QUERY OPTIMIZATION – CULTURAL FACILITIES

ASSIGNMENT GOALS

Analyse several SQL execution plans in a test database. Assess the impact of indexes and statistics and the use of different strategies for query organization.

WORK GROUP

The assignment is meant for group work. The group size should stay between one and three elements.

SITUATION

The facilities where cultural activities take place are characterized by a name and a capacity, are of a certain room type and are located in an address in a municipality. An id number has been attributed, for identification purposes. The type is represented by a number with an associated description (theatre, cinema, …).

A municipality is described by an official code and a designation and are located in a district and in a region. The need to indicate the region of the municipality is due to the fact that some districts include municipalities from more than one region. The districts have also official codes and designation. There is also a region attribute, with the region code, for the cases of the districts completely integrated in a region. In the cases that some municipalities of a district are in a region and others in another, the attribute region is null. The regions also have a code and a designation, plus the attribute NUT1, which may be Continente, Açores or Madeira.

The activities take place in the cultural facilities. The recorded activity categories are cinema, circus, dance, music, bullfights and theatre. We have chosen to use these designations for the ref attribute and to repeat them in the attribute activity of the activities table. As in each place there may be activities of more than one category, each row in the Uses table indicates the id of the place and an activity occurring there.
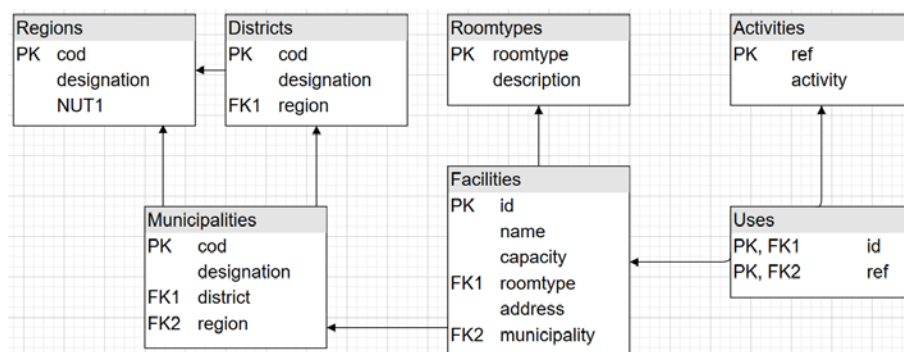

Figure 1 Database model for the Cultural Facilities case.

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DATA

The tables of this database are available in the user GTD8 in the Oracle server (connection: BD, user: <user>, password: <pass>, host: oraalu.fe.up.pt, port: 1521, SID: ALU). The tables should be copied three times, with prefixes "x", "y" and "z" (xregions, yregions, zregions, …). The goal is to create three experimentation environments:

X – no indexes and no integrity constraints.

Y – with the standard integrity constraints (primary keys and foreign keys).

Z – with the standard integrity constraints and the extra indexes you may find convenient; you must justify the creation of each extra index; consider testing different kinds of indexes and file organizations.

METHOD

0) Start with the justification of the constraints (Y) and the extra indexes (Z).

With respect to each questions below, you need to write:

1) the SQL query;

2) the answer;

3) the three execution plans in the three environments, their analysis and of the corresponding estimated effort;

4) if the execution time is measurable, a comparison of the execution times in the three environments.

QUESTIONS

1. Selection and join.

   Which are the facilities where the room type description contains 'touros' and have 'teatro' as one of their activities? Show the id, name, description and activity.

2. Aggregation

   How many facilities with 'touros' in the room type description are there in each region?

3. Negation

   How many municipalities do not have any facility with an activity of 'cinema'?

   a. Use not in.

   b. Use external join and is null.

4. Which is the municipality with more facilities engaged in each of the six kinds of activities? Show the activity, the municipality name and the corresponding number of facilities.

5. Compare the execution plans (just the Z environment) for the query giving the municipality designation, the facility name, and the room type description, where the room type of the facility includes 'touros' and the municipality is part of the Porto district.

   a. With a B-tree index on the roomtype and municipality columns of the facilities table;

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    b. With a bitmap index on the roomtype and municipality columns of the facilities table.

6. Which are the codes and designations of the districts with facilities in all the municipalities?