After Study
Visualization of LTE cellular networks in a JAVA-based radio network simulator

Version 0.2

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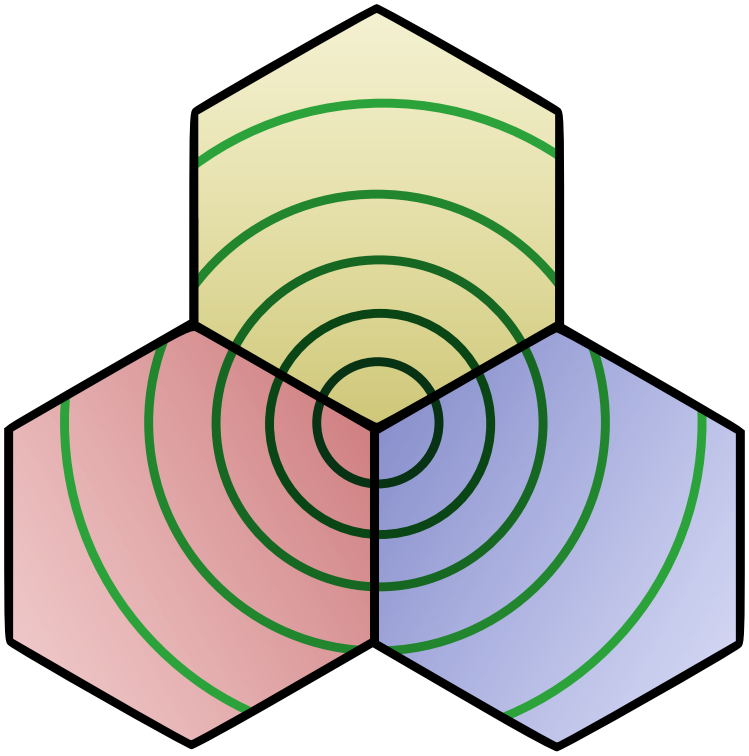

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Project Identity

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Document History

Version	Date	Changes made	Sign	Reviewer
0.1	2011-12-03	First draft.	SO	PS
0.2	2011-12-12	Second draft.	SO	PS

Contents

1 Introduction

In this document, we evaluate the work done during the project. The whole group was involved in the discussion that led to this document. The project is divided into the before phase, the during phase and the after phase, as described later. This document discusses only the before and during phases since the after phase has not ended yet.

2 Time Report

In the table below, the number of hours each project member has spent on the project during before and during phase is shown. The time for the during phase is up to but not including work done in the last week.

Phase	SO	AK	PS	MK	MZ	JN	PR	JK	ST
Before	93	85	118	77	77	77	79	80	91
During	119	130	102	138	134	134	131	140	127

2.1 Time Report over spent time

Most people in the group spent a considerably less number of hours per week in the before phase than in the during phase. That gave those quite heavy amounts of time to spend per week in the second part of the project. The exception is the project leader who spent more time in the first phase than in the second. Since the different tasks in the during phase were not especially dependent on each other, the group members where quite free to plan how they wanted to divide their time over the weeks, as long as the task was finished in time.

2.2 Comparison between planned and spent time

We found it hard to estimate how long time each activity would take, since we did not have a good understanding of how we would build our program when we made the time plan. The lack of JAVA and GUI programming knowledge also made the time plan more of a guess. Thus, it is not so surprising to us that for example the hierarchy of classes for data storage took almost 50 hours less than planned, and that the a class that turned out to be more central than expected took 43 hours more than planned. Luckily, the changes cancelled each other out quite well in total. The technical documentation also took considerably less time, since we where allowed to use the generated JAVAdoc documentation.

2.3 Summing of total economy

Looking at the total resources spent within the project, we were able to keep within budget on all accounts. In the end, there was some differences in hours spend between the group members. However, this is to expect within these circumstances.

Member:	SO	AK	PS	MK	MZ	JN	PR	JK	ST
Total:	230	227	238	233	240	24	225	241	240

Looking at the total hours spent by the project members, we were within 2% of the total hours to spend. On all other accounts we were well below the maximum number available. However, the actual number for hours spent with our supervisors at ER is most probably

larger than the one stated here since not all hours were accounted for. No hours were spent with experts at ISY, which is probably due to a combination of the low focus on actual communication technology and the high quality of support from ER.

Account:	Internal man-hours	Hours with supervisor, ISY	Hours with supervisor, customer	Hours with experts, ISY
Available:	2160	15	30	25
Spent:	2117	5.5	16.5	0

3 Analysis of work effort and problems

In this section, we first describe what happened during the different phases. Since the after phase in not done, it is not discussed in this document. Then, we evaluate the distribution of work and the collaboration both in the group and with supervisor and customers. Finally, the few problems we had in the group are discussed, and we give our thought on the use of the project model LIPS in this project.

3.1 What happened during the project phases?

During the before phase, we were mainly writing documents, and to a much lesser extent doing some studying of LTE. The documents where the requirement specification, the project plan, system drawing, time plan and design specification. The LTE studying was done in order to find interesting things to visualize.

In the During phase, all the actual programming took place. We also wrote technical documentation and a user manual.

3.2 Distribution of the work between the project participants

The distribution of work was fairly even between the project participants. The estimation of how long each activity would take was not so accurate, but we where able to rearrange the non-programming tasks like documentation, web page and poster so to give all a fair amount of work. It was also quite flexible how much time to put on each task since it was so much GUI programming: a component could always be made to look better or have a slightly increased functionality. We managed to separate the tasks reasonably well in the during phase. That meant that everyone had something to do at all times, and we never had people waiting for some other task to be finished.

3.3 Collaboration in the group

The collaboration in the group has been good, especially in the during phase. In the before phase, we felt that the group was too big to be efficient. There was just not enough to do when we were writing documents. It also takes long time to discuss when the group is larger. The room we got at Ericsson was good for the communication in the group. Since there was often several other people in the group there, it was easy to just ask questions when you got them, instead of having to wait for a meeting or writing emails. The commit log history in the subversion repository was also important to help people understand what was going on in other parts of the project. We had no conflicts or problem in the group hindering the work.

3.4 Collaboration with customer and supervisor

The collaboration with both our customers at Ericsson Research, Håkan and Martin, and our supervisor Johannes at Communication Systems was good. Håkan and Martin was always available and very helpful. However, we feel that it would perhaps have been more efficient for them if they had known more about how our course and project model worked.

3.5 Problems

There was no problems in the project which halted the work. The problems we had was mostly practical. The largest one being that there was only four computers in the project room, and no internet connection if we brought laptops. Sometimes almost all of the group wanted to work at the same time, but there was not enough computers. We were also not allowed to take some things outside Ericsson, which made it harder to just go home and work when all computers were taken.

3.6 The project model Lips – use, comments

The project model Lips was one of the parts in the project we were the least satisfied with. Since we had very limited experience in both programming graphical interfaces and in JAVA, it was very hard to decide in detail how the program should be designed, before starting to do any programming. We spent about 170 hours in total on the design specification, and the part we used from it was only the general structure of the program, not much more detailed than the system drawing. It is of course useful to use a project model for managing a project like this, but the group thinks that it would have been better to get the chance to try a more agile method, since this turned out to be a pure programming project. Those are also becoming more and more common. That way, we could have developed the program as we were programming and learning. We could also have used a lot of the hours spent on the design specification on something more productive. Also, we feel that since we had so little time before making the requirement specification and design specification, we had not time to read enough on LTE to find more interesting things to visualize. Instead, we had to choose things we knew about.

4 Fulfillment of the goal

In this section, we discuss how we fulfilled the goals made for the project.

4.1 Summary of achievements

We fulfilled all priority one goals in the requirement specification, and one goal with priority two. Some people in the group were satisfied with the result. Others felt that it would have been possible to achieve considerably more if we have not had to spend so much time on documentation in the before phase.

4.2 How the study situation influenced upon the project

In the during phase of the project, we spent 20-30 hours per week on the project. The group members who studied full time and had other courses which was of normal difficulty thought that those courses suffered a bit from not being able to spend enough time on

them. One project member instead felt that the first period was the toughest, with lots of effort spent on learning JAVA while also taking two other courses.

5 The project and course

This turned out to be a pure programming project. We had to do a small amount of LTE studying in order to decide what to visualize, but in the during phase it was mostly GUI related programming. It took a lot of time to read up on GUI programming and to understand the example code we got from ER. Even if it was interesting to do the project itself, and useful to learn JAVA, it would have been nice to get a chance to use what we have learned about communication in earlier courses. The project directive and introductory lectures suggested to us that maybe it was believed that this project would contain more communication that it actually turned out to do? As it was, it would have been more useful for us with some lectures on basic GUI programming and how to structure a larger object oriented project. If we had not had to spend so much time on understanding the programming parts, we could maybe have done more communication related things in the visualization. As it was, we had to settle for the more obvious things to visualize.

6 Summary of the three most important experiences

The team thinks that it was nice to do the project at Ericsson, and getting to know the company a bit more. It was useful to learn JAVA. It was also fun to work in a larger software project than most of us have been in before.