Exercise for Lecture “P2P Systems” (Lab)

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Exercise No. 3
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Submission either via Moodle or on paper before the lab exercise.
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– Example Solution –

Remark: This exercise contains two types of assignments. Assignments marked by an *asterisk* (*) have to be filled in by students *not participating in the user study*. Assignments marked by a *cross* (†) have to be filled in by *students deploying an RB-HORST access point*.

Problem 3.1 - RB-HORST Setup and Tests†

This assignment leads you through the setup of the RB-HORST access point at your home premise and asks you to conduct some functionality tests.

A) Please complete the setup of the access point at your home premise as described in the exercise slides. Please report any problems in the given space.

B) As a functionality test, please consume the following one minute videos. If all videos play, you are done with the setup. Please report any problems in the given space.
   - https://vimeo.com/76427539 "Italy - A 1 Minute Journey"
   - https://vimeo.com/23733740 "Brussels in 1 minute"
   - https://vimeo.com/76926148 "Australia : 1 Minute"

Problem 3.2 - NAT Traversal*

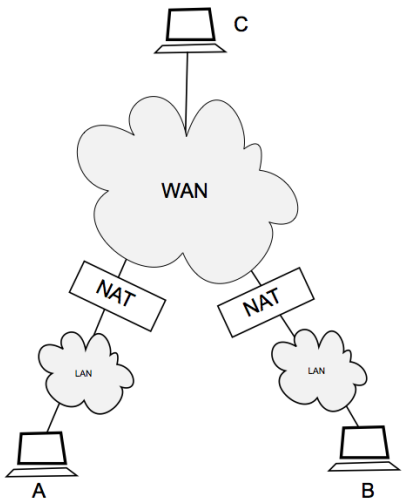
The Network Address Translation (NAT) problem is a well-known problem in Peer-to-Peer systems. The main purpose of NAT is the reuse of one public WAN IP address for many hosts in order to save scarce public IP addresses and to hide hosts in private networks behind this address for security purposes. A connection can only be initiated from the private LAN network to the public WAN network, however for the reverse type of connection, a NAT traversal mechanism is necessary. The problem becomes evident when describing the NAT mechanism running on a gateway (e.g., a home router) in detail:

- The gateways maintain a NAT table of the following format: (lan-port, lan-ip, wan-port)
- Whenever a packet reaches the NAT gateway from the LAN side, it checks the packet' s source IP (lan-ip) and the source port (lan-port) in the NAT table.
  - If there is no entry, it rewrites the source IP to the gateway's public IP (wan-ip) and the source port (lan-port) to a random unused port (wan-port). It then puts **(lan-port, lan-ip, wan-port)** into the NAT table.
  - If there is an entry, it rewrites the source IP to the gateway's public IP (wan-ip) and the source port (lan-port) to the one in the table (wan-port).
- When a packet reaches the gateway from the WAN side, it looks up the packet's destination port in the table (wan-port) and rewrites the packet's destination IP address and port to lan-ip/lan-port before passing it to the LAN.

Obviously, a connection initiated from the WAN to the LAN cannot easily traverse the NAT, as there is no mapping in the NAT table.

In the followings scenario, host A, B and C are connected to the Internet, where host A and B are each hidden behind a NAT gateway, and Host C is directly reachable. A and B know the network/transport information of C, other network/transport information between the hosts is previously unknown. Suppose you can choose the behavior of host C to your purpose.

A) Describe how you can set up a Peer-to-Peer connection between host A and B by only exchanging four messages.



- A sends a packet destined to C.
- B sends a packet destined to C.
- C sends a packet destined to B, containing source port and IP address of the packet it received from A.
- B sends a packet to A with the received source port and IP address from A as the destination information.
- The connection between A and B is established.

Solution:

B) Students deploying an RB-HORST access point have to enable port forwarding to get a working system. Inform yourself on port forwarding. How does port forwarding interact with the NAT table?

Solution: A manually enabled port forwarding is a static entry in the NAT table **(lan-port, lan-ip, wan-port)** that is maintained independently of all other traffic.