

# Quality of Service for Multiplayer Game Provisioning in Mobile Ad Hoc Networks

Master Thesis

Task Description

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# 1 Introduction

Mobile Ad Hoc Networks (MANET) are self-organised wireless multi-hop networks comprising various heterogeneous mobile devices that are independent of any existing networking infrastructure and can be set up spontaneously. Each node participating in a MANET can act as both, an end host and a router at the same time. Furthermore, due to device mobility the network topology may vary frequently. Additionally, new nodes may emerge and join the MANET whereas existing nodes may vanish at any time. In order to send packets from a source node all along the way passing several intermediate nodes to a destination node a routing protocol is needed that takes device mobility and wireless network conditions into account. MANETs will become widespread as the number of mobile devices and applications increases continuously.

Multiplayer Computer Games (MCG) enjoy great popularity and with the advent of more powerful mobile devices people would like to play MCG using their mobile devices without the hassle of installing a game or the burden of setting up the networking infrastructure. To deal with these challenges a distributed service provisioning framework SIRAMON [1] is currently developed that provides for description, indication, deployment and management of services in MANETs. Since MCG, in particular real-time games have strict demands on the network [2], quality of service (QoS) has to be provided to cope with unreliable connections, low bandwidth, high latency and limited device resources.

The main objective of this master thesis is to analyse and evaluate quality of service routing protocols focusing on multiplayer computer games in mobile ad hoc networks.

## 2 Scope of the project

Starting with a collection of networking requirements of common multiplayer games, typical game scenarios should be modelled in the network simulator ns-2 [3] including mobility and communication patterns. Afterwards, these scenarios should be simulated in ns-2 employing standard ad hoc routing protocols as well as enhanced protocols providing for quality of service. This also includes the modification of existing or implementation of new QoS routing protocols. The results of the simulations should be evaluated against the requirements mentioned before. The routing protocols that achieve the best average performance should be implemented in Linux and evaluated in a test environment. However, a concurrent ns-2 / Linux implementation is preferred when possible. Finally, an interface between the routing protocol and SIRAMON should be specified and implemented to enable SIRAMON using QoS routing and accessing essential networking parameters.

## 3 Project Plan

Major tasks of the project are shown in the following project plan, whereas several tasks are accomplished in parallel as indicated by the column *Duration*, in particular, the implementation and simulation of routing protocols and writing the thesis.

<i>Week</i>	<i>Date</i>		<i>Task</i>	<i>Duration</i>
0	April    May	1 <sup>st</sup> - 3 <sup>rd</sup>	Start of the master thesis	1 week
1		4 <sup>th</sup> - 10 <sup>th</sup>	Evaluation criteria of routing protocols for MCGs	2 weeks
2		11 <sup>th</sup> - 17 <sup>th</sup>	Modelling MCG scenarios in NS-2	4 weeks
3		18 <sup>th</sup> - 24 <sup>th</sup>	Modify routing protocols providing for QoS	8 weeks
4		25 <sup>th</sup> - 1 <sup>st</sup>	Running simulations in NS-2	7 weeks
5		2 <sup>nd</sup> - 8 <sup>th</sup>		
6		9 <sup>th</sup> - 15 <sup>th</sup>		
7		16 <sup>th</sup> - 22 <sup>th</sup>		

<i>Week</i>	<i>Date</i>		<i>Task</i>	<i>Duration</i>
8	June	23 <sup>rd</sup> - 29 <sup>th</sup>	Evaluation and comparison of routing protocols	2 weeks
9		30 <sup>th</sup> - 5 <sup>th</sup>		
10		6 <sup>th</sup> - 12 <sup>th</sup>		
11		13 <sup>th</sup> - 19 <sup>th</sup>		
12	July	20 <sup>th</sup> - 26 <sup>th</sup>	Implementation of routing protocols in Linux	9 weeks
13		27 <sup>th</sup> - 3 <sup>rd</sup>		
14		4 <sup>th</sup> - 10 <sup>th</sup>		
15		11 <sup>th</sup> - 17 <sup>th</sup>		
16	August	18 <sup>th</sup> - 24 <sup>th</sup>	Writing master thesis	13 weeks
17		25 <sup>th</sup> - 31 <sup>st</sup>		
18		1 <sup>st</sup> - 7 <sup>th</sup>		
19		8 <sup>th</sup> - 14 <sup>th</sup>		
20	September	15 <sup>th</sup> - 21 <sup>st</sup>	Evaluation using the test environment	3 weeks
21		22 <sup>nd</sup> - 28 <sup>th</sup>		
22		29 <sup>th</sup> - 4 <sup>th</sup>		
23		5 <sup>th</sup> - 11 <sup>th</sup>		
24		12 <sup>th</sup> - 18 <sup>th</sup>		
25		19 <sup>th</sup> - 25 <sup>th</sup>		
26		26 <sup>th</sup> - 30 <sup>th</sup>	Hand in the Thesis	

## 4 General Regulations

This master thesis is carried out in collaboration between TU Braunschweig and ETH Zurich. The thesis is guided by Oliver Wellnitz (TU Braunschweig) and Karoly Farkas (ETH Zurich) and marked by Prof. Lars Wolf (TU Braunschweig) and Prof. Bernhard Plattner (ETH Zurich). At the end of the project a written document describing the work and the achieved results has to be delivered. An intermediate presentation has to be given at TU Braunschweig and final presentations at ETH Zurich and TU Braunschweig.

Start: Friday, 1<sup>st</sup> April 2005  
End: Friday, 30<sup>th</sup> September 2005

## References

- [1] K. Farkas, "*Service provisioning fRAMework for self-Organized Networks*", <http://www.csg.ethz.ch/research/projects/siramon/>, ETH Zurich, March 2005
- [2] L. Pantel L. Wolf, *On the Impact of Delay on Real-Time Multiplayer Games*, in *Proceedings of the 12th International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV 2002)*, Miami Beach, Florida, USA, 2002
- [3] Information Sciences Institute, "*The Network Simulator ns-2*", <http://www.isi.edu/nsnam/ns/>, ISI, March 2005

Braunschweig, March 2005  
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