Journal of Research in Science, Technology, Engineering and Management (JoRSTEM)
ISSN: 2456-0197

A review on challenging issues of Selecting Network from Heterogeneous Wireless Networks

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Abstract—***In heterogeneous wireless network environment, the major challenging issue is to select the network depends upon the demands from users and various networks. Network selection mechanisms play a major role to ensure the quality of service in the heterogeneous multi-access environment. In this research article, survey on different network selection mechanisms and analysis of various techniques for selecting a best networks are analysed for heterogeneous networks and given as key point for future researcher.***

Keywords-Network Selection, Analytic Hierarchy Process, Heterogeneous Wireless Networks, Radio Access Network, WSN.

I. INTRODUCTION

The construction of heterogeneous wireless networks consists of different types of wireless networks in user side and at the operator side; traffic from different access networks may share a common backbone bandwidth to provide various multimedia services. Hence bandwidth consumption of different network will reduce [1] as shown in Fig. 1.

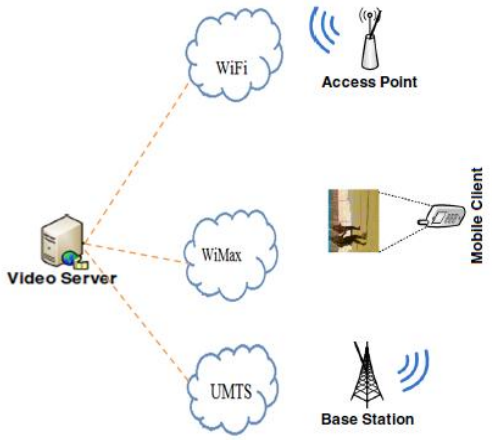

Fig. 1 Bandwidth Consumptions

Heterogeneous Networks are essentially made up of existing disparate Radio Access Network (RAN) technologies (e.g. WiMAX, Wi-Fi, UMTS, GPRS etc.). They consist of various architectures, transmission solutions, and base stations of varying power capacity. The constituent networks are used to improve the user experience, reducing bottlenecks in RAN and core network. Heterogeneous Wireless Networks are also used to introducing intelligent IP traffic routing and management, and also the efficient load balancing and resource allocation. Wireless LAN has been examined other inter-technology options. This is possibly to the attendant complementary offerings e.g. for WLAN: high data rates, low mobility and short range, while for UMTS: relatively low data rates, long range and high mobility. The service has been able to provide the ubiquity required in network coverage with accompanying Quality of Service (QoS) levels. This paper concentrates on various algorithms to select a best network in heterogeneous environment based on demands from users, cost and available bandwidth.

A. Network Selection Issues

In communication research field it is very tough to select the best network for Heterogeneous Wireless Networks, and it is also a difficult to reduce the handoff and to provide service for all users at the same time. Hence a multiple attribute network selection algorithm to select the network based on Analytic Hierarchy Process (AHP) and synergetic theory was identified in various research areas. The algorithm takes both the coordinates of objective attributes and different QoS requirements into consideration. The network performance will be better if the synergetic value is greater. The entropy of the system is considered to be less if the synergetic degree is high. The synergic algorithm reduces the number of handoff and provides subscribers a better QoS according to different services [2].

Always Best Connected (ABC) scheme was recognized to guarantee the mobile users for network selection by integrating wireless local area network (WLAN) system, The ABC mechanism focused on the process of balancing user preference from different networks, service application based on the need of customer and network condition under traffic. ABC scheme comprises three parts: first the availability of WLAN was detected for providing best service, second an Analytic Hierarchy Process (AHP) was applied to calculate the relative weights of request from each users and third to normalize parameters and to calculate decision-making index to take decision for choosing best network. The advantage of the AHP technique is that it not only works for an integrated UMTS/WLAN system, but also be applicable to systems with more heterogeneity (e.g.WiMAX). Simulations reveal that AHP network selection technique can effectively decide the optimum network through making trade-offs among network condition [3].

A traditional way to select a target network based on the received signal strength (RSS) to meet the various demands of different multimedia applications and different users was introduced. The considered multiple criteria includes QoS, security, connection cost. Firstly, IEEE 802.21 was taken to obtain the information of neighbouring networks which falls into two categories compensatory information and non-compensatory information. Secondly, the non-compensatory information was used to sort out the capable networks [4]. Thirdly, to combine a hybrid ANP and RTOPSIS model to rank the candidate networks the values of compensatory information was used as input values. Finally, a comparison study was made between TOPSIS based algorithm and new algorithm RTOPSIS based model to select best network [9].

The selection of the optimal access network requires service delivery in a heterogeneous wireless environment. The selection of an access network depends on several parameters such as the network and the application characteristics, the user preferences, and the service cost. An effective access network selection algorithm for heterogeneous wireless networks was designed that combines two Multi Attribute Decision Making (MADM) methods, the Analytic Hierarchy Process (AHP) method [5] and the Total Order Preference. The AHP method is used to determine weights of the criteria and the TOPSIS method is used to obtain the final access network ranking. Hence the combination of these two methods can be very effective for the selection of the optimal access network according to requirements of the application [13].

In previous network selection policies were based on Shannon theory, they do not consider the delay characteristics. In reality, different services have different delay constriction. The two new network selection policies are introduced for heterogeneous environment systems using effective capacity which incorporate the delay constraint into the transmission rate. In this policies aim is to maximize the entire throughput with different delay constraints. The new network selection policies were updated which can efficiently improve network throughput and provide QoS guarantees for a delay constraints [6].

Mobile terminals in heterogeneous wireless environment the select the network within the initial access and handover process. Mobile terminal is connected to the network in possible way in terms of QoS performance and energy consumption. Before selecting a network the things which are to be taken into account are network condition, QoS performance and energy consumption. The best balancing network is to select based on the performance and energy consumption. Hence to improve energy consumption in real-time and non real-time applications, fuzzy logic was designed. The most difficult challenge faced by many researchers is to balance the process between different wireless networks for mobile devices is important to complete the handover process with successful network selection[7]. The handover operation is to find the delay and packet loss to the quality of service in a certain level. Selecting the best available network at the proper time is very important to the ubiquitous networks. Enhanced access router discovery (EARD) is illustrated to select the best network by prioritizing the network. EARD was developed and implemented to work in a heterogeneous wireless networks including of WiMAX and WLAN networks. The EARD method implemented to prioritize the rating for multiple criteria to select the target network and to evaluate the priority with respect to various conditions with different traffic types [8] and [9].

One of the most challenging issues is to select the optimal network based upon the type of the demanding application. Vertical handoff will occur when a mobile terminal decides is to select the network from the available

network. A network selection algorithm mainly based on Fuzzy Multiple Attribute Decision Making (MADM). The algorithm mainly consider these parameters Received Signal Strength (RSS), Monetary cost(C), Band Width (BW), Velocity (V) and user preference (P). MADM finds the Network selection function (NSF) that measures the efficiency in utilizing radio resources by handing off to a particular network. Network selection the highest NSF is considered to select the best network to hand off.

II. CONCLUSION

This survey analyzed several network selection algorithms available at present for heterogeneous wireless networks. The network engineer can choose the suitable algorithm to provide good service for their customer and to achieve better results. This paper provides classifications of network selection issues involved in over Heterogeneous Wireless Networks and the techniques identified for researchers to solve their challenging issues. There are many unresolved issues addressed as future research.

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