Towards Robust Energy Efficient Query Execution Plans

Keywords: Query optimization, Energy efficiency, cost model

Problem: Designing an energy efficient DBMS is gaining importance for a variety of reasons: minimizing the carbon footprint, reducing the cost of running the infrastructure in data centres, and for computation done on low-power devices like laptops and mobile applications. Traditionally, the query optimizer of a DBMS optimizes the execution plans for performance. But the fastest query is not necessarily the most energy efficient. Recently there has been a substantial research work for designing a query optimizer that optimizes the plans for energy efficiency [1,2].

However, all these optimization models assume that the estimates done inside the query optimizer (e.g. cardinality estimation) are accurate. But in practice, a lot of mistakes creep into the cardinality and cost calculations of the optimizer.

This project studies the impact of cardinality mis-estimations on the energy consumption of the plan. Based on the observations, an algorithm/strategy needs to be proposed that minimizes the impact of bad plan choices on the energy consumption. The plan selection algorithm thus needs to select a robust energy efficient plan instead of one that minimizes the energy consumption.

Project: The goal of this project is initially to understand the impact of cardinality mis-estimations on the energy consumption of the query plan and subsequently the design and implementation of a novel algorithm/strategy which will minimize tackle the problems recognized.

Plan:
1. Study the impact of cardinality estimation errors done by PostgreSQL optimizer on the quality of the query plan chosen in terms of energy efficiency.
2. Design and implement a novel algorithm/strategy to find robust energy efficient query execution plans.
3. Using empirical evaluation, show the effectiveness of the algorithm proposed.

Supervisor: Prof. Anastasia Ailamaki, anastasia.ailamaki@epfl.ch

Responsible collaborator(s): Ramachandra Satyanarayana Valluri (satya.valluri@epfl.ch)
Appuswamy Raja (raja.appuswamy@epfl.ch)
Olma Matthaios Alexandros (matthaios.olma@epfl.ch)

Duration: One Semester
References:


