Dynamic Cooperative Communications Using Dijkstra's Algorithm

Viji. M

Department of Computer Science and Engg.
Sree Buddha College of Engineering
Alappuzha, Kerala
vijivijayan12@gmail.com

Abstract: Cooperative communication has become a tremendous interest in Wireless Network. This type of cooperative communication is used for improving the network capacity in wireless network by reducing the interference and also improving the transmission power. In a normal networking communication, require so much time to transmit the message from source system to destination system, even if a node failure in between the transmission time. The goal of this paper is to improve the network capacity in order to reduce the interference by increasing the transmission power. The existing paper discusses less improvements of network capacity in a single network. By the use of COCO(Capacity Optimized Cooperative) topology, increase in the network capacity by jointly considering both the link level physical layer issues(such as outage probability & outage capacity) and upper level network layer issues (such as network capacity, routing, topology control) and also time should be delayed, if a system failure during transmission. So, propose a shortest path algorithm called Dijkstra's algorithm is used for finding the shortest distance between systems.

Keywords: Wireless Network, Network Capacity, topology Control, Cooperative communication,

1. INTRODUCTION

Cooperative communication plays a role in wireless network. Network is a group of two or more computer systems linked together. Network may classify according to a wide variety of characteristics such as communication protocol used, scale, topology & organizational steps. Mainly networks consist of wired & wireless networks. The purpose of network is to share resources. Wireless Network is to transmit the data over air using infrared or radio frequencies. Its a type of network in which two or more nodes that can communicate each other without using network cables. Network is dependent on topology. That means, internet connection is limited in a single but it extended in a whole cafe or outdoor location wherever the people communicates. There are many advantages by using this wireless networking such as, mobility, easiness, low maintenance cost. Normally in a normal networking communication, if a node failure during the transmission time then retransmit again from source node. Thus become time should be delayed. There are many advantages by using this wireless networking such as, mobility, easiness, low maintainace cost. Here, Cooperative communication has become a tremendous interest in wireless network. The idea of utilizing this cooperative communication is used for improving the performance of wireless network with time varying channels. This motivation will come from the Multiple Input Multiple Output (MIMO) systems. However this type of MIMO systems may not be able to communicate in wireless device especially in mobile device due to the size, cost, hardware limitations etc. This type of communication in which, user can share their resources to form a good transmission quality. Cooperative communication means that single antenna radios to share their antennas to form a virtual antenna array. It is type of relay generalization. Here the source node transmits the message to the relay node and that relay node forwards the message to the destination node. Thus the relay node acts as hub or a router for transmitting the message from source to destination using IP address. If a node failure during normal networking communication, then again retransmit the data from source to another node so that time should be delayed. Thus the data should be taken too much time should be taken to reach to the destination. The figure 1 shows the cooperative communication in wireless network. In cooperative communication mainly there are two type of transmissions; direct transmission and multi hop transmission. Direct transmission means that the source can transmit the information directly to the destination without using any mediator. But in multi hop transmission, the source can transmit the information to relay and retransmitted the information from relay to destination. Relay is acts both as transmitted messages as well as a cooperative agent to pass the information from source to destination. By using this cooperative communication, achieve high throughput and low delay by transmitting the information from source to destination.

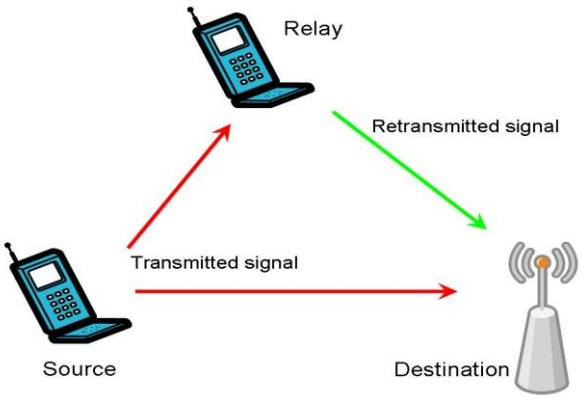

Figure 1: Cooperative Communication

Relay plays an important role in cooperative communication. Relay selection among available relays is to perform a cooperative relays. Relays are selected according to the shortest path from source to destination. The idea of cooperative relaying is that some nodes that transmit the information from source node relay to destination node instead of treating as interference. Interference occur when some nodes are transmitting

same frequency to the destination, otherwise no interference occur. In a single network, the data should be transmitted from source to destination through the corresponding IP Address and choose a location to where the data to be reached. So in this network, the corresponding sending data should be reached in a single system itself not in another system. So in a proposed system, propose a dynamic network. In this dynamic network the data to be send from source to destination in different systems through various IP Address. That is, one system is in server side and the other systems are in client side also. Here also, with the help of IP Address, the data should be reached from source to destination or from client to server. In this dynamic network, first choose the IP Address from the client system to which server system the sending data to be received. Then choose the corresponding location to where the data to be received. Here in this network, multiple systems IP address should be displayed so that choose the nearest neighboring systems IP address using the algorithm called dijkstra's algorithm. This is used to find out the shortest distance neighboring systems from source to destination. The rest of this paper is organized as follows: Section 2 introduces the related work, section 3 defined the problem definition, section 4 explained the system design, section 5 explained the proposed system and finally section 6 conclusions.

II.RELATED WORK

Many existing papers focus only the physical layer issues. So these papers does not mention about the improvements of network capacity.

Q. Guan et al [1] proposed a COCO (Capacity Optimize Cooperative) topology for improving the network capacity in MANET by jointly considering both the link level physical layer issues and upper level network layer issues. The concept of this paper is same as my base paper, but does not explained the improvements of network capacity. Here channel capacity as the important aspects of network capacity. In this, physical layer with cooperative communications, topology control and network capacity in MANET are used for improving the network capacity in MANET. The goal of network topology is to reduce the node power extension in order to increase the lifetime of the network. Relay selection is extended to a network wide behaviour for taking the network capacity into accounts. Network connectivity and path length should be considered as the optimization problem such as network connectivity & path length. So the disadvantage of this paper is that from the network point of view, the network topology may be insufficient for the overall performance in MANET.

Y. Wei, F. R. Yu, and M. Song [2] presented a Decode and Forward (DF) scheme for transmitting the signals from source to relay for increasing the transmission power. In cooperative communication relay act as a router. Since the destination node receives fading copies of information from the source node. Here the relaying could be implemented using three schemes such as Decode and Forward (DF), Amplify and Forward (AF), Distributed Space Time Coded (STC) schemes. Most of the existing papers do not focus on STC scheme and the disadvantage is that existing papers only focus relay selection process both the source and relay use the same Modulation and Coding scheme(MCS). With the use of this proposed scheme the key features such as mitigate error propagation and increase the spatial efficiency, reduce the computation and the complexity of the relaying selection. Thus the advantage of this proposed scheme is fully distributed and scalable.

K. Woradit et al. [3] considered two types of Decode and Forward (DF) schemes such as FSDF and SSDF for outage capacity and outage probability by using with and without direct link combining method. Outage probability means outage will occur at a specified time period. But the outage means a period when power supply or other service is not available or when the equipment is closed down. This outage probability depends upon the various factors such as node distribution, transmission success, MAC scheme etc. Here, focus on DF where each relay node fully decodes, re encodes and retransmit the source messages. So here consider the single relay transmission for transmitting the signals to destination The relay network is arbitrary so that the source node can transmit the signals to destination nodes directly or they are transmitted via the relay nodes. The disadvantage is that physical layer issues such as outage capacities and outage probabilities are focussed only on direct transmission and does not occur the network capacity.

J. Laneman, D. Tse, and G. Wornell [4] focussed only on Amplify and Forward scheme can be used to predict the impact of cooperative diversity. Cooperative diversity means that cooperative multiple antenna technique for improving or maximizing total network channel capacities by decoding the combined signal of the relayed signal and the direct signal. In this communication, the relay nodes are used for transmitting the signals from source to destination. The source node can send independent signals to relay and the destination, but the destination node receives two signals from source and retransmitted the signals from relay also. With the help of this relay node, the qualities of the received signals are improved. In this DF and AF schemes are used. The drawback is that the cooperative communication is focussed only on the Amplify and Forward scheme not use decode and forward scheme.

Aria Nosratinia,Todd E. Hunter, Ahmadreza Hedayat [5] proposed a new method called cooperative communication that enables the single antenna mobile to share their antennas to form a virtual antenna array. In this, the users can share and coordinate their resources to enhance the information transmission quality. Here relay play an important role for passing the signals from source to destination. With the help of relay, we need good quality of signals is transmitted. So the role of relay is act both as transmitted messages and as a cooperative agent. In this paper three schemes are introduced, Decode and Forward (DF), Amplify and Forward (AF) and coded cooperation. The key efficiency of this coded cooperation is that it will manage automatically through code design with no feedback between users. In comparing the three cooperative transmission schemes coded cooperation performs better than the other cooperative methods. The disadvantage is that other two schemes does not provide

better performance and low effective signal to Noise Ratio is obtained.

M. Burkhart et al [6] is used to solve the interference issue while providing transmissions occur from source to destination. The problem is that when the signals passing from source to destination interferences occur, thus less transmission power is required and does not improve the network capacity. On the other hand, reducing the transmission power also confines the interference, which in turns low energy consumption decreases the number of collisions and consequently reduces the packet transmission also. Here LLISE topology is used to preserve the minimum interference path. So the interference can be reduced by having nodes with less transmission power. The area covered by the smaller transmission range will contain fewer nodes, yielding less interference. The drawback of this paper is that this LLISE topology should consider only multi hop transmission without consider the cooperative communication.

Carlos A. S Oliveira, Panos M. Pardalos [7] proposed a CCPMANET (cooperative MANET) for maximizing the connectivity for a set of objects travelling from a set of sources to a set of destinations. Here MANET is useful technique for providing the communication infrastructure. They consist of loosely coupled and communicate them locally. In this multi hop transmission is considered for transmitting the signals. In this transmission, relay is an cooperative agent to pass the signals from source to destination. The problem is that an optimal route of ad hoc users so that the connection time among those nodes are maximized in MANET. Thus it can be used where the mobile devices are not controlled by a central authority. Majority of the work for MANET has concentrated on minimizing the number of nodes. So this paper a CCPMANET problem is formulated for maximizing the network connectivity. The drawback is that it does not deal about the cooperative communication and also does not improve the network capacity. So network capacity does not occur in MANET without cooperative communication.

Quansheng Guan, Shengming Jiang, Senior Member [8] paper discusses the impact of topology control on network capacity is first analyzed in the cross layer optimization. Based on the analytical result, optimal schemes for neighbor selection and transmission power control are used to maximize the capacity. This indicates that topology control with stable node degree renders the capacity not to decrease with increase in the number of nodes present in the entire network. Capacity analysis, which depends on many aspects, such as network architecture, physical layer, interference, routing, traffic model, can be formulated as cross layer optimization problem. Two types of network capacity. The first one is transport capacity, which is somewhat similar to total one-hop capacity in the network. Another type of capacity is throughput capacity, which is based on the information capacity of a channel. One-hop throughput is found to be proportional to network area, and local traffic, which communicate with nearby neighbors is found to improve network capacity.

III .PROBLEM DEFINITION

Existing papers discusses about how the cooperative communication should work in a network using decode and forward, amplify and forward method. While using this, drawbacks are maximize time delay, low reliability etc, occur during the message transmission from source to destination. In order to overcome this, proposed a shortest path algorithm called dijkstra's algorithm is used in the cooperative communication for finding the shortest path during the message transmission time.

IV. SYSTEM DESIGN

The figure 2 shows the design of how the message should transfer from source to destination in single and multiple systems using IP addresses while the system connected in LAN network.

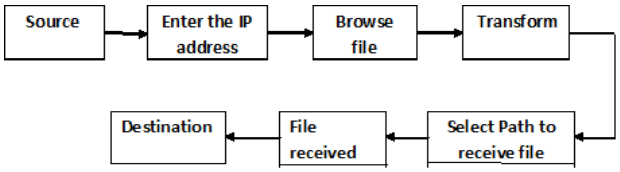

Figure 2: Design of the System

In a single network, the data should be transmitted from source to destination through the corresponding IP Address and choose a location to where the data to be reached. So in this network, the corresponding sending data should be reached in a single system itself not in another system. So in a proposed system, propose a dynamic network. In this dynamic network the data to be send from source to destination in different systems through various IP Address. That is, one system is in server side and the other systems are in client side also. Here also, with the help of IP Address, the data should be reached from source to destination or from client to server using destination system IP address. In this dynamic network, first choose the IP Address from the client system to which system the data to be received. Then choose the corresponding location to where the data to be received and stored. In this way the data to be transferred from source to destination.

V. PROPOSED SYSTEM

Here, proposed a Dynamic network done in cooperative communication. In this network, the communication between two or more systems that should transfer the data from source to destination using an IP address. Here, one system act as a server and other systems act as a client. In this, first the server should select the receiving path that means choose a path to receive the message and start the server system. Then the client system should have the IP address of the server system. In which system the client want to send the file, that system's IP address will taken. So, take the receiving system's IP address using "ipconfig" in the command window. So the client system enter the IP address of which system want to receive the file, that's IP address and the corresponding file to be send. Thus the file should be received in that server system. Next another

client system also transfer the file to the same server using that server system's IP address connected local area network. Then the message go through the shortest path system's IP address using an algorithm, dijkstra's algorithm.

1. DIJKSTRA'S ALGORITHM

In cooperative communication, dijkstra's algorithm is used for representing the size and distance of each node. This algorithm will assign some initial distance values and also calculate the distance from each node will try to improve them step by step as follows.

1. Assign to every node a tentative distance value: set it to zero for our initial node and to infinity for all other nodes.
2. Mark all nodes unvisited. Set the initial node as current. Create a set of the unvisited nodes called the *unvisited set* consisting of all the nodes except the initial node.
3. For the current node, consider all of its unvisited neighbors and calculate their *tentative* distances. For example, if the current node *A* is marked with a distance of 6, and the edge connecting it with a neighbor *B* has length 2, then the distance to *B* (through *A*) will be 6 + 2 = 8. If this distance is less than the previously recorded tentative distance of *B*, then overwrite that distance. Even though a neighbor has been examined, it is not marked as "visited" at this time, and it remains in the *unvisited set*.
4. When we are done considering all of the neighbors of the current node, mark the current node as visited and remove it from the *unvisited set*. A visited node will never be checked again.
5. If the destination node has been marked visited (when planning a route between two specific nodes) or if the smallest tentative distance among the nodes in the *unvisited set* is infinity (when planning a complete traversal), then stop. The algorithm has finished.
6. Select the unvisited node that is marked with the smallest tentative distance, and set it as the new "current node" then go back to step 3.

2. SECURITY

Security is important factor in internet while the message transferred from source to destination in a cooperative communication. Without security measures, we cannot work effectively and securely while entering data or message through internet because any one can access the data at any time. Here in this communication, all systems are mutually communication. Security is more important here. So, two ways to provide the security in wireless network. One is the sender system should choose which system the message should transfer, enter the system's username and password are given to sender system itself. Another one is that 802.IX authentication. This can help to enhance the security for both LAN and Wan network. In wireless network, this can be work with Wired Equivalent Privacy. This type of authentication is used when the system connected to a workplace network. This security measures can provide safety while transferring the message to a network.

VI. CONCLUSION

This paper discussed how the message sending from multiple systems using various IP addresses. Here, cooperative communication plays an important role in wireless network. The goal is to improve the network performance, low time delay, high reliability etc. The existing paper discusses how the messages transmitting in a single system using decode and forward method. So, here proposed a dijkstra's algorithm is used for determining the shortest path nearest neighboring systems to send data from source to destination easily. By using this type of algorithm, time should not be delayed. And some security measures is to used for transferring the message to this type communication in a network. Without security in cooperative communication, we cannot work effectively and securely.

REFERENCES

[1] Q. Guan et al., "Capacity-Optimized Topology Control for MANETs with Cooperative Communications," IEEE Trans.
Wireless Communication. July 2011.

[2] Y. Wei, F. R. Yu, and M. Song, "Distributed Optimal Relay Selection in Wireless Cooperative Networks with Finite-State Markov Channels," IEEE Trans. Vehicle. Tech., vol. 59, June 2010.

[3] K. Woradit et al., "Outage Behavior of Selective Relaying Schemes," IEEE Trans. Wireless Commun., ,2009.

[4] J. Laneman, D. Tse, and G. Wornell, "Cooperative Diversity in Wireless Networks: Efficient protocols and Outage Behavior," IEEE Trans.,2004.

[5] Aria Nosratinia,Todd E. Hunter, Ahmadreza Hedayat "Cooperative Communication in Wireless Networks," IEEE Trans 2004.

[6] M. Burkhart et al., "Does Topology Control Reduce Interference?," Proc. 5th ACM Int'l. Symp. Mobile Ad Hoc Networking and Computing, May 2004.

[7] Carlos A. S Oliveira, Panos M. Pardalos "An Optimization Approach for Cooperative communication in Ad Hoc Networks," IEEE 2005.

[8] Quansheng Guan, Shengming Jiang, Senior Member "Impact of Topology control on capacity of Wireless Ad hoc Networks", IEEE 2008.