

Effective Cache Management in Mobile Computing Environment

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ABSTRACT: Mobile computing is one of the main emerging technologies in modern era. Mobile computing allows for data transmission, audio and video through a computer or any kind of wireless equipment without connecting to a fixed physical line. Most major problems in mobile computing cache management are data availability, high bandwidth consumption, data access delay and packet loss, failures in database servers and data server workload are recent issues in mobile computing cache. Recent researches are highlights above drawbacks are occurred due to some failures in cache consistency algorithms, cache replacement algorithms, cache discovery algorithms and cache admission control. At present there are plenty of research are conducted with relate to the cache management in mobile computing. As a result of that so many approaches, mechanisms and algorithms are proposed to enhance the cache management in mobile computing but the above mentioned issues are still exist.

Keywords: Cache management, Cache invalidations, Cache replacements, Cache consistency and Data management.

I. INTRODUCTION

Caching plays a major role in modern mobile computing and its frequently accessed data objects at the local buffer of a mobile environment is an efficient way to reduce query delay and save bandwidth which increase the system performance. Mobile computing platform can be easily described as the client-server paradigm. Mobile infrastructure has enabled to start of new mobile applications that square measure starting from uncomplicated ones to several vendable group actions. Based on both business and technology views, data management that may bear simple knowledge access from and to mobile devices is amongst the main issues in mobile data systems.

Appropriate to mobile behavior, it's laborious to use the nowadays offered info to the data management technology that's helps to use the databases on mobile computing. Database has used very advanced, innovative technology and therefore this database environment is challenging and complex. Saxena, Rosini [1] has evaluated the challenges of data management, such as,

- Data can be obtainable from anyplace independent of the provision of the fastened network association
- Databases on each mobile and glued hosts area unit shareable in seamless manner

This paper highlights the different impact that mobile computing had in the area of data management and therefore mainly focused on recent issues and discussed about the several related areas. Further, Existing cache management approaches are not suitable for modern mobile environments because of disconnection and mobility of the mobile clients.

II. LITERATURE REVIEW

Figure one (1) show the architecture for mobile environment. It's consisting with multiple entities such as, mobile units and fixed hosts (Mobile Support System – MSS). MSS has improved the wireless interface to converse through the mobile units called cell. This cell will be a locality of cellular communication network or a wireless native space network among the realm of building. Within the cellular communication network the bandwidth are going to be restricted. On this structure, all units might be tied with the wireless interface. These units are offerings for which cellular customers are client, because of cell property purchaser can alternate the area as well as the network connection. When converting the region it is vital for /cellular host to preserve the relationship. For this it'll take a guide of fixed host /desk bound host with the wireless verbal exchange abilities so that database .It allows cell database to maintain replace its records. Even as conversation, it isn't always vital that mobile host and database host should be linked with the equal network. Communication can be completed at irregular durations and for terribly brief span of time.

Further, at the same time as the use of the mobile gadgets for storing the database its miles very hard to decide which a part of the information may be saved in to the tool and which element is needed to be replaced. Keeping the connectivity is also a big trouble in mobile computing which may be intentional or unintentional. Chakravorty, Usha [3] has suggests some features for mobile computing systems which makes them more unique, such as,

- Skewness in the communications
- Ubiquitous disconnections
- Power limitations
- Screen size

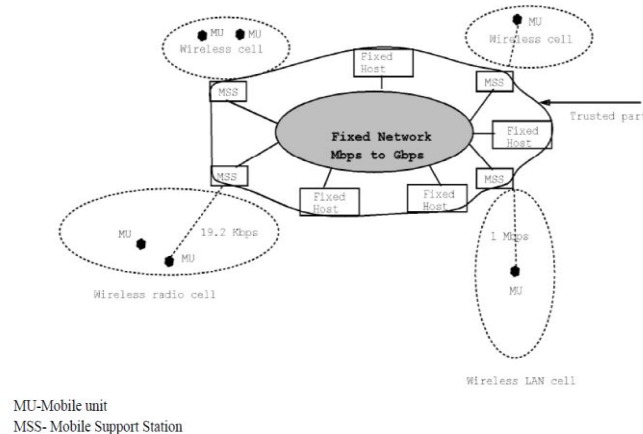


Figure (1) Mobile architecture

Mobile Computing environments square measure typically famed as slow wireless links and relatively disadvantaged hosts with restricted battery powers, square measure liable to recurrent disconnections. High Bandwidth consumption, data access delay and packet loss is a major issue in cache of mobile computing environment as stated in above. Cache replacement, Cache consistency and Cache invalidation are the most major and advanced approaches when discuss about the cache in mobile computing.

Due to frequent disconnections and mobility of mobile users, marinating the cache consistency is very tough task. Number of cache consistency schemes and algorithms are proposed for mobile computing environment. Saxena, Rosini [1] stated, primary objective of these schemes and algorithms are to ensure valid data object in the cache to reduce the overhead due to consistency maintenance and to enhance the availability. A proper mechanism should implement to perform caching effectively for frequently accessed data objects at the local buffer in order to increase the efficiency. Further, cache consistency algorithm is depending on two properties [1],

- State full where server will be unaware of cache content of mobile users
- Stateless approaches are scalable

Data objects in the database server are cached to enhance the transaction throughput. It's should be a primary concern to invalidate it accordingly in order to ensure the data consistency. If it's a proper system cache invalidation strategies should permit user to re-establish the cache state from invalid to valid and cache invalidate algorithms should consider the bandwidth and limited the resources. It's a must to implement an effective cache invalidation strategy or algorithm that ensures the consistency between the cached data in mobile clients and the original set of data stored in the database server. There are basic ways of designing invalidation strategies [1], such as,

- Invalidation with state full server
- Validation of cache data by mobile client
- Invalidation with stateless server

Cache replacement algorithms are provides the mechanism to find the group of items from the cache which are more suitable. Existing cache replacement algorithms are based on the last access time, entry time and expiration time of the particular item which is located in the cache, hit ratio and several factors, but there are several algorithms for cache replacement which are designed by using context of operating system virtual memory management and database buffer management [1]. There are several caching strategies such as,

- Broadcast primarily based strategy wherever mobile nodes broadcast the request to search out the mobile nodes that reply the response with requested document.
- Information or location based strategy wherever mobile nodes can exchange or store the knowledge regarding the placement wherever data is accessible.

- Role primarily based strategy relies on the cluster. Cluster is going to be making on the bottom of practicality of the node.
- In the directed request strategy consumer can send a request directly to the server and the expected reply should be in similar method.

Further there are many algorithms for cache replacement, such as,

- Least Recently Used (LRU)
- Least Recently Used – K (LRU – K)
- Cost based algorithm
- Predicted Region Based Replacement Policy (PRRP)
- Prioritized Predicted Based Cache Replacement Policy (PPRRP)
- Furthest Away Replacement (FAR)

III. RELATED WORKS

There are few approaches which have been taken to overcome the cache management issues which are occurred during recent past.

- Anandharaj, Anitha [4] has projected an inspiration by combining cache placement algorithmic rule, cache discovery algorithmic rule, cache consistency algorithmic rule and cache replacement algorithmic rule.
- Vakali [6] has bestowed a study of applying a history primarily based approach to the Web-based proxy cache replacement method. Trace-driven simulation was utilized to gauge and inquiries into the performance of the projected cache replacement techniques.
- Cao [7] has addressed associate UIR-based approach. In his approach, a tiny low fraction of the essential data (called Updated annulment Report (UIR)) associated with cache annulment is replicated many times inside associate IR interval and thence the shopper will answer a question while not waiting till ensuing IR. However, if there's a cache miss, the shopper still has to watch for the information to be delivered.
- Tang et al. [8] have targeted on developing economical caching techniques in ad-hoc networks with memory limitations.

IV. FUTURE WORKS

Very deep research needs to be conduct to identify more issues with relevant to the proposed topic and should come up with an innovative solution to overcome the existing issue by considering several facts that should address when developing a new approach for the mobile cache management, such as,

- The cache discovery algorithmic program that's accustomed with efficiency discovers, choose and deliver the requested information things from neighboring nodes.
- Cache admission control-this is to make your mind up on what information things are cached to boost the performance of the caching system.
- The cache consistency algorithmic program that ensures that updates square measure propagated to the copies elsewhere and no stale information things square measure gift.
- The style of cache replacement algorithm-when the cache area is adequate for storing one new item, the shopper places the item within the cache. Otherwise, the chance of exchange alternative cached things with the new item is taken into account.

Further a proper mechanism should proposed and implement by combining all the caching techniques such as cache consistency, cache invalidation, cache discovery, cache replacement algorithms to overcome the identified issues. This will become a challengeable task to overcome because the technology is changing rapidly in every single second, therefore whatever the mechanism that going to implement is should be very effective and stable for longer period of time and should adapt to the changes in technology.

V. CONCLUSION

Cache management in mobile computing environment is really challengeable and it includes cache consistency, cache invalidation and cache replacement. Cache management is a must in this kind of platform because, it will create less severe the performance and handiness limitations of weakly connected and disconnected operations. Author has identified major issues in mobile computing environment cache management, such as, high bandwidth consumption, data access delay, failures in database servers, effect of node mobility. Ordinary cache management techniques are not suitable for the mobile computing environment due to many reasons, such as, disconnection and the mobility of the IEEE mobile clients. There are few proposed architectures, algorithms and approaches to overcome the above issues but due to the rapid growth of the technology those concepts are not efficient in order to provide a better, stable and effective cache management in mobile computing environment.

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