Selected Topics - Part I - Database Index

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Outline

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Reminder: Project Demo and Presentation

Are you ready for project demo and presentation?

Outline

Selected Topics

To discuss

- ▶ Database index
- ▶ ACID and transactions
- ▶ Introduction to database in programming environment

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Database Index: Concept

A database index is a data structure created on one or more attributes that make search efficient

- ▶ i.e., it is to make it efficient to find those tuples that have a fixed values for those attributes.

Database Index: Motivation

An analogy: binary search vs. sequential search

Observe this query

```
SELECT *
FROM Students
WHERE birthdate >= '1980-01-01';
```

Without any additional data structure, we must sequentially search all the tuples for name and phone.

Database Index: Index Type

Index type: data structures

- ▶ MariaDB index data structure
- ▶ PostgreSQL index data structure

Declaring Index

To declare an index, use

CREATE INDEX <index_name> ON <relation(list of attributes)>

Declaring Index: Examples

Example 1. Create an index on `birthdate` of Students

  CREATE INDEX BirthDateIndex **ON** Students(birthdate);

Example 2. Create an index on `phone` of Students

  CREATE INDEX PhoneIndex **ON** Students(phone);

Example 3. Create an index on `name`, `phone` of Students

  CREATE INDEX NamePhoneIndex **ON** Students(name, phone);

Discussion Questions

▶ What kind of queries can be made more efficient by having an approriate index?

▶ What kind of queries can become slower by having an index?

Selection of Index

Choosing which indexes to create requires the database designer to analyze a trade-off

- ▶ Benefit. The existence of an index on an attribute
  - ▶ may speed up greatly the execution of those queries in which a value, or range of values, is specified for that attribute
  - ▶ may seepd up greatly jonis involving that attribute as well.
- ▶ Cost.
  - ▶ Every index built for one or more attributes of some relation makes insertions, deletions, and updates to that relation more complex and time consuming.

Continue to explore this on your own or in a future database class.

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Questions and Summary

▶ A brief introduction to database index