUT	PREROUTING	OUTPUT
FORWARD	POSTROUTING	FORWARD
		PREROUTING
		POSTROUTING


IN
PREROUTING
nat
mangle
raw
Destination = localhost?
FORWARD
filter
mangle
INPUT
filter
mangle
LOCALHOST
OUTPUT
filter
nat
mangle
raw
POSTROUTING
nat
raw
mangle
OUT