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GLOBAL NETWORK WORKING SYSTEM IN MOBILE COMMUNICATION USING ON-DEMAND MULTICAST ROUTING PROTOCOL

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Abstract

In Beyond Third Generation Wireless Communications, multiple overlays of wireless Access Network may cooperate to allow a user access to novel services, the demands of the services will significantly increase the load on location management systems within the networks. In Our paper we proposed a scheme for providing efficient Mobile Terminal (MT) Location Discovery and Paging across an inter-worked network consisting a Digital Video Broadcast (DVB) network and Universal Mobile Telecommunication System (UMTS) network. ODMRP (On-Demand Multicast Routing Protocol) is a popular multicastprotocol for wireless adhoc networks. The strengths of ODMRP are simplicity, high packet delivery ratio, and non-dependencyon specific unicast protocols. Owing to performing scoped flooding of packets ODMRP suffers from excessive controloverhead and redundant data transmissions when the number of multicast source increases, which simultaneously leads toincreasing network load and waste of the limited resources of thenodes. In order to cope with the problems, we propose animproved ad hoc multicast routing protocol based on ODMRPreferred to as IODMRP.The simulation results allow cellular network operators to configure their inter-worked system to reduce location management and paging costs whilst controlling average latency and also broadcast to Mobile Terminals. Our results demonstrate that our UMTS LA plus DVB paging schemes provide efficient MT discovery in an inter-network environment that includes uni-directional broadcast network such as DVB; we achieve a minimum 4 times reduction in paging cost across the inter-network compared with independent paging systems.

I Introduction

MANET [1] is a multi-hop wireless network with nofixed infrastructure or central administration. Ad hocnetworks are characterized by the limited energy, lowbandwidth, and unreliable communication. Due to theirinherent broadcast capability, ad hoc networks are well suited

for multicast. To support multicast, an efficient multicastrouting protocol is required for ad hoc networks because oftheir characteristics. Efficient multicast routing protocols forad hoc networks can be different from what we have for fixed

networks, and designing such schemes can be challengingresearch issue. Various multicast routing protocols for ad hocnetworks have been proposed such as Ad hoc MulticastRouting.

Mobile Cellular Networks

In Third Generation (B3G), Evolution of 1st generation, 1980s analogue and voice data can be sent.In2nd generation 1990s, that is increased to digital, Voice, fax data and 95% coverage of UK by 1991.In 3rd generation - within 10 years digital form of data can be sent anywhere,

anytime, anything. Most significant development in telecommunications in recent years.

Cellular principle

Cells are hexagonal shape. Base station located in middle. Radius of cell is governed by power of Base Station. Increasing the power increases geographical size of cell. Smaller sizes automatically increase the network capacity but can also increase interference

Network Components

Base Station System

It has Base Transceiver Station and antenna. It will give the Interfaces to MS and can Able to transmit and receive signals on many channels simultaneously.

Base Station Controller

It can Controls a number of Base Transceiver Stations and a concentrator (multiplexer).it multiplexes Base Transceiver Stations onto high speed link. Passes Location Area Code to Base Transceiver Station for broadcasting to MTs.

Mobile Switching Centre (MSC)

An ISDN switch enhanced to operate in mobile network. In addition to switching it can manages calls for all MTs within its domain and it can do Billing, Handover, Authentication.

Home Location Register (HLR)

One logical HLR in network. It contains an entry for every subscriber or mobile terminal. It can stores static information about subscriber. It contain Location Area Code where MT is currently operating.

Visitor Location Register (VLR)

One VLR for every Location Area in network. Typically an Mobile Switching Centre „covers" a location area .VLR contains information on every subscriber (visitor) currently operating in the domain of VLR Entries are added when visitors enter VLR domain. Entries are deleted when visitors leave VLR domain.

On a session setup request from an external caller, the home network queries its HLR to find the idle

MT"s VLR/MSC ,that will indicating the MT"s current LA; the VLR must then page the MT in all cells of this LA. This page step consists of the VLR sending a „paging" message to each cell within the LA that requests that the MT notify the network of its current cell. The MT checks the ID of its current cell, signals this ID to the VLR and thus the MT is accurately located to within a single cell.

In wireless communication there are many different heterogeneous Mobile access technologies for integrated or „inter-working" schemes include the 3G mobile networks International Mobile

Telecommunications 2000 (IMT 2000) system and Universal Mobile Telecommunications System (UMTS), the Wireless LAN (WLAN) technologies of IEEE 802.11 a/b/g, digital broadcasting systems such as the Digital Video Broadcast (DVB) standard from European Telecommunications Standards Institute (ETSI).

In wireless communication, two approaches to B3G system architectures are considered; namely integrated and inter-worked architectures. In an integrated network, elements from candidate access networks are tightly coupled at the Radio Access Network (RAN) or Core Network (CN) level .In an inter-working architecture instead uses Heterogeneous Roaming Agreements (HRA) to loose couple networks through gateways located on the edge of each CN or in the internet.

The technique focuses on topologies where two co-operating networks are largely non overlapping with a well defined „boundary region‟ between them. Co-located MSC‟s and VLR‟s of each system in the boundary region, which consists of adjacent cells in each network that together form a continuous boundary line between the networks, are interconnected using a new entity, the Boundary Location Register (BLR). This BLR provides the inter-working function between the networks by storing all information on MT‟s from both systems when the MT is within the boundary region. The BLR can therefore be queried for a pointer to the HLR or VLR from which the MT can be optimally paged.

II Review of the previous work

A significant amount of research efforts have been directed towards cellular overlay networks for identifying the mobile location exactly. In existing work the mobile terminal identification done by

„request‟ and „update‟ messages to the mobile terminal. For that first send the request message the HLR of mobile terminal, that HLR request again to the new VLR for getting the new address of Mobile while it crossover the boundary location of its UMTS cell. Paging scheme classified into two according to the factor load of network and the delay .Two paging scheme is used to identify the location of the mobile terminal. First one is sequential paging that is sending the request message to the highest priority mobile terminal, if there is no response from that terminal. Then only send that request to other highest terminal. Second one is Blanket paging, in this send that request to the entire mobile terminal in that Location area.

III Motivation

Co-operation in location management offers the possibility of significant efficiency gains by reducing the duplication of location management systems.

Removing the need for some secondary technology such as the Global Positioning System (GPS) for geographic positioning. The methods are particularly suited to urban areas where GPS signals are often unreliable due to obstructions. These methods accurately determine geographic position; some secondary system such as a mapping system would still be needed to determine the current MTs location.

IV Multi-Tier Location Management

In our paper we focus on our solutions for inter-working cellular technologies such as UMTS with Digital Video Broadcasting (DVB) networks such as DVB-T (Terrestrial) and DVB-H (Handheld) ; providing the user with a return link for interactive TV and high bandwidth asymmetric downlink for data transfer to terminals operating in the heterogeneous roaming environment.

Figure.1. below illustrates our baseline UMTS-DVB inter-worked architecture .In this architecture the IoN gateway resides on the edge of the core of each network and IoN signaling is carried over the logical link between the networks. The multi-tier system thus comprises a single bi-directional PLMN network and a uni-directional (downlink only) digital broadcast network.

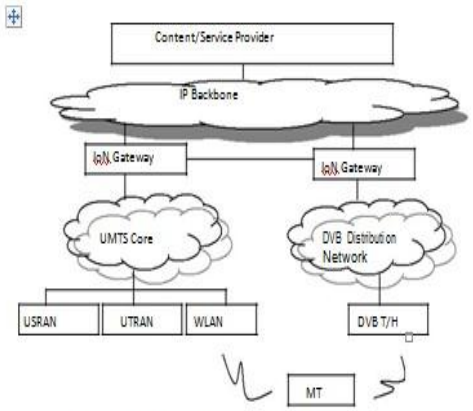

Figure 1.IoN inter –working model

A.Novel Location Management Proposal

Our location management approach, Location Area information that is maintained by the UMTS network. That the UMTS and DVB networks maintain LA and cell coverage maps respectively for their networks. On receiving a connect request for the DVB interface of a UMTS/DVB multi-interface terminal, we first query the HLR of UMTS to discover the stored LA of the MT. Using an overlaid

UMTS LA/DVB cell coverage map, we can approximately „map" from the MT"s UMTS LA to the cell in the DVB network. The probability of success for mapping to each overlapping cell is determined by calculating the area of overlap between the particular LA and those DVB cells that overlay it.

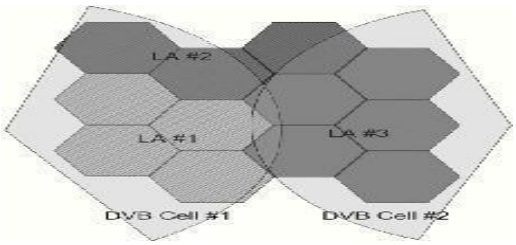

Figure2. UMTS LA to DVB mapping

The above figure illustrates our method; UMTS LA #1 is known to map geographically to DVB cell

#1 and UMTS LA #3 is known to map to DVB cell #2. The UMTS network provides the MT"s current LA as LA #1 or #2, the MT"s DVB cell can be correctly mapped by referring to some data base maintained by the network operators. In both these cases, i= {1} and P^S (1) =1. if suppose i={2} means

UMTS LA"s map badly to DVB cells, that is MT located in UMTS LA #2 and UMTS LA#1 also map with DVB cell, so that the MT"s current DVB cell cannot be determined exactly, so the probability of mapping is termed as $P^S(1)$,$P^S(2)$.

B. Paging Scheme

In our paper the results returned by the mapping process, when there is ambiguity in the UMTS to DVB mapping the network may attempt to contact the user in two ways

Sequential Paging

The network operator contacts the user by most likely cell first. In this paging the mapping database will provide a list of possible DVB cells in which the MT may be located each with an associated MT probability. The network then attempts to contact the user in the highest probability cell first and if there is no response tries the next highest.

Blanket Paging

The network operator contacts the user by sending the request to the entire cell in that location area. Blanket paging occurs when P^S (i) $\leq \Theta$ where Θ ($0 \leq \Theta \leq 1$) is chosen according to the paging load and latency requirements of the network operator.

C. Signaling Scheme

For our method, the signaling is carried out by the following ways.

1) DVB Requests and Receives Current LA from UMTS

2) GGSN Database Access to HLR

3) DVB Gateway Requests LA to DVB Cell Cluster Mapping and P_j

4) DVB Network Pages MT in Cell Cluster (P^s (i) $\leq \Theta$ [all i])

5) MT responds to DVB through UMTS with current Cell ID, Ps (i) $\leq \Theta$ [all i]

V Analysis and Computational Results

In our paper to achieve approximate accuracy of the proposed method, we first investigate the impact of the relative size of UMTS paging areas and DVB cells. For that there is one method, where each LA and DVB cell is modeled as a square cell, and different cell alignments are considered between UMTS LA"s and DVB cells.

In this square cell analysis, LA"s can be categorized as „corner", „edge" or „middle" (c, e, m on the diagram). We define the probability of successfully mapping MTS LA to DVB cell from each category of LA, denoting probabilities for c, e, m as P_c, P_e, P_m .we first define the following ratio for DVB/UMTS side lengths:

$$\frac{\text{DVB Side Length}}{\text{UMTS Side Length}} = r = \frac{\alpha}{\beta}$$

Where α = DVB Cell Side Length and β = UMTS Paging Area Side Length. From Fig 4.we can express the probability of successfully mapping the UMTS LA to the DVB cell, P_s, as:

$$P_s = \frac{P_c + 2(r-1)P_e + (r-1)^2 P_m}{r^2}$$

VI Simulation Environment and Result

In our paper to gain a better understanding of the performance of our proposal, we present a simulation and its results, which are described as follows. Our results are from a set of simulation where we vary the DVB/UMTS side ratio, r.

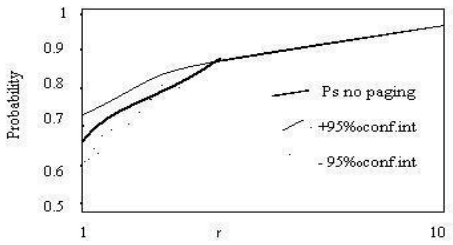

Figure 3. Side length versus probability of mapping

The above figure 3. Shows the probability of mapping by using the DVB and UMTS mapping scheme

.here there is no paging scheme is used to identify the location of the MT. so the probability of mapping is less compared to the paging scheme.

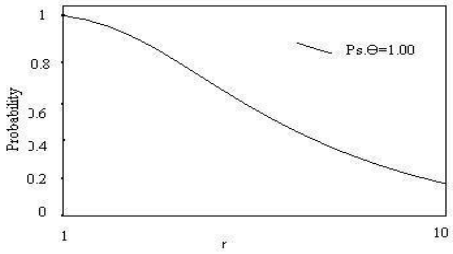

Figure 4.Probabilty of mapping for varying side length of r with paging.

The above figure shows the probability of mapping of cell in the DVB and UMTS network. Compared to non paging scheme, the probability of mapping is more in this simulation.

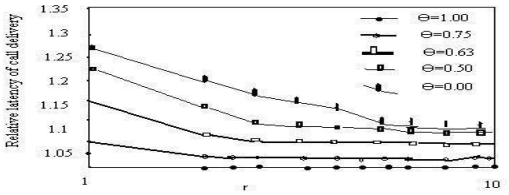

Figure 5. DVB/UMTS Side length versus relative latency

Figure. 5 illustrate the average latency for various values of Θ, with the Θ=0 means blanket paging case. It provides the uniform single attempt success rate reference. Θ = 1means the sequential paging system reduces the average number of paging attempts and reduces the resource usage.

VII Conclusion and Future Work

In our paper, we have introduce Digital Video Broadcast (DVB) technology and we have explored novel approaches to location tracking and paging in overlay networks incorporating broadcast and cellular overlays in an efficient manner. Our proposal offers a powerful method to reduce location discovery and paging costs in an inter-network environment. It is confirmed through extensive simulation that IODMRP has a better end-to-end delay and delivery ratio than ODMRP with increasing senders.This will allow broadcast network operators to provide exiting location dependent and interactive services at the minimum cost.

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