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CENTRALIZED NETWORK SELECTION SCHEME FOR HANDOVER IN HETEROGENEOUS WIRELESS NETWORK

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ABSTRACT

Next generation wireless communication network will be an era of over laid heterogeneous networks such as UMTS, WLAN, Wi- MAX and LTE. The user can access these technologies with a mobile node having multiple interfaces. The seamless continuity of service and interoperability in heterogeneous network is achieved by vertical hand off. Vertical hand off across different radio access technologies is facilitated by IEEE802.21 media independent specifications. Among the overlaid heterogeneous radio access technologies, selecting an appropriate candidate network for handover becomes important to remain always best connected. The hand over algorithm must consider QOS parameters to access the performance of different available networks in a physical location. As the mobile nodes move across different networks at high speed, taking quick decision in selecting candidate network become very important. This paper presents a novel method, where candidate network selection is carried at network side with the assistance of mobile node. The proposed method reduces the time required for candidate selection and improves the handover performance.

Keywords: *Heterogeneous networks, vertical hand off, candidate network.QOS.*

I. INTRODUCTION

In heterogeneous wireless network environment different wireless radio access technologies, which differ in operating parameters such as bandwidth of operation, coverage area, mobility support etc, co exist [1].The wider use of mobile communication proliferated wide deployment of different wireless networks which resulted in the overlay of these technologies in a area [2]. The mobile end devices are also available with multiple interfaces to support use of different radio access technologies; such mobile end devices are called multimode nodes. The availability of multimode nodes and overlaid network technologies promoted “Always Best Connected” possibility for the mobile users [3]. For the seamless connectivity and always remain connected to best available network handoff from one network to another network is an essential feature. The handoff from one radio access technology to another radio access technology is referred to as Vertical handoff. To adders the issues of vertical handoff the Media Independent

Handover (MIH) standard IEEE 802.21 defines common interfaces between different radio access technologies such as Wi-Fi, Wi-Max, UMTS [3].MIH facilitates three media independent services namely

i) MIH Event Service (MIES)
ii) MIH Command Service (MICS)
iii) MIH Information Service (MIIS).

The figure.1 shows the architecture of the MIH Functions.

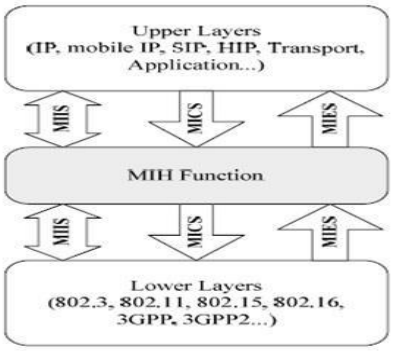

Figure 1: IEEE 802.21 Architecture

Media Independent Event Service(MIES):
The MIES take care of recognizing the events triggered at lower layers which indicate changes in the state of physical layer and changes in the state of transmission behavior of physical and data link layers. . It does the function of passing the information of occurrence of an event from local and remote interfaces to the MIH users in the upper layer .

Media Independent Command Service (MICS):
These are the commands generated form MIH user and sent to lower layers. These commands are intended to control lower layers i.e physical layer, data link and logical link layers. The commands are the decisions taken by the upper layers and sent to lower layers for implementation of the decision at local devices or at remote entity. The lower layer has to implement these commands as mandatory instruction. The MIH user utilizes the MICS to control multimode devices to achieve optimal performance

Media Independent Information Service(MIIS):
The media independent information service (MIIS) mechanism allow the MIHF user to obtain the network related information required for handover in a heterogeneous network . The information that can be obtained from MIIS are, information about available neighboring networks, point of attachment for the access network, the IP address of these access points , geographical locations. The MIIS also provide general information about the nearby networks. The information includes QOS offered by the neighboring networks, security levels, channel parameter, security etc. This information is used by MIHF user to make decision on selecting the best network. The information is available in a Media Independent Information Server(MIIS Server). The MIHF user in Mobile Node (MN)can access these services by making a request for information.

Seam less vertical handoff across different radio access technologies is facilitated by IEEE802.21 Media Independent Handover MIH specifications

Among the overlaid heterogeneous radio access technologies selecting an appropriate radio access technology as a candidate network become important to maintain quality of service [4]. The hand over algorithms must consider QOS parameters to assess the performance of different over laid networks in a location. Different candidate network selection schemes are suggested in literature [5]. As the mobile node MN move fast in a location covered by multiple networks quick handover is to be initiated to maintain service continuity. To make handover to the best available network mobile node has to make fast decision of candidate network. The proposed work suggest a novel method in which central MIIS server decides the candidate network access point to handover with the assistance of mobile node. The proposed scheme achieves fast candidate network section and hence reduces the handover delay.

II. LITERATURE REVIEW

M Ali et al. [3] proposed a load aware radio access selection method in heterogeneous wireless network. Radio access selection technique is an important issue in vertical hand off. The mobile node should handover to the most suitable radio access technology. Selecting the access technology which has highest qos interms of signal strength and bandwidth would lead to all nodes opting for the same RAT which intern overload the RAT and remaining RATs are off loaded and resource are underutilized. To overcome this limitation the proposed paper suggests a mechanism to select a RAT which has less load and achieve load balance in the network and resource are optimally utilized.

Enrique Esteven-Navarro, et al. [4] suggested a method to determine a suitable candidate network for initiating handoff. The algorithm proposed is based on MDP(Markov Decision Process). The mobile node acquire the link state of neighboring network such as AvBw, average dealy, and user preference as factors for arriving at best candidate network. The mobile node calculate a list of reward function . The network which has maximum reward is chosen as the candidate network.

Fabio Buiati,et al. [6] Devised a mechanism to get detailed information about surrounding neighboring network of a mobile node in heterogeneous wireless network. the scheme suggests multiple MIIS hierarchically distributed in the coverage area , MIIS are categorized as zone MIIS, Local MIIS , Global MIIS. This distributing of MIIS aims to optimize neighbor discovery scheme compared with single centralized MIIS or no MIIS scheme.

Shusmita AS et al. [7]; presented a vertical handoff algorithm to improve the performance in heterogeneous wireless network. The condition in which vertical hand off should be initiated to achieve improved performance is demonstrated. Two vertical handoff decision making algorithms namely MDP SAW and MAP TOPSIS are proposed. These methods observed to minimize unnecessary handoffs.

GuangLuet et al. [8] implemented a solution using IEEE802.21 standards to reduce handover latency in vertical hand over. The scheme is mobile controlled and network assisted handover scheme. The performance is analyzed for video streaming application and registered that proposed scheme outperform load balance scheme in terms of handover latency.

Farnaz Farid, et al. [9] proposed a application oriented qos evaluation technique in heterogeneous wireless network. The levels of qos importance are expressed as weights. The proposed method gives a methodical approach in calculation of weights.

Manzoor AK et al. [10] user preference for different application requirements are considered for candidate network selection. The truth telling behavior of network operator is considered and network was selected based on negotiation between operator and user preference over option as qos levels required and billing price and offered qos of the network.

Lusheng Wang et al. [11] presented a paper which studies the different candidate network selection schemes based on different mathematical models. The paper focus on network selection schemes as MADM, Fuzzy logic based schemes, game theory based schemes.

Harsha A Bhute et al. [5] presented a vertical handover decision schemes in heterogeneous network. different network selection strategies as RSS base VHO schemes , cost function base VHO sachems , Multiple attribute VHO schemes, AI base VHO schemes, Context aware based VHO sachems are described.

Amina Gharsalah et al. [12]: proposed network selection scheme based on application requirement. Different applications demand different level of qos. These requirements are satisfied by different network technologies, by making handover to network which suit the application,network resources are optimally utilized. The proposed algorithm in base on MADM method and demonstrated by VHO between LTE and WLAN.

S Cheng-Shong Wu et al. [13]considered mobile nodes speed as a factor in handover decision in addition to RSS. The handover scenario such as macro cell to femto cell, femto cell to femto cell are tested and found that macro cell to femeto cell handover reduce the load on macro cell and improves the usage of femtocel. With small speed femto cell usage in more ,with high speed number of handover are minimized and femto cell usage reduces.

Araniti J et al. [14] devised an algorithm to save power in handover . If MN is having high speed macro cell to femto cell Hanover is avoided. The candidate base station accepts new user only if they don't increase the intra cell interference.

Chin-Yu Liu et al. [15] gives details of heterogeneous inter working by heterogeneous handover using 3GPP ANDSF. ANDSF is a functional unit to assist the user equipment to discover neighboring networks. Using ANDSF is claimed to have reduced handover latency.

R.Tawil et al. [1] proposed a method of candidate network selection. The processing of the network work parameters for deciding the suitability of the candidate network for qos handover is distributed to neighboring nodes. This distributed processing found to reduce the handover delay compared to centralized decision taken at mobile nodes.

Miriam Tauil et al. [16] measure various timing delays involved in mobile initiate hand over process and network initiated handover process. The process suggested has many redundancies that could be avoided, to reduce the handover delay.

III. METHODOLOGY

In the presently used method of candidate network selection the network selection is carried out by the MN by utilizing the information obtained through MIIS server. When the qos of the mobile user degrades it send a MIH-network-info request to the MIIS through is current access point. In response to the request MIIS sends a list of surrounding network radio access points and qos related parameters as Available band width , Bit Error rate, SINR, current load etc.. to the mobile node. The mobile node on receiving the MIH-network-info –response, calculate the qos of the all the networks in the list based on the metric and predetermined function to calculate qos and select the best network of the list supplied by the MIIS server [5]. This procedure is time consuming and involve much redundant and over heads. To avoid these redundancies and overheads and to improve the performance by reducing the time of the candidate network selection in hand over process, we have proposed a novel method in this paper.

IV. THE PROPOSED SYSTEM ARCHITECTURE

The proposed architecture is a heterogeneous network consisting of Wi-Fi and UMTS . The mobile node can access Wi-Fi or UMTS through the Wi-Fi Access Points(AP) or through UMTS RACs (RAC), which are overlaid and simultaneously available to the user. The mobile nodes are multimode terminals and are MIHF enabled. The MN can access internet either by Wi-Fi Network or by UMTS network . Both UMTS and WI-Fi networks share a common MIIS server. Any mobile node can get information related to qos of possible candidate network by inquiring MIIS by sending a MIH request command to MIIS server "Get- network –info-request". Such a situation of network deployment is applicable in busy urban regions. The proposed system architecture is as shown in the figure-2.The networks will experience varying degree of traffic and frequent changes in the load. In such situations the qos of the network will not maintained constantly it observes fluctuations. The mobile node in motion will frequently change the boundary of coverage area of a access point need to make quick handover. Mobile nodes are wanted to be associated with best available network for want of better qos. The Always Best Connected is possible by hand off to better network among available networks and connecting to a access point among multiple access points for want of greater quality of service. To reduce handover latency, selecting an appropriate access point quickly ,among the overlaid AP's of Wi-fi or RNC of UMTS become important. Our proposed work focus towards fast candidate network selection in heterogeneous situation.

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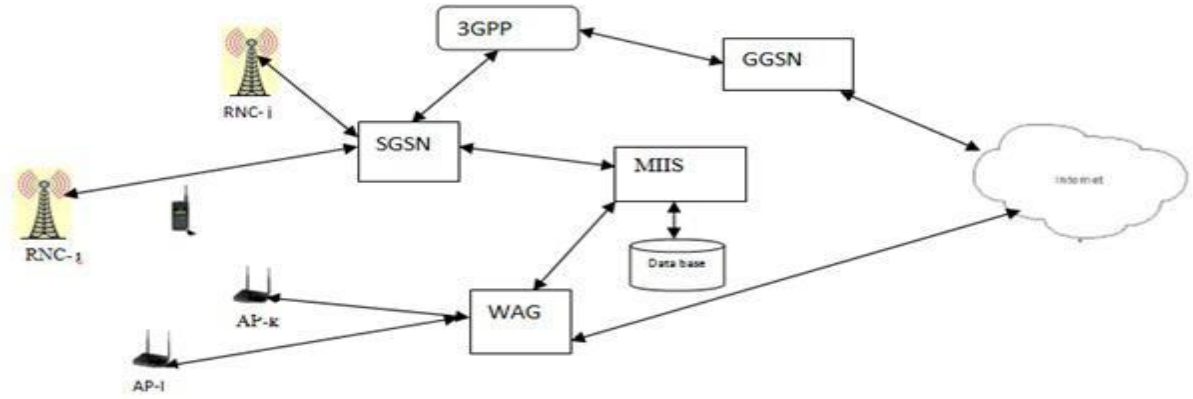

Figure 2: Proposed system architecture

V. PROPOSED METHOD

In the proposed method of candidate network selection, mobile node is constantly monitoring the current status 3 of the traffic. The current qos is accessed by a "cost function" C= _(1-1/(1+SNR) +(1-_) (1-1/(1+BW)) [17]. BW is the available band width, calculated by ma king proactive radio measurements on current traffic [18]. SNR is directly computed by bit error rate from theoretical tables [19]. All access points and RACs periodically broad cast Beacon messages. Mobile nodes hear to these Beacon messages and by using the Beacon messages MN list the ID of strong networks by measuring RSS of the Beacon messages. When cost function of ongoing traffic go below a threshold the MN send MIH- "Get –Network –info- request" command on the present ongoing link to MIIS Server. The request message includes the list of ID's of nearby networks from which MN has received strong signals. After receiving the MIH- Get -networkinfo- request message MIIS compute the cost function of all the networks listed in the request message. The MIIS make use of its data base to obtain the measured network parameters. The qos is measured by using the cost function which is used in the mobile node. In the cost estimation two parameters are taken as the essential parameters. One is SNR, the SNR is compute by all gate ways form their access points by measuring the BER of the current traffic flow and reported to MIIS .From BER, SNR is calculated using theoretical table [19].Available band width is periodically estimated by the gateways, by making proactive measurements using the bottleneck doubling principle. The various access points and RNC periodically transmit supervisory packets which are time stamped to their corresponding gateways. Gateways on receiving these packets estimate the available band width between them and various access points and this information is stored in the MIIS server. MIIS on reception of MIH-Get-network -info – request message from a MN it compute the cost function on all the access points, in the list sent from MN, and selects a access point which has better cost factor. The MIIS send back to the MN a response message MIHGet- Network -info-Response, which had the information of the candidate network i.e it's ID, calculated cost . Mobile node compare the cost of the link of candidate network received from the MIIS with the cost of the current connection, if the cost of the current link is less than the cost of the received candidate network link, the suggested network for the hand over is accepted and MN send an handover accepted message to MIIS, and perform handover operation to the candidate network. The timing diagram for the proposed method is shown in the figure 3. The algorithm at the mobile node is shown in the figure 4 and the algorithm at the MISS server is shown in the figure 5

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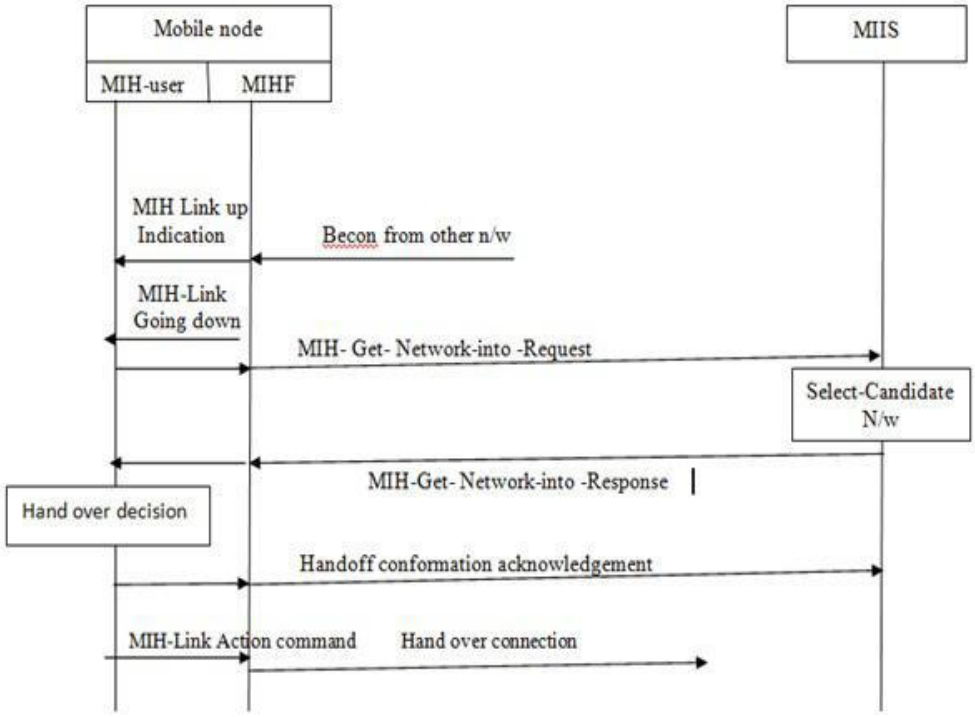

Figure 3: Timing diagram for the proposed method

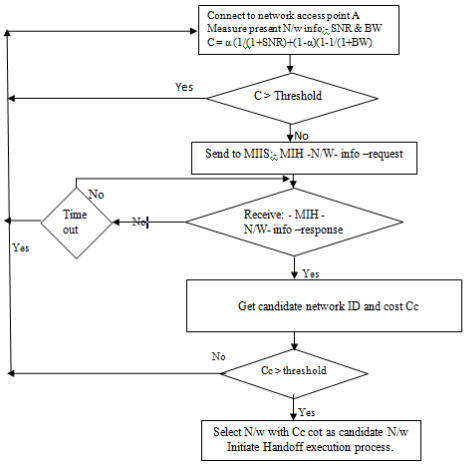

Figure 4. The algorithm at the mobile node.

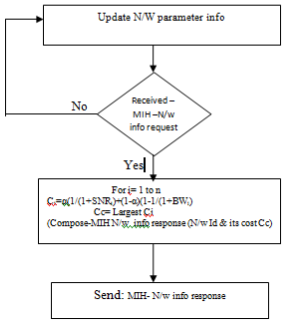

Figure 5. Algorithm at the MISS server

VI. RESULTS ANALYSIS

It can be observed from the figure 6 that the proposed scheme of candidate network selection take minimum time in selecting a candidate network access point to make hand over in comparison to other two methods. In the MIIS assisted method MN compute cost of all access points listed by MIIS and selects the best network. In the MN-MIIS assisted method MN compute the cost of access points listed by MN and obtained the qos parameters from the MISS. In the proposed MIIS selected method MIIS will not perform candidate network search thus save the time on

candidate network search. MIIS compute the cost of the links of only the access point of networks listed by the mobile node, this will save time of computation , when compare to the computation time required if carried out at the Mobile Node. The time saved in decision making is more as the number of neighboring network access points increases. The results are computed for the movement of the Mobile Node at a speed of 3m/sec. In the fig 7 and fig 8 the PDR is plotted against number of nodes when moving at a speed 4m/sec and 8m/sec. In the proposed scheme as number of neighbor network access points increases PDR is maintained at higher value compared other methods. PDR drops slowly as number of nodes increases and also PDR drops slowly as speed increases. The proposed scheme has minimum time of hand over decision making and offer less overhead on the current traffic in obtaining the information about the status of the neighboring network access points which causes reduced packet loss and increased PDR.

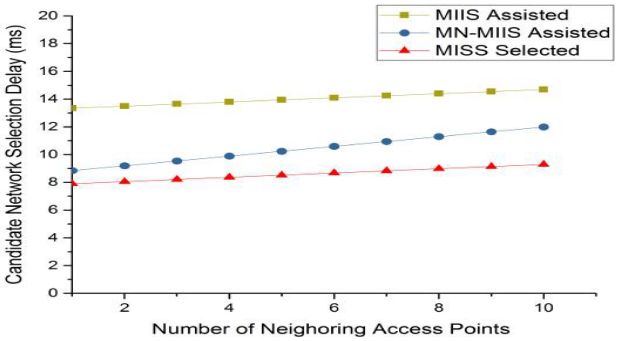

Figure 6: Candidate selection delay v/s number of neighbor access points

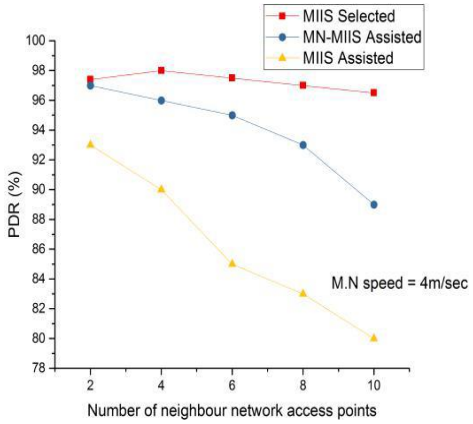

Figure 7: PDR v/s number of network access points at speed 4m/sec

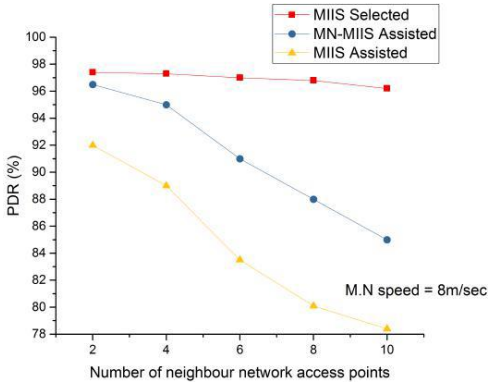

Figure 8: PDR v/s number of network access points at peed 8m/sec

VII. CONCLUSION

Feature telecommunication networks are heterogeneous networks involving diverse networks which have different characteristics. User can be benefited by inter operating in the diverse environment by making vertical handover. To select a candidate network to make handover in a challenging and important issue. Fast decision of the candidate net work reduce the delay in handover and reduced packet loss and improved Packet Deliver Ration. In the propose scheme candidate network access point is chosen by the MIIS server based on the information of neighbor access points provided by the Mobile Node. This method outperform the other methods of candidate network selection taken place at the mobile node with the network parameter information provided by the MIIS.

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