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SIMULATION OF SEAMLESS VERTICAL HANDOFF BETWEEN UMTS-WLAN

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ABSTRACT

The method proposed in this paper provides Always Best Connectivity (ABC) to the user. Algorithm implemented in this paper is for two-tier heterogeneous network like UMTS-WLAN. The results are calculated using the RSS value received to MN and threshold values of networks. The packet loss is compared for various speed of node travelling through overlay network.

Keyword: UMTS, WLAN, RSS, MIH, ND, BS, AP, RNC, Vertical Handoff (VH), Packet loss, Handoff Latency

I INTRODUCTION

Heterogeneous network consist of two or more radio access technologies with different architectures with increasing mobile network capacity and providing quality of service. This heterogeneity provides always best connectivity to user [1].UMTS networks provide large network coverage but relatively low data rates. UMTS preserves the global roaming capability of second generation GSM/GPRS networks and provides new enhanced capabilities [8].

WLAN networks provide high data rates but relatively small network coverage. Wi-fi refers towireless networking technology that allows computers and other devices to communicate over a wireless signal. It is based on one of the 802.11 standard [10].

When a mobile object changes its point of connection its IP address gets changed. Mobile object should be able to maintain all the existing connections using the new IP address [3]. This process of changing the connection from one network to another one is called Handoff [2]. While switching if mobile object maintains old connection until new connection establishment then that handoff is known as soft handoff and if mobile node terminate first connection and establish new one is known as hard handoff [2]. Network controlled handoff is used to optimize network resources as well as traffic management that maintains a good QoS. Mobile terminal controlled handoff approach guarantees handoff initiation in optimal time and reduces the complexity of the mobile terminals. In mobile terminal approach measures the upstream and downstream [3].

In overlay network when mobile object leaves low coverage network and moves into a higher coverage network, then that is known as upward handoff [7]. In that case all the existing connections need to be handed off the higher

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coverage network. If mobile node moves towards low coverage network for high data rate then that is known as DownwardHandoff [5]. Traffic flowing through network will be real time and non-real time services the mobile terminal may decide at any time to release the connection with the weaker network during handoff [6].

An integrated network consist of different access technologies and a single MN should be capable of access both technologies [8]. A dual mode MN can able to communicate with both UMTS and WLAN. It can easily measures the RSS values and able to switch between these networks when roaming in heterogeneous network. The standard IEEE 802.11 being developed to enable handoff [10]. The MIHF facilities standards based on message exchange between the various accesses networks to share information about the current network conditions and available RSS [9].

II PROPOSED ALGORITHM

In proposed algorithm, two different networks were considered, WLAN and Cellular network. The proposed algorithm is shown in figure. It is divided into two parts[1].

In the first part the user is in the WLAN and wants to initialize a handoff to a cellular network. In another part, user is in the cellular network and wants to initiate a handoff to a WLAN.

Received Signal Strength (RSS) is the measure parameter considered in algorithm. The performance of a wireless network connection depends in part on signal strength between a mobile node (MN) and access point (AP). The wireless signal strength in each direction determines the total amount of network bandwidth available along that connection.

If the following conditions occur then mobile node goes into blocking stage i.e. handoff failure.

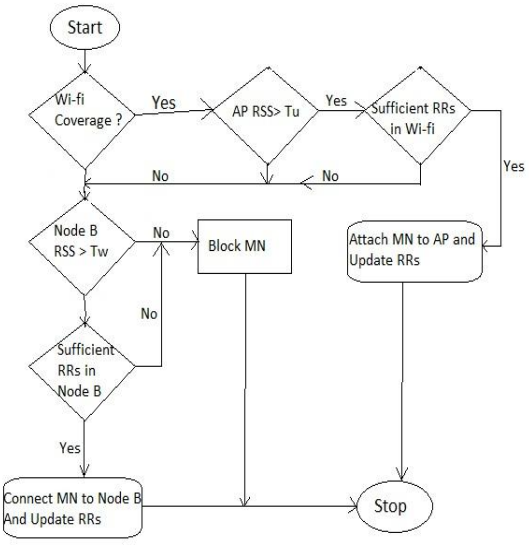

Fig1. Flow chart of handoff

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1) MN is accessing 3G network, but its RSS dropped below threshold and MN is not in the coverage of any of the WLAN APs.
2) The current serving network is WLAN and its RSS dropped below threshold and there is no free channel in 3G network.
3) The MN connected to WLAN but its RSS dropped below threshold and RSS of 3G network is also below threshold.

2.1 Implementation: Parameters:

UMTS	MN node	WLAN
Cell range	Data rate	WLAN range
Bandwidth	Multi-interfacing	Bandwidth
Threshold		Frequency
Frequency		Threshold
Channel		Channel
Antenna		Antenna

Scenario:

In implementation scenario there is one multi interfacing node connected to Base station, moves from one point to another. In his journey it may come across the WLAN network.

There is one sender who send data through one router. Following figure shows the detailed view.

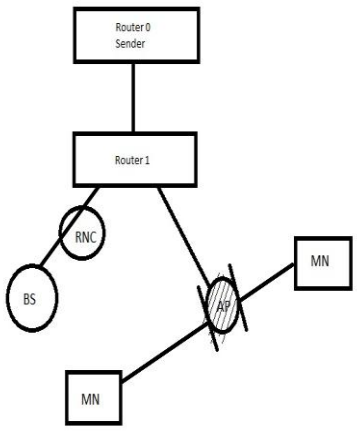

Fig2. Implemented scenario

For  region data travel through Router 0 -> Router 1 -> Access Point and rest of other goes Router 0 -> Router 1 -> RNC -> BS.

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2.2 Implementation Platform:

1. We used Fedora 10 which is distribution of Linux with 512 MB RAM for the simulation using NS-2.29.
2. For mobility we used NIST mobility patch which is responsible for handoff.
3. For Graphical output we used NAM 1.11 and XGRAPH for plotting graph.
4. To calculate statistic awk scripts are used which filters the trace file.

GRAPH:

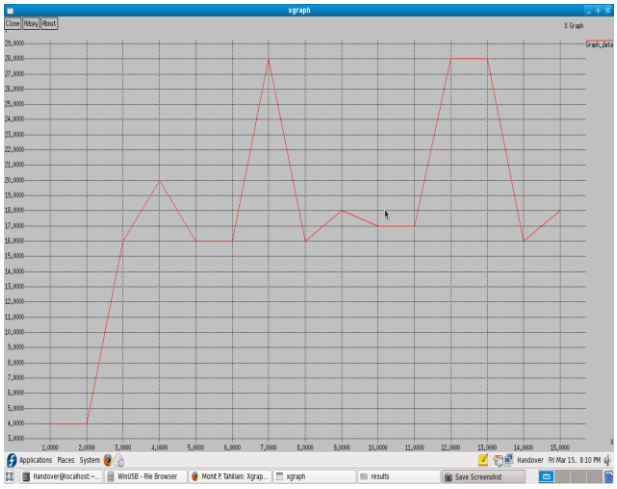

Fig 3. Packet Loss Vs Speed of node movement

2.2 Modified Files from NS2 2.29:

```
//Inclusion of headres and neccessary files
//Purpose: useful for for distance calculation


staticint monitor=0;
doubleprev_distance=0;
#include <phy.h>
/* NIST */
staticboolinterferenceEnable_;
/* END NIST */


//In Recv Function to calculate Path-loss
        assert(initialized());
/*  Handle outgoing packets. */
        if(hdr->direction() == hdr_cmn::DOWN) {
```

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```
// Add 1 for the frame just received from the queue.
qwait_watch_.update(NOW-qwait_watch_.current());
send(p, h);
return;
      }
/ * Handle incoming packets.*/
/*If the interface is currently in transmit mode, thenit probably won't even see this packet.  However, the"air" around me is BUSY so I need to let the packet proceed.  Just set the error flag in the common header to that the packet gets thrown away.*/

if(tx_active_ &&hdr->error() == 0) {
                        hdr->error() = 1;  }

if(rx_state_ == MAC_IDLE) {
                        setRxState(MAC_RECV);
                        pktRx_ = p;
                        mhRecv_.start(txtime(p));}
else {
if(pktRx_->txinfo_.RxPr / p->txinfo_.RxPr>= p->txinfo_.CPThresh)
 {
            capture(p);}
else {
            collision(p);
      }
}
```

III CONCLUSION

This paper presents a simple vertical handoff algorithm for UMTS/WLAN integrated architecture to provide ubiquitous connectivity with less number of packet losses. The algorithm provides economical solution to user because of freely available WLAN network. In future we can provide choices to the user to use the node i.e. for data always use WLAN while for voice use UMTS.

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