

Mat-2.177 Seminar on Case Studies in Operations Research

Modeling Mobile Peer-To-Peer Networks

Project Status Report

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I. Overview

This study is part of the course Mat-2.177 Seminar on Case Studies in Operations Research in spring 2007. The client of this project is Nokia Research Center which is a separate unit within Nokia.

This report presents the preliminary results of our project work, updated project schedule, and risks. The subject of the project has been narrowed down slightly; we will be focusing on the heterogeneity of nodes and its effects in diffusion of information and messages in a peer-to-peer network.

II. Preliminary results and progress of the project

In this section, we present the progress and an updated schedule for the rest of the project work.

i. Phase I

Phase I is presented in the Table 1, and it has been completed earlier on.

Table 1 Summary of phase 1

Phase 1: startup
Group meeting: getting to know each other and choosing a leader
First meeting with client
Brainstorming
Initial literature reviews: what has already been done? Preferably we would like to do something new
Locking the direction: simple model - what do we want get out from it?
Biggest challenge: choosing right direction
Phase 1 COMPLETED - project plan is published. Eighty hours of project work done.

ii. Phase II

In the first and simplest scenario, the objective was to model the propagation of text-messages, when network users or nodes prefer all information sent to them in the same way. During this second phase, the first simulation model has been developed, but the work is still slightly in progress. The simulation model has been programmed by Matlab and Java. However, this has brought about some

problems: the interface between Java and Matlab is very novel and not documented at all. Due to unexpected difficulties within the programming phase, the schedule has been somewhat delayed, but still so far the problems have not been extensive and the choice of tool seems right.

The literature review so far has consisted of exploring theory on diffusion models and general overview on peer-to-peer networks research. At the moment, we have not found any research combining heterogeneity and diffusion models. Studies on peer-to-peer networks are mainly related to on topics such as pure file sharing applications with two-way traffic and efficient structures of networks, which have not been directly applicable to the scope of our project. The literature review will be focused more on finding articles concerning heterogeneity and on the other hand one-way message diffusion in the network. The core tasks mostly completed are presented in Table 2.

Table 2 Tasks of phase 2

Phase 2: hands-on	
Model development	Literature review
Choosing relevant tools	Searching for articles on the narrower topic of the project
First simulation model	Trying to find new ideas or parameters to our model
Deepening and expanding our model	
Start analyzing first results	
Biggest challenge: keeping feet on ground while scanning the horizon	
Phase ends - midterm report is published.	
100 hours of project work done.	

iii. Phase III

The most important task of the third phase is to analyze the results of the simulation model, and in particular write the final report. The focus of the final report will be on presenting the results of the more complex simulation models and cases. The tasks of the third phase are listed in Table 3.

Table 3 Tasks of phase 3

Phase 3: results
Analyzing thoroughly the results of the first model
Explaining the results
Implementing further features to the model
Analyzing the results from the extended models
Writing the report
Biggest challenge: bringing up real results with statistical significance ,Writing the report
Phase ends - final report is published

III. Risks

The research area, in general, is quite complex. In the following, we address some of the future risks.

i. Time

Programming has taken more time than initially planned, and this problem may persist during the final phase of the project as well. In addition to delays, this may force us to discard some of the initial objectives and scale down the targeted complexity of the model.

ii. Tools

The choice of the programming tool has been made, and if severe structural problems relating to model formulation and the programming language should arise, this would significantly harm the project schedule, achievability of objectives and workload.

iii. Too trivial results

Complexity as such is no guarantee for interesting results. Even if we succeed in adding various features to the model, it may not give us useful results, but instead produce undesired and too simple or trivial information on behavior in the network context.