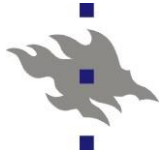# Seminar: Congestion Control and Fairness

Introduction

Jussi Kangasharju

Matemaattis-luonnontieteellinen tiedekunta

Outline

n Organization of seminar

n Introduction to seminar topics

n Selection of topics

n Some hints on where to look for articles

Organizational Details

n Meetings on Mondays 14-16 in C221

n Responsible teacher: Jussi Kangasharju
  - n Office hours: Mon 12-13 + Fri 9-10 in D233
  - n Other appointments by email

n Seminar language is English
  - n Written work, presentation, review in English
  - n Don't stress, it's a foreign language for all of us J
  - n Communication is more important than grammar
    - But please don't throw grammar out the window…

Seminar Tasks

n You have 4 tasks to complete in the seminar

n Write a paper about a given topic

n Review two papers written by other students

n Prepare a presentation

n Participate in the seminar by asking questions, raising discussions on the topic, etc.

n Grading:

    n 40% written paper

    n 40% oral presentation

    n 20% participation (includes review)

Schedule

- Phase 1 (Period III) 14.1-3.3.
    - Decide topic
    - Collect material
    - Write paper
    - Schedule also on website

- Phase 2 (Period IV) 10.3.-21.4.
    - Review two papers written by others
    - Oral presentations of papers
    - 2 talks per week

- No seminar on 24.3. (Easter Monday)

Questions?

Congestion Control and Fairness

n Congestion control is about controlling the rate at which nodes can send traffic to the network

n Goal is to avoid congestion collapse (= traffic jam ☺)

n In other words:

Network is a shared resource and congestion control decides how it should be shared between competing (not necessarily cooperating!) entities

n Fairness relates to sharing of resources

n Easy to grasp intuitively?

n When resource is shared in a fair manner, all parties are satisfied?
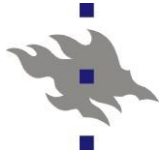
Internet

n Congestion control in Internet handled by TCP

n Original specification in RFC 675 in 1974!

n TCP has served Internet well and has shown itself to be extremely robust in face of new applications

n TCP development in hands of IETF

    n Both in good and bad…

In good:
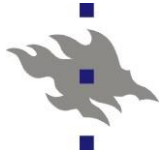
n IETF has ensured stability of the Internet

In bad:

n TCP is not a protocol, it's a religion
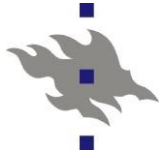
Seminar Topics

1. Basic TCP Congestion Control
2. RED and Active Queue Management (*)
3. Explicit Congestion Notification (*)
4. FAST TCP (*)
5. BIC TCP (*)
6. UDT: UDP-Based Data Transfer (*)
7. TCP-Friendly Rate Control (*)
8. Datagram Congestion Control Protocol (*)
9. Fairness: Definition
10. Utilities (*)
11. Fairness: Dismantling a Religion (*)
12. Price Discrimination and Networks (*)

Topics

1. **Basic TCP Congestion Control**

   - Review basic TCP functionality

   - Slow start, congestion avoidance, fast recovery and retransmit

2. **RED and Active Queue Management**

   - Review of RED and other AQM mechanisms

3. **Explicit Congestion Notification**

   - What is ECN? How does it work? How widely it is used?

Topics

4. FAST TCP
5. BIC TCP
6. UDT: UDP-Based Data Transfer

n All of the above are variants of TCP for different kinds of environments

n Especially for fast transfers on high bandwidth-delay-product links where TCP is bad

Topics

7. TCP-Friendly Rate Control
8. Datagram Congestion Control Protocol

- Congestion control for non-TCP protocols (= UDP)
- TFRC is more about general principles of "TCP-Friendliness"
- DCCP current IETF effort on congestion control for unreliable datagrams (read: UDP-like protocols)

Topics

9. Fairness: Definition
   - What is fairness?
   - Look for definition in economics, game theory, or social sciences

10. Utilities
    - How to measure the impact on the user? How should network resources be shared?

11. Fairness: Dismantling a Religion
   - What is wrong with TCP?

12. Price Discrimination and Networks
    - Network pricing models

Seminar Topics

1. Basic TCP Congestion Control
2. RED and Active Queue Management (*)
3. Explicit Congestion Notification (*)
4. FAST TCP (*)
5. BIC TCP (*)
6. UDT: UDP-Based Data Transfer (*)
7. TCP-Friendly Rate Control (*)
8. Datagram Congestion Control Protocol (*)
9. Fairness: Definition
10. Utilities (*)
11. Fairness: Dismantling a Religion (*)
12. Price Discrimination and Networks (*)
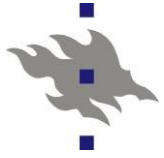
Topic Assignment

n Pick 3 topics from the list

n Write them down in order of preference on a piece of paper

n Write your name on paper

n Give paper to Jussi

Next Steps

By next week:

n Provide list of sources you will use as references

 - n You should have 4-5 papers by then
 - n List can be refined later

n Lecture on 28.1. about how to do a seminar

 - n Help for writing and giving presentations
 - n Not mandatory, but highly recommended

n Presentations during Period IV (March/April)

 - n Two talks per week, grouped thematically (when possible)
 - n Have to attend 5 out of 6 weeks (80% rule)
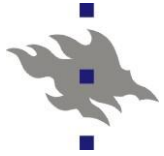
How to Find Articles and Information?

n Google is your friend and Google Scholar even more so

   n http://scholar.google.com

   n Also CiteSeer: http://citeseer.ist.psu.edu/cs

n IEEEXplore: IEEE's digital library

   n http://ieeexplore.ieee.org

n ACM Digital Library

   n http://portal.acm.org/dl.cfm

n IEEE and ACM work from our university network

   n "Work" = Full access to articles

n Traditional library J