

Computer Science CSCI 251

Systems and Networks

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Network Address Translation (NAT)

The two most compelling problems facing the IP Internet are IP address depletion and scaling in routing. Long-term and short-term solutions to these problems are being developed. The short-term solution is CIDR (Classless InterDomain Routing). The long-term solutions consist of various proposals for new internet protocols with larger addresses.

It is possible that CIDR will not be adequate to maintain the IP Internet until the long-term solutions are in place. This memo proposes another short-term solution, address reuse, that complements CIDR or even makes it unnecessary. The address reuse solution is to place Network Address Translators (NAT) at the borders of stub domains.

[RFC 1631] 1994

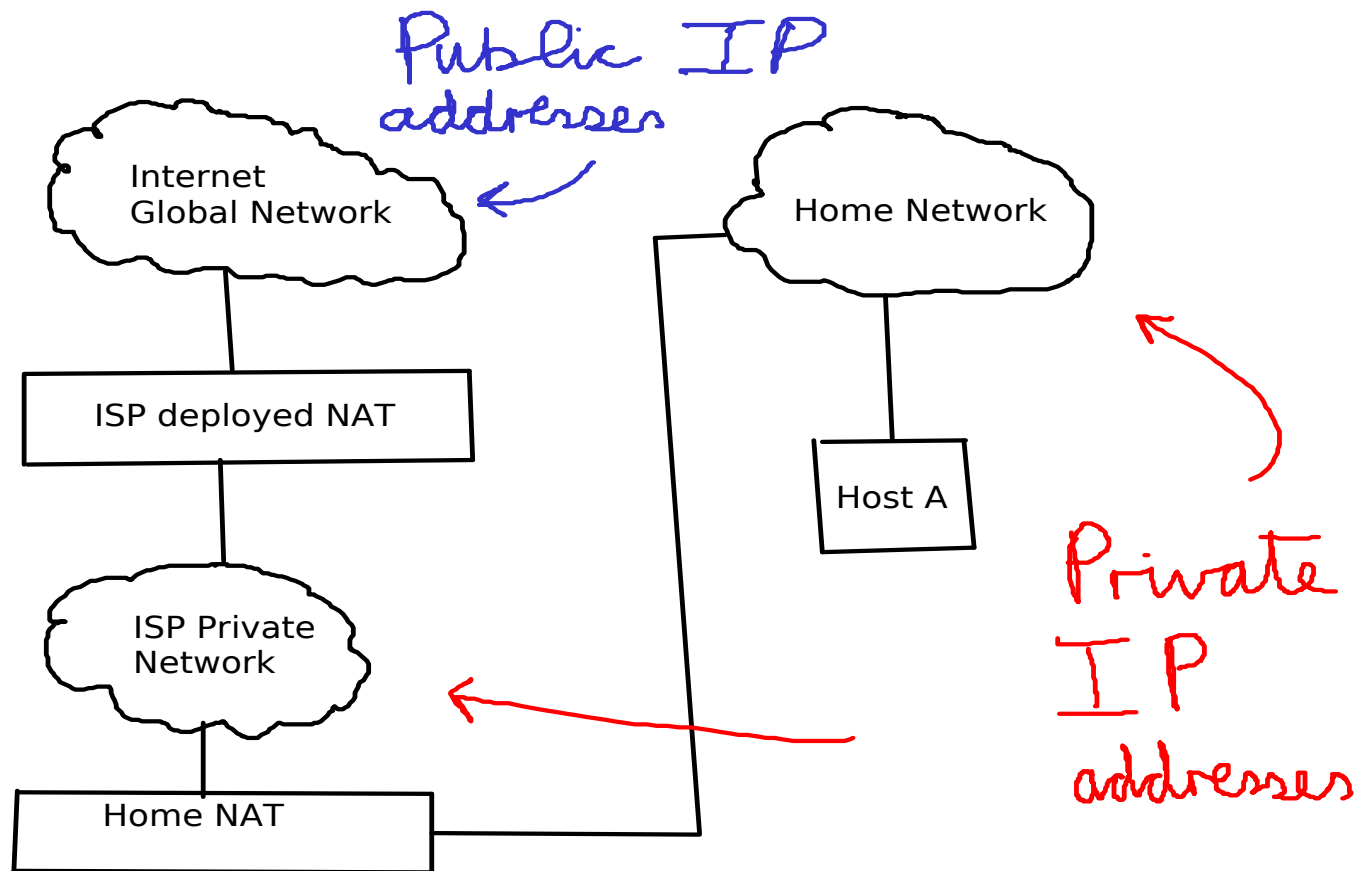
De Facto Internet Address Architecture

- Public Addresses
 - unique across the Internet

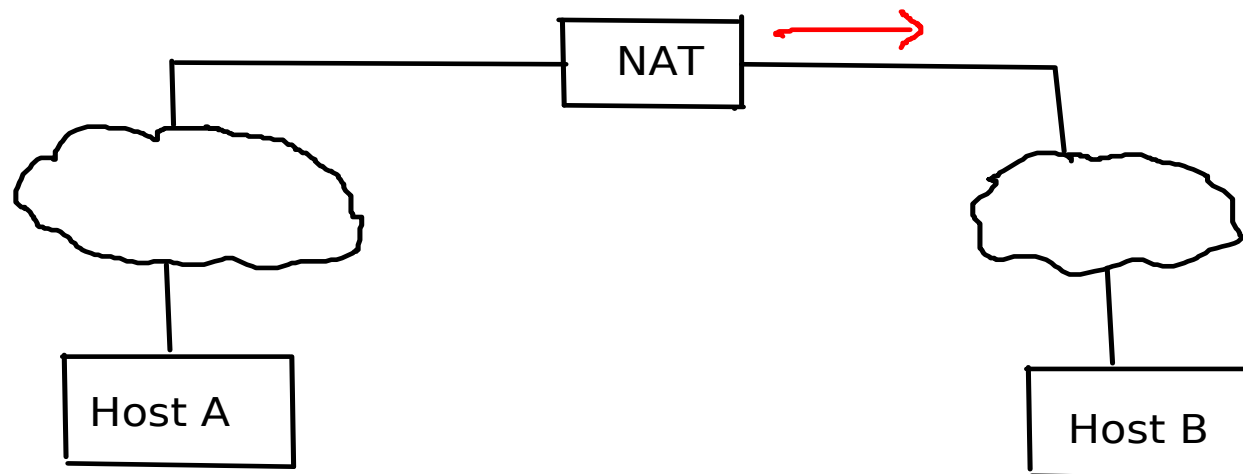
- Private Addresses
 - not unique across the Internet
 - 10.0.0.0/8
 - 169.254.0.0/16
 - 172.16.0.0/12
 - 192.168.0.0/16

- Connectivity
 - NAT interconnects the inside realm (private addresses) with the outside realm (public addresses)

Internet Address Architecture cont.



IP Address Translation



Host	Source	Destination
A	<u><10.1.1.6:5234></u> , <104.128.240.4:7075>	
NAT	< <u>209.165.200.250:5234</u> >, <104.128.240.4:7075>	

<10.1.1.6:5234> <-> <209.165.200.250:5234>

NAT Types

○ Static NAT

- one-to-one mapping of a private IP address to a public IP address
- allows an inside realm host to initiate traffic to the Internet and to receive responses
- allows the Internet to initiate traffic to an inside realm host and receive responses

e.g., $\langle 10.1.1.6:5234 \rangle \leftrightarrow \langle 209.165.200.250:5234 \rangle$
 $\langle 10.1.1.6:5235 \rangle \leftrightarrow \langle 209.165.200.250:5235 \rangle$
 $\langle 10.1.1.7:5234 \rangle \leftrightarrow \langle 209.165.200.251:5234 \rangle$

NAT Types cont.

○ Dynamic NAT

- one-to-one mapping between a private IP address to a public IP address where the public IP address is taken from a pool of IP addresses
- allows an inside realm host to initiate traffic to the Internet and to receive responses
- does not allow the Internet to initiate traffic to an inside realm host and receive responses

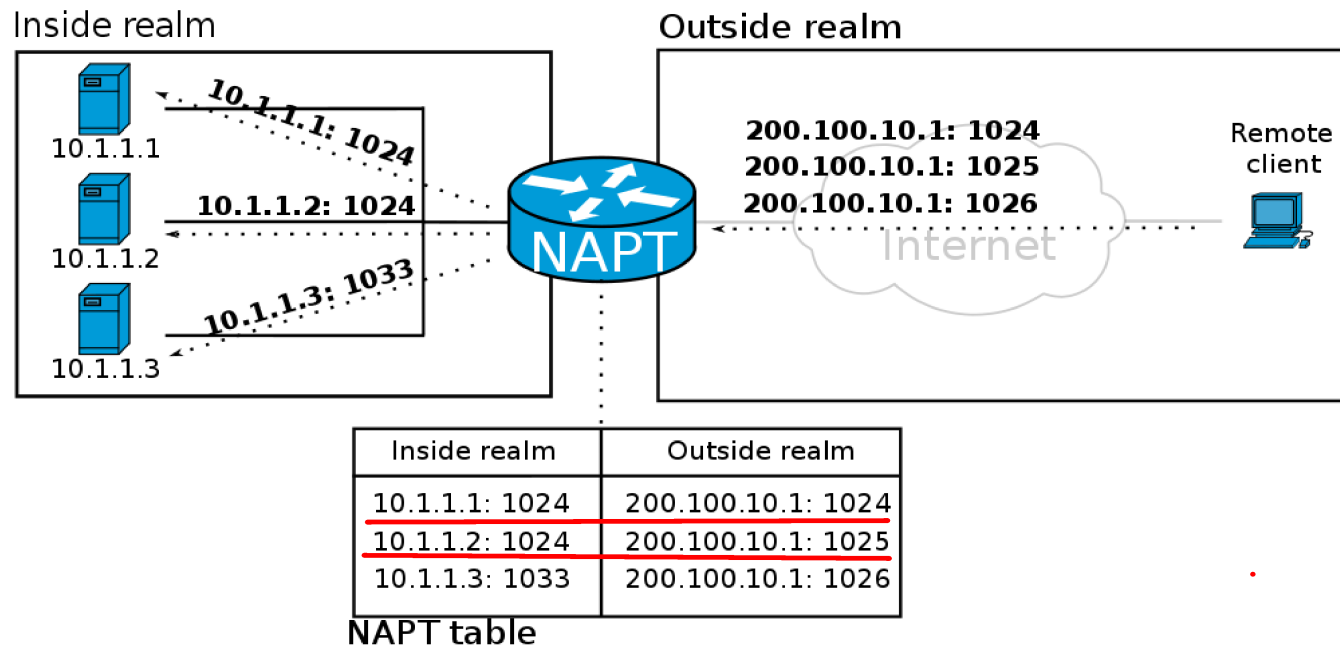
e.g., $\langle 10.1.1.6:5234 \rangle \leftrightarrow \langle 209.165.200.250:5234 \rangle$
 $\langle 10.1.1.6:5235 \rangle \leftrightarrow \langle 209.165.200.250:5235 \rangle$
 $\langle 10.1.1.7:5234 \rangle \leftrightarrow \langle 209.165.200.251:5234 \rangle$

NAT Types cont.

- NAPT (Network Address and Port Translation)
 - map multiple private IP addresses to a single public IP address using port address translation
 - allows an inside realm host to initiate traffic to the Internet and to receive responses
 - does not allow the Internet to initiate traffic to an inside realm host and receive responses

e.g., $\langle 10.1.1.6:5234 \rangle \leftrightarrow \langle 209.165.200.250:6001 \rangle$
 $\langle 10.1.1.6:5235 \rangle \leftrightarrow \langle 209.165.200.250:6002 \rangle$
 $\langle 10.1.1.7:5234 \rangle \leftrightarrow \langle 209.165.200.251:6003 \rangle$

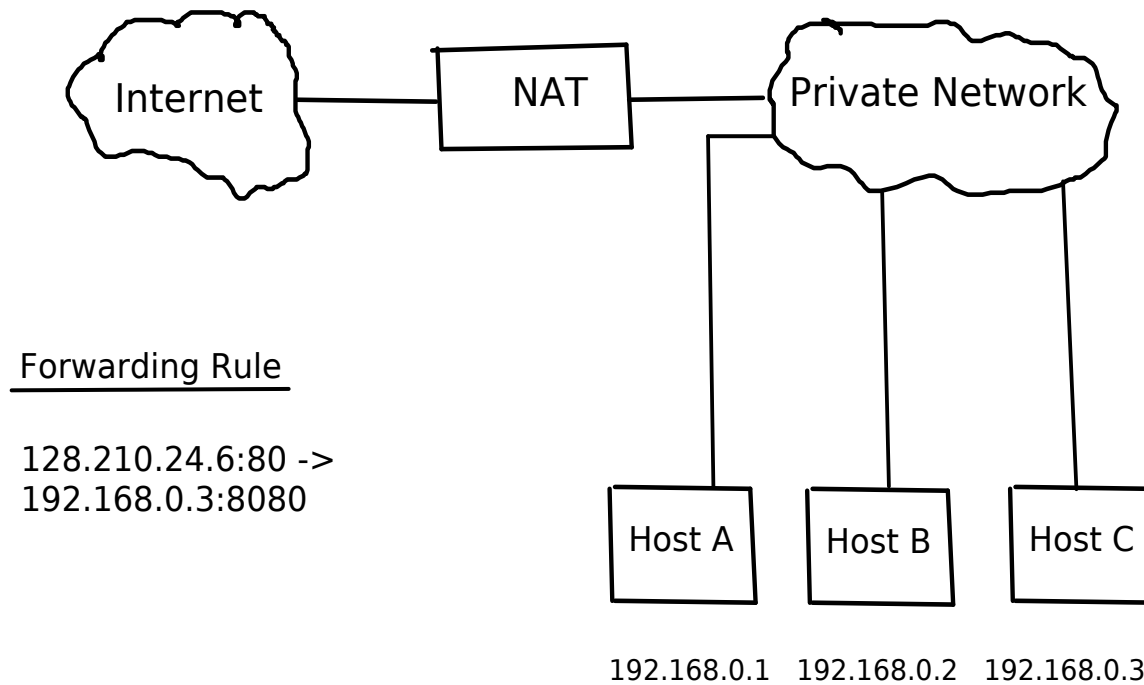
NAPT



By Michel Bakni - Derived from files [1], [2], [3] and [4]. Wendell Odom (2013)
(in English) Cisco CCENT/CCNA ICND1 100-101 Official Cert Guide (Academic ed.),
Pearson Education, Inc., p. 586 ISBN: 1587144859., CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=88333277>

Port Forwarding

- NAT application



NAT Conclusions

- Advantages
 - prevents depletion of ip v4 addresses
 - better security through hiding the identity of hosts behind NAT

- Disadvantages
 - performance
 - compatibility issues with other protocols

Virtual Network Computing (VNC)

- Service (X11VNC)
 - remote desktop access
- Server Port
 - 5900
- Client Application
 - `vncviewer ip:port`
 - e.g., `vncviewer 192.168.1.72:5900`

ssh Port Forwarding

