An efficient query result caching using dynamic data cache

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Abstract— Re-using the results of previously computed queries with the help of cached queries result is one of the most important query optimization techniques. Query result caching is a technique that can drastically improve the performance of any database application. Due to query result caching multiple read operations for the same result is avoided. Caching is a popular technique for reducing both server load and user response time. Backend database system most of the times suffer from the performance impediment when running applications. The need for speed is increasing rapidly so we must be able to handle large amount of data in small time units like seconds or even milliseconds. The main problem that affects this to be fulfilled is the intensive usage of database through unnecessary, repetitive calls. A common approach to scale the database component is query result caching. Client directs its database requests to a dynamic data cache, rather than the backend database management system. A solution for our performance problem and in gaining more speed in our application is to cache query results so that it can be helpful in obtaining dynamic content.

Keywords— dynamic data cache, database system, queries, query result caching, query processing

1. INTRODUCTION

The cache as a component improves performance by storing data such that future requests for that data can be served faster. The data that is stored within a cache might be query results that have been computed earlier. If requested data is contained in the cache it means if it is cache hit, that request can be served by simply reading the cache, which is comparably faster. Caching query results is one of the most crucial mechanisms to cope with a demanding load.

It is obvious that the cached query results will provide very high performance benefits over results that are not cached. A key to achieving high performance and scalability in client-server database systems is to effectively carry out query result caching. When there is a high probability of queries being repetitive in use, query result caching will provide better performance. Instead of wasting time in re-evaluating the query, the database can directly fetch the results from already stored cache. The most obvious benefit of query result caching can be seen in systems where data retrieval rate is very high when compared to data manipulation. Hence database i.e. data store get modified after the long periodic intervals. During these intervals if a particular query is fired 100 times then the result of the query is calculated only once that is for the first time and 99 times the stored result is reused. Data Manipulation can invalidate the cache results because the inserted or updated or deleted data can bring the difference between the cached results and the actual results. Hence regeneration of the cached results will be required to restore the results back again to the useful state. If data manipulation rate is not low, database system will have to spend a considerable amount of time in bringing the invalidated results once again into a valid state, thus forfeiting the advantage of using this technique. Data Warehousing Systems, Decision Support Systems, are very good examples of database systems where query result caching can be optimally used because data manipulation will be very low.

Caching queries and reusing results of previously computed queries is one important query optimization technique. Search engines receive wide number of queries per day, and for each query, return a result page to the user who submitted the query. The user may request additional result pages for the same query, submit a new query, or quit searching altogether. Thus an efficient mechanism for caching query may enable search engines to lower their response time in obtaining the result pages. Also in web services communities systems that access distributed web services providers, an efficient query
processing requires an advanced caching mechanism to reduce the query response time.

Caching query result is a technique that can drastically improve the performance of any database application. Due to caching multiple read operations for the same query results are avoided. Caching the query results is a popular technique for reducing both server load and user response time in client server database systems. Caching queries is critical for improving the performance of many client server database systems. In order for an application to benefit from caching, it must repeatedly use data which is expensive to retrieve.

2. ANALYSIS OF PROBLEM

One of the major cost factors is query processing in operating large web search engines databases. In this paper, we study query result caching, one of the main techniques used to optimize query processing performance. Web search engines and large scale information retrieval systems need to cache query results for efficiency and to reduce query workload purposes. Most of the applications fail to be efficient due to a large number of unnecessary database calls, communication between the application itself and the database server, retrieving and loading the results for same request from server. For example, when a particular query is fired then application initiates database call for loading the results. If the requested result is accessed multiple times and by multiple users the number of database calls is increasing rapidly from few to hundreds or even thousands this depends mainly how dynamic is the data. This repetitive and unnecessary access makes the application either to respond harder or to freeze and/or fail until receives a response from server. There are many techniques, strategies and solutions for tuning an application such as caching. The demand and usage of web application are increasing exponentially. Generally, these web applications are dynamic in nature. These applications retrieve the data from databases based on user's requests. The high demand servers receive thousands of requests in a second. This overloads the database and degrades the overall performance of the web applications. The proposed work mainly focuses on caching the query results and its advantages.

3. IMPLEMENTATION METHODOLOGY

The approach is to cache the queries, if same query is requested in future its result can be reused and will improve the performance of application. It will consist of techniques for query matching, consistency maintenance, and cache replacement to achieve the desired efficiency. To increase the speed in delivering dynamic web pages, database query result caching is useful. The proposed work will be implemented in such a way that it will receive SQL queries and will determine if they can be satisfied from dynamic data cache. Dynamic data cache will maintain previous query results. The main issue will be in retaining data consistency. The cache replacement component of dynamic data cache will consist of a replacement policy, which determines which cached query to replace, and a replacement mechanism, that determines how to replace cached query so that data consistency will be maintained.

Dynamic caching of query results is more complex than caching static results, because the cached query entries may become invalid as a result of database writes. Dynamic data cache maintains previous query results. When a query result is requested from an application, first it is searched inside the cache and if found result is returned to the client, otherwise is loaded from database, cached and returned to the client. When an update, delete or insert query is received the cache will remove all cached query entries dependent on the affected tables. So that if next time query is fired related to that tables user will get right results. Objective of proposed work is to reduce query processing load, to result in users receiving query result faster using caching and to reduce load on backend database management system.

4. IMPLICATION

Query result caching allows reuse of answers to previous queries, so reducing the delivery time of answers and the traffic. Query processing and optimization is a fundamental part of any database management system. To be utilized effectively, the results of queries must be available in the time period needed by the user be it a person, robotic, assembly machine or even another distinct and separate database management system. So optimizing the query by caching query results will decrease the query workload of the backend database system by serving a large part of the queries at the dynamic data cache. This reduces average response time when the backend server is experiencing high load. It offloads backend database system and provides better client response time.

5. CONCLUSION

The primary goal of the database system is to provide the user a convenient and efficient access to the query related data. This paper presents a cache solution to improve querying. Our proposal saves computation time since it maximizes query result
caching. In order to improve the efficiency of query processing in the client server environment it can be enhanced using the query result caching. In this paper, we have mentioned query result caching mechanism also we have concentrated with an approach for primary goal of database that is to provide user a convenient and efficient way to access the required data. This can be achieved by proper and best processing of query.

6. REFERENCES


