



Vertical Handoff Situation Awareness by Avalanche Effect

G. U. Mali

PhD Scholar

Department of Electronics Engg. and Tech.
North Maharashtra University, Jalgaon
Maharashtra, India

D. K. Gautam

Prof. and Head of Electronics Department
Department of Electronics Engg. and Tech.
North Maharashtra University, Jalgaon
Maharashtra, India

ABSTRACT

Most of the time mobile nodes in wireless networks are loosely coupled with the network availability. And due to this on switching of network devices mobile nodes often lose the complete network thereby data dropping occurred which results in vulnerability. This is quite often a big problem on performance of routing protocols. Vertical handoff technique is boon to this as it provides stability of the network even on losing of the availability of the established network by instant switching to other stable networks. There are many ways of handling vertical handoff decisions based on one or another reasons. Proposed paper put forwards an idea of vertical handoff situation awareness by comparing the hash keys at the pool manager of a wireless network pool with another network pool based on the defined protocols like routing path.

Keywords

Avalanche Effect, Hashing, Vertical Handoff, Wireless network pool.

1. INTRODUCTION

Wireless Network is a wired free network set up among network nodes and uses radio signal frequency for communications between network devices. The setup of wireless (also called WiFi) network is simple and it avoids costly cable connection between different network nodes. Radio waves are use of wireless network for connection between devices such as cell phone, laptop, etc. There are four main types of wireless network named as Wireless Local Area Network (WLAN), Wireless Metropolitan Area Networks (MAN), Wireless Wide Area Network (WAN) and Wireless Personal Area Network (PAN). The two main components used to setup wireless connection between devices are wireless routers and wireless clients. Operating modes in wireless network are of two types first is Infrastructure mode in which device is associated with wireless network adapters to a set up wired network with the support of wireless router and second is Ad hoc mode in which in which two wireless devices are directly connected without the help of wireless router.

In today's world the communication is a significant component of everyone's life. The wireless communication is a faster medium of transmission of instructions or data between two devices, which are not plugged in with any electrical conductor, wires or cables without any delay and loss rates. The data is carried through air by using radio frequency, satellite etc. There are lots of devices used in wireless communication like mobile, GPS units, satellite television, cordless phones, Bluetooth, etc. In wireless communication, nodes exchange data or instructions with each other through a single hop transmission or multiple hop transmission rely upon the transmission range of the sender.

During communication every node in network works like a router that exchange data files for other nodes. In wireless communication, routing is done to discover a shortest path for connecting nodes. Shortest path is a path in between two nodes that minimize total of the weight of its component edges. In wireless communication routing process is used to transfer data or information between two nodes with minimum cost. To generate feasible route between two nodes shortest path method is used to transfer traffic ahead the chosen path and to obtain high performance. To find out the shortest path between nodes different algorithm can be used like, Dijkstra's Algorithm, Genetic Algorithm, Bellman-Ford Algorithm and Floyd-Warshall Algorithm. Dijkstra's Algorithm is one of the best algorithms to find the shortest path.

Data dropping or Packet loss in wireless network occurs when data packets travel in wireless network is unsuccessful to achieve their destination. Network congestion is the important reason behind Data dropping or Packet loss in wireless network. When arriving packets rate are more than expected than it is difficult to send it through a given router, then the packets are drop to minimize network congestion. In Data dropping a wrong node change or modifies some packets that should be sent in network and also alters the data generates by packets to protect itself. Percentage of Data dropping or Packet loss is calculated as packets lost concerning packets sent. There are more reasons for Data dropping or Packet loss in wireless network other than network congestion like weak radio signals, faulty network drivers or network hardware, etc. In wireless network Data dropping or Packet loss is detects by Transmission Control Protocol (TCP). Many routers in wireless networks contain logs or status pages which contain all the data with respect to percentage of packet drops during a particular period of time.

Vertical handoff is changing or shuffling between two networks base stations depends upon network availability and to access a supporting infrastructure. For example when a computer device or mobile connect with internet via two different networks it automatically connected with available network. Vertical handoff is occurs normally to favor node mobility. It refers as change over from one network to another automatically to maintain communication flow. Devices that supports vertical handoff requires dual mode card for connecting with two different wireless networks. In vertical handoff the wireless technology with best handoff metric is preferred amongst other. Some of the input parameters for vertical handoff are mobile terminal speed, bandwidth availability, number of users, received signal strength, traffic type, user preference, etc.

The rest of the paper is organized as follows. Section 2 discusses some related work and section 3 presents the design of our



approach. Section 4 provides the conclusion of this research paper.

2. RELATED WORK

Author [1] work focuses to minimize network computational cost with minimum effort in data transmission. This gives rise to development of data aggregation protocols. Both securities of data with data aggregation are challenging work. Recoverable Concealed Data aggregation Protocol for Homogeneous wireless sensor networks is been designed. This protocol implements strong security with packet drop detection.

Future scope of work is detecting malicious nodes, dropping them from network path. Built dynamically network consisting non malicious nodes. Additionally round time needs to be reduced in network management.

Article [2] is related to issue of packet drop in MANETS. Elimination of malicious node from network is major task to achieve. No detection of adversary leads to unhanding of any kind of attack in network. Proposed system presents effective packet drop detection in network and reducing of network delay. Major limitation is the work is simulation based and merely presents a idealistic results. Certain nodes behave selfish in network transmission and drop packet instead to trying to save them. Future work duplicate reception in destination node is yet to be done.

Mobile nodes in MANET are self configurable and built a network path within range of communication. but this makes them prone to any malicious attack. [3] Article presents AODV based network analyzer. A digital authenticator is been implemented above AODV for preventing fight back against intruders and malicious nodes.

End to end Security has been presented for routing protocol. Protocol reduces routing overhead and minimizes energy usage. Future scope is better key management process, fight back against chipper attack. Design a integrated network attack detection system.

[4] Ubiquitous services are increased in MANET and present a challenge. A dynamic decision management system is been required in cell management, selection of routing route. Ping pong call drop and corner effects needs to be eliminated.

Handover challenge is been addressed here using decision support system. System performance has been tested in femtocell to macrocell.

Designed protocol is implementable in WIMAX, WIFI, WLAN and represent scope of work. This research work assist in mobile cellular communication enhancement.

In MANET topology updating is challenge [5]. Fading multi-user interfaces, dynamic topology change, optimal routing requirements are challenges in manet. Author presents methodology to select best optimum path from multiple available paths. System increases data transfer with lesser end to end delay. REHIDS is system and has been evaluated on network simulator N2.34. Majorly seamless data transfer cannot be achieved in manet with changing topology. Hamming distance and delay has been used in optimal network path selection.

Proposed system major challenge is network table management.

WLAN have been implemented in numerous application domains cyber physical management. support in data transferee is been required dynamically [6]. Provenance process leads to

data security issue in MAET. As off numerous nodes interacting with base station would lead to data loss and attack would attack on network. proposed system implements packet drop attack detection process. this technique is been assisted using PDAC a algorithmic process to fight against attacker. This technique eliminates black holes from network.

Existing system only guarantee confidentiality integrity and purity of provenance. PDAC methodology with better implementation assist in packet drop detection. Scope of future is overall optimal network security achievement.

Article [7] focuses to solve issue of vertical handoff. Numerous small networks combine to work and form bigger network. This leads to challenge task of hand off management in network. Proposed system reduces call blocking and dropping during handoff process. Proposed system enhances data delivery ratio.

Future scope remains in undertaking better system with QoS and achieve better system.

Work of [8] address wireless network management. In heterogeneous Remote correspondence arrange, exchanging of information between moving hubs can be dealt with by very much outlined portability administration framework, in which handover is a vital consider keeping up space association to base station even in fast. Amid handover portable hub moving starting with one base station territory then onto the next base station territory, there is a need to change starting purpose of association with a new base station zone towards which the portable hub is moving. Handover (HHO) is a symmetric procedure and happens inside the same innovation e.g between various Wi-Fi situations. On the off chance that it is executed between various innovations, for instance, UMTS to wlan, at that point it is called vertical HO. routinely a portable client may meander and finish the vertical HO utilizing single criteria, or example, got flag quality (RSS). Single criteria vertical handover choice, in any case, may cause wasteful handoff, uneven system load, and administration interference. This paper expected an appropriate technique among the different vertical handover choice calculations in the earth of three organize interfaces: (i) remote neighborhood (WLAN), (ii) wideband code division various get to (WCDMA), and (iii) overall interoperability for microwave get to (WiMAX) and likewise a portion of the vertical handoff choice calculations are contrasted and the standard technique (RSS).

The overall system performance is better and found to be best for lower delay and better data transmission.

Future scope remains in implementing weighted scheme and better outcome.

Decision support is major challenge in network handoff. Author [9] address this problem with hybrid methodology. Connecting heterogeneous network technologies in optimal manner is scope of work. This research presents vertical handoff methodology in optimal network management. System guarantee continuity of service within network with diverse wireless technologies. proposed handoff choice and system choice calculation consider five imperative parameters including data transmission, RSS, cost, and handoff time delay, is relied upon to wipe out Ping-Pong impact which causes pointless handoff forms and diminishes call blocking likelihood. Proposed system is been implemented on grounds of simulation and major limitation of algorithmic procedure. Even though this work address simulation based system approach and design would certainly enhance system performance.

Future scope is approach selection of parameters in achieving hybridization process.

Heterogeneous network facilitate best ratio management for existing handover connection [10] . VHO vertical handoff is major challenge in networking. Traditional design approach cannot make up with dynamic topology and changing network system. This leads to network performance degradation .proposed article presents layered architectural style in classifier implementation. System achieves optimal results with multi classifier.

Future scope is to apply system to LTE WIMAX and WIFI Networks. this would guarantee ubiquitous networking system. Designing numerous approach to implement classifier is also future scope of work .

3. PROPOSED MODEL

Proposed methodology of vertical handoff situation awareness can be seen in the below figure 1.

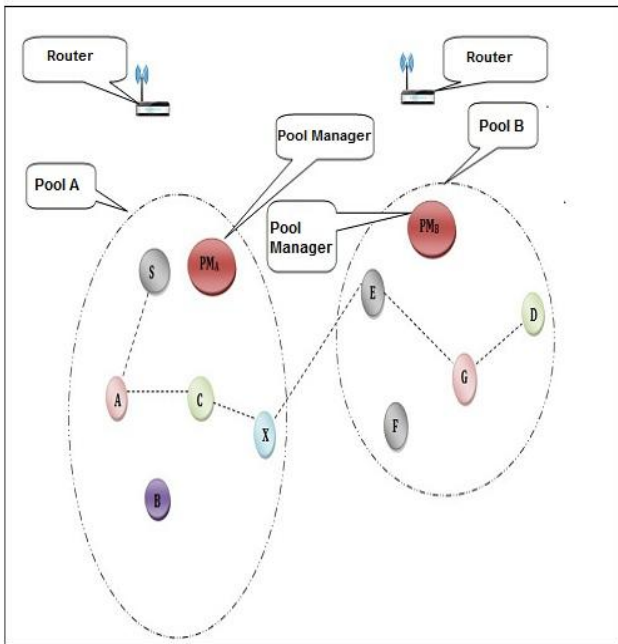


Figure 1: Overview of the proposed model

Step 1: This is the initial step of our system where source node “S” identifies the shortest path to route the data to destination node “D”. System uses the fuzzy logic to evolve the shortest path that is discussed in our past research work.

Step 2: For sake of understanding let we consider a shortest path the evolved is {S, A, C, X, E, G, D}.Where first and the last nodes are Source and destination respectively. And Nodes { S, A,C,X } belongs to pool A. Whereas Nodes { E,G,D} belongs to pool B.

As the pool is established and source node is started to transferring the data using two phase commit protocol as discussed in our one of the past edition [11].

Step 3: Here in this step each and every node on its data hopping it creates an instance path belongs to the respective pool. And for this instance path node are keep creating a hash key using MD5 hashing algorithm on each hop and sends back to the pool manager to keep an eye for pool changing.

So according to this all the nodes of Pool A are creating hash key for the routing path { S,A,C,X} and nodes of Pool B are creating hash key for the routing path { E,G,D}.

Step 4: Avalanche effect- Here in this phase of the proposed model pool manger of Pool A keep recording the hash key received by its nodes { S,A,C,X}. And comparing each hops hash keys with the previous one. As the node X transfers the data it creates the hash key for its instance destination node that is E ‘s pool routing path which is { E,G,D} and sends it back to pool manager of pool A.

And now the hash key of the node C and hash key of the Node X are compared by the pool manager of the pool A. Even a slightest change in the hash keys creates an avalanche effect in the difference. This difference indicates the change of the data transfer in between the pool though nodes X and E. This eventually triggers the vertical handoff decision making. This can be depicted with the below mentioned algorithm 1.

ALGORITHM 1: AVALANCHE EFFECT

```
// Input : Sender Data D
           Destination Node Dn
// Output: Vertical handoff Decision through Avalanche Effect
Step 0: Start
Step 1: Set vertical_handoff_Flag=false
Step 2: Add Pool managers M1 into pool P1, and so on Mn to Pn
Step 3: Add node Nn to pool Pn
Step 4: Activate all pool managers Mn
Step 5: Select Data D by source node Sn
Step 6: Select Destination node Dn
Step 7: Identify the shortest path Pth
Step 8: WHILE D ∉ to Dn
Step 9: For each Hop H
Step 10: Routing path hash key HC and HP
Step 11: HC → Pi
Step 12: HP → Pi
Step 13: IF HC ≠ HP
Step 14: Set vertical_handoff_Flag=false
Step 15: End IF
Step 16: End For
Step 17: End While
Step 18: return flag
Step 19: Stop
```

4. RESULT AND DISCUSSIONS

The proposed system of vertical handoff situation awareness system is deployed in real time scenario by using 20 computers of windows based operating system. Each device is equipped with core i3 processor with average 4GB of primary memory. And proposed system is developed on java platform by using Netbeans 8.0 as IDE.

For evaluation of the vertical handoff decision making speed proposed technique is compared with methodology of [12]. Where [12] is handling vertical handoff decision using traditional fuzzy logic which is supported with some parameters like RSS, monetary cost, bandwidth, time delay and BER.

The accumulated results are tabulated in the below table 1 for the time parameter by comparing first 10 handoff time with that of traditional fuzzy logic method.

Table 1: Comparison of Vertical Handoff Time

Sr No	Fuzzy Logic based Vertical Handoff Decision (Time in milli seconds)	Avalanche Effect based vertical Handoff Decision (Time in milli seconds)
1	25	17
2	40	34
3	44	41
4	60	50
5	60	54
6	70	61
7	80	65
8	82	66
9	82	71
10	84	71

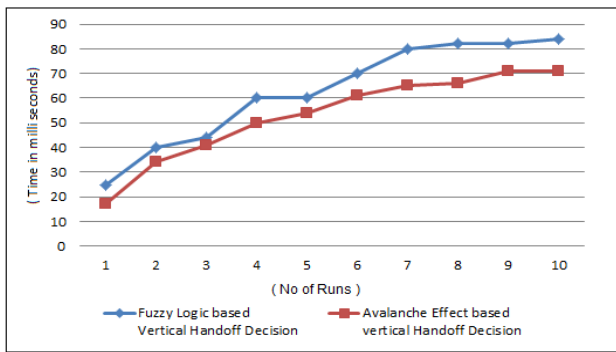


Figure 2: Comparison of Vertical Handoff Time for different Run

In the above plot in figure 2 red worm belongs to our proposed system of vertical handoff using avalanche effect which crawling below of blue worm which belongs to fuzzy logic based vertical handoff decision. This clearly indicates that vertical handoff using avalanche effect reduces the decision time than that of fuzzy logic based vertical handoff. This is due to using of pool tile method along with avalanche effect which eventually takes off the burden of handling handoff from nodes, so this reduces decision making time drastically.

5. CONCLUSION

This paper proposes an idea of gathering routing info of defined attributes for the instance network pool and prepares a hash key for that using MD5 algorithm. And this hash key is been sending to pool manager on each hop of the routing process. As the network pool changes it affects the hash key of the attributes and thus an avalanche effect is happened at the pool manager side. This change in the hash key is considers as the avalanche effect and this eventually triggers the process of the vertical handoff during the routing process of the data.

In the coming edition of our research this idea will be deployed and compared with many other methodologies that eventually triggers the vertical handoff process.

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