



Universität  
Zürich<sup>UZH</sup>

# 3041 - Blockchains and Overlay Networks

## *Exercise 1*

4 March 2021

Due: 10 March 2021

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Students **must** send their solutions to **scheid@ifi.uzh.ch** and **killer@ifi.uzh.ch** up until the deadline. The solutions will be discussed the day after the deadline. Handing in all exercises is mandatory to receive credits and will be very useful for preparing to the final exam. We encourage students to solve the exercises on their own and actively participate in the exercise discussions.

## 1 Definitions and Characteristics

- 1 Define what is an “Overlay Network” in your own words, and give examples of applications that have/may have an overlay network.
- 2 What is the difference between overlay and underlay? Why is creating an overlay necessary?
- 3 Discuss the following affirmation: “WhatsApp can be considered an Overlay Network”. Do you agree/disagree? Explain the reasons.
- 4 Considering the figure depicted below, answer the following questions:
  - 4.1 How many overlay hops there are between the devices?
  - 4.2 What is the minimum underlay hops that are between the devices?
  - 4.3 Which example of P2P application can this figure be representing?

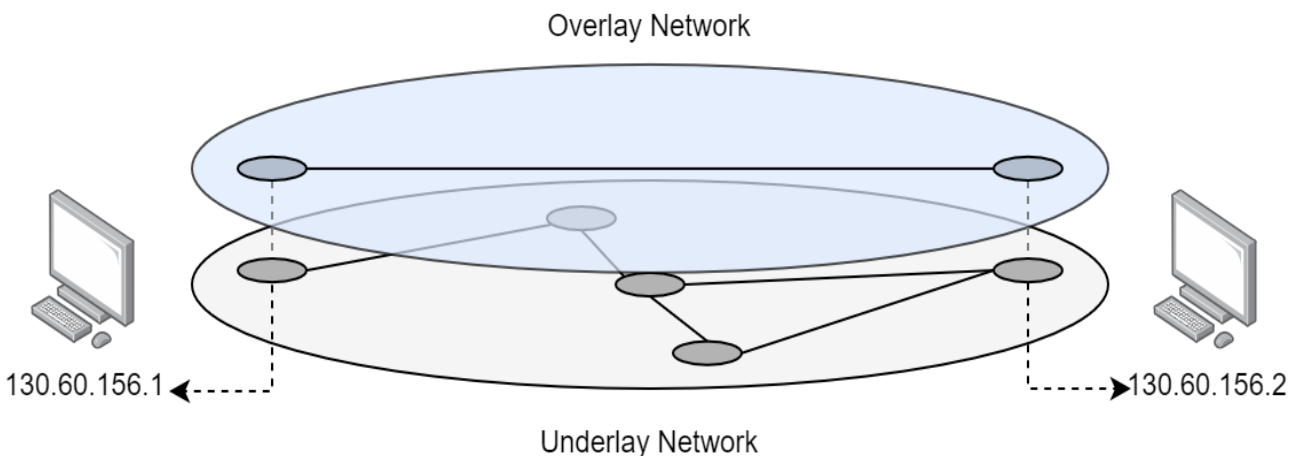


Figure 1: Overlay and Underlay Representation

## 2 Classification of P2P systems

- 1 Why in a decentralized system (pure P2P) a peer can be removed without loss of functionality? How bootstrapping can be performed in such a system?
- 2 Skype can be considered a pure P2P network or an hybrid P2P network? Discuss the answer.
- 3 In file-sharing P2P applications, how is search/lookup done in “early” Napster (centralized)? And in Gnutella (flooding-based)? Explain each with few short sentences, including at least one advantage and one disadvantage of each.
- 4 Why bootstrapping using the IP Layer Broadcast scheme is limited to local network?

### 3 P2P Applications

- 1 Imagine a P2P application that has an accurate locality system, *i.e.* that is able to identify the closest peers, considering “close” as the underlay hop distance (IP) between two nodes. Discuss why this property may be desirable by ISPs (Internet Service Providers).
- 2 If you were affiliated with a copyright enforcement authority, how would you collect identities of users breaking copyright law, *i.e.* uploading illegal content in Gnutella? Would you conclude that users of P2P networks are generally less bound to be sued for distributing copyright-infringing material than users of a C/S system, such as RapidShare? What would be the best strategy for a user who does not want to get caught?
- 3 Based on Figure 2, which represents a Gnutella P2P network, will the peer searching for the song find the song it? If not, what is the minimum Time To Live (TTL) to find it? Why the TTL of a flood request important?

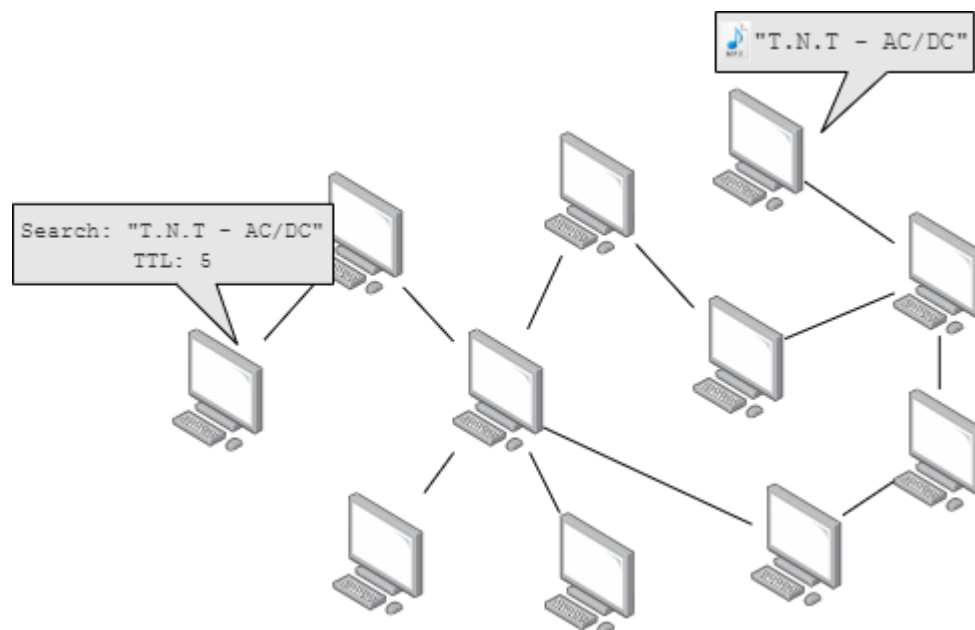


Figure 2: Gnutella File Search Representation