Eng. & Tech. Journal, Vol.31, No.2 , 2013

Seamless Handover by Optimal Route to Materialize ABC With Heterogeneous B3GWN

Dr. Thamir R. Saeed
Electromechanical Engineering Department, University of Technology/Baghdad
Email:thrsrw@yahoo.com

Received on: 19/7/2011 & Accepted on: 6/9/2012

ABSTRACT

The actual trend is to integrate complementary wireless technologies with overlapping coverage, to provide the expected ubiquitous coverage and to achieve the Always Best Connected (ABC) concept. Therefore, the continuation of an active call is proof to that trend, and can satisfied that trend by good handover management.

This paper, focus on the vertical handover decision process and improvement of network performance when the user's position and optimum path are taken into account. From the results the improvement in handover time by(5-30msec) was materialize, well, reduce the memory size.

Keywords*:* Handover/Handoff, Wireless Network, Routing optimization

تسليم سلس من خلال الطريق الأمثل لتجسيد ABC مع B3GWNغير المتجانسة

الخلاصة

الاتجاه الفعلي لدمج التكنولوجيات اللاسلكية لتكاملها و لتوفير التغطية المتوقعة في كل مكان ودائما من أجل تحقيق مفهوم أفضل أتصال (او تواصل) (ABC). لذا، فإن استمرار وجود مكالمة نشطة هو دليل على هذا الاتجاه، ويمكن تحقيق هذا الاتجاه من قبل إدارة تسليم جيدة. هذه المقالة تركز على عملية اتخاذ القرار في التسليم العمودي وتحسين أداء الشبكة عند أخذ مكان المستخدم والمسار الأمثل له في الاعتبار. من النتائج كان التحسن في وقت تسليم (٥-١٥ مللي ثانية) وبالتالي خفض حجم الذاكره.

INTRODUCTION

In the current mobile network context, a mobile node can change its point of attachment to different networks [1]. These networks arecellularnetworks, metropolitan area networks, wireless local area networks, and personal area networks. The combination of all these networks is usually called the heterogeneousBeyond 3G Wireless Networks (B3GWN) [2].

From this fact, it follows that no access technology or service provider can offer ubiquitous coverage expected by users requiring connectivity anytime and anywhere. But, the continuation of an active call is one of the most important

https://doi.org/10.30684/etj.31.2A.13
2412-0758/University of Technology-Iraq, Baghdad, Iraq

quality measurements in the cellular systems[3] . Therefore, the users will expect to continue their connections without any disruption when they move from one network to another. This important process in wireless networks is referred to as handoffor handover[2].Handoff(or handover) process is transferring anactive call from one cell to another. The transfer of current communication channel could be in terms of time slot, frequency band, or code word to a new base station (BS). If new BS has some unoccupied channels thanit assigns one of them to the handed off call. If all of the channels arein use at the handofftime there are two possibilities: to dropthe call or to delay it for a while [3] .A promising approach to meet quality of service(QoS) requirements is based on the use of handover buffers at the (destination) base station, where transmitted cells are stored while the connection is being reestablished [4].So, future-generation mobile communication will provide broadband multimedia services to users, anywhere and anytime. On the other hand network performance should be guaranteed to support these applications and services. [5].

The purpose of our work is to achieve the concept of ABC in heterogeneous networks by a combination of all its. In the existing technical literature, many related studies on HO have been reported, these works are;

Pooja 2011[6],presented a handoffand route optimization solution using reserved VCs between adjacent ATM switches to reroute connections during inter-switch handoff.Also, a distributed optimization process is initiated to optimally reroute handoffconnections.

Cong 2011[1],suggested a supplementation an additional procedure AR caching to mobile node for storing all the access routers that it connected in the past.

Enrique 2009[2],a comparisonbetween the performance of four decision algorithms proposed for VHO. SAW , TOPSIS and GRA with the Multiplicative Exponent Weighting (MEW). Also, VHO was simulated by using stochastic models and several kinds of traffic. The results show that although the performance of the four algorithms is very close, in some situations, GRA is able to provide a slightly better performance than SAW, TOPSIS and MEW.

Jinsoo2006[7],proposed a new handover scheme for Fast Mobile IPv6 over the IEEE 802.16e system. By integrating FMIPv6 with IEEE 802.16e system efficiently, the proposed scheme can minimize not only L3 handover latency but also packet losses.

Masahiro 2004[8],discussion a network segmentation with mobility management and multicast management for the scalability of the Mobile Ethernet by reducing network traffic. Also, heevaluatethe verticalhandover comparing to Mobile IPv6 fast handoverMarkopoulos2003[5], presented a set of Location Aided Handover mechanismsthat use the location information to assist safe handover decisions. The implemented algorithms are validated by means of a cellular network simulator.

HANDOVER/HANDOFF

The process that a Mobile Node (MN) changes its point of attachment (transferring an active call from one cell to another) to the network or moves from

one network to another network is known as handoffor handover[1,2,3,9].And this is called intra-swtchhandoffand inter-switch handoff respectively.
The handoff function ensures that all these ongoing connections are rerouted to another access point in a seamless manner. In other words, the design goal is to prevent service disruptions and degradation during and after thehandoff process.[6]
The principal parameters used to evaluate handofftechniques are: forced termination probability and call blocking probability. The mechanisms such as guard channels and queuing handoffcalls decrease the forced termination probability while increasing the call blocking probability[3].

Traditionally, the handover process has been considered and studied among wireless networks using the same access technology. This kind of handover process is defined as horizontal handover (HHO). Now, with the emerging mix of overlapped B3G wireless networks deployed, the handover is a more complicated process and previous handover management techniques cannot be used. The new handover process among networks using different technologies is defined as vertical handover (VHO) [2], and fgure(1) shows these different types of HO.
In general, the vertical handoffprocess can be divided into three main steps, namely *system discovery*, *handoffdecision*, and *handoffexecution* [2,10].The handoffdecision mechanism is formulated as an optimization problem. Each candidate network is associated with a cost function. The decision is to select the network which has the lowest cost value. The costfunction depends on a number of criteria, including the bandwidth, delay and power requirement[10].Therefore, the aim of a handoffprocedure is to decrease forced termination probability while not increasing call blocking probability significantly[3].

OPTIMAL ROUTE

To send the packets from source to destination node on optimum route in mobile network, the router must find the path with minimum cost. If an intermediate node has failed, the routing table will be updated and the path should be changed depending on this failure. In traditional protocols, the packet is sent on the path with minimum number of hops and this path is not always optimum, therefore the router selects the path depending oncomputing cost for each link and send the packets on path with minimum consumption energy, maximum capacity or minimum delay. Checking the failure node in the path, if there is not, then computing the optimum path in minimum cost is more suitable and efficient than the path with minimum number of hops[11].The rerouting of connections must be done quickly with minimal disruption to traffic. Also the resulting routes must be optimal [6].Once the new CoA construction is done, the MN must update the binding cache in its HA and CN by sending a Binding Update (BU) message[1].
The enormous growth of personal telecommunication services, together with the scarcity of radio spectrum has leadto reducing the cell size in cellular systems. Smaller cell size entails a higher handoffrate and more frequent handoffsper call[12].

PROPOSED HANDOVER PROCEDURE

We will adopt the model in references[1,8] and heterogeneous wireless network (WN) are considered with the addition of the following points are :-

1. Each AR sends the status of the paths associated.
2. The status in (1) means:-
    a- Pass or not beforesendthe information (periodically).
    b- Location, battery status and destination point with information by same channel or by trigger channel.
3. Determine the status of the user and networkas follows;There are four status:

Table (1) status of user and network.

network	user
R	R
R	IR
IR	R
IR	IR

R-Regular.
IR-Irregular.

4. Send the optimum routpath with all inside nodesby use Dijkastra algorithm (Ref.[11]).
5. Estimate arrival time and mobile speed(from its massages).
6. Then, according to the above one can determine the method of finding the mobilityprocedure.

Table(2) method of finding the mobility according the status.

Network	user	MFMP
R	R	PFH - or - PFOpR
R	IR	PFOpR
IR	R	PFOpR
IR	IR	PFOpR

MFMP- Method of finding mobilityprocedure.
PFH - Predicted from history.
PFOpR- Predicted from Op-route

7. So can make a handover process as follows:-
    a- The first step (System discovery)are takenfrom thePFH if case(1) or taken from PFOpRprocedurefor cases (1, 2, 3 and 4).
    b- The second step (Handover decision) dependon the information about the paths (cost (one of the important parameter of it is a bandwidth) and availability).
    c- If it is necessary to apply (VHO) the third step (Execution) with new network or path (unoccupied channels).
    d- Or delay it for a while (stored while the connection is being reestablished), if all bandand all channels are occupied.

DISCUSSION

There are many points can be noted; these are:-

1. From Figure(2) the three different calls can transmittedthrough the channels which match with it. But when no matched there is a loss time (call waiting).
2. Also, from same figure it's clear the low calls can transmitted through the high channels if necessary to continue the activation of calling but not reversed.
3. From Figure(3) the difference in handover time between the methods in Table (2). The time which the PFH was taken more than the time of PFOpR because the difficulties of its prediction in the applied cases(2-4).
4. In first wayPFHcan madea log of database of a certain number routers and moving direction of mobile node(MN) depends heavily on travel time. Also, this way will be need a large size of memory which tend to slow the handover operation.
5. For otherwayPFOpR can find the routers which will be movethrough its from optimum rout then can predict the time of arrival from predict MN speed from its massages, by use this arrangementscan reduce the handover time(as in fig.(3) from 5-30 msec) and memory then reduce the cost.

CONCLUSIONS

There are many points can be viewed, these are;

1. Reduce the HO time.
2. Reduce the memory which used for queued the calls.
3. Then reduce the cost and satisfied the concept of ABC.

REFERENCES

[1].Cong, H. T. andVan T.T. "Mobile IPv6 Fast Handover Techniques", IEEE, 13th International Conference on AdvanecdCommunication Technology,Pag. 1304-1308, 2011.

[2].Enrique, S. N., Ulises P. R. andJesus A. E., "Vertical Handover in Beyond Third Generation (B3G) Wireless network", International Journal of Future Generation Communication and Networking, Vol. 1, No. 1 2009.

[3].Nasif, E., Tara S., Sibel K. andKemal F., "An Overview of Handover Techniques in Cellular Network", International Journal of Information Technology Volume 2 Number 2, Vol. 2, No. 2, June, 2005.

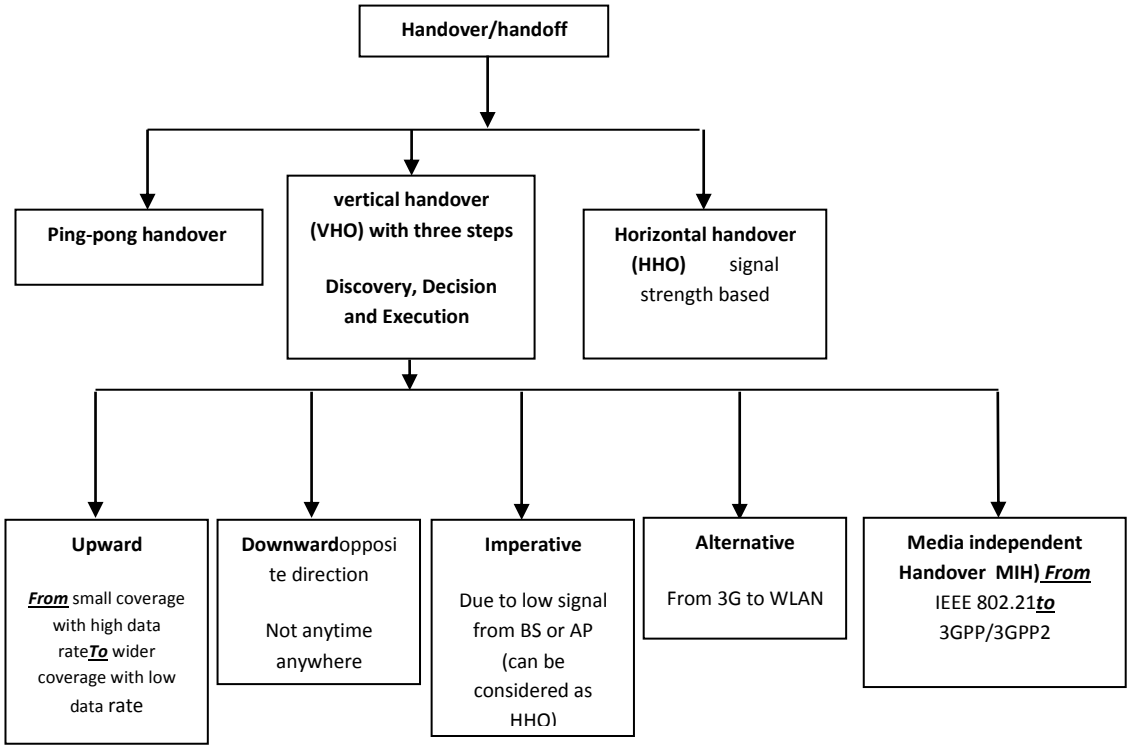
[4].Ajmone, M., Carla F. C. andAndrea F., "Performance Models of Handover Protocols and Buffering Policies in Mobile WirlessATM Network", IEEE Transaction on Vehicular Technology, Vol. 50, No. 4 July 2001.

[5].A. Markopoulos, P. Pissaris, S. Kyriazakosand E. Sykas, "Optimized Handover Procedure Based on Mobile Location in Cellular System", The 14th IEEE International Symposium on Personal Indoor and Mobile Radio Communication Proceeding 2003.

[6].Pooja, Megha K., V. K. Banga, and P. S. Sandhu, "Optimization for Reducing Handoff Latency and Utilization of Bandwidth in ATM Network", World Academy of Science and Technology, Issue 75, March 2011.

[7]. Park,J. D. H. Kwonand Y. J. Suh," An Integrated Handover Scheme for Fast Mobile IPv6 Over IEEE 802.16e System", IEEE, 2006.

[8].M. kuroda, M. Inoue, A. Okubo, T. Sakbkura, K. Shimizu and F. Adachi, "Scalable Mobile Ethernet and Fast Vertical Handover", IEEE Communication Society, WCNC,2004.
[9].Ching, Y. H, Chieh, Y. H. andHsuanli, L., "Handoff Mangement in Cellular Systems", Recent Patents on Electrical Engineering, 2008.
[10].Enrique, S. N. andVincent W.S.W. " Comparison Between Vertical Handoff Decision Algorithms for Heterogeneous Wireless Network", Canada 2006.
[11].Thamir, R. Saeed, Emad S. andDalia K., "Routing Optimization of Mobile Network System", Engineering and Technology Journal, Vol. 27, No. 8, 2009.
[12].Vicent, P. andVicente, C. G., "Analytical-Numerical Study of The Handoff Area Sojourn Time", Ministry of Science and Technology, Spanish, 2004.



Figure(1) Different Types of Handover.

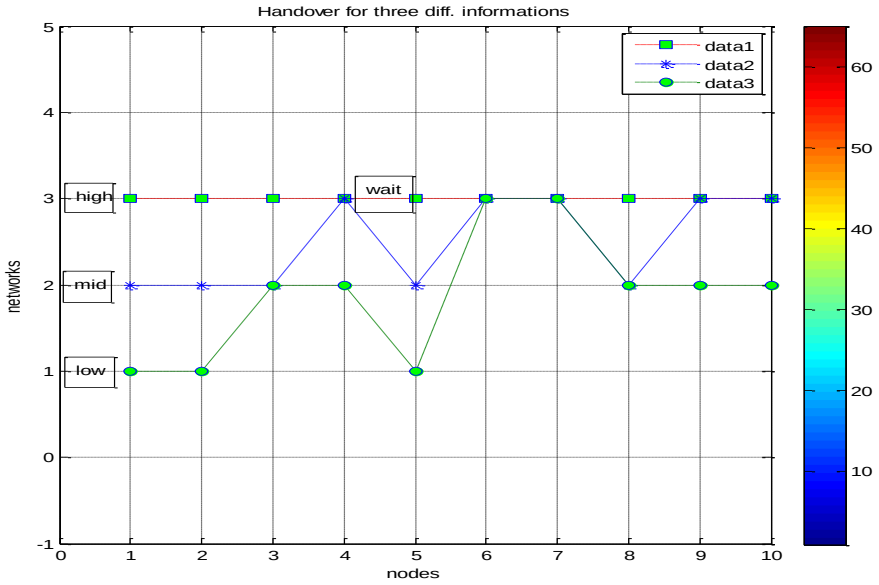


Figure (2) Three different calls through three different channels

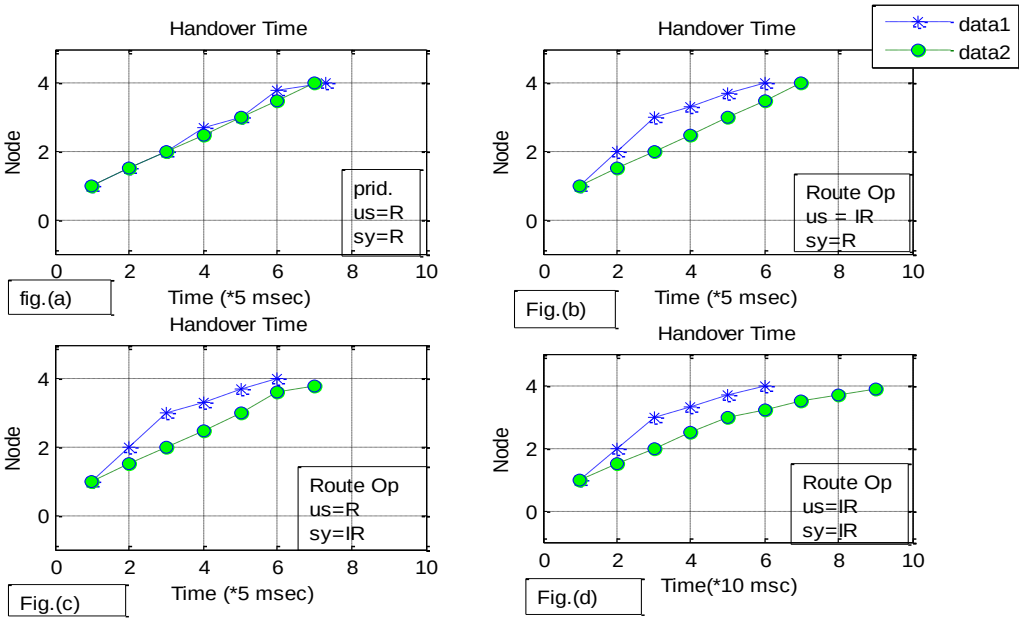


Figure (3) Handover time for four cases (table (2))

Note:These values of time, taken for the purpose of analysis and relied on the messages sent by the (RA) is between 30 msec and 70 msec as in the ref.[1].