582615: Overlay and peer-to-peer Networks, Autumn 2011

Exercise 1

Instructions:
• The exercises are to be done in the groups assigned on the lecture, or individually
• Answer the questions and return your answers by email to petri.savolainen ät hiit.fi
• Due date 28.9.2011 at 10:15, before the exercise session
• Accepted formats: plain text e-mail, PDF, ODT, DOC, DOCX, or RTF.
• Please include all the names and student numbers of all the group members in the submission.
• Groups/individuals will be picked randomly to present their answers at the exercise session
• The practical exercise should not be returned electronically. The practical exercise is submitted by demonstrating the running software at the exercise session.

Questions

1. What are overlay networks and why are they needed? What kind of applications are they best suited for? (3 points)

2. Give short answers to the the following questions: (5 points)

a) What does BitTorrent use HTTP for?
b) Explain the structure of a .torrent file. Explain the function of each part of the file.
c) What is choke algorithm?
d) What is the difference between the new and the old choke algorithms in the seed mode?
e) What are the benefits and drawbacks of rarest-first piece selection compared to sequential piece selection?

Refer to the following documents for more information on BitTorrent:

http://conferences.sigcomm.org/imc/2006/papers/p20-legout.pdf
http://wiki.theory.org/BitTorrentSpecification

Practical Exercise 1 (8 points)

a) Build NS3 (2 points)

On the department's computers the following commands work out of the box, on other computers, please refer to http://www.nsnam.org/wiki/index.php/Installation.

```
# Please follow this directory structure, future makefiles will assume it.
cd
mkdir  ns3
cd ns3

# Download and build ns3 with examples. The script below could be optimized a bit. How?
wget http://www.nsnam.org/release/ns-allinone-3.12.1.tar.bz2
tar xvjf ns-allinone-3.12.1.tar.bz2
cd ns-allinone-3.12.1
./build.py
```

cd ns-3.12.1
./waf configure –enable-examples
./waf build

# Source code of example simulation programs is now in
# examples/ and  the example executables build/debug/examples/. Before you can run them, you
#need to add the directory of the ns3 libraries to the search path of the OS

export  LD_LIBRARY_PATH=$LD_LIBRARY_PATH:~/ns3/ns-allinone-3.12.1/ns-3.12.1/build/debug

b) Try out the example programs, and study their source code. Be prepared to show the running example programs and to answer to the following question at the exercise session: Which one of the example programs would you choose as a basis for simulating P2P networks and why? (2 points)

c) Modify the example program that you chose to use 1000 nodes. Send a message “Hello Helsinki” from one originator node to all the other nodes in the network. Record the simulation time and real time that it takes until all the target nodes receive the message (hints: Simulator::Now, gettimeofday). Please remember that this is a discrete-event simulator, so you might get packet collisions much easier than in real networks. If this happens, introduce some delay between the packets. Display the resulting .pcap files with Wireshark. (4 points)

Documentation of NS3 can be found in http://www.nsnam.org/ns-3-12/documentation/.