

**M A S A R Y K
U N I V E R S I T Y**

FACULTY OF INFORMATICS

**Implementation of provenance
chains traversal**

Bachelor's Thesis

TOMÁŠ ZOBAČČ

Brno, Fall 2023

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TOMÁŠ ZOBAČČ

Advisor: RNDr. Rudolf Wittner

Department of Computer Systems and Communications

Brno, Fall 2023



Declaration

Hereby I declare that this paper is my original authorial work, which I have worked out on my own. All sources, references, and literature used or excerpted during elaboration of this work are properly cited and listed in complete reference to the due source.

Tomáš Zobačč

Advisor: RNDr. Rudolf Wittner

Acknowledgements

TODO

Abstract

Provenance is a standardized information type that documents the history of an object. It can hold information, such as the origin of an object or previous actions performed on it. This information can be serialized into one of the many supported file formats (e.g., PROV-N, XML). These files can then be interconnected, resulting in the creation of a provenance chain. This thesis aims to implement a library for traversing said provenance chains, retrieving information about the precursors or successors of an entity represented in one of the files in the current chain, and optionally retrieving the type of actions performed on the object by the retrieved precursors/successors. The implementation will simulate the operational environment by providing a command-line user interface from where the user can call the mentioned actions on a set of prefabricated simulation files. The implementation will follow a W3C PROV-DM standard for provenance notation, and the simulation files will be of a PROV-N serialization of provenance data. Additionally to the traversing operations, it will also implement the generation of a provenance metadata to make the simulation of a traversal possible.

Keywords

Java, provenance, SOBHA, ÚVT

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Introduction

Theses are rumoured to be “the capstones of education”, so I decided to write one of my own. If all goes well, I will soon have a diploma under my belt. Wish me luck!

1 Provenance

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2 PROV-DM

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3 Used technologies

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3.2 Maven

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3.3 JetBrains IDEA

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3.4 ProvToolBox

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3.4.1 PROV MODEL

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3.4.2 PROV INTEROP: LIGHT

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3.6 GitLab4J API

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3.7 JLine Bundle

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3.8 Jansi

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3.9 Apache Maven Shade Plugin

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4 Implementation

4.1 Components

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4.2 Simulation

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4.3 Algorithm

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4.4 Deployment

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5 Manual

5.1 Set-up

5.1.1 Clone the repo

1. Clone/Code
2. Clone with HTTPS
3. In the console, run `git clone <copied_url>`

5.1.2 Init simulation files

In order for the simulated environment to run, you need to pull the required files 1. Open the cloned repo in the console 2. Move to the submodule using `cd .\src\main\resources\bthesis-provenancechain-digpat` 3. Run `git submodule foreach git fetch -tags` (There should be no output)

4. Finish by running `git submodule update -init -recursive`
5. The `bthesis-provenancechain-digpat` submodule should now be populated with `.provn` files

5.2 Building

The implementation uses a Maven Shade plugin for jar packaging

1. Open the cloned repo in the console
2. Run `mvn clean package`
3. Execute the created jar with `java -jar .\target\BThesis-ProvenanceChain-VERSION.jar`
 - alternatively, if the targeted environment doesn't have a JRE, you can create an exe installer using Java's prepackaged `jpackage` command line tool

5.3 Omitting the simulated environment

In order to simulate the traversal, the implementation uses multiple classes and files to provide the required objects for the traversing algorithm to work. For clarity, these classes are moved to packages `bthesis.provenancechain.simulation` and `bthesis.metageneration`, while the required files are located in the submodule `.\src\main\resources\bthesis-prov` mentioned before. All of these can be removed as long as the classes needed are sufficiently replaced.

6 Real life application

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Conclusion

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After linking a bibliography database files to the document using the `\thesissetup{bib={file1,file2,...}}` command, you can start citing the entries. This is just dummy text (1) lightly sprinkled with citations (2, p. 123). Several sources can be cited at once: [1, 2, 3]. “Camel drivers and gatecrashers” was written by Greenberg in 1998. We can also produce Greenberg [2] or (Greenberg [2], 1998). The full bibliographic citation is: GREENBERG, David. *Camel drivers and gatecrashers: quality control in the digital research library*. In: HAWKINS, B.L; BATTIN, P (eds.). *The mirage of continuity: reconfiguring academic information resources for the 21st century*. Washington (D.C.): Council on Library and Information Resources; Association of American Universities, 1998, pp. 105–116. We can easily insert a bibliographic citation into the footnote¹.

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