



# **LinkAnalysisTool Final Project Report**

**Version 1.1**

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## Revision History

<b>Date</b>	<b>Version</b>	<b>Description</b>	<b>Author</b>
2010-01-12	0.1	Initial Draft	Dominik Rojković
2010-01-13	1.0	Release Candidate	Dominik Rojković
2010-01-14	1.1	Final version -added: project experiences, financials and metrics	Dominik Rojković

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## Table of Contents

1.	Introduction	4
1.1	Purpose of this document	4
1.2	Intended Audience	4
1.3	Scope	4
1.4	Definitions and acronyms	4
1.4.1	Definitions	4
1.4.2	Acronyms and abbreviations	4
1.5	References	5
2.	Background and Objectives	5
3.	Organization	5
3.1	Project Manager	5
3.2	Project Group	5
3.3	Steering Group	5
3.4	Customer	5
3.5	Others	6
4.	Milestones	6
4.1	Remarks	6
5.	Project Results	7
5.1	Requirements	7
5.1.1	Requirement Compliance Matrix	7
5.1.2	Requirements Compliance Summary	7
5.1.3	Remarks	7
5.2	Work Products and Deliverables	8
5.2.1	Remarks	8
6.	Project Experiences	9
6.1	Positive Experiences	9
6.2	Improvement Possibilities	9
7.	Financials	10
7.1	Project Cost Summary	10
7.2	Work per Member	10
8.	Metrics	10
8.1	Milestone Metrics	10
8.2	Effort Metrics	10

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 1. Introduction

### 1.1 Purpose of this document

The purpose of this document is to give a final insight to the “Link Analysis Tool” project and team who worked on it. The emphasis is on metrics, milestones and financial statistics.

### 1.2 Intended Audience

The intended audience is:

- The supervisor,
- The customer,
- The Steering group
- All *LinkAnalysisTool*'s team members.

### 1.3 Scope

This document describes final state of “LinkAnalysisTool” project containing information like metrics, statistics, milestone state, financial state.

### 1.4 Definitions and acronyms

#### 1.4.1 Definitions

Keyword	Definitions
Visualize Transactions	Graphically represent the calls or data transfer between different users.
Search Depth	No of hops from a certain user or Subscriber
Activity Matrix	A table representing certain transactions over a period of Time
Glassfish	GlassFish is an open source application server project led by Sun Microsystems for the Java EE platform.
PostgreSQL	PostgreSQL is a DBMS (Database Management System)

#### 1.4.2 Acronyms and abbreviations

Acronym or abbreviation	Definitions
<b>MoM</b>	“Minute of Meeting” document
<b>GG</b>	Project’s Google groups
<b>SVN</b>	Subversion
<b>LAT</b>	Link Analysis Tool
<b>FER</b>	Faculty of electrical engineering and computing, University of Zagreb
<b>MdH</b>	Mälardalen University, Västerås, Sweden
<b>JS</b>	JavaScript scripting language

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 1.5 References

## 2. Background and Objectives

Today losses in the telecommunications industry are estimated to more than \$30 billion a year. Telecommunication companies (banks, insurance companies, etc. as well) use many techniques to combat fraud, with some success.

Fraud management systems are the most powerful and irreplaceable tools that large companies use to combat fraud. One of the techniques that are used in these systems is the so-called "link analysis". It helps fraud agents to visualize the behavioral patterns of subscribers, using collected information in CDR-s (Call Detail Records). This gives fraud agents the opportunity to detect unknown members of a fraudster organization, trace mobile devices or SIM cards used in fraudulent activities, create subscriber profiles, etc.

To enable an easy integration, the tool must be accessible using standard web browsers without the need for additional proprietary client side software. The main functionality of the tool is to visualize transactions (call detail records data read from a database table) in a defined period of time and with a defined search depth (who called whom) for a given subscriber.

## 3. Organization

### 3.1 Project Manager

**Project leader** – Dominik Rojković

**Team leader** – Hassan Aziz Khan

Project leader and team leader were responsible for the project management. They had to insure good implementation of project plan and coordinate distributed team members over two remote locations, mainly Västerås and Zagreb. They had to communicate with Supervisor and Customer.

### 3.2 Project Group

Name	Initials	Responsibility (roles)
Adrien Olivier	AO	Database communication developer
Rashid Khan	RK	Matrix developer
Seyed Morteza Hosseini	SMH	Testing, making use cases and scenarios, documentation
Hassan Aziz Khan	HAK	Team leader, documentation
Petar Dučić	PD	Interface designer, domain layer developer, integration
Petar Butković	PB	SVN manager, system manager, application layer developer, integration, matrix co-developer
Dominik Rojković	DR	Project leader, Graph & JS developer, documentation, system (server) co-manager

### 3.3 Steering Group

The project Supervisor is doc.dr.sc. Igor Čavrak from FER.

### 3.4 Customer

The customer is Mr. Branko Beslać M.Sc., Kapsch TIS Ltd.

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

### 3.5 Others

Prof.dr.sc. Mario Žagar (FER)  
Prof.dr.sc. Ivica Crnković (Mdh)

## 4. Milestones

Id	Milestone Description	Responsible Dept./Initials	Finished week				Metr.	Rem.
			Plan	Forecast		Actual		
				Week	+/-			
M001	Project vision	DR, HAK	39	39	0	39	0	
M002	Project plan	DR	40	40	0	40	0	
M003	Requirements Definition	HAK	40	40	0	40	0	
M004	Design Description	RK, DR	41	41	0	41	0	
M005	Prototyping–Iteration1	RK, PD	44	44	0	44	0	
M006	Milestone - Alpha prototype	RK, PD	44	44	0	44	0	
M007	Prototyping–Iteration2	PB, PD, AO, DR	47	47	0	47	0	
M008	Milestone - Beta prototype	PB, PD, AO, DR	47	47	0	47	0	
M009	Implementation	DR, RK, AO, PB	51	51	0	51	0	
M010	Milestone – Release candidate	DR, RK, AO, PB	51	51	0	51	0	
M011	Testing	SMH	01 (2011)	01 (2011)	0	01 (2011)	0	
M012	Final Project Report, final versions of existing documents, other project-related documentation	HAK, DR, SMH	02 (2011)	02 (2011)	0	01 (2011)	0	
M013	Final product	RK, PB, PD, AO	02 (2011)	02 (2011)	0	01 (2011)	0	

### 4.1 Remarks

Remark Id	Description

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 5. Project Results

### 5.1 Requirements

#### 5.1.1 Requirement Compliance Matrix

Id	Requirement Description	completed	Rem
Network Graph			
GRP-1	Clickable graph	Yes	
GRP-2	Zoom able graph	Yes	
GRP-3	Subscriber details	Yes	
GRP-4	Colored links	Dropped	
Activity Matrix			
ATM-1	Selectable	Partially	1
ATM-2	Summary of Transactions	Yes	
Control Panel			
CTP-1	Search Depth Adjustment	Yes	
CTP-2	Time Period Adjustment	Yes	

*Completed: Yes (completely implemented)*

*No (not implemented at all)*

*Partially (partially implemented, more description under Remarks subsection)*

*Unknown (completion status not known)*

*Dropped (requirement was dropped during the course of the project)*

#### 5.1.2 Requirements Compliance Summary

Total number of requirements	8
Number of requirements implemented	6
Requirements partially fulfilled	1
Requirements not fulfilled	0
Requirements dropped	1

#### 5.1.3 Remarks

Remark Id	Description
1	Activity matrix made selectable. Pop-up shows only number of transaction for selected hour but not details of transactions for selected hour.

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 5.2 Work Products and Deliverables

To	Output	Planned week	Promised week	Late +/-	Delivered week	Rem
Project management	Week Report	40 (2010) - 02 (2011)	40 (2010) - 02 (2011)	-	-	1
Steering group	Summary Week Report	41 (2010) - 03 (2011)	41 (2010) - 03 (2011)	-	-	2
Steering group	Minutes of Meeting	40 (2010) - 02 (2011)	40 (2010) - 02 (2011)	-	-	3
Steering group	Revisions of existing documents	40 (2010) - 02 (2011)	40 (2010) - 02 (2011)	-	-	4
Steering group	Project plan document	40	40	0	40	
Steering group	Requirements Definition document	40	40	0	40	
Steering group	Design Description document	41	41	0	41	
Steering group	Acceptance test plan	50	50	0	50	
Steering group	Test report	1 (2011)	2 (2011)	0	2	
Steering group	Final Project Report	2 (2011)	2 (2011)	0	2	
Steering group	Final versions of all project documents	2 (2011)	2 (2011)	0	2	
Steering group	Final product and documentation	2 (2011)	2 (2011)	0	2	

### 5.2.1 Remarks

Remark Id	Description
1	Every week, starting from W40 <sup>th</sup> 2010 to W2 <sup>nd</sup> 2011, all team members will send weekly report.
2	Every week, starting from W41 <sup>th</sup> 2010 to W2 <sup>nd</sup> 2010, summary weekly report will be delivered.
3	After (important) meeting, MoM document will be delivered.
4	Deliver on major changes



LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 6. Project Experiences

### 6.1 Positive Experiences

There were many positive experiences especially due to new kind of project organization (distributed) and positive team members as persons. Here is list of some positive experiences:

- Learned new things
- Improved communication skills
- Better team players
- Became good friends
- Knowledge of other nations
- Learned how to cover each other
- Remote work & management
- Overriding arisen problems in team and work and succeed despite the problems

### 6.2 Improvement Possibilities

As this tool is started to be developed from the ground up (from beginning) there are lot of areas which can be improved. Here is a list of common areas which are good to include in improvements.

Client improvements:

1. Develop zoomed-out graph or find better alternative,
2. Make improvements and add features missing in used library "JavaScript InfoVis Toolkit",
3. Emphasize transaction selected through activity matrix or through other ways,
4. Upgrade Activity Matrix style as well as core,
5. Display statistics and details of selected transactions (through connection diagram or activity matrix),
6. Way to visualize different type of transaction on connection diagram,
7. Show way and type of transaction when user clicks on connection graph edge.

Server improvements:

1. Upgrade authentication system,
2. Speed up data delivering
3. Speed up searching the data
4. Optimize code

LinkAnalysisTool	Version: 1.1
Final Project Report	Date: 2011-01-14

## 7. Financials

### 7.1 Project Cost Summary

Planned Cost	\$26.040
Actual Cost	\$28.035

### 7.2 Work per Member

Member	W39	W40	W41	W42	W43	W44	W45	W46	W47	W48	W49	W50	W51	W52	W53	W01	Total
Adrien	9	2			18	13	19	22	9	8		16	13	0		2	131
Dominik	9	18	14	16	37	31	10	30	14	14	23	25	28:30	10		20	299:30
Hassan	9	20	24	11	14	11	12	13	11	0	27	14	36	0		23	225
Morteza	9			6	20:30	17	4:30	4:30	13:15	18	19	18	14:15	10:30		10:30	165
Petar B.	9	9	20	6	39	26	23	24		2	11	38:30	18	3		17	245:30
Petar D.	9	11	13	4	23	8	9	19	11	2		17	12	6		10	154
Rashid K.	9	15	18:45	15:30	13	13	4	15	13	7	16	16:30	11	6		9	181:45
<b>Total</b>	<b>63</b>	<b>75</b>	<b>89:45</b>	<b>58:30</b>	<b>164</b>	<b>119</b>	<b>81:30</b>	<b>127:30</b>	<b>71:15</b>	<b>51</b>	<b>96</b>	<b>145</b>	<b>132:45</b>	<b>35:30</b>	<b>0</b>	<b>91:30</b>	<b>1401:45</b>

Note: empty cell means WR wasn't published (on time).

## 8. Metrics

### 8.1 Milestone Metrics

Completed as planned or earlier	Total	Timeliness
13	13	100%

### 8.2 Effort Metrics

Activity	Actual Effort	Planned Effort	Deviation (%)
Requirements Engineering	189:45	108	75,69%
Application Design	278	252	10,32%
Prototyping	203	240	-15,42%
Implementation	315:30	300	5,17%
Testing & bug fixing	134	150	-10,67%
Documentation and maintenance	281:30	252	11,71%
<b>TOTAL</b>	<b>1401:45</b>	<b>1302</b>	<b>7,66%</b>

<b>Effort estimation accuracy (%)</b> <i>(100*(1 - abs(Actual - Planned)/Actual))</i>	<b>92.88%</b>
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