Query execution plan (aka. query plan)

Retrieving plan

used symbols: (*) - executes the SQL statement, so you can see exactly how long it takes

textually:

e.g.: select * from table1;

```
P       EXPLAIN [ANALYZE]                       <SQL query>;      - "ANALYZE" - (*)
 M      EXPLAIN [ANALYZE] [FORMAT = TREE]       <SQL query>;      - "ANALYZE" - (*)
   L    EXPLAIN QUERY PLAN                      <SQL query>;

  O     EXPLAIN          PLAN FOR               <SQL query>;
  O     SELECT * FROM TABLE(DBMS_XPLAN.DISPLAY);

   S    SET {SHOWPLAN_ALL | STATISTICS PROFILE} ON;       - "STATISTICS PROFILE" - (*)
   S    <SQL query>;
```

graphically:

PMOS can be done in the main DBMS client program (pgAdmin, MySQL Workbench, Oracle SQL Developer, SQL Server Management Studio) (PS: (*) as an option)

Possible operations in the explain plan

they are described at use-the-index-luke.com/sql/explain-plan

Optimizers

- CBO (cost based optimizer) - requires statistics (e.g. a histogram of the distribution of a table column values)
  PMOS: uses CBO only, statistics used by CBO are automatically collected and updated
  L: uses CBO, but statistics used by CBO aren't automatically collected nor updated. So, run:
  - "ANALYZE [database1|table1|index1]" to collect all statistics [for a given object], and/or
  - "PRAGMA analysis_limit=400; PRAGMA optimize;" prior to closing each database connection, to incrementally update statistics if it is needed.

  See sqlite.org/lang_analyze.html for details.
- RBO (rule based optimizer) – not used in PMOS

If the data has changed a lot and you want to update the statistics for CBO sooner, then you can do it manually:

```
P       ANALYZE          [table1 [(col1 [,...])] [,...]]  - def. the whole database; locks table1 with a read lock
 M      ANALYZE TABLE    table1                  [,...]   -                           locks table1 with a read lock
  O     DBMS_STATS.{GATHER|DELETE}_{DATABASE|SCHEMA|TABLE|INDEX}_STATS(...) - see the documentation
   S    UPDATE STATISTICS ...                                                - see the documentation
    L   ANALYZE [database1|table1|index1]        - def. all attached databases
```