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Routing using Autonomous Network Reconfiguration System with Bandwidth Guarantees

Jeevabarathy Manivannan[1], Mathivanan Muthu[2]

Department of Information and Communication Engineering,
MNSK College of Engineering, Vallathirakottai, Pudukottai 622 305, India

Assistant Professor, Department of ECE,
MNSK College of Engineering, Vallathirakottai, Pudukottai 622 305, India

Abstract: ***This project 'Routing using Autonomous Network Reconfiguration System (ANRS) with bandwidth guarantees' focuses on a wireless mesh network (WMN) consists of a large number of wireless nodes. WMN has to support diversified multimedia applications for its users. It is essential to provide efficient Quality-of-Service (QoS) support in this kind of network. Seeking the path with the maximum available bandwidth is one of the fundamental issues for supporting QoS in the wireless mesh network. In real time application, the communication path usually consists of a succession of links, each with its own bandwidth. If any one of these links is much slower than it is called bandwidth bottleneck. So in this paper we propose a new path weight which captures the maximum available bandwidth path information. In case of link failures which are recovered by Autonomous network Reconfiguration System (ARNS) technique that allows to autonomously reconfiguring its local network settings. Finally routing can be performed with guaranteed bandwidth where the routing protocols should satisfy both optimality and consistency.***

Keywords: Wireless Mesh Network, Autonomous Network Reconfiguration System, Quality of Service, Link Failure

1. Introduction

Wireless mesh network (WMN) is the key technology for present generation in wireless networking for providing fast and hassle free services to users. Nodes in wireless mesh networks comprise 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 in within direct wireless transmission range.

Connectivity between nodes in wireless mesh networks is automatically established and maintained among the participating nodes. This makes wireless mesh network a dynamically, self-organized, and self-configured wireless network. This feature brings many advantages such as low installation cost, low cost in maintenance, robustness and reliable service coverage.

Wireless mesh networks can also be used in other applications such as broadband, Networking, community and neighborhood networks, enterprise networking building automation, etc Wireless mesh networks can be deployed one node at a time and they also have a capability of self-organization and self-configuring. Reliability and connectivity for the users of such networks increases significantly as more nodes are installed.

1.1Wireless Mesh Network Infrastructure

Wireless mesh network infrastructure is considered as the network providing cost effective and dynamic high bandwidth networks over a specific coverage area. Mesh architecture sustains signal strength by breaking the long distances into a series of shorter hops. Intermediate nodes not only boost the signal, but cooperatively make forwarding decisions based on their knowledge of the network, i.e. perform routing. Such architecture may with careful design provide high bandwidth, spectral efficiency, and economic advantage over the coverage area.

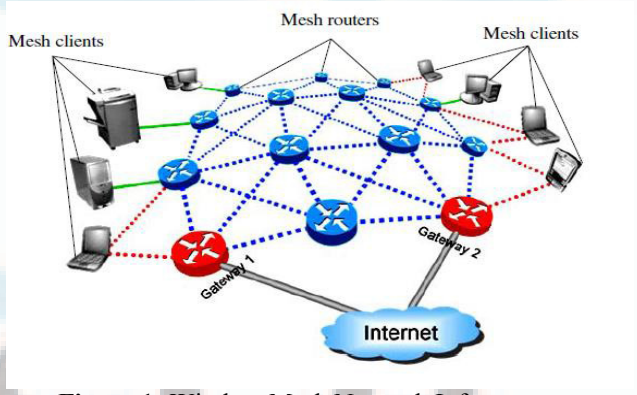

Figure 1: Wireless Mesh Network Infrastructure

The Wireless Mesh Network infrastructure is shown in the Figure 1.The Role of Access Points (APs) in WMN is it provides internet access to Mesh Clients (MCs) by forwarding aggregated traffic to Mesh Routers (MRs), known as relays, in a multi-hop fashion until a Mesh Gateway (MG) is reached. MGs act as bridges between the wireless infrastructure and the Internet. WMNs are comprised of two types of nodes: mesh routers and mesh clients.

2. Related Work

Generally Link failures are one of major issue in the networking area. So, that wireless information communication is the most promising and complicated field.

As wireless mesh networks are concerned these provides larger coverage's and high data rate information transfer. Even though they provide lot of benefits to the users and several high range applications they still suffer from the occurrences of the link failure.

A considerable amount of work has been done to solve the problems in WMNs and to build a healthy wireless network. Network reconfiguration needs a planning algorithm that keeps necessary network changes that is to recover from link failures as local as possible, as opposed to changing the entire network settings. And also the network change made autonomously when failure occurs.

These link failures will occur due to some interferences, different obstacles etc.. By this link failure the information transfer can be lost so the quality of communication cannot be achieved and also the performance of this Wireless Mesh Networks can low. So in order to recover from the link failures Autonomous Reconfiguration System is commonly used.

In environmental monitoring some links of a WMN may experience significant channel interference from other coexisting wireless networks. Some parts of networks might not be able to meet increasing bandwidth demands from new mobile users and data cannot reach to the destination within time due to link failures.

2.1 Existing Approaches

In Existing System, the packet can be routed on available path bandwidth between the intermediate routers .It also considers the interferences occur in the link. Static Protocol makes the packet forwarding in WMN. This protocol does not guaranteed the packet delivery and network performance in case of any link failures. If any link failures occur then the routing protocol made a manual changes to precede the further processing .When the packet will be lossed in the network it leads to degraded performances. So retransmission of packet be the major issues in existing system and that can be overcome in proposed system by different techniques and routing Protocols.

Already the following technique made some more changes in network but they fail to satisfy the markable performance in the networking bandwidth guarantee. Resource-Allocation Algorithm when the link failure occur the entire network configuration settings have to change to recover from these local link failures. Drawback of this method is when the local link failure occur we have to change the entire configuration settings time is inefficient in this method. Greedy Channel-Assignment Algorithm when the link failure occurs the acknowledgment will be send to the source. Source will transmit the data again in another path. Drawback of this method is when the link failure occurs the data have to be retransmitted from the source. Time is inefficient by using greedy method. Local rerouting or multipath 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. To overcome the above limitations ANRS is proposed. Throughput and efficiency is improved with guaranteed bandwidth.

3. Proposed Technique

The routing protocol used is OSPF. This Open Shortest Path First (OSPF) is an Interior Gateway Routing Protocol based on Shortest Path First (SPF) or link-state technology. OSPF is defined in RFC. OSPF was designed specifically for the TCP/IP Internet environment, and supports the following features like Authentication of routing updates, Tagging of externally-derived routes, Fast response to topology changes with low overhead, Load sharing over meshed links. And finally they should satisfy both consistency and optimality requirements. Optimality requirements made routing protocol and Consistency tends to packet forwarding. While this is in progress the link failure also occurred in WMN. This Project mainly proposed for link failure problem.

The link failure occurred means the packet will be rerouted to another path by carrying the widest path by using the ANRS technique. ANRS technique autonomously recovers the local link failures and enables the reconfiguration phase. By reconfiguration the packets will be delivered to the particular destination without the packet loss. And also we use Reconfiguration Planning Algorithm for further enhancements in order to achieve the higher Bandwidth.

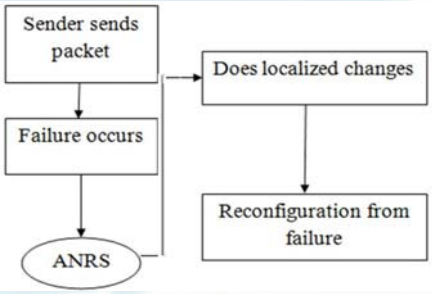

Figure 2: Overview of ANRS Technique

3.1 Overview of Algorithm

The algorithm used in ANRS technique is Reconfiguration Planning Algorithm. Why we need this algorithm is to improve and maintain the performance of ANRS and WMN in case of dynamic link failures in the network. To withstand failures by enabling MR WMNs and to autonomously reconfigure channels and radio assignments. This algorithm have different phases to monitor and recover the dynamic link failures in the network. The major phases are;

- Monitoring Period
- Failure Detection
- Planning Period
- Reconfiguration Period

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3.1.1 Monitoring Period

Monitoring is an important phenomenon when we consider the link failure. Generally monitoring is the basic operation involved in many link recovery algorithms. Monitoring period is used to monitor the links from which the information is started to the end of that period in the network that we considered.

3.1.2 Failure detection

After this link monitoring, the failure links are detected using the failure detector. Due to this link failure the packet dropping occurs. This packet loss occurred not only for link failure even they occur if the traffic exhibits some congestion.

3.1.3 Planning Period

The planning is here fully based on energy. And Energy is calculated for the neighboring nodes from the link failure occurred node. Then the node with highest energy is elected as an leader. It will send the request to the failure occurred node and then that node will generate the reconfiguration plan, send to the leader node. Finally the link failures are recovered and transmission continues through the leader node to the destination.

3.1.4 Reconfiguration Period

By using reconfiguration plan send to the leader node the changes to node are made. So that the changes are made to the links. The most important task carried out in this period is the changes must be made to link. Here the link recovery is based on the highest energy which is at the path in nearby distance.

4. Results Analysis

They are undergoing rapid progress and inspiring numerous deployments in WMNs will deliver wireless services for a large variety of applications in personal, local, campus, and metropolitan areas. But they should satisfy some more requirements based on the application. It is essential to provide QoS, guaranteed bandwidth, high Throughput, low cost, etc.

In this Project, We Propose new path weight that captures the maximum available bandwidth incase of failure packets. The Packet can be routed based on OSPF protocols which satisfy consistency and optimality .If the link failure occurred then the packet can be rerouted to another path using Autonomous Network Reconfiguration System in order to find the bandwidth of packet transferred in WMN.

Finally the performance of the system can be measured by parameters like throughput, delay, packet delivery ratio, guaranteed bandwidth etc. A high performance system achieved by high throughput, low delay, and high packet ratio compared to the existing system. And also by this technique we measure the each nodes involvement that is we found the flows taken by the each and every node in the network for the particular packet transmission. By finding each node flow we can able knows the traffic occurrence in each and every link of nodes involved.

So by this we will able to know which path is better for particular size packet transmission in order to get a high packet delivery ratio and high performance compared to the existing techniques. Obviously we will get the guaranteed bandwidth, high throughput, and high packet delivery ratio when router flow or the performance is known.

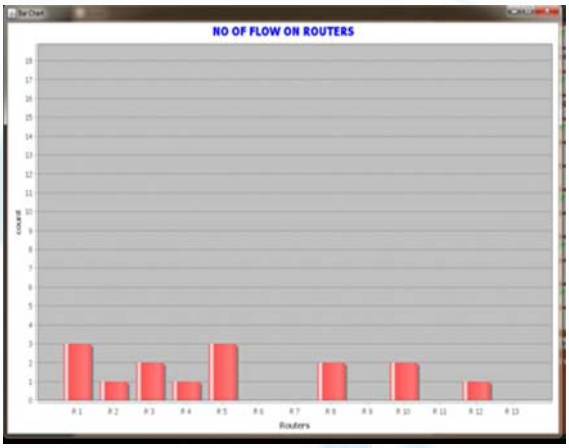

Figure 3: Router flow in the Network

So this system can also be implemented in Java platform. Figure 4 shows the maximum available bandwidth in a particular time period with ns-2 simulator.

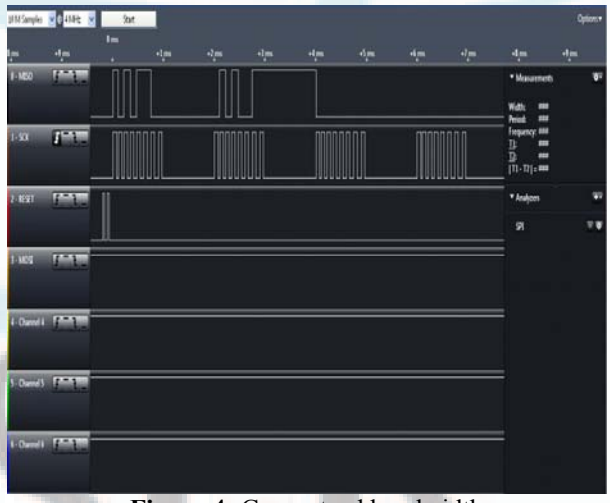

Figure 4: Guaranteed bandwidth

5. Conclusion

In this paper, the link failure recovery is considered as the main objective. It is done by using Autonomous Network Reconfigurable System with Reconfiguration Planning Algorithm. Even though it provides a lot of benefits still the router require more energy for every packet transfer. So Energy consumption can be considered as an issue for the future work. We can solve this energy consumption issue by preserving and fulfilling the demands of WMN. Mainly energy consumed because of the reconfiguration process. So it will be reduced for the high throughput. Then some

theoretical results need to be confirmed to enhance the scalability of Protocols. In order to overcome from these limitations, enhanced form will need.

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Author Profile

Jeevabarathy Manivannan received the undergraduate degree in Computer science and Engineering from Anna University Chennai in 2012 and currently doing her Postgraduate degree in Faculty of Information and communication engineering under Anna University Chennai. Her Area of Interest includes Computer Networks, Network Security.

Mathivanan Muthu received the undergraduate degree in Information Technology from Sastra University in 2006 and Postgraduate degree from Anna University Chennai in 2008. He has more than 5 years of teaching Experience. His area of interest includes High speed Networks, Mobile Communication, Adhoc Networks. He is currently working in MNSK College of Engineering, Pudukottai.