ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 10, October 2014

A Survey of Associate Access Points to Increase the Performance of IEEE 802.11 Wirelesses LAN

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Abstract: The wireless LAN is an IEEE standard which gives an efficient bandwidth usage with low cost. It is also called as IEEE 802.11. To maintain better connections from multiple mobile nodes we can access multiple Access point (AP), which can give a best signal for better communication. While communicating from various mobile nodes load will be there at the routers which will imbalance the network by mismatch communication between various access points. As we know that if load increases than the threshold value then the Throughput and Delay will vary. Then the performance degradation of will occur if overload on the Access Points. A scheme is introduced in this paper is the degradation performance of the mobile nodes will be initiated with assistance from the associate Access points which can perform handoff to less load on the Access Points ranges to give better performance.

KEYWORDS: WLAN, HANDOFF, Throughput and Delay Vs Load, AP.

I. INTRODUCTION

As now a days the technology usage and invention gaining to high peaks and which will cause a tremendous changes in the communications also. In that a special changes in the mobile and wireless communications which will play a vital role in the man life and took a great revolution in the technology history. Among these WLAN`s (Wireless Land Area Network) which is having of more popular with its usage at different areas like Military, Medicine, Science etc. It`s standard in IEEE form is IEEE 802.11.

In this WLAN the mobile used has to connect to LAN through the wireless connection which is also less cost and ease of deployment. It consists of multiple Access points where the overlapping of coverage area will be also considered. In this the Access Points will be interconnect which can form Extended Service Set (ESS). The usage of WLAN will have a limit upto a building or campus to extend these cover a large area of network and to cover more number of mobile nodes than the usual then the WLAN can be connected to WMAN (Wireless Metropolitan Area Network) which has a standard of IEEE 802.16, which can provide a great mobility to users. When the mobile node connects to the Access Point will give the best signal to communicate irrespective of load. By this which will cause the imbalance in the load on the different Aps in the ESS. Then the performance degradation will occur and can decreases the Quality of Service (QoS) in terms of throughput ,delay, packet loss etc., In this paper we proposed a scheme is that with the assistance of AP`s the mobile node experience the QoS degradation occurs which can causes the handoff, then the mobile node searches for the alternate AP As the MN does not know the load conditions on these APs it does not handoff to such an AP immediately but sends the list of such APs along with its own load information to the associated AP. The associated AP exchanges messages with the given APs to know the load on those APs and based on that, it selects a list of APs to which the MN can handoff and communicates the same to the MN. The MN chooses one of such APs and performs handoff. In this way, loads move from overloaded APs to the less loaded APs. Due to this, the bandwidth is better

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shared among the APs within an ESS and the overall throughput of the ESS increases. In case the suffering MN does not find a suitable AP to handoff, it performs vertical handoff to a BS covering the area.

1. Salient features

To increase the throughput in the ESS with minimum load, the following features are required

1. When the Mobile Node suffers then the Load has to be adjusted
2. To move from one AP to other a list will be maintained at the Mobile node
3. AP offers alternate to Mobile node if the load is on MN
4. The final decision is on the Mobile node whether to shift to alternatives offered by AP
5. MN are with less number for MN`s changing associated to AP
6. MNs are the wireless links through the wireless channels those are not involved while the AP`s can communicate via infrastructure
7. To locate the APs a very scanning will be required
8. Throughput should be balanced to maximum
9. While covering APs in ESS get overloaded the MN performs the handoff

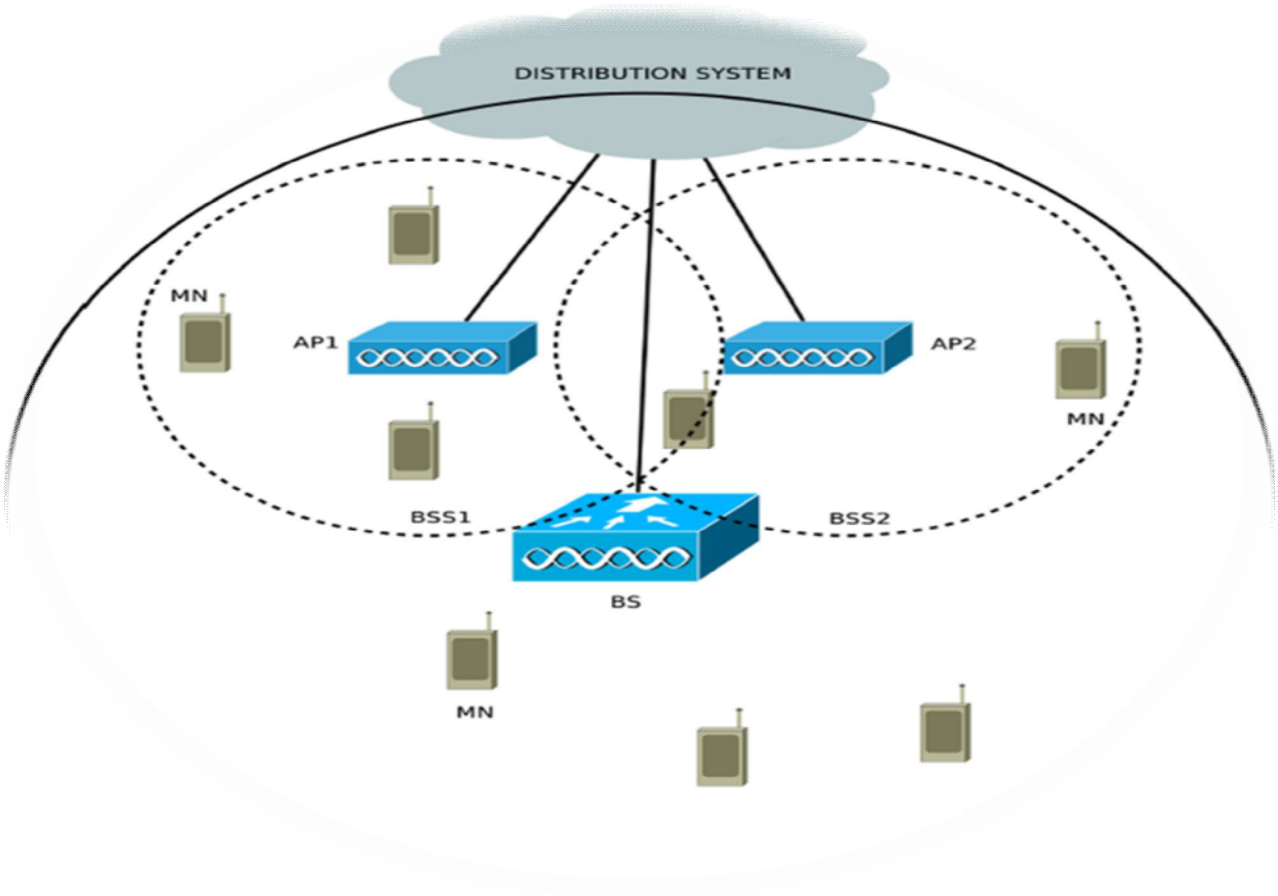

Figure 1. A WiFi-WiMax heterogeneous network.

II. RELATED WORK

Many of the researchers are performing their research on the performance efficiency in terms of throughput and delay when the load increases than the threshold value in the WLAN when connected to multiple AP Networks. To solve such problem many researches invented many theories. According to GILBERT SAWMA scheme if any load on

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the AP then dynamically the mobile node can be adjusted when the new MN tries to associate with other new AP to balance the load, by this load reduction will be seen at the AP. In this method AP load also take into account. According the author RSSI is consider for load balancing which is not a good for factor for balancing then the AP decides the Mobile node should be Hand off.

There are many other schemes proposed for the better performance improvement in WiFi-WiMax heterogeneous network. According to Ali-Yahiya, K. Sethom, and G. Pujolle when the mobile nodes performs the Handoff however the QoS of applications degrade. According to J. J. Roy, V. Vaidehi, and S. Srikanth, the packet loss and delay considered as main criteria for performing the handoff comparing with one to other networks. In this paper they said 9ms is the maximum delay which is not seen in the WiMAX without altering the parameters.

III. OUR PROPOSED SCHEME

The proposed scheme in this paper is when the MN`s experience degradation of performance are handed over to other AP in the ESS if an under loaded AP is found. If the mobile node is not under loaded AP then the MN is handoff to cover the BS, which will improves the throughput and delay of the suffering MNs also ESS.

4.1 Parameter Assumptions

We use some parameters to estimate the delay and throughput when the load increases beyond the threshold value. The following are the parameter assumptions

a. To the backbone AP and BS are connected
b. ESS coverage area within the area of BS
c. Spare capacity should be sufficient for BS
d. Overlapping coverage area cover APs
e. The Non overlapping channels can operate the Overlapping BSS

4.2 Description of the Scheme

At any time the mobile node is at performance degradation then it scans for different channels to find best Access Point which can perform the handoff. During the scanning period the mobile node takes the information of all Access points (AP) and set as a list to which a MN can associate. This list is called APList. For example if any MN connect to the any AP in the list it will consider as $AP_{a,}$ if MN wants to associate then it connects if not then it will dissociate and searches for the alternate AP for better performance. To move from one AP to other it will use a command called *Move Request.* So sending the commands to AP the MN update Exponentially Weighted Moving Average [EWMA] of the queue length and the Move Request messages repeatedly with a repeated time period of t_{repeat} for to "N' number of AP n_{repeat} or until the MN waits for the response from any of the AP. When the AP_a receives *the Move Request* from the MN, the AP sends the *Load Request* message to all other APs in the APList through the backbone and then it gives a *Load Response* message through the backbone to AP_a within the given time APList it received from the MN, selects zero or more APs to which the MN can handoff. AP_a keeps the list of such APs in *HCList*. Let AP_i be the i^{th} AP in the ESS. Let the concerned MN be associated to the j^{th} AP. Let *La* be the traffic passing through the j^{th} AP. Let *Li* be the traffic passing through the i^{th} AP and *M* is the load on the MN. Let also the set of APs in the *HCList* be *HC*.

$$HC = \{AP_i \mid i \neq j \text{ and } L_a - M - L_i > \Delta\} \quad (1)$$

Where L_i, M, L_a *and* Δ are the traffic volumes in bps. Δ is of small fraction to get maximum throughput. If the value of Δ is too small then the MN performed handoff to get better performance will tend to handoff again and many handoff occur unwantedly, if the Δ value is large, then the opportunity may increase performance may lost. The *HandoffcandidateList* send from AP_a in its reply messages *HandofftargetMessages*, to MN. The MN selects the AP in the APList and to perform the handoff to that particular AP based on the Signal to Interference plus noise ratio (SINR). So this process continues until it crosses the limit of queue length if it crosses then MN activate the WiMAX interface and it starts scanning the BS As the current communication still continues through the WLAN interface, there is no disruption of communication. However, based on the overload on the associated AP, there may be some performance degradation for a brief moment till the MN performs handoff. When a suitable BS is found, the MN records the same.

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After getting the *HandoffcandidateList*, if the MN observes that the list is empty, it performs network entry with the BS found earlier and transfers all flows to the BS. It does so while still communicating through the associated AP. After all the flows are successfully transferred, the MN sends a route update (RU) messages through the BS. It then disassociates from the associated AP and starts communicating through the BS.

While connected through the BS, the MN periodically scans for WLAN using interleave scanning technique. If an AP is found, MN sends a *Load Request from MN* to the AP. The AP replies with a *Load Response* message where it informs about its spare load. If sufficient spare load exists in the AP, the MN associates with the AP, sends RU message through the AP and disconnects from the BS. The destination of the RU message sent by the MN is the correspondent node (CN) the MN is communicating. Each node receiving RU message will update their routing table to reflect the current location of the MN. So the time required to calculate those is large, the communication will interrupt during the time of handoff until the routers has to update the routing tables and also have significant effect on the TCP Congestion window which will cause more end to end delay.

4.3. **Performance Degradation Detection (PDD)**

The performance degradation can be sensed in two different categories. In this the first method is the packet drop rate is used to sense the degradation of performance. A moving average of the number of packet dropped within a time window is kept. In this whenever the average increases above some threshold, the MN tries to find an alternate AP for association. It is observed that, when the traffic in the ESS increases gradually, packets gets delayed considerably even when the throughput does not get effected significantly. So, changing the association of MNs when degradation of performance is sensed this way will result in improvement of performance in terms of throughput but there may be still degradation of performance in terms of delay. In the second method the degradation of performance is sensed by observing the interface queue length. To smooth out the variations in the interface queue length the EWMA of the queue

length is calculated every t units of time. Let E_t be the EWMA of the queue length at time t. Let E_{t-1} be the EWMA of the queue length at time $t-1$ and let Y_{t-1} be the actual queue length at time $t-1$. Then we calculate E_t as

$$E_t = a X Y_{t-1} + a X E_{t-1}, \quad 0 < a \leq 1, \; t > 3 \qquad (2)$$

By using this value we can decide that how fast the MN forgot the old values of Y. If the E_t value crosses the threshold value then MN will finds the alternate AP for association to get better performance.

4.4. Finding the AP to Handoff

As we know before that MN scans whole channels which will cause interruption in communication instead to scan one channel at a time is the better option. While scanning by MN, it switches to the channel and sends a message *DSProbe* in that channel and come back to the channel in which it was communication. So in this channel it contains both MN`s and AP`s addresses The APs, if any, receiving the *DSProbe* message sends a *DSProbeResponse* message to the associated AP through the distribution system (DS). The associated AP, after receiving the *DSProbeResponse* messages forwards the message to the MN. Thus the MN finds the different APs within it's radio range. MN keeps the information of different APs found during scanning in a list

When the MN detects the performance degradation, it performs the list called circular list of channel numbers for scanning which contain 802.11 channels expect for the current using channel and overlaps with other channels. Then it initializes the variable for *Next Channel*. Then it empties the APList and the timer also start which is called the *Scan Timer*. The timeout value is T. Then at the expiry time T when the event is triggered the MN the below process happens

a) If the channel number of AP equals to Next Channel then MN empties the APList

b) *Next Channel* changed by the MN

c) When the *DSProbe* message received at AP then it sends the *DSProbeResponse* message to the associated AP

d) *DSProbeResponse* message forwards from AP to MN

e) All the information regarding the AP will be obtained at the APList

f) The MN changes the current channel to Next Channel to which it can communicated is associated with AP

g) The MN updates the Next Channel to further entry in cyclically form in the Channel list

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International Journal of Innovative Research in Computer and Communication Engineering

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h) To know the duration the MN starts timer called Scan Timer and then the normal communication starts

4.5. **Choosing the LOAD COST**

For load balancing system the Load cost is the main factor. In GSM each call takes equal amount of bit rate and so number of call is a good metric in GSM. In WLAN, different flows require different bit rates. The load metric based on measured traffic is a good metric for load balancing in WLAN. Number of competing stations is used as metric for load. By the use of wireless medium busy time (MBT) as the metric. For the client utilization estimate (CUE) as the fraction of time per time unit needed to transmit the flow over the network. CUE is an indicator of network resource usage. CUE is also used in as load metric. In our scheme, we use traffic as load metric. However, for the initiation of the load adjustment process, in the MNs, we use packet drop and EWMA of the interface queue length to sense degradation of performance. Packet drop and the queue length of the EWMA gives the early indication of performance degradation.

Conclusion

In this paper we proposed a scheme by balancing the load at the APs in the 802.11. If the Mobile node suffers from the performance degradation when it is associated to AP. So by balancing the Load at the AP we can gain or increase the performance of 802.11. By maintaining the load balance at the AP we can increase the performance of the throughput and delay Vs load. A new scanning technique was introduced i.e., to scan the channel by the MN one time to update the router fast about the routing information. By this we can reduce the latency in handoff.

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Vol. 2, Issue 10, October 2014

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