ISSN:0975-9646

V Anji Reddy et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014, 975-977

Mobility Management Approaches for Mobile IP Networks

V Anji Reddy[1], Swetha Tanavarapu[2] ,Harish Sampatharao[2],Vasavi Potipireddi[2,] Shyam Pallanti[2]

[1]Associate Professor, [2]B.Tech Student
CSE, L.I.E.T,
Vizianagaram

Abstract- In wireless networks, efficient management of mobility is a crucial issue to support mobile users. The Mobile Internet Protocol (MIP) has been proposed to support global mobility in IP networks. Several mobility management strategies have been proposed which aim reducing the signaling traffic related to the Mobile Terminals (MTs) registration with the Home Agents (HAs) whenever their Care-of-Addresses (COAs) change. They use different Foreign Agents (FAs) and Gateway FAs (GFAs) hierarchies to concentrate the registration processes. For high-mobility MTs, the Hierarchical MIP (HMIP) and Dynamic HMIP (DHMIP) strategies localize the registration in FAs and GFAs, yielding to high-mobility signaling. The Multicast HMIP strategy limits the registration processes in the GFAs. For high-mobility MTs, it provides lowest mobility signaling delay compared to the HMIP and DHMIP approaches. However, it is resource consuming strategy unless for frequent MT mobility. Hence, we propose an analytic model to evaluate the mean signaling delay and the mean bandwidth per call according to the type of MT mobility. In our analysis, the MHMIP Outperforms the DHMIP and MIP strategies in almost all the studied the \main contribution of this paper is the analytic model that allows the mobility management approaches performance evaluation.

Keywords*: Care of address(COA),Foreign agent(FA),Gate way foreign agent(GFA),Home agent(HA),Mobile Terminal(MT).*

1 . INTRODUCTION

IP multimedia applications are becoming popular in the packet-based wireless networks. The integration of these applications in wireless networks requires the support of seamless terminal mobility. Mobile IP (MIP) has been proposed by the Internet Engineering Task Force (IETF) to provide global mobility in IP networks It allows maintaining mobile terminals ongoing communications while moving through IP network. In the MIP protocol, Mobile Terminal (MT) registers with its home network from which it gets a permanent address (home address). This address is stored in the Home Agent (HA). It is used for identification and routing purpose. If MT moves outside the home network visiting a foreign network, it maintains its home address and obtains a new one from the Foreign Agent (FA). This Foreign address is called Care-of-Address (CoA). To allow continuity of ongoing communications between the MT and a remote end point, the MT shall inform the HA of its current location when it moves outside the home network. The HA delivers to MT the intercepted packets by tunneling them to the MT's current point of attachment. IP mobility in wireless networks can be classified into macro- and micro mobility. The macro mobility is the MT mobility through different administration domains. The micro mobility is the MT movements through different subnets belonging to a single network domain. For micro mobility where the MT movement is frequent, the MIP concept is not suitable and needs to be improved . Indeed, the processing overhead related to location update could be high specifically under high number of MTs and when MTs are distant from the HAs yielding to high mobility signaling delay.

Hierarchical Mobile IP (HMIP) has been proposed to reduce the number of location updates to HA and the signaling latency when an MT moves from one subnet to another .In this mobility scheme, FAs and Gateway FAs (GFAs) are organized into a hierarchy. When an MT changes FA within the same regional network, it updates its CoA by performing a regional registration to the GFA. When an MT moves to another regional network, it performs a home registration with its HA using a publicly routable address of GFA. The packets intercepted by the HA are tunneled to a new GFA to which the MT is belonging. The GFA checks its visitor list and forwards the packets to the FA of the MT .This regional registration is sensitive to the GFAs failure because of the centralized system architecture Moreover high traffic load on GFAs and frequent mobility between regional networks degrade the mobility scheme performance . In order to reduce the signaling load for interregional networks, mobility dynamic location management approaches for MIP have been proposed: A Hierarchical Distributed Dynamic Mobile IP (HDDMIP) and Dynamic Hierarchical Mobile IP (DHMIP).In the HDDMIP approach, each FA can act either as an FA or GFA according to the user mobility. The traffic load in a regional network is distributed among the FAs. The number of FAs attached to a GFA is adjusted for each MT. Thus, the regional network boundary varies for each MT. This number rate. This number is adjustable from time to time according to the variation of the mobility and the packet arrival rate for each MT is computed according to the MT mobility

2 . EXISTING SYSTEM

Hierarchical Mobile IP (HMIP) has been proposed to reduce the number of location updates to HA and the signaling latency when an MT moves from one subnet to another. In this mobility scheme, FAs and Gateway FAs (GFAs) are organized into a hierarchy. When an MT changes FA within the same regional network, it updates its CoA by performing a regional registration to the GFA.

When an MT moves to another regional network, it performs a home registration with its HA using a publicly routable address of GFA. The packets intercepted by the HA are tunneled to a new GFA to which the MT is belonging

.The GFA checks its visitor list and forwards the packets to the FA of the MT .This regional registration is sensitive to the GFAs failure because of the centralized system architecture .Moreover, a high traffic load on GFAs and frequent mobility between regional networks degrade the mobility scheme performance.

3 . PROPOSED SYSTEM

In order to reduce the signaling load for interregional networks, mobility dynamic location management approaches for MIP have been proposed: A Hierarchical Distributed Dynamic Mobile IP (HDDMIP) and Dynamic Hierarchical Mobile IP (DHMIP). In the HDDMIP approach, each FA can act either as an FA or GFA according to the user mobility. The traffic load in a regional network is distributed among the FAs. The number of FAs attached to a GFA is adjusted for each MT. Thus, the regional network boundary varies for each MT. This number is computed according to the MT mobility characteristics and the incoming packet arrival rate. This number is adjustable from time to time according to the variation of the mobility and the packet arrival rate for each M incoming packet arrival rate.

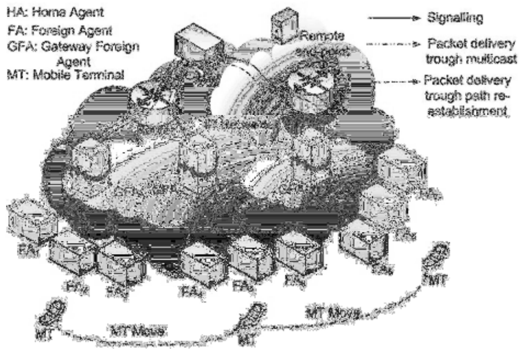
4 . OUR APPROACH

4.1 Multicast-Based Mobility Approaches:

The multicast has been proposed to be used for mobility support and specifically in wireless networks with small radio cells and high mobility of MTs. Several multicast based mobility approaches have been proposed [11]. They can be classified into multicastbased mobility in connection oriented and connectionless networks. For connection oriented networks, Acampora and Naghshineh propose a virtual tree concept, where a multicast connection tree is preestablished. This tree is a collection of radio base stations and ATM network switches connected to the tree's root. The signaling delay is limited to the activation and deactivation of pre-established branch in the tree. For Connection less network, Seshan, in proposes to apply a multicast to Mobile IP to reduce the handoff delay. The HA encapsulates the intercepted packets into multicast packets and sends them to the targeted MT over multiple FAs. Ghai and Singh propose to divide the wireless network into regions controlled by a supervisor host. Each region includes groups of cells such as each cell may be part of several of these groups. The performance of multicast mobility approaches has been evaluated through simulation or through analytic models. A set of performance metrics (such as handoff delay, packet loss, and bandwidth overhead due to handoff) have been identified and evaluated for multicast mobility approaches that have been simulated using NS2 network simulator.

4.1.1. Multicast Hierarchical Mobile IP

In this approach, we propose to build hierarchical multicast groups. In each group, FAs are connected to each other through a GFA. A set of GFAs are connected to an HA. When an MT moves through FAs belonging to the same group, the GFA of this group multicasts the received packet (coming from the HA) to the MT. When the MT moves outside a group, the new CoA is registered to the GFA of the new group to which the MT is currently belonging. This GFA sends this CoA to the HA. This latest tunnels the packet to the new GFA which will multicast the received packets within the new FAs group. This approach reduces the frequency of the location update to the HA. This update is performed every inter-GFAs mobility rather than every inter-Fas mobility limiting the location update processing only at the GFA. In this example, the group creation is static in the sense that the numbers of groups and FAs do not change and remain fix [11]. In Fig, when the MT moves from FA2 to FA5, the location registration is performed between HA and GFA2. GFA2 multicasts packets to FA4, FA5, and FA6. Thus, when MT moves to FA6 or FA4 there is no need for the MT location registration.



Hence, this approach allows reducing the mobility signaling delay compared to the HMIP and DHMIP mobility approaches specifically for high-mobility MTs. However, it is network resources consuming approach due to multicast protocol use. Consequently, it is required for comparison purpose to evaluate the performance not only in term of handoff signaling delay but also in term of bandwidth use. This latest is the bandwidth used for signaling transfer and packet delivery. If we take the same MIP network architecture for the three mobility management approaches, the bandwidth used by MHMIP signaling is smaller than that of MIP or DHMIP approaches because the path reestablishment is performed only between HA and GFAs. However, the bandwidth used by an MT for packet delivery is high because several connections are used for packets' transfer to the MT. It is clear that the total bandwidth used for signaling and packet delivery in MHMIP approach is higher than that used by the other approaches. Nevertheless, in case of MTs with high mobility (high handoff requests), the multicast resource in the GFA groups are reused by the MT every handoff event that occurs during its call holding time. Consequently, we expect that the MHMIP mean bandwidth per call for MTs with high mobility is no greater than that of the DHMIP and MIP mobility approaches. We also expect that the MHMIP mean handoff delay (including signaling and packet delivery delays) is smaller than that of the DHMIP and MIP mobility approaches. Hence, we propose to derive an analytic model that allows computation of mean bandwidth and mean handoff delay per call for MIP, DHMIP, and MHMIP mobility approaches. These performance measurements are computed according to the MTs mobility type (high or low) and the call holding time duration.

5.FUNCTIONAL REQUIREMENTS:

Modules:

- *Mobile terminal*
- *Foreign agents*
- *Gateway Foreign agents*
- *Mobile Server*

Mobile Terminal:

In the MIP protocol, Mobile Terminal (MT) registers with its home network from which it gets a permanent address (home address). This address is stored in the Home Agent (HA). It is used for identification and routing purpose. If MT moves outside the home network visiting a foreign network, it maintains its home address and obtains a new one from the Foreign Agent (FA). This Foreign address is called Care-of-Address (CoA).

Foreign agents:

In the HDDMIP approach, each FA can act either as an FA or GFA according to the user mobility. The traffic load in a regional network is distributed among the FAs. The number of FAs attached to a GFA is adjusted for each MT. Thus, the regional network boundary varies for each MT. This number is computed according to the MT mobility characteristics and the incoming packet arrival rate. This number is arrival rate for each MT. adjustable from time to time according to the variation of the mobility and the packet

Gateway Foreign agents:

We propose to build hierarchical multicast groups. In each group, FAs are connected to each other through a GFA. A set of GFAs are connected to an HA. When an MT moves through FAs belonging to the same group, the GFA of this group multicasts the received packet (coming from the HA) to the MT

Mobile Server:

In this module we collect the information given by mobile terminal through foreign agents and gate way foreign agents,and we calculate the bandwidth and which protocol is used and comparision between MIP,DHIMP,MHIMP

6. NON-FUNCTIONAL REQUIREMENTS:

The major non-functional Requirements of the system are as follows

I.Usability

The system is designed with completely automated process hence there is no or less user intervention.

II. Reliability

The system is more reliable because of the qualities that are inherited from the chosen platform java. The code built by using java is more reliable.

III. Performance

This system is developing in the high level languages and using the advanced front-end and back-end technologies it will give response to the end user on client system with in very less time.

IV. Supportability

The system is designed to be the cross platform supportable. The system is supported on a wide range of hardware and any software platform, which is having JVM, built into the system.

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