International Journal of Engineering Research in Computer Science and Engineering (IJERCSE) Vol 3, Issue 6, June 2016

A Bandwidth Utilization Approach to Resolve Congestion in Mobile Networks

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Abstract- **A mobile network is one of the busiest networks in use these days. It includes different type of data flow over the network. As the data flow increases over the network it suffer from the problems like congestion, data loss, data distortion etc. As the size of the network increases such kind of problems increases very fast. There are number of approaches that use different routing algorithm or the hardware to improve the transmission ratio over the network. The proposed work is also in the same direction. In this proposed approach we are presenting the better utilization of available bandwidth in such a way the loss can be minimized. The proposed approach will use the bandwidth according to the type of data. The system will be applied on data link layer and it will avail the bandwidth to a communication on the basis of data that will be transferred over the network. The work also includes the analysis in terms of throughput and the data loss over the network**

Keywords **: Bandwidth, Adhoc, Mobile, dataloss, Frequency**

I. INTRODUCTION

"Ad hoc" word is used to describe solutions that are developed on-the-fly for a specific purpose. In computer networking, an ad hoc network refers Wireless base station to a network connection established for a single session and does not require a router or a For example, if you need to transfer a file to your friend's laptop, you might create an ad- hoc network between your computer and his laptop to transfer the file. This may be done using an Ethernet crossover cable, or the computers' wireless cards to communicate with each other. If you need to share files with more than one computer, you could set up a mutli-hop ad hoc network, which can transfer data over multiple nodes.
Basically, an ad hoc network is a temporary network connection created for a specific purpose (such as transferring data from one computer to another). If the network is set up for a longer period of time, it is just a plain old local area network. [8] A **wireless ad hoc network** is a decentralized wireless network where the network does not depend on a preexisting infrastructure, such as routers in wired networks or access points (AP) in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data to the other nodes, and so the determination of which nodes forward data is made dynamically i.e. the normal nodes is converted to a routers and gateways. [8]

The earliest wireless ad hoc networks were the "packet radio" networks (PRNETs) from the 1970s, after the ALOHA net project sponsored by DARPA.

This decentralized nature of the Ad Hoc networks make them suitable at places where a single central node acting as a base station does not work efficiently or the terrain is not suitable to deploy stationary nodes which are connected via wired links. This makes Ad Hoc networks very useful in emergency condition.

A Wireless network can by I) Wireless Mesh Network II) Wireless Sensor Network III) Mobile Adhoc Network. In this proposed work we are dealing with Wireless Mesh Network and the environment area is a clustered area. Each cluster is defined with some surrounding nodes. Each node has to reply to its Cluster Head. Here we are defining the same network.

Wireless mesh network (WMN) is a communications network made up of radio nodes organized in a mesh topology. A wireless network is a communication made up of radio nodes organized in a mesh topology. Wireless mesh networks often consist of mesh clients, mesh routers and gateways. The mesh clients are often laptops, cell phones and other network devices while the mesh routers forward traffic to and from the gateways which may but need not connect to the Internet. The coverage area of the radio nodes working as a single network is sometimes called a mesh cloud. Access to this mesh cloud is dependent

on the radio nodes working in harmony with each other to create a radio network. A mesh network is reliable and offers redundancy.

When one node can no longer operate, the rest of the nodes can still communicate with each other, directly or through one or more intermediate nodes. The animation below illustrates how wireless mesh networks can self form and self heal. Wireless mesh networks can be implemented with various wireless technology including cellular technologies or combinations of more than one type.

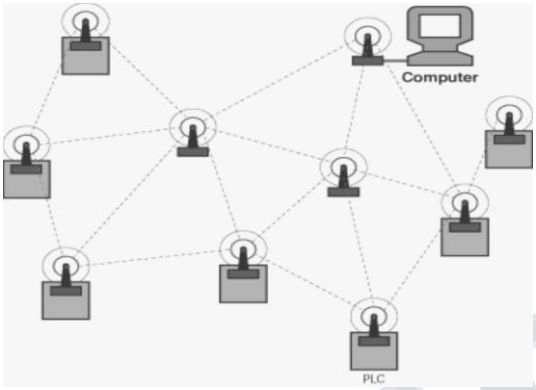

Figure 1 -Wireless Mesh Network

A wireless mesh network can be seen as a special type of wireless ad-hoc network. A wireless mesh network often has a more planned configuration, and may be deployed to provide dynamic and cost effective connectivity over a certain geographic area. An ad-hoc network on the other hand, is formed ad hoc when wireless devices come within communication range of each other. The mesh routers may be mobile, and be moved according to specific demands arising in the network. Often the mesh routers are not limited in terms of resources compared to other nodes in the network and thus can be exploited to perform more resource intensive functions.

The most commonly used topology for wireless mesh networks is a grid layout, due to the layout of buildings. Since each node would communicate with the gateway, it must do so either directly, if it is within the radio transmission range, or indirectly, which requires other nodes to forward packets. In order to minimize the collision probability, each node should adjust its power to a level that is able to reach its four direct neighbors, and no more. This, thus, forms a grid network. Therefore, we can adopt a quasi-xy-routing algorithm in WMN. Xy-routing is commonly used in mesh or torus topology parallel computers to avoid deadlock in wormhole routing [1]. In WMN with this grid topology, each node routes to its direct neighbours. For example, a node (x, y) in Fig. 1 has direct neighbors $(x-1, y)$, $(x+1, y)$, $(x, y-1)$, $(x, y+1)$. Each node performs packet forwarding for its neighbors to and from the gateway [1]

II LITERATURE SURVEY

In year 2011, Olivia Brickley, Susan Rea, Dirk Pesch, has defined an attempt to optimize the received quality in 802.11b WLAN by balancing the load between various access points while changing the coverage area of each access point, a technique commonly known as cell breathing. He presents a cell breathing concept in cellular WLAN that performs load balancing with the aim of improving the QoS for real-time applications. Access points can dynamically adjust their transmission power in an attempt to shed users to reduce the cell load. Neighboring [5]. Eduard Garcia Rafael Vidal Josep Paradells has defined a work on distributed algorithm with which the APs in an IEEE 802.11 WLAN are able to tune their cell size according to their load and also to their neighbor's load. This technique improves the fairness and the performance levels and is known as Cell Breathing. They introduce the ability to dynamically change the cell size according to the environment. The approach not only provides good network performance but also ensures an even share of bandwidth among clients and a balanced load among APs.[6] Paramvir Bahl Mohammad T. Hajiaghayi Kamal Jain Vahab Mirrokni Lili Qiu Amin Saberi,Has defined a work on access points and clients Cell Breathing, a well known concept in cellular telephony, as a load balancing mechanism to handle client congestion in a wireless LAN. We develop power management algorithms for controlling the coverage of access points to handle dynamic changes in client workloads. We further incorporate hand-off costs and manufacturer specified power level constraints into our algorithms. Our approach does not require modification to clients or to the standard. It only changes the transmission power of beacon packets, and does not change the transmission power of data packets to avoid the effects of auto-rating. We analyze the worst-case bounds of the algorithms, and show they are either optimal or close to optimal [7]. HAMDI Salah defined a study on load balancing algorithms (LBA) consider only the associated stations to balance the load of the available access points (APs). However, although the APs are balanced, it causes a bad situation if the AP has a lower signal length (SNR) less than the neighbor APs. So, balance the load and associate one mobile station to an access point without care about the signal to noise ratio (SNR) of the AP cause possibly an unforeseen QoS; such as the bit rate, the end to end delay, the packet loss, In this way, we study an improvement load balancing algorithm with SNR integration at the selection policy [8].

A critical aspect of applications with wireless networks is network lifetime. Power-constrained wireless networks are usable as long as they can communicate sensed

data to a processing node. Sensing and communications consume energy, therefore judicious power management and sensor scheduling can effectively extend network lifetime. To cover a set of targets with known locations when ground access in the remote area is prohibited, one solution is to deploy the sensors remotely, from an aircraft. The lack of precise sensor placement is compensated by a large sensor population deployed in the drop zone that would improve the probability of target coverage. The data collected from the sensors is sent to a central node (e.g. cluster head) for processing.

Paramvir Bahl Mohammad T. Hajiaghayi Kamal Jain Vahab Mirrokni Lili Qiu Amin Saberi Has defined a work on access points and clients Cell Breathing, a well known concept in cellular telephony, as a load balancing mechanism to handle client congestion in a wireless LAN. We develop power management algorithms for controlling the coverage of access points to handle dynamic changes in client workloads. We further incorporate hand-off costs and manufacturer specified power level constraints into our algorithms. Our approach does not require modification to clients or to the standard. It only changes the transmission power of beacon packets, and does not change the transmission power of data packets to avoid the effects of auto-rating. We analyze the worst-case bounds of the algorithms, and show they are either optimal or close to optimal. In addition, we evaluate our algorithms empirically using synthetic and real wireless LAN traces. Our results show that cell breathing significantly out-performs the commonly used fixed power scheme, and performs at par with sophisticated load balancing schemes that require changes to both the client and access points.
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Olivia Brickley, Susan Rea, Dirk Pesch, has defined an attempt to optimize the received quality in 802.11b WLAN by balancing the load between various access points while changing the coverage area of each access point, a technique commonly known as cell breathing. He presents a cell breathing concept in cellular WLAN that performs load balancing with the aim of improving the QoS for real-time applications. Access points can dynamically adjust their transmission power in an attempt to shed users to reduce the cell load. Neighbouring

III. PROPOSED APPROACH

As the Load increases over a network there are more chances of congestion in the network. The congestion in a network can occur generally at a particular point and in some cases it can occur in whole network but in both cases it affect the whole network. The congestion in a network can cause some delayed transmission or some times the packet loss. Network congestion occurs when load exceeds the available capacity at any point in a network. In wireless networks, congestion can degrades the quality of the whole network or the communication over that channel. One solution to resolve the channel is to add extra hardware or nodes or channel in the network, but this solution is costly as well not the not practical. We need some congestion control approach that will utilize the available resources in an efficient way that will increase the throughput in the network as well as it will decrease the packet loss and delayed transmission over the network.

The proposed is in same direction to mitigate the congestion by improving the path selection. In other words we can say here we are proposing a prevention approach to avoid the congestion over the network. The proposed approach is an intelligent approach and it is inspired from the Min-Max Algorithm of the Artificial Intelligence. To understand the whole concept we need to define the concept of Min max Algorithm. The proposed approach can solve the problem in wireless networks because concurrent transmissions on direct links interact with each other, and because channel quality shows high variable attitude over multiple time-scales.

In this proposed approach we are taking a Grid based scenario. Grid network is one of the common type of topology that we can see in a network. Even then the proposed approach is independent to the topology as well as network.

As we can in this node each node can transfer data to its neighbour node. Each node of the network is defined along with some parameters.

1. Minimum Load on a node
2. Maximum Load on a Node
3. M-Size Buffer
4. Transmission Speed
5. Forwarding Speed

The proposed approach is a host based approach in which each node is an intelligent approach and it can perform some kind of decision making regarding the route

decision. The decision will be taken to move on next node using Min-Max Algorithm.

The decision parameter basically depends on the load on the next possible node. It will also estimate the packet ratio along with current load. As the load on this node increases, the packet loss started, as we know a node has fix power to work on, as the load exceeds it starts behaving abnormally and start packet loss and energy loss. While the corner nodes are less utilized. This uneven load distribution results in heavily loaded nodes to discharge faster when compared to others. This causes few over-utilized nodes which fail and result in formation of holes in network, resulting in increase of failed messages in the network. A routing strategy developed should be such that it load balances the network and prevents the formation of holes.

The main objectives that we are going to cover in this proposed approach is

a) Mitigating the overall load within network
b) Representing the intelligent node that can perform its on decision making while forwarding the data packet.
c) Comparison of the above approach with existing one

The proposed algorithm for the specified approach is

A) Algorithm:

- Information is gathered and search executed at sink
- Starts with initial admissible state (all nodes are CH's)
- Single node states are iteratively modified and accepted if:
- New state is admissible (meet all constraints)
- New state is not in list
- Goal is to move to lower cost states, unless you cannot
- Visited states go into the list (short-term memory to prevent cycles and local minima)
- After Imax iterations, the algorithm is complete and the configuration is applied
- Network resets after period T, algorithm is re-execute

IV CONCLUSION

From the preliminary study we can estimate that the proposed approach may be less efficient and will provide a smaller delay in comparison to the existing approach.

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