



**RESEARCH ARTICLE**

# A Physical and Communication Parameter Based Vertical Handover in Hybrid Vehicular Network

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*Abstract: One of the most effective Vehicular communication process is handover. Handover is about the selection of effective base station, when a Vehicular node comes outside its current coverage range. In case of hybrid communication environment, the criticality of handover process is increases. In this paper, a effective parametric handover mechanism is defined for WiFi and WiMax based hybrid network. The base station selection is here defined under the physical and communication parameters based analysis. This paper has defined the parametric analysis based analysis. The obtained results shows the effective base station selection so that the network throughput will be improved with minimum data loss and communication delay.*

**Keywords – Vertical Handover, Communication Parameter, Physical Parameter, WiFi, WiMAX**

## 1. Introduction

A Vehicular Ad-hoc network is one of most dynamic communication network in which nodes are connected through wireless links. Because of the dynamic Vehicular communication architecture, the nodes in such network are defined with mobility. The dynamic nature of the network allows the network to add or remove a network node. The dynamic nature of the Vehicular network makes it as unpredictable Vehicular network under the topological architecture. As the network type is dynamic, the organization of network nodes requires more consideration. In this present work, the main consideration is defined for two main Vehicular network types called WiFi network and WiMax Network. In this section, the exploration to these network types is given

## A) WiMAX Networks

WiMAX (Worldwide Interoperability for Microwave Access) is a telecommunication technology based network type that includes the transmission of wireless data using different transmission approaches. This network type support the internet based communication through multipoint communication links. A WiMax network support high speed communication over the network for wired as well as wireless communication. This network form includes the broadband communication. The inter-operability is one of the major characteristic of this network. This network type ensures the broadband communication for DSL communication lines. The WiMAX communication network is shown in figure 1.

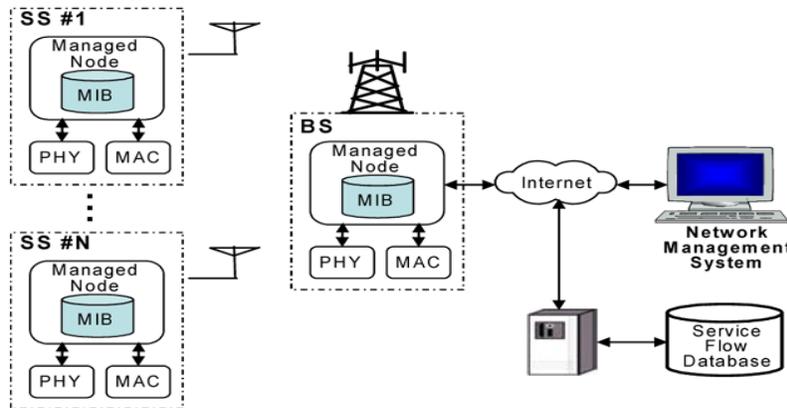


Figure 1 : WiMAX Communication

WiMAX network type includes the high speed communication over the optical cable or microwave links. This communication is performed using point to point antenna that allow high range communication. The multipoint connectivity in such network includes the LOS ( Line of Sight) based communication. This connectivity analysis is performed under signal capacity analysis.

## B) WiFi Networks

WiFi (Wireless Fidelity) is another internet based Vehicular communication technology that provides the communication under restriction. This network architecture is beneficial for small range communication. In wireless-LAN architecture this kind of communication is more effective. In such networks, WiFi access points are setup for indoor communication to provide effective secure and fast network communication. The signal strength of this network type is restricted up to small coverage area. The access point installation is performed to improve the power level and coverage area based communication. The ratio signal based data transformation is allowed in this internet communication.

The presented work has defined an effective vertical handover mechanism for WiFi and WiMax networks. In this section, an exploration to the Vehicular network and different network architectures is defined. In section II, the work done by the earlier researchers on different network architecture and different type of handover process is defined. In section III, the proposed handover process model is defined with algorithmic description. In section IV, the results obtained from the work are defined and explored. In section V, the conclusion obtained from the work is defined.

## 2. LITERATURE SURVEY

Lot of work is already done in the area of handover in Vehicular network. Some of the work done by earlier researchers is discussed in this section. **Ejaz Ahmed** [1] has defined a work on handover mechanism in WiMax networks. Author has presented a work to analyze minimum number of base stations under the physical strength analysis and prioritize the base station relatively. Based on this prioritization process, the effective base station will be elected to which the handover will be performed. Another work on WiMax environment study was presented by Farhat Anwar[2]. Author defined the analysis of this environment under different protocols. Author identified the ZRP and AODV are most effective protocols with WiMax environment. Author analyze the work under the delay and throughput analysis. A comparative analysis on WiFi

and Wimax based handover was defined by Haidarali K. Ansari[3]. Author defined the analysis on high speed network so that fast handover analysis will be performed under the fast link layer connectivity analysis. Author defined a work on IP layer to control the handover mechanism. Harjit Kaur[4] has presented an effective switching mechanism for WiMax Network. Author presented the effective base station selection procedure so that the data loss over the handover process will be minimum. Author considered both the soft as well as hard handover processes. Author also defined a comparative analysis between these two type of handover under delay analysis and packet delivery analysis. Jianlin Guo[5] has presented a location aware handover process for WiFi and WiMax Networks. Author performed the analysis under delay parameter so that the ping-pong effect in vertical handover will be minimized. Author also analyzes the handover latency over the network so that effective communication mechanism over the network will be minimized. Author applied the seamless handover between these two environments to perform vertical handover.

J. Ho Park et. Al. [6] has analyzed the WiMax Vehicular network under different application areas and different channel problems. Author defined a frame structure based analysis so that the bit error rate for communication will be minimized. Author defined an effective structure for communication under OFDM communication with fading probability. Author analyzed the work under limited hardware equipments so that reliable communication will be drawn. Kheya Banerjee[7] has presented a handover mechanism under IPv6 for WiMax environment. Author defined work to reduce the latency in handover process. Author presented a pre-registration approach while performing a new access point selection so that the effective handover over the network will be performed. M.Grine[8] has presented a performance optimization for horizontal handover in WiMax Networks. Author defined a predictive approach under linear regression model that will analyze the direction and signal strength indicator is defined so that the operating cost and latency cost get reduced. Author also reduced the packet loss rate during the handover process.

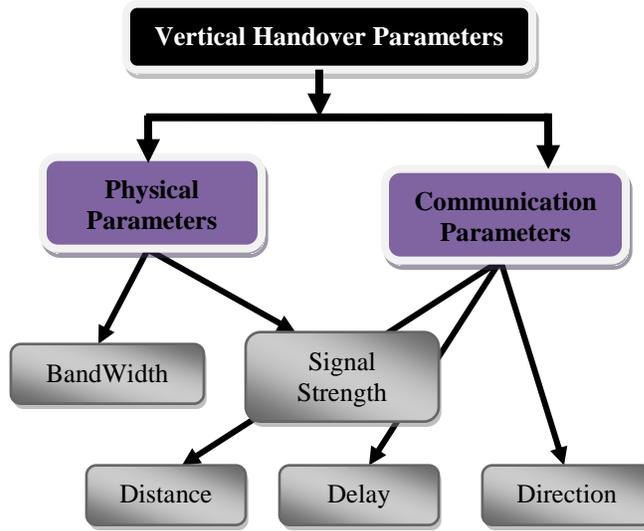
A comparative work on handover process in WiMAX network network for long distance and high speed communication was presented by Neeraj Jangra[9]. Author considered the seamless handover process so that data loss will be reduced. Author defined a static scan scheme for neighboring base station and performs the best base station under potential feature analysis. N. SriNath[10] has presented the exploration to the one of the effective communication environment called WiMax Networks. Author defined the analysis under broadband communication for high communication rate, high reliability and improves efficiency analysis. Author analyzed the work under standard parameters and different real time environments. Author defined the mechanism for physical and MAC layer based analysis so that the QoS optimization will be achieved. Author also considered the secure property so that the reliability over the communication will be achieved[11]. Paul Boone has presented a work on scanning approaches in Vehicular station so that effective handover process will be performed. Author defined the base station oriented analysis in such network along with coverage range and scan operation based analysis. Author analyzed the Vehicular traces so that effective communication schedule will be obtained. Pranit Chandrakant Patil[12] has presented a Vehicular aware WiMax network for heterogeneous networks. Author defined the communication analysis for WiFi and WiMAX networks so that effective handover process will be performed. Author analyzed the handover under different approaches under delay analysis. Author defined the horizontal handover with soft communication schemes. Another work on hard handover process in WiMax networks was presented by Rambir Joone[13]. Author presented the comparison between the soft and hard handover processes so that the data loss during the handover process will be minimized. Author defined a base station selection procedure under the delay analysis. Author also improved and analyze the performance of handover process. P.P. Edwin Winston[14] has presented a power control based antenna oriented analysis on handover process. Author analyzed the physical parameters while performing the base station adaptation and handover decision is taken.

### **3. PARAMETERIC VERTICAL HANDOVER PROCESS**

A Vehicular network is one of the most versatile communication network in which high speed nodes are communicated over the network. Different communication environments are involved in such kind of networks. The presented work is the hybridization of two main communication networks called WiFi and WiMax networks. Each Vehicular node over the network is defined under some come communication network and the base station of that network controls the communication over that particular node. As a Vehicular node moves outside the coverage range of its current communication network, It enters to the global area where different base stations of WiFi and WiMax environment polls to adapt the control of Vehicular node. In such case, which Vehicular environment or the base station is more effective, is required to select. This process of effective selection of base station over the possible coverage range base station is defined as the vertical handover process. In this defined process, an analysis will be performed on the physical and communication

level based analysis on all the polling base stations. Based on this collective parametric analysis the base station will be selected. The parameters considered in this work are shown in figure 2.

As shown in the figure, the parameters considered in this work to perform the effective handover. These parameters are divided in two main categories called physical parameters and communication parameters. The physical parameters include the physical strengths of the base stations. These physical parameters include the bandwidth analysis and the signal strength analysis.



**Figure 2 : Handover Parameters**

The base station that has the higher bandwidth and the signal strength are considered most effective base station for handover process at the earlier stage. But if the load over such base station increases, the handover delay increases. To handle such situation, the communication parameter based analysis is also performed in this work. This analysis is performed under three main parameters called distance analysis, delay analysis and direction analysis. If a node is moving away from one base station and moving towards other base station. Then the base station towards which the Vehicular node is moving, will be selected as the effective base station and the control of the node will be shifted to that particular base station. The algorithmic concept involved with this vertical handover process is shown here under

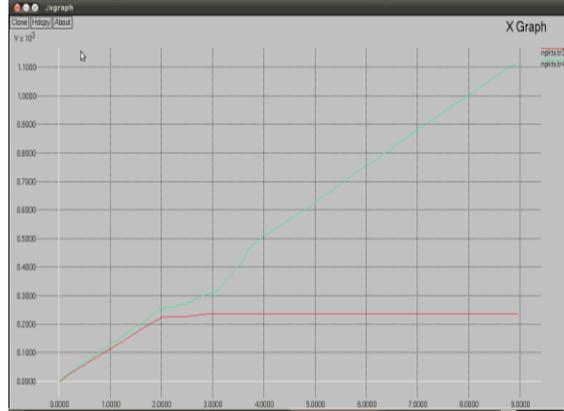
Table 1 : Vertical Handover Process Algorithm

<p>Algorithm()                  {                  1. Define a Vehicular network with N number of Vehicular Nodes with different moving speed.                  2. Define M Number of WiMax and WiMax Base station with adaptive positions over the network                  3. Identify the effective base station for each Vehicular node with adaptive physical parameters i.e. VehicularNode(i) =&gt; BaseStation(j)                  4. Select a particular Node i over the network and perform the random direction based movement of node outside its coverage area.                  5. As the node comes outside the current coverage,</p>
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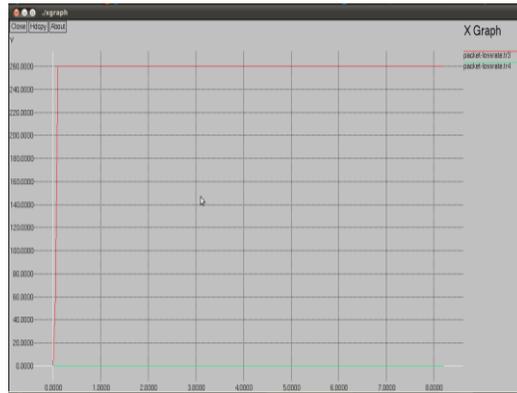
Antenna Model	Omni directional
MS Speed	Random

These parameters include the physical parameters of the node along with sensing range and the communication rate parameters. The network architecture is constructed based on these all parameters.



**Figure 3 : Communication Analysis**

Here figure 3 is showing the packet communication analysis in proposed approach and the default adaptive approach of protocol. Here x axis represents the simulation time and y axis represents the packet communication. Figure is showing the proposed work has provided the effective communication over the network in specified time.



**Figure 4 : Packet Loss Analysis**

Here figure 4 is showing the packet loss analysis in proposed approach and the default adaptive approach of protocol. Here x axis represents the simulation time and y axis represents the packet loss. Figure is showing the proposed work has provided the effective communication over the network in specified time. The figure shows that the proposed approach as reduced the packet loss over the network.

### 5. CONCLUSION

In this paper, an effective parametric vertical handover is been defined for WiFi and WiMax networks. The physical parameters considered in this work are bandwidth and signal strength analysis. The communication parameters considered in this work are delay analysis, distance analysis and direction analysis. The obtained results showing the effective handover procedure implementation over the network.

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