

Benchmarking of Graph Databases - Suitability for the Industrial Environment

Master's Thesis
by

Christian Navolskyi

Chair of Pervasive Computing Systems/TECO
Institute of Telematics
Department of Informatics

First Reviewer:	Prof. Dr. Michael Beigl
Second Reviewer:	M.Sc. Andrei Miclaus
Supervisor:	M.Sc. Andrei Miclaus

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Karlsruhe, den **TODO: date**

Zusammenfassung

TODO: Zusammenfassung (Deutsch)

Abstract

TODO: Zusammenfassung (Englisch)

Contents

1	Introduction	1
1.1	Problem Statement	1
1.1.1	Use Case - Industry 4.0	1
1.1.1.1	Inserting Data	1
1.1.1.2	Reading Data	1
1.2	Methodology	1
1.3	Goal of this Thesis	1
2	Background & Related Work	3
2.1	Industrial Data	3
2.2	Graphs	3
2.3	Graph Databases	3
2.3.1	Triple Stores	3
2.3.1.1	Apache Jena	3
2.3.2	Document Stores	3
2.3.2.1	OrientDB	3
2.3.3	Graph Stores	3
2.3.3.1	Neo4j	3
2.3.3.2	Sparksee	3
2.4	Graph Database Benchmarks	3
2.4.1	LDBC: Graphalytics	3
2.4.2	XGDBench	3
2.4.3	YCSB	3
2.5	Related Work	3
2.5.1	Graph Database: Anna	3
2.5.2	TODO: Add more	3
3	Analysis	5
3.1	Data	5
3.1.1	Data Structure NOTE: Here or in Design?	5
3.1.2	Data Amount	5
3.2	Workloads	5
3.2.1	Inserting Data into the Database	5
3.2.2	Retrieving Data from the Database	5
3.3	Benchmark - YCSB	5
4	Design	7
4.1	Data Structure	7
4.2	Workloads	7

4.2.1	Inserting	7
4.2.2	Production Simulation	7
4.2.3	Reading under load	7
4.3	Extension of the Benchmark	7
4.3.1	Generating a Dataset	7
4.3.1.1	Storing the Dataset	7
4.3.1.2	Restoring the Dataset	7
4.3.2	Graph Workload	7
4.3.3	Bindings	7
4.3.3.1	Apache Jena	7
4.3.3.2	Neo4j	7
4.3.3.3	OrientDB	7
4.3.3.4	Sparksee	7
5	Implementation of your Project	9
5.1	Graph Workload	9
5.2	Graph Data Generator	9
5.2.1	Graph Data Creator	9
5.2.2	Graph Data Recreator	9
5.3	Graph Database Bindings	9
5.3.1	Apache Jena	9
5.3.2	Neo4j	9
5.3.3	OrientDB	9
5.3.4	Sparksee	9
6	Evaluation	11
6.1	Maximum Load	11
6.1.1	Probing Node Count NOTE: Comparing indexed to not indexed	11
6.1.2	Probing Node Size NOTE: See change over increasing node size	11
6.2	Throughput	11
6.2.1	Product Complexity NOTE: More child nodes.	11
6.2.2	Production Suitability NOTE: Testing production like workload	11
6.3	Responsiveness	11
6.3.1	Reading under load	11
6.3.2	Scanning under load	11
7	Conclusion and Future Work	13
7.1	Conclusion	13
7.1.1	Suitability	13
7.1.2	General Performance of Databases	13
7.2	Future Work	13
7.2.1	More Bindings	13
7.2.2	Concurrency	13
7.2.3	Other input methods NOTE: I only used native Java APIs, to directly test the database.	13
7.2.4	Workload TODO: what kind?	13
8	Summary	15

1. Introduction

1.1 Problem Statement

1.1.1 Use Case - Industry 4.0

1.1.1.1 Inserting Data

NOTE: How is that used by the industry.

1.1.1.2 Reading Data

NOTE: How is that used by the industry.

1.2 Methodology

1.3 Goal of this Thesis

2. Background & Related Work

2.1 Industrial Data

2.2 Graphs

2.3 Graph Databases

2.3.1 Triple Stores

2.3.1.1 Apache Jena

2.3.2 Document Stores

2.3.2.1 OrientDB

2.3.3 Graph Stores

2.3.3.1 Neo4j

2.3.3.2 Sparksee

2.4 Graph Database Benchmarks

2.4.1 LDBC: Graphalytics

2.4.2 XGDBench

2.4.3 YCSB

2.5 Related Work

2.5.1 Graph Database: Anna

2.5.2 **TODO: Add more**

3. Analysis

3.1 Data

3.1.1 Data Structure **NOTE: Here or in Design?**

3.1.2 Data Amount

3.2 Workloads

3.2.1 Inserting Data into the Database

NOTE: What is the pattern of insertion

3.2.2 Retrieving Data from the Database

NOTE: What is the pattern of retrieving

3.3 Benchmark - YCSB

NOTE: Activity diagram in this section. What WAS the workflow.

4. Design

4.1 Data Structure

4.2 Workloads

4.2.1 Inserting

4.2.2 Production Simulation

4.2.3 Reading under load

4.3 Extension of the Benchmark

4.3.1 Generating a Dataset

4.3.1.1 Storing the Dataset

4.3.1.2 Restoring the Dataset

4.3.2 Graph Workload

NOTE: Graph Workload functionality NOTE: Activity diagram of the workflow with graph data.

4.3.3 Bindings

4.3.3.1 Apache Jena

4.3.3.2 Neo4j

4.3.3.3 OrientDB

4.3.3.4 Sparksee

5. Implementation of your Project

5.1 Graph Workload

5.2 Graph Data Generator

5.2.1 Graph Data Creator

5.2.2 Graph Data Recreator

5.3 Graph Database Bindings

5.3.1 Apache Jena

5.3.2 Neo4j

5.3.3 OrientDB

5.3.4 Sparksee

6. Evaluation

6.1 Maximum Load

6.1.1 Probing Node Count **NOTE:** Comparing indexed to not indexed

6.1.2 Probing Node Size **NOTE:** See change over increasing node size

6.2 Throughput

6.2.1 Product Complexity **NOTE:** More child nodes.

6.2.2 Production Suitability **NOTE:** Testing production like workload

6.3 Responsiveness

6.3.1 Reading under load

6.3.2 Scanning under load

7. Conclusion and Future Work

7.1 Conclusion

7.1.1 Suitability

7.1.2 General Performance of Databases

7.2 Future Work

7.2.1 More Bindings

7.2.2 Concurrency

7.2.3 Other input methods **NOTE: I only used native Java APIs, to directly test the database.**

7.2.4 Workload **TODO: what kind?**

8. Summary

