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Review Paper on Spectrum Aware On-Demand Routing in Cognitive Radio Networks Technologies-A Survey

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ABSTRACT: With the rapid deployment of new wireless devices and applications, the last decade has witnessed a growing demand for wireless radio spectrum. However, the fixed spectrum assignnment policy becomes a bottleneck for more efficient spectrum utilization, under which a great portion of the licensed spectrum is severely under-utilized. The inefficient usage of the limited spectrum resources urges the spectrum regulatory bodies to review their policy and start to seek for innovative communication technology that can exploit the wireless spectrum in a more intelligent and flexible way. The concept of cognitive radio is proposed to address the issue of spectrum efficiency and has been receiving an increasing attention in recent years, since it equips wireless users the capability to optimally adapt their operating parameters according to the interactions with the surrounding radio environment. There have been many significant developments in the past few years on cognitive radios. This paper surveys recent advances in research related to cognitive radios. The fundamentals of cognitive radio technology, architecture of a cognitive radio network and its applications are first introduced. The existingworks in spectrum sensing are reviewed, and important issues in dynamic spectrum allocation and sharing are investigated in detail[1].

KEYWORDS*:* Cognitive radio (CR), platforms and standards, radio spectrum anagement, software radio, spectrum sensing, wireless communication**.**

I. INTRODUCTION

Low utilization and increased demand for the radio resource suggests the notion of secondary use, which allows licensed but unused parts of spectrum to become available temporarily. Cognitive Radio (CR) technology enables secondary users to sense, identify and intelligently access the unoccupied spectrum. The fundamental difference of Cognitive Radio Network (CRN) from traditional wireless networks is that there is no statically allocated spectrum, all traditional wireless devices work on certain fixed spectrum block while each device in CRN dynamically senses its *Spectrum Opportunity* (SOP), a set of frequency bands that are currently unoccupied and available for use. On-demand routing in multi-hop CRN faces several new challenges. First, as different nodes may work on different frequency bands, routing should be closely attached by spectrum assignment in order to find next hop nodes and determine frequency band. Second, SOPs of nodes may vary with time, which would change the network topology. Thus, an SOP exchanging and synchronization mechanism is required to find routes with communication potential, despite of SOP inconsistency. Third, switching frequency band incurs extra switching delay, while in the same band, traditional hidden-terminal and exposed-terminal problems occur, resulting in backoff delay. Facing the need of and switching for more utilization and less interference, and sharing a common band for connection between neighbors, our goal is to reach a balance between the two through on-demand routing and frequency bands selection. Similar research works were done in multi-channel networks to find effective routes and assign channels. Some are based on centralized algorithms for achieving optimized overall network performance. However, those proactive methods are based on previously-known global information. which is hard to obtain or update in Cognitive Radio Network (CRN). On-demand methods are also presented. They assume that the set of available channels is static and globally known by all, whereas CRN nodes individually detect their Spectrum Opportunities (SOP), which might be quite different from node to node. In this paper, we focus on the scenario of multi-hop CRN. Neither centralized spectrum allocation nor multi-channel routing fits for this scenario due to the lack of shared information. Borrowing the idea of on-demand routing in multihop networks, we propose a framework of spectrum aware on-demand routing with novel multi-flow multi-frequency scheduling, which models the impact of existing flows on route selecting. Simulation results shows that our approach outperform the similar routing algorithms[1][2][3].

II. RELATED WORK

In [1]Cognitive radio technology holds great promises in enabling unlicensed operation in licensed bands, to meet theincreasing demand for radio spectrum. The new open spectrum operation necessitates novel routing protocols to exploit the available spectrum opportunistically. In this paper we present SAMER, a routing solution for cognitive radio mesh networks. SAMER opportunistically routes traffic across paths with higher spectrum availability and quality via a new routing metric. It balances between long-term route stability and short-term opportunistic performance. SAMER builds a runtime forwarding mesh that is updated periodically and offers a set of candidate routes to the destination. The actual forwarding path opportunistically adapts to the dynamic spectrum conditions and exploits the link with the highest spectrum availability at the time. We evaluate SAMER through simulations, and show that it effectively exploits the available network spectrum and results in higher end-to-end performance.

In [2].Ad-hoc routing protocols with cognitive capabilities have been proposed which solves the problem of spectrum scarcity. It does it by intelligently allowing the unlicensed devices to opportunistically communicate in the available licensed spectrum, while ensuring that the performance of the licensed users is not affected. New emerging routing protocols is a taxing job due to variation in channel usage and channel accessibility by nodes in the network. In this paper, we discussed about adaption of On- Demand routing protocols for cognitive scenario by addressing their merits and demerits.

In [3].cognitive radio ad hoc networks (CRAHNs) are a class of cognitive radio networks. In recent years, they have gained popularity, and routing protocols have been proposed. Above all, the protocols based on on-demand routing are considered favorable in the literature. It is mainly because the accomplishments of ad hoc on-demand distance vector (AODV) routing and dynamic source routing (DSR) in mobile ad hoc networks have lead to a number of adaptations of both protocols to suit CRAHNs. In this paper, we review the on-demand routing protocols applicable for CRAHNs, which are based on AODV, DSR, and hybrid protocols. After explaining their basic principles, we qualitatively compare the protocols in terms of inherent characteristics and performance. This paper further addresses the pros and cons of routing protocols and discusses research challenges and open issues.

III. PROBLEM DISCUSSION

Cognitive radio technology has been proposed in recent years as a revolutionary solution towards more efficient utilization of the scarce spectrum resources in an adaptive and intelligent way. By tuning the frequency to the temporarily unused licensed band and adapting operating parameters to environment variations, cognitive radio technology provides future wireless devices with additional bandwidth, reliable broadband communications, andversatility for rapidly growing data applications. In this survey, the fundamental concept about cognitive radio characteristics, functions, network architecture and applications are presented, and then various research topics on cognitive radio networks are discussed. We start with the prerequisite requirement on deploying cognitive radio, i.e., spectrum sensing, and review different types of detection techniques and cooperative spectrum sensing protocols. In addition, recently proposed dynamic spectrum management and sharing schemes are reviewed, such as medium access control, spectrum handoff, power control, routing, and cooperation enforcement. The reviews provided in this survey article demonstrate the promising future of cognitive radio technology in terms of dynamic spectrum selectivity, high-speed seamless communications, and low deployment cost. Meanwhile, the intrinsic features of the new communication technology impose new challenges in the design of efficient spectrum management and sharing schemes . Researchers are expected to come up with novel solutions to higher spectrum efficiency enlightened by this survey.

In our study we want to suggest the mechanism for dynamically spectrum sensing ability of the switching component so that on the basis of spectrum sensing free spectrum amongst the intermediate node or destination node can be used. It will be useful in terms of cost cutting. Otherwise new spectrum must has to be arranged for this additional

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communication for value addition services. If spectrum sensing can be efficient then this type of technique can be used for local communication. But according to existing papers there can be various drawback of this type of technique. Because it will produces unnecessary delay. Unaware messages drop etc.

IV. PROPOSED WORK IN COMPARISON TO BASE PAPER

In base paper each time path identification requires spectrum inspection. This type of spectrum technique requires large time in knowing the spectrum frequency. It will put large delay. Various challenges these technique encounters like:

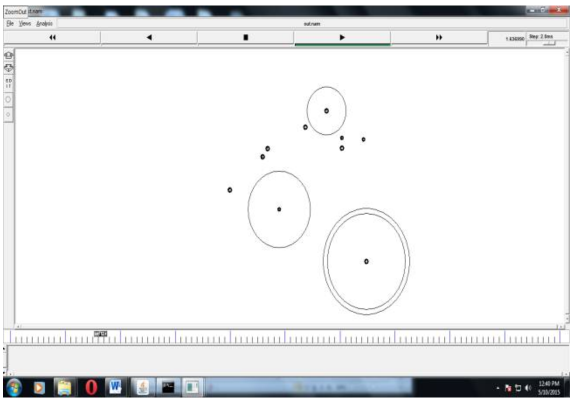
1. As different nodes may work on different frequency bands
2. Routing should be closely attached by spectrum assignment in order to find next hop nodes and determine frequency band.
3. SOPs of nodes may vary with time, which would change the network topology
4. Thus, an SOP exchanging and synchronization mechanism is required to find routes with communication potential.
5. despite of SOP inconsistency. Third, switching frequency band incurs extra switching delay

But in our technique we will buffer the frequency utilization pattern of each node. Pick that path based on identification of node and its freeness. Each time whole no. of nodes spectrum utilization need not to be known.it will reduces the time delay. This technique implementation has shown better results.

V. RESEARCH METHODOLOGY

1. we have taken 10 nodes network works wirelessly.
2. These networks lies under MANET and works under protocol as AODV.
3. We have considered the route from source to destination. It is considered There are multiple routes from source to destination.
4. While transferring packets spectrum awareness will be generated. This awareness will identify the free available spectrum.
5. Using this spectrum the data will be sent using this spectrum.
6. Each node has been considered to have specific delay and transfer rate.
7. During transfer of packet specific sized buffer will also be used for queuing. But beyond specific level node lies intermediate to communication starts dropping the packets.
8. Those packet which does not has acknowdgement will be considered to be dropped. In this situation that path will be stopped for a while for transmission of packet till its buffer get cleared.

VI. RESULTS AND DISCUSSIONS



Above Screen shot is the Animated output of tcl file. Once the tcl file will be compiled nam file will be generated. This nam file gives the output shown in in the output. In above 10 wireless node has been taken. These wireless nodes are

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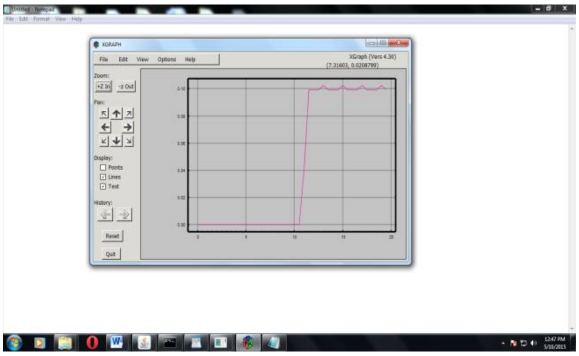
intercommunicating to each other. Using AODV route will be identified. For identifying the route, route request will be sent. Now in above two nodes has been taken such which does not belongs to actual network. They want to use the spectrum awareness of the existing nodes of the network. Once such nodes will be identified which are not using the spectrum allotted to them some other nodes can use the existing spectrum availability. And sent there own packets to transmit the data.



Once tcl code file using otcl and c++ is written tr(trace file will be generated. Later on using c++awk file will be written which will read tr(trace file) and generate xg file. This xg file has format of two column one for x-axis and other is y-axis.in graph we have taken two parameters one is time other is utilization. As time grows utilization also grows. This xgraph is the output display of those two parameters .time is along x-axis ,utilization along y-axis.

VII. IMPLEMENTATION REQUIREMENTS

For showing the implementation we have taken NS2 as network simulator. This network simulator will helps in showing the communication amongst various wireless nodes. These wireless nodes are using certain fixed frequency spectrum. This frequency spectrum is used for sending the data and receiving the data.

VIII. METHODOLOGY OF IMPLEMENTATION

We have taken few considerations:

1. There is a limited area wireless communication amongst various nodes.
2. For large amount of time the spectrum remain free.
3. Because it remain free will be underutilization of the network fixed spectrum.

IX. DISCUSSION

As we have implemented the concept of spectrum aware cognitive network. In this type of network we have considered 10 nodes. Eight nodes are working with there existing spectrum. 2 nodes want to use the existing spectrum. For it they want to generate the spectrum awareness such that using existing free spectrum in the existing network. They can send and receive the data. This technique is useful in utilization free spectrum for reducing the cost. In graph it has been shown that as network free spectrum will be used and the utilization will be increased. It will also increases the through put of the network.

X. CONCLUSION AND FUTURE WORK

In our implementation we have taken a wireless network working in specific spectrum range. Each node has the knowledge of each other node spectrum utilization rate. This will helps us in using that spectrum in that time period for value added services. It will increase the utilization of the frequency spectrum. This type of technique may be useful for making wireless local area. It also has less packet drop and less time back off.

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Future work:
In future work it can be further enhance the time awareness . such that spectrum utilization pattern with time can be developed. Which will further enhance the network efficiency.

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