International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue 7, ISSN No. 2455-2143, Pages 87-91
Published Online May - June 2016 in IJEAST (http://www.ijeast.com)

OPTIMAL METHOD FOR SHARING INTERNET IN WIRELESS MESH NETWORK USING FIXED-BAND NON-SHARING, NON-FIXED-BAND NON-SHARING / SHARING ALGORITHMS

Palanivel.N
Assistant Professor
Department of CSE
Manakula Vinayagar Institute of Technology,
Puducherry – 605 107

Arun Prasath.A
UG Student
Department of CSE
Manakula Vinayagar Institute of Technology,
Puducherry – 605 107

Abstract – **Internet is crucial and should be universally accessible by everyone, and as such, there have been several initiatives aimed at enabling wider access to the Internet. Public Access Wi-Fi Service (PAWS) is one such initiative that takes advantage of the unused available capacity in the home broadband connections and allows Less-than-Best Effort access to these resources, as exemplified by Lowest Cost Denominator Networking. PAWS has been recently deployed in Nottingham, and, as other crowd-shared network, it faces limited coverage, since there is a single point of Internet access for every guest user whose availability is depended on the user sharing policies. To mitigate this problem and extend the coverage, here we use the crowd-shared wireless mesh network (WMN), at which the home routers are interconnected as a mesh. Such a wireless mesh network provides multiple points of Internet access and enables resource pooling across all available paths to the Internet. To coordinate the traffic redirections through the WMN, we deploy a software-defined Wireless Mesh Network (SDWMN). We further investigate the potential benefits of a crowd-shared WMN for public Internet access through a comparative study by separating control and data traffic over different spectrum using FB-NS, NFB-NS and NFB-S algorithms.**

Keywords— Wireless Mesh Network, Crowd shared network, spectrum allocation, and bandwidth

I. INTRODUCTION

The backbone of the wireless mesh network (WMN) is made up of dedicated wireless nodes called the mesh routers (MRs), which are configured in an ad hoc mode and use omni directional antennas, with one or multiple wireless radio interfaces that are based on IEEE 802.11 technologies. These Mesh Routers can be freely organized into any network topology, and made to communicate with each other with the help of protocols such as the Optimized Link State Routing (OLSR) protocol, Better Approach to Mobile Ad Hoc Networking (BATMAN), etc.. However, traditional WMNs are difficult to manage them and to upgrade because the configurations are made manually and are error-prone. It usually takes weeks or months to provide new services for service activation, test, and assurance. Furthermore, the mesh routers work in a self organized manner without a global view, leading to the poor network resource allocation and thereby low performance, usually in large-scale networks.

Software defined networking (SDN) is a promising network paradigm that effectively simplifies the network management. By decoupling control plane and the data plane, SDN ensures the flexible control and dynamic resource configuration with a global view of the entire network. In this way, network policies (for example, load balancing, access control, and fault tolerance) can easily be realized, and new services are rapidly and agilely deployed.

In this article, a novel architecture of software defined wireless mesh networks (SD-WMNs) is proposed providing internet services. A logically centralized controller maintains and has all of the network information available, and does global resource allocation. Software defined Mesh Routers make data forwarding according to the rules specified by the controller. Particularly, the Open Flow is used to implement complicated interactions between the controller and the software-defined Mesh Routers in wireless networks.

Then several critical challenges are summarized in SD-WMNs, such as spectrum isolation of the control and data planes, then status monitoring and collection, and congestion control. Although the SD-WMN is promising due to its global network knowledge and the centralized management, the frequent message exchange between the controller and the software-defined Mesh Routers can lead to high traffic load that would intensify transmission congestion in wireless networks. In order to improve the utilization of the resources, we have examined the traffic characteristics in SD-WMNs, and proposed three spectrum allocation and traffic scheduling algorithms, that is, Fixed-Bands Non-Sharing algorithm (FB-NS), Non-Fixed-Bands Non-Sharing algorithm (NFB-NS), and Non-Fixed-Bands Sharing algorithm (NFB-S) algorithms, to exploit the frequency and the spatial multiplexing. And finally, the performance and working of the proposed algorithms are evaluated by extensive simulation.

II. PROPOSED SYSTEM

First, we present the FB-NS algorithm (Fixed-Band Non-Sharing Algorithm). The idea is to allocate a fixed fraction of sub-bands to control traffic. In other words, among all B sub-bands, a· B sub bands can be used to transfer control traffic and the B sub-bands can be used to transmit data traffic. Although the FB-NS algorithm is simple and easier to deploy, its fixed spectrum allocation might lead it to low resource utilization because the traffic in Software Defined-WMN is uneven over the whole network. For example, the control traffic is busy on the links near the controller, and the data traffic is busy on the links closer to the gateway. In order to avoid congestion occur-ring in these busy links, we propose the NFB-NS (Non-Fixed-Band Non-Sharing) algorithm by relaxing the fixed spectrum allocation. Compared to the FB-NS algorithm, the NFB-NS algorithm does not specify spectrum partition. Also, when the traffic flows are scheduled in each link, the available sub-bands are selected freely for control traffic and data traffic with a higher priority given to control traffic. For example, in the link, the sub-band set is scheduled first for control plane; the other available sub-band set is then selected to carry data traffic over the data plane. On the other hand, control and data traffic flows cannot share the same sub-band, that is, they are transmitted in separated networks.

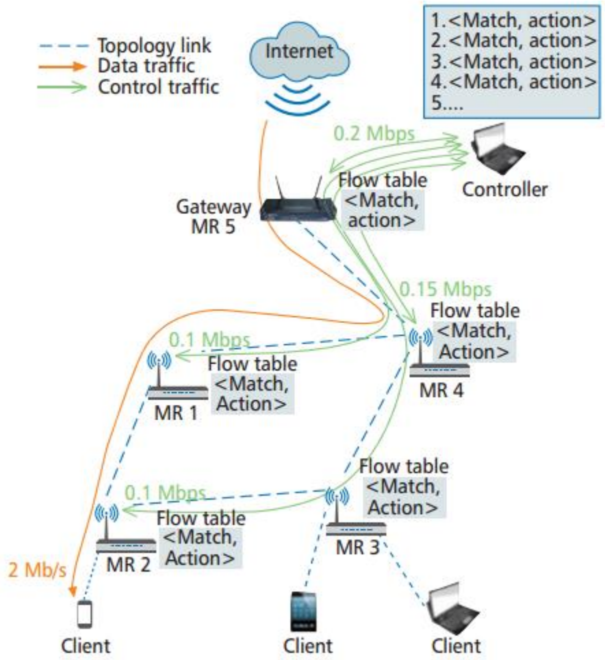


Fig. 1. Architecture of proposed work

Algorithms used

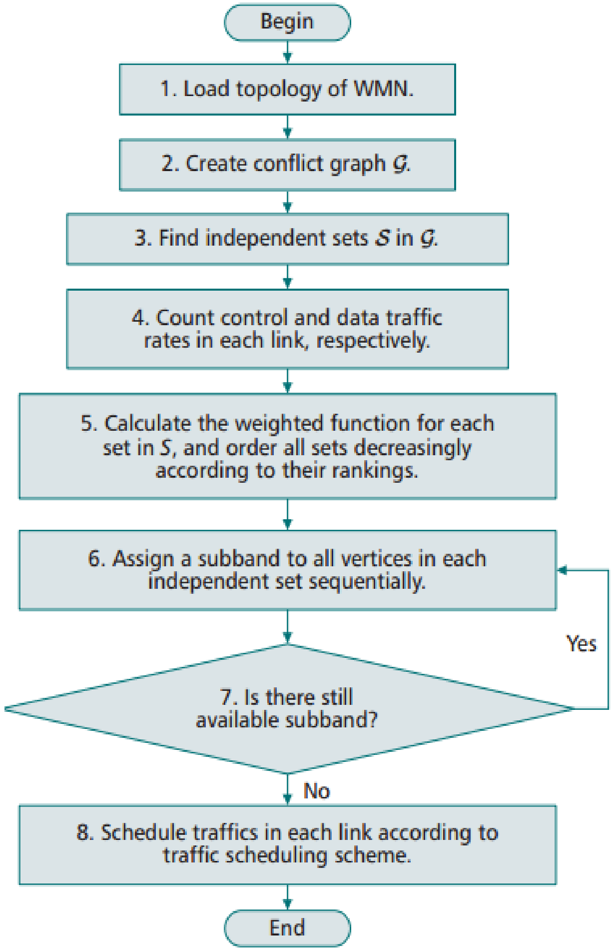
To take advantage of the coverage provided by a WMN, we develop and evaluate techniques for the redirection of guest user traffic during the periods that the home user does not permit the sharing of his broadband connection. In this case, Internet is accessed through the router of another home network where sharing is allowed. In the following, we present an algorithm for the assignment of the gateway and the path through which the traffic will be redirected through the Wireless Mesh Network. This algorithm will be executed by a SDN controller which is aware of the WMN topology and utilization, the Internet access links utilization, and the user sharing policies.

A. Gateway and Path Assignment

The algorithm assigns the gateway and the shortest path to each flow demand. The algorithm is executed whenever there is any insufficient shared bandwidth in the local home network. Initially the flow demands are sorted based on the flow rate in decreasing order. For every flow demand, the algorithm selects a home router with the highest access link bandwidth .Subsequently, the algorithm identifies the set of paths, Pug, between the local home router and the assigned gateway that satisfy the flow rate requirement.

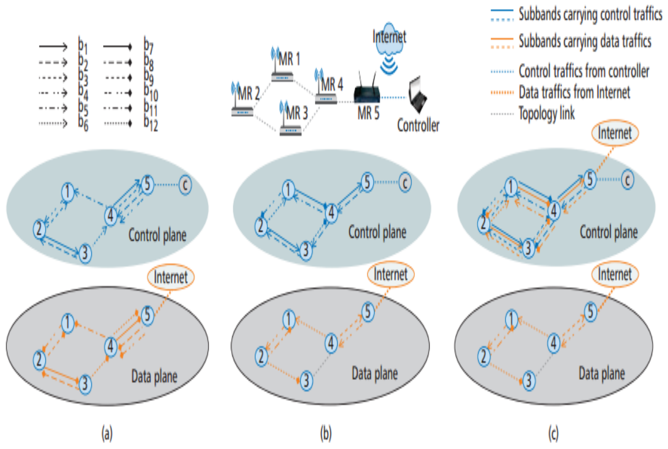
International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue 7, ISSN No. 2455-2143, Pages 87-91
Published Online May - June 2016 in IJEAST (http://www.ijeast.com)

B. Fixed-Bands Non-Sharing Algorithm



C. Non-Fixed-Band Non-Sharing Algorithm

Although the FB-NS algorithm is simpler and easy to deploy, its fixed spectrum allocation may lead to lower resource utilization because traffic in the Software Defined-WMN are not even over the entire network. For example, the control traffic is busy over the links closer to the controller, and data traffic is busy over the links closer to the gateway. In order to avoid congestion occur-ring in these busy links, we propose the NFB-NS algorithm by removing the fixed spectrum allocation.



a) Traffic scheduling in the FB-NS algorithm; b) traffic scheduling in the NFB-NS algorithm; c) traffic scheduling in the NFB-S algorithm.

Compared to the FB-NS algorithm, the NFB-NS algorithm does not specify spectrum partitioning. Additionally, when the traffic flows are being scheduled in each link, the available sub bands are selected freely for control traffic and data traffic. For example, in link (4, 1), sub band set b5 is first scheduled for the control plane, then the other available sub band set, b6, is then selected to carry data traffic in the data plane. However, the control and the data traffic flows cannot share the same sub band, because, they are transmitted over separate networks. For example, in link (5, 4), b2 can be exploited to transmit control traffic alone and not data traffic even though it has remaining capacity.

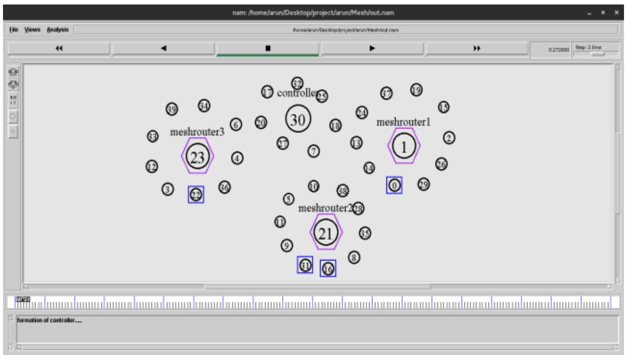
D. Non-Fixed-Band Sharing Algorithm

Since a sub band cannot be shared by control and data traffic after it has been allocated on the previous NFB-NS algorithm, its forwarding capability cannot be fully exploited when the traffic rate is less than sub band capacity. This motivates us to develop a sub band sharing algorithm to improve spectrum utilization. Compared to the NFB-NS algorithm, the NFB-S algorithm has the same rationale of spectrum allocation. The only difference is that, after satisfying the control traffic flows, if there is still available bandwidth remaining in each sub band, say b2 in link (5, 4) of Fig. c, the remaining bandwidth of b2 can be exploited to transmit data traffic.

III. EXPERIMENT AND RESULT

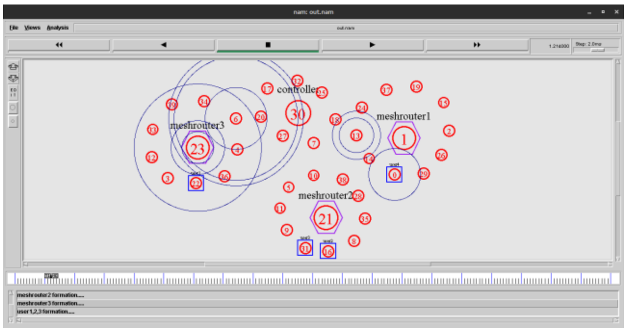
The test set for this evaluation of the wireless mesh network is done using Network Simulator 2. The system for the experiment has an Intel core i3, 2.4GHz Personal laptop and 2GB memory.

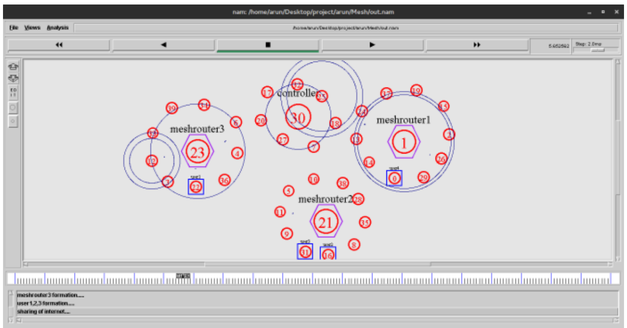
Formation of controller



The controller is formed with the three meshrouters. The three routers are having their own users. They are formed as a group.

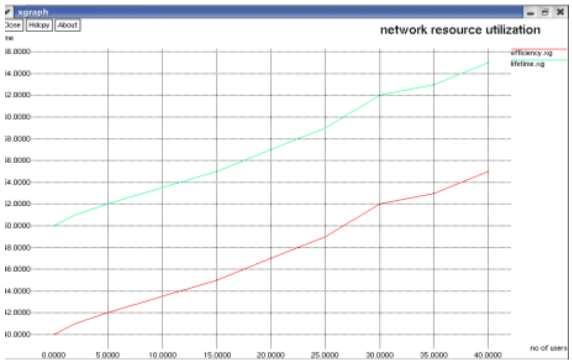
Network sharing by the users





The sharing of internet in the mesh networks with the help of meshrouters are shown in the above snaps. The users around various meshrouters are sharing the internet which is used to show the network utilization.

Network resource utilization graph



The graph is plotted between number of users and time of sharing the network. The green curve represents the efficiency of the network by sharing and red curve represents the lifetime of the network.

IV. CONCLUSION

Thus in this article, we have presented a novel architecture to establish the SD-WMN concept. The focus is also on how to address the challenges of building a separated control and data networks by spectrum division and avoiding the congestion that occurs in the shared medium. The three novel allocations of spectrum and traffic scheduling algorithms, namely, Fixed-Bands Non-Sharing, Non-Fixed-Bands Non-Sharing, and Non-Fixed-Bands Sharing, are proposed and evaluated by extensive simulations.

V. REFERENCE

[1] E. Kohler, R. Morris, B. Chen, J. Jahnotti, and M. F. Kasshoek, The Click Modular Router, ACM Transaction on Computer Systems, 18(3), 2000.

[2] N. McKeown et a!., OpenFlow: Enabling Innovation in Campus Net- works, ACM SIGCOMM CCR, 38(2), April 2008.

[3] B. Pfaff, J. Pettit, T. Koponen, K. Amidon, M. Casado, and S. Shenker, Extending Networking into the Virtualization Layer, ACM HotNets,New York, USA, October 2009.

[4] A. Sathiaseelan et a!., Public Access WiFi Service (PA WS), Digital Economy All Hands Meeting, Aberdeen, October 2012.

[5] A. Sathiaseelan, C. Rotsos, C.S. Sriram, D. Trossen, P. Papadimitriou, 1. Crowcroft, Virtual Public Networks, IEEE EWSDN, Berlin, Germany, October 2013.
[6] A. Sathiaseelan and J. Crowcroft, Internet on the Move: Challenges and Solutions, ACM SIGCOMM CCR, 43(1), January 2013.

[7] A. Sathiaseelan and T. Radzik, Reorder Detecting TCP, IEEE HSNMC, Estoril, Portugal, July 2003.

[8] A. Sathiaseelan and T. Radzik, Reorder Notifying TCP (RN-TCP) with Explicit Packet Drop Notification (EPDN), IJCS, Wiley, 19(6), September 2005.

[9] A. Sathiaseelan and J. Crow croft, LCD-Net: lowest cost denominator networking, ACM SIGCOMM CCR, 43(2), April 2013.

[l0] L. Suresh et al., Towards Programmable Enterprise WLANs with Odin, ACM SIGCOMM HotSDN, Toronto, Canada, August 2011.

[11] L. Townsend, A. Sathiaseelan, G. Fairhurst, C. Wallace, Enhanced broadband access as a solution to the social and economic problems of the rural digital divide, Journal of Local Economy, 28(6), 2013.

[12] K. Yap et a!., OpenRoads: Empowering Research in Mobile Networks, ACM SIGCOMM, Barcelona, Spain, August 2009.