A Survey Paper On Vertical Handoff Algorithm For WLAN And 3G

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***Abstract:-*Communication services anywhere and anytime is driving an accelerated technological development towards the integration of various wireless access technologies such as WLAN, 3G and etc. MTs (Mobile Terminal) must be able to seamlessly transfer to the "best" access link among all available candidates with no perceivable interruption to an ongoing data, voice or video conversation. Such ability to handover between heterogeneous networks is referred to as vertical handovers. VHD (Vertical Handoff Decision) algorithm can be classified in to different four category 1) RSS (Received Signal Strength) based 2) Freq. based 3) cost based 4) combination. These algorithms need to be designed to provide the required Quality of Service (QoS) and different parameter to a wide range of applications while allowing seamless roaming among a multitude of access network technologies.**

***Keywords* - WLAN; 3G; VHD.**

I. INTRODUCTION

Over the past few years, there have been several exciting innovations in wireless network technology. Today's, wireless communication technologies have become an integral parts of human day to day life and the wireless communication market has grown rapidly[9]. 3G:3rd Generation, which is also known as "International Mobile Telecommunications-2000 (IMT-2000), ITU" contains a few standards for 3G, such as UMTS, GPRS and EDGE. In the mobile environment, all of these standards provide some services, which are Voice, fax, Video calls and data through wireless. If we compare 3G with its previous generations, such as 2G and 2.5G, it is providing more data rate service with a wide range of coverage by using the best spectral efficiency and good quality of voice with multiple usage of speech at the same time, along high level security[9].

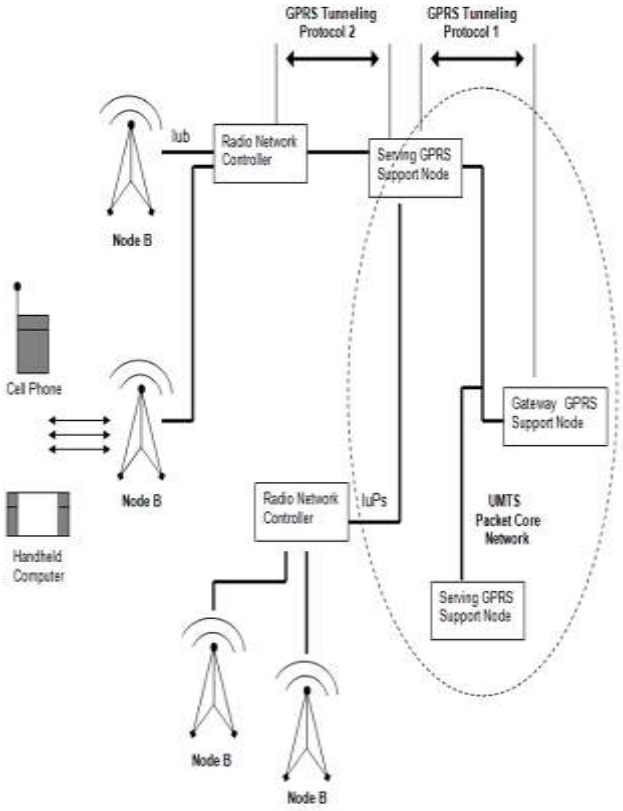

Figure 1: 3G Network Architecture

WLAN:wireless local area network in is the network in which different nodes communicate with each other on the basis of radio waves. Wireless signals are broadcasted, so the nodes in range can easily share it. We can say that it is an extension of current wired based networks; it provides much flexibility to users who can easily change their positions without disconnection. Normally, its data transfer rate is 1 to 54 Mbps, within a radius of 65 to 300 feet; a few latest standards are also providing300 to 600 Mbps[9].

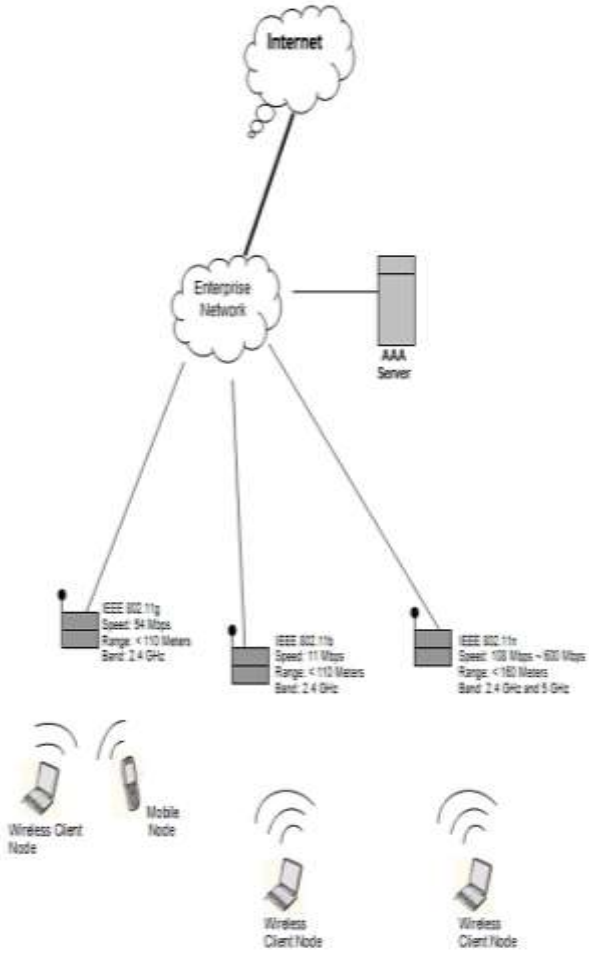

Figure 2: WLAN Architecture

In above figure 2, the enterprise wireless network consists of three AP's (access point) with three wireless client nodes and one mobile node. We have different types of IEEE standards for WLAN like, (IEEE 802.11g, IEEE 802.11b and IEEE 802.11n), our network is attached to AAA (Authentication Authorization Accounting). This is the term which is used for controlling the access of nodes, auditing of usage and billing for services. This combination makes an effective way for managing the network and its security. This whole WLAN is connected back to the Internet for giving access to wireless client/mobile nodes to internet[5].

Handoff: The term "handoff" or "handover" refers to the process of transferring a mobile station from one base station or channel to another channel or base station. One example is a seamless transfer of an ongoing voice or video conversation from one channel served by a core network to another. Depending on the access network that each point of attachment belongs to, the handover can be either horizontal or vertical[4].

A horizontal handover takes place between points of attachment supporting the same network technology, for example, between two neighboring base stations of a cellular network. On the other hand, a vertical handover occurs between points of attachment supporting different network technologies, for example, between an IEEE 802.11 access point and a cellular network base station.

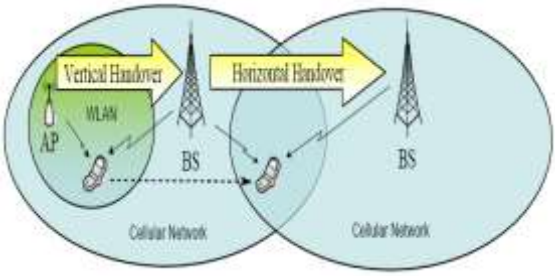

Figure 3: Horizontal/ Vertical Handover[4]

Vertical handover can be classified into two types: 1)Upward handover : Moving of a mobile node from a small network cell with a high data rate to a big network cell with a low data rate is called "upward handover". 2) Downward handover:In downward handover, the mobile node moves from a large network cell with a low data rate to a small network cell which has high data rates.

Hard handover: In hard handover, the mobile node has to disconnect first from the current network before connecting to the new network.Whereas in Soft handover, the mobile node can select the new network before the disconnection of the current network. So in soft handover mobile node is connected to two networks at the same time[9].

A handover process can be split into three stages: handover decision, radio link transfer and channel assignment. Handover decision involves the decision to which point of attachment to execute a handover and its timing. Radio link transfer is the task of forming links to the new point of attachment, and Channel assignment deals with the allocation of resources.

Classification of VHD Algorithms

VHD (Vertical Handoff Decision) algorithm can be classified in to different four category 1) RSS (Received Signal Strength) based RSS is used as the main handover decision criterion in this group. Various strategies have been developed to compare the RSS of the current point of attachment with that of candidate point of attachment. RSS based horizontal

handover decision strategies are classified into six subcategories: relative RSS, relative RSS with threshold, relative RSS with hysteresis, and relative RSS with hysteresis and threshold, and prediction techniques. For VHD, relative RSS is not applicable, since the RSS from different types of networks cannot be compared directly due to the disparity of the technologies involved.

2) Freq. based: : Available bandwidth for a mobile terminal is the main criteria. In some algorithms, both bandwidth and RSS information are used in the decision process. Depending on whether RSS or bandwidth is the main criterion considered, an algorithm is classified either as RSS based or bandwidth based.

3) cost based: This class of algorithms combines metrics such as monetary cost, security, band-width and power consumption in a cost function and the handover choices is made by comparing the result of this function for the candidate networks. Different weights are assigned to different input metrics depending on the network conditions and user preferences.

4) combination: These VHD algorithms attempt to use a richer set of inputs than the others for making handover decisions. When a large number of inputs are used, it is usually very difficult or impossible to develop analytical formulations of handover decision processes. Due to this reason, researchers apply machine learning techniques to formulate the processes.

II. Literature Review

1. Optimizations for Vertical Handoff Decision Algorithms [1]

In this paper, concept of policy-based handoffs and a cost function is defined to judge target networks based on a variety of user.A performance analysis demonstrates that significant gains in quality of service and a more efficient use of resources can be achieved from the proposed optimizations.It increases the complexity of the handoff process and makes the handoff decision more and more ambiguous.Use of an optimized cost function can simplify the handoff process and speed up the handoff decision.

2. A Vertical Handoff Decision Scheme In Heterogeneous Wireless Systems[2]

Objective is to provide a diverse range of seamlessly provide high-data rate multimedia services across different wireless networks. To achieve this, seamless vertical handoff techniques are used. Main goal is to reduce the processing overhead in the mobile terminal by delegating the calculation of handoff metrics for network selection to the Visiting Networks i.e. WiFi. Results show that the larger is the number of available networks, the higher is the processing delay when making the handoff decision.

DVHD scheme exhibited better performance in terms of processing delay, handoff blocking rate and throughput, than the CVHD scheme.

3. Combined SINR Based Vertical Handoff Algorithm for Next Generation Heterogeneous Wireless Networks [3]

In this paper, author propose a novel vertical handoff algorithm which uses received SINR from various access networks as the handoff criteria. To provide seamless handover between WLAN and WCDMA, a SINR based vertical handoff that can support multimedia QoS with adaptive data rate is desirable.This algo also makes load balancing. Analysis results show that the performance of RSS based vertical handoff with different thresholds setting differs under different network conditions. In contrast, the new SINR based vertical handoff algorithm is able to consistently offer the end user with maximum available throughput during vertical handoff.

4. A Novel Fuzzy Logic Vertical Handoff Algorithm with Aid of Differential Prediction and Pre-Decision Method [4]

To reduce call-dropping probability in vertical handoff, author introduce FDPA to predict the next time received signal strength. Author use mobile velocity (v) and PRs as the pre-decision metrics to filter part of input data for FNQD and accomplish the handoff trigger. This operation can eliminate quiet a few unnecessary handoff decisions. Finally, the optimized handoff decision is made by comparing the performance evaluation values of candidate networks.

5. Performance Evaluation Framework for Vertical Handoff Algorithms in Heterogeneous Networks [5]

3G-network will provide global coverage with low data-rate service, the WLAN will provide high data-rate service within the hotspots. Author present a novel framework to evaluate the VHO algorithm design impact on system resource utilization and user perceived QoS. Author used this framework to compare the performance of two different VHO algorithms. The results show a very good match between simulation and analytical results. The underlay network that can provide better service at lower cost to the user, as well as improve the overall system resource utilization.

6. Middleware Vertical Handoff Manager: A Neural Network-based Solution [6]

The use of neural networks provides a way to optimize the selection of the best available wireless network in a heterogeneous environment during a handoff process. The average performance of the neural network selection is 87%. To test for the robustness and effectiveness of the neural network algorithm, some of the features were removed from the training set and results showed a significant impact on the overall performance of the system.

7. Tramcar: A Context-Aware Cross-Layer Architecture for Next Generation Heterogeneous Wireless Networks [7]

Tramcar becomes more context-aware and consequently achieves higher user satisfaction. Furthermore, Tramcar allows users to identify and prioritize their preferences. Simulation results demonstrate that Tramcar increases user satisfaction levels and network throughput under rough network conditions and reduces overall handoff latencies. To support author's proposed system, an NS-2 simulation model of Tramcar was developed.

Using the presented context-aware and mobility control system, we were able to overcome the inadequacies, limitations and weaknesses of individual non context-aware mechanisms.

8. A Cross-Layer (Layer 2 + 3) Handoff Management Protocol for Next-Generation Wireless Systems [8]

CHMP, is developed to support seamless intra and intersystem handoff management in NGWS. Through analysis, observe that, when a fixed value of RSS Threshold(Sth) is used, handoff failure probability increases when either speed or handoff signaling delay increases. Using the insights from analysis, author develop a cross-layer handoff management protocol called CHMP, which estimates mobile's speed and predicts the handoff signaling delay of possible handoffs. CHMP also significantly reduces the cost associated with the false handoff initiation because it achieves lower false handoff initiation probability.

9. An Algorithm for optimizing Vertical handoff algorithm for WLAN and 3G [10]

Author designed a vertical handoff algorithm and extend that analytical model by adding two different models. The models are for handoff from Wireless Local Area Network (WLAN) to cellular network for the voice session and for handoff from cellular network to WLAN for the data session based on RSS. Since the RSS is considered in this model, it is predicted this algorithm reduces the number of vertical handoffs. Probability of handoff occurring for a different time are considered main issue.

III. CONCLUSION

The objective of this literature survey is to provide novice wireless network researchers a comprehensive idea on Handovers that is useful for mobile wireless communications. Also the survey provides one-stop documentation on terminologies, concepts, classifications of Vertical Handovers.

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