

Practical Exercises

Communication Systems (Rechnernetze II)

Network Address Translation and ICMP Solutions

EXERCISE 1

- Both internal and external laptops can reach the router. As we set default gateway of internal network to the router, it is obvious that external network is reachable from internal network (computers behind the router). And internal network is not reachable from outside.
- Because of POSTROUTING packets are altered before routing. MASQUERADE allows an internal network to **invisibly** access the external network via gateway. Then router **FORWARDS** the packets from internal network.
- One most interesting thing to observe on Wireshark from external network is that: whenever internal network pings external network the external network would see packets coming from router, not from internal network. This is what *Network Address Translation* means. Router translates the IP address of internal network to its own public IP address with which it's accessing external network and sends the packets out.

EXERCISE 2

<i>Network</i>	<i>MTU</i>
Network behind the router	900
Router	500 for external interface
External network	Not altered

- External networks receive double the packets sent by internal network, this is because of fragmentation of packets. If internal network sends a packet of size 1400 it fragments into two packets. And at the router, the packet larger than 500 is again fragmented into two.

EXERCISE 3

- If you observe the result in Wireshark, then there are different types of ICMP packets with different codes. A keen observation of ICMP error packets would lead to one of the following combinations:

This is a complete listing of ICMP types and codes:

TYPE	CODE	Description	Query	Error
0	0	Echo Reply	x	
3	0	Network Unreachable		x
3	1	Host Unreachable		x

TYPE	CODE	Description	Query	Error
3	2	Protocol Unreachable		x
3	3	Port Unreachable		x
3	4	Fragmentation needed but no frag. bit set		x
3	5	Source routing failed		x
3	6	Destination network unknown		x
3	7	Destination host unknown		x
3	8	Source host isolated (obsolete)		x
3	9	Destination network administratively prohibited		x
3	10	Destination host administratively prohibited		x
3	11	Network unreachable for TOS		x
3	12	Host unreachable for TOS		x
3	13	Communication administratively prohibited by filtering		x
3	14	Host precedence violation		x
3	15	Precedence cutoff in effect		x
4	0	Source quench		
5	0	Redirect for network		
5	1	Redirect for host		
5	2	Redirect for TOS and network		
5	3	Redirect for TOS and host		
8	0	Echo request	x	
9	0	Router advertisement		
10	0	Route solicitation		
11	0	TTL equals 0 during transit		x
11	1	TTL equals 0 during reassembly		x
12	0	IP header bad (catchall error)		x
12	1	Required options missing		x
13	0	Timestamp request (obsolete)	x	
14		Timestamp reply (obsolete)	x	
15	0	Information request (obsolete)	x	
16	0	Information reply (obsolete)	x	
17	0	Address mask request	x	
18	0	Address mask reply	x	

