

Abstract

This document describes the user requirements for TRACEVIS EXTENDED, the extension of TRACEVIS. This application is part of the Software Engineering Project (2IP35) at Eindhoven University of Technology. TRACEVIS is used for visualizing traceability information
5 within time-varying interrelated, hierarchically organized data. These user requirements are established according to the request of our customer LAQUISO, represented by Joost Gabriels.

Chapter 1

45 Introduction

1.1 Purpose

The user requirements document (URD) contains the requirements for TRACEVIS EXTENDED. These requirements are the negotiated agreement between LAQUISO and VISdev. Listed requirements, and only these, will be implemented in TRACEVIS EXTENDED, according to
50 their priorities. Any changes to these requirements require the full consent of both parties.

1.2 Scope

Currently, the user can use TRACEVIS to load data from a single XML file. Then the user can use TRACEVIS to visualize this data.

55 With TRACEVIS EXTENDED, the technical user will be able to load data from a database, which contains all the projects added by the technical user. The technical user can construct converters to extract relevant data from a source to a format that can be imported into the database environment. The user can also use TRACEVIS EXTENDED to query the data at runtime via the QUERY BUILDER.

1.3 List of definitions

- 60 1. Artifact: Anything constructed when developing software, for example, this URD.
2. Attribute query: A query on a selection in TRACEVIS EXTENDED, the results of which are shown by changing (deleting, modifying or adding) a given attribute.
3. Command log: A file containing the sequence of commands executed by the user.
4. Converter: A program, specifically tailored to a source, to extract relevant data for
65 further analysis in TRACEVIS EXTENDED.
5. Database: An organized collection of data, related to a specific project.
6. Database environment: A collection of databases including a management UI.
7. Database management: The changing, reading, updating and deleting of both data and databases.

- 70 8. Data set: A database loaded into TRACEVIS EXTENDED.
9. Difference query: A query showing the difference between two snapshots.
10. Front-end user: The user working with TRACEVIS EXTENDED.
11. GUI (Graphical user interface): A type of user interface (UI) that allows users to interact with electronic devices with images rather than text commands.
- 75 12. INTERFACE LANGUAGE: The language used for querying the data.
13. LAQUSo (Laboratory for Quality Software): The client for this project.
14. Multi-screen difference: The result of a difference query across two screens.
15. Project: A collection of interrelated artifacts to be analyzed. All the data related to a project is stored in one database.
- 80 16. Query: A precise request for information retrieval.
17. QUERY BUILDER: The GUI allowing for the construction of the queries.
18. Scope: The selection the user made. If no selection is made, then the scope is the entire set of data loaded into TRACEVIS EXTENDED.
19. Selection query: A query on a selection in TRACEVIS EXTENDED, resulting in a new
85 selection.
20. Single-view difference: The result of a difference query in one screen.
21. Snapshot: The state of a system at one particular moment in time.
22. State of a system: All properties and attributes of the loaded data set at a certain time.
23. Technical User: The user working with the database environment and the converters.
- 90 24. TRACEVIS: A tool for traceability visualization developed by W.J.P van Ravenstijn for LAQUSo.
25. TRACEVIS EXTENDED: The visualization application built on TRACEVIS, by VISdev, for LAQUSo.
26. UI (User Interface): The space where interaction between humans and machines (for
95 example computers) occurs.
27. View: A TRACEVIS EXTENDED window showing a snapshot with all corresponding GUI elements.
28. VISdev (Very Interesting Software Development): The team of developers working on TRACEVIS EXTENDED.
- 100 29. XML (Extendable Markup Language): Markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

1.4 List of references

- [1] VISdev. Software requirements document. 2012.
- [2] VISdev. Software user manual. 2012.

105 1.5 Overview

In Chapter 2 the user requirements are described for TRACEVIS EXTENDED in an informal manner. A look into possibilities and constrains of the system, the users and the environment in which the system will run is given.

Chapter 3 presents a list of the formal user requirements.

110 Chapter 2

General description

2.1 Product perspective

TRACEVIS is a software application used for gaining insight in traceability information, developed by Van Ravenstijn for LAQUSO. This information comes from time-varying, interrelated, hierarchically organized data. Examples of such data can be found in the field of software engineering, evolutionary biology and many other scientific and industrial fields. The current version of TRACEVIS imports a single XML file containing the data. For most artifacts this XML file has to be manually constructed from a set of documents, source files, or other resources. Because this is a very time consuming operation, a database environment has to be used to replace the XML files. This database has to be as generic as possible and has to facilitate the easy writing of converters from different types of resources to this database. Furthermore, some functionality will be added to TRACEVIS. An INTERFACE LANGUAGE and QUERY BUILDER will be constructed so that front-end users can query the data resulting in a selection or modification of attributes, and a multi-screen GUI will be developed, allowing these users to view and compare multiple snapshots (at different times) of the same loaded data set.

2.2 General capabilities

130 The user requirements discussed in this section are divided into logical subsections, each representing an aspect of the user interaction with TRACEVIS EXTENDED and the database environment.

2.2.1 Overall

135 The front-end user can have multiple instances of TRACEVIS EXTENDED running at the same time on a single computer. In each of these instances, this user can load a project database from the database environment. This data consists of nodes and relationships, as extracted by the converters from project artifacts.

When the front-end user changes the color of a node or relationship, this is immediately shown

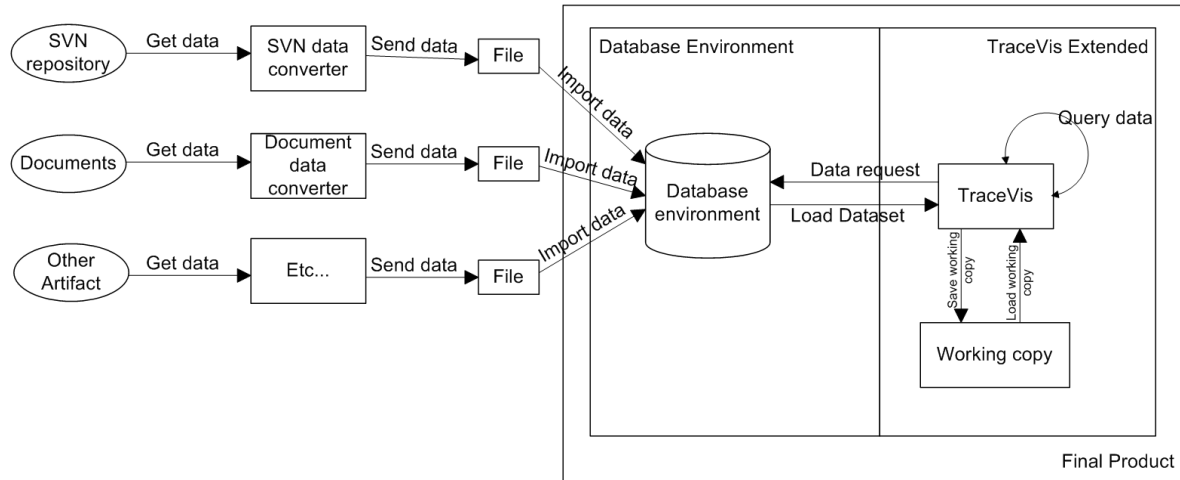


Figure 2.1: Project description

140 in the visualization of the node or relationship.

The front-end user can save an image of the view at a location on disk, as specified by this user.

2.2.2 Database environment

All data associated with one project, will be stored in one database (see Fig. 2.2).

145 It will be possible for the technical user to write converters, which convert data from project artifacts into data useable by the database environment. This data is stored into a file. The user can then use the database environment to import files created by a converter. The exact specifications on how to format the data can be found in the SRD [1] and the User Manual [2].

150 The database will have a UI through which the technical user can create, read, update and delete (parts of) databases.

2.2.3 Multi-screen

The front-end user can choose to use TRACEVIS EXTENDED with a single view of the data as in TRACEVIS, using the timeline to specify which snapshot of the data should be shown.

155 However, the user can also open multiple views. Each of these views will then display the same data as the original view, but the user will also be able to, using the timeline, specify what snapshot of the data should be shown in each separate view. This makes it possible for the user to compare the different snapshots.

160 2.2.4 Query Builder

The front-end user can select a combination of the nodes and relationships of the database loaded by TRACEVIS EXTENDED. Then, the user can formulate a query using the INTERFACE LANGUAGE in the element of the GUI which is called the QUERY BUILDER. This

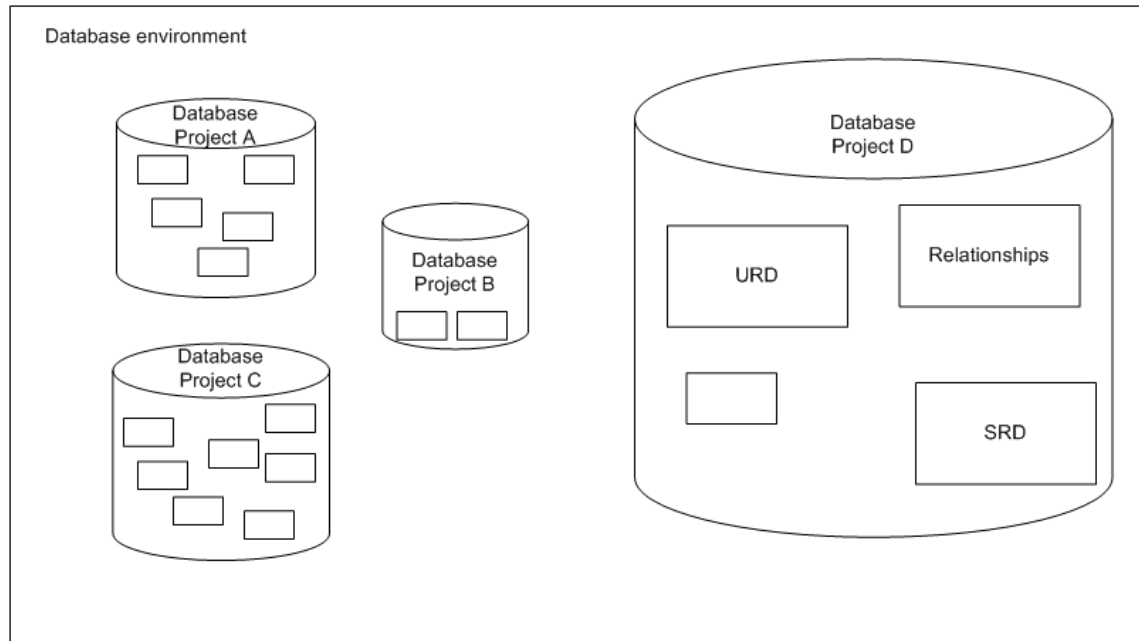


Figure 2.2: Database environment description

165 QUERY BUILDER will allow the user to specify three types of queries. Selection queries, attribute queries and difference queries. The result of those queries will be based on the scope the user is currently working in. The scope the user is working in is the entire data set loaded by TRACEVIS EXTENDED if there is no selection made. If there is a selection made, then the scope is this selection.

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- With a selection query the user can request a new selection, based on (values of) attributes of the current scope.
 - With the attribute query the user can add, change or delete the attributes of (a part of) the current scope, possibly based on (the values of) attributes of the current scope.
 - 175 However, the user cannot change or delete attributes that were loaded from the original database.
 - With the difference query, the user can visualize the differences between snapshots. This can be done in one of two ways; in a single screen, or across multiple screens.
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 - If the user wishes to view the difference in a single screen, the user indicates two snapshots and then the differences are shown in a new screen using different colors for nodes and relations that have been changed, added and deleted.

- 185 – If the user wishes to view the difference in two screens, then screen A will highlight what is not present in screen B, and vice versa. This highlighting is done by either selecting the differences or changing the color of the differences.

2.2.5 Saving

The user has two options for saving his work available.

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- The user can save a command log of all executed actions (queries using the QUERY BUILDER and their scope) he has done.

If the user reopens the command log, after reloading the corresponding database from the database environment, there are two options which can occur:

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- The database hasn't changed, since the creation of the command. The user can now either apply the entire command log, or go step-wise through the command log, executing every action separately and in order.

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- The database has changed, since the creation of the command log. The user now gets a warning, after which the user can choose to continue as above (on his own risk), or choose to start over again.

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- The user can save a local copy of the loaded data set, as well as the command log. Now the user can open the database and command log as above, but no warnings can occur.

2.3 General constraints

These are the general constraints the program must conform to:

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1. The changes made in TRACEVIS EXTENDED will not be written to the database.
2. TRACEVIS EXTENDED will be developed for Microsoft Windows.
3. If the technical user makes changes to the database the front-end user is working with, this is not shown in TRACEVIS EXTENDED unless the front-end user loads the database again.

2.4 User characteristics

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TRACEVIS EXTENDED differentiates between two different types of users, the technical-user and the front-end user. The technical user will be working with the database environment, and the creation and usage of the different converters, and the front end-user will be working with the already existing functionality of TRACEVIS like viewing the data, and the new functionalities in TRACEVIS EXTENDED like the QUERY BUILDER.

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Both types of users will have affinity with computers, and know what to expect from TRACEVIS EXTENDED.

2.5 Environment description

Both the front-end and the technical user will run TRACEVIS EXTENDED and the database
225 environment on personal computers with no specialized hardware. The technical users will
also be able to create converters. These converters are stand-alone tools, which can be
developed on any preferred platform. The technical user can use these converters to extract
data from artifacts, and import this data in the database environment. He can do this by
230 having the converter create a file, which can then be imported by the database environment
(Fig. 2.1).

2.6 Assumptions and dependencies

The following are the assumptions upon which the specific requirements of Chapter 3 are
based.

- 235 1. VISdev will base the code of TRACEVIS EXTENDED on the version of TRACEVIS as
received from LAQUISO.
2. The users are familiar with TRACEVIS as it was before the project.
3. The data stored in the database is complete and correct, when loading data in TRACEVIS
EXTENDED.
4. A database only holds one project, the database environment can hold multiple databases.

Chapter 3

Specific requirements

The specific user requirements are described below. There are 3 levels of priorities, and each user requirement has a priority associated with it. A lower number means a higher priority. Priority 1 means that the functionality must be implemented, priority 2 means it most probably will be implemented and priority 3 means it will only be implemented if there is enough time.

3.1 Overall

These requirements are the overall user requirements of TRACEVIS EXTENDED.

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 1.1	The language used in TRACEVIS EXTENDED is English US International.	1
UR 1.2	The front-end user must be able to have multiple instances of TRACEVIS EXTENDED running at the same time on a single personal computer.	3
UR 1.3	The front-end user must be able to load the same database in each running instance of TRACEVIS EXTENDED.	3
UR 1.4	The front-end user must be able to load a different database in each running instance of TRACEVIS EXTENDED.	3
UR 1.5	The front-end user must be able to visualize the color of a node, if available.	1
UR 1.6	The front-end user must be able to visualize the color of a relationship, if available.	1
UR 1.7	The front-end user can only load one database at a time in a single running instance of TRACEVIS EXTENDED.	1
UR 1.8	After loading a database, the front-end user will see one view of the data set, containing the latest snapshot of this data set.	1

250 3.2 Database environment

These user requirements are applicable to the database environment.

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 2.1	The technical user must be able to manage the database environment via the database environment UI.	1

3.3 Multi-screen

These user requirements specify the interaction of the user with the option of multiple views, called the multi-screen.

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 3.1	The front-end user can open a new view of the data set, within one running instance of TRACEVIS EXTENDED, showing the latest snapshot of the data set.	2
UR 3.2	The front-end user can close views of the data set.	2
UR 3.3	The front-end user can change the time of the snapshot by using the slider on the timeline associated with the view.	2

255 3.4 Query Builder

These user requirements specify the interaction of the user with the QUERY BUILDER.

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 4.1	The front-end user must be able to select individual nodes.	1
UR 4.2	The front-end user must be able to select individual relationships, including the nodes connected by these relationships.	1
UR 4.3	The front-end user must be able to select a combination of nodes and relationships, including the nodes connected by the relationships.	1
UR 4.4	The front-end user must be able to create a new selection using the QUERY BUILDER based on (values of) attributes of the current scope.	1
UR 4.5	The front-end user must be able to add attributes using the QUERY BUILDER, possibly based on (values of) attributes of the current scope, as long as these attributes don't exist yet.	1
UR 4.6	The front-end user must be able to change attributes which have not been loaded in from the original database, using the QUERY BUILDER.	1
UR 4.7	The front-end user must be able to delete attributes which have not been loaded in from the original database, using the QUERY BUILDER.	1

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 4.8	The front-end user must be able to visualize the differences between two snapshots in two views.	2
UR 4.9	The front-end user must be able to visualize the differences between two snapshots in one view.	2
UR 4.10	The front-end user is not able to do difference queries on a single-view difference.	2

3.5 Saving

These user requirements specify how the user can save and load his work.

<i>UR no.</i>	<i>Description</i>	<i>Priority</i>
UR 5.1	The front-end user must be able to save a command log.	2
UR 5.2	The front-end user must be able to save a command log combined with a local copy of the data set this command log is associated with.	3
UR 5.3	The front-end user must be able to load a database from the database environment and its associated command log.	2
UR 5.4	The front-end user must be able to load a local copy of a data set and its associated command log.	3
UR 5.5	If the front-end user loads a command log and the data set on which the command log has been created is different from the one currently loaded in TRACEVIS EXTENDED, then the user must receive a warning.	2
UR 5.6	If the front-end user loads a command log, the user must be able to choose to execute all the commands in the command log at once.	2
UR 5.7	If the front-end user loads a command log, the user must be able to choose to execute the commands in the command log step-wise.	2
UR 5.8	The front-end user must be able to save a image of his current view on disk on any location specified by the user.	3