MySQL RDBMS

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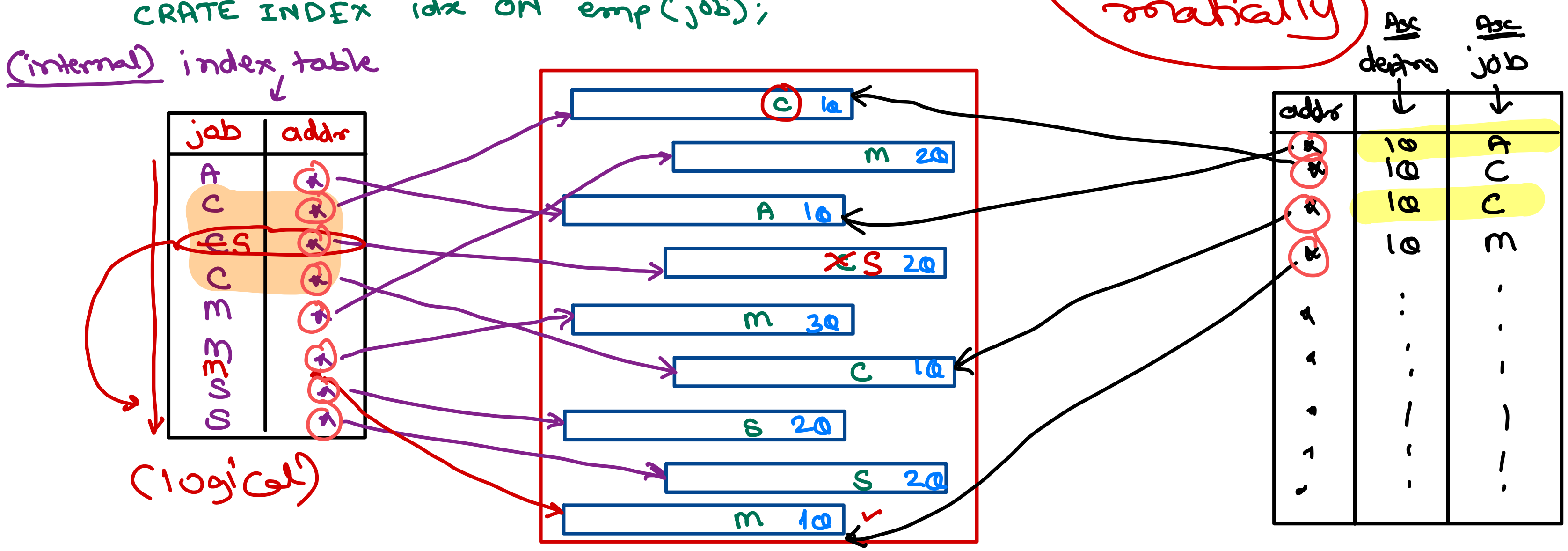
Index

- Index enable faster searching in tables by indexed columns.
  - CREATE INDEX idx_name ON table(column);
- One table can have multiple indexes on different columns/order.
- Typically indexes are stored as some data structure (like BTREE or HASH) on disk.
- Indexes are updated during DML operations. So DML operation are slower on indexed tables.

automatically

CRATE INDEX idx ON emp(job);



Index

- Index can be ASC or DESC.
  - It cause storage of key values in respective order (MySQL 8.x onwards).
  - ASC/DESC index is used by optimizer on ORDER BY queries.
- There are four types of indexes:
  - Simple index
    - CREATE INDEX idx_name ON table(column [ASCIDESC]); → single column → duplicates allowed
  - Unique index
    - CREATE UNIQUE INDEX idx_name ON table(column [ASCIDESC]);
    - Doesn't allow duplicate values.
  - Composite index
    - CREATE INDEX idx_name ON table(column1 [ASCIDESC], column2 [ASCIDESC]);
    - Composite index can also be unique. Do not allow duplicate combination of columns.
  - Clustered index
    - PRIMARY index automatically created on Primary key for row lookup.
    - If primary key is not available, hidden index is created on synthetic column.
    - It is maintained in tabular form and its reference is used in other indexes.

Index

- Indexes should be created on shorter (INT, CHAR, …) columns to save disk space.
- Few RDBMS do not allow indexes on external columns i.e. TEXT, BLOB.
- MySQL support indexing on TEXT/BLOB up to n characters.
  - CREATE TABLE test (blob_col BLOB, …, INDEX(blob_col(10)));
- To list all indexes on table:
  - SHOW INDEXES ~~ON~~ FROM table;
- To drop an index:
  - DROP INDEX idx_name ON table;
- When table is dropped, all indexes are automatically dropped.
- Indexes should not be created on the columns not used frequent search, ordering or grouping operations.
- Columns in join operation should be indexed for better performance.

Query performance

- Few RDBMS features ensure better query performance.
  - Index speed up execution of SELECT queries (search operations).
  - Correlated sub-queries execute faster.
- Query performance can observed using EXPLAIN statement.
  - EXPLAIN FORMAT=JSON SELECT …;
- EXPLAIN statement shows
  - Query cost (Lower is the cost, faster is the query execution).
  - Execution plan (Algorithm used to execute query e.g. loop, semi-join, materialization, etc).
- Optimizations can be enabled or disabled by optimizer_switch system variable.
  - SELECT @@optimizer_switch;
  - SET @@optimizer_switch='materialization=off';

Constraints → DDL → Integrity/Validity of data.

- Constraints are restrictions imposed on columns. → restricts values to be added in the column.
- There are five constraints
  - NOT NULL ✓ → Col
  - UNIQUE ✓ → Col, Tbl
  - PRIMARY KEY ✓ → Col, Tbl
  - FOREIGN KEY ✓ → Col, Tbl
  - CHECK ✓ → Col, Tbl

given while creating table.

OR

given later using ALTER TABLE.

- Few constraints can be applied at either column level or table level. Few constraints can be applied on both.
- Optionally constraint names can be mentioned while creating the constraint. If not given, it is auto-generated.
- Each DML operation check the constraints before manipulating the values. If any constraint is violated, error is raised. → slower.

Constraints

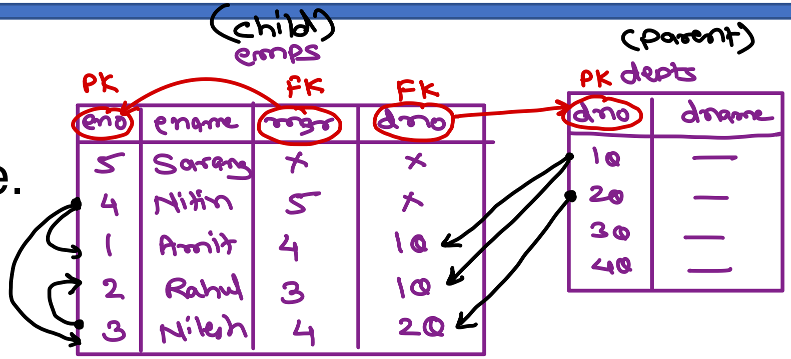
- NOT NULL
  - NULL values are not allowed.
  - Can be applied at column level only.
  - CREATE TABLE table(c1 TYPE NOT NULL, …);
- UNIQUE
  - Duplicate values are not allowed.
  - NULL values are allowed.
  - Not applicable for TEXT and BLOB.
  - UNIQUE can be applied on one or more columns.
  - Internally creates unique index on the column (fast searching).
  - Can be applied at column level or table level.
    - CREATE TABLE table(c1 TYPE UNIQUE, …);
    - CREATE TABLE table(c1 TYPE, …, UNIQUE(c1));
    - CREATE TABLE table(c1 TYPE, …, CONSTRAINT constraint_name UNIQUE(c1));

Constraints

- PRIMARY KEY
  - Column or set of columns that uniquely identifies a row.
  - Only one primary key is allowed for a table.
  - Primary key column cannot have duplicate or NULL values.
  - Internally index is created on PK column. → Primary Index (clustered)
  - TEXT/BLOB cannot be primary key.
  - If no obvious choice available for PK, composite or surrogate PK can be created.
  - Creating PK for a table is a good practice.
  - PK can be created at table level or column level.
  - CREATE TABLE table(c1 TYPE PRIMARY KEY, …);
  - CREATE TABLE table(c1 TYPE, …, PRIMARY KEY(c1));
  - CREATE TABLE table(c1 TYPE, …, CONSTRAINT constraint_name PRIMARY KEY(c1));
  - CREATE TABLE table(c1 TYPE, c2 TYPE, …, PRIMARY KEY(c1, c2));

Constraints

- FOREIGN KEY
  - Column or set of columns that references a column of some table.
  - If column belongs to the same table, it is "self referencing".
  - Foreign key constraint is specified on child table column.
  - FK can have duplicate values as well as null values.
  - FK constraint is applied on column of child table (not on parent table).
  - Child rows cannot be deleted, until parent rows are deleted.
  - MySQL have ON DELETE CASCADE clause to ensure that child rows are automatically deleted, when parent row is deleted. ON UPDATE CASCADE clause does same for UPDATE operation.
  - By default foreign key checks are enabled. They can be disabled by
    - SET @@foreign_key_checks = 0;
  - FK constraint can be applied on table level as well as column level.
  - CREATE TABLE child(c1 TYPE, …, FOREIGN KEY (c1) REFERENCES parent(col))



eno	ename	mgr	dno
5	Sarang	x	x
4	Nitin	5	x
1	Amit	4	10
2	Rahul	3	10
3	Nilesh	4	20

dno	dname
10	—
20	—
30	—
40	—

SUNBEAM

Thank you!

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