

RIGA TECHNICAL UNIVERSITY FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY INSTITUTE OF APPLIED COMPUTER SYSTEMS

Practical Assignment #3 "Database Management Systems" **Data Structures Comparison**

Author: Emir Oğuz

Course, Group: DSP201, Group 1 Student Card No: 230ADB011

Checked: Andrejs Gaidukovs

Content

I	Task – I	Data Structures Comparison	3
2	Main Se	ections of Practical Work	4
2.	1 Hea	p-Organized Table	4
	2.1.1	Query all record	4
	2.1.2	Query the total number of records	4
	2.1.3	Query one record	4
2.	2 B-T	ree Index	4
	2.2.1	Query all record	4
	2.2.2	Query the total number of records	5
	2.2.3	Query one record	5
2.	3 Bitr	nap Join Index	5
	2.3.1	Query all record	5
	2.3.2	Query the total number of records	5
	2.3.3	Query one record	5
2.	4 Clu	stered Index	6
	2.4.1	Query all record	6
	2.4.2	Query the total number of records	6
	2.4.3	Query one record	6
2.	5 Has	h Cluster	6
	2.5.1	Query all record	6
	2.5.2	Query the total number of records	7
	2.5.3	Query one record	7
2.	6 Inde	ex-Organized Tables	7
	2.6.1	Query all record	7
	2.6.2	Query the total number of records	7
	2.6.3	Query one record	
3	Conclus	sions	
4	Referen	ces	Ç

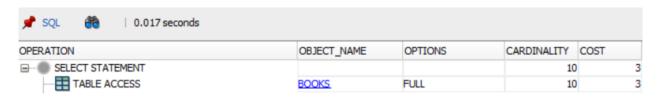
1 Task - Data Structures Comparison

- 1. For choosen topic select two tables; the same table must be used for all structures.
- 2. Enter data in those two tables (minimum 20). The same data must be used for all structures.
- 3. Analyze following data structures:
 - a. Heap-Organized Table. Two tables that are linked by one to many (1:N)
 - b. B-Tree Index. One index for every table
 - c. Bitmap Join Index.
 - d. Indexed Cluster. The cluster combines two tables.
 - e. Hash Cluster. The cluster combines two tables.
 - f. Index Organized Tables.
- 4. Tables (CREATE TABLE), clusters (CREATE CLUSTER) and indexes (CREATE INDEX) must be used.
- 5. You need to create 3 queries (SELECT) that retrieves:
 - a. all records;
 - b. the total number of records;
 - c. one record;
- 6. Take small screenshot where execution time of the query and the cost of the execution plan (COST) can be seen for every query (tip: 5 structures * 3 queries = 15 screenshots). Fill tables in conclusions the execution time of the query and the cost of the execution plan (COST) for every query for each index;
- 7. Write conclusion: at least 250 words;
- 8. Upload 2 files, types and naming:
 - a. Report in Word: *DBMS_3_YourSurname.docx*;
 - b. Sql script: *DBMS_3_YourSurname.sql*; sql script should include create and drop operations for tables and indexes, insert operations;

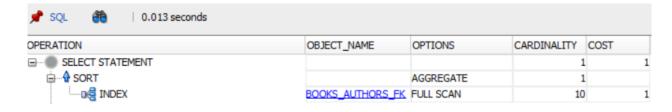
2 Main Sections of Practical Work

2.1 Heap-Organized Table

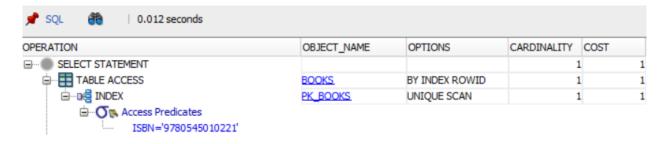
2.1.1 Query all record



2.1.2 Query the total number of records

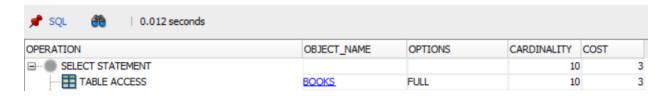


2.1.3 Query one record



2.2 B-Tree Index

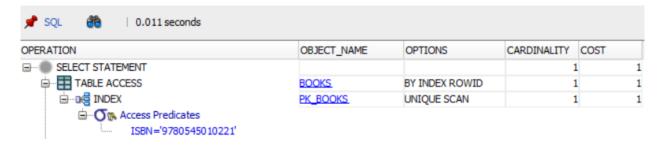
2.2.1 Query all record



2.2.2 Query the total number of records

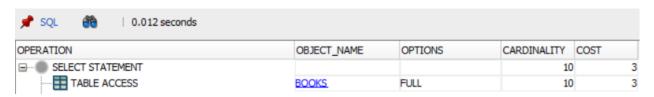
₱ SQL 🍪 0.012 seconds				
OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			1	1
ia ··· · · · · · · · · · · · · · · · · ·		AGGREGATE	1	
od INDEX	IDX_BOOKS_AUTHO	FULL SCAN	10	1

2.2.3 Query one record

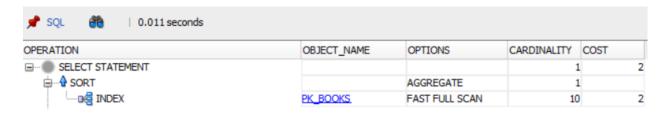


2.3 Bitmap Join Index

2.3.1 Query all record



2.3.2 Query the total number of records

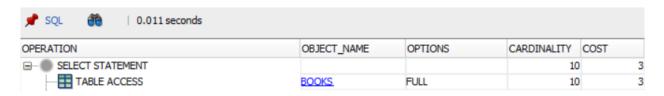


2.3.3 Query one record

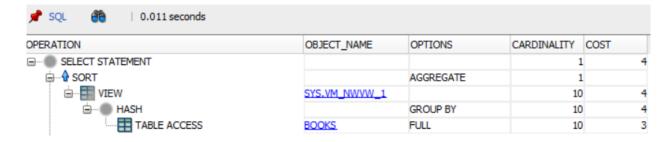


2.4 Clustered Index

2.4.1 Query all record



2.4.2 Query the total number of records

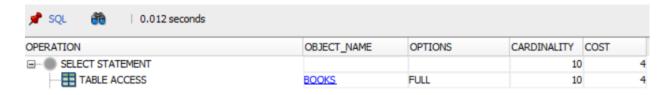


2.4.3 Query one record

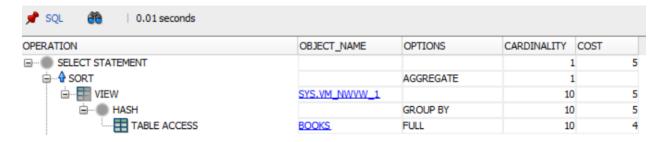


2.5 Hash Cluster

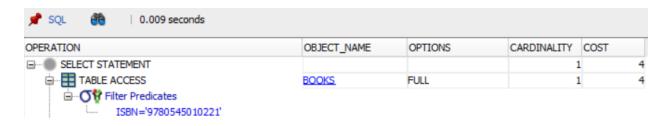
2.5.1 Query all record



2.5.2 Query the total number of records

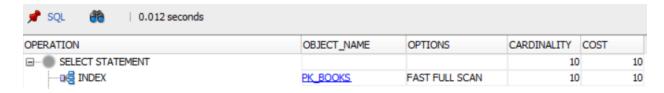


2.5.3 Query one record

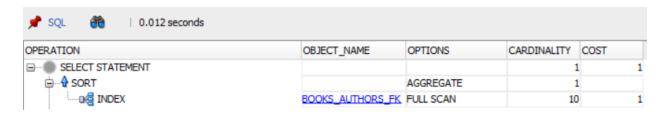


2.6 Index-Organized Tables

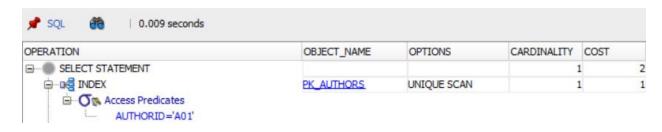
2.6.1 Query all record



2.6.2 Query the total number of records



2.6.3 Query one record



3 Conclusions

Cost

	Heap-	B-Tree	Bitmap Join	Clustered	Hash	Index-
	Organized	Index	Index	Index	Cluster	Organized
	Table					Tables
All records	3	1	3	3	4	10
Count of	1	1	2	4	5	1
records						
Single	1	1	1	2	4	2
record						

Time

	Heap-	B-Tree	Bitmap Join	Clustered	Hash	Index-
	Organized	Index	Index	Index	Cluster	Organized
	Table					Tables
All records	0.017	0.012	0.012	0.011	0.013	0.012
Count of	0.013	0.012	0.011	0.011	0.010	0.012
records						
Single	0.011	0.011	0.010	0.009	0.009	0.009
record						

As part of this assignment, I learned how to use different indexes in a database management system. Throughout the process, I saw the differences in the indexes in terms of cost and time. I created different code blocks for the indexes that were wanted to be analyzed in the assignment and tried to analyze them one by one. It was quite an instructive work.

In conclusion, indexes are important components of database management systems, and knowledge of the many types and uses for them may enhance a database's functionality and effectiveness significantly. The most basic type of table without an indexing structure, useful for temporary data storage, is a Heap-Organized Table. Database management systems frequently employ B-Tree Indexes because of their effectiveness in searching and retrieving data from tables. Bitmap Join Indexes are a useful tool for speeding up queries that use join operations on many tables. To integrate two or more linked tables into a single entity and speed up related data retrieval, Clustered Index and Hash Cluster are utilized. An advanced type of table is an Index-Organized Table.

In summary, understanding the various index types, their use, and implementation may significantly boost a database's performance and effectiveness. The nature of the data, how frequently it is accessed, and the sorts of queries being run all influence the choice of index type. These elements will be taken into account by an efficient database management system when choosing the index to employ for a certain table or query. Database managers may make sure that their databases are optimized for efficiency and that their applications run as efficiently as possible by making effective use of indexes.

4 References

- Riga Technical University, Faculty of Computer Science and Information Technology, Institute of Applied Computer Systems, DSP201 – Database Management Systems, Presentations