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QOS Parameters based Vertical handoff Decision in Heterogeneous Network: A Practical Approach

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Abstract: This paper proposed the vertical handoff decision method to measure call blocking probability with respect to available number of wireless networks and analyzes the variation in mean number of request by variation in its parameter value. The multi criteria vertical handoff decision algorithm will select the best available network with optimized parameter values. For the handoff decision, the different parameters of network need to be considered based on which the handoff process will be initiated. These parameters are Network Bandwidth, RSS, threshold bandwidth, power dissipation, power consumption, network condition and these are considered as the QOS (Quality of service) as the decision will depend on these parameters and calculations. The handoff approach will handle the optimization problems of vertical handoff in heterogeneous wireless network. The proposed approach is easy to implement and has less computational complexity in terms of time.

Keywords: Network Parameter, QOS, Received Signal Strength, Handoff, Decision.

I. INTRODUCTION

The cellular network allows a person to make or receive a call anytime and from anywhere. Likewise, a person is allowed to continue the phone conversation while on the move. Cellular communications is supported by an infrastructure called a cellular network, which integrates cellular phones into the public switched telephone network. To accommodate more cellular phone subscribers, digital TDMA (time division multiple access) and CDMA (code division multiple access) technologies are used in the second generation (2G) to increase the network capacity. The 3G cellular networks have been deployed in some parts of Asia, Europe, and the United States since 2002 and will be widely deployed in the coming years. The cellular network has gone through three generations. The first generation of cellular networks is analog in nature. With digital technologies, digitized voice can be coded and encrypted. Therefore, the 2G cellular network is also more secure. The third generation (3G) integrates cellular phones into the Internet world by providing high speed packet-switching data transmission in addition to circuit-switching voice transmission. The two registers are required, one for mobiles for which the network is the home network, i.e. the one with whom the contract exists, and the other for visitors. The approach which is adopted is to send a message back to the HLR when the mobile first enters the new country saying that the mobile is in a different network and that any calls for that mobile should be forwarded to the foreign visited network. If there was only one register then every time the mobile sent any message to the foreign network, this would need to be relayed back to the home network and this would require international signalling. Then the handoff process will also be initiated and performs the handoff based on the new network type. If the new network is of same type, then the horizontal handoff will be processed otherwise the vertical handoff process will be initiated. By undergoing a registration procedure when the mobile is turned on, the cellular network is able to communicate correctly with it, provide access for outgoing calls, and also route any incoming calls to it in the most efficient manner. Registration also only allows those mobiles that have permission to access the network to communicate with it. The complete registration will be success if the handover process initiated, proper decision has been taken and handover to the new network.

The handover or handoff is the process of transferring an ongoing call or data session from one channel connected to another channel and these channels are connected to the core network.

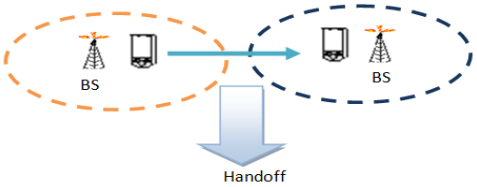

Fig 1 Handoff Scenario in Network

It is often initiated either by crossing a cell boundary or by a weakening in quality of the signal in the current channel. The handoff is required for provide the high availability of services to the users. The handoff mechanism includes the frequency, time slot, spreading code, or combination of these in channels associated with the current connection. While the call is in progress, the connection should not be broken, so there are different techniques for managing the handoff in mobile communication.

II. ELEMENTS OF CELLULAR NETWORK

There are some elements of cellular network and these are core part to start communication.

a. Base Station (BS): The covered area of a cellular network is divided into smaller areas called cells. Each cell has a base station which communicates

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simultaneously with all mobiles within the cell, and passes traffic to the Mobile Switching Centre. The base station is connected to the mobile phone via a radio interface.

a. Mobile Switching Centre (MSC): This controls a number of cells (or cluster), arranges base stations and channels for the mobiles and handles connections.
b. Mobile Station (MS) : This is basically the mobile phone
c. National Carrier Exchange: This is the gateway to the national fixed public switched telephone network (PSTN). It handles connections on behalf of the national communication systems, and is usually integrated with the MSC.

III. VERTICAL HANDOFF DECISION

There are number of methods have been proposed for performing handoff in mobile communication. The decision of handoff should be made at right time for good resource allocation. In the vertical handoff decision phase, the mobile terminal determines whether the connections should continue using the existing selected network or be switched to another network. The decision may depend on various parameters including the type of the application (e.g., conversational, streaming), minimum bandwidth and delay required by the application, access cost; transmit power, and the user's preferences. During the vertical handoff execution phase, the connections in the mobile terminal are re-routed from the existing network to the new network in a seamless manner. This phase also includes the authentication, authorization, and transfer of a user's context information. Various vertical handoff decision algorithms have been proposed recently. The vertical handoff decision is formulated as a fuzzy multiple attribute decision making problem.

First, the connection duration needs to be taken into account during the vertical handoff decision. Second, the processing and signalling load during the vertical handoff execution also needs to be taken into consideration. The decision-making process of handoff may be centralized or decentralized which means the handoff decision may be made at the Mobile Station (MS) or network.

IV. LITERATURE REVIEW

Handoff scheme for management the data loss in mobile communication has been proposed. The author has performed number of studies dealt with handoff management in mobile communication systems and some of these studies presented handoff schemes to manage this important process in cellular network. The existing schemes use relative signal strength (RSS) measurements. In author's Work, a new proposed handoff scheme had been presented depending not only on the RSS measurements but also used the threshold distance and neighbouring BSS power margins in order to improve the handoff management process [1].

The author explained the handoff mechanism in terms of cost effectiveness and handoff should be feasible means it should be implemented on proper time during call in mobile communication. They explained that Heterogeneous networks with different wireless technologies increase the availability of Internet services (i.e., cloud services). They presented a feasible handoff management solution (CSH-MU) with embedded vertical handoff decision algorithm (VHDA) based on RSS and power consumption for mobile phones with restricted system resources (e.g., limited access to decision metrics, battery life) [2].

The author has been assimilated the knowledge about Vertical handoff and different distance based schemes for improvement in vertical handoff. They explained the core concept to implement the data transfer rate vertical handoff in 4G wireless heterogeneous networks. They explained that the Wireless Heterogeneous Networks are integrated within fourth generation recently. The 4G wireless communication system should assure a few of QoS related facilities such as offering high data rates, seamless mobility, strong RSS. When accomplishment and requisite of a user is acknowledged the system gets succeed in handoff and seamless connectivity [3].

Vertical handover can be implemented by taking the techniques used in Wi-Fi (Wireless Fidelity) & WiMAX (Worldwide Interoperability for Microwave Access). They explained that if a mobile station velocity is high and its movement pattern is irregular, unnecessary handovers likely occur more frequently, and then a seamless handover algorithm between heterogeneous wireless networks is required [4]. The author has explained the vertical handoff in mobile networks having different networks and implemented in VANET. They explained that In Vehicular ad hoc network (VANET), vehicular users (VUs) are capable of connecting to different access networks for interacting both safety related information and user application related information. In the overlapped area of heterogeneous networks, VUs are allowed to perform vertical handoff between various access networks. As the performance of vertical handoff plays an important role in guaranteeing user quality of service (QoS) and achieving system performance enhancement, it should be examined and evaluated thoroughly [5].

V. PROPOSED METHODOLOGY

The prime objective is to improve the decision making efficiency. There is need of Selection of optimal target network using efficient decision making algorithm and Perform the necessary handoffs in Vertical Communication. In terms of power, it is need to minimize the power drain by keeping vertical handoff decision simple and Bandwidth Overhead need be minimize the amount of additional network traffic used to implement handoffs by achieving optimal network. The extended vertical handoff decision function is developed to measure the improvement gained by handing off to a particular network. In existing paper, this methodology has been proposed and implemented in this paper. The methodology is (i) Study the Vertical Handoff Concept and Process (ii) Analyse the Factors Considered in the Vertical Handoff Decision. (iii) Study the Improvement factor for improves the unnecessary Handoffs. The proposed Handoff Process method has been implemented in Matlab.

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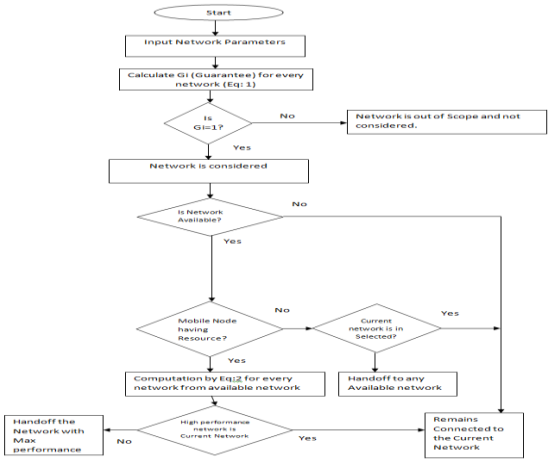

Fig 2 Flow Chart

VI. PARAMETERS

Initially, the input parameters are required on which the decision will be calculated such as network condition and also identify that the new network can handle the handoff or not.

Table 1: Parameters

General Parameters	Number of Networks under Evaluation
	Threshold Bandwidth
	Threshold RSS (Received Signal Strength)
	Threshold Estimated Time
Network Parameters	Available Bandwidth
	RSS(Received Signal Strength)
	Estimated Time
	Power Dissipation
	Mean number of Request Arrival per unit time
	Mean number of calls served per unit time
	Number of Networks under Evaluation
	Threshold Bandwidth

VII. RESULTS

The results has been generated with consider the input parameters. The two results will be generated in individual graph. The ten networks have been considered with its parameters value such as condition, RSS value etc. And graph has been drawn.

Experiment: 1: The common parameters for is:

Table 2: General Parameters

Number of Networks	10
Threshold Bandwidth	100
Threshold RSS	-500
Threshold Estimated Time	1

The other variation parameters of individual network have been explained as:

Table 3: individual Network Parameters

Network	Parameter Values in Sequence
1	110,-400,1,1,0,1,1,1
2	110,- 400, 2,2,2,2,2,2
3	110,- 400, 2,2,4,2,2,2
4	110,- 400, 1,1,6,1,1,1
5	110,-400, 1,1,8,1,1,1
6	110,- 400, 2,2,10,2,2,2
7	110,- 400, 1,1,12,1,1,1
8	110,- 400, 2,2,14,2,2,2
9	110,- 400, 1,1,16,1,1,1
10	110, -400, 2,2,18,2,2,2

The resulted graphs show the call blocking probability as shown by bubble and another graph is of mean number of request with number of handoffs.

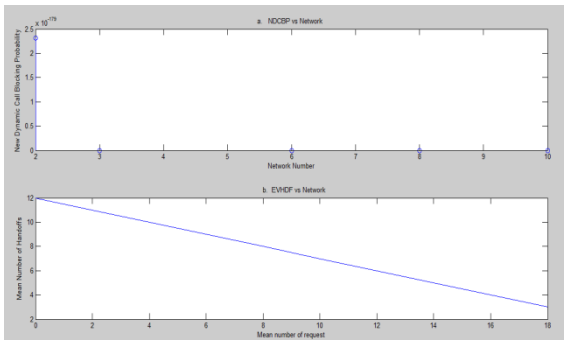

Fig 3 Call blocking Vs. Network Number for 10 Networks

Experiment 2: in this, the five networks have been considered and results generated.

Table 4: General Parameters

Number of Networks	5
Threshold Bandwidth	50
Threshold RSS	-300
Threshold Estimated Time	2

The other variation parameters of individual network have been explained as:

Table 5: individual Network Parameters

Network	Parameter Values in Sequence
1	60,-200,2,2,0,2,2,2
2	60,- 200, 3,3,2,3,3,3
3	60,- 200, 2,2,4,2,2,2
4	60,- 200, 1,1,6,1,1,1
5	60,-200, 2,2,8,2,2,2

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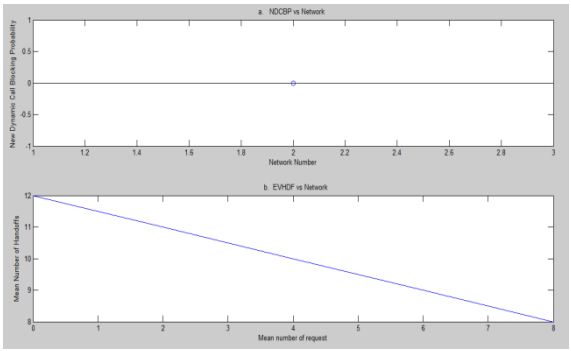

Fig 5 Call blocking Vs. Network Number for 5 Networks

VIII. CONCLUSION AND FUTURE WORK

In this research, we have presented a vertical handoff scheme mobile communication environment. The number of nodes is present in the mobile communication. The existing system was performed the unnecessary handoffs and we have improved the number of required handoff. Initially, the number of network parameters has been considered and implemented using MATLAB Simulation tool. The main importance of the research work presented in this research is to develop an efficient vertical handover mechanism for wireless networks to reduce the unnecessary handoffs.

The proposed handoff approach can handle the following optimization problems of vertical handoff in heterogeneous wireless network. Handoff is done fast and its delay is as less as possible. Number of handoff is minimized, which avoids degradation in signal quality and additional loads of the network. Handoff latency during handoff is minimized. The improved and efficient result has been generated. Handoff algorithm is simple and has less computational complexity etc.

In future work, optimize vertical handoff algorithm with memory and considering precise energy model to constantly lower the power consumption of mobile phones and also, the evaluate of the dual interface performance in real network. There can be also work out a mechanism to dynamically select the communication switching threshold values depending upon the speed of mobile node and network layout.

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