A Survey for CRN using AODV Routing Protocol

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ABSTRACT

Cognitive Radio Networks are a promising technology likely to be deployed in the very near future as a viable solution to the spectrum shortage problems faced by traditional wireless systems. Technological breakthroughs in the field of Software Defined Radios enabled the development of flexible cognitive radio transceivers capable of dynamically changing their transmission parameters in order to efficiently exploit the available wireless resources. This increased capability of cognitive radios to self adapt based on interactions with the surrounding environment makes them the perfect candidates for opportunistic spectrum access in those bands that are assigned to primary users. While these primary users are allowed to access their licensed spectrum resources anytime and anywhere, within the contractual limits imposed by spectrum management authorities, cognitive radios have to scan and identify any unused spectrum in the licensed bands. Most importantly, in order not to interfere with primary users, they have to rapidly vacate the licensed spectrum as soon as the primary user begins to use its legitimate spectrum resources. The coexistence of cognitive radios with such primary users is very challenging. When considering the natural evolution of cognitive radio networks to more complex systems, the challenges and problems to be faced increase substantially.

Keywords: - CRN, AODV, Routing Protocol.

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I. INTRODUCTION

TRADITIONALLY wireless networks have been operating based on fixed spectrum assignment policies. According to these policies, licensees are granted the rights for exclusive use of frequency bands on a long term basis over vast geographical areas. Because of this static allocation of the available spectrum resources, several portions of the licensed bands are unused or underused at many times and/or locations [1]. On the other hand, several recent technologies - such as IEEE 802.11, Bluetooth, Zig Bee, and to some extent WiMAX - that operate in the Industrial, Scientific and Medical (ISM) unlicensed bands, have experienced a huge success and proliferation. As a consequence, the wireless spectrum they are accessing - especially the 2.4 GHz ISM band - has become overcrowded. In an effort to provide further spectrum resources for these technologies, as well as to allow potential development of alternative and innovative ones, it has recently been proposed to allow unlicensed devices, called secondary users, to access those licensed spectrum resources that are unused or sporadically used by their legitimate owners,

called primary users. This approach is normally referred to as Dynamic Spectrum Access and the technology that enables secondary users to find and opportunistically exploit unused or underused spectrum bands is called Cognitive Radio [2].

II. COGNITIVE RADIO NETWORK

Cognitive Radio Networks have consequently emerged as viable architectural solutions to alleviate the spectrum shortage problem faced by traditional wireless networks [4,5] by exploiting the existing wireless spectrum opportunistically. However, when designing such solutions it is necessary to consider that, besides the strict requirements imposed by the opportunistic coexistence with Primary Users, Cognitive Radios may also have to deal with other malicious/selfish (adversary) Cognitive Radios that aim at denying/gaining access to the available spectrum resources with no regard to fairness or other behavioral etiquettes. This is possible because the same Software Defined Radio technology can enable adversary Cognitive Radios to significantly modify the perception that legacy Cognitive Radios have of the surrounding environment, resulting in suboptimal or interruption of operation for Cognitive Radio Networks.

III. ARCHITECTURAL SOLUTION

To tackle these issues we propose an architectural solution for Cognitive Radio Networks which uses network coding techniques for reliable control information exchange and enables Cognitive Radios to maintain up-to-date information regarding the network status and promptly react to wireless environmental changes. Its main features are: 1) a robust neighbor discovery algorithm able to guarantee fast and reliable network deployment; 2) a robust control channel for prompt control information exchange; 3) efficient cooperative detection of Primary Users' activity; 4) distributed allocation of the spectrum resources to Cognitive Radios for both single hop and multi hop Cognitive Radio Networks; 5) a spectrum aware cluster formation protocol that allows spectrum reuse and network scalability.

IV. MOTIVATION

The cognitive radio presents a very lucrative area of the research field. Inefficient spectrum utilization is the driving force behind cognitive radio and adopting it can lead to a reduction of spectrum scarcity and better utilization of the spectrum resources. Spectrum Sensing i.e. checking the frequency spectrum for empty bands forms the foremost part of the cognitive radio. There are number of schemes for spectrum sensing like energy detector and matched filter. But the former functions properly for higher signal to noise ratio (SNR) value whereas the latter's complexity is very high. These constraints led to implementing a detector which performed well under low SNR

conditions as well and with complexity not as high as the matched filter. Cyclostationary detector turned out to be the choice for such specifications.

V. LITERATURE OF REVIEW

Application of the standards like IEEE 802.11,TCP has explained in detail by M. Gandetto, C. Regazzoni and Goff, J. Moronski et al.

Two approaches have been advocated for CRNs . The first is based on the use of a synchronization window, while the second approach uses a specific common control channel for exchanging control information. Due to the difficulty in implementing centralized clocking among all the nodes in the first approach, the adoption of a common control channel is preferred in many MAC and routing schemes. The common control channel is usually a low-frequency reserved band chosen from the unlicensed pool, which covers long distances but, on the other hand, supports low rates. It can eliminate the synchronization problems that may arise from neighbors tuned to different.

The major requirements of a routing protocol was proposed by Tao Lin et al that includes minimum route acquisition delay, quick routing reconfiguration, loop-free routing, distributed routing approach. A review of Routing Protocols has been explained in detail by Changling Liu, Jorg Kaiser. Obviously, most of the routing protocols are qualitatively enabled. A lot of simulation studies were carried out in the paper to review the quantitative properties of routing protocols.

Elizabeth M. Royer and Sung- Ju Lee , "The effect of MAC protocols on Ad-Hoc network communication" University of California, Los Angeles New Orleans, LA, June 2000.

Sung- ju Lee et. all Investigated simulating the performance of three ad hoc routing protocols when run over different MAC protocols. It is determined that the choice of MAC layer protocol does, in fact, affect the relative performance of the routing protocols and concluded that proactive protocols act identically with different Media Access Control protocols.

Yao Zhao "A Multiple Access Protocol with Collision Avoidance and Multi- CTS Candidates for Multi-channel Ad-hoc Networks" University of Computer Science and Technology Beijing, China june 2000 . [9]

Yao Zhao et. all proposed a new MAC protocol for multi-hop ad hoc networks, which combines the CSMA/CA and Multi-channel techniques. And they call it Multiple Access with Collision

Avoidance and Multi-CTS Candidates (MACA-MCC). By round robin searching scheme, MACA-MCC adequately utilizes the limited channels, and makes itself collision free.

Ibrahim Amadou et, all gave good summery of the work in high congestion wireless networks with evaluation the performance and characterize these solutions when they are used to reserve the wireless channel through broadcasting message for reader-to-tag communication. If the most important criteria for the application is to give equal access time to readers, SIFT should be chosen none of the MANETs CSMA approaches improves all criteria at the same time.

Mojtaba Razfar and jane dong, "Empirical Study of Mobility effect on IEEE 802.11 MAC protocol for Mobile Ad- Hoc Networks" Department of Electrical and computer Engineering California State University Los Angeles .[11]

Mojtaba Razfar et. all presented the performance of IEEE 802.11 MAC protocol under various mobility patterns for different network topologies. illustrated that the performance of the network improves as the traffic decreases when a sufficient transmission ranges of nodes is provided, The RTS/CTS handshaking method demonstrated its efficiency on the mobile nodes when the number of collisions becomes more and more.

Michele Garetto and Theodoros Salonidis, "Modeling Per-flow Throughput and Capturing Starvation in CSMA Multi-hop Wireless Networks "Department of Electrical and Computer Engineering Rice University, Houston, TX 77005 1996. [12]

This paper shows that the fundamental cause is not merely differences in the number of contending neighbors, but a generic coordination problem of CSMA-based random access in a multi-hop environment they develop a new analytical model that incorporates this lack of coordination, identifies dominating and starving flows and accurately predicts per-flow throughput in a large-scale network.

Jun Peng and Liang Cheng, "A Wireless MAC Protocol with Collision Detection". IEEE Transactions on Mobile computing , vol.6, No.12, 2007 . [1]

Jun Peng et. all Gave The basic idea of the proposed protocol is the use of pulses in an out-of-band control channel for exploring channel condition and medium reservation and achieving both collision avoidance and collision detection. the proposed MAC protocol achieves outstanding throughput gains in Ad-hoc networks with hidden terminals.

Electromagnetic radio spectrum is one in every of the foremost scarce and precious resource. a set spectrum assignment strategy is follow by Wireless networks these days, by government agencies is that the use of that is licenced. as a result of numerous factors like quantity of traffic load on licenced users or geographical variations [1] for allotted spectrum getting used only intermittently or not in any respect This ends up in an outsized portion. for the licenced spectrum by the licenced or primary user (PU) Actual measurements by FCC [2] support this truth by showing a severe underutilization. as a result of restricted accessibility of radio spectrum and high inefficiency in its usage, new insights into the employment of spectrum have challenged the normal approaches to spectrum management. to harness the underutilized wireless spectrum by accessing it opportunistically to harness the underutilized wireless spectrum by accessing it opportunistically, This necessitates a replacement communication paradigm. This new communication technology is referred as Dynamic Spectrum Access (DSA) or cognitive Radio (CR). Derived from J.Mitola's doctoral thesis [4], a cognitive radio is associate degree intelligent wireless communication system that depends on timeserving communication between unauthorized or secondary users (SU) s over briefly unused spectral bands that are licenced to their PUs. The FCC suggests that any radio having reconciling spectrum awareness should be said as ―Cognitive Radio [5].

Sanjeev Khambra, Shivani Rao, " A Comparative Analysis of MAC Protocol in MANET" ISSN 2250-2459, ISO 9001: 2008 Volume 3, Issue 9,September 2013. [7]

Sanjeev Khambra et. all studied and analyze the standardize MAC Protocol this paper shows comparative analysis on different MAC protocol with varying node density, and comparison perform on the basis of performance metrics Throughput end to end dely.

Cognitive radio (CR) is an intelligent wireless communication system that is aware of its surrounding environment, learns from the environment and adapts its internal states to statistical variations in the incoming RF stimuli by making corresponding changes in certain operating parameters in real time. The term cognitive radio was first suggested by [Mitola 1999]. He defines the cognitive radio as a radio driven by a large store of a priori knowledge, searching out

The idea of the Cognitive radio Ad-hoc network was explained by I. Akyildiz, W.Y. Lee, K.R. Chowdhury. A number of extensive simulation studies on various CRNs routing protocols have been performed in terms of control, route discovery and route maintenance. However, there is a severe lacking in implementation and operational experiences with existing CRNs routing

protocols. The various types of mobility models were identified and evaluated by K.R. Choudhury, M.D. Felice et al because the mobility of a node will also affect the overall performance of the routing protocols. A framework for the ad hoc routing protocols was proposed by Tao Lin et al using Relay Node Set which would be helpful for comparing the various routing protocols like AODV, OLSR & TBRPF.

Chris Barrett et. all proposed three basic mobility models: Grid mobility model, Random way point model, and Exponential correlated Random model. The performance of protocols is measured in terms of quality of service measures including throughput, number of packets received and, long term decency.

Mojtaba Razfar et. all presented the performance of IEEE 802.11 MAC protocol under various mobility patterns for different network topologies. illustrated that the performance of the network improves as the traffic decreases when a sufficient transmission ranges of nodes is provided, Capturing Starvation in CSMA Multi-hop Wireless Networks "Department of Electrical and Computer Engineering Rice University, Houston, TX 77005 1996. [12] This paper shows that the fundamental cause is not merely differences in the number of contending neighbors, but a generic coordination problem of CSMA-based random access in a multi-hop environment they develop a new analytical model that incorporates this lack of coordination, identifies dominating and starving flows and accurately predicts per-flow throughput in a large-scale network.

VI. CONCLUSION

Cognitive radio technology has been proposed as an advanced solution towards more efficient utilization of the insufficient spectrum resources in an adaptive and intelligent way. The dynamic spectrum changing pattern of the devices enabled with cognitive radio capabilities makes routing a challenging job. In this paper, firstly the types of networks, that is infrastructure based and infrastructure less CRNs are discussed. Then the four main challenges for routing in CRN are discussed which are, Link Availability, Unidirectional Links, Network heterogeneity and Deafness Problem. In the sense of efficient routing in the CR environment, many routing protocols are used with their good or not so good results. Some of the routing protocols which try to provide an efficient and effective routing in CRNs are discussed in this paper, which are classified on their operations such as On demand routing, Local coordination based routing, Tree based routing, Spectrum aware routing and Multipath based routing. Then according to their

features, the summary of these routing protocols is presented in table format .Even though all these protocols are giving the better results, but these are using the routing metrics same as that of the previously used. Hence there is need to design new metrics which covers all the dynamic characteristics of CRNs and based on these metrics novel routing scheme should be presented.

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