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# Deployment of Location Management Protocol and Fault Tolerant Technique for Mobile Agents

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***Abstract:*** The location management of the Mobile Agent and its current updated Location and maintenance in the mobile database and its reliability design are the current issues in a distributed technology. It still represents an open research area. . This paper analyses the new locating management schemes with the graph theory concept and probability reliability design which will make some difference in heterogeneous networks. In this work, a deployment of four type of locators protocols are proposed for optimal and fault tolerant free location management technique through mobile agent such as HSL, OSL, ICL ,UZL and sub locators as IZHSL, IZOSL, IZICL. The theoretical model of graph theory optimization technique is used for optimal throughput of updated LA (location area) which is residing under the structure of BA and MSC. To achieve the reliability design the theoretical method of Tie-set/Cut-set approach is proposed. A simulation is performed and the result of location updates through deployment of locators is achieved.

***Keywords:*** mobile agent, mobile switching centre, location management, cut-set, ad-hoc network, reliability

## I. INTRODUCTION

Mobile agents are autonomous software processes capability of migrating from one network to another. They have receive much attention in the last few years because of their advantages in accessing distributed resources in a low bandwidth network and they are used to developed a new approach for collecting subscriber information on the terminal side in mobile communication networks the reliability of the agent and distributed wireless communication network may affect the performance of location strategy of mobile agent system.[1] Computer network contains a collection of machine intended for running user applications. These machines are called hosts all the host that are far away from home and want to be in connection with main host machine are known as mobile host .in distributed network there are one or more foreign agents which are processes that keep track of all mobile host by locating and accessing their tracks of visits (both of current area as well as of host). The agent's main function is to keep trace of location of subscribers or user who are continuously moving from one station to another.

## II. TOOLS FOR LOCATING MOBILE AGENTS

To locate the mobile agent the location management and its scheme play a great role. There is requirement of an efficient mobility management for locating Mobile Agent.

The basic operations associated with mobility management are:

A. A roaming agent updates its location frequently to the central management server, that is, a directory server
B. The agent management server refreshes the current location record of the agent in its location database.
C. When there is a request asking for the location of the agent, the management server searches the database and replies with the current location of the Mobile Agent. It is very important to understand the meaning of Location Management in Cellular Networks and in Adhoc network. .[2] It is achieved by Location Updates and various Location Management schemes. There are also some common assumptions for performance evaluation for locating a mobile agent.

## III. LOCATING CALL ARRIVAL FROM LOCATION AREA

A One of the main difficulties introduced by mobile networks, compared to public switching networks, is the fact that mobile stations (MS) have no permanent connection to the mobile telephone network. For this reason the network has to track the position of a mobile subscriber. This is why so called location areas (LA) are introduced.

Cellular network, a service coverage area is divided into smaller hexagonal areas referred to as cells. Each cell is served by a base station. The base station is fixed. It is able to communicate with mobile stations such as cellular telephones using its radio transceiver. .[3]The base station is

connected to the mobile switching centre (MSC) which is, in turn, connected to the public switched telephone network (PSTN).

A location area is a geographic area covered by base stations belonging to the same group. The identity of the location area a cell belongs to is sent in the cell on a broadcast channel, thus enabling mobile stations to be informed about the location area they are in. Location management schemes [40] are essentially based on MS mobility and incoming call rate characteristics. The network mobility paradigm exhibits a strong antagonism between locating and paging. The locating procedure provides the network with the initial information (i.e. the Location Area) about a MS location. The paging procedure results in the exact MS location information i.e. the Base Station to which the subscriber is connected. Within the same LA, the MS may roam between different base stations (e.g. cells) of this area without initiating a location update. Location update occurs every time the MS crosses a LA border.

An LA consists of one or more cells (Figure 1). Paging is used to determine the cell in which the MS is located. Paging includes sending paging messages to all cells of the location area. With a high number of cells the paging cost can be very high[4]. On the other hand, a high number of cells per LA also mean that LAs are big so that the location update cost is low, since the MS will less often cross a LA border. The locating procedure brings the MS service profile near its location and allows the network to rapidly provide the user with the required service.

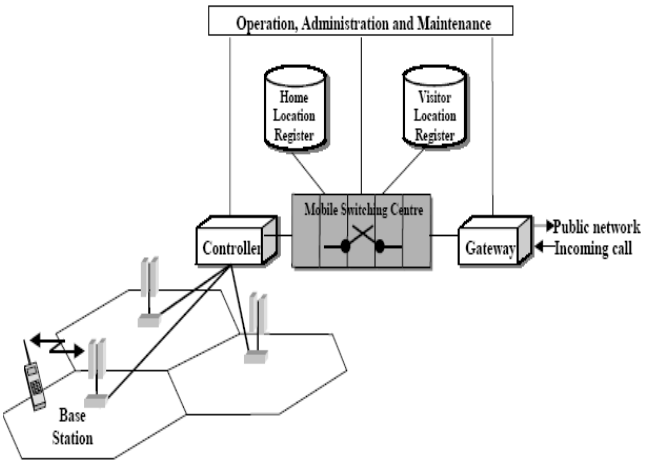


Figure 1

Each cell has one Base Station (BS) representing the connection point for MSs to the network. Several BSs may be grouped together under the control of a Base Station Controller (BSC). In turn, several BSCs are usually controlled by a mobile switching centre.[5] (MSC, see Figure 3). For incoming calls the MSC sends out a paging message to all BSs of the LA in which the called user is registered. If the called MS answers, the MSC connects the calling subscriber and the called one.

The action taken by a MS in order to provide location information to the mobile network is referred to as location update.

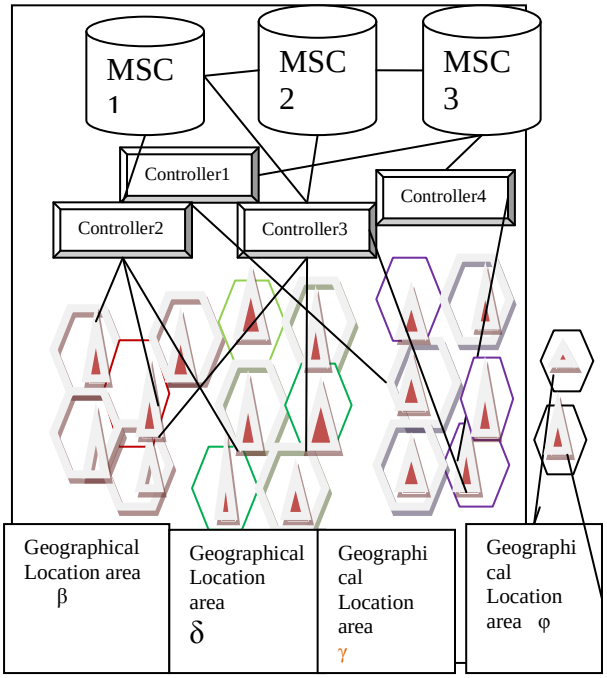


Figure 2.

## IV. DEPLOYMENTS OF LOCATORS

For incoming calls the mobile network has to locate the called MS by paging.

In current approaches this problem is solved by introducing pointer locators. Functionally, there are four types of locators:

A. Home State Locator (HSL) where all subscriber parameters of the MS are permanently stored and subscribers basically belong to this base station. It includes sub locator i.e. Inner Zone Home State Locator (IZHSL).

B. Other State Locator (OSL) where all subscriber parameters of the MS are temporary stored where all relevant data concerning a MS are stored as long as the MS is within the area controlled by the OSL .It include sub locator i.e. Inner Zone Other State Locator (IZOSL).

C. International country Locator (ICL) where all subscriber parameters of the MS are temporary stored where all relevant data concerning a MS are stored as long as the MS is within the area controlled by the ICL. It includes sub locator i.e. Inner Zone International country Locator (IZICL).

D. Unknown Zone Locator (UZL) when all subscriber parameters of the MS are unable to locate the zone location then this type of locator occurs and it is difficult to identify the location in this.

The whole area (Roaming area) in which the network enables MSs to connect to it, is divided into several Location Area (LA, see Figure 4). One or more LAs are allocated to a particular OSL or ICL that records all subscribers within these LAs. If the subscriber is moving to a LA allocated to a different OSL or ICL, the new OSL or ICL will record the newcomer and report the change of LA (i.e. OSL or ICL) to the HSL to which the subscriber is assigned. This procedure is called location update. Location updates store the current subscriber's LA in the OSL or ICL.

Depending on the relationship between the old and the new LA, Four cases of location updates can be distinguished:

[a] Location updates occurring in the same OSL, IZOSL or ICL, IZICL area.
[b] Location updates between two OSL or ICL areas, within the reach of the same MSC.
[c] Location updates between two OSL or ICL area are allocated to different MSCs.
[d] Location updates occurring in the IZHSL area.

## V. ANALYTICAL COLOURING TECHNIQUE MODEL

Colouring technique is an important tool of graph theory it is used to do distinguish between different nodes, especially between the adjacent nodes. .[6] In this Work, m-colourability optimization technique is proposed for main Locators (i.e. HSL, OSL, ICL, figure5). And next value varying 2-way colouring reporting technique is proposed for sub locators (i.e. IZHSL, IZOSL, IZICL, figure 5).

### *A. Algorithm m-colourability optimization technique is proposed for main Locators (i.e. HSL, OSL, ICL).*

// it is used to maintain the location of area zone of International roaming and local calls.
// all the assignment of colour and id no of 1 -- -- - m is done according to four category of geographical area zone
// so that BS& MSC easily identify the new incoming location.

```
{
Repeat
   { if x[c] = 0 then return//no incoming call
{       for c:=1  to n
{           if x[c] != 0  and (c = m)// incoming call arrival
{             for i:=1  to n
{                if x[id no] = x[i] //incoming call  detect the
geographical  location area if it match with HSL
                    x[c]= col1 } //assign color1 to HSL
                      else if
                        for j:=1  to n
{                          if x[id no] = x[j] // incoming call
detect the geographical location area if it match with OSL
                          x[c]=  col2  }// assign  color2  to
OSL
                             elseif
                               for k:=1  to n
{                                if x[id no] = x[k] // incoming
call  detect the geographical location area if it match with
ICL
                                 x[c]=  col3//assign  color3to
ICL
                                    else
                                      x[c]=  0  }// case  of
Unknown  geographical area UZL}
 until (false)  }
```

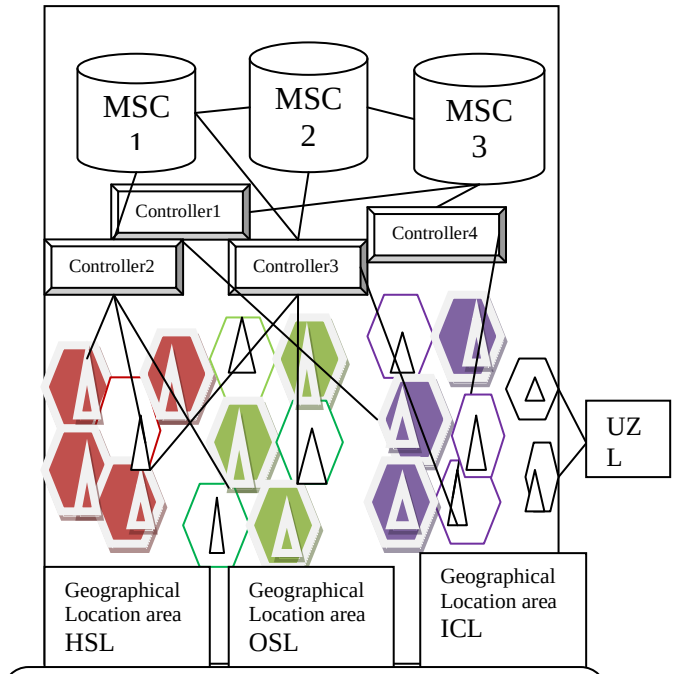


Figure 3.

### *B. Algorithm next value varying 2-way coloring reporting technique for IZHSL,IZOSL,IZICL*

// it is used to maintain the loction area of new incoming call
// x[1] … x[c-1] have assign different id no in the range [1,m] such that every cell have distinct id no.A value for x{c] is determined in the range of [0,m].
// c stands for cell that are assign to different base station
//x[c] is assigned the next different Idno. and color
// while maintaining distinction from the previous location and current location of cell of arrival call
// if no such color assigned then x[c]=0 means no arrival call.

```
{  Repeat
        {   x[c] := (x[c] + 1) Mod (m+1)://next color
             If x[c]=0 Then return  / /no call arrival
              For j:=1 to n do
{ //check if previous call and latest call are assign various
different  colors  for ex previous call always assign color1
and current call always assign color2
//IC = incoming call
  If ((IC [c, j] != 0 and x[c] = x[j]   //call arrival
                 X[c]= col1// assign color 1
                  X[Loc]=id[c] }
                   Else if x[c] =  x [ j++ ]
                      {  X[c] = col2    // x[j] previous call
assign col1 n vary to col2
                         X[c] = x[j+1]
                           X[c ]= col1    //each time new
incoming call arrive it will //assign  col1and previous one
vary it color back to col2 so that location of new incoming
call is always detected.
                 X[Loc]=id[c]
                  break;}
                    Print X[Loc]  //current update location  }
Until (false)   }
```

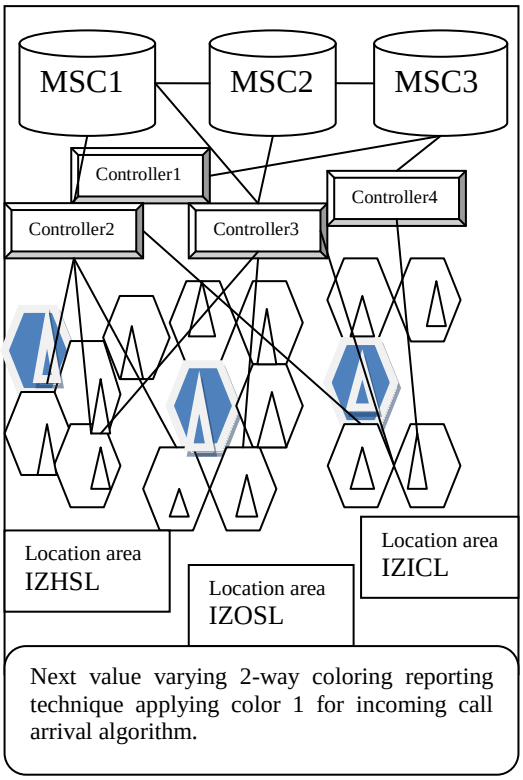


Figure 4.

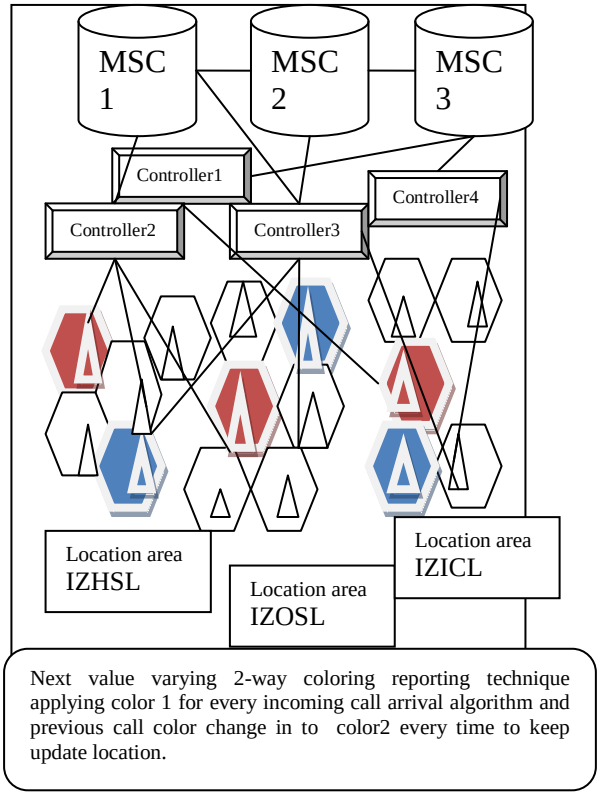


Figure 5.

## VI. SIMULATING LOCATORS THROUGH COLOURING TECHNIQUE MODEL

The number of messages (i.e. bytes) exchanged at each interface in the location update processes for GSM are shown in Table 1. Particularly in highly urban spots or in OSL and ICL, where the location areas are relatively small, the location updating rate can be much higher than the calling rate. In future wireless systems it is even expected to augment dramatically since the LA sizes tend to be decreasing.

TABLE I: SIMULATED DATA BY USING LOCATORS

| Locator | Location update Overhead | | |
|---|---|---|---|
| | Traffic generated by LU | Messages / call arrival rate | Bytes |
| OSL | In the same OSL or sub locator i.e IZOSL | 15 | 402 |
| HSL | In the same HSL or sub locator i.e IZHSL | 36 | 1307 |
| OSL | In the different OSL | 8 | 215 |
| ICL | In the same ICL or sub locator i.e IZICL | 10 | 289 |
| ICL | In the different ICL | **5** | 122 |

## VII. RELIABILITY CONCERNS OF MOBILE AGENTS

Many open distributed systems, alike a mobile agent system may fail due to two reasons: site failure and communication failure, there can be two different consequences. If the mobile agent is not residing on the failing site, the mobile agents keep alive with its state. However, if the failing site is one of the destinations of the agent, .[10] the agent must reroute its itinerary. If the mobile agent is residing on the failing side, the mobile agent will be lost. The state of the agent and computation result will also be lost. Persistance of agents is an issue specific to the mobile agent system. However, there is not much new challenge, and existing technique like logging, check-point, and transaction processing may be directly applied. .[11] In case of communication failure, the mobile agent must be informed of the failure, and it must be able to reroute its itinerary. Otherwise, it will wait indefinitely for the failed communication link to recover, and the system will be virtually dead. In short, agent persistence and agent rerouting are two of the new challenges that mobile agent systems bring to reliability research.

## VIII. RELIABILITY MODELLING THROUGH CUT-SETS OF GRAPH THEORY

All mobile networks are generally failed due to disconnection in the mode of connectivity due to any reason i.e poor signal ,bugs, breakage of connectivity , congestion, traffic jams etc...[12]In the wireless computer networks, although links and nodes have the same functional properties with the wired ones, their structure, abilities and dynamics are different from the wired ones and also the mobility of the mobile hosts differentiate them from the wired ones so a given computer network system are separated into wireless and wired section, called sub-network.

An access point is an intersection of both a wired and a wireless sub-network. The access point is considered as a part of the wired computer sub-network. Mobile nodes

cannot communicate with each other without access point.[13]. It is necessary to separate the network into small parts only when source node and target node are in different wireless and wired sub-networks, and also in the network using hierarchical addressing or similar one.[14]. Therefore general formulation of the reliability for consecutive wireless and wired sub-networks is as follows:

$$R_{st}(t) = \prod_{i}^{K} R_i(t)$$

*i* number of sub-network which can be separated.
*k* total number of sub-networks system.
$R_i(t)$ the reliability of the sub-network *i* from the mask source node to mask target node in sub-network *i*.
*mask source,* the entrance and exit points of the sub-network *mask target,* while the data is forwarded from real source to real target.

In this section, very simple technique of cut-set has been implemented in which connection is provided although some of the connectivity path has been removed from the cellular network. Some of the properties of cut-set are:

A. Every Cut-set (removal path) in a connected network C must contain atleast one cell of base station.
B. If the source and target node are in different domains according to hierarchical addressing or similar to this kind of addressing, the network is separated into sub-networks in accordance with the domains.
C. Determine mask source and mask target nodes as defined the above. Note that entrance point and exit point of domains in hierarchical addressing are fixed and the route out of the sub-network is fixed to arrive at one destination's sub-network.
D. Define all tie-sets in different sub-networks.
E. Compute the reliability in sub-networks.
F. Compute the reliability between sub-networks.
G. In a connected network C, any minimal set
H. of connections containing at least one cell of base station is a cut-set..

## IX. CONCLUSIONS

In this work , a deployment of four type of locators are proposed for optimal and fault tolerant free location management technique through mobile agent such as HSL, OSL, ICL ,UZL and sub locators as IZHSL, IZOSL, IZICL.

The theoretical model of m-colourability optimization technique and next value varying 2-way colouring reporting technique are used for optimal throughput of update LA(location area) which are residing under the structure of BA and MSC. And for movement based mobility management Bellman Ford technique is used.

For the proper and smooth functionality of the mobile computing the reliability design and fault free wireless environment is very essential and one can achieve the aim of locating mobile agent only through reliable fault free functionality. So, to achieve the reliability design the theoretical method of Tie-set/Cut-set approach is proposed.

A simulation is performed and the result of location updates through deployment of locators is achieved.

## X. ACKNOWLEDGMENT

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