

Network Address Translation

COMP476
Networked Computer Systems

Running out of IP Addresses

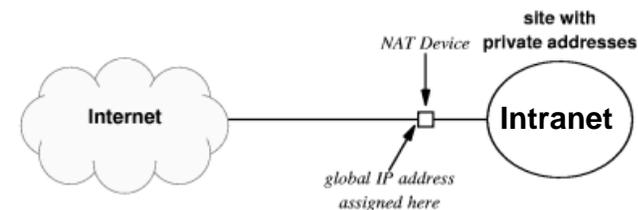
- There are only
 - 2,113,928,964 class A addresses
 - 1,073,577,988 class B addresses
 - 532,676,608 class C addresses
 - 3,720,183,560 total possible addresses
- Far fewer address are actually available. Each domain does not use all of its available addresses.
- More than half of the class B domains have fewer than 50 hosts.

Hiding Network Configuration

- Most network owners do not want hackers checking their network configuration.
- It is relatively easy to write a program to “ping” every possible address in a domain.
- Many network administrators do not want just anybody connecting to their computers from the Internet.

Network Address Translation (NAT)

- A NAT router sits between the Internet and a private network.



Changing Addresses

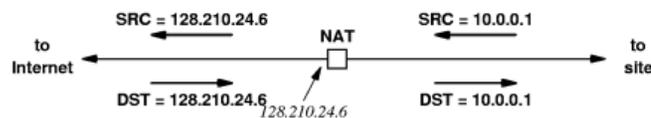
- The NAT router has a single internet address. This is the address that the rest of the world sees.
- Computers within the private intranet have addresses that are never used outside of the private intranet

Mapping Addresses and Ports

- When a computer within the private intranet creates a connection to an Internet site, the NAT router changes the address and port.
- The packet on the Internet has the NAT routers IP address as the source.
- The NAT keeps a table mapping the Internet addresses and ports to private address and ports.

Translation

- The only address seen on the Internet is the NAT router's IP address. Remote systems do not know this is a translated address.



Multiple Computer Mapping

- What happens if two computer on the private intranet want to connect to the same Internet host?
- The NAT router will change the port numbers that appear on the Internet.
- The NAT mapping tables include the port number and the remote Internet address.

Mapping Example

- Imagine two computer, 10.0.0.1 and 10.0.0.2 use port 30000 to connect to the same web server at 128.10.19.20

NAT mapping table

Direction	Fields	Old Value	New Value
out	IP SRC:TCP SRC	10.0.0.1:30000	128.10.19.20:40001
out	IP SRC:TCP SRC	10.0.0.2:30000	128.10.19.20:40002
in	IP DEST:TCP DEST	128.10.19.20:40001	10.0.0.1:30000
in	IP DEST:TCP DEST	128.10.19.20:40002	10.0.0.2:30000

Connections from the Internet

- Since individual computers on the private intranet do not have distinct Internet addresses, remote Internet sites cannot connect to them.
- If you have two web servers on the private intranet, they will be inaccessible from the Internet
- Typically all incoming Internet connections are passed to one specific computer on the private intranet.

Private IP Addresses

- Certain IP addresses are reserved for the use of Intranets.
- The addresses 192.168/16, 172.16/12, and 10/8 should never appear on the Internet.

Home Products Available

