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# BALANCING HANDOFF FAILURE BY SUBSTITUTING WIMAX INTERFACE

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**ABSTRACT**

Presently.IEEE 802.16e based broad band wirless solution that enables coverage through wide area broadband radio access technology. The main issue regarding wirless technology is handoff. Due to limited coverage of basestation.When a mobile station moves outside the range of its current base station it needs to perform handoff. This causes data loss and interruption in communication. However seamless handoff management still a open matter of research.Here we proposed a method to balance the handoff failure probability by implementing Mobile WiMAX in the cellular network. The Mobile WiMAX which produces the coverage over 70 milies and provides the strong coverage .On the other hand it relieves the congestion in the cellular network

**Keywords-**MobileWiMAX,IEEE802.16,Handoff

## 1. INTRODUCTION

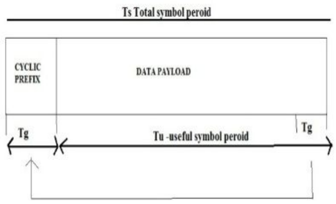
In recent years different wirless technologies have been implemented from 2G and 3G cellular system.All these wirless networks are different radio access technologies .The actual trent to integarate wirless technologies to provide coverage and to achieve Always Best Connected Concept.IEEE 802.16 is based on WiMAX technology standard provides itself as a technology that will play a key role in fixed broad band wirless meteroplitian area networks.Where Fixed WiMAX is based on IEEE802.16 air interface standard ,which is alternative to cable and DSL services .In order to provide mobility over the network WiMAX defining the system Which is Mobile WiMAX.

### 1.1MOBILE WiMAX

Mobile WiMAX is a broad band wirless solution that enables convergence of mobile and fixed broadband networks through a common wide area broadband radio access technology.The Mobile WiMax air interface adopts Orthogonal Frequency Division Multiple Acess (OFDM) for improved multi path performance in non line of sight environments.

### 1.2OFDM

Orthogonal Frequency Division Multiplexing is a multiplexing technique that subdivides the bandwidth in to multiple frequency sub carriers.The input data stream is divided in to several parallel sub stream .The increased in symbol duration improves robustness of OFDM to delay spread.The introduction of cyclic prefix can be completely eliminate inter-symbol interference.




### 1.3HANDOFF

When a mobile station moves out of reach of its current base station it must be reconnected to a new base station to continue its operation.The search for a new base station and subsequent registration under it constitute the handoff process which tackes enough time called handoff latency to interference with proper functioning of many applications.

***Hard & Soft handoff***

Where in case of hard handoff when a mobile station moves from one base station to another base station the connection will be broken with old base station.This result in large handoff delays.However in soft handoff the old connection is maintained until a new one is established thus significantly reducing packet loss.In hanoff procedure consists of three logical phases they are scanning ,authentication ,re-association.One of the most important reasons of handoff failure is the handoff latency caused by channel scanning.

## 2. RELATED WORKS

In recent times large amount of research is done in improving the handoff latency ,but it is a still an issue unsolved in the cellular world.Method based on integarating a WLAN with the cellular network to minimize the handoff failure.This causes a heavy overhead to the MSC in the cellular network..A method based on send probe requests to the base station one after other and perform handoff immediately after any base station sends the response.This allows us to scan fewer channels.GPS based base station maps for handoff management.Handoff using received signal strength of base station.

## 3.PROPOSED SYSTEM

Here we propose to balance the handoff failure by implementing Mobile WiMAX in the cellular network.Fast Base Station Swithching (FBSS) and Macro Diversity Handover are the two optional modes.Which maintains the handoff delays less then 50 milli seconds.When the FBSS is supported the mobile station and base station maintain a list of base stations that are involved in FBSS with the mobile station,this set is called activeset...In FBSS the mobile station continuously monitors the base station in the active set Among the basestations in the actve set an anchor base station is defined.The mobile station only communicates with the anchor base station.A FBSS handoff begins with with decision by mobile station to receive or transmit data from anchor base station that may change within the active set.For mobile station and base stations that supports MDHO,the ms and BS maintain an active set of base stations.When operating in MDHO the mobile station communicates with all base stations in the active set.

## 4. MIMO-OFDM

MIMO-OFDM is the corener stone for next generation broad band communication systems.MIMO which achieves higher throughput,OFDM converts frequency selective channel to parallel frequency flat fading channel.Which removes the need of complicated equalizer to do the operation of the convertion of frequency selective channel to flat fading channel

MIMO frequency selective channel is modeled as

$$Y(k) = \sum_{l=0}^{L-1} H(l)\, x(k-l) + n(k)$$

Y(k) does not depends on X(k),but also

X(k-1),X(k-2)……….Hence there is inter symbol interference between current and the previous symbols vectors.For a MIMO –OFDM system one need to perform IFFT operation at the each transmit antennas.

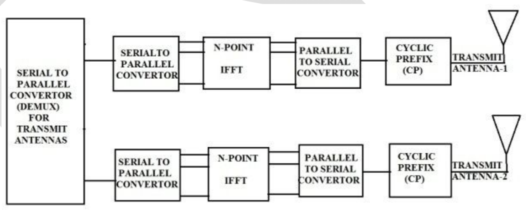



**Figure 1 .Schematic Diagram Mimo- Ofdm Transmitter.**

. At transmitter bank of modulators is replaced by IFFT.The process of IFFT is implemented on a DSP chip .Thus by the effective process of OFDM frequency selective fading is converted to frequency flat fading channel.

$$Y(0) = H(0)\, X(0)$$
$$Y(1) = H(1)\, X(1)$$
$$. \quad . \quad . \quad .$$
$$Y(N-1) = H(N-1)\, X(N-1)$$

A set of N flat fading channels is formed by the performance of OFDM.Thus the wide or broadband channel is converted to amultiple parallel flat fading narrow band channel.

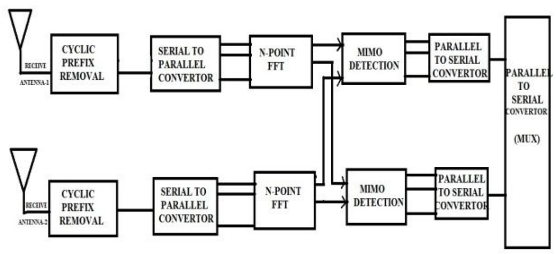



**Figure-2 Schematic Diagram Of Mimo-Ofdm Receiver**

Where in case of MIMO-OFDM receiver,we have to perform the detection operation .Across each subcarrier we have to perform MIMO detection.For each subcarrier in the MIMO system,collecting all the received symbols corresponding to the first subcarrier and the MIMO detection is performed.Hence the channel matrix for corresponding different sun carriers

Y(k) .= H(k) X(k) .Where H(k) is the flat fading channel matrix corresponding to subcarrier k ,Y(k) is the receive vector corresponding to sub carrier.X(k) is the transmit vector corresponding to sub carrier k.

## 5.SMART ANTENNA TECHNOLOGY

Smart antenna technology typically involve matrix operation on signals due to multiple antennas.OFDM allows smart antenna operation to be performed in flat fading channel.Which reduce the complicated equalizer operation.Beamforming system uses multiple antennas to transmit weighted signals to improve coverage and the capacity of the system.Space time codes inorder to acquire the transmit diversity and to produce spatial diversity alamouti code is perefered. Spatial multiplexing If the receiver has multiple antenna ,it can separate the different streams to achieve higher throughput compared to single antenna systems.With 2x2 MIMO ,spatial multiplexing increases the peack data rate where in uplink each user has only one transmit antenna.So they can transmit collaboratively in the same slot and their two streams are spatially multiplexed from two antennas of the same user.

## 6. MULTIPLE ANTENNAS FOR MOBILE HANDSET

Implementing an additional antenna for the mobile handset which increase receive diversity,and remove the effect caused by fading.Multiple links will be possible so multiple copies of the same information can be transmitted from transmit antenna to independent paths.The antennas at the receiver should be placed apart,because signal received are highly correlated at the receiver.So achieve independent path from antennas ,antennas should be placed apart from each other.The minimum spacing required for the antennas is $\lambda/2$ .Where $\lambda$ is the wavelength corresponding to the carrier frequency.Where $\lambda$ =C /fc ,C is the speed of light ,fc is the carrier frequency.The carrier frequency for 4G is 2.3GHz.Therefore the minimum spacing required for the mobile hadset for multiple antenna is 6.5Cm.As a result,the carrier frequency increases the antenna spacing decreases.Hence it is possible to have multiple antennas in mobile hand set.

6.1 Micro strip antennas for Mobile Handset

Micro strip antennas are the antennas of less size,weight,cost.The operating frequency is above 100MHz.Micro strip antennas consists of a very thin metallic strip placed above the ground plane.The strip and groundplane are separated by dielectric sheet called substrate.Arrays of micro strip is a single feed or multiple feeds used for greater directivity.As the thickness of the micro strip antenna is very small.Micro strip is said to be a monopole antenna by its radiation the major difference is their size,microstrip is ten micro metre .where monopole antenna has an size in centimeters.

## 7. SIMULATION RESULTS

We made simulation of our proposed method. The simulations shows the increase in data rate,spectral efficiency.Where the number of channel increases the call blocking probability decreases.In case of data rate as number of bits increases,the BER(bit error rate) decreases.The seamless handoff scenario for the received signal is shown.

Finally the comparision between the 3G and Mobile WiMAX resulting a rapid increase in video,voice..etc are shown in the graphs..In case of handoff as the time increases the received signal does not drops to zero or dropping rather it maintains the connection through out the entire communication between the users.

Where the beam produced by the antenna is adaptive beam due to the smart antenna this adaptive beam is produced which reduce the handoff latency in the cellular network.The additional antenna to be used is an microstrip antenna which is small in size and which provides the way to the mimo system..Thus the implementation of Mobile wimax in the cellular network provides a rapid increase in data rate, spectralefficiency,and reduce the handoff failure.

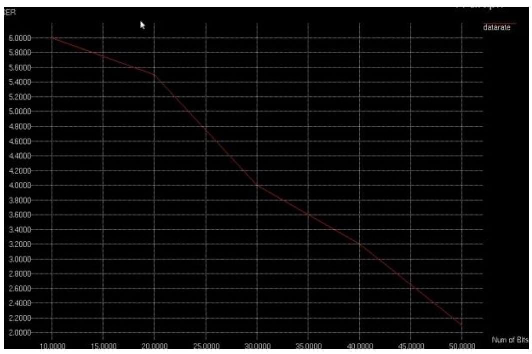



**Figure-3 plot of increase in data rate. (Number of bits Vs BER)**

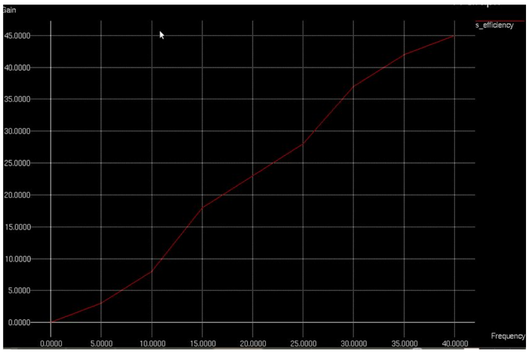



**Figure-4 Plot of increase in spectral efficiency (Frequency Vs Gain)**

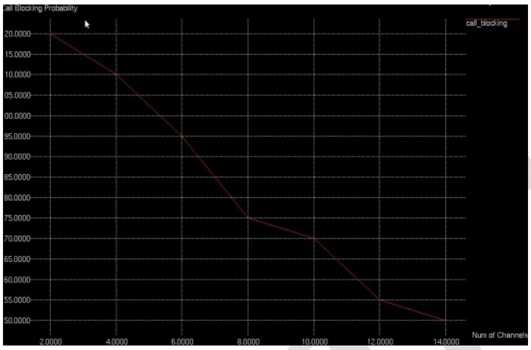



**Figure-5 Plot of Increase of Channels (call blocking probability Vs number of channels.)**

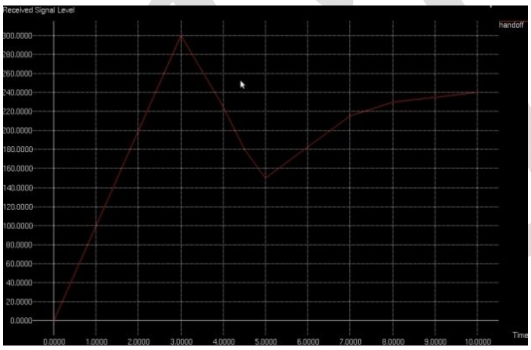



**Figure -6 Plot of handoff scenario (Time Vs Received signal level)**

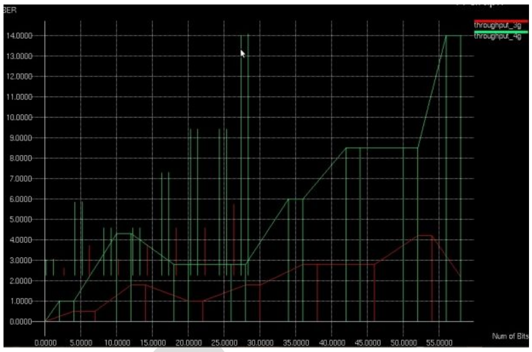



**Figure -7 Plot of Mobile WiMax Vs 3G**

Thus by implementing Mobile WiMAX in the cellular network,which supports optimized handover schemes with latencies less than 50 milli seconds..By the inclusion of MIMO antenna techniques ,which supports higher data rate,degree of freedom in communication between the antennas these produce more flexibilityAs the mobile station movement the beam produced by the antenna will also move so there will not be handoff latency and dropping of signal strength in the cellular network.

## 8. CONCLUSION

Thus by proposed method ,we can reduce the handoff failure latency quite a remarkable.The various advantages by implementing MobileWiMAX in cellular network is entitled as follows.

- Handoff failure probability tends to zero
- By MIMO technique rapid increases in data rate
- Complicated equalizer is eliminated by using MIMO-OFDM.
- OFDM which converts frequency selective fading to afrequency flat fading.This reduces inter symbol interference.
- IFFT in MIMO-ODFM transmitter and FFTin MIMO-OFDM receiver reduces the block of modulators to be used.
- Due to smart antenna technology,the performance of the beam forming is increased
- By implementing the micro strip antenna in our mobile handset,which reduces the size and increase data rate and receiver diversity.Which enables to decrease the fading effect caused due multipath communication.
- Increase in receivers at both transmitter and receiver which employ degree of freedom.

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