



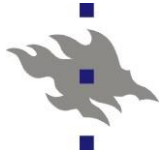
HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Seminar: Opportunistic Networks Introduction

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Matemaattis-luonnontieteellinen tiedekunta





Outline

- n Organization of seminar
- n Introduction to seminar topics
- n Selection of topics
- n General information about seminars
 - n What are the goals, how to achieve them?
 - n Presentations
 - n Sources of information



Organizational Details

- n Meetings on Thursdays 12-14 in C220

- n Responsible teacher: Jussi Kangasharju
 - n Office hours: Mon + Wed: 13-13:30 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

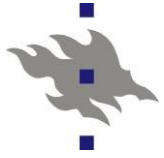
- n Phase 1 (Period I) 6.9.-18.10.
 - n Decide topic
 - n Collect material
 - n Write paper
 - n Review two papers written by others
 - n Schedule on website

- n Phase 2 (Period II) 1.11.-29.11.
 - n Oral presentations of papers
 - n 2 talks per week

- n No seminar on 18.10. and 6.12.



Questions?



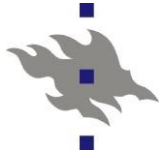
Opportunistic Networks

- n What are they?
- n That's what this seminar is for...
- n How to define opportunistic networks?
- n Unfortunately, no definition exists
 - n At least, no commonly accepted definition
- n We are going to look at how opportunistic networks are designed, built, and used
 - n Also look at related technologies



Where Do They Come From?

- n Opportunistic networks typically wireless
- n Nodes are typically handheld devices carried by people
 - n But see later about wireless sensor networks
- n No infrastructure required
 - n Nodes communicate directly with each other
 - n Sometimes additional support from infrastructure
- n Nodes discover each other automatically and communicate with no user intervention



Hey, I Know What That Is!!!

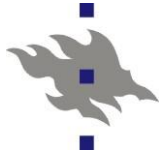
- n Those kinds of networks are called **ad hoc networks!**
 - n Often: **M**obile **A**d hoc **N**etworks (MANET)

n Yes... and no

Yes:

- n Opportunistic networks and MANETs have lot in common
- n Many techniques from MANETs can be used in opportunistic networks and vice versa

But...



Differences to MANETs

- n MANETs often aim at **synchronous** communications between two (or more) nodes
 - n Requires routing in real time
 - n Routing in an ad hoc network is challenging (but doable)

- n MANET assumes everyone wants to **contribute**
 - n Everybody is willing to route any traffic
 - n Not true in every (most?) scenario
 - n Why should I waste my battery to let you talk to others?

- n Let's look closer at opportunistic networks



What Does an Opportunistic Network Do?

- n Opportunistic networks also based on wireless communications
- n Usually **asynchronous** communications
- n Lots of emphasis on **information dissemination**
 - n Exploits human mobility to move information
- n Communication typically happens when two nodes are within communication range
 - n **One-hop communications**
 - n MANETs implement multi-hop communications



Why Opportunistic Networks?

- n New kind of networks and applications
 - n Or just a buzzword? Time will tell...
- n They attempt to overcome some problems of MANETs
- n Basic concepts widely applicable in other wireless nets



Seminar Topics

1. Mobile Ad Hoc networks (MANETs)
2. Ad hoc routing (e.g., AODV, DSR)
3. Wireless Sensor Networks
4. Epidemic Dissemination Algorithms
5. User Mobility Traces (non-HAGGLE)
6. Mobility Models
7. HAGGLE project/Pocket-Switched Networks
8. iClouds project
9. Opportunistic Routing
10. Delay-Tolerant Networks
11. Opportunistic Networks



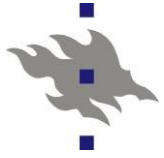
MANETs and Ad Hoc Routing

1. Mobile Ad Hoc Networks

- n What are MANETs?
- n How are they used?
- n What kinds of problems do MANETs try to solve?
- n Examples of networks
- n “Overview” topic

2. Ad hoc routing

- n As mentioned, focus in ad hoc networks is routing
- n Look at different routing algorithms in MANETs
- n For example, AODV and DSR
 - Or other routing algorithms you discover in literature
- n “Discuss and compare algorithms” topic



Sensor Networks and Epidemic Algorithms

3. Wireless Sensor Networks (WSN)

- n What are wireless sensor networks?
- n How are they used?
- n What kinds of problems do WSNs try to solve?
- n Examples of networks
- n “Overview” topic

4. Epidemic Dissemination Algorithms

- n What are they?
- n How are they used in ad hoc networks?
- n Describe basics of epidemic dissemination
- n “Discuss and compare algorithms” topic



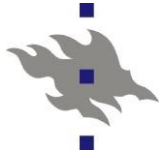
Mobility

5. User Mobility Traces

- n What kinds of mobility traces exist out there?
- n Who has collected and what kind of data?
- n For example, look at CRAWDAD
- n Do not talk about HAGGLE project (see below)
- n “Describe and discuss” topic

6. Mobility Models

- n Mobility traces refer to actual human mobility
- n Mobility models attempt to define synthetic models which capture the essential aspects of human mobility
- n What kinds of models exist?
- n “Discuss and compare models” topic



Research Projects on Opportunistic Networks

7. HAGGLE project/Pocket-Switched Networks

- n <http://www.haggleproject.org>
- n What are they doing?
- n How does that relate to opportunistic networks?
- n “Overview of research topics and results” topic

8. iClouds project

- n <http://iclouds.tk.informatik.tu-darmstadt.de>
- n What are they doing?
- n How does that relate to opportunistic networks?
- n Project has also done classification of opportunistic networks (with an attempt at definition!)
- n “Overview of research topics and results” topic



Opportunistic Networks (Finally! J)

9. Opportunistic Routing

- n Start from a given article and work from there
- n What is it? What are they doing? What else exists?
- n The most “typical seminar topic” of our topics

10. Delay-Tolerant Networks

- n What are they?
- n How are they used?
- n Discuss and compare proposed solutions

11. Opportunistic Networks

- n Find definitions for opportunistic networks
- n Find work about opportunistic networks
- n Discuss, compare, propose definition



Topic Assignment

1. Mobile Ad Hoc networks (MANETs)
 2. Ad hoc routing (e.g., AODV, DSR)
 3. Wireless Sensor Networks
 4. Epidemic Dissemination Algorithms
 5. User Mobility Traces
 6. Mobility Models
 7. HAGGLE project/Pocket-Switched Networks
 8. iClouds project
 9. Opportunistic Routing
 10. Delay-Tolerant Networks
 11. Opportunistic Networks
- n Every topic marked in green must be taken by someone



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 We meet weekly during Period I, but attendance is not mandatory
 - n Website gives topic for each meeting

- n Presentations during Period II (November)
 - n Two talks per week, grouped thematically (when possible)
 - n Have to attend 4 out of 5 weeks (80% rule)