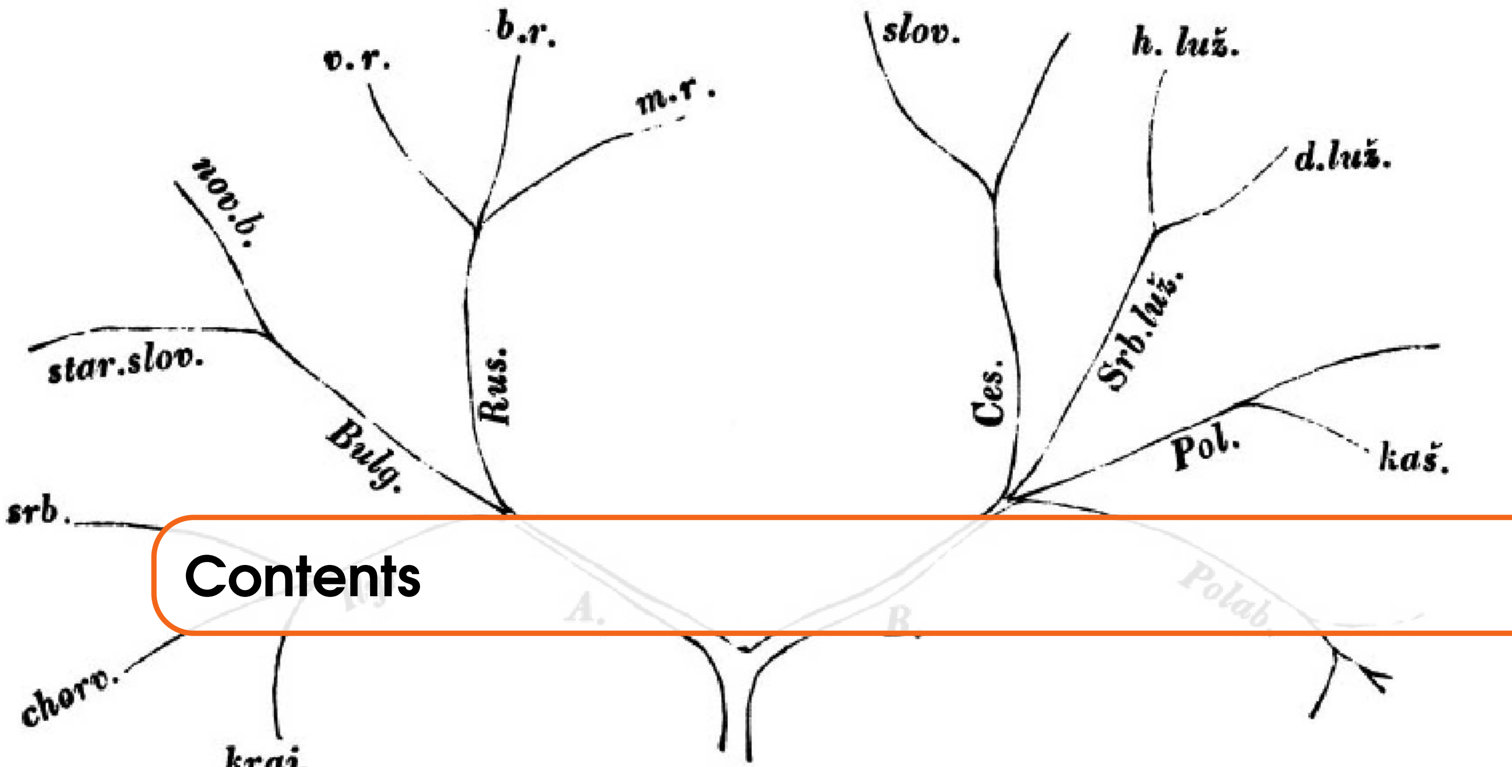
Stemmarest

Dokumentation des PSE2 Projekt

Jakob Schaerer, Severin Zumbrunn, Ido Gershoni, Joel Niklaus, Ramona Imhof

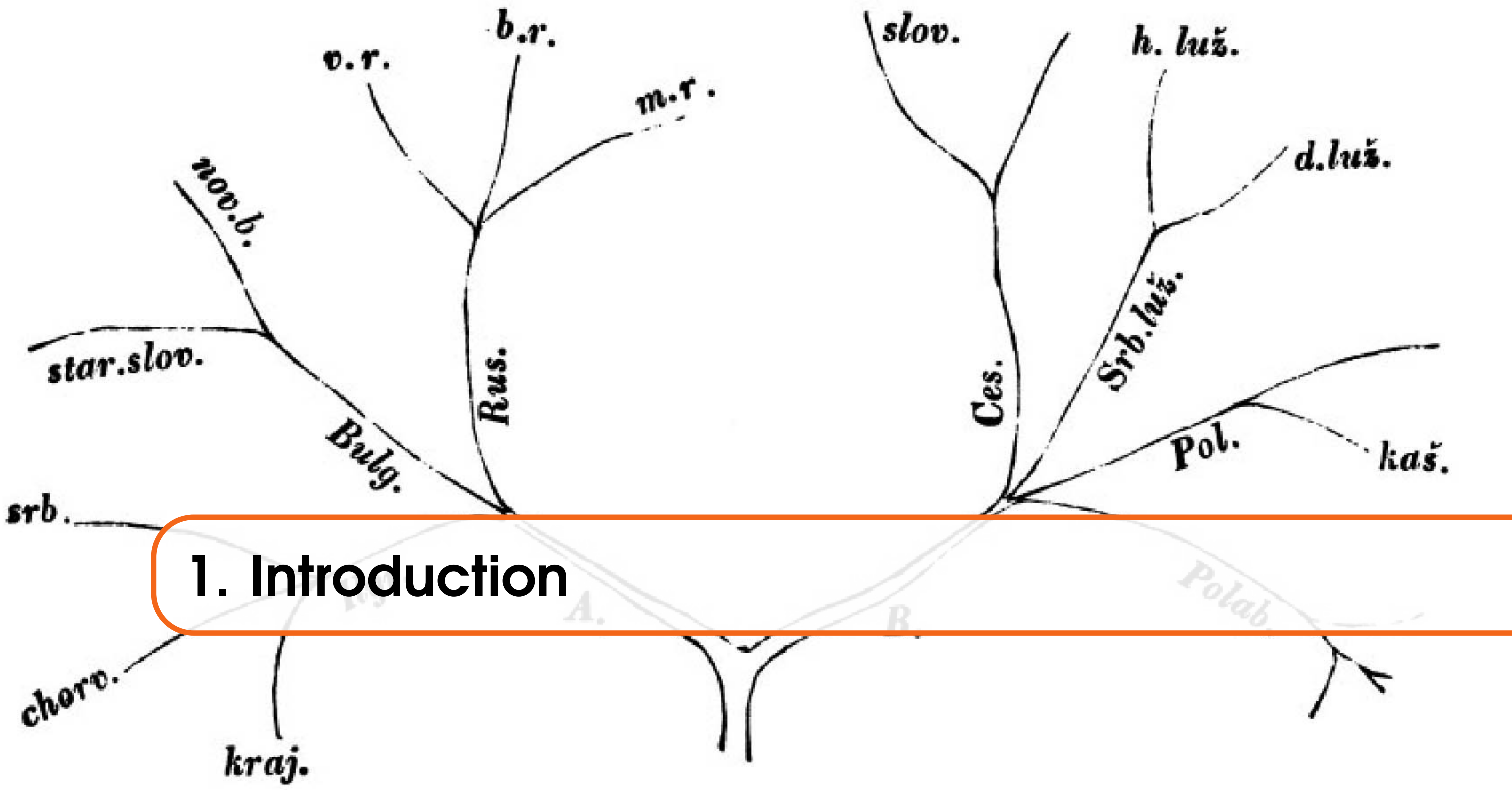
First printing, March 2013


b.r.
v.r.
m.r.
nov.b.
star.slov.
Bulg.
Rus.
srb.
chorv.
kraj.
slov.
Ces.
h. luž.
d.luž.
Srb.luž.
Pol.
kaš.
A.
B.
Polab

Contents

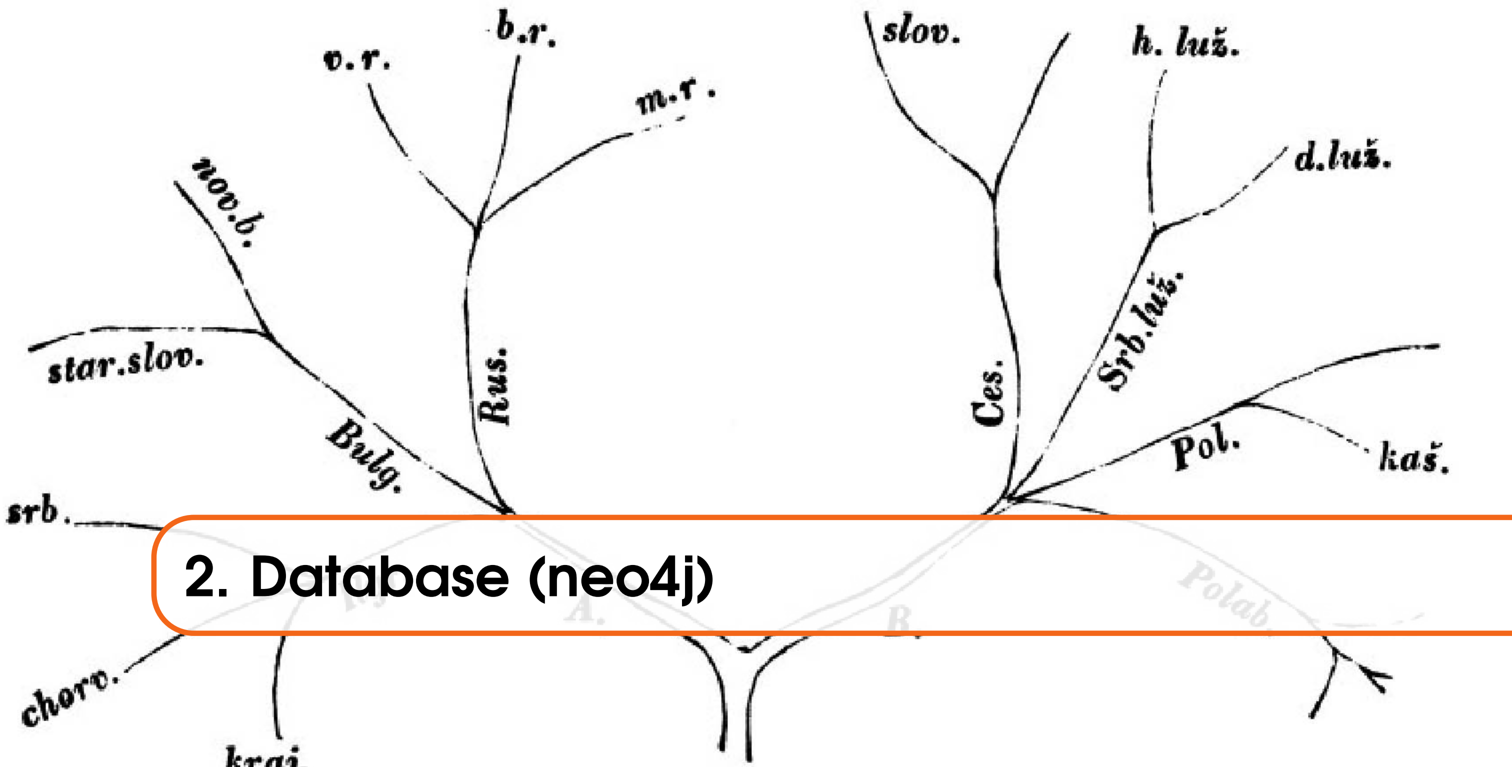
III RESTful API

Project



1. Introduction

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.



2. Database (neo4j)

In our project we used a graph database instead of a relational database.
This was due to the fact, that relational databases are much faster when it comes down to look for objects in a list that fulfill some constraints to other objects. Normally in a relational database you would use multiple joins to get your desired result. In the graph way it's much easier because you traverse the graph (previously mentioned as list) from top down using either breadth- or depth-first algorithm and look for a specific relation between two nodes (previously objects). In respect of that we save a lot of time traversing instead of writing complicated queries which run mostly slow.

Therefore we use Neo4J (Additional info can be found under http://neo4j.com/developer/graph-db-vs-rdbms/). Neo4J is a graph database that is capable of managing millions of nodes and relationships and returning or changing them within logarithmic or even constant time. That means that it won't make a big difference whether you use 10 nodes, or 1 million. You can find additional information on benchmarking in the related chapter of this documentation.

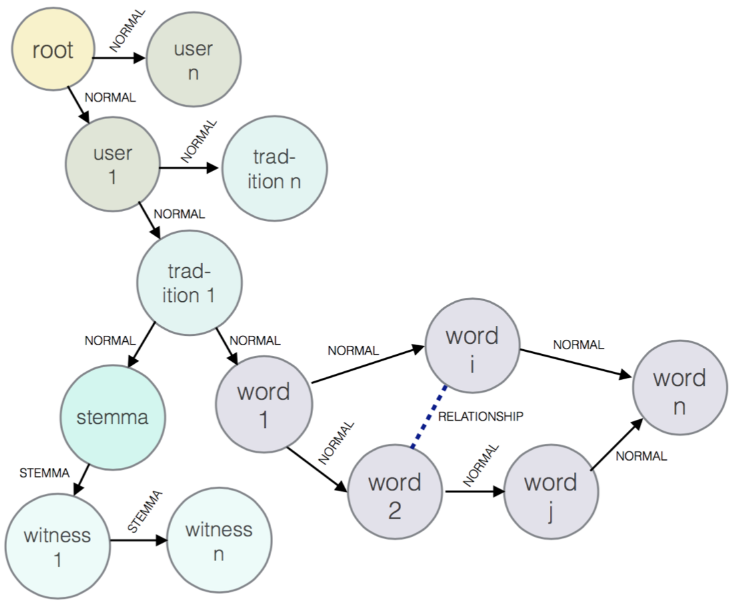
Our database is mainly one big graph. We use different Labels for Nodes and Relationships to increase the search speed.

In the database we use only a few labels:

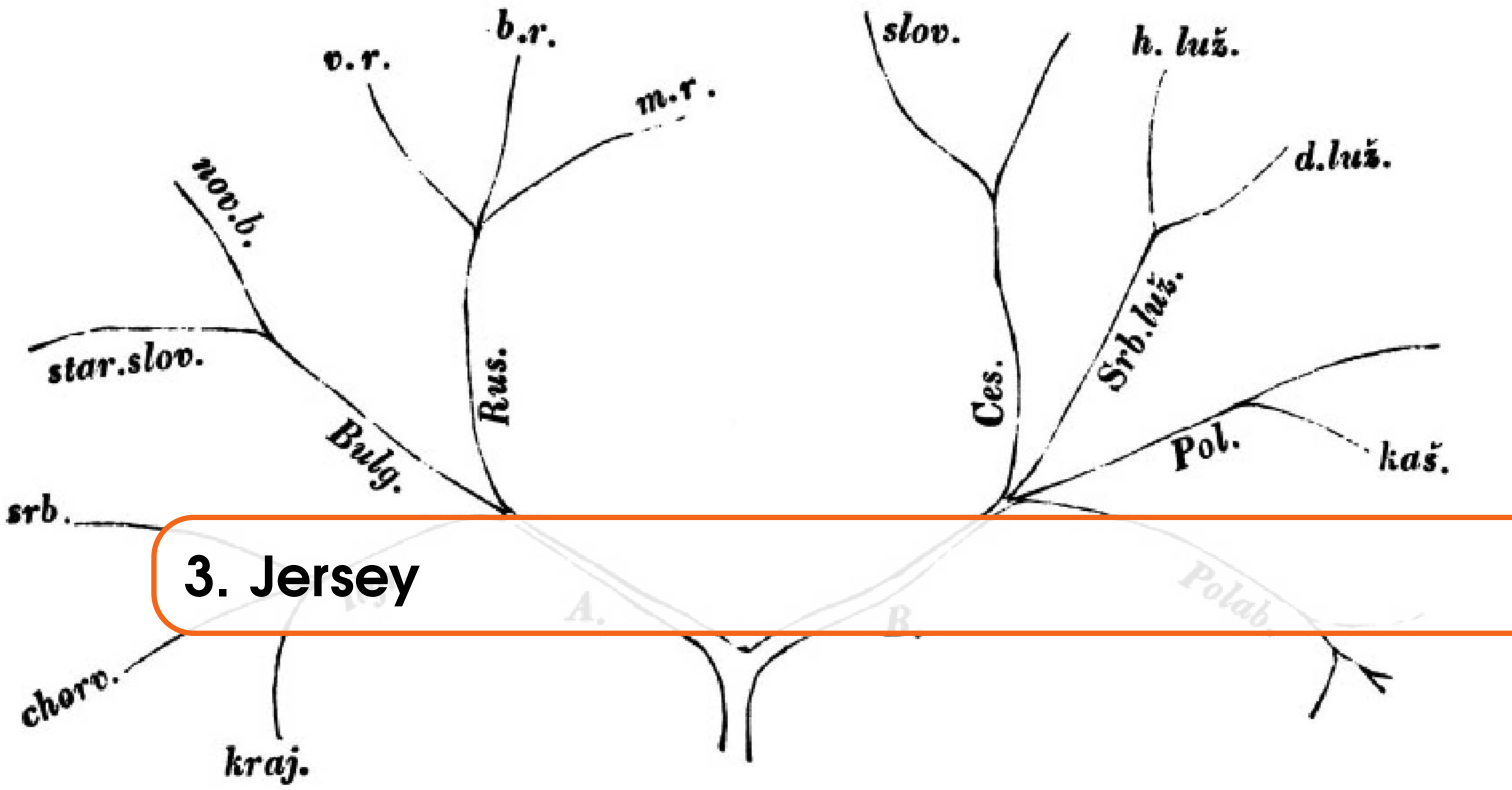
Nodes	**Relationships**
ROOT	RELATIONSHIP
STEMMA	STEMMA
WITNESS	NORMAL
TRADITION	
USER	
WORD	

Since each label is stored in another file, searching or traversing the graph is stunningly fast.

The database structure is as follows:



Neo4J is delivered with a powerful script language called cypher. It's the equivalent to SQL in relational databases. Cypher is a declarative graph query language that allows for expressive and efficient querying and updating of the graph store. Using cypher you can write simple queries that return nodes or traverse graphs. Cypher queries can be sent to the database and will then be interpreted and translated into an execution plan by the ExecutionEngine. This takes some time and therefore cypher can not compete with the native java traversal API.

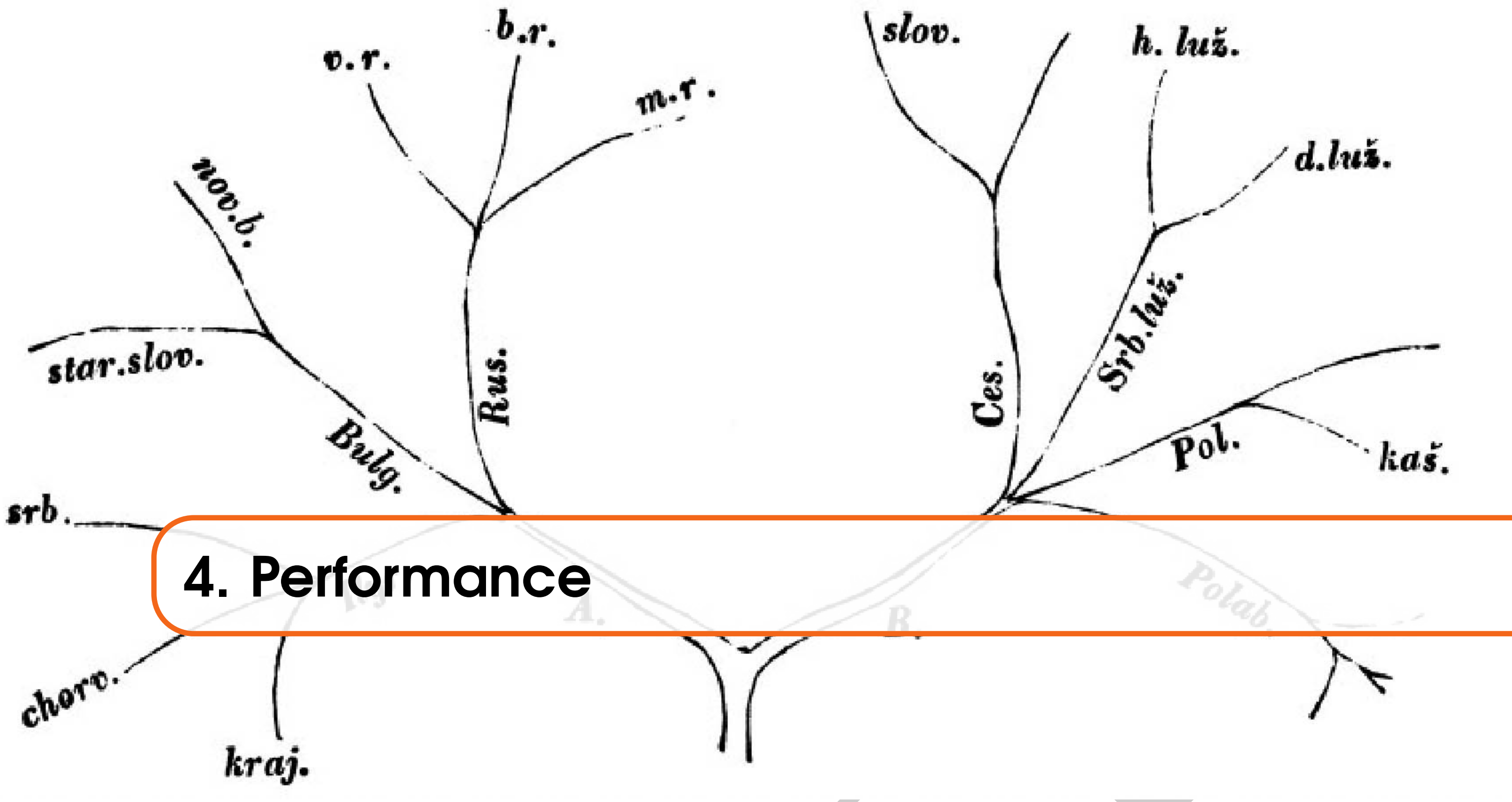


3. Jersey

In our project we built a REST-API for stemmaweb an online tool for textual scholars willing to explore their texts. For this REST-API we needed a simple and easy to use Java framework and chose Jersey.
Jersey is an open source framework for developing RESTful Web Services in Java that is built upon JAX-RS and serves as a JAX-RS Reference Implementation. It adds additional features and utilities in order to further simplify development of REST-APIs. It abstracts away low-level details of the client-server communication which made it more easy for us to concentrate on the actual implementation of the user stories. In our project it is deployed with GlassFish, a Java EE Application Server. Jersey can help support exposing the data in very different media types, including JSON, which we used very frequently.
Jersey uses Annotations which made it very easy to use for us.
Here as an example the method declaration of duplicateReading:

```
@POST
@Path("duplicatereading/fromtradition/{tradId}")
@Consumes(MediaType.APPLICATION_JSON)
@Produces(MediaType.APPLICATION_JSON)
public Response duplicateReading(DuplicateModel duplicateModel)
```

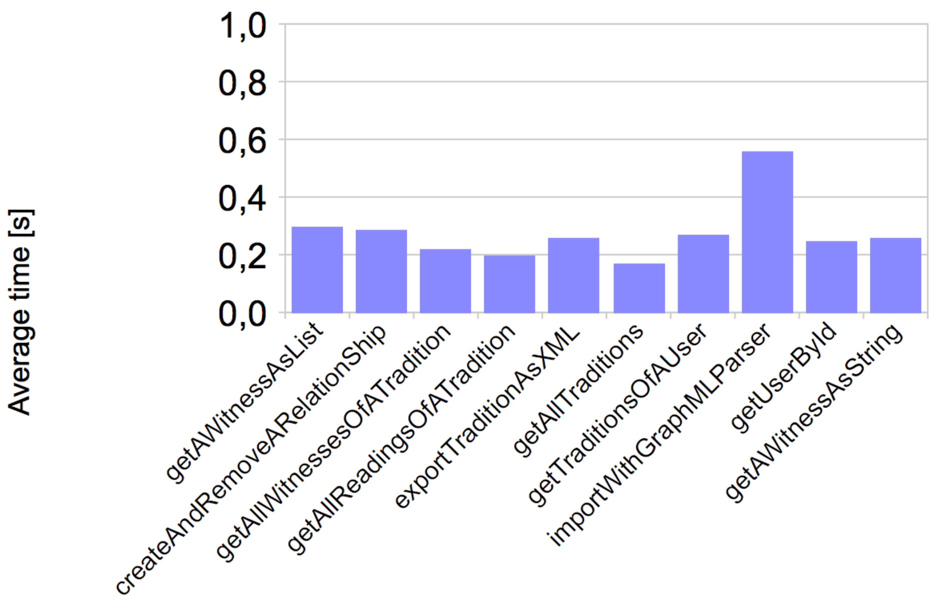
At the top the „POST“ annotation states the http method. Then the „Path“ annotation lets us set the url path with parameters in curly braces. Furthermore the method can „consume“ data, in this case JSON. The „DuplicateModel“ is passed with the call as a JSON object and then gets parsed in a POJO. Last but not least the method „produces“ a response, in this case also in JSON.



4. Performance

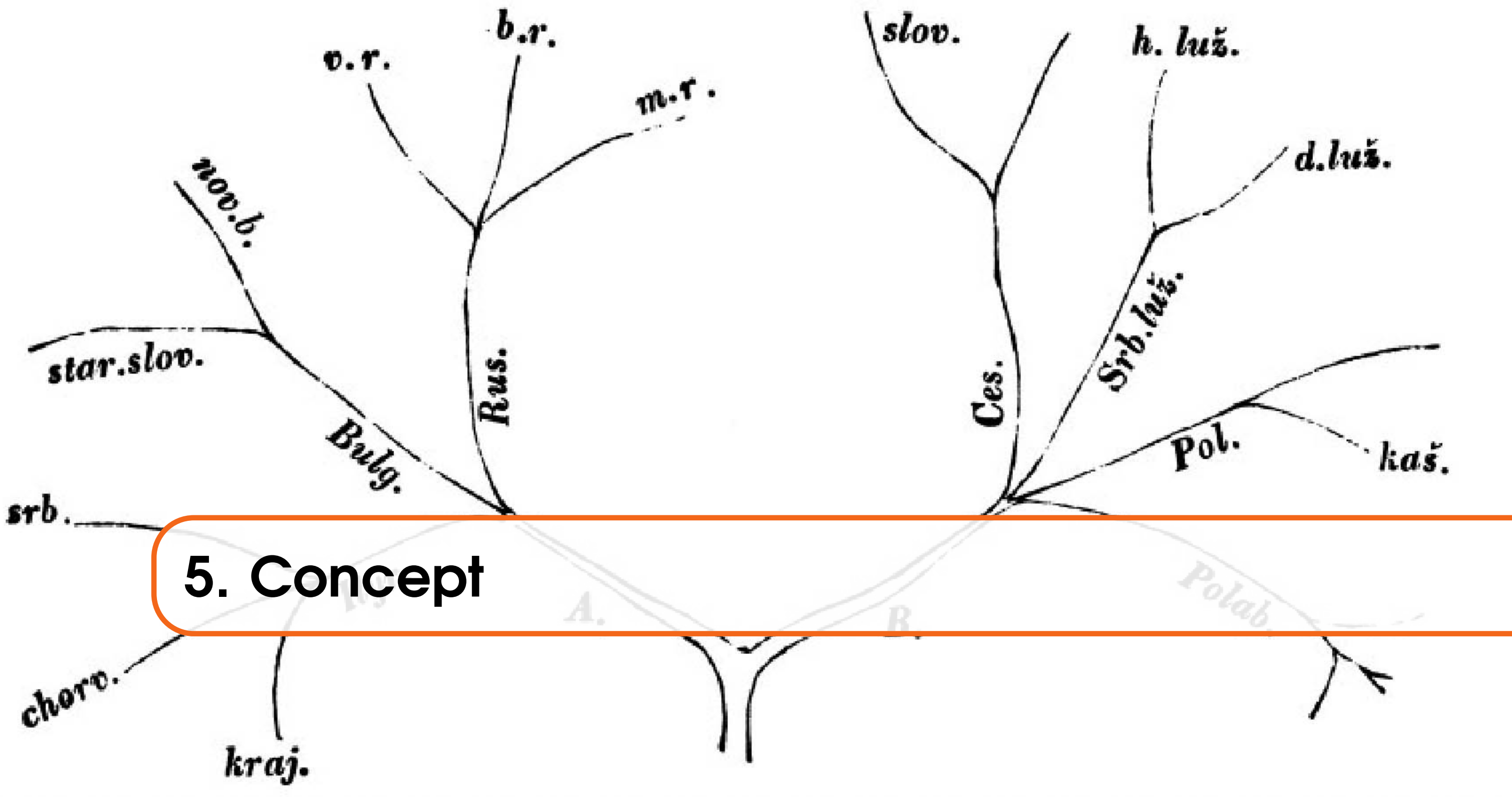
The performance is tested by benchmark tests. Please consult the chapter Benchmark Tests in the part Testing of this documentation for further technical information.

Figure 4.1: An example to show what will come here.



II

Testing



5. Concept

This chapter describes the test-concept of the Digital Humanities PSE2 Project. The testing is used to assure the quality of the project and for test driven development. All tests are written in a manner they don't have any impact on the architecture of the project.

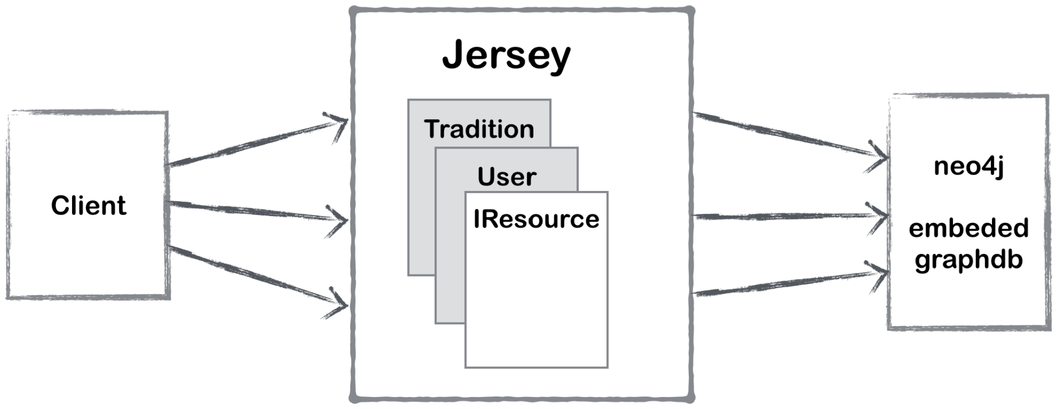
Integration Tests

Every user story is tested by an integration Test. The integration tests assures the quality of the project. The technique of integration tests is described in the Integration test chapter.

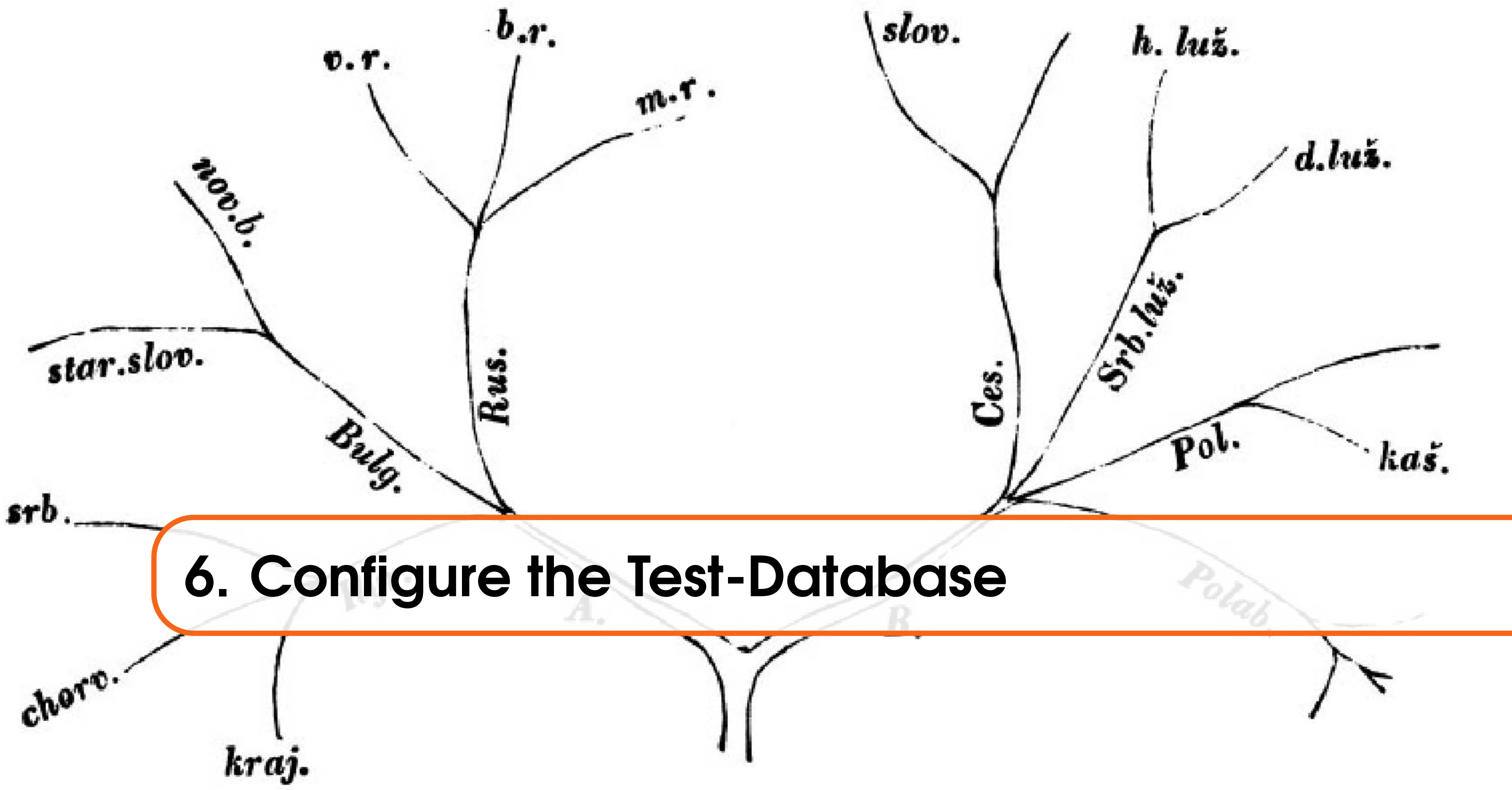
Unit Tests

Unit tests are used for test driven development and are defined by the developer. They are only for the development process and are not referenced in quality audits.

Jersey Overview



In the productive system for every REST call jersey is instantiating the requested resource and providing the service. Each resource object has its own database service, which is closed after each call. In production a embedded neo4j GraphDatabase is used. To achieve a minimal invasive test system the productive database needs to be replaced with a test database. To change the database with minimal test related code in the project, the GraphDatabaseServiceProvider can be configured to return an impermanent Database.



6. Configure the Test-Database

In this Project the GraphDatabaseService is a Singleton Object provided by the GraphDatabaseServiceProvider. To use a Testdatabase in the Tests the following steps have to be done. A Claswide GraphDatabaseService object db has to be registered.

```
GraphDatabaseService db;
```

In the @Before method the singleton GraphDatabaseService provided by the GraphDatabaseServiceProvider has to be overwritten by the following line:

```
GraphDatabaseServiceProvider.setImpermanentDatabase();
```

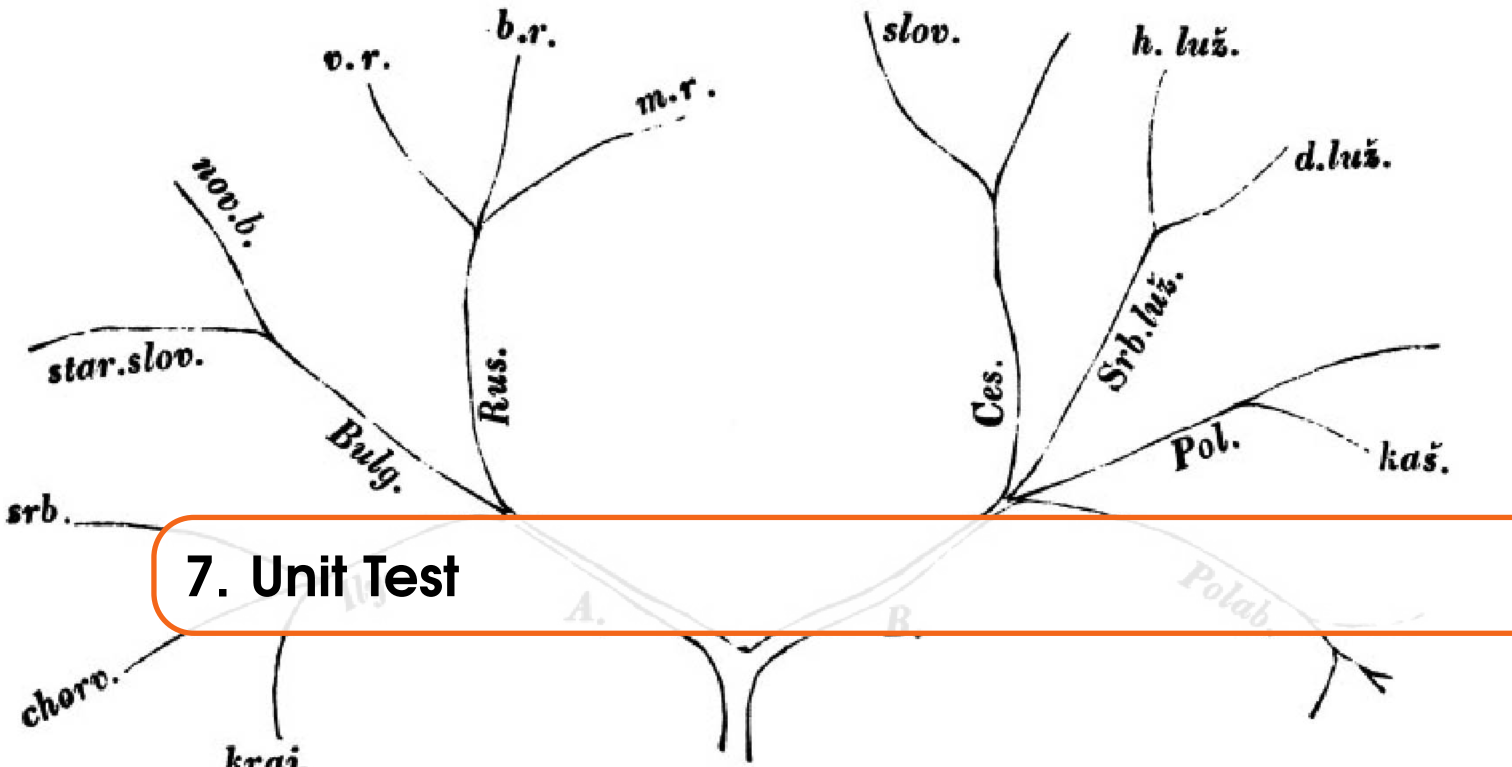
Later the db object can be initialized by:

```
db = new GraphDatabaseServiceProvider().getDatabase();
```

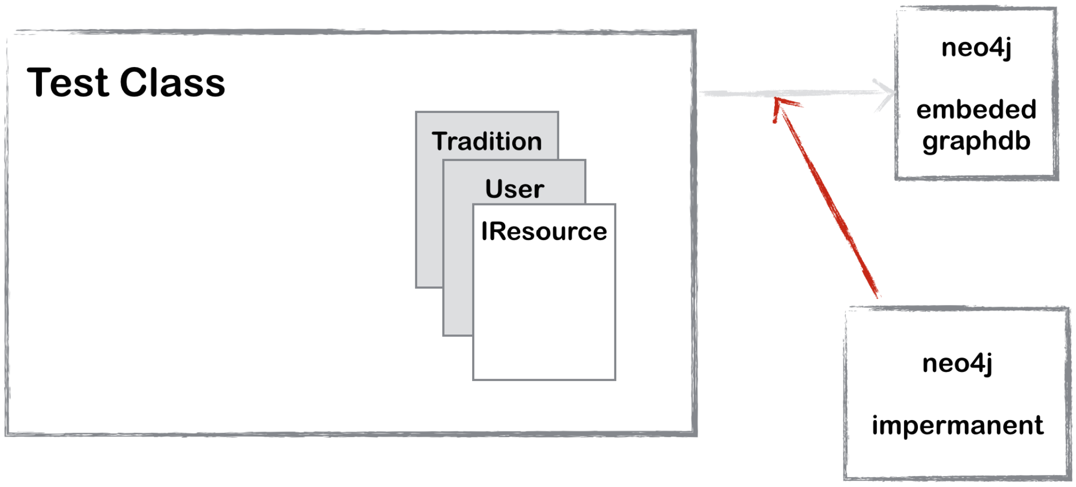
In the @After method the database has to be closed

```
db.shutdown();
```

With this configuration the impermanent Testdatabase of Neo4j is used during the tests.



7. Unit Test

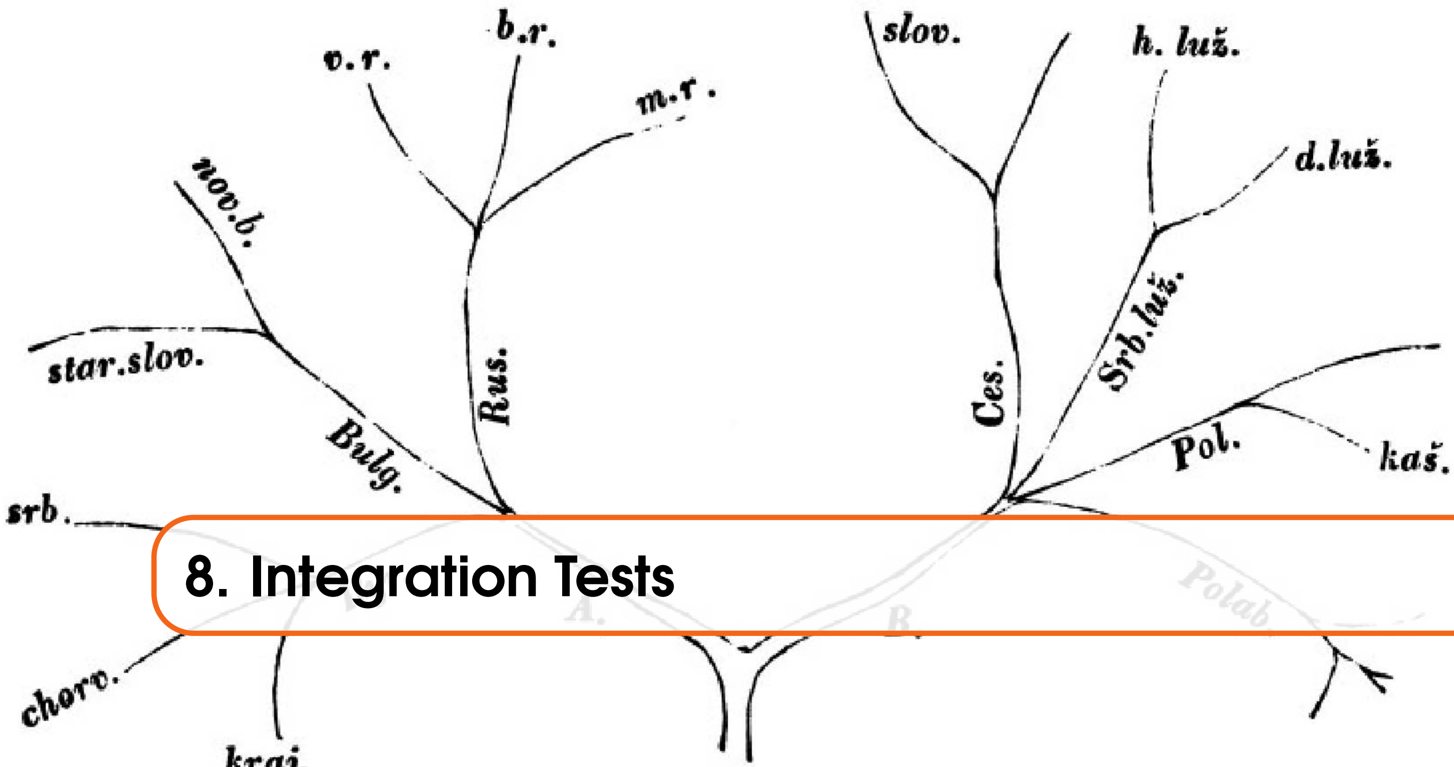


For Unit Tests the methods of the resource are called directly.

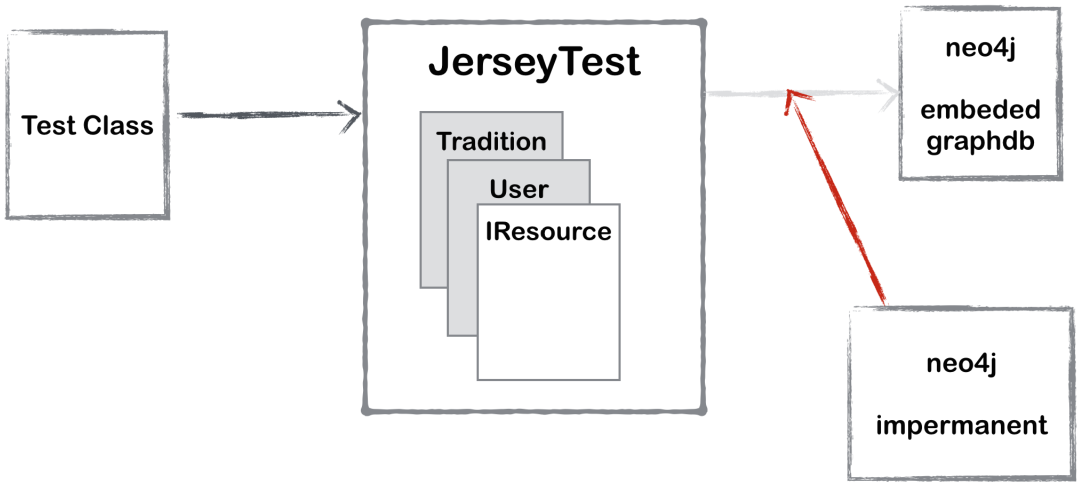
```
@Test
public void SimpleTest(){
   String actualResponse = userResource.getIt();
   assertEquals(actualResponse, "User!");
}
```

Example

https://github.com/tohotforice/PSE2_DH/blob/e364fcb0c164981281c5799a6bf9f9f9ea5eb503/stemmarest/src/test/java/net/stemmaweb/stemmaserver/UserUnitTest.java



8. Integration Tests



To inject objects into a resource it is mandatory that the resource is created statically at the place the injection is done. This is not possible when the resources are instantiated when a REST call occurs. To solve this JerseyTestServerFactory creates a server where already instantiated resources can be registered. To start a JerseyTestServer a global JerseyTest has to be created.

```
private JerseyTest jerseyTest;
```

The JerseyTestServerFactory creates a JerseyTest with already instantiated resources. This is necessary to inject the mock objects. Multiple resources can be added by chaining .addResource(..).addResource()

```
jerseyTest = JerseyTestServerFactory.newJerseyTestServer()
        .addResource(userResource).create();
jerseyTest.setUp();
```

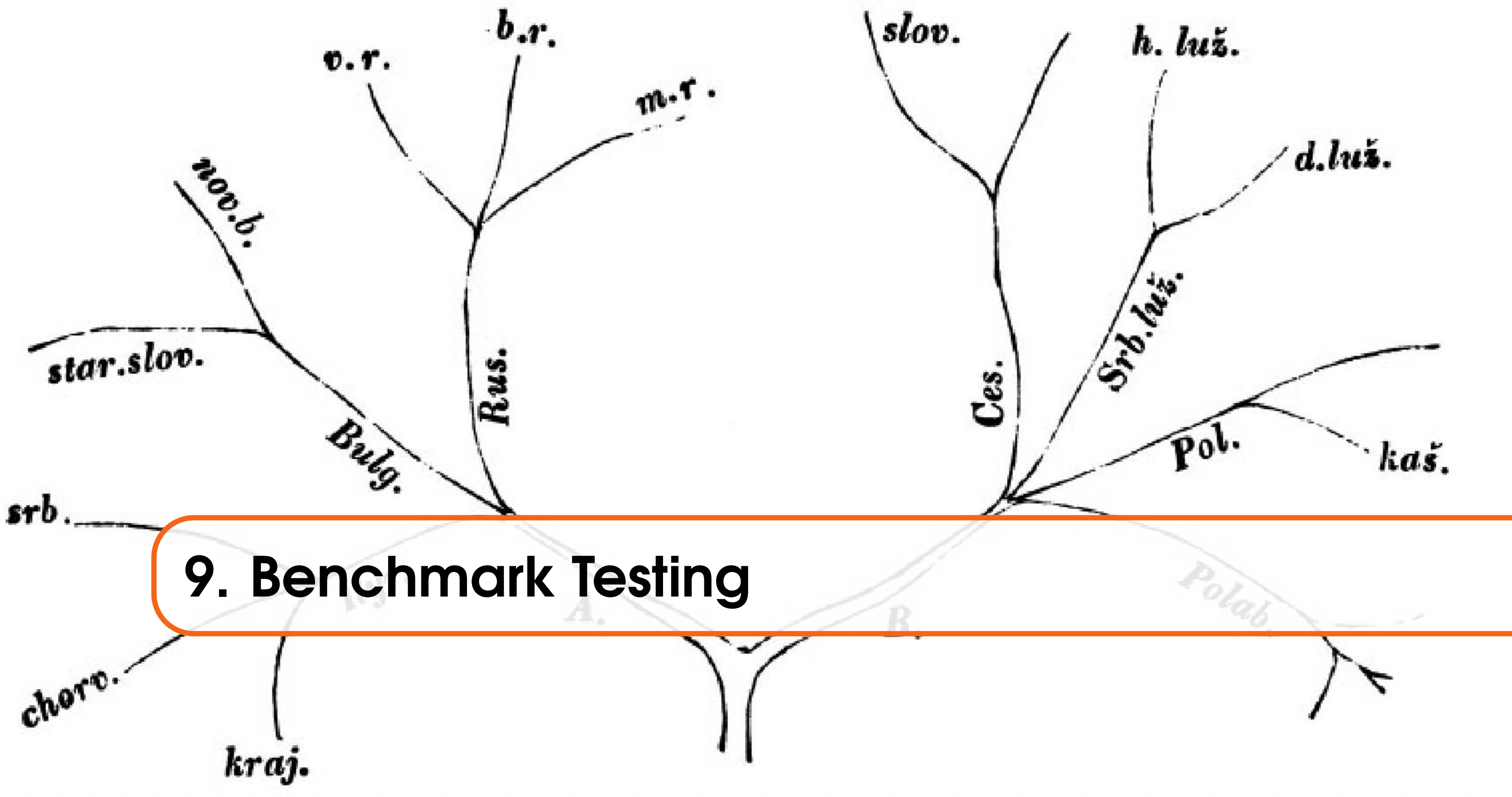
The test is done by calling a webresource of jerseyTest

```
@Test
```

```
public void SimpleTest(){
  String actualResponse = jerseyTest.resource()
      .path("/user").get(String.class);
  assertEquals(actualResponse, "User!");
}
```

Example

https://github.com/tohotforice/PSE2_DH/blob/e364fcb0c164981281c5799a6bf9f9f9ea5eb503/stemmarest/src/test/java/net/stemmaweb/stemmaserver/UserTest.java



9. Benchmark Testing

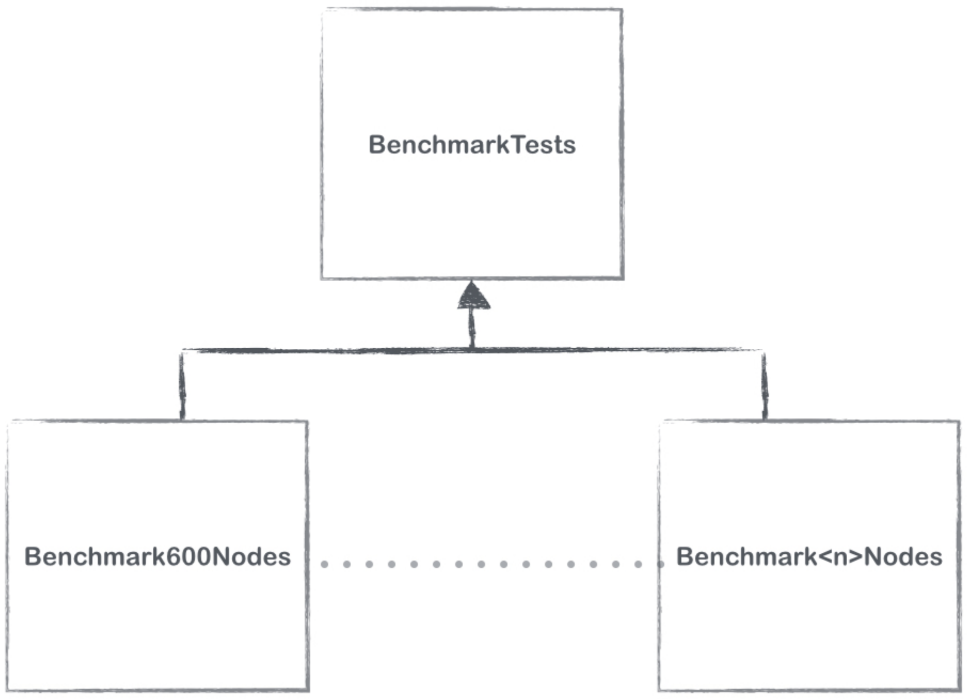
A main goal of the PSE2 stemmarest project is a good performance compared to the previous RESTful service. To measure the performance benchmark testing is needed. A benchmark test basically calls the RESTful service multiple times and measure the response time. To achieve this *com.carrotsearch.junitbenchmarks* a handy JUnit benchmark test suite is used. This JUnitbenchmarks measure the time which is used to execute a test and can generate visual representations of the measurement.
For the benchmark testing it is of interest to have a variety of different databases. Those databases should differ in their size from small to very huge. This allows to measure the algorithms in extreme situations. To generate valid graphs only limited by diskspace the class *RandomGraphGenerator* can be used. By calling the static method role a graph is generated according to the parameters.

R Please note that the response time highly depends on the hardware the tests are running on and the actual state of Javas virtual machine.

To reduce the influence of the virtual machine before the measurements 5 warm-up calls are done to bring the virtual machine to live. The hardware which was used for testing is represented in the report.

Setup

All the classes related to the Benchmark Tests can be found in the package *net.stemmaweb.stemmaserver.benachmarktests*. The class BenchmarkTests contains all Tests. The classes Benchmark<n>Nodes contain the database generation. Here is configured how many nodes the database has. This are also the classes which are run with JUnit test. BenchmarkTests cant be run as a JUnit test as it is a abstract class. s



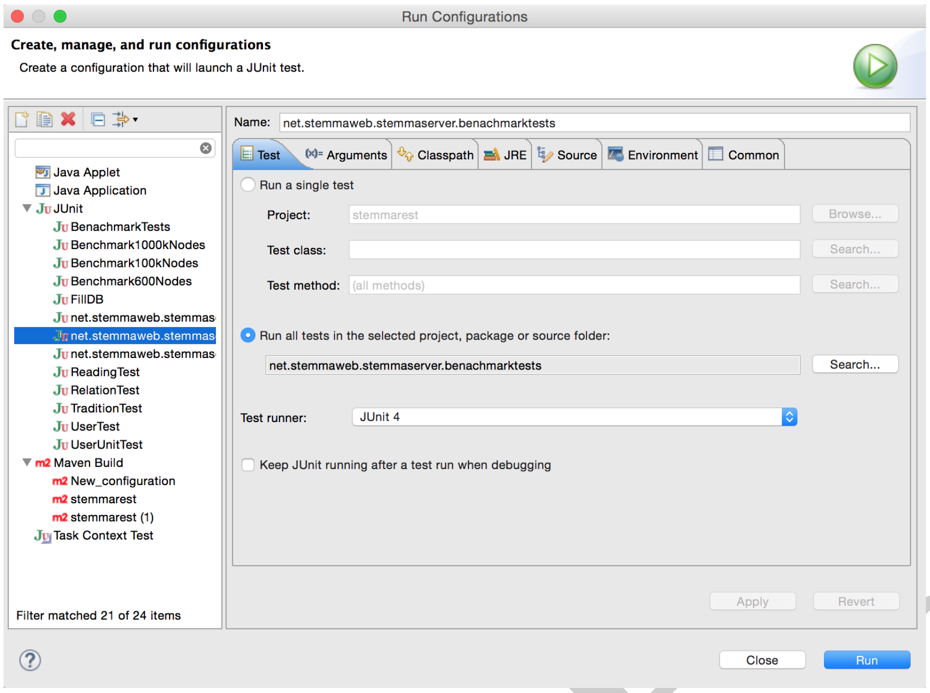
Tests are simply implemented in the BenchmarkTests class with the @Test annotation. It is best practice only to implement the restcall in this method and only test if Response.Status is OK. This assures that as less as possible overhead time is measured. And the integration- and JUnit tests should be done on a other place.

R JUnitBenchmarks measures the time to execute (@Before, @Test, @After). Heavy operations which should not be measured can be done in @BeforeClass and @AfterClass.

To create a new database test-environment copy the class Benchmark600Nodes and rename it to the count of Nodes that should be inserted. In the class itself only two small adjustments need to be done. First change the name of the report file *@BenchmarkMethodChart(filePrefix = "benchmark/benchmark-600Nodes")*. Second adjust the properties of the database which should be generated *rgg.role(db, 2, 1, 3, 100);*. role(databaseService, cardinalityOfUsers, cardinalityOfTraditionsPerUser, cardinalityOfWitnessesPerTradition, degreeOfTheTraditionGraphs)

Run Benchmarktests

The Benchmarktests can be run as every JUnit test. But to generate the report an argument needs to be passed by. Create a JUnit Test as follows:



Run Configurations

Create, manage, and run configurations

Create a configuration that will launch a JUnit test.

- Java Applet
- Java Application
- JUnit
  - BenachmarkTests
  - Benchmark1000kNodes
  - Benchmark100kNodes
  - Benchmark600Nodes
  - FillDB
  - net.stemmaweb.stemmas
  - net.stemmaweb.stemmas
  - net.stemmaweb.stemmas
  - ReadingTest
  - RelationTest
  - TraditionTest
  - UserTest
  - UserUnitTest
- Maven Build
  - New_configuration
  - stemmarest
  - stemmarest (1)
- Task Context Test

Filter matched 21 of 24 items

Name: net.stemmaweb.stemmaserver.benachmarktests

Test | Arguments | Classpath | JRE | Source | Environment | Common

Run a single test

Project: stemmarest

Test class:

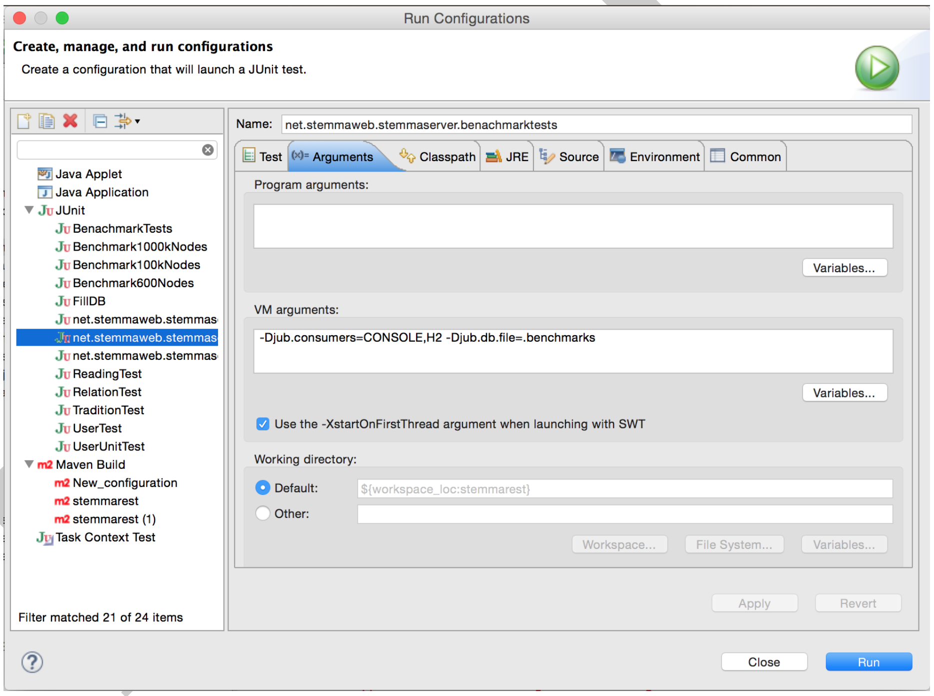
Test method: (all methods)

Run all tests in the selected project, package or source folder:

net.stemmaweb.stemmaserver.benachmarktests

Test runner: JUnit 4

Keep JUnit running after a test run when debugging



Run Configurations

Create, manage, and run configurations

Create a configuration that will launch a JUnit test.

Name: net.stemmaweb.stemmaserver.benachmarktests

Test | Arguments | Classpath | JRE | Source | Environment | Common

Program arguments:

VM arguments:

```
-Djub.consumers=CONSOLE,H2 -Djub.db.file=.benchmarks
```

Use the -XstartOnFirstThread argument when launching with SWT

Working directory:

Default: ${workspace_loc:stemmarest}

Other:

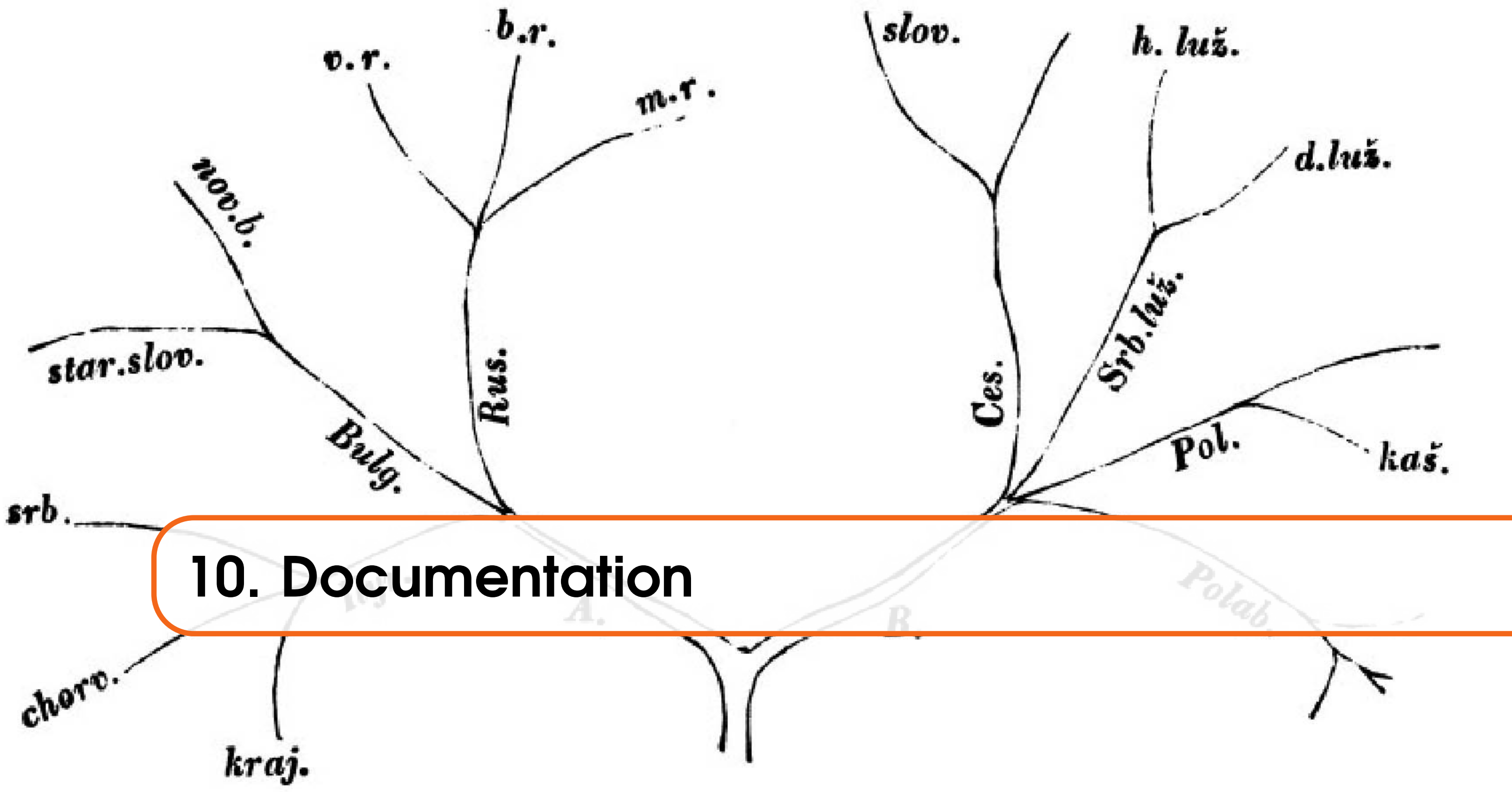
Filter matched 21 of 24 items

On the tab Arguments *-Djub.consumers=CONSOLE,H2 -Djub.db.file=.benchmarks* has to be inserted into the VM Arguments input. After the test can be run as usual. After the test execution the reports are stored under *benchmark/*.

R The execution of the tests will take some time because of the generation of huge graphs. Its recommended not to use the computer during this tests.

III

RESTful API



10. Documentation

10.1 /user

GET /user

Summary

Returns a welcome message

Parameter

Return — SUCCESS. text/plain
"User!"

10.2 /user/create

POST /user/create

Summary

Creates a user.

Parameter application/json
{ "userId":<userId>, "isPublic":<isAdmin> }

Return — CREATED. application/json
{ "userId":<userId>, "isPublic":<isAdmin> }

Return — CONFLICT. application/json
Error: A user with this id already exists

10.3 /user/{id}

GET /user/{id}

Summary

Returns the user as JSON Object

Parameter URL
Id: the user id

Return — OK. application/json
{ 'userId': <userId>, 'isAdmin': <isAdmin> }
The information about the user

Return — NOT_FOUND. application/json
The information about the user

10.4 /user/traditions/{userId}

GET /user/traditions/{userId}

Summary

List all Traditions of a user

Parameter URL
userId: the id of the user

Return — OK. application/json
{"traditions":[{"name":<traditionName> }] }

Return — NOT_FOUND. application/json
Error: A user with this id does not exist!

10.5 /textinfo/{textId}

POST /textinfo/{textId}

Summary

Update the textInfo of a tradition.

Parameter URL
textId: the id of the tradition

Parameter application/json
{ 'name': <new_name>, 'language': <new_language>, 'isPublic': <is_public>, 'ownerId': <new_ownerId> }

Return — SUCCESS. application/json
{ 'name': <new_name>, 'language': <new_language>, 'isPublic': <is_public>, 'ownerId': <new_ownerId> }
The new information of the tradition.

Return — CONFLICT. application/json
"Error: A user with this id does not exist"
If the user does not exist.

Return — NOT_FOUND. application/json
If the tradition was not found.

10.6 /tradition/witness/{tradId}

GET /tradition/witness/{tradId}

Summary

List all Witness of a tradition

Parameter URL
tradId: the id of the tradition

Return — OK. application/json

Return — NOT_FOUND. application/json
Error: A tradition with this id does not exist!

10.7 /tradition/relation/{tradId}/relationships

GET /tradition/relation/{tradId/relationships}

Summary

List all Relationships of a tradition

Parameter URL
tradId: the id of the tradition

Return — OK. application/json

10.8 /tradition/new

POST /tradition/new

Summary

Create a new tradition.

Parameter text/plain
name: The name of the tradition

Parameter multipart/form-data
language: The language of the tradition
public: 0 if the tradition is not public 1 if the tradition is public
name: The name of the tradition

file: multipart file input stream

Return — CONFLICT. application/json
"Error: No user with this id exists"

Return — INTERNAL_SERVER_ERROR. application/json
"Error: Tradition could not be imported!" *If the server was not able to parse the input file*

Return — OK. application/json
"Tradition imported successfully"

10.9 /tradition/get/{tradId}

GET /tradition/get/{tradId}

Summary

Get a graphml of a tradition

Parameter URL
tradId: the id of the tradition

Return — OK. application/xml

Return — NOT_FOUND. application/json
Error: A tradition with this id does not exist!

10.10 /tradition/reading/{tradId}/{readId}

GET /tradition/reading/{tradId}/{readId}

Summary

Get a specific reading of a tradition

Parameter URL
tradId: the id of the tradition

Parameter URL
readId: the id of the reading

Return — OK. application/json The reading in json

Return — NOT_FOUND. application/json
Error: A tradition with this id does not exist!

Return — NOT_FOUND. application/json
Error: A reading with this id does not exist!

10.11 /tradition/duplicate/{tradId}

POST /tradition/duplicate/{tradId}

Summary

Duplicates readings in a tradition. Is the opposite method of merge.

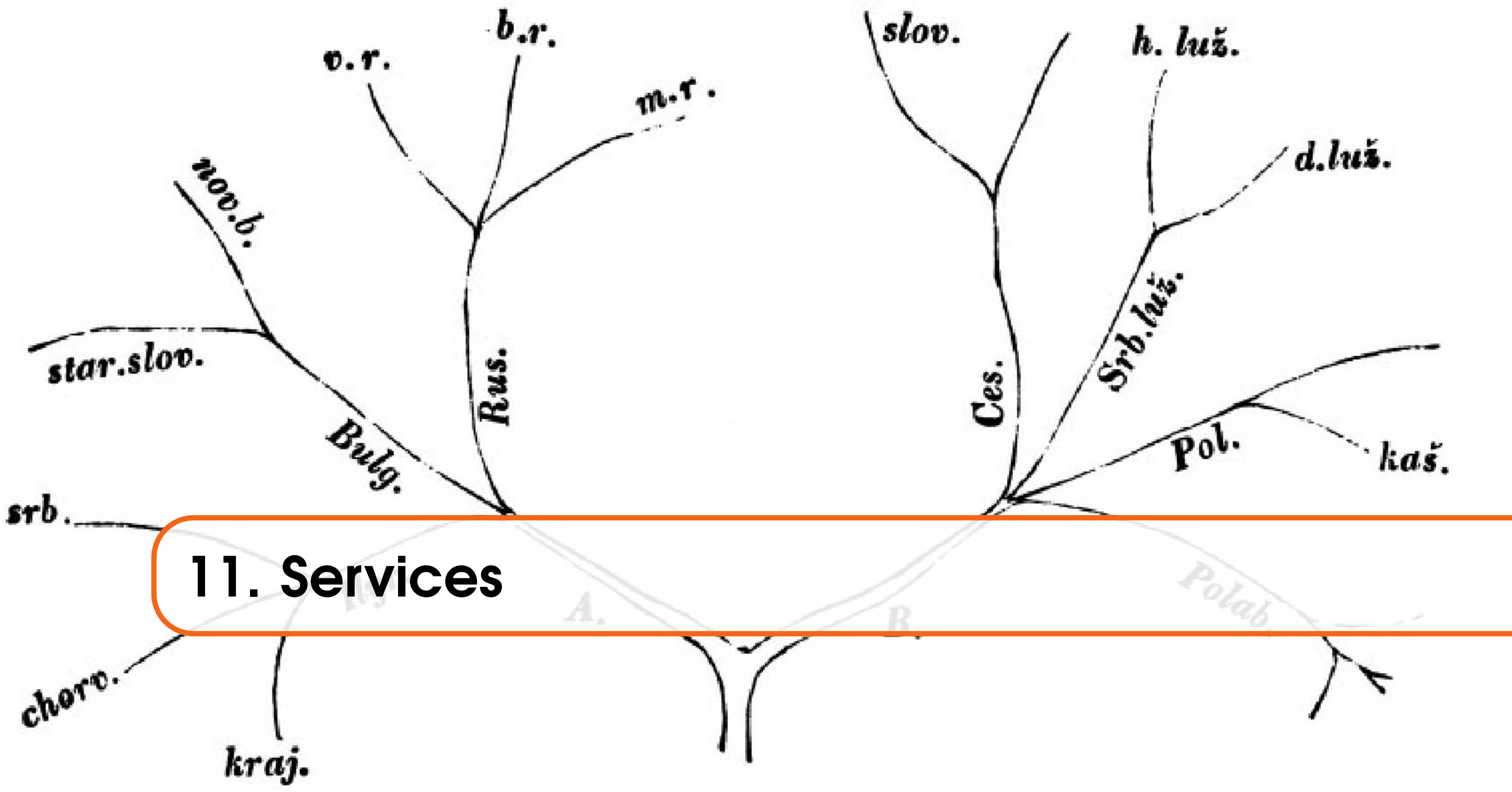
Parameter URL
tradId: the id of the tradition

Parameter application/json
{ 'readings': [readId1, readId2], 'witnesses': ["wit1", "wit2"]}

Return — OK. application/json
Successfully duplicated readings

Return — NOT_FOUND. application/json
If the tradition was not found.

Return — NOT_FOUND. application/json
If one of the readings was not found.



11. Services

11.1 Baseresource:

http://localhost:8080/

11.2 /user

Method Name: getIt

GET /

Response as text/plain

Method Name: create

POST /create

Request userModel as application/json

Response as application/json

Method Name: getUserById

GET /{userId}

Response as application/json

Method Name: deleteUserById

DELETE /{userId}

Response as text/plain

Parameter userId as string

Method Name: getTraditionsByUserId

```
GET /traditions/{userId}
```

Response as application/json

Parameter userId as string

11.3 /relation

Method Name: getIt

```
GET /
```

Response as text/plain

Method Name: delete

```
POST /{textId}/relationships/delete
```

Request relationshipModel as application/json

Response as text/plain

Parameter textId as string

Method Name: create

```
POST /{textId}/relationships
```

Request relationshipModel as application/json

Response as application/json

Parameter textId as string

Method Name: deleteById

```
DELETE /{textId}/relationships/{relationshipId}
```

Response as text/plain

Parameter textId as string

Parameter relationshipId as string

11.4 /witness

Method Name: getWitnssAsPlainText

GET /string/rank/{tradId}/{textId}/{startRank}/{endRank}

- **Response** as application/json
- **Parameter** textId as string
- **Parameter** endRank as string
- **Parameter** tradId as string
- **Parameter** startRank as string

Method Name: getWitnessAsPlainText

GET /string/{tradId}/{textId}

- **Response** as application/json
- **Parameter** textId as string
- **Parameter** tradId as string

Method Name: getWitnessAsReadings

GET /list/{tradId}/{textId}

- **Response** as application/json
- **Parameter** textId as string
- **Parameter** tradId as string

Method Name: getNextReadingInWitness

GET /reading/next/{tradId}/{textId}/{readId}

- **Response** as application/json
- **Parameter** textId as string
- **Parameter** readId as long
- **Parameter** tradId as string

Method Name: getPreviousReadingInWitness

GET /reading/previous/{tradId}/{textId}/{readId}

- **Response** as application/json
- **Parameter** textId as string
- **Parameter** readId as long

Parameter tradId as string

11.5 /tradition

Method Name: getAllRelationships

```
GET /relation/{tradId}/relationships
```

Response as application/json

Parameter tradId as string

Method Name: deleteUserById

```
DELETE /{tradId}
```

Response as text/plain

Parameter tradId as string

Method Name: changeOwnerOfATradition

```
POST /{textId}
```

Request textInfoModel as application/json

Response as application/json

Parameter textId as string

Method Name: getReading

```
GET /reading/{tradId}/{readId}
```

Response as application/json

Parameter readId as long

Parameter tradId as string

Method Name: getAllTraditions

```
GET /all
```

Response as application/json

Method Name: duplicateReading

```
POST /duplicate/{tradId}
```

Request duplicateModel as application/json

Response as application/json

Parameter tradId as string

Method Name: mergeReadings

```
POST /merge/{tradId}/{firstReadId}/{secondReadId}
```

Response as application/json

Parameter secondReadId as long

Parameter tradId as string

Parameter firstReadId as long

Method Name: splitReading

```
POST /split/{tradId}/{readId}
```

Response as application/json

Parameter readId as long

Parameter tradId as string

Method Name: getAllWitnesses

```
GET /witness/{tradId}
```

Response as application/json

Parameter tradId as string

Method Name: getTradition

```
GET /get/{tradId}
```

Response as application/json

Parameter tradId as string

Method Name: importGraphMl

```
POST /new
```

Request as multipart/form-data

Response as application/json

Method Name: getAllReadingsOfTradition

```
GET /readings/{tradId}
```

Response as application/json

Parameter tradId as string

Method Name: getDot

```
GET /getdot/{tradId}
```

Response as application/json

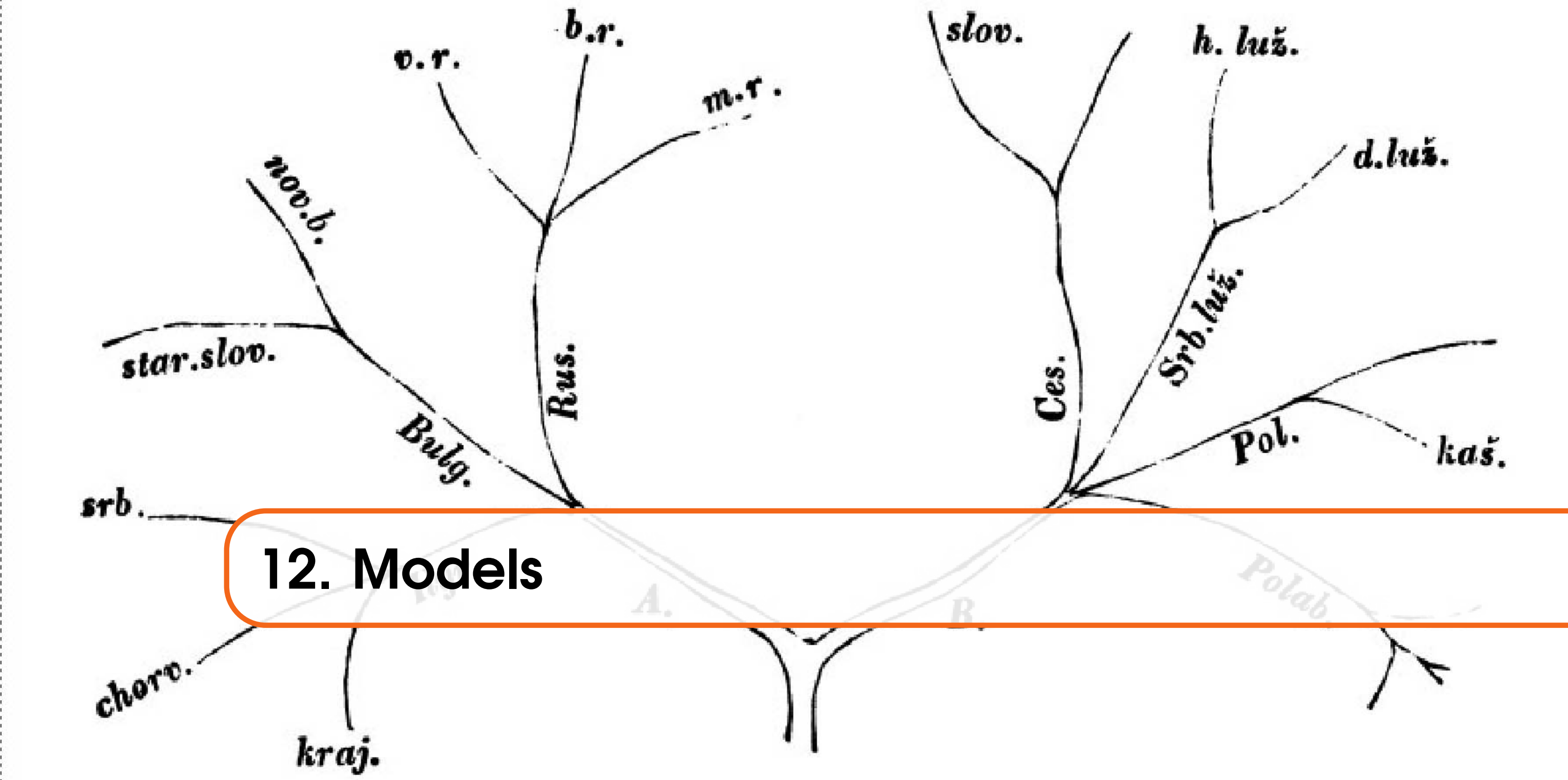
Parameter tradId as string

11.6 /myresource

Method Name: getIt

```
GET /
```

Response as text/plain



12. Models

12.1 userModel

Property id as string

Property isAdmin as string

12.2 relationshipModel

Property de0 as string

Property de1 as string

Property de10 as string

Property de11 as string

Property de12 as string

Property de2 as string

Property de3 as string

Property de4 as string

Property de5 as string

Property de6 as string

Property de7 as string

Property de8 as string

Property de9 as string

Property id as string

Property source as string

Property target as string

12.3 duplicateModel

Property readings as long

Property witnesses as string

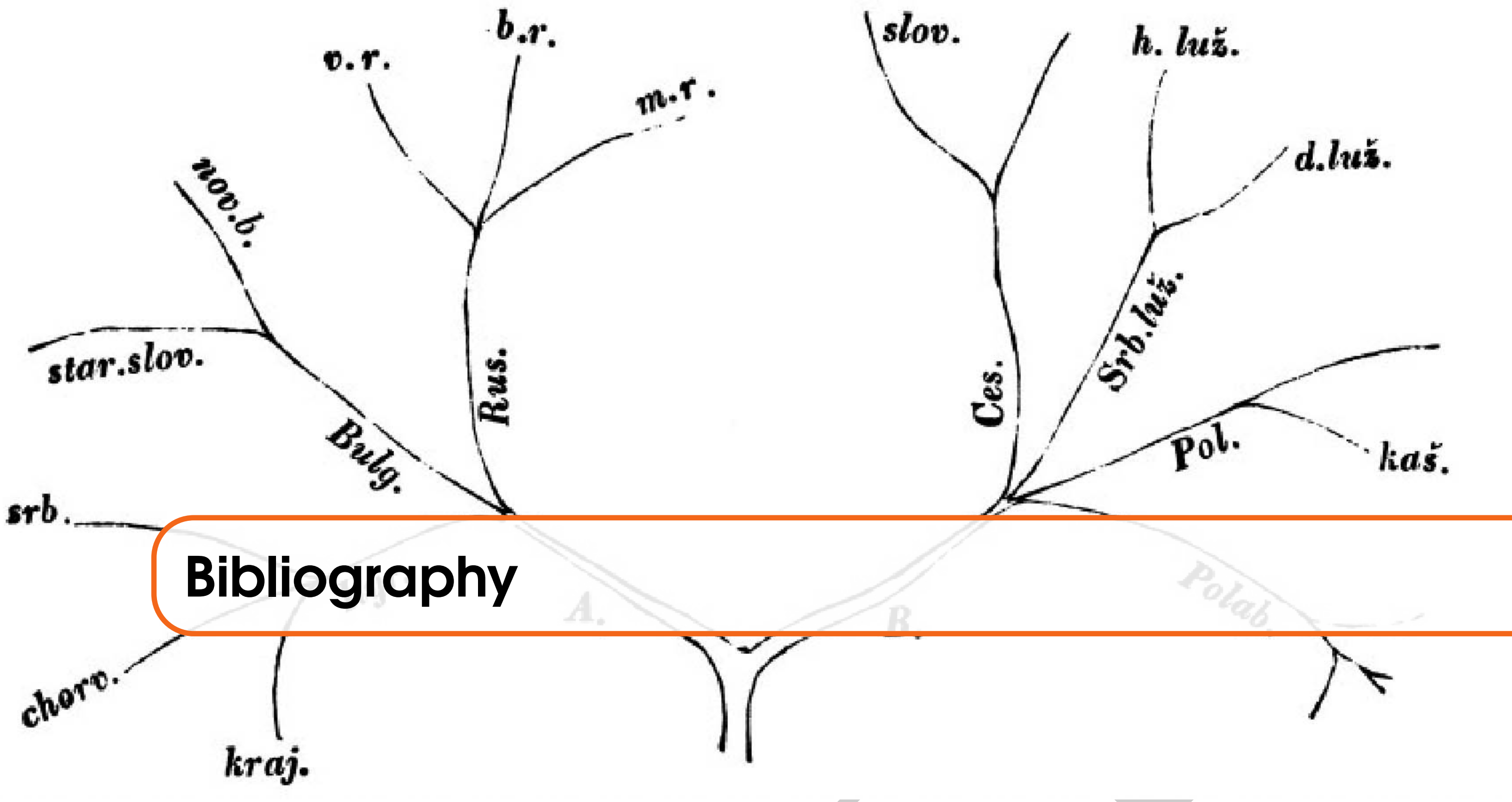
12.4 textInfoModel

Property isPublic as string

Property language as string

Property name as string

Property ownerId as string



Bibliography