CS422 Principles of Database Systems
Introduction to Query Tuning

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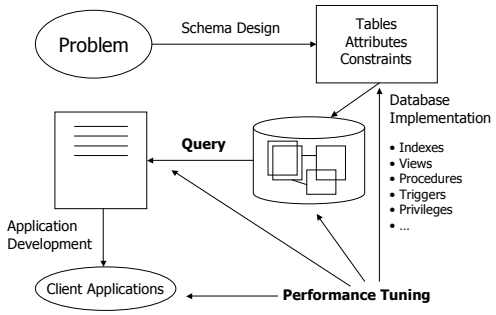
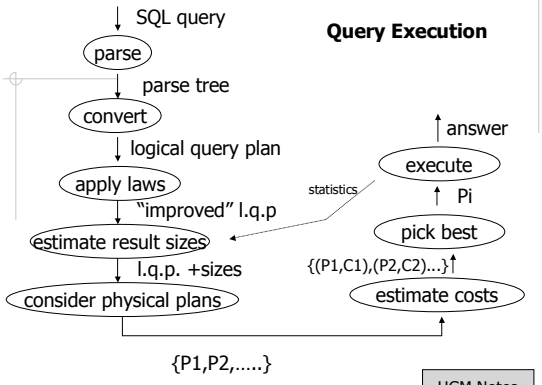
Performance Tuning





Query Tuning

- Identify the SQL statement that need to be tuned
- Find out the current execution plan
- Find a better execution plan
- Tell the DBMS to use the better plan

About Query Tuning

Tuning rests on a foundation of informed common sense. This makes it both easy and hard.

Dennis Shasha and Philippe Bonnet
Database Tuning: Principles, Experiements and Troubleshooting Techniques

So What are the Biggest "Common Sense" in DB?

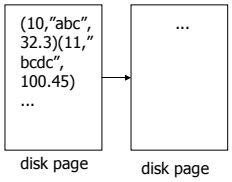
- ??

Tables – Heap File

table

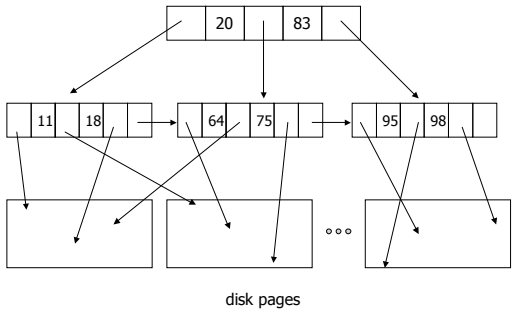
A1	A2	A3
10	"abc"	32.3
11	"bcdc"	100.45
...	...	...

heap file



- by tuple
- unordered – low update cost

Indexes – B+-tree (dense)



Clustered vs. Non-clustered

- Clustered (primary) index
  - Tuples are clustered by the indexed attribute(s)
- Non-clustered (secondary) index
- "*Cluster*" has a different meaning in Oracle – store attributes from different tables in the same disk block

Composite Index

- Composite index – an index which involves multiple attributes

View Query Plans

- EXPLAIN PLAN
- SET AUTOTRACE ON/OFF
- More detailed information
  - TIMED_STATISTICS
  - SQL_TRACE

Control Query Plans – RBO or CBO?

- Rule-based Optimizer (RBO)
  - Perform well in most cases
  - Produce robust query plans
  - Code-freeze since Oracle 7
    - No improvement in the future
    - Cannot handle new object types
- Cost-based Optimizer (CBO)
  - More statistics about the data, better query plan
  - Keep improving
  - Produce bad plans if the statistics are not up-to-date

Control Query Plans – Using Optimizer Hints

- Hints are special comments that pass instructions to the query optimizer
- Hints syntax:

{DELETE|INSERT|SELECT|UPDATE} **/*+** hint [text] [hint[text]]... ***/**

or

{DELETE|INSERT|SELECT|UPDATE} **--+** hint [text] [hint[text]]...

Common Optimizer Hints

- Access path
  - INDEX(table_name index_name)
  - FULL(table_name)
- Join order
  - ORDERED
  - LEADING (table_name table_name …)
- Join method
  - USE_NL, USE_MERGE, USE_HASH

Further Readings

- Oracle Database Performance Tuning Guide
- SQL Tuning by Dan Tow
- Database Tuning by Denise Shasha and and Philippe Bonnet
- Expert One-on-One – Oracle by Thomas Kyte

About FINAL

- Topics that will be covered
  - SQL
  - PL/SQL (stored procedures and triggers)
  - OO features
  - JDBC
- Topics that may be covered in extra credit problems
  - ORM and hibernate
  - SQLJ
- Topics that won't be covered
  - SQL tuning