Chapter 11: Indexing

Edited by Radhika Sukapuram

Database System Concepts, 7th Ed.

Basic Concepts

- Indexing mechanisms are used to speed up access to desired data.
  - E.g. index at the back of a book
  - Query: “Find all instructors in the Physics department”
    - Instead of reading every tuple to check if *dept_name* is Physics, the system must be able to locate the record directly
  - Create additional structures that we associate with files
- **Search Key** - attribute or set of attributes used to look up records in a file [Different from primary/candidate/super key]
- An **index file** consists of records (called **index entries**) of the form

search-key	pointer

- Index files are typically much smaller than the original file

Basic types of indices

- Two basic kinds of indices:
  - **Ordered indices:** search keys are stored in sorted order
  - **Hash indices:** search keys are distributed uniformly across "buckets" using a "hash function".

Index Evaluation Metrics

- Access types are supported efficiently.
  - Finding records with a specified value in the attribute
  - Finding records with an attribute value falling in a specified range of values.
  - Etc.
- Access time
- Insertion time
  - Time to insert data item
  - Time to update index structure
- Deletion time
  - Time to delete data item
  - Time to update index structure
- Space occupied by the index structure

Ordered Indices

- **Ordered index**: index entries are stored based on a sorted ordering of the search key values.
  - E.g., author catalog in library.
  - **Clustering index:** in a sequentially ordered file, the index whose search key specifies the sequential order of the file.
    - Also called **primary index**
    - The search key of a clustering index is usually (but not necessarily) the primary key.
  - **Non-clustering index**: an index whose search key specifies an order different from the sequential order of the file. Also called **secondary index.**
- Two types of ordered indices: **dense** and **sparse**.