# The Distributed Management System of Moving Objects for LBS

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## ABSTRACT

Recently, owing to performance elevation of telecommunication technology, increase of wireless internet's subscriber and diffusion of wireless device, Interest about LBS (Location Based Service) which take advantage of user's location information and can receive information in concerning with user's location is increasing rapidly. So, MOMS (Moving Object Management System) that manage user's location information is required compulsorily to provide location base service. LBS of childhood such as service to find a friend need only current location, but to provide high-quality service in connection with Data Mining, CRM, We must be able to manage location information of past. In this paper, we design distributed manage system to insert and search Moving Object in a large amount. It has been consisted of CLIM (Current Location Information Manager), PLIM (Past-Location Information Manager) and DLIM (Distributed Location Information Manager). CLIM and PLIM prove performance of searching data by using spatiotemporal-index. DLIM distribute an enormous amount of location data to various database. Thus it keeps load-balance, regulates overload and manage a huge number of location information efficiently

Keywords: LBS, MOVING OBJECT

## 1. Introduction

These days, owing to the development of Telecommunication technology, diffusion of wireless internet and performance elevation of mobile device, Location-based Services (LBS) that is based on user's location information has been useful service. Although there is some difference in definition of LBS, it commonly known as that Location-based services (LBS) employ accurate, real-time positioning to connect users to nearby points of interest, advise them of current conditions such as traffic and weather, or provide routing and tracking information - all via wireless devices (ex :portable phone, PDA, notebook PC and etc)

To provide Location-Based Service that takes advantage of feature that is mobility to user, we need Moving Object Management System(MOMS) [2, 3, 4] that can efficiently manage user's location information that be changed continuously. In former times, we focus on latest location information. Therefore, we cannot get past moving router or information that concerning with data Mining, CRM. In this paper, we do manage not only current location information but also past location information. Also, we do design LMC (Location Management Component) to insert and search efficiently location data in large amount.

Composition of this paper is same as following. Section 2 contains system architecture of MOMS (Moving Object Management System). And in Section 3, we shall show the architecture of the LMC (Location Management Component) designed by this Paper. LMC is one component of MOMS. And we will conclude in Section 4.

## 2. Moving Object Management System

The architecture of MOMS (Moving Object Management System) is same with Figure1. MOMS has been consisted of LAC (Location Acquisition Component), LQC (Location Query Component), LMC (Location Management Component) and Application. In brief, the function of each component is same as following.

### 2.1 Location Acquisition Component

Through various location acquisition strategies, this component acquires current location of moving object, with minimizing network traffic. LAC (Location Acquisition Component) is gotten by network based moving object, handset-based object such as GPS. In this paper, we use location information of moving object generated by GSTD [5, 6], City Simulator [7].

### 2.2 Location Query Component

LQC (Location Query Component) is component that executes query based on model of moving object and its operator [8].

### 2.3 Location Storage Component

LSC(Location Storage Component) is component that achieve function that store moving object that report from location acquisition component and function that search moving object that correspond to query result of location query component. Examine particularity in Section 3.

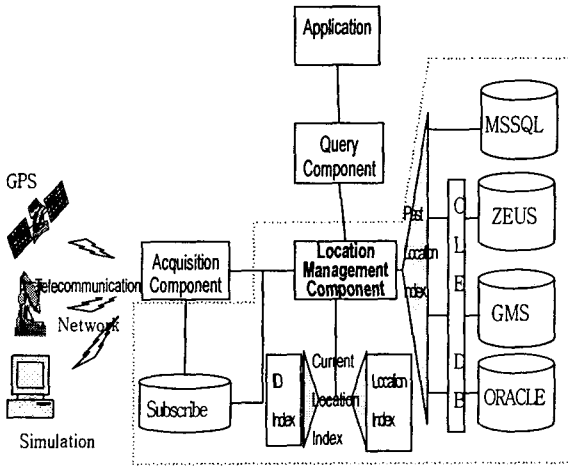


**Figure 1. Moving Object Management System**

### 2.4 Application

As CRM, Data Mining etc, it is execute query about moving object through Location Query Component. It can become various application program optimized so that offer Location Based Service and fit in service that do.

## 3. Location Management Component

The function of LMC (Location Management Component) is to insert moving object that is reported from LAC (Location Acquisition Component) and to search moving object that correspond to query of LQC (Location Query Component). Also, it is managing current location in main memory using CLIM (Current Location Information Manager) efficiently. In case of past data, PLIM (Past Location Information Manager) manage it in memory and disk. Location management component is consisted of CLIM, PLIM and DLIM. The architecture of LMC (Location Management Component) is same with Figure 2.

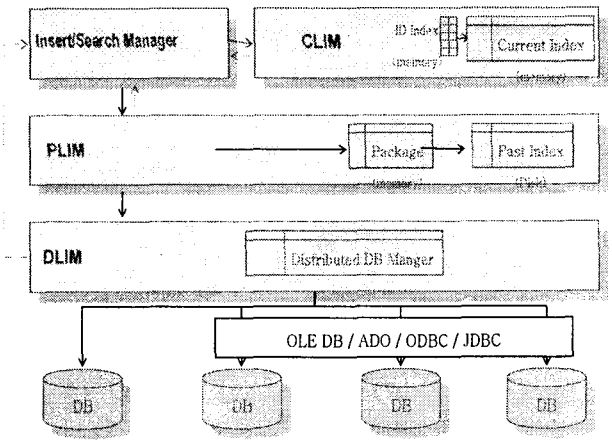


**Figure 2. Location Management Component**

### 3.1 Current Location Information Manager

Role of CLIM (Current Location Information Manager) manage current location information and index about it (that is acquired most recently). CLIM supports spatial-based index on location and object-based index on MOID (Moving Object Identification) like Figure 3. By using Object-based index, we can confirm location information of given MOID. And, by using Spatial-based index, we can do Moving Object correspond to given spatial query. Then, Spatial-based index and Object-based index reside in main memory to update frequent location information and to execute query efficiently.

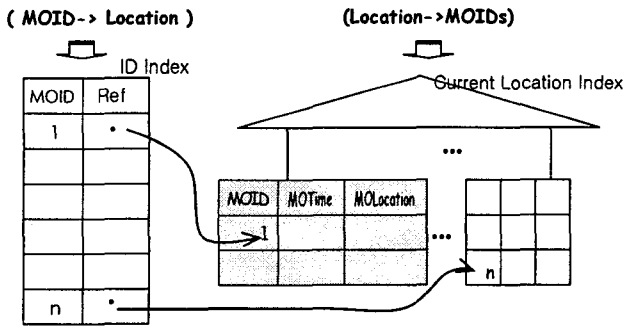


**Figure 3. Current Location Information Manager**

### 3.2 Past Location Information Manager

PLIM (Past Location Information Manager) manages past location information and spatiotemporal-index about it. PLIM store location data and retrieve it by using index. If it establishes spatial filter and temporal filter and executes query, then PLIM return set of MOID of relevant objects like Figure 4. PLIM insert Moving Objects into package that is main memory buffer. Moving Objects in package is recently Location Information for time interval. It's owing to next two

reasons. First, usually, frequency of query is high to moving object information stored recently than older past data. Second, if it is stored each moving object to database, then transaction increases, overload increases. And it is not easy that analyze moving route. Therefore, information of Moving Object is managed at package before storing to database. When LQC (Location Query Component) requests query, PLIM (Past Location Information Manager) examines whether relevant result is existed in package. If result of query is within buffer, PLIM return result. Otherwise, PLIM call DLIM. After DLIM execute query through distributed location management and return relevant result. This component must be able to run trace of wheels query about past location information of Moving Object effectively.

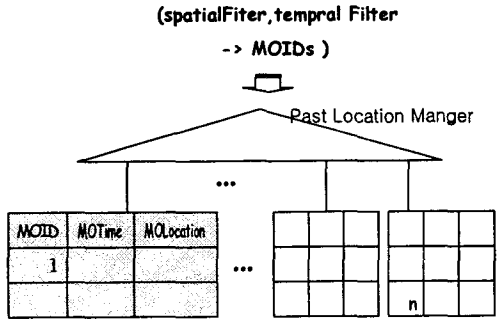


**Figure 4. Past Location Information Manager**

### 3.3 Distributed Location Information Manager

DLIM (Distributed Location Information Manager) distribute package into heterogonous database system. The package is managed by PLIM. If it is time to be package full or to be deadline of time interval, DLIM store package like figure 2. Distributed DB Manger connects and manages various heterogonous database systems. At this time, DLIM can offer interoperability with supporting OLE DB Interface. It is same as following to method that distribute moving object

- Distributing Round Robin
- Distributing with MOID
- Distributing with Approximation
- Distributing with Time-sequence
- Distributing Weighted Round-Robin
  (Considering Network Traffic / Disk Space)
- Distributing Least-Connection
- Distributing Weighted Least-Connection

In this paper, we take method that use distributing with MOID (Moving Object identification). Also we manage Moving Object in Table made by time interval within each database. Basis structure of each database is same with Figure 5.

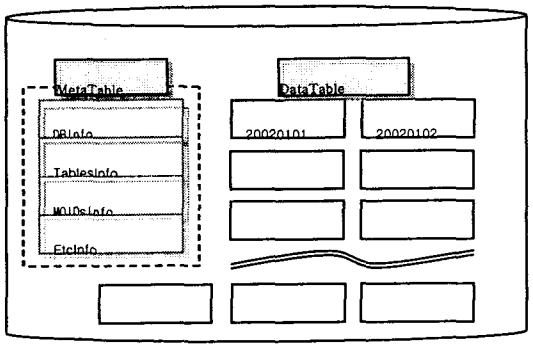


**Figure 5. The Architecture of Database**

Each database has meta-Tables and data-Tables. Meta table is consisted of database meta-information and table meta-information, MOID meta-information of Moving object and etc. Database meta-information has common attributes of managing database. For example, Location Acquisition method, Time Interval to be stored, Error

rate etc.

Table meta-information has each table's Name, MBR of Moving Object that is managed, from Time, to Time, Version info, etc. Basis information of object managed to database has been stored at MOID meta-information.

Data Tables divided by time interval. Each Table has MOID, MBR of Moving Object, and Time information. The role of DLIM is to distribute to various databases and to retrieve Moving Object. In addition, it has to backup, restore, export, import if database is full.

## 4. Conclusion

Recently, due to an explosive increase of interest in wireless internet and a wide spread of mobile terminal such as portable phone, PDA, HPC, LBS is appearing by useful service that is based on user's location information. It is LBS that combine user's location information who is moving with useful another information including geographic information and various contents, then offer high value-add information to user.

This case, location information varies from hour to hour. Addition to that, it is very huge size. Therefore we required location management system that can store and search current and past location information effectively to distributed database system.

In this paper, we discuss location storage and search component on distributed database system. Then discuss index component to help location management effectively.

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