"Enhanced HLR-VLR Scheme For Reduction Of Number Of Queries"

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Abstract

For implementation of global mobile system Location independent Personnel Telecommunication Number (PTN) scheme is very beneficial. For large mobile users Nongeographic PTN scheme may give rise to large centralized database technology. In this paper I proposed multi-tree database architecture which consists of many distributed database subsystems (DSs) where each is a three level tree structure ie DB0,DB1,DB2. In this each database subsystem communicate through their root. This scheme is more advantageous than the traditional HLR-VLR scheme. Here database access time is analysed. Here efficiency and cost is analysed in terms of database access. Results shows that proposed multi tree distributed database architecture will sufficiently support high user density in future mobile network and also that the database access if we use the proposed multi tree distributed database architecture is much less than the traditional HLR-VLR scheme.

Keywords: Database Architecture, Location management, Location Tracking, Mobile Network

Introduction

Mobile network in future will provide heterogeneous service across network provider. In future mobile global roaming is the basic service [1]. In order to implement terminal mobility, service provider portability, a nongeographic personal telecommunication number (PTN) is needed. With this scheme mobile user can access their personalized services regardless of terminal. Location independent PTN scheme is beneficial because in location dependent PTN SN may exhaust if the area is highly populated and SN are wasted if the area is in less populated [2]. So if we use location independent PTN scheme it will introduce centralized database this centralized database will create lots of problem in future so we need a high throughput database which reduces the problems of centralized database.

One important function that support global roaming is Location management. Through Location management network identifies the present location of mobile terminal. Right now two standards which are used for location management are –GSM and Intrim standard-41(IS-41) [3] [4]. Both standards use two level architecture including one Home Location Register(HLR) and many visitor location register(VLR) known as HLR-VLR architecture shown in fig.[1]. Here HLR is centralized database and serve the entire network it store information such as user profile ,current location of mobile terminal.VLR serve one or more location area and store information related to mobile user currently residing in its area. The main aim of proposed concept is to provide minimum number of updates or evaluations (queries).This paper proposes scalable robust database architecture.

HLR-VLR Scheme

Two standards that are used are: GSM and IS-41 they use two types of registers HLR and VLR to store location information of mobile terminal. Fig[1] represent HLR-VLR architecture.

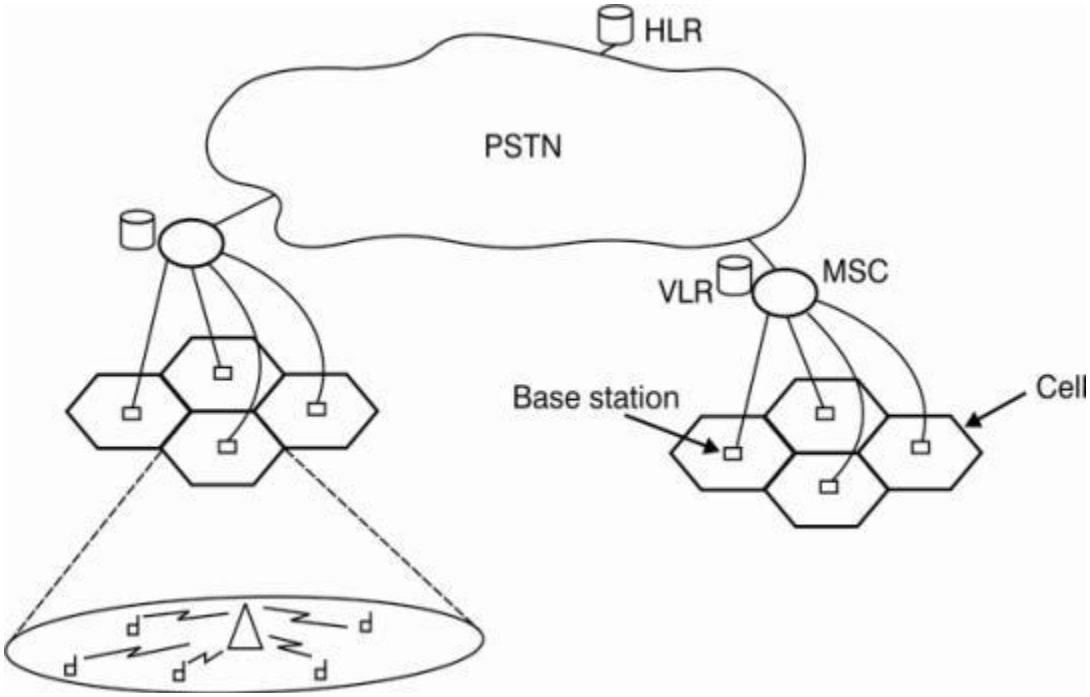

Fig. 1: The Standard PCN architecture

HLR stores user profile of all the users of its area.VLR stores copy of user profile of users currently residing in its area (LA). In order to locate the current location of mobile terminal, MT should report its location whenever it enters new location area(LA)s. This location reporting process is called location update.When location update message is received by the MSC it update its associated VLR and send location information to HLR. This location update process is called location registration.
Major steps involved in location registration scheme are as follows fig[2][5]:

Step 1 : The mobile terminal moves into a new LA and sends a location update message to the nearby base station.

Step 2: The base station forwards this message to the new serving MSC.

Step 3: The new MSC updates its associated VLR, indicating that mobile terminal is now residing in its service area and sends location registration message to HLR.

Step 4: The HLR sends acknowledgment message to the new MSC/VLR together with a copy of the subscriber's user profile.

Step5: The HLR sends a registration cancellation message to the old MSC/VLR .

Step 6: The old MSC removes the record for the mobile terminal at its associated VLR and sends a cancellation acknowledgment message to HLR.

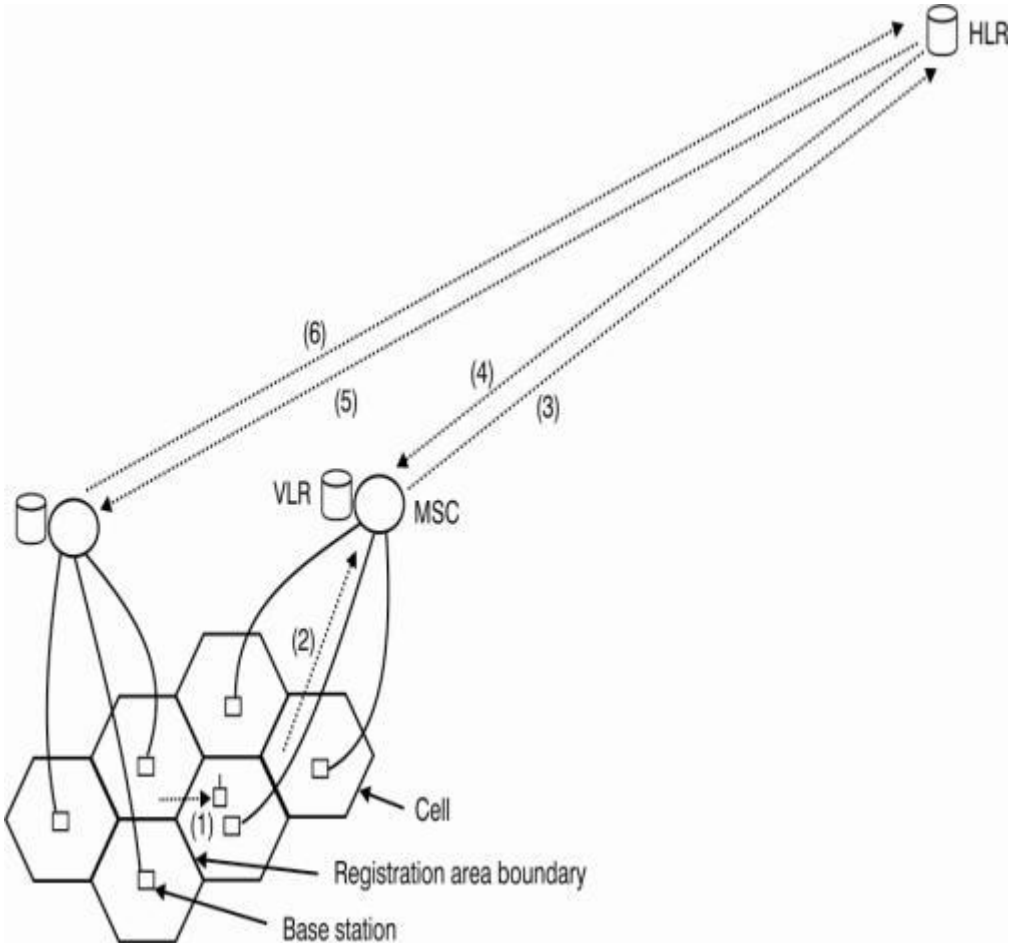

Fig 2: Location registration

Steps involved in call delivery shown in fig [3] are as follows:

Step 1 : The calling mobile terminal sends call initiation signal to its serving MSC through nearby base station.

Step 2: The MSC of calling mobile terminal sends a location request message to HLR of mobile terminal.

Step 3: The HLR determines the current serving MSC of the called mobile terminal and sends a route request message to this MSC.

Step 4: The MSC determines the cell location of called mobile terminal and assigns a temporary location directory number (TLDN) to the called mobile terminal.MSC then sends this TLDN to HLR.

Step5: The HLR sends the TLDN to the MSC of the calling mobile terminal. The calling MSC can now set up a connection to the called MSC through PSTN.

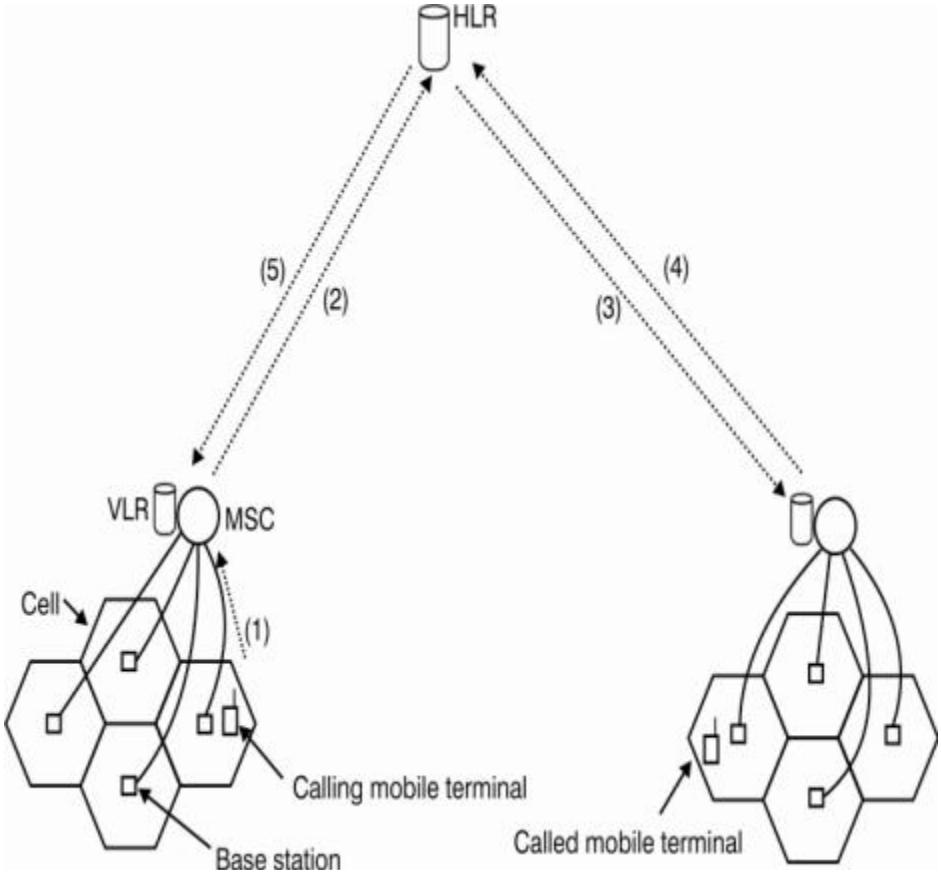

Fig 3: Call delivery

Disadvantage of HLR-VLR Scheme

1. Whenever mobile terminal changes its LA HLR is updated ie frequent updation of HLR.
2. HLR is heavily loaded.
3. Call drop occur.
4. Call setup delay occur.

Problem Statement

In the existing system (HLR-VLR scheme) many problems have been encountered such as if density of users from same area who are roaming increases then query load on HLR will also increase as a result of which call drop may occur or call set up delay may occur. Due to this entire problem this existing scheme is inefficient and infeasible.

Proposed Scheme

The proposed database system is a multi tree structure (Fig. 4.1), consisting of a number of distributed database subsystems (DSs), each of which is a three-level tree structure. More levels are not included because it will introduce longer delay in location registration and call delivery. These DSs communicate with each other only through their root databases.

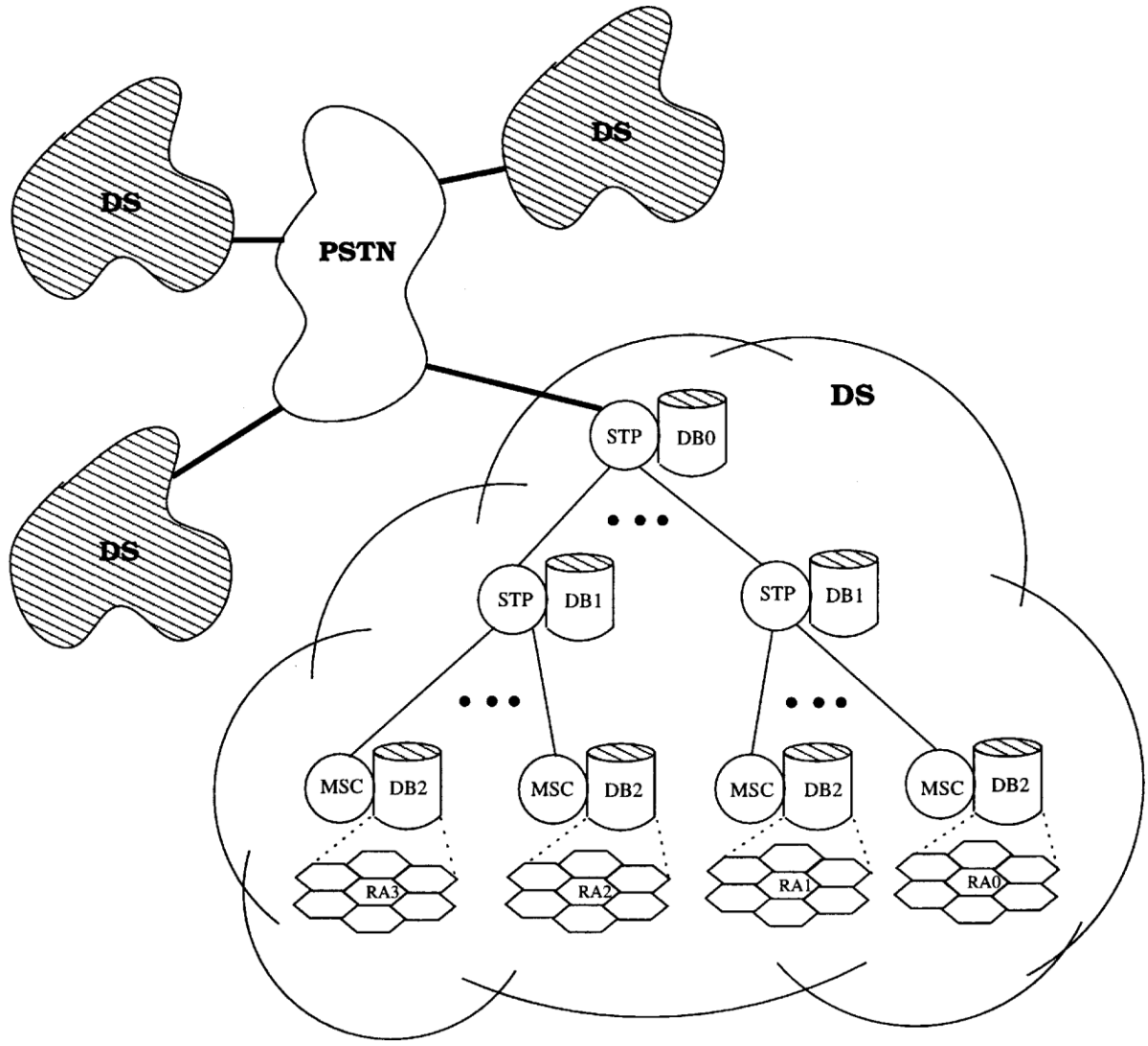

Fig. 4.1 Proposed multi tree database architecture

The multi tree database architecture is much more robust than the one-root hierarchical architecture.
In the proposed architecture, an MT's profile is stored in one of the root databases according to its current location. Thus, each root database only maintains a small portion of the user profiles in the global mobile system. The crash of one root database will not disrupt the operation of other root databases, the multi tree database architecture is scalable, the proposed multi tree database system is easy to expand.

Multi tree Database Architecture for location Tracking

All the DSs are interconnected together via a fixed network, such as PSTN or ATM net- work. This architecture can support a multi operator environment which is expected in future mobile networks. In each DS,databases DB0 and DB2 may correspond to the HLR and the VLR Each DB2 may control an RA where a user can roam freely without triggering registrations. Each DB2 is co-located with an MSC. A number of DB2s are grouped into one DB1 and several DB1s are connected to a single DB0. Each DB1 and DB0 also needs a switch, called the STP. The DB0 maintains the service profile for each user currently residing in its service area, and maintains an entry for each user in the global mobile system. Each DB1 has an entry for every currently residing user, storing a pointer to the DB2 the user is currently visiting. Every DB2 has a copy of the service profiles of the users currently roaming within its area. With this architecture, the frequency of queries to the higher level databases is greatly reduced.

Location Registration and Call Delivery Procedure

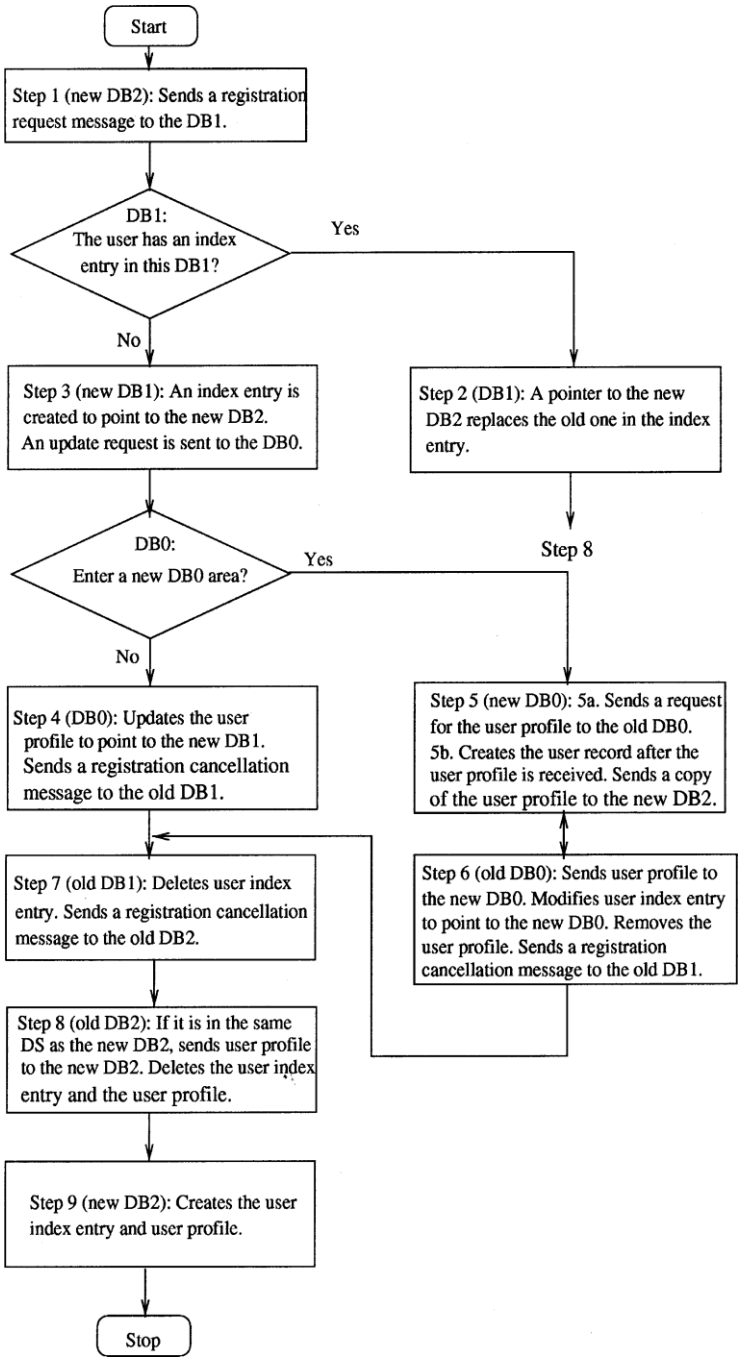

Fig. 4.2. Flow chart of location registration procedure.

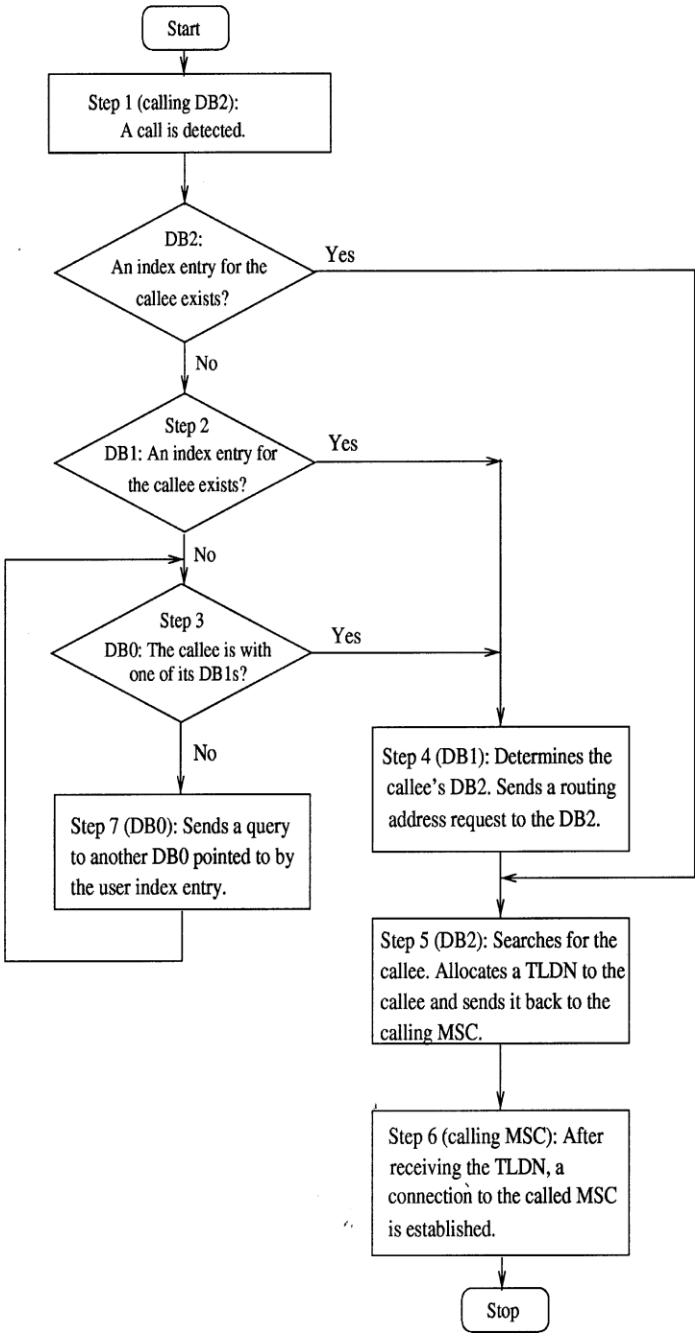

Fig.4. 3. Flow chart of call delivery procedure.

Advantage of proposed architecture

1. Multi-tree distributed database architecture is robust.

2. Multi-tree distributed database architecture is Scalable.

3. Multi-tree distributed database architecture is easy to expand.

Result

The result shows Performance comparison of HLR-VLR Scheme and Multi tree distributed data base scheme and calculation of number of queries if we use HLR-VLR scheme through node(mobile)movement and if we use multi tree distributed architecture through region movement. Result reveal that the database access if we use HLR-VLR scheme is higher than multi tree distributed database architecture.

Conclusion

Distributed multi tree database architecture is proposed for location management in a global mobile system, here the location-independent PTNs is employed to support seamless global roaming.

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