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Multi-Scan Approach: Packet Loss Rate Optimization in Vertical Handoff of Heterogeneous Wireless Network

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Abstract—Now a days, a lot of mobile devices are increased in the heterogeneous wireless network. The Quality of Service is the important factor in the heterogeneous wireless network because of the established connection. There will be loss in handover in Wireless Local Area Network and cellular networks. A lot of existing techniques are implemented to resolve this issue. However, these techniques could not be achieved complete connection loss handover in WLAN. A new framework is proposed in this project to handoff and packet loss optimization. The mobile device is handover between the two WLAN using Vertical Handover Algorithm. A handover probability is measured in the Vertical Handover Algorithm using packet loss rate and time interval in order to decide the mobile device handover in the Wireless Local Area Network and cellular networks. Also, a packet loss optimization approach called multi-scan approach is introduced to improve our proposed system and to develop the performance of the proposed system.

1 Introduction

The emerge of the wireless communications within the past ten years has led to the development of various wireless networks with the advantage of coverage degrees, objective service, Quality of service(QoS) and cost. More exploration has been done for the progression of wireless networks in and around the world. The handlers are also interested in giving a try for heterogeneous wireless networks (i.e.maneuers with various usages in terms of operating system, protocol and peripheral equipments. Mobile Terminals (MT) have been fortified due to the prominence of voice over internet protocol (VoIP)l aloft wireless local area network(WLAN) because it has larger frequency and cheaper rates. Modern techniques such as Vertical Handover algorithm have been flourished to maintain the effective call flow between two channels.

This algorithm explains the logical estimation of the packet loss rate for heterogeneous wireless networks. The handover activation is in need of assuring the utilization of means and voice call stability. The handover is activated as the MT is linked with the WLAN.After a few seconds of delay; the voice traffic is transferred with the help of a fresh channel.

But in existence, the quality of the call is not completely assured while high communication stability is received.

The possibility of the handover is logically designed for a handler inside a UMTS WLAN combined network. Based on performance or handlers serenity, the possibility of failure and serviceability of a VH algorithm is not determined.

In this paper, we propose a new technique called Multi-scan technique that enables mobile nodes to use two WLAN interfaces for channel scanning and multi-path transmission rather than single WLAN interface. This technique introduces an extra network overhead during multi-path transmission. This work optimizes the network overhead and packet loss and keeps VoIP communication at an acceptable level.

II. PROCEDURAL DESIGN

The different stages of signal stability from the access point (AP) and base station (BS) are received by the wireless devices which roam around WLAN and structural area limit. The packet loss or delay occurs due to the lack of communication strength reduction, jamming of networks etc

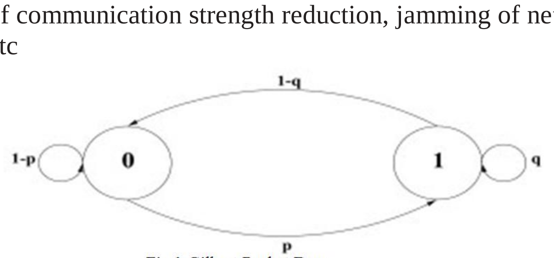


Fig.1 Gilbert Packet Drop

II.1. CALL DONE WITH WLAN/CELLULAR

The booming categorization of the structural networks permits to acknowledge as universal but on the other side WLAN offers its benefits on a certain restricted areas. Due to the large scale and small scale path fall, the reduction in the communication stability occurs across a wireless median. In a large scale path loss, the obtained power is given by,

$$P_o(x) = P_t - K - 10N\log\frac{x}{x_0} + \partial(\sigma,\mu) \quad (1)$$

Where,

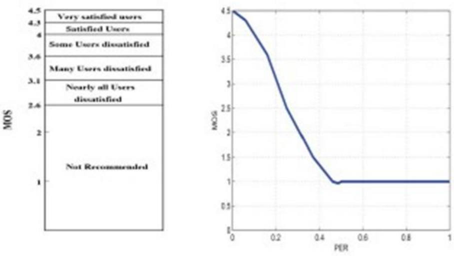
P_o – obtained power
x, x_0 – distance in meters
P_t – transferred power
$\partial(\sigma,\mu)$ – gua ssian random variable
σ – mean
μ – standard deviation

And the auto-equivalence is given by,

$$\delta(\gamma x) = \mu^2 \exp\frac{-|\gamma x|}{x} \quad (2)$$

The analogous movement of objects in a particular area of an MT leads to immediate changes in communication stability, which results in small scale fading. The MT makes use of WLAN channel for packet transaction. Here we introduce the 2 state Gilbert model that alters the consequences of the impairments which occurs due to small scale fading. The 2 state Gilbert model explains that a specific packet possibility of packet loss rely upon the condition of the preceding packet. As soon as the packet is obtained, the loss probability of the succeeding packet is indicated as *a*, and the PPL pursuing the lost packet is indicated as *b*.Generally,*b* is found to be more than *a*, which results in the burst errors. The average PPL in the Gilbert model is represented as,

$$P_{fall} = \frac{a}{a+1-b} \quad (3)$$



(a) (b)

II.2. ALGORITHM FOR INITIATING HANDOVER

In heterogeneous wireless network, various communication stability from various networks is obtained by mobile nodes. This algorithm takes decisions on which particular time the handover can be activated. As soon as the handover is activated, a particular interval is needed to promote the voice traffic with the help of a new channel. It calculates the average in motion and relates it with low frequency. We imply this algorithm to overcome some limitations such as unsteadiness in signal, delay of packets and variance. The potential of the WLAN usage is defined as the relation between the total time that the MT is connected to the WLAN channel ($I_{WLAN-used}$) to that of valid WLAN ($I_{WLAN-valid}$).

$$\varepsilon_{WLAN} = \frac{I_{WLAN-used}}{I_{WLAN-valid}} \quad (4)$$

III. EVALUATING THE PERFORMANCE

Here, we first illustrate the evaluation of PLP-based call drop design by expressing in a derivative manner.

III.1. Basic Relations for Call Drop Possibility

Here, we calculate the call dropping possibility for a moving MT on a given VH algorithm in a heterogeneous atmosphere.

Once the MT is connected to the WLAN, the call is initiated with the interval $I_{initial}$.This call may be successfully terminated or dropped out at any instance.Hence, to determine the possibility for a given $I_{initial}$ is,

$$prob(c_{Dp}|I_{initial}) = 1 - prob(I_{hand-out} \le I_{drop} - I_h | I_{initial})$$
(5)

Where,

$$prob(I_{hand-out} \le I_{drop} - I_h | I_{initial}) = \oint prob(\tau \le \alpha - I_h | \overline{\omega_\alpha} \cdot f_{\overline{\omega_\alpha}}(\overline{\omega_\alpha}).d(\overline{\omega_\alpha}) \quad (6)$$

$$\oint prob(\tau \le \alpha - I_h | \overline{\varphi_\alpha}).f_{\overline{\varphi_\alpha}}(\overline{\varphi_\alpha}).d(\overline{\varphi_\alpha}) \quad (7)$$

Where,

c_{DP} – call drop
$I_{hand-out}$ – hand – out interval
I_h – hand – over interval
$\overline{\omega_\alpha}$ – realization of the communication stability order
$\overline{\varphi_\alpha}$ – pattern of packet loss
$f_{\overline{\omega_\alpha}}, f_{\overline{\varphi_\alpha}}$ – probability distribution

The number of packets upon the average packet loss is calculated as,

$$n_f = \left|\frac{I_1}{I_p}\right| \quad (8)$$

The tolerance of the call drop is given as,

$$n_t = [n_p \times R_{call-drop}] \quad (9)$$

Where,

n_p – number of packets
I_1 – given time interval

I_p – transaction of the packets at given interval

$R_{call-drop}$ – *rate of call drop*

III.2. Design based on Packet Loss Prototype

In this part, we adduce various packet loss prototype which leads to call drop. All the possible sequences that results in call drop are obtained by the set of vectors $[v_j]$ which can be produced as follows.The number of sequences is given by,

$$N_{co} = \binom{n_p-1}{n_t-1} \quad (10)$$

III.3. Estimation of Handover

The number of packets upon the average packet loss is determined as,

$$n_g = \left\lceil \frac{I_z}{I_p} \right\rceil \quad (11)$$

The call drop can be evaded when the handover is initiated before the time i_0.The packet loss prototype relys on communication stability decay pattern.

III.4 Deriving PLP Probability,Po_{s_j}

The vectorS_j, correlates to the packet loss prototype that exists,
over the preceding packet sampling (n_p).” a” is denoted as $[a[1]\ a[2]\ a[3] \ldots a[n_p]]^I$,which is the column vector that contains the probability of packet loss for every preceding n_p packet sampling.The neutral packet loss model is given as

$$p \nexists ob(s_j[c] = 1) = a[c], \quad (12)$$

$$prob(s_j[c] = o) = 1 - a[c] \quad (13)$$

The probability implied on the handover $Po_{s_j'}$ is varied from unstable probability of occurrence of $S_j(Po'_{s_j'})$ at time t_0.

According to Gilbert packet loss model,Po_{s_j} is represented as,

$$Po_{s_j} = Po'_{s_j} / \sum_{j=1}^{n_d} Po'_{s_j} \quad (14)$$

Therefore, the logical design provided in this path is used to calculate packet loss based handover algorithms for the given set of packet loss probability prototype and for call drop issue.

III.4.1 Independent Packet Drop

The vector S_j correlates to the packet loss prototype that exists over the preceding packet sampling (n_p).The unstable probability of occurrence of S_j is denoted as Po'_{s_j}.Thus the common term for Po'_{s_j} is given as,

$$Po'_{s_j'} = \prod_{i=0}^{n_v} f[i] \quad (15)$$

Where,

The product values of a[c] and 1-a[c] is denoted as Po'_{s_j} .

$$f[i] = \begin{cases} a[i], & S_j[i] = 1 \\ 1 - a[i], & S_j[i] = 0 \end{cases} \quad (16)$$

The vector f can be represented as addition of two vectors which is given below.

$$F = \begin{bmatrix} a[1] \\ 1-a[2] \\ 1-a[3] \\ a[4] \end{bmatrix} = \begin{bmatrix} 0 \\ 1-a[2] \\ 1-a\,□3] \\ 0 \end{bmatrix} + \begin{bmatrix} a[1] \\ 0 \\ 0 \\ a[4] \end{bmatrix} = f_0 + f_1 \quad (17)$$

Such that,

$$f_0[i] = \begin{cases} 0, & S_j = 1, \\ 1 - a_j, & S_j[i] = 0, \end{cases}$$

$$=(1-a[j])(1-S_j[i]) \quad (18)$$

$$f_1[i] = \begin{cases} a[i], & S_j[i] = 1, \\ 0, & s_j[i] = 0, \end{cases}$$

$$=a[i]S_j[i]. \quad (19)$$

III.4.2 Gilbert Packet Drop

In this section, various packet sampling are excluded from the vectors a and b. a[i] is the preceding packet which has been obtained and b[i] is the preceding packet which has been obscured.
Eqn.(15) represents Po'_{s_j} and f[i] is given as,

$$f[i] = \begin{cases} a[i] & S_j[i] = 1 \ \& \ S_j[i+1] = 0, \\ 1 - a[i] & S_j = 0 \ \& \ S_j[i+1] = 0, \\ b[i], & S_j[i] = 1 \ \& \ S_j[i+1] = 1, \\ 1 - b[i], & S_j[i] = 0 \ \& \ S_j]i+1] = 1, \\ \frac{a[i]}{a[i]+1-b[i]} & i = n_v \ \& \ S_j[i] = 1, \\ \frac{1-b[i]}{a[i]+1-b[i]} & i = n_v \ \& \ s_j[i] = 0. \end{cases}$$

(20)

The final element of the S_j is progressively the first packet of the order and f[n_v] in the previous eqn is considered as average packet loss rate according to Gilbert model.If S_j=[0 1 1 0 0],then f can be given as,

$$f = \begin{bmatrix} 1 - b[1] \\ b[2] \\ a[3] \\ 1 - a[4] \\ f[n_v] \end{bmatrix}$$

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$$= \begin{bmatrix} 0 \\ 0 \\ a[3] \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1-a[4] \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ b[2] \\ 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 1-b[1] \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ f[n_v] \end{bmatrix}$$

$$= f_{01} + f_{00} + f_{11} + f_{10} + f_{final}, \qquad (21)$$

Where,

$$f_{final}[i] = \begin{cases} \frac{a[i]}{a[i]+1-b[i]}, & i = n_v \,\&\, S_j[i] = 1, \\ \frac{1-b[i]}{a[i]+1-b[i]}, & i = n_v \,\&\, S_j[i] = 0, \end{cases}$$

(22)

And

$$f_{01}[i] = a[i]S_j[i](1 - S_j[i+1]), \qquad (23)$$

IV MATHEMATICAL ANALYSIS

In this part, we illustrate the mathematical analysis which is obtained using Logical method.

A simple packet loss design with values $n_f = 24, n_t = 6, n_v = 120 \; and \; n_h = 3$.There is a undeviating increase n the probability from a $[n_v] = 0.052, a[1] = 2R_{call-drop}$.

The graph is plotted against the call drop probability $Po_{call-drop}$ and the WLAN usage potential $å_{WLAN}$ with the values

$n_s = 18 \; and \; n_s = 12$.

The Gilbert packet drop model and simple packet drop model can be illustrated with the values $n_f = 100, n_t = 25, n_v = 500 \; and \; n_h = 5$. There is an undeviating increase in the probability from $a[n_v] = 0.052, a[1] = 2R_{call-drop}$

The graph is plotted against the call drop probability $Po_{call-drop}$ and the WLAN usage potential $å_{WLAN}$ wiyh the values $n_s = 18 \; and \; n_s = 1$

V CONCLUSION

This paper puts forward an overview of a pragmatic performance calculation outline for packet drop based VH algorithm. We have done through a complete estimation of the system. The implementation of the VH algorithm illustrated here depends on the average in motion of the packet drop rate and both the simple packet drop and the Gilbert packet drop algorithm are implied here. We have implemented a new technique called as Multi-scan technique in which the channels has been scanned with the help of two WLAN interface.Multi-path transaction occurs with the help of a extra network than using a single WLAN interface. This technique enhances the network and tries to maintain the communication flow at an acceptable level.

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