Cairo University - Faculty of Engineering

Computer Engineering Department

Advanced Database Systems

Project Phase Two

Mohamed Shawky Zaky
SEC:2, BN:15

Remonda Talaat Eskarous
SEC:1, BN:19

Mohamed Ahmed Mohamed Ahmed
SEC:2, BN:10

Mohamed Ramzy Helmy
SEC:2, BN:13

Contents

List of Figures

1 Query Statistics

1.1 Query 1

1.1.1 Execution Plan Before Optimization

1.1.2 Execution Plan After Optimization

1.1.3 Parallel Query Processing

1.2 Query 2

1.2.1 Execution Plan Before Optimization

1.2.2 Execution Plan After Optimization

1.2.3 Parallel Query Processing

1.3 Query 3

1.3.1 Execution Plan Before Optimization

1.3.2 Execution Plan After Optimization

1.3.3 Parallel Query Processing

1.4 Query 4

1.4.1 Execution Plan Before Optimization

1.4.2 Execution Plan After Optimization

1.4.3 Parallel Query Processing

1.5 Query 5

1.5.1 Execution Plan Before Optimization

1.5.2 Execution Plan After Optimization

1.5.3 Parallel Query Processing

2 Optimization Details

2.1 New Database Statistics

2.2 Schema Optimization

2.3 Memory Optimization

2.4 Index Tuning

2.5 Query Optimization

2.5.1 Query 1

2.5.2 Query 2

2.5.3 Query 3

2.5.4 Query 4

2.5.5 Query 5

3 Validation Details

3.1 Time and Space Analysis

In this section, we evaluate both time and space improvements of each optimization on each query. We consider both before and after *disk cache*. Moreover, the space improvement is considering the total size of the transferred tables between memory and disk. Execution time is measured in *seconds*.

Query 1	Before Cache			After Cache		
	Time	Time %	Space %	Time	Time %	Space %
Initial Query	16.78	-	-	1.77	-	-
After Index Opt.	-	-	-	-	-	-
After Query Opt.	10.87	-	-	0.39	-	-
After Schema Opt.	8.8	-	-	0.33	-	-
After Memory Opt.	7.8	-	-	0.3	-	-

Query 2	Before Cache			After Cache		
	Time	Time %	Space %	Time	Time %	Space %
Initial Query	1535	-	-	1463	-	-
After Index Opt.	9.49	-	-	0.78	-	-
After Query Opt.	7.75	-	-	0.68	-	-
After Schema Opt.	6.8	-	-	0.65	-	-
After Memory Opt.	5.77	-	-	0.65	-	-

Query 3	Before Cache			After Cache		
	Time	Time %	Space %	Time	Time %	Space %
Initial Query	0.36	-	-	0.07	-	-
After Index Opt.	0.23	-	-	0.01	-	-
After Query Opt.	0.19	-	-	0.01	-	-
After Schema Opt.	0.14	-	-	0	-	-
After Memory Opt.	0.12	-	-	0	-	-

Query 4	Before Cache			After Cache		
	Time	Time %	Space %	Time	Time %	Space %
Initial Query	10.41	-	-	0.27	-	-
After Index Opt.	-	-	-	-	-	-
After Query Opt.	-	-	-	-	-	-
After Schema Opt.	6.37	-	-	0.15	-	-
After Memory Opt.	6.01	-	-	0.13	-	-

Query 5	Before Cache			After Cache		
	Time	Time %	Space %	Time	Time %	Space %
Initial Query	6.14	-	-	0.33	-	-
After Index Opt.	-	-	-	-	-	-
After Query Opt.	4.39	-	-	0.26	-	-
After Schema Opt.	2.94	-	-	0.21	-	-
After Memory Opt.	2.34	-	-	0.2	-	-

3.2 Database Size Effect

The following plots show the effect of increasing database sizes on the execution time of our 5 queries. We consider both before and after *disk cache*.

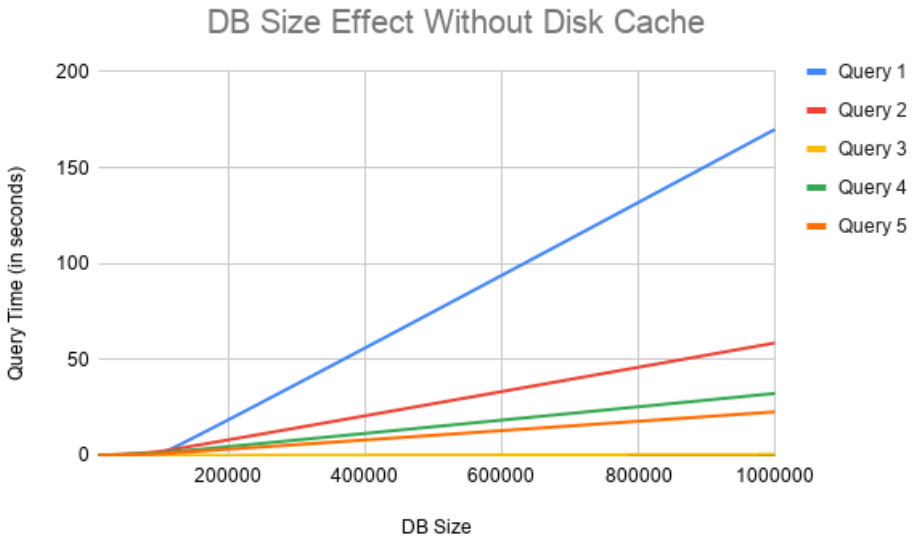

Figure 1: Database Size Effect Without OS (Disk) Cache.

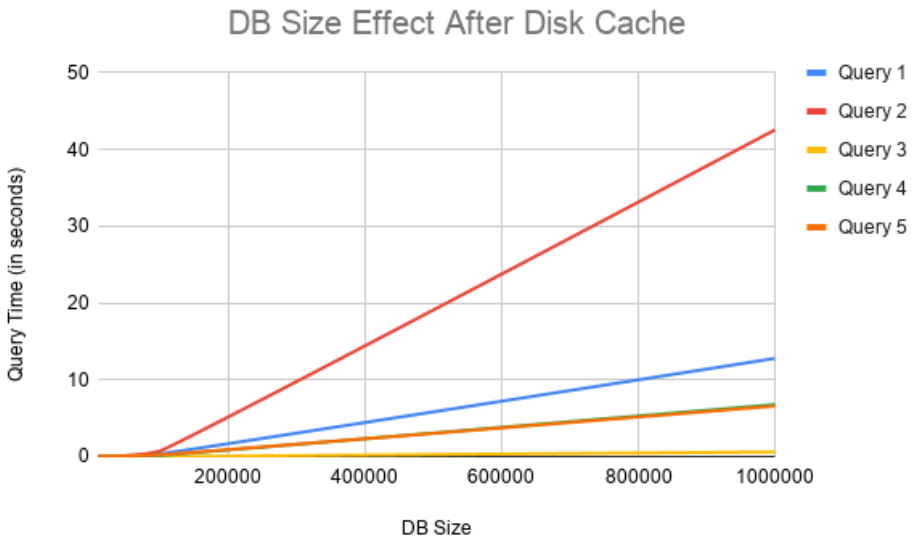

Figure 2: Database Size Effect After OS (Disk) Cache.

3.3 Optimized SQL vs. NoSQL

3.4 Hardware Effect

4 Final Remarks