

Mobility Management Schemes for WMNS Using Pointer Forwarding Techniques

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Abstract: The efficient mobility management schemes based on pointer forwarding for wireless mesh networks (WMNs) with the objective to reduce the overall network traffic incurred by mobility management and packet delivery. The proposed schemes are as per-user-based, i.e., the optimal threshold of the forwarding chain length that minimizes the overall network traffic is dynamically determined for each individual mobile user, based on the user's specific mobility and service patterns. Wireless Mesh Networks (WMN's) are achieving swiftly developing focus in current years, and are commonly recognized as an advanced option for next era wireless networks. Contrasted with regular wireless and mobile networks, eg .Wi-Fi based wireless networks and mobile IP networks, WMN's have the advantages of low price, easy implementation, self organization and self healing, and being compatible with current wired and cordless networks by the gate way/bridge circuit feature of mesh network routers. A WMN is manufactured up of mesh network routers and mesh customers. In this paper two per-user-based mobility management schemes for WMN's, namely, the static anchor method and dynamic anchor method. Both techniques are depending on pointer forwarding, i.e., a chain of forwarding pointer is used to trace the current location of mesh client. The optimum limit of the transmission sequence length is identified for very personal mesh client dynamically depending on the mesh client's specific mobility and service pattern's. paper illustrate that for both strategies, there exists on optimum limit of the transmission sequence length that reduces the overall network traffic received by mobility management and packet transmission when given a set of variables characterizing the particular mobility and service design of a mesh client.

Keywords: Mobility Management, Wireless Mesh Networks, Pointer Forwarding, Mobile Internet Protocol.

I. Introduction

The mobile communication as part of this instance, relate to the structure put in place to guarantee that easy and trusted communicating runs on. These would likely consist of gadgets like standards, services, data transfer, and sites required facilitating and helping of the mentioned services. The data structure is also defined at this stage. This guarantees that there is no crash with other existing system with offer the equivalent service. Since the news is unguided/unbounded, the overlaying framework is more of broadcast wave oriented. That is, the signals are transported over the air to desired devices that are able of receiving and sending like types of signals.

Mobility management is nothing but the technique in which unbroken signal connectivity is managed, when a mobile device changes locations from one network to another network. Mobility management is one of the leading features of a GSM or a UMTS network. Mobile products inform the mobile network, whenever it goes from one place region to another. Mobile devices identify the place region codes. Once a mobile discovers that the place region code is various from its last update, it does different upgrade by delivering to the network, a place upgrade appeal, with each other with its previous site, and its temporary mobile customer identification(TMSI) as well. Thus a client really enjoys an unbroken accessibility to the network.

Wireless communication is without a question a much desired service has highlighted by the great development in both cellular and wireless local area networks (WLAN's).However, this to significantly various technologies addresses only a small range of connectivity needs, and there are many other applications that can gain from wireless connectivity. The cellular networks offer wide area coverage, but the service is fairly costly and offers low data rates: even the third generation of cellular networks (3G) offers (at best) low data rates (2Mbps) contrasted to WLAN's. On the other hand, the WLAN's have rather restricted coverage (and the associated reduced mobility). Furthermore, in order to enhance the coverage of WLAN's a wired backbone linking several access points is needed.

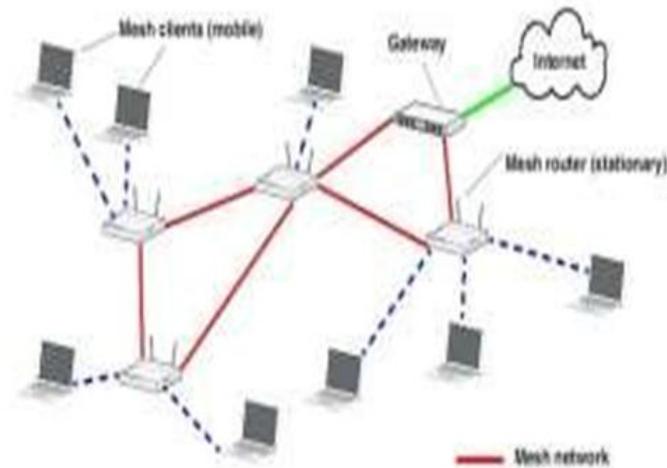


Fig: 1 Wireless Mesh Network

II. Mobility Management Systems

Mobility administration is practically nothing but the strategy in which unbroken signal connections is managed, when a cellular device alters areas from one circle to different circle. Mobility administration is one of the principal features of a GSM or a UMTS network. Cellular devices notify the mobile network, whenever it shifts from one site area to the other. Cell phones devices identify the site area codes.

Whenever a mobile discovers that the site area code is assorted from its past upgrade, it executes different upgrade by delivering to the system, a place upgrade request, along with its past area, and its Temporary Mobile Subscriber Identity (TMSI) as well. Thus a customer delights in an unbroken accessibility to the network.

1.1 System Analysis

A per-user-based mobility management scheme can apply specific optimal settings to individual mobile users such that the overall network traffic incurred by mobility management and packet forwarding is minimized. The optimal settings of each mobile user should depend on the user's specific mobility and service patterns, and should be computationally easy to determine. Two per-user-based mobility management schemes for WMNs, namely, the static anchor scheme and dynamic anchor scheme. Both schemes are based on pointer forwarding, i.e., a chain of forwarding pointers is used to track the current location of a mesh client.

1.2 Cellular IP Strategies

The mobile IP can provide continuous Internet access services for the mobile user and does provide a simple and scalable solution to user mobility. Yet, mobile IP is not a good solution for users with high mobility because it may cause excessive signaling traffic and long latency. The hierarchical mobile IP (HMIP) protocol was proposed to employ the hierarchy of foreign agents (FAs) and the gateway FAs (GFAs) to reduce the number of registration operations and to reduce the signaling latency. However, since user mobility characteristics and network traffic load are always in changing, the centralized and pre-planned network topology of HMIP would become invalid or even lead more signaling cost if no adjustment to be adopted. This paper introduces a novel distributed and dynamic mobility management strategy for mobile IP where the signaling burden is evenly distributed and the regional network boundary is dynamically adjusted according to the real-time measurement of handover strength or traffic load in the networks. Mobility administration is practically nothing but the strategy in which unbroken signal connections is managed, when a cellular device alters areas from one circle to different circle. Mobility administration is one of the principal features of a GSM or a UMTS network. Cellular devices notify the mobile network, whenever it shifts from one site area to the other. Cell phones devices identify the site area codes.

To develop the analytical models based on stochastic Petri nets to evaluate the performance of the proposed schemes. Using the stochastic Petri net models, it demonstrate that for both schemes, there exists an optimal threshold of the forwarding chain length that minimizes the overall network traffic incurred by mobility management and packet forwarding when given a set of parameters characterizing the specific mobility and service patterns of a mesh client. It show that our schemes can yield significantly better performance than schemes that apply a static threshold to all mesh clients, especially when a mesh client's mobility rate is relatively high compared to its service rate. Between the two proposed schemes, it show that the dynamic anchor scheme is better in typical network traffic conditions, whereas the static anchor scheme is better when the service rate of a mesh client is considerably high such that the advantage of the dynamic anchor scheme is offset

by the extra cost. Whenever a mobile discovers that the site area code is assorted from its past upgrade, it executes different upgrade by delivering to the system, a place upgrade request, along with its past area, and its Temporary Mobile Subscriber Identity (TMSI) as well. Thus a customer delights in an unbroken accessibility to the network.

Wireless metropolitan area networks (WMAN's), partially link this space providing high data rates with sure quality of services to a really large customer base (up to tens of miles from the base station). The main disadvantages of WMAN's are their lack of mobility support and the line of sight (LOS) requirements: if a customer does not have a clear LOS to the WMAN base station, it is not likely that he can get service. In communities with high density of interferences, more than half of the customers cannot be offered due to the LOS requirement. Furthermore the base station tends to be complex and costly. The wireless mesh networks (WMN's) have the possible to minimize many of these drawbacks by providing low-cost, wireless broadband internet access both for mixed and mobile users.

1.3 Progressive and Effective Network Signaling

Mobility management protocol that supports intradomain mobility within a WMN. Although the use of MAC-layer events can help Ant speedup handoff, the signaling cost of location updates in Ant is considerably high, because a location update message has to be sent to a central location server every time a mesh client changes its point of attachment. This is especially a severe problem if the average mobility rate of mesh clients is high.

A WMN consists of two types of nodes: mesh routers (MRs) and mesh clients (MCs). MRs are usually static and forms the wireless mesh backbone of WMNs. Some MRs also serves as wireless access points (WAPs) for MCs. One or more MRs are connected to the Internet and responsible for relaying Internet traffic to and from a WMN, and such MRs are commonly referred to as gateways. To assume that a single gateway exists in a WMN. Hence, it 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 cases. The main contribution of this paper is the analytic model that allows the mobility management approaches performance evaluation. The hierarchical mobile IP (HMIP) method was recommended to utilize the structure of foreign agents (FAs) and the gateway FAs (GFAs) to minimize the amount of subscription functions and to minimize the signalling rotational latency.

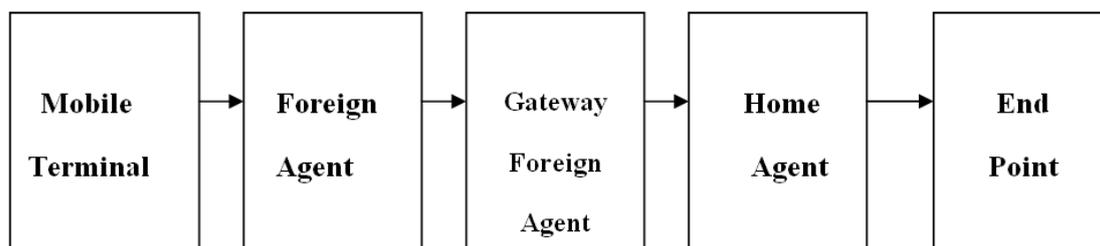


Fig. 2. System Architecture

In the mobility management schemes, the central location database resides in the gateway. For each MC roaming around in a WMN, an entry exists in the location database for storing the location information of the MC, i.e., the address of its anchor MR (AMR). The AMR of an MC is the head of its forwarding chain. With the address of an MC's AMR, the MC can be reached by following the forwarding chain. Data packets sent to an MC will be routed to its current AMR first as shown in fig 3.1, which then forwards them to the MC by following the forwarding chain. Packet delivery in the proposed schemes simply rely on the routing protocol used. Mobility management schemes based on pointer forwarding for wireless mesh networks, namely, the static anchor scheme and dynamic anchor scheme.

To compare the proposed schemes with two baseline schemes and with the WMM scheme. Analytical results show that 1) the dynamic anchor scheme is better than the static anchor scheme in typical network traffic conditions, whereas the static anchor scheme is better when the service rate of an MC is comparatively high such that the advantage of the dynamic anchor scheme is offset by the extra cost; 2) our schemes perform significantly better than the baseline schemes, especially when SMR is small; and 3) the dynamic anchor scheme is superior to the WMM scheme when the network traffic is dominated by mobile Internet applications characterized by large traffic asymmetry for which the downlink packet arrival rate is much higher than the uplink packet arrival rate.

III. Related Work

In this recommended system an analytical model to examine the suggest signalling postpone and the average data transfer per call based on to the kind of MT mobility. In this evaluation, the MHMIP outperforms the DHMIP and MIP techniques. The hierarchical mobile IP (HMIP) method was recommended to utilize the structure of foreign agents (FAs) and the gateway FAs (GFAs) to minimize the amount of subscription functions and to minimize the signalling rotational latency. In this process, utilizes a unique dispensed and powerful flexibility administration approach for cellular IP where the signalling load is uniformly delivered and the location network border is dynamically readjusted based on to the real-time description of handover durability or targeted traffic burden in the networks.

IV. Modules

Here four modules are included, Analytical model that permits calculation of average data transfer and suggest handoff postpone per call for MIP, DHMIP and MHMIP mobility techniques. These overall performance proportions are calculated regarding to the MTs mobility type (maximum or minimal) and the call retaining time period.

1.1. MIP protocol

In the MIP process, Mobile Terminal (MT) subscribes with its residence network from which it will get a fixed address (home address). This address is kept in the Home Agent (HA). It is utilized for recognition and routing factor. If MT steps outdoors the home network travelling to a foreign network, it holds its home address and gets a latest one from the Foreign Agent (FA). This Foreign address is known as Care-of-Address (CoA). To enable continuation of continuous interactions in between the MT and a remote end point, the MT shall notify the HA of its existing location when it transfers external the home network. The HA provides to MT the intercepted packets by tunnelling them to the MT's existing aim of connection.

1.2. DHMIP Approach

The DHMIP strategy has been recommended to minimize the venue upgrade information to the HA by enrolling the new CoA to the past FA and constructing a structure of FAs. Therefore, the user's packets are intercepted and tunnelled together the FAs structure to the MT. The structure level figures are dynamically readjusted based on cellular user's mobility and targeted traffic burden important information.

1.3. Multicast-based Mobility Approaches

An additional approach that minimizes the signalling burden in Mobile IP community is to usage a multicast- dependent mobility technique. These techniques have been recommended to minimize the flexibility signalling wait by setting a multicast cluster. The MTs address upgrade procedures are focused into the multicast community nodes. Therefore, MHMIP mobility strategy is recommended to minimize the signalling wait utilizing multicast teams.

1.4. Multicast Hierarchical Mobile IP

In this strategy, recommended to establish hierarchical multicast teams. In every group, FAs are associated to every another through a GFA. A set of GFAs are associated to an HA. When an MT transfers through FAs that belong to the exact same team, the GFA of this particular group multicasts the accepted packet (approaching from the HA) to the MT. When the MT goes outdoors a group, the latest CoA is subscribed to the GFA of the latest group to which the MT is presently that belong. This GFA delivers this CoA to the HA. This present channels the packet to the latest GFA which kind of will multicast the accepted packets inside the new FAs team. This strategy decrease the regularity of the venue upgrade to the HA.

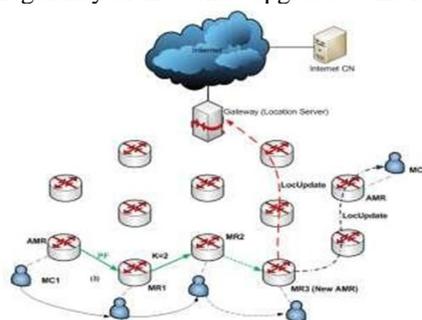


Fig. 3. The handling of location handoffs in the proposed pointer forwarding schemes (Loc Update means a location update message, and PF means pointer forwarding).

V. Performance Analysis

In this section, we analyze the performance of the proposed schemes, in terms of the total communication cost incurred per time unit. Additionally, we compare the proposed schemes with two baseline schemes. In the first baseline scheme, pointer forwarding is not used, meaning that every movement of an MC will trigger a location update event. Thus, it is essentially the same as having $K \approx 0$ in the proposed schemes. In the second baseline scheme, pointer forwarding is employed, but the same threshold of the forwarding chain length is preset for all MCs, e.g., $K \approx 4$ for all MCs. We also carry out the performance comparison between our schemes and the WMM scheme. A detailed description of the WMM scheme and the SPN model constructed. The time unit used is second.

1.4 Proposed Pointer Forwarding Schemes

Fig. 4 shows the total communication cost as a function of K in both schemes, under different SMRs. As shown in the figure, for both schemes, there exists an optimal threshold K that results in minimized total communication cost. For example, when $SMR \approx 1$, the optimal K is 10 for the static anchor scheme, whereas it is 11 for the dynamic anchor scheme. Another observation is that the total communication cost in both schemes decreases, as SMR increases. This is because given fixed session arrival rates, the mobility rate decreases as SMR increases, thus the signalling cost incurred by location management as well as the total communication cost decreases. It is interesting to note in Fig. 4 that the dynamic anchor scheme always performs better than the static anchor scheme investigated SMRs. However, since, the dynamic anchor scheme incurs additional overhead of resetting the forwarding chain of an MC upon session arrival, it is expected that in cases that session arrival rates are considerably high, the additional overhead will offset its advantage. This is demonstrated by Fig. 4, which plots the cost difference between the static anchor scheme and dynamic anchor scheme, as a function of SMR.

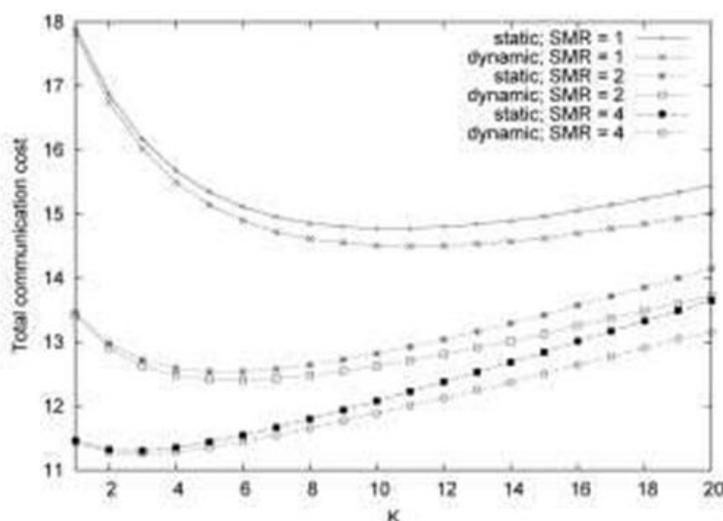


Fig: 4 Total Communications

It can be seen in Fig. 4 that, initially, when SMR is small, the dynamic anchor scheme performs better than the static anchor scheme. However, as SMR increases, there exists a crossover point beyond which the static anchor scheme starts performing better than the dynamic anchor scheme. It is interesting to see that there exists another crossover point of SMR beyond which the dynamic anchor scheme is superior again. This is because when SMR is considerably large, i.e., when the mobility rate is considerably small relative to the session arrival rate, resetting the forwarding chain due to new session arrival in the dynamic anchor scheme essentially makes the AMR of an MC be the same as its current serving MR most of the time, thus significantly reducing the packet delivery cost. It is worth noting that because the total communication cost is a per time unit measure, the accumulative effect of even a small cost difference will be significant.

VI. Conclusion And Future Scope

1.5 Conclusion

In this paper, utilizes a unique dispensed and powerful flexibility administration approach for cellular IP where the signalling load is uniformly delivered and the location network border is dynamically readjusted based on to the real-time description of handover durability or targeted traffic burden in the networks.

1.6 Future Scope

In cellular networks this strategy is recommended for the roaming purpose that is to provide domestic and international roaming feature to the cellular users and also to identify the localization of the particular mobile user. These strategies suggest using this technology in further generations of wireless network. Definitely this method will occupy the some part of further technology.

References

- [1] I.F. Akyildiz, X. Wang, and W. Wang, "Wireless Mesh Networks: A Survey," *Computer Networks*, vol. 47, no. 4, pp. 445-487, Mar. 2005.
- [2] A. Raniwala and T.-c. Chiueh, "Architecture and Algorithms for an IEEE 802.11-Based Multi-Channel Wireless Mesh Network," *Proc. IEEE INFOCOM*, vol. 3, pp. 2223-2234, Mar. 2005.
- [3] I. Akyildiz, J. McNair, J. Ho, H. Uzunalioglu, and W. Wang, "Mobility Management in Next-Generation Wireless Systems," *Proc. IEEE*, vol. 87, no. 8, pp. 1347-1384, Aug. 1999.
- [4] I. Akyildiz, J. Xie, and S. Mohanty, "A Survey of Mobility Management in Next-Generation All-IP-Based Wireless Systems," *IEEE Wireless Comm.*, vol. 11, no. 4, pp. 16-28, Aug. 2004.
- [5] D. Huang, P. Lin, and C. Gan, "Design and Performance Study for a Mobility Management Mechanism (WMM) Using Location Cache for Wireless Mesh Networks," *IEEE Trans. Mobile Computing*, vol. 7, no. 5, pp. 546-556, May 2008.
- [6] A. Boukerche and Z. Zhang, "A Hybrid-Routing Based Intra-Domain Mobility Management Scheme for Wireless Mesh Networks," *Proc. 11th Int'l Symp. Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM '08)*, pp. 268-275, Oct. 2008.
- [7] H. Wang, Q. Huang, Y. Xia, Y. Wu, and Y. Yuan, "A Network-Based Local Mobility Management Scheme for Wireless Mesh Networks," *Proc. IEEE Wireless Comm. and Networking Conf. (WCNC '07)*, pp. 3792-3797, Mar. 2007.
- [8] R. Huang, C. Zhang, and Y. Fang, "A Mobility Management Scheme for Wireless Mesh Networks," *Proc. 50th IEEE Global Telecomm. Conf.*, pp. 5092-5096, Nov. 2007.
- [9] V. Navda, A. Kashyap, and S. Das, "Design and Evaluation of iMesh: An Infrastructure-Mode Wireless Mesh Network," *Proc. Sixth IEEE Int'l Symp. World of Wireless Mobile and Multimedia Networks (WoWMoM '05)*, pp. 164-170, June 2005.
- [10] M. Ren, C. Liu, H. Zhao, T. Zhao, and W. Yan, "MEMO: An Applied Wireless Mesh Network with Client Support and Mobility Management," *Proc. 50th IEEE Global Telecomm. Conf.*, pp. 5075-5079, Nov. 2007.
- [11] Y. Amir, C. Danilov, M. Hilsdale, R. Musaloiu-Elefteri, and N. Rivera, "Fast Handoff for Seamless Wireless Mesh Networks," *Proc. MobiSys*, pp. 83-95, June 2006.
- [12] R. Jain and Y. Lin, "An Auxiliary User Location Strategy Employing Forwarding Pointers to Reduce Network Impacts of PCS," *Wireless Networks*, vol. 1, no. 2, pp. 197-210, 1995.
- [13] N. Nandiraju, L. Santhanam, B. He, J. Wang, and D. Agrawal, "Wireless Mesh Networks: Current Challenges and Future Directions of Web-in-the-Sky," *IEEE Wireless Comm.*, vol. 14, no. 4, pp. 79-89, Aug. 2007.
- [14] J. Robinson and E. Knightly, "A Performance Study of Deployment Factors in Wireless Mesh Networks," *Proc. IEEE INFOCOM*, pp. 2054-2062, May 2007.
- [15] I.F. Akyildiz, Y.-B. Lin, W.-R. Lai, and R.-J. Chen, "A New Random Walk Model for PCS Networks," *IEEE J. Selected Areas in Comm.*, vol. 18, no. 7, pp. 1254-1260, July 2000.
- [16] C. Hirel, B. Tuffin, and K.S. Trivedi, "SPNP: Stochastic Petri Nets, Version 6.0," *Proc. 11th Int'l Conf. Computer Performance Evaluation: Modelling Techniques and Tools*, pp. 354-357, Mar. 2000.
- [17] A. Campbell, J. Gomez, S. Kim, A. Valko, C. Wan, and Z. Turanyi, "Design, Implementation, and Evaluation of Cellular IP," *IEEE Personal Comm.*, vol. 7, no. 4, pp. 42-49, Aug. 2000.
- [18] R. Ramjee, T.L. Porta, S. Thuel, K. Varadhan, and S. Wang, "HAWAII: A Domain-Based Approach for Supporting Mobility in Wide-Area Wireless Networks," *Proc. Seventh Int'l Conf. Network Protocols (ICNP '99)*, pp. 283-292, 1999.
- [19] H. Lim and C. Kim, "Flooding in Wireless Ad Hoc Networks," *Computer Comm.*, vol. 24, nos. 3/4, pp. 353-363 2001.
- [20] S.-Y. Ni, Y.-C. Tseng, Y.-S. Chen, and J.-P. Sheu, "The Broadcast Storm Problem in a Mobile Ad Hoc Network," *Proc. Ann. ACM/ IEEE MobiCom*, pp. 151-162, Aug. 1999.