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(13) Database Indexes / System Design Fundamentals

Q) What are indexes and why do we need them?

A) Indexes help us in proper searching and faster retrival of data by efficiently grouping and storing data.

Lets take for example:

A Read from a Database

UserId	UserName	DOB	Profession	Region
1	xyz	"	Guitarist	India
2	abc	"	Fashion Designer	Belgium
3	wyz	"	Software Engineer	USA
4	new	"	Lawyer	Canada

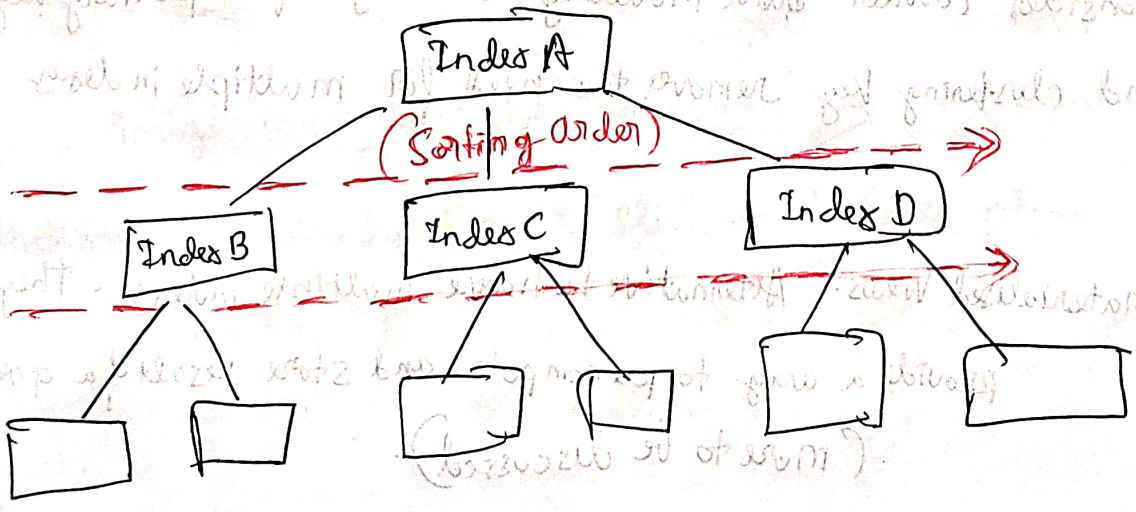
Now if someone does a query that finds the user that has (Profession = Software Engineer) and (Region = USA)

in that case what happens, is ~~that~~ that it will search all the rows one by one until it gets the match.

O(N) operation.

Imagine an index is created on (Profession, Region) Column.

It basically will try to create a b-tree and ~~mark it~~ ~~has~~ has value = (Profession + Region) mix



Q) Shall we create index on every column of the table then?

A)

Indexes are additional data structures that databases use to speed up query operations. An index is typically a smaller, more manageable subset of data that references the main table data.

Indexes speed up read operations, by allowing quick lookups, But introduce significant overhead on write operations, because all the index tables which have been created by replica have to be ~~recreated as well~~, ~~was~~ modified as well.

Hence only create indexes on columns frequently used.

Consider Correct Data Modeling correctly. After primary key and clustering key removes the need for multiple indexes

Materialised Views: Alternative to have multiple indexes. They provide a way to precompute and store result of a query (more to be discussed).