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MIP Protocol: A Novel Distributed and Dynamic Mobility Management Strategy for Mobile IP

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Abstract:

One of the major challenges for the wireless network design is the efficient mobility management, which can be addressed globally (macromobility) and locally (micromobility). Mobile Internet protocol (IP) is a commonly accepted standard to address global mobility of mobile hosts (MHs). It requires the MHs to register with the home agents (HAs) whenever their care-of addresses change. However, such registrations may cause excessive signaling traffic and long service delay. To solve this problem, the hierarchical mobile IP (HMIP) protocol was proposed to employ the hierarchy of foreign agents (FAs) and the gateway FAs (GFAs) to localize registration operations. However, the system performance is critically affected by the selection of GFAs and their reliability. In this paper, we introduce a novel dynamic hierarchical mobility management strategy for mobile IP networks, in which different hierarchies are dynamically set up for different users and the signaling burden is evenly distributed among the network. To justify the effectiveness of our proposed scheme, we develop an analytical model to evaluate the signaling cost. Our performance analysis shows that the proposed dynamic hierarchical mobility management strategy can significantly reduce the system signaling cost under various scenarios and the system robustness is greatly enhanced. Our analysis also shows that the new scheme can outperform the Internet Engineering Task Force mobile IP hierarchical registration scheme in terms of the overall signaling cost. The more important contribution is the novel analytical approach in evaluating the performance of mobile IP networks. Index Terms—Mobile IP (MIP), mobility management, roaming, wireless networks.

Keywords:

Mobile Internet Protocol, Mobile terminal,Foreign Agent, Home Agent, Internet Engineering Task, Care of Address, Hierarchical Mobile Internet Protocol Gateway Foreign Agent, Hierarchical Distributed Dynamic Mobile Internet Protocol, Dynamic Hierarchical Mobile Internet Protocol.

INTRODUCTION:

Mobile Computing is becoming increasingly important due to the rise in the number of portable computers and the desire to have continuous network connectivity to the Internet irrespective of the physical location of the node. The Internet infrastructure is built on top of a collection of protocols, called the TCP/IP protocol suite. Transmission Control Protocol (TCP) and Internet Protocol (IP) are the core protocols in this suite. IP requires the location of any host connected to the Internet to be uniquely identified by an assigned IP address. This raises one of the most important issues in mobility, because when a host moves to another physical location, it has to change its IP address. However, the higher level protocols require IP address of a host to be fixed for identifying connections.

The Mobile Internet Protocol (Mobile IP) is an extension to the Internet Protocol proposed by the Internet Engineering Task Force (IETF) that addresses this issue. It enables mobile computers to stay connected to the Internet regardless of their location and without changing their IP address. More precisely, Mobile IP is a standard protocol that builds on the Internet Protocol by making mobility transparent to applications and higher level protocols like TCP. 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.

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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. 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 cases. The main objective of this project is shows the robustness of the MHMIP approach in the sense that for critical scenario corresponding to the extreme situation where all handoff events are localized at the multicast group borders in Mobile IPNetworks.

Managing the mobility efficiently in wireless networks causes critical issue, in order to support mobile users. To support global mobility in IP networks The Mobile Internet Protocol (MIP) has been proposed. The Hierarchical MIP (HMIP) and Dynamic HMIP (DHMIP) strategies are also proposed for providing high signaling delay. Our proposal approach "Multicast HMIP strategy" limits the registration processes in the GFAs. For high-mobility MTs, MHMIP 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 gives the best performance among the DHMIP and MIP strategies in almost all the studied cases. The main contribution of this paper is to implement the MHMIP and provide the analytic model that allows the comparison of MIP, DHMIP and MHMIP mobility management approaches.

LITURATUE SURVEY:

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 by R.Caceres et.al.

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 with C.Castelluccia. As per S.Pack et.al, 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.The authors L.Yu et.al, propose an analytic performance model to evaluate the signaling transmission, the packet delivery, and the total costs of HMIP, HDDMIP, and DHMIP mobility approaches using a one-dimensional random walk model. The performance analysis shows that the DHMIP scheme outperforms compared to the HMIP and HDDMIP ones.

Despite that, the DHMIP approach still requires the new location update and packet route processing in FAs belonging to the hierarchy increasing the mobility signaling and packet delivery delay. Moreover, the path extension through the FAs hierarchy increases the network resources used for packet delivery and location update signaling for an ongoing communication.As per the report on GSM and Mobile IP Mobility concern the another inter-FAs tunneling approach has been proposed to optimize the route between the remote end point and the MT. This approach enables remote end point to get the CoA associated to the MT and to use it to reach the MT through the foreigner network without passing through the home network. When the MT moves from one foreigner network to another, it communicates its new CoA to its previous FA through its new FA.

The previous FA tunnels the received traffic from the remote end point to the MT's new location. At the same time, it sends a message to the HA requesting that the remote end point be notified of the MT's new CoA. Upon receiving this new CoA, the remote end point uses it to reach the MT through the new foreigner network without passing through its previous foreigner network. This approach requires to restore an optimized route after each CoA change. It aims to transfer packets through the resulting route with smaller delay than that experienced when these packets transit through the home network.

However, this may not be always the case, and such performance will depend on the route optimization mechanism used and a set of influencing factors such as remote end point to FAs distance, the loads of the networks the optimized route should pass through, and the MT inter-FAs mobility frequency. In LTE systems, where small cells deployment is expected, MT with high mobility will be able to access different wireless networks frequently yielding to increase traffic overhead due to MIP signaling and tunneling. This signaling includes not only location update signaling but also security association signaling required for MIP support. This can be proposed by A acampora et.al.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 preestablished branch in the tree.

For Connection-less network, Seshan, 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. A unique IP multicast ID is assigned to each of these groups.R.Katz et.al. are extend this work by considering multiple wireless networks and cases where mobile device is not able to use channel characteristics to trigger handoffs due to the frequent network interface change.Different Mobile IP multicast protocols have been proposed. J Wu proposed a Mobility Supporting Agents (MSA)-based architecture has been proposed using IGMPv2 and PIM SM IP multicast protocols. M.Shabeer et,al, proposed an Core Based Trees (CBT)-based multicast mobile IP approach has been proposed for micro mobility. A.Helmy et.al propose a set of multicast mobility protocols called Candidate Access Router set (CARset).

RELATED WORK

MIP:

In the MIP , 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.

HMIP:

Hierarchical Mobile IP (HMIP) [5],[8] 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. 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:

DHMIP approach has been proposed to reduce the location update messages to the HA by registering the new CoA to the previous FA and building a hierarchy of FAs. Hence, the user's packets are intercepted and tunneled along the FAs hierarchy to the MT. The hierarchy level numbers are dynamically adjusted based on mobile user's mobility and traffic load information. If the MT becomes attached to FA4 the level number reach the threshold and the MT will set up a new hierarchy.

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PROBLEME STATEMENT:

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.

PROBLEME DEFINITION:

we propose to compute the mean bandwidth per call and the mean handoff delay per call used for signaling and packet delivery according to the MT mobility and call holding time duration, and to compare the performance of a Multicast Hierarchical Mobile IP approach (MHMIP) with those of the DHMIP and MIP mobility strategies. We derive a set of recommendations for the usage of these mobility management approaches according to the MTs mobility. The main contribution of this paper is the analytic model that allows performance evaluation of three mobility management approaches.The main advantage of this is to provide the robustness of the MHMIP approach in the sense that for critical scenario corresponding to the extreme situation where all handoff events are localized at the multicast group borders in Mobile IP Networks.

IMPLEMENTATION:
Mobility based approach:

Mobility based approach can u se any one of the approach like Hierarchical Mobile IP, Multicast Hierarchal Mobile IP, etc.,

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. IfMT 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:

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 comparisons between MIP,DHIMP,MHIMP.

Home agent:

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 in the network.

CONCLUSION:

In this paper, we have proposed an analytical model which evaluates the mean handoff delay per call and the mean bandwidth per call of three mobility management

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approaches: MIP, DHMIP, and MHMIP. Numerical results show that the MHMIP mobility approach compares very favorably with the previously considered mobility approaches. More specifically, our analysis gives in almost all cases a lower mean handoff delay per call and a mean bandwidth per call than those offered by the DHMIP and MIP approaches. It also shows the robustness of the MHMIP approach in the sense that for critical scenario corresponding to the extreme situation where all handoff events are localized at the multicast group borders, this approach essentially yields to

1) a lower mean bandwidth per call than the DHMIP and MIP approaches;

2) a lower mean handoff delay per call than that offered by the MIP approach;

3) a lower mean handoff delay than that offered by the DHMIP except in case of frequent inter-GFAs handoffs with a network configuration having a high number of links involved in MHMIP path reestablishment such as the configurations. Since we expect a diversity of multimedia applications for future IP mobile networks, we recommend using the MHMIP approach in networks parts carrying delay sensitive and/or low mean bandwidth consumption type of applications and this according to the mobility type.

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