Exercise package 1 (20 points)

The exercises are intended to be done working in pairs. This package contains four exercises and an optional turbo challenge. During the course there will be three sets of exercises. The course book and the lectures contain some answers, but searching for outside sources too is encouraged.

Return your answers by email to juhani.toivonen@cs.helsinki.fi as an attached PDF or TXT document. Use "Overlay Exercise 1" as the subject line. The document should include:

- The title "Overlay exercise package 1"
- The name and student number of both writers
- The answers to the exercises

There are two types of exercise sessions: Clarification sessions, where you can ask questions about the exercises or other matters about the course; and Answer sessions, where some answers to the exercises are presented and discussed.

- Clarification session: Wednesday 20.1. at 12:15
- **Submission deadline**: Tuesday 26.1. at 23:59
- Answer session: Wednesday 27.1. at 12:15

Assignments

Assignment 1 - Overlays (5 points)

Describe on a general level:

- What does a network overlay do?
- What kind of systems can use an overlay? What advantage do they get?
- Does using an overlay sacrifice something? What are the trade-offs?
- Why would one use an overlay instead of simply changing the deployed Internet protocols to do what they need?

Assignment 2 - Overlays and the TCP/IP-stack (5 points)

TCP/IP is usually presented as a stack of layers, each with their own responsibility and assigned protocols. Overlay networks can be presented in a similar way.

- What kind of layers can be found in an overlay network stack and what do they do?
- How would an overlay stack relate to the regular TCP/IP stack? How would you combine them?
- Do the layers of an overlay stack and those of the TCP/IP stack perform similar functions? If yes, what are they, are they redundant, and why?

Assignment 3 - Peer-to-Peer (P2P) (5 points)

Explain briefly:

- What is the P2P networking model? How does it compare to the traditional Client-Server model?
- What typical uses for P2P technologies are there?
- What challenges are there for P2P systems on today's Internet? Are there solutions?
- Name three systems that use P2P technologies and briefly explain what they do.

Assignment 4 - Delivering content (5 points)

Describe on a general level:

- What are Content Delivery Networks (CDN)?
- What are the main benefits of using a CDN?
- How are typical CDN:s different from typical P2P systems that perform a similar task?
- Can a CDN use P2P technology and still serve content to non-P2P clients?

Turbo challenge - Teredo (5 points)

The turbo challenge allows you to recover lost points from other assignments, but will not increase the maximum points available. You can get full points from the exercise set without the turbo challenge. The turbo challenge points will carry over to other exercise sets.

Teredo is an example of an overlay network. Explain in detail:

- What does Teredo allow a network connected host to do?
- What are Teredo clients, servers, and relays, and what purpose do they have?
- What are Teredo bubble messages?
- Explain the steps when a client successfully contacts a host through Teredo and receives a response.