ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

Energy Efficient Routing By Choosing Alternate Path Selection in Cognitive Radio Networks

T.Lamana[1], K.Karthikeyan[2]

PG Scholar, Department of EEE, SNS College of Engineering, Coimbatore, India

Assistant Professor, Department of EEE, SNS College of Engineering, Coimbatore, India

ABSTRACT: Spectrum efficiency and energy efficiency are two critical issues for wireless communication networks. In the past years, much effort has been made to enhance capacity of wireless communication networks via various technologies such as cognitive radio. Meanwhile, cognitive radio has emerged as a promising paradigm to improve the spectrum usage efficiency and cope with spectrum scarcity problem through dynamically detecting and re-allocating white spaces in licensed radio band to unlicensed users. In order to achieve this requirement, alternate path selection routing in cognitive radio networks is proposed that saves the energy by efficiently selecting the energy efficient path in the routing process. It investigates how a CR user senses multiple channels and determines the optimal transmission duration and power allocation. When performing optimization, take energy efficiency, throughput, and interference with the primary users into consideration and find a closed-form solution for transmission duration for chosen channels. It is shown that the proposed optimization approach significantly improves energy efficiency and throughput of CR networks. The proposed work is simulated through the NS2 Simulator.

KEYWORDS: Energy Aware Routing, Battery Aware Routing, cognitive user, Hop by Hop Retransmission, Reliability, and Cognitive radio Networks**.**

I. INTRODUCTION

Cognitive Radio (CR) is one of the new long-term developments taking place and radio receiver and radio communications technology. After the Software Defined Radio (SDR), which is slowly becoming more of a reality, cognitive radio (CR) and cognitive radio technology will be the next major step forward enabling more effective radio communications systems to be developed. A cognitive radio is a form of wireless communication in which a transceiver can intelligently detect which communication channels are in use and which are not. It instantly moves into vacant channels while avoiding occupied ones. Cognitive radio networks is new type of network, it's transmission or reception parameters are concurrently changing in a given spectrum. It changes path messages dynamically using co –operative diversity. In some instances it may be necessary to use software defined radio, so that it can reconfigure itself to meet the optimal transmission technology for a given set of parameters. Accordingly Cognitive radio technology and software defined radio are often tightly linked.

A **.***Functions of cognitive radio networks*

- Power control
- Spectrum sensing
- Transmitter detection

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

- Wideband spectrum sensing

B .*Cognitive radio architecture*

In addition to the level of processing required for cognitive radio, the RF sections will need to be particularly flexible. Not only need to swap frequency bands, possibly moving between portions of the radio communications spectrum that are widely different in frequency, but also need to change between transmission modes that could occupy different bandwidths.

Infrastructure Architecture

In the Infrastructure architecture, a MS can only access a BS/AP in the one hop manner. MSs under the transmission range of the same BS/AP shall communicate with each other through the BS/AP. Communications between different cells are routed through backbone/core networks. The BS/AP may be able to execute one or multiple communication standards/protocols to fulfill different demands from MS. A cognitive radio terminal can also access different kinds of communication systems through their BS or AP.

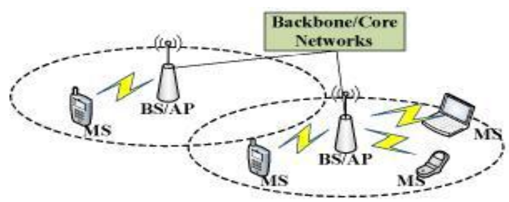

Figure 1.1 Infrastructure architecture

Ad-hoc Architecture

There is no infrastructure support (or defined) in ad-hoc architecture. If an MS recognizes that there are some other MS nearby and are connectable through certain communication standards/protocols, they can set up a link and thus form an ad hoc network. Note that links between nodes may be set up by different communication technology. Two cognitive radio terminals can either communicate with each other by using existing communication protocols (e.g. WiFi, Bluetooth) or dynamically using spectrum holes.

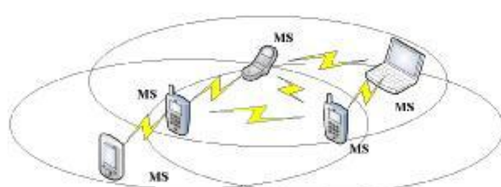

Figure 1.2 Ad hoc architecture

II. RELATED WORK

In[2]authors describe a framework for QoS support in such NGNs, Next Generation networks where multi-interface terminals are given end-to-end QoS guarantees regardless of their point of attachment. The framework supports media independent handovers, triggered either by the user or by the network, to optimize network resources distribution. This Framework not only flows are provided with service guarantees seamlessly, but also operators are given the ability to reconfigure the distribution of network resources to optimize performance. This framework does account for the challenges to be tackled in NGNs with a flexible and scalable solution.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

In [3], authors proposed a cognitive framework using an evolutionary algorithm, Swarm Intelligence, are proposed. This framework uses a novel approach that utilizes a cost function that chooses the optimal parameters to provide an adaptive quality of service (QoS) based on the user's needs. This approach ensures interoperability and scalability between different modulation techniques in the physical layer and enhances security against Denial of Service attacks such as jamming attacks and signaling attack. Modulations such as OFDM, W-CDMA, to evaluate real-time cognitive network are not incorporated in our present work.

In [4], authors proposed a framework for quality of service provisioning over the air interfaces in future wireless networks, including 3G enhancement and cognitive mobile networks. The framework is based on the paradigm of service classes, wherein each class can exhibit a characteristic behavior in terms of resource allocation over the air interface. In this approach the user application can choose the service class that best suits its expectations in terms of QoS and cost of access. But it may be necessary to restrict the number of classes of applications the user runs simultaneously.

In[5], authors proposed the idea of developing a novel QoS optimization architecture that will judge the user requirements and knowing peak times of services utilization can save the bandwidth/cost factors. The proposed architecture can be customized according to the network usage priorities so as to considerably improve a network's QoS performance. The concept will be refined by a field trial with real users after an initial test phase in controlled environments.

. In [6], authors analyzed that a system combining extensions of two radio access technologies, IEEE 802.11 and IEEE 802.16 cognitive requirements. Real-world use cases for such handovers include responding to applications, operators, or users asking for higher data rates, lower costs, higher quality of service, or improved traffic management, as well as to changes in mobility status or coverage. Voice call continuity (VCC) potentially applies to 802.16m/802.11 VHT handover. VCC increases network complexity. In this [6] paper, author proposed the QoS architecture and the corresponding QoS signaling protocols to be developed inside the IST project. QoS management of the system also described through the Policy–based Management System, and a Real-time Network Monitoring system able to aid in admission control with the results of active and passive measurements. Applicable to only limited set of available paths.

In[7] authors proposed the emerging requirements users are imposing upon the evolving world of heterogeneous cognitive mobile/wireless networks through their perception of final services. In particular the different concepts of adaptability, and service provision, which will respect users' aspirations and viewpoints, are considered primary with given priority for QoS requirements upon the heterogeneous cognitive networks. This model does not consider about updating this mapping as user-focused scenarios and requirements, as well as considering user perspective for the research integration.

In [8] authors address the problem of integration of these two classes of networks to offer such seamless connectivity. Specifically, he describes two possible integration approaches - namely tight integration and loose integration and advocates the latter as the preferred approach. Integrated 802.11/3G wireless data services support seamless inters technology mobility, Quality of Service (QoS) guarantees and multi-provider roaming agreements. The modifications to the proposed architecture are needed to support UMTS.

III. PROPOSED SYSTEM

Proposed system focuses based on end to end per packet energy consumption in Cognitive radio Networks. Sensor nodes in Cognitive Radio Network are constrained by their limited power, processing, memory resources and high

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

degree of mobility. In such networks, the wireless mobile nodes may dynamically join or leave the network topology. One of the main challenges in cognitive radio networks (CRNs) is the high energy consumption, which may limit their implementation especially in battery-powered terminals. In proposed system implements the alternate path selection to reduce energy in cognitive radio network. It has reduced energy consumption of the node by selecting node in other coverage area. Proposed Energy efficient routing for cognitive radio networks invokes the residual energy and hop count as parameters. In the routing process path with largest minimum residual energy and least hop count is chosen. Transmission power of the node is adjusted according to neighbor's range of the node. Proposed Energy efficient routing scheme using alternate path is compared with the existing protocols. This improves the lifetime of the nodes in the network. Quality of Service of the communication network is also improved by achieving the lesser end-to-end delay. Thus proposed routing scheme provides better lifetime and Quality of Service. Cognitive Radio technology is a promising solution to enhance the spectrum utilization by enabling unlicensed users to exploit the spectrum in an opportunistic manner. Since unlicensed users are temporary visitors to the licensed spectrum, they are required to vacate the spectrum when a licensed user reclaims it.

A. *Path Selection*

It specializes in a cellular cognitive radio network as the framework. Additionally, it is used to contemplate a replacement admission management as the way to boost the performance of the algorithmic program. It investigates the result of belongings users change by reversal base stations and show the ensuing power saving potency. Also, it demonstrates however a straightforward admission management algorithmic program will improve system performance in terms of power consumption, SIR levels, and network capability. The most purpose of this work is to introduce completely different tradeoffs which can be used to manage network performance in numerous situations. In real time, user will choose any style of application like as video occupation, voice occupation, web and e-transfer and so on, based on that the path will be selected.

B. Wireless Network Evolution Standards

The 3G to cognitive transition, supported by such technologies, can see a transition towards a pre-dominance of machine-driven and autonomously initiated machine-to-machine interactions. Such developments can after all be in the middle of in progress evolution of already anticipated 3G services, such as:

- Send/receive e-mail
- Internet browsing (information)
- On-line transactions (e-business)
- Location-dependent data
- Company information access
- Large-file transfer.

C. Customizing Parameters

Personal communications, information systems, broadcast and entertainment will have merged into a seamless pool of content available according to the user's requirement. The user will have access to a wider range of services and applications, available conveniently, securely and in a manner reflecting the user's personal preferences. The customizing parameters checks the coverage area whether the data transmission is possible or not otherwise it will choose the alternate path in other coverage area. The customizing parameters are energy and hop count as parameters.

D. Network Selection

Network selection in a heterogeneous all-IP wireless network environment depends on several factors. The WNSF is triggered when any of the following events occur: (a) a new service request is made; (b) a user changes his/her preferences; (c) the MT detects the availability of a new network; (d) there is severe signal degradation or complete

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

signal loss of the current radio link. Parameters (attributes) used for the WNSF include the signal strength (S), network coverage area (A), data rate (D), service cost (C), reliability (R), security (E), battery power (P), mobile velocity (V), and network latency (L).

E. Spectrum formula technique

Input*:* Rank lists α1, α2, α3, αn of m networks from the set N corresponding to each of the n parameters.
Output*:* an optimally ordered list N (). (Rank)
Begin initialize Sort respective lists α1, α2, α3, αn
Assign a position score for each network in each of the n lists.
Check the parameter for each and every value
For j = 1 to m
For x = 1 to n
Sx (j) = the number of networks whose score of parameter x is ranked below j in αx
end for
end for
sort N (j) of values in decreasing order where j = 1 to m

IV. SIMULATION RESULTS

A. Path selection and wireless network evolution standards

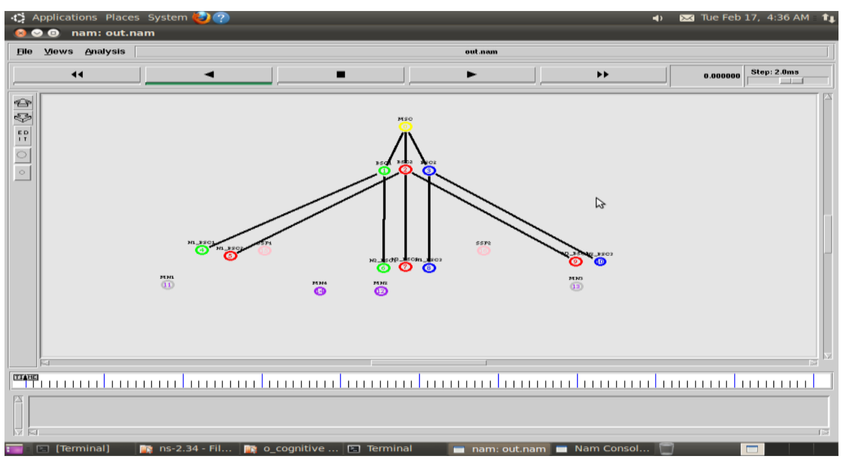

Figure 4.1 Path selection and wireless network evolution standards

Initially, Source node is ready to send the data packet by selecting the path in cognitive radio network. It checks whether it has same coverage or not. Whether it has the same coverage it will send the data packets directly. Based on the network standard path will be selected for the efficient data transmission as shown in figure 4.1. It specializes in a cellular cognitive radio network as the framework. Additionally, it is used to contemplate a replacement admission management as the way to boost the performance of the algorithmic program. It investigates the result of belongings users change by reversal base stations and show the ensuing power saving potency. Also, it demonstrates however a straightforward admission management algorithmic program will improve system performance in terms of power consumption,

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

B. Customizing Parameters

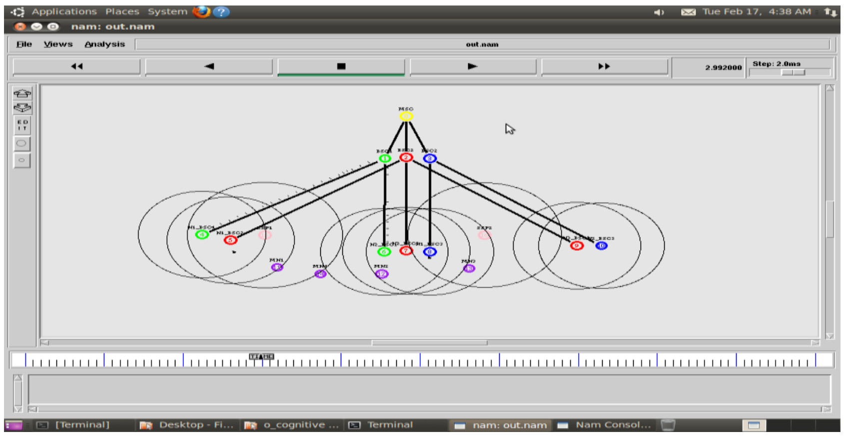

Figure 4.2 Customizing parameters

After selecting the path, source node start to send the data packets. Only node in the path has maximum energy it will send the data packets. If energy level of the node in the path will be decreased then it will select the other path in other coverage area as shown in figure 4.2. The colors green, red, blue indicate the three different base stations with different coverage area. The mobile nodes makes routing based on coverage area. The yellow color indicates of the master of the base station. The customizing parameters checks the coverage area whether the data transmission is possible or not otherwise it will choose the alternate path in other coverage area.

C. Network selection

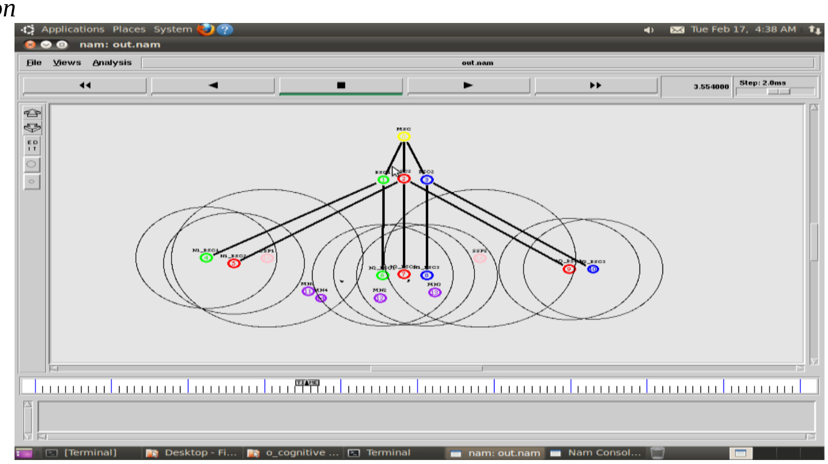

Figure 4.3 Network selection

If source and destination node have same coverage then it will send packets from source to destination. By selecting other coverage area path it has conserved the energy level of the node in cognitive radio network as shown in figure 4.3.When the mobile nodes are not within that coverage area ,It will select the routing path in other coverage area with minimum number of hop counts it leads to energy efficient routing.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2015

V. CONCLUSION

Energy efficient routing which proposed for cognitive radio networks invokes the residual energy and hop count as parameters. In the routing process path with largest minimum residual energy and least hop count is chosen. Transmission power of the node is adjusted according to neighbor's range of the node. Proposed Energy efficient routing scheme using alternate path is compared with the existing protocols. This improves the lifetime of the nodes in the network. Quality of Service of the communication network is also improved by achieving the lesser end-to-end delay. Thus proposed routing scheme provides better lifetime and Quality of Service.

REFERENCES

[1]Satish Anamalamudi, Chang Liu, and Minglu JIN "Energy Efficient CCC based AODV Routing Protocol for Cognitive Radio Ad-Hoc Networks Journal of Communications Vol. 9, No. 2, February 2014.

[2]M. Cesana, F. Cuomo, and E. Ekici, "Routing in cognitive radio networks: Challenges and solutions," *Ad Hoc Networks*, vol. 9, no. 3, pp. 228-248, May 2011.

[3] G. Cheng, W. Liu, Y. Z. Li, and W. Q. Cheng, "Joint on-demand routing and spectrum assignment in cognitive radio networks," in Proc. IEEE International Conference on Communications, June 24-28, 2007, pp. 6499-6503

[4] M. Kamruzzaman, E. Kim, and D. G. Jeong, "Spectrum and energy aware Routing Protocol for cognitive radio Ad Hoc networks," in Proc. International Conference on Communication, IEEE, June5-9, 2011, pp. 1-5.

[5] T. Chen, H. G. Zhang, G. M. Maggio, and I. Chlamtac, "CogMesh:A cluster based cognitive radio network," in Proc. 2nd IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks, April 17-20, 2007, pp.168-178.

[6]J. Zhao, H. T. Zheng, and G. H. Yang, "Distributed co ordination in dynamic spectrum allocation networks," in Proc. First IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks, Nov 8-11, 2005, pp. 259-268.

[7]J.Mitola"Cognitive radio for flexible mobile multimedia communications," in Proc. Sixth International Workshop on Mobile Multimedia Communications, San Diego, CA, 1999.

[8] K. Patil, R. Prasad, and K. Skouby, "A survey of worldwide spectrum occupancy measurement campaigns for cognitive radio,"in *Proc. International Conference on Devices and Communications (ICDeCom)*, Feb 24-25, 2011, pp. 1-5.

[9] S. Krishnamurthy, M. Thoppian, S. Venkatesan, and R. Prakash,"Control channel based MAC-layer configuration, routing and situation awareness for cognitive radio networks," in Proc. Military Communications Conference, IEEE, vol. 1, Oct 17-20,2005, pp. 455-460.

[10] F. B. Lo, "A survey of common control channel design in cognitive radio networks," Physical Communication, vol. 4, no. 1,pp. 26-39, March 2011.

[11] C. H. W. Oey, I. Christian, and S. Moh, "Energy- cognitive-radioaware routing in cognitive radio sensor networks," *International Journal of Distributed Sensor Networks*, 2012.

[12] H. Khalife, N. Malouch, and S. Fdida, "Multihop cognitive radio networks: to route or not to route," *Network, IEEE* , vol. 23, no. 4, pp. 20-25, July-August 2009.

[13] X. H. Zhang, T. W. Burress, K. B. Albers, and W. B. Kuhn, "Propagation comparisons at VHF and UHF frequencies," in *Proc. Radio and Wireless Symposium, IEEE*, Jan 18-22, 2009, pp. 244-= 247.

[14] P. Lee and G. Wei, "NS2 model for cognitive radio networks routing," in *Proc. International Symposium on Computer Network and Multimedia Technology*, Jan 18-20, 2009, pp. 1-4.