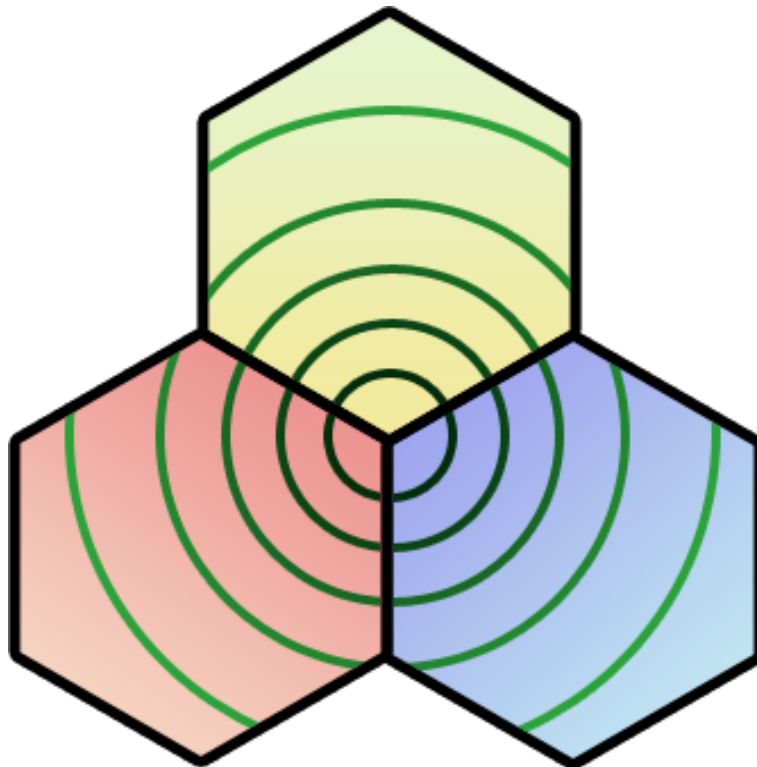


Project Plan

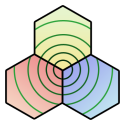
Visualization of LTE cellular networks in a JAVA-based radio network simulator

Version 1.0

Author: Martin Krisell
Date: September 28, 2011



Course name:	Communication Systems	E-mail:	tsks05_2011@googlegroups.com
Project group:	Group 1	Document responsible:	Martin Krisell
Course code:	TSKS05	Author's E-mail:	markr088@student.liu.se
Project:	LTE Visualization	Document name:	Project Plan



Status

Reviewed		
Approved		

Project Identity

Group E-mail: tsks05_2011@googlegroups.com
Homepage: http://www.isy.liu.se/en/edu/projekt/kommunikationssystem/2011/lte_visualization/
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Document History

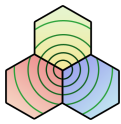
Version	Date	Changes made	Sign	Reviewer
0.1	2011-09-19	First draft	MK	JL
0.2	2011-09-26	Second draft, mostly editorial updates and milestones added	MK	JL
1.0	2011-09-26	Approved - Updated distribution of documents	MK	JL

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1 Who is the customer

Ericsson Research in Mjärdevi, Linköping has ordered this product from the project group. Contact persons at Ericsson Research are Håkan Andersson and Martin Hessler.

2 An overview of the system

This section gives a brief overview of the project and its goals, the included deliveries of the project and what is not included in the project.

2.1 Purpose and goal

The purpose of the project is to design and implement visualization components capable of illustrating the dynamic behaviour of an LTE cellular system in the Java-based simulator at Ericsson Research [1].

2.2 Deliverables

At the end of the project the software produced will be delivered to Ericsson Research along with documentation in the form of a user manual, a technical report and a poster. Status reports and time reports will be produced throughout the project and delivered to the customer, sponsor and supervisor. In addition to this, a web page shall be produced and an oral presentation of the project will be held.

2.3 What is not included

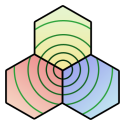
The system merely provides visualization tools and does not include the simulation part. Hence, the correctness of the used simulator is vital to the usefulness of this system. The functionality of the software is defined in the Requirement Specification [2] and any additional functions are considered to be of lower priority.

3 Plan for the project phases

Following the LIPS model, the project will be divided into the three phases listed below.

3.1 Before phase

The Communication Systems group at the Department of Electrical Engineering (ISY), Linköping University, along with Ericsson Research initializes the project with a number of informational lectures. The project group then defines the goal of the project by producing a Requirement Specification and a System Sketch based on the Project Directive provided by Ericsson Research. These documents, along with the project plan which defines the project work, are delivered to the customer at TG2. Based on this a decision is made, whether or not to enter the during phase of the project.



3.2 During phase

The first task after passing TG2 is to write a Design Specification based on the previously produced system sketch. This document will in greater detail describe how the software will be designed and implemented. The implementation of the project is then started. During this phase the Design Specification may have to be altered as better ways of performing some tasks may be realized. Documentation in the form of a User Manual and Technical Specification is being worked on continuously during this phase. The During phase is ended by an oral presentation of the results, a poster and the launch of a project web page.

3.3 After phase

After the project is finished it will be evaluated in an After study.

4 Organization plan

The organization within the project consists of a project group, a sponsor, a customer, a number of technical experts and supervisors. The project group, in turn, consists of nine group members, of which one has been assigned to be the project manager.

4.1 Organization plan for each project phase

The general organization will remain static throughout the project. When required, team leaders may be appointed for certain tasks.

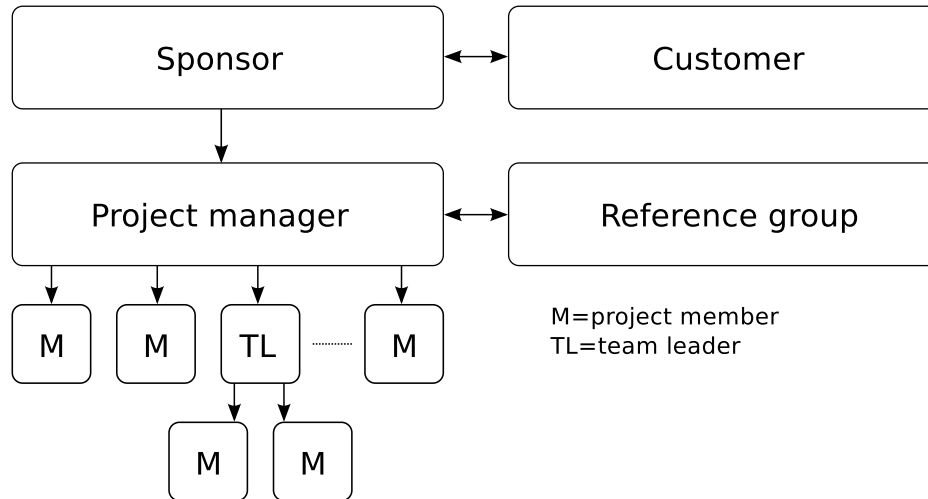
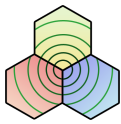


Figure 1: Organization plan used within the project

4.2 The customers organization

Ericsson Research is part of the Ericsson concern and the primary contact persons are Håkan Andersson and Martin Hessler.



4.3 Conditions for the co-operation in the project group

The group have agreed upon a group contract which determines the guidelines for co-operation in the project group.

4.4 Definition of work contents and responsibilities

The project will be divided into different areas of responsibility as defined below

4.4.1 Project Manager (PM)

The Project Manager is responsible for the progress of the project and the fulfillment of the requirements set upon the product and the work process. Part of this responsibility is organization and running of group meetings, motivation of group members and the overall management of the resources available to the project.

4.4.2 Responsible for Documentation (DOC)

DOC is responsible for ensuring that documents follow a consistent standard, that the contents are acceptable and that the documents are delivered on time. DOC is also responsible for keeping track on versions for all documents, as well as storing them, mainly electronically but also physically when needed. As documents are written, the DOC needs to make sure that all documents get reviewed appropriately by at least one group member, and that the document history in each document is properly updated.

4.4.3 Responsible for Testing (TST)

The person Responsible for Testing is to make sure that the system functionality, partially and as a whole, is properly tested. TST is also responsible for the fulfillment of requirement 4 in the Requirement Specification [2].

4.4.4 Responsible for Layout (LAY)

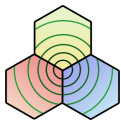
The person responsible for the layout should set up the general guidelines for what the layout of the GUI should look like. During the development phase this person should make sure that all components are following the initial guidelines and make appropriate changes to the guidelines when needed.

4.4.5 Responsible for Code style and maintenance (CSM)

The person Responsible for Code style is to make sure that all code conforms to the Ericsson Coding Conventions and is object oriented. CSM is also responsible for the proper maintenance and merging of the code throughout the project.

4.4.6 Team Leader (TM)

In some cases a group member will be promoted to Team Leader. He or she is then responsible for a smaller group of people to reach a certain goal in a short time.



5 Plan for included documents

In this section the that are to be delivered are listed along with some conventions regarding the documents. The documents produced will all be written in English. Only the members of the project group will have access to document drafts, once a document is considered ready for submission, the customer, sponsor and supervisor will also get access to the document. The version of the documents will be on the form x.y, where x begins being 0 and y being 1. Each time a document is submitted for revision y is incremented. When a document is approved by the customer and the supervisor, x is incremented to 1. The following documents are to be delivered.

Document	Author/ Approved by	Purpose	Distribution	Ready
Requirement spec.	MK/PS	Definition of all requirements.	ER, JL	110915
System sketch	MK/PS	Define the work flow of the project.	ER, JL	110923
Project plan	MK/PS	System sketch shows an overview of the system.	ER, JL	110923
Time plan	PS / SÖ	Time plan depicts distribution of time in the project.	ER, JL	110923
Design specification	MK/PS	Design specification describes how the system works in great detail.	ER, JL	111013
User manual	MK/PS	User manual provides instructions on how to use the product.	ER, JL	111201
Technical documentation	MK/PS	Technical documentation describes how the product works.	ER, JL	111201

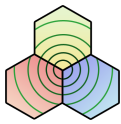
6 Development method

All code shall be developed using an object oriented paradigm. Unit tests shall be used when applicable. Code shall also conform to the coding conventions at Ericsson Research, which falls under the responsibility of CSM. Methods shall be well commented using the JavaDoc standard, so that an HTML documentation can be automatically produced. Code shall, whenever appropriate, reuse provided code by Ericsson, e.g. by inheritance. Before submission, all code shall be reviewed by at least one group member who was not involved in writing it.

7 Education plan

This section describes the need for education of involved parties.

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7.1 Education for the project members

Introductory LTE lectures have already been held for the project group. Experts and supervisors will be contacted by PM to arrange further education for the group if found necessary. Group internal Java education will be held to ensure that everyone has a good understanding of how to construct Java programs using the SWING libraries. Each group member is responsible for further self studies if he or she finds it necessary.

7.2 Education for the customer

A user manual will be produced with the purpose of explaining how to use the system. The system GUI shall work as intuitively as possible, to facilitate learning. Since most of the development will be performed at ER, the customer will also be able to learn the system during development.

8 Report plan

The project manager will send weekly time reports with an updated time plan to the supervisor, sponsor and examiner. Each group member informs PM of the time used every week by noon on Sundays. Status reports will be produced and submitted to the customer as well as the course examiner upon request.

9 Meeting plan

Weekly meetings involving the complete project group will be held. At least one hour per week shall be scheduled for this, more if there are important matters to discuss. The meeting agenda shall be provided by the PM to the project group at least 24 hours before the meeting. Meeting minutes will be taken by a group member appointed at the meeting, and another member will verify them. The minutes will be written using the LISP template. In addition to this, the PM will call for work meetings whenever needed. At these meetings, the whole group may not need to attend.

10 Resource plan

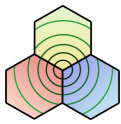
The following section describes the given resources for the project, what they are and how they will be used throughout the project.

10.1 Personnel

The group will be allocated the following resources from other people than the group members:

- 25 hours of expert guidance at Linköping University
- 15 hours of supervision at Linköping University
- 30 hours of supervision at Ericsson Research

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The resources above will be used as necessary during the project. In order to use these resources efficiently, the majority of the communications will go through the project manager or another group member by agreement of the group.

10.2 Material

All the necessary software for the development is freely available on the Internet. Log files required for developing the interface towards the Ericsson RedHawk simulator will be provided by Ericsson Research.

10.3 Working rooms

The group will have access to computers and a working area at Ericsson Research in Mjärdevi.

10.4 Economy

A maximum of 2160 hours can be spent for the whole group. The workload shall be distributed as evenly as possible among the all group members.

11 Milestones and tollgates

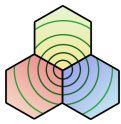
Milestones and tollgates will be used as internal respectively external points in time to verify that the project is on schedule.

11.1 Milestones

No	Description	Date
0	System drawing and Project Plan approved - TG2 passed	110928
1	Design specification approved - TG3 passed	111013
2	Parser done	111106
3	LTE classes (UE, BS, etc.) done	111106
4	Bottom layer of Generic visualization layer	111113
5	LTE specific visualization libraries done	111120
6	Everything ready for testing	111127
7	Project approved for delivery - TG5 passed	111202
8	Delivery approved - TG6 passed	111208

11.2 Tollgates

Tollgates are times when the project meets the project's sponsor. The sponsor verifies that the requirements for the toll gate is met and, if so, the sponsor may allow the project to continue.

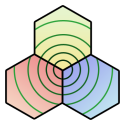


No	Description	Date
0	Approval of the project directive, decision to start the prestudy	-
1	Prestudy completed	110915
2	Approval of the Project Plan, Requirement Specification and System Sketch. Decision to start the During phase.	110928
3	Approval of the design specification, decision to continue the execution phase	111013
4	(Not used in this project)	-
5	Approval of the functionality of the product, decision to deliver	111202
6	Approval of the delivery, decision to resolve the project group	111208

12 Activities

This section describes the activities required to meet the requirement specification and an estimated amount of time that each activity will require to be fulfilled.

No	Activity	Description	Est. time
0	Group Meetings	Internal meetings with the group.	208
1	Other meetings	Meetings with people surrounding the project.	77
2	Project manager related activities		59
3	Managing code and Subversion/Wiki		37
4	Document responsible related activities	Proof reading and finalizing documents	8
5	Miscellaneous: Reading mail, struggling with development environments, etc.	Activities that does not fit in any other category	115
6	Lectures	Lectures directly related to the project for the education of the group.	58
7	Requirement specification	Analyzing the task, formulating requirements and producing the document.	55
8	Project plan	Planning of the project and producing the document.	30
9	System drawing	Creating the outline of the system and producing the document.	46
10	Time plan	Planning the timeline of the project and producing the document.	26
11	Design specification	Detailed planning of the implementation phase, further research in specific areas of LTE needed for the implementation and producing the document.	125



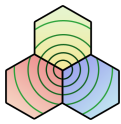
12	Technical documentation	Producing the document.	98
13	Afterstudy		30
14	User manual	Producing the user manual.	30
15	Web page	Creation of a webpage describing the project.	25
16	Poster	Creation of a poster describing the project	15
17	Presentation	Preparations for the oral presentation	40
18	Test protocols		15
19	Education LTE		108
20	Education programming		125
21	Parser	Implementation of the Parser interface.	48
22	Unit-tests for parser	Implementation of a unit test for the Parser.	16
23	LTE Classes such as BS, UE, channel..	Implementation of the classes describing LTE components.	81
24	Visualization library: Protocols	Implementation of the part of the visualization library specific for the Protocol stack view.	91
25	Visualization library: Time/freq grid	Implementation of the part of the visualization library specific for the time/frequency grid view.	91
26	Visualization library: Map	Implementation of the part of the visualization library specific for the map view	92
27	Bottom layer of Generic visualization library	Implementation of the parts of the visualization library not covered by the activities above.	91
28	GUI	Implementation of the Graphical User Interface.	60
29	Integration and testing of complete system		61

13 Schedule

The schedule is presented in the document entitled "Time Plan" [3].

14 Change plan

Minor changes in the Time Plan can be done without consulting the supervisors, customer or sponsor. Major changes to the Time Plan need to be approved by the sponsor. Changes to the Requirement Specification regarding priority 1 requirements need to be approved by the sponsor. The Design Specification will be updated continuously as implementation of the project begins. Crucial design changes must be approved by the customer. Eventual delays of documents will have to be discussed with the sponsor.



15 Quality plan

The group member responsible for the Code (CSM) will make sure that all code that have been submitted to the subversion repository follows the coding convention from Ericsson Research. This also includes ensuring that comments in the code conform to the JavaDoc standard, so that HTML documentation can be generated. The group member responsible for the documentation (DOC) will examine all documents to make sure they follow the correct standards.

15.1 Reviews

All documents should be reviewed by at least one person besides the author - if possible more than one person besides the author.

15.2 Test plan

The group member responsible for testing (TST) will regularly test the code to make sure it's function is fulfilling the requirements set up in the requirement specification.

16 Risk analysis

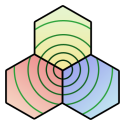
The risks associated with the project is that crucial code and documents could be lost. To prevent this all code and documents must be committed to the projects subversion repository, which will act as both a backup and a version handling system.

17 Priorities

All requirements with priority 1 must be completed before the final product can be delivered to Ericsson Research. If time and resources are still available after all priority 1 requirements have been fulfilled, the project group will focus on the requirements with priority 2, then finally 3. The priorities of the requirements can be found in the requirement specification [2].

17.1 Project close-out

The last phase of the project will be when the final product is delivered to Ericsson Research. The final product will consist of the code for the visualization application, documentation of the code and a user manual. The following needs to be delivered to Linköping University, a technical documentation, a poster of the project, a web page with a summary of the project as well as a final presentation must be held at Linköping University. Before the project is closed an after study shall be written and turned in to Linköping University.



References

- [1] COMMSYS and ER (2011) *Project Directive - Visualization of Cellular Networks in a JAVA-Based Radio Network Simulator*, CDIO project document, TSKS05, Linköping.
- [2] Krisell, Martin (2011) *Requirement Specification - Visualization of Cellular Networks in a JAVA-Based Radio Network Simulator*, CDIO project document, TSKS05, Linköping.
- [3] Sundström, Per (2011) *Time plan*, CDIO project document, TSKS05, Linköping.