

Review of Cache Management Issues in Mobile Computing Environment

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Abstract

Mobile computing is an innovative technology which enables us to access information, anytime and anywhere. Newly, there has been lots of research area is into mobile computing. Caching techniques reduce bandwidth utilization and data access delay. In this paper, we have discussed about dissimilar impact that mobile computing has had in the area of data management. In wireless communication the data accessibility is the most imperative problem, so we have listening carefully on the problem of data availability and discussed about replicating mobile databases.

Keywords - Cache Consistency, Cache Invalidation, Cache Management, Cache Replacement, Data Management.

I. INTRODUCTION

Mobile infrastructure has enabled to commence of new mobile applications which are ranging from uncomplicated ones to many saleable transaction. From business and technology perspectives, data management knowledge that can bear easy data access from and to mobile devices is amongst the main concerns in mobile information systems. Appropriate to mobile behavior, it is hard to employ the at present available database solutions since most of them had developed for the use on the fixed network surroundings. Mobile database is accepted terminology which is having the accredited to the data management Technology that help to help to the use of databases on the mobile computing environment. This database is more superior and demanding. The major challenges of the data management which are given below with a help of mobile-devices, users can store a part of record and use it while being mobile. When a mobile user requirements data which is not available locally, he can raise the request of for activating of the wireless communication of his device and instigate connection to the network via the closest mobile support station (MSS).

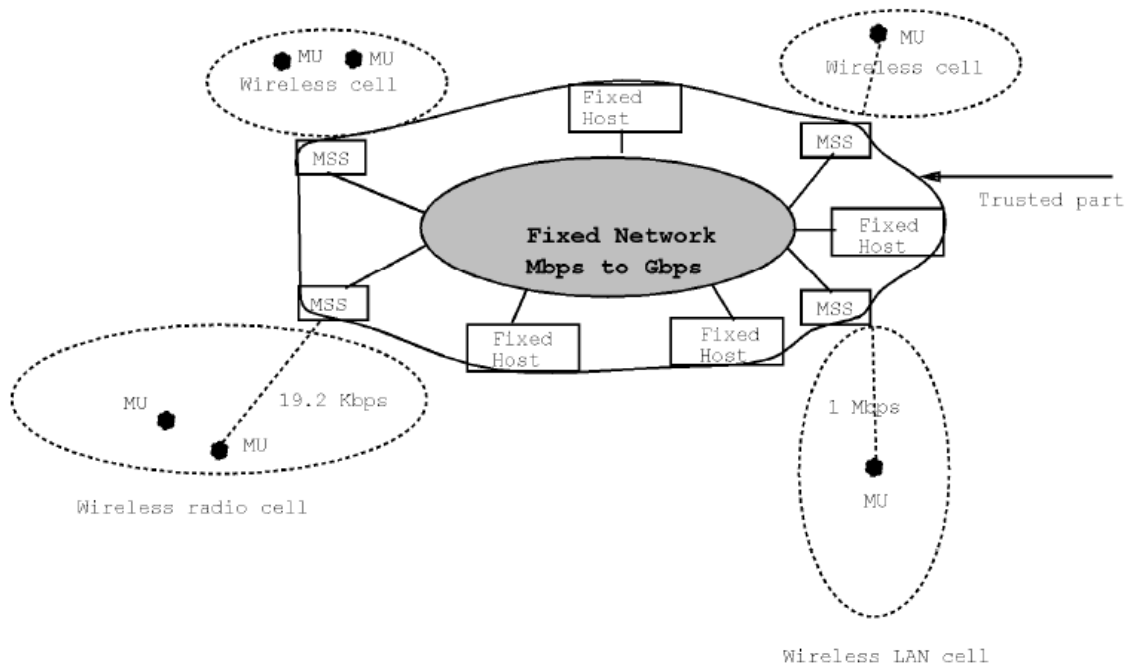
Once it is associated, he can access the data from the data base which can be an ingredient of distributed database. Mobile users can practically

access any data, anywhere and anytime, even in the deficiency of fixed network connection. In mobile information systems, databases exhausted on both mobile and fixed hosts which is forming a disseminated database system. There are many techniques are existing which use for data allocation in distributed databases. They are more complex than that algorithm which obtainable for centralized databases. In a mobile environment, use of wireless network which is known to be prone of regular disconnections and the period of disconnection is also impulsive.

II. MOBILE ARCHITECTURE

The architecture of the mobile environment is given in Fig 1. Mobile Environment consists of two different sets of entities that are mobile units and fixed hosts. These fixed hosts are called Mobile Support System (MSS). This Mobile Support System are improved the wireless interface to converse through the mobile units known as cell. This cell can be a part of cellular communication network or a wireless local area network within the area of building. In the Cellular Communication Network the bandwidth will be restricted. It Supports data rates from 10 to 20 Kbits/sec. In the Wireless network the bandwidth is much wider up to 10 Mb/sec. Fixed hosts will communicate with the fixed network, while mobile units will communicate with other hosts via wireless channel.

In this architecture, all units will be attached with the wireless interface. This unit is on condition that the military for which mobile users are client. Due to transportable property client can change the location as well as the network connection. While changing the location it is compulsory for or mobile Host to preserve the connection. For this it will take fixed host or stationary host with the wireless communication abilities which will be provided by Mobility support System (MSS). In a cell, each MSS will communicate with all its mobile Hosts. At any summit Mobile host can communicate with only those MSS which is answerable for that area. Movement of a MH (Mobile Host) from one cell to another.



MU-Mobile unit
 MSS- Mobile Support Station

Fig 1. A Mobile Computing Environment

The mobile database will trade the information with host database. It helps mobile database to remain modernize its information. While communication, it is not required that mobile host and database host should be related with the same network. Communication can be done at unbalanced intervals and for very short span of time. While using the transportable devices for storing the database it is very tricky to decide which part of the data can be store in to the device and which part is compulsory to be replaced. Maintaining the connectivity is also a big problem in mobile computing which can be intentional or unintentional. The wireless medium will provide an authoritative new method of disseminate information to a large number of users. New access method, algorithms and data paradigm have to be developed for broadcasting the data for the recipients.

Daniel Barbará [2] has suggested some distinguishing features that make the mobile computing system unique and discover the productive area of research. These are,

1) Skewness in the Communications

The bandwidth for the downstream direction that is servers-to-clients is much greater than that in the upstream direction clients-to-servers. Still some times

clients will be not having capability to send messages to the servers.

2) Ubiquitous Disconnections

Appropriate to mobile property mobile unit do not stay coupled with the network continuously. They repeatedly switch their unite on and off.

3) Power Limitations

Some time transportable units will be restricted battery backup. They recurrently need to be recharged.

4) Screen Size

Portable units like the Personal Digital Assistants, Mobiles are having very small screens. All the above facial appearance has a uniformly impression for data management in mobile computing. These helps to successfully manage the data into the system.

III. DATA DISSEMINATION

Mobile Computing environments are usually known as slow wireless links and comparatively deprived hosts with limited battery powers, are prone to recurrent disconnections. Caching data at the hosts in mobile computing surroundings can solve the problems which are connected with slow, limited bandwidth wireless links, by reducing latency and conserve

bandwidth. Cache replacement, Cache Consistency, Cache Invalidation are the most common technique used for data management in wireless network.

A. Cache Invalidation

Commonly desirable data items in the database server are cached to get better transaction throughput. It is needed to maintain the data in the cache. It must be correctly invalidated, for ensure the consistency of data. Cache Invalidation approach permit the mobile user to reinstate the cache state from invalid stage to valid stage. Even Cache validation algorithm be supposed to consider the scarce bandwidth and limited the resources. For this technique most of the time the data base server concerned is cache invalidation, by sending Invalidation report (IR) to all the mobile clients. It is essential to develop the effective cache invalidation strategies that ensure the reliability among the cached data in the mobile clients and the original data stored in the database server. There are three basic ways to design invalidation strategies,

1) Invalidation with Stateful Server:

The server knows which data are cached by which mobile clients. Whenever a data item is distorted, the server will send a termination message to those clients which cached that meticulous item. These methods necessitate the server to locate the clients. Since disengaged mobile clients cannot be contacted by the server, the disconnection of a mobile client repeatedly assumes that its cache is no longer valid upon reconnection. Also the mobile client needs to inform the server of its relocation. The mobility, disconnection of the clients and updating of data items will augment the uplink and downlink messages.

2) Validation of Cache Data by Mobile client:

The clients that have cached the data items in general query the server to verify the validity of their caches, whenever any cached data is used or on reconnection after disconnection if any. These methods generate lot of uplink traffic in the network.

3) Invalidation with Stateless Server:

The server is not aware of the state of the client's cache. The server simply occasionally broadcasts a termination report containing the data items that have been rationalized recently. The client assures the strength of the data item by listening to the report, going uplink only if the cache validity is no longer guaranteed. Amongst all this cache invalidation practice stateless technique found more suitable.

There are many algorithms has optional for the invalidation that is,

- a) Broadcasting Time stamping (TS)
- b) Amnesic Timestamp (AT)

- c) Signature (SIG)

B. Cache Replacement

Caching the regularly data items is believe as an efficient mechanism for humanizing the system performance. Cache replacement algorithm is as long as the solution for sentence suitable group of items from the cache. Most of the cache substitution existing algorithm are based on the time since last access, entry time of the item in the cache, hit ratio, running out time of the item in the cache, location etc. Most of the time cache replacement algorithm has calculated in the context of operating system virtual memory management and database buffer management.

They have divided this strategy into four categories,

1. Broadcast based strategy where mobile nodes transmit the demand to find out the mobile node which replies the retort with the requested document.
2. Information Based or location based strategy where mobile nodes will switch over or store the information about the position where data is accessible.
3. Role-Based Strategy is based on the cluster. Cluster will be create on the based of functionality of the node. Depending on the architecture some mobile node will be selected as a controller.
4. In the Directed Request strategy client will send direct request to the server and it predictable the reply from the same way.

The majority of cache replacement algorithms are influenced by location based strategy. Least Recent Used (LRU) frequently in cache. These algorithms are restricting it by not allowing for the location and direction of the client movement. Cache replacement also considered on Cost based Algorithm. The Cost based Prediction based algorithm follow the cost function which will be calculating the cost, where cost is connected with the cached data. Probability Area algorithm is one of well known algorithm which follow cost-based replacement policy, every cached object is related with a cost. PAID (Probability Area Inverse Distance) is an extensive version of Probability Area algorithm. Distance between mobile clients and data objects is become an ingredient of cost function that can use for Cache replacement decision. Mobility Aware Replacement Scheme (MARS) is to calculate the cost function includes temporal locality, spatial locality and a cost for the data object. Most of these algorithms confirm the consideration of distance factor where fails to identify the predict region or area where the client can be in near future. There are many algorithms has considered on the base of prophecy of the movement of the mobile client.

C. Cache Consistency

Caching commonly accessed data objects at the neighboring buffer of a mobile user (MU) can appreciably improve the presentation of mobile wireless networks. Maintaining the cache consistency in mobile environment is a demanding task due to regular disconnections and mobility of MUs. Several cache consistency maintenance schemes have been anticipated for the mobile wireless environments. The goals of these schemes and algorithms are to guarantee valid data objects in the cache to augment their accessibility and diminish transparency due to consistency maintenance.

Major cache consistency algorithm is depending on two properties:

1. Stateful where server will be unaware of cache content of mobile users
2. Stateless approaches are scalable.

IV. CONCLUSIONS

Management of the massive data in wireless mobile computing creates the new challenges. The major goals of Mobile data management are to give security of data availability and consistency even when the node will disconnect. Data management issues demonstrate new task for both global and local. In this paper, has discussed about network mobility, disengagement, Battery Backup, design of wireless information system and how they concern the implementation of database for wireless network and mobile computing.

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