

# Vertical Handover for Heterogeneous Wireless Networks of Packet Loss Using NS-2

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**Abstract**— In a heterogeneous wireless networks, the main challenge is continual connection among the different networks like Wi-Fi, WIMAX, WLAN, WPAN, Internet, Intranet etc. The main theme of this research is to observe the conditions based on which vertical handoff should be performed. Multi Attribute Decision Making (MADM) helps to select the best network from the available Visible Network (VTs) for sequential connection by the terminal of mobile. VHDS (Vertical Handover Decision Schemes) used two types, Trusted-Distributed Vertical Handover Decision Scheme (T-DVHD) and Distributed Handover Decision Scheme (DVHD). The Centralized Vertical Handover Decision Scheme is the advanced Scheme of DVHD and the T-DVHD is the extended work of DVHD. Here we individually evaluate the internet, intranet and Wi-Fi network performance before performing the handover process. The network performance is evaluated by the packet loss. MADM algorithms of SAW and TOPSIS where compared to reduce the processing, reduce the packet dropping ratio and also select the best network.

**Keywords**— Handover Mechanism, Vertical handover decision schemes, TOPSIS.

## I. INTRODUCTION

### Wireless Sensor Networks

Wireless Sensor Networks also known as Wireless Sensor and Actuator Networks (WSAN) are relatively distributed independent sensors to monitor the physical or environmental conditions like sound, temperature, pressure, etc and to cooperatively transfer their information through the network to the main location.

WSN is made of nodes, each node is connected to one sensors. Sensor nodes cost is similarly variable, range from a few to several of dollars, depends on complexity of individual sensor nodes.

### Cellular Networks

Cellular network is one of the type of wireless network which is used the wireless communication links to interconnect wireless host. This type of network is called

infrastructure based network, because it needs infrastructure to operate.

The base station (BS) is the main part of this wireless network infrastructure, and it is responsible for communicating with the wireless hosts, coordinates simultaneous transmission and reception by many hosts under its control and forwarding packets of data between these hosts.

### WIFI

The Wi-Fi standard includes the IEEE 802.11a/b/g standards for WLANs. Users can connect to a network at broadband speeds in the 2.4, 3.6 and 5 GHz frequency bands through an access point (AP) or without one when in ad hoc mode of operation.

### Bluetooth

Bluetooth was developed as the technology of data cable replacement for the peripherals of computer like keyboards, joysticks, printers and mice. It is used to exchange of data without wire over the shortest distance at minimum power consumption using the cost of low transceiver chips.

### WIMAX

WIMAX is a wireless communication technology, for wireless “Network of Metropolitan Area”(WMAN), on the basis of IEEE 802.16 working group and adopted by both IEEE and ETSI (European Telecommunication Standards Institute).

IEEE 802.16e- 2005 is a wireless broadband standard, provides the features and attributes to the standard required to support mobility, and provides solutions for high speed broadband wireless access in a metropolitan area network.

### WIMAX Network Architecture

In mobile WIMAX, the architecture aimed to support unified range of functionalities for different deployment models, such as flat, hybrid and centralized

The architecture consists of three main logical parts: Mobile Stations (MS) used by different subscribers to access the underlying network; Access Service Network (ASN) and the Connectivity Service Network (CSN).

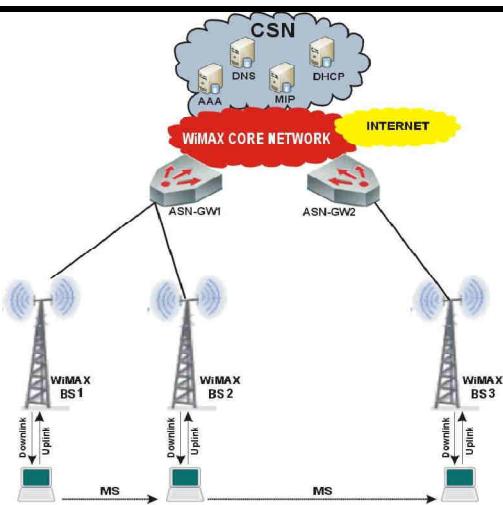


Fig.1: ASN and CSN Anchored Mobility

The two soft handover processes, FBSS and MDHO are the optional types, and the hard handover is the default handover mechanism. In hard handover, the connection with a BS is ended initially before the MS switches to another BS.

#### Handover Process

The whole handover process in IEEE 802.16e standard presents two phases, namely, Network Actual Handover Phase (AHOP) and Topology Acquisition phase (NTAP).

The decision for making process of handover in Mobile WIMAX by the MS called Mobile-Controlled Handover, where the MS makes a handover initiation decision when the received signal strength (RSS) from service base station (SBS) drops below particular threshold, which might disturb the current an ongoing communication session, and MS goes to handover with one of neighbor BS (NBS), called target BS (TBS).

#### Packet Loss

Packet loss is the process of failure in one or more transmitting packets to reach at their destination. This causes some of the effects in all the types of digital communications.

Packet loss effects:

- Packet loss produces the errors in data
- It creates a jitter in video conference environments.
- It also creates a frequent gaps and jitter in receiving speech in the audio communication like VoIP.

## II. RELATED WORK

Now a day many of the vertical handover mechanism of algorithm can be shown in the literature. In (1) a new method of protocol called as DLN (Data Loss Notification)

can be introduced. It improves the throughput and performance delay of TCP, with distinguish the packet loss. In (2) gives the solution to the TCP/IP protocol of internet connectivity through mobile terminals that emerging with 802.11 wireless links. It proposed the new scheme at link layer and transport layer. In (3) proposed the performance of the site specific measurements which essential for path loss prediction. It offers the propagation measurements in frequency range that allocated for broadband wireless system.

In (4) covers the long distance data in many ways. This proposed method selects a base station for potential soft handover. It uses the Macro Diversity Handover mechanism. In (5) wireless local area networking standard introduced the quality of service. It provides new protocols of MAC, mainly EDCF and HCF which is used as a separate coordination function for wireless ad-hoc networks. In (6) describes, Wireless Sensor Networks, including structure monitoring, require collecting all data without loss from nodes. This method examines the diverse options for improving reliability through the multiple-hops, focusing mainly on point-to-point routing.

In (7) IEEE 802.11b wireless network deployed at the 62nd Internet Engineering Task Force (IETF) meeting to analyze the congestion in wireless networks. In (8) In AIRMAIL, proposed two well known link error recovery techniques, that is forward error correction (FEC) and automatic repeat request (ARQ) are employed.

In (9) proposed to collect the sensing data quickly and reliably. Fault tolerant scheduling for data collection (FTS) algorithm leads to high fault tolerance and short data collection time. In (10) proposed intermittently connected networks, there is no guarantee that a connected path is exist between source and the destination. PROPHET is a probabilistic routing protocol for such networks.

## III. TOPSIS: (TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SOLUTION).

This paper uses the TOPSIS algorithm and Trust Value calculation.

The following are the steps of TOPSIS:

Step 1: Construct the decision matrix. Each element  $r_{ij}$  is the Euclidean decision matrix then  $R$  can be calculated.

Step 2: The decision matrix for voice is weighted using the weighting factors from  $W_v$  and the weighted normalized matrix  $V_{ij}$ .

Step 3: To determine positive ideal solution  $A^*$  and negative ideal solution  $A^-$ .

Step 4: To determine the distance between each alternative positive ideal solution and negative ideal solution.

Step 5: From  $C_i^*$ , Choose the base station is the best to connect the mobile terminal by TOPSIS decision maker.

#### IV. NETWORK SIMULATOR TOOL (NS 2)

NS is a real network simulator in the year of 1989. In 1995 NS was supported by DARPA through the project of VINT project at LBL, UCB, Xerox PARC and USC/ISI. NS is built by using C++ and Python and scripting is available with either language. Split over 30 modules, features of ns-3 also include:

- Call-back-driven events
- Default and per-object simulation values is managed by attribute system.

#### V. RESULTS AND DISCUSSION

In this paper, the Network simulator software version 2 has been used for our simulations because of its easy to use in node deployment and network setup.

##### 5.1 Packet Delivery Ratio

The packet delivery ratio is the successfully deliver the packet between source to destination. Packet delivery ratio is a measure of how many units of information or number of packets successfully delivered through the network in a given amount of time.

**Packet delivery ratio :** The total number of delivered data packet to the destination.

Total Number of packet receive / Total Number of packet send

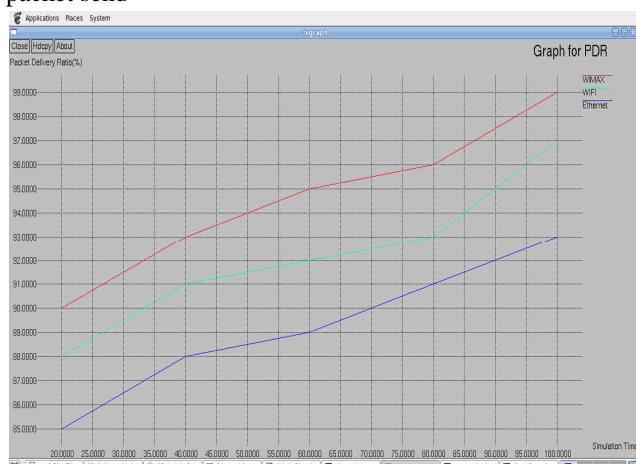


Fig.2: Graph for PDR

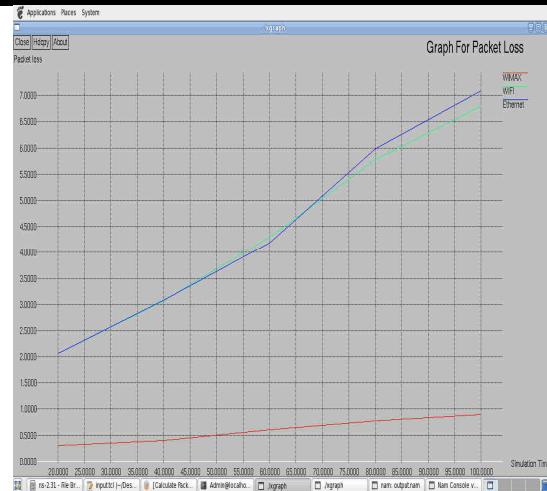


Fig.3: Graph for Packet Loss

#### VI. CONCLUSION

In this paper separately evaluated the Wi-Fi, WIMAX and Bluetooth performance under the data loss parameter. WIMAX reduced the data loss while compared to the Wi-Fi and Bluetooth.

And also the experimental result shows the proposed algorithm (TOPSIS) reduce the processing, packet dropping ratio. Finally this paper concludes the handover algorithm selected the best network by analyzing the QOS of each visited network.

In future work will focus the data security and prevent the data from malicious node. So we will process for prevent the data from the malicious node and also improve the privacy of the data using advance encryption standard.

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