Indexing in typical DBMSs

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Outline

- Oracle
  - Normal index
  - Composite
  - Bitmap
- Microsoft SQL Server
  - Clustered/non-clustered
- MySQL
  - Btree
  - Rtree
  - Hash
- Full-text index

Oracle

- Oracle automatically creates an index for each UNIQUE or PRIMARY KEY declaration.
- INDEX_TYPE: NORMAL -> B-TREE (B^+ tree)
- Null values are not indexed.
- Statistics terms
  - BLEVEL: depth of the index tree
  - LEAF_BLOCKS: number of leaf blocks in the index
  - DISTINCT_KEYS: number of the distinct index key

Oracle

- Composite
  - create index emp_idx on employee(name, id);
  - Type of this index?
  - Selective: id vs name?
  - If only id is referred in the WHERE clause?
  - Skip scanning is used when the leading column is not referred, so the query still utilizes the composite index.

Oracle

- Bitmap

FNAME	LNAME	ID	SECTION	MGR	GDR
David	Smith	10	ADT	DS	M
Belinda	Anderson	20	HRM	MD	F
Peter	Neuman	30	ADT	DS	M
Michael	Ducunal	40	PRS	DS	M
Windy	Lucida	50	ADT	MD	F
Jenny	Eastwood	60	ADT	DS	F

- SELECT id, fname, lname, mgr,
- FROM emp
- WHERE section = 'ADT' AND
- mgr = 'DS' AND
- gdr = 'M';

Oracle

- Bitmap

ADT	HRM	PRS
1	0	0
0	1	0
1	0	0
0	0	1
1	0	0
1	0	0

SECTION

M	F
1	0
0	1
1	0
1	0
0	1
0	1

GDR

DS	MD
1	0
0	1
1	0
1	0
0	1
1	0

MGR

Oracle

- Bitmap

```
        101011
        101101
AND     101100
        101000
```

ID	FNAME	LNAME	MGR
10	David	Smith	DS
30	Peter	Neuman	DS

Microsoft SQL Server

- Clustered index
  - B-tree
- Non-clustered index
  - Flat file

MySQL

- The applicability of the indexes is depended on the file (storage engine) used.
  - MyISAM: Btree, Rtree
  - InnoDB: Btree
  - Memory/Heap: Hash, Btree

Full-text index

- Typos
- Stop words
- Stemming
- Rank query

References

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