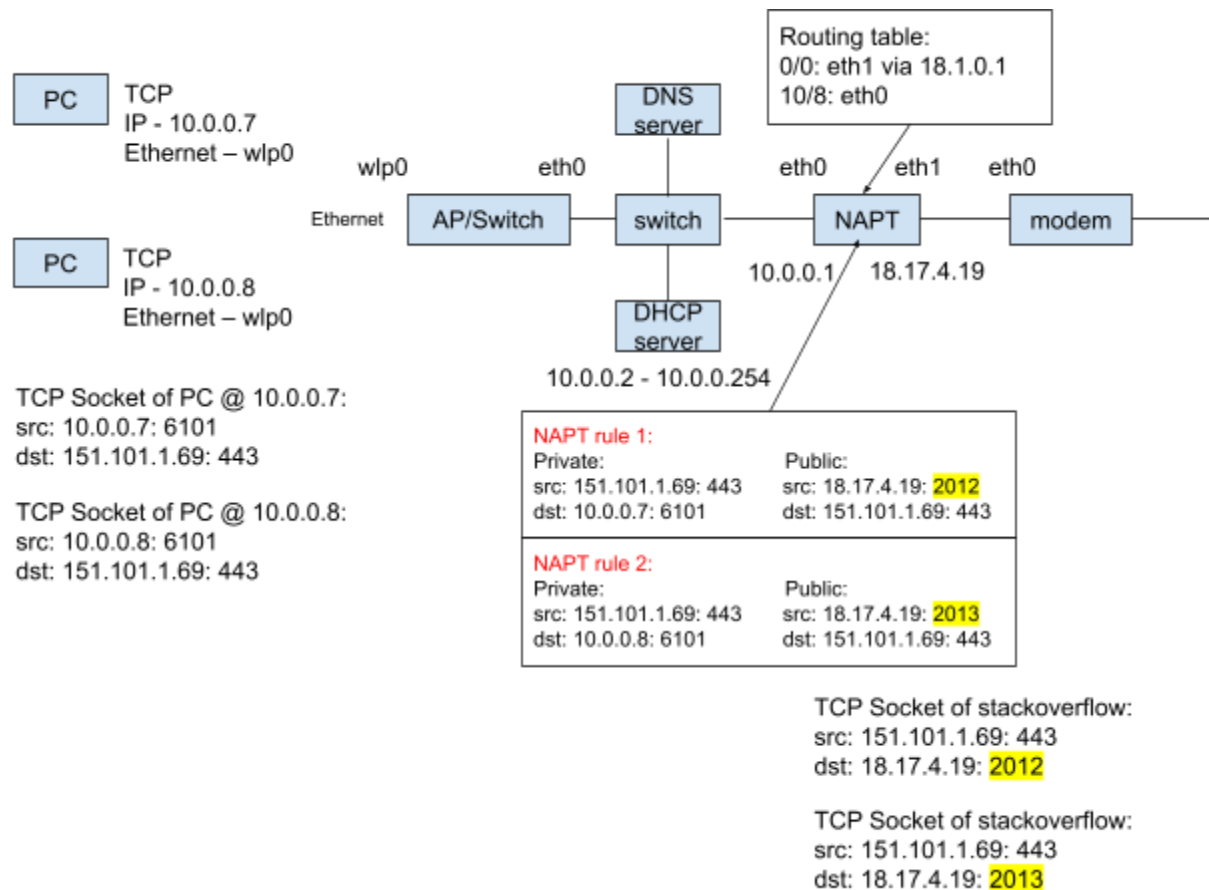


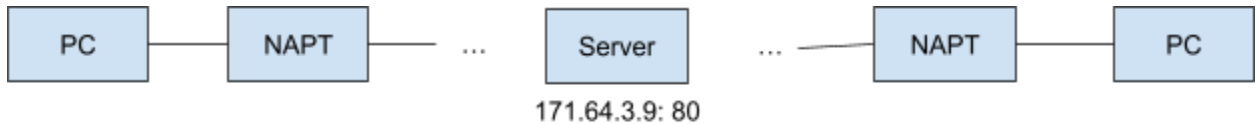
Level 8: NAPT



- If the PC @ 10.0.0.7 wants to start a connection with stackoverflow @ 151.101.1.69 either through a proxy or a transparent proxy or a NAPT translator.
 - The number of TCP connections between any PC on the subnet to stackoverflow is equal to the number of possible port numbers (65536)
 - Each new TCP connection between a PC on the subnet to a public IP address adds a new NAPT rule
 - A NAPT rule is garbage-collected either when a TCP connection is closed or the rule has not been used for a while
- However, what happens if stackoverflow @ 151.101.1.69 wants to start a connection with the PC @ 10.0.0.7? Or how to allow PC @ 10.0.0.7 to host a file server?
 - The dumbest way: have file servers on the public internet that are not behind NAPT, and upload any files to those public servers for sharing

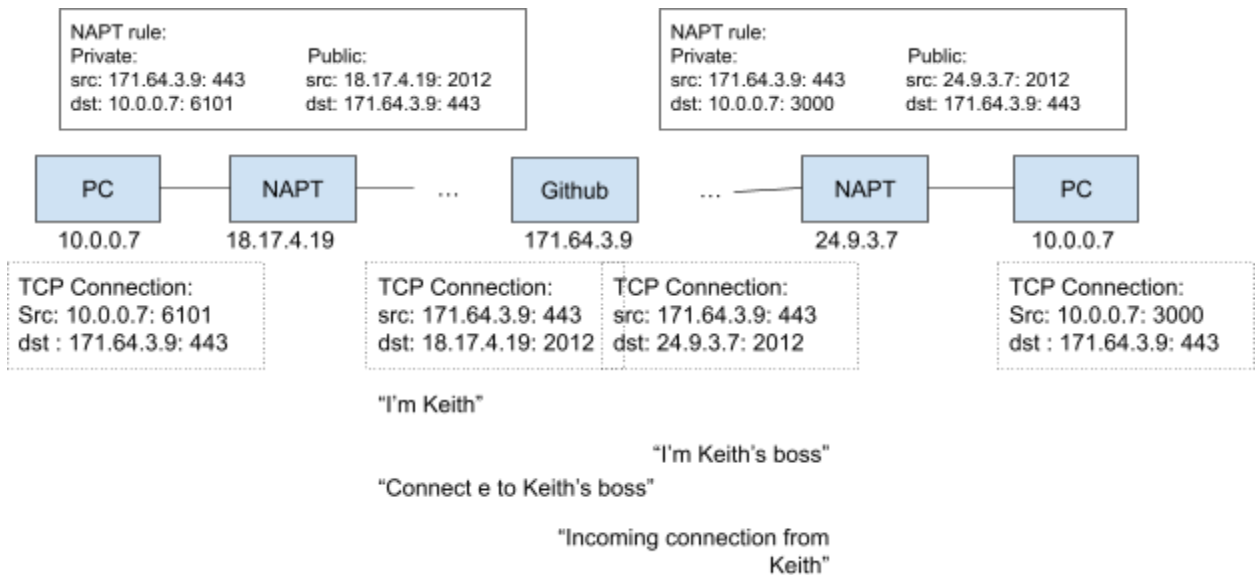
Level 9a: P2P networking via public server

- Use one public server to hold the files between PCs behind NAPTs



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- How to achieve this without having the server to hold on to some files?

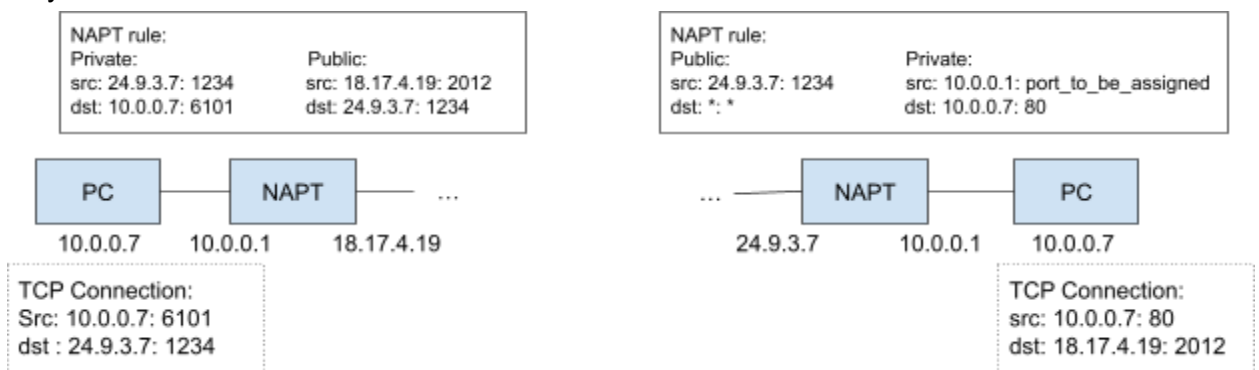
Level 9b: P2P networking via public proxy/relay/ TURN (Traversal Using Relays around NAT)



-
- What could we do if we don't want to connect through any kind of relay server in between?

Level 9c: P2P networking via explicit NAT rules (port forwarding)

- Why can't two PCs talk to each other when they are both behind NAT?
 - Their IP addresses are not meaningful on the public Internet
- Why can't one PC connect to the NAT on the other side?



-

- If we add the NAT rule to the NAT @ 24.9.3.7 before the TCP Connection is started, then a direct TCP Connection can be established between the two PC behind NATs.

-----The following content was not part of the lecture-----

There was some confusions around how the private src and public dst are set in a NAT rule, and this is decided by the NAT implementations defined here:

<https://www.rfc-editor.org/rfc/rfc3489#section-5>.

Say PC @ 10.0.0.7: 6101 starts a TCP connection to PC @ 24.9.3.7:1234 by sending a packet, the rule established would be:

- Full Cone

private:	public :
src: * : *	src: 18.17.4.19: 2012
dst: 10.0.0.7 : 6101	dst: * : *

- Restricted Cone

private:	public :
src: * : *	src: 18.17.4.19: 2012
dst: 10.0.0.7 : 6101	dst: 24.9.3.7: *

- Port Restricted Cone

private:	public :
src: * : *	src: 18.17.4.19: 2012
dst: 10.0.0.7 : 6101	dst: 24.9.3.7: 1234

- Symmetric

private:	public :
src: 24.9.3.7: 1234	src: 18.17.4.19: 2012
dst: 10.0.0.7: 6101	dst: 24.9.3.7: 1234