ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Self Re-Directed Manets in Wireless Mesh Networks

Gannapu Uday Narasimha
M.Tech Student
Department of ECE
VBIT College, Hyderabad, Telangana.

S. A Mansoor
Assistant Professor
Department of ECE
VBIT College, Hyderabad, Telangana.

Abstract: ***Wireless mesh networks have emerged as a key technology for next-generation wireless networking. Because of their advantages over other wireless networks, WMNs are undergoing rapid progress and inspiring numerous applications. The advanced version of basic WMN is MANET. This concept is basically useful when there is a very high link failure due to migration of nodes from the available network region. There is a frequent link failure in adhoc networks, which causes packet to be lost or packets doubts to reach destination. In this scenario a different mechanism and scheme is proposed and implemented to make the important time critical data like real time or voice data to reach the destination without any loss. The mechanism used is a special propagation which propagates a unique kind of parallel route discovery for real time application scenario to send the time critical data safely. The scheme used is temporary parallel route recovery builds a temporary parallel path between the nodes during link failure. This paper presents self-directed network Reconfiguration System that enables a single-radio MANET to self-dejectedly recover from local link failures to preserve network performance.***

Keywords: WMN, MANET, Reconfiguration, Link failure.

1 INTRODUCTION

1.1) Wireless Networks

Wireless networks provide unprecedented freedom and mobility for a growing number of laptop and PDA users who no longer need wires to stay connected with their workplace and the Internet. Ironically, the very devices that provide wireless service to these clients need lots of wiring themselves to connect to private networks and the Internet. This white paper presents a viable alternative to all those wires - the wireless mesh network.

1.2) Types of Wireless Networks

One of the unique features of wireless networks compared to wire network is that data is transmitted from one point to another through wireless links i.e. there is no need of wired link between the two nodes for transmission. They just need to be in the transmission range of each other. Wireless networks are divided into two categories. Infrastructure wireless network and infrastructure less or ad hoc wireless network.

1.3) Infrastructure Networks

Infrastructure network have fixed network topology. Wireless nodes connect through the fixed point known as base station or access point. In most cases the access point or base station or connected to the main network through wired link. The base station, or access point, is one of the important elements in such types of networks. All of the wireless connections must pass from the base station. Whenever a node is in the range of several base stations then it connect to any one of them on the basis of some criteria

1.4) Ad hoc Networks

Ad hoc networks also called infrastructure less networks are complex distributed systems consist of wireless links between the nodes and each node also works as a router to forwards the data on behalf of other nodes. The nodes are free to join or left the network without any restriction. Thus the networks have no permanent infrastructure. In ad hoc networks the nodes can be stationary or mobile. Therefore one can say that ad hoc networks basically have two forms, one is static ad hoc networks (SANET) and the other one is called mobile ad hoc networks (MANET). From the introduction of new technologies such as IEEE802.11 the commercial implementation of ad hoc network becomes possible. One of the good features of such networks is the flexibility and can be deployed very easily. Thus it is suitable for the emergency situation. But on the other side it is also very difficult to

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

handle the operation of ad hoc networks. Each node is responsible to handle its operation independently. Topology changes are very frequent and thus there will be need of an efficient routing protocol, whose construction is a complex task.

A wireless mesh network (WMN) is a communications network 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 wireless devices while the mesh routers forward traffic to and from the gateways which may but need not be connected 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.

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. In this way, the wireless mesh network differs from an ad-hoc network, since these nodes are often constrained by resources.
Nodes are composed of mesh routers and mesh clients. Each node operates not only as a host but also as a router, forwarding packets on behalf of other nodes that may not be within direct wireless transmission range of their destinations. A WMN is dynamically self-organized and self-configured, with the nodes in the network automatically establishing and maintaining mesh connectivity among themselves. Extend the range and link robustness of existing Wi-Fi's by allowing mesh-style multi-hopping. A user finds a nearby user and hops through it - or possibly multiple users - to get to the destination Every user becomes a relay point or router for network traffic Mesh networks consist of multiple wireless devices equipped with COTS802.11 a/b/g cards that work in ad-hoc fashion 802.11 capable antennas placed on rooftops allow a large area coverage .

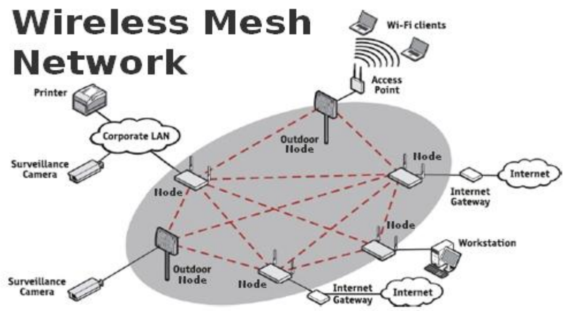

Fig.1 example wireless mesh network

2) System Analysis

2.1) Existing System

WIRELESS mesh networks are being developed actively and deployed widely for a variety of applications, such as public safety, environment monitoring, and citywide wireless Internet services.
First, resource-allocation algorithms can provide guidelines for initial network resource planning. However, even though their approach provides a comprehensive and optimal network configuration plan, they often require "global" configuration changes, which are undesirable in case of frequent local link failures.

Next, a greedy channel-assignment algorithm can reduce the requirement of network changes by changing settings of only the faulty link(s). However, this greedy change might not be able to realize full improvements, which can only be achieved by considering configurations of neighboring mesh routers in addition to the faulty link.

Third, fault-tolerant routing protocols, such as local rerouting or multipart routing, can be adopted to use network-level path diversity for avoiding the faulty links. However, they rely on detour paths or redundant transmissions, which may require more network resources than link-level network reconfiguration

2.2) Proposed System

This paper presented a self-directed network reconfiguration system (SRS) that enables a radio MANET to self-dejectedly recover from wireless link failures. SRS generates an effective reconfiguration plan that requires only local network configuration changes by exploiting channel, radio, and path diversity. Based on multiple channels and radio associations available, SRS generates reconfiguration plans that allow for changes of network configurations only in the vicinity where link failures occurred while retaining configurations in areas remote from failure locations.

Furthermore, SRS effectively identifies reconfiguration plans that satisfy applications' QoS constraints, admitting up to two times more flows than static assignment, through QoS aware planning. Next, SRS's online reconfiguaring allows for real-time failure detection and network reconfiguration, thus improving channel efficiency by 92%. Our experimental evaluation on a Linux-based implementation and ns2-based simulation has demonstrated the effectiveness of SRS in recovering from local link-failures and in satisfying applications' diverse QoS demands.

3) Modules:

- **Route Discovery**
- **Failure detection**
- **Route recovery/Network selection**
- **Reconfiguration system**

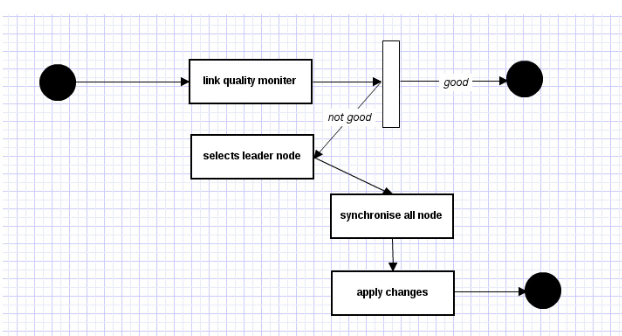

Fig2. Activity flow of SRS

3.1) Route discovery

Initially, all nodes collecting the data about neighbor nodes. The network monitors having the detailed information of neighbor nodes such as routing table. It provides the connection information to Route manager.

3.2) Failure detection:

The network monitor only provides the information about node details. Channel analyzer collecting detail about channel capability. Threshold analyzer comparing the default value and current value of signal and then it find the failure details

3.3) Route recovery & Reconfigure:

In this section the signal handoff is done with the knowledge of route plan. The route manager informs the channel fading. In this section, route recovery system analyzing the channel and radio switching details. In past link is capable of transferring packet then the route will established through the past link by using that radio and channel switching. If that switch is not possible then it will change the path

Algorithm

- Initialize the Monitoring period
- monitor the link Quality for each link
- Sending the monitored result to gateway
- Initialize failure detection period
- If there is any problem form the group
- Initialize planning period
- Select leader node and generate reconfiguration plan within the period
- Synchronize all nodes
- Change the link according to need

4) SRS theory model

4.1) Cross-layer interaction:

SRS actively interacts across the network and link layers for planning. This interaction enables SRS to include a rerouting for reconfiguration planning in addition to link-layer reconfiguration. SRS can also maintain connectivity during recovery period with the help of a routing protocol.

Algorithm describes the operation of SRS. First, SRS in every mesh node monitors the quality of its outgoing wireless links at each and reports the results to a gateway via a management message. Second, once it detects a link failure(s), SRS in the detector node(s) triggers the formation of a group among local mesh routers that use a faulty channel, and one of the group members is elected as a leader using the well-known bully

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

algorithm for coordinating the reconfiguration. Third, the leader node sends a planning-request message to a gateway. Then, the gateway synchronizes the planning requests—if there are multiple requests—and generates a reconfiguration plan for the request. Fourth, the gateway sends a reconfiguration plan to the leader node and the group members. Finally, all nodes in the group execute the corresponding configuration changes, if any, and resolve the group. We assume that during the formation and reconfiguration, all messages are reliably delivered via a routing protocol and per-hop retransmission timer.

4.2) Planning for Localized Network Reconfiguration:

The core function of SRS is to systematically generate localized reconfiguration plans. A reconfiguration plan is defined as a set of links' configuration changes (e.g., channel switch, link association) necessary for a network to recover from a link(s) failure on a channel, and there are usually multiple reconfiguration plans for each link failure.

Generating feasible plans is essentially to search all legitimate changes in links' configurations and their combinations around the faulty area. Given channels, and routes, SRS identifies feasible changes that help avoid a local link failure but maintain existing network connectivity as much as possible.

4.3) Controlling the scope of reconfiguration changes:

SRS has to limit network changes as local as possible, but at the same time it needs to find a locally optimal solution by considering more network changes or scope. To make this tradeoff, SRS uses a -hop reconfiguration parameter. Starting from a faulty link(s), SRS considers link changes within the first hops and generates feasible plans. If SRS cannot find a local solution, it increases the number of hops so that SRS may explore a broad range of link changes. Thus, the total number of reconfiguration changes is determined on the basis of existing configurations around the faulty area as well as the value.

4.4) Per-link Analyze:

Each and every feasible plan, SRS has to check whether each link's configuration change satisfies its bandwidth requirement, so it must analyze link bandwidth. To estimate link bandwidth, SRS accurately measures each link's capacity and its available channel airtime. In multi-hop wireless networks equipped with a CSMA-like MAC, each link's achievable bandwidth (or throughput) can be affected by both link capacity and activities of other links that share the channel airtime. Even though numerous bandwidth-estimation techniques have been proposed, they focus on the average bandwidth of each node in a network or the end-to-end throughput of flows, which cannot be used to calculate the impact of per-link configuration changes. By contrast, SRS estimates an individual link's capacity based on measured link-quality information—packet-delivery ratio and data-transmission rate measured by passively monitoring the transmissions of data or probing packets . Here, we assume that SRS is assumed to cache link-quality information for other channels and use the cached information to generate reconfiguration plans. If the information becomes obsolete, SRS detects link failures and triggers another reconfiguration to find QoS-satisfiable plans.

4.5) Breaking a tie among multiple plans:

Different reconfiguration plans can have the same benefit, and SRS needs to break a tie among them. SRS uses the number of link changes that each plan requires to break a tie. Although link configuration changes incur a small amount of flow, the less changes in link configuration, the less network disruption

5) Parameters analysis

5.1 Packet Delivery Fraction

The Packet Delivery Fraction is the ratio of the number of packets received by the destination to the duration of the packets generated

PDF=Number of packets received / duration of packets generate).

5.2) End-To-End Delay

Average end-to-end delay depends on the delay of data propagation, transfer, the delays caused by buffering, queuing and retransmitting data packets. The delay of each packet is computed as the time of received data packets minus the time of sent this data packet. The average end to end delay is computed as follows

Avg delay =Total delay/Total packets received.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Technique	PDF (kb/s)	Delay (ms)	Overhead (pkt)
DSDV	6.8	41	152
AODV	9.30	100	710
SRS	15.78	63	708

Table.1 performance comparison

Results:

We evaluated network layer based SRS algorithm in NS2. From the simulator we got two type of output, one is Nam window and another one is xgraph. The fig shows that animation model of route discovery and failure reconfiguration system. The fig shows that analyzing model of route failure reconfiguration with comparison of our SRS and existing system.

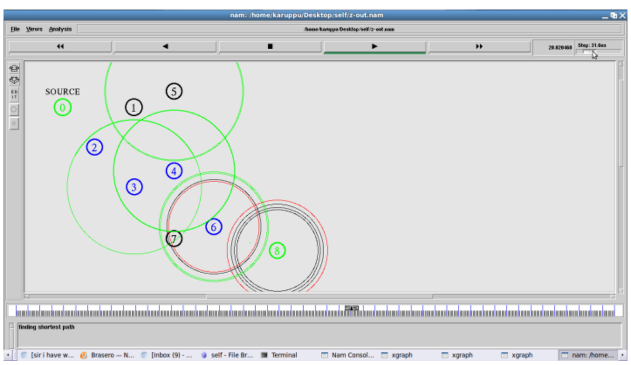

Fig.3 Nam window output

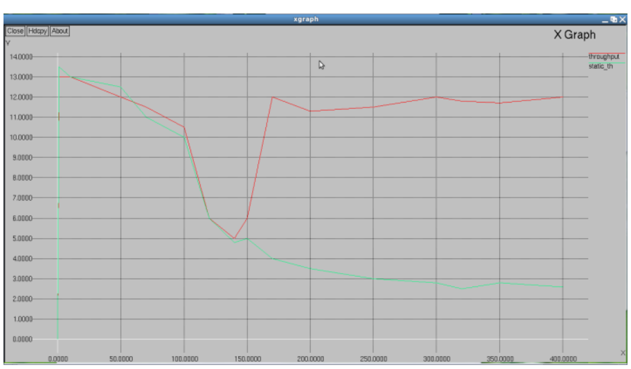

Fig.4 SRS Reconfiguration (red) and Existing System (green)

6) Conclusion

Self Re-Directed Manets network reconfiguration system (SRS) that enables a radio MANET to self-dejectedly recover from wireless link failures. SRS generates an effective reconfiguration plan that requires only local network configuration changes by exploiting channel, radio, and path diversity. Furthermore, SRS effectively identifies reconfiguration plans that satisfy applications' QoS constraints, admitting up to two times more flows than static assignment, through QoS aware planning. Next, SRS's online reconfigurability allows for real-time failure detection and network reconfiguration. Based on existing MAC, routing, and transport protocols, network performance is not scalable with either the number of nodes or the number of hops in the network. This problem can be alleviated by increasing the network capacity through using multiple channels/radios per node or developing wireless radios with higher transmission speed. However, these approaches do not truly enhance the scalability of WMNs, because resource utilization is not actually improved. Therefore, in order to achieve scalability, it is essential to develop new MAC, routing, and transport protocols for WMNs.

REFERENCES

[1] H. Adiseshu, G. Parulkar, and G. Varghese, "A reliable and scalable striping protocol", In SIGCOMM, 1996

[2] A. Adya, P. Bahl, J. Padhye, A. Wolman, and L. Zhou, "A multi-radio unification protocol for IEEE 802.11 wireless networks", in BroadNets

[3] M. Allman, H. Kruse, and S. Ostermann, "An application-level solution to TCP's satellite inefficiencies" In WOSBIS, 1996

[4] B. Awerbuch, D. Holmer, and H. Rubens, "High throughput route selection in multi-rate ad hoc wireless networks", Technical report, Johns Hopkins University, 2003

[5] P. Bahl, A. Adya, J. Padhye, and A. Wolman, "Reconsidering Wireless Systems with Multiple Radios", ACM CCR, Jul 2004.

[6] Bay area wireless users group. http://www.bawug.org/.

[7] S. Bhandarkar, N. Sadry, A. L. N. Reddy, and N. Vaidya, "TCP-DCR: A novel protocol for tolerating wireless channel errors", IEEE Trans on Mobile Comp,
Feb 2004.

[8] G. Bianchi. Performance analysis of the IEEE 802.11 distributed coordinated function. IEEE JSAC, 18(3):535–547, March 2000.

[9] J. Broch, D. A. Maltz, and D. B. Johnson, "Supporting hierarchy and heterogeneous interfaces in multi-hop wireless ad hoc networks", in Workshop on Mobile Computing at I-SPAN, 1999

[10] F. Cali, M. Conti, and E. Gregori, "IEEE 802.11 wireless LAN capacity analysis and protocol enhancement", in INFOCOM, 1998

[11] R. Chandra, V. Bahl, and P. Bahl. MultiNet: Connecting to multiple IEEE 802.11 networks using a single wireless card. In INFOCOM, 2004.

[12] C. Y. Chang, P. C. Huang, C. T. Chang, and Y.-S. Chen. Dynamic channel assignment and reassignment for exploiting channel reuse opportunities in ad hoc wireless networks. IEICE Trans on Comm, Apr 2003.

[13] K.-W. Chin, J. Judge, A. Williams, and R. Kermode. Implementation experience with MANET routing protocols. ACM CCR, Nov 2002.

[14] R. R. Choudhury and N. Vaidya. Impact of directional antennas on ad hoc routing. In PWC, 2003.

[15] D. De Couto, D. Aguayo, J. Bicket, and R. Morris. High-throughput path metric for multi-hop wireless routing. In MOBICOM, 2003.

[16]http://www.ijvspa.net/docs/IJVSPA20120404.pdf

[17]http://www.mashpedia.com/Wireless_mesh_network

[18]http://www.deccanwifi.com/mesh-technology.html