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Basic Parameter Study for Handover Schemes

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Abstract

Many mechanisms implemented to fulfill the growing demands for better mobile communication service. The ever growing discussions about the limitation of signaling and switching are almost solved by various algorithms and methods. The most effective method is handover; the mechanism transfers an on-going call from one cell to another as user moves through coverage. Handover became more efficient with increasing use and demands in communication i.e. multimedia application and web-based application etc. With growing generations of networks there are introduced various algorithms for better quality of service (QoS) and decrement of Call dropping probability. This paper discusses summarized and comparative study of various handover designs. These various designs include different handoff schemes in their generation time. "Welcome Logic", based on MAC theory also suggested with summarized issues and approaches of generation.

Keywords: Relative Signal Strength (RSS), handover, Channel Scanning, IEEE 802.11 b and handover latency**.**

1. Introduction

Handover is a process to reroute the call to a new station that requires network resources. It occurs when a mobile station moves beyond the radio range of one access point (AP) to another AP. During the handoff, management frames are exchanged between the AP and the stations. APs involved may exchange certain context information specific to the station. Consequently, there is latency involved in the handoff process during which the station is unable to send or receive traffic.

IEEE 802.11 handoff latency is solved using various techniques. These techniques find out all the adjacent access points having better signal strength by selective scanning technique. In this scanning technique, the mobile host will find all the active APs by using received signal strength indicator. After scanning process, mobile station will start the authentication and re-association process to register all the mobile station with the selected APs. [1]
According to the IEEE 802.11 standard, to scan the channels for APs, there are two methods- passive and active.

Passive scanning involves Scanning which is perform manually and active scanning involves active determination of each channel status by sending probed. Once the best Access Point is identified; the mobile station authenticates and re-associates with the new AP.

The MAC specification allows for two operating modes namely, the ad hoc and the infrastructure mode. In the ad hoc mode, two or more wireless stations recognize each other and establish a peer to- peer communication, whereas in infra-structure mode there is a fixed entity called an access point.

This paper analyses various proposal for reducing hand-over in sense of class of data as well generations. Generation is set as package name which contains all parameter such as latency, bandwidth etc. At the end a thought is proposed to reduce handover, based on MAC theory and RSS.

2. Handover- Related Work

The base stations need to serve many mobile nodes at the same time, all mobiles in the cell need to transmit to the base station so interference among different senders and receivers also arise problems so we need multiple access scheme. For that we are having three schemes, named frequency division multiple access (FDMA), time division multiple access and code division multiple access (CDMA). All mobile generation are based on these three schemes. Here work is to describe various changes in handover scheme regarding generations.

2.1 Before Third Generation Communication

In 1940 car based telephone was introduced with single channel used for sending and receiving. In 1960 an advanced scheme introduced that used two channels (one for sending, one for receiving). First generation came with some key points i.e. geographical area divided into cells, frequency borrowing. Digital generation (second

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generation) was abbreviation for Global System for Mobile Communications. The European system was called GSM and deployed in the early 1990's.

A. Sub-Cell Concept

This is geographical solution for handoff problem in which cell is sub-divided into smaller cells. Handover problem comes when we need to move on different frequency cell. Smaller size cells having own BTS so latency time also can reduce.

Drawbacks: Interference, BTS cost.

B. Hexagonal Size

A hexagonal cell size was very satisfied solution to handover problem that reduces handover by covering most of space.

Drawbacks: Handover reduced at most but satisfaction was not there because of latency and weak signals problems.

2.2 Third – Generation Communication

3G is created by ITU-T and is called IMT-2000. There are various technologies have been implemented in era of 3G cellular system because all these are heterogeneous in reference of different protocols, different techniques and different administrative domains. Thus IEEE 802.11b standard have become more popular but suffered from limited coverage area problem. This topic discuss about best proposed techniques for successful handoff.

According to IEEE standard there are three main phases to manage a handover. These are: When mobile host moves one cell to another cell scanning performs by mobile station. Mobile station uses MAC layer scanning to find new APs. According to a survey 90% of the handoff delay comes from channel scanning [2]. Second phase authentication is essential for security purpose to associate the link with new AP. IEEE 802.11 defines two subtype of authentication service: 'open system' and 'shared key'. Null authentication takes time of 1ms in re-authentication process.[3] Final phase re-association is the process to transfer old AP to new one is called Re- Association.

As time passes new ideas generate, that reduce the possibility of call termination. There are many ideas suggested such as handover in WATM networks, green cellular networks. Some adopted ideas are given below:

A. Receive Signal Strength Measurement

In IEEE 802.11b path loss is given by:

$$PL=L+10 \times Y \times \log(d)+S \quad (1)$$

Here L represent constant power loss, Y is path loss that lies between 2 to 4, d is for distance and S for shadow fading. The Receive signal strength is calculated as:

RSS = PT-PL, (PT stands for power distribution);

A tabulated result is shows if we draw a circle by taking RSS as the radius and AP as a center. When mobile host enters in the region it sends a request and mobile station scans channels. This technique makes traffic decrease.

Table 1: Traffic Analysis

Range	*RSS*
50	*-59.67*
100	*-68.70*
200	*-77.73*

Higher the RSS values increases the probability.

Drawbacks: Weak Signals also try to make circle that is wastage of time.

B. Change of Base Station in Cellular Network

This is the process in which minimization perform by reducing the number of base station to be scanned. As scanning process ends, the mobile station send authentication requests and then re-association takes only two signals.

Drawbacks: Scanning algorithm will b more complex and how to decide limit of area.

2.3 Fourth-Generation Communication

Forth generation presented multiple bindings that reduce packet loss and generate negligible delays due to hand off in third generation cellular system.

With increasing demand for the provision of multimedia application, such as video calling, video on demand and many web based applications, there is a need to paid attention towards resource allocation. Since multimedia is very sensitive scheme, various parameter such as delay, QoS and bandwidth matters a lot.

In recent years, a variety of resource reservation algorithms have been proposed for traditional cellular networks, Such as a shadow cluster scheme presented by Lee et al. to reserve resource with neighboring cells by exchanging information related to movement position and pattern. [4] Affecting parameters are *QoS*- Quality of Service is divided in to two parameters, namely call dropping probability and call blocking probability. *Bandwidth*- bandwidth should be degradable for ongoing multimedia. And *Traffic*- Traffic is divided into two classes, voice call and video call.

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The handoff process in 4G system is more complicated and challenging task than any traditional task. Thus some mathematical technique such as support vector regression (SVR) and practical swarm optimization (PSO) proposed in 4G era [5].

A. Bandwidth Reservation Mechanism using Support Vector Regression

As define above traffics are divided into two classes, non-real time data traffic and real- time data traffic. Class first connection request will make handoff into one of its neighbor thus try to reserve some bandwidth in neighboring cells before connection request admitted. But in 4G multimedia handoff its became doubtful so a derivation is provided, which depend on three factors: Probability that mobile host will move to its neighboring cell, Minimum bandwidth requested by mobile host and Distance between mobile host positions to requested neighboring cell.

Let A wants reservation on its neighbor cell B. bandwidth reservation can be calculated by:

$$BR(B)= C. P(B). BW(MH).1/D(B) \quad (2)$$

Where C is a constant, P(B) is probability that a moves to B, BW(MH) minimum bandwidth requested by mobile host at cell A, D(B) denotes distance between mobile host to cell B.

Drawback: optimization problem.

B. Bandwidth Reservation Mechanism using Practice Swam Optimization

Every individual moves from a given point to a new point which is best position ever found. It can be implemented to a wide range of application. For more accuracy this algorithm uses non linear relationship:

$$BR(b)(t)= C.(P(B)(t))^x1. (BW(MH)(t))^ x2. 1/(D(B)(t))x3 \quad (3)$$

3 Proposed Logic

Logic proposes to reduce the handoff by reducing scanning time. As we have studied MAC theory and polling system. If a token passing theory of MAC merged with RSS concept. Neighboring nodes set an id (token). This token will contain information about reserve channels, its distance to mobile host and its bandwidth. Node declares a good neighbor with a note "welcome". It's a type of advertisement technique.

$$P= B(N). (1/ R(N).d(n)) \quad (4)$$

Here P is a probability factor
N= neighbors
B= bandwidth
R= reserve channel
d= distance

Higher the probability factor will tag itself a good neighbor. Thus mobile host will get it next router, scanning time will be reduce. For that each node has to update its information by the time.

4 Conclusions

In this paper a comparative and summarized study is being presented and mathematical formula also derived for reducing scanning time. The handover discussion is based upon generations of mobile communication. As time passes technologies become huge to overcome problem of handover. New innovations make our data more connected. As neighbor nodes scanning is being main reason behind handover problem a solution proposed behalf of MAC control.

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